A Bibliography of Publications on Floating-Point Arithmetic

Norbert Juffa
2445 Mission College Blvd.
Santa Clara, CA 95054
USA
Tel: +1-408-727-1885
FAX: +1-408-727-1265

E-mail: juffa@ira.uka.de (Internet)

Nelson H. F. Beebe
University of Utah
Department of Mathematics, 110 LCB
155 S 1400 E RM 233
Salt Lake City, UT 84112-0090
USA

Tel: +1 801 581 5254
E-mail: beebe@math.utah.edu, beebe@acm.org, beebe@computer.org (Internet)
WWW URL: https://www.math.utah.edu/~beebe/

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Introduction

This is a bibliography of material on floating-point arithmetic that I came up with while doing research on a floating-point package of my own. I don't claim it to be anywhere near complete. The material listed is only what I myself possess.

My main interest was in software based, binary floating-point arithmetic on a microprocessor, so you won't find much material about the hardware used in floating-point arithmetic (e.g. adders, carry propagation schemes, higher radix representation for multiplication and division, etc.) in this list. There is also not too much on non-binary floating-point arithmetic.

For most fields covered in this bibliography, the important or historically relevant articles should be included. There is also some material on integer arithmetic in this list as some of the methods used with integer arithmetic contain interesting ideas that may be useful in the realization of a floating-point arithmetic package.

Also, depending on the type of microprocessor used, one may need to implement integer multiplication and division for use in the floating-point package, so articles about this topic are included as well.

As I am German, there is a bit of material in German in this bibliography. However, English translations are provided for all non-English titles.

Thanks to the people who have helped me with previous versions of this document by sending me papers or additional references:

- Steven Sommars (`sesv@research.bell-labs.com`),
- Jim Kiernan (`jmk@teak.cray.com`),
- Warren Ferguson (`ferguson@seas.smu.edu`),
- Nhuan Doduc (`ndoduc@framentec.fr`),
- K. C. Ng (`kwok.ng@eng.sun.com`),
- Nelson H. F. Beebe (`beebe@math.utah.edu`).

Bibliography entries in the **Books** section are ordered alphabetically by author; ordering is by ascending year in the remaining sections.

Warning: it has yet not been possible to bring this citation list up-to-date with the entries in the BibTe

Books, hardware oriented

[1722, 282, 1287, 1217, 3119, 3325, 1917, 842, 1165, 1001, 1458, 844, 1344, 7338, 7339, 1558]

Books, software oriented or theory

[1274, 467, 470, 471, 119, 1421, 2399, 909, 1050, 353, 2960, 2440, 2977, 2276, 321, 528, 7192]

Books, machine specific

[2179, 3225, 3121, 2442, 1768, 1904, 2295, 1936, 2477]

Journal Publications, Conference Papers, Technical Reports, Ph.D. Dissertations, Book Contributions, etc.

1 Choice of base, floating point formats

[499, 751, 753, 731, 728, 894, 1142, 1132, 2037, 2273, 2397, 2550, 2778, 2792]

1.1 Precision and Rounding

[434, 559, 746, 848, 882, 897, 965, 1033, 1042, 1046, 1195, 1297, 1436, 1377, 1539, 1730, 2286, 2462, 2535, 2849, 3166, 3290]

1.2 Determination of parameters of floating point arithmetic

[687, 824, 1637, 2279, 2205]

1.3 IEEE standards for floating point arithmetic

[994, 1198, 1224, 1207, 1235, 1197, 1204, 1341, 1327, 1328, 1281, 1301, 1459, 1386, 1410, 1388, 1726, 1825, 1863, 1864, 1861, 2089, 2176, 2345, 2579, 3061]

1.4 Floating point arithmetic, general and implementation issues

[634, 720, 1015, 1036, 1084, 1096, 1095, 1237, 1239, 1211, 1275, 1267, 1476, 1494, 1993, 2013, 2221, 2222, 2378, 2452, 2355, 2534, 2779, 2780, 2708, 2777, 3019]

1.5 Floating point packages

[1288, 1701, 1680, 1774, 1732, 1885, 1850, 1886, 1968, 2082, 2105, 2208, 2304, 2305, 2306, 2485, 2486, 1353]

1.6 Floating point units

[417, 1154, 1321, 1279, 1331, 1355, 1324, 1350, 1271, 1316, 1325, 1499, 1541, 1498, 1534, 1557, 1663, 1577, 1579, 1580, 1681, 1611, 1608, 1616, 1643, 1717, 1619, 1790, 1777, 1717, 1758, 1787, 1719, 1798, 2009, 1971, 1999, 1965, 2018, 1957, 1950, 1951, 2132, 2084, 2157, 2251, 2280, 2313, 2256, 2282, 2257, 2188, 2217, 2326, 2268, 2218, 2293, 2467, 2413, 2414, 2438, 2328, 2449, 2411, 2408, 2320, 2430, 2469, 2369, 2329, 2450, 2334, 2570, 2505, 2525, 2565, 2520, 2497, 2568, 2551, 2542, 2666, 2775, 2738, 2965, 2878, 2948, 3105, 3055, 3196, 3357]

1.7 Test of floating point routines

[501, 1455, 1727, 1871, 1870, 2021, 2022, 1966, 2109, 2475, 2603, 2611, 2680, 2679, 2795, 2774, 2760, 3060]

2 Addition and Subtraction

[376, 1514]

2.1 Floating-point Summation

[326, 346, 363, 362, 571, 640, 678, 832, 1662, 2281, 2358]

2.2 Multiplication

[681, 1247, 1261, 1477, 1544, 1517, 1575, 1602, 1594, 1620, 1677, 1592, 1759]

2.3 Division

[209, 238, 223, 323, 349, 439, 1018, 1065, 1312, 1404, 1568, 1646, 1624, 1607, 1771, 1891, 2016, 1995, 2393, 2784, 2729, 2975, 3024, 7360, 2957]

3 Elementary functions, general

[385, 399, 587, 651, 616, 1123, 1266, 1628, 1657, 1757, 1720, 1718, 1795, 1841, 7279, 1946, 2053, 2158, 2101, 2283, 7298, 2566, 2603, 2553, 3344, 2555, 2524, 2704, 2857, 2668, 2819, 2820, 2697, 3377, 3345]

3.1 Elementary functions, CORDIC and related algorithms

[190, 191, 248, 264, 374, 524, 552, 660, 652, 668, 734, 856, 1069, 1085, 1294, 1452, 1700, 1898, 1709, 1812, 1964, 2163, 2387, 2316, 2547, 2573, 2723, 2817, 3018, 3013, 3136, 3076, 3122]

3.2 Elementary functions, function approximation

[240, 241, 482, 624, 769, 768, 984, 1022, 1163, 2001, 2054, 2616, 2692, 2790, 2791]

3.2.1 Polynomial evaluation

[259, 280, 305, 427, 1062, 1229, 2357]

3.3 Square root, general

[1083, 1188, 1482, 1599, 1652, 2571, 2684]

3.3.1 Square root, bit-oriented, iterative, and table methods of computation

[120, 153, 360, 1023, 1009, 1152, 1354, 1445, 1407, 1373, 1427, 1538, 1826, 1923, 1835, 1888, 1972, 1953, 2036, 1956, 2007, 2048, 2091, 2143, 2183, 2259, 2396, 2583, 2540, 2716, 3046]

3.3.2 Square root, Newton's method

[158, 281, 303, 375, 348, 344, 384, 452, 428, 514, 519, 533, 597, 586, 580, 582, 703, 1329, 1318, 1398, 1584, 2339, 3026, 2955]

3.4 Sine and Cosine

[180, 1069, 1019, 1024, 1177, 1399, 1545, 1667, 1666, 1766, 1854, 1954, 2124, 2235, 2612, 2969, 2966, 2888, 2988, 3082]

3.5 Logarithm

[154, 271, 332, 691, 999, 1113, 1300, 1530, 2110, 2111, 2613, 2742]

3.6 Exponential function

[141, 410, 1184, 1362, 1519, 1749, 1848, 2476, 2614, 3010]

3.7 Arctangent

[143, 160, 207]

3.8 Other transcendental functions

[500, 614, 161, 1025, 366, 276, 361, 2103, 1158, 2867, 3062]

4 Binary-decimal conversion

[189, 173, 222, 476, 577, 685, 1166, 1292, 1293, 1406, 1655, 1710, 2003, 1976, 2515, 2607, 2531, 2863]

5 BCD arithmetic

[675, 727, 778, 779, 780, 781, 782, 783, 784, 1383, 1493, 1706, 1641, 2039, 2652, 2968]

6 Multiple precision arithmetic

[293, 331, 411, 429, 633, 617, 954, 1003, 1100, 1099, 1266, 1351, 1431, 1543, 2812, 2796, 3041, 3232]

7 Conferences on computer arithmetic

[7218, 7228, 7233, 7242, 7245, 7258, 7276, 7277, 7319, 7349, 7357, 7351, 7383]

8 Additional contributions from Nelson H. F. Beebe

[121, 136, 169, 215, 298, 347, 368, 450, 753, 556, 849, 878, 922, 923, 975, 989, 1003, 1008, 1071, 1073, 1100, 1099, 1193, 1164, 1222, 1246, 1265, 1272, 1289, 1389, 1426, 1431, 1460, 1461, 7258, 1715, 1725, 1728, 1742, 1748, 1856, 1862, 1896, 1924, 1980, 2023, 2034, 2063, 2106, 2120, 2128, 2173, 2281, 2282, 2335, 2492, 7331, 2537, 2541, 2554, 2561, 2570, 2611, 2623, 7357, 2747, 2748, 2772, 2776, 2793, 2812, 2865, 2866, 2980, 3060, 3277, 208, 215, 216, 252, 283, 295, 307, 308, 312, 343, 363, 422, 441, 474, 493, 527, 571, 593, 617, 640, 711, 795, 828, 830, 846, 865],[898, 900, 905, 927, 948, 974, 976, 983, 985, 1017, 1064, 1072, 1253, 1284, 1358, 1431, 1438, 1462, 1465, 1560, 1565, 1625, 1639, 1648, 1649, 1704, 1745, 1785, 1789, 1808, 1809, 1814, 1816, 1833, 1844, 1845, 1937, 1969, 2014, 2025, 2100, 2145, 2174, 2190, 2255, 2270, 2285, 2307, 2366, 2377, 2381, 2463, 2487, 2493, 2538, 2585, 2599, 2662, 2673, 2709, 2753, 2804, 2868, 2936, 2942, 2976, 3002, 3010, 3045, 3098, 3106, 3184, 3198, 3201, 3245, 3288, 3335, 7189, 7226, 7234, 7243, 7244, 7269, 7281, 7278, 7324]

Title word cross-reference

#26 [5508].

$((2^n)^m)$ [3811]. $(10^{31}-1)/9$ [1977]. (2^m) [4366, 4387, 4571, 4580, 4485]. (2^n+1) [1082, 4804, 3924]. (2^n-1) [5023]. $(2^n-1, 2^{n+p}, 2^n+1)$ [6304]. $(2^n 2^q 1)$ [6106]. $(2^n \pm 1)$ [5535, 4152]. $(2m)$ [4450]. $(2n+3)$ [6563]. $(2n-(2p\pm 1))$ [4866]. $(a\cdot x)\cdot x?$ [6843]. (d,r) [790]. (M,p,k) [5827]. $(\mathcal{R})$ [2916]. (p) [4366, 4450].

$(x+y)*(x-y)$ [6711]. -2 [744, 183, 206, 950, 802]. $-\infty < n < +\infty$ [141, 160]. 0 [5655]. $0 < N < 1$ [161]. $0 \div 0$ [700]. **$1** [3753]. 1 [5003, 4359, 5168, 5656, 3707, 2169]. $1,000,000$ [619]. $1/\sqrt{x}$ [5798]. $1/t$ [2178]. 10 [531, 6037]. 116 [4034]. 128 [4872]. 15 [531]. 16 [2510, 4200, 4087]. 17×69 [3055]. 2 [1006, 4317, 2051, 5692, 3237, 4006, 619, 6070, 431, 4359, 5024, 3293, 3471, 1761, 3481, 3148, 3488, 5630, 3503, 531, 322, 3694, 3830, 4466, 3707, 5112, 3371, 4956]. $2,576,980,370,000$ [5657]. $22n+1$ [2150]. 256 [4453]. 27 [434]. $2^(n+1)+1\}$ [3983]. $2^{2n+1}-1$ [6052]. $2^{2n+2}-1$ [6052]. 2^{2q} [6042]. 2^8-1 [2863]. 2^k [4498, 5011, 5515, 5052, 5060]. 2^k+1 [867]. 2^{k-1} [4498]. 2^m [4572]. 2^n [1569, 6052, 3983]. 2^n+1 [3983, 5003, 5738, 4476]. $2^{n+1}-1$ [6553]. 2^{n+k} [6553]. $2^n-(2^{n-2}+1)$ [5355]. 2^N-1 [2995, 4839, 6553, 4229, 3983]. 2^q-3 [7059]. $2^q \pm 1$ [6042]. $2^q \pm 3$ [6042]. $2^x p^y \pm 1$ [6271]. 2×2 [5937]. 3 [378, 5005, 4194, 431, 4049, 4218, 4054, 5044, 4889, 322, 6240, 4133, 6637, 4953, 4954]. $3-j$ [299]. 32 [3999, 4453]. 3×3 [2499]. 4 [3983, 4331, 4675, 2527, 2528, 431, 3438, 5743, 5541, 4398, 4731, 2958, 4087, 4089, 2818, 3009, 1933, 3536, 3541]. **$49.95** [3720]. 5 [6042, 4816]. 54×54 [3495]. $6-j$ [299]. 64×64 [2284]. 8 [434, 3451, 4087, 3503]. 84 [308]. **$85.00** [4157, 4158]. 88062 [531]. $8k$ [6880]. 8×8 [5112]. $9-j$ [299]. $<$ [6248]. $>$ [6248]. $[0,1]$ [5168]. ^{0} [4372]. ^{2} [5756]. ^{4} [2803]. ^{5} [3911]. ^{e} [1160]. th [1160]. ^{TM} [4642]. $A(N+C)$ [1911]. $a+b$ [3650]. $a+b+c$ [6332]. $AB+CAB+C$ [6993]. $ab+cd$ [6121]. $ab+cd+e$ [7154]. $a\cdot(x\cdot x)$ [6843]. $A\cdot T$ [4080]. $\arctan Z$ [143]. $a\times b+c\times d$ [6332]. β [6363, 7104]. $C+AB^2$ [4296]. $c/\sqrt{(a^2+b^2)}$ [6313]. $\mathrm{CLP}(R)$ [2936]. $\cos^{-1}$ [3136]. $\cos N$ [180]. $\cos x$ [374]. $\cot^{-1} x$ [374]. d [4709, 5518, 3817]. Δ_2^0 [4957]. e [460]. e^n [141]. e^x [410]. ϵ [3484]. η_T [5684]. ηT [5260]. $\exp(x)$ [1362]. $\exp x$ [374]. $f(x)=0$ [1223]. G_α [810]. $\mathrm{GF}(2)[x]$ [5883]. $GF(2^m)$ [4420, 4788, 4403, 6071, 4990, 5446, 4921, 5887]. $\mathrm{GF}(2n)$ [4215]. $GF(p^m)$ [4667]. H [5185]. I^2L [3246]. ∞/∞ [5031]. K [5454, 4317, 5939, 2110, 6025, 6363, 5981]. $k<m$ [6363]. L [4359]. L^2 [5268]. L^∞ [5267, 7023]. l_2 [6081]. $\ln(x)$ [1530]. $\ln x$ [374]. $\log n$ [1229]. $\log Z$ [143]. LU [6831, 6585]. M [4853, 180, 4147, 2632, 2637, 2646, 2926, 5349, 582, 6363]. $M^E \bmod N$ [2783]. $\mathbf{F}_2[X]$ [7103]. $\mathbf{f}_{2^m}$ [4245]. $\mathbf{F}_{5^{5n}}$ [5702]. $\mathbf{F}_{7^{7n}}$ [5702]. $\mathbf{R}^n$ [6945]. $\mathbf{Z}^2$ [4075, 5051]. $\mathrm{GF}(2)$ [5323, 1693]. $\mathrm{GF}(2^4)^2$ [6186]. $\mathrm{GF}(2^{4\mathrm{n}})$ [3935]. $\mathrm{GF}(2^8)$ [6186]. $\mathrm{GF}(2^{\mathrm{k}})$ [4978, 3782, 4936]. $\mathrm{GF}(2^{\mathrm{m}})$ [5498, 4688, 4996, 3887, 4542, 5157, 3593, 4548, 3898, 5527, 2904, 2905, 3766, 4876, 5323, 5186, 4730, 4401, 5048, 2434, 5447, 4620, 4761, 4922, 5451, 3206, 4296, 4951, 4787, 2314]. $\mathrm{GF}(2^{\mathrm{n}})$ [5010]. $\mathrm{GF}(\mathrm{p})$ [2083]. $\mathrm{GF}(\mathrm{p}^{\mathrm{m}})$ [3499]. $\mathrm{GF}(\mathrm{p}_{\mathrm{k}})$ [4663]. $\mathrm{GF}(\mathrm{q}^{\mathrm{n}})$ [4711]. MECIPTI [283]. μ [1427, 4882, 4924, 2315]. μP [1611, 2009]. N [3978, 809, 2339, 2340, 160, 161, 180, 4591, 5084, 4942, 5981, 5704, 4175, 6081, 1295, 3634]. $n^{\text{ième}}$ [1160]. $N_0' = -N_0^{-1} \bmod W$ [4273]. $N \geq 32$ [5872]. $n\log(n)$ [6501]. $n \times n$ [3147]. $O(1)$ [6400]. $O(n)$ [1196, 3441, 1548]. $O(n^2)$ [2784, 2785]. $O(n\log n)$ [6550, 6702]. Ω [4938]. Arccos$x$ [207]. Arcsin$x$ [207]. Arctan$x$ [207]. mod$p$ [1916]. P [6541, 4652, 2061, 1131, 895, 1045, 1636, 7104, 4289, 4638, 3359]. p^k [6719]. π [1631, 2239, 2240, 4617, 268, 5657, 1694, 460]. $p \times p$ [4596, 4740]. q [5800]. $q*m-n$ [1629]. QR [6146]. R [3614, 3069, 1606, 1614, 6443, 5872]. $r=m^k$ [1439]. r^a [4961]. r^b-1 [4961]. r^c+1 [4961]. $\{r^n-2, r^n-1, r^n\}$ [5314].

$r \geq 8$ [5872]. s [4893]. sin(**BIG**) [5249]. $\sin^{-1}$ [3136]. $\sin N$ [180]. $\sin x$ [374]. $\sqrt{(a^2+b^2)}$ [6313]. $\sqrt{(x)}$ [1482]. $\sqrt{(x/d)}$ [3859]. $\sqrt{2}$ [7027]. $\sqrt{x}$ [1308, 452]. $\sqrt{x^2+y^2}$ [5692]. T [6601]. $\tan^{-1} x$ [374]. $\theta(\log N)$ [2360]. $\times$ [4080, 3929, 4146]. w [4748]. X [1543, 2901]. x^2+ny^2 [3720]. x^n [6005, 3317]. $x \star (1/x) \neq 1$ [3254]. y [4429]. Z [5346].

-2 [1005]. **-adic** [1131, 1045, 1636, 2061, 895]. **-Approximations** [7023, 5267, 5268]. **-ary** [2926, 4147]. **-b** [3495]. **-Bit** [3999, 6880, 308, 5981, 5084]. **-body** [4591, 4942]. **-circulant** [6443]. **-Coordinate** [4429]. **-count** [6601]. **-D** [5692, 4194, 4218, 3293, 6240, 4133, 5112, 3371, 2169]. **-Depth** [3441]. **-Digit** [434]. **-Dimensional** [5518, 2051, 4709]. **-Fold** [5454]. **-Friendly** [5827]. **-function** [5185]. **-gram** [5704]. **-Matrix** [4853]. **-Moduli** [6042, 3983, 4675, 4816]. **-Norms** [6081]. **-Order** [3614]. **-Partition** [6025]. **-Real** [4957]. **-select** [4175]. **-sets** [3069]. **-spaces** [4893]. **-th** [5939, 3817, 5800, 2340]. **-transform** [5346]. **-Vectors** [6081].

.NET [6453, 5087].

/m [4882]. **/spl** [4882].

0.18-CMOS [5794]. **0.4.1rc** [6454]. **0.80pJ** [6589]. **0.80pJ/flop** [6589]. **'00** [7459, 7464, 2546]. **'01** [7473]. **'03** [7502]. **'04** [7511, 7519]. **'07** [7554, 7560, 7562, 7567]. **'08** [7571, 3040, 5394].

1 [217, 3559, 6675, 3422, 2884, 228, 63, 65, 67, 564, 3285, 6709, 4080, 4423, 1164, 5794, 7109, 1934, 3879]. **1-GHz** [6675, 4423, 5794]. **1-Output** [5360]. **1.0** [3880]. **1.24Tflop** [6589]. **1.24Tflop/sW** [6589]. **1.5** [5672]. **10** [5756]. **10-kA** [5756]. **10-kA/cm** [5756]. **10/20** [959]. **100** [2897, 2898]. **100-MFLOPS** [2897, 2898]. **1014** [6786]. **1057** [1982]. **10858** [1747]. **10967** [4377, 5174]. **10967-1** [3285]. **10967-2** [4377]. **10967-3** [5174]. **10th** [7269, 7603, 7351, 7480, 7493, 27, 7250, 2770]. **'11** [7598, 1111, 1392, 1508, 1409, 1313]. **11-bit** [4924]. **11/780** [2037, 1570, 1571, 1804, 1020]. **116** [270]. **1164/WTL** [2034]. **11i** [4939]. **11th** [7471, 7364, 7382, 7383, 3191]. **120B** [1121]. **128-bit** [6354, 4131]. **12th** [7514, 7580, 7225, 7406, 3466, 7566]. **13** [4336, 2092]. **132-Bit** [343]. **13th** [7499, 7241, 7425, 7395, 7553, 3858, 3786, 7623]. **14-Port** [3929]. **144** [2038]. **14th** [7386, 7470, 7501, 7552, 7464, 7450]. **15** [2773]. **15-b** [4468]. **15-bit** [4136]. **15C** [1630]. **15th** [7289, 7560, 7225, 7568, 7472, 7518]. **16-19** [7189]. **16-b** [6490]. **16-Bit** [4547, 6717, 6734, 7119, 6880, 3031, 1261, 1602, 5008, 3084, 1760, 6353, 1477]. **16-bit-** [1611]. **16-bit-Multiplikation** [1477]. **16-by-8-bit** [1646]. **16-Digit** [5380]. **160-ns** [2842]. **160-Word** [3929]. **1620** [255]. **164** [1816]. **167** [3503, 3541]. **16BST** [1818, 1734, 1735, 1737, 1741, 1751, 1764, 1773, 1690]. **16F/400** [918]. **16th** [7543, 7534, 4664, 7498, 7540]. **17** [288, 839]. **17-Bit** [649, 648]. **1788** [6577].

1788-2015 [6095]. **17th** [7605, 7545, 7461, 7535, 7538]. **'18** [7616, 563]. **18-21** [7551]. **18.Mai** [1485]. **18th** [7570, 7559, 7565, 5488]. **18th-Century** [5488]. **1945** [61]. **1947** [7181]. **196** [5700, 5711]. **1962** [7189]. **1965** [7193, 7195]. **1967** [7200, 7202]. **1968** [7205]. **1969** [7203, 7204, 588]. **1971** [7215]. **1972** [7213, 4061]. **1973** [4138, 4139]. **1975** [7222]. **1976** [7223, 7225]. **1977** [7226, 7251, 1653]. **1979** [7231, 7234]. **1980** [7235, 7241, 1526, 7246, 7243]. **1981** [7248, 7253]. **1983** [7269]. **1984** [7278]. **1985** [7295]. **1987** [2089]. **1988** [7298, 7309]. **1989** [7322, 2585]. **1989-01** [2391]. **1989/Taipei** [7322]. **1991** [2641, 7344, 2770]. **1992** [2862, 7407]. **1993** [7375, 7418, 3191]. **1994** [7396]. **1994-12** [3285]. **1995** [7397, 7409, 3466]. **1998** [7435, 7437, 3906]. **1998-12** [3905]. **1999** [7447, 7448, 7453, 7455]. **19th** [7578, 7548]. **1st** [7432].

2 [2180, 6502, 2523, 1735, 64, 66, 68, 4377, 4050, 4589, 6462, 3932, 4907, 529, 2015, 7110, 3525, 4131, 4780, 2828, 3021]. **2-D** [3525]. **2-Digit** [4188]. **2-dimensional** [2996]. **2.0** [3630]. **2.44** [4049, 4218]. **20** [2672, 2405]. **20-MFLOPS** [2406, 2405]. **200-ns** [1486]. **'2000** [7458, 7457, 7458, 7464]. **2001** [7469, 7470, 7472, 4841, 7474, 7480, 7481]. **2002** [7483, 7484, 7486, 7487, 7488, 7495]. **2003** [7498, 7499, 7502, 7503]. **2004** [7510, 7511, 7513, 7519, 7520, 4899]. **2005** [7527, 7528, 7530, 7533, 7539]. **2006** [7542, 7543, 7546, 7550]. **2006Petrozavodsk** [7600]. **2007** [7554, 7556, 7557, 7559, 7562, 7564, 7574, 7569]. **2008** [7570, 7571, 5500, 7573, 6562, 5945, 5946, 6729, 5552, 5777, 5575]. **2009** [7576, 7580, 7583, 7584, 5533]. **2010** [7593, 7594, 7596]. **2011** [7599]. **2013** [7604]. **2015** [7607, 7608]. **2016** [7612]. **2017** [7613]. **2018** [6475]. **2019** [6528, 7618, 7619]. **2020** [6657, 6655, 6656, 6658, 6659, 6661, 6682, 7620, 6708]. **2020s** [6771]. **2021** [6771, 6772, 6773, 6774, 6782, 7624, 6828, 6847]. **2022** [6885, 6886, 6887, 7626, 6914, 6915]. **2023** [7628]. **20th** [7582, 7622, 7601, 7563]. **21-23** [7580]. **2100** [2564]. **21064** [3351]. **210uW** [6424]. **210uW/MHz** [6424]. **21164** [3396]. **21st** [7588, 7516, 7460, 7604, 7577]. **22** [338]. **22-nm** [6675]. **22nd** [7608]. **22nm** [6589]. **23-28** [7547]. **23nd** [7612]. **23rd** [7334, 7591, 7594]. **24** [1128]. **24-26** [7500]. **24-bit** [2370]. **24.und** [7251]. **24732** [5176]. **248GOPS** [6860]. **248GOPS/W** [6860]. **24b** [2467]. **24th** [7613, 7433, 7436, 7490, 7596, 7251]. **25-28** [7459]. **256** [6310]. **25th** [7330, 7446, 7251, 7561, 7617]. **26-28** [7511]. **26th** [7596, 7619]. **27th** [7620, 7593]. **281** [3063]. **286** [3649]. **28nm** [6860]. **28th** [7624, 7441]. **29.95** [3720]. **29th** [7449, 7626]. **2B** [646]. **2DFFT** [1884]. **2nd** [7592, 4593, 7214]. **2Sum** [6162, 6270].

3 [3101, 5174, 6437, 2776, 6135]. **3-ps** [5794]. **30** [2038]. **30-bit** [2427]. **30-MFLOP** [2251]. **30-ns** [3481]. **300** [4218, 1230]. **300-MHz** [4218]. **300MHz** [4049]. **30th** [7628]. **312** [433]. **3171** [2505]. **31st** [7303]. **32** [5130, 2063]. **32-** [6954]. **32-Bit** [3728, 2318, 2187, 2331, 5492, 4819, 3422, 1404, 5020, 1624, 2741, 2412, 2413, 2414, 2415, 6837, 2563, 1997, 2437, 3319, 2575, 3195, 3965, 2490, 3210]. **320** [3104]. **320-MFLOPS** [3105, 3104]. **320C25** [3297]. **32b** [2251]. **33** [2217]. **33rd** [7414, 7465, 7358]. **34** [513]. **34-MFLOP** [2490]. **360**

[418, 419, 505, 384, 392, 393, 682, 440, 481, 1442, 6471, 538]. **3600** [303]. **36th** [7378]. **370** [1946, 2037, 2484]. **37th** [7564]. **390** [4091, 3825, 3826, 4117, 4118]. **39th** [7554, 7571]. **3CT** [3391]. **3DNow** [3932, 4050]. **3DTV** [5783]. **3m** [6378]. **3rd** [7430, 7218, 7536]. **3X** [5452].

4 [3401, 4805]. **4-2** [1168]. **4-bit** [6750]. **4-Input** [5360]. **4-Input/1-Output** [5360]. **4.4ns** [3495]. **40** [2414]. **40-MFLOPS** [2412, 2414]. **40-ns** [649]. **400** [918]. **4000** [498]. **400MHz** [3929]. **400th** [7407]. **4096-Core** [6874, 6758]. **40ns** [648]. **41** [444]. **432** [1857]. **44th** [7550]. **45th** [3773]. **48th** [7533]. **4d** [4686]. **4m** [6378]. **4th** [7228, 7459, 7353, 7481, 7627].

5 [3551, 4160, 6974]. **50** [2329]. **50-Megacycle** [149]. **50-MHz** [2329]. **501** [3790, 3640]. **50th** [7390]. **512** [6386, 7035]. **512-bit** [6900]. **528** [1119, 4032]. **53*53** [3271]. **53nd** [7589]. **54** [339]. **54-b** [2842]. **55-b** [3481]. **5th** [7497, 7579, 7245, 7548, 7404].

6.7-MFLOPS [2448, 2450]. **60** [606, 579, 411]. **600** [3998]. **600-MHz** [3998]. **6000** [3391, 2541, 637, 2566, 2570, 1243, 3373, 718]. **6000/7000** [1037, 1243]. **600MHz** [4091]. **601** [3351]. **603e** [3623]. **60M** [2640]. **60M-flops** [2640]. **64** [4793, 4005, 4180, 4040, 4206, 4207, 6548, 4252, 4127]. **64-active-instruction** [3537]. **64-b** [3649, 2965, 3537]. **64-Bit** [2438, 3929, 7099, 2326, 2329, 5401, 5143, 5002, 3077, 3439, 5168, 2718, 3455, 2405, 2406, 2551, 2410, 2932, 6954, 2775, 2265, 3333, 4940, 2034]. **64-bit-Universal-Floating-Point-ISA-Compute-Engine** [6548]. **6400** [1695]. **64b** [2328]. **65** [625]. **65-nm** [7099]. **65/6600** [625]. **650** [2091]. **651** [2050]. **65nm** [6424]. **6600** [732, 555, 625, 592, 1346]. **6600/7600** [732]. **665** [2205]. **68000** [1885]. **68000-Einplatinenrechner** [2082]. **693** [2812]. **6th** [7544, 4849, 7509, 7258, 7448, 7563, 7426, 7539, 7513].

7-9 [7582]. **70** [5696]. **7000** [1243]. **7094** [398, 473]. **7094-II** [473]. **70th** [5610]. **714** [3060]. **715** [3062, 3677]. **719** [3041]. **722** [3061]. **7289** [7027]. **73** [1030]. **754** [3852, 5584, 2864, 4319, 3404, 6057, 3989, 4525, 5500, 6528, 6913, 3880, 4341, 6805, 4838, 6811, 6812, 1410, 6559, 6825, 6194, 1862, 6562, 2095, 3461, 3626, 5610, 5953, 5337, 4247, 5059, 5195, 6950, 6598, 7092, 7093, 2277, 6475, 6360, 7104, 1680, 4767, 3950, 5650, 2017, 1459, 6751, 7169, 3360, 5570, 5575, 5805, 7127]. **754-1985** [1861, 1862]. **754-2008** [5437, 5500, 6562, 5575]. **754-2019** [6561, 6528]. **754-Posit** [6950]. **754r** [5428, 5133, 5146, 5278, 5501, 5179, 5232, 5178, 5191, 5380]. **7600** [732]. **77** [1191, 4032, 1332]. **780** [2037, 1570, 1571, 1804]. **786** [3954]. **'79** [7231, 7234]. **7th** [7235, 7237, 7542, 7276, 7306, 7547].

8 [1296]. **8-Bit** [3819, 6872, 7006, 1968, 7057, 7081, 6960, 7098, 6486]. **8-to-64** [6589]. **80** [1484]. **80*87** [3022]. **80-bit** [1929]. **80-FLOPS** [2965]. **8000** [3455]. **80287** [1904]. **8080/8085** [1584, 1134, 1220]. **8080A** [1488].

8085A [2392]. **8086/80286** [1936]. **8087** [1630, 1316, 1904]. **8087/80287** [1936, 1904]. **8087/80287/80387** [2295]. **8088/8087** [1734]. **80960** [2247]. **80960KB** [2248]. **80b** [2449]. **80h** [1296]. **80's** [7240]. **814** [4456]. **8231A** [4156]. **826** [6424]. **'83** [7261]. **83S87** [2518]. **'84** [7270]. **842** [5013]. **'85** [7275, 481]. **854** [3411, 3412, 2089, 3485]. **854-1987** [2041, 2089]. **'86** [7282, 7283]. **86**^{TM} [3928]. **871** [5457]. **'88** [7304, 7305, 7308, 2311]. **881** [5516]. **'89** [7316, 7323]. **89/TI** [4469, 4470]. **8s** [766]. **8th** [7328, 7528, 7437, 7290, 5639].

9 [517, 696]. **9-11** [7556]. **9.4** [6860]. **'90** [7326, 7335, 7350, 4312, 3395, 4973, 4974, 2682, 3493, 4456, 3844]. **908** [5668]. **90nm** [4805]. **'91** [7347, 7350, 417, 396]. **'92** [7356, 7359, 7362, 7370, 4469, 4470]. **'93** [7373]. **'94** [7385, 7386, 7395]. **'95** [7402, 3857, 4452, 4764]. **954** [6073]. **'96** [7416, 7420]. **96-bit** [2261]. **97** [3721]. **'98** [7433, 7441, 3975, 7431]. **980A** [1016]. **'99** [7446, 7447, 7448]. **9th** [7319, 7594, 7551, 7253, 2362].

= [2806, 2807, 3353, 7215].

_Imaginary_I [5570].

A-Priori [2103]. **A.K** [4681]. **a.k.a** [5547]. **A/D** [3896, 906, 3353, 4136, 4468, 802]. **A/D-konverter** [3353]. **A1** [1099, 1193]. **Aarhus** [7258, 7258]. **Abacus** [202, 1027, 5551]. **Abbreviating** [7]. **abc}** [4823]. **ABE** [547]. **ABI** [6881]. **Abnormal** [6767, 6046]. **Abotec** [3185]. **Absolute** [3398, 3399, 2766, 2255, 433]. **Abstract** [5592, 4553, 5626, 526, 5343, 5867, 6373, 4850, 2916, 2114, 5868, 4902, 4914, 2990]. **abstraction** [5487, 5845, 1330]. **abstraction-based** [5487]. **Abstracts** [7374, 7465]. **Abu** [408]. **Acadiana** [7437]. **ACBAM** [6972]. **ACBAM-Accuracy-Configurable** [6972]. **Accelerate** [6609, 6303, 4591]. **Accelerated** [6810, 5026, 5499, 5708, 6456, 6994, 7118]. **Accelerating** [5477, 6051, 4811, 3875, 5718, 6924, 6809, 6185, 7052, 7075, 4246, 6726, 6344, 4738, 6349, 5786]. **Acceleration** [6697, 6831, 6210, 6824, 6446]. **Accelerator** [6053, 6783, 6508, 5700, 5712, 7034, 5737, 7055, 6321, 6940, 6340, 2256, 6462, 6730, 7091, 6027, 6969, 4922, 7117, 6987, 6635, 6401, 2269, 7107]. **Accelerators** [6928, 7043, 6571, 7062, 6836, 7083, 6466, 7125, 4783, 6998, 5290, 3509]. **Acceptance** [3493]. **Access** [2146, 5121, 3404, 4594, 4648, 6994]. **Accessibility** [7526]. **Accessible** [6923]. **Account** [3, 5570]. **Accumulate** [6523, 4997, 6423, 6827, 6442, 6736, 6977, 5975, 3833, 6648, 6761, 4517, 6588, 3678]. **Accumulated** [1368, 575, 977]. **Accumulation** [6274, 2057, 1959, 179, 5941, 6201, 5319, 6101, 5558, 4439, 77, 454, 1072, 3715, 5825, 3741, 3766, 5763, 574, 5555, 2769, 95, 5460]. **accumulations** [4246]. **Accumulator** [3869, 4776, 6247, 380, 2699, 1032, 3319, 5795, 5882, 4778]. **Accumulators** [6516, 6342, 371, 1073]. **accuracies** [2605]. **Accuracy** [4656, 217, 6251, 7011, 6895, 1715, 5482, 861, 1015, 4809, 5401, 7141, 6794, 6795, 2680, 5912, 6063, 3243, 5919, 6173, 5286, 5154, 6180, 1841, 227, 228, 7147, 7148, 434, 390, 1290, 1852, 3616, 4562, 4374, 2383, 6433, 1746, 1981, 2545, 1621, 7058, 1984, 5936, 6317,

1628, 2403, 7063, 3122, 753, 5189, 6724, 832, 5194, 3801, 6972, 5792, 3168, 6236, 3685, 165, 6977, 1685, 2021, 2022, 6751, 411, 3533, 6870, 6989, 494, 6762, 6763, 5392, 7000, 5894, 5679, 5824, 1813, 4670, 5910, 6283, 6802, 6068, 6931, 3765, 3098, 1745, 6711, 2549, 2100, 1994, 5188, 5856, 5190, 6455, 3794]. **accuracy** [1756, 5352, 6128, 7100, 1679, 107, 2463, 1689, 1922, 1785, 6371, 2302, 3198, 6485, 3849, 545, 5126, 2053, 1211, 3654, 651, 1353, 2573]. **accuracy-adjustable** [7100]. **accuracy-guaranteed** [5352]. **Accurate** [5586, 5130, 1805, 2651, 2654, 2871, 7140, 1385, 4351, 4537, 4538, 4539, 4691, 4833, 4834, 3746, 4355, 5999, 6175, 6288, 4017, 5291, 2697, 6073, 4706, 4846, 4848, 5297, 2704, 5416, 5523, 5529, 4371, 6560, 6094, 5935, 5609, 5755, 5939, 5940, 3290, 5941, 6201, 230, 2553, 2242, 6941, 6581, 3304, 905, 571, 3476, 640, 5775, 6597, 7279, 4905, 4906, 5077, 6028, 2981, 1536, 5085, 5453, 5454, 5455, 5561, 5640, 5967, 5968, 3687, 3822, 3824, 4933, 5101, 4126, 2611, 6036, 6867, 3024, 598, 5982, 4497, 1795, 5814, 3053, 5264, 3244, 3425, 4692, 4185, 2367, 5522, 6295, 4212, 5934, 1868, 5937, 2737, 3126, 758]. **accurate** [759, 2956, 4745, 2964, 4747, 6126, 4261, 2149, 4460, 5227, 3011, 2844, 5470, 5246, 1095]. **Accurately** [3567, 6521, 2515, 5753, 5045, 2607, 4932, 6522, 6278, 4820, 4821, 5623, 5647]. **ACE** [946, 5118]. **achieved** [3028]. **Achieving** [6045, 5401, 5698, 6291, 1841, 4751, 5875]. **ACL2** [7483, 4278]. **ACL2-2002** [7483]. **ACM** [7298, 7385, 7510, 7511, 7526, 7527, 7541, 7554, 7570, 7571, 7546, 7473, 7489, 2092, 7495, 7512, 2349, 7403, 7350]. **ACM/IEEE** [7541]. **ACM/SIGDA** [7510, 7527]. **ACM/SIGPLAN** [7512]. **Acoustics** [7282, 7348, 7502, 7519]. **Acousto** [1907]. **Acousto-Optic** [1907]. **acquisition** [2504, 2672]. **ACRITH** [1981, 1813, 2545, 1984, 1870, 2105]. **ACRITH-XSC** [2545]. **across** [5337]. **ACSSC** [7574]. **ACT8837** [2341]. **ACTION** [6943]. **Activation** [6681]. **Activations** [6325]. **active** [5783, 3537]. **Activity** [5892]. **Actual** [5330, 6512]. **acyclic** [3213]. **Ada** [7385, 7328, 7364, 1873, 7385, 2324, 2647, 2648, 2873, 2874, 3233, 2508, 2665, 3428, 2355, 2075, 6075, 2529, 7364, 1526, 1750, 2106, 1757, 3646, 2771, 2141, 2815, 1702, 2843, 1484]. **Ada-Europe** [7364]. **Ada83** [3044]. **adaptable** [4343]. **Adaptation** [2877, 4413, 6855]. **adapted** [6009]. **Adapting** [2936, 4032]. **Adaptive** [5837, 6566, 4233, 3117, 1634, 2926, 6723, 6834, 6217, 2451, 1770, 3692, 3693, 3827, 1463, 1550, 6987, 2177, 1948, 1583, 1721, 4818, 4989, 6429, 5169, 2395, 3788, 3920, 1756, 2431, 6116, 2967, 3152, 5791, 3704, 5658]. **ADC** [4367, 2456, 4146, 4960]. **ADCOM** [7560]. **Add** [6505, 5485, 3055, 4673, 4987, 6274, 4334, 5497, 7033, 6176, 5165, 2542, 6705, 5315, 3456, 6439, 3907, 4395, 5333, 5334, 5335, 3128, 5772, 5559, 5637, 5444, 5445, 5084, 6973, 4768, 7120, 6240, 6382, 6647, 6531, 4498, 2333, 4813, 5695, 3059, 3591, 5018, 4038, 5025, 6190, 4567, 5029, 4581, 4883, 4079, 6016, 5062, 4747, 3156, 5646, 4775, 4947, 1705, 4650, 4790]. **add/sub** [3591]. **Addendum** [1231, 763]. **Adder** [6052, 3728, 3981, 4318, 4819, 5496, 4993, 1103, 5280, 2893, 336, 6927, 1125, 5749, 6437, 5756, 754, 3796, 6602, 5960, 6026, 3805, 3667, 6603, 5355, 5356, 4438, 4278, 4928, 5650, 6981, 534, 590, 937, 5376, 5575, 6869, 6483, 6381, 5383, 5578, 133, 5245, 5390, 803, 2187, 4988, 2681, 5995, 3067, 2890, 3261, 5732, 4561, 2908, 3113, 3114, 3115, 3116, 1429, 2754, 5955, 2114, 4891, 5777, 2961,

4259, 2798, 6974, 1168, 5795, 5882, 4630, 5458, 4940, 2484, 5806]. **Adder-Based** [6052, 3113, 3114, 3115, 3116]. **Adder/Subtractor** [5749, 6437, 6869, 4891, 5777]. **Adders** [6045, 4315, 608, 5697, 3056, 4172, 5494, 867, 6806, 6807, 6419, 5726, 2077, 2079, 5607, 5418, 5535, 4229, 5036, 4065, 4390, 6100, 6448, 6212, 6838, 5196, 7082, 7160, 6732, 2002, 6739, 2789, 3817, 4283, 4454, 5380, 4476, 1181, 1192, 1495, 2337, 2667, 3872, 4006, 2732, 1900, 5781, 4749, 4096, 7097, 3338, 7166, 5232, 7169, 2480, 4473, 4781]. **adders/subtractors** [7169]. **Addictive** [1872]. **Adding** [1383, 3401, 2330, 3880]. **Addition** [1361, 6492, 2040, 1087, 804, 1372, 7018, 464, 551, 4329, 4987, 3736, 4171, 4334, 1824, 4994, 1108, 672, 6413, 1394, 5601, 5294, 3080, 1514, 507, 5011, 6182, 1126, 1613, 3443, 5608, 6563, 5318, 744, 4875, 1874, 4391, 4068, 5943, 6106, 4732, 4885, 5050, 1144, 4892, 363, 3147, 1439, 5962, 1444, 5355, 7165, 4101, 922, 923, 3166, 2281, 1676, 2142, 455, 3822, 5090, 6980, 787, 213, 933, 3832, 4126, 3192, 5568, 5236, 6484, 5579, 415, 1706, 377, 5122, 4152, 3229, 4168, 4326, 4813, 3871, 4678, 3578, 4178, 4685, 6416, 2526, 4699, 1513, 1969, 509, 6692, 2903, 3265]. **addition** [4215, 2923, 4881, 2744, 3642, 4246, 1648, 1649, 3654, 2767, 3934, 2266, 3810, 4098, 4267, 2589, 2982, 653, 711, 4929, 927, 3702, 376, 846, 1928, 3198, 3707, 493, 3846, 2633]. **Addition-based** [5011]. **Addition-Related** [5962]. **Addition/Subtraction** [4171, 5943, 4732, 6980, 3871, 4678]. **additional** [3375]. **Additions** [7102, 3621, 3468, 1937]. **Additive** [4533, 5052, 5775, 485, 3603, 1664]. **Additively** [6600]. **Address** [2678]. **Addressable** [5072, 1561]. **adds** [1373, 6113]. **Adelaide** [7450]. **adequate** [2190]. **Adiabatic** [4776]. **adic** [1131, 1045, 1636, 2061, 895]. **Adjustable** [2106, 5565, 7100]. **adjustment** [3745]. **Ado** [2093]. **ADPCM** [3179, 3180]. **ADSP** [2564, 2950]. **ADSP-2100** [2564, 2950]. **Advance** [6830, 4811]. **Advanced** [3857, 4358, 5309, 3455, 7560, 4578, 7294, 7417, 7451, 7462, 7491, 7505, 7522, 3483, 3493, 5559, 7365, 7354, 1541, 2292, 934, 5238, 4483, 1813, 6900, 7544, 2032, 7478, 7537]. **Advances** [7183, 7194, 1221]. **Advancing** [2334]. **Advection** [6896]. **Adversarial** [6823]. **Aerospace** [7496]. **AES** [6777, 6186, 6474]. **af** [1368]. **Affair** [3417]. **affiliated** [7483]. **Affine** [6504, 4599, 6645, 4830, 5270, 4704, 5742, 5345, 5215]. **Affirmative** [3]. **AFIPS** [7187, 7274]. **after** [2015, 3701]. **Afternotes** [3701]. **Again** [6413, 1909]. **Against** [6380, 6322, 4418, 4603, 4605, 4748, 4649]. **Age** [5021]. **aggregation** [5354, 5438]. **aggressive** [4079]. **ago** [6132]. **Ahead** [5231, 803, 606]. **Ahmad** [408]. **ähnliche** [1700]. **AI** [6931, 6935, 6460, 7112, 7114, 7123, 6872, 5909]. **AI-based** [7123]. **AI/ML** [6935]. **Aid** [14, 682, 5073, 1562]. **Aided** [7577, 7403, 7473, 7520, 7352, 7420]. **Aiken** [4138]. **air** [4565]. **Aircraft** [51]. **Airy** [5909]. **Aizu** [7455]. **Aizu-Wakamatsu** [7455]. **al** [408, 408, 408]. **al-Fusul** [408]. **al-Hasan** [408]. **al-Hindi** [408]. **al-Uqlidisi** [408]. **ALA'01** [4841]. **Alabama** [7362]. **Alamos** [2757]. **Alan** [7529, 704]. **Albena** [7349]. **Albuquerque** [7347]. **Alegre** [7556]. **Alessandro** [7454]. **Algebra** [3558, 4516, 1581, 7275, 7387, 4351, 6415, 4841, 7063, 6840, 3493, 7112, 5987, 6273, 2068, 3891, 4714, 6933, 6712, 6713, 5860, 833, 2962]. **Algebraic** [7558, 7231, 5145, 430, 2372, 4199, 7431, 389, 5313, 5754, 3776, 3637, 7416, 4397, 2147, 7507, 1071, 3834, 5226, 7467, 5112, 7370, 7597, 7192, 7198, 7128,

4303, 45, 5266, 1827, 515, 516, 4237, 4396, 3310, 2121, 7234, 5874, 2976, 1679, 5215, 4782, 458]. **Algebraic-integer** [2372]. **Algebraicznych** [458]. **ALGOL** [579, 735, 758, 579, 492, 540, 273, 411]. **algorism** [4687, 1027]. **Algorithm** [1709, 5251, 1710, 1261, 3974, 4969, 6500, 3043, 3226, 3726, 3863, 1807, 3046, 726, 6895, 5260, 1373, 808, 1493, 2050, 5486, 6395, 6668, 6510, 6786, 1099, 1815, 3408, 4986, 3569, 1498, 5701, 3736, 815, 5705, 1821, 2204, 5277, 3997, 2345, 2061, 1018, 1826, 2877, 5151, 2353, 1832, 3076, 4017, 5719, 6421, 1116, 1836, 429, 4028, 4848, 6183, 5524, 3441, 4863, 3613, 3768, 4044, 4563, 4046, 4216, 4217, 6558, 2387, 2723, 1618, 5027, 5741, 5743, 741, 3459, 973, 5537, 2092, 5757, 1631, 1874, 5323, 3298, 2742, 829, 6940, 5947, 6104, 3469, 314, 5328, 5329, 4075, 2427, 5052, 1049, 5622]. **Algorithm** [2108, 570, 2110, 262, 641, 4741, 2116, 6951, 763, 2955, 1650, 1891, 2118, 2260, 5349, 2572, 6219, 6465, 1655, 1898, 4427, 2781, 2968, 4429, 1533, 1662, 2784, 2785, 3672, 6027, 7165, 4913, 5443, 5785, 1158, 2595, 6133, 4919, 924, 2143, 925, 7106, 776, 4626, 1244, 2016, 5651, 6035, 373, 3829, 4128, 3192, 4133, 4464, 5104, 1694, 6241, 457, 4472, 2829, 3530, 2159, 490, 5574, 5800, 5886, 5977, 596, 3712, 1479, 244, 3214, 3543, 5123, 4295, 2636, 1711, 604, 2177, 2042, 4798, 6501, 3561, 3864, 5256, 6394, 3409, 1583, 1721, 4818, 2668, 2669, 3413, 5144, 3237, 2676, 2513, 3995, 3579]. **algorithm** [3422, 5710, 3740, 3425, 3246, 4348, 4349, 3884, 3885, 6288, 3590, 3078, 466, 4698, 4700, 5009, 4023, 3591, 1205, 5302, 4852, 2219, 5843, 5725, 6295, 1972, 3898, 4210, 3267, 3446, 3447, 4215, 2907, 515, 516, 2722, 4047, 3903, 5937, 4724, 5034, 2404, 749, 5759, 2739, 2740, 5182, 2556, 2743, 6722, 5857, 4582, 3471, 4585, 4586, 3639, 3792, 5055, 2945, 2252, 5863, 574, 4895, 762, 578, 1763, 2956, 4898, 5064, 1892, 984, 5434, 6021, 3315, 6356, 2783, 5872, 3153, 5557, 2786, 2975, 1908, 2976, 2454, 4756, 5442, 2135, 2589, 4617, 4762, 4923, 998, 1065, 3346, 3184, 3697, 3525, 1923, 3526, 2608, 294]. **algorithm** [1928, 2818, 3009, 5105, 4779, 5464, 5465, 4292, 3198, 6485, 660, 2489, 3207, 3371, 4786, 5470, 5120, 6041, 3381, 7172, 4958, 6685, 3041, 3562, 2050, 6786, 1193, 2205, 3060, 3061, 3062, 3063, 385, 6073, 1119, 1206, 5013, 5516, 433, 4032, 513, 6428, 565, 2091, 3677, 5457, 270, 2812, 3954, 4456, 5668, 6833]. **algorithm-based** [2252, 3525, 3207, 3371, 3381]. **Algorithmen** [2399, 2235, 2573, 1700, 2306]. **Algorithmes** [4690, 5338, 4357, 2763]. **Algorithmic** [5838, 7547, 3911, 252, 3668, 2803]. **Algorithmics** [7090, 4495, 5100]. **Algorithmique** [5100, 4495]. **Algorithms** [851, 2039, 6654, 4157, 4158, 723, 1806, 3862, 856, 666, 1012, 6894, 7528, 3231, 5397, 5688, 6270, 1266, 1376, 5403, 5405, 1585, 276, 3063, 6279, 3877, 4684, 1106, 5831, 2882, 4535, 4536, 4690, 3251, 4537, 3742, 6070, 1023, 1024, 1025, 1113, 6925, 5414, 3080, 4022, 4189, 6537, 5157, 2073, 2365, 6811, 6812, 5515, 3082, 468, 3752, 737, 824, 878, 6693, 1518, 6080, 5522, 884, 4206, 5167, 2540, 7572, 4214, 4373, 3616, 4562, 3617, 3902, 1520, 1413, 1522, 3283, 4221, 4721, 4722, 3106, 3107, 5748, 2547, 3108, 6200, 6714, 2399, 2235, 4230, 828, 522, 1421, 3913, 7595, 523, 6719, 3119]. **Algorithms** [4573, 3299, 4392, 631, 5855, 5330, 2938, 1529, 4076, 3128, 2941, 3305, 7417, 7537, 1050, 6842, 3648, 1640, 1888, 687, 1641, 691, 1642, 4894, 7295, 7309, 4414, 5061, 4598, 3309, 448, 357, 477, 6730, 361, 3655, 5065, 4420, 2573, 3804, 7086,

4424, 1323, 3807, 3325, 1441, 3811, 1444, 4265, 1445, 1771, 6028, 2796, 3816, 7366, 7178, 6030, 6856, 5967, 5968, 7354, 6976, 4624, 775, 2462, 3514, 5361, 926, 7109, 7110, 712, 3695, 374, 4127, 1342, 2609, 2819, 2820, 5798, 5885, 3013, 940, 2831, 3842, 1700, 2306, 5577, 3369, 1474, 3377, 7170, 5122, 5391, 7173, 552, 3217, 1084, 3560, 5477]. **algorithms** [5987, 4512, 4980, 4324, 5140, 6162, 6268, 6788, 6898, 7317, 2671, 2203, 221, 3873, 1961, 420, 4004, 1828, 1200, 2688, 3068, 3426, 4833, 2209, 1837, 3255, 4697, 6929, 3435, 225, 5159, 5162, 6083, 6425, 7344, 4038, 4717, 5735, 6933, 1300, 3279, 5317, 1983, 742, 2926, 4394, 2417, 3124, 4587, 1755, 2428, 3794, 831, 1756, 1883, 1638, 5624, 7451, 7462, 7478, 7491, 7505, 7522, 4081, 2567, 4743, 3139, 2763, 5063, 5198, 2439, 2571, 5200, 5435, 6467, 4092, 5873, 4094, 1443, 1664, 5635, 6226, 2272, 4914, 2458, 4617, 2597, 4104, 3943, 4625, 3174, 3175, 3516, 5363, 2468, 1785, 2024, 5227, 4777]. **algorithms** [3008, 1074, 2830, 3199, 493, 1704, 4951, 5389, 3026, 4959, 2351, 2048, 7295, 7309, 358, 2007, 1062, 1538, 4681]. **Algorithmus** [2048, 385, 2007, 1538]. **Alignment** [5962, 3866, 3930]. **alignments** [1921]. **all-one** [4990]. **Allerton** [7201]. **Alley** [3613]. **allgemeine** [1095, 1211]. **allgemeiner** [1353]. **Allocatable** [3482, 3493]. **Allocation** [6631, 4554, 5759, 4600, 4602, 4473, 3361]. **Alloy** [5866, 6018]. **Almost** [7185, 2285, 5055]. **ALOHA** [7178]. **ALOHA-FP2I** [7178]. **Alpha** [2993, 3396, 2885, 3519, 3351]. **alphabetical** [101]. **Alps** [6834]. **also** [2969]. **Alternanten** [768]. **Alternate** [4432]. **alternating** [3645]. **Alternative** [1280, 6696, 6574, 6952, 6400, 962, 575, 6360, 4648]. **Alternatives** [4315, 1143, 6457, 3137, 4611, 4727]. **Alto** [7434, 7420]. **ALU** [4309, 5476, 5677, 6424, 2098, 1903, 1660, 5796, 2034, 1799, 2851]. **ALUs** [2170]. **always** [6150]. **am** [1653, 7251, 2615]. **Am25S05** [621]. **Am29000** [2269]. **Am29027** [2269]. **Am29050** [2576]. **Am29C327** [2320]. **Am9511A** [1381]. **Am9511A/Am9512** [1381]. **Am9512** [1271, 1381]. **ambiguity** [4962]. **AMD** [6882, 6540, 4050, 3932, 4092, 3942, 3943, 4106, 4278]. **AMD-K7**^{TM} [4092, 3943]. **AMD5** [3928]. **ameliorating** [1038]. **amélioration** [4324]. **America** [23]. **American** [2041, 7254, 7189, 2862, 31]. **Amherst** [7617]. **Amidst** [6818]. **Among** [1222, 4087]. **amount** [4036]. **Amounts** [3748, 3890, 4018]. **amplifier** [2224]. **Amplifiers** [184]. **Amplifying** [1719]. **Amsterdam** [7557, 7622]. **AN-Codes** [4359]. **AN/UYK** [839]. **AN/UYK-17** [839]. **Anaheim** [7286, 7314, 7342]. **Analog** [463, 111, 4201, 3605, 139, 140, 230, 113, 232, 444, 370, 4107, 132, 150, 4151, 2896, 4861, 4048, 690, 4924, 1688, 3703, 2315]. **Analog-To-Digital** [4151, 4201, 4861, 3703]. **Analogrechenschaltungen** [548]. **analogue** [548, 1064, 3213]. **analogue-to-digital** [3213]. **Analyse** [5706, 40, 7215]. **Analyses** [4364, 3910, 1467, 2821]. **Analysis** [603, 2173, 7236, 152, 4307, 1804, 5134, 7400, 6667, 6504, 4321, 6505, 6269, 3406, 6670, 2875, 171, 5701, 5491, 1585, 2337, 2671, 5705, 1589, 2677, 1386, 1018, 6798, 7374, 6170, 3879, 6684, 7031, 6533, 2357, 6419, 7036, 7145, 819, 4853, 7268, 112, 5727, 4857, 5729, 5844, 2902, 3091, 6554, 6555, 126, 4563, 2224, 7621, 4050, 6707, 397, 3284, 7291, 2917, 6197, 2395, 398, 628, 2731, 2920, 743, 1139, 1046, 400, 6326, 6724, 3790, 832, 5770, 6212, 6584, 6838, 2753, 1148, 6347, 4415, 356, 914, 5065, 6119, 5350, 2772, 1899, 764, 837,

4903, 2970, 1057, 1662, 4097, 988, 1156]. **Analysis** [1907, 4916, 5787, 1537, 2802, 706, 6857, 7105, 5879, 5360, 5792, 2463, 4284, 785, 38, 42, 3691, 932, 2998, 3522, 1071, 1342, 2819, 2820, 7190, 5228, 6751, 6373, 7169, 2829, 3843, 6638, 1475, 7253, 216, 5242, 7553, 7215, 2852, 2853, 7174, 412, 2636, 2174, 5473, 1948, 2042, 3560, 496, 1489, 1090, 1190, 1369, 1808, 2184, 2503, 2185, 4316, 5824, 3731, 2663, 1583, 1721, 2669, 3413, 6402, 3058, 40, 423, 1828, 2065, 3069, 6288, 2209, 466, 4700, 5009, 4023, 4704, 506, 3435, 3595, 225, 511, 6076, 5839, 5015, 5162, 2377, 2713, 7269, 3607, 2223, 309, 825, 2081, 1745]. **analysis** [3275, 3276, 5742, 5317, 1983, 5744, 7225, 5937, 3289, 473, 3292, 6099, 629, 3293, 748, 1225, 520, 1226, 1227, 4394, 6449, 3787, 1883, 1638, 525, 572, 2252, 4253, 7080, 1648, 1649, 5551, 5064, 5346, 364, 404, 2446, 2121, 2962, 2963, 836, 3151, 985, 2967, 3152, 3814, 4268, 990, 2270, 2272, 369, 1159, 4441, 2592, 2597, 6231, 5971, 3944, 841, 3179, 3180, 3349, 3517, 1066, 5216, 1547, 3354, 3701, 2297, 1925, 376, 3835, 3836, 4465, 1176, 7324, 2832, 3199, 1252, 716, 795, 3015, 5662, 1704, 3848, 1183, 2630, 3851, 6685, 1817, 7352]. **Analysis-Based** [4916]. **Analytic** [3402, 7222, 7222]. **Analytical** [1724, 5724, 191, 16, 5192, 15, 6218, 6463]. **Analytics** [6433]. **Analyzed** [6717, 693, 694, 695, 761]. **Analyzer** [314]. **analyzers** [2376]. **Analyzing** [2388, 6855]. **Anatomy** [3505]. **Anchored** [6516, 6342]. **Ancient** [5821, 6512, 600]. **Andrews** [7467]. **Angeles** [7182]. **Angewandte** [7244, 7243]. **Angle** [2387]. **Angles** [4225]. **angular** [84]. **ANL** [440]. **Ann** [7245, 7379]. **Anniversary** [7390]. **Annotated** [5689, 1236]. **Announcements** [3857]. **Annual** [7235, 7385, 7397, 7443, 7554, 7571, 7343, 7201, 7237, 7328, 7514, 7556, 2074, 7244, 7302, 7334, 7358, 7531, 7393, 7426, 7493, 7552, 7568, 7524, 7465, 7211, 7216, 7468, 7254, 7289, 7213, 7241, 3773, 7350, 7550]. **Annuities** [4274]. **Anomalies** [1870]. **Anomalous** [39]. **ANOVA** [5644]. **ANR** [6412]. **ANSI** [6528, 1861, 1862, 4099]. **ANSI/IEEE** [6528, 1861, 1862]. **Answer** [1354]. **Anti** [51]. **Anti-Aircraft** [51]. **Anticipation** [4451, 5062]. **Anticipator** [5578, 4695, 2541]. **anticipators** [6113]. **anticipatory** [3810, 3702]. **Antikythera** [5925]. **antilogarithmic** [4651, 5493]. **Antitrust** [5370]. **Anton** [5563]. **Antonio** [7350]. **ANTS** [7547]. **ANTS-VII** [7547]. **Anwendungen** [1976]. **Anwendungsgebiete** [1485]. **anwendungsorientierten** [1237]. **Any** [5707, 1223, 6643, 6497, 4520, 4521, 4382]. **Anyway** [6753]. **AOP** [4571, 4876]. **AP** [1121, 7447]. **AP-120B** [1121]. **AP-ASIC** [7447]. **Apache** [5655]. **APL** [700]. **APMathLib** [4497]. **App** [6390]. **Apparatus** [613, 4352, 4016, 6319, 6588, 3866, 4036, 3897, 4039, 3762, 3930, 2122, 3706, 3375]. **APPAs** [7166]. **Appearance** [3900]. **Apple** [4532, 5344, 1162]. **APPLESOFT** [1011, 1086, 1337]. **Applicability** [1709, 6400]. **Application** [5471, 3977, 4312, 6667, 860, 1014, 6505, 3569, 7388, 7401, 7588, 6679, 7374, 40, 6683, 4011, 4344, 4834, 7500, 7545, 3588, 510, 3260, 4214, 6557, 564, 3452, 7348, 7518, 7534, 7559, 7573, 7582, 1135, 6576, 3784, 5051, 3304, 1641, 4598, 4599, 4604, 2575, 2579, 6469, 1237, 6230, 7494, 3689, 1782, 7466, 5798, 1930, 7427, 4942, 2830, 6754, 7540, 7384, 7030, 2639, 5895, 951, 6264, 4316, 2661, 1269, 6929, 4196, 2375, 2710, 7344, 3278, 3279, 2729, 5939, 1227, 4727, 6328, 5952, 2768, 3326, 5963, 2800, 4102, 2598, 3167, 2604,

5100, 108, 3008, 3705, 6375, 1472, 1473, 4493, 2315]. **Application-Oriented** [1237]. **Application-Specific** [6667, 7588, 7500, 7545, 7518, 7559, 7573, 7494, 7466, 7427, 6754, 7540, 7384, 7534, 7582, 7030, 2639, 6375]. **Applications** [6879, 7003, 4965, 6251, 7373, 7398, 7429, 4311, 4508, 1572, 5898, 7135, 7543, 7557, 4667, 5396, 7483, 1719, 956, 1958, 6165, 7499, 6677, 6407, 6904, 3584, 3744, 4014, 4354, 5718, 2692, 7036, 6926, 2212, 3433, 6422, 6073, 6817, 306, 1742, 1849, 7047, 558, 5167, 4369, 4371, 6822, 7432, 1301, 1410, 1618, 7224, 7240, 7322, 7581, 1306, 5178, 6830, 7415, 5321, 4386, 2929, 5184, 1140, 5426, 313, 7307, 6578, 6579, 6941, 6582, 7073, 5861, 4593, 1433, 4893, 6348, 6736, 4906, 7395, 2132, 3815, 4438, 5213, 7262, 6473, 1540, 373, 2295, 1554, 6988, 7215, 6648, 4830, 7385, 7000, 1186]. **applications** [3030, 1486, 2318, 5986, 3228, 1491, 4167, 7471, 7317, 5703, 2058, 5908, 2341, 1728, 3427, 3743, 6687, 2691, 6288, 1840, 2371, 5159, 4714, 4038, 5022, 6547, 4212, 5739, 7154, 6007, 6440, 3111, 3462, 749, 2421, 7379, 2940, 7293, 2564, 2950, 317, 4903, 4608, 3156, 2591, 5789, 7250, 5972, 3513, 3523, 2019, 791, 456, 17, 3198, 7369, 1352, 5804, 1705, 5388, 1976, 1701, 7215]. **Applied** [7386, 7263, 549, 1195, 3574, 6421, 1129, 7546, 5022, 7606, 7189, 5360, 7281, 7623, 2047, 2325, 2717, 3625, 7546, 7516, 7603]. **Applying** [2864, 334, 3902, 5346, 5345, 2574]. **Approach** [6778, 6051, 4162, 3402, 4329, 1724, 1104, 5280, 3586, 6534, 7037, 5295, 6538, 5837, 1841, 5723, 737, 6188, 5530, 7332, 7413, 7485, 7602, 6555, 5418, 3902, 5535, 5613, 1138, 7259, 1993, 6952, 1439, 1155, 7336, 4438, 2134, 1451, 3170, 3691, 7126, 6381, 5582, 3386, 3387, 1080, 1185, 2181, 2046, 1270, 962, 5291, 2705, 2930, 635, 3787, 2559, 2255, 6116, 6218, 6463, 2962, 3668, 2592, 5789, 3343, 5362, 3007, 1352, 1939]. **Approaches** [1087, 6755, 3333]. **Approaching** [2187]. **Approved** [6562]. **Approximate** [6652, 6879, 5985, 6152, 7009, 7135, 6165, 5502, 156, 6921, 6419, 1125, 7043, 6294, 6301, 6819, 558, 6821, 6199, 3776, 6573, 6938, 6836, 6338, 6458, 6584, 6838, 6946, 691, 6347, 6462, 1651, 6119, 6731, 6958, 7085, 6848, 6964, 6473, 6477, 6742, 7167, 7124, 6867, 6638, 6988, 6991, 6992, 7170, 6995, 7131, 7000, 4167, 283, 3278, 7166, 4132]. **Approximated** [5687, 6902]. **Approximating** [2396, 3317, 2790, 4111, 2988, 3732, 5026, 5308, 3628, 2432, 5205, 3026]. **Approximation** [3971, 6500, 2054, 6793, 5495, 6679, 6681, 1019, 4835, 2692, 428, 624, 6932, 7150, 3456, 3457, 6566, 4230, 6210, 6841, 5081, 321, 528, 4108, 3824, 3689, 3948, 4120, 4126, 5976, 6140, 2616, 5115, 6038, 6645, 1378, 221, 3585, 5507, 5158, 426, 2367, 5159, 3772, 2919, 3110, 6944, 7077, 4253, 7295, 7309, 3146, 984, 3311, 2122, 7101, 1682, 3176, 5214, 5809, 1835, 7233]. **Approximationen** [514]. **Approximations** [1260, 5399, 6397, 7023, 1022, 2070, 2210, 281, 2697, 384, 427, 2901, 470, 471, 119, 3612, 514, 6935, 4391, 2555, 909, 2957, 2001, 1766, 580, 769, 1163, 3822, 3823, 4113, 240, 241, 271, 533, 7125, 168, 597, 3024, 2178, 5267, 5268, 5156, 5510, 251, 3765, 4052, 4053, 689, 4745, 1058, 482, 1454, 3346, 4125, 2844]. **Apps** [6735]. **Apr** [6562]. **April** [7216, 7315, 7511, 7200, 7514, 7399, 7483, 7275, 7546, 7270, 7282, 7362, 7487, 7502, 7549, 7592, 7599, 7604, 7291, 7225, 7450, 7189, 7260, 7419, 7426, 7440, 7493, 7552, 7568, 7222]. **Aptitude** [1700]. **Ara** [6675]. **Arabia** [2870]. **Arabic** [5551, 101, 6962, 408]. **Arb** [6097, 6316]. **arbitraire** [3986, 4496]. **Arbitrarily** [438, 2804, 845, 6712, 6713].

Arbitrary [2053, 4985, 5398, 1102, 963, 429, 5606, 6316, 6567, 2103, 3785, 6207, 6334, 6455, 5063, 3149, 2796, 1775, 4618, 4619, 4445, 651, 589, 933, 4128, 3711, 4496, 4510, 6779, 3986, 4812, 1598, 1731, 6008, 5853, 7079, 1330, 6358, 2144, 2837, 5128]. **Arbitrary-accuracy** [6455]. **Arbitrary-Precision** [6316, 6567, 6207, 6334, 4128, 4496, 6008, 7079, 6358]. **Arbor** [7245, 7379]. **Architect** [4402]. **Architectural** [7315, 4334, 5838, 4715, 1418, 5959, 2310]. **Architecture** [7235, 6882, 3970, 4793, 5586, 2497, 5130, 6386, 7237, 4969, 6156, 1370, 2659, 1817, 1101, 5272, 6166, 1821, 4684, 5146, 5500, 1020, 2885, 6282, 4997, 7143, 6926, 4188, 1971, 6184, 5160, 1518, 4366, 6296, 2715, 4040, 3611, 7332, 7413, 7485, 7602, 3269, 3270, 2385, 2225, 4375, 5315, 1857, 1217, 3103, 3281, 5171, 7333, 7348, 7487, 4221, 4721, 4722, 6312, 6437, 6442, 5757, 2097, 2924, 3630, 4232, 4572, 1423, 4575, 4577, 6102, 5328, 6204, 1313, 1882, 4244, 3306, 6349, 6355, 2957, 7394, 4257, 6848, 6961, 3325, 7336, 5964, 6027, 4272, 4913, 5441, 6971, 6741, 6133, 994, 4621, 3001, 7312, 1680, 6613, 4450]. **Architecture** [6980, 2810, 2993, 3519, 6749, 2154, 5230, 5374, 1468, 5800, 5977, 1470, 3370, 3372, 6247, 7129, 6758, 6874, 4788, 6760, 1084, 4504, 6497, 2642, 4798, 3396, 1811, 5828, 2668, 3237, 3059, 4180, 4688, 2353, 2066, 7265, 2373, 7044, 4858, 7045, 1973, 3605, 5532, 2226, 7213, 4723, 2729, 5421, 2232, 2233, 2401, 2402, 2408, 2552, 4234, 2743, 2418, 2419, 3916, 2247, 3788, 2426, 4889, 3924, 1761, 4890, 2565, 2761, 2762, 2258, 5434, 5631, 5073, 2576, 3669, 481, 2271, 4276, 3678, 6228, 2593, 2594, 1063, 7250, 5086, 2287, 5797, 3526, 936, 1340, 4775, 4779, 1789, 2301, 3206, 1705, 2167, 6041, 3384]. **Architecture** [4868, 2112, 2254, 7442]. **Architectures** [7457, 7133, 5816, 6153, 5480, 3981, 7528, 4667, 5684, 3052, 4333, 7588, 4996, 7500, 7545, 6177, 6809, 6078, 3763, 4207, 5741, 2388, 7474, 7518, 7534, 7559, 7573, 7582, 5743, 5748, 4571, 4729, 6331, 2938, 3128, 2941, 7417, 7537, 1656, 6738, 3811, 4095, 5445, 7366, 6608, 7354, 7494, 4117, 6614, 7109, 7110, 5651, 2992, 2152, 5974, 7466, 7427, 6867, 7540, 4483, 6145, 1949, 2650, 7556, 2195, 6060, 4682, 2360, 6929, 4876, 4079, 7451, 7462, 7478, 7491, 7505, 7522, 3139, 2763, 3935, 4263, 3156, 2267, 5209, 4921, 2468, 2999, 3000, 2821, 4947, 4787, 2846, 2847]. **Arcsin** [161]. **Arctan** [160, 652]. **Arctangent** [1631, 3287]. **Area** [3717, 7010, 3051, 5903, 3239, 3240, 2516, 7029, 6282, 5717, 6186, 2079, 6312, 4225, 4387, 4080, 6587, 2002, 6738, 5076, 7094, 1668, 6474, 6362, 2148, 2152, 3524, 3698, 3699, 4292, 6867, 6638, 6382, 6875, 6760, 3389, 3403, 4561, 3296, 3125, 4081, 2768, 1900, 3670, 7536]. **Area-Constrained** [7010]. **Area-Efficient** [5717, 2079, 5076, 2152, 6760, 6312, 4292, 3296, 3670]. **Area-Optimal** [6186]. **Area-Optimized** [6867]. **Area-Time** [6282, 2002, 6738, 1668, 2148, 2516, 1900]. **Area/Performance** [3524]. **Arenaire** [5199]. **Argument** [5485, 3433, 3482, 2966, 3522, 3264, 4736]. **Arguments** [5305, 2103, 2111, 2966, 1177]. **Ariane** [3551, 4160, 3790, 3640]. **arifmetiki** [2327, 1246]. **ARITH** [7498, 7472, 7613, 7620, 7535, 7624, 7626, 7628, 7538, 7612, 7608, 7619, 6657, 6655, 6656, 6658, 6659, 6661, 6771, 6772, 6773, 6774, 6885, 6886, 6887, 6782, 6682, 6828, 6847, 6914, 6915]. **ARITH-15** [7472]. **ARITH-16** [7498]. **ARITH-17** [7535, 7538]. **ARITH-26** [7619]. **ARITH9** [2362]. **Arithmazium** [2236]. **Arithmetic** [7616, 2635, 1709, 7002,

851, 852, 1006, 1081, 1082, 1187, 1259, 1564, 6653, 2039, 4499, 5813, 3029, 7410, 3973, 6491, 5892, 1010, 1713, 2641, 3721, 3857, 4659, 5133, 5254, 5255, 5475, 5673, 6390, 6496, 5817, 3558, 3559, 3722, 3977, 4305, 378, 4306, 3723, 3861, 4310, 169, 245, 298, 1804, 4796, 7357, 546, 722, 854, 219, 547, 723, 855, 1366, 1572, 1806, 3725, 4797, 2322, 3862, 4975, 7498, 4977, 4978, 5135, 6051, 805, 1367, 1012, 1368, 1809, 1091, 6502, 6667, 6894, 2647, 3400, 5480, 1576, 6503, 6504, 7014, 7136, 3050, 2328, 4800, 4667, 3984, 860]. **Arithmetic** [1014, 4322, 5482, 331, 1094, 1095, 2049, 2655, 2871, 5902, 6668, 6784, 6785, 7018, 5141, 3054, 1718, 5690, 6271, 6511, 6057, 729, 810, 862, 1098, 1099, 1100, 1193, 1265, 3987, 5691, 1376, 4328, 2873, 196, 7025, 7578, 5693, 6514, 7231, 2335, 6673, 7472, 7613, 4332, 1195, 23, 2199, 171, 2055, 2056, 1722, 5491, 3571, 2202, 6403, 613, 7028, 669, 1822, 670, 868, 1382, 1587, 1383, 6406, 1384, 6794, 6795, 2060, 1273, 6407, 731, 1503, 1726, 1825, 2345, 2678, 3061, 1387, 1591, 2061, 3999, 4176, 4177, 4681, 6279, 1198, 1199, 1275, 1727, 5911, 4005, 5278, 5501, 7620, 2062, 4994]. **Arithmetic** [6526, 4336, 4686, 4995, 6061, 6907, 6908, 6909, 6910, 6911, 6912, 223, 1107, 224, 7445, 5712, 3242, 277, 1276, 1506, 3583, 4342, 6800, 5831, 4999, 5503, 2685, 2208, 5913, 618, 870, 4831, 1507, 4184, 6805, 6068, 6173, 5284, 871, 6532, 3742, 3746, 4355, 3075, 2891, 1968, 5600, 4019, 5413, 4841, 1834, 6420, 1114, 2212, 2362, 7319, 4844, 136, 174, 199, 157, 6928, 6537, 3257, 5836, 4024, 1396, 1279, 6811, 6812, 7039, 963, 1204, 12, 1839, 4194, 4195, 7040, 250, 1738, 5515, 7041, 6539, 282, 510, 3436, 3594, 3081, 1280, 675, 5604, 6075, 5605, 1606, 1124, 4359, 4546, 555]. **Arithmetic** [388, 965, 5518, 5519, 824, 4033, 3755, 6002, 881, 6693, 2534, 2707, 2708, 3599, 4550, 4713, 5842, 5415, 6293, 556, 1129, 1034, 1286, 3895, 5521, 1402, 1287, 4365, 883, 5728, 307, 4860, 2712, 390, 1405, 1850, 4715, 1211, 1290, 3601, 6185, 7047, 4368, 3603, 6187, 6189, 6297, 6298, 6299, 6300, 7618, 7625, 7048, 7627, 1614, 680, 339, 340, 341, 560, 4041, 1036, 1294, 3900, 2906, 2717, 3767, 4559, 6553, 4214, 4373, 6307, 6430, 6556, 6823, 6934, 3770, 4719, 5310, 5418, 1979, 4867, 6308, 1131, 6309, 6433, 1301, 1410, 4566, 1132, 1302, 2087, 4376, 518, 1133, 1217]. **Arithmetic** [1522, 1859, 7276, 1746, 1981, 2545, 3904, 7214, 7218, 7228, 7245, 7258, 1862, 1863, 2088, 7535, 7604, 6095, 6562, 7624, 7626, 7056, 7628, 5176, 5316, 343, 6935, 4156, 1414, 7290, 6310, 5419, 2917, 6564, 1984, 438, 6827, 5754, 5938, 6313, 1626, 3109, 5538, 6316, 1627, 6010, 6200, 6317, 6318, 6714, 6829, 1748, 4055, 3624, 1417, 1987, 2096, 2730, 4227, 4870, 5032, 743, 746, 347, 3777, 5035, 20, 5612, 7349, 887, 4571, 4388, 828, 3781, 2099, 3117, 892, 1873, 6718, 2738, 3466, 7406, 1634, 4235, 5850, 3119, 7450, 4067, 4236, 4573, 1044, 1139, 1425, 1754, 2102, 2416, 7351, 5324, 5325, 7565, 5543, 5618]. **Arithmetic** [5761, 5852, 6011, 3122, 3784, 752, 894, 4069, 895, 1045, 1046, 899, 1310, 1993, 4578, 5426, 5944, 6577, 6832, 5945, 3917, 6327, 902, 1880, 3786, 7425, 6330, 5189, 33, 2106, 4073, 4402, 4584, 6208, 6335, 6581, 233, 287, 351, 5767, 5768, 7068, 7069, 3304, 4076, 2939, 7071, 1142, 4244, 289, 1145, 5770, 6340, 7075, 3305, 6341, 1885, 442, 573, 1886, 6585, 2560, 2942, 2943, 2944, 3475, 3643, 4888, 181, 3644, 7566, 4593, 2753, 2946, 3476, 2561, 5547, 3647, 979, 687, 443, 1762, 1641, 1433, 1642, 3652, 4893, 7078, 6840, 526, 692, 911, 1315, 1889, 4741, 5550,

4598, 447, 4254]. **Arithmetic** [4896, 6951, 5627, 3482, 5431, 4255, 913, 4599, 162, 290, 356, 359, 144, 102, 3484, 5866, 1651, 1055, 6353, 6354, 6598, 6599, 5554, 4744, 7538, 7612, 6216, 6955, 6217, 4420, 1654, 4604, 3149, 2770, 4422, 5632, 5869, 7608, 6464, 6956, 6023, 6845, 6957, 7084, 7086, 145, 1656, 915, 6024, 6737, 1658, 1901, 479, 3490, 3662, 765, 5203, 3663, 3809, 6963, 6964, 2970, 1155, 2125, 2126, 3325, 4430, 1441, 1661, 2127, 7095, 6970, 3811, 1059, 1325, 1905, 2128, 4265, 6129, 6604, 4269, 121, 5439, 2, 7418, 6969, 702, 2134, 6850, 6851, 2792, 4274, 209, 3500, 6607, 2796, 5211]. **Arithmetic** [1447, 4440, 5213, 3940, 1672, 1673, 4615, 483, 583, 584, 1448, 6741, 5450, 1238, 2140, 1240, 1161, 4618, 4619, 122, 73, 6475, 370, 1451, 6134, 708, 6609, 6032, 924, 6857, 6033, 267, 4446, 1913, 5640, 6363, 7104, 1540, 4107, 7167, 408, 3509, 775, 322, 3511, 6613, 6859, 1683, 4452, 1455, 3514, 3515, 4112, 4281, 4927, 5088, 5089, 2147, 7601, 1917, 2289, 7168, 1685, 4769, 6860, 6978, 1245, 2148, 6744, 6861, 7117, 187, 1919, 588, 5564, 928, 929, 269, 212, 5796, 1780, 19, 22, 931, 1457, 1687, 2812, 3954, 4772, 5654, 2293, 6863, 3829, 5217, 6747, 6864, 1001, 1458, 2814]. **Arithmetic** [790, 6982, 6983, 5218, 5219, 4632, 713, 657, 934, 935, 1459, 1460, 5565, 4635, 6985, 4128, 845, 534, 1171, 1172, 1343, 1344, 1345, 1692, 1926, 7338, 7339, 3191, 7382, 7383, 7609, 7610, 7611, 7619, 4289, 2475, 2476, 2613, 2614, 3010, 794, 1552, 1695, 1932, 1933, 7617, 4939, 411, 593, 3357, 4471, 457, 941, 1075, 1174, 4942, 490, 594, 715, 3531, 6754, 7125, 7340, 1699, 5573, 3533, 5235, 5467, 5378, 6379, 1556, 5111, 5576, 3844, 4945, 2304, 2305, 2306, 2485, 2486, 6755, 944, 149, 1470, 1702, 4478, 3368, 5239, 5661, 6645, 1179, 1180, 1558, 1474]. **Arithmetic** [1475, 413, 3966, 3711, 3020, 3847, 1077, 4484, 1003, 273, 6757, 6993, 4145, 4486, 2845, 1004, 4489, 800, 1359, 1707, 950, 1940, 1941, 2171, 3714, 1360, 2854, 4788, 7132, 5714, 6801, 7030, 4830, 6803, 6635, 4640, 6377, 1353, 1469, 4792, 3970, 5810, 663, 7001, 1186, 1565, 5983, 7555, 6249, 3719, 3856, 5472, 3548, 721, 1484, 4157, 4158, 4504, 7007, 1802, 1803, 2500, 2864, 328, 1571, 4312, 1805, 299, 6049, 6392, 2868, 3045, 605, 1088, 2045, 1808, 2184, 2503, 2185, 2646, 5479, 2648, 5136, 5681, 4979, 5258, 5259, 2329, 1373, 2188, 2189, 1578, 1813, 6266, 6267]. **arithmetic** [2190, 2652, 3053, 1814, 3986, 4324, 4518, 4668, 4806, 4807, 5262, 5826, 6268, 7017, 300, 2051, 3867, 5142, 5591, 6273, 7020, 7021, 3868, 301, 2874, 5828, 4330, 5487, 5488, 7140, 6518, 2336, 2511, 6275, 2201, 1500, 5270, 6402, 2671, 4676, 5271, 610, 4678, 3873, 4174, 3416, 4525, 3575, 3059, 3995, 5992, 382, 383, 2343, 2344, 1590, 4526, 4682, 1105, 1962, 1505, 1593, 2207, 6408, 4685, 4007, 1963, 2064, 2349, 6410, 5713, 3883, 4343, 6285, 5408, 424, 4346, 4347, 2065, 2690, 3426, 4013, 5152, 5505, 5834, 4837, 3070, 465, 5155, 3073, 6922, 2523, 4185, 3887, 3888, 2068, 503]. **arithmetic** [2356, 5412, 1395, 2360, 3891, 5511, 1510, 1511, 1736, 2894, 3892, 4021, 735, 4544, 1027, 4702, 4704, 1028, 506, 4705, 1970, 736, 3259, 509, 2216, 4358, 6814, 3595, 468, 1030, 5300, 337, 4709, 4548, 4711, 3598, 622, 880, 1031, 2706, 6003, 1740, 284, 1844, 4857, 5416, 6005, 6082, 6083, 6425, 178, 308, 679, 2713, 1851, 6303, 6426, 6427, 1291, 3762, 5022, 1214, 1975, 1215, 1296, 1297, 1298, 4560, 4215, 5933, 5168, 5531, 4045, 3769, 3449, 1299, 4565, 6704, 6006, 437, 515, 516, 565, 2911, 6434, 6560, 6706, 7053, 7054, 7153, 1216, 2725, 5742, 2390, 2391, 1864, 1747, 3285].

arithmetic [4377, 5174, 5175, 5177, 5533, 6708, 4567, 5317, 5744, 1134, 1220, 1867, 2392, 2229, 6438, 1868, 3288, 3622, 6315, 1303, 6008, 1985, 6712, 6713, 3111, 2095, 2548, 3461, 3626, 3627, 4226, 4228, 4873, 3292, 6099, 629, 2239, 2240, 4231, 3294, 3631, 7292, 5320, 258, 1420, 4876, 7155, 630, 2242, 520, 2741, 2928, 1228, 1635, 2244, 2556, 5617, 6831, 6446, 1047, 1426, 7477, 5762, 636, 5946, 2421, 2746, 5327, 3919, 5856, 5190, 7156, 5331, 2425, 2936, 3920, 6012, 4241, 4884, 5621, 5952, 1, 4587, 3126, 4408, 4589, 5336, 5429, 5546, 5860, 352, 4590, 4591, 3793, 3794, 637, 525, 572, 2429, 1758, 5337]. **arithmetic** [5954, 1639, 3132, 6588, 1051, 1996, 2758, 234, 1314, 7159, 1761, 2949, 641, 688, 3650, 689, 575, 2255, 4892, 5626, 576, 6593, 6116, 2763, 5197, 5063, 448, 7189, 357, 358, 477, 762, 833, 982, 1053, 1054, 5198, 6728, 3800, 6729, 3146, 2436, 6018, 319, 696, 5551, 5344, 5345, 3656, 5553, 6954, 1320, 2000, 5630, 5350, 3314, 6022, 1765, 2574, 4424, 7162, 5870, 5781, 985, 4747, 2264, 3152, 5, 1154, 6962, 1233, 2452, 4750, 3326, 581, 5204, 4094, 4910, 2578, 1443, 1664, 5874, 4264, 5079, 3157, 4266, 5635, 699, 3812, 3813, 3814, 4099, 4268, 4753]. **arithmetic** [2581, 2582, 5357, 701, 990, 3815, 2584, 2273, 2585, 3335, 838, 3337, 1330, 4918, 1536, 2984, 3678, 3679, 5358, 839, 5449, 210, 5082, 6031, 4444, 2985, 3339, 1243, 2012, 1678, 6610, 5642, 5643, 6233, 2144, 6975, 4622, 4623, 5645, 5879, 5791, 998, 3510, 3944, 3341, 2287, 2987, 4764, 3347, 3513, 3348, 2464, 3174, 3175, 4767, 2465, 4455, 3690, 7116, 3183, 5214, 5973, 2149, 6616, 3692, 3827, 3517, 5215, 5364, 2017, 3518, 2602, 2151, 28, 2604, 4125, 3521, 1000, 4456, 1067, 1068, 1782, 2019, 2020, 1170, 3832, 5221, 2816, 3004, 656, 1461, 108, 4460, 4934, 4461, 1462, 2025]. **arithmetic** [4462, 324, 4937, 456, 5657, 6986, 1465, 2156, 2300, 3011, 1249, 3012, 847, 5658, 3358, 1347, 4137, 4293, 535, 2830, 1348, 2479, 3199, 6375, 3961, 4473, 3707, 540, 2303, 3708, 4474, 4475, 5801, 3202, 2164, 2622, 4782, 5113, 3367, 3965, 4481, 5385, 5663, 5803, 2491, 1472, 1473, 2624, 3017, 5117, 2035, 2625, 295, 1939, 4642, 1357, 1561, 5387, 5243, 948, 2630, 4147, 2846, 5807, 599, 798, 1358, 194, 4490, 2495, 6997, 7172, 4495, 4496, 5127, 4827, 5149, 5597, 2351, 6244, 4946, 2041, 1008, 3858, 1189, 1365, 4664, 1494, 3991, 1388, 1115, 6543, 1860, 6561, 1861, 2089, 2913, 2399, 3774]. **Arithmetic** [4066, 751, 975, 4242, 2124, 5437, 921, 1675, 3164, 1246, 1701, 1476, 5746, 21, 44, 5890, 5891]. **Arithmetic-Based** [6504]. **Arithmetic-Centered** [6801]. **Arithmetic-Friendly** [6553]. **Arithmetic-Geometric** [1718, 3644, 3986]. **arithmetic-level** [5204]. **Arithmetic-Modular** [4359]. **Arithmetic-Type** [483, 5270]. **Arithmetic/Logic** [2199]. **Arithmetic/Logical** [3029]. **Arithmetical** [6, 46, 513, 5855, 5947, 6104, 6345, 197, 4362, 401]. **Arithmetick** [3, 43]. **arithmético** [3986]. **arithmético-géométrique** [3986]. **Arithmetics** [6393, 195, 6799, 5516, 4371, 6717, 5774, 4595, 3937, 2981, 6611, 215, 1258, 1942, 1090, 1190, 1369, 4316, 6797, 5504, 5013, 4212, 830, 898, 756, 760, 1437, 2585, 5789, 1781]. **Arithmeticus** [2]. **Arithmetik** [1095, 894, 405, 1469, 1007, 1008, 1494, 2082, 751, 752, 2942, 2943, 1001, 2304, 2305, 2306, 2485, 2486, 1476]. **arithmetikk** [646]. **Arithmetikroutinen** [1701]. **Arithmétique** [5826, 4884, 2004, 702, 4496, 4324, 6273, 3416, 4357, 5338, 5197, 108, 4495, 4518, 990]. **arithmétiques** [4807, 5419, 4242, 2763]. **Arithmetische** [2399].

arithmetischen [1886]. **arithmometer** [146]. **Arithmos** [4338]. **aritmética** [4606]. **aritmetikk** [1740]. **AritPIM** [7068]. **Arizona** [7240]. **ARM** [5269, 6680, 6796, 6903, 6587, 6639, 5802, 3362]. **ARMv8** [6339, 6639, 6620]. **ARMv8-A** [6639, 6620]. **Army** [7263]. **ARPREC** [4510]. **Arrangement** [198, 2330]. **Array** [852, 1486, 1573, 665, 726, 808, 730, 7388, 7401, 3057, 3415, 1384, 1588, 1596, 1391, 1121, 1604, 823, 6701, 5028, 1218, 5743, 2393, 1418, 3299, 829, 6458, 6946, 3641, 1432, 638, 639, 686, 1434, 3141, 649, 1238, 2140, 1676, 6972, 1778, 939, 2831, 7384, 1182, 1940, 2499, 2181, 2650, 1492, 3414, 2207, 2686, 2883, 2354, 3898, 4720, 2419, 4403, 3792, 4409, 3129, 2000, 2451, 2972, 648, 2284, 3523, 1698, 1560]. **Array-Like** [852]. **Arrays** [7510, 7527, 1187, 1824, 871, 5998, 3257, 7040, 2711, 1136, 6203, 4072, 2938, 6014, 3130, 3474, 979, 3482, 644, 1665, 2134, 2801, 5654, 7495, 6400, 2695, 2409, 3131, 3493, 3525, 4296, 3207, 3371]. **Arrondi** [5427, 5100]. **Arsenal** [273]. **arsenide** [3236]. **Art** [7291, 6595, 2276, 2980, 6135, 1179, 7225]. **Article** [1484]. **Articles** [53]. **Artificial** [6552, 43, 6846, 6756]. **artificially** [5709]. **ary** [2926, 4147]. **As-if** [5540]. **ASAP** [7500, 7545, 7534, 7540, 7588, 7559, 7582]. **Asia** [7447]. **Asian** [7392]. **ASIC** [7356, 7481, 7539, 5152, 7376, 7447, 5536, 3189, 3025]. **ASICON** [7539]. **ASICs** [7447, 3865]. **Asilomar** [7300, 7318, 7329, 7424, 7272, 3786, 7425, 7439, 7452, 7463, 7479, 7492, 7506, 7574, 7586, 7615, 7367, 7408]. **Ask** [5370]. **AskConstants** [6370]. **Aspect** [855, 421, 4073]. **Aspects** [3417, 4375, 1237, 2366, 481, 1886]. **Aspekte** [1237, 1886]. **Aspen** [7398]. **ASPLOS** [7315]. **ASPLOS-III** [7315]. **Assembler** [4469]. **Assembly** [1508, 1401, 3297, 3466, 3532, 3022, 1734, 2825]. **Asserting** [4553]. **Assertion** [6388, 6472]. **Assertion-Based** [6388, 6472]. **Assertions** [3405, 3751]. **Assessing** [6677, 6180, 3925, 4082]. **Assessment** [7423, 2922, 6109]. **Assessments** [4871]. **ASSETS** [7526]. **assignment** [2574]. **Assimilations** [287]. **Assistance** [4222, 4738]. **Assistant** [7078, 5138, 5966]. **Assisted** [3658, 6144, 1706, 4147, 4149, 4648]. **Associate** [1905]. **Associated** [5701, 106, 4424, 2976]. **Association** [7254, 1332]. **Associative** [2882, 6413, 6101, 2128, 3672, 1683, 4635, 2287, 2987]. **Assurance** [7285]. **ASTC** [6362]. **Astronom** [1322, 1167, 1467]. **Astronomer** [1167]. **Astronomical** [5636]. **Astronomy** [7047]. **Astrophysics** [7191]. **Asymmetric** [5275, 6534, 5043, 4421, 5649]. **asymptotic** [4984, 3587, 819, 2014]. **Asymptotically** [6313, 5247, 6666]. **Asynchronous** [1376, 5650, 5881, 3438, 3320, 4631]. **AT&T** [2218, 3099]. **AT-based** [2271]. **Atan2** [6065]. **Atanasoff** [4061, 5653]. **Atari** [2069]. **Athens** [7217]. **Athlon** [4278]. **Atkin** [5182]. **Atlanta** [7386, 7328, 7621, 7296]. **Atlantic** [7200, 7207, 7189]. **Atlas** [379, 383]. **atmosphere** [2709]. **ATOM** [3354]. **atomic** [6764]. **Atrubin** [969]. **attached** [1816]. **Attack** [6156, 6646]. **Attacks** [6881, 6161, 4418, 4603, 4605, 4748, 5830]. **Attainable** [728, 5590]. **Attempt** [469]. **Attention** [4656]. **attenuation** [736]. **attributable** [4160]. **attribute** [5508]. **attributes** [2843]. **Auctions** [5014]. **Audio** [2929, 3896, 978]. **Auditorium** [7434]. **AUGMENT** [1265, 1098, 1107]. **Augmented** [5692, 730, 823, 6475, 6784]. **Augmenting** [2730, 2138]. **August** [7211, 7254, 7400, 7543, 7557, 7412, 7471, 7558, 7484, 7589, 7614,

7501, 7208, 7390, 7431, 7434, 7436, 7447, 7533, 7581, 7490, 7417, 7462, 7478, 7505, 7522, 7537, 7310, 7205, 7395, 7248, 7523, 7507, 7467, 7369, 7553, 4061]. **Ausführung** [1886]. **Ausgabefunktionen** [2486]. **Aussage** [768]. **Austin** [7435, 7475, 7604]. **Australia** [7242, 7450]. **Australian** [7306]. **Austria** [7275]. **Auswahl** [1237]. **Auswertungsalgorithmen** [1062]. **Authentication** [4800]. **Author** [4503, 4658, 5253, 5474, 6252, 6768, 6883, 773, 6621]. **Auto** [6543, 4201, 7130]. **Auto-Ranging** [4201]. **Auto-tuning** [6543, 7130]. **Autocode** [379, 383]. **autocorrelation** [3888]. **autogeneration** [5457]. **Automata** [4815, 5274, 5496, 4024, 4577, 7190, 2890, 256]. **Automatable** [6057]. **Automated** [6251, 6076, 4737, 6229, 5654, 6943]. **Automatic** [1481, 2865, 5901, 5396, 105, 381, 668, 5707, 1728, 7374, 6683, 6906, 99, 4832, 3588, 1509, 112, 7344, 625, 86, 5029, 4394, 4399, 5856, 6108, 6724, 120, 94, 983, 365, 5779, 3662, 5352, 2133, 4615, 706, 6230, 4104, 187, 1071, 6371, 167, 5378, 5576, 6642, 4947, 1562, 552, 7372, 296, 329, 6283, 283, 92, 679, 2727, 4071, 364, 3185, 147, 6994, 35, 57, 7529, 7344, 69]. **Automatically** [6128, 6333, 6452]. **Automatics** [1554]. **Automating** [6292, 4545]. **Automation** [7376, 7414, 7530, 5427, 17]. **automatique** [17]. **automatisation** [5427]. **Automotive** [4001, 7256]. **Autonomous** [6407, 5758]. **Autoscale** [1551]. **AUTOSCALER** [4238]. **aux** [40, 108]. **Available** [617, 4325, 1497, 2808]. **Average** [6054, 6395, 5037, 2562, 4465]. **Averaging** [1589]. **avionics** [2665]. **Avoid** [4966, 5924]. **avoidance** [956]. **avoided** [4680]. **Avoiding** [4506, 3138, 5958, 7168, 3580, 1128]. **Avoids** [6029]. **AVR** [6092]. **Avril** [7430]. **AVX** [6386, 7035]. **AVX-512** [6386, 7035]. **AVX2** [6831]. **AVX512** [7103]. **Aware** [7015, 6506, 7009, 7049, 6723]. **AWGN** [5192]. **Axiomatic** [3170, 635]. **Axiomatisierung** [2700]. **Axiomatization** [1762, 2700, 2701]. **Axiomatizations** [1942, 2585]. **axis** [7156]. **AxOMaP** [7167]. **AXP** [3519]. **AxRMs** [6991].

B [340, 341, 262, 6490, 6510, 3271, 3649, 3481, 2965, 2447, 3495, 2284, 4468, 2842, 3537, 3415, 3605, 993, 2672]. **B-factory** [3605]. **B-Spline** [3415]. **B.S.T.J.** [1515]. **B5500** [302]. **BaBar** [3605]. **Babbage** [16, 60, 235, 3671]. **Babuska** [579]. **Babuskasche** [579]. **Babylonian** [4086]. **Back** [2501, 5422, 6480, 3185]. **back-of-the-envelope** [3185]. **Backward** [3405, 6798, 3069, 3751, 6076]. **Bad** [4166, 3881, 6459, 7279, 6529, 4160, 4010, 4291]. **balance** [2195]. **Balanced** [5685, 2752, 5271]. **balancing** [3213]. **baleful** [3625]. **Ballistic** [71]. **Balls** [6243]. **Baltimore** [7327, 7526, 7461, 7489]. **Band** [2631]. **Bandwidth** [6899, 6374, 1397, 5931, 4412]. **Bangalore** [7563, 7594]. **Bangladesh** [7580]. **banking** [2015]. **banks** [3851]. **Barrel** [4611]. **Barrett** [6421, 5614, 7106]. **barycentric** [6346]. **Base** [851, 1006, 378, 4314, 499, 815, 332, 3744, 4014, 6534, 6808, 885, 1035, 5524, 4370, 2906, 744, 347, 2110, 445, 475, 577, 765, 919, 775, 776, 322, 933, 3959, 7126, 6643, 950, 4815, 5907, 5703, 4707, 2721, 5863, 757, 5774, 5631, 5, 6363, 7104, 2466, 5797, 148, 5241, 4956, 3162]. **Base-** [1006, 2110, 6363, 7104]. **base-2** [757]. **Base-Prime** [6808]. **Based** [1563, 5892, 6388, 5816, 3394, 2863, 7011, 3395, 6051, 6052, 3046, 6667, 5988,

6504, 7136, 4515, 6511, 5827, 2199, 6901, 611, 5829, 6166, 220, 2059, 6903, 6282, 6409, 3584, 3742, 5717, 6287, 5837, 6541, 6930, 6815, 6184, 5841, 5930, 4551, 6080, 4715, 6697, 6698, 5731, 6302, 2716, 4209, 3900, 6821, 5737, 5418, 4046, 6091, 5535, 5608, 1631, 5614, 6718, 6939, 2555, 4577, 6940, 5186, 5044, 7072, 1143, 5622, 6340, 6838, 6946, 4080, 6726, 3802, 2572, 4085, 7083, 6846, 6124, 4427, 7165, 7099, 4101, 5785, 2134, 4916, 6472, 6854, 5638, 7107, 6367, 6615, 6860, 712, 6744, 5651, 5365, 2814, 1694, 4939]. **Based** [6987, 5799, 6374, 7125, 5383, 5887, 6990, 6992, 3966, 3377, 6993, 1004, 6760, 5124, 5833, 6531, 4295, 4963, 4655, 5676, 3560, 6264, 6394, 3865, 6783, 4169, 5487, 4677, 6681, 4683, 4004, 4529, 5710, 5713, 4836, 6921, 4541, 5507, 4838, 3888, 2890, 2209, 4704, 4193, 5011, 6816, 5302, 6931, 6003, 5415, 4858, 6429, 3769, 3449, 4565, 5169, 5739, 4566, 4048, 2392, 1523, 2230, 5421, 5757, 3113, 3114, 3115, 3116, 2246, 2419, 2422, 3303, 5860, 4078, 3793, 2941, 5771, 2252, 4248, 4249, 4250, 4411, 4412, 4594, 4890, 4081, 4251, 2431, 5773, 5341, 5196, 7295, 7309, 364, 5067, 4745, 6733, 3316]. **based** [6737, 6964, 3669, 2972, 2267, 183, 206, 5784, 2271, 4273, 4275, 4616, 1537, 1774, 1162, 2985, 772, 4763, 4923, 5790, 5971, 7167, 4455, 7116, 3517, 2017, 5797, 1000, 6862, 1921, 3525, 4630, 6983, 3527, 3704, 4290, 4779, 1347, 2827, 3840, 7123, 5376, 5377, 2482, 4481, 5803, 3207, 3371, 4148, 4149, 4488, 4646, 4647, 6487, 2846, 6994, 3381, 2315, 1943, 6653, 7062]. **Basel** [7340, 2585]. **Bases** [5478, 6780, 6893, 549, 550, 6164, 6177, 5296, 4580, 5627, 6117, 531, 598, 5148, 4045, 2226, 3812, 4758, 5647, 3184, 3365, 3969]. **Basic** [3558, 5820, 6393, 1267, 1501, 513, 6318, 4395, 634, 5046, 3647, 1147, 290, 6956, 2141, 1162, 6033, 5119, 1194, 5762, 756, 2816, 3004, 4935, 1086, 1011, 2588, 1337, 2600, 1092, 4516, 1728, 4474]. **Basics** [2501, 4164]. **Basis** [5694, 2881, 5999, 6071, 5157, 4708, 751, 752, 894, 4073, 6355, 4426, 5206, 3818, 4277, 4443, 4760, 6608, 485, 1702, 5121, 600, 4688, 3593, 3607, 3914, 4730, 3795, 1897, 4902, 4260, 146, 4759, 4761, 4920, 4921, 5083, 4463, 2489, 4643]. **Basiserweiterung** [3162]. **Basiswahl** [751, 752, 894]. **batch** [6481]. **batches** [6651]. **Bath** [3466, 7406]. **Battle** [3753]. **Baugh** [5572]. **Baule** [7235, 7237]. **Bayesian** [6942, 7067]. **BC** [7377, 1102, 3073]. **BCD** [6169, 2003, 1710, 859, 1493, 6281, 5280, 5421, 4055, 521, 1641, 1655, 2003, 778, 779, 780, 781, 782, 783, 784, 1166, 5107, 1789, 5231, 5232, 5575, 6037, 5380]. **BCD-based** [5421]. **BCD-floating-point** [1789]. **BDDs** [5136]. **Be** [989, 3037, 4680, 2076, 1297, 2548, 890, 6459, 5]. **Beach** [7443, 7510, 7527, 7596]. **Beamforming** [3117, 2422, 2451]. **Beating** [6298, 6299]. **Beauty** [7331, 1943]. **Because** [6521, 6535]. **bedingte** [548]. **Bedot** [7051]. **beefs** [2220]. **been** [7027]. **Before** [6598, 5488, 32, 1833, 2015, 96]. **Begründung** [975]. **behave** [5989]. **Behavior** [4966, 4353, 881, 5889, 6687, 6813, 880, 6017]. **Behavioral** [3892, 4313, 4021]. **behaviour** [2599, 2620]. **Behind** [5604, 3440]. **Behrooz** [4157, 4158]. **Beijing** [7484, 7490]. **Being** [2577]. **Beispiel** [2615]. **Beispielen** [2735]. **Beitr** [801]. **Belfast** [7471, 7587]. **Belgium** [7573, 7369]. **beliebige** [2103]. **beliebigen** [2053]. **beliebiger** [651]. **Bell** [2691, 75, 98, 5744]. **bench** [3518]. **Benchmark** [6170, 1741, 1871, 1751, 1764, 1773, 1690, 4531, 1734, 1735, 1737, 3583]. **Benchmarks** [2677, 2238, 3037, 3625]. **Benefit** [6650, 1491].

Benefits [6791, 6792, 5059, 5195, 2492, 1484]. **Benford** [5273, 5585, 3718, 5682, 5683, 5589, 1097, 5285, 5514, 4855, 5014, 4552, 5170, 5043, 5185, 4240, 1446, 4437, 5448, 5788, 2285, 2286, 785, 717, 1471, 661]. **Benutzerhandbuch** [1469]. **Berechnung** [1812, 1095, 385, 2100, 586, 651, 1628, 1795]. **beregner** [1329]. **berekenen** [492]. **Berger** [3641, 2429, 3129]. **Bergman** [4632]. **Berichtigung** [894, 358]. **Berkeley** [1379, 2109, 2250]. **Berlin** [7231, 7266, 7547, 7480]. **Berlin/Wendisch** [7231]. **Berlin/Wendisch-Rietz** [7231]. **Bernstein** [5609, 6590, 6361]. **Bertinoro** [7544]. **Beschreibung** [2615]. **Besieged** [5032]. **besonderer** [1700]. **Bessel** [5529]. **Best** [5924, 2692, 514, 580, 2281, 599, 3391, 6939, 482]. **Bestehens** [1653, 7251]. **bester** [514]. **Bestimmung** [514]. **Beta** [4469, 4470, 4935]. **Betriebssystems** [587]. **Better** [6360, 7119, 2194, 4241]. **Between** [3979, 5911, 5181, 4075, 5051, 7248, 585, 3682, 598, 4806, 5905, 6163, 5145, 4181, 4837, 5284, 5157, 674, 3762, 3771, 3315, 4425, 208, 3820, 6039, 3247]. **Beyer** [531]. **Beyond** [1725, 6187, 6297, 2225, 1893, 1442, 3204, 5661, 5588, 2045, 4758]. **BF16** [6967, 6639]. **Bfloat** [6857]. **bfloat16** [6552, 6430, 6753, 6436, 6569, 6802, 6620, 6639, 6644, 6515]. **Bhubaneswar** [7551]. **Bi** [1169, 1000]. **Bi-Imaginary** [1169, 1000]. **Bialystok** [7623]. **Biased** [1839, 6477]. **Bibliography** [5682, 1432, 928, 595, 5170, 705, 991, 1236]. **BiCGstab** [3521]. **BiCMOS** [3605, 3271]. **BID** [5106, 7169]. **BIDEC** [155]. **Biennial** [7253, 7269]. **Bifurcation** [3674]. **Big** [6406, 6536, 1518, 6185, 3900, 5433, 6131, 6460, 5626]. **BigDecimal}** [4822, 4636]. **BigNum** [5218, 5219]. **bilinear** [1664]. **billing** [5424]. **Billion** [3753, 6746]. **Bimodular** [5947]. **Binaire** [1]. **binäre** [3344]. **binären** [801]. **binärer** [1976]. **Binary** [5471, 5670, 1081, 1259, 1361, 7005, 7006, 2863, 5820, 1087, 5897, 665, 1012, 859, 2869, 1372, 6159, 5686, 5990, 809, 551, 3055, 6163, 196, 5694, 170, 730, 610, 611, 1103, 1383, 1273, 2345, 3061, 332, 1198, 1727, 4005, 5278, 5501, 155, 224, 6169, 1108, 1830, 5280, 173, 2688, 5922, 504, 174, 3080, 5295, 5296, 507, 673, 5012, 1280, 431, 1606, 3753, 4547, 2531, 623, 1400, 1843, 5415, 5930, 2537, 1406, 1613, 4862, 1614, 558, 342, 3761, 5733, 86, 5528, 5530, 6551, 1976, 5310, 2391, 1861, 1862, 1863, 2088, 7056, 7057, 5316, 973, 5537, 6313, 4056, 4224, 3290, 3774, 5179]. **Binary** [2742, 286, 2104, 6104, 260, 5544, 233, 287, 5053, 1145, 6584, 181, 261, 3478, 262, 2111, 639, 686, 691, 1644, 4415, 263, 447, 693, 694, 761, 265, 102, 266, 5072, 1056, 645, 121, 988, 1156, 2788, 1235, 368, 34, 920, 1535, 584, 210, 370, 123, 586, 185, 267, 7104, 531, 239, 1680, 486, 3344, 372, 1166, 4117, 4453, 7115, 96, 843, 1781, 714, 1459, 1460, 6985, 2155, 5106, 189, 167, 939, 5375, 5376, 5377, 5569, 5799, 6382, 659, 415, 244, 6993, 3850, 1940, 3214, 552, 1710, 1711, 6497, 6264, 6154, 953, 2045, 2646, 2652, 90, 5591, 7020, 7021]. **binary** [4330, 3733, 6400, 4816, 2196, 6518, 5703, 1962, 6418, 5926, 5298, 225, 5520, 1292, 1293, 3097, 1300, 1864, 4379, 3289, 3626, 5610, 2923, 2733, 2926, 2556, 2418, 1230, 5859, 1, 4244, 1429, 1758, 234, 402, 3134, 4596, 4740, 695, 833, 3926, 5631, 1233, 6468, 2786, 3679, 6228, 4920, 1678, 5971, 2598, 2017, 5797, 2468, 6982, 1461, 1928, 3706, 5660, 5801, 6640, 3363, 3364, 2837, 3375, 5386, 5389, 801, 4650, 4790, 4791, 6878]. **Binary-BCD** [1166]. **Binary-Coded** [1606, 1614]. **Binary-Coded-Decimal** [5179, 1145]. **Binary-Decimal** [2531]. **Binary-Integer** [5106]. **binary-**

residue [3926, 3363, 3364]. **Binary-Ternary** [5471, 5670, 6159]. **Binary-to-Decimal** [2863, 5990, 155, 224, 1406, 261]. **Binary-to-Multidigit** [5072]. **Binary/Decimal** [6382]. **Binary128** [5740, 5846, 6208, 6335]. **binary64** [7053, 7054, 7153, 5905, 6208, 6335, 6221]. **Bindings** [3857]. **BinFPE** [6941]. **Biography** [4285, 5653]. **biological** [5358]. **Biologically** [7576]. **Biology** [7302]. **biometric** [6401]. **Biophysically** [5982]. **biopolitics** [6877]. **Biot** [7108]. **Bipartite** [4971, 5423, 3512, 3824, 4111]. **bipolar** [2949]. **biquad** [1879]. **Biquinary** [811]. **Biresidue** [583]. **Birmingham** [7362, 7291]. **Birthday** [7331, 5610, 7407]. **bis** [61, 7407]. **Bisection** [3250, 6583, 3710, 3249, 3426]. **bisection-like** [3426]. **BIST** [4781]. **BIT** [217, 228, 3728, 3055, 5694, 4991, 1196, 5498, 3999, 4996, 2883, 1600, 6071, 4547, 1609, 6542, 4366, 5527, 2904, 5309, 7051, 3282, 343, 5172, 2093, 4571, 6717, 2102, 2416, 4580, 5764, 4401, 6206, 5052, 570, 4600, 2438, 4604, 3929, 6734, 2966, 5206, 7099, 649, 5447, 4760, 2011, 3819, 4444, 5084, 5451, 2987, 7119, 1548, 1780, 1549, 5655, 1787, 2299, 2483, 3204, 6872, 1557, 3209, 4643, 2857, 6880, 3031, 1261, 7006, 2318, 5986, 4795, 2326, 2329, 2187, 2189, 2331, 4806, 2193, 5487, 6900, 5401, 1955, 5143, 4990, 5492, 4819, 3422, 4688, 4183, 5002, 1968, 1602, 3077, 5008, 5010]. **bit** [2370, 4851, 3084, 4034, 4712, 3598, 1404, 1611, 3439, 308, 4554, 5020, 6548, 5168, 2718, 6824, 3455, 7057, 1624, 2405, 2406, 2551, 3914, 2410, 2741, 2412, 2413, 2414, 2415, 2244, 2556, 2932, 4730, 5189, 5190, 5048, 2427, 6837, 5954, 6589, 1760, 2562, 2563, 1997, 4596, 4740, 1646, 7081, 2437, 5867, 6353, 6354, 6954, 2261, 2775, 3319, 2265, 6960, 2575, 5352, 1443, 4267, 3333, 1908, 7098, 648, 5446, 3678, 4921, 4924, 7107, 4925, 2471, 4461, 6750, 4131, 3195, 1929, 3012, 4136, 4940, 3965, 2490, 6486, 1477, 2034, 1256, 1705, 2841, 3210, 3968, 3969, 5981, 2314, 1943]. **bit-complexity** [1443]. **bit-flip** [5954]. **Bit-Level** [6071, 2883, 4600, 7107, 4806, 5867]. **Bit-Manipulations** [6206]. **bit-map** [3204]. **Bit-Parallel** [5498, 5527, 4401, 5206, 5447, 5451, 5172, 2987, 4643, 4990, 5010, 3914, 5048, 3678, 3968, 3969]. **Bit-Pipelined** [2416, 2244, 2556]. **bit-reproducible** [5986]. **Bit-Sequential** [1196, 2011, 1548, 1780, 1549, 2189, 2471]. **Bit-Serial** [4991, 1609, 4366, 5527, 4571, 2102, 5052, 4604, 2904, 3282, 2193, 3598, 4925, 3012, 1705, 2314]. **bit-slice** [1955, 1256]. **Bit-Sliced** [5694, 4444]. **bit-true** [6824]. **bit-vector** [5487]. **Bit-Width** [5764, 4851, 5352]. **Bits** [4964, 4165, 431, 434, 2563, 5959, 6364, 1943]. **bitwise** [6110, 6965]. **Bivariate** [5752, 6175, 5427]. **bivariées** [5427]. **BKM** [3043, 3226]. **Black** [5942]. **Blackfin** [4659]. **blame** [6231]. **BLAS** [4516, 6043, 6148, 6158, 6278, 5920, 5996, 6172, 6413, 6916, 6917, 6093, 6094, 6709, 6710, 4588, 6349, 5868, 5782, 4943, 5802, 6635]. **BLAS1** [6576]. **BLAST** [4210, 4211, 4958]. **Bledy** [458]. **Blending** [5111]. **blew** [6746]. **Blinn** [3730]. **BLIS** [6868]. **BLITZEN** [2506]. **Block** [7011, 3398, 6505, 3994, 4853, 4235, 1226, 6105, 3802, 7091, 2294, 1788, 3037, 4818, 4989, 2667, 2522, 4023, 1205, 3111, 3463, 3629, 4878, 1227, 4898, 5064, 581, 2274, 4102, 1066, 2491, 1939, 3709]. **Block-Floating-Point** [4235, 3463, 3629, 4878, 581]. **Block-Level** [7011]. **Blocked** [6174]. **Blocklength** [2634]. **Blocks** [6318, 6956, 7097, 6367, 6991, 5390, 6995, 5046, 981, 5849]. **blood** [2338, 2512]. **Bloomington** [7404]. **Blue**

[3753, 4992, 5005, 5056]. **BlueGene** [4798]. **BlueGene/L** [4798]. **blur** [2310]. **BN** [669]. **BNS** [2418]. **Board** [3551, 5712, 2082, 2315, 3640]. **boards** [1998]. **body** [4591, 4942]. **Boltzmann** [4635]. **Bombelli** [3941]. **Bonas** [7366]. **Book** [3720, 4157, 4158, 21, 4681, 510, 554, 389, 340, 341, 44, 1653, 1322, 1672, 996, 531, 372, 272, 2481, 908, 2477]. **Books** [6559, 6825]. **Bookshelf** [4593]. **Boolean** [7014, 2661, 335, 354, 997, 790]. **Boost** [3980, 2530, 6931, 2008]. **Boosting** [4084, 4419]. **boot** [3508]. **Booth** [3389, 1261, 4839, 7150, 6199, 6338, 3478, 3936, 4610, 7165, 6972, 925, 6638, 4299]. **Borel** [4815]. **Borland** [2220]. **Borneo** [3880, 4340]. **Borrow** [144, 2892]. **borrow-save** [2892]. **Boston** [7211, 7315, 7511, 7202, 7238, 7301, 7361, 7582, 7284, 7466]. **both** [6275, 981]. **Boulder** [7248]. **Bound** [952, 5707, 6319, 4075, 3657, 3680, 5450, 2991, 4666, 3732, 4560, 5192, 2807, 2990, 4154, 2822]. **Boundary** [5545, 3674]. **Bounded** [3973, 5600, 3334, 2136, 5136, 5412]. **Bounding** [6896, 5593, 3475, 3643, 3919, 3930]. **Bounds** [6492, 5985, 3398, 3399, 7024, 7037, 7144, 4030, 6090, 5938, 6313, 6318, 3783, 3301, 4397, 6343, 6590, 6213, 6956, 3661, 4090, 479, 6028, 6361, 586, 6230, 6611, 849, 4479, 799, 5248, 7409, 5987, 4512, 5681, 3047, 1949, 5265, 4824, 4825, 5596, 5150, 6929, 7049, 6007, 6198, 6314, 6440, 3915, 5860, 1639, 365, 6356, 4752, 5449, 1335, 6234, 4771, 2025, 7121, 942, 5125]. **Box** [6474, 6777]. **Box/Inverse** [6474]. **Br** [7243]. **Brahmagupta** [2404]. **Brains** [5021]. **Branch** [2093, 3796, 3680]. **Branch-and-Bound** [3680]. **Branching** [6727, 3680]. **Brazil** [7556, 7596]. **Breakdown** [7168]. **breakdowns** [6540]. **Breaking** [5273]. **Breakthroughs** [6872]. **Breckenridge** [7344]. **Breisgau** [7449]. **Brent** [5890, 5891, 1098, 1265]. **Bresenham** [4617]. **Brickell** [2219]. **Bridge** [5444]. **Bridging** [4806, 5456, 6375]. **Brief** [5030, 6877]. **Briefs** [1515, 3753]. **Briefwechsel** [4865]. **Briggs** [5814]. **Brightening** [6859]. **Brighton** [7320]. **Bring** [3753]. **Bringing** [6872, 5429]. **Brings** [6639, 1997]. **British** [7397, 7571, 7390]. **broadband** [4250, 4594]. **Broadmoor** [7241]. **Broken** [6972]. **Brook** [7223, 7304]. **Brousentsov** [4632]. **Brouwer** [5875]. **Bruijn** [2822]. **Bruijn-Newman** [2822]. **Brussels** [7369]. **Bubbles** [1077]. **Buch** [2477]. **Buchbesprechungen** [908]. **Buchholz** [272]. **bucks** [6460]. **Bug** [3724, 3727, 6161, 3565, 3418, 3738, 3876, 3749, 3440, 6352, 3505]. **Bugs** [4593, 7177, 6746]. **Build** [2077, 6127, 7529]. **Building** [3854, 547, 4353, 7515, 7256, 6318, 5849, 6956, 5208, 6991, 6995, 5046, 3354]. **Built** [304, 4035, 3759, 2253, 3940]. **Built-In** [304, 4035, 3759, 2253, 3940]. **Bulgaria** [7400, 7349]. **bulk** [6965]. **bulk-bitwise** [6965]. **Bunka** [7599]. **Bureau** [7181]. **Burroughs** [1124]. **burst** [5169]. **burst-by-burst** [5169]. **bursty** [4249]. **bus** [2499, 4409]. **bus-connected** [2499]. **Business** [7331, 4220, 5032]. **Business-Oriented** [4220]. **butterfly** [1761, 1723]. **Byte** [6506]. **Byte-Aware** [6506].

C [4967, 340, 341, 3121, 7157, 2765, 3145, 372, 930, 7008, 3853, 6778, 2331, 5689, 5902, 5904, 5142, 4673, 6513, 3870, 6524, 3995, 3996, 5147, 5279, 6069, 7039, 6539, 1128, 3760, 3450, 5175, 5176, 5177, 5533, 5038, 3118, 3121, 5853, 4238, 5620, 4405, 2561, 4422, 6220, 3493, 7217, 4099, 2977, 3160, 2276, 2980, 2455, 2588, 5446, 4445, 7105, 5972, 3167, 2600, 5457, 2288, 6745, 3352, 2824,

4469, 3529, 7313, 3844, 1796, 7422]. **C-MOS** [1796]. **C-testable** [5446]. **C-XSC** [3118, 5853]. **C.** [5488]. **C/C** [6778, 6069, 5457, 3844]. **C2** [2398]. **C99** [5570]. **C9X** [4597]. **CA** [7402, 7504, 7583, 7478, 7537, 7228, 7303, 7420, 7286, 7371, 7456]. **cache** [3350, 3401]. **caches** [3492, 3666]. **CAD** [3083]. **CADAC** [1387, 1591]. **Cadence** [4499]. **CADNA** [3416, 3574, 5420, 5620, 5362]. **CADNA_C** [5620]. **Cairo** [7525]. **calc.exe** [6512]. **Calcolo** [3941]. **Calcul** [3986, 6273, 4242, 2807, 4495, 5127]. **calculate** [1329, 1255]. **Calculated** [3895, 7027]. **calculates** [1848]. **Calculating** [7181, 154, 5016, 6693, 6319, 30, 25, 1757, 1318, 6132, 77, 296, 4, 40, 1598, 1731, 3465, 50, 2436, 2783, 95, 492, 35, 29, 124]. **Calculation** [5985, 6152, 327, 5260, 2657, 4017, 281, 384, 431, 5724, 3899, 626, 1631, 94, 2955, 2766, 6023, 207, 920, 1535, 709, 268, 6746, 1694, 5800, 299, 6512, 40, 6688, 2694, 283, 391, 6429, 4567, 2239, 2240, 4877, 1988, 4242, 6218, 6463, 452, 34, 3941, 107, 4625, 2604, 5657, 3198, 2487, 4495]. **Calculations** [4163, 381, 4822, 5503, 3428, 1608, 6081, 3784, 2140, 3711, 1562, 3222, 6518, 5924, 1854, 2389, 1765, 3508, 2144, 460, 35, 6636]. **Calculator** [1481, 2872, 1102, 61, 1509, 1023, 1024, 1025, 1113, 86, 1041, 1223, 1307, 4389, 94, 3799, 1151, 115, 121, 6134, 1682, 926, 1546, 269, 932, 1338, 3528, 70, 5109, 6267, 118, 159, 100, 1137, 3465, 1531, 1052, 6120, 235, 3671, 1167, 104, 3185, 108, 124, 57, 1567, 69, 1645, 134]. **Calculators** [727, 1022, 4389, 4291, 3472, 107]. **calculer** [29, 40, 108]. **calculs** [40, 3159]. **calculus** [7159]. **Calgary** [7591]. **calibrating** [4861]. **Calif** [7314]. **California** [7457, 7510, 7527, 7554, 7373, 7300, 7318, 7329, 7319, 7213, 7346, 7403, 7434, 7488, 7607, 7272, 3786, 7425, 7462, 7505, 7479, 7492, 7574, 7261, 7612, 7354, 7367, 7408, 7495, 7342, 7514, 7399, 7424, 7182, 7271, 7473, 7561, 7439, 7452, 7463, 7506, 7586, 7615, 7419, 7426, 7440, 7493, 7552, 7568, 7494]. **Call** [5254, 5255, 5475, 5673]. **Call-for-Papers** [5475]. **called** [5]. **calls** [1191]. **CalmRISC32** [4380]. **calorimeter** [3605]. **Cambridge** [7323, 7335, 7360, 7353]. **CAML** [2952]. **Can** [5585, 4351, 1041, 1137, 2550, 2973, 3392, 5132, 4680, 2076, 1297, 3111, 3627, 6459]. **Canada** [7397, 7571, 7254, 7429, 7256, 7348, 7519, 7559, 7438, 3191, 7558]. **Canadian** [7591]. **Cancellation** [5909, 4339, 995, 3945, 6412, 5948, 2973, 3944]. **Cancun** [7579]. **Canonic** [3584]. **Canonical** [1549, 2926, 3914, 5388]. **Can't** [6535]. **Cantilever** [3775]. **capabilities** [1847, 2746]. **Capability** [1566, 2873, 6948, 6949, 1373, 2947, 1997]. **Cape** [7535, 7538]. **CAPI** [6404]. **Carathéodory** [7217]. **Card** [94, 1546, 104]. **Card-Programmed** [1546, 104]. **Cardinality** [5997]. **Cards** [4715]. **Care** [3085]. **Carefully** [6428, 3713]. **Carlo** [7182, 5910, 6068, 6173, 6074, 3813, 3814, 4099, 4268, 4269, 5382, 5807]. **CARM** [7118]. **Carnegie** [7222]. **Carnegie-Mellon** [7222]. **Carriers** [150]. **Carry** [378, 7009, 4329, 5697, 3736, 4172, 4819, 3578, 4535, 4536, 6171, 336, 5294, 3080, 1125, 2077, 5747, 6195, 754, 233, 287, 144, 3147, 2002, 3334, 2789, 5786, 4928, 5231, 5245, 803, 2337, 2667, 2883, 4350, 2526, 4699, 2732, 1900, 5086, 1168, 5795, 5882, 2480, 4473]. **Carry-aware** [7009]. **carry-free** [5086]. **carry-lookahead** [803]. **Carry-Lookahead** [4172, 2002, 2667, 1900]. **carry-propagate** [2526]. **Carry-Propagation** [378, 233]. **Carry-Save** [4535, 4536, 6171, 336, 5294, 3147, 2789, 3578, 2883, 4350, 4699, 1168, 5795, 5882]. **carry-save-adders**

[4473]. **Carry-Select** [5770]. **Carry-Skip** [2077, 2337, 2667, 2732, 2480]. **Carry-Storage** [287]. **carrying** [762, 1054]. **cas** [5100]. **Cascade** [367, 478, 2907, 2407, 2336]. **cascade-correlation** [2907]. **Cascaded** [3469]. **cascades** [1781]. **Cascading** [371, 1779]. **CASCON'98** [7438]. **Case** [4306, 5484, 6695, 3783, 1439, 3496, 4278, 1453, 2810, 934, 4459, 7123, 6143, 3369, 6146, 3229, 4533, 4702, 7052, 3915, 5619, 6017, 6742, 4465, 6375, 3380]. **Cases** [3429, 2357, 5305, 4404, 4735, 5191, 5428, 5949, 4415, 4634, 5102, 5249, 6517, 4718, 3461, 4734, 4596, 4740, 4774, 5100]. **Casting** [6059, 7066, 2836]. **Castle** [7572]. **Catastrophic** [4339]. **Categorial** [7231]. **Cauchy** [3636]. **caused** [1756, 701]. **Causes** [6366, 6478, 3360, 1703]. **Causing** [5991]. **CAV** [7577]. **Caveats** [5708, 5499]. **CCD** [1527, 2114]. **CCECE** [7591]. **CD** [7465]. **CD-ROM** [7465]. **CDC** [625, 303, 732, 555, 637, 1243, 1346, 718]. **CDC-3600** [303]. **CDMA** [5169, 4248, 4249, 4250, 4411, 4412, 4594, 4890, 4148]. **Ce.** [2082]. **celebrate** [5610]. **Celebration** [7567]. **CELEFUNT** [3060]. **céleste** [40]. **celestial** [40]. **Cell** [5697, 2897, 4034, 7348, 2393, 2917, 3186, 5583, 2681, 3747, 2898, 2729, 3287, 2419, 2754, 3189, 5068, 5078]. **Cells** [6652, 3440]. **Cellular** [5274, 5496, 1596, 2890, 4024, 1218, 4577, 638, 686, 939, 3414, 5424, 2586]. **Cent** [334, 165]. **Center** [7327, 7541, 720, 7277, 7414, 7460, 7532, 7584, 7599, 7259, 7226]. **Centered** [6801]. **central** [3154, 3155]. **Centre** [7616, 7348, 7502, 7418, 7215]. **centric** [7584]. **centuries** [1160]. **Century** [7516, 7390, 4042, 7460, 27, 31, 5488, 1322, 931]. **CEQRNS** [3523]. **CERN** [625]. **Certain** [13, 1812, 812, 734, 5014, 83, 3140, 366, 4432, 4433, 589, 552, 1269, 466, 1397, 225, 1868, 3461, 5183, 3171, 2617, 2618, 2619, 1704]. **Certificate** [6114]. **Certification** [5596, 5798, 595, 5264, 5427, 5197, 539]. **Certified** [5495, 6343, 6590, 5779, 6361, 4824, 4825, 5342]. **Certifying** [5483, 5409, 5715]. **CFloat16** [7007]. **CFloat8** [7007]. **CFT77** [2425]. **CG** [3649, 3801, 2620]. **CG-Like** [3801]. **CG-S** [2620]. **CGO** [7504]. **Château** [7366]. **chain** [2249, 3713, 5241]. **Chained** [6973]. **Chains** [5683, 6195, 3334, 5786, 3845, 6416, 620, 3964]. **Chaitin** [4938]. **Challenge** [4395, 409]. **Challenges** [7343, 7433, 7391, 6107, 5576, 5898, 7563]. **chance** [3486]. **changes** [1703, 3016]. **Changing** [6805, 7343]. **Channel** [6526, 4418, 4603, 4605, 4748, 4680, 2246]. **Channels** [6880, 6748, 2636, 6322, 3788, 5192, 4248, 4249, 4646]. **Chaos** [6521, 6535, 6544, 3716, 6522, 2578]. **Chaotic** [6509, 2162, 7064, 6039]. **Chapter** [1617]. **Character** [1769, 1906, 6497]. **Characteristic** [5135, 5260, 5684, 5983]. **Characteristics** [3734, 615, 731, 504, 396, 1637, 2279, 1844, 5744, 1883, 2024]. **Characterization** [3718, 1703]. **characterizations** [3314]. **Characters** [878]. **Charge** [4994, 3213, 4685, 4960]. **Charge-balancing** [3213]. **charge-integrating** [4960]. **CHARGOGGAGGOG-GMANCHAUGAGOGGCHAUBUNAGUNGAMAUG** [876]. **Charles** [21, 235, 3671]. **Chasing** [3753]. **chasm** [5850]. **Chebyshev** [514, 6263, 116, 624, 6434, 6560, 5755, 2107, 5622, 689, 1057, 1058, 2616, 2165, 1078]. **Check** [811, 6059, 3641, 6230, 166, 2051, 3129, 700, 5362]. **Checked** [4041, 413, 3928, 3942, 3943, 4106]. **checker** [1714]. **Checkers** [1626, 6114, 2230, 2264, 2584]. **Checking** [3573, 6173, 5738, 1626, 2094, 5769, 121, 483, 6973, 937, 5395, 3580, 6068, 229, 1524, 2230, 2264]. **Checksum** [2974, 3525]. **chemistry**

[3625]. **Chen** [930]. **Chengdu** [7592]. **Chester** [7283]. **Chi** [2118, 2260]. **Chicago** [7227, 7224, 7189]. **child** [4873]. **child-engineering** [4873]. **Children** [7515]. **China** [7484, 7592, 7481, 7539, 5699]. **Chinese** [4655, 5504, 2538, 2409, 401, 600]. **Chip** [1271, 2062, 1965, 1403, 1294, 3274, 1884, 6462, 1777, 2018, 6752, 4472, 2028, 4486, 3362, 2640, 3222, 3392, 2509, 1957, 2878, 2879, 2880, 2522, 2699, 3605, 2408, 1761, 2257, 2768, 2263, 4925, 1929, 1796, 2168, 3848, 4960, 2351]. **Chip-Set** [1403, 2522]. **Chiplet** [6758, 6874]. **Chips** [6390, 1834, 7599, 6460, 1331, 2858, 2530, 7434, 2138, 2030, 1799]. **Chisel** [6862]. **Chisel-based** [6862]. **Choice** [499, 170, 1520, 751, 752, 894, 1237, 283, 5108]. **Choices** [3409, 3828]. **Cholesky** [2352, 3340, 6146]. **Choose** [6279]. **Choosing** [5183, 3828]. **Chopping** [6263]. **Chromatic** [7031]. **CIC** [3894]. **CICG** [7460]. **CIFM** [5230]. **cifre** [137, 138]. **Ciminiera** [5893]. **Cincinnati** [7533]. **Cipher** [3802, 6264]. **Ciphers** [5927]. **Circuit** [7201, 378, 3588, 733, 876, 3441, 2086, 7320, 6566, 2100, 1880, 3481, 4604, 6465, 6601, 698, 5366, 1171, 6865, 5979, 5245, 5981, 2330, 3570, 3737, 4006, 4181, 4695, 3070, 3888, 1032, 2536, 4048, 1869, 2940, 5955, 3797, 3659, 3326, 5222, 5460, 292, 3211, 3212]. **Circuitry** [1994, 2420, 133]. **Circuits** [1361, 5813, 3973, 7458, 724, 2055, 3573, 1273, 7589, 5600, 3080, 4194, 250, 4363, 7446, 7433, 7239, 7303, 7321, 7346, 7361, 7378, 7448, 7460, 7532, 7533, 7549, 7562, 7584, 5756, 3777, 3464, 7272, 5057, 1640, 1888, 443, 3480, 4254, 4896, 1650, 478, 2782, 5450, 2596, 38, 42, 5564, 2814, 4130, 7220, 6242, 5378, 5576, 3366, 1180, 3966, 7371, 7170, 7325, 7396, 7421, 7456, 5124, 4330, 1586, 3575, 5152, 3887, 5412, 2896, 4548, 4711, 6006, 4231, 3296, 3912, 5850, 3473, 2253, 2949, 2764, 4601, 4602, 1233, 3670, 2787, 5449, 1168, 5364, 3002, 790, 3955, 4473]. **circulant** [6443]. **Circular** [4159, 4970, 2728, 4462]. **Cirencester** [7513]. **CIRM** [7418]. **City** [7200, 7207, 7195, 7189, 7455]. **Civic** [7277]. **CIVP** [5374]. **Claims** [6482]. **Clara** [7373, 7612]. **Clarification** [2038]. **CLARINET** [6744, 7116]. **Clarity** [4719]. **Class** [5498, 4996, 3586, 1601, 737, 5530, 3614, 1138, 3299, 4401, 4406, 265, 5355, 3937, 1911, 164, 2804, 3688, 374, 191, 552, 3720, 2203, 5156, 5510, 2905, 3090, 229, 3118, 3914, 527, 130, 163, 3348, 5973, 3968, 4645]. **Classes** [1424, 5048]. **Classical** [6313, 5015]. **Classification** [4570]. **classifier** [2836]. **Claude** [3182]. **Clean** [1374, 1387]. **Cleaning** [4840]. **Clenshaw** [4512, 1057]. **Cleve** [3486, 3656, 6019, 6020, 6352, 6353, 6354, 6598, 6599]. **Climate** [6574, 6717, 6359, 6493, 6593]. **Clipper**^{TM} [2385]. **Clock** [3831, 4169, 6072, 3361]. **clocked** [3194]. **Clockgating** [5559]. **Clocking** [875]. **Close** [6570, 7022, 6370]. **Closed** [2901, 2125, 5556]. **closest** [4672]. **Closing** [4943]. **Closure** [3973, 2560]. **Cloud** [6644]. **Clouds** [6637]. **CLP** [2916]. **CLT** [5585]. **Cluster** [7089, 2186, 5759, 2451]. **Clusters** [6236]. **cm** [5756]. **cmath** [6778]. **CMOS** [3717, 5672, 2329, 5697, 3056, 3734, 2666, 2337, 3874, 4181, 2878, 2879, 2880, 1834, 2896, 3084, 2384, 4048, 3104, 3105, 3635, 2251, 3491, 3495, 7099, 2982, 4924, 4108, 3825, 3826, 5794, 4130, 4468, 3357, 3358, 1794, 2490, 3208, 2841, 2842, 4146, 5122]. **CNC** [5803]. **CNIT** [7356]. **CNN** [7029, 6836, 7107]. **Co** [3723, 1577, 6167, 6597, 2438, 2004, 7112, 1944, 1945, 6047, 3861, 3865, 3424, 6016, 3012, 6994, 7313]. **Co-Design** [6597]. **co-designed** [6016]. **Co-optimization** [7112]. **Co-processeur** [2004].

Co-Processor [1577, 2438, 1944, 1945, 6047, 3865, 3424, 3012, 6994]. **Co-Transformation** [6167]. **Co-Transformations** [3723, 3861]. **Coarse** [4575, 4472]. **Coarse-Grain** [4575, 4472]. **COBOL** [4220, 258]. **Cod** [7535, 7538]. **Code** [1364, 1806, 1575, 7136, 6513, 6058, 5707, 3996, 6686, 1407, 5734, 7504, 2551, 1872, 181, 1641, 3307, 5779, 1556, 5889, 718, 5395, 6512, 2058, 2523, 6076, 6291, 6700, 1620, 5856, 6593, 6371, 4148]. **codebreaker** [7529]. **Coded** [723, 6169, 1606, 1614, 5179, 1145, 3305, 1489, 5169, 4233]. **Coder** [3736, 3179, 3180, 3527, 3704]. **coders** [2376]. **Codes** [1366, 1572, 806, 1091, 196, 811, 812, 6791, 6792, 5594, 669, 6169, 6281, 6417, 1606, 4359, 176, 388, 1614, 1145, 583, 1449, 1911, 2140, 2142, 1919, 6037, 944, 1264, 5479, 2051, 229, 5311, 5312, 1415, 1416, 1523, 3124, 4243, 5192, 2429, 2264, 2584, 5362, 4487, 4488, 2633]. **Codesign** [7043, 6943, 6027]. **codesigned** [4878]. **codeword** [872]. **Coding** [172, 3874, 4375, 201, 6457, 6583, 6725, 6945, 5874, 187, 5110, 4304, 2058, 63, 64, 65, 66, 67, 68, 4879, 5041, 2930, 3787, 4078, 7418, 3007, 2307]. **Codings** [5184, 4980]. **Coefficient** [4483, 2057, 3291, 896, 3152, 2852]. **Coefficients** [3063, 1022, 4361, 2177, 5709, 3888, 4859, 3263, 7176, 4586, 2463, 1253]. **Cohesive** [1965]. **Coimbatore** [7576]. **COIN** [147]. **coins** [5]. **Collected** [7184, 7185, 7186, 7188, 7190, 7191, 3182]. **Collection** [5921]. **College** [7214, 7295, 7309, 3701]. **Collision** [5145, 6099]. **Colloquium** [7400, 7333]. **Colorado** [7472, 7545, 7344, 7241, 7522, 7248, 7417, 7451]. **Colossus** [1061]. **Colour** [3510, 3337]. **Columbia** [7397, 7571, 7390]. **Column** [4321, 3535, 4786]. **Combatting** [1430]. **Combination** [5134, 4731, 6497, 2724]. **Combinational** [857, 2988, 594, 6242, 2717, 5955]. **Combinatorial** [4275, 1350, 3427]. **Combinatoric** [741]. **combine** [2008]. **Combined** [4500, 4547, 3109, 3470, 5780, 6474, 4280, 4765, 3956, 3957, 5103, 5230, 5374, 5569, 6382, 4480, 5888, 4143, 3859, 5828, 5520, 4070, 4089]. **Combines** [999]. **Combining** [5483, 6458, 2957, 6973, 6858, 2363, 3797]. **combustion** [2850]. **Come** [60]. **Comeback** [6417]. **commands** [3073]. **Comment** [463, 4032, 6079, 3100, 3273, 647, 1248, 536, 658]. **Comments** [1006, 1013, 808, 5825, 1270, 671, 819, 823, 1979, 2913, 3295, 829, 440, 5858, 441, 979, 1149, 6956, 3810, 3670, 1770, 773, 1548, 930, 2471, 792, 214, 544]. **commerce** [3753]. **Commercial** [6179, 4274, 22, 520]. **commercially** [2808]. **committed** [5108]. **Committee** [6257, 6259, 6772, 6774, 6885, 6887, 7204, 6847, 6625, 6628, 6915, 539]. **Committees** [6253, 6655, 6656]. **Common** [2642, 561, 3899, 6124, 3681, 532, 786, 3424, 5332, 4417, 6481, 5389, 1784, 3432, 3963, 2845]. **common-multiplicand** [6481, 5389]. **commonality** [3308]. **Communication** [5987, 7544, 7359, 4440, 5213, 2686, 2223, 4565, 4249, 4250, 4413, 4149, 4646, 4647]. **Communications** [7377, 7521, 4616, 2234, 7560]. **Community** [5849, 7515]. **Commutative** [3166]. **Como** [7290, 7454]. **Compact** [1070, 6987]. **Compaction** [5786]. **companies** [6460]. **Companion** [7606]. **Comparative** [3275, 6751, 3071, 2209]. **Comparator** [4500, 5143, 5367, 5103, 5225]. **Comparator/Selector** [4500]. **Compare** [5585, 5212]. **Compared** [3999, 344]. **Comparing** [4000, 3596, 3108, 6957, 3937, 5225, 5367]. **Comparison** [2037, 1482, 1483, 1087, 5905, 6163, 6905, 5284, 2523, 3430, 4022, 4189, 879, 966, 678, 1408,

6194, 5750, 3907, 891, 289, 831, 2949, 443, 5868, 182, 4087, 5351, 1440, 1660, 2275, 4451, 3524, 6747, 5365, 1553, 6796, 4181, 4837, 6919, 2889, 3072, 4847, 4859, 3769, 3449, 2226, 748, 1225, 3918, 2015, 5093, 2024, 541, 542]. **Comparisons** [4165]. **Compatible** [2913, 888, 1758, 6854, 1464, 5434, 2581, 2582, 2277, 5363]. **Compatibles** [773, 2295, 792]. **COMPCON** [7213, 7271, 7402]. **Compensated** [6929, 5017, 5165, 5329, 5330, 6788, 5018, 6083, 6425, 7045]. **Compensation** [1766, 2733, 6371, 2494]. **compensés** [5338]. **Competence** [488]. **Competes** [6167]. **Competition** [4322]. **competitive** [2922]. **Compilation** [6056, 3493, 4615, 4798, 5993]. **Compile** [5392, 147, 6632]. **Compile-Interpreter** [147]. **Compile-Time** [6632, 5392]. **Compiler** [7008, 3857, 3860, 5902, 5830, 5994, 6284, 2215, 1849, 4112, 2290, 187, 5106, 1191, 2331, 2658, 1496, 2523, 6700, 3450, 2425, 637, 4738, 2277, 4115, 2824, 2621]. **compiler-induced** [6700]. **Compilers** [7457, 3980, 7501, 6856, 6984, 6582]. **Compiling** [708]. **Complement** [1573, 726, 808, 1829, 176, 621, 879, 4200, 1218, 1874, 829, 6577, 5764, 1428, 912, 144, 915, 3817, 123, 4280, 1247, 5103, 5372, 4480, 1002, 4143, 4980, 4808, 3237, 2347, 3587, 3449, 1415, 1416, 4253, 2598, 5973, 789, 5386]. **Complementary** [631, 6642, 5256]. **complements** [5389]. **Complete** [5897, 1762, 3368, 3207, 134, 1469]. **Completely** [5043]. **Completes** [1786]. **Complex** [3544, 3722, 3977, 3723, 4661, 5476, 5677, 5678, 3043, 3226, 2867, 5823, 1013, 2053, 6164, 7141, 3869, 3060, 2877, 1276, 1506, 1596, 3742, 5506, 4696, 4842, 4843, 5292, 5293, 4024, 5516, 433, 1852, 6302, 3094, 3277, 5936, 1303, 2093, 2730, 2098, 3295, 2103, 1877, 1990, 6581, 4076, 3644, 4598, 1893, 5868, 3494, 368, 4271, 5965, 1332, 924, 5648, 2150, 3954, 6864, 1924, 2023, 6749, 3834, 1933, 3199, 5570, 6378, 5888, 6038, 3536, 273, 949, 5248, 6651, 3720, 3861, 4307, 1262, 5681, 6394, 5265, 7140, 4174, 382, 4182, 5599, 5507, 2356, 2693, 5511, 4845, 2214, 5013, 4707, 4859, 4208]. **complex** [5174, 4379, 6198, 6314, 6315, 1989, 1991, 1992, 2246, 2418, 2421, 2746, 5430, 1996, 2114, 2006, 4915, 5652, 2994, 1000, 1782, 5094, 3189, 188, 4462, 5113, 3965, 5580, 5662, 4950, 2625, 2839, 5387, 5125, 5174, 270]. **complex-arithmetic** [1996, 5113]. **Complex-Number** [3869, 3536]. **complexities** [1664]. **Complexity** [5813, 855, 4008, 5281, 4351, 4539, 5295, 5296, 6423, 5530, 6718, 3637, 5854, 4406, 4257, 3933, 2129, 5965, 4760, 5451, 5360, 3695, 5665, 2851, 5983, 863, 955, 2661, 4990, 4692, 3887, 4542, 5156, 5510, 4548, 2905, 4726, 3914, 4730, 5048, 2940, 5771, 2432, 834, 3669, 1443, 3936, 1908, 4761, 4921, 5083, 4936, 7222, 5466, 5573, 3968, 3969, 4951, 3028]. **Compliance** [7092, 4093, 5805, 7127, 5337, 3942, 3943]. **Compliant** [6390, 3583, 3750, 3655, 4284, 5110, 4525, 4190, 4569, 4259, 3319, 3947]. **complying** [3852]. **Component** [5756, 5654, 716, 795, 576]. **Component-wise** [716, 795]. **Components** [505, 1518, 4559, 1245, 5784, 5227, 5238]. **Componentwise** [5936]. **Composite** [432, 6186, 3770, 4446, 5800, 4260, 3669, 4094, 4754]. **Composite-Field** [6186]. **Composition** [5339, 3154, 3155]. **Compostela** [7498]. **Compound** [1859, 1441]. **Comprehensive** [5904]. **Compressed** [6014]. **Compression** [4321, 612, 6533, 5837, 5321, 7072, 5193, 5636, 3683, 6374, 1801, 6517, 3333, 3705, 3535]. **Compression/Decompression** [3683]. **Compressor** [5489, 5404, 2764]. **Compressors** [2059, 1282, 6294, 6119]. **Com-**

prising [5772]. **COMPSAC** [7227]. **Comput** [1484, 1296]. **Computable** [4983, 4609, 5164, 4586, 3314]. **Computation** [7236, 4502, 7386, 7181, 3859, 4975, 805, 2651, 6265, 7014, 153, 1812, 861, 1015, 1095, 5486, 1718, 1815, 1267, 1268, 1377, 7558, 3410, 668, 2339, 4171, 6676, 5495, 5992, 615, 1104, 332, 6526, 4822, 1390, 4011, 156, 4351, 4537, 4539, 961, 5154, 6287, 4015, 3746, 4355, 1601, 7144, 2215, 6538, 3433, 4193, 385, 554, 6077, 1285, 7431, 1289, 1742, 6188, 7149, 3089, 5526, 4040, 5529, 4369, 6089, 2383, 4046, 4566, 1132, 1412, 2545, 5748, 3458, 4059, 2237, 4870, 4871, 5422, 3776, 7349, 3781, 1873, 2736, 141, 160, 161, 180, 5542, 5851, 2742, 1989, 2931, 975, 7259, 1311]. **Computation** [7416, 5764, 904, 6455, 5861, 524, 2942, 2943, 143, 1050, 759, 2566, 6114, 3144, 6597, 449, 4900, 1902, 1534, 1327, 4439, 4613, 4913, 7196, 7197, 2278, 7248, 5451, 586, 651, 7250, 5970, 186, 3945, 842, 1684, 1916, 7507, 999, 410, 790, 3003, 713, 844, 5655, 2817, 1073, 214, 7467, 3843, 5574, 1351, 5112, 6645, 413, 7597, 216, 5980, 4150, 7131, 6249, 3042, 4510, 5822, 5898, 3229, 4981, 1813, 3986, 2191, 1017, 1194, 7231, 3870, 2340, 3871, 4678, 4174, 6678, 1963, 3244, 3425, 6802, 4692, 4833, 4185, 3888, 2359, 76, 5156, 5510, 4025, 2366, 7267, 251, 7390, 4710, 1209]. **computation** [1284, 1210, 100, 1745, 1300, 827, 1216, 5937, 6009, 2548, 7292, 2100, 2737, 5616, 4396, 7379, 6582, 5054, 1639, 6350, 365, 1897, 5071, 2121, 7234, 4428, 987, 1328, 4756, 1536, 4617, 3165, 1242, 1334, 5972, 211, 3343, 2290, 2292, 5095, 5096, 4457, 4458, 4633, 131, 5566, 5108, 2830, 2482, 3202, 6039, 1472, 1473, 543, 2627, 545, 1938, 2641, 2656, 1628, 2573, 7569, 7370, 1795, 996]. **Computational** [7397, 7443, 7468, 6493, 855, 807, 3574, 3417, 4834, 5296, 3081, 390, 2394, 5538, 5320, 3637, 1143, 834, 1656, 2970, 1539, 4926, 3695, 7569, 5980, 7138, 3868, 1501, 4338, 4693, 4705, 3595, 7390, 2918, 576, 7222, 7422, 7622]. **Computationally** [3637, 3196]. **Computations** [3544, 4501, 3227, 5137, 6056, 5401, 3572, 3740, 873, 1026, 1029, 4199, 4553, 5727, 6552, 1133, 1413, 3618, 4568, 3910, 5848, 6011, 3783, 895, 1045, 6721, 905, 1431, 6596, 7279, 5554, 5786, 2981, 4916, 6030, 2146, 4628, 5092, 6618, 5371, 849, 1349, 3377, 4302, 5477, 4668, 5907, 6168, 6804, 2068, 3891, 2695, 3751, 3897, 7415, 3915, 5853, 4237, 1141, 635, 5188, 5950, 757, 5347, 5348, 5432, 5553, 7249, 4923, 3951, 5223, 2625]. **Compute** [5903, 6395, 6548, 2991, 6004, 6965, 1908, 4276, 2807, 2990, 3184]. **Compute-Bound** [2991, 2807, 2990]. **Computed** [2813, 2270]. **Computer** [7235, 7187, 7193, 7200, 7202, 7203, 7207, 1564, 720, 1008, 7236, 7410, 1010, 7237, 2641, 7356, 3721, 3858, 5254, 5255, 5475, 5673, 5817, 3559, 1363, 327, 7288, 7357, 722, 854, 1189, 1365, 4664, 7498, 2647, 7556, 607, 6268, 6785, 5141, 3054, 7577, 3987, 5691, 7578, 5693, 6514, 7275, 246, 3991, 7472, 7613, 1195, 7387, 248, 7212, 1722, 7544, 7620, 7445, 4343, 7289, 2891, 873, 874, 1026, 1115, 2362, 7319, 136, 174, 4544, 467, 282, 510, 430, 1029, 338, 965, 1126, 7255, 5519, 1516, 2534, 2707, 2708, 3599, 4550, 4713, 5842, 62, 676, 556, 1129, 4714]. **Computer** [390, 1211, 1290, 3897, 253, 6187, 6297, 5021, 1130, 1744, 2539, 3606, 4555, 339, 470, 471, 7332, 7413, 7485, 7602, 436, 6308, 4375, 2388, 1302, 2087, 518, 1217, 7276, 1860, 1982, 7580, 7204, 7213, 7214, 7218, 7224, 7228, 7245, 7257, 7258, 7271, 7283, 7304, 7323, 7335, 7358, 7360, 7403, 7435, 7473, 7475, 7486, 7517, 7520, 7531, 7535, 7561, 7583, 7591, 7592, 7604, 7624, 7626, 7628,

4219, 7290, 344, 6829, 71, 1135, 2237, 4383, 7292, 7349, 2553, 892, 3466, 7406, 567, 141, 160, 161, 180, 3119, 4066, 7450, 4067, 4236, 4573, 7351, 7565, 5543, 286, 899, 975, 1426, 1993, 4578, 5426, 5944, 2745]. **Computer** [3786, 7425, 5044, 1637, 4402, 1313, 2426, 1428, 570, 3475, 3643, 7566, 4593, 2946, 5547, 1762, 1642, 4741, 5550, 447, 4255, 318, 162, 5628, 266, 7538, 7612, 6216, 6955, 5433, 2001, 3658, 4257, 2770, 7608, 643, 7274, 2775, 2965, 6024, 479, 5203, 6963, 2125, 3325, 1440, 2578, 4265, 5635, 121, 7336, 7575, 989, 7395, 129, 3500, 6607, 1673, 1061, 583, 921, 1675, 1240, 6609, 6135, 1913, 6611, 1164, 7312, 3511, 1455, 5088, 2147, 7601, 487, 1917, 1685, 588, 928, 7524, 7442, 1458, 47, 1071, 272, 6985, 7221, 1344, 7338, 7339, 3191, 7382, 7383, 7609, 7610, 7611]. **Computer** [7619, 7122, 2475, 591, 7617, 592, 7222, 941, 1075, 1174, 2160, 7340, 1350, 7525, 3020, 6144, 97, 151, 1559, 718, 5890, 5891, 6487, 494, 602, 1800, 3216, 7030, 552, 1353, 1469, 7555, 98, 3548, 297, 605, 1090, 1190, 2648, 606, 548, 4518, 1016, 6273, 956, 1500, 7529, 960, 1508, 1598, 1731, 1395, 4358, 1030, 1840, 283, 2374, 284, 2380, 3769, 517, 2229, 3625, 2550, 259, 285, 1047, 7477, 3794, 4888, 5773, 354, 576, 696, 2569, 4417, 5434, 2962, 3671, 146, 183, 206, 2585, 1536, 993, 772, 710, 2805, 5653, 6746, 1689, 7420, 2816, 3004, 3005, 4934, 936, 1340, 456]. **computer** [147, 2821, 2622, 2627, 1561, 798, 3384, 1007, 1008, 5826, 498, 3600, 2082, 7352, 1539, 1001, 934, 4157, 4158, 4681, 1672]. **Computer-Aided** [7403, 7473, 7520, 7420]. **Computer-Arithmetik** [1007, 1008]. **Computer-Oriented** [7236]. **Computers** [7526, 135, 7183, 7194, 217, 7287, 7497, 7542, 1572, 1370, 1491, 6509, 5696, 1499, 6521, 1380, 7300, 7318, 7329, 7430, 6535, 2893, 7424, 5516, 4849, 7509, 227, 228, 1287, 6544, 435, 200, 625, 119, 139, 7283, 7304, 7335, 7360, 7377, 7435, 7517, 7272, 6202, 6320, 1423, 4574, 289, 181, 5547, 7439, 7452, 7463, 7479, 7492, 7506, 7574, 7586, 7615, 182, 915, 480, 5439, 7199, 7219, 7247, 122, 123, 530, 1165, 7367, 7408, 1687, 2021, 2022, 7190, 167, 1562, 1805, 6522, 4687, 1508, 249, 732, 5013, 226, 1844, 679, 2381, 1409, 7486, 312, 521, 1141, 3918, 5337, 234, 316, 3153]. **computers** [704, 705, 770, 991, 1236, 7250, 1922, 4288, 80, 3248, 2013]. **Computes** [4075, 1646]. **Computing** [7216, 7428, 7541, 7554, 7571, 7576, 6384, 75, 4794, 218, 7263, 3721, 6494, 6771, 7514, 7288, 45, 7357, 7399, 4511, 6155, 6393, 1491, 3729, 6506, 6508, 6054, 105, 1497, 6903, 7529, 5912, 6525, 1827, 6913, 7445, 7579, 4344, 4351, 7501, 3074, 6419, 7389, 2072, 5720, 1841, 5518, 5843, 112, 3756, 2377, 5931, 6085, 340, 341, 342, 6428, 86, 3612, 6820, 6192, 518, 7391, 7459, 7560, 7621, 4218, 7600, 3286, 3288, 5752, 6313, 7603, 4230, 6321, 5324, 5325, 5617, 3636, 7476, 5857, 7156, 6209, 1882, 6338, 1887, 7566, 4593, 3476, 353, 94, 5058, 1434, 5625, 3136, 7278, 693, 694]. **Computing** [761, 5065, 7311, 7567, 366, 6121, 6731, 7090, 3318, 4090, 5960, 6026, 5633, 4430, 6604, 6968, 5440, 3938, 7419, 7426, 7440, 7493, 7552, 7568, 2276, 2980, 1670, 2279, 6609, 5560, 5640, 239, 5647, 2286, 6977, 3687, 1456, 7381, 3834, 4133, 4464, 6141, 2029, 6374, 2303, 190, 6990, 243, 6758, 6874, 5391, 5669, 5914, 7030, 7372, 7410, 7555, 7254, 6497, 4160, 6050, 6267, 58, 1585, 3238, 4529, 4685, 5925, 2213, 2894, 7266, 3259, 387, 4709, 620, 92, 63, 64, 65, 66, 67, 68, 6005, 6082, 4038, 7546, 4208, 4049, 6315, 3118, 5182, 7477, 7067, 4403, 831, 5863]. **computing** [2954, 7189, 695, 364, 4256, 6022, 480, 5784, 1669, 2137, 4623,

3517, 2472, 5368, 5369, 85, 2487, 3965, 3206, 6873, 6994, 274]. **Cómputo** [4606]. **con** [4606]. **Concept** [2501, 1353, 5840, 2380]. **Conception** [2563]. **Concepts** [3089, 2403, 4830, 1501, 2549, 5087]. **Concerning** [979]. **Concise** [6592, 7090, 6370]. **Concordia** [7220]. **Concurrent** [5480, 1842, 6184, 5733, 2429, 5956, 6355, 1665, 5965, 1853, 1472, 1473]. **Condition** [3796, 4008, 1739, 1038, 4492]. **Conditional** [6409, 1394, 744, 6727, 3493, 213, 5236, 548]. **Conditional-Sum** [744]. **Conditioned** [2804, 2147, 4568, 192, 193]. **Conditions** [1281, 1034, 4068, 1676, 4519, 1127, 6764]. **conducted** [7226]. **Conference** [7216, 7229, 7297, 7298, 7315, 7326, 7457, 7512, 7526, 7541, 7616, 7193, 7200, 7202, 7203, 7207, 7343, 7355, 7201, 7237, 7263, 7328, 7373, 7429, 7458, 7497, 7513, 7542, 7543, 7557, 7423, 7577, 7412, 7470, 7471, 7275, 7231, 7605, 7388, 7401, 7588, 7300, 7318, 7329, 7430, 7499, 7374, 7579, 7500, 7545, 7389, 4841, 7238, 7301, 7424, 7266, 7509, 2377, 7618, 7625, 7627, 7302, 7446, 7433, 7580, 7320, 7213, 7224, 7239, 7256, 7270, 7271, 7277, 7282, 7283, 7303, 7304, 7323, 7335, 7346, 7348, 7359, 7360, 7361, 7376, 7377, 7391, 7403, 7414, 7435, 7436, 7447, 7448, 7459, 7460, 7461, 7473, 7475, 7486, 7489, 7502, 7503]. **Conference** [7517, 7518, 7519, 7521, 7532, 7534, 7548, 7560, 7561, 7563, 7573, 7581, 7582, 7583, 7591, 7592, 7593, 7594, 7621, 7306, 7600, 7291, 7225, 7603, 7363, 7364, 7349, 7272, 7622, 7307, 7393, 7294, 7417, 7295, 7309, 7439, 7452, 7463, 7479, 7492, 7506, 7574, 7586, 7615, 7278, 7550, 7310, 7260, 7261, 7273, 7284, 7551, 7567, 7394, 7274, 7262, 7248, 7596, 7494, 7587, 7455, 588, 7569, 7381, 7367, 7408, 7252, 7465, 7466, 6623, 7481, 7539, 7427, 7313, 7341, 7369, 7540, 7496, 7281, 7384, 7525, 7253, 7286, 7325, 7396, 7421, 7456, 7623, 7211, 7230, 7227, 7289, 7267, 4849, 7269, 7434, 7533, 7559, 7584]. **conference** [7624, 7626, 5610, 7566, 7418, 7464, 7420, 7280, 7314, 7342, 7235, 7187, 7424, 7439, 7452, 7463, 7574, 7586, 7615]. **Confidence** [6863]. **Configurability** [6902]. **Configurable** [7011, 4737, 6971, 4615, 6972, 6866, 6247, 7007, 5497, 4246, 5204, 3965]. **configurations** [4526]. **Conformance** [3040, 5394]. **Conforming** [5380]. **conforms** [4259]. **CoNGA** [7625, 7627, 7616]. **CoNGA'19** [7618]. **Congress** [7576, 7386, 7444, 7484, 7208, 7590, 7242, 7490, 7206, 7395, 7250, 7195, 7205, 7516]. **conjecture** [4823]. **Conjugate** [6924, 5638, 5365, 5198, 4755, 4123, 4124]. **conjugate-pair-moduli** [4124]. **conjunction** [7260, 7273]. **connect** [3326]. **Connected** [3415, 1668, 2499]. **connection** [674, 2658, 2773]. **Connectionist** [3242]. **connectivity** [7461]. **Conquer** [3549, 6088, 4447, 2813, 4104]. **Consecutive** [438]. **Consequences** [892]. **Conservative** [5318]. **Consideration** [1568, 5333, 1060]. **Considerations** [6511, 2532, 1621, 1986, 2435, 4952]. **considered** [5331]. **Considering** [2970]. **Consistencies** [4000]. **Consistent** [6916, 6917, 5841]. **Consisting** [1225]. **Constant** [6149, 6492, 7139, 5707, 5287, 2714, 5313, 4068, 5854, 6203, 6323, 6448, 1881, 3138, 4901, 5070, 3173, 2817, 2837, 4948, 4483, 6531, 4671, 5400, 7020, 7021, 4676, 3745, 7044, 2750, 6218, 6463, 5381, 2822]. **Constant-Current** [2714]. **constant-factor-redundant-CORDIC** [2750]. **Constant-Time** [6149, 7139]. **Constants** [1952, 2657, 4985, 5398, 5405, 5701, 4032, 6558, 3163, 6242, 6376, 3539, 5833, 4812, 7050, 5747, 460, 5832]. **Constrained** [7010, 4209, 689, 5658, 5804]. **Con-**

straint [5897, 5997, 6154, 4650, 4790]. **Constraints** [4964, 5252, 634, 4416, 5136, 4791]. **constructed** [1264]. **Constructing** [5704, 2939, 7074, 4936]. **construction** [2905, 4385, 2758, 4620, 3944]. **Constructions** [4540]. **constructive** [4982, 2558, 4586, 3197]. **Constructively** [2283]. **Consumption** [4509, 3056]. **Contained** [614, 500]. **Containment** [5211]. **Contents** [6662, 6775, 6888, 6260, 6629]. **Context** [6402, 5448, 6134, 7126, 6392]. **Context-enriched** [6402]. **Context-Free** [5448]. **Contiguous** [2453]. **Continental** [7282]. **Continued** [26, 677, 6080, 311, 3779, 1876, 6104, 4407, 442, 573, 1685, 3522, 240, 241, 271, 941, 1075, 1174, 1828, 5419, 5556, 772, 211, 5466, 2622]. **Continued-Fraction** [3522, 271]. **continues** [5419]. **Continuing** [6955]. **continuity** [6616]. **Continuous** [624, 6129, 251, 1868, 4622, 7188]. **Continuous-Digit** [6129]. **Continuum** [7482]. **contrôle** [3159]. **Contractivity** [4558]. **Contras** [5585]. **Contribution** [3374, 5610, 801]. **Contributions** [1727, 1962, 965, 6078, 5874, 990, 2585, 7340]. **Control** [4001, 6690, 3260, 112, 1520, 7520, 3286, 2090, 6568, 6715, 3318, 2970, 51, 5790, 6612, 269, 590, 329, 5479, 423, 5924, 7461, 2930, 364, 1770, 1454, 3350, 3007, 4777, 1463, 1550, 4140, 4294, 1252, 2162, 5382, 414, 545, 1037, 293, 592]. **Controlled** [57, 1481, 6251, 381, 1387, 1591, 4994, 3754, 69, 1437, 4685, 1521, 889, 1879, 4428, 3197, 3017, 2850]. **Controlled-Precision** [1591]. **Controller** [6063, 2970, 1347, 5117, 4955]. **Controllers** [5956, 6631, 3339, 4952]. **Controlling** [2989, 4352]. **Controversial** [6020]. **Convention** [7327, 7541, 7616, 7414, 7502, 7584]. **Conventional** [2418, 2071]. **conventions** [697]. **Convergence** [1568, 6895, 964, 306, 3614, 2723, 5425, 5760, 1184, 3264, 5026, 5308, 4912, 998, 2285, 3521, 2620]. **Convergent** [2177, 3688, 3645]. **convergents** [5419]. **Converging** [3457, 2394, 3516]. **Conversation** [3849]. **Conversion** [2635, 2863, 1364, 859, 3984, 5990, 1958, 5703, 3996, 222, 224, 279, 5288, 885, 1406, 4862, 3761, 86, 1293, 1618, 4056, 202, 347, 5181, 4068, 5945, 260, 685, 261, 6950, 445, 475, 577, 359, 5072, 644, 1906, 647, 2788, 208, 1449, 267, 486, 1166, 933, 189, 538, 1699, 2485, 658, 3850, 598, 601, 802, 5392, 6383, 6488, 1711, 6047, 951, 3228, 3733, 5908, 960, 2071, 2075, 2536, 1035, 1292, 2721, 2230, 2733, 2740, 5946, 2933, 402, 3926, 5631, 5209, 4629, 4931, 5797, 3363, 3364, 2847, 3213, 1976, 2003]. **Conversions** [173, 6415, 505, 2531, 631, 2606, 476, 3329, 3330, 4475]. **Converter** [6052, 3983, 5492, 5829, 155, 5179, 3353, 4136, 4151, 4651, 1714, 1371, 4675, 4816, 5493, 4003, 4683, 4861, 4238, 5859, 690, 4924, 3952, 1688, 3703, 4468, 3213, 2855]. **Converters** [4201, 5316, 906, 5341, 5196, 6748, 3896, 2734, 4262, 4275]. **Converting** [1769, 2588, 2196, 3762, 566, 4923]. **convertor** [2856]. **convertors** [3006]. **converts** [1710, 3393, 1655]. **Convex** [3562, 4017, 2939, 3288, 2398]. **conveyors** [3912, 3473]. **Convolution** [2875, 5080, 3162, 2140, 3048, 3049, 2658, 3331, 3332]. **Convolution-Type** [2140]. **Convolutional** [6411, 6423, 6572, 6573, 6938, 6325]. **Convolver** [2161]. **Convolvers** [3065, 1656, 2346, 4607, 2470]. **Cook** [5261, 5666]. **COOL** [7599]. **Cooley** [6670]. **Coonen** [7056]. **cooperation** [7356]. **Coordinate** [4429, 5421, 365]. **Coordinates** [4605, 4215]. **Copley** [7361]. **Coprime** [6545]. **coprocesseur** [2807]. **coprocessing** [2368]. **Coprocessor** [4505, 3400, 6507, 5911, 2062, 2519, 2520, 2221, 2222, 2715,

3611, 1619, 4380, 5758, 2555, 3121, 1999, 1896, 2120, 2262, 2442, 2443, 2450, 7094, 2004, 2280, 2282, 3514, 2991, 1787, 1798, 1717, 1957, 1723, 2687, 2530, 2725, 2227, 2090, 2741, 5953, 2117, 1895, 2444, 2448, 3154, 3155, 6130, 2274, 2593, 2594, 2806, 2807, 2990, 4290, 2157, 2032, 2166, 2850, 3923]. **Coprocessors** [2505, 1608, 2579, 2295, 2698, 2533, 2751, 3513]. **Coprozessoren** [3121, 3121]. **Copyright** [6657, 6884, 6254, 6769, 6622]. **Coq** [5138, 5483, 5688, 6268, 6213, 7078]. **CORDIC** [2573, 3093, 1709, 3394, 3976, 4159, 4970, 2056, 2201, 1964, 173, 3076, 3590, 6183, 5725, 3264, 1294, 3094, 3268, 4046, 4867, 2722, 2387, 2723, 3102, 5757, 3122, 3785, 5044, 2423, 2750, 4076, 2428, 3483, 1898, 2985, 5792, 6035, 2817, 3013, 5574, 5886, 1700, 190, 3543, 2351, 2689, 2547, 3136, 2163]. **CORDIC-Algorithmen** [2573]. **CORDIC-Based** [5044, 2985]. **Core** [4962, 6051, 5160, 6564, 6947, 6948, 6949, 6461, 6732, 5969, 6236, 6615, 6633, 6866, 7123, 6988, 6874, 5251, 3733, 4674, 6060, 6931, 5929, 2375, 2710, 4063, 6593, 2458, 5791, 6758, 7179, 6979]. **CORE-MATH** [7179, 6979]. **Cores** [6781, 6897, 6505, 5124, 6813, 6427, 7180, 5597, 5597]. **Core**^{TM} [5539]. **Corfu** [7569]. **Cork** [7585]. **Cornea** [6197, 6121]. **Corner** [7385, 3730, 3486, 3656, 6352, 6353, 6354, 6598, 6599, 6019, 6020]. **Corners** [6617, 3193]. **Corporation** [1037, 1567, 696]. **Correct** [5486, 6395, 5266, 815, 6406, 4690, 5012, 556, 349, 439, 4404, 4735, 3500, 7365, 6235, 1776, 323, 5582, 6150, 6267, 5298, 5427, 5950, 7161, 5874, 2270, 5127, 4827, 5427]. **Correcting** [725, 196, 812, 1614, 1145, 583, 4669, 2417, 2855, 2856]. **Correction** [1566, 1713, 806, 608, 5482, 670, 6171, 508, 1415, 743, 1872, 1754, 894, 901, 6833, 4399, 572, 3641, 702, 1674, 1334, 2142, 3173, 2609, 6241, 3200, 4948, 541, 4297, 797, 3070, 1278, 3631, 2930, 3124, 4071, 4078, 688, 3153, 1785, 2608, 3007, 4488]. **Corrections** [4177, 1174, 6870, 749]. **Correctly** [5397, 6668, 6787, 4812, 4985, 5398, 5692, 6272, 7137, 4346, 4347, 5299, 2531, 6693, 4862, 3761, 6439, 5542, 5851, 4398, 6332, 3789, 4241, 6207, 6334, 3172, 2857, 5984, 6898, 4811, 7020, 7021, 7022, 4823, 4998, 6190, 7053, 7054, 7153, 7154, 2094, 5616, 5617, 3921, 6837, 6944, 4935, 4828, 5282]. **Correctly-Rounded** [6668, 6272, 5542, 7137, 6898, 7020, 7021, 7022, 7053, 7054, 7153, 7154, 5616, 4935]. **Correctly-Rounding** [4862]. **Correctness** [3877, 4004, 1507, 3250, 7063, 4257, 3817, 3249, 3426, 1299, 5619, 6333, 6452, 707, 4106]. **correlated** [760]. **correlation** [2907]. **Correlator** [220, 2338, 2512]. **Correspondence** [382, 3075, 626, 585]. **Corrigenda** [3218]. **Corrigendum** [2707, 1296, 2092, 2260, 2023]. **Corum** [7458]. **Cos** [1766, 2235, 537]. **cosimulation** [5204]. **cosin** [2124]. **Cosine** [4046, 2124, 1069, 2817, 2612, 242, 953, 4026, 4356, 1854, 3275, 3287, 4738, 4261, 4276, 3211, 3212]. **Cosines** [52, 1399]. **Cost** [1366, 1806, 6781, 4171, 4175, 6066, 5286, 4197, 3767, 5740, 5846, 4054, 4870, 6572, 5956, 7085, 6849, 2981, 5637, 655, 6746, 6139, 6634, 944, 6757, 7137, 6922, 1403, 5739, 4869, 2264, 2584, 2138, 3509, 2806, 1067]. **cost-effective** [4869, 2584, 2806]. **Cost-Efficient** [6572]. **Cost/performance** [4175, 4054]. **Costs** [3984, 6145, 1484]. **COSY** [5082]. **Cotes** [5299]. **Cotransformation** [6665, 4507]. **Could** [6538, 3753, 6493]. **Count** [1041, 5132, 1137, 6465, 6601, 2, 6865]. **Counter** [1372, 5418, 3831, 5502, 2764, 320, 6184]. **Counters** [3498, 2130, 5119, 4727, 2837]. **Counting**

[3973, 5502, 5386]. **countries** [7395]. **Country** [7346]. **course** [369, 1159, 4441, 488]. **Court** [7453]. **Covariance** [4877, 1241]. **cover** [6256, 6770]. **Coverage** [6390, 6291]. **Cox** [3720, 4232]. **Cox-Rower** [4232]. **CPFloat** [7039]. **CPU** [5672, 1291, 2227, 2241, 3939, 6854, 4131, 4943, 6146]. **CPUs** [6540, 4944]. **CR** [5984, 4998, 5199]. **CR-LIBM** [4998, 5199, 5984]. **Cray** [7330, 2425, 2180, 3401, 2548, 2553, 2460, 1164, 2015]. **Cray-1** [1164]. **Cray-2** [2180, 2015]. **Cray-4** [3401]. **CRC** [6184]. **CRC-Based** [6184]. **CRD** [1369]. **Creating** [6544, 3760, 3283]. **Creation** [5998]. **Credible** [3476]. **Creek** [7561, 7583]. **crisis** [6746, 3848]. **Criteria** [1055]. **Criterion** [334, 428, 416, 426, 5973]. **Critical** [6390, 3019, 7001, 4718, 4267]. **Critique** [419]. **crlibm** [4826]. **CRNS** [5895]. **cross** [6688, 3450]. **cross-compiler** [3450]. **CRT** [4655, 4003, 4683]. **CRT-based** [4683]. **Crunch** [1257]. **Cruncher** [1213]. **crunching** [1189]. **Cryptanalysis** [4649]. **Crypto** [3274]. **Crypto-Chip** [3274]. **Cryptographic** [6156, 4667, 7139, 6526, 5167, 4369, 5218, 5219, 4910]. **Cryptography** [5471, 4663, 6051, 6783, 6511, 6534, 5604, 6541, 6435, 5186, 4922, 5880, 3181, 6993, 5895, 6797, 4196, 1908, 2979]. **cryptoprotocols** [1908]. **Cryptosystem** [4141, 3008]. **Cryptosystems** [5670, 4209, 4572, 3120, 6345, 4429, 6228]. **Crystal** [3662]. **CS2** [2574]. **CSD** [3247]. **CSI** [7345, 3605]. **CSI/IEEE** [7345]. **c't** [2082]. **c't-KAT-Ce.** [2082]. **Cube** [6442, 49, 2127, 5441, 6646, 799, 1497, 1445, 3941]. **Cubic** [6073, 6878]. **Cubiche** [3941]. **CUDA** [6551, 5942, 5363, 7118]. **CUDA-Accelerated** [7118]. **CUG247** [2289]. **Cultural** [2953]. **Cumberland** [7501]. **Cumulative** [1882]. **Currency** [3748, 3890, 4018, 4421]. **Current** [6153, 5509, 2714, 5769, 3296, 3912, 3918, 3473, 2949, 3670, 6145]. **current-mode** [3296, 3670]. **curriculum** [576]. **Curve** [5471, 5670, 4301, 5816, 4305, 4663, 6541, 4563, 5186, 4418, 4603, 4744, 4429, 4605, 4922, 373, 5256, 7022, 4215, 7155, 2119, 6228]. **Curve-Based** [5186]. **Curve-Fitting** [373]. **Curve25519** [6738]. **Curves** [5393, 5134, 5684, 5411, 5836, 4360, 4368, 4388, 5858, 3140, 4432, 4433, 4609, 3937, 1916, 3829, 4491, 3873, 6797, 6408, 6416, 4546, 6468]. **curvilinear** [3705]. **Custom** [7514, 7399, 6791, 6792, 6686, 1965, 5006, 1849, 4044, 7346, 7361, 6340, 7419, 7426, 7440, 7493, 7552, 7568, 6632, 4544, 2908, 1869, 3517]. **custom-designed** [1869]. **Custom-Precision** [6791, 6792, 6686, 6632]. **Customer** [2828]. **customers** [3392]. **Customisation** [4545]. **Customizable** [6491]. **Customized** [6539, 6697, 6732, 3354]. **Customizing** [5008, 6947, 3508]. **Cuts** [2093]. **Cutting** [6617, 3193]. **CVA6** [6947]. **CVAX** [2257]. **CX** [2518]. **CX-83S87** [2518]. **CXgen** [2681]. **Cycle** [3055, 6597, 988, 1156, 3047, 745]. **Cycle-Accurate** [6597]. **Cycles** [507, 1489, 3445, 3302, 900, 976, 2010, 3017]. **Cyclic** [4359, 5080, 2140, 1004]. **Cylindrical** [5226]. **Cyprus** [7448]. **Czech** [7432, 7549, 7581].

D [3401, 5692, 5005, 4194, 3896, 4049, 4218, 4054, 3293, 5541, 5044, 906, 4889, 5630, 6846, 3694, 3353, 3525, 7121, 6240, 4133, 4136, 4468, 6637, 5112, 3371, 2169, 4953, 4954, 4956, 802]. **D-cache** [3401]. **D-konverter** [3353]. **D-LNS** [4956]. **D.** [742]. **D/A** [906]. **D2.50** [6562]. **Dadda** [5893].

DAG [6978, 7111]. **Dagstuhl** [7509, 7572]. **d'algorithmes** [4324]. **Dallas** [7218, 7350, 7310, 7273]. **Dangerous** [4285]. **Dangers** [3729]. **DAP** [1765]. **Darcy** [4253]. **Dark** [6799, 7030]. **d'arrondi** [990]. **Darstellung** [2615]. **Data** [3040, 5394, 6766, 6250, 6491, 5589, 1376, 5489, 866, 5285, 6533, 5837, 1617, 3089, 6546, 1037, 971, 6433, 5538, 3780, 6939, 893, 2103, 7066, 5333, 5193, 3647, 7295, 1316, 983, 145, 1324, 6968, 6854, 2459, 7114, 592, 1468, 6374, 5110, 6639, 5577, 4478, 5114, 3369, 4657, 1805, 48, 2504, 6267, 2662, 6517, 2672, 3994, 4352, 4541, 5926, 1510, 4855, 2900, 3086, 682, 5339, 5340, 1761, 4411, 4890, 2763, 4601, 4602, 5434, 3803, 1321, 1326, 3333, 2005, 1330, 3350, 2292, 2619, 3705, 1348, 2166, 2689, 293]. **Data-Dependent** [3780]. **Data-Driven** [1376]. **data-objects** [4601, 4602]. **Data-Parallel** [3369]. **data-paths** [4541]. **DataBase** [2828]. **Dataflow** [2040, 4034, 7112, 6994]. **Datapath** [4653, 4329, 4813, 6906, 4559, 2948, 5583, 2326, 2188, 3992, 4522, 4934]. **datapaths** [3759]. **Datatron** [110]. **Datatype** [6552]. **Datatypes** [6667]. **Datenformate** [2103]. **David** [3720]. **Dawn** [5021]. **DBM** [5701]. **DBNS** [3584, 4188, 4059, 5971, 5797]. **DC** [7263, 1151, 7341, 3073]. **DCIS** [7458]. **DCT** [4193, 5317, 5112, 4783, 4490, 3543]. **DCT/IDCT** [3543]. **DDA** [1149, 970]. **DDC** [1687]. **DDFUN90** [4973]. **de-normalized** [4576]. **dead** [3953]. **Deadly** [6459]. **Dealing** [53]. **Debate** [6189]. **Debugging** [7004, 7175, 6678, 6276, 682, 4593]. **December** [7327, 7576, 7513, 7528, 7579, 7580, 7503, 7521, 7241, 7438, 7551, 7285]. **Decidability** [5145]. **Deciding** [5845]. **Decimal** [5252, 2039, 5133, 2863, 5820, 5137, 2049, 2652, 6395, 5990, 6163, 2873, 2874, 811, 812, 170, 4332, 32, 5700, 6518, 5143, 612, 866, 5492, 5829, 1383, 1387, 1591, 5146, 5278, 5500, 5501, 155, 4336, 4337, 4530, 4686, 4687, 4995, 6061, 6907, 6908, 6909, 6910, 6911, 6912, 198, 224, 6169, 6281, 5280, 173, 3745, 5289, 502, 4543, 4699, 5007, 5294, 5414, 5512, 5513, 5602, 673, 675, 6182, 2531, 5415, 5930, 5521, 6079, 2537, 1406, 4862, 5932, 3761, 86, 5528, 1292, 1293, 1976, 3904, 5171, 5176, 5316, 5534, 1304, 2231, 4056, 5179, 5757, 1631, 4875, 5036, 5038, 260, 1145, 261]. **Decimal** [94, 403, 6597, 115, 5202, 2968, 2788, 994, 267, 1540, 5878, 842, 1165, 1684, 486, 4927, 5089, 5562, 269, 166, 2606, 534, 5106, 5107, 189, 5376, 5377, 5569, 5799, 3532, 5236, 5379, 5574, 5575, 5659, 5886, 6379, 6869, 6382, 3368, 4949, 5116, 5383, 5384, 5578, 5579, 134, 3850, 5245, 1079, 5473, 6497, 1805, 5591, 5404, 5493, 465, 2706, 6003, 5520, 1291, 5732, 5175, 5177, 5533, 5536, 566, 2239, 2240, 4874, 5339, 5340, 402, 354, 6350, 1160, 1063, 5646, 781, 653, 6982, 5566, 5657, 4940, 7169, 5660, 5801, 2488, 5385, 5663]. **Decimal-Based** [5930, 5799, 5415, 5376, 5377]. **Decimal-Binary** [173, 2531]. **Decimal-Floating-Point** [5171]. **decimal-point** [781]. **Decimal-to-Binary** [155, 4862, 267, 1292, 1293, 402]. **Decimal/Hexadecimal** [2606]. **decimal64** [5777, 5905, 5552, 5428, 5191]. **Décimales** [1160]. **Decimals** [619, 43, 5318, 5544, 268, 1694]. **decimation** [3276]. **decimation-in-time** [3276]. **Decision** [4306, 5554, 4128, 5487, 3619, 4078, 5553, 4931]. **Decisions** [5032, 1978, 1309]. **decNumber** [5147, 5279]. **Decodable** [4359]. **Decoded** [5578]. **Decoder** [7150, 6362, 4131]. **decoders** [4124]. **Decoding** [4509, 7048, 6551, 6718, 570, 4506, 1089, 2360, 4243, 5192, 4907, 2027, 4487]. **Decoding-Free** [7048].

Decodings [6957]. **decomposable** [4013]. **Decomposition** [3102, 2393, 3295, 1887, 5340, 5194, 356, 4432, 773, 3688, 2994, 792, 2511, 4858, 6831, 2423, 477, 3348, 5226]. **Decompositions** [5316, 997]. **Decompression** [6918, 3683]. **Decreasing** [4015, 2463]. **decryption** [3577]. **DECSYSTEM** [1401, 959]. **DECsystem-10** [959]. **DECsystem-10/20** [959]. **DECSYSTEM-20** [1401]. **Dedicated** [2991, 2807, 2990]. **Dedication** [5893]. **dedié** [2807]. **Deductive** [5989]. **Deep** [6490, 7133, 6491, 6390, 6519, 6520, 6407, 6679, 6681, 6904, 6905, 6918, 6084, 6546, 7051, 6569, 6325, 6451, 6834, 6724, 7073, 6586, 6839, 6726, 6953, 6600, 6968, 6131, 6969, 6470, 6853, 6856, 6987, 6639, 6648, 6761, 7131, 6680, 6796, 6444, 6723, 6456, 6733, 6960, 6750, 6519, 6733, 7088, 6486]. **Deep-dish** [6131]. **Defect** [7380, 1785, 2827]. **defect-tolerant** [2827]. **Defektberechnung** [2573]. **defense** [2870, 1567, 1645]. **deficiencies** [1737]. **defined** [4990, 5164]. **Defining** [3485]. **Definite** [6650, 283]. **Definiteness** [6230]. **Definition** [2349, 556, 6436, 5041, 5069, 3411, 2371, 748, 1225, 4879, 6232, 17]. **Definitions** [6908, 1554]. **Degeneracies** [3484]. **Degeneracy** [3343]. **Degradation** [5047, 6031]. **Degrades** [3775]. **Degree** [5811, 5685, 4335, 1666, 4792, 5300, 6356, 6368]. **Dekker** [6833, 5140, 6696, 6722, 7173]. **Delaunay** [3694]. **Delay** [3734, 2667, 3575, 3874, 5513, 6003, 7060, 4080, 6739, 4929, 4746, 4749, 3375, 5806]. **Delay-based** [6003]. **Delay-optimized** [4929]. **Delay-power** [3575]. **delayed** [5262, 4246]. **Delays** [2892]. **Delhi** [7345]. **Delight** [5978, 7508, 4593]. **delimited** [5220]. **Delimiting** [3027, 2848]. **deliver** [3204]. **delivers** [2186, 2509]. **Delivery** [7385]. **della** [138]. **Delta** [3576, 3993]. **Delta-sigma** [3576, 3993]. **Demmel** [4848]. **demodulator** [3576]. **Demonstration** [5031, 3570, 88]. **Denmark** [7258]. **denoising** [5710]. **dénominateurs** [5419]. **Denominator** [6023, 5556]. **denominators** [5419]. **Denormal** [6981, 7120, 5896]. **Denormalization** [3837, 4036, 4039]. **Denormalized** [1389, 1207, 5025, 3930, 4119, 4766, 3375]. **Denormals** [6020, 6145]. **Dense** [6961, 5638, 6303, 5967, 5968]. **Densely** [4530, 5179]. **Densely-Packed-Decimal** [5179]. **densities** [2934]. **Density** [4556, 4716, 6450]. **Denver** [7417, 7451, 7522, 7313]. **Department** [7181, 7222]. **Depend** [4361]. **Dependable** [7389]. **dependant** [5806]. **Dependence** [5333, 6032]. **Dependent** [5159, 3780, 5114, 890, 6372]. **depending** [4008]. **Depends** [5980]. **Deployment** [6823]. **Depth** [3973, 5600, 3441, 2782, 5564, 4968, 6512, 5412, 5850, 5364, 6865]. **Depth-3** [5564, 5364]. **deren** [1211, 3121]. **Derivation** [5447, 3002, 3850, 2972]. **derivative** [5609, 5939, 981, 108]. **Derivatives** [373, 6112]. **dérivées** [108]. **Descent** [1716, 2709]. **Describe** [3482]. **Describing** [4043]. **Description** [4832, 4312, 118, 827, 747, 1225, 918]. **Design** [7326, 7512, 663, 7002, 1563, 5472, 5587, 5130, 7134, 7458, 3977, 4308, 546, 547, 4315, 5988, 4318, 48, 2504, 2188, 7018, 6669, 7019, 2333, 3989, 4331, 5269, 4675, 4816, 3570, 6901, 1498, 1722, 3236, 380, 4992, 2338, 2512, 4334, 6165, 5494, 5274, 5496, 4993, 1103, 3874, 7544, 6683, 1729, 3066, 1831, 334, 3067, 7142, 5155, 5506, 7515, 6419, 7036, 2525, 3077, 2212, 4845, 6928, 3750, 1396, 1604, 1124, 5721, 5722, 5928, 3753, 3084, 6078, 4034, 881, 3438, 4200, 1846, 6294, 1402, 1287, 883, 390, 4861, 435, 5730, 1291, 469, 3768, 4044, 6553,

1978, 4565, 5738, 5739, 5028, 5315, 5740]. **Design** [5846, 517, 1217, 7320, 7204, 7283, 7304, 7323, 7335, 7345, 7360, 7376, 7403, 7414, 7435, 7473, 7474, 7475, 7486, 7517, 7520, 7548, 7549, 7561, 7563, 7583, 7594, 1623, 6709, 5535, 1626, 4054, 3289, 7060, 4227, 5756, 5180, 1418, 6937, 1527, 2738, 7595, 4575, 4881, 5619, 4578, 6324, 2104, 902, 5765, 6105, 3125, 4403, 5859, 4588, 5333, 5334, 5335, 7070, 7071, 1143, 1884, 6212, 6338, 6458, 6584, 6838, 6946, 1314, 4248, 5955, 979, 7076, 2563, 3480, 5341, 5196, 2256, 2435, 6349, 6597, 6119, 2570, 2958, 3803, 6465, 6601, 6846, 1439, 5960, 6026, 3319, 3491, 3496, 3663, 3808, 3809, 4750, 5204, 766, 6606, 7575]. **Design** [2584, 2789, 4438, 4611, 5210, 7454, 7365, 5637, 2798, 5444, 4918, 2801, 3338, 4616, 6473, 6229, 1451, 1676, 6972, 6973, 1453, 5878, 3513, 3514, 4927, 4284, 4454, 7523, 1778, 5796, 3520, 1000, 1920, 1458, 4460, 4776, 7221, 5798, 4135, 4466, 4467, 5231, 3012, 592, 2827, 7124, 2028, 5376, 5377, 2478, 2160, 2161, 5659, 6638, 2032, 2305, 6755, 3204, 4641, 3369, 5662, 3208, 796, 3211, 3212, 1561, 1004, 4299, 5245, 5390, 4788, 6759, 6996, 5583, 1480, 2172, 6801, 2689, 3217, 4798, 605, 1717, 2191, 58, 4814, 1500, 2337, 2341, 420, 5995, 2353, 4190, 2699, 4358, 622, 880, 1031, 6003, 2900]. **design** [3086, 2536, 6426, 3769, 2224, 2718, 2543, 2086, 4720, 2724, 1858, 1039, 2398, 4226, 4228, 5612, 3296, 4064, 1633, 2741, 4727, 3788, 3920, 2427, 3793, 3794, 2764, 5063, 696, 2569, 2437, 3313, 2961, 2264, 1154, 3321, 3327, 3328, 2267, 1060, 3670, 772, 4923, 3167, 3509, 3684, 7524, 3828, 7420, 4934, 4134, 3840, 2489, 3535, 4648, 4955, 6041, 4960, 2351, 7530, 1001, 7190]. **Designed** [6490, 1965, 1869, 6016]. **designer** [2823, 1943]. **Designers** [1558, 2138]. **Designing** [5813, 5986, 4341, 5418, 2732, 7167, 2470, 4130, 7125, 5124, 4711, 5840, 2706, 4784]. **Designs** [5414, 5605, 4545, 4856, 5316, 6566, 7163, 4265, 5360, 3172, 3345, 3686, 6865, 5799, 5579, 7170, 3237, 4851, 2434, 5635, 5663, 4951, 4157, 4158]. **Desirable** [615, 1132, 1216]. **DESIRE** [1528]. **Desk** [727, 1102, 86, 1151, 121, 100]. **Desk-Calculator** [121]. **Desperately** [5848]. **Desynchronize** [5806]. **Details** [1812]. **Detect** [5285]. **Detectable** [2155]. **Detecting** [1366, 196, 4855, 6578, 6246, 6764, 6678, 5223, 2488]. **Detection** [5251, 6499, 5899, 6156, 497, 857, 806, 6502, 6894, 5480, 811, 3430, 6184, 3261, 4363, 5733, 1419, 1632, 1872, 6941, 901, 288, 7070, 289, 5956, 5343, 2130, 2974, 1665, 5965, 4440, 3817, 2142, 4451, 4282, 2609, 1171, 6241, 1699, 6379, 944, 945, 5900, 5901, 2193, 1109, 1110, 5926, 1278, 1205, 5161, 2717, 5169, 3278, 257, 5948, 1755, 2429, 2752, 6226, 5093, 3007, 2850, 7172]. **detective** [5331]. **Detector** [5750, 4655, 5751]. **Determinant** [4011, 2876]. **Determinants** [3725, 3885, 5937, 6443, 5438, 1542]. **Determination** [514, 1637, 3497, 1776, 589, 3988, 5744]. **Determine** [3040, 5394, 2205]. **Determining** [1055, 706, 773, 792, 3762, 1430, 2255]. **Determinism** [5603, 6276]. **Deterministic** [5849, 776, 4781, 7049, 6873]. **deterministic-stochastic** [6873]. **Deutschland** [61]. **Develop** [2038]. **Developed** [1732]. **Developers** [6923, 5033, 4470]. **Developing** [859, 2505, 2914, 7096, 7395]. **Development** [7229, 7385, 3563, 3233, 5594, 7264, 1107, 2067, 2757, 3134, 2257, 2141, 5645, 3169, 7221, 5803, 6645, 3540, 1712, 2504, 1819, 61, 3085, 2914, 3145, 235, 5071, 2999, 3000, 274, 1355]. **Developments** [853, 4640, 98, 7445]. **Deviates** [182]. **Device**

[13, 3127, 7088, 6871, 6990, 2198, 1703]. **Devices** [4515, 6451, 1245, 7496, 50, 5363, 85, 5802]. **dezimale** [1976]. **Dezimalrechner** [1165]. **DFE** [3322, 3323]. **DFT** [3057, 1823]. **DFU** [5290]. **Dhahran** [2870]. **diagnostic** [4025]. **Diagnostics** [7549, 1525]. **diagonal** [3252, 3253]. **Diagram** [5518, 4709]. **Diagrams** [5418, 4330, 2100]. **Dianostics** [1792]. **Diego** [7554, 7346, 7488, 7462, 7478, 7505, 7537, 7354, 7371]. **Dienste** [124]. **Difference** [3433, 6288, 3671, 4754, 6636, 3671]. **Differences** [5911, 4286, 6685]. **Different** [6667, 438, 6957, 4326, 5910, 5303, 8, 4492]. **différentes** [4326]. **Differential** [860, 1014, 3589, 4850, 7209, 179, 314, 441, 4090, 6803, 1728, 5158, 92, 2376, 5164, 6704, 2743, 365, 4773]. **Differentiation** [3588, 3662, 7344, 2727, 2133]. **differently** [2694]. **Difficult** [1188, 3461]. **Difficulty** [537]. **Dig** [1484]. **Digest** [7333, 7239, 7271, 7303, 7325, 7396, 7421, 7213, 7345, 7403, 7456, 7402]. **Digit** [6385, 4968, 4969, 219, 1366, 462, 2044, 2644, 5698, 3869, 1820, 4334, 4689, 5285, 2893, 6070, 6177, 4697, 4188, 6422, 4194, 386, 555, 434, 5726, 1402, 7151, 3901, 1623, 5608, 4224, 347, 5039, 6100, 5186, 4398, 5328, 4582, 6455, 7071, 524, 7074, 1146, 3130, 4080, 1147, 6215, 162, 5349, 3490, 5351, 1441, 1661, 2580, 6129, 3334, 5441, 1909, 5970, 534, 4133, 5373, 5798, 6241, 490, 594, 5380, 6245, 4477, 3966, 1941, 2171, 2510, 4678, 4174, 957, 6072, 3255, 4703, 5732, 5536, 4382, 4728, 4074, 3131, 319, 3148, 3311, 3312, 3313, 3488, 5631, 5073, 4747, 3157, 4266, 5209, 2453]. **digit** [4920, 2012, 1472, 1473, 5388]. **Digit-by-Digit** [524, 5349, 5441, 3311, 3313]. **Digit-by-Rounding** [5698, 5798]. **Digit-First** [7071]. **Digit-Level** [6177]. **digit-multiplier** [6072]. **Digit-Recurrence** [4969, 5328, 3130, 4133, 4968, 4697, 3255, 3131]. **Digit-Serial** [3869, 4477, 4266, 4920, 1472, 1473]. **Digit-serial-in-serial-out** [4582]. **Digit-Slice** [1402]. **Digital** [135, 7181, 724, 1490, 3398, 3399, 6509, 3406, 248, 6901, 1500, 1722, 6521, 2670, 220, 1273, 1597, 3584, 873, 874, 1026, 1837, 2212, 4844, 125, 1396, 875, 2218, 3260, 338, 621, 1287, 4201, 435, 200, 558, 119, 2724, 7474, 3109, 1305, 1135, 3624, 743, 630, 5943, 1993, 4578, 314, 901, 2422, 142, 7293, 181, 1640, 1888, 2564, 2950, 910, 5341, 1531, 318, 2955, 1055, 182, 1233, 2575, 2970, 2268, 6129, 121, 4440, 7196, 7197, 7199, 7219, 7247, 122, 407, 123, 164, 585, 454, 7523, 5794, 2998, 2293, 1069, 4934, 941, 1075, 1174, 6380, 1558, 243, 97, 151]. **Digital** [1559, 4151, 1360, 1480, 1080, 1185, 2858, 1565, 2317, 98, 1801, 2181, 1089, 3047, 3048, 3049, 3731, 2333, 3234, 2200, 956, 6522, 380, 1270, 2338, 3239, 3240, 422, 4182, 1277, 4350, 3587, 1278, 674, 736, 5840, 92, 284, 1844, 2376, 679, 4861, 3265, 1214, 1975, 3445, 4564, 4565, 1411, 1039, 1221, 1523, 1869, 1985, 1040, 3291, 3463, 3292, 629, 474, 745, 3293, 2407, 312, 521, 1877, 1990, 2245, 2246, 2418, 896, 4238, 1879, 2557, 3302, 900, 976, 978, 525, 572, 684, 316, 690, 114, 1437, 364, 320, 2261, 5073, 453, 985, 581, 146, 183, 206, 1770, 2135, 2274]. **digital** [4102, 1537, 1910, 2010, 704, 705, 770, 991, 1236, 2457, 2592, 2802, 2984, 840, 3339, 130, 163, 4924, 3167, 2986, 3820, 1918, 5973, 2811, 1000, 5653, 1067, 1068, 1688, 1783, 2019, 2020, 2294, 4287, 3194, 1463, 1550, 3703, 1935, 3011, 3841, 2162, 1178, 1797, 541, 542, 3017, 796, 2839, 80, 2494, 2627, 4952, 2630, 2853, 3213, 2854, 3247, 696]. **Digital-Filter** [454]. **digital-signal** [2261]. **digital-to-analog** [1688]. **Digits** [3040, 5394, 550, 811, 1195, 3064,

99, 1603, 1836, 964, 967, 1033, 1129, 5040, 3638, 5961, 237, 4614, 531, 4107, 845, 848, 3536, 3714, 3038, 3224, 3552, 3553, 3554, 3555, 3556, 3557, 91, 137, 3897, 138, 3771, 2239, 2240, 8, 2973, 4622, 5657, 1555, 2488, 4785]. **Dijkstra** [7331]. **Dijon** [7546]. **Dilemma** [6153, 4734]. **Dimensional** [330, 1806, 4354, 5518, 6345, 1150, 1656, 1930, 5112, 6038, 2051, 6688, 4356, 4709, 3646, 5073, 4902, 985, 6224, 2272, 1918, 2996, 4938, 2821, 3705, 3017]. **Diminished** [6563, 4476, 5003]. **diminished-** [5003]. **Diminished-3** [6563]. **Diminished-One** [4476]. **d'implantations** [4326]. **d'intervalles** [5197]. **Diode** [334]. **Diodes** [277, 184]. **Direct** [3398, 2050, 2716, 2957, 1711, 3239, 3240, 3585, 682, 1753, 3302, 6582, 1437, 3152, 3017]. **direct-executing** [1753]. **Direct-Form** [3398, 3302, 1437]. **Directed** [5431, 4100, 4270, 7173, 7504, 5968]. **directional** [3123]. **Directions** [7405, 5259]. **directly** [6497]. **director** [2496]. **DIS** [1747, 3164]. **disasters** [4160, 6459]. **Discovered** [1483, 1553]. **Discovery** [5680]. **Discrete** [4797, 5515, 5052, 1897, 791, 2029, 4945, 2634, 816, 1827, 4026, 4356, 2713, 5860, 5435, 1908, 4276, 3685, 2031, 4782, 3015, 3211, 3212, 6997, 6543]. **Discretely** [174]. **Discriminant** [5486, 5264]. **Discussion** [5692, 9, 10, 58, 545]. **Discussions** [18, 105, 52, 36, 26, 86, 30, 94, 5488]. **dish** [6131]. **disk** [5744]. **displays** [2209]. **Dissecting** [6565]. **Dissipation** [4116, 4170, 4182, 4930]. **Distance** [4017, 4075, 5051, 3938, 3682, 4487]. **Distance-Calculation** [4017]. **Distillation** [3974, 5123, 4903]. **distinctions** [2310]. **Distributed** [1713, 1382, 1587, 7459, 7487, 5861, 590, 5655, 5235, 1360, 2683, 5713, 2918, 1761, 6226, 4288, 1788, 5467, 850, 4481, 2491, 4490]. **distributed-memory** [4288, 5467]. **Distribution** [462, 1368, 964, 55, 1125, 559, 2923, 5185, 2934, 3638, 451, 698, 237, 5448, 777, 2286, 1791, 2160, 491, 4795, 1263, 2713, 6087, 3771, 3468, 4437, 3340, 2014, 1555, 2480, 4785]. **Distributions** [495, 1809, 5419, 4240, 1882, 2145, 848, 5074]. **Distributivity** [1676]. **distribuzione** [138]. **Districts** [5551]. **Dither** [6873]. **Dithering** [3889, 7432, 2628]. **Dive** [6639]. **Diversity** [7567]. **Divide** [3971, 3549, 2052, 5269, 815, 3877, 2350, 5525, 6088, 4221, 4721, 349, 439, 1665, 3503, 4447, 5456, 655, 3524, 3698, 3699, 2813, 323, 5570, 597, 2172, 3392, 4331, 4004, 4180, 2567, 2951, 3504, 4104, 4625, 3025]. **Divide-and-Conquer** [6088]. **Divide-and-Correct** [815, 349, 439, 323]. **Divide/Square** [3524]. **divided** [6685]. **Dividends** [5701]. **Divider** [11, 6399, 1597, 3077, 6566, 4384, 230, 313, 2104, 4088, 5351, 1156, 714, 3956, 1934, 5384, 2034, 6757, 1480, 6398, 2204, 5599, 4845, 4712, 3438, 5520, 2382, 6547, 2904, 4869, 4382, 4725, 5859, 5771, 2947, 2253, 114, 3321, 2983, 2139, 5459, 5580, 2842]. **Dividers** [6652, 5587, 809, 6165, 3452, 6458, 6946, 3641, 2131, 6473, 6742, 4968, 4198, 3129, 2586, 4131, 1934, 5662]. **divides** [1517, 1404, 1624]. **Dividing** [6695]. **Divisibility** [2863]. **Divisible** [438]. **Division** [2638, 7134, 6, 1568, 1569, 853, 7010, 3863, 1367, 858, 5823, 727, 4515, 1812, 7016, 3565, 5990, 729, 3232, 3408, 6671, 6899, 7026, 6164, 1582, 32, 730, 5405, 5701, 815, 5272, 671, 3875, 3997, 1018, 4684, 3064, 3241, 4996, 4011, 3429, 5506, 6070, 7035, 3749, 1603, 1836, 3255, 3256, 4020, 4186, 4696, 2073, 6422, 425, 508, 553, 4028, 432, 1607, 823, 306, 6542, 2711, 6080, 3262, 2381, 1852, 5731, 3763, 7151, 4206, 6088, 5736, 3766, 4372, 3768, 4044, 4216, 3453, 5027, 4722,

4051, 3456, 3457, 741, 6312, 344, 5537, 5936, 4057, 3460, 4060, 7061, 3777, 3778]. **Division** [6570, 257, 4572, 750, 5425, 5615, 5760, 5039, 4392, 286, 349, 568, 569, 632, 1636, 314, 3470, 4731, 5328, 5544, 25, 288, 1312, 1881, 1049, 128, 1755, 2108, 2941, 5862, 7074, 3130, 2430, 2254, 3479, 4894, 3481, 4414, 6115, 2116, 5061, 4415, 264, 763, 3655, 266, 5778, 1894, 2957, 3311, 4084, 4901, 5070, 7086, 236, 4087, 5780, 6221, 5871, 5202, 3664, 3665, 3807, 3808, 2784, 2785, 2129, 4613, 5210, 5443, 3676, 2136, 238, 6852, 6741, 1775, 2596, 650, 3819, 164, 585, 5084, 4103, 239, 776, 186, 165, 5361, 2016, 7109, 7110, 712, 4770, 843, 270, 3828, 323]. **Division** [5370, 1924, 2023, 6749, 5104, 5373, 4135, 4466, 6865, 167, 214, 940, 1175, 2159, 490, 594, 6242, 6376, 2481, 6245, 3014, 3845, 5888, 1002, 544, 244, 2309, 5469, 6145, 3023, 3024, 6646, 5247, 5833, 3852, 664, 2639, 3859, 951, 461, 3561, 1088, 4811, 7020, 7021, 3409, 2510, 5144, 3237, 3414, 4173, 2676, 2513, 3579, 4688, 6285, 2883, 2361, 2363, 2528, 2695, 3079, 4697, 4700, 4701, 5009, 2365, 3591, 3592, 3593, 3435, 2367, 225, 2075, 2705, 5304, 7044, 3898, 3604, 3264, 4203, 4863, 2080, 3446, 3447, 3448, 3451, 3278, 3279, 4047, 3903, 3772, 2094, 4724, 5034, 3112, 3294, 2927, 3916]. **division** [401, 4070, 3125, 4074, 4590, 5430, 5624, 2945, 2112, 2562, 3133, 3797, 4596, 4740, 4742, 4743, 2761, 2762, 3139, 578, 1891, 5629, 6954, 3927, 2767, 2958, 3148, 3312, 3313, 3488, 4419, 3928, 6021, 5958, 2122, 2964, 453, 4089, 3492, 3666, 4092, 4908, 4752, 2975, 4915, 4442, 4762, 130, 163, 3942, 3943, 1065, 780, 3346, 3177, 3178, 3516, 4930, 6746, 3526, 3830, 2473, 2474, 294, 4288, 4289, 1173, 1464, 5229, 1074, 2478, 3964, 4296, 4784, 4949, 4950, 1254, 2168, 2841, 2844, 4951, 4787, 4493, 4300, 1995, 262, 1771, 1477]. **Division-and-accumulation** [3766]. **Division-Free** [5990, 3264]. **Division/Square** [5888, 3859, 4070]. **division/square-root** [3859]. **Divisionless** [222, 211]. **Divisions** [561, 265, 532, 786, 4258, 3206]. **Divisionsalgorithmus** [1771]. **Divisionsverfahren** [1812]. **Divisor** [561, 439, 3937, 532, 786, 544, 461, 4811, 2964, 4752]. **Divisors** [741, 3279]. **DivSqrt** [7050]. **DLFloat** [6490]. **DLLs** [3188]. **DMT** [4795]. **DNA** [4566]. **DNA-based** [4566]. **DNN** [7043, 7091, 6967, 6989, 6990, 6998]. **DNNs** [6903]. **DNS** [5311, 5312]. **Do** [4676, 1417, 4351, 6004, 3440, 3111, 4383, 1329]. **Document** [6220]. **Documentation** [6097, 587]. **Documents** [3857]. **Does** [6055, 2523, 2, 7101]. **Dog** [3566]. **Doing** [1289]. **Dojo** [7007, 7122]. **Dokumentation** [587]. **Dollars** [6746]. **Domain** [5592, 1821, 6819, 7065, 3688, 6990, 2512, 3264, 2395, 3348, 3951, 6868]. **Domains** [5343, 5867, 3348]. **Domestic** [243]. **dominated** [3865]. **Donald** [6135]. **done** [2548]. **données** [2763]. **Don't** [2115]. **Dot** [6053, 6668, 5403, 5496, 3066, 7033, 4856, 6703, 7051, 6567, 6571, 3298, 6321, 7073, 4905, 4906, 5077, 6606, 5974, 6239, 5274, 2881, 3741, 6929, 5742, 2737, 5762, 5952, 5876, 5386, 5470]. **Dot-Product** [6668, 6571, 3298, 7073, 6606]. **dot-products** [5742]. **dots** [7162]. **Double** [4654, 4329, 4813, 5489, 7141, 4679, 303, 4690, 3584, 3744, 4014, 6177, 6420, 3434, 7147, 7148, 6693, 5524, 4214, 4373, 7058, 3458, 5749, 6312, 6318, 5321, 348, 6576, 5545, 4404, 4735, 6013, 5333, 352, 6117, 2436, 362, 363, 5868, 6956, 5201, 4753, 4613, 6029, 6033, 709, 5650, 375, 1934, 1073, 5237, 5980, 6763, 3385, 5984, 4973, 4974, 4976, 5588, 4168, 4326, 4810, 5910, 4688, 4998, 4346, 4347, 2356, 626,

5536, 6831, 5046, 5056, 5957, 696, 6954, 5631, 5958, 1332, 5797, 4935, 5229, 492, 540, 3376, 5241, 2629, 4827, 4828, 5282]. **Double-Base** [3744, 4014, 5524, 5241]. **Double-Based** [3584]. **double-basis** [4688]. **Double-Datapath** [4329, 4813]. **Double-Double** [6576, 4973, 4976]. **double-extended** [4827]. **Double-Length** [709, 626, 540]. **Double-Precision** [5489, 303, 6693, 348, 6013, 5333, 362, 363, 5201, 5650, 375, 3385, 5984, 4998, 696, 6954, 4935, 4828, 5282]. **Double-residue** [5237]. **double-single** [4974]. **Double-Size** [4679]. **Double-Word** [6318, 6956]. **Doubled** [2095, 1431, 1781]. **doubled-mantissa** [1781]. **Doubled-Precision** [1431, 2095]. **Doubledouble** [3867]. **doubles** [6360, 2797]. **d'ouvrages** [1467]. **Down** [2130, 3831]. **Downloadable** [3857]. **DPD** [7169]. **DPU** [7111, 6978]. **Draft** [1198, 4336, 1280, 6562, 5038, 1157, 1235, 1459, 1786, 56, 3203, 2886, 2913, 4223, 1461, 4673, 1822, 3164]. **draw** [529]. **drawing** [2209, 4617]. **Dream** [60]. **Drexel** [7507]. **Drift** [922, 923]. **Driven** [5130, 1376, 6579, 6210, 3816, 2476, 2613, 3010, 2538, 2614, 3382]. **Driverless** [6387]. **Drivers** [3062]. **drives** [6387]. **Driving** [6407, 7271]. **Drum** [134]. **DS** [4249, 4411, 4412, 4148]. **DS-CDMA** [4148]. **DSD** [7474]. **DSFUN90** [4974]. **DSL** [6615]. **DSL-Based** [6615]. **DSP** [5672, 2640, 2318, 3979, 4162, 3865, 2331, 5703, 4677, 3427, 3743, 4354, 2522, 1970, 2370, 4549, 6006, 3619, 3111, 4059, 6830, 4878, 6105, 6204, 6836, 4887, 4081, 2955, 4901, 5070, 6736, 3156, 7097, 4438, 5790, 6367, 3684, 3169, 2467, 3523, 2999, 3000, 2472, 2473, 2474, 2824, 2825, 3195, 4947, 3025, 2315, 5598, 2351]. **DSP-Enabled** [6204, 5598]. **DSP-Oriented** [2955]. **DSP32** [2631]. **DSP32C** [2218]. **DSP48E2** [7163]. **DSP56000** [2294]. **DSP96002** [2441]. **DSPs** [4541, 3899, 2461]. **Dual** [4654, 5476, 4547, 3611, 6312, 3907, 4073, 4732, 5549, 4423, 7109, 7110, 6875, 3230, 5155, 4191, 3593, 2226, 3635, 3797, 2441, 5652, 2489, 3969]. **Dual-Issue** [6875]. **Dual-mode** [6312]. **Dual-Pass** [3907]. **Dual-Path** [4732]. **dual-port** [2441]. **dual-precision** [5155]. **Dual-Purpose** [5476, 7109, 7110]. **dual-rail** [3797]. **Dualmaschinen** [586]. **dualzahlensystem** [1230]. **dubbele** [492, 540]. **Due** [136, 199, 5954, 3151, 4931, 942]. **Duisburg** [7446, 7566]. **Dummy** [3482, 2852]. **d'un** [2004]. **Dundee** [7269, 7253]. **d'une** [702, 108]. **Duo** [5160]. **Duodecimal** [44]. **Duplicate** [6139]. **Durbin** [1200]. **durch** [1835, 2036]. **Durchfuhrung** [35]. **During** [6319, 2709]. **Dutch** [195, 492, 540]. **dyadic** [801]. **Dyadik** [801]. **Dynamic** [6507, 731, 6433, 5948, 2573, 6736, 5245, 6649, 5824, 3868, 4169, 6672, 2672, 4181, 4385, 2743, 3797, 3151, 6640, 4146]. **dynamic-range** [2672]. **Dynamical** [6509, 5061, 6593, 4743]. **Dynamically** [1822, 2205, 3087, 6822]. **Dynamics** [3242, 3658, 5563, 6144, 5822, 7138, 5499, 5708, 5006]. **dynamischer** [2573]. **Dysan** [1680]. **dyscalculia** [5079].

E-commerce [3753]. **E-Graphs** [6906]. **E-mail** [3753]. **E29** [3040, 5394]. **E29-08** [3040, 5394]. **Eagle** [7453]. **EALU** [7001]. **Earliest** [23, 408]. **Early** [1370, 3054, 1380, 3796, 5772, 4274, 1456, 5925, 5005, 4617, 31, 1528]. **Early-Normalizing** [5772]. **earth** [6110, 6372]. **EASIAC** [129]. **easier** [4822]. **Easily** [1604, 1778]. **Easily-Testable** [1604]. **Easy** [5935, 1215, 1296]. **ebaY** [5014]. **ECC** [5907, 6591]. **ECCTD** [7320]. **Echtzeitanwendungen** [3196].

ECM [6310, 5250]. **Ecole** [108]. **Econometric** [4083]. **Economic** [652]. **Economical** [421, 3761, 632]. **Economics** [4274]. **Economizing** [2791]. **Ecosystem** [6597]. **EDCC** [7389]. **EDCC-1** [7389]. **Edge** [6894, 6905, 6735, 6871, 6990, 6723, 2956, 6965, 5783]. **Edge-Device** [6871, 6990]. **Edinburgh** [7470, 7205, 7206, 5639]. **Edited** [272]. **Edition** [4899, 4593]. **Editor** [260, 1956, 428, 5071, 3724, 3727, 421, 199, 426, 348, 285, 3482, 2290, 212, 375, 717]. **Editorial** [6963]. **Editors** [5817, 5693, 6514, 4236, 5543, 6024, 5088]. **EDOC** [7459]. **EDSAC** [105, 87, 1559, 3021, 3847, 88]. **Edsger** [7331]. **education** [6877]. **educational** [4891]. **EDVAC** [72, 56, 3203]. **EDVAC-type** [72]. **Effect** [3401, 967, 1033, 2933, 1676, 2668, 3265, 3625, 2743, 5644, 2617, 2618, 2619, 1252, 1703, 1708, 232]. **Effective** [3546, 6558, 6012, 4407, 2876, 5716, 4035, 4869, 1638, 2584, 2806, 3776]. **Effectiveness** [6841, 6322]. **Effects** [3388, 1801, 6791, 6792, 1393, 6925, 3453, 6938, 3144, 4909, 4286, 6240, 1791, 1797, 4484, 3855, 2395, 3463, 1430, 1051, 6346]. **Efficaces** [4690]. **Efficiencies** [2394]. **Efficiency** [6520, 6794, 6795, 5322, 5330, 7170, 4412, 4081, 707]. **Efficient** [6879, 2316, 6043, 6148, 6654, 6385, 6250, 5892, 6891, 7011, 4663, 856, 5136, 5988, 7014, 6895, 4667, 4981, 5690, 5267, 5399, 7023, 3990, 7139, 2196, 5405, 6675, 5702, 613, 866, 3237, 6523, 5494, 5991, 5276, 5498, 1824, 6282, 4690, 4537, 4691, 5917, 6172, 6920, 5717, 5003, 1114, 5007, 6928, 2214, 5836, 6073, 3081, 3082, 5721, 4360, 6815, 6816, 6002, 4363, 4551, 6542, 6081, 2379, 6699, 2077, 2079, 6546, 6088, 4369, 6429, 3094, 5607, 4044, 6304, 7051, 5738, 2387, 3102, 5027, 3618, 6310, 3456, 3457, 3772, 6195, 6098, 6316, 2091, 6712, 6713, 6568, 7060, 6937, 2733, 4387, 6572, 6573, 6576, 3123]. **Efficient** [3300, 4237, 6102, 4580, 5545, 6332, 4072, 4073, 6336, 7071, 5193, 3128, 5862, 1759, 4080, 3648, 3140, 6117, 6349, 4420, 6021, 6845, 5072, 6846, 6466, 5959, 6124, 2002, 5960, 6026, 6738, 2264, 4426, 5076, 4260, 4429, 6966, 3935, 4267, 5206, 5356, 6850, 6851, 4915, 7178, 7102, 4277, 4758, 4920, 4446, 5452, 6976, 7106, 4624, 6612, 6367, 1542, 4113, 7111, 7112, 5363, 2148, 7117, 6980, 2152, 5365, 240, 3006, 4776, 2611, 1932, 457, 6242, 7125, 1076, 5572, 6638, 5577, 6382, 5115, 5887, 6871, 6990, 4483, 7129, 6993, 5390, 6875, 5122, 3214, 6647, 6648, 6759, 6760, 6876, 7131, 4152, 6998, 7000]. **efficient** [5671, 3548, 3868, 2668, 3737, 3873, 6278, 3059, 4833, 6416, 6922, 6072, 3595, 1517, 4858, 6426, 4210, 4213, 3451, 6312, 2092, 3296, 2419, 4396, 5327, 3125, 4736, 4411, 5064, 2439, 1900, 4750, 5782, 3670, 7100, 7166, 6358, 3697, 3952, 4124, 4463, 2818, 4292, 7169, 2032, 4954, 6758, 3381, 6997]. **Efficiently** [7005, 5309, 5753, 5045, 4609, 3317, 6368]. **Efficiently-Computable** [4609]. **Effort** [4130, 4400]. **Egypt** [7525]. **Eidetic** [7034]. **Eigensolvers** [5059, 5195]. **Eigenvalue** [1832, 4471, 7198, 3426, 6112, 4137]. **eigenvalues** [6112, 4428]. **Eigenvectors** [2813]. **Eighteenth** [7272, 7220, 31, 2377]. **Eighth** [7398, 7271]. **Eignung** [1700]. **Ein-** [2486]. **Einbettung** [1353]. **einem** [1628]. **einfach** [1771]. **einfacher** [1795]. **Einführung** [3121]. **Einige** [1237]. **Einiger** [836, 385]. **Einplatinenrechner** [2082]. **eins** [548]. **Eisenstein** [3743]. **Eispack** [3100, 3273]. **elastic** [2412, 2414]. **electric** [1703]. **Electrical** [10, 7256, 7591, 2563, 7525, 48, 5931]. **Électrique** [2563]. **Electro** [7238, 7301,

7260, 7284, 7238]. **Electro/80** [7238, 7238]. **Electro/83** [7260]. **Electro/86** [7284]. **Electro/88** [7301]. **Electrologica** [5619]. **electromagnetic** [3951]. **Electronic** [135, 3550, 727, 136, 5021, 7549, 7405, 140, 141, 160, 161, 180, 94, 1531, 103, 51, 407, 530, 1546, 70, 5109, 7525, 150, 243, 97, 151, 1559, 80, 297, 58, 422, 960, 118, 63, 64, 65, 66, 67, 68, 183, 104, 62, 3600, 1165]. **Electronic/Mechanical** [3550]. **electronically** [2850]. **Electronics** [724, 7256, 7448, 7585, 3605, 274]. **électroniques** [487]. **Electrons** [76]. **Elektronik** [274]. **Elektronische** [1165]. **Element** [547, 883, 518, 1634, 5068, 1656, 3661, 5078, 6871, 6998, 2650, 1816, 2686, 2972, 2267, 839, 3523, 2821]. **élémentaires** [3986, 4690]. **elementaren** [651, 1700]. **elementarer** [385]. **Elementary** [1946, 2316, 5586, 3043, 3226, 856, 2867, 6393, 1715, 1718, 2053, 954, 1266, 4333, 616, 1274, 3060, 1391, 4540, 2355, 734, 4187, 6811, 6812, 385, 1123, 1841, 2704, 1132, 3277, 5940, 6098, 2093, 2553, 399, 2555, 2103, 4404, 4735, 6013, 2109, 2250, 353, 691, 4252, 6213, 913, 6462, 2573, 3660, 3804, 5200, 6731, 2782, 989, 3816, 587, 651, 3172, 3345, 4111, 240, 1342, 2475, 2819, 2820, 2158, 535, 1700, 2165, 3377, 2857, 5715, 552, 1353, 1795, 2038, 1085, 5984, 3986, 863, 955, 4174, 197, 2349, 4998, 3244, 3425, 5283, 1397, 1216, 5174, 5332, 5953, 4590, 6944, 689, 2566, 4739]. **elementary** [1897, 3324, 3171, 3701, 4935, 4777, 660, 3376, 3538, 5126, 4827, 5149, 4690, 4377]. **Elementary-Function** [1715]. **Elements** [1124, 309, 139, 6195, 2148, 3887, 3747, 2356, 4548, 7052, 1040, 5806]. **Elevation** [6524]. **Eleventh** [7397, 7385]. **Elf** [7072]. **elicited** [3949]. **Eliminate** [1207, 1080, 1185, 3390, 1270, 1437]. **Eliminating** [2171, 3897]. **Elimination** [3402, 5729, 5844, 3302, 5871, 5676, 1808, 1814, 2739, 1542, 1462, 1925, 2025]. **Elision** [6455]. **Elizabeth** [7519]. **Elliptic** [5471, 5670, 4301, 5816, 4305, 6391, 4663, 5256, 5684, 6077, 4360, 4563, 4388, 3140, 4418, 4603, 4744, 4429, 4605, 4748, 4432, 4433, 4922, 4449, 4624, 1916, 5652, 3829, 3873, 6797, 4215, 2119, 6468, 6228, 3348, 5241]. **elliptical** [108]. **elliptique** [108]. **ELU** [6681]. **Elusive** [4593, 5449]. **ELXSI** [1695]. **Email** [3493]. **Embedded** [7457, 6293, 6435, 7536, 7548, 7563, 7594, 6935, 6715, 3917, 6105, 6451, 2960, 6734, 5871, 5880, 7001, 6660, 2502, 3865, 6401, 5152, 4887, 4608, 7097, 3940, 5458, 5459, 5461, 5658]. **Embedding** [1028, 1353]. **emerged** [3671]. **Emergence** [6955, 576]. **Emerging** [7460, 6829, 6963, 7524, 7556]. **emphasis** [7504]. **Empirical** [1125, 7296, 5626]. **Empiricism** [6744, 7116]. **Employing** [743, 5549, 6115, 1360, 629, 985, 2495]. **empty** [3440]. **emulate** [3339]. **Emulating** [6784]. **Emulation** [4659, 5397, 3407, 5106, 1191, 5619]. **emulator** [6286]. **Enable** [3493, 4101, 3930]. **Enabled** [6650, 4549, 6204, 6331, 6606, 6614, 6633, 6866, 7116, 5598]. **Enabling** [6815, 6816, 7078]. **Encapsulation** [6575]. **Enclosing** [3712, 1269]. **Enclosure** [7357, 3581, 3674, 4560, 7477, 4428, 5782]. **Encoded** [1806, 4299, 942, 2835, 3200]. **encoder** [2297]. **Encoding** [5278, 5501, 4530, 4686, 6911, 7143, 3295, 6106, 1644, 2459, 1171, 5106, 465, 5452, 2994, 7169, 4493]. **Encodings** [6079, 5932, 4101, 5107]. **Encrypted** [6609]. **Encryption** [6653, 3753, 7075, 6600, 6609, 4446, 7118, 7126, 3279]. **End** [6815, 6816, 6085, 6086, 3972, 1518, 3605, 2315]. **end-points** [3972]. **ENDGame** [6593]. **Endlicher** [836]. **Endomorphism** [5134, 6416]. **Endomorphisms**

[4360, 4609]. **enemy** [6360]. **Energy** [6879, 6045, 6385, 5892, 7011, 6675, 6799, 5513, 5721, 6815, 6816, 6002, 6310, 7060, 6845, 6466, 5959, 4749, 6966, 5356, 7100, 4776, 6871, 6990, 7170, 6875, 6998, 3548, 4858, 5931, 6426, 2808]. **Energy-** [6879]. **Energy-delay** [4749]. **Energy-Efficient** [6385, 7011, 6675, 5721, 6002, 6310, 6845, 5959, 6966, 5356, 6871, 6990, 6998, 7100, 4858, 6426]. **Engine** [3052, 4353, 7036, 6809, 5539, 2469, 4, 16, 6512, 2389, 4567, 2167, 7529, 6548, 3671]. **Engineer** [2915, 4741]. **Engineering** [135, 3857, 7605, 7302, 10, 7591, 7592, 2398, 2237, 5422, 5848, 4384, 3790, 3694, 7569, 7525, 7267, 5022, 1621, 4873, 4725, 317]. **engineers** [254, 739, 1974]. **engines** [2850]. **England** [3466, 7406]. **English** [195, 73]. **Enhance** [5401, 1541, 1779]. **Enhanced** [6386, 3857, 5482, 1505, 1593, 4890, 3141, 6981, 7120, 6752, 5271, 3649, 4115]. **Enhancement** [7423, 7066, 4693]. **Enhancements** [4501, 4302]. **Enhancing** [4001, 6433]. **ENIAC** [62, 3600]. **Enough** [4311, 5154, 554, 434]. **enriched** [6402]. **Ensure** [5329]. **entering** [7516]. **Enterprise** [3970, 7459, 3825]. **entwickelt** [1732]. **Entwicklung** [61, 274, 1355]. **Entwicklungslinien** [274]. **Entwurf** [2305, 1001]. **Enumeration** [2164]. **envelope** [3185]. **Environment** [7229, 3563, 1194, 1267, 5594, 3452, 5796, 1712, 4338, 6103, 5784, 3335, 1697]. **Environments** [6881, 1525, 2279, 3769, 5533, 2487]. **Epsilon** [3100, 3273, 3653]. **Epsilon-Inflation** [3653]. **equal** [1921]. **equality** [3238]. **equalizer** [3788, 3920]. **Equals** [2123]. **Equation** [860, 1014, 2050, 5904, 6073, 1223, 204, 205, 4090, 5158, 5164, 1528, 1753, 1241, 108, 3198, 108]. **Equations** [1716, 810, 304, 3589, 7209, 884, 253, 179, 904, 441, 3688, 4142, 3712, 3716, 45, 4316, 1816, 1728, 4850, 92, 6704, 515, 516, 565, 2743, 365, 5354, 947, 4494, 4789, 1253]. **Equatorial** [7481]. **Equipment** [106, 696, 274]. **Equivalence** [6973]. **Equivalent** [904, 1446, 531]. **equivalents** [6982]. **Era** [5720, 5633, 7030, 7511, 7563, 147]. **Erasing** [7072]. **Erasing-Based** [7072]. **Eratosthenes** [3714]. **Erfahrungen** [124]. **erfand** [159]. **Erfinder** [3472, 1322, 1167, 1467]. **Ergebnisse** [2013]. **Ergodic** [7185]. **ergodicity** [4327]. **ERL** [4852]. **Errata** [1388, 231]. **Erratum** [1109, 923, 5464]. **erreurs** [990]. **Error** [603, 1566, 3551, 6500, 327, 723, 1366, 1572, 1806, 6391, 7135, 1368, 1809, 2184, 2503, 2185, 725, 806, 1264, 5479, 5681, 807, 3398, 3399, 5480, 4163, 3402, 6896, 6505, 5687, 6269, 3405, 5265, 6670, 7020, 7021, 7024, 196, 811, 812, 1581, 2875, 171, 5403, 5491, 3057, 6165, 6524, 5707, 670, 6798, 5912, 6280, 6683, 1963, 6684, 334, 5150, 6533, 3073, 3589, 6288, 6176, 504, 466, 6929, 7145, 6290, 1123, 6074, 6075, 4030, 388, 5724, 4853, 1285, 6817, 882, 2535, 1210, 1289, 1742, 6085, 6086, 1614, 5733, 179, 6555, 5742, 6707, 2917, 5938, 6197, 6313, 6314]. **Error** [1626, 6318, 6319, 628, 3910, 3292, 629, 743, 1872, 519, 6717, 5425, 6576, 2103, 3783, 6328, 903, 1638, 525, 572, 1145, 6338, 3305, 6585, 3475, 3643, 315, 4247, 6343, 6590, 688, 5956, 5864, 6347, 447, 6348, 2766, 2573, 6121, 6956, 643, 1766, 2772, 3661, 5959, 1899, 764, 837, 985, 479, 1057, 1155, 6223, 5353, 2974, 1665, 582, 6028, 5965, 7196, 7197, 1674, 483, 583, 6473, 706, 2142, 6361, 6230, 5876, 6611, 6742, 6366, 1454, 6746, 1071, 1342, 2155, 2819, 2820, 6241, 593, 6373, 7123, 6482, 849, 2829, 3530, 942, 491, 6379, 6988, 6642, 2488, 4782, 5112, 1475, 1704, 216, 797]. **Error** [3715, 5125, 7174, 7000, 2636, 1186, 1565, 7409,

2174, 2175, 2177, 2178, 1948, 2042, 3560, 329, 1489, 1090, 1263, 1190, 1369, 1808, 1810, 4512, 4666, 3229, 1714, 4327, 2193, 2662, 2663, 1583, 1721, 816, 2057, 2669, 3413, 3058, 3580, 4008, 1828, 1200, 6804, 2065, 3069, 3070, 732, 1278, 4700, 5009, 4023, 4704, 3751, 6076, 3754, 1209, 1284, 5015, 968, 1845, 6005, 6082, 2713, 6699, 7049, 3607, 229, 1298, 1745, 3275, 5317, 1983, 5744, 2727, 6198, 6315, 1524, 2230, 5420, 474, 3631, 5424, 2733, 3915, 4394, 2930, 3124, 2557, 3919, 3787, 5860, 2107, 4078, 1756, 1883, 977, 684, 907, 2429, 2752]. **error** [5954, 1639, 574, 575, 760, 2255, 4253, 3135, 7080, 3146, 5064, 3486, 364, 365, 2446, 6022, 1438, 2121, 2962, 2963, 836, 2967, 3152, 1234, 5963, 6126, 3153, 5557, 3814, 4268, 482, 990, 2270, 2272, 2590, 1335, 6234, 5644, 6478, 3944, 7108, 711, 3179, 3180, 4771, 5216, 2997, 2605, 4773, 2297, 2024, 1462, 1925, 2025, 2608, 3007, 3835, 3836, 4134, 4465, 6371, 1176, 4140, 4294, 716, 795, 2162, 3016, 3371, 4786, 414, 3713, 1183, 948, 4488, 3851, 2855, 2856, 3381, 7172, 4154, 6685, 3247]. **Error-Bounding** [3475, 3643]. **Error-Checking** [483]. **Error-Coded** [723, 3305]. **Error-Correcting** [1614, 1145, 583]. **Error-Detectable** [2155]. **Error-Detecting** [1366]. **Error-Detection** [2142]. **Error-Free** [6290, 1289, 1742, 6576, 5112, 1963, 1210, 6223, 5353, 4782, 5963, 6126, 5557, 3371]. **error-inducing** [6699]. **Error-Optimized** [6500]. **Error-Resilient** [7135, 6817, 7000]. **Error-Tolerant** [6165, 6338, 6988]. **Errors** [812, 865, 5495, 5991, 2352, 278, 7144, 136, 175, 112, 389, 82, 395, 346, 746, 4230, 3298, 4399, 904, 905, 204, 205, 2753, 356, 5343, 2970, 53, 77, 6029, 371, 995, 3945, 1336, 4286, 6137, 6138, 6619, 2609, 4777, 848, 79, 944, 7192, 7128, 326, 5248, 1080, 1185, 2317, 5402, 1270, 1959, 6678, 3739, 423, 4824, 4825, 249, 5923, 3751, 5303, 2377, 2902, 3265, 3091, 394, 6007, 6440, 3629, 4385, 2417, 3468, 6580, 4071, 6015, 6112, 6346, 5555, 3315, 3151, 1058, 1060, 987, 990, 95, 1537, 5875, 3820, 4931, 927, 3951, 4631, 1170, 2296, 4287]. **errors** [1072, 1937, 1252, 6246, 458, 1708, 3542, 2852, 2853, 6764, 2620, 3709, 199]. **Erweiterungen** [1936]. **escalator** [1983]. **eServer** [4854, 4627]. **especially** [2420]. **Essais** [17]. **Essays** [3161, 1554, 17]. **ESSCIRC** [7446, 7433]. **Essential** [2225]. **Estimate** [482, 5785, 4792, 7027, 6802]. **Estimates** [1195, 964, 1123, 1129, 2103, 5864, 544, 461, 4008, 6328, 6580, 3135, 3654, 5216, 1462, 1925, 4786, 6636]. **Estimating** [2195, 3056, 5420]. **Estimation** [6652, 327, 3589, 905, 4121, 6137, 6138, 6619, 3091, 5742, 2727, 5860, 1756, 4749, 5876, 2605, 948]. **estimators** [4984, 1060]. **ETAPS** [7483]. **etc** [1630, 6685]. **Étendue** [17]. **ethical** [3848]. **Etruscan** [5551]. **ètude** [990, 2004]. **Euclid** [3898]. **Euclidean** [6428, 3561, 3863, 1093, 4679, 6416, 4709, 5518, 2786, 4133]. **Euro** [7614, 3748, 3890, 4018, 7356, 7412, 7614]. **Euro-Par** [7614, 7412, 7614]. **Euro-Par'96** [7412]. **EUROCAL** [7275]. **EUROMICRO** [7523, 7474, 7436]. **Europe** [7530, 7364, 7480, 7337]. **European** [7275, 4177, 7389, 7446, 7433, 7320, 7376, 7307, 7369, 4176]. **EUROSAM** [7234]. **EUSIPCO** [7307, 7369]. **EUSIPCO-88** [7307]. **EUSIPCO-92** [7369]. **Evading** [922, 923]. **Evaluate** [767, 5320]. **Evaluates** [1307]. **Evaluating** [3725, 5399, 6673, 5293, 427, 1859, 2555, 1057, 2601, 6634, 2165, 6243, 3885, 5004, 6295, 3127]. **Evaluation** [4963, 2037, 1083, 1362, 7134, 6500, 298, 6504, 729, 954, 5827, 248, 5707, 5909,

1384, 2679, 5999, 2524, 280, 734, 873, 874, 1026, 1114, 305, 427, 467, 1123, 737, 7047, 3443, 2720, 3452, 6434, 6706, 6091, 3618, 5752, 5940, 6317, 259, 6576, 400, 440, 1229, 5329, 7070, 5337, 691, 1530, 3138, 3142, 6597, 3926, 4744, 5779, 3316, 764, 837, 917, 6964, 1444, 6357, 1062, 6365, 1543, 1915, 5089, 6143, 1177, 1184, 2857, 4534, 552, 2183, 4512, 4665, 4666, 863, 955, 7022, 7137, 5402, 1819, 2876, 4836, 2888, 3071, 6175, 2211, 1397, 1513, 6814, 4847, 4852, 5522]. **evaluation** [562, 1408, 6560, 682, 7176, 5609, 5755, 5939, 4237, 4396, 5049, 3922, 689, 4738, 448, 477, 3146, 5630, 2774, 3324, 1234, 4261, 1452, 5215, 192, 193, 3376, 3538, 4953, 285]. **Evaluations** [6839]. **Evaluator** [6397, 2113]. **Even** [1950, 6784, 4593, 5887]. **Even-Type** [5887]. **Event** [7376]. **Ever** [6805, 1671]. **Ever-Changing** [6805]. **Every** [6800, 2891, 2707, 2708, 4713, 3020]. **Everybody** [4342]. **Everyone** [3908, 3909]. **Everywhere** [3908, 3909]. **Evils** [6048]. **Evolution** [5906, 5406, 3756, 3799, 6803, 29, 3700, 29]. **Evolutionary** [4604]. **Evolving** [3881, 4010]. **Exa** [7122]. **Exa-Scale** [7122]. **Exact** [3050, 5137, 6053, 4322, 5687, 4328, 6274, 3410, 4822, 4344, 7033, 4019, 3433, 3081, 4365, 6301, 3900, 1131, 4376, 6093, 5754, 1304, 6321, 895, 1045, 6104, 4885, 5050, 5051, 7158, 1529, 2939, 6585, 5554, 3657, 2769, 3660, 4422, 5869, 6365, 3171, 4455, 2622, 4150, 5582, 5668, 4494, 299, 4981, 2653, 5825, 3986, 4519, 5142, 5511, 3595, 3300, 5762, 5763, 5327, 4071, 6012, 5952, 4586, 4587, 5054, 6116, 5553, 3659, 5071, 1765, 6122, 6123, 6616, 4789]. **Exactly** [3345, 4266, 2303]. **examine** [3713]. **Examining** [643]. **Example** [5589, 4339, 4592, 6615, 721, 5140, 1227, 319, 5644]. **Examples** [607, 10, 1775, 827, 2925]. **Exascale** [5912, 5919, 6276, 5995, 6193]. **ExBLAS** [6093, 6094]. **Exception** [3251, 6916, 6917, 7142, 1520, 3277, 4222, 3286, 2921, 6941, 7070, 3318, 2645, 3068, 6691, 7042, 7146, 3266, 3905, 3620, 3906, 4223, 1358]. **Exception-Handling** [2921]. **Exceptions** [7004, 7175, 2085, 2096, 6578, 6942, 5901, 3404, 1203, 3444, 3608, 2228, 7067, 7177]. **Excess** [6106]. **Excess-Modulo** [6106]. **Exchange** [6500, 6793, 6738, 1671]. **execute** [4676]. **executing** [1753, 4119]. **Execution** [6881, 3041, 4380, 5539, 1886, 3946, 7111, 7112, 6875, 1562, 417, 5900, 4025, 6699, 2541, 3635, 2570, 3537, 35]. **Exercise** [5821, 1330]. **Exercises** [4430, 2816, 3004]. **Exhaustive** [6390, 3603]. **Exhibition** [7256, 7502]. **Existence** [438, 5345, 5300, 5164, 7251]. **existing** [6687]. **exit** [3508]. **ExPAN** [6846]. **expanded** [1524]. **Expanding** [2723]. **Expansion** [1821, 6080, 6604, 2626, 977]. **Expansions** [549, 3883, 4011, 4012, 6200, 6590, 6219, 6361, 6137, 6138, 6619, 242, 6168, 6009, 146]. **Experience** [3729, 1654, 124]. **Experiences** [1560]. **experiment** [2068, 2624]. **Experimental** [328, 4511, 6903, 179, 6554, 591, 149, 1638, 7189, 340, 341]. **Experiments** [1161, 6796]. **Expert** [3075, 5270]. **Explaining** [1038, 4437]. **Explains** [5330]. **Explanation** [5585, 5514, 4395, 957, 1]. **Explication** [1]. **Explicit** [6269, 5518, 6443, 6568, 6576, 6612, 1699, 4709]. **Exploit** [4615, 1245]. **exploitation** [4992]. **Exploiting** [3217, 5897, 6154, 6407, 4710, 2416, 5189, 5190, 5334, 3165, 3946, 457, 4298, 3813, 7107]. **Exploration** [6502, 6901, 5494, 6683, 7143, 5928, 7071, 6221, 4927, 4953, 5204]. **Explorations** [6686]. **Exploring** [7142, 6935, 6846, 3828, 5704]. **Explosion** [4160]. **Expm1**

[2614, 3010]. **Exponent** [5482, 5766, 5951, 6736, 3027, 2043, 2934, 4887, 3326, 6039, 2848]. **Exponential** [5584, 6272, 248, 1960, 4183, 6287, 6693, 1519, 4204, 3615, 1980, 1749, 6331, 5191, 5428, 6964, 4913, 2476, 2611, 5977, 1184, 3989, 610, 4346, 4347, 4838, 4852, 3764, 201, 7156, 3479, 2783, 4757, 414, 5598]. **exponentially** [2042]. **Exponentials** [668, 1848, 3127, 783]. **Exponentiation** [3985, 6409, 5281, 3742, 6177, 6420, 5723, 5838, 5523, 3441, 3617, 4387, 3782, 6336, 6124, 771, 5359, 3845, 3964, 1479, 5914, 4323, 500, 3884, 5011, 4029, 4239, 6481, 3009, 5387, 5389]. **exponents** [4094, 5224]. **Export** [3753]. **Exposé** [2236]. **Expr** [4150]. **Expressing** [2283]. **Expression** [3138]. **Expressions** [4796, 729, 810, 5707, 3075, 2901, 6213, 6028, 708, 1919, 1556, 1186, 5709, 5596, 6128, 7172]. **ExSdotp** [6897]. **Extant** [408]. **Extended** [2862, 6385, 331, 5295, 5296, 7147, 7148, 7149, 2715, 6304, 2545, 7058, 6200, 6317, 2400, 3784, 7066, 5334, 6219, 3335, 1457, 1003, 721, 1086, 1011, 6168, 1028, 4038, 7052, 3118, 633, 4588, 5868, 4902, 1337, 5224, 2832, 4827]. **extended-precision** [721, 6168, 4038, 633]. **Extended-Range** [1457]. **Extending** [1487, 5258, 617, 3751, 6332, 6118, 1893, 4325]. **Extensible** [6247]. **Extension** [1261, 4306, 3862, 7013, 6897, 2655, 3879, 6534, 1733, 5927, 6930, 7149, 5733, 5175, 5176, 5177, 5533, 3781, 2736, 6940, 765, 919, 6849, 3162, 2275, 4110, 1936, 1470, 7130, 4312, 6680, 5599, 735, 4920, 2466, 4938]. **Extensions** [5134, 4314, 2045, 5490, 6185, 5201, 481, 5964, 3160, 2142, 3529, 7126, 1996, 5113]. **Extent** [1554, 17]. **Extentions** [4599]. **External** [6782, 3482]. **Extra** [2180, 4870, 5150]. **Extra-Precise** [4870, 5150]. **Extracting** [13, 36, 7097, 1445, 5097, 6878]. **Extraction** [727, 158, 49, 638, 686, 5349, 4086, 5977, 3604, 4042, 1160]. **Extractor** [2716]. **Extracts** [2583, 1398]. **Extrapolation** [6576, 3315, 6685]. **extremal** [4596, 4740]. **Extreme** [2481, 2080].

F [5488]. **F00F** [3876]. **F77** [3482]. **F90** [3482]. **Face** [6959]. **Face-off** [6959]. **Facilitating** [6155]. **Facilities** [4184, 827]. **Facility** [2105]. **fact** [3701]. **Factor** [5251, 1823, 2817, 1977, 2750, 1438]. **Factor-2** [5251]. **Factorial** [2906]. **Factorial-Base** [2906]. **factorising** [604]. **Factorization** [6585, 5964, 6027, 2829, 6146, 4718, 2119, 3340, 4771, 5809]. **Factorizations** [7168]. **Factors** [7005, 2072, 6115, 2213]. **factory** [3605]. **fading** [4248, 4646]. **Fail** [6521]. **Failure** [3551, 1523, 3790, 2870, 3640, 3132]. **Fairchild** [403]. **Fairmont** [7519]. **Faithful** [4311, 4517, 5329, 4439, 5453, 5454, 3512, 3821, 4308]. **Faithfully** [5998, 6081, 6091, 6721, 6140]. **Fall** [7193, 7203]. **fallback** [7087]. **Falls** [7501]. **Family** [2497, 4804, 1579, 1580, 2660, 5403, 5406, 1834, 5724, 5726, 4866, 3103, 3281, 4065, 4390, 1643, 3306, 4281, 3829, 5379, 4491, 2502, 5402, 6006, 7293, 2564, 2950, 3356, 3373]. **famous** [6746]. **Fan** [2136]. **Fan-In** [2136]. **Fans** [6864]. **FAQ** [4979, 6907, 6908, 6909, 6910, 6911, 6912]. **FasMath** [2518]. **Fast** [4498, 6653, 6880, 3544, 4301, 4659, 5815, 378, 219, 3862, 5257, 6157, 2183, 7012, 3048, 3049, 5684, 3231, 3866, 2050, 6788, 1718, 6271, 2052, 954, 6670, 5697, 1584, 2339, 2340, 4334, 5495, 1384, 1588, 6679, 6680, 6681, 1019, 4003, 6527, 1595, 1829, 3066, 3244, 2685, 5504, 3246, 5408, 5913, 4535, 4536, 4834, 5918, 3427, 4015, 1832, 6418, 3076, 7035, 2526, 5010, 3432, 4193, 821, 4028, 6077, 1607, 3753,

1843, 1518, 1848, 1613, 557, 2079, 5529, 3899, 5307, 3613, 3767, 5607, 4866, 3615, 3617, 2720, 1300, 6558, 3452, 3279, 4047, 6435, 7176, 6310, 3457, 6195, 310, 5940, 4232]. **Fast** [4386, 2553, 2737, 1422, 3298, 3782, 1636, 3916, 5855, 6724, 1881, 5336, 5546, 1049, 5193, 1886, 2111, 5058, 3142, 4744, 2572, 6218, 6463, 5779, 7087, 6122, 6123, 6738, 5202, 5351, 1153, 919, 3664, 4428, 4605, 4748, 5873, 2784, 2785, 3811, 4094, 6603, 5355, 5080, 3816, 2799, 4616, 4919, 4443, 4759, 1677, 2143, 5455, 5561, 5641, 5877, 4108, 1543, 1166, 4928, 2465, 4454, 6481, 6614, 3181, 2466, 2468, 2606, 2609, 4130, 1693, 2157, 1073, 6037, 6483, 3363, 3364, 6382, 6870, 6989, 850, 325, 2844, 3024, 3376, 3377, 3538, 5241, 2169, 5386, 5387, 6040, 2846, 5981, 4491, 5246, 5247, 2857, 4827]. **Fast** [5282, 4295, 4946, 6383, 803, 3031, 2502, 953, 5825, 1497, 6400, 2057, 6797, 3425, 4836, 2889, 3072, 3885, 4016, 4542, 4027, 4852, 4710, 2219, 1740, 5522, 1972, 6426, 6427, 4211, 3267, 1215, 1296, 4215, 5531, 3275, 1411, 7053, 7054, 7153, 1620, 5317, 3622, 5421, 2100, 2739, 3124, 5763, 4239, 5429, 907, 2755, 4739, 910, 1647, 2956, 3926, 3324, 3668, 4261, 6226, 2272, 2135, 1331, 6227, 7166, 1774, 1062, 3685, 3692, 3827, 2470, 4122, 1921, 3526, 5227, 5566, 3356, 4292, 3961, 5802, 6485, 543, 1184, 1561, 4648, 4300, 4661, 7024, 2663, 1385, 2235, 1995, 2259, 1771, 2007]. **Fast** [3681, 654, 1477, 2036, 6041]. **Fast-Direct** [2050]. **Fast-Division** [1049]. **fast-optimaler** [1062]. **Fast-Start** [5058]. **Fast2Sum** [6162, 6270]. **Faster** [6777, 1950, 4679, 3068, 3251, 118, 6420, 5301, 5517, 4360, 5735, 6549, 7152, 6567, 5614, 5760, 6582, 4432, 7103, 1920, 2838, 6142, 6150, 6666, 1491, 6796, 2694, 6113, 3018]. **Fastest** [464, 3037]. **FastRTS** [4637]. **FastTwoSum** [6833, 6722]. **Fault** [5899, 3405, 2207, 4198, 6184, 5734, 3109, 7380, 3331, 3332, 2134, 1171, 2170, 4649, 7001, 6156, 2181, 3048, 3049, 3597, 2717, 4565, 2252, 2971, 3523, 3525, 3207, 3371, 2850, 3381]. **Fault-Masking** [2170]. **Fault-Tolerant** [5734, 2134, 4198, 3331, 3332, 7001, 3048, 3049, 3597, 4565, 3523, 3207]. **faults** [3261]. **Faulty** [6881]. **FCC** [3753]. **FCCM** [7514, 7568, 7493, 7552]. **Fclass** [4570]. **FCT** [7231]. **FD** [6675, 6589]. **FD-SOI** [6675, 6589]. **FDIV** [3580, 3418, 3506]. **FDLIBM** [3150]. **FDTD** [4937]. **Fe** [7464]. **Feasibility** [2524, 1139, 1148, 4623, 2718]. **Feasible** [3637]. **Feature** [255, 5849, 6471, 3204]. **Features** [5059, 5195, 4423, 2864, 3039, 379, 3455, 2400]. **featuring** [7385]. **February** [7510, 7527, 7374, 7239, 7271, 7303, 7437, 7415, 7350, 7524, 7495, 7421, 4138]. **Federal** [108]. **Fédérale** [108]. **Federation** [7208, 7205]. **Feedback** [3055, 738, 5793, 7504, 2557, 114, 3146, 4911, 3542]. **feedback-directed** [7504]. **feedforward** [3058]. **Fehlerabschätzungen** [2103]. **Fehlerschranken** [405, 1335]. **Fehlerschranken-** [405]. **Feigenbaum** [2657]. **FELIN** [2062]. **Fermat** [3720, 6527, 1912, 5233, 2029]. **Few** [4085]. **Fewer** [4193]. **FFT** [1979, 6166, 1959, 6282, 6409, 5719, 6549, 1745, 1226, 1227, 3128, 1761, 910, 3144, 1438, 3151, 5792, 6615, 1692, 1926, 5884, 4465, 1932, 1933, 2156, 1072, 1176, 1251, 1356]. **FFT-Based** [6166, 6282, 6409]. **FFTS** [1066, 4307, 5005, 7069, 6142, 1986]. **FHT** [3276]. **fi** [408]. **fiable** [4242]. **Fibonacci** [4796, 2243, 1428, 3941, 1471, 661]. **fictions** [2778]. **fidelity** [978]. **Field** [7510, 7527, 7514, 5480, 7543, 7557, 5490, 7499, 5921, 6177, 6690, 3257, 5296, 4547, 6186, 4209, 7503, 7581, 6203, 4073, 7075, 3130, 3474,

1656, 5436, 3931, 4426, 7426, 7493, 7552, 7568, 1238, 4446, 5654, 3834, 4289, 5885, 7495, 6993, 3027, 2851, 3720, 5262, 6062, 5505, 5155, 3891, 3894, 2226, 1412, 5172, 4726, 3131, 3669, 3951, 1703, 2489, 3969, 4643, 4644, 2848, 7471]. **Field-Oriented** [6690]. **Field-Programmable** [7510, 7527, 7514, 7543, 7499, 7503, 7426, 7493, 7552, 7568, 5654, 7495, 5155, 3894, 7471]. **Fields** [3862, 5135, 5490, 5922, 5295, 4366, 5526, 5733, 5530, 4406, 4420, 4900, 6959, 3811, 7165, 1448, 2459, 4450, 1916, 6136, 5983, 2517, 3887, 4548, 2904, 2905, 3090, 3914, 5182, 2434, 4260, 3669, 3935, 4094, 2454, 4920, 3206, 3968, 4645]. **FIFOs** [3194]. **Fifteenth** [7443, 7255, 7189, 3991]. **Fifth** [7479, 7312, 1365]. **Fifty** [7615]. **Fifty-First** [7615]. **Figure** [5906]. **Figures** [55, 54, 1671, 3982]. **File** [3929]. **Files** [2588]. **Filter** [4188, 2955, 1055, 1150, 454, 2998, 4641, 2631, 6801, 4989, 5713, 3598, 3449, 2724, 629, 2246, 2419, 2931, 6015, 5435, 3820, 1067, 1783, 2020, 3965, 4481, 2491, 541, 542, 3017, 5117, 3851]. **filterbank** [5073]. **Filtering** [558, 2376, 1221, 630, 2418, 910, 5658, 5233]. **Filters** [1490, 3398, 3399, 3406, 6901, 4832, 743, 5943, 901, 7095, 6631, 6380, 6755, 1080, 1185, 1565, 2317, 1948, 1489, 7012, 3047, 1811, 3731, 2333, 3868, 3234, 2200, 4170, 4817, 1270, 4182, 1277, 4350, 2353, 3587, 1278, 674, 736, 3894, 1214, 1975, 5933, 4565, 1039, 1523, 1869, 2395, 1985, 3291, 3292, 474, 745, 3293, 2407, 2245, 896, 2557, 3302, 900, 976, 525, 572, 684, 4251, 5342, 1437, 5346, 4425, 985, 2967, 3152, 581, 6224, 4102, 1537, 1910, 2010, 2457, 2592, 2802, 2984, 840, 2986, 1918, 5973, 1068, 5094, 2294, 4287, 1788, 3841, 1797, 1939, 2630, 2495, 2853, 3247]. **FINAC** [136]. **Final** [3147, 3578]. **Financial** [5820, 7065, 4274]. **Find** [6389, 1093, 2901, 5824, 5556]. **Finding** [7005, 3550, 4672, 4335, 561, 2394, 6942, 7067, 4593, 6366, 6478, 6368, 532, 786, 5981, 416, 863, 955, 7176, 4586, 2755, 4462, 1835]. **Fine** [6449, 7089, 3259]. **Fine-Grain** [7089, 3259]. **Fine-grained** [6449]. **Finely** [6541]. **Finely-Pipelined** [6541]. **Fingers** [14, 170]. **Finite** [5135, 5480, 5683, 5490, 3571, 3572, 4540, 5727, 4366, 5526, 4209, 3463, 1635, 1876, 5040, 5618, 4406, 7075, 692, 1315, 1644, 1889, 3144, 449, 4900, 1656, 3661, 5436, 4426, 7165, 1448, 1238, 6032, 4450, 1916, 4484, 4644, 6993, 2851, 5983, 4668, 5262, 1816, 2517, 5505, 3887, 466, 4548, 1210, 2904, 2905, 3090, 2226, 1412, 5172, 1039, 4726, 3914, 5182, 636, 760, 2434, 5198, 836, 3669, 2454, 2602, 3521, 2821, 2489, 3206, 2491, 5117, 3968, 3969, 4643, 4645, 4952, 1754]. **finite-element** [2821]. **Finite-Field** [5480, 5436, 5505]. **Finite-Precision** [4484, 760, 5117]. **Finite-state** [5683]. **FIR** [1811, 4170, 5713, 4832, 2353, 3598, 3449, 2931, 4251, 1150, 4425, 2020, 4134, 3965, 4641, 4481, 3247]. **Fire** [51]. **Firmware** [3802, 1837, 1633, 918]. **Firmware-Oriented** [3802]. **First** [7263, 195, 5285, 7389, 7424, 3901, 7224, 7391, 7447, 567, 7071, 1146, 7615, 3490, 237, 1909, 2595, 73, 19, 22, 56, 3203, 957, 7484, 249, 6931, 7344, 3762, 3771, 7574, 1052, 369, 1159, 4441, 7420, 3194, 2157, 3841, 3017, 7600, 588]. **first-** [3841]. **first-in** [3194]. **first-order** [3017]. **first-out** [3194]. **Fischler** [2481]. **Fisherman** [7504]. **Fists** [170]. **Fitting** [373]. **Five** [5066, 1714, 3440]. **five-moduli** [1714]. **fix** [6389, 6546]. **fixe** [2763]. **Fixed** [2636, 4499, 5672, 3547, 5892, 2042, 1371, 7136, 6668, 2670, 1821, 3058, 6406, 3996, 4822, 960, 7143, 2075, 6817, 3895, 390, 6302, 4208, 3902, 6311, 741, 5750, 5751, 3297, 1139, 3917,

6325, 6451, 4072, 4405, 6014, 911, 1148, 6462, 5792, 7114, 189, 6631, 491, 5572, 6755, 6989, 5664, 7130, 5915, 6065, 6803, 5392, 1263, 1810, 4814, 2669, 5908, 736, 4851, 968, 2713, 5933, 6704, 3275, 3276, 2724, 3279, 5317, 3619, 2395, 1986, 521, 4238, 6209, 684, 981, 2763, 6729, 3146, 3803, 2446, 5435, 2967, 5352, 2274, 3339, 4923, 6233, 5973, 4629, 4931, 3350, 4778, 4134, 147, 1797, 541, 542]. **fixed** [2307, 2628, 6064]. **Fixed-** [2670, 5750, 5751, 5664, 2763]. **Fixed-Integer** [741]. **Fixed-Point** [4499, 5892, 6406, 3895, 6302, 3902, 6311, 3297, 3917, 6451, 4405, 6462, 5792, 7114, 6631, 491, 6755, 6065, 2636, 2042, 7136, 3058, 7143, 2075, 6325, 7130, 5915, 5392, 1810, 5908, 736, 4851, 968, 2713, 5933, 6704, 3275, 3276, 1986, 4238, 6209, 684, 6729, 3146, 2446, 5435, 2967, 3339, 4923, 5973, 4629, 4931, 3350, 4778, 4134, 2628, 6064]. **Fixed-Point-Arithmetic** [6668]. **Fixed-Posit** [6817]. **fixed-precision** [2307]. **Fixed-Rate** [6014]. **Fixed-Size** [1821, 4072]. **Fixed-Slash** [1139, 911, 1148]. **Fixed-Width** [5572, 3803]. **Fixed-Word-Length** [390]. **fixing** [6246]. **flag** [5462]. **flagged** [4988]. **flags** [5223]. **Flap** [5565]. **flash** [5208]. **Flaw** [3419, 3453, 3506, 3392, 3349]. **FLECKmarks** [3583]. **flerformat** [1740]. **Flex** [2063]. **Flex/32** [2063]. **FlexBlock** [7091]. **flexibility** [3204]. **Flexible** [5516, 6541, 6815, 6816, 5841, 6311, 4575, 1886, 7091, 698, 4769, 2839, 6761, 4541]. **flexiblen** [1886]. **Flexpoint** [6470]. **Fließkomma** [2304, 2305, 2306, 2485, 2486, 1476]. **Fließkomma-Arithmetik** [2304, 2305, 2306, 2485, 2486, 1476]. **Fließkommapakets** [2305]. **Flight** [3790, 3640]. **flip** [5954]. **Float** [2115, 2455, 5810, 6383, 5163, 5025, 6039, 6546, 3336]. **Float-Fix** [6546]. **float-float** [5163]. **float-point** [6039]. **float-Precision** [3336]. **float-to-string** [6383]. **float.h** [2794, 2587]. **Float16** [7007]. **Float8** [7007]. **FLOATing** [5634, 2041, 4505, 7008, 3970, 2635, 5811, 7002, 2037, 6490, 4653, 4964, 5252, 5812, 6043, 6148, 6654, 5584, 4500, 4654, 3854, 7004, 7175, 2174, 2175, 4502, 4965, 217, 417, 3974, 5672, 6250, 6492, 7005, 6767, 6251, 1485, 2859, 2860, 2861, 3032, 3033, 3034, 3035, 3036, 3219, 3220, 3221, 3223, 3550, 4659, 5131, 5133, 6048, 6388, 6390, 6660, 7006, 5674, 5675, 5818, 5819, 1948, 169, 1804, 5897, 6778, 4313, 2322, 4975, 1368, 1809, 3397, 5988, 1013, 3398, 3399, 3981, 4163, 4164, 4165, 1950, 4513, 2328, 4320, 1951, 4800, 6781, 1577, 2505, 2189, 3730, 6506, 5686, 861]. **Floating** [1015, 1095, 2049, 2332, 2655, 2871, 4520, 4521, 5263, 5483, 5688, 5902, 6054, 6055, 6056, 6395, 6784, 7017, 3405, 3406, 7018, 1579, 1580, 3407, 2052, 1719, 6057, 2507, 2053, 728, 2334, 5268, 5905, 6163, 105, 1267, 1268, 1377, 6513, 4329, 4813, 4987, 6399, 6671, 7026, 3567, 6516, 2509, 5489, 247, 6401, 865, 5700, 171, 3235, 3412, 1498, 1499, 5403, 5143, 6675, 2666, 1584, 5592, 2670, 3573, 4334, 5492, 5829, 6902, 1271, 2673, 2674, 2675, 5991, 6059, 6277, 3059, 3996, 1725, 2515, 731, 1197, 1386, 1502, 1503, 1726, 1825, 2206, 2345, 3061, 3999, 6167, 4001, 1198, 1199, 1275, 1388, 1727]. **Floating** [5911, 3877, 4005, 5146, 5278, 5500, 5501, 2877, 4337, 4822, 3420, 3421, 3582, 2063, 2064, 3423, 3740, 6174, 6170, 3583, 3879, 3881, 4342, 6800, 2350, 2519, 2520, 6684, 4011, 4012, 4344, 2208, 4831, 617, 2352, 2887, 3250, 4351, 4537, 4539, 4691, 4834, 5917, 5918, 6066, 6805, 6173, 1965, 5284, 4695, 6921, 5286, 5154, 6533, 3746, 4355, 6923, 6808, 1966, 2067, 502, 6176, 3889, 1733, 1833, 2891, 2893, 1968, 5413, 505, 1395, 1834, 6420,

6690, 4543, 5294, 5512, 3431, 3750, 4022, 4189, 3257, 5513, 1838, 4704, 6179, 2215, 1279, 6811, 6812, 963, 1512, 3432, 1204, 6538, 1514, 4705, 6180, 5603]. **Floating** [4195, 7040, 822, 2217, 6539, 6691, 7042, 7146, 5012, 5837, 1280, 2218, 2897, 6292, 4545, 2704, 5721, 2530, 3260, 3753, 227, 228, 1608, 1971, 5518, 824, 878, 4034, 5840, 881, 1285, 6817, 1741, 2374, 2707, 2708, 4713, 966, 5415, 5930, 6293, 6694, 967, 1033, 1403, 1610, 6695, 4364, 4553, 5523, 307, 1611, 308, 678, 2221, 2222, 2378, 1849, 1850, 4201, 7047, 5730, 5731, 2714, 6187, 6297, 6298, 6299, 6819, 7149, 4862, 3759, 970, 392, 393, 3442, 3764, 4041, 4204, 4205, 5166, 5306, 3899, 6548, 3265, 2540, 1036, 1037, 3611, 3093, 6821, 5607, 1616]. **Floating** [1976, 1297, 436, 6703, 4373, 971, 6556, 3450, 5532, 2542, 5737, 1299, 2544, 2719, 2910, 6191, 6705, 6309, 1301, 1410, 5315, 5846, 3902, 1132, 6194, 1619, 5171, 3905, 6561, 1861, 1862, 1863, 2088, 2089, 6562, 7056, 7057, 4223, 5176, 5746, 6708, 3104, 3105, 4218, 3283, 343, 1865, 4222, 5173, 5608, 6096, 2915, 5935, 3106, 3107, 5749, 6312, 5537, 5752, 5754, 5936, 5938, 6313, 6441, 4054, 4380, 3907, 5538, 1304, 1627, 1222, 2397, 6200, 6317, 6714, 255, 6319, 1628, 5941, 6201, 627, 345, 1224, 1308, 1417, 1987, 2236, 2921, 3774, 3908, 3909, 4227, 4381, 4570, 4870, 4871, 5032, 5422, 5848, 4384, 3776, 743]. **Floating** [746, 3293, 7061, 5319, 3294, 1871, 5758, 2551, 6571, 1751, 891, 1042, 258, 2552, 3297, 5541, 828, 4235, 3467, 2413, 2928, 2929, 1139, 5324, 5325, 5852, 4393, 3783, 751, 752, 894, 1988, 4576, 896, 1046, 753, 6101, 5854, 5945, 3301, 6578, 6579, 6720, 6941, 6942, 6325, 6326, 4581, 4883, 6721, 6105, 6204, 6329, 6331, 5189, 1637, 6108, 5047, 2106, 350, 2423, 2747, 2749, 2937, 6206, 4584, 4885, 5050, 6207, 6334, 6581, 5767, 5768, 6836, 1529, 441, 5333, 5334, 7070, 7072, 6211, 1142, 6456, 2108, 5193, 6014, 6457, 832, 905, 1431, 571, 5769, 6212, 3305, 2942, 2943, 2251, 2430, 6342, 6587, 2753]. **Floating** [1890, 4899, 2561, 94, 6589, 1760, 640, 687, 2563, 5956, 3651, 980, 6460, 1641, 2760, 7078, 1643, 6214, 3135, 5864, 6841, 4595, 526, 577, 911, 1148, 3798, 5776, 403, 2568, 1149, 4415, 6951, 6348, 1999, 6349, 3483, 3144, 5628, 4416, 7082, 7160, 983, 2259, 5552, 5343, 3801, 450, 6019, 6020, 6352, 6353, 6354, 6598, 6599, 363, 2438, 5554, 1532, 1764, 6217, 642, 1896, 2120, 2262, 2442, 2443, 3149, 5068, 5632, 6219, 6464, 1438, 3929, 1152, 2121, 2772, 7092, 4423, 2449, 2450, 6466, 6602, 6734, 5959, 916, 5075, 5960, 6026, 3805, 5202, 5351, 7091, 3493, 2781, 4093, 3663]. **Floating** [3665, 3667, 3808, 3809, 4092, 5078, 2575, 2970, 2576, 5962, 4430, 2784, 2785, 5437, 7094, 2004, 645, 1059, 1325, 2579, 2268, 4269, 6225, 646, 6740, 1157, 1235, 1327, 5964, 6027, 5636, 2131, 7099, 702, 4272, 4438, 6028, 2272, 2792, 2793, 3160, 2008, 6607, 5559, 838, 2796, 2981, 1773, 6132, 2588, 3163, 4916, 5637, 5444, 5445, 2009, 6471, 6472, 2278, 992, 2984, 7178, 2279, 1239, 3681, 922, 923, 6229, 2280, 994, 3166, 2281, 4621, 5638, 2282, 6231, 2804, 5085, 5453, 5454, 5640, 5969, 4278, 6743, 6477, 1541, 6366, 1680, 454, 1681, 6367, 3945, 3946, 5087, 1544, 4109, 2600, 1455, 1776, 4927, 5089]. **Floating** [5361, 2288, 4117, 4284, 4454, 4768, 5090, 5793, 7109, 4628, 5092, 2991, 1686, 7114, 1777, 5650, 5881, 2601, 3693, 4931, 2467, 269, 212, 2151, 2992, 2018, 5796, 1547, 2469, 788, 1687, 2812, 2998, 3186, 3187, 3188, 3352, 3698, 3699, 2293, 5974, 6239, 6981, 7120, 3353, 6137, 6138, 6619, 2021, 2022, 1690, 1691, 3003, 5975, 2607, 4932, 5220, 5221, 5222, 5223,

5458, 5459, 5460, 5461, 5462, 2816, 3004, 844, 1339, 1459, 1460, 1786, 5565, 3956, 3957, 5103, 1341, 2297, 4128, 2026, 5884, 4287, 6240, 3959, 1787, 5567, 2476, 2613, 2614, 3010, 5106, 5107, 1466, 5568, 6751, 1790, 5230, 5374, 3529]. **Floating** [4939, 6140, 6632, 4136, 593, 3357, 4471, 6373, 7123, 6036, 7124, 6482, 1073, 5375, 2028, 3841, 849, 5376, 5569, 2829, 3198, 3530, 2831, 6753, 3360, 6374, 2833, 2834, 1350, 5110, 1076, 5571, 5886, 3708, 1351, 3844, 3201, 6245, 6483, 6484, 2305, 3963, 215, 6382, 1470, 1702, 2623, 1703, 5116, 5239, 5383, 5384, 5578, 5579, 5661, 5664, 6486, 1557, 1355, 1472, 1473, 1474, 1475, 3967, 2034, 5805, 7127, 2035, 3019, 3020, 5979, 216, 3209, 2308, 6247, 2843, 4297, 6145, 134, 1798, 5242, 7171, 5980, 2631, 800, 1358, 3027, 1707, 3541, 5390, 5808, 4151, 949, 1942, 6758, 6874, 6875, 5982, 6647]. **Floating** [5123, 5582, 5668, 5124, 5391, 5248, 6649, 5598, 5715, 5914, 4640, 6377, 4295, 1938, 2176, 3385, 5392, 663, 2858, 1944, 1945, 6488, 3972, 1565, 5671, 6249, 3031, 3719, 3856, 5472, 5473, 6046, 6150, 6047, 721, 297, 1486, 2498, 2640, 3037, 3222, 3390, 3391, 3392, 3393, 4504, 6389, 6497, 6498, 7007, 2499, 1086, 1011, 5676, 1801, 2318, 1802, 1803, 1363, 2320, 1570, 1571, 2043, 2321, 4798, 6154, 4161, 1488, 2502, 2868, 3045, 5588, 5900, 2045, 1369, 1808, 2184, 2503, 2185, 5901, 4316, 2047, 2325, 7012, 2649, 3229, 3047, 2326, 4319, 5258, 5259, 1092, 2186, 1371]. **floating** [2329, 5824, 4803, 2504, 1191, 5139, 3866, 2330, 6266, 2331, 2190, 2652, 2653, 3053, 1814, 4324, 4519, 4669, 4806, 4807, 4808, 5140, 5262, 5989, 6268, 3731, 1717, 300, 2191, 667, 5265, 5590, 4327, 3867, 1016, 4811, 5400, 5591, 7020, 7021, 7138, 2192, 1017, 1194, 6398, 5828, 6672, 3234, 4988, 3568, 1816, 2194, 2662, 7140, 6400, 1955, 6517, 1378, 6518, 3411, 6275, 1379, 4818, 4989, 2668, 3236, 380, 1586, 6402, 3870, 4992, 1819, 2058, 2672, 3737, 3872, 5908, 1381, 1723, 2204, 2341, 4525, 5497, 3994, 3995, 5992, 4820, 4821, 3998, 1590, 5499, 5708, 6168, 4178, 2681, 1105, 1962]. **floating** [4004, 4687, 4532, 422, 5502, 3422, 5710, 2348, 2878, 2879, 2880, 3880, 4010, 3245, 6285, 2686, 6286, 5409, 5410, 960, 1277, 2688, 6412, 5995, 5716, 3067, 2886, 3249, 3426, 4538, 4692, 4833, 6172, 6068, 4013, 3069, 249, 4837, 5153, 5283, 4352, 962, 4541, 5599, 6687, 5155, 2522, 5288, 2523, 5002, 2354, 4185, 2890, 5289, 2209, 503, 1734, 1735, 2892, 6001, 4016, 1203, 5291, 5156, 5510, 735, 1117, 5008, 4190, 4191, 6929, 4702, 4703, 5602, 1513, 1969, 2366, 1737, 1970, 820, 509, 3751, 1205, 5298, 1030, 6291, 2898, 2370, 4851, 6692, 4709, 5839, 4710, 283, 3084, 3261, 4712]. **floating** [4854, 3085, 2532, 622, 880, 1031, 1209, 1284, 1740, 3438, 2900, 3086, 1032, 2709, 1844, 5520, 1845, 2536, 1846, 5725, 2376, 4857, 4858, 1847, 5416, 6005, 6082, 6543, 1288, 2377, 252, 178, 3896, 2381, 1851, 4367, 4861, 3897, 2538, 4037, 6699, 6700, 3088, 4038, 5020, 3605, 5845, 7049, 4039, 4556, 4716, 6547, 2902, 2903, 3607, 6429, 3091, 3444, 3608, 1292, 1408, 1214, 1975, 3610, 2223, 3445, 1409, 1298, 3270, 3098, 4045, 2224, 4564, 2908, 2541, 3099, 2718, 5311, 5312, 1745, 2911, 6434, 6560, 6706, 5739, 2086, 5740, 517, 827, 1216, 2389, 5742, 682, 2391, 1219, 1864, 1747, 3285, 3620]. **floating** [5174, 5175, 5177, 5533, 2227, 2228, 4049, 4567, 7176, 3619, 1134, 1220, 1867, 2392, 4723, 5934, 2914, 4569, 5750, 5751, 1625, 3288, 6007, 6198, 6314, 6315, 6440, 201, 2090, 3623, 6008, 6444, 2231, 2919, 3110, 3289, 6009, 2233, 2401, 2402, 2234, 3111, 2094, 2095, 3461, 3626, 3627, 4226, 4228, 5610,

5756, 4725, 2923, 3291, 3463, 3629, 3292, 6099, 629, 474, 745, 2405, 2406, 2407, 2408, 747, 748, 1225, 2241, 2100, 1633, 312, 521, 4877, 4878, 6322, 2741, 1226, 1227, 2412, 2414, 2415, 1752, 1875, 1528, 1753, 5617, 6831, 3635, 3915, 4394, 3123, 3300, 4881, 5619, 2932]. **floating** [3468, 5326, 830, 898, 974, 1994, 4238, 5946, 6103, 4882, 2557, 3302, 900, 976, 2934, 7067, 2247, 2248, 5948, 6449, 6328, 3918, 3919, 5856, 5190, 7156, 6209, 756, 2748, 2936, 3125, 4583, 5859, 6109, 6012, 5952, 4886, 3791, 4408, 4589, 352, 4591, 3922, 6837, 4887, 525, 572, 5623, 1758, 5337, 3642, 5624, 5954, 1639, 5339, 5340, 4246, 6016, 4889, 6588, 2253, 7177, 1051, 1996, 1314, 2949, 3649, 574, 641, 758, 759, 402, 689, 690, 575, 6017, 2255, 4891, 1997, 1998, 981, 910, 3134, 1435, 2567, 4596, 4740, 6116, 3137, 2257, 2117, 2763, 5062, 2258, 5342, 3143, 6728, 7081, 1647, 1648, 1649]. **floating** [696, 2569, 5777, 5867, 3485, 5344, 4898, 5064, 5346, 5347, 5348, 5432, 5553, 6954, 2570, 2000, 3928, 5067, 5434, 320, 1895, 2261, 2441, 2444, 2769, 3659, 6022, 2962, 2963, 918, 7088, 2447, 2448, 985, 4259, 3319, 4747, 2265, 3152, 6222, 3320, 3321, 3934, 2452, 3810, 4907, 6965, 3326, 581, 4908, 5352, 5873, 6224, 481, 4261, 3154, 3155, 5353, 5557, 6128, 5874, 986, 4264, 4098, 4267, 5783, 766, 987, 3813, 4099, 7097, 4753, 3333, 6130, 4911, 1328, 2005, 5784, 7098, 2269, 208, 701, 990, 2270, 2976, 2271, 3815, 7100, 2273, 2585, 3335, 527, 7101, 3504, 2274, 7180, 2589, 2798]. **floating** [2983, 4917, 2277, 3338, 4102, 5787, 6227, 2457, 2592, 2802, 2593, 2594, 1774, 2139, 1333, 5082, 6855, 993, 529, 1241, 1242, 1334, 707, 1063, 2985, 1064, 3339, 1678, 484, 4923, 3508, 774, 5966, 5642, 5643, 5876, 6234, 5790, 3942, 3943, 4106, 1337, 4924, 4623, 1914, 3167, 107, 5791, 5646, 6478, 998, 2986, 2463, 3944, 5647, 3684, 3342, 777, 2014, 2285, 2599, 2145, 7108, 4925, 6034, 710, 711, 3178, 3825, 4118, 4767, 5562, 2465, 3947, 4455, 4929, 4930, 5794, 3949, 3690, 2806, 2807, 2989, 2990, 2808, 3349, 3183, 2290, 3692, 3827, 4629, 927, 3184, 3517, 2017, 3518, 1066]. **floating** [3951, 5216, 4125, 4456, 6746, 3828, 2472, 1689, 1922, 3002, 4631, 2294, 1170, 2473, 2474, 4457, 4458, 4633, 5097, 5098, 5099, 5224, 5225, 5366, 5367, 5368, 5369, 1785, 1461, 293, 1462, 2025, 4775, 3702, 4131, 376, 324, 4777, 846, 2824, 2825, 3194, 3195, 5105, 1929, 3703, 147, 1465, 1788, 1931, 2300, 1935, 1789, 3011, 5229, 6371, 3012, 1697, 847, 3356, 4468, 4940, 1072, 3358, 1347, 4137, 4293, 7169, 1792, 3705, 1793, 1698, 1937, 4140, 4294, 2030, 942, 6375, 4943, 4944, 716, 795, 3706, 1794, 2621, 2482, 2484, 4474, 4475, 2032, 5237, 1352, 2836, 2164, 493, 3204, 2487, 850]. **floating** [3965, 2490, 3015, 4784, 4949, 5238, 5385, 5804, 6246, 2491, 1796, 1704, 1356, 1797, 541, 542, 543, 2166, 2307, 5117, 796, 2492, 2493, 1256, 295, 1705, 2167, 3210, 3375, 1939, 1560, 2310, 2494, 1357, 2627, 4144, 1799, 1561, 4952, 5244, 5581, 5806, 948, 2630, 4146, 4298, 4953, 4954, 5807, 599, 798, 2848, 6994, 194, 2850, 2313, 2495, 2852, 2853, 3213, 3851, 7172, 5246, 4959, 4960, 5125, 5127, 4650, 4790, 4791, 2315, 6764, 6999, 5149, 2351, 2689, 1253, 6508, 1732, 3906, 4884, 1885, 3656, 3196, 2304, 2305, 2306, 2485, 2486, 1476, 5597, 996]. **floating-** [5392, 5908]. **Floating-Decimal** [134]. **Floating-Point** [2041, 7008, 3970, 2635, 4653, 4964, 5252, 5812, 5584, 4654, 7004, 7175, 4965, 3974, 6492, 7005, 6251, 4659, 5133, 6388, 6390, 6660, 7006, 5674, 5675, 5818, 5819, 5897, 6778, 4975, 3398, 3981, 4163, 4164, 4165, 1950, 4513, 2328, 4800, 6781, 2505,

3730, 5686, 861, 1015, 1095, 2049, 2655, 2871, 5263, 5483, 5688, 5902, 6054, 6055, 6056, 6395, 6784, 3406, 3407, 2052, 6057, 2507, 2053, 728, 2334, 5905, 6163, 1267, 1268, 1377, 4329, 6399, 6671, 7026, 3567, 6516, 5489, 247, 865, 5700, 3235, 3412, 5143, 6675, 2666, 1584, 5592, 2670, 3573, 4334, 5492, 5829, 6902, 1271, 6277]. **Floating-Point** [731, 1386, 1503, 1726, 2345, 3061, 3999, 6167, 4001, 1199, 1275, 1727, 5911, 3877, 4005, 5146, 5278, 5500, 5501, 2877, 4337, 3420, 3421, 3582, 2063, 6174, 6170, 4342, 6800, 2519, 2520, 6684, 4344, 4831, 617, 5917, 5918, 6066, 6805, 6921, 5286, 5154, 6533, 4355, 6923, 1966, 2067, 6176, 3889, 1733, 2891, 2893, 5413, 505, 6690, 4543, 5294, 5512, 3431, 4022, 4189, 1838, 6179, 2215, 1279, 6811, 6812, 1512, 6180, 4195, 7040, 2217, 6539, 5012, 5837, 1280, 2218, 2897, 6292, 4545, 5721, 3753, 1971, 5518, 878, 4034, 881, 1285, 6817, 2707, 2708, 4713, 5415, 5930, 6293, 6694]. **Floating-Point** [1403, 1610, 6695, 4364, 4553, 5523, 307, 2221, 2222, 2378, 1850, 4201, 7047, 5731, 6819, 4862, 970, 392, 393, 5306, 3899, 2540, 6821, 5607, 1976, 971, 6556, 2544, 2719, 2910, 6191, 6309, 1301, 5315, 5846, 3902, 1132, 6194, 1619, 6561, 1861, 1862, 1863, 2088, 2089, 6562, 7056, 5176, 5746, 6708, 3104, 3105, 4218, 343, 5608, 6096, 5935, 5537, 5752, 5754, 5936, 5938, 6313, 6441, 4380, 3907, 5538, 1222, 6200, 6317, 6714, 1628, 5941, 6201, 345, 1224, 1308, 1417, 1987, 2921, 3774, 3908, 3909, 4227, 4381, 4570, 4870, 4871, 5032, 5422, 5848, 4384, 3776, 743, 746, 7061, 5319, 1871, 2551, 6571]. **Floating-Point** [891, 1042, 3297, 5541, 828, 2413, 2929, 5324, 5325, 5852, 3783, 751, 752, 894, 1046, 5945, 3301, 6578, 6579, 6720, 6941, 6942, 6326, 6204, 6331, 6108, 5047, 2749, 6206, 4885, 5050, 6207, 6334, 6581, 5767, 5768, 1529, 441, 5333, 5334, 7070, 7072, 2108, 5193, 6014, 832, 905, 1431, 571, 5769, 6212, 3305, 2942, 2943, 2251, 2430, 6342, 2753, 4899, 2561, 6589, 640, 687, 2563, 5956, 6460, 1641, 2760, 7078, 5864, 6841, 4595, 526, 577, 1149, 3483, 5628, 4416, 7082, 7160, 983, 5552, 5343, 2438, 5554, 1764, 6217, 642, 1896, 2120, 2262, 2442, 2443, 3149, 5068, 5632, 6219, 6464]. **Floating-Point** [1152, 2772, 2449, 2450, 6466, 6602, 6734, 916, 5075, 5202, 5351, 2781, 4093, 3665, 3667, 3808, 2970, 5962, 2784, 2785, 5437, 7094, 2004, 645, 1325, 2579, 2268, 6740, 6027, 7099, 702, 4272, 6028, 2792, 2793, 3160, 6607, 5559, 4916, 5637, 5444, 5445, 6472, 2278, 2279, 1239, 3681, 922, 923, 6229, 2280, 994, 3166, 2281, 4621, 2282, 2804, 5085, 5453, 5454, 5640, 5969, 6743, 6477, 1681, 6367, 3946, 1544, 4109, 1455, 1776, 4927, 5089, 5361, 4454, 4768, 5090, 5793, 7109, 5092, 2991, 7114, 5650, 5881, 3693, 2467, 212, 2992, 2812, 2998, 3186, 3187, 3352, 3698, 3699, 2293, 5974, 6239, 6981, 7120]. **Floating-Point** [6137, 6138, 6619, 2021, 3003, 2607, 4932, 1459, 1460, 1786, 5565, 5103, 1341, 5884, 1787, 5567, 2476, 2613, 2614, 3010, 1466, 5568, 6751, 1790, 3529, 4939, 6140, 6632, 4136, 593, 3357, 6373, 6036, 7124, 5375, 2028, 849, 5569, 2829, 3530, 2831, 6753, 3360, 6374, 5886, 3844, 3201, 6245, 6484, 2305, 215, 1470, 1702, 2623, 5116, 5239, 5383, 5384, 5578, 5579, 5664, 1355, 2034, 3020, 216, 3209, 2308, 6247, 5242, 7171, 2631, 800, 3027, 1707, 5390, 4151, 6874, 6875, 6647, 5123, 5582, 5668, 5124, 5391, 5248, 6649, 5715, 5914, 4640, 6377, 4505, 7002, 4500, 2174, 2175, 417, 3223, 1948, 4313]. **Floating-point** [6506, 2332, 7017, 7018, 1579, 1580, 1719, 5268, 6513, 4813, 4987, 2509, 6401, 2673, 2674, 2675, 5991, 6059, 1502, 1825, 2206, 2064, 3740, 5284, 4695, 1395, 4704, 2530, 2374, 308, 3759, 5166,

1297, 5532, 1299, 3905, 7057, 4223, 4222, 4054, 3293, 258, 2928, 4576, 896, 6101, 6325, 4581, 4883, 6721, 2423, 6836, 6456, 1760, 3651, 980, 3135, 6951, 6348, 2259, 3929, 2121, 2576, 5636, 2008, 2009, 6231, 3945, 4284, 4931, 2151, 2469, 2297, 2026, 4287, 6240, 7123, 3841, 5376, 3198, 2833, 2834, 1076, 3708, 1351, 6483, 1472, 1473, 1474, 1475, 5980, 6758, 5598, 1938, 2176, 3385, 2858, 3972, 1565]. **floating-point** [6249, 5473, 6150, 721, 1486, 2640, 3037, 3390, 3391, 3392, 4504, 6389, 6497, 2499, 1086, 5676, 1801, 2318, 1802, 1803, 6154, 4161, 2868, 3045, 5588, 5900, 5901, 2325, 7012, 2649, 2326, 4319, 5258, 5259, 2186, 2329, 5824, 4803, 5139, 2331, 2190, 2652, 3053, 1814, 4324, 4806, 4807, 5140, 5989, 6268, 3731, 2191, 5265, 5590, 4327, 1016, 4811, 5400, 5591, 7020, 7021, 2192, 1017, 1194, 6398, 5828, 6672, 3234, 4988, 2194, 7140, 6517, 1378, 3411, 4989, 1586, 6402, 4992, 2058, 2672, 3872, 4525, 3995, 3998, 1590, 5499, 5708, 6168, 1962, 4004, 4687, 5502, 2348, 2878, 2879]. **floating-point** [2880, 4010, 6286, 5409, 5410, 2688, 6412, 5716, 3067, 4538, 4013, 3069, 249, 4837, 5153, 5283, 4352, 962, 4541, 5155, 5002, 2354, 4185, 2890, 5289, 503, 1734, 1735, 6001, 5291, 735, 1117, 4191, 6929, 1969, 1737, 1970, 820, 509, 5298, 1030, 6291, 2898, 2370, 4851, 6692, 4709, 4712, 4854, 3085, 622, 880, 1031, 1209, 1284, 1740, 3438, 2900, 3086, 1844, 5520, 1845, 2536, 1846, 5725, 4857, 4858, 6005, 6082, 6543, 1288, 252, 178, 1851, 4367, 4861, 6699, 6700, 5020, 3605, 5845, 4039, 4556, 4716, 2902, 2903, 3444, 3608, 1408, 1214, 1975, 3445, 3270, 4564, 2541, 5311, 5312]. **floating-point** [1745, 6434, 6560, 6706, 5739, 2086, 5740, 1216, 5742, 2391, 1219, 1864, 1747, 3620, 5175, 5177, 5533, 2227, 2228, 4049, 7176, 1134, 1220, 1867, 4723, 5934, 2914, 5750, 5751, 1625, 6007, 6198, 6314, 6315, 6440, 6008, 2233, 2401, 2402, 3111, 2094, 2095, 3461, 3626, 3627, 4226, 4228, 5610, 5756, 4725, 2923, 3291, 3463, 3292, 629, 474, 745, 2405, 2406, 2407, 2408, 4877, 6322, 2741, 2412, 2414, 2415, 1528, 1753, 5617, 6831, 3635, 3915, 4881, 5619, 3468, 830, 898, 974, 4238, 5946, 6103, 4882, 2557, 3302, 7067, 2247, 2248, 5948, 6449, 6328, 3918, 3919, 5856, 6209, 756, 2748, 2936, 3125]. **floating-point** [4583, 6109, 6012, 5952, 4886, 4408, 4589, 4591, 3922, 4887, 525, 572, 5623, 1758, 5337, 5624, 5954, 1639, 4246, 6016, 4889, 6588, 7177, 1051, 1996, 574, 641, 758, 759, 402, 689, 575, 6017, 4891, 1997, 1998, 1435, 6116, 2257, 2117, 2763, 5062, 5342, 1648, 1649, 696, 2569, 5777, 5867, 3485, 5344, 4898, 5064, 5346, 5347, 5348, 5432, 5553, 6954, 2570, 2000, 3928, 5067, 5434, 1895, 2261, 2441, 2444, 2769, 3659, 6022, 2962, 2963, 7088, 2447, 2448, 985, 4259, 4747, 2265, 3152, 6222, 3321, 3934, 6965, 4908, 5352, 5873, 6224, 481, 4261, 3154, 5353, 5557, 5874, 986, 5783, 987, 3813, 4099]. **floating-point** [7097, 4753, 4911, 5784, 2269, 701, 990, 2270, 2976, 3815, 7100, 2273, 2585, 3335, 2589, 2798, 2983, 4917, 4102, 6227, 1333, 5082, 6855, 1241, 1242, 1334, 707, 1063, 2985, 3339, 1678, 4923, 3508, 774, 5966, 5642, 5643, 5876, 6234, 5790, 3942, 1337, 4924, 4623, 1914, 5791, 5646, 998, 2986, 2463, 3944, 5647, 777, 2014, 2285, 4925, 6034, 710, 711, 3178, 3825, 4118, 4767, 5562, 3947, 4455, 4929, 4930, 3949, 3690, 2806, 2807, 2989, 2990, 3183, 2290, 3692, 3827, 4629, 2017, 3951, 4125, 4456, 6746, 3828, 3002, 2294, 1170, 2473, 2474, 4457, 4458, 4633, 5368, 5369, 1785, 1461, 293]. **floating-point** [1462, 2025, 4775, 4131, 376, 4777, 846, 2824, 2825, 3194, 5105, 147, 1465, 1788, 1931, 1935, 3011, 6371,

1697, 3356, 4468, 4940, 3358, 1347, 4293, 1792, 1698, 1937, 4140, 4294, 2030, 942, 6375, 4943, 4944, 716, 795, 2482, 2484, 4474, 4475, 5237, 1352, 2164, 2487, 850, 3965, 4784, 4949, 5238, 5385, 5804, 6246, 1796, 1704, 2307, 5117, 796, 2492, 1256, 295, 3210, 1939, 2310, 1357, 1799, 1561, 4952, 5244, 5581, 5806, 948, 2630, 4146, 4298, 4953, 4954, 5807, 2848, 6994, 2850, 2313, 2495, 2853, 3213, 3851, 7172, 5246, 4959, 4960, 5125, 5127, 4791, 2315, 6764, 6999, 5149, 2689, 5597, 6508, 1732]. **Floating-point** [3906, 4884, 1885, 3196, 2304, 2305, 2306, 2485, 2486, 1476, 996]. **floating-point-number** [5794]. **Floating-point-Pegasus** [350]. **Floating-point-processing** [1611]. **Floating-Point-Roundoff** [454]. **Floating-Point-Routinen** [1732]. **Floating-Slash** [1139, 911, 1148, 2465]. **FLOATP_toolbox** [6728]. **Floats** [2182, 5484, 5753, 6574, 3960, 6360, 6370, 2797]. **FloatX** [6539]. **FLoC** [5639]. **Flocq** [5688, 6785]. **flop** [4256, 503, 6589]. **FloPoCo** [6732, 5597, 6530]. **FLOPS** [6414, 5630, 2965, 2640]. **FLOPS-** [5630]. **Florian** [7096]. **Florida** [7443, 7541, 7570, 7355, 7305, 7487, 7308, 7550, 7567, 7252]. **flotante** [4606]. **flots** [2763]. **flottant** [2807, 5127]. **Flottante** [2563, 2004, 702, 4324, 4807, 4357, 2217, 4884, 5338, 2763, 990]. **Flow** [6859, 5654, 3719, 3856, 2338, 2512, 5924, 1348, 1252]. **FlowFPX** [7004, 7175]. **FLPPEG** [350]. **Fluid** [6367, 7138]. **Flux** [3464]. **Fly** [5907, 6171, 3752, 5900, 2071, 2361, 2894, 5025, 4733]. **Flying** [4037]. **Flyttalls** [3353]. **FMA** [5397, 5687, 5722, 5740, 5846, 6827, 5936, 6314, 6332, 5624, 6967]. **FMAC** [3611, 3930]. **FMCAD** [7420]. **FME** [7480]. **Focus** [1231, 1248, 1202, 1048]. **Fold** [5454]. **Fonctionnelle** [2563]. **Fonctions** [4690, 3986, 5427, 5100]. **Forces** [2992]. **Forcing** [5442, 5098]. **Forensic** [5821]. **Foreword** [1010, 6255, 1365, 4664, 3991, 4523, 6682, 1115, 2362, 1860, 6828, 3466, 4066, 3786, 2770, 921, 3191, 6624, 6914]. **Form** [5471, 4301, 952, 3398, 548, 5276, 5277, 1829, 1830, 4853, 2901, 4866, 6337, 5622, 3796, 4429, 4605, 1446, 2150, 6645, 3720, 826, 7154, 5609, 5755, 6443, 3302, 3479, 1437, 5215, 3841, 3017]. **Formal** [6388, 6390, 2047, 2325, 4320, 4668, 4807, 5262, 5263, 5484, 5689, 5903, 6054, 6785, 6057, 7605, 7544, 4706, 4846, 4848, 877, 3085, 4205, 4206, 4717, 4378, 4569, 4384, 5539, 7061, 7063, 4064, 5770, 2756, 6460, 6595, 5871, 2579, 6472, 6230, 4278, 5970, 6973, 4625, 5793, 7420, 7032, 3385, 2046, 4806, 5140, 5826, 5989, 6268, 5029, 4725, 4400, 7480, 3154, 3155, 2493, 7605, 7544]. **Formalisation** [4324]. **Formalization** [4499, 4324, 830, 898, 974, 2946, 577, 6956]. **Formalizaton** [6096]. **Formally** [5485, 5486, 5902, 6395, 7145, 6114, 5342, 6954, 4093, 3500, 4824, 4825, 7079]. **Formally-Proved** [6395]. **Formally-Verified** [5902, 7145]. **Format** [6490, 6502, 6793, 4001, 5278, 5501, 6170, 971, 6705, 6194, 5179, 6445, 6943, 5191, 5428, 2760, 6599, 6740, 3959, 5106, 6753, 5380, 6639, 6245, 6641, 2176, 3982, 667, 4818, 6412, 4541, 4702, 2536, 3762, 521, 6723, 5046, 4898, 320, 5232, 1628, 2259, 3344]. **Formats** [6250, 7006, 5141, 6520, 6694, 6191, 6192, 7057, 4381, 6717, 2929, 6953, 6607, 5087, 2600, 7114, 6747, 6497, 7007, 6960, 2103]. **formel** [6273, 4495]. **formelles** [4807, 5826]. **Forms** [3369, 4961, 1883, 2024, 4492]. **formula** [951]. **Formulae** [5275, 2394, 5066, 5402]. **formulas** [5934]. **Formulated** [1642]. **Formulation** [6195]. **Formulations** [5393, 4773]. **Forslag** [1740]. **Forsythe** [4512]. **Fort**

[7487]. **Forth** [7350, 1847, 1752, 1875, 7262, 1996, 1532]. **forthcoming** [5132, 6418]. **FORTRAN** [187, 2862, 6428, 4312, 3041, 1191, 418, 419, 3062, 563, 440, 633, 637, 317, 2954, 916, 2812, 1351, 3857, 2865, 3395, 4973, 4974, 3404, 1093, 1094, 862, 1099, 1100, 1193, 2658, 1505, 1593, 2682, 2063, 4032, 3905, 3906, 4223, 4382, 1751, 446, 3482, 915, 3493, 1332, 4452, 4764, 4115, 4456, 489, 3844, 1003]. **Fortran-90** [3395, 4973, 4974]. **FORTRAN/77** [1191]. **Forty** [7574, 7586]. **Forty-first** [7574]. **Forty-Third** [7586]. **Forum** [2891, 3020]. **Forward** [1925, 1828, 4394, 4262, 4275]. **Forwarding** [3798, 3805, 6614, 4259]. **found** [5847]. **Foundation** [899, 1327, 2779, 2780, 1328]. **Foundations** [6194, 7358, 975, 3652, 692, 1315, 3798, 7090, 798, 7296, 4714, 1047, 7395, 1008]. **Four** [754, 184, 165, 6239, 3424, 2066, 4048, 2232, 5850, 4131]. **Four-Quadrant** [184, 165, 4048]. **Four-Term** [6239]. **Fourier** [4661, 6670, 7024, 2663, 3031, 2057, 1827, 3267, 2720, 907, 910, 764, 1057, 2272, 1244, 3685, 1073, 2029, 2031, 3367, 543, 2634, 6997]. **Fourteenth** [7278, 4066]. **Fourth** [7373, 7345, 7521, 7307, 7463, 7296, 7329, 4462, 1189, 1115]. **Fowler** [5016]. **FP** [6412, 5836, 6023, 6606, 7097, 4954]. **FP-ANR** [6412]. **FP-Arithmetic** [5836]. **FP-Enabled** [6606]. **fp16** [6430, 6650, 6427, 6987, 6803]. **FP16-Enabled** [6650]. **FP2I** [7178]. **FP8** [6953]. **FPC** [5489]. **FPChecker** [6578]. **FPGA** [7510, 7527, 7002, 7003, 5676, 5396, 6401, 5908, 4680, 5152, 5834, 5153, 4541, 4838, 5002, 6689, 6926, 6690, 5008, 5605, 5304, 5725, 7044, 3769, 5532, 5737, 6824, 6309, 6433, 5749, 6438, 5536, 6327, 5765, 6105, 6450, 4583, 4732, 6453, 5767, 5952, 6013, 5430, 6340, 5773, 5341, 5196, 4595, 5552, 5777, 5630, 5067, 6846, 5781, 5786, 4621, 5638, 4923, 5971, 7167, 6367, 6861, 3517, 5797, 6984, 4290, 7495, 6374, 7125, 4943, 6869, 6483, 4481, 5580, 5803, 4482, 4483, 7129, 5124, 4534, 3247]. **FPGA-Based** [5737, 6340, 6846, 5638, 6367, 6374, 7125, 5124, 4838, 3769, 5773, 5341, 5196, 5067, 7167, 5803]. **FPGA-processor** [5908]. **FPGA-Specific** [6984, 5781]. **FPGAs** [7399, 7579, 7419, 7440, 3031, 7009, 5588, 6669, 6790, 7019, 5400, 5718, 6179, 6541, 4857, 4858, 6429, 5607, 6311, 5758, 4881, 6102, 6324, 6447, 6204, 6329, 6331, 3791, 4591, 3922, 5771, 3642, 5776, 6848, 6606, 7097, 4753, 6469, 5360, 6747, 5227, 5463, 5230, 5374, 6140, 7169, 4944, 4784, 5804, 5808, 4959, 5597, 5598, 5915, 6531]. **FPgen** [4653]. **FPL** [7557, 7471, 7581, 7543, 7499, 4616]. **FPL-based** [4616]. **FPLibrary** [5153]. **FPMAC** [5975]. **FPRev** [7171]. **FPS** [1816, 2223]. **FPS-164** [1816]. **FPT** [7503]. **FPTRP** [345]. **FPU** [3852, 5894, 6781, 5928, 3440, 2743, 5056, 5956, 7096, 5802, 5113]. **FPUs** [5029, 6460]. **FPV** [1966]. **FPX** [7070]. **fractal** [3787, 3204]. **fractals** [2578]. **Fraction** [3390, 6080, 1876, 3522, 240, 271, 189, 3842, 1828, 1846, 4596, 4740, 5556]. **Fraction-Free** [3842]. **fraction-unit** [1846]. **Fractional** [3900, 5961, 4145, 3547, 4558]. **Fractions** [1574, 26, 677, 6104, 4407, 442, 573, 1160, 1685, 241, 941, 1075, 1174, 1710, 5419, 311, 3779, 1655, 772, 3832, 5466, 2622]. **Framework** [4653, 6251, 7014, 4195, 1119, 1206, 6822, 6715, 6943, 6724, 2580, 3334, 6744, 6373, 6868, 5895, 5005, 6733, 3814, 4268, 1908, 7116, 6640, 6873]. **frameworks** [4897]. **France** [7235, 7297, 7237, 7497, 7542, 7483, 7577, 7412, 7605, 7401, 7430, 7614, 7267, 7546, 2770, 7608, 7234, 7418, 7366, 7588, 7351, 7565, 7523]. **Francisco**

[7213, 7271, 7303, 7402, 7504, 7261, 7421, 7456]. **fraud** [4855]. **Fraudulent** [5285]. **Fray** [3753]. **Free** [5990, 3736, 6290, 2711, 1289, 1742, 7048, 6576, 2941, 6585, 1055, 1767, 5448, 7107, 1696, 3842, 5112, 3027, 548, 1963, 6285, 1210, 3264, 4878, 5430, 5055, 7159, 1435, 5963, 6126, 6223, 5353, 5557, 5086, 4134, 4782, 4950, 3371, 2848, 6999]. **Freiburg** [7449, 7486, 7243]. **Freie** [7266]. **French** [3986, 4324, 4326, 4518, 4807, 5826, 6273, 3416, 29, 40, 4690, 5419, 5427, 4242, 4884, 1, 2563, 2763, 5197, 2004, 702, 990, 1160, 5100, 108, 17, 4495, 4496, 5127]. **Frequency** [1544, 6380, 2858, 3234, 137, 138, 826, 4874, 4248, 8, 4648]. **frequency-hopped** [4648]. **frequency-sampling** [3234]. **frequency-selective** [4248]. **frequenza** [137]. **FRG** [7279]. **Friedrich** [4865, 1653, 1467]. **Friendly** [5827, 5836, 6546, 6553, 5106]. **Frobenius** [5134, 3873]. **front** [3605, 2315, 6256, 6770]. **front-end** [3605]. **FT** [7001]. **FT-EALU** [7001]. **Fujitsu** [3857]. **Fukuoka** [7555, 7444, 7441]. **Fukuoka-shi** [7444]. **Full** [3113, 3114, 3115, 3116, 6981, 7120, 3852, 4799, 5140, 2908, 4074, 4630, 7465, 3583]. **Fully** [2893, 4195, 5521, 1618, 7059, 5335, 5078, 1661, 6660, 4569, 4891]. **Fully-Pipelined** [5078]. **Function** [2316, 5584, 298, 3979, 6265, 6504, 1715, 5399, 5827, 6397, 248, 3735, 4333, 5909, 6681, 1504, 2679, 2680, 3062, 1019, 4831, 4835, 5921, 733, 2524, 427, 429, 6930, 6693, 5305, 4204, 5529, 3443, 4043, 3615, 6091, 1980, 6311, 6576, 440, 634, 5191, 5428, 6013, 3304, 524, 2109, 2250, 6462, 2781, 989, 5081, 3822, 3824, 2988, 5102, 4126, 2476, 2613, 2614, 3010, 6140, 2158, 2163, 6642, 5115, 6038, 2626, 3377, 2845, 5715, 552, 4962, 5251, 1085, 863, 955, 4672, 7020, 7021, 7022, 7137, 3989, 3733, 4674, 501, 2681, 2688, 4346, 4347, 4836, 5283, 2888, 2889, 3252, 3253, 6001, 1510, 5164, 3764]. **function** [4208, 7053, 7054, 7153, 4052, 4053, 5185, 5049, 3126, 6944, 1760, 4739, 3146, 5199, 3327, 3328, 3158, 1682, 4154, 514]. **Functional** [7298, 1944, 1945, 810, 553, 6554, 396, 2563, 3664, 2597, 1163, 997, 3217, 5158, 2912, 6017]. **Functions** [1946, 4793, 5586, 5130, 1083, 1362, 4967, 855, 6778, 3043, 3226, 856, 2867, 6393, 3980, 4162, 7013, 1812, 861, 1015, 4983, 1718, 2053, 954, 1266, 6272, 7023, 1267, 4673, 6058, 7141, 5706, 276, 1960, 616, 1274, 2345, 3060, 3061, 5595, 2350, 1391, 4690, 335, 2355, 1024, 1025, 1113, 734, 873, 874, 1026, 1114, 4187, 2697, 467, 385, 3082, 1123, 6077, 1841, 7147, 7148, 624, 6696, 680, 4040, 4205, 4207, 3899, 4046, 1132, 3277, 1859, 3618, 7058, 3458, 5754, 5940, 6098, 1628, 2093, 3633, 1527, 2553, 3634, 399, 2101, 2555, 2103, 4397, 6108, 4404, 4735, 7157, 1757, 909, 1050]. **Functions** [3644, 3477, 353, 691, 4252, 6213, 7295, 1530, 361, 366, 2440, 2573, 3660, 3804, 6731, 1766, 1657, 3493, 6964, 1902, 2782, 6604, 1666, 1667, 3816, 2455, 1239, 1333, 4919, 6229, 321, 528, 587, 651, 997, 4448, 7105, 6365, 3344, 3172, 3345, 4111, 1545, 6745, 3954, 2021, 2022, 240, 271, 1069, 4127, 2611, 2612, 2819, 2820, 7185, 3193, 5574, 1700, 1177, 2165, 3711, 3713, 6762, 6763, 2857, 4534, 1353, 1795, 2038, 5984, 3986, 5266, 5268, 1194, 2661, 4815, 610, 4174, 197, 4998, 3882, 3424, 3244, 3425, 5834, 2359, 5006, 1397, 251, 4852, 2375, 2710, 6295, 2538, 3264, 1216, 4377]. **functions** [5174, 6709, 201, 5326, 636, 5427, 756, 4241, 5332, 5953, 4590, 3795, 759, 354, 689, 2566, 3136, 4597, 1897, 3314, 5200, 7161, 2774, 3324, 5874, 3157, 2790, 2009, 5449, 1452, 784, 3171, 4456, 1922, 2153, 790, 5100, 4935, 4780, 6141, 660, 3376, 3538, 5126, 4827, 5149, 5598,

5915, 1812, 2486]. **Fundamental** [6521, 975]. **Fundamentals** [7236, 7231]. **Funktionen** [385, 651, 1700, 1628]. **Further** [4689, 966, 5937, 785, 1812, 346]. **Fused** [6505, 4983, 5485, 7025, 4987, 6274, 4334, 5497, 7033, 5165, 6703, 2542, 6705, 5315, 6827, 6439, 3907, 6571, 4395, 5333, 5334, 5335, 3128, 5772, 6845, 6736, 6961, 4439, 5559, 5637, 5444, 5445, 6741, 4768, 5974, 6239, 5975, 5884, 6240, 6382, 6647, 4498, 4517, 4813, 5695, 5018, 4038, 5025, 5029, 4581, 4883, 4079, 6113, 5062, 4747, 3156, 5646, 4775, 4947]. **Fused-mac** [4983]. **Fused-Multiply-Add** [6439, 5029, 5646]. **Fused-Multiply-Add-Type** [5559]. **Fusion** [3388, 4272, 6493, 6016]. **Fusul** [408]. **Futile** [4871]. **Future** [2322, 5422, 480, 5602]. **Fuzzy** [5585, 4502, 4965, 3755, 1232, 5022, 5320]. **FV** [6666]. **FVG** [1733].

G [801]. **G.** [5610, 801]. **G4** [4532, 3825]. **G5** [4091, 4117, 4118]. **GaAs** [3728, 3422, 3423]. **GAF** [2681]. **Gaffer** [5603]. **Gain** [6143]. **Gal** [4933, 5101]. **Galinhas** [7596]. **Galley** [401]. **gallium** [3236]. **Galois** [4547, 6184, 3141, 4420, 3811, 3935, 4094, 4289]. **Galois-Enhanced** [3141]. **Galois/Counter** [6184]. **Galt** [7270]. **Galveston** [7518]. **Gamble** [4269, 5699]. **Game** [4353, 6298, 6299]. **Games** [5603, 7191]. **GAMM** [7409, 7566, 7357, 7477, 1255]. **GAMM-IMACS** [7477]. **Gamma** [2679, 429, 4456, 606]. **Gaon** [27]. **gap** [4806, 4943]. **GAP9** [6735]. **GAPP** [2739]. **Gappa** [5483, 6785, 5409, 5715]. **Gaps** [6309]. **Gate** [7510, 7527, 3257, 1043, 6203, 3130, 3474, 5654, 7495, 2831, 3131]. **gatefield** [1703]. **Gates** [1779, 5564, 5364]. **gating** [4169, 6072]. **gauge** [2389]. **Gauss** [5676, 5488, 6285, 5297, 1631, 3632, 3141, 1694, 4946]. **Gaussian** [6152, 1808, 1814, 5148, 6177, 5729, 5844, 2739, 6608, 6976, 7106, 1542, 1462, 1925, 2025, 2031]. **gave** [6931]. **GCC** [6729, 6029]. **GCD** [1815, 2715, 3108, 2786]. **GCM** [6184]. **GCR** [5879]. **GDR** [7231]. **Geburtstag** [7407]. **Gem** [5508]. **gems** [2643]. **Genaue** [1095, 4494, 4789]. **genauer** [1795]. **Genauigkeit** [1628, 2100, 1211, 651, 1353]. **Gene** [4992, 5005, 5056]. **Gene/L** [4992, 5005, 5056]. **General** [297, 5589, 1095, 4995, 6061, 6907, 873, 874, 1026, 5723, 5309, 7391, 750, 1906, 4443, 6140, 1468, 2483, 1353, 604, 2502, 301, 2676, 5308, 4891, 2435, 1531, 2436, 2261, 4759, 4298, 2315, 2689, 4946, 1211]. **General-Purpose** [5309, 7391, 6140, 1531, 2502, 2435, 2315]. **generalisation** [2219]. **Generalization** [1503, 5963, 548, 1590, 2800]. **Generalized** [549, 1372, 1960, 6545, 2110, 1887, 2580, 582, 2140, 4121, 5107, 4471, 3710, 816, 6527, 5182, 2931, 3157, 1914, 2598, 4936, 4137, 4650, 4790, 6834]. **Generate** [6690, 2523, 4036]. **generated** [2523, 3468, 4956]. **generates** [1399]. **Generating** [6780, 6893, 4824, 4825, 465, 6695, 2110, 2118, 2260, 182, 7083, 2587, 3838, 597, 1994, 2420, 7080, 5099]. **Generation** [7616, 4653, 2316, 6264, 7136, 5396, 3735, 4333, 5707, 4832, 5007, 2218, 6541, 6187, 6297, 7618, 7625, 7627, 558, 6934, 2542, 7504, 6311, 7059, 344, 5611, 399, 4737, 5625, 4415, 983, 115, 4604, 5779, 2781, 4100, 4270, 5654, 6632, 1556, 1354, 5468, 718, 5242, 2650, 2203, 1728, 4013, 3439, 6699, 6015, 1760, 2567, 3930, 3668, 3158, 3684, 4947, 850, 3373, 2167, 3382, 4650, 4790]. **Generative** [6823, 7051]. **Generator** [6403, 5928, 6437, 6564, 6732, 6861, 3694, 6648, 1085, 953, 2681, 6438, 4886, 3690, 3183, 5597].

Generators [5812, 6058, 915, 2789, 6615, 3852, 4498, 3739, 3603]. **Generic** [7011, 4344, 2355, 4376, 4885, 5050, 2141]. **genetic** [5710, 2688]. **Geneva** [7460]. **Genus** [4368]. **Geograph** [1322, 1167, 1467]. **Geographer** [1167]. **Geometric** [1718, 3410, 4540, 2383, 3644, 3309, 3170, 3693, 3986, 4327, 4063, 4237, 4396, 2746, 5054, 5342, 4424, 3343, 3692, 3827]. **Geometrical** [600]. **géométrique** [3986]. **Geometry** [7397, 7443, 7468, 4834, 3081, 4054, 5538, 5044, 4926, 7188, 3868, 3595, 2436, 7418, 4298]. **Georg** [1052]. **George** [44]. **Georgia** [7386, 7328, 7621, 7296]. **German** [2381, 2100, 548, 61, 2700, 391, 159, 3107, 1137, 3465, 752, 1230, 3472, 908, 2943, 836, 579, 3162, 1335, 107, 777, 654, 1167, 7251, 7407, 124, 801, 4494, 4789, 35, 274, 1469]. **Germany** [7409, 7410, 7357, 7431, 7572, 7547, 7446, 7530, 7477, 7243, 7480, 7395, 5488, 61, 7509, 7449, 7486, 7566, 7601, 7597]. **Gers** [7366]. **Gesamte** [1469]. **Geschichte** [801]. **Gesellschaft** [7244]. **Get** [6460, 2194, 3610, 6358, 2492]. **Gets** [1950, 6756, 5850]. **Getting** [2529, 2751, 4593]. **gewisser** [1812]. **GF** [4289, 3811, 4580, 6541, 4366, 4234, 4387, 4571, 4572, 4388, 2739, 4450, 4485]. **GFLOPS** [4049, 4218]. **Ghz** [5672, 6675, 4423, 5794]. **giant** [118]. **Giants** [1492]. **gigabyte** [6835]. **gigaflops** [2658, 2773]. **Given** [1323, 5556, 7324]. **Givens** [6788, 2711]. **Gives** [5370]. **giving** [2138]. **glasses** [5783]. **glassy** [5499, 5708]. **Gleichungssysteme** [4494, 4789]. **gleitendem** [107]. **Gleitkomma** [894, 2942, 2943, 751, 752, 2615, 1355]. **Gleitkomma-** [2943]. **Gleitkomma-Arithmetik** [894, 751, 752]. **Gleitkomma-Prozessoren** [1355]. **Gleitkomma-Prozessors** [2615]. **Gleitkomma-und** [2942]. **Gleitkommaarithmetik** [1885]. **Gleitkommadarstellung** [777]. **Gleitkommaformat** [1628]. **Gleitkommaprozessor** [1790, 3196]. **Gleitkommarechnern** [2381]. **Gleitkommazahlen** [1095, 1976, 2100, 2259]. **Gleitpunktalgorithmen** [3106, 3107]. **Gleitpunktrastern** [2053]. **glitch** [6746]. **glitches** [3953]. **Global** [3564, 3587, 518, 1218, 7359, 3633, 4599, 3672, 3680, 5910, 5308]. **Globally** [7019, 3688]. **GLOBECOM** [7359]. **GLSVLSI** [7511, 7570]. **GMICRO** [2241]. **GMP** [4514, 5138, 4300, 5247, 5302]. **gmp-based** [5302]. **GMRES** [5013, 5516]. **GNB** [5887]. **GNU** [4860, 3450, 6208, 6335, 4115, 5669]. **Goals** [1717]. **Gödel** [3272]. **Godfather** [1061]. **Godson** [5699]. **Goldschmidt** [4020, 4186, 4700, 5009, 4198, 5615, 5760, 4894, 5210, 5442, 5785]. **Golem** [993]. **Golub** [1893]. **Good** [4311, 4166, 3881, 1841, 2966, 6529, 4010, 6360]. **Gordon** [2691]. **got** [4822]. **GPFP** [2650]. **GPU** [6505, 6059, 6168, 6920, 5719, 6420, 6427, 6822, 6565, 6010, 5942, 6578, 6579, 6941, 7070, 5633]. **GPU-FPX** [7070]. **GPUMixer** [6579]. **GPUMP** [5667]. **GPUs** [6650, 6251, 5679, 5499, 5708, 6178, 6936, 6942, 6210, 7070, 7075, 6344, 5868, 7092, 5440, 7105, 6640, 5805, 7127, 6146, 5667]. **graceful** [6031]. **Gradient** [117, 6924, 5638, 4818, 4989, 5198, 2956]. **Gradual** [4966, 5158, 1122, 5030, 2424, 1436]. **Gradual-Underflow** [4966]. **Grain** [4575, 7089, 4472, 3259]. **grained** [6449]. **gram** [5704, 6822, 603, 5985, 5015, 4786, 7174]. **Grand** [7520]. **Granularity** [6240]. **GRAPE** [5712]. **GRAPE-MP** [5712]. **Graph** [4604, 2661, 3737, 529]. **Graphic** [4567]. **Graphical** [6592, 5079]. **Graphics** [6251, 2643, 5601, 4218, 6710, 5044, 4593, 5628, 2575, 5440, 5163,

5739, 4049, 6709, 2745, 2421, 3132, 4889, 2569, 4953, 4954]. **Graphs** [807, 6906, 1222, 6978, 7112]. **Great** [7511, 7570, 6189, 7437, 7453, 22]. **greater** [3308]. **Greatest** [5680, 561, 532, 786]. **Greece** [7534, 7569, 7540]. **GreenWaves** [6735]. **Greenwood** [28]. **Grenoble** [7483, 7577, 7614, 7351, 2770]. **grids** [3705]. **Gröbner** [5647, 3184]. **Groebner** [4045]. **Gronwal** [548]. **Gronwall** [548]. **großer** [654]. **Group** [7385, 3857, 7006, 7330, 5509, 7204, 7057, 7350, 1786, 7185, 2480, 2656]. **Grouped** [4122]. **Grouped-moduli** [4122]. **Groups** [3937, 1004]. **Grove** [7398, 7300, 7318, 7329, 7424, 7272, 7439, 7452, 7463, 7479, 7492, 7506, 7574, 7586, 7615, 7367, 7408]. **Growth** [6391, 365]. **gruboi** [2327]. **Grundlagen** [1904, 1007, 1008, 975]. **grundlegende** [3121]. **GSFAP** [5658]. **Guarantee** [1184]. **Guaranteed** [5707, 4999, 3661, 2605, 5352, 4912, 3198, 5246]. **guaranteed-accurate** [5246]. **Guard** [967, 1033, 5040]. **Guarding** [6818]. **Guest** [5071, 6963, 5817, 5693, 6514, 4236, 5543, 6024, 5088]. **Guide** [6882, 7008, 1375, 1275, 1388, 5834, 2225, 7090, 1927, 3839, 4470, 4941, 3362, 7007, 6305, 1867, 1337, 1689, 2026, 2824, 2825, 2826, 4593]. **guidebook** [5234]. **guided** [5908]. **Guidelines** [400]. **guides** [3145, 2298]. **gun** [2496]. **Gustafson** [6189].

H [418, 419, 389, 340, 341, 563, 996]. **H.F.D.** [5185]. **Hacker** [6570, 7508, 5978, 4593]. **Hadamard** [2759]. **Hadoop** [5655]. **Haffmen** [1064]. **Hague** [7500, 7433]. **HAKMEM** [677]. **HAL** [4423]. **halblogarithmischer** [2700]. **Half** [6430, 6557, 5756, 3796, 6352, 6599, 6746, 6651, 7390, 6303, 6426, 1037, 3947, 6353]. **Half-Adder** [3796]. **half-century** [7390]. **half-complex** [6651]. **Half-Precision** [5756, 6352, 6426]. **half-word** [1037]. **Hall** [232]. **Hall-Effect** [232]. **Halstead** [2275]. **halting** [4938]. **halves** [3962]. **Halving** [5134, 5241]. **Hamada** [2719]. **Hamburg** [7395]. **Hamming** [2142, 4624, 5388]. **hamper** [6493]. **Hand** [1022, 3671]. **Handbook** [6265, 1020, 2885, 3258, 353, 5632, 6464, 1469, 1121, 4714, 2823]. **handbooks** [110]. **Handheld** [1307]. **handing** [4223]. **Handle** [5547, 6412]. **Handlers** [4165]. **Handling** [3251, 6916, 6917, 7142, 1203, 2085, 3444, 3608, 1520, 3277, 4222, 3286, 2096, 2921, 4247, 3318, 2645, 5270, 3068, 3266, 3905, 3620, 3906, 1358]. **Hands** [5613, 4878]. **Hands-on** [5613]. **Hannover** [1485]. **Happen** [4166]. **Happened** [5889]. **Hard** [6204, 6331, 4415, 2835, 3200, 5865, 7097]. **Hard-wired** [2835, 3200]. **Hardest** [5949, 6114]. **Hardest-to-Round** [5949, 6114]. **Hardness** [5412, 5600]. **Hardness-Randomness** [5600, 5412]. **Hardware** [7000, 1081, 1259, 6653, 7003, 5587, 6388, 6390, 6777, 4797, 3043, 3226, 7135, 6393, 5988, 6897, 5260, 6053, 3985, 6266, 2654, 7018, 3735, 6403, 4171, 615, 6909, 959, 1506, 5281, 5505, 5411, 3078, 1026, 5293, 4543, 5414, 6928, 5836, 3082, 4033, 7043, 3601, 6186, 6546, 4216, 4217, 4375, 5741, 7055, 1622, 6436, 6564, 1040, 6571, 7062, 6321, 3122, 260, 6943, 5858, 4584, 6836, 5052, 5053, 4593, 691, 6950, 4598, 6597, 6730, 916, 2781, 4093, 4265, 7575, 7165, 6469, 7365, 6357, 6472, 7178, 6133, 4922, 1452, 4621, 3683, 3172, 3345, 3514, 3686, 3176, 3689, 4766, 7109, 7110, 7112, 7113, 7115, 2809]. **Hardware** [6861, 7117, 6980, 6983, 1069, 4459, 4464, 5104, 1466, 5376, 5377, 5799, 6634, 6376, 7125, 4478, 4783, 5579, 5664,

6872, 3377, 1184, 6757, 6993, 4649, 6041, 6065, 5473, 4157, 4158, 1089, 4323, 4671, 2197, 2336, 2341, 7544, 5996, 4693, 4836, 5283, 1837, 4544, 7265, 4710, 3261, 5163, 1037, 2914, 6712, 6713, 5034, 5612, 4064, 1309, 2737, 4878, 5049, 1758, 4246, 6016, 4745, 5870, 2783, 5204, 5635, 766, 3333, 6228, 4762, 772, 3510, 1244, 1918, 1689, 2818, 3008, 3009, 1464, 1789, 5237, 5663, 1356, 1561, 6064]. **Hardware-accuracy** [7000]. **Hardware-Based** [5988, 3377]. **Hardware-Friendly** [6546]. **Hardware-Oriented** [1026, 5293, 2781, 4745]. **Hardware-Software** [7043]. **hardware/firmware** [1837]. **hardware/microcode** [1309]. **Hardware/Software** [7575, 7112, 6016]. **Hardwired** [2211, 2110]. **Harmful** [2076]. **harmonic** [4424]. **Harnessing** [6427]. **Harrison** [6197, 6121]. **Hartley** [3622]. **Harvard** [7181]. **Hasan** [408]. **Hash** [5057]. **Haskell** [3975, 2912]. **Hastlayer** [6453]. **Haugeland** [742]. **Hauptschriften** [801]. **Having** [436]. **Hawaii** [7394, 7465, 7465]. **hazard** [5843, 5857]. **HC6811C** [3450]. **HDL** [4934]. **Header** [2794]. **Health** [6877, 5362]. **Heap** [5682]. **Heaps** [4361]. **heard** [4660]. **hearing** [5073]. **Heat** [204, 37]. **Heaven** [3715]. **heavily** [2989]. **Held** [7328, 7182, 7409, 7410, 7231, 7227, 4841, 7266, 7344, 7269, 7548, 7563, 7594, 7291, 7225, 7295, 7309, 7278, 7246, 7189, 7243, 7418, 7381, 7222, 7340, 7253, 7296]. **Helical** [5145]. **Helmholtz** [2050]. **Help** [813, 5554, 5553]. **Hénon** [6010]. **Hensel** [1449, 3944, 2633]. **Herbgrind** [6366]. **Herbie** [6389]. **Hermite** [4090]. **Hermite-Obreschkoff** [4090]. **Hermitian** [3201]. **Herrn** [391]. **Herz** [2481]. **Herz-Fischler** [2481]. **Heslington** [7225]. **Hessenberg** [4853, 3709]. **heterodyne** [5094]. **Heterogeneity** [6818]. **Heterogeneous** [3729, 5924, 7067, 6111, 5337, 5773, 5784, 3002]. **Heuristics** [6669]. **Hewlett** [2225]. **Hex** [4117, 3393, 2003]. **Hex-BCD-Umwandlung** [2003]. **Hexadecimal** [462, 1628, 2606, 682, 566, 2003]. **Hexadecimal-BCD** [2003]. **hexadezimalen** [1628]. **HFFT** [2050]. **HGCD** [7121]. **HGCD-D** [7121]. **Hida** [4848]. **hidden** [6249]. **hiding** [4657]. **Hierarchical** [6534, 4235, 7126, 7172]. **Hierarchy** [4957]. **High** [7428, 7541, 2635, 852, 1187, 3544, 5586, 5587, 2040, 3976, 4159, 1572, 4161, 2866, 4511, 4975, 5822, 5898, 6049, 1367, 4801, 1577, 6783, 1813, 4323, 5685, 1095, 2050, 6898, 2872, 6397, 6899, 6516, 3568, 5489, 5698, 3735, 4333, 730, 3992, 1586, 3869, 5991, 670, 4819, 6903, 1826, 4527, 3581, 4006, 3241, 6281, 6174, 277, 5713, 1597, 4693, 3428, 3074, 3590, 5601, 5719, 3256, 125, 2073, 1396, 1397, 1512, 3259, 4195, 5720, 6814, 5516, 1841, 823, 4712, 93, 1518, 5726, 6079, 1403, 4367, 200, 340, 341, 5932, 4561, 4720, 5028, 1133, 1746, 1981, 2545, 7621, 2227, 4218, 5748, 3458]. **High** [5749, 5536, 1984, 6199, 6317, 4229, 3628, 683, 5180, 3112, 3778, 3296, 5036, 1043, 5942, 1634, 3120, 6100, 568, 6940, 6101, 6323, 2104, 3470, 5044, 6450, 754, 142, 233, 6453, 7068, 4076, 4590, 1144, 6837, 3794, 570, 1429, 7074, 4245, 6342, 2947, 3476, 234, 1640, 1888, 355, 6345, 6950, 2761, 2764, 1999, 6350, 1055, 4601, 4084, 1654, 7083, 3491, 3663, 5076, 1902, 3497, 4262, 3670, 207, 4612, 4613, 4756, 5081, 5637, 2982, 77, 703, 2456, 6228, 994, 5638, 5878, 486, 653, 4110, 6977, 3823, 4114, 3174, 3175, 3948, 4120, 5090, 1685, 6614, 2808, 6618, 714, 1070, 85, 5463]. **High** [1343, 1926, 1928, 2155, 1930, 4135, 4467, 1697, 939, 6374, 6754, 6378, 5379, 5575, 5659, 5380, 4476, 6989, 6991, 6992, 1178, 1179, 945, 1257, 1182, 1798,

3025, 4951, 5242, 4299, 1360, 2856, 6996, 3543, 1480, 2172, 3248, 74, 3217, 664, 3222, 3859, 1802, 1803, 5986, 4798, 2180, 6050, 1088, 2186, 2188, 4675, 3570, 2336, 1957, 380, 4992, 2512, 2353, 6920, 2522, 6688, 5288, 3079, 2365, 2699, 387, 2367, 5013, 6291, 4710, 4857, 4858, 4038, 6547, 3446, 3447, 2908, 2384, 2390, 2228, 4049, 6196, 1303, 1985, 6712, 6713, 4874, 1992, 4070, 5859, 4886, 978, 2752, 4411, 4594, 4890]. **high** [2949, 5773, 2562, 50, 2951, 3143, 7189, 2569, 4419, 2964, 1154, 3321, 3810, 4749, 2783, 5872, 4096, 4263, 4752, 3158, 5357, 5784, 2584, 4757, 2589, 4917, 2009, 95, 3678, 1063, 1679, 5641, 3177, 3178, 1067, 3002, 5097, 1785, 3702, 1173, 6375, 3361, 5662, 6644, 2624, 2855, 3382, 2689, 2053, 2573]. **High-Accuracy** [1981, 1984, 6317, 6977, 1685, 6989, 1813, 1785, 2053, 2573]. **High-Bandwidth** [6899]. **High-Dimensional** [6345, 6688]. **High-end** [1518]. **high-frequency** [4874]. **High-Level** [1095, 6174, 1512, 4195, 7083, 994, 6754, 4161, 6898, 6453, 4601, 1697, 1063, 6375]. **High-Order** [2050, 3581, 1055, 3174, 3175]. **High-Performance** [7428, 1572, 5698, 3735, 4333, 3869, 4819, 5516, 5028, 4218, 6199, 5076, 5637, 5463, 6374, 5379, 5575, 5659, 6991, 6992, 6814, 4720, 2227, 4590, 6378, 3248, 3217, 5986, 4798, 6050, 4992, 4857, 4858, 4038, 2951, 3321, 4749]. **high-period** [5288]. **High-Precision** [3544, 4975, 4801, 6516, 1133, 3778, 5942, 6342, 5822, 5898, 6049, 6920, 6688, 2624]. **High-Radix** [5587, 3241, 3120, 6100, 4076, 3497, 5090, 4135, 4467, 6996, 4323, 4262, 4612, 4756, 3174, 3175, 2390, 2783, 4096, 4263, 4752, 4757, 3177, 3178, 1173]. **high-rate** [4411, 4890, 2689]. **High-resolution** [4367]. **High-Speed** [852, 1187, 1367, 6783, 5489, 730, 670, 4527, 277, 1597, 125, 6079, 1403, 200, 5932, 5748, 3458, 4229, 683, 5180, 5036, 1043, 1634, 568, 6940, 142, 233, 1144, 570, 4245, 1640, 1888, 355, 1902, 4613, 5081, 77, 703, 4110, 3823, 4114, 3948, 4120, 1685, 714, 2155, 939, 5380, 945, 5242, 4299, 1360, 1480, 2172, 1586, 3590, 4561, 3296, 3794, 1429, 234, 2764, 3670, 2982, 2456, 6228, 85, 1928, 1178, 4951, 2856, 1802, 1803, 2188, 2365, 387, 3446, 3447, 1303, 1985, 1992, 4886, 2752, 4594, 1154, 3810, 2584, 2589, 4917, 2009, 95, 3678, 1067, 3702]. **High-Spped** [1070, 1179]. **High-Throughput** [5586, 5044, 7068, 6614]. **high/variable** [2336]. **Higher** [7398, 461, 546, 853, 5988, 7470, 1582, 2514, 1603, 6552, 2397, 2935, 5549, 2572, 5959, 2142, 1913, 1175, 2030, 544, 3083, 3091, 2919, 3110, 2439, 5091, 3846]. **Higher-Order** [7398, 3091]. **Higher-Precision** [6552]. **Higher-Radix** [1603, 544, 461]. **Highlights** [1042]. **Highly** [4793, 2506, 5499, 5708, 6689, 1842, 4207, 518, 2567, 3961, 2203, 1853, 4754, 1472, 1473]. **Hilfe** [385, 35]. **Hill** [272]. **Hilton** [7385, 7283, 7304, 7321, 7461]. **Hindi** [408]. **hings** [6248]. **Hisab** [408]. **histogram** [5363]. **Historical** [5550, 6134, 530, 3540]. **History** [853, 7411, 91, 21, 6289, 512, 623, 1400, 6559, 6825, 4219, 2727, 4062, 20, 2953, 4274, 2481, 5925, 2080, 6120, 801, 6877, 7251]. **hits** [6716]. **HLS** [6632]. **HMC** [6442]. **HMC-MAC** [6442]. **HMFPCC** [6047]. **HMM** [6635]. **Hobbit** [3099]. **Hochgenaue** [2053, 2573]. **Hogenauer** [3894]. **höheren** [1095]. **HOL** [4499, 5584, 3411, 3412, 3442, 3764, 3765, 4204, 6096]. **HOL95** [7398]. **Hole** [5942, 6727]. **Holiday** [7277]. **Homepage** [4340]. **homogeneous** [1973, 5342]. **Homomorphic** [6653, 7075, 6600, 6609, 7118, 7126]. **Hong** [7502]. **honor** [6476]. **Hood** [5203, 3708]. **hopped** [4648]. **Horizon** [2301]. **Horizontal**

[2059, 2551]. **Horner** [4670, 4809, 7140, 2357, 5017, 5018, 5165, 7045, 5329, 5773, 6234]. **Hot** [3874, 4527, 7434, 3575, 3576, 3577, 3993, 4528]. **Hotel** [7510, 7511, 7213, 7257, 7271, 7282, 7346, 7348, 7360, 7361, 7437, 7461, 7519, 7520, 7521, 7241, 7587, 7481, 7421]. **Hough** [742]. **hour** [3627]. **House** [7227, 7270]. **Householder** [2722]. **Houston** [7255]. **Howard** [4138]. **Howell** [1092]. **HP** [1630, 4408, 4589, 2112, 2254, 4780, 4939]. **HP-15C** [1630]. **HP-UX** [4408, 4589, 4780, 4939]. **HPC** [6791, 6792, 6677, 5718, 6720]. **HPR** [6666]. **HSD** [4080]. **HSD-1** [4080]. **HUB** [6191, 6705, 7084, 6245, 6483, 6484, 6641]. **Huffman** [4385]. **Huge** [6535, 2966]. **Hull** [3612, 4043, 3288]. **Hulls** [3562, 2939]. **human** [7584]. **Hundred** [4430, 4183]. **Hungary** [7445]. **Hurts** [3908, 3909, 2548]. **Hvordan** [1329]. **HW** [6507]. **Hyatt** [7323, 7335]. **Hybrid** [5471, 5670, 6047, 7135, 1811, 6160, 6169, 6281, 6177, 5734, 7055, 6442, 4059, 5770, 6458, 6946, 4080, 6726, 6591, 6606, 6969, 3334, 6238, 6035, 2300, 4480, 6992, 5808, 4788, 5582, 7000, 5908, 4006, 423, 5739, 2421, 2746, 4253, 1931, 6873]. **Hybrid-Double** [6177]. **Hybrid-mode** [6047]. **Hybrid-Triple** [6177]. **Hyderabad** [7548]. **Hydra** [587, 587]. **Hydrodynamic** [6205]. **Hydrodynamics** [7191]. **Hyper** [4410]. **Hyper-systolic** [4410]. **Hyperbolic** [6679, 4919, 6365, 242, 3264, 201, 784]. **hypercube** [2223]. **Hypercubes** [2895, 2938]. **Hyperelliptic** [4609, 3937, 4491]. **Hypergeometric** [1882]. **HyPoRes** [6591]. **hypot** [6510, 6786]. **hypotenuse** [6788, 4154].

I. [930]. **I/O** [3248]. **i486**^{TM} [2369]. **i7** [5539]. **i860** [2937, 2565, 2410, 3696]. **i860**^{TM} [2469]. **i960** [2502]. **IA** [4793, 5130, 4005, 4180, 4040, 4206, 4207, 4252, 4127]. **IA-32** [5130]. **IA-64** [4793, 4005, 4180, 4040, 4206, 4207, 4252, 4127]. **iAPX** [1857, 1622, 1866, 1468]. **IBM** [2038, 7259, 3970, 1946, 2038, 2037, 417, 3391, 5132, 109, 1370, 4332, 5700, 1101, 418, 419, 2878, 2879, 2880, 5290, 384, 4854, 5019, 563, 2541, 396, 682, 2546, 3280, 255, 1870, 5611, 1309, 6211, 94, 2566, 2570, 6740, 2271, 6471, 4927, 4627, 5562, 104, 1546, 187, 2295, 536, 5113, 5468, 134, 4497]. **IBM/370** [2037]. **ibn** [408]. **Ibrahim** [408]. **IC** [1930]. **ICASSP** [7502, 7519, 7282, 7348]. **ICCAD** [7473]. **ICCD** [7561, 7583, 7283, 7304, 7323, 7335, 7517]. **ICCET** [7592]. **ICCIT** [7580]. **ICCMSE** [7569]. **ICCS** [7622]. **ICECS** [7448, 7448]. **ICEEC'04** [7525]. **Iceland** [7603]. **ICFEM** [7605]. **ICIAM** [7516]. **ICIT** [7551]. **ICMS** [7590]. **ICS** [7464, 2530, 1179]. **ICSPAT** [7373]. **IDCT** [5112, 4783, 3543]. **Idea** [4285]. **Ideal** [2087]. **Idealized** [3775]. **Ideals** [1302]. **ideas** [4850, 7379]. **identical** [5910, 6110]. **Idiosyncracies** [392]. **Idle** [3946]. **IEC** [3905, 5746, 5570, 2913, 1747, 3285, 3906, 4377, 5174, 5175, 5176, 5177, 5533, 6708, 5035]. **IEE** [1484]. **IEEE** [7541, 2041, 7356, 3858, 7514, 7399, 722, 1365, 4664, 7498, 7556, 7578, 3991, 7472, 7613, 7588, 7620, 3583, 7589, 7375, 1115, 1860, 7204, 7213, 7214, 7224, 7271, 7282, 2089, 7377, 7435, 7447, 7448, 7449, 7460, 7473, 7486, 7502, 7503, 7518, 7519, 7520, 7534, 7535, 7549, 7559, 7583, 7584, 7599, 7604, 7607, 6562, 7624, 7626, 7628, 4066, 7450, 7351, 7565, 3786, 2259, 7538, 7612, 7608, 7426, 7440, 7493, 7552, 7568, 921, 1680, 3344, 7494, 7601, 588, 1339, 7619, 7540, 2304, 2305, 2306, 2485, 2486, 7396, 2176, 3385, 3970, 3852,

5584, 7355, 5133, 6390, 7006, 2864, 1570, 1571, 1804, 2045, 3981, 4319]. **IEEE** [1191, 3404, 2655, 6057, 3989, 4988, 3411, 3412, 4525, 1197, 1503, 1590, 2345, 3061, 3877, 4005, 5146, 5278, 5500, 5501, 6528, 3422, 3423, 3880, 3882, 4341, 4184, 2690, 6805, 7500, 7545, 4838, 5509, 3750, 4022, 4189, 4190, 4191, 4701, 6811, 6812, 1512, 4192, 4195, 4357, 2704, 2532, 5304, 2712, 2538, 2085, 7302, 5168, 1410, 6559, 6825, 6194, 6561, 1219, 7239, 7257, 7270, 7277, 1863, 7283, 7303, 7304, 7321, 7323, 7335, 7346, 7360, 5746, 4722, 4378, 4569, 1627, 1308, 2095, 3461, 3626, 3774, 5178, 5610, 5179, 4067, 4881, 6577, 7425, 7393, 5191, 5428, 5953, 6457, 7380, 1758, 5337, 3642, 2430, 2561, 4247, 5059]. **IEEE** [5195, 2259, 5552, 5777, 3485, 3655, 3656, 6598, 2441, 7092, 4259, 3319, 4093, 3664, 4430, 4606, 2579, 4098, 3333, 6225, 2788, 7454, 7419, 3335, 3500, 2799, 4917, 2277, 1675, 6475, 6360, 1678, 7104, 3942, 3943, 3167, 2462, 4767, 3947, 4284, 4454, 4768, 4929, 4930, 5090, 3950, 7587, 1777, 5650, 2017, 7524, 2293, 5370, 1339, 1459, 1461, 7466, 2476, 2613, 2614, 3010, 1466, 5232, 7427, 1697, 7169, 5377, 3360, 5570, 5575, 5380, 2034, 7371, 5805, 7127, 1799, 7325, 7421, 7456]. **IEEE-754** [3852, 5584, 6057, 3989, 4525, 6913, 4838, 1410, 5953, 5059, 5195, 7093, 6475, 7104, 7169, 3360, 5570]. **IEEE-754-2008** [5552, 5777]. **IEEE-754R** [5179]. **IEEE-854** [3411, 3412, 3485]. **IEEE-Format** [2259]. **IEEE-Spezifikationen** [2304, 2305, 2306, 2485, 2486]. **IEEE-TCCA** [7214]. **IEEE/ACM** [7473, 7403]. **IEEE/KCS** [1191]. **IEEE754** [5945, 5946, 6363]. **IEEE754-2008** [5945, 5946]. **if** [6190, 5540, 1055, 2425]. **IFIP** [7600, 7195, 7205, 7395, 7248, 7423, 7208, 7242, 7206]. **IFMA** [6185]. **Ihren** [1137]. **ihres** [1653, 7251]. **II** [4655, 7309, 4655, 1086, 6152, 2643, 3724, 3727, 7411, 4515, 3738, 5599, 2070, 5925, 1024, 1511, 5008, 6183, 93, 2910, 516, 565, 3280, 5744, 7603, 398, 473, 6718, 7622, 4580, 4730, 127, 573, 759, 403, 4082, 448, 361, 3805, 7366, 1162, 5454, 5968, 1337, 7354, 779, 2471, 3007, 4463, 7185, 4475, 193, 4646]. **IIB** [1934]. **III** [7226, 6262, 6630, 7315, 6890, 245, 546, 7299, 2210, 1025, 468, 4907, 481, 3161, 780, 7186]. **IIR** [1537]. **Ill** [4568, 2804, 2147, 1038, 192, 193]. **ill-condition** [1038]. **Ill-Conditioned** [2804, 2147, 4568, 192, 193]. **ILLIAC** [546]. **Illinois** [7227, 7223, 7276, 7189]. **ILUT** [5771]. **ILUT-based** [5771]. **im** [7449, 2259, 1653, 7251, 124]. **IMA** [7295, 7291]. **IMA/SIAM** [7291]. **IMACS** [7386, 7566, 7409, 7386, 7357, 7477, 7250]. **IMACS-GAMM** [7357]. **Image** [6879, 1817, 2897, 6971, 1930, 3527, 4304, 2341, 6680, 5008, 2898, 3287, 1988, 3787, 2569, 3337, 3510, 3704, 3204, 4146]. **Images** [5636]. **Imaginary** [279, 203, 1424, 3937, 1169, 231, 236, 1000]. **Imaging** [7355, 2271]. **Immune** [4649]. **IMP** [918]. **IMP-16F** [918]. **IMP-16F/400** [918]. **Impact** [869, 1197, 1204, 5311, 5312, 5943, 4079, 5883, 5473, 6276, 6855, 5644]. **Impacting** [6829, 6963]. **impacts** [7395]. **imperfection** [3508]. **implantations** [4326]. **Implement** [6191, 7085, 1191]. **Implementable** [2039]. **Implementation** [7326, 7512, 7002, 5584, 7003, 5586, 7134, 5133, 3860, 4971, 4972, 1568, 6777, 1804, 4797, 7135, 804, 1807, 2324, 6393, 6894, 1576, 5260, 609, 6901, 1722, 1958, 5705, 1504, 1275, 1388, 5146, 5278, 5501, 4997, 3424, 4831, 4350, 5411, 5506, 3746, 3076, 1968, 2525, 5005, 2363, 6928, 5836, 963, 4356, 1971, 4200, 556, 6542, 5163, 1847, 1211, 1290, 6186, 5525, 625, 6428, 6547, 7572, 3269, 3768, 4044,

4214, 2385, 1979, 6309, 2387, 3102, 1411, 6194, 4050, 6310, 6195, 5749, 5537, 6098, 1627, 2091, 6317, 1306, 742, 5756, 5179, 6830, 2098, 6937, 4388, 5323, 1991, 2245, 5426, 3469, 4398]. **Implementation** [2105, 6105, 6329, 6108, 6332, 5858, 6453, 5767, 6013, 3791, 5052, 3128, 5771, 1759, 1886, 3642, 3474, 6950, 3309, 3143, 1650, 1150, 5630, 3804, 7084, 915, 1657, 4426, 4427, 3322, 3323, 2126, 3325, 5962, 2004, 1325, 2131, 6469, 3500, 4616, 2141, 6133, 5638, 4446, 6974, 4108, 485, 4110, 5090, 7115, 4123, 3828, 1692, 1926, 5884, 4288, 2476, 2613, 2614, 3010, 1932, 1935, 3011, 5230, 6631, 4472, 1251, 2831, 1348, 2832, 6642, 6989, 3372, 6993, 4150, 2631, 1940, 4152, 5715, 1353, 4651, 5671, 5676, 1570, 4799, 1949, 2192, 3990, 4817, 1500, 2512, 2341, 4680, 4528, 4007, 2881, 4183, 5410, 2353]. **implementation** [5505, 5834, 3585, 3886, 4838, 3747, 5289, 3078, 6929, 4026, 1205, 2367, 5302, 3084, 3598, 3438, 5304, 2536, 5725, 7344, 1851, 4861, 2538, 3898, 6429, 4211, 3270, 5933, 4045, 3450, 6709, 6196, 5751, 2090, 2092, 2552, 2739, 2246, 2419, 830, 898, 974, 4882, 5327, 2423, 4074, 3471, 5952, 4588, 2107, 5430, 3131, 4081, 5773, 3650, 5776, 6729, 1763, 2569, 2439, 5199, 5200, 2964, 3321, 4092, 3157, 3329, 3330, 4099, 2274, 2798, 2800, 1678, 5452, 4929, 1168, 2017, 5797, 2468, 1547, 2996, 2020, 2294, 5883, 5657, 1173, 2156, 5232, 847, 4292, 7169, 1176, 2479, 4481, 5580, 2841, 4490, 4493, 2689]. **Implementations** [6149, 5674, 5675, 5818, 5819, 3231, 7139, 6523, 5406, 4690, 6690, 4365, 3760, 3763, 4575, 6453, 3130, 7417, 7537, 4598, 4087, 3807, 1903, 4264, 4101, 5443, 7354, 6612, 3181, 3524, 3698, 3699, 2612, 3531, 4141, 4641, 6757, 3214, 6065, 4690, 1262, 3047, 2661, 4175, 4181, 5409, 3255, 3435, 3449, 2734, 5326, 3302, 6333, 6452, 3639, 3792, 1758, 7451, 7462, 7478, 7491, 7505, 7522, 4102, 2598, 4766, 3828, 5094, 5237, 4947, 3015, 4953, 4300]. **Implemented** [3406, 864, 892, 7104, 6380, 3731, 2057, 1770, 2277, 1463, 1550, 4952]. **Implementierung** [1211, 1759, 1886, 1353]. **Implementing** [6665, 5142, 5591, 3875, 6433, 3277, 2547, 3665, 2464, 5218, 5219, 3833, 2158, 6378, 3534, 1258, 610, 6290, 2559, 2266, 1330]. **implements** [2009]. **implicants** [465]. **Implications** [1512, 2160, 4640, 2821]. **Implicit** [1699, 4887]. **Implicit-Explicit** [1699]. **Importance** [6110]. **important** [3849]. **Imprecise** [3710, 1319, 6127]. **Improbability** [3910]. **Improve** [4371, 5716, 4212, 5188, 5093]. **Improved** [6147, 4507, 6504, 6510, 6786, 1195, 5829, 6525, 198, 5286, 6183, 1129, 7046, 3263, 5526, 469, 5024, 4559, 5938, 4388, 5182, 5425, 1312, 4414, 4895, 5629, 5778, 4744, 478, 580, 4433, 3340, 6234, 5216, 166, 5974, 3829, 6864, 4127, 5659, 1706, 2847, 1941, 4678, 3607, 2740, 2589, 2149, 1688, 5221, 4958]. **Improvement** [6677, 5151, 2356, 5513, 6191, 6830, 6345, 3324, 6126, 1662, 6742, 4955, 4324, 5062]. **Improvements** [3546, 1184, 4345, 3239, 3240, 6288, 2006, 3690]. **Improves** [6931, 1611, 1407]. **Improving** [2639, 5679, 6157, 3235, 5271, 6283, 4020, 4186, 5723, 338, 5018, 5165, 1849, 4374, 1745, 5534, 7062, 6327, 6836, 832, 4412, 5194, 4081, 318, 7095, 6362, 6749, 6485, 6870, 2623, 5392, 4169, 2195, 5407, 6128]. **impulse** [1039, 2491, 4648]. **IMS** [2084]. **IMTC** [7461]. **IMTC/2000** [7461]. **In-and-out** [476]. **In-Memory** [7034, 7068]. **In-Order** [4380]. **in-place** [3267]. **In-Situ** [6726]. **Include** [1470]. **Including** [4430, 2532, 3264]. **Inclusion** [3634]. **Inclusions** [4043, 3614, 3636]. **Inclusive**

[6972]. **Incomplete** [7168]. **Incompletely** [2371]. **Incorporated** [989]. **Incorporating** [809, 4413]. **Increase** [1288]. **increasing** [7480]. **Increment** [4773]. **incremental** [2376, 4413]. **incrementation** [958]. **Indefinite** [4286]. **Independent** [2041, 7580, 2089, 6197, 5035, 6115, 3164, 3831, 1786, 412, 1726, 1825, 3285, 4377, 5174, 6196, 758, 4601, 4602, 4474, 4475, 1747]. **Indeterminate** [700]. **Index** [5253, 5474, 6658, 6768, 6883, 1091, 2060, 2560, 2944, 3475, 3643, 2126, 584, 6621, 4503, 4658, 6252, 2343, 2344, 178, 4444, 5214, 942]. **Indexe** [3638]. **India** [7576, 7345, 7594, 7548, 7563, 7551]. **Indian** [5821, 4042]. **Indiana** [7404]. **indicators** [3676]. **Indices** [1872]. **indirect** [3152]. **Indispensable** [4593]. **induced** [6700, 3132]. **inducing** [6699]. **induction** [4231]. **Industrial** [5674, 5675, 5818, 5819, 6017]. **Industry** [5131, 6771, 1715, 5173, 3391]. **Inefficiency** [5389]. **inequality** [548]. **Inexact** [6652, 6212, 5223]. **Infeasibility** [3938]. **Inference** [6490, 6918, 6815, 6816, 6325, 6451, 7089, 6860, 6747, 6761, 6723, 7098]. **Inferno** [3757]. **Infinite** [449, 2288, 2626, 2464, 4938]. **Infinitely** [4051, 5540]. **Infinities** [1122, 5570]. **Inflation** [3653]. **Influence** [1084, 2757, 420, 5923, 4937]. **influences** [622, 1031]. **Informal** [5639]. **Information** [3857, 3233, 302, 7208, 3087, 7580, 3905, 7521, 4223, 5533, 5746, 6708, 1632, 7242, 7551, 7205, 7206, 5636, 7296, 6258, 6672, 7402, 2758, 5972, 5098, 5222, 5458, 5459, 5460, 5461, 5462, 1747, 3285, 3906, 4377, 5174, 7195, 7205, 7395]. **Informed** [6844, 1943]. **Ingénierie** [3159]. **ingenuity** [4417]. **Inherent** [6766, 904, 356, 1661, 4542]. **Inheritable** [3658]. **Inherited** [6363]. **Initial** [4502, 386, 7209, 179, 3456, 3457, 903, 4090, 2364, 2527, 3754, 137, 138, 3772, 3346]. **Initialized** [3482]. **iniziali** [137, 138]. **Injecting** [5812]. **Injection** [5383]. **Injection-Based** [5383]. **Inlining** [4780]. **Inn** [7277]. **Inner** [1384, 3612, 6707, 5938, 5541, 1899, 1453, 1920, 596, 3071, 3113, 3114, 3115, 3116, 1921, 1698, 492, 2625]. **Innocuous** [3434, 6033]. **innovation** [7567]. **innovations** [3204]. **Innovative** [7213]. **Input** [7025, 1196, 1595, 1609, 6542, 7048, 754, 1905, 1548, 538, 2486, 1177, 1357, 1801, 2347, 1277, 1214, 1975, 3445, 6015, 2764, 3329, 3330]. **Input-Output** [538]. **input-scaled** [1214, 1975]. **Input/1** [5360]. **Input/output** [1357, 3329, 3330]. **Inputs** [5991, 1125, 6942, 6699, 4576, 7067]. **Inquiry** [3551, 3640]. **Insecure** [4479]. **insertion** [4908]. **Insight** [7489, 5388]. **Insights** [5184]. **Insignificant** [6020]. **Insomniacs** [5187]. **Inspired** [7576, 5802]. **Instabilities** [701]. **instability** [5900, 6109]. **installation** [2015]. **Instant** [4353]. **Instantaneous** [11, 2224]. **Instead** [6799, 1245, 1879, 6141]. **Instinct** [6882]. **Institut** [7243]. **Institute** [7386]. **Instruction** [6882, 4302, 4501, 6385, 2677, 5599, 5927, 6930, 1850, 2385, 2551, 5323, 5330, 5334, 989, 3939, 5392, 2639, 6497, 1111, 1392, 4352, 6414, 6418, 6176, 6540, 2380, 1851, 4038, 1225, 2269, 7103, 5883, 3537, 4954, 6540]. **Instruction-Level** [5334]. **instruction-set** [5392]. **Instructions** [5672, 5525, 3904, 4050, 1042, 6575, 1759, 6947, 2449, 2450, 6900, 5008, 201, 747, 748, 1225, 2447, 2448, 4747, 3942, 1256, 4298, 4953, 4791]. **instrument** [58, 63, 64, 65, 66, 67, 68]. **Instrumentation** [7461, 1686, 6640]. **Instrumente** [61]. **instruments** [61, 1016, 3195]. **Insurance** [33]. **Integer** [2638, 7134, 7010, 5395, 3046, 6503, 5137, 1952, 3052, 5261, 1815, 5400, 7022,

2335, 1818, 1956, 5405, 6524, 6059, 1822, 6406, 222, 4180, 3878, 224, 2350, 6411, 5913, 1022, 6069, 7035, 3077, 5601, 5719, 2895, 5515, 386, 5517, 4363, 5161, 5415, 5930, 4715, 6185, 6819, 6088, 6550, 6702, 2540, 3613, 3448, 741, 5753, 6570, 5540, 5324, 5325, 5544, 5766, 5951, 5053, 2111, 2112, 2254, 6595, 6601, 6844, 145, 3496, 2124, 3498, 4432, 1906, 7099, 4914, 1670, 2136, 6357, 7178, 1775, 2596, 4442, 6229, 2143, 6477, 6976, 7106, 3946, 4282, 7110, 4770, 2150, 589, 5104, 5106, 5230, 5374]. **Integer** [6865, 5376, 5377, 5799, 6242, 6376, 5112, 3368, 1254, 1077, 3539, 5667, 5833, 2183, 4803, 5828, 2661, 2196, 4173, 6527, 5408, 6920, 2209, 821, 3595, 5301, 2705, 2899, 2372, 5302, 6082, 4554, 4718, 6549, 7152, 3097, 5174, 2409, 5617, 4238, 6015, 4246, 2755, 4742, 7079, 5867, 6954, 6021, 6022, 7101, 1669, 6358, 2809, 3697, 5099, 3005, 4461, 4642, 5666, 3285]. **Integer-Division** [6570]. **Integerarithmetik** [2124]. **Integers** [6891, 18, 550, 812, 5276, 5277, 3063, 878, 6695, 5736, 3900, 4386, 3647, 3648, 2115, 1147, 6215, 5778, 1769, 4436, 1668, 4614, 7102, 531, 2016, 3960, 5577, 2309, 3215, 3383, 2324, 1827, 872, 3262, 5623, 5629, 5212, 2031, 4782]. **integrable** [4424]. **Integral** [548, 334, 1350, 283]. **Integral-Ungleichun** [548]. **Integrals** [6077, 1307, 3636, 6688, 1513, 7156]. **integrands** [5168]. **Integrate** [6947]. **Integrated** [5672, 7458, 4795, 724, 3563, 2506, 2055, 7346, 7361, 7562, 1425, 2248, 1880, 1180, 4338, 1032, 2536, 1869, 2427, 2258, 2472]. **Integrated-Circuit** [1880]. **Integrating** [3099, 1434, 5784, 7461, 4960]. **Integration** [6269, 1823, 4019, 625, 82, 4374, 83, 7393, 441, 204, 77, 6748, 937, 4693, 283, 92, 95, 2138, 4125, 194]. **Integrations** [6107, 2590]. **Integrator** [62, 3600]. **Integrity** [4478, 3646]. **INTEL** [1378, 980, 5130, 6386, 5131, 5894, 1488, 1957, 5911, 4684, 5500, 7035, 6540, 3753, 5160, 6185, 6296, 6703, 1857, 4723, 1630, 5849, 2247, 2248, 1316, 5433, 1059, 1324, 2469, 6746, 2295, 5883, 3848, 2313]. **Intellectual** [7271]. **Intelligence** [5720, 6552, 6735, 6756]. **Intel(R)** [4805, 5539]. **Intensive** [1719, 6513, 6348, 3196, 6875]. **Inter** [1081, 6553, 7282]. **Inter-Continental** [7282]. **Inter-Modulo** [6553]. **Inter-relationships** [1081]. **interaction** [5644]. **Interactions** [3979]. **Interactive** [1753, 1151, 984, 7515]. **Interchangeability** [1081]. **interconnected** [5791]. **Interest** [7350, 53]. **Interface** [1098, 1265, 7255, 7575, 2228, 986]. **Interfaces** [3760, 3101, 5533]. **Interfacing** [3194]. **Interim** [7006, 7057]. **Interior** [4484]. **Interior-Point** [4484]. **Interlaced** [6181]. **Interleaved** [1133, 5614, 3304, 6727, 3126]. **interlock** [2195]. **Intermediate** [4964, 5252, 4862, 4080, 4101, 3762, 5046]. **Internal** [3546, 3396, 6079, 5932, 6952, 3691, 3005, 1844, 2565, 2850]. **Internal-Newton-Method** [3546]. **internals** [3178]. **Internation** [7394]. **International** [7297, 7315, 7510, 7526, 7527, 7409, 7410, 2641, 7373, 7398, 3721, 7429, 7513, 7357, 7482, 7400, 4664, 7528, 7543, 7557, 7483, 7577, 7412, 7470, 7471, 7558, 7605, 7388, 7401, 7588, 7499, 7544, 7484, 7374, 7445, 7579, 7589, 7500, 7614, 7501, 7545, 7266, 7208, 7590, 7431, 7625, 7627, 7302, 7572, 7432, 7580, 7213, 7224, 7239, 7256, 7257, 7271, 7282, 7283, 7303, 7304, 7321, 7322, 7323, 7335, 7345, 7348, 7360, 7391, 7403, 7404, 7435, 7448, 7449, 7459, 7460, 7473, 7475, 7486, 7487, 7502, 7503, 7504, 7517, 7518, 7519, 7520, 7521, 7532, 7534, 7548, 7559, 7560, 7561, 7563, 7564, 7573, 7582, 7583, 7584, 7592,

7593, 7594]. **International** [7621, 7603, 7364, 7349, 7622, 7416, 7393, 7490, 7380, 7566, 7309, 7246, 7551, 7205, 7234, 7243, 7480, 7217, 7366, 3164, 5639, 7441, 7494, 7507, 7587, 7455, 7569, 7465, 7466, 7481, 7539, 7617, 7427, 7467, 7495, 7540, 7496, 7384, 7525, 7370, 7597, 7371, 7325, 7396, 7421, 7456, 7623, 7553, 7267, 7547, 7415, 7477, 7418, 7464, 7420, 7457, 7562, 7581, 7442]. **Internet** [3753, 7118]. **Interoperability** [3493]. **Interpolation** [6665, 5490, 3415, 3902, 1140, 1651, 3821, 5364, 5564, 373, 6038, 4792, 6688, 5311, 5312, 6346, 2122, 6356, 6467]. **Interpolator** [4310, 59, 5076, 5081, 4308, 3126]. **Interpolators** [3304]. **Interpretation** [3411, 6373, 3378, 3379]. **Interpreter** [4553, 147]. **Interpretive** [134, 297, 293]. **interrupt** [788]. **Intersections** [6951, 2436]. **INTerval** [4105, 4500, 7015, 3868, 3569, 5270, 5592, 4999, 5503, 5413, 5509, 7041, 556, 1852, 3601, 3612, 4043, 4046, 4867, 3618, 6095, 6316, 1628, 3632, 2103, 7476, 3637, 1310, 6577, 1433, 3652, 404, 7311, 1654, 3657, 6023, 4090, 7243, 3662, 3675, 3816, 5211, 1161, 4618, 4619, 6030, 924, 586, 6233, 3514, 3515, 3686, 4112, 4281, 4121, 3695, 3956, 3957, 4459, 5228, 5111, 799, 1359, 3714, 4640, 5472, 4662, 1269, 5300, 6004, 5164, 4560, 5744, 7415, 5853, 5762, 1639, 5197, 364, 365, 1320, 5556, 5870, 5873, 3335, 5358, 5877, 3347, 3513, 4115, 3348, 5221, 4462, 2035, 5243, 1358, 5149, 7243]. **Interval** [3344]. **Interval-Aware** [7015]. **interval-enhanced** [4115]. **Interval-type** [5270]. **Intervall** [3344]. **Intervallargumente** [2103]. **Intervalle** [2053]. **Intervals** [2053, 6101, 3673, 6863, 5228, 3245, 6001, 1511, 283, 7050, 5368, 5369]. **Interview** [3950, 4061, 3949, 4138, 4139]. **INTLAB** [4105]. **Intra** [6614]. **Intra-Unit** [6614]. **Intractable** [3637]. **IntRepair** [6844]. **Intrinsic** [3979, 3980, 4162]. **Introduction** [1564, 5817, 722, 854, 4518, 5693, 6514, 3748, 3890, 4018, 511, 4849, 4033, 5160, 1401, 435, 41, 1212, 3609, 126, 825, 2081, 6308, 1857, 4236, 5543, 2938, 446, 1317, 5065, 291, 6024, 5088, 656, 936, 1340, 3529, 1558, 7422, 1508, 5022, 5417, 5071, 2137]. **introductory** [2343]. **intrusion** [1205]. **intrusion-detection** [1205]. **Invariant** [3718, 5778, 3262, 5629]. **Invariant-Sum** [3718]. **Invarianten** [3106, 3107]. **Invariants** [1490, 3106, 3107]. **invented** [159, 5653]. **Invention** [4219, 6985, 4417, 1160]. **Inventor** [1167, 6482]. **inventors** [3472]. **Inverse** [1366, 5151, 1025, 4187, 5167, 6558, 3634, 2103, 3469, 5058, 6355, 366, 4613, 6474, 6608, 4279, 4114, 242, 6870, 3711, 6041, 5815, 6692, 3264, 201, 6443, 3462, 4895, 1892, 6218, 6463, 4262, 6485, 2103, 5055]. **Inverse-Square-Root** [3469]. **Inverses** [1112, 6000, 4369, 5060, 3142, 6643, 3206]. **Inversion** [6159, 3569, 4996, 2899, 6301, 4572, 5323, 6719, 5676, 468, 3898, 6198, 5086, 6479, 4296, 4787]. **Inversion/Division** [4572]. **Inversions** [5922]. **invertible** [4556, 4716]. **Inverting** [93, 74]. **Investigating** [6650, 6303]. **Investigation** [6766, 3144, 3951, 328, 2868, 3045, 5555]. **investigations** [772]. **Invisible** [4964]. **Invitation** [1526, 1750]. **Invited** [4850, 4914, 4926, 7516]. **Involved** [6670]. **involving** [5596, 3675, 3676, 5224]. **inwendig** [492]. **IoT** [6815, 6816, 6735]. **IP** [6674, 6615, 6632]. **Ipm** [61, 1509, 61]. **Ipojuca** [7596]. **Ireland** [7471, 7587, 7585]. **iRRAM** [4422]. **Irrational** [549, 2033]. **Irreducible** [5498, 5206, 5172, 4763]. **Irregular** [6860, 6978, 7111, 7112, 7113].

ISA [6548, 6897, 7149, 6130]. **ISAAC** [7444, 28]. **ISAs** [6939]. **ISCAS** [7532, 7460]. **ISIC** [7562]. **ISMVL** [7441]. **ISMVL'07** [7564]. **Isn't** [554, 2554, 3166, 3713]. **ISO** [3905, 2913, 1747, 3906, 5533, 5035, 6729, 2492]. **ISO-Pascal** [2492]. **ISO/IEC** [2913, 1747, 3285, 3906, 4377, 5174, 5175, 5176, 5177, 5533, 6708, 5035]. **ISO/IEC/IEEE** [5746]. **ISO/IEC/TR2** [3905]. **Isogeny** [6511]. **Isogeny-Based** [6511]. **Isolating** [4718, 6700]. **isolation** [6394, 5466, 5243, 2850]. **ISPAN** [7528]. **Israel** [4681]. **ISSAC** [7370, 7431, 7416, 7507, 7467, 7597]. **ISSCC** [7303]. **Issue** [5254, 4841, 4033, 6308, 4380, 4067, 4236, 5088, 6875, 2229, 5071, 6476]. **Issues** [4794, 1804, 3624, 1418, 6729, 3663, 3808, 3938, 6030, 4331, 5957, 3509, 2996, 4123, 4460]. **ISVLSI** [7556, 7531, 7524]. **Italia** [3941]. **Italian** [137, 138, 3941]. **Italy** [7544, 7290, 7380, 7246, 7365, 7384, 7454, 3941]. **Itanium** [4504, 4529, 4684, 4221, 4222, 4721, 4722, 4395, 4408, 4589, 4739, 4780, 4939]. **Itanium-2** [4589]. **Itanium-Based** [4939, 4529]. **Iterated** [242, 1578, 4981, 6082, 6022]. **Iterating** [2116]. **Iteration** [4801, 1112, 6000, 553, 4864, 2110, 580, 3664, 6643, 5116, 5384, 6394, 610, 958, 5744, 6009, 3148, 3488, 2006, 4912, 78, 4949]. **Iterations** [1208, 1283, 2957, 3024, 4208, 5183, 4631, 2844, 947, 1183]. **Iterative** [664, 6147, 330, 665, 1374, 7026, 730, 1385, 1588, 1104, 3877, 278, 871, 281, 823, 158, 883, 969, 2394, 2396, 1420, 6572, 892, 568, 632, 1636, 3469, 5189, 6455, 4243, 639, 6727, 450, 644, 6848, 2129, 703, 6133, 3688, 5793, 5567, 6241, 4471, 7124, 1349, 5800, 5977, 5801, 191, 5666, 2174, 2175, 5150, 249, 7038, 6426, 6427, 3621, 3628, 5190, 4585, 5192, 5067, 4756, 6855, 4762, 2284, 1781, 2818, 4137, 716, 795, 4951, 5120, 4493]. **IV** [418, 419, 563, 1113, 7307, 781, 7188, 7281]. **IX** [7451].

J [2038, 1484, 389, 1296, 7056, 7259, 531]. **J.** [262]. **Jack** [7213, 2877]. **Jacobi** [3746, 5067]. **Jacobian** [4491]. **Jager** [43]. **Jaguar** [5969]. **Jahr** [1653, 7251]. **Jahre** [1230]. **January** [7181, 7344, 7572, 7345, 7548, 7563, 7594, 7353, 7465, 7341]. **JANUS** [2382]. **Japan** [7555, 7444, 7590, 7532, 7599, 7242, 7441, 7455, 7619, 7482, 7282, 7459, 2922]. **Japanese** [3198]. **Java** [7428, 3879, 4636, 5395, 4982, 4822, 3880, 3881, 4010, 6800, 3753, 4549, 3756, 4038, 3908, 3909, 4256, 4271, 4642]. **Java-Enabled** [4549]. **java.math** [4336]. **JavaOne** [7469]. **Java**^{TM} [3882, 4342]. **JBits** [4534]. **Jersey** [7207, 7189]. **Jim** [3730]. **John** [3720, 340, 341, 7288, 5729, 5844, 6189, 3773, 4061, 5653, 7184, 7185, 7186, 7188, 7190, 7191]. **Joho** [7599]. **Join** [2992]. **Joint** [7187, 7193, 7200, 7202, 7203, 7207, 5471, 7521, 7291, 4274, 4624, 5169]. **joint-detection** [5169]. **Jointly** [7181, 7548, 7563, 7594]. **jokes** [4660]. **Jordan** [5676, 6285]. **Jose** [7457, 7403, 7473, 7607, 7494]. **Josef** [7132]. **Josephson** [1515]. **Journeyman** [4163, 4164, 4165, 4166]. **Joys** [6048]. **JPEG2000** [5110]. **JSR** [4336]. **JTC1** [5175, 5176, 5177]. **Julia** [4919, 6610]. **July** [7297, 7298, 7385, 7409, 7386, 7542, 7423, 7577, 7558, 7613, 7401, 7588, 7269, 7547, 7182, 7534, 7559, 7573, 7582, 7585, 7600, 3466, 7406, 7416, 3786, 7425, 7451, 7491, 7295, 7309, 7612, 7274, 7418, 7354, 7494, 7601, 3191, 7382, 7383, 7466, 7427, 7540, 7597, 1526, 4139]. **Jump** [5433]. **Jumps** [3753]. **June**

[7385, 7397, 7443, 7468, 7554, 7343, 7356, 7469, 7498, 7577, 7578, 7472, 7330, 7620, 7223, 7500, 7269, 7182, 7276, 7258, 7414, 7535, 7624, 7603, 7364, 7351, 7565, 7622, 7379, 7538, 2770, 7608, 7234, 7418, 7365, 7366, 7262, 7251, 7407, 588, 3191, 7382, 7383, 7619, 7617, 7280, 7253, 7326]. **Juni** [1653, 7251, 7407]. **Just** [5154, 7030, 4822].

K5 [3477, 4106]. **K6** [4050, 3932]. **K6-2** [4050, 3932]. **K7** [3942]. **K7**^{TM} [4092, 3943]. **Kōbe** [7590]. **kA/cm** [5756]. **Kahan** [579, 5486, 6189, 5937, 1662, 3949, 3950, 3849]. **Kalman** [2317, 7095, 2631]. **Kalray** [6310]. **KaratSaber** [7129]. **Karatsuba** [4698, 6698, 6447, 6337, 5622, 5066, 7165, 7129, 4153]. **Karatsuba-Based** [5622]. **Karatsuba-Like** [5066, 6698]. **Karlsruhe** [7477]. **Karpinski** [21]. **KAT** [2082]. **KCS** [1191]. **keel** [6765]. **Keeping** [6765]. **Keio** [7282]. **Kentucky** [7270]. **Kernels** [2991, 2807, 2990]. **Kerr** [5942]. **Key** [5586, 3862, 6435, 1223, 4386, 4572, 6575, 6738, 3811, 5880, 3222, 6264, 4196, 3795, 4094, 2979]. **Key-Exchange** [6738]. **keying** [3134]. **Keynote** [5898, 2678, 5925, 6086, 6820, 6107, 6840, 6132, 6151]. **Kharosthi** [5551]. **Kind** [6931]. **Kingdom** [7320]. **Kingdon** [7423]. **Kit** [2308, 2826]. **Kitab** [408]. **Kleine** [1335]. **Knot** [769]. **Knotenpolynomen** [769]. **knots** [3263]. **Know** [4342, 6800, 2891, 2707, 2708, 4713, 3020, 2]. **Knowledge** [5812]. **Known** [7024, 5924, 832, 4811]. **Knuth** [1506, 6135, 3850]. **Kobe** [7532]. **Koblitz** [5858, 5393, 5134, 5411, 4368]. **Kolloquium** [1485]. **Komma** [107]. **komplexe** [2053, 2103]. **Kong** [7502]. **Können** [1137]. **Konrad** [1380]. **konverter** [3353]. **Konvertierung** [1976]. **Konvertierungsroutinen** [2485]. **Konvolutionssumme** [3162]. **Korea** [7447, 7553]. **Koren** [4681]. **Krivine** [6590, 6361]. **Krylov** [3560, 6929, 4286]. **Kulisch** [1672, 1673]. **Kummer** [6959]. **Kutta** [7145]. **kvadratroden** [1329]. **KY** [7501]. **Kyoto** [7619, 3198].

L [1484, 6789, 1672, 4798, 4992, 5005, 2393, 5056]. **L-U** [2393]. **L.** [24, 1673]. **l.s.d** [2160]. **label** [3037]. **Laboratories** [75, 98, 2757]. **Laboratory** [7181, 3559, 4105, 5118]. **Ladder** [6727, 896, 6468]. **Lafayette** [7374, 7437, 7524]. **Lagrange** [5135]. **Lahey** [3857]. **Lake** [7561, 7583]. **Lakes** [7511, 7570, 7437, 7453]. **lambda** [7159]. **lambda-calculus** [7159]. **Lancaster** [7324]. **Lanczos** [4030, 5198]. **Land** [6340]. **Language** [7326, 7512, 2862, 2635, 1102, 1729, 1390, 4340, 4341, 4342, 1512, 4199, 4361, 1401, 3758, 3272, 827, 2913, 4220, 2730, 5035, 3911, 1044, 1654, 7164, 943, 3975, 6497, 1011, 5704, 1508, 1734, 2912, 5175, 5176, 5177, 5533, 627, 2925, 1528, 1753, 5621, 2581, 2582, 7098, 2137, 2803, 1784, 2825, 1697, 3022, 3285, 4377, 5174, 3164]. **Languages** [7315, 7411, 1204, 4195, 3087, 4383, 4247, 5448, 7248, 994, 3844, 7267, 252, 2220, 3905, 3906, 4223, 5533, 7292, 3308, 1063, 5108, 3374, 1095, 7501]. **LAPACK** [2886, 6916, 6917, 6349]. **LAProof** [7063]. **Large** [7181, 1572, 6893, 859, 6669, 4171, 5498, 5917, 5718, 2895, 2715, 5305, 4209, 1413, 5848, 4384, 6324, 25, 2111, 1531, 3654, 5080, 1668, 6357, 7102, 6359, 6856, 2016, 937, 3710, 1177, 1078, 3215, 3383, 45, 6275, 4678, 3058, 3576, 3993, 6286, 3751, 5302, 2532, 2382, 4725, 2926, 3486, 6122, 6123, 5872, 7098, 1910, 2010, 7250, 654,

3002, 410, 947, 1183]. **Large-Number** [25]. **Large-Scale** [7181, 5718, 1413, 1531, 6856, 3654, 7250]. **l'Arithmétique** [1]. **l'Arrondi** [4690]. **Laser** [1964, 3260]. **Last** [5486, 2966, 2857]. **Latched** [336]. **latencies** [6540]. **Latency** [7134, 4969, 4970, 3981, 3055, 4987, 6671, 6899, 5722, 5541, 6587, 3667, 5443, 5785, 5651, 6035, 3013, 6996, 4813, 3239, 3240, 6285, 5536, 4730, 4581, 4883, 5062, 5781, 3666, 3934, 3947]. **Latin** [2]. **Lattice** [6051, 5627, 4634, 5102, 2177, 4818, 4989, 5593, 2389, 1983, 1883, 4902, 3152, 4774, 2024, 2495, 3851]. **Lattice-Based** [6051]. **Lattices** [6345]. **Lauderdale** [7487]. **Launches** [6390]. **Law** [39, 1097, 4240, 2286, 5370, 5704, 826, 3771, 4253, 5074, 5875, 2285, 5585, 3718, 5682, 5683, 5273, 5285, 5514, 4855, 5014, 4552, 5170, 5043, 5185, 1446, 5788, 785, 717, 1471, 661]. **Lawrence** [6476]. **Laws** [5043, 5074, 4437, 4361]. **Layer** [7028, 4907]. **layers** [3204]. **Layout** [3452, 1802, 1803, 1192, 1495]. **Lazy** [3050, 3893, 3800, 6116]. **LCAS** [2731, 2920]. **LCPC** [7501]. **lead** [5019]. **Leading** [2541, 5040, 5062, 3810, 2800, 4451, 3702, 5578, 4695, 3897, 6113, 1555, 4785]. **Leading-Zero** [5578, 2541, 3810, 3702]. **leads** [4038]. **Leak** [6336]. **leakproof** [3044]. **Leaks** [6526]. **learn** [3627]. **Learned** [3506]. **learners** [5079]. **Learning** [6490, 6390, 6905, 6926, 6934, 2907, 6569, 6571, 1634, 6451, 6724, 7073, 6953, 6600, 6964, 6470, 6856, 6857, 6987, 6753, 6639, 6648, 7131, 6084, 2909, 6444, 6723, 6456, 6733, 6965, 7100, 7088]. **Least** [603, 2711, 643, 2829, 2177, 1948, 3982, 2024]. **least-mean-squares** [1948]. **Least-Square** [2829]. **Least-Squares** [643, 1948]. **leave** [3953]. **Lebenswerk** [602, 1800]. **Lecture** [4850, 3626, 3774, 4914, 4926, 742, 3773]. **Lectures** [3572, 2691, 3701, 7324, 7544]. **led** [2870]. **LEDA** [3410, 3568]. **Ledley** [262]. **Left** [5028, 4224, 6585, 5549, 1556, 4720, 5037]. **Left-Looking** [6585]. **Left-to-Right** [5028, 4224, 5549, 4720, 5037]. **legacy** [5806]. **Legendre** [5999, 5297, 6706, 1631, 1457, 1694]. **Leibniz** [391, 3472, 801, 391, 1230, 3472, 6120, 96, 6985, 801]. **leibnizsches** [1230]. **leichte** [548]. **leistungsfähiger** [1759]. **LEMA** [5621]. **L'empire** [3602]. **lengte** [540]. **Length** [4171, 174, 1125, 390, 513, 1131, 3144, 709, 6631, 593, 3027, 2043, 6264, 3232, 4678, 5497, 1726, 1825, 674, 626, 6824, 3291, 3463, 521, 4601, 4602, 5434, 3676, 540, 2837, 4952, 2848, 1795]. **lengths** [942]. **Less** [2867, 5843, 5857, 4698, 1620, 5745]. **Lessons** [3506, 3392]. **Let** [3610]. **Letter** [3724, 3727, 1956, 421, 199, 426, 348, 285, 260, 2290, 212, 375, 717, 428, 1687]. **leur** [29]. **leurs** [29]. **Leuven** [7573]. **Level** [7011, 1095, 3573, 2060, 2343, 6174, 6071, 6177, 1512, 4195, 6709, 3109, 7062, 5330, 5334, 2560, 2944, 3475, 3643, 1654, 7083, 2126, 994, 7107, 6754, 6635, 4161, 4806, 6898, 3580, 2344, 2883, 4832, 5716, 2699, 3083, 6935, 6453, 5867, 4600, 4601, 5204, 5083, 1063, 3942, 5214, 4123, 4461, 1697, 2617, 2618, 2619, 6375, 2621, 5802, 4146]. **level-1** [5802]. **Level-Index** [2060, 2560, 2944, 3475, 3643, 2126, 2343, 2344, 5214]. **Leverage** [7271]. **Leveraging** [6552, 7125]. **Levinson** [1200]. **lexically** [1496]. **Lexicographic** [1876, 2459]. **L'Extraction** [1160]. **LIA** [5035, 2884, 3164]. **LIA-1** [2884]. **LibEFT** [6290]. **libm** [6196, 4998, 5199, 5984, 4408, 4589, 4829, 5001, 4939]. **Libmcr** [4935]. **Libraries** [7008, 6791, 6792, 563, 634, 2760, 7032, 5473, 3975, 4063, 6582, 6837]. **Library** [6653, 720, 6265, 4513, 5688, 418, 419, 4344, 5503, 6686, 4694, 6179,

7039, 6539, 5012, 1119, 1120, 1206, 2897, 2704, 4860, 4202, 1981, 6094, 1865, 6710, 6010, 6317, 7063, 440, 4584, 4885, 5050, 6842, 989, 2977, 3336, 3818, 4445, 3507, 7105, 6743, 2288, 2289, 2601, 6745, 2603, 4637, 4939, 2158, 4942, 5664, 1559, 1003, 5667, 4497, 5984, 6660, 5481, 4803, 2665, 6797, 2681, 5147, 5279, 4998, 5153, 5511, 6290, 5298, 2898, 1134, 1220, 1867, 4723, 5420, 6008, 4063, 3118, 633, 756, 5950, 4408, 4589, 5429, 4739, 4597, 7079, 5357, 1774, 6358, 5972, 1689, 4935, 147, 5238, 3713, 4967, 4982, 4673]. **Library** [7157, 4899, 4618, 4619, 5634]. **lieu** [2425]. **Life** [33, 4274, 3216, 6405]. **LifeJacket** [6222]. **Lifting** [6302]. **Lifting-Based** [6302]. **Light** [3753, 3764, 4204, 6096]. **Lightweight** [6904, 5927, 7093, 7096, 5828, 3883]. **Like** [852, 903, 3801, 5066, 3931, 3426, 6698, 4225, 5795, 5882, 1782]. **Likelihood** [4909, 4984]. **Limit** [3047, 6521, 745, 900, 976, 2010, 1489, 1491, 6522, 3445, 6716, 3302, 5656, 3017]. **Limit-cycle** [745]. **Limitation** [1623, 5704, 674]. **Limitations** [1661]. **Limited** [4056, 442, 573, 3151, 3044, 5499, 5708, 4697, 6084, 2907, 2909]. **Limiting** [884]. **Limits** [5835]. **Line** [3227, 3402, 2893, 1116, 2072, 2212, 1402, 3268, 7432, 1623, 913, 1533, 1441, 1661, 1447, 4440, 2155, 4135, 4466, 940, 1175, 2159, 2831, 1474, 1475, 1941, 2171, 6243, 2333, 6164, 2209, 2359, 2892, 1736, 2213, 821, 4707, 1612, 2382, 2244, 4881, 2428, 3476, 4598, 2436, 3314, 4266, 4757, 4617, 4930, 2604, 1074, 2478, 2830, 1472, 1473, 1704]. **line-drawing** [4617]. **Linear** [603, 4963, 3558, 4516, 1716, 1393, 4351, 6415, 5927, 430, 4030, 4853, 253, 3900, 6557, 2083, 5313, 4230, 7063, 3299, 895, 1045, 4399, 5189, 4239, 904, 6585, 443, 6840, 5554, 3493, 5080, 2136, 6032, 5788, 6369, 7112, 4121, 4286, 5463, 6631, 3842, 1078, 45, 5987, 4665, 2068, 3891, 6303, 6426, 4558, 6933, 5933, 515, 516, 565, 6712, 6713, 1420, 4071, 5190, 4403, 4409, 5860, 7080, 5553, 5435, 1664, 5354, 5438, 3331, 3332, 3815, 7101, 5967, 5968, 6975, 1542, 3523, 4631, 3198, 3015, 947, 1183, 4494, 4789, 4841]. **Linear-Array** [3299]. **Linear-System** [4963]. **Linear-Time** [4230]. **Linear/Linear** [5927]. **Linearer** [4494, 4789]. **linearization** [1638]. **Linearly** [6902]. **Lines** [274, 6700]. **Ling** [5494, 6927]. **Linger** [3408]. **link** [4413, 3713]. **Linkage** [7395]. **linked** [2574]. **l'Invention** [1160]. **Linz** [7275]. **Liquid** [3662]. **Lisbon** [7499]. **LISP** [7298, 1496, 1741, 1784, 2833, 2834, 1478, 3432, 3681, 3700, 1927, 3963, 2845]. **List** [6659]. **listing** [1890]. **Lists** [6540, 2574]. **Lite** [6961]. **literate** [4312]. **literate-programming** [4312]. **little** [6273]. **Live** [6496]. **Livermore** [2757]. **living** [7584]. **Ljubljana** [7208]. **LLL** [4393, 5627, 5075]. **LLL-Reduction** [4393]. **LLVM** [6222]. **LMS** [1583, 1721, 2669, 3413, 4023, 2395, 1650, 1763, 5064]. **LNS** [4307, 4308, 4309, 4310, 4311, 4506, 4507, 4509, 3871, 4171, 4678, 6167, 3424, 4694, 5153, 5745, 3126, 3304, 4608, 2267, 4956]. **load** [3340]. **Local** [746, 3482, 4526, 5839, 365, 2453]. **locality** [6672]. **Location** [342, 781]. **Log** [6573, 2782, 5658, 1543]. **Log-Depth** [2782]. **Logarithm** [1487, 6892, 275, 332, 5515, 1979, 4217, 1749, 6204, 6331, 5052, 2110, 2111, 6958, 4913, 6229, 4108, 652, 938, 1692, 2611, 2613, 5977, 6871, 6990, 1184, 5814, 2864, 610, 757, 6350, 1908, 4612, 7101, 5099, 5566, 3382, 4828]. **Logarithm-Approximate** [6958]. **Logarithm-Domain** [6990]. **Logarithmic** [6147, 3723, 4508, 4661, 4971, 4972, 5476, 5677, 5678, 6499, 6665, 1809, 248, 5492, 5829, 1960,

3999, 4176, 4177, 5284, 4354, 1113, 5605, 6819, 6572, 519, 5943, 1880, 4732, 4076, 6458, 6946, 5194, 4595, 3489, 7085, 5072, 4431, 582, 6236, 271, 5976, 2299, 2319, 2500, 3861, 4662, 5896, 1808, 2057, 4837, 2700, 2701, 4852, 6712, 6713, 3291, 630, 2745, 5859, 2427, 3479, 575, 5073, 2014, 2297, 1931, 2300, 5382]. **logarithmic-exponential** [3479]. **logarithmischer** [2700]. **Logarithms** [154, 864, 668, 558, 2742, 286, 691, 266, 999, 1300, 6209, 783, 5282]. **Logic** [7002, 1006, 1082, 7398, 857, 1012, 7543, 7557, 2199, 6404, 7499, 867, 304, 1276, 1394, 282, 4359, 339, 7404, 7449, 7564, 7581, 5318, 1527, 6838, 4593, 6604, 4615, 483, 584, 3817, 4278, 7596, 7441, 2988, 4769, 4628, 7117, 5796, 213, 1001, 1458, 2155, 5230, 939, 7496, 950, 5982, 7001, 7471, 4181, 3894, 5845, 4382, 4888, 7162, 3810, 4275, 778, 779, 780, 781, 782, 783, 784, 2020, 3702, 5232, 5108, 3707, 7204, 7184]. **Logic-Based** [6838]. **Logical** [3029, 1103, 1743, 4130, 4968, 58, 2425, 2429, 1664]. **logiciel** [3416]. **LogiCORE** [5244, 5581]. **Logics** [7470]. **Logik** [1001]. **Logistic** [5980]. **Logo** [1773]. **London** [7613, 272, 7285, 43]. **Long** [3408, 4991, 2678, 4715, 5736, 438, 6107, 3647, 3648, 6955, 4436, 845, 4135, 3745, 2699, 4557, 5762, 2590, 2809, 5795, 5882, 5666]. **long-term** [2590]. **longer** [6460]. **Look** [5922, 3895, 1743, 4209, 3443, 5072, 5203, 2126, 4439, 3838, 5231, 803, 2668, 4031, 5531, 6459, 3958, 2157, 4956]. **Look-Ahead** [5231]. **Look-Up** [1743, 4209, 5072, 2126, 4439, 3838, 3443, 2668, 4031, 3958, 4956]. **Lookahead** [4172, 3469, 2002, 5245, 2667, 1900]. **Looking** [6585]. **Lookup** [5515, 4028, 6091, 5042, 4414, 5060, 5775, 2128, 2129, 6365, 3822, 1545, 999, 2819, 2820, 3871, 3440, 4047, 4869, 3329, 3330, 4097, 3158, 2036]. **Lookup-Table-Based** [6091]. **Loop** [3388, 3106, 7038, 5434, 2167, 3107]. **Loops** [3235, 4615]. **LORIA** [7542]. **Losing** [7113]. **Loss** [1514, 5636, 1513, 1969]. **Lossless** [5837, 7069, 7072, 5110, 2307, 3705]. **lossy** [6517]. **Lost** [813, 5847, 6364]. **Lösung** [1599, 4494, 4789]. **Lottery** [7113]. **Louis** [21, 7289]. **Louisiana** [7302, 7437, 7524]. **Louisville** [7270]. **Low** [2858, 4969, 4970, 1366, 1806, 6781, 6897, 6671, 6899, 6274, 609, 4817, 6520, 4990, 4819, 3874, 5276, 5277, 7029, 6285, 5286, 5507, 4021, 6928, 3591, 7039, 6423, 4200, 1403, 3896, 7047, 5730, 7048, 3767, 6556, 5028, 5740, 5846, 4048, 6199, 6566, 7060, 4726, 3914, 5943, 6323, 6943, 5048, 4406, 7070, 4251, 5956, 7085, 4087, 4088, 4089, 6735, 6736, 4902, 4431, 4607, 7096, 4272, 4438, 7454, 5965, 6607, 5637, 6853, 4760, 4761, 4921, 5083, 5451, 4108, 4110, 4928, 7168, 5793, 655, 5651, 6035, 6618, 6139, 5567, 3013, 6987, 944, 6989, 4481, 3968, 6995, 6760, 6996, 4651, 5983]. **low** [5995, 6809, 2905, 5739, 3903, 5536, 7064, 3916, 4730, 5950, 5771, 3797, 5073, 2264, 3669, 5783, 3812, 7097, 2584, 2986, 1067, 5227, 6750, 2621, 3969, 4951]. **Low-Complexity** [5451, 3914, 5048, 3969, 4951]. **Low-Cost** [1366, 1806, 6781, 5286, 3767, 5846, 5956, 7085, 5637, 655, 6139, 944, 1403, 5739, 2264, 2584, 1067]. **Low-dimensional** [4902]. **Low-frequency** [2858]. **Low-Latency** [6899, 5651]. **low-level** [2621]. **Low-Overhead** [7070]. **Low-Power** [4819, 5028, 6199, 6566, 5943, 4087, 4088, 4431, 7096, 7454, 4108, 4110, 4928, 5793, 5567, 6989, 6760, 4817, 4021, 3591, 4089, 4651, 3916, 5073, 5783]. **Low-Precision** [6897, 6520, 7029, 7048, 6736, 6853, 7039, 6943, 7097]. **Low-Weight** [5276, 5277]. **Lower** [1949, 4075, 3657, 5450, 5987, 4560, 5449, 2822].

LP [3657]. **LPE** [6871]. **LS** [1883]. **LSA** [4466]. **LSB** [5535]. **LSI** [1189, 1508, 1409, 1325, 1245, 1257]. **LSI-11** [1508, 1409]. **LTI** [6755]. **LU** [4858]. **Lubbock** [7277]. **LUCAS** [1659, 1471, 661]. **Luigi** [5893]. **Luminy** [7418]. **LWE** [7115, 6993]. **LX** [564]. **LX-1** [564]. **Lyapunov** [6039]. **Lyon** [7497, 7412, 7608]. **LZA** [2541].

M [24, 3271, 4234, 4882, 4924]. **M.I.R.A.C.L.** [2289]. **M68000** [1579, 1580]. **MA** [7511, 7617, 7315, 7202, 7238, 7301, 7582, 7284]. **mac** [4983, 5988, 6523, 6913, 7029, 5840, 6442, 6937, 5955, 6845, 4272, 6977, 4131, 4956, 2323]. **MACHAR** [2205]. **Machin** [4617]. **Machine** [75, 6390, 1569, 153, 2506, 7023, 46, 6903, 2205, 224, 1021, 1507, 6926, 4032, 5016, 884, 342, 4041, 6934, 3100, 3273, 6571, 49, 25, 3141, 6964, 6857, 1453, 1246, 5563, 657, 6753, 943, 1002, 1478, 3711, 296, 45, 420, 422, 92, 1853, 2916, 15, 758, 3654, 5867, 6965, 2153, 656, 108, 1935, 1348, 2836, 2487, 3965, 2658, 2773]. **Machine-Checked** [4041]. **Machine-Efficient** [7023]. **machine-independent** [758]. **Machinery** [105, 86, 94, 7181]. **Machines** [7514, 5820, 7399, 1376, 81, 3752, 7055, 449, 7419, 7426, 7440, 7493, 7552, 7568, 77, 4635, 4326, 29, 40, 637, 72, 6120, 95, 1243, 3517, 124, 493, 35, 586]. **Macintosh** [3225, 2911]. **MacLISP** [835]. **Macro** [4559, 3189]. **Macro-Model** [4559]. **Macrocell** [5269, 3929, 3852]. **Macrocellular** [870]. **macromodule** [774]. **Macros** [1592]. **Macsyma** [963]. **Mactaggart** [2877]. **MAD** [2649]. **made** [3671]. **Madison** [7226]. **Madrid** [7543]. **Magic** [6558, 6218, 6463]. **Magnavox** [2141]. **Magnetic** [1077, 134, 3788]. **Magnification** [2163]. **Magnitude** [1091, 1872, 289, 584, 5365, 2889, 1879, 684, 2484]. **Magnum** [2629]. **mail** [3753]. **main** [379, 801]. **Mainframe** [5468]. **Mainly** [10]. **Mainstream** [3753, 2529]. **Maintaining** [3521]. **Major** [6179, 3828]. **Majority** [4359, 6195, 6838]. **Majority-Logic-Decodable** [4359]. **majors** [2816, 3004]. **Make** [6413, 6012, 5989, 1331, 3713]. **Maker** [4734, 6153]. **makers** [3392]. **Makes** [5433]. **makeup** [3016]. **Making** [4184, 6535, 6923, 7041, 411, 3486]. **Makuhari** [7459]. **malicious** [6249]. **Malo** [7297]. **man** [1329, 3949, 5653]. **management** [3044, 1697]. **Managing** [6348]. **Manchester** [2337]. **Mandarin** [7521]. **Mandelbrot** [5704]. **MANIAC** [127, 245]. **Manifest** [6793]. **Manipulating** [6714, 1239, 2382, 1333]. **Manipulation** [7234, 1071]. **Manipulations** [5309, 6206]. **Manitoba** [2377, 7278]. **Manticore** [7014, 6874]. **Mantissa** [6697, 2286, 1795, 2934, 3326, 4911, 777, 1781, 942]. **mantissas** [2014, 2285, 2599]. **Mantisse** [777]. **Mantissenlänge** [1795]. **Manual** [4505, 1947, 2179, 498, 2659, 302, 1274, 224, 959, 2069, 4708, 69, 3092, 1622, 1865, 1866, 835, 1896, 2120, 2262, 2442, 2443, 2445, 3001, 2993, 3519, 2154, 4469, 1468, 3370, 1478, 1086, 1011, 1092, 1381, 2518, 1134, 1220, 1526, 2117, 2952, 1895, 2441, 2444, 1162]. **Many** [6703, 438, 6571, 6060, 1625, 778, 5246]. **many-core** [6060]. **Many-Term** [6703, 6571]. **Map** [6010, 5980, 3873, 3204]. **MAPLD** [7496]. **Maple** [7379, 5429, 2872, 4984, 5407, 3609, 5357, 6975, 7422]. **MAPM** [4445]. **Mapping** [3052, 589, 5122, 6041]. **Mappings** [445]. **Maps** [3204, 4981]. **March** [1484, 7328, 7374, 7255, 7618, 7625, 7627, 7432, 7240, 7257, 7271, 7277,

7402, 7504, 7530, 7350, 7453, 7550, 7279, 7480, 7454, 7226, 7596, 7381, 7252]. **Mark** [1934]. **Market** [3493, 1997, 3356]. **Marketing** [4226, 4228]. **Markov** [6249, 5683]. **marks** [2030]. **Marriott** [7453, 7421]. **Marseille** [7234]. **Maryland** [7526, 7214, 7461, 3701, 722, 7214]. **mashinnoi** [1246]. **mask** [4650, 4790]. **Masking** [3402, 2170]. **MasPar** [3559]. **Massachusetts** [7211, 7468, 7323, 7335, 7360, 7361, 7535, 7538, 7466]. **Massey** [3090, 4620]. **Massive** [5816, 6301]. **Massively** [2506, 2893, 4194, 7391, 5613, 3520, 2649, 2650, 3259, 4196, 2987, 4925, 2351, 3248]. **massively-parallel** [2649, 4196, 2987]. **master** [7529]. **Mastrovito** [6337, 4129]. **matched** [910]. **Matching** [2771, 4167]. **Materialiensammlung** [1485]. **Math** [5130, 6386, 6495, 3724, 3727, 1096, 1720, 3738, 3420, 3421, 3582, 554, 2530, 3753, 6931, 2533, 2085, 3095, 3096, 2092, 440, 4405, 6460, 2760, 2256, 4597, 1999, 3144, 5433, 3493, 3336, 2138, 4445, 7105, 2603, 2021, 2022, 5218, 5219, 2295, 3355, 2157, 6036, 3209, 3713, 5481, 2509, 2665, 5006, 2698, 2702, 4723, 6837, 2009, 1331, 1689, 1922, 3210, 7179, 6979]. **Math-who** [3095]. **math.h** [6778, 6333, 6452]. **math.h** [**?**]Bagnara:2021:PAV. **MathCW** [6265]. **Mathemagix** [6244]. **Mathematica** [2901, 2915, 3647, 3648, 5234]. **Mathematical** [720, 4793, 1482, 4967, 5134, 7482, 5680, 5822, 6265, 7023, 4673, 6791, 6792, 6058, 7141, 5706, 1104, 7484, 7264, 81, 4831, 6686, 467, 1029, 1120, 7590, 2704, 4199, 881, 7147, 7148, 4207, 3899, 6194, 7058, 7349, 634, 899, 975, 1047, 7379, 7157, 909, 1050, 526, 7246, 7189, 2440, 53, 7199, 7210, 2283, 7167, 1541, 6745, 2481, 6762, 6763, 2857, 4497, 7032, 1712, 4, 496, 6049, 61, 880, 2080, 5326, 5427, 756, 2774, 1452, 3832, 5100, 2816, 3004, 791, 4780, 7482, 7484, 7590, 7226]. **Mathematical-Function** [6265]. **Mathematicians** [7490, 4042]. **Mathematics** [7386, 7263, 7513, 4511, 5821, 7374, 6799, 3749, 2377, 7606, 1630, 4226, 4228, 6577, 7278, 7206, 2141, 7226, 2805, 7281, 2033, 2626, 7623, 719, 2312, 7215, 1378, 1840, 7390, 7516, 3625, 2758, 7189, 4086, 7243, 7368, 1797, 6877, 7390, 340, 341]. **Mathematik** [7244, 7243]. **mathématiques** [5427, 7418, 5100]. **mathematische** [975]. **mathematischen** [3121, 1904]. **Mathematischer** [61]. **MATLAB** [6494, 6305, 4923, 6728, 5565]. **Matrices** [6650, 93, 1213, 5638, 2804, 713, 3201, 74, 6651, 5261, 4671, 1269, 2899, 4208, 6443]. **matriciel** [2807]. **Matrix** [6651, 6044, 6157, 5401, 6404, 4993, 1385, 6174, 6287, 7034, 4853, 6296, 6301, 5530, 3094, 6554, 6089, 6557, 5737, 1413, 1522, 6567, 895, 1045, 6323, 3644, 6344, 356, 2450, 6961, 1659, 2974, 5964, 6027, 1915, 2152, 3355, 1693, 6987, 79, 2482, 6378, 6868, 6143, 5391, 5676, 5679, 2180, 5992, 2516, 5002, 2695, 2214, 4208, 6936, 974, 4409, 4410, 6111, 2113, 477, 2447, 2448, 4747, 4428, 5782, 5873, 5963, 6126, 6223, 1335, 5877, 5972, 2303, 3207, 3371, 414, 3381, 4959, 468, 2449]. **Matrix-Multiplication** [6987]. **Matrix-Multiply** [6404]. **Matrix-Vector** [6044, 2516, 6111]. **Matrixproblemen** [1335]. **Matter** [6799]. **Maui** [7465]. **MAX** [5139]. **Maximal** [1820, 875, 1628, 5111, 5164, 2100, 1795]. **maximaler** [1628, 2100]. **Maximally** [1795]. **Maximization** [117]. **Maximum** [3719, 3856, 861, 1015, 1125, 5724, 1852, 6739, 773, 792, 5981, 6264, 4984, 6005, 6082, 3451, 1994, 6022, 482, 5366]. **maximum-redundancy** [3451]. **Maxwell** [6178]. **May** [7216, 7235, 7570, 7571, 7202, 7207, 7237, 722, 7556, 7544, 4841, 7238, 7301, 7267, 7214, 7245, 7321,

7322, 7346, 7348, 7361, 7404, 7449, 7460, 7461, 7519, 7532, 7564, 7584, 7591, 7593, 7607, 7306, 7290, 7195, 7284, 7243, 7464, 7441, 7281, 7371, 7027, 4067]. **MB** [2377]. **MC** [2262, 2443]. **MC68000** [2017, 1470]. **MC68000/NS32081** [2017]. **MC68881** [1717, 1719, 1619, 2117, 1895, 1896, 2120, 2442, 2444, 1777]. **MC68881/MC68882** [2117, 2120, 2444, 2442]. **MC68882** [3307, 2117, 2120, 2442, 2444]. **MC8810** [2948]. **MC88100** [2445]. **MCALIB** [6074]. **McClellan** [2107]. **McGee** [372]. **McGraw** [272]. **McGraw-Hill** [272]. **McLaughlin** [6409, 6545]. **McLean** [7385]. **MCM** [3537]. **MCMC** [6340]. **MCU** [6781]. **MD** [7489, 7327]. **Mean** [1718, 431, 5724, 3644, 2481, 1948, 3986, 2080, 3934, 1060]. **Means** [1383, 385, 139, 2573, 269, 2036, 1353, 3972, 4242, 831, 4424, 3832]. **measure** [886, 5, 707, 1255]. **Measurement** [1976, 7432, 7461, 2279, 1701, 2512, 9, 4938, 1703]. **Measurements** [1804, 10, 2338, 5005]. **Measuring** [3583, 3243, 6074, 6191, 3168, 6246]. **mécanique** [40]. **Mechanical** [3550, 5689, 12, 3784, 6134, 4626, 40, 5925]. **mechanically** [4325, 3928, 3942, 3943, 4106]. **mechanically-checked** [3942]. **Mechanics** [7482, 37, 7184, 40, 274]. **Mechanik** [7244, 274]. **Mechanism** [4306, 6575, 48, 1292, 5925]. **Mechanized** [5904]. **Mechanizing** [3777]. **Medford** [7468]. **Media** [3875, 4729, 4737, 5008]. **Medical** [7355]. **Medicine** [7302, 7287]. **medieval** [1027, 6962]. **Medium** [5135, 6098, 755, 6142]. **Medium-Precision** [6098]. **Meeting** [7385, 7330, 7244, 7337, 7254, 3773]. **Meets** [4511, 7084]. **Megacycle** [149, 133]. **megaflops** [4256]. **mehrfacher** [1095]. **mein** [602, 1800]. **Melbourne** [7242, 7550]. **Meliá** [7543]. **Mellon** [7222]. **Melodica** [6826]. **member** [3356]. **Members** [6257, 438]. **Memoing** [3875]. **Memoization** [4965]. **memorandum** [152]. **Memorial** [7434, 7454]. **Memoriam** [6789]. **Memories** [5734, 2768]. **Memory** [864, 3235, 7034, 4209, 6442, 6568, 7068, 3304, 6726, 5203, 4748, 1905, 6612, 2146, 1245, 5893, 2683, 6922, 4882, 3126, 6965, 2015, 4288, 5467, 3534, 2624, 2632]. **Memory-Efficient** [6568, 6612]. **Merged** [1172, 1345]. **Meridien** [7271]. **Meritus** [7521]. **Mersenne** [5690]. **Mesh** [3415, 3459, 4392, 1668, 3694, 4167, 1472, 1473]. **Mesh-Connected** [3415, 1668]. **Mesopotamian** [7077]. **Message** [4800]. **Meßdatenverarbeitung** [1701]. **meßtechnische** [1976]. **messy** [2688]. **Meteorology** [7191]. **Method** [603, 3546, 1569, 804, 1367, 153, 154, 3564, 7016, 2330, 2054, 5399, 5827, 609, 813, 613, 1383, 222, 304, 1965, 6287, 5924, 2357, 4016, 873, 874, 1026, 5293, 36, 425, 508, 6930, 26, 158, 6698, 4039, 3762, 3612, 681, 514, 2387, 6197, 2396, 3290, 5423, 30, 519, 5425, 5615, 5760, 349, 49, 1887, 315, 5058, 1318, 1893, 4603, 366, 6121, 643, 3930, 2122, 4090, 6025, 4605, 4748, 1057, 4433, 1906, 121, 582, 5785, 773, 186, 3689, 4119, 1545, 5365, 4933, 5101, 533, 4126, 792, 6140, 4471, 214, 3706, 3710, 4142, 3375, 2036, 1078, 600, 3540, 6878, 1562]. **method** [5814, 6150, 6497, 4795, 1088, 6062, 5839, 2706, 2709, 1844, 1128, 3264, 5026, 3451, 7052, 7182, 3278, 566, 5320, 401, 3127, 6588, 2755, 4411, 2562, 4897, 2259, 5556, 3315, 2964, 836, 579, 3668, 4267, 4912, 27, 4917, 6852, 1064, 5879, 1542, 6368, 3348, 4629, 4457, 4458, 4633, 5097, 5098, 5099, 5224, 4462, 4936, 3837, 4137, 2827, 3367, 414, 3381, 5875]. **Methodist** [7218]. **Methodologies** [7246, 7365]. **Methodology** [6901, 2212, 4551, 4630].

Methods [3971, 218, 7357, 546, 547, 6895, 727, 6269, 1716, 7231, 7605, 117, 817, 870, 1601, 7145, 6422, 427, 1029, 3085, 966, 678, 1289, 1742, 625, 3767, 5308, 3614, 5313, 6091, 7474, 3456, 3457, 6319, 3632, 892, 5614, 4391, 6576, 7476, 439, 1046, 832, 6841, 446, 982, 1053, 3801, 2957, 7311, 2960, 2440, 182, 4085, 1658, 2974, 6357, 7199, 703, 3680, 164, 585, 4451, 1166, 3688, 7569, 2814, 5368, 5369, 323, 2817, 3843, 7340, 1349, 6378, 415, 1706, 4484, 4345, 5000, 5392, 3853, 7409, 4303, 2174, 2175, 3560, 2047, 2325, 863, 955, 7140, 7317, 7544, 6929, 7267]. **methods** [4036, 3897, 254, 739, 1974, 5531, 5744, 2726, 397, 3284, 3628, 5037, 2100, 7477, 2933, 3303, 5339, 2756, 317, 2119, 4745, 7480, 5205, 2270, 2585, 2008, 130, 163, 5642, 5643, 3521, 7420, 3198, 716, 795, 194, 1708, 5666, 1253, 1599, 1165]. **Metric** [32]. **Metrics** [3563]. **Metropolis** [340, 341, 531]. **Metropolitan** [7536]. **Mexico** [7347, 7464, 7579]. **Mflop** [2351, 2251, 2280, 2490]. **Mflops** [2217, 2509, 2666, 2897, 3104, 3105, 2405, 2406, 2412, 2413, 2414, 2415, 2775, 2447, 2448, 2449, 2450, 2469, 2217, 2898]. **MHz** [2328, 2329, 3998, 6424, 4218, 3649, 2438, 3503, 3504, 2467, 3541]. **MI200** [6882]. **Miami** [7443]. **Michigan** [7245, 7379, 7453]. **Micro** [2039, 3392, 2348, 1598, 1731, 7260, 7261, 7273, 7284, 5370, 1249, 1373, 1395, 6540, 1647, 3703, 7334, 7241]. **micro-computer** [1395]. **micro-operation** [6540]. **Micro-optimization** [2348]. **micro-power** [3703]. **micro-programmable** [1647]. **Micro/mini** [1598, 1731]. **Micro/Minicomputers** [2039]. **Microarchitectural** [5286]. **Microarchitecture** [1804, 4805, 2369, 5772, 7122, 1571, 2204, 7334, 4627]. **Microbenchmarking** [6565]. **microcode** [1309, 4106]. **Microcoding** [1256]. **Microcomputer** [1202, 1633, 1759, 2017, 2032]. **Microcomputers** [1083, 1362, 1530, 2968, 1772, 943, 622, 1031, 1528, 1760, 1732, 1700]. **Microcomputing** [2399]. **Microcontroller** [2278, 2183]. **Microcontrollers** [7010, 7088, 5787]. **Microelectronics** [7585, 7593, 7306]. **Micrografx** [3204]. **micropipeline** [3967]. **Microprocessor** [1261, 1482, 2342, 4177, 5711, 1599, 1968, 7265, 2716, 3092, 564, 7240, 5746, 6708, 2411, 2937, 1143, 1997, 2445, 4901, 5070, 2775, 2965, 4091, 3932, 2280, 4110, 5361, 5468, 5714, 3039, 1488, 3396, 4814, 1378, 5020, 1408, 3099, 2391, 3623, 2410, 2932, 2565, 2435, 2437, 4092, 4749, 1774, 1678, 3342, 2808, 3696, 3828, 4131, 1347, 3361, 1943, 4176, 1427]. **Microprocessor-Based** [1143, 1774, 1347, 1943]. **Microprocessors** [1584, 2521, 4197, 6435, 5880, 4544, 980, 1331, 2138]. **Microprogrammable** [887, 1360]. **Microprogrammed** [1030, 1320, 721, 1891, 1356]. **Microprogramming** [7241, 839, 7334]. **Microsecond** [133]. **Microsoft** [2600]. **MicroVAX** [2018]. **Midcon** [7273]. **Midcon/84** [7273]. **Middle** [4863]. **Midpoint** [6316, 6004]. **Midpoints** [5754]. **Midwest** [7589, 7378, 7533, 7220]. **MIEL** [7593]. **might** [2548]. **Migration** [3388, 7093]. **Mikrorechentechnik** [2399]. **Mikrorechner** [1732, 1700]. **Mikrorechnerprozeduren** [1599]. **Mikrorechnersystemen** [1759]. **Milestones** [7056]. **Military** [1499, 7295, 7309, 7496]. **millennium** [7433]. **million** [1486, 3224, 3552, 3553, 3554, 3555, 3556, 3557, 6368]. **Millisecond** [5563]. **Millisecond-Scale** [5563]. **Mills** [3408]. **Milne** [24]. **Milne-Thomson** [24]. **MIMD** [3596]. **MIMO** [6502, 6301, 5750, 5751].

MIN [5139]. **MIN/MAX** [5139]. **Mindless** [4871]. **Minefield** [3232]. **Mini** [7260, 7261, 7273, 7284, 1598, 1731, 5950]. **mini-library** [5950]. **Mini/Micro** [7260, 7261, 7273, 7284]. **Minicomputer** [887]. **Minicomputers** [2039, 1621, 1528]. **MiniFloat** [6897]. **MiniFloat-NN** [6897]. **Minimal** [3298, 360, 5037, 3795, 5556, 7108]. **Minimally** [4689, 265, 6477, 7050]. **Minimax** [5081]. **Minimization** [2317, 870, 1743, 287, 913, 2296, 4179]. **minimize** [2407]. **Minimizing** [6045, 1629, 4385, 3933]. **Minimum** [2178, 1582, 5724, 2161, 6757, 4487, 1565, 3591, 4752, 711, 5366]. **Minimum-distance** [4487]. **Minis** [1518]. **Minneapolis** [588]. **Minnesota** [588]. **Minor** [6746]. **Minus** [6159]. **MIPS** [2660, 2342, 2677, 3258, 3092, 2097, 2924, 2282, 2808, 2629]. **MIPS-R3000** [2660]. **MIPS-X** [2342]. **Miranker** [1672, 1673]. **Mirror** [868, 4632]. **Mirror-symmetrical** [4632]. **Miscalculating** [4225]. **miscalculation** [3440]. **Miscellaneous** [6912]. **MISHA** [2144]. **Mismatch** [6799]. **missile** [2870, 2997]. **Missing** [1213]. **Mississippi** [484]. **Missouri** [7289]. **Mistakes** [6535]. **Mister** [391]. **Mitchell** [6821, 6573, 5194]. **Mitchell-Based** [6821]. **Mitigation** [6717]. **mitigations** [5830, 6322]. **mittels** [2100, 2573, 1353]. **Mixed** [6650, 6505, 5401, 1958, 5494, 6277, 5280, 6411, 6933, 6432, 1618, 6439, 5945, 6840, 6593, 6351, 7089, 6853, 6612, 5463, 7125, 6868, 6146, 6647, 5477, 3228, 1714, 5695, 6427, 2230, 2740, 5946, 2933, 4588, 4253, 5879, 5227, 2492, 2847]. **Mixed-domain** [6868]. **mixed-hybrid** [4253]. **Mixed-Precision** [6650, 6277, 7089, 6612, 5463, 6146, 6647, 6593, 6868, 5695, 6427]. **Mixed-Radix** [1958, 5494, 1618, 6439, 2740, 2847]. **Mixing** [6822]. **ML** [3860, 4708, 6935, 3818]. **MMIX** [6135]. **mobile** [5739, 4250]. **Möbius** [5855]. **Mod** [2646, 6719, 3359, 5508]. **Mode** [6184, 7091, 7178, 6047, 5725, 6312, 3296, 4428, 3670, 6233]. **Model** [417, 1268, 1377, 6521, 3573, 5706, 5992, 1123, 176, 4559, 396, 6568, 6715, 5540, 6717, 481, 3939, 6612, 1776, 593, 1186, 6249, 1484, 1016, 1017, 6522, 3580, 5303, 3607, 1298, 4596, 4740, 6593, 3656, 2768, 2604, 5382, 3391, 6593, 2460]. **Modeling** [7482, 4199, 6717, 2944, 5532, 6110, 2773, 6616, 4937]. **Modelling** [7349, 6127, 7123, 5802, 6372]. **Models** [1576, 2535, 7051, 395, 6574, 6739, 6249, 5704, 1502, 506, 2902, 394, 699, 7098, 5082]. **modem** [3134]. **Modems** [3753]. **Modern** [218, 3860, 2647, 5691, 512, 5729, 5844, 6428, 316, 5059, 5195, 6216, 4621, 7569, 2648, 5830, 7529, 6103, 2019, 5890, 5891]. **Modes** [3596, 5178, 5980, 301, 4352, 6944]. **Modification** [5240, 3772, 3958]. **Modifications** [1571, 393, 2595]. **Modified** [5813, 5482, 6274, 813, 4839, 181, 1898, 1057, 925, 5215, 1169, 7174, 1191, 2058, 1959, 3090, 3294, 1992, 2931, 2591, 1000, 2303, 4786, 5387, 4960]. **Modifying** [3283, 6870]. **modpn** [5429]. **Modula** [2523, 1735, 3101, 2776]. **Modula-2** [2523, 1735]. **Modula-3** [3101, 2776]. **Modular** [1082, 6880, 6891, 3726, 4314, 4977, 5478, 5899, 6897, 5396, 6159, 1578, 3985, 2193, 5488, 5272, 6166, 7028, 4679, 5276, 5277, 3425, 5281, 2685, 5913, 5151, 6532, 3891, 6178, 6420, 2696, 4196, 4359, 5929, 6542, 6080, 6932, 6545, 6698, 3441, 5167, 2905, 5307, 3617, 5741, 1218, 5743, 6310, 7059, 3109, 5423, 4387, 5614, 3120, 4577, 4072, 4401, 6336, 289, 3802, 5196, 5627, 6952, 1894, 2572, 6124, 765, 3497, 3812, 5080, 4434, 2789, 6850, 6851, 6133, 4103, 5359, 4279, 6615, 7115, 5651, 845, 1171, 3008, 3192, 5373, 4467,

2838, 4478, 4479, 1479, 6040, 6996, 5391, 6244, 3864, 4323, 6900, 5271, 6410]. **modular** [5408, 3884, 3078, 6814, 4029, 2219, 4213, 4561, 5531, 4045, 4724, 5034, 4234, 4403, 4585, 1314, 7159, 4895, 4897, 5350, 5789, 6481, 2818, 3009, 4779, 5237, 3205, 3846, 5387, 5120, 6997, 4959]. **Modular-Multiplication** [2572]. **modulation** [4233, 4147]. **Modulator** [132, 3993]. **Module** [3857, 1499, 1114, 2695, 2430, 3493, 3169, 4452, 3532, 4317, 2333, 1272, 2363, 2951, 4764, 5803]. **Modules** [1576, 4513, 4584, 3493, 4886, 3339]. **Moduli** [6042, 6052, 3983, 6545, 1743, 4866, 6304, 6553, 5314, 919, 6976, 7106, 5365, 4141, 4479, 3386, 3387, 4961, 1264, 1714, 4675, 4816, 5271, 4003, 4683, 2933, 4755, 1910, 2010, 5093, 4122, 4123, 4124, 2840]. **Modulo** [4652, 4804, 5690, 6271, 809, 669, 867, 6000, 5515, 4715, 5023, 6553, 5738, 5535, 6563, 7059, 1306, 4229, 6106, 5052, 5060, 5355, 2978, 3501, 3502, 1912, 185, 5639, 4770, 4638, 4476, 6643, 1004, 4152, 2637, 3978, 4839, 5003, 5011, 1295, 3924, 1908, 4754, 4622, 2995, 5656, 2632]. **Modulo-** [5535, 6563, 7059, 6106, 5052, 809]. **Modulus** [4057, 2098, 1002, 4498, 1963, 2466, 2303, 2625, 2839]. **modulus/multi** [3327, 3328]. **Möglichkeiten** [1759]. **Molecular** [37, 5563, 5006]. **Møller** [3315]. **moment** [4330]. **Moments** [1791]. **Monica** [7319, 7228]. **Monitoring** [1209, 1284, 1285, 329, 5716]. **monodromy** [5992]. **Monolithic** [1787, 1557, 1178]. **Monotone** [2070, 2210, 2697, 1269]. **Monotonicity** [7082, 7160]. **Monte** [5910, 6068, 6173, 6074, 7182, 3813, 3814, 4099, 4268, 4269, 5382, 5807]. **Monte-Carlo** [5807]. **Monterey** [7510, 7527, 7495]. **Montgomery** [5055, 6880, 4301, 3726, 3864, 4978, 5899, 6392, 3985, 4323, 6789, 5705, 6166, 5277, 6408, 6062, 6282, 6409, 6410, 5151, 3078, 6689, 5157, 4029, 5723, 5838, 7046, 5527, 5733, 5024, 5741, 5743, 3462, 4232, 7155, 5614, 4582, 5048, 4895, 4897, 6959, 6025, 3931, 7163, 4427, 4751, 4429, 4605, 6468, 4910, 4434, 4435, 4273, 7102, 6133, 6476, 4279, 5086, 6479, 6136, 6238, 5651, 4779, 4472, 4479, 5887, 4485, 4645, 6996]. **Montgomery-Based** [5887]. **Montgomery-Form** [4429, 4605]. **Montgomery-Like** [3931]. **Monticello** [7201]. **Montpellier** [7458, 7565]. **Montreal** [7519, 7250, 7220, 7215, 7559]. **MOPS** [6424]. **Morocco** [4841]. **Morphable** [4524]. **MORUS** [6646]. **MOS** [1613, 2104, 2263, 1796]. **Most** [5131, 462, 5173, 7071, 4593, 5332, 2973, 6746]. **Most-Significant** [7071]. **Motion** [5145, 2709]. **Motivations** [4618, 4619]. **Motorola** [2497, 2498, 1408, 3450, 1678, 2157]. **Motors** [6690]. **Moursund** [426, 428]. **Movable** [6487]. **moves** [6765]. **movies** [5759]. **moving** [7364]. **moyenne** [3986]. **Moyens** [4242]. **MP** [3559, 1099, 1193, 1375, 5712, 4860, 2553]. **MP-1** [3559]. **MP/Model** [2460]. **mpc** [5511]. **mpcheck** [5126]. **MPCS** [7391]. **MPEG** [4506, 4508, 4509, 4131]. **MPEG-1** [4506]. **MPEG-2** [4131]. **MPEG1** [4907]. **MPEG1/2** [4907]. **MPFI** [4618, 4619]. **MPFR** [5012, 5298, 4202, 4885, 5050, 6208, 6335, 6842, 4899, 5127, 5669]. **MPFUN** [3870]. **MPFUN2020** [6779]. **MPHELL** [6797]. **MPI** [3857]. **mpmath** [6008]. **MPPA** [6310]. **MPPA-256** [6310]. **MQRNS** [1992]. **MR** [1296]. **MRC** [6052]. **MRI** [4564]. **MRRNS** [2840]. **MS** [2765]. **MS-DOS** [2765]. **MSB** [3490]. **MSB-First** [3490]. **mu** [3271]. **Much** [2093, 5212]. **Mulders** [4557]. **Multi** [1087, 6156, 1577, 5907, 3875, 3065, 5712, 3742, 4354, 1394, 3080, 5929, 513, 2903, 6435, 1422, 5196, 7082, 7160, 7091, 1905, 6740, 7099, 3673,

7178, 6362, 6236, 1683, 2287, 2289, 5880, 5568, 3966, 6060, 2354, 6072, 6547, 1879, 2764, 5630, 5073, 3327, 3328, 3195, 5387]. **multi-** [6060]. **Multi-base** [5907]. **Multi-Core** [6236, 5929]. **Multi-Dimensional** [4354, 5073]. **Multi-Exponentiation** [3742, 5387]. **Multi-fault** [6156]. **multi-FPGA** [5630]. **multi-function** [3327, 3328]. **Multi-Input** [1905, 2764]. **Multi-Intervals** [3673]. **Multi-Length** [513]. **Multi-Media** [3875]. **Multi-Mode** [7091, 7178]. **multi-modulus** [3327, 3328]. **multi-modulus/multi-function** [3327, 3328]. **Multi-Operand** [1087, 1394, 1422, 2903, 5196, 1683, 2287, 5568, 6072]. **Multi-output** [6362, 1879]. **Multi-Parallel** [3065]. **multi-port** [3195]. **Multi-Precision** [7099, 2289, 5712, 6435, 5880, 6547]. **multi-purpose** [2354]. **Multi-Term** [7082, 7160]. **Multi-User** [1577]. **Multi-Valued** [3080, 3966]. **multibit** [5872, 2598]. **Multibyte** [6250, 1968]. **multicarrier** [4233, 4248, 4250, 4594]. **Multichip** [3169]. **Multicomputer** [2063, 5235, 5467]. **Multicore** [5705, 7096, 7111, 6146, 5791]. **Multidigit** [5072, 256]. **Multidimensional** [5072, 816, 2999, 3000]. **Multidoubling** [4449]. **Multiformat** [6182, 1740]. **Multifunction** [5076, 4095, 5383]. **Multigrid** [132]. **Multilinear** [5450]. **Multimedia** [4502, 4965, 4508, 5139, 7521, 7536, 4109, 4769]. **MultiModuli** [4961]. **Multinomials** [4963]. **Multioperand** [4315, 5280, 3080, 4875, 5036, 1874, 2128, 2789, 4283]. **Multipartite** [5042, 4345, 4534, 5000]. **Multiparty** [7014]. **Multipath** [4646]. **multiplatform** [3037]. **Multiple** [6491, 1566, 299, 3042, 4979, 1372, 6508, 1095, 862, 863, 954, 955, 1099, 1100, 1193, 1265, 3232, 5909, 382, 383, 4179, 223, 1108, 4535, 4536, 5717, 7035, 5719, 5012, 5297, 5299, 1283, 4860, 437, 5027, 5315, 7404, 7449, 7564, 4568, 6710, 6936, 6010, 1748, 6570, 1872, 1527, 5853, 5854, 6203, 4885, 5050, 1144, 570, 3644, 402, 763, 4602, 2574, 6124, 2784, 2785, 2974, 209, 238, 2458, 3507, 1543, 7441, 1915, 4768, 787, 2812, 3954, 4772, 5218, 5219, 323, 2609, 3007, 4778, 5567, 6241, 457, 2483, 1351, 6143, 3204, 944, 3369, 6146, 5121, 6647, 6761, 6876, 5667, 6377, 3870, 1963, 3883]. **multiple** [4352, 3073, 3892, 4021, 5298, 827, 6709, 2239, 2240, 3296, 6944, 578, 4600, 4601, 6021, 3670, 4273, 2593, 2594, 4456, 2020, 293, 4288, 5105, 5657, 2303, 1352, 5381, 4148, 4648, 1098, 4899]. **multiple-access** [4648]. **Multiple-Bit** [570, 2483]. **Multiple-length** [3232]. **multiple-modulus** [1963]. **Multiple-Precision** [862, 954, 1099, 1100, 1193, 5909, 4535, 4536, 7035, 5012, 5297, 5299, 5027, 5315, 4568, 6710, 1748, 6570, 4885, 5050, 3644, 763, 2784, 2785, 238, 2812, 3954, 4772, 5567, 6647, 6761, 6876, 5667, 299, 4979, 6508, 863, 955, 6936, 6010, 4602, 4778, 5298, 6709, 2239, 2240, 578, 4600, 4601, 6021, 293, 4288, 5105, 5657, 1352]. **multiple-precision-arithmetic** [3073]. **Multiple-Radix** [5717]. **Multiple-Valued** [7404, 7449, 7564, 7441, 1527, 3296, 3670, 2020]. **Multiple/arbitrary** [5853]. **Multiples** [5351, 2869]. **Multiplexed** [970, 1149, 1656, 2245]. **Multiplexor** [4101, 3495]. **Multiplexor-Based** [4101]. **multiplicand** [6481, 5389]. **Multiplication** [1361, 5393, 6880, 4301, 1188, 1261, 6, 7, 14, 5816, 6891, 5134, 3726, 4314, 4978, 5478, 5899, 6157, 665, 3230, 726, 1952, 727, 4515, 4980, 3231, 6783, 808, 5685, 1493, 464, 4985, 5398, 864, 5694, 6164, 814, 5405, 5701, 5490, 5907, 611, 4334, 5705, 6166, 4679, 5276, 5277, 3875, 1106, 2877, 6174, 6282, 5281, 5913, 672,

4835, 5287, 5411, 7034, 6071, 6809, 5601, 5719, 6178, 5007, 5294, 5414, 5512, 125, 2696, 4022, 4189, 2895, 5157, 5296, 819, 507, 4193, 5517, 4360, 176, 5929, 4363, 5930, 967, 1033, 6294, 6079, 4036, 6080, 7046, 5524, 6545, 6698, 6296, 200, 5932]. **Multiplication** [5527, 5733, 469, 4209, 1295, 681, 436, 6554, 4563, 5737, 3617, 5741, 6435, 5743, 5534, 7059, 344, 973, 6567, 4058, 1306, 5423, 683, 256, 4232, 5321, 4386, 6572, 6938, 6716, 5614, 1422, 3120, 4392, 286, 4880, 829, 4577, 6940, 5854, 6203, 6323, 6448, 4580, 6450, 4072, 5858, 6581, 142, 1144, 5622, 570, 6339, 4245, 1759, 2430, 2254, 5194, 639, 355, 263, 264, 3140, 6117, 266, 1893, 4418, 4603, 6119, 6355, 1894, 2572, 6219, 6025, 4426, 7163, 4427, 2968, 1323, 1659, 4429, 4605, 3497, 3498, 4432, 4433, 4609, 5965, 4614, 6357, 703, 6133, 4277, 4443, 123, 1676, 1677, 925]. **Multiplication** [6477, 4449, 4624, 1915, 1544, 5648, 3173, 3686, 4116, 4282, 4765, 4453, 5880, 712, 7115, 1247, 5651, 5564, 787, 2152, 3833, 1070, 6139, 3192, 3838, 5373, 5230, 5374, 167, 939, 6987, 4472, 940, 491, 6378, 6868, 6037, 6869, 2838, 4479, 4950, 1477, 1706, 459, 4482, 5240, 4483, 7129, 6040, 4491, 6760, 5391, 4152, 5248, 5832, 6651, 951, 2180, 6501, 3864, 4663, 5256, 5257, 1263, 1575, 3982, 2869, 5261, 90, 4671, 5265, 4812, 7020, 7021, 2193, 2661, 6900, 5271, 3414, 3578, 2516, 1592, 6527, 5148, 6410, 3246, 5408, 6920, 6416, 5002, 6418, 3078, 2363, 2526, 2695, 4699, 2214, 3592]. **multiplication** [3593, 4027, 821, 4029, 4196, 2075, 4707, 5301, 5302, 620, 2219, 968, 1845, 3262, 6549, 6550, 6702, 7152, 6092, 101, 6936, 3772, 5747, 6314, 4724, 5034, 4726, 5037, 4234, 2243, 2926, 3123, 3300, 4403, 4585, 4409, 2559, 4410, 5430, 6111, 3642, 3924, 2112, 4892, 2434, 4897, 2762, 4751, 5782, 5873, 5963, 6126, 6223, 3499, 2787, 4754, 4434, 2454, 4273, 27, 6228, 4758, 4759, 4921, 7103, 5877, 3943, 779, 654, 3947, 4930, 6136, 6481, 2809, 5364, 5652, 3697, 2468, 3832, 5883, 4132, 1928, 2818, 3008, 3009, 3958, 5105, 4779, 1074, 5801, 3534, 493, 5381, 3205, 3846, 5241, 5386, 5120, 5389]. **multiplication** [3380, 5666, 2633, 3381, 4959, 5125, 7118, 372, 3720]. **Multiplication-Add** [4334]. **Multiplication-free** [4950, 5430]. **multiplication/division** [4724, 5034]. **Multiplication/Division/Square** [2430]. **Multiplications** [4012, 6177, 4856, 6302, 5167, 5313, 3802, 6124, 4748, 6968, 767, 2483, 3539, 5679, 5702, 6082, 4258, 2818]. **Multiplicative** [1012, 4996, 6000, 4369, 5060, 6115, 6355, 6028, 6608, 3524, 6643, 610, 1109, 1110, 4701, 5304, 1612, 3772, 2628, 3028]. **Multiplier** [1563, 6147, 4654, 5587, 1566, 3977, 4310, 330, 463, 7011, 1573, 3982, 4515, 3869, 1196, 6902, 5274, 5496, 5498, 5406, 198, 3423, 6169, 1596, 1831, 6171, 6921, 504, 3077, 6689, 425, 508, 111, 431, 6181, 1515, 4547, 621, 1609, 1843, 4200, 5415, 969, 4366, 5730, 5024, 5530, 4866, 5738, 3274, 139, 5028, 310, 1305, 7060, 140, 5180, 6830, 6937, 1043, 230, 4387, 5615, 3299, 4575, 113, 232, 4729, 6102, 313, 2104, 4406, 6337, 128, 3480, 444, 912, 2437, 5552, 1150, 103, 6601, 6958, 5436, 367, 478, 6848, 698, 5206, 988, 649, 184, 5210, 1668, 1912, 2011, 585, 6972, 5878]. **Multiplier** [5360, 4450, 165, 5361, 3826, 5793, 6614, 5881, 1779, 2150, 1548, 3957, 1549, 4776, 793, 2155, 5567, 1551, 1552, 1696, 4467, 5569, 6867, 6988, 325, 5887, 5665, 3536, 150, 2034, 2169, 4485, 7170, 4299, 3541, 6759, 6876, 6996, 3385, 7000, 803, 5671, 3545, 2637, 2192, 3236, 4990, 3422, 2890, 6072, 4191, 5010, 4192, 674, 3084, 1846, 2382, 2904, 3090, 4213, 3271, 2543, 4720, 1858, 4048, 5536,

3296, 4874, 4576, 4730, 2421, 4239, 4582, 2940, 2752, 2113, 3649, 4891, 2764, 3143, 2961, 2263, 3319, 3495, 3669, 3935, 3670, 4098, 648, 7100, 4620, 5971, 7107, 2598, 2284, 3342, 3178, 2471, 3189, 5220, 4129, 4463]. **multiplier** [1794, 3023, 1799, 4643, 4644, 4645, 2852, 2314]. **Multiplier-Accumulator** [3869, 4776]. **Multiplier-Based** [4515]. **Multiplier-Dividers** [5587]. **multiplier-Free** [7107]. **multiplier/accumulator** [3319]. **Multiplier/Divider** [3077, 2034, 2382]. **Multiplier/shifter** [2437]. **Multiplier/Squarer** [4387, 4239]. **Multiplierless** [6091, 5381]. **Multipliers** [6879, 2316, 3717, 7009, 2044, 5588, 3402, 4804, 5396, 3051, 4321, 6669, 6790, 7019, 3734, 4679, 4524, 2059, 6281, 333, 1595, 1829, 5717, 1600, 5998, 6926, 4187, 5295, 1604, 6541, 5724, 879, 7043, 557, 7150, 5607, 1218, 6199, 3295, 6573, 3780, 5186, 6324, 6447, 5764, 4401, 7158, 6836, 6338, 6584, 6838, 3641, 4080, 6347, 3147, 6732, 1056, 1153, 2131, 5447, 4760, 1676, 6477, 2462, 5792, 4280, 1778, 589, 3520, 1068, 132, 7124, 5572, 5379, 5659, 6638, 4477, 5114, 4641, 4783, 5115, 6991, 6992, 4297, 3377, 2849, 6995, 7131, 6531, 3855, 3389, 2644, 3403, 5400, 2203, 2347, 4839]. **multipliers** [5003, 4542, 4035, 5161, 2905, 2226, 3282, 5172, 3914, 5048, 3129, 3795, 3803, 4260, 3668, 5872, 2577, 4096, 4917, 5446, 7166, 4761, 4920, 5083, 4763, 5091, 2994, 2995, 3955, 4461, 4936, 2835, 3200, 5660, 2489, 3535, 1178, 3968, 3969]. **multiplies** [1517]. **Multiplikation** [1824, 654, 1477]. **Multiplikationsprogramme** [1759]. **Multiply** [6044, 2040, 6505, 5485, 2052, 3055, 4987, 6274, 6404, 6523, 5497, 4997, 876, 6423, 5165, 5025, 2542, 6705, 5315, 3456, 6827, 6439, 6442, 3907, 5323, 4395, 754, 755, 5333, 5334, 5335, 3128, 5772, 6736, 3156, 1665, 5559, 5637, 5444, 5445, 5084, 6973, 6977, 4768, 655, 7120, 5975, 3833, 6240, 5570, 3532, 6382, 6647, 6648, 6761, 2172, 4498, 3390, 4517, 2333, 4813, 5695, 3059, 1594, 1602, 5018, 4038, 4567, 1620, 3621, 5029, 4581, 4883, 4079, 6016, 6113, 2951, 5062, 4747, 3678, 5646, 4775, 4778, 4947, 1705, 3025]. **Multiply-Accumulate** [4997, 6423, 6827, 6736, 6977, 3833, 6648, 6761]. **multiply-accumulator** [4778]. **Multiply-Add** [6505, 5485, 4987, 5497, 2542, 5315, 3456, 3907, 4395, 3128, 5772, 5637, 5444, 5445, 5084, 6973, 4768, 7120, 6240, 6647, 5025, 3156, 2333, 4813, 3059, 4038, 4567, 4581, 4079, 6016, 5062, 4747, 4947]. **Multiply-Add-Fused** [5333, 5334, 5335, 4883, 4775]. **Multiply-Addition** [2040]. **multiply-additions** [3621]. **multiply-adds** [6113]. **Multiply-by-Three** [876]. **multiply/add** [1705]. **Multiplying** [1588, 3532, 3215, 3383, 4698, 3375]. **MultiPosits** [6945]. **Multiprecise** [2335]. **Multiprecision** [6494, 2865, 2866, 3041, 3395, 6675, 4178, 5728, 6088, 6307, 6092, 3622, 6339, 5344, 1775, 3819, 4007, 5511, 6306, 3123, 3300, 4237, 4396, 2113, 5972, 5457, 2465]. **Multiprocessor** [2720, 2146, 1723, 5204, 5804]. **Multiprocessors** [3388, 1859, 2624]. **multiPULPly** [6809]. **multipurpose** [2499]. **Multispeculative** [6171]. **Multistep** [2424]. **MultiTitan** [2066, 2232]. **multivalued** [3246]. **Multivariable** [1140]. **Multivariate** [2927, 3945, 6356, 6467, 3944]. **Munich** [7530, 7597]. **muP** [2530]. **Must** [6460, 3037, 3713]. **MWSCAS** [7589]. **My** [5889, 3216, 6190]. **mystery** [2153].

N [340, 341, 6846, 531, 1160, 3097]. **N.** [2471]. **N.A.P** [400]. **N1154** [5175]. **N1161** [5176]. **N1176** [5177]. **Nīlakantha** [4042]. **NaBIC** [7576]. **NAF** [4748]. **Names** [4381, 3493]. **NAN** [6691, 7042, 7146, 6405, 5570]. **Nancy** [7542]. **nano** [7162]. **nano-scale** [7162]. **nanoelectronics** [7563]. **nanometer** [7511]. **Nanosecond** [3436, 3594, 1934, 2187]. **NaNs** [4025, 3675]. **Napa** [7514, 7399, 7419, 7426, 7440, 7493, 7552, 7568]. **Narrow** [3636, 2631]. **Narrow-Band** [2631]. **Narrowing** [3615]. **Nat** [4139]. **National** [2041, 2862, 7328, 2757, 7274, 1951, 5118]. **Native** [6690, 5106]. **Natural** [4062, 6204, 6592, 5704, 8, 3508]. **Naturally** [5014]. **Nature** [7576, 6129, 4552, 4437]. **Navier** [3574, 4142]. **Navy** [7181, 3953]. **Nb** [5756]. **NBSF** [2615]. **NC** [2504]. **NDRAM** [3753]. **Near** [3584, 1606, 1525, 3674, 1062, 6394, 4579, 1943]. **Near-optimal** [1062, 6394]. **near-optimum** [1943]. **Near-Perfect** [1606]. **Nearest** [6784, 6191, 6192, 5761, 5852, 5454, 5560, 5967]. **Nears** [3753]. **nebst** [586]. **Necessary** [4519, 4068, 767, 3528, 4293]. **Need** [1715, 1417, 6967, 5371, 3844, 5931]. **Needed** [1289, 5848, 3493, 3498, 532, 786, 5212]. **Needle** [4225]. **Needle-like** [4225]. **needlessly** [4291]. **needs** [3095, 3096]. **Neergaard** [531]. **Negabinary** [803, 1081, 1259, 1361, 1372]. **Negabinary-Binary** [1259]. **Negative** [851, 815, 424, 279, 1424, 631, 647, 4614, 775, 776, 5372, 148, 658, 601, 4533, 5774, 146]. **Negativo** [3]. **Negativo-Affirmative** [3]. **Negotiating** [2758]. **Nekotorye** [2327]. **Nervana** [6703]. **nescit** [2]. **Net** [3753]. **Netherlands** [7557, 7375, 7433, 7364, 7622, 7500]. **Nets** [6849, 594, 2165]. **Network** [7428, 6879, 7133, 6519, 6904, 6918, 7036, 6546, 6703, 7062, 1634, 4391, 6325, 6726, 6118, 7088, 6846, 6969, 6761, 3719, 3856, 2909, 7100, 5100, 4955]. **Networking** [7541, 7621]. **Networks** [6491, 7528, 7136, 6515, 6520, 6407, 6679, 6681, 1104, 6411, 818, 870, 2893, 7034, 6809, 3430, 6423, 6815, 6816, 6823, 1623, 6572, 6573, 6938, 6834, 6586, 6839, 913, 7089, 6968, 6853, 6860, 7119, 6747, 6620, 2196, 3058, 6680, 6796, 4027, 2717, 3793, 6960, 6750, 3836, 2854, 6486]. **Neue** [1485]. **Neuenahr** [7279]. **Neumann** [7288, 6287, 676, 5729, 5844, 6301, 3773, 567, 7184, 7185, 7186, 7188, 7190, 7191]. **Neural** [6879, 7133, 6491, 7136, 6515, 6519, 6520, 6407, 6679, 6681, 6904, 6411, 6918, 7034, 7036, 6809, 6423, 6815, 6816, 6546, 6703, 7062, 6572, 6573, 6938, 4391, 6325, 6834, 6586, 6839, 6726, 7088, 7089, 6846, 6968, 6969, 6853, 7119, 6620, 6486, 6761, 3058, 6680, 6796, 2909, 6704, 6960, 7100, 3509, 6750, 2854]. **Neuromorphic** [6462]. **Neuroprocessors** [5982]. **Nevada** [7316, 7528, 7193, 7203]. **Never** [5714]. **Neville** [6685]. **New-Generation** [5625]. **Newcomb** [5448]. **Newest** [2310, 3356]. **Newman** [2822]. **News** [3753, 6716, 2629]. **Newton** [3546, 7010, 6394, 4801, 7016, 6787, 813, 4004, 6000, 5299, 4198, 4864, 5026, 6009, 3290, 3294, 519, 5183, 5624, 1318, 2766, 2957, 3311, 452, 5958, 580, 2975, 582, 6852, 6368, 3346, 533, 4137, 4471, 6870, 6643, 4949, 5116, 5384, 3540, 3382, 6685]. **Newtonian** [6799]. **Newtonlike** [1708]. **Next** [7616, 6187, 6297, 7618, 7625, 7627, 6934, 5611, 5468, 2650, 3439, 7433, 2569, 3373]. **Next-Generation** [5611, 5468]. **Nice** [2357]. **Nicholas** [510]. **Nicht** [1812, 159]. **Nicht-Standardfunktionen** [1812]. **NIL** [1330]. **Nimble** [7004, 7175]. **Ninth** [7429, 7408, 7453]. **NIOS** [5599, 5008]. **Nis** [7593]. **NJ**

[7200]. **NLMS** [4898]. **nm** [5672, 6675, 7099, 6978]. **NN** [6897]. **NNP** [6703]. **NNP-T** [6703]. **No** [1484, 597, 4962, 2038, 1296, 2092, 6460]. **No.95** [7333]. **Nodes** [6815, 6816, 2683, 6346]. **Noise** [1490, 3406, 809, 5841, 2714, 3301, 789, 2998, 3731, 674, 736, 820, 3265, 3607, 2923, 3293, 2407, 1226, 1227, 896, 2557, 2457, 2592, 2802, 840, 2986, 1066, 3840, 2482, 541, 542, 543, 2628, 2630, 2495]. **noise-tolerant** [3840]. **noises** [3841]. **nombres** [6273, 3602, 7215]. **Non** [378, 853, 6799, 5927, 506, 6694, 1286, 6545, 4722, 1632, 3633, 1312, 6337, 4244, 6726, 6465, 3496, 5788, 6241, 191, 5119, 1805, 6264, 1264, 6276, 5709, 4533, 3252, 3253, 5839, 5164, 3897, 2912, 3289, 3639, 3792, 6975, 6370, 2619]. **Non-Analytical** [191]. **Non-binary** [4244, 6264, 3289]. **non-computable** [5164]. **Non-Coprime** [6545]. **non-decimal** [1805]. **non-determinism** [6276]. **non-floats** [6370]. **Non-IEEE** [4722]. **Non-Iterative** [6241]. **Non-Linear** [5927, 5788, 6975]. **Non-Linear/Linear** [5927]. **non-local** [5839]. **non-negative** [4533]. **Non-Newtonian** [6799]. **non-normal** [2619]. **Non-Normalized** [6694]. **non-numeric** [5709]. **Non-Overflow** [1286]. **non-pairwise-prime** [1264]. **Non-Recursive** [6337]. **Non-Redundant** [1632, 3252, 3253]. **Non-Restoring** [6465, 3496, 853, 1312, 3639, 3792]. **non-significant** [3897]. **Non-Smooth** [3633]. **Non-standard** [506]. **non-strict** [2912]. **Non-traditional** [5119]. **Non-Underflow** [1286]. **Non-Volatile** [6726]. **Nonbinary** [1919]. **nonclassical** [2703]. **Nondecimal** [623, 1400]. **Nonlinear** [7013, 6503, 3586, 7144, 738, 3458, 3633, 2955, 3688, 3712, 4484, 3794, 759, 5345, 947]. **nonrectangular** [3348]. **nonrecursive** [2245]. **nonredundant** [3961]. **Nonrestoring** [858, 1582, 671, 638, 650, 1354, 1891, 1065, 3177]. **Nonscalar** [767]. **Nonspeculative** [5732]. **Nonstandard** [1812, 1258]. **Nonsupersingular** [3140]. **Nord** [646]. **Nord-2B** [646]. **Nordsieck** [441]. **Norfolk** [7381]. **Norm** [1093, 4133, 6428]. **Normal** [7005, 1490, 5694, 6177, 5296, 4580, 6596, 5628, 6355, 182, 4426, 4277, 4443, 6608, 5148, 3587, 2226, 3914, 4730, 3795, 4260, 4758, 4759, 4761, 4920, 5083, 4463, 2617, 2618, 2619, 2489]. **normalisée** [4357]. **normality** [5644]. **Normalization** [2061, 967, 1033, 439, 2012, 1941, 2171, 1586, 1833, 4036, 1612, 3706]. **Normalized** [6694, 178, 1235, 1457, 3413, 312, 4576, 477]. **Normalizing** [6293, 3088, 5772]. **Norms** [5692, 5495, 6081]. **normwise** [5923]. **Northcon** [7363]. **Northcon/92** [7363]. **Northeast** [7260, 7284]. **Northeast-83** [7260]. **Northeast-86** [7284]. **Northeast/83** [7260]. **Northern** [7471, 7587]. **Norwegian** [1740]. **Notation** [4689, 6132, 1336, 312, 5551]. **notations** [4808]. **notch** [2967]. **Note** [1006, 3978, 275, 223, 278, 125, 175, 158, 969, 513, 342, 561, 82, 343, 744, 202, 362, 8, 919, 1670, 3817, 708, 712, 1924, 2023, 3019, 2309, 5469, 6145, 4489, 950, 7173, 4327, 116, 2886, 4557, 1975, 1625, 1228, 6722, 6833, 3645, 757, 1669, 3197, 78, 1253]. **Notes** [195, 669, 52, 36, 26, 344, 2394, 4052, 3774, 30, 207, 1670, 742, 3626, 5332, 7161]. **Nothing** [2093, 4062, 6962]. **notice** [6254, 6657, 6769, 6622]. **Notwendigkeit** [405]. **Nov** [7509]. **Novel** [804, 4317, 6681, 6808, 876, 6698, 3276, 2729, 6827, 2108, 6355, 4096, 4263, 2801, 3678, 6741, 4621, 5231, 5232, 5380, 6869, 6040, 4657, 6072, 2945, 5631, 5971, 4775, 4951]. **November** [7316, 7457, 7541, 7193,

7203, 7458, 7605, 7227, 7300, 7318, 7329, 7424, 7302, 7218, 7224, 7305, 7347, 7403, 7489, 7621, 7241, 7272, 7438, 7308, 7439, 7463, 7479, 7492, 7506, 7574, 7586, 7615, 7246, 7261, 7408, 7420, 7286, 7314, 7342, 4899]. **NPB** [6677]. **NPL** [946]. **NPU** [6990]. **ns** [1486, 3271, 3481, 649, 2841, 2842]. **NS16000** [1643]. **NS16081** [1643]. **NS32000** [1953]. **NS32081** [1971, 2017]. **NS32381** [1951]. **NS32532** [2186, 2227]. **NS32532-NS32580** [2186]. **NS32580** [2186]. **NSA** [1645]. **NSW** [7306]. **NTRU** [4751]. **NTT** [6783, 6940, 6760]. **NTT-Based** [6940, 6760, 6783]. **NTT-Uncoupled** [6760]. **NTTU** [6760]. **NU** [1363]. **Nuclear** [7355]. **Null** [391]. **Nullstellensätze** [4069]. **Number** [5670, 6042, 6880, 7133, 3548, 3722, 1487, 3723, 4508, 4661, 4971, 4972, 5476, 5677, 5678, 6499, 6665, 6892, 219, 855, 3863, 4314, 4977, 6780, 497, 666, 804, 857, 725, 806, 1091, 1576, 7014, 6160, 6055, 5690, 728, 6901, 6519, 1958, 3869, 4991, 612, 220, 1276, 1596, 5831, 5503, 672, 7143, 6532, 3584, 3744, 4014, 4354, 6415, 3889, 1202, 3430, 6289, 3080, 5515, 433, 177, 337, 338, 6931, 6078, 885, 1743, 253, 2078, 5023, 5734, 561, 1213, 1293, 7572, 6431, 5314, 1618, 6194, 6441, 1626, 1135, 1136, 1306, 3776, 202, 347, 1419, 1632, 3464, 5181, 750, 828, 6717, 6939]. **Number** [203, 6445, 1138, 1424, 1876, 5618, 5943, 753, 5855, 5947, 25, 1048, 1231, 4732, 288, 6835, 4076, 5053, 906, 685, 6586, 6839, 7076, 5341, 5196, 4595, 692, 1148, 1889, 4598, 3141, 6952, 2953, 318, 1650, 3489, 5072, 915, 3931, 1153, 919, 3494, 2782, 1440, 3498, 3327, 3328, 4431, 4607, 2580, 4100, 4270, 988, 1156, 767, 1907, 3334, 3162, 3501, 1674, 6852, 1912, 6854, 1540, 5878, 709, 455, 485, 6236, 3344, 1917, 532, 786, 2150, 7119, 1169, 6747, 4632, 4635, 2609, 938, 1248, 5372, 3959, 2475, 2299, 5885, 939, 2029, 1251, 6634, 2834, 2161, 6381, 5661, 3536, 3024, 5121, 797]. **Number** [4649, 598, 3027, 7215, 2634, 3214, 3386, 3387, 4961, 4962, 4498, 1711, 4304, 4657, 3547, 2642, 2319, 3861, 4662, 5896, 4795, 6264, 3561, 6392, 2181, 1089, 1262, 1489, 2045, 2047, 2325, 1264, 3228, 3229, 1811, 1949, 3048, 3049, 1714, 4167, 3865, 5590, 6273, 3988, 3733, 4674, 4675, 4816, 2196, 2200, 4170, 4522, 956, 2057, 4677, 5271, 2338, 2512, 2673, 2674, 2675, 2676, 2513, 3239, 3240, 3575, 3576, 3577, 3993, 4680, 3739, 4528, 6062, 1827, 4182, 5713, 1109, 1110, 4350, 2353, 2889, 3072, 3252, 3253, 3585, 3743, 3886, 3747, 3888, 1278, 4026, 4356, 2700, 2701, 4029, 4196]. **number** [2371, 2705, 2899, 2372, 3894, 3597, 226, 2373, 2375, 2710, 252, 1035, 1210, 2379, 2380, 1292, 5025, 7547, 3446, 3447, 3448, 3449, 2384, 4565, 626, 5169, 5739, 1411, 2724, 3903, 6438, 4379, 1039, 1221, 1303, 1415, 1416, 1523, 1524, 1869, 2230, 1985, 2919, 3110, 2234, 1040, 257, 888, 4233, 2734, 3113, 3114, 3115, 3116, 312, 231, 2417, 2930, 3124, 1877, 1989, 1990, 1991, 1992, 2245, 2246, 2418, 2419, 2931, 2745, 2933, 2421, 2746, 2422, 1230, 3788, 3920, 4078, 4243, 5192, 1755, 2752, 2945, 4248, 4249, 4250, 4411, 4412, 4413, 4594, 4890, 4081, 4251, 5863, 2431, 2114, 575, 5774, 5626]. **number** [1763, 3926, 5071, 5556, 6733, 5073, 7087, 236, 4425, 4746, 2451, 3322, 3323, 2971, 2972, 4096, 4262, 4263, 3157, 3329, 3330, 406, 3331, 3332, 3499, 1770, 1908, 5209, 6226, 4434, 4435, 4755, 2978, 2979, 3502, 3676, 527, 7101, 4275, 2456, 2591, 4276, 1537, 1910, 2010, 2458, 1450, 4442, 529, 4622, 2463, 3944, 5794, 5093, 3690, 1918, 3183, 2149, 5797, 2470, 2811, 2996, 3952, 4122, 4123, 4124, 1000, 1067,

1068, 1688, 1782, 1783, 2019, 2020, 5094, 2999, 3000, 4630, 3006, 188, 2608, 3007, 324, 1463, 1550, 3527, 3704, 1931, 2300, 2027, 5233, 2827, 3840, 1176, 5108]. **number** [3198, 4140, 4294, 2833, 3706, 2031, 3363, 3364, 3365, 5382, 148, 4481, 2839, 2844, 3211, 3212, 3378, 3379, 4147, 4148, 4149, 4487, 4488, 4646, 4647, 4648, 2846, 2847, 2848, 4955, 545, 801, 3028, 2855, 2856, 6878, 4817]. **Number-Theoretic** [4100, 4270]. **Numbers** [7497, 7542, 665, 1013, 4166, 39, 5137, 1493, 1095, 6395, 2507, 551, 5905, 6163, 3567, 6521, 6522, 7430, 4523, 1383, 2515, 6679, 332, 1389, 1108, 1829, 1830, 4344, 156, 6808, 4840, 6536, 673, 1207, 4849, 7509, 55, 878, 1516, 3755, 6695, 54, 3758, 6188, 7048, 2715, 559, 560, 41, 1212, 2540, 6821, 1976, 2544, 2719, 2910, 6192, 6194, 4219, 343, 5935, 6202, 6320, 4574, 7065, 1636, 6101, 260, 1529, 5547, 639, 686, 5864, 6592, 447, 2953, 4416, 2259, 3486, 6019, 115, 6023, 7085, 1152, 2784, 2785, 368, 4614, 1449, 3817, 1239, 6857, 185, 3945, 4926, 2150]. **Numbers** [6617, 2607, 4932, 5371, 3834, 3530, 1699, 3366, 6486, 6756, 1471, 1257, 661, 5981, 949, 1079, 4957, 6803, 5251, 3972, 6150, 3391, 4980, 2330, 3568, 4815, 6400, 5703, 5144, 2673, 2674, 2675, 5910, 4820, 4821, 2347, 5599, 2889, 5288, 3745, 2693, 2694, 2703, 2371, 137, 1404, 2377, 308, 2382, 1615, 6087, 4556, 4716, 5417, 1215, 1296, 138, 6190, 3278, 682, 1624, 256, 2100, 2740, 2926, 4879, 5041, 3468, 5326, 1994, 2934, 6328, 4074, 5623, 6588, 2255, 6214, 3135, 1435, 2952, 1319, 3654, 3487, 3310, 364, 5631, 2769, 3659, 8, 4754, 4271, 4437, 4914, 1333, 1064, 2598]. **numbers** [2145, 654, 711, 4119, 4766, 2805, 4455, 5652, 3189, 6982, 3005, 846, 5464, 5465, 6141, 3961, 850, 4950, 2307, 3375, 5246]. **numeral** [5551]. **Numerals** [877, 5551, 961]. **numerare** [2]. **Numeration** [7003, 1605, 512, 623, 1400, 96, 6983, 2703]. **numeri** [137, 138]. **Numeric** [2645, 1581, 6674, 3437, 893, 1044, 577, 1316, 2954, 2778, 1324, 1326, 1534, 2459, 929, 1687, 1936, 2477, 2508, 5709, 2368, 3762, 3444, 3608, 2751, 1321, 6356, 1663]. **Numerical** [7229, 2173, 5811, 7236, 7409, 4656, 4794, 496, 7482, 6050, 7400, 2868, 3045, 6157, 6895, 3729, 7423, 5484, 5689, 5904, 6269, 1716, 6673, 6520, 5592, 5594, 731, 1197, 6060, 7374, 7223, 1390, 817, 6063, 7031, 3251, 4351, 5919, 5835, 3586, 1601, 4019, 6925, 6813, 1840, 1208, 7209, 622, 1031, 62, 93, 3600, 7268, 3756, 6083, 6425, 2377, 5729, 5844, 6086, 3089, 254, 739, 1974, 82, 4371, 179, 3616, 4562, 126, 4374, 1132, 1520, 83, 1623, 7291, 4568, 398, 1525, 3910, 5033, 4230, 5424, 5942, 2555, 3122, 400, 975, 6205, 6943, 6107, 441, 1756, 204, 205, 1642, 6840, 6841]. **Numerical** [446, 317, 4083, 7278, 6596, 2960, 7090, 4430, 1327, 2276, 2980, 2981, 1237, 7248, 1062, 6030, 6359, 5362, 1342, 7190, 3198, 7324, 3843, 6374, 7340, 4945, 1702, 4142, 947, 1078, 7171, 719, 2312, 7215, 4492, 412, 74, 3853, 3217, 1084, 4160, 5987, 4665, 1813, 6276, 6678, 420, 6283, 6286, 6802, 6804, 1730, 3068, 5004, 511, 6076, 3754, 1127, 1739, 5162, 6084, 4212, 309, 6933, 825, 2081, 2907, 1216, 4377, 5174, 397, 3284, 7225, 2400, 473, 4063, 2408, 6723, 5860, 1638, 5548, 6593, 2763, 834, 5346, 5555, 697, 6960, 1328, 2585, 369, 1159, 4441, 2597, 841, 4773, 5095, 5096]. **numerical** [3701, 1252, 3849, 194, 545, 7269, 1855, 769, 7253]. **numerically** [6141]. **numérico** [4606]. **Numerics** [3721, 1947, 2179, 6507, 7445, 6818, 6436, 7476, 7566, 1657, 2777, 6966, 6470, 3030, 7410, 7555, 1957, 7477, 2815, 5226, 5234, 3225]. **Numerik** [1904, 2477].

Numerik-Prozessoren [1904]. **numérique** [2806, 7215]. **numériques** [2763]. **Numerische** [769]. **numerischen** [975, 1936]. **numerischer** [1237, 1062]. **NumPy** [6701]. **Nuprl** [2914]. **NV** [7414, 7274]. **Nvbit** [6640]. **NVIDIA** [6178, 6813, 7070, 6461, 5363, 6640, 5805, 7127, 6565].

O [6935, 3248]. **Oak** [7223]. **Obey** [5683, 661]. **Object** [6352, 3671, 5456, 3204]. **Object-Relational** [5456]. **Objectives** [634]. **objects** [4601, 4602, 3204]. **Obreschkoff** [4090]. **observed** [137]. **Obsolete** [3482]. **Obtaining** [5910, 5189, 5775, 6028, 652, 1844, 5190]. **OCAPI** [2715]. **Occurring** [5014]. **OCP** [7081]. **Oct** [7340]. **Octal** [267]. **October** [7526, 7555, 7355, 7373, 7357, 7482, 7300, 7318, 7375, 7228, 7283, 7304, 7323, 7358, 7360, 7435, 7488, 7517, 7561, 7583, 7363, 7242, 7380, 7452, 7463, 7615, 7567, 7367, 7408, 7481, 7539, 7313, 7384, 7296]. **Octocore** [5625]. **Octonary** [931]. **Octuple** [4532]. **Octuple-precision** [4532]. **Odd** [5397, 1276, 6029, 1919, 4810]. **Odd-Valued** [1276]. **oddification** [4506]. **odds** [2805]. **ODE** [5555]. **odor** [2690]. **OFDM** [5750, 5751]. **Off** [6896, 609, 278, 1112, 7145, 175, 882, 634, 204, 205, 2753, 315, 6345, 1671, 6619, 6373, 3530, 79, 603, 1186, 2174, 6051, 2323, 6269, 865, 1583, 6520, 956, 4008, 423, 1200, 4824, 4825, 6176, 4544, 3754, 5303, 968, 5744, 4054, 5420, 474, 5424, 1309, 1756, 1883, 2255, 3315, 6959, 1060, 2270, 53, 3951, 6137, 6138, 2024, 4134, 1937, 4140, 4294, 1183, 3247]. **offer** [7101]. **Offers** [6390]. **Official** [3857, 6496]. **Offs** [6236, 7000, 2516, 4183, 4750, 3846]. **Ofman** [4698]. **OFP8** [7081]. **often** [3440]. **Ohio** [7533]. **Oja** [3835]. **Okay** [5370]. **Old** [3566, 3283, 6512, 3949]. **Oldenburg** [7409, 7357]. **Olmo** [7290]. **Omnidirectional** [6487]. **Omura** [3090, 4620]. **on-chip** [2768]. **On-Device** [7088]. **on-fly** [5025]. **On-Line** [3227, 3402, 2893, 1116, 2072, 2212, 1402, 3268, 7432, 1623, 1533, 1441, 1661, 1447, 4440, 2155, 4135, 4466, 940, 1175, 2159, 2831, 1474, 1475, 1941, 2171, 6164, 1736, 2213, 4707, 1612, 2428, 3476, 4598, 4757, 4930, 1074, 2333, 2359, 2892, 821, 2382, 2244, 4881, 3314, 4266, 2604, 2478, 2830, 1472, 1473, 1704]. **On-the-Fly** [5907, 6171, 3752, 5900, 2071, 2361, 2894, 4733]. **One** [5585, 5131, 330, 6269, 811, 3874, 4527, 2537, 6559, 6825, 5173, 6944, 144, 915, 4430, 5080, 1777, 5102, 4476, 133, 3552, 3553, 3554, 3555, 3556, 3557, 4990, 3575, 3576, 3577, 3993, 4528, 4356, 391, 3627, 5442, 2800, 6368, 6746]. **One-Dimensional** [330]. **One-Hot** [3874, 4527, 3575, 3576, 3577, 3993]. **One-Megacycle** [133]. **One-Microsecond** [133]. **one-sided}** [5442]. **One-Step** [6269]. **One-Variable** [5102]. **Ones** [3419, 4397]. **OneSpin** [6390]. **Online** [6182, 5738, 2108, 5213, 5668, 3759]. **Only** [864, 1905, 4850, 1868, 2114, 5626, 4914, 3534, 5597]. **Ontario** [7558, 7330, 7348, 7438, 3191, 7382, 7383]. **OPAC** [2806, 2807, 2990, 2991]. **OPEN** [6404, 6495, 6897, 6179, 6293, 5033, 7073, 6948, 6949, 7099, 7312, 6512, 6196]. **Open-Architecture** [7312]. **Open-Source** [6179, 7073, 6948, 6949, 7099]. **OpenCL** [6220]. **OpenFOAM** [7138]. **OpenGL** [3857]. **OpenLibm** [6196]. **OpenVMS** [4504]. **Operand** [1087, 1394, 4842, 5292, 891, 1422, 5194, 6124, 4101, 5786, 5650, 787, 3838, 2838, 5888, 5240, 3409, 6072, 4843, 2903, 3772, 5196, 5872, 1683, 2287, 5097, 5099, 5462, 3958, 5568, 5806]. **operand-dependant** [5806]. **Operand-**

Optimized [5650]. **Operands** [723, 1806, 1573, 4696, 1405, 4570, 3305, 6235, 4476, 5578, 2528, 4698, 4192, 1412, 5220, 5225, 5366, 5367]. **Operating** [7315, 2714, 587, 2765, 1703]. **Operation** [247, 3066, 69, 2078, 4376, 106, 472, 972, 4868, 6199, 4395, 6235, 3689, 3833, 6645, 4486, 1486, 4169, 6540, 3649, 3176, 4630, 4775, 3837, 3207, 4650, 4790]. **Operational** [184, 114]. **Operationen** [1886]. **Operations** [5252, 6, 6390, 3558, 5820, 4977, 5135, 5480, 6506, 6784, 6670, 105, 196, 7141, 3235, 2060, 4005, 4994, 2063, 6411, 5917, 136, 199, 157, 6811, 6812, 388, 4856, 4364, 6819, 513, 6821, 5737, 6442, 6319, 1136, 2551, 5761, 1310, 5044, 6332, 1886, 181, 5549, 5431, 290, 6118, 7085, 3665, 3808, 121, 483, 122, 6475, 6033, 485, 7117, 4770, 6983, 5884, 2831, 5579, 5661, 6145, 5983, 1486, 2868, 3045, 2653, 4519, 4669, 4988, 6275, 4676, 6796, 1728, 4180, 4685, 422, 2349, 2348, 3069, 4016, 3591, 2538, 6007, 6440, 5320, 6446, 5619, 974, 6209, 4583, 3922, 2429, 6588]. **operations** [6116, 5867, 4608, 5353, 3329, 3330, 3675, 5787, 6227, 2138, 5082, 3174, 3175, 3002, 5224, 4777, 1249, 5229, 2832, 942, 2621, 3707, 4474, 6246, 3371, 4144, 1799]. **Operator** [4963, 6918, 6935, 4615, 1353, 2989, 4938, 5244, 5581]. **Operator-level** [6935]. **Operatorkonzepts** [1353]. **Operators** [3227, 4515, 2877, 7033, 4694, 3755, 5962, 7167, 7186, 5714, 3852, 5262, 5596, 5153, 4541, 2892, 5163, 6006, 7154, 2956, 7185]. **Opportunities** [6432, 6840]. **opposite** [3229]. **Optic** [1907]. **Optical** [3029, 2199, 2390, 2234, 1650, 6859, 2431]. **Optimal** [6045, 6492, 7009, 3862, 1494, 2049, 6790, 7019, 1269, 1195, 5296, 428, 6692, 620, 1129, 1211, 1290, 6186, 3459, 6313, 4224, 3632, 568, 2744, 6324, 6448, 4580, 3480, 1318, 2766, 452, 3657, 1903, 3329, 3330, 2975, 5636, 1668, 2596, 2986, 3346, 6136, 6369, 3955, 533, 1462, 1790, 6631, 2480, 493, 6645, 5117, 597, 4952, 1353, 4792, 5987, 3228, 6394, 5261, 667, 2204, 426, 6007, 3123, 4730, 1062, 4758, 1064, 2025, 4463, 1789, 4140, 4294, 4473, 6440, 751, 752, 894, 107]. **Optimale** [751, 752, 894, 107]. **optimalen** [1494]. **optimaler** [1211, 1062, 1790, 1353]. **optimisation** [4851]. **Optimised** [4436]. **Optimistic** [5319]. **Optimization** [3564, 6906, 6174, 6686, 7504, 3633, 6323, 6942, 978, 4599, 3496, 4608, 3158, 6849, 6605, 3680, 5792, 3696, 5576, 2667, 2348, 2688, 3892, 4021, 2709, 5020, 6824, 5612, 2407, 7067, 7088, 5352, 3341, 6034, 6237, 7112, 7504]. **Optimizations** [3979, 3437, 4197, 6203, 4621, 4489, 4671, 5781, 6222]. **optimize** [5856, 6371]. **Optimized** [4793, 3717, 6500, 6689, 6926, 5605, 4207, 6571, 6208, 6335, 6113, 2771, 6465, 6601, 7163, 7093, 7094, 5964, 7115, 5650, 6867, 3668, 5782, 4929, 3247]. **Optimizing** [5410, 6178, 509, 2368, 1849, 6296, 6006, 5313, 2558, 5049, 3307, 4904, 5210, 3355, 6865, 4144, 5808, 1496, 4541, 4238, 2824, 4293, 2621]. **Optimum** [852, 3545, 334, 5186, 2161, 2732, 1943]. **Options** [967, 1033, 2138, 2315]. **Optoelectronic** [4194, 6969, 3793]. **Oracle** [6999]. **Oracle-free** [6999]. **orbit** [2590]. **orbits** [7064]. **Order** [2635, 7398, 2050, 7470, 3581, 4835, 93, 3614, 4380, 1644, 1055, 6959, 2970, 3680, 1913, 4109, 4113, 6618, 2998, 7171, 74, 3047, 6396, 2353, 249, 3091, 5308, 3628, 1437, 4745, 3812, 6130, 3174, 3175, 5225, 4462, 4287, 3841, 3017, 3537, 2630]. **Ordered** [1260, 5865]. **Ordering** [2281, 3075, 2933]. **Ordinary** [7209, 179, 4090, 5164, 6704, 365]. **ordinateur** [3159]. **Ordinateurs** [487, 4518, 5826, 6273]. **Ordnance** [7181].

Oregon [7578, 7620, 7280]. **Organization** [7257, 7575, 6623, 4466, 1508, 1130, 1744, 2539, 3606, 4555, 206]. **organizations** [1853]. **organized** [7208, 7205]. **Organizing** [6847, 6915]. **Orientalist** [1322, 1167, 1467]. **orientation** [6224]. **Oriented** [7236, 4001, 1026, 5293, 6690, 4220, 3802, 2955, 2781, 1237, 4486, 1996, 4745, 847, 3840]. **origin** [401]. **original** [3982, 3303]. **Origins** [5729, 5844, 7219, 7247, 704, 705, 770, 991, 1236]. **Orlando** [7570, 7355, 7305, 7308, 7567, 7252]. **Orleans** [7343, 7302, 7257]. **Orthogonal** [2146, 373, 4512, 3585, 3886, 4646, 4647]. **Orthogonality** [1525, 2813]. **Orthogonalization** [4393, 5015]. **Orthonormal** [3767]. **OS/360** [563, 505, 440]. **Oscillations** [1055, 1277, 3754, 745, 1437]. **oscillator** [2858]. **Osnovy** [1246]. **OSR** [3993]. **osservati** [137]. **Other** [623, 1400, 1136, 6596, 3665, 3808, 7188, 4226, 4228, 235, 2778, 3329, 3330, 4125, 3204]. **otsenochnoi** [2327]. **Our** [14, 7331, 4734]. **Out-of-Order** [4380, 4109]. **out-of-order-execution** [3537]. **Outer** [3612, 4121]. **outline** [4004, 4647]. **Output** [1196, 1609, 5360, 1548, 538, 2486, 1879, 320, 3329, 3330, 6362, 1357]. **Outputs** [698]. **Over-Redundant** [6070, 3313, 3312, 3830]. **Over-Relaxation** [315]. **over-the-air** [4565]. **Over/Underflow** [345]. **overestimation** [5358]. **Overflow** [3551, 6499, 608, 1106, 6069, 136, 199, 1969, 3592, 7041, 1281, 4363, 1034, 1286, 1872, 3469, 901, 288, 289, 3138, 1055, 3817, 4282, 1696, 6145, 2848, 3027, 548, 1109, 1110, 5158, 5161, 257, 5332, 1430, 6015, 1435, 3820, 6986]. **Overflow-Free** [1696, 548]. **Overflow/Underflow** [3027, 2848, 1435]. **Overflow/Underflow-Free** [3027, 2848, 1435]. **Overflows** [5395, 1126, 5866, 6844, 1128, 6018]. **Overhead** [7070, 3797, 4904, 2842]. **Overlapped** [507, 3503, 2483, 3504, 1934, 2841]. **Overload** [2771]. **Overrelaxation** [1569]. **oversampling** [3576]. **Overscaling** [7011]. **overstates** [5894]. **'Overturned** [2961]. **'Overturned-stairs'** [2961]. **Overview** [722, 963, 1257, 1736, 4723]. **Own** [6298, 6299, 6756]. **Oxford** [4157, 4158, 7423].

P [1484, 6541, 1427, 6827, 1680]. **P-754** [1680]. **P-FMA** [6827]. **P1788** [5509]. **P3109** [7006, 7057]. **P6** [5375]. **p754** [1339, 6562, 1461, 5377]. **P754/D2.50** [6562]. **P854** [1786]. **PA** [7507, 3455, 7239, 3630]. **PA-8000** [3455]. **PA-RISC** [3630]. **PA7100** [3039]. **PaCAL** [6011]. **Pacific** [7300, 7318, 7329, 7424, 7377, 7447, 7521, 7272, 7439, 7452, 7463, 7479, 7492, 7506, 7574, 7586, 7615, 7367, 7408]. **Package** [2866, 331, 862, 1099, 1100, 1193, 1265, 2335, 3060, 3062, 2355, 1966, 2067, 963, 6075, 1870, 6011, 1886, 1532, 2141, 2812, 5565, 1003, 4510, 4973, 4974, 4976, 6779, 301, 1378, 3870, 503, 1409, 521, 3646, 980, 1357, 1561, 1098, 2305]. **Packages** [1107, 3428, 1738, 6594, 1492, 2315]. **Packard** [2225]. **Packed** [1493, 4530, 5179, 7130]. **Packet** [3798, 3805, 4259]. **Packet-Forwarding** [3798, 3805, 4259]. **packing** [4169, 1037]. **PACoGen** [6564]. **Padé** [2616]. **Pafos** [7448]. **Page** [6659, 6889, 6890, 6261, 6262, 6663, 6664, 6776, 6630]. **PageRank** [6697]. **pages** [3720, 4157, 4158]. **Painter** [3204]. **pair** [4048, 4124, 5366, 6635]. **Pair-HMM** [6635]. **Pairing** [5260, 5684, 5836, 4744]. **Pairing-Friendly** [5836]. **Pairs** [891, 5365, 4755, 4123]. **pairwise** [1264]. **Paleo** [5821].

Paleo-Mathematics [5821]. **Palletizing** [6487]. **Palmer** [7227]. **Palo** [7434, 7420]. **PAM** [6902]. **Panel** [6771, 4767]. **paper** [930, 214]. **Papers** [7298, 3858, 5254, 5255, 5475, 5673, 7288, 2664, 7300, 7329, 7445, 7204, 7239, 7271, 7303, 7603, 7415, 7272, 7595, 7310, 7219, 7247, 7221, 7623, 7216, 7254, 2066, 7213, 7322, 7334, 7345, 7358, 7402, 7403, 2232, 770, 991, 3182, 7465, 7325, 7421, 7456, 7614, 7501, 7625, 7572, 7600, 344, 207, 7396]. **PAPIA** [1817]. **Par'96** [7412]. **PARA** [7603]. **Paradigm** [7015, 1940, 4259]. **Paradoxes** [2403, 2549]. **Parallel** [3970, 1563, 5393, 6044, 6045, 5816, 3394, 219, 4978, 4315, 726, 4318, 7528, 6895, 3564, 1372, 3403, 808, 2506, 729, 6900, 1817, 7317, 1196, 5705, 3415, 4174, 5274, 4993, 1823, 4680, 5498, 1824, 2059, 6168, 6169, 6281, 333, 3065, 5280, 2882, 2685, 672, 1831, 2887, 3250, 6067, 7501, 6287, 6688, 2893, 6927, 5295, 7266, 425, 508, 4194, 4027, 1515, 1282, 1283, 879, 5929, 1843, 4856, 6079, 5932, 5527, 4371, 2720, 3274, 1618, 4566, 518, 7391, 7487, 5534, 6563, 7603, 5941, 6201, 4229, 2551, 4232, 3780, 5613, 4068, 4880, 829, 4577, 1311, 6330, 6106, 4401, 2938, 4406, 1529, 3792, 4409, 4244]. **Parallel** [2942, 2943, 1887, 144, 7089, 2775, 2965, 916, 6025, 4910, 6603, 6739, 1444, 3672, 5206, 7366, 5447, 6030, 4760, 123, 7249, 4763, 5451, 7250, 3172, 4283, 3688, 3177, 3825, 7455, 2602, 2992, 7381, 1548, 1780, 3520, 714, 5657, 3531, 5379, 5659, 4476, 5660, 3369, 1181, 3712, 2169, 7623, 4145, 4299, 3380, 3214, 2649, 2650, 7412, 1192, 1495, 4990, 2203, 5910, 6060, 2683, 3246, 2886, 3249, 3426, 4542, 6929, 5010, 3259, 4196, 4035, 7045, 2905, 3090, 4212, 3267, 2543, 5172, 3914, 4730, 5048, 1761, 5626, 2567, 2263, 3322, 3323, 3668, 3153, 3669, 4098, 5446, 3678, 7166, 4620, 4921]. **parallel** [4762, 3340, 2987, 4925, 3697, 5797, 2468, 4631, 3955, 4288, 3841, 2302, 7324, 3961, 3968, 3969, 4643, 5470, 4149, 4646, 4647, 2351, 2689, 3248]. **Parallel-array** [3792]. **Parallel-Prefix** [4229, 6739, 4476]. **Parallel-Verarbeitung** [2942, 2943]. **Parallelism** [3984, 869, 1842, 5330, 5334, 4615, 3217, 2229, 2979, 4298]. **Parallelizable** [4603]. **Parallelization** [5319, 4104]. **Parameter** [6166, 6723, 6040, 958]. **Parameterisable** [4583]. **Parameterized** [4513, 6403, 6096, 6827, 4584]. **Parameters** [1267, 2205, 1776, 1194, 1502, 5303]. **Parametric** [3755, 3229, 4700, 5009, 2630]. **parametrisable** [5153]. **Parametrized** [6741]. **Paranoia** [1871]. **parasitic** [1277]. **paraunitary** [3851]. **Pareto** [5074]. **Parhami** [4157, 4158]. **Paris** [7356, 7605, 7430, 7267]. **Park** [7214, 7587, 3701]. **Parkinson** [2496]. **Parliament** [3016]. **parsing** [6835, 7087]. **Part** [3421, 3582, 2222, 5744, 7603, 7622, 5949, 759, 481, 53, 6134, 5968, 1350, 2304, 2305, 2306, 2485, 2486, 7623, 3326, 5087, 5097, 5099, 6907, 6908, 6909, 6910, 6911, 6912, 2525, 63, 64, 65, 66, 67, 68, 3285, 4377, 5174, 3925, 4082, 5453, 5454, 5967, 7109, 7110]. **Partial** [6652, 860, 1014, 4000, 6171, 3589, 5007, 1286, 2083, 7059, 2126, 4436, 6992, 544, 3545, 461, 5404, 3598, 6112, 3668, 4752, 108, 2835, 3200]. **partially** [2869, 4745]. **particle** [5910]. **Particular** [1700]. **Particularly** [136]. **partielles** [108]. **Partition** [1821, 6181, 6025]. **Partitioned** [1413, 1522, 4234, 2287]. **Partitioning** [891, 1318]. **Partnership** [4927]. **Parts** [3550]. **Pascal** [159, 3121, 1353, 1469, 3089, 2735, 2736, 2925, 1690, 1938, 3563, 1728, 676, 159, 2400, 893, 3121, 2137, 2492, 718, 1469]. **Pascal-SC**

[1469, 1938, 1728, 2137, 1469]. **PASCAL-XSC** [3089, 2735, 2736, 2925, 3563]. **Paso** [7415]. **Pass** [3907, 3495]. **pass-transistor** [3495]. **passion** [7567]. **passive** [2200]. **Past** [480, 3384]. **Pat** [996]. **Patentees** [5370]. **Path** [3223, 4732, 6854, 4768, 5975, 4267]. **Pathology** [6509, 6493, 6877]. **Paths** [6939, 3960, 4541, 6193, 3803, 4762]. **Patriot** [2870, 2997]. **pattern** [3338, 2167]. **patterns** [3603]. **Paul** [5890, 5891]. **PBHD** [3737]. **PC** [3400, 2271, 2291, 2295, 2477, 2315]. **PC/AT** [2271]. **PC/AT-based** [2271]. **PC/XT/AT** [2477, 2477]. **PCA** [3836]. **PCs** [1998]. **PD77230** [2315]. **PDE** [1842, 5227]. **PDEs** [3348]. **PDP** [1508, 517, 696, 766]. **PDP-11** [1508]. **PDP-8s** [766]. **PDP-9** [517, 696]. **PDPU** [7073]. **Peak** [2965, 6143, 2509, 6414, 1853, 2405, 2406, 4944]. **Peculiar** [3638]. **PEGASE** [3574]. **Pegasus** [350]. **Pelikan** [7132]. **Pellet** [6394]. **Penalties** [4966]. **Pennsylvania** [7358, 7222]. **PeNSieve** [6733]. **Pentagonal** [560]. **Pentanomials** [5498, 5206, 4763]. **Pentium** [3392, 4660, 3724, 3727, 3565, 3580, 3417, 3418, 3738, 3876, 3749, 3437, 3440, 3453, 3454, 3486, 3505, 3506, 3349, 6746, 3355, 3190, 3848]. **Pentium4** [4725]. **Pentium(R)** [4805]. **Pentium(R)4** [4384]. **penultimate** [4747]. **PERC** [6752]. **Percentages** [1201, 451]. **PERCIVAL** [6948, 6949]. **Percola** [2265]. **Perfect** [2524, 1606, 2, 7132, 5149]. **Perfectly** [2182, 2606]. **Perfectus** [2]. **Perform** [377, 459, 2695, 4039, 2728]. **Performance** [7428, 7541, 1563, 3717, 3389, 5130, 5473, 2040, 4966, 3039, 1572, 2866, 4511, 1950, 1577, 4326, 1719, 2334, 5401, 5698, 3735, 4333, 6520, 3869, 4678, 4819, 418, 6903, 501, 2679, 3999, 4181, 7029, 2063, 6281, 3583, 3074, 1396, 5720, 5516, 3437, 2369, 4197, 1841, 338, 1849, 563, 2720, 5028, 7621, 4218, 5749, 6199, 6317, 1986, 6830, 6576, 6579, 6450, 5189, 5047, 2747, 2749, 2937, 4249, 6461, 6950, 6348, 318, 5868, 2774, 6221, 3491, 3663, 5076, 3939, 5637, 1242, 1334, 6362, 7105, 5971, 6236, 5089, 1779, 3524, 3698, 3699, 5463, 6374, 5379, 5575, 5659, 3963, 6991, 6992, 5805, 1798, 3217, 3222]. **performance** [3391, 5986, 4798, 6050, 2186, 4169, 1957, 4992, 4175, 4006, 5716, 4693, 5923, 2522, 2209, 5005, 4023, 6814, 5013, 2530, 4712, 4857, 4858, 1611, 4038, 1853, 2223, 2384, 3275, 4720, 3455, 2227, 2228, 4049, 5536, 4054, 3918, 5190, 2748, 4590, 5192, 6837, 4079, 4248, 2949, 5773, 2761, 2951, 3143, 2569, 3321, 4749, 5357, 5784, 2008, 2138, 7250, 3509, 2015, 3356, 2030, 4943, 4944, 6378, 6644, 3967, 3025, 3248]. **Performance-Driven** [5130, 6579]. **Performance-Efficiency** [6520]. **Performance-improved** [4678]. **Performance/area** [3389]. **Performance/Error** [6348]. **Performance/Power** [6221]. **Performances** [4326, 5338]. **Performing** [1261, 6275, 5309, 5761, 4016, 6588, 4098, 5224, 5386, 5389]. **performs** [1486, 1602]. **PERI** [6633, 6866]. **perilous** [5331]. **Period** [3831, 5288]. **Periodic** [5305, 7064, 7185, 1177]. **Periodicities** [892]. **periods** [4946]. **Peripheral** [1279, 1418]. **permanent** [3261]. **Permits** [3753]. **permitted** [1758]. **Permutation** [3274, 3793]. **Permutations** [6369]. **Perron** [548, 548]. **Personal** [1023, 1024, 1025, 1113, 3753, 1982, 1223, 1637]. **Perspective** [3984, 3987, 3790, 4402, 4741, 5550, 3665, 6605, 3208, 5289]. **Perspectives** [7600, 7477]. **Perturbation** [2357, 4631, 6580, 3343, 4771]. **Perturbations** [3201]. **Perturbing** [5004]. **Petascale** [5625]. **Pete** [5610, 5610]. **Peter**

[6789, 6476]. **Peters** [4681]. **Petri** [6849]. **peu** [6273]. **PFFT** [1713, 1382, 1587]. **PGM** [3274]. **Ph.D.** [7585]. **PHAc** [7117]. **phase** [3134]. **Phenomenon** [3901, 1146, 1909, 957]. **Phi** [6296, 5911]. **Philadelphia** [7239, 7507]. **Philosophy** [963]. **phone** [5424]. **Photomultiplier** [3397]. **Photoresistive** [463, 444]. **Physical** [6073, 5118]. **Physics** [3571, 6799, 10, 37, 5822, 6049, 3625]. **Pi** [5655, 409]. **Picture** [6131, 3204]. **PID** [6063]. **Piecewise** [6902, 7101]. **Piecewise-Linearly-Approximated** [6902]. **Pilot** [946, 5118]. **PINT** [297]. **pioneer** [5653]. **Pipeline** [871, 1882, 979, 6849, 2165, 3067, 4695, 2100, 2412, 2414, 5630, 4259, 4908, 2351]. **Pipelined** [1713, 4970, 5480, 2328, 2654, 6899, 7026, 3871, 4171, 1382, 1587, 4701, 875, 4194, 6541, 3894, 1423, 2416, 5335, 2253, 5057, 3798, 3805, 3667, 5078, 934, 5227, 4136, 7123, 5572, 3543, 5124, 3385, 4309, 2329, 2195, 3992, 3236, 1586, 3059, 4181, 3888, 5304, 3088, 4039, 2228, 4869, 2244, 2556, 3635, 4409, 4246, 910, 2000, 5434, 4924, 2284, 2989, 3179, 3180, 1783, 4468, 2351, 2763]. **pipelined-loop-compatible** [5434]. **Pipelines** [7040, 5772, 1658, 1901, 2763]. **Pipelinetechnik** [2100]. **Pipelining** [2893, 680, 3491, 5558, 5229, 2728]. **pires** [5100]. **Pisot** [4815]. **Pitfalls** [5140, 554, 131, 5347, 5348, 5432]. **Pittsburgh** [7358, 7222]. **PIU** [6860]. **Pivoting** [2083, 4786]. **Pixel** [6002, 3510, 4146]. **Pixel-Arithmetic** [6002]. **pixel-level** [4146]. **pixels** [3337]. **PL** [563, 6990]. **PL-NPU** [6990]. **PL/I** [563]. **PLA** [2364, 2527]. **Place** [7256, 7361, 6132, 3267]. **placement** [3545]. **Places** [1631]. **plain** [6549]. **Plains** [7326]. **PLAM** [6958]. **Plane** [295]. **planes** [4526]. **planetary** [2590]. **Planning** [246, 63, 64, 65, 66, 67, 68, 272]. **PLAs** [1181]. **Platform** [4659, 5790, 4636]. **platforms** [5204]. **PLAUs** [7085]. **Plaza** [7282]. **pLiner** [6700]. **PLL** [5794]. **PLM** [986]. **plotter** [529]. **plotting** [5215]. **Plovdiv** [7400]. **Plug** [1998]. **Plug-in** [1998]. **Plus** [6159, 5766, 5951, 1766, 4469, 4470]. **Plus-Minus** [6159]. **PLX** [4953, 4954]. **PMNS** [6919, 6922]. **PNCL** [1390]. **PNU** [6674]. **PNU-IP** [6674]. **Pocket** [932]. **Pod** [6965]. **Pod-racing** [6965]. **Point** [2041, 7008, 3970, 2635, 5811, 2037, 6490, 4653, 4964, 5252, 5812, 6043, 6148, 6654, 4499, 5584, 4654, 3854, 6881, 7004, 7175, 4502, 4965, 217, 3974, 5672, 6250, 6492, 7005, 6767, 6251, 5892, 1485, 2859, 2860, 2861, 3032, 3033, 3034, 3035, 3036, 3219, 3220, 3221, 3550, 4659, 5131, 5133, 6048, 6388, 6390, 6660, 7006, 5816, 5674, 5675, 5818, 5819, 169, 1804, 5134, 5897, 6778, 2322, 4975, 1368, 1809, 3397, 5988, 1013, 3398, 3399, 3981, 4163, 4164, 4165, 1950, 4513, 2328, 4320, 1951, 4800, 6781, 1577, 2505, 3730, 5686, 861, 1015, 1095, 2049, 2655, 2871, 4520]. **Point** [4521, 5263, 5483, 5688, 5902, 6054, 6055, 6056, 6395, 6668, 6784, 3405, 3406, 3407, 2052, 6057, 2507, 2053, 728, 2334, 5905, 6163, 1267, 1268, 1377, 4329, 6399, 6671, 7026, 3567, 6516, 5489, 247, 865, 5700, 171, 3235, 3412, 1498, 1499, 5403, 5143, 6675, 2666, 1584, 5592, 2670, 3573, 4334, 5492, 5829, 6902, 1271, 6277, 6406, 3996, 1725, 2515, 731, 1197, 1386, 1503, 1726, 2345, 3061, 3999, 6167, 4001, 1198, 1199, 1275, 1388, 1727, 5911, 3877, 4005, 5146, 5278, 5500, 5501, 2877, 4337, 3420, 3421, 3582, 2063, 3423, 6174, 6170, 3583, 3879, 3881, 4342, 6800, 2350, 2519, 2520, 6684, 4011]. **Point** [4012, 4344, 2208, 4831, 617, 2352, 2887, 3250, 4351, 4537, 4539, 4691, 4834,

5917, 5918, 6066, 6805, 6173, 1965, 6921, 5286, 1732, 5154, 6533, 5411, 3746, 4355, 6923, 6808, 1966, 2067, 502, 6176, 3889, 1733, 2891, 2893, 1968, 5413, 505, 1834, 6420, 6927, 6690, 4543, 5294, 5512, 3431, 3750, 4022, 4189, 3257, 5513, 1838, 6179, 2215, 1279, 6811, 6812, 963, 1512, 3432, 1204, 6538, 1514, 6180, 5603, 4195, 7040, 2217, 6539, 5012, 5837, 1280, 2218, 2897, 6292, 4545, 2704, 5721, 4360, 3260, 3753, 227, 228, 1608, 1971, 5518, 824, 878, 4034, 881, 1285, 6817, 1741, 2707, 2708, 4713, 966]. **Point** [5415, 5930, 6293, 6694, 967, 1033, 3895, 1403, 1610, 6695, 4364, 4553, 5523, 307, 678, 2221, 2222, 2378, 1849, 1850, 4201, 7047, 5730, 5731, 2714, 6187, 6297, 6298, 6299, 6302, 6819, 7149, 4862, 342, 970, 392, 393, 3442, 4041, 4204, 4205, 5306, 3899, 6548, 2540, 1036, 3611, 3093, 6821, 5607, 1616, 1976, 436, 6703, 4373, 971, 6556, 2542, 5737, 2544, 2719, 2910, 6191, 6705, 6309, 1301, 1410, 5315, 5846, 3902, 1132, 6194, 1619, 5171, 6561, 1861, 1862, 1863, 2088, 2089, 6562, 7056, 5176, 5746, 6708, 3104, 3105, 4218, 3283, 343, 1865, 5173, 6311, 5608, 6096, 2915]. **Point** [5935, 3106, 3107, 5749, 6312, 5537, 5752, 5754, 5936, 5938, 6313, 6441, 4380, 3907, 5538, 1304, 1627, 1222, 2397, 6200, 6317, 6714, 255, 6319, 1628, 5941, 6201, 345, 1224, 1308, 1417, 1987, 2236, 2921, 3774, 3908, 3909, 4227, 4381, 4570, 4870, 4871, 5032, 5422, 5848, 4384, 3776, 743, 746, 7061, 5319, 1871, 5758, 2551, 6571, 1751, 891, 1042, 5321, 3297, 5541, 4388, 828, 4235, 3467, 2413, 2929, 5324, 5325, 5852, 4393, 3783, 751, 752, 894, 1046, 753, 5854, 5945, 3301, 3917, 6578, 6579, 6720, 6941, 6942, 6326, 6105, 6204, 6329, 6331, 5189, 6451, 1637, 6108, 5047, 2106, 2747, 2749]. **Point** [2937, 5858, 6206, 4584, 4885, 5050, 6207, 6334, 6581, 5767, 5768, 4405, 1529, 441, 5333, 5334, 7070, 7072, 6211, 1142, 2108, 5193, 6014, 6457, 832, 905, 1431, 571, 5769, 6212, 3305, 2942, 2943, 2251, 2430, 6342, 6587, 2753, 4899, 2561, 6589, 640, 687, 2563, 5956, 6460, 1641, 2760, 7078, 1643, 5864, 6841, 4595, 526, 577, 3798, 403, 2568, 1149, 4415, 1999, 6349, 3483, 3144, 5628, 4416, 6462, 7082, 7160, 983, 5552, 5343, 3801, 450, 6019, 6020, 6352, 6353, 6354, 6598, 6599, 363, 4418, 4603, 2438, 5554, 1532, 1764, 6217, 642, 1896, 2120, 2262, 2442, 2443, 3149, 5068, 5632, 6219]. **Point** [6464, 1152, 2772, 7092, 4423, 2449, 2450, 6466, 6602, 6734, 5959, 916, 5075, 5960, 6026, 3805, 5202, 5351, 7091, 3493, 2781, 4093, 3663, 3665, 3667, 3808, 3809, 5078, 2575, 2970, 5962, 4430, 2784, 2785, 5437, 7094, 2004, 645, 1059, 1325, 2579, 2268, 4432, 4609, 4269, 6225, 6740, 1157, 1235, 1327, 5964, 6027, 2131, 7099, 702, 4272, 4438, 6028, 2792, 2793, 3160, 3674, 6607, 5559, 2796, 2981, 1773, 2588, 3163, 4916, 5637, 5444, 5445, 6471, 6472, 2278, 992, 7178, 2279, 1239, 3681, 922, 923, 6229, 2280, 994, 3166, 2281, 4621, 5638, 2282, 2804, 5085, 5453, 5454, 5640, 5969, 4278, 6743, 6477, 1541]. **Point** [6366, 1680, 454, 1681, 6367, 5792, 3946, 5087, 1544, 4109, 2600, 1455, 1776, 4927, 5089, 5361, 2288, 4117, 4454, 4768, 5090, 5793, 7109, 4628, 5092, 2991, 7114, 1777, 5650, 5881, 2601, 3693, 2467, 269, 212, 2992, 2018, 5796, 1687, 2812, 2998, 3186, 3187, 3188, 3352, 3698, 3699, 2293, 5974, 6239, 6981, 7120, 3353, 6137, 6138, 6619, 2021, 2022, 1690, 3003, 5975, 2607, 4932, 844, 1339, 1459, 1460, 1786, 5565, 3956, 3957, 5103, 1341, 4128, 5884, 3959, 1787, 5567, 2476, 2613, 2614, 3010, 5106, 5107, 1466, 5568, 6751, 1790, 5230, 5374, 6631, 3529, 4939, 6140, 6632, 4136, 593]. **Point** [3357, 4471, 6373, 6036, 7124, 6482,

1073, 5375, 2028, 849, 5569, 2829, 3530, 2831, 6753, 3360, 6374, 1350, 491, 5110, 5886, 6637, 3844, 3201, 6245, 6484, 2305, 3963, 6755, 215, 6382, 1470, 1702, 2623, 5116, 5239, 5383, 5384, 5578, 5579, 5661, 5664, 6486, 1557, 1355, 2034, 5805, 7127, 3019, 3020, 5979, 216, 3209, 2308, 6247, 4297, 6145, 1798, 4484, 5242, 7171, 2631, 800, 3027, 1707, 3541, 5390, 5808, 4151, 949, 1942, 6874, 6875, 5982, 6647, 5123, 5582, 5668, 5124, 5391, 5248, 6649, 5715, 5914, 6065, 6803, 4640, 6377, 4295, 2176, 4505, 3385, 5392, 663, 2858, 2636, 1944, 1945, 6488, 7002]. **point** [3972, 1565, 4500, 5671, 6249, 3031, 2174, 2175, 3719, 3856, 5472, 417, 5473, 3547, 6046, 6150, 6047, 721, 297, 1486, 2498, 2640, 3037, 3222, 3223, 3390, 3391, 3392, 3393, 4504, 6389, 6497, 6498, 7007, 2499, 1086, 1011, 1948, 2042, 5676, 1801, 2318, 1802, 1803, 1363, 2320, 1570, 1571, 2043, 2321, 4798, 6154, 4161, 4313, 1488, 2502, 2868, 3045, 5588, 5900, 2045, 1263, 1369, 1808, 2184, 2503, 2185, 1810, 5901, 4316, 2047, 2325, 7012, 2649, 3229, 3047, 2326, 4319, 5258, 5259, 1092, 2186, 1371, 7136, 2329, 5824, 4803, 2504, 1191, 5139, 3866, 2189, 2330, 6266]. **point** [6506, 2331, 2190, 2332, 2652, 2653, 3053, 1814, 4324, 4519, 4669, 4806, 4807, 4808, 5140, 5262, 5989, 6268, 7017, 3731, 7018, 1579, 1580, 1717, 300, 2191, 1719, 667, 5265, 5590, 4327, 3867, 1016, 4811, 5268, 5400, 5591, 7020, 7021, 7138, 2192, 1017, 1194, 6513, 4813, 4987, 6398, 5828, 6672, 3234, 4988, 3568, 2509, 1816, 4814, 2194, 2662, 7140, 6400, 6401, 1955, 6517, 1378, 6518, 3411, 6275, 1379, 4818, 4989, 2668, 3236, 380, 1586, 2669, 6402, 3870, 4992, 1819, 2058, 2672, 3737, 3872, 5908, 1381, 1723, 2204, 2673, 2674, 2675, 5991, 6059, 2341, 3058, 4525, 5497, 3994, 3059]. **point** [3995, 5992, 4820, 4821, 3998, 1502, 1590, 1825, 2206, 5499, 5708, 6168, 4178, 2681, 1105, 1962, 4004, 4687, 4532, 422, 2064, 5502, 3422, 5710, 3740, 2348, 2878, 2879, 2880, 3880, 4010, 3245, 6285, 2686, 6286, 5409, 5410, 960, 1277, 2688, 6412, 5995, 5716, 3067, 2886, 3249, 3426, 4538, 4692, 4833, 6172, 7143, 6068, 4013, 3069, 249, 4837, 5153, 5283, 5284, 4352, 4695, 962, 4541, 5599, 6687, 5155, 2522, 5288, 2523, 5002, 2354, 4185, 2890, 5289, 2209, 503, 1734, 1735, 1833, 2892, 6001, 4016, 1203, 1395, 5291, 5156, 5510, 735, 1117, 5008, 4190, 4191, 6929, 4702, 4703, 5602, 4704, 1513]. **point** [1969, 2366, 1737, 4705, 1970, 736, 820, 509, 822, 3751, 6691, 7042, 7146, 1205, 5298, 1030, 2075, 6291, 2898, 2370, 4851, 2530, 6692, 4709, 5839, 4710, 283, 3084, 3261, 4712, 4854, 5840, 3085, 2532, 622, 880, 1031, 1209, 1284, 1740, 3438, 2374, 2900, 3086, 1032, 2709, 1844, 5520, 968, 1845, 2536, 1846, 5725, 2376, 4857, 4858, 1847, 5416, 6005, 6082, 6543, 1288, 1611, 2377, 252, 178, 308, 2713, 3896, 2381, 1851, 4367, 4861, 3897, 2538, 4037, 6699, 6700, 3088, 4038, 3759, 5020, 3605, 5845, 7049, 4039, 4556, 4716, 6547, 3764, 5166, 2902, 2903, 3265, 3607, 4208]. **point** [6429, 1037, 3091, 3444, 3608, 1292, 1408, 5025, 1214, 1975, 3610, 2223, 3445, 1409, 1297, 3270, 3098, 5933, 4045, 2224, 3450, 5532, 4564, 2908, 2541, 3099, 1299, 2718, 5311, 5312, 1745, 6704, 2911, 6434, 6560, 6706, 5739, 3275, 3276, 2086, 5740, 517, 2724, 827, 1216, 2389, 5742, 682, 2391, 3905, 1219, 1864, 7057, 1747, 3285, 3620, 4223, 5174, 5175, 5177, 5533, 2227, 2228, 4049, 4567, 5317, 7176, 3619, 1134, 4222, 1220, 1867, 2392, 4723, 5934, 2914, 4569, 5750, 5751, 1625, 3288, 6007, 6198, 6314, 6315, 6440, 2395, 201, 2090, 4054, 3623, 6008, 6444, 2231, 2919, 3110, 3289, 6009, 2233, 2401]. **point** [2402, 2234, 3111,

1986, 627, 2094, 2095, 3461, 3626, 3627, 4226, 4228, 5610, 5756, 4725, 2923, 3291, 3463, 3629, 3292, 6099, 629, 474, 745, 2405, 2406, 3293, 3294, 2407, 2408, 747, 748, 1225, 258, 5037, 2552, 2241, 2100, 1633, 312, 521, 4877, 4878, 6322, 2741, 1226, 1227, 2412, 2414, 2415, 2928, 1752, 1875, 1528, 1753, 5617, 6831, 3635, 3915, 4394, 3123, 3300, 1988, 4881, 5619, 4576, 896, 2932, 3468, 5326, 830, 898, 974, 1994, 6101, 4238, 5946, 6103, 4882, 2557, 3302, 900, 976, 2934, 7067, 2247, 2248, 6325, 5948, 6449, 4581, 4883, 6328, 6721, 3918, 3919, 5856, 5190, 7156]. **point** [6209, 350, 756, 2423, 2748, 2936, 3125, 4583, 5859, 6109, 6012, 5952, 6836, 4886, 3791, 4408, 4589, 352, 6456, 4591, 3922, 6837, 4887, 525, 572, 684, 5623, 1758, 5337, 3642, 5624, 5954, 1639, 5339, 5340, 4246, 6016, 4889, 6588, 2253, 1890, 7177, 1051, 1996, 1314, 1760, 2949, 3649, 574, 641, 758, 759, 402, 3651, 689, 690, 980, 575, 6017, 2255, 4891, 1997, 1998, 981, 910, 3134, 6214, 3135, 1435, 2567, 4596, 4740, 5776, 6116, 3137, 2257, 2117, 6951, 6348, 2763, 5062, 2258, 5342, 3143, 6728, 7081, 1647, 6729, 3146, 1648, 1649, 696, 2569, 2259, 5777, 5867, 3485, 5344, 4898, 5064, 5346, 5347]. **point** [5348, 5432, 5553, 6954, 2570, 2000, 3928, 5067, 5434, 320, 1895, 2261, 2441, 2444, 2446, 2769, 3659, 6022, 1438, 3929, 2121, 2962, 2963, 918, 5634, 7088, 5435, 2447, 2448, 985, 4259, 3319, 4747, 2967, 2265, 3152, 6222, 3320, 3321, 3934, 4092, 2452, 3810, 4907, 6965, 2576, 3326, 581, 4908, 5352, 5873, 6224, 481, 4261, 3154, 3155, 5353, 5557, 6128, 5874, 986, 4264, 4098, 4267, 5783, 766, 987, 3813, 4099, 7097, 4753, 3333, 6130, 4911, 646, 1328, 2005, 5784, 5636, 7098, 2269, 208, 701, 990, 2270, 2976, 2271, 3815, 7100, 2272, 2273, 2585, 3335, 2008, 527, 7101, 3504, 2274]. **point** [838, 7180, 2589, 2798, 2983, 4917, 2009, 2277, 3338, 4102, 5787, 6227, 2457, 2592, 2802, 2984, 2593, 2594, 1774, 2139, 1333, 5082, 6855, 993, 529, 1241, 1242, 1334, 707, 1063, 2985, 1064, 3339, 1678, 484, 4923, 3508, 774, 5966, 6231, 5642, 5643, 5876, 6234, 5790, 3942, 3943, 4106, 1337, 4924, 4623, 1914, 3167, 107, 5791, 5646, 6478, 998, 2986, 2463, 3944, 3945, 5647, 3684, 3342, 777, 2014, 2285, 2599, 2145, 7108, 4925, 6034, 781, 710, 711, 3178, 3825, 4118, 4767, 5562, 3947, 4284, 4455, 4929, 4930, 5794, 3949, 3690, 2806, 2807, 2989, 2990, 2808, 1686, 3349, 3183, 5973]. **point** [2290, 3692, 3827, 4629, 4931, 927, 3350, 3184, 3517, 2017, 3518, 2151, 1066, 3951, 5216, 1547, 2469, 788, 4125, 4456, 6746, 3828, 2472, 1689, 1922, 3002, 4631, 1691, 2294, 1170, 2473, 2474, 4457, 4458, 4633, 5097, 5098, 5099, 5220, 5221, 5222, 5223, 5224, 5225, 5366, 5367, 5368, 5369, 5458, 5459, 5460, 5461, 5462, 2816, 3004, 1785, 1461, 2297, 293, 1462, 2025, 2026, 4775, 3702, 4131, 376, 324, 4287, 4777, 846, 2824, 2825, 3194, 3195, 6240, 5105, 1929, 3703, 4778, 4134, 147, 1465, 1788, 1931, 2300, 1935, 1789, 3011, 5229, 6371, 3012, 1697, 847, 3356, 4468, 4940, 1072, 3358]. **point** [1347, 4137, 7123, 4293, 7169, 1792, 3705, 1793, 3841, 5376, 1698, 1937, 3198, 4140, 4294, 2030, 942, 6375, 2833, 2834, 4943, 4944, 716, 795, 3706, 1076, 5571, 1794, 2621, 2482, 2484, 3708, 4474, 4475, 1351, 2032, 6483, 5237, 1352, 2836, 2164, 493, 2487, 850, 1703, 3965, 2490, 3015, 4784, 4949, 5238, 5385, 5804, 6039, 6246, 2491, 1796, 1472, 1473, 1474, 1475, 1704, 1356, 1797, 541, 542, 543, 3967, 2166, 2307, 5117, 796, 2035, 2492, 2493, 1256, 295, 1705, 2167, 3210, 3375, 1939, 1560, 2310, 2843, 2494, 1357, 2627, 2628, 4144, 5241, 1799,

1561, 4952, 5244, 5581, 5806, 5980]. **point** [948, 2630, 4146, 4298, 4953, 4954, 7130, 5807, 599, 798, 1358, 2848, 6994, 194, 2850, 2313, 6758, 2495, 2852, 2853, 3213, 3851, 7172, 5246, 4959, 4960, 5125, 5127, 4650, 4790, 4791, 2315, 6764, 6999, 5149, 5598, 5915, 6064, 2351, 2689, 1253, 1938, 5597, 6508, 1732, 3906, 4884, 1885, 3196, 2304, 2305, 2306, 2485, 2486, 1476, 996]. **Point-Targeted** [6927]. **Point/Integer** [2350]. **point/logarithmic** [2300]. **Pointers** [3493]. **Points** [2053, 5827, 5754, 3674, 3972, 7022, 3656]. **Poisoning** [6881]. **Poland** [7474, 7623]. **Polar** [6645]. **Polish** [458]. **Pollard** [2119]. **Polyhedra** [4017]. **Polyhedron** [3612, 4043]. **Polymath** [1322]. **Polymorphic** [902]. **Polynomapproximation** [769]. **Polynome** [1062]. **Polynomial** [4652, 4977, 6504, 6783, 3052, 5399, 6397, 5490, 4171, 5276, 5277, 4351, 6532, 6001, 280, 6071, 5157, 819, 427, 884, 3614, 5752, 3295, 5323, 1140, 6940, 1878, 5329, 5622, 4254, 4896, 6952, 477, 5779, 837, 917, 1444, 5206, 769, 4760, 1915, 2150, 373, 271, 4128, 7129, 2634, 4792, 416, 4512, 4666, 3048, 3049, 5261, 4672, 5267, 5402, 6062, 2211, 5156, 5510, 6814, 4847, 3597, 620, 5522, 3765, 562, 5744, 5609, 5755, 5939, 5429, 6944, 2113, 448, 3146, 984, 1234, 3499, 5357, 2006, 482, 4921, 2463, 1454, 5215, 2602, 2811, 2994, 2996, 4134, 4639, 4643, 3378, 3379]. **polynomial** [3028, 1253, 4607]. **Polynomials** [5985, 6500, 4809, 421, 4335, 4015, 5999, 5293, 305, 6186, 1229, 3142, 767, 1457, 241, 2165, 4670, 4990, 5410, 4836, 6418, 6175, 1511, 1127, 1739, 4859, 5416, 1038, 6434, 6560, 6706, 7176, 259, 285, 4586, 1430, 6356, 6467, 2791, 5789, 6368, 192, 193, 4492, 6064, 769, 1062]. **Polyphase** [2346, 4817]. **Polytechnical** [108]. **Polytechnique** [108]. **Pope** [1018]. **Popular** [6753]. **Port** [7283, 3929, 2441, 3195, 1120]. **Portability** [2884, 7223]. **Portable** [2866, 6265, 1093, 3060, 3062, 1021, 1119, 1206, 4445, 4448, 6745, 1702, 6247, 1003, 1359, 4497, 3852, 1712, 5986, 2681, 6196, 981, 4099, 3183]. **Portland** [7578, 7620, 7321, 7628, 7280]. **Porto** [7556, 7596]. **Portugal** [7499]. **PosAx** [6935]. **PosAx-O** [6935]. **Posit** [7003, 6766, 6673, 6674, 6519, 6403, 6677, 6406, 6794, 6795, 6407, 6679, 6681, 6903, 6904, 6913, 7029, 7036, 6926, 6928, 7043, 6817, 6298, 6299, 6300, 6823, 6433, 6935, 6437, 6564, 6827, 7060, 6937, 6832, 7066, 6451, 6723, 6453, 7069, 7073, 6586, 6839, 7076, 6947, 6948, 6949, 6950, 6732, 6845, 6957, 6958, 7083, 7084, 7085, 7086, 6736, 6737, 6848, 6964, 7093, 7095, 6971, 6852, 6853, 6857, 6974, 6613, 6859, 6860, 6978, 6744, 6861, 7117, 6980, 6983, 6751, 6633, 6866, 6634, 6989, 6871, 6990, 6757, 6648, 6759, 6876, 7131, 6998, 6635, 6796, 6931, 6438, 6733, 7116, 6830, 6741, 6752]. **Posit-Based** [6903, 7083, 6990, 6681, 6931]. **Posit/IEEE** [6913]. **Posit/IEEE-754** [6913]. **Posit8** [6918]. **PositGen** [6832]. **Positing** [6487]. **Position** [6160]. **Position-Residues** [6160]. **Positional** [5551]. **PositIV** [6971]. **Positive** [6650, 279, 6925, 1424, 145, 6230, 2309, 711, 846]. **Positive-Integer** [145]. **Positnn** [6853]. **Positron** [6519]. **Posits** [6404, 6931, 6568, 6715, 6574, 6846, 6529, 6678, 6680, 6469, 6834]. **Posit**^{TM} [6970, 7114]. **Possibilities** [1641, 1759]. **Possible** [411, 5332, 2270, 599]. **possibly** [4669]. **Post** [6783, 5841, 6575, 6993, 5001, 509, 7566, 4829]. **post-proceedings** [7566]. **Post-Quantum** [6783, 6993]. **Post-tabular** [5841]. **Post-ultimate** [5001, 4829]. **Postcorrection** [858, 650]. **Postcorrections**

[671]. **Posteriori** [3589, 849, 6223, 2025]. **Postscale** [5775]. **Postscaled** [4414]. **Postshifts** [1544]. **Postsmoothing** [2669]. **Potential** [4543, 6426, 3713, 1943]. **Potentially** [4479]. **pour** [4690, 4242, 2763, 5100]. **pow** [5545]. **Power** [4509, 1579, 1580, 3056, 3734, 5494, 4819, 3874, 614, 7029, 6928, 4200, 5730, 4559, 4563, 5028, 6199, 6566, 5943, 6323, 6836, 5862, 6587, 4087, 4088, 4746, 6221, 6735, 5074, 4431, 7096, 4272, 4438, 7454, 5637, 4449, 4108, 6367, 6235, 4110, 4116, 4928, 5793, 241, 3838, 5567, 6987, 5572, 6638, 6989, 5114, 5390, 6995, 6759, 6760, 4651, 4169, 4170, 4817, 3575, 4182, 5995, 6809, 6072, 4021, 4698, 3591, 620, 1288, 3896, 5931, 4203, 4863, 5735, 7053, 7054, 7153, 3903, 2927, 3916, 4251, 3797, 5073, 4089, 4750, 4607, 5783, 4930, 3703, 4293, 2617, 2619, 3204, 4481, 3372]. **Power-Delay** [3734, 4746]. **Power-Efficient** [5494, 6367, 5572, 5390, 6072]. **power-series** [2927]. **POWER2** [3217, 3270, 3350, 3373, 3269]. **Power3**^{TM} [3971]. **POWER6** [5290, 5132]. **POWER7** [5686, 5611]. **Powering** [4439, 4913, 3958, 5977, 4756]. **PowerPC** [5113, 3225, 3269, 3103, 3281, 3623, 3306, 4110, 3351, 3356, 3372]. **Powers** [6000, 819, 5324, 5325, 6643, 4, 1578, 6082, 5617, 6022]. **pp** [217, 1484, 228, 272]. **PPAM** [7623]. **PR** [6746]. **Pracniques** [346, 354]. **Practical** [4306, 1568, 6778, 3729, 3938, 2586, 3386, 3387, 1225, 978, 5071]. **practicality** [3922]. **Practically** [6610, 1543, 6036, 2642]. **Practice** [7598, 3040, 5394, 6155, 7572, 7232, 7233, 1673, 2206, 1027, 1426, 5336, 5546, 2452, 6368, 1672]. **practiced** [716, 795]. **Prague** [7432, 7549, 7581]. **Praxis** [7233]. **Pre** [5907, 5723, 3438]. **Pre-computations** [5907]. **Pre-processing** [5723]. **pre-scaling** [3438]. **Precimonious** [5966]. **Precise** [2173, 3853, 2657, 6077, 3615, 4051, 4870, 6592, 3341, 5095, 5096, 4479, 5150, 2228, 6222, 6227, 5464, 5465, 4396, 4237]. **precisie** [492]. **Precision** [6650, 5811, 7002, 6147, 3544, 4654, 6491, 3857, 1487, 3725, 4975, 6504, 4801, 6897, 6505, 6507, 2872, 728, 862, 954, 1098, 1099, 1100, 1193, 1265, 4985, 5398, 5692, 6791, 6792, 6274, 6516, 5489, 5401, 7141, 6520, 3571, 3572, 381, 5706, 6523, 6524, 1102, 6676, 5707, 5909, 6277, 6677, 1589, 303, 1387, 1591, 5912, 223, 7029, 3423, 6411, 4535, 4536, 4690, 6686, 617, 4540, 3428, 6924, 7035, 5601, 5719, 6420, 6179, 963, 429, 7040, 5012, 5297, 5299, 5606, 7147, 7148, 6693, 4364, 4553, 5727, 4860, 884, 6697, 7047, 7048, 7149, 4862, 7049, 6552, 4373, 6430, 6556, 6557, 6432]. **Precision** [10, 2225, 4046, 4216, 4217, 4867, 5027, 5315, 1520, 1856, 1980, 83, 1133, 3283, 343, 7058, 4568, 6710, 3286, 3458, 5749, 6312, 6098, 6316, 6567, 6200, 6317, 1748, 4056, 5756, 3778, 6570, 5942, 348, 5615, 1754, 1876, 5040, 5042, 5618, 3784, 349, 5854, 6204, 6331, 5545, 6724, 2106, 4404, 4735, 4885, 5050, 6207, 6334, 5767, 5768, 6013, 5333, 5335, 6211, 1431, 6340, 3474, 2560, 6726, 3644, 6342, 4899, 2112, 2254, 6461, 4252, 6840, 6841, 692, 1315, 1889, 5775, 6118, 6351, 763, 6352, 6353, 6354, 6599, 362, 363, 3149, 5868, 6219, 7089, 6734, 5959, 3318, 6736, 6737, 5201, 1323]. **Precision** [5078, 2784, 2785, 207, 7099, 4613, 209, 6607, 2796, 3336, 238, 6853, 4618, 4619, 706, 771, 4445, 3507, 6032, 6363, 7104, 7105, 6858, 6612, 709, 1543, 1915, 4452, 3514, 4281, 2288, 2289, 7168, 6860, 6978, 5650, 6618, 2812, 3187, 3954, 4772, 5218, 5219, 323, 5565, 4128, 5463, 375, 5567, 189, 1934, 4135, 5374, 6632, 1073, 1351, 6143, 5239, 5661, 5664, 5805, 4484, 1003, 5980, 6146, 7130, 460, 6647, 6761,

6876, 5667, 6762, 6763, 6649, 6142, 6377, 4690, 3385, 721, 5984, 1011, 5477, 299, 3042, 4510, 5822, 5898, 6049, 6779, 5588, 4979, 6508, 3986, 4168, 4325, 4326, 4668, 863, 955]. **precision** [5590, 4812, 7138, 5695, 6672, 3568, 2336, 3870, 1272, 382, 383, 5910, 5499, 5708, 6168, 4179, 4532, 5712, 4998, 3883, 4183, 6286, 4346, 4347, 2065, 1598, 1731, 6920, 5155, 3073, 5924, 6688, 5507, 2068, 3892, 4021, 4697, 735, 4191, 7038, 7039, 3259, 5298, 4710, 6543, 6084, 5931, 4038, 6303, 6426, 6427, 1291, 3762, 6547, 6933, 2907, 7052, 2909, 9, 5311, 5312, 626, 6704, 437, 827, 1521, 2725, 886, 6435, 5742, 6709, 6936, 1868, 6008, 6712, 6713, 6010, 2095, 2239, 2240, 3112, 1420, 7064, 1635, 6831, 2743, 5853, 633, 6449, 6943, 5331, 5859, 5950, 5952, 5953, 3791, 4588, 352]. **precision** [2940, 3642, 402, 760, 4891, 4739, 5548, 6593, 7079, 5063, 2954, 5198, 6728, 6350, 578, 2436, 696, 4600, 4601, 4602, 6954, 6021, 2574, 5634, 7088, 4904, 4752, 7097, 4753, 4273, 1330, 5212, 2277, 1332, 6855, 6358, 1243, 2012, 5966, 6231, 5641, 2144, 5645, 5879, 3167, 6034, 4764, 710, 3347, 3513, 2464, 5880, 3690, 3183, 3692, 3827, 3521, 4456, 293, 5227, 4935, 6750, 4288, 5105, 5657, 4778, 5229, 6372, 4293, 6868, 492, 4474, 4475, 1352, 2487, 5238, 6039, 6246, 2624, 2307, 5117, 2492, 2627, 3376, 3538, 3382, 4496, 5128, 4827, 4828, 5282, 3986, 4326, 5338, 3159, 4496]. **Precision** [297, 1539]. **Precision-** [6363, 7104, 4474, 4475]. **Precision-aware** [7049]. **Precision-Scalable** [6860, 6978]. **precision-specific** [6246]. **precision/range** [4293]. **Precisions** [6822, 6651]. **Precompiler** [1107, 1003, 5457]. **precomputation** [4273]. **Precomputed** [4436]. **preconditioned** [2620]. **Preconditioners** [3632]. **predecessor** [5560]. **Predicates** [3693, 5577, 7012, 4237, 4396, 5342, 3692, 3827]. **Predictable** [3844]. **Prediction** [3394, 1836, 5837, 3641, 3794, 3129, 6593, 2800]. **Prediction-Based** [5837]. **Predictive** [4201, 6568, 6715, 6470, 6612, 5382]. **Predictors** [51, 4134]. **Preface** [722, 3269, 4574, 588]. **Preferences** [1302, 1240]. **Prefix** [4318, 4993, 2887, 6927, 6563, 4229, 1311, 6106, 5770, 6603, 6739, 4476, 4167, 4988, 2886, 4385, 7166]. **Prefix/Carry** [5770]. **Prefix/Carry-Select** [5770]. **prefixed** [5308]. **Prehistory** [4219]. **Preliminary** [58, 5171, 2830, 2166]. **Prenormalization** [4988]. **Prepackaged** [2702]. **Preparation** [72, 97, 151, 1559]. **Preprocessor** [2455, 827]. **Preprocessors** [3493]. **prerogative** [6460]. **Presburger** [4306]. **Prescale** [5775]. **Prescale-Lookup-Postscale** [5775]. **Prescaled** [4742]. **Prescaling** [5506, 3256, 4696, 4842, 5292, 3470, 4084, 5888, 3079, 4843, 2935, 4070, 4419]. **prescribed** [4042]. **Presence** [5997, 5047, 1899, 6739, 2620]. **present** [480, 3384]. **Presentations** [7483, 7251]. **Presented** [7298, 7300, 7329, 7238, 7301, 7272, 7260, 7261, 7273, 7284, 7252, 7286, 7216, 7254, 7445, 7204, 7415, 3701, 7314]. **Preserving** [1644, 6600]. **Press** [4157, 4158]. **Presubstitution** [5031]. **Preuves** [4807, 4357, 4324, 5826]. **Preventing** [5866, 6018]. **Preview** [5849]. **price** [3391]. **price/performance** [3391]. **Prices** [5014]. **Priest** [4903, 5201]. **primarily** [6983]. **PRIME** [7585, 5135, 810, 1823, 6808, 6000, 1306, 6959, 6136, 5809, 2634, 1264, 465, 1438, 1908, 2632, 1689]. **primeneniia** [2327]. **Primer** [1768]. **Primes** [6689, 438, 6527, 6549, 3720]. **primitive** [2836]. **Primitives** [2793, 4697]. **Princesa** [7543]. **Princeton** [7606]. **Principal** [3636, 7221]. **principes** [29]. **Principle** [4632]. **Principled** [3496]. **Principles**

[6155, 1302, 1217, 106, 472, 972, 4868, 975, 1240, 3372, 3208, 4312, 29, 235, 1246]. **Print** [2607, 4932]. **Printed** [195, 73, 19]. **Printf** [6489, 6488]. **Printing** [6150, 3567, 5623, 1052]. **Priori** [5491, 3581, 3783, 2103, 3915]. **Privacy** [7607, 6600, 6609]. **Privacy-Preserving** [6600]. **Privacy-Protecting** [6609]. **private** [6099]. **Prize** [2691]. **Probabilistic** [1090, 1190, 1369, 1808, 6798, 2882, 7037, 5730, 6555, 2909, 395, 6707, 3910, 6347, 1648, 1649, 5065, 6860, 7112, 7114, 7174, 2377, 7049, 394, 5555]. **probabilities** [509]. **Probability** [495, 386, 4593, 2753, 5065, 2123, 1791, 1513, 2255, 1054, 4938, 4593]. **Problem** [3057, 1832, 1984, 3661, 4090, 6482, 4942, 7198, 2171, 2870, 3754, 562, 6112, 5865, 6224, 7422]. **Problem-Solving** [1984]. **Problems** [603, 6391, 2508, 4002, 618, 7209, 1844, 2711, 179, 2383, 4568, 5538, 3637, 3674, 1671, 2147, 3695, 4471, 3710, 6389, 5900, 5824, 5488, 118, 63, 64, 65, 66, 67, 68, 2709, 1621, 1868, 1756, 72, 1335, 1679, 4137, 4140, 4294, 1472, 1473, 3248, 4593, 7246]. **Proc** [7201, 1484, 7267, 7206]. **Proc.-E** [1484]. **Procedural** [1802, 1803]. **Procedure** [6051, 83, 5775, 5554, 1152, 3493, 5487, 2407, 758, 5553, 3197, 35]. **Procedures** [4306, 1812, 513, 747, 3482, 3493, 4909, 1237, 2279, 585, 411, 273, 1225, 492, 540]. **Proceedings** [7211, 7229, 7235, 7315, 7316, 7326, 7443, 7457, 7570, 7187, 7181, 7237, 7328, 7373, 7429, 7458, 7357, 7482, 7400, 7444, 7543, 7423, 7470, 7275, 7227, 7330, 7388, 7430, 7499, 7389, 7375, 4841, 7319, 7255, 7431, 7344, 7269, 7618, 7302, 7182, 7276, 7228, 7240, 7245, 7256, 7258, 7283, 7304, 7305, 7323, 7335, 7345, 7346, 7347, 7360, 7361, 7362, 7376, 7378, 7391, 7392, 7436, 7459, 7461, 7473, 7475, 7489, 7517, 7560, 7564, 7621, 7628, 7290, 7291, 7405, 7241, 7349, 7622, 7259, 7307, 7416, 7242, 7393, 7379, 7490, 7380, 7451, 7462, 7491, 7505, 7522, 7438, 7492, 7189, 7279, 7394, 7274, 7480, 7217, 7365, 7366, 7248]. **Proceedings** [7464, 7226, 7337, 7312, 7507, 7569, 7220, 7382, 7383, 7617, 7222, 7341, 7340, 7253, 7597, 7215, 7296, 7511, 7541, 7554, 7571, 7343, 7576, 7409, 7410, 7386, 7254, 7356, 7498, 7556, 7412, 7231, 7472, 7401, 7588, 7484, 7620, 7579, 7500, 7266, 7208, 7546, 7446, 7433, 7270, 7322, 7358, 7414, 7448, 7460, 7486, 7502, 7503, 7518, 7519, 7530, 7533, 7548, 7559, 7563, 7593, 7594, 7306, 7195, 7350, 7450, 7425, 7294, 7566, 7308, 7295, 7309, 7453, 7551, 7567, 7205, 7353, 7243, 7395, 7418, 7454, 7419, 7493, 7552, 5639, 7524, 7420, 7466, 7481, 7539, 7427, 7467, 7280, 7313, 7369, 7525, 7298, 7327, 7397, 7468, 7542]. **Proceedings** [7514, 7399, 7528, 7557, 7577, 7471, 7558, 7578, 7605, 7387, 7289, 7244, 7627, 7224, 7377, 7404, 7435, 7437, 7449, 7474, 7504, 7521, 7534, 7535, 7536, 7549, 7604, 7225, 7406, 7351, 7565, 7417, 7506, 7278, 7233, 7550, 7538, 7426, 7440, 7568, 7596, 7494, 7601, 7523, 7455, 7381, 7465, 7370, 7553, 7385, 7590, 7547, 7532, 7624, 7626, 7364, 7384]. **Procesach** [458]. **Process** [4030, 200, 5756, 6998, 92, 5015, 3508]. **Processes** [278, 264, 77, 652, 79, 191, 7192, 458, 7128, 249, 95, 5358, 711, 846, 1252, 389]. **Processeur** [2217, 2563, 2004]. **Processing** [1709, 6879, 3029, 7003, 7373, 7429, 7513, 1574, 3563, 7299, 6515, 302, 2670, 6904, 4527, 3584, 7036, 5601, 2212, 3432, 883, 1743, 6819, 3089, 6553, 564, 7333, 7282, 7348, 7377, 7488, 7502, 7519, 7521, 3104, 3105, 4218, 4156, 6710, 3109, 6442, 1135, 3624, 2551, 1140, 4729, 7307, 7242, 7417, 7537, 7076, 6344, 5341, 7206, 145, 916, 6961, 2128, 6971,

3681, 7354, 1541, 4769, 6978, 7111, 7455, 2992, 7381, 6618, 3186, 1172, 6871, 7623, 5980, 3222, 2181, 1089, 2650, 7412, 2338, 2341, 3875, 6680, 2686, 4693, 7375, 5008, 7208, 2372, 5723, 6003, 2375, 1611, 3088, 6547, 3265]. **processing** [6429, 5025, 3267, 4049, 6709, 2729, 3287, 1303, 1040, 7195, 3463, 2241, 2928, 1988, 1877, 1990, 1992, 2418, 2932, 4882, 2940, 7293, 7451, 7462, 7478, 7491, 7505, 7522, 2564, 2950, 2569, 7205, 2972, 4608, 3154, 3155, 2267, 7395, 2591, 839, 5791, 5214, 2811, 4122, 3523, 2019, 6620, 3011, 1348, 7324, 7369, 3204, 1796, 1178, 2492, 2839, 1705, 4298, 4955, 2855, 2856, 2689]. **Processing-in** [6442]. **processing-in-memory** [4882]. **processing-in-wire** [6003]. **Processor** [7002, 3971, 1713, 4659, 6496, 3397, 2328, 1951, 1577, 4805, 2049, 6675, 2056, 2666, 1271, 3415, 1822, 1382, 1587, 1823, 1964, 2350, 1391, 3747, 502, 6924, 2525, 1121, 2369, 2218, 2897, 3260, 5160, 1849, 1850, 1294, 1616, 6703, 2385, 4867, 5743, 4222, 1414, 6310, 5750, 6827, 5537, 5753, 4054, 4059, 5539, 5611, 887, 2738, 2413, 7066, 2747, 2749, 4402, 5768, 2251, 6589, 2563, 1434, 5625, 1316, 3483, 2438, 5068, 3929, 1656, 2449, 6735, 1657, 5078, 7093, 2575, 7094, 1324, 2268, 3672, 7096, 7099, 6971, 483, 1238, 3819, 4278, 1541, 1681, 3515, 3687, 6860, 7111, 2469, 1920, 2293, 3190, 1930]. **Processor** [2299, 1936, 3196, 1468, 1350, 5385, 6990, 1182, 2631, 6875, 1360, 2858, 1944, 1945, 3031, 6047, 1486, 2498, 5132, 2499, 2318, 1363, 2320, 3042, 1488, 2502, 3401, 2186, 2329, 3865, 1016, 4169, 1816, 1955, 2201, 2668, 1819, 5908, 1381, 2341, 5497, 1272, 3998, 2207, 2878, 2879, 2880, 3424, 2354, 5008, 822, 2216, 2898, 6931, 5840, 2706, 1740, 1851, 2384, 2718, 2386, 5739, 2086, 1411, 517, 2412, 2414, 2415, 3635, 2746, 2748, 2427, 3793, 2431, 2566, 3134, 2567, 1647, 2000, 2261, 2441, 3316, 2447, 1321, 2265, 2451, 1154, 3326, 4261, 1326, 5783, 766, 2269, 2135, 2274, 2277, 3943, 3167]. **processor** [5791, 2987, 3347, 4627, 5562, 1686, 3349, 1921, 3525, 2472, 1929, 1931, 2300, 1935, 1789, 3012, 2301, 1793, 1698, 2490, 3207, 3371, 796, 1256, 3537, 1560, 2494, 6994, 2351, 2217, 1124, 2583, 1790]. **processor-based** [6994]. **Processor-T** [6703]. **Processors** [4502, 6385, 6771, 547, 3406, 7388, 7401, 7588, 2670, 6904, 5911, 5500, 7500, 7545, 1838, 5929, 5309, 3102, 3103, 3281, 7304, 7323, 7335, 7360, 7435, 7517, 7518, 7534, 7559, 7573, 7582, 3104, 3105, 1418, 2099, 5613, 3122, 895, 1045, 1432, 4737, 3306, 6734, 4095, 6229, 4443, 6856, 4281, 7494, 2992, 1780, 4459, 7466, 7427, 7540, 7384, 1557, 6377, 2649, 1492, 4803, 3731, 6396, 3234, 1586, 5830, 5910, 2683, 3427, 5602, 3445, 7486, 3113, 3114, 3115, 3116, 2242, 4238, 2422, 6111, 4904, 3327, 3328, 6227, 4759, 3194, 1792, 2310, 4298, 2313, 1355]. **produce** [6944, 4747]. **produced** [3195]. **producing** [4266]. **Product** [7385, 806, 6053, 6668, 6274, 5403, 3874, 1384, 3066, 7033, 5007, 4856, 5523, 6696, 4863, 6703, 7051, 7059, 6567, 6571, 5541, 3298, 6321, 7073, 1899, 4905, 4906, 5077, 6606, 1453, 1920, 5974, 6239, 6747, 6992, 2626, 3545, 1486, 5479, 5404, 1959, 3575, 2881, 3071, 3585, 6929, 4036, 4557, 1523, 3113, 3114, 3115, 3116, 3124, 5762, 5952, 3668, 5876, 789, 1921, 3011, 1698, 492, 5244, 5581, 5470]. **Product-Based** [6992]. **Production** [7246, 6856]. **productivity** [7480]. **Products** [1095, 2654, 882, 2535, 558, 6707, 5938, 7158, 4436, 596, 5825, 3741, 100, 5742, 2100, 2737, 1994, 2420, 5763, 3310, 6234, 2835, 3200, 2625]. **Produkte** [1095].

Profession [4719]. **Professor** [159]. **Profile** [5908]. **Profile-guided** [5908]. **profiles** [5923]. **Profiling** [6686]. **Program** [3393, 6257, 6772, 6885, 2501, 1093, 5484, 5904, 1507, 6570, 3297, 567, 2554, 5548, 2788, 4927, 6625, 1076, 3850, 5900, 5824, 6672, 3995, 1598, 1731, 283, 1517, 1299, 2721, 7584, 4382, 2239, 2240, 1226, 4238, 6017, 1646, 5197, 3928, 986, 707, 6237, 3354, 293, 1255, 5126]. **Programmability** [6461]. **Programmable** [7510, 7527, 7514, 7543, 7557, 7499, 3257, 7503, 7581, 6203, 3130, 3474, 7426, 7493, 7552, 7568, 7596, 3186, 5654, 7495, 7496, 5895, 5155, 3894, 2384, 5739, 3131, 1647, 2265, 4956, 7471]. **programmation** [487]. **Programmed** [3266, 94, 1546, 104]. **Programmer** [3987, 3420, 3421, 3582, 6800, 3258, 1866, 889, 3647, 3648, 3145, 2298, 4637, 3362, 2521, 2026]. **Programmer-controlled** [889]. **programmes** [5197]. **Programmiersprachen** [1095]. **Programmierung** [3121, 3121]. **Programming** [7229, 7298, 7315, 7326, 7512, 2862, 2635, 6265, 7411, 7015, 1095, 172, 4342, 157, 4195, 6074, 3596, 4199, 1401, 3272, 3905, 4223, 5533, 6317, 1525, 2730, 4383, 5613, 3121, 1313, 7232, 6459, 4247, 6343, 446, 3308, 2959, 2960, 2776, 3161, 7248, 6135, 7167, 2295, 3190, 3844, 943, 2623, 326, 4484, 494, 6248, 3975, 4312, 1092, 301, 1508, 6291, 6701, 2912, 5175, 5176, 5177, 7292, 2408, 2426, 317, 2765, 2574, 1162, 487, 489, 147, 1249, 5108, 3374, 3022, 3380, 7422, 3906]. **Programmpaketes** [1886]. **Programs** [6778, 2865, 3041, 1715, 1374, 5263, 5483, 5689, 6054, 6059, 2679, 2680, 7031, 6923, 6292, 7063, 2440, 643, 5871, 4447, 3170, 4628, 6373, 97, 151, 1559, 6243, 5989, 1594, 6283, 5004, 7038, 5839, 3444, 3608, 3461, 2238, 5620, 2558, 6855, 6034, 5457, 2296, 6371, 6999]. **Progress** [2656, 5054]. **Progressions** [438, 5217]. **progressive** [3527, 3705]. **Project** [3854, 3436, 3594, 400, 2109, 5, 3809, 1453, 7312, 6979, 272, 1346, 1945, 7179, 1379, 1723, 3266, 2086, 2090, 1697, 246]. **Projection** [6637, 6692, 1524]. **Projective** [4388, 4605, 4215]. **PROLOG** [1772]. **Promise** [6820]. **Proof** [4514, 5264, 5904, 4706, 4846, 4848, 556, 4384, 4725, 2554, 7078, 5871, 925, 2483, 3850, 5138, 5140, 5262, 2914, 5619, 2756, 2758, 3928, 5082, 3942, 3943, 4106, 2598, 998, 4300]. **Proofs** [5689, 4999, 6923, 7063, 6842, 3658, 3817, 6230, 6144, 7032, 4168, 4324, 4668, 4807, 5826, 6268, 4004, 4343, 1299, 7352, 707]. **Propagate** [6806, 6807, 2526]. **Propagation** [378, 5897, 5912, 1125, 1285, 395, 903, 233, 204, 205, 3334, 414, 2174, 2175, 6154, 1200, 6691, 7042, 7146, 1209, 1284, 394, 1298, 5744, 5747, 5420, 760, 1234]. **Properly** [1856, 892]. **Properties** [725, 4520, 4521, 4808, 2507, 824, 687, 3658, 4431, 2273, 2981, 703, 1911, 2177, 820, 1415, 1416, 2230, 4879, 5041, 641, 3521, 2495]. **Property** [6646, 4003]. **proportion** [6746]. **Proportional** [6585]. **Proposal** [2871, 3053, 4673, 3879, 4831, 1207, 2085, 3770, 3776, 1157, 1235, 2005, 2581, 2582, 4927, 3324, 788, 2492, 1740]. **Proposals** [1386]. **Proposed** [296, 1197, 1503, 1726, 1825, 1198, 1199, 1275, 1388, 1727, 6916, 6917, 2355, 1512, 1204, 1280, 1301, 1410, 1219, 1224, 1308, 4570, 6475, 1459, 1460, 1466, 70, 5109, 2045, 1191, 1590, 1105, 1962, 15, 5, 1918, 1339, 1461]. **proposer** [7056]. **proposes** [6370]. **PROSE** [2133]. **prosessor** [1740]. **prospects** [3248]. **Protected** [1577]. **Protecting** [2140, 6609]. **Proteins** [5563]. **proton** [2808]. **Prototype** [5705, 1390]. **Prototyping** [6861]. **Provably**

[6406, 5411, 2070, 2210, 4230, 5858, 6951, 4747]. **Proved** [5397, 6395]. **Proven** [5486, 4828]. **Prover** [7483, 4231]. **provider** [5461]. **Provides** [3857, 4748, 1182, 3391]. **Providing** [5724, 3508, 5366]. **Proving** [7398, 5688, 7470, 3997, 3877, 5300, 6213, 6973, 2332, 3579, 5166, 6333, 6452]. **Prozessor** [1936, 2583]. **Prozessoren** [1904, 1355]. **Prozessors** [2615]. **PRP** [529]. **pruning** [3303]. **ps** [5794]. **Pseudo** [1812, 422, 962, 264, 115, 129, 6875, 3603, 5311, 5312, 3316]. **Pseudo-Computer** [129]. **Pseudo-Division** [1812]. **Pseudo-Divisionsverfahren** [1812]. **pseudo-exhaustive** [3603]. **Pseudo-operations** [422]. **Pseudo-Random** [115]. **Pseudo-round** [962]. **pseudo-spectral** [5311, 5312]. **Pseudodivision** [652]. **pseudoduplication** [3261]. **Pseudoinverse** [713]. **Pseudorandom** [2849, 4498, 850]. **pseudorandom-number** [4498]. **pseudozero** [4859]. **PSI** [1363]. **psudo** [2015]. **psudo-banking** [2015]. **Public** [3862, 4336, 6435, 4386, 4572, 3811, 5880, 4196, 4094, 2979]. **Public-Key** [3862, 6435, 4386, 4572, 3811, 5880, 4196, 4094]. **publication** [1982, 2546]. **Publications** [5682, 24]. **publicity** [3392]. **Published** [23]. **Publisher** [3204]. **Publisher's** [6258]. **Pulse** [698, 1801]. **Punkte** [2053]. **punto** [4606]. **Purdue** [297]. **Pure** [3882, 7368]. **purely** [2912, 2744]. **Purpose** [5476, 1107, 5309, 7391, 3122, 5768, 6013, 1531, 3161, 4443, 7109, 7110, 6140, 2502, 2354, 2435, 2261, 2265, 4759, 4298, 2315, 2689]. **Putting** [2461]. **PVS** [3412, 4587, 3485]. **PX** [53]. **pyramid** [5388]. **Pyramidal** [1817]. **Pythagorean** [1601, 1652]. **Python** [6008, 6011, 5142]. **Pytorch** [6934].

Q [3736]. **Q-Coder** [3736]. **QCA** [6003]. **QD** [4976, 3740]. **QD-algorithm** [3740]. **QL** [998]. **QR** [2423, 6125, 4771]. **Qrd** [2941, 6330]. **Qrd-based** [2941]. **Qtorch** [6934]. **Quad** [4168, 4214, 4373, 6211, 4976, 4326, 4739]. **Quad-Double** [4214, 4373, 4326]. **Quadrant** [184, 165, 4048]. **Quadrate** [3941]. **Quadratic** [4310, 5760, 3141, 5081, 2150, 2029, 3369, 4182, 3585, 2734, 3113, 3114, 3115, 3116, 1877, 1989, 1990, 1991, 1992, 2245, 2246, 2419, 2931, 2422, 6112, 2451, 4276, 1782, 3006, 4817]. **quadratic-like** [1782]. **Quadratic-Polynomial** [2150]. **quadratic-residue** [3006]. **quadratically** [3516]. **Quadrature** [5811, 6152, 5297, 5168, 903, 5299, 6685]. **Quadratwurzel** [586, 2048, 1427, 2007, 1538]. **Quadratwurzel-Algorithmus** [2048, 2007, 1538]. **Quadratwurzelfunktion** [514]. **Quadratwurzeln** [1599]. **Quadrillionth** [5655]. **Quadruple** [4654, 7147, 7148, 7058, 6354, 5868, 6763, 6831, 5953, 5645]. **quadruple-precision** [5953]. **qualified** [3037]. **Qualifying** [4809, 4670]. **Quality** [6879, 7423, 3694, 7285, 1189, 2523, 2726, 6196, 3002, 3374]. **Quality-Efficient** [6879]. **Quantifying** [6720]. **Quantitative** [7332, 7413, 7485, 7602, 1440, 7336, 4284, 3517, 886, 5555]. **Quantities** [13]. **Quantization** [1489, 6834, 2970, 1170, 5112, 2628, 1565, 1801, 3587, 2372, 2373, 2902, 4911, 701, 4931, 789]. **Quantizations** [7125]. **Quantized** [6815, 6816, 7089, 6989]. **Quantum** [6892, 6783, 5274, 5496, 6820, 3464, 6575, 3784, 7071, 6465, 6601, 5960, 6026, 7184, 6865, 5235, 5979, 6993, 7162, 5972, 4938, 5467]. **Quantum-Dot** [5496, 5274]. **quantum-dots** [7162]. **Quarter** [973, 1305]. **Quartic**

[6073]. **Quartus** [5784]. **Quasi** [5057, 912, 362, 363, 793, 2964, 2689]. **Quasi-Pipelined** [5057]. **Quasi-Serial** [912, 793]. **quasi-systolic** [2689]. **quasi-unity** [2964]. **quasigroup** [6446]. **quater** [236]. **quater-imaginary** [236]. **Quaternary** [1506, 1596, 4174, 2114]. **Quaternion** [5678, 4312]. **Quaternions** [6714]. **Qubit** [6465]. **Que** [7220]. **Quebec** [7519, 7250]. **Queen** [7519]. **Queries** [2828]. **Query** [2882]. **Question** [6293, 5033]. **Questions** [18, 6907, 6909, 6910, 6911, 6912, 36, 26, 1127, 1739, 30]. **Queuing** [4593]. **Qui** [2]. **Quick** [5318, 3193, 1337]. **Quickhull** [3562]. **Quickly** [3567, 5623]. **Quire** [7036, 6947, 6948, 6949, 7116]. **quire-enabled** [7116]. **quirk** [2425]. **Quixilica** [7180]. **Quotient** [3064, 4355, 6421, 1603, 1836, 6932, 7074, 5351, 3497, 5970, 3024, 610, 4185, 6288, 4382, 2927, 4728, 1646, 3311, 2012, 3830, 5368, 1934, 2844]. **quotient-difference** [6288]. **quotient-digit** [4382]. **Quotients** [558, 265]. **QuPAT** [5645, 5879].

R [262, 531, 2471, 2386]. **R.O.C.** [7322]. **R/3000** [2386]. **r0p2** [4505]. **R1994** [2089]. **R2000** [2097]. **R3000** [2660, 2808]. **R3010** [2282, 2808]. **R4000** [3092]. **R63** [288]. **R65** [338, 339]. **R65-22** [338]. **R65-54** [339]. **R67** [444]. **R67-41** [444]. **Rabat** [4841]. **racecar** [6387]. **racehorses** [2523]. **racetrack** [6965]. **Racine** [1160]. **racing** [6965]. **radar** [3994]. **Radian** [1667]. **Radical** [6188]. **Radici** [3941]. **Radio** [7047, 4565, 4648]. **Radisson** [7511]. **Radius** [6316]. **Radix** [2041, 5587, 3976, 4159, 1569, 546, 853, 3227, 856, 5988, 4980, 6398, 6399, 6899, 7026, 1582, 5698, 2510, 1958, 5494, 1726, 1825, 3241, 224, 279, 5717, 5506, 6070, 734, 1603, 2364, 2527, 3256, 2073, 1606, 5726, 1614, 5024, 7151, 1618, 1133, 2089, 5743, 5316, 6439, 6197, 6199, 2397, 1424, 3120, 6100, 631, 5945, 5946, 3470, 4398, 4731, 5328, 4076, 6725, 1884, 6338, 7074, 3476, 3481, 1147, 5549, 359, 3312, 4084, 2572, 4087, 5780, 1439, 644, 3806, 5351, 3497, 647, 5441, 3503, 3504, 1775, 2142, 267, 3826, 4453, 5090, 1919, 933, 3830, 1786, 6749, 1933, 1934, 4135, 4466]. **Radix** [4467, 1175, 2159, 6037, 658, 5888, 3536, 544, 3541, 6996, 601, 802, 1005, 3859, 951, 461, 3228, 4317, 1714, 4323, 4331, 2514, 4006, 424, 2528, 3079, 2365, 3591, 3438, 7050, 3451, 2390, 2230, 2919, 3110, 3289, 890, 2740, 2933, 2935, 4070, 3471, 1761, 2439, 2767, 2958, 3148, 3488, 4419, 4089, 2783, 5872, 4096, 4262, 4263, 4752, 4612, 4756, 4757, 2983, 5452, 3174, 3175, 3177, 3178, 5091, 3526, 2818, 3009, 1173, 3846, 5580, 5662, 2847, 1747]. **Radix-** [1569, 2510, 1726, 1825, 6070, 2527, 1606, 1614, 5024, 4398, 4731, 3503, 4453, 1933, 4466, 6037, 3536, 3541, 4317, 4331, 4006, 2528, 3438, 3451, 3471, 1761, 3488, 4089, 2818, 3009]. **Radix-10** [5328]. **Radix-16** [734, 5780, 5888]. **Radix-2** [3227, 856, 4980, 5441, 5872, 3504]. **Radix-4** [5506, 2364, 7151, 6338, 5351, 2159, 3526]. **Radix-64** [6398, 6399, 6899, 7026, 2983]. **Radix-8** [5698, 6199, 3312, 3504, 3826, 5452, 5580]. **radix-dependent** [890]. **Radix-Independent** [2041, 2089, 6197, 1786, 1747]. **Radizierverfahren** [2259, 2036]. **Rail** [2155, 3797]. **RAIVE** [6109]. **RAND** [91, 5370, 1567]. **Random** [386, 6695, 5321, 6011, 6215, 2118, 2260, 115, 915, 4316, 91, 3739, 4013, 5288, 3338, 777, 3690, 3183, 5656]. **Randomization** [6532, 3815]. **Randomized** [6526, 5997, 6720, 5065, 4605]. **Randomness**

[6384, 2202, 5600, 5412, 3813]. **Range** [2635, 275, 5482, 4986, 6433, 2723, 5748, 6098, 569, 632, 4733, 5072, 589, 1457, 3391, 2672, 3244, 3425, 4348, 4349, 4560, 5337, 3151, 3341, 4293, 4474, 4475, 5237, 4146, 545, 4791]. **Range-Addressable** [5072]. **range-independent** [4474, 4475]. **Range-Reduction** [4986]. **Range-Transformation** [569, 632]. **Ranged** [5540]. **Ranging** [4201]. **rank** [826]. **rank-frequency** [826]. **Ranker** [6496]. **Ranks** [6496]. **Raphson** [7010, 4004, 6000, 4198, 6009, 3290, 3294, 5183, 5624, 2766, 2957, 3311, 452, 5958, 2975, 6852, 3346, 6870, 6643, 4949, 5116, 5384, 3540]. **Rapid** [3986, 224, 36, 344, 262, 7093, 4754, 1545, 244, 1378]. **rapid-approximation** [1378]. **rapide** [3986]. **Rapidly** [2394]. **Rare** [6968]. **RAS** [4423]. **rask** [1740]. **raster** [2209]. **Rate** [504, 6014, 1056, 698, 1182, 380, 4411, 4890, 3510, 3361, 2689]. **Rates** [875, 4911]. **Ratio** [3235, 4149, 3576, 2080, 2481]. **ration** [1066]. **Rational** [2054, 5399, 6397, 7023, 428, 1405, 1133, 1414, 2919, 3110, 1987, 2555, 1425, 1754, 2102, 2416, 1315, 1889, 4255, 1651, 6023, 580, 3337, 1449, 4919, 241, 2845, 1707, 3972, 221, 426, 251, 6295, 1215, 1296, 1412, 4052, 4053, 1228, 1635, 2244, 2556, 5556, 4914, 3510, 1249, 5464, 5465, 5832]. **Rational/Radix** [1133]. **Rationale** [2355, 5176]. **Rationally** [1839]. **Rationals** [1644, 1598, 1731]. **Ratios** [668]. **ray** [2836]. **Rayleigh** [5192, 4248]. **RC** [498]. **RC-4000** [498]. **RDSP** [4677]. **Re** [3075, 3493, 3922]. **re-evaluation** [3922]. **Re-ordering** [3075]. **Reach** [3419]. **Read** [864, 2515, 1905, 4820, 4821, 3534]. **Read-Only** [864, 1905, 3534]. **Reading** [5935, 48]. **Readings** [607]. **readyreckoner** [31]. **Real** [3029, 7497, 7542, 3722, 3723, 5476, 5677, 330, 7014, 4322, 1096, 2053, 2054, 4328, 6164, 7430, 4523, 1589, 6903, 2679, 5503, 2888, 4019, 5516, 4849, 7509, 1516, 2373, 969, 3757, 6188, 7048, 2078, 3900, 7572, 2544, 2719, 2910, 6192, 564, 4376, 7536, 1628, 4574, 2103, 6104, 447, 2960, 2573, 5868, 5869, 7085, 3937, 6857, 4926, 6749, 4128, 411, 3196, 5108, 5243, 2631, 4957, 7001, 3972, 3861, 4795, 5142, 4815, 2662, 7140, 2665, 2338, 382, 3585, 3886, 3891, 5013, 4707, 4859, 1615, 2238, 636, 5327, 6328, 7156, 6012, 4586, 1430, 2255, 6214, 6116, 5063, 3654, 5071, 6975]. **real** [2805, 6616, 5466, 2622, 1178, 2082, 4150]. **REAL-Arithmetik** [2082]. **Real-Numbers** [6192]. **Real-Time** [3029, 330, 1589, 969, 564, 3196, 2631, 2960, 7001, 2665, 2338, 1178]. **Real/Complex** [3722, 5476, 5677]. **Real/Expr** [4150]. **Realisation** [1237, 2004]. **Realisierung** [1237, 1494]. **Realisierungen** [1485]. **Realistic** [1268, 1377, 1123, 1017]. **Realization** [4024, 250, 1214, 1975, 581, 4102, 4989, 1869, 1985, 1040, 4251, 5064, 1244, 1494]. **Realizations** [454, 2317, 1089, 4877, 3820, 541, 542, 5117, 4952]. **realized** [3234, 3292, 896, 525, 572, 3339, 3851]. **Realizing** [6820]. **RealLib** [5327]. **really** [4676]. **Reals** [6905, 5994, 6284, 6457, 6583, 6725, 4982, 5993, 2558]. **Realtime** [6495]. **reasoning** [6012, 2816, 3004]. **Receiver** [4616, 4564, 3134]. **Receivers** [4440]. **Recently** [4660]. **Rechenanlagen** [107, 1001, 2013]. **Rechenautomat** [61]. **Rechenautomaten** [124, 405, 124]. **Rechengenauigkeit** [107, 1539]. **Rechengeräte** [274]. **Rechengeräte-Entwicklung** [274]. **rechenintensive** [3196]. **Rechenmaschine** [159, 3465, 1167, 1467, 1322]. **Rechenmaschinen** [35, 3472]. **Rechentechnik** [3465]. **recherche** [5100]. **Rechnens** [975]. **Rechner** [1137]. **Rechnerarchitekturen**

[1485]. **Rechnerarithmetik** [1211, 1353, 975]. **Rechners** [1469]. **Rechnung** [391]. **Rechnungen** [35]. **Recipes** [2276, 2980]. **Reciprocal** [4969, 6787, 5698, 3243, 4020, 4186, 4722, 4050, 4051, 2393, 2917, 4058, 4398, 4731, 5775, 4613, 5210, 3168, 3512, 3683, 3821, 3823, 3948, 4120, 4464, 5240, 6788, 6898, 4823, 5507, 2367, 4852, 5735, 2729, 3287, 6009, 3479, 3492, 3666, 2604]. **Reciprocals** [2638, 5698, 5042, 4113, 1961, 4718, 3696]. **Reciprocation** [4187]. **Reciprocity** [1259]. **RECIPROOT** [89]. **reclaims** [5019]. **Recoding** [5907, 5524, 2387, 4224, 3478, 5549, 585, 5256, 2926, 5872, 3936, 2598, 5386]. **recodings** [5091]. **Recognition** [5892, 99, 6401]. **recommendations** [1585]. **recommended** [3882]. **recompilation** [5004]. **Recompiling** [6180]. **ReConFig** [7579]. **Reconfigurable** [3722, 3985, 6404, 1822, 7579, 7487, 3459, 4575, 4598, 6737, 5791, 6613, 4472, 5572, 4477, 5664, 4486, 4788, 5982, 5391, 5914, 7030, 5895, 4167, 4323, 4522, 2216, 4409, 5434, 2267, 4623]. **reconfiguration** [6072, 4565]. **Record** [7300, 7238, 7301, 4155, 7359, 7363, 7272, 7574, 7586, 7260, 7261, 7273, 7284, 6474, 7252, 7286, 7216, 7355, 7230, 7329, 7424, 7434, 7439, 7452, 7463, 7479, 7615, 7367, 7408, 7314, 7342]. **recorded** [3701]. **Recording** [320, 48]. **Records** [7129]. **Recovering** [6205]. **Recovery** [4429]. **rectangles** [7077]. **Rectangular** [6447, 5361, 3377]. **rectilinear** [3069]. **Recurrence** [4969, 7151, 4398, 5328, 3130, 6749, 4133, 6245, 5122, 4968, 3255, 4697, 6434, 6706, 740, 3131, 357, 358]. **Recurrences** [814, 4665, 7080]. **Recurring** [1707]. **Recursion** [7159, 4447]. **Recursion-free** [7159]. **Recursive** [3995, 1831, 2376, 6337, 6347, 5788, 2829, 6991, 6992, 6995, 2177, 1948, 951, 1489, 3047, 2333, 4698, 1846, 1221, 1985, 2245, 896, 2557, 3302, 985, 1910, 1918, 1067, 1783, 1939, 2853]. **Recycled** [5959]. **RedMulE** [6987]. **Reduce** [5615, 1661, 3024, 4400, 365, 5434, 2844, 3381]. **Reduced** [4509, 3981, 3051, 4987, 6523, 6676, 5909, 7040, 1850, 1632, 5541, 5854, 7088, 4907, 5637, 5447, 4624, 4116, 1777, 5665, 2851, 4968, 3403, 2197, 6286, 2380, 1851, 4561, 6704, 4581, 4883, 2940, 4930]. **reduced-area** [4561]. **Reduced-Instruction-Set** [1850, 1851]. **Reduced-Precision** [7040, 6704]. **Reducibility** [1222]. **Reducing** [4170, 5403, 4182, 4689, 5923, 346, 5764, 3148, 3488, 3666, 3934, 3498, 5875, 371, 239, 4293, 326]. **Reduction** [6251, 5485, 4986, 5277, 5917, 3433, 6932, 7150, 5307, 6091, 7059, 5748, 5849, 5614, 6718, 4393, 2557, 3919, 4733, 5627, 6952, 6118, 2966, 1658, 1901, 1666, 1667, 5080, 3501, 5358, 840, 6976, 7106, 6238, 4770, 3522, 4634, 5102, 5665, 4482, 3539, 5124, 6392, 4813, 5404, 5593, 6060, 3244, 3425, 4348, 4349, 3264, 4253, 3146, 4902, 3668, 4755, 2978, 3502, 4773, 4774, 5100, 5237, 3028, 2853, 5100]. **Reductions** [7102, 5139, 4736]. **Redundancy** [546, 854, 855, 4801, 1820, 6523, 4689, 3109, 2416, 166, 3451, 4413]. **Redundant** [5813, 6385, 3394, 3722, 3977, 2319, 2500, 725, 3055, 1103, 4689, 6070, 1278, 5521, 6079, 5932, 5734, 3268, 5418, 5608, 3290, 1632, 6939, 5040, 2104, 4076, 6584, 3478, 5436, 3494, 2580, 6968, 3334, 6854, 1540, 3948, 4120, 5793, 2609, 2155, 2817, 5373, 5886, 6037, 2170, 4488, 797, 4489, 378, 2869, 4990, 3070, 3252, 3253, 2693, 2071, 4702, 4703, 4192, 4711, 7050, 4565, 5169, 1415, 1416, 4233, 2556, 2417, 2930, 2423, 2750, 4074, 4078, 4243, 5192, 2754, 3148, 3312, 3313, 3488, 4910, 2786, 3812, 3165, 2466, 3830, 3007, 1928, 3008, 4644, 4487, 4493].

Redundant-Digit [6385, 5608]. **Reed** [6417]. **reelle** [2053, 2103, 2573]. **reellen** [1628]. **reellintervallwertigen** [1628]. **Reference** [6882, 4505, 5133, 498, 2659, 302, 813, 2069, 6428, 1622, 1866, 835, 7164, 2993, 3519, 1927, 4469, 4637, 1468, 1559, 1086, 1011, 1092, 682, 1526, 2925, 2952, 1337, 4935]. **Refinement** [3972, 5189, 450, 7353, 4471, 5378, 5150, 6426, 6427, 1420, 312, 5190, 3311, 1781, 6986, 4137]. **Reflected** [181]. **reflection** [2177]. **Reflections** [3565, 6530]. **Refutation** [2731, 2920]. **Regained** [6364]. **Regards** [136]. **Regency** [7323, 7335]. **regime** [283, 6974]. **Regime-5** [6974]. **Region** [7277]. **Regional** [7550]. **Register** [3144, 3929, 1056, 4278, 2161, 4528, 3942]. **Register-Number-Minimum** [2161]. **Register-Transfer** [4278]. **register-transfer-level** [3942]. **Registers** [738, 3316]. **Regression** [3063, 643]. **Regular** [6923, 1900, 2002, 1192, 1495]. **Regularity** [3682]. **Regularization** [7062]. **regulator** [1241, 1242, 1334]. **Reinventing** [6120]. **rekenen** [540]. **Related** [2679, 4994, 5962, 6615, 5579, 4685, 1127, 1739, 5957, 4456, 84, 3707]. **Relation** [5921, 1631, 740, 6039]. **Relational** [5343, 5456]. **Relations** [4914, 3238, 357, 358]. **Relationship** [5157, 7248, 1853, 3771, 3315]. **Relationships** [1259, 1081]. **Relative** [6280, 1845, 2535, 6313, 5954, 3533, 2178, 2065, 5923, 6005, 6082, 6007, 6315, 6440, 6711, 574, 6022, 987, 707, 2487]. [3121]. **Relaxation** [315]. **Relay** [59, 38, 42, 1338]. **Release** [563, 6097]. **Reliability** [4593, 3925, 4082, 4083, 7311, 7285, 5111, 1730, 2726]. **Reliable** [4501, 7445, 1021, 5933, 3781, 3305, 4899, 6966, 5640, 6143, 6380, 6755, 5669, 4302, 4338, 2881, 2408, 4237, 4396, 4242, 5621, 4460, 3202, 6039, 7572]. **Remainder** [4655, 4802, 3877, 4684, 4221, 4721, 5785, 5488, 4180, 2381, 6582, 4752, 2463, 4474]. **remaindering** [5504, 2409]. **Remainders** [6652, 544, 461, 3148, 3488]. **Remark** [1193, 1206, 6428, 1436, 3677, 3681, 491, 3488]. **Remarkable** [4339]. **Remarks** [249, 335, 346, 765, 846]. **Remedies** [5848]. **Remez** [2595]. **Reminiscences** [3949]. **remote** [2918]. **Removing** [4801, 3484, 6968, 4267]. **Renaissance** [3865]. **rencontres** [7418]. **Rennes** [7588, 7523]. **Reno** [7316]. **repair** [6999]. **Repairing** [6844]. **repeated** [3846]. **Repeatedly** [4002]. **Repetitive** [6968]. **Replacement** [737, 4254, 4896]. **Replacing** [5539, 1652]. **Replay** [4353]. **Replication** [4656, 1575, 2625]. **replications** [2840]. **Reply** [1483, 228, 773, 3810]. **Report** [7006, 2656, 2912, 7057, 3911, 51, 2603, 2021, 2022, 56, 3203, 2074, 3620, 3640, 6110, 2803, 1689, 1922, 1339]. **Reports** [3857, 7598]. **Representable** [4669]. **Representation** [5813, 6766, 5135, 1574, 1013, 3399, 5137, 3407, 170, 866, 4993, 2685, 3889, 673, 2703, 878, 1516, 3755, 6817, 307, 6186, 2078, 4043, 1131, 5535, 6563, 1304, 3290, 1044, 2104, 4080, 6591, 1147, 6592, 447, 6215, 642, 5436, 3806, 4614, 4624, 7114, 929, 7119, 1687, 241, 2155, 3199, 949, 1079, 3547, 3548, 2652, 2662, 4990, 3737, 5710, 6412, 962, 3887, 2892, 4548, 4711, 252, 1615, 1215, 1296, 2231, 4726, 5037, 5188, 1435, 3137, 697, 4910, 7101, 3337, 777, 5216, 3005, 3008, 850, 4644, 5388]. **Representations** [4652, 2037, 219, 855, 5897, 6905, 5717, 1617, 2397, 5040, 5761, 5852, 1428, 685, 6590, 2580, 3334, 6361, 1540, 4635, 5979, 3027, 6154, 2661, 2693, 1967, 872, 2071, 3289, 888, 6837, 6944, 2778, 208, 1914, 2848, 2763]. **Represented** [265]. **Representing** [3087, 5223]. **represents** [5462]. **Reprint**

[175]. **ReproBLAS** [6158, 5920]. **Reproducibility** [6155, 6895, 5919, 6066, 5835, 4371, 6205, 6030, 6050, 6276, 6060, 4212, 6110]. **Reproducible** [6043, 6044, 6148, 6654, 6158, 6396, 6516, 6278, 5917, 5918, 5920, 5996, 6067, 4353, 6094, 6342, 6125, 6966, 6641, 5986, 6172, 6413]. **Republic** [7432, 7581, 7549]. **Required** [4862, 561, 3291, 5615, 1142, 377, 459, 4752]. **Requirement** [439]. **Requirements** [1021, 3713]. **Res** [2038]. **Research** [7585, 7259, 6326, 2109, 7365, 7226, 6609, 4489, 7215, 1945, 152, 1723, 5843, 5020, 3266, 2086, 2090, 5857, 7294, 1697]. **réseaux** [5100]. **residual** [1925, 2025]. **Residue** [6042, 6880, 4971, 4972, 6499, 6665, 1364, 1366, 3863, 4314, 4978, 6780, 497, 605, 666, 804, 805, 857, 1367, 1574, 1262, 725, 806, 1091, 1576, 3984, 2199, 4522, 4817, 6901, 1958, 220, 3874, 7143, 6415, 177, 226, 338, 6078, 885, 1405, 1743, 253, 5023, 5734, 229, 4866, 5314, 1618, 1524, 1626, 1135, 1136, 1419, 1632, 1872, 7062, 3464, 750, 828, 3781, 288, 906, 4250, 4594, 2431, 5341, 5196, 3141, 318, 1650, 1765, 919, 2782, 4607, 1905, 2128, 1907, 6969, 2789, 2134, 2979, 3162, 3501, 1674, 584, 1912, 455, 485, 2150, 2019, 5094, 713, 2609, 456]. **Residue** [6241, 1551, 1552, 1696, 1932, 2029, 1251, 4639, 1699, 413, 3966, 4147, 4148, 4648, 5121, 797, 4649, 1940, 2634, 3214, 3386, 3387, 4961, 1711, 4304, 4657, 3547, 2642, 6264, 3561, 6392, 2181, 1088, 1089, 1489, 1264, 3228, 1811, 1949, 3048, 3049, 1714, 4167, 3865, 2051, 3988, 3733, 4675, 4816, 2196, 2200, 4170, 5144, 4677, 5271, 2338, 2512, 2673, 2674, 2675, 2676, 2513, 3239, 3240, 3575, 3576, 3577, 3993, 4680, 4528, 2207, 1827, 1963, 4182, 5713, 1109, 1110, 4350, 2353, 3070, 2889, 3072, 3252, 3253, 3585, 3743, 3886, 3747, 3888, 1278, 4026, 4356, 4029, 4196, 2371, 2705, 2899, 2372]. **residue** [3894, 3597, 2373, 2375, 2710, 679, 1035, 2379, 2380, 3446, 3447, 3448, 3449, 2384, 4565, 5169, 515, 516, 565, 1411, 2724, 3278, 3903, 1039, 1221, 1303, 1415, 1416, 1523, 1869, 2230, 1985, 2234, 1040, 3631, 257, 4233, 2733, 2734, 3113, 3114, 3115, 3116, 2740, 2417, 2930, 3124, 1877, 1989, 1990, 1991, 1992, 2245, 2246, 2418, 2419, 2931, 6446, 2933, 2422, 3788, 3920, 4078, 4243, 5192, 1755, 2752, 2945, 4248, 4249, 4411, 4412, 4413, 4890, 4081, 4251, 688, 1232, 1763, 3926, 4425, 4746, 2451, 3322, 3323, 2971, 2972, 4096, 4262, 4263, 3329, 3330, 3331, 3332, 3499, 1770, 5209, 6226, 4434]. **residue** [4435, 4755, 2978, 3502, 3676, 527, 4275, 2456, 2591, 4276, 1537, 1910, 2010, 2458, 1450, 4442, 5093, 1918, 2149, 2470, 2811, 2996, 3952, 4122, 4123, 4124, 1067, 1068, 1688, 1782, 1783, 2020, 2999, 3000, 4630, 3832, 3006, 2608, 3007, 324, 1463, 1550, 3527, 3704, 1465, 2156, 2027, 5233, 2827, 3840, 1176, 3961, 2031, 2303, 5237, 3363, 3364, 3365, 4481, 2625, 2839, 3211, 3212, 3378, 3379, 4149, 4487, 4488, 4646, 4647, 2846, 2847, 4955, 3028, 2855, 2856, 3327, 3328, 510]. **Residue-Level** [7062]. **residue-number-arithmetic** [1068]. **Residue-number-system-based** [2431]. **residue-to-binary** [4816, 2733]. **Residues** [6160, 5535, 6563, 6106, 185]. **Resilience** [6526]. **Resilient** [7135, 6817, 7000]. **Resist** [4563]. **Resistance** [4603]. **Resistant** [6336, 1523]. **Resistor** [645]. **Resistors** [184]. **resizable** [4878]. **Resolution** [5904, 139, 3796, 2771, 4367, 5794, 108]. **Resort** [7527, 7561, 7583]. **Resorts** [7616]. **Resource** [6790, 6324, 6026, 7125, 3361, 5804, 4482, 3044, 4179, 5658, 3247]. **Resource-constrained** [5804, 5658]. **Resource-Efficient** [6026, 7125]. **Resources**

[3946]. **Respect** [6526, 1676]. **Response** [3399, 5303, 1250, 3015, 1039, 2491]. **Rest** [2381, 2777]. **Restklassenzahlensystemen** [3162]. **Restoring** [6652, 6165, 6458, 6946, 6465, 3496, 853, 1312, 3639, 3792]. **Restricted** [3493, 4683]. **Result** [4964, 5252, 1582, 7374, 7372, 3148, 3488, 3930]. **Resultant** [3945, 3392]. **Results** [4502, 1483, 4322, 6903, 3076, 6694, 5051, 4085, 121, 2013, 6235, 710, 1553, 4945, 1941, 1805, 3866, 2194, 3575, 5910, 2359, 4850, 4039, 4556, 4716, 5311, 5312, 6944, 3133, 5199, 4266, 1908, 2270, 2976, 5442, 5642, 5643, 5649, 2808, 2830, 1938]. **Retaining** [6319]. **Rethinking** [6444]. **Retrofitting** [1804]. **Retrospective** [4821, 4932]. **Return** [5283, 5322]. **Reusable** [3760, 3646]. **Reveal** [824, 878, 687, 641]. **Revealing** [2153, 7171]. **Reverse** [6052, 3983, 3984, 4329, 5209, 6748, 1711, 4675]. **Reverse-Carry** [4329]. **Reversed** [2107, 2249]. **Reversible** [5318, 5179, 5960, 6026, 5230, 5231, 7162, 5232]. **reversion** [2249]. **Review** [1484, 3720, 4157, 4158, 21, 4681, 4336, 510, 389, 340, 341, 44, 262, 1653, 1322, 1672, 996, 531, 372, 2481, 5890, 5891, 98, 5649]. **Reviewer** [6659]. **Reviewers** [6782]. **Reviewing** [6100]. **Reviews** [24, 272, 908]. **Revised** [7614, 7501, 7625, 7572, 7600, 7603, 3911, 7623, 5864, 2803]. **Revision** [3879, 6562, 7081, 6220]. **Revisions** [4767]. **Revisit** [5903]. **Revisited** [3232, 280, 1122, 2378, 4864, 4592, 5075, 4279, 4933, 5101, 6488, 4009, 6092, 7155, 4902]. **Revisiting** [4728, 5189, 5190]. **Revolution** [1534, 1663]. **rewriter** [5926]. **Rewriting** [6858, 5378, 3368]. **REXX** [1729]. **Reykjavík** [7603]. **Rezension** [4865]. **RF2P** [7093]. **Rhine** [7387]. **RHW** [4486]. **Rhyne** [2471]. **Richard** [510, 7567, 5890, 5891]. **Richardson** [385, 385, 6685]. **Richardson-Algorithmus** [385]. **Rietz** [7231]. **Right** [5028, 4224, 3299, 6460, 5549, 655, 3828, 1556, 7030, 5931, 4720, 5037, 2969]. **Right-Shift** [3299]. **right-size** [5931]. **Right-to-Left** [1556]. **Rigorous** [6277, 6684, 4195, 6318, 6724, 6956, 4090, 4448, 5643, 6137, 6138, 6619, 6755, 3716, 5642]. **Rijndael** [4446]. **Rim** [7377, 7521]. **Ring** [3052, 176, 7115, 6993, 1827, 4726, 2031]. **Ring-LWE** [6993]. **Rings** [3806, 7186, 1262, 3585, 2602]. **Ripple** [5697]. **Ripple-Carry** [5697]. **RISC** [6508, 2541, 2546, 2566, 2570, 7002, 6660, 7013, 6781, 6897, 2660, 6675, 4677, 2342, 6796, 6904, 2208, 6810, 6930, 6815, 6816, 2380, 4715, 7149, 5020, 2542, 2225, 2386, 3103, 3280, 3281, 2097, 2924, 3630, 2405, 2406, 6939, 6940, 2932, 7066, 6589, 7076, 6947, 6948, 6949, 3306, 2258, 6597, 2959, 2445, 3929, 7089, 7093, 7094, 3156, 7096, 6130, 7099, 6854, 2280, 6744, 7116, 1547, 2610, 6633, 6866, 6987, 6988, 3373, 2629, 7130, 6994, 6758, 6874, 3362]. **RISC-Based** [4715]. **RISC-V** [6508, 6660, 7013, 6781, 6897, 6675, 6796, 6904, 6810, 6930, 6815, 6816, 7149, 6939, 6940, 7066, 6589, 7076, 6947, 6948, 6949, 6597, 7089, 7094, 7096, 6854, 6744, 6633, 6866, 6988, 7130, 6994, 6758, 6874]. **RISC-V-Based** [7099, 6987, 7116]. **RISC-V3** [6854]. **RISCS** [1547, 2639, 3351]. **Rise** [6307]. **Rising** [6818]. **Risk** [7113]. **RLS** [2636, 2042, 5435]. **RLWE** [6653]. **RLWE-Based** [6653]. **RN** [4980, 4879, 5041, 5184]. **RN-coding** [4879, 5041]. **RN-Codings** [5184, 4980]. **RNC** [7542]. **RNC3** [7430]. **RNC5** [7497]. **RNC'6** [7509]. **RNS** [5840, 6226, 7118, 4962, 5251, 4655, 5816, 3726, 3864, 4799, 5478, 5899, 6051, 6156, 6893, 6159, 4674, 4003, 4527, 4683, 6526, 5713, 4832, 3427, 6919, 3885, 6534, 2360, 4193, 5723, 5838, 4031,

4551, 6545, 3768, 4044, 4213, 4561, 6304, 6553, 3278, 3279, 3903, 7062, 3117, 2418, 6336, 4427, 4095, 6129, 5355, 2801, 4616, 1537, 7107, 5093, 2466, 4124, 5365, 6748, 4289, 1933, 3842, 4781, 7126, 5120, 6040]. **RNS-based** [7062, 5816, 4551, 7107, 4193]. **RNS-to-weighted** [4124]. **Road** [2678]. **Robert** [43]. **Robot** [6487]. **Robust** [5823, 7041, 2942, 6951, 6467, 5356, 6612, 3170, 3693, 3525, 7012, 6797, 3882, 3885, 4838, 4063, 6616, 3692, 3827, 3542, 2943]. **Robuste** [2942, 2943]. **Robustness** [6766, 6270, 2383, 4926, 6162, 5839]. **Rochester** [7262, 4139]. **Rocket** [6752]. **Roessler** [3716]. **Roger** [2481]. **Role** [854, 2884, 7311, 4635]. **roll** [3042]. **roll-up** [3042]. **ROM** [7465, 3243, 5745, 1136, 2245, 2246, 897, 3168, 3512]. **ROM-based** [2246]. **ROM-less** [5745]. **ROM-Rounding** [897]. **Roman** [5551, 961]. **Romanian** [422, 283]. **Romberg** [903, 6685]. **Romberg-Like** [903]. **Rooms** [3466]. **Root** [3971, 1009, 13, 1083, 1483, 3038, 3224, 3552, 3553, 3554, 3555, 3556, 3557, 4969, 952, 1807, 3046, 2651, 153, 275, 4514, 727, 6055, 6787, 6671, 6899, 7026, 5269, 1956, 2339, 2344, 303, 3877, 4684, 3241, 304, 2350, 334, 619, 4020, 4186, 4187, 4842, 5292, 36, 2073, 6422, 384, 433, 1283, 26, 2711, 158, 2901, 5525, 2716, 7151, 3613, 514, 6558, 1856, 4376, 4221, 4721, 4722, 4050, 4051, 3457, 6566, 2091, 4060, 3778, 348, 519, 180, 5039, 3469, 49, 3470, 4398, 5861, 2941, 5862, 7074, 3474, 2430, 1640, 4894, 3481, 6595, 2955, 2766, 5349, 6465, 1152, 5780]. **Root** [5871, 3931, 580, 3496, 1533, 5207, 2007, 582, 4613, 5441, 5443, 3503, 1670, 6741, 1538, 5451, 2143, 586, 5970, 709, 6366, 652, 4626, 3689, 3524, 3698, 3699, 3828, 375, 4464, 1553, 242, 5885, 5800, 5977, 168, 6870, 1354, 5116, 5888, 597, 2626, 5240, 6757, 600, 4153, 2172, 3852, 416, 5815, 3859, 4317, 6394, 5138, 1373, 6788, 3732, 4331, 1497, 1818, 610, 2340, 3237, 3414, 4175, 4004, 958, 1598, 1731, 2361, 2363, 2364, 2527, 2695, 3255, 4697, 4843, 2365, 1972, 1407, 3604, 4203, 4863, 4717, 5735, 4210, 4211, 4042, 3097, 3451, 626, 740, 4048, 5744, 7176, 3772]. **root** [2729, 3287, 2092, 3112, 3294, 3916, 2935, 4070, 4731, 3125, 4074, 3471, 3639, 3791, 3792, 3131, 2947, 2755, 7077, 2432, 3797, 2567, 2761, 2762, 2951, 3139, 2956, 2439, 2767, 3148, 3488, 6218, 6463, 236, 5435, 4089, 4092, 4908, 1329, 2006, 4912, 3504, 1669, 1160, 4617, 3942, 3943, 4106, 6478, 4625, 782, 3176, 3178, 3516, 2473, 2474, 5461, 292, 188, 4288, 1464, 4290, 5229, 4292, 5466, 78, 84, 4474, 6485, 4784, 3025, 5809, 4493, 4958, 4300, 2048, 1835, 6041]. **root-extraction** [4042]. **Root-Finding** [1835]. **Rooters** [7135]. **Rooting** [1188, 1584, 1116, 1208, 2540, 120, 1888, 360, 703, 3570, 3992, 2514, 4006, 4181, 2896, 3621, 2404, 3912, 3473, 2259, 2571, 4097, 2135, 2036, 3023]. **Roots** [4652, 3544, 5821, 18, 549, 550, 1095, 810, 5692, 5698, 1953, 813, 668, 1826, 4002, 52, 3878, 1599, 1023, 281, 1283, 5526, 3614, 344, 2394, 5752, 2396, 4872, 30, 1427, 638, 686, 2759, 1318, 1652, 4900, 997, 531, 186, 1916, 4113, 4114, 3193, 4638, 214, 2033, 799, 3978, 2183, 6898, 1269, 1497, 5593, 1961, 2684, 4823, 1967, 1398, 4208, 5026, 5308, 4052, 4053, 6315, 3628, 5182, 4237, 4396, 4586, 1430, 1892, 3310, 4086, 5205, 1445, 1908, 5212, 3941, 211, 6368, 3696, 1923, 3359, 3026, 6878, 2583, 24]. **Ropes** [5484]. **Rostock** [7431]. **Rotation** [4159, 2072, 2711, 3767, 3102, 5757, 2213, 5725, 5421]. **Rotation/Vectoring** [4159]. **Rotations** [3746, 6302, 3767, 4295, 6788, 295]. **Rotator** [3394, 2689].

Rotators [4611]. **rotten** [2779, 2780]. **Round** [603, 6896, 6269, 6784, 609, 865, 1200, 278, 6176, 7145, 882, 4554, 6191, 6192, 5744, 474, 5761, 5852, 5949, 204, 205, 2753, 315, 6114, 6345, 4415, 6029, 6137, 6138, 6619, 4134, 6373, 1937, 3530, 4140, 4294, 1183, 1186, 2174, 1583, 956, 4008, 423, 4824, 4825, 962, 3754, 5303, 968, 6190, 5420, 5424, 1756, 1883, 2255, 3315, 1060, 2270, 3951, 2024, 2123]. **Round-Off** [6896, 609, 278, 7145, 882, 204, 205, 2753, 315, 6345, 6619, 6373, 3530, 603, 6269, 865, 1200, 6176, 5744, 474, 6137, 6138, 4134, 1937, 4140, 4294, 1183, 1186, 2174, 1583, 956, 4008, 423, 4824, 4825, 3754, 968, 5420, 5424, 1756, 1883, 2255, 3315, 2270, 3951, 2024]. **round-off-errors** [5303]. **Round-to-Nearest** [6191, 6192, 5761, 5852]. **Round-to-Nearest-Ties-to-Even** [6784]. **Round-to-Nearest-Ties-to-Zero** [6784]. **Round-To-Odd** [6029]. **Round-up** [4554]. **Rounded** [2182, 5397, 6668, 6787, 4985, 5398, 6272, 1112, 5998, 6811, 6812, 2531, 6693, 6081, 3761, 6091, 1856, 6439, 5542, 5851, 4398, 6721, 6332, 3789, 6207, 6334, 2939, 451, 3172, 3345, 6140, 1349, 2857, 5984, 6898, 4811, 4812, 7020, 7021, 7022, 7137, 6278, 4823, 4998, 5596, 4346, 4347, 5299, 7053, 7054, 7153, 7154, 2094, 5616, 5617, 635, 3921, 4241, 6837, 6944, 637, 2436, 4745, 4266, 789, 4935, 4828, 5282]. **Rounder** [3798]. **Rounding** [3976, 4311, 6051, 4512, 3229, 807, 5397, 5692, 5698, 5829, 1724, 3063, 3739, 6798, 5709, 5912, 1828, 3245, 4690, 1201, 5997, 3748, 3890, 4018, 6925, 7037, 7144, 3256, 4022, 4189, 3434, 175, 5012, 6074, 4853, 5841, 5015, 4862, 6555, 1983, 4051, 5608, 1986, 3290, 5178, 5757, 3298, 5425, 5615, 7065, 897, 1046, 4579, 3470, 4399, 903, 5545, 2424, 4404, 4735, 4885, 5050, 5051, 904, 1529, 905, 6112, 4421, 5431, 7080, 6730, 4084, 3660, 643, 1899, 3664, 1234, 4909, 4100, 4270, 5443, 5785, 2799, 1671, 53, 3679, 7178, 6029, 995, 6033, 6230, 5453, 5454, 2462, 1336, 3516, 927, 212, 4771, 4286]. **Rounding** [2606, 1342, 5798, 1791, 5377, 5799, 79, 3962, 491, 5575, 6484, 5383, 3016, 7192, 7128, 662, 2849, 5582, 1005, 7174, 6685, 6636, 3709, 3859, 4795, 2046, 4666, 4517, 4810, 6396, 5266, 3990, 4988, 1586, 3422, 4352, 3587, 1833, 5511, 2361, 2894, 3079, 4701, 4192, 3893, 5298, 5159, 5304, 2377, 3263, 1298, 2909, 6704, 2727, 4378, 890, 2733, 3123, 3300, 3468, 1879, 4070, 3919, 4071, 5427, 3303, 5950, 6456, 6944, 977, 1051, 5957, 4253, 6346, 4596, 4740, 6729, 1437, 4419, 5555, 7161, 4428, 1058, 5874, 4098, 4267, 990, 4612, 4757, 4917, 5875, 5560, 5967, 5968, 6233, 5644, 5649, 3171]. **rounding** [2465, 4773, 2296, 5100, 4132, 4937, 5464, 5465, 3197, 2617, 2618, 2619, 1252, 2162, 1352, 3017, 1708, 3542, 4154, 4827, 5916, 2620, 836, 458, 389]. **Rounding-Exact** [1529]. **Rounding-Off** [175, 79, 6051]. **Roundings** [1260, 800, 7173, 3741, 5958, 2453]. **Roundoff** [3560, 6391, 1263, 1368, 1809, 1490, 3406, 3731, 2662, 2875, 5402, 816, 3057, 732, 4023, 736, 2713, 82, 3607, 395, 5317, 3775, 4871, 3629, 746, 3301, 907, 6585, 6343, 6590, 3146, 914, 2590, 2457, 6361, 454, 3179, 3180, 2997, 2998, 3836, 593, 848, 491, 3371, 4786, 543, 3715, 2495, 3851, 1080, 1185, 2636, 2317, 2177, 2042, 1810, 4327, 2663, 1721, 2057, 1270, 2669, 3413, 3058, 1959, 674, 820, 3265, 3091, 394, 3275, 3276, 2395, 2923, 3293, 4385, 2407, 889, 896, 2557, 3787, 2107, 684, 5064, 2446, 1438, 3151, 2967, 3814, 4268, 2592, 2802, 840, 6232, 2986, 3820, 2605, 4287, 3835]. **roundoff** [4465, 1072, 3841, 2482, 541, 542, 414, 2628, 2630, 2852, 2853, 3381, 3247]. **Roundoff-**

error [3146]. **Roundoff-Error-Free** [6585]. **Rounds** [2123]. **Routine** [1009, 1584, 3100, 3273, 345, 348, 375, 537, 1818, 1602, 1398, 1404, 1407, 1624]. **Routinen** [1732]. **Routines** [614, 3062, 1732, 427, 5516, 1984, 1881, 992, 1701, 6635, 1191, 2508, 5013, 1288, 1760, 7108, 2485]. **Routing** [3672, 3545]. **Rower** [4232]. **Royal** [7360, 7295, 7309]. **RPC** [297]. **rpe** [6286]. **RPQ** [1746]. **RPR** [6523]. **RRNS** [6241]. **RS** [3391]. **RS/6000** [3391]. **RSA** [4799, 3577, 4680, 3279, 4427, 3181, 3008, 4141, 4479, 4649]. **RT** [1982]. **RTL** [4832, 5378]. **RTL-level** [4832]. **Rule** [4809, 1748, 4430, 491, 4670, 2890, 889, 890, 2249, 5773, 3835]. **Rules** [7, 5906, 4593, 3680, 5704, 4042, 2390]. **Ruminations** [4226, 4227, 4228]. **Rump** [4592]. **Run** [5343, 6412]. **Run-Time** [5343, 6412]. **Rundungsfehleranalyse** [836]. **Runge** [7145]. **Runs** [4397]. **runtime** [7504, 6109]. **Russia** [7600]. **Russian** [2868, 2709, 7600, 312, 2255, 1648, 527, 1064, 493, 6878]. **Rust** [6513]. **RV32E** [6660]. **Ryū** [6383, 6488]. **Rye** [7283, 7304]. **ryu** [6489].

S [3970, 510, 44, 742, 262, 4505, 6777, 4091, 6474, 3825, 3826, 4117, 4118, 1934, 2484, 2620]. **S-1** [1934]. **S-Box** [6474, 6777]. **S-Box/Inverse** [6474]. **S/370** [2484]. **S/390** [3970, 4091, 3825, 3826, 4117, 4118]. **Sa** [17]. **Śaṅkara** [4042]. **SA23** [1982, 2546]. **SA23-1057** [1982]. **SA23-2619-00** [2546]. **Saadia** [27]. **Saber** [6940, 7129]. **Sabrewing** [5828]. **Safe** [3044, 2876, 1281, 2487, 6779, 4642, 2013]. **Salute** [7331]. **same** [5744]. **Samos** [7534, 7540]. **sample** [1585, 831]. **sampling** [3234, 3605]. **San** [7457, 7554, 7213, 7271, 7303, 7346, 7402, 7403, 7473, 7488, 7504, 7607, 7350, 7462, 7478, 7505, 7537, 7261, 7354, 7494, 7371, 7421, 7456]. **Sand** [1630]. **Santa** [7373, 7319, 7228, 7612, 7464]. **Santiago** [7498]. **SAS** [7553]. **satellite** [6099]. **Satisfiability** [5639]. **Satisfying** [4240]. **Saturated** [5558]. **Saturating** [4315, 4727, 4280, 4283, 5119, 4145]. **Saturation** [1055, 4282, 4928, 4682]. **Saudi** [2870]. **Savage** [1734, 1735, 1737, 1741, 1751, 1764, 1773, 1690]. **Savart** [7108]. **Save** [4535, 4536, 6171, 336, 5294, 754, 3147, 2789, 3578, 2883, 4350, 2892, 4699, 5931, 1168, 5795, 5882, 4473]. **Saving** [4593]. **SC'06** [7541]. **SC'20** [7621]. **SC2002** [7489]. **SC22** [5175, 5176, 5177]. **Scalable** [6675, 6684, 5926, 5005, 7044, 5024, 5743, 7163, 4908, 6367, 4450, 6860, 6978, 5651, 4467, 4472, 5242, 6996, 4959, 5124, 5391, 6680, 6031, 4779]. **Scalar** [1946, 5393, 4301, 6491, 5134, 2654, 5907, 5524, 4563, 5758, 6117, 4747, 4429, 4605, 4748, 4449, 4624, 4491, 2038, 5256, 5257, 3401, 6416, 2233, 2401, 2402, 2100, 1994, 2420, 6228, 3011, 5241, 6508]. **Scalars** [4624, 4892]. **Scale** [7181, 1823, 5917, 5718, 1413, 7393, 1531, 6359, 6856, 5563, 937, 2817, 7122, 3654, 7162, 7250, 6372]. **scale-dependent** [6372]. **scaleable** [3965]. **Scaled** [4802, 3733, 1214, 1975, 5958]. **Scalers** [6304]. **Scales** [32]. **Scaling** [4674, 3063, 1136, 4755, 657, 2838, 3855, 3859, 548, 2528, 4031, 3438, 2379, 1986, 4915, 2149, 4630, 2608, 3961]. **Scalings** [3976]. **SCAN** [7445, 7566, 7410, 7555, 2641, 3721, 7357, 7340]. **SCAN-1991** [2641]. **SCAN-91** [7357]. **SCAN-95** [7410]. **SCAN-97** [3721]. **SCAN-98** [7445]. **Scanning** [2483]. **SCG'01** [7468]. **Schaltkreisen** [2615]. **Schaltungen**

[1165]. **Schaltungsanordnung** [2100]. **scheduling** [2728]. **Scheme** [4963, 7134, 1364, 6896, 611, 2072, 5017, 5165, 7150, 5023, 5608, 3290, 3780, 1422, 897, 4732, 441, 261, 3003, 1070, 6379, 1184, 4304, 2213, 4031, 4035, 5018, 7045, 5311, 5312, 3631, 2412, 2414, 3133, 6234, 4646, 4647, 3382, 4840, 3911, 2803, 4144]. **Schemes** [333, 1595, 5296, 568, 632, 917, 1903, 5962, 5559, 7118, 664, 3548, 3578, 4847, 1408, 1234, 3329, 3330, 4149, 6685]. **Scheutz** [1052]. **Schickard** [159, 4865, 1653, 1322, 1167, 7251, 7407, 1467, 159, 3465, 4389, 3472, 1167, 7407]. **Schickard-Symposion** [7407]. **Schickards** [3465]. **Schleifen** [3106, 3107]. **Schleifen-Invarianten** [3106, 3107]. **Schmidt** [603, 5015, 4786, 7174]. **schnell** [1771]. **Schnelle** [2235, 1995, 654, 1477]. **schnellen** [2100, 1886]. **Schneller** [2007, 3018]. **Schnelles** [2259, 2036]. **Schönhage** [5302]. **School** [7544, 7324]. **Schools** [591]. **Schranken** [586]. **Schur** [4253, 5354, 5438]. **Science** [7355, 135, 7212, 7289, 7255, 6432, 7358, 5422, 5848, 7622, 4593, 7295, 7309, 7251, 7569, 7222, 7296, 412, 6765, 4705, 576, 317, 2805, 2816, 3004]. **Sciences** [7394, 7465]. **Scientific** [7372, 7410, 7555, 2641, 3721, 7357, 4975, 6155, 6508, 6677, 615, 4529, 7445, 5285, 1124, 1285, 1849, 3089, 6433, 2545, 3286, 7603, 2237, 7349, 3781, 1873, 2736, 7476, 7259, 6579, 1142, 7566, 1434, 7279, 7311, 7090, 3318, 2276, 2980, 7250, 7381, 932, 934, 2492, 5477, 1491, 6517, 3238, 6687, 4025, 7267, 1209, 1284, 5843, 1621, 2548, 7292, 3118, 7477, 5857, 4591, 3646, 1536, 2137, 5362, 2472, 3202, 7422]. **Scientist** [4794, 2891, 2707, 2708, 4713, 3020]. **Scientists** [6535, 254, 739, 1974]. **Scilab** [5823, 5645]. **Scope** [6717, 1893]. **scoped** [1496]. **Scotland** [7470, 7269, 7467, 7253, 5639]. **script** [5407, 4220]. **Scripting** [4220]. **Scrutiny** [6570]. **SE** [4636, 2323]. **Search** [1954, 5991, 2882, 6400, 3097, 4734, 3795, 5797, 5100, 7172]. **Searching** [6010, 5102]. **Seattle** [7216, 7589, 7363, 7491]. **Seck** [4865, 1653, 1467]. **Second** [7444, 4835, 2218, 2542, 7349, 5038, 7309, 7439, 3680, 4113, 2998, 1486, 3047, 7412, 7300, 7318, 3762, 7350, 6835, 1437, 4287, 3841, 2630, 722, 7407]. **Second-Generation** [2218, 2542]. **Second-Order** [3680, 2998, 3047, 1437, 4287, 3841, 2630]. **Secondary** [5091]. **secret** [6405, 6644]. **Section** [5255, 5673, 5817, 5693, 6514, 6829, 5543, 6024, 6963, 7254]. **sections** [3841]. **Secure** [6249, 6099, 5861, 4605, 4748, 6227, 4304]. **Securing** [4418]. **Security** [7607]. **See** [5714]. **Seek** [3753]. **SEGGER** [6660]. **Segment** [4393, 4075, 5051, 5627, 2436]. **Segmentation** [6921, 6697, 2926, 4778]. **segmented** [6111]. **Seidel** [3632]. **Seismic** [2773]. **selbsttätigen** [35]. **Select** [5770, 4175]. **Selected** [5478, 7614, 7625, 7334, 7600, 7603, 7595, 1432, 7219, 7247, 2021, 2022, 7623, 770, 991, 1922, 5098]. **Selecting** [2698, 3386, 3387]. **Selection** [7512, 3976, 5829, 6421, 1603, 3256, 1743, 7151, 5757, 5039, 3470, 7074, 4084, 5351, 5970, 3365, 6040, 3859, 6062, 3079, 7050, 4382, 889, 4728, 2958, 4419, 4612, 4757, 2012, 5093, 3830, 1934, 6943]. **Selections** [6409]. **selective** [4248]. **selectively** [5366]. **Selector** [4500, 478]. **Self** [4172, 500, 614, 4032, 3604, 5738, 1626, 2230, 4074, 5769, 3481, 5962, 3687, 937, 7340, 413, 3027, 3992, 3236, 4035, 4861, 3759, 3267, 3797, 1437, 2264, 2584, 2585, 3940, 2139, 2489, 2168, 2841, 2842, 5807, 2848, 4956]. **Self-adapting** [4032]. **Self-Alignment** [5962]. **self-calibrating** [4861]. **Self-Checked** [413]. **Self-**

Checking [5738, 1626, 937, 2230, 2264]. **Self-Contained** [614, 500]. **Self-Delimiting** [3027, 2848]. **self-dual** [2489]. **self-generated** [4956]. **self-sorting** [3267]. **self-sustained** [1437]. **self-test** [4035, 3940]. **self-testing** [2584, 2139]. **Self-Timed** [4172, 3481, 4074, 3992, 3236, 3797, 2168, 2842]. **self-timing** [2841]. **Self-Validating** [3687, 7340, 2585, 5807]. **Semantics** [2653, 6057, 3879, 5413, 1525]. **Semi** [2044, 4044, 6108, 6724, 3489, 6642, 5887, 2700, 2701, 981, 4099]. **Semi-Automatic** [6108, 6724, 6642]. **Semi-Custom** [4044]. **Semi-Logarithmic** [3489, 2700, 2701]. **semi-portable** [981, 4099]. **Semi-Systolic** [2044, 5887]. **Semiannual** [7330]. **Semidefinite** [6317, 6343]. **seminal** [235]. **Seminar** [7572, 7246]. **Seminumerical** [522, 1421, 3913, 523]. **send** [1168]. **Sensitive** [5722]. **sensitivities** [2852]. **Sensitivity** [6074, 4316, 736, 896, 1058]. **sensor** [4146]. **Seoul** [7447, 7553]. **Separate** [5772, 144, 3326]. **Sept** [7562]. **September** [7410, 7373, 7398, 7429, 7497, 7482, 7470, 7231, 7499, 7545, 7319, 7266, 7590, 7446, 7320, 7213, 7256, 7335, 7448, 7459, 7474, 7475, 7486, 7518, 7520, 7536, 7581, 7626, 7628, 7349, 7477, 7566, 7278, 7310, 7273, 7395, 7523, 7587, 7455, 7569, 7525, 7623, 7215]. **sequel** [2780]. **Sequence** [57, 1481, 69, 6264, 7077, 2463]. **Sequences** [438, 443, 6134, 5788, 845, 6497, 3832, 3026]. **sequencing** [2989]. **Sequential** [1196, 1600, 3752, 1519, 1749, 443, 2011, 1548, 1780, 1785, 1549, 2189, 4761, 5083, 2471]. **Serbia** [7593]. **Serial** [2044, 608, 549, 3869, 4991, 5274, 1824, 1108, 1595, 1829, 1830, 4996, 6071, 174, 6422, 1609, 1843, 883, 4366, 5527, 4571, 2102, 5186, 4580, 6327, 351, 5052, 912, 6355, 4604, 3490, 843, 793, 3531, 4477, 1077, 2169, 2644, 2193, 2347, 4688, 2686, 3598, 6003, 2904, 3282, 4582, 4266, 4920, 4925, 2292, 3012, 1472, 1473, 1705, 2314]. **serial-data** [2292]. **serial-input** [2347]. **Serial-Parallel** [1824, 1843, 2169]. **Series** [3971, 6263, 2680, 3581, 6287, 6301, 2249, 764, 1057, 6604, 5875, 373, 241, 4512, 116, 1728, 466, 4203, 4863, 5735, 2927, 3645, 7080, 1058, 4625, 3701, 2223, 1037]. **Server** [5611, 3825, 2918]. **servers** [5759, 3970]. **service** [6273, 124]. **services** [5424]. **Servo** [2494]. **ses** [17]. **Sessions** [7238, 7301, 7260, 7261, 7273, 7284, 7252, 7286, 6151, 7314]. **Set** [6882, 6042, 4501, 6385, 6052, 3569, 2677, 4689, 2882, 3428, 6808, 6070, 5927, 5516, 6930, 1403, 1850, 6304, 2385, 5314, 904, 1049, 1676, 411, 5111, 5392, 4302, 6497, 548, 4516, 4675, 2511, 4683, 1111, 1392, 5599, 2522, 6414, 5013, 2380, 1851, 4042, 3312, 4918, 7103, 5093, 1796, 4954]. **set-ups** [548]. **Sets** [1260, 6545, 6553, 891, 1147, 989, 2976, 5211, 4919, 4121, 5217, 7184, 5577, 3386, 3387, 1269, 6517, 5271, 3069, 872, 4855, 4859, 636, 5336, 5546, 3313, 5434, 2453, 5883, 4494]. **Setters** [5370]. **Setun** [5696]. **SEU** [2808]. **Seven** [5066]. **Seven-Term** [5066]. **seventeenth** [7468, 931]. **Seventeenth-Century** [931]. **Seventh** [7526, 7506, 7394, 1860]. **Several** [3108, 1408, 831, 1237]. **severe** [1969]. **Sexagesimal** [6132, 101]. **SFM** [7544]. **SFQ** [5756]. **SFU** [6210]. **SFU-Driven** [6210]. **Shadow** [6802]. **Shallow** [6717, 2787]. **Shanghai** [7481, 7539]. **Shannon** [3182]. **SHARE** [400]. **Shared** [2073, 3618, 3481, 7096, 2365, 4198, 3916, 4074, 4778, 2624]. **Sharing** [111, 6423]. **Sharp** [6198, 6580, 4154]. **Sharpness** [7024]. **sheet** [3042]. **shelf** [4544]. **Sheraton** [7257, 7348]. **shi** [7444]. **Shift** [1106, 818, 431, 738, 1213, 3299, 1056, 655, 6531, 509, 4036, 3134].

Shift-And-Add [6531]. **Shifted** [5157, 5206, 4036]. **shifter** [2437]. **Shifters** [2131, 4611]. **Shifting** [1304]. **Shiftrix** [355]. **Shifts** [988, 1156, 3930]. **Ship** [3953]. **Shop** [4163, 4164, 4165, 4166]. **Short** [4652, 3, 5736, 344, 2394, 2929, 5764, 7158, 207, 1670, 3352, 6145, 4557, 3479, 4258, 5781]. **short-latency** [5781]. **Shortcut** [999]. **Shortest** [3960]. **Shorthand** [1336]. **shot** [2629]. **Should** [4342, 6800, 2891, 3085, 2707, 2708, 4713, 890, 3482, 989, 3020]. **Shrivenham** [7295, 7309]. **shutter** [5783]. **shuttle** [710]. **SIAM** [7344, 1296, 7381, 7291, 3773]. **sic** [4599, 3947]. **sich** [1137]. **Sichere** [2013]. **Side** [6526, 4418, 4603, 4605, 4748, 4680]. **Side-Channel** [6526, 4418, 4603, 4680]. **sided}** [5442]. **Siècles** [1160]. **Sierra** [4469]. **Sieve** [5921, 3931, 5885, 6062]. **SIGACCESS** [7526]. **SIGAda** [7385]. **SIGDA** [7510, 7527]. **SIGForth** [7350]. **sigma** [3576, 3993]. **Sign** [5251, 1487, 497, 857, 3988, 3430, 1979, 2093, 1419, 1632, 2130, 6972, 5454, 938, 1692, 1699, 4655, 2864, 3229, 4208, 3278, 1755, 684, 6226, 5093, 2484]. **sign-magnitude** [684, 2484]. **Sign/Logarithm** [1979, 938, 1692, 2864]. **Signal** [7003, 7373, 3223, 7429, 7513, 3406, 7299, 2670, 4527, 3584, 2212, 2218, 2897, 3260, 564, 7333, 7282, 7348, 7377, 7488, 7502, 7519, 7521, 3109, 3624, 7307, 7417, 7537, 5341, 2575, 2268, 7354, 1066, 3186, 2293, 1172, 7369, 1360, 2858, 2181, 1089, 3731, 3234, 4693, 3888, 7375, 2898, 5840, 2375, 6547, 3265, 3445, 2729, 3287, 1303, 1040, 3463, 2928, 1877, 1990, 1992, 2418, 4238, 2940, 7293, 7451, 7462, 7478, 7491, 7505, 7522, 2564, 2950, 2261, 4608, 2135, 2274, 2591, 839, 3167, 5791, 2811, 4122, 2019, 3194, 3011, 1178, 2839, 1705, 2494, 2689]. **Signal-to-noise** [1066]. **signaling** [4646, 4647]. **Signalling** [5395]. **Signals** [3397, 7300, 7318, 7329, 7424, 1135, 7439, 7452, 7463, 7479, 7492, 7506, 7574, 7586, 7615, 7367, 7408, 3896]. **Signed** [6891, 378, 219, 1366, 665, 1820, 4334, 672, 5726, 5535, 4224, 6100, 4080, 639, 2580, 3334, 2011, 4107, 534, 939, 490, 594, 6867, 3966, 90, 2510, 4678, 4174, 5732, 4074, 3157, 5209, 3679, 2471, 5570, 5388]. **Signed-Digit** [219, 1366, 1820, 4334, 4224, 6100, 4080, 2580, 3334, 490, 594, 3966, 2510, 4678, 4174, 3157, 5209]. **Signed-LSB** [5535]. **Signed-Number** [672]. **Significance** [860, 1014, 1514, 284, 1748, 762, 833, 1054, 794, 1513, 1969, 178, 982, 1053, 788, 2618, 2619, 942]. **Significand** [5575]. **significands** [4036]. **Significant** [3040, 5394, 462, 5906, 55, 555, 54, 347, 7071, 162, 5961, 5636, 237, 848, 3714, 3897, 319, 2973, 1555]. **significant-digit** [319]. **Signs** [3725, 3885]. **SIGNUM** [7229, 539]. **SIGPLAN** [7326, 7512]. **SIKE** [6689, 6810, 6575]. **Silicon** [5322, 7030, 2277]. **SIMD** [4305, 6153, 4798, 5690, 4992, 5712, 4997, 4352, 6814, 3596, 7045, 5740, 5846, 6740, 7102, 5567, 4298, 7130, 6244, 6377]. **Similar** [1700, 943]. **Simple** [858, 4809, 1268, 1377, 1603, 2528, 5514, 2896, 1518, 4553, 4563, 6558, 4566, 5180, 2554, 442, 573, 2767, 6224, 121, 1771, 650, 1453, 1795, 4670, 2684, 118, 5416, 1972, 6112, 2958, 453, 3198]. **Simpler** [4706, 4846]. **Simplification** [2845]. **Simplified** [5023, 5053, 1354, 3924]. **simplify** [4506]. **Simplifying** [3497]. **simulated** [5303, 7064, 760]. **Simulating** [7039, 6556]. **Simulation** [7482, 6509, 5835, 3588, 335, 2893, 5731, 636, 2944, 3662, 7250, 3167, 6367, 5796, 1944, 1945, 3575, 3067, 747, 1225, 1528, 1753, 4400, 5955, 981, 5358, 1450, 1935, 3012, 796, 354]. **Simulation-Based** [5731]. **Simulations**

[5942, 6205, 6359, 5563, 6493, 5910, 5499, 5708, 6286, 6824, 4591]. **Simulator** [881, 3283, 1447, 880]. **Simulink** [5790, 3339]. **Simulink-based** [5790]. **Simultaneous** [4301, 6415, 1208, 253, 3614, 6453, 4624, 5257, 5744, 4267, 4462]. **Sin** [2235, 1766, 2124, 537]. **Sin/Cos** [1766, 537]. **Sine** [1954, 1019, 1854, 4046, 2988, 1069, 2817, 2612, 953, 3287, 4738, 2969, 4261, 2124]. **Sine-Cosine** [1069]. **sine/cosine** [953, 3287, 4261]. **sines** [1399]. **Singapore** [7618, 7625, 7627, 7521, 7616, 7521]. **Single** [7002, 3222, 4310, 3725, 3055, 7141, 1271, 3423, 4835, 6177, 7147, 7148, 2082, 7058, 3907, 2098, 3464, 5042, 5854, 6448, 6204, 6331, 5335, 2940, 5775, 1150, 1656, 5078, 1674, 709, 3960, 6762, 6763, 4974, 1957, 5703, 2878, 2879, 2880, 4352, 2890, 626, 1868, 2930, 2245, 2246, 3791, 3642, 5954, 1761, 4891, 3797, 5631, 2263, 2277, 3690, 3183, 2608, 1929, 3538, 2856]. **Single-** [3907]. **Single-Board** [2082]. **single-channel** [2246]. **single-chip** [2878, 2879, 2880, 1929]. **Single-Multiplier** [4310]. **Single-Precision** [3725, 5335, 5078, 2940, 4891, 3690, 3183]. **single-rail** [3797]. **single-term** [5703]. **Singular** [3746, 4355, 3102, 1887, 4185, 4428]. **singularity** [5168]. **Sink** [6538]. **Sinking** [6649]. **Sinks** [6010]. **SIPE** [5766, 5951, 5950]. **SIPS'02** [7488]. **SiSoftware** [6496]. **Sites** [3857]. **Situ** [6726]. **Six** [5586, 3419, 5066]. **sixteen** [5]. **sixteenth** [4042, 1322]. **sixteenth-century** [4042]. **Sixth** [7201, 7393, 7492, 1675, 7381, 7369, 7216, 7367]. **Size** [6891, 1582, 1821, 4679, 6091, 4072, 6736, 6850, 6851, 5450, 2596, 3831, 3059, 4698, 5931, 5872, 4097]. **Sizes** [5719]. **Skalarprodukten** [2100]. **Skalierung** [548]. **Skewed** [7040]. **skewness** [4984]. **Skills** [3242]. **Skinny** [6125]. **Skip** [4819, 2077, 233, 1049, 4928, 2337, 2667, 2732, 2480]. **Skip-and-Set** [1049]. **skipping** [2562, 2767]. **SLAC** [3605, 1409]. **Slash** [1139, 911, 1148, 1889, 2465]. **Slave** [1951]. **SLEEF** [6745]. **SLI** [3558, 2942, 2943, 3132, 2479, 2832, 3199, 3531]. **SLI-Arithmetik** [2942, 2943]. **Slice** [1402, 1955, 1256]. **Sliced** [5694, 4444]. **Slide** [6445, 3316]. **slide-windowed** [3316]. **slight** [548]. **Slimmer** [7032]. **Slopes** [5592, 4043]. **Slow** [597]. **slowly** [3645]. **Small** [5813, 6781, 4515, 5684, 6267, 6905, 4335, 1022, 4835, 3430, 4187, 4028, 4230, 5766, 5951, 6738, 4748, 4614, 1335, 5217, 6242, 6376, 2840, 5833, 6651, 1492, 6275, 3871, 6922, 3887, 4548, 4047, 4869, 521, 2559, 574, 3486, 4745, 6122, 6123, 1561]. **Small-Characteristic** [5684]. **Small-data** [6267]. **small-order** [4745]. **Smallest** [6023]. **Smart** [7461, 3953, 7584, 4715]. **Smartphone** [5892]. **Smartphone-Based** [5892]. **Smooth** [3633]. **smoother** [5435]. **SMT** [5639, 6975]. **SMURF** [6508]. **snap** [1331, 3854, 3436, 3594, 3809, 2798]. **Snitch** [6875]. **SNOBOL4** [1028]. **Snowbird** [7298]. **Soar** [3753]. **Soars** [3356]. **SOC** [7587]. **SOCC** [7587]. **Social** [4794]. **Society** [7556, 7302, 7213, 7224, 7271, 7531, 7189, 1675, 7524, 7356]. **sociology** [2756, 2758]. **SoCs** [6987]. **Soft** [3923, 4078]. **Soft-decision** [4078]. **Softcore** [7009, 6102, 6867]. **SoftPosit** [6454]. **Software** [7229, 1482, 5133, 2647, 6265, 3563, 2870, 7423, 7605, 3574, 7544, 869, 616, 1197, 1274, 1504, 4001, 7374, 5146, 5278, 5501, 7223, 7264, 5595, 5148, 2884, 4535, 4536, 1021, 881, 7043, 1851, 3760, 3453, 4375, 7224, 2726, 4222, 1984, 5537, 2092, 1308, 5033, 1418, 3782, 6943, 6332, 6453, 1431, 4245, 1886, 4593, 4894, 3925, 4082, 4083, 7246, 6597, 914, 7206,

4426, 3333, 7575, 3161, 7210, 7112, 3953, 2612, 5106, 536, 3843, 7285, 4945, 1702, 1359, 7296, 5149, 3970, 6765, 1712, 5473, 2648, 4319, 1819, 3416, 1501, 7484, 1730, 6919, 6001, 7265, 7590, 880, 1409, 4565, 5533, 2728, 5612, 521]. **software** [4878, 756, 6582, 1758, 6016, 6728, 7480, 5204, 7226, 4456, 1689, 5883, 2826, 2479, 3374, 2315]. **Software-Hardware** [6597]. **Software-Oriented** [4001]. **software/hardware** [4878]. **SOI** [6675, 6589]. **Solar** [6107]. **Solid** [7446, 7433, 7239, 7303, 1327, 2311, 7325, 7396, 7421, 7456, 1328, 6616]. **Solid-State** [7446, 7433, 7239, 7303, 7325, 7396, 7421, 7456]. **Solidity** [6986]. **Sollya** [5594]. **Solomon** [6417]. **SolType** [6986]. **Solution** [603, 2050, 1599, 430, 5518, 884, 179, 2083, 904, 6585, 4090, 3688, 4121, 1078, 45, 1816, 3754, 4709, 562, 1868, 2743, 2248, 5345, 5555, 3815, 5967, 5968, 4773, 108, 947, 5243, 4494, 4789]. **Solutions** [4002, 4335, 3661, 4142, 5473, 3071, 365, 3198]. **Solve** [1223]. **Solved** [6482, 3132]. **Solver** [3574, 6073, 1842, 3673, 5463, 1693, 2683, 6285, 5067, 6975]. **Solvers** [6650, 3633, 4286, 6303, 6426, 6427, 5227]. **solves** [118, 1923]. **Solving** [4964, 5252, 6153, 1716, 1393, 3586, 4853, 2711, 253, 6557, 565, 1984, 5045, 4416, 1679, 3842, 4650, 4790, 4791, 4850, 6704, 515, 516, 5354, 5789, 2302, 7422, 1253, 3709]. **Somastuvan** [4042]. **Some** [4311, 3227, 856, 549, 550, 4983, 6785, 4671, 5591, 6670, 812, 671, 333, 1595, 2359, 505, 4187, 2366, 2697, 385, 965, 2535, 1610, 625, 3101, 1984, 5754, 3624, 5184, 3637, 5332, 832, 979, 3133, 4893, 5957, 1764, 3314, 5869, 7161, 3493, 1903, 703, 1161, 3690, 2021, 2022, 2612, 849, 536, 4479, 4345, 301, 3426, 5531, 1621, 749, 4879, 5041, 5188, 689, 2767, 2006, 5649, 1922, 194, 4160, 819]. **Somme** [702]. **Son** [2780, 108]. **sondern** [159]. **Sonesta** [7360]. **Sons** [3720]. **Sony** [2629]. **SORN** [6502, 6667, 6894, 7025, 7055, 6718]. **SORN-Arithmetic** [6718]. **Sorrento** [7246]. **Sorting** [3459, 4027, 2903, 3267, 4955]. **SoRuCom** [7600]. **Sound** [5993, 3615, 6015, 37, 6616]. **Source** [6179, 7073, 6948, 6949, 7099, 2587, 3960, 6512, 6196, 6371]. **source-to-source** [6371]. **Sourced** [6495]. **Sources** [809, 7264, 2307, 3713]. **Southcon** [7252]. **Southcon/82** [7252]. **Southeast** [7550]. **Southeastcon** [7270, 7362]. **Southern** [7218, 7596]. **Southwest** [7273]. **Southwest-84** [7273]. **Southwest/84** [7273]. **Soviet** [7600]. **SP** [7607]. **Space** [3399, 3406, 6901, 6166, 1821, 5494, 6683, 7142, 5295, 5928, 5530, 891, 7071, 6221, 5960, 2998, 3846, 3731, 4542, 6429, 3293, 4877, 3787, 5204, 2457, 710, 4287, 2630]. **Space-Efficient** [5960]. **Space-Time** [1821, 6429]. **Space/time** [3846]. **spacecraft** [2709]. **Spaces** [1310, 1349, 4893]. **Spain** [7498, 7543]. **Spanish** [1844]. **SPARC** [2664, 2677, 3439, 2747, 2748, 2749, 2154, 3370, 2505, 2519, 2520]. **SPARC64** [3537, 5625]. **SPARC64(R)** [4423]. **Sparse** [5401, 6585, 6590, 6961, 6968, 6361, 7112, 5577, 6936, 6111, 6356, 6467, 5357, 3340]. **Sparseness** [6045, 6927]. **Sparsity** [7062, 7107]. **spatial** [2177]. **SPEC** [2677]. **SPECFUN** [3062]. **Special** [5254, 5255, 5673, 5817, 1266, 4673, 5693, 6514, 276, 3062, 1107, 5595, 3429, 4841, 4033, 6308, 7391, 2229, 1416, 6829, 7350, 4067, 4236, 5543, 3122, 6108, 5768, 6013, 361, 5071, 6024, 6963, 6476, 6976, 6235, 5088, 1559, 6151, 7504, 5048, 2265, 4763, 1415]. **Special-Purpose** [7391, 3122, 5768, 6013]. **Specialized** [5563]. **Specific** [6667, 7388, 7401, 7588, 7500, 7545, 5525, 5526, 7518, 7559, 7573, 7494, 6984, 7466, 7427,

6754, 7540, 7384, 2639, 7534, 7582, 5781, 6375, 6246, 7030]. **Specification** [3412, 1105, 4337, 4995, 6910, 2887, 3281, 1873, 3306, 6220, 5870, 2579, 2304, 2305, 2306, 2485, 2486, 1944, 1945, 4168, 4806, 2886, 7081, 3942, 2493, 5244, 5581]. **Specifications** [3040, 5394, 1199, 2725, 6380, 4600, 942]. **specified** [2371]. **spectra** [3832]. **Spectral** [6410, 6841, 5359, 7052, 5311, 5312]. **Spectrum** [1907, 2717, 3151, 4648]. **Speculation** [3064, 3241]. **Speculative** [6111, 6016, 5236]. **Speech** [7282, 7348, 7502, 7519, 3888, 5169]. **Speed** [852, 1187, 1367, 6783, 5489, 730, 670, 1826, 4527, 277, 1597, 125, 2073, 823, 1608, 6079, 1403, 200, 340, 341, 5932, 5737, 5534, 5748, 3458, 4229, 683, 5180, 5036, 1043, 1634, 568, 6940, 6101, 6577, 2104, 754, 755, 142, 233, 1144, 570, 4245, 1640, 1888, 4252, 355, 1999, 1902, 988, 1156, 4613, 5081, 77, 703, 5878, 1541, 486, 4110, 3823, 4114, 3948, 4120, 1685, 714, 1343, 1926, 2155, 1930, 939, 5380, 4476, 7126, 945, 1257, 7129, 5242, 4299, 1360, 3543, 1480, 2172, 664, 1802, 1803, 2180, 1088, 1491, 2188, 4675, 3992, 1586, 2512, 1592, 5713, 3590]. **speed** [2365, 387, 2367, 3759, 6427, 6547, 3446, 3447, 4561, 2908, 1303, 1985, 3296, 6716, 1992, 5856, 2751, 4886, 3794, 1429, 2752, 2947, 234, 4594, 50, 5865, 2764, 7189, 3930, 2964, 1154, 3668, 3810, 4750, 3670, 3158, 2584, 2589, 2982, 4917, 2009, 95, 2456, 3678, 6228, 2138, 653, 1067, 85, 3702, 4937, 1928, 1178, 4951, 2855, 2856]. **Speed-Up** [5737, 7126]. **Speedcoding** [109]. **Speeding** [1569, 5524, 4368, 4203, 4863, 5321, 2119, 4609, 4449]. **speeds** [1575, 1988, 1891]. **Speedup** [3388, 4543, 4649, 6997]. **speedups** [2809]. **speedy** [3356]. **spell** [3440]. **spending** [6460]. **Spezifikationen** [2304, 2305, 2306, 2485, 2486]. **Sphere** [6718]. **Spheres** [5518, 4709]. **SPIE** [7417, 7451, 7462, 7491, 7505, 7522]. **SpiNNaker** [6462]. **SpiNNaker-2** [6462]. **Spirit** [7090]. **spl** [4882]. **Spline** [3415, 3263, 759]. **Split** [6696, 6441, 5975, 7281, 3534, 3023]. **Split-Path** [5975]. **Splitting** [6542, 6126]. **Spoken** [99]. **Sponsored** [7181, 7204]. **Sponsors** [6661, 6773, 6886, 6626]. **Spped** [1070, 1179]. **Sprachbeschreibung** [2735]. **Sprache** [2615]. **spread** [4648]. **spread-spectrum** [4648]. **Spreadsheet** [1764]. **Spring** [7200, 7202, 7207, 5491, 7271, 7337, 7187]. **Springs** [7545, 7241]. **SPRU100A** [4637]. **SPUR** [1944, 1945, 1978, 2090]. **SPW** [4499]. **Spying** [6687]. **SQL** [6594, 7164]. **Square** [3971, 4652, 3544, 1009, 13, 1188, 1083, 1483, 3038, 3224, 3552, 3553, 3554, 3555, 3556, 3557, 4969, 952, 5821, 7135, 1807, 3046, 18, 2651, 153, 275, 4514, 727, 549, 550, 6055, 6787, 5692, 6671, 6899, 7026, 5269, 5698, 1953, 813, 1956, 1584, 668, 303, 1826, 4002, 3877, 4684, 3241, 304, 52, 2684, 3878, 2350, 334, 1599, 619, 1023, 1116, 4020, 4186, 4187, 4842, 5292, 36, 281, 2073, 6422, 384, 433, 1208, 1283, 5724, 26, 2711, 1972, 2901, 5525, 2716, 5526, 7151, 2540, 3613, 514, 6558, 1856, 4221, 4721, 4722, 4050, 4051, 3456, 3457, 3621, 24, 3287]. **Square** [344, 2394, 973, 5752, 5753, 6566, 1305, 2091, 2396, 4060, 4872, 30, 3778, 348, 519, 3912, 5039, 3469, 3470, 4398, 4731, 120, 5861, 2941, 3473, 5862, 7074, 3474, 2430, 1640, 1888, 638, 686, 2759, 4894, 3481, 6595, 360, 2955, 2259, 1652, 3310, 2766, 4900, 6465, 1152, 5435, 5780, 5871, 3931, 580, 3496, 1533, 5207, 2007, 4613, 5443, 3503, 1670, 703, 6741, 1538, 5451, 2143, 586, 997, 5970, 531, 709, 186, 652, 4626, 1916, 4113, 4114, 3689, 3524, 3698, 3699, 3828, 375, 4464,

1553, 242, 5885, 3193, 4638, 214, 2829, 3359, 168, 6870, 1354, 5116, 5888, 2033]. **Square** [597, 2626, 5240, 2036, 6757, 799, 600, 6041, 4153, 2172, 3852, 5815, 3978, 4317, 5138, 1373, 6788, 6898, 3732, 4331, 1269, 1497, 3570, 3992, 1818, 610, 3237, 3414, 5593, 4175, 2514, 1961, 4004, 4006, 4181, 4823, 958, 1598, 1731, 1967, 2361, 2363, 2364, 2527, 2695, 3255, 4697, 4843, 2365, 2896, 1398, 1407, 3604, 4203, 4863, 4717, 5735, 4208, 4210, 4211, 5026, 5308, 3097, 3451, 626, 740, 4048, 3772, 2729, 4052, 4053, 6315, 2092, 2404, 3628, 3112, 3294, 5182, 3916, 2935, 4070, 3125, 4074, 3471, 3639, 3791, 3792, 3131, 2947, 2755, 7077, 2432, 3797, 2567, 2761, 2762, 2951, 3139]. **square** [2956, 1892, 2439, 2571, 2767, 3148, 3488, 6218, 6463, 4086, 236, 4089, 4092, 4908, 5205, 1060, 4097, 1329, 1445, 1908, 2006, 4912, 3504, 2135, 1669, 5212, 4617, 3941, 3942, 3943, 4106, 211, 4625, 782, 3176, 3178, 3516, 3696, 1923, 2473, 2474, 5461, 292, 188, 4288, 1464, 4290, 5229, 4292, 78, 84, 4474, 6485, 4784, 3023, 3025, 3026, 5809, 4493, 4958, 4300, 6878, 2048, 1427]. **Square-Root** [4969, 153, 3241, 2073, 1283, 4398, 1640, 1152, 2007, 6741, 3698, 3699, 168, 600, 1972, 3287, 4731, 5435, 3859, 1407, 3604, 4210, 4211, 3451, 4048, 2729, 3916, 4074, 2956, 4912, 4617, 4290, 78, 84, 4958, 2048]. **Square-Root-X** [1483, 1553]. **Square-Rooting** [1584, 1208, 1888, 703, 3912, 3473, 2259, 2036, 4181, 2896, 4097, 2135, 3023]. **square-roots** [3978, 1892]. **Squared** [334]. **Squarer** [334, 4387, 6605, 4485, 4239, 4643, 4645]. **Squarers** [4991, 132, 4480, 4948, 5115, 4143, 3282]. **Squares** [603, 1830, 2711, 4872, 4880, 686, 643, 1677, 4765, 2177, 1948, 100, 292, 2024]. **Squaring** [611, 5275, 1519, 5023, 5527, 1749, 4577, 5549, 6355, 4436, 3215, 3383, 2344, 2896, 4403, 211, 6136]. **Squaw** [7561, 7583]. **Squeezing** [6557]. **SQUID** [2714]. **SRT** [3488, 3409, 4331, 3579, 3997, 3763, 3451, 3460, 4382, 3777, 4728, 5039, 7074, 3133, 4743, 5061, 3139, 3148, 3933, 4103, 5970, 1934, 2841]. **SRTEST** [4382]. **SSEC** [1531]. **St** [7297, 7289, 7467]. **ST100** [4901, 5070]. **ST231** [5537, 5753]. **Stabilität** [1062]. **Stabilitätsatzes** [548]. **Stability** [6157, 1716, 6673, 3574, 1112, 1208, 4371, 3616, 4562, 7095, 2981, 1062, 5973, 1078, 496, 548, 3587, 4212, 1756, 1638, 834, 2597, 947]. **Stabilized** [103]. **Stabilizing** [4911]. **Stable** [5043, 1229, 2616, 889, 890]. **Stack** [1034, 1286]. **Stacked** [6240]. **Stacking** [6240]. **stage** [5995]. **Stages** [4193, 3503, 3504, 1934, 2841]. **Staggered** [5482, 3515]. **stairs'** [2961]. **Stairway** [3715]. **Standard** [2041, 2862, 3040, 5394, 3975, 3981, 1950, 1812, 1715, 2655, 2334, 4673, 5697, 3412, 1197, 1386, 1503, 1726, 1825, 2345, 3061, 1198, 1199, 1275, 1388, 1727, 4005, 3423, 6170, 6805, 2355, 1733, 5413, 5509, 1512, 1204, 1280, 2704, 4034, 3770, 1301, 1410, 6559, 6825, 6561, 1861, 1862, 1863, 2088, 2089, 6095, 6562, 7056, 24, 1628, 1224, 1308, 1417, 2095, 3626, 3774, 4570, 5610, 3493, 5437, 6970, 1059, 6225, 1157, 1235, 4448, 7105, 3344, 1777, 6745, 1339, 1459, 1460, 1341, 1466, 2028, 1470, 1181, 5583, 3852, 1570, 2045, 1191, 3411, 4525, 1590, 2681, 1105, 1962, 3747, 506, 2226, 1219, 1864, 1996, 6729]. **standard** [3485, 2581, 2582, 2277, 1678, 4767, 2017, 1461, 4937, 3374, 4967, 6390, 4195, 4708, 7157, 3656, 2579, 2977, 3164, 3818, 5370]. **Standard-** [1628]. **Standard-Cell** [5697, 5583, 2681]. **Standardfunktionen** [1812, 2053, 2103, 2573, 587, 3344, 1353, 1795, 1812]. **Standardization** [5706, 4831, 5326, 3493, 4640, 2815].

Standardized [4381]. **Standards** [5131, 2678, 5173, 3950, 6751, 2304, 1502, 2206, 1758, 3482]. **Standpoint** [390]. **Stanford** [7434, 7294]. **STAP** [5776]. **Start** [5058]. **Starting** [281, 384, 2766, 580, 3689, 533, 597, 5183, 452, 3176]. **starts** [1663]. **State** [7598, 3399, 3406, 7446, 7433, 7239, 7240, 7303, 7291, 3787, 6595, 2998, 1179, 7325, 7396, 7421, 7456, 3542, 5683, 3731, 7225, 3293, 4877, 2457, 1242, 1334, 2605, 4287, 2311, 2630]. **State-of-the-Art** [6595]. **State-Space** [3406, 2998, 3787, 3731, 3293, 4877, 4287, 2630]. **Statement** [3388]. **States** [7241, 7628]. **Static** [4819, 731, 4528, 6921, 3595, 4364, 5162, 5727, 4887, 4916, 3691, 4181, 5759, 3797, 5346, 7553]. **statistic** [4149]. **Statistical** [4794, 550, 3063, 225, 54, 3902, 1227, 753, 905, 3925, 4082, 3349, 4629, 593, 7254, 2671, 138, 1226, 3303, 987, 3814, 4268]. **statistici** [138]. **Statistics** [720, 418, 7255, 563, 4593, 1810, 5407, 3091, 291, 2617, 2618, 2619]. **Status** [5509, 3774, 2603, 3626, 6110, 772, 5098, 5222, 5458, 5459, 5460, 5461, 5462]. **Std** [2041, 6528, 6562]. **Steady** [6955]. **Steamboat** [7545]. **Steering** [6259, 6774, 6887, 6628]. **Stein** [1018]. **Stencil** [6618]. **Stengle** [6590, 6361]. **Step** [6269, 6787, 1076, 92, 3113, 3114, 3115, 3116, 1698]. **step-by-step** [92]. **Steps** [4359, 5869, 283, 2767]. **Stepwise** [5378]. **Sterbenz** [996]. **Stewart** [5610]. **Sticky** [4165, 3741, 4267]. **sticky-bit** [4267]. **still** [2190]. **stingy** [2577]. **Stinks** [2712]. **STOC** [7554, 7571]. **Stochastic** [2174, 4797, 2875, 6798, 6925, 7037, 7144, 5841, 5728, 6543, 6704, 4892, 4893, 6730, 6604, 2270, 6034, 6237, 6977, 6863, 4945, 4792, 6396, 2663, 4525, 6083, 6425, 2902, 5860, 6456, 5435, 2599, 3202, 6873, 3416]. **Stochastically** [6811, 6812]. **stochastique** [3416]. **Stock** [3638, 1671]. **Stocks** [4274]. **STOIC** [1686]. **Stokes** [3574, 3661, 4142]. **stopping** [416]. **Storage** [866, 5519, 7621, 287, 144, 5931, 3350]. **Storage-Efficient** [866]. **Stored** [2501, 3080, 5608]. **Stored-Carry** [3080]. **Stories** [5021]. **story** [5331]. **Strader** [2471]. **Straight** [6243, 6387]. **Straight-Line** [6243]. **Strasbourg** [7401]. **Strassen** [5719, 5302]. **Strategies** [6327, 3480, 4169]. **Strategy** [6432]. **Strawman** [4686]. **Stream** [6737, 6860, 6264]. **Stream-Based** [6860, 6737]. **Streamed** [6369]. **streaming** [5791]. **streamlined** [2269]. **streamlines** [1796]. **Streams** [6374, 5668]. **Strength** [4770, 3539]. **Stretch** [246, 272]. **Strict** [2025, 2912]. **strikes** [6480]. **string** [6383, 4167, 627, 1890]. **Strings** [1769, 833]. **Strong** [3753, 3682]. **Strongly** [2939]. **Structural** [481]. **Structurally** [2200]. **Structure** [248, 672, 733, 1842, 883, 6013, 6134, 2814, 4477, 5577, 4213, 2931, 1141, 406, 4762, 1918, 3851, 1385]. **Structured** [2055, 1965, 7232, 4773]. **Structures** [852, 607, 859, 2656, 4527, 5515, 1413, 6330, 5060, 1439, 1660, 1451, 6615, 2998, 1251, 5271, 4013, 4561, 896, 3493, 2986, 791, 2304]. **struggle** [7529]. **strukturelle** [2615]. **Strukturen** [2304]. **Studies** [7268, 179, 841, 794, 6146, 822]. **Study** [4306, 550, 5484, 6791, 6792, 6276, 3574, 505, 5838, 1125, 176, 6695, 6569, 1042, 753, 144, 3496, 4278, 1453, 7114, 2810, 934, 7123, 2828, 3369, 3229, 300, 3234, 2671, 562, 3445, 7052, 2718, 1225, 5619, 760, 6017, 5626, 1908, 710, 324, 6375, 194, 3380, 2004]. **Stupid** [6055]. **Sub** [3436, 3594, 3591, 2386, 627]. **sub-language** [627]. **Sub-Nanosecond** [3436, 3594]. **Subcommittee** [7204]. **subdivision** [6394]. **Sublinear** [5287, 5411, 5858]. **Subnormal** [6767, 5047,

6046]. **Subprograms** [4516, 634]. **Subquadratic** [5295, 5296, 5530, 4936]. **Subroutine** [154, 2205, 1120, 1981, 1848, 539]. **Subroutines** [720, 5868, 2283, 1559, 501, 484, 147, 1599]. **Subsets** [3493]. **subspace** [3560, 6929, 3835]. **Substitution** [2199, 2390]. **subsystem** [2341, 2569]. **Subtracting** [4002]. **Subtraction** [804, 4520, 4521, 7018, 4171, 5601, 1514, 5943, 4732, 5055, 1439, 2142, 455, 6980, 4507, 3871, 4678, 1513, 1969, 3832]. **Subtraction-free** [5055]. **subtractions** [3468]. **Subtractive** [3655, 3524, 2473, 2474, 3471]. **Subtractor** [5749, 6437, 5231, 6869, 4891, 5777]. **subtractors** [7169]. **Subtyping** [4362]. **Subword** [4856, 4880]. **Subword-Parallel** [4856, 4880]. **Succeeding** [3493]. **Success** [3653]. **Successful** [5131, 5173]. **Successive** [1835, 315]. **successor** [5560]. **Such** [6609]. **Suck** [6544]. **Suddenly** [6753]. **Sufficient** [4068, 4519]. **Suggestion** [953, 4866, 310, 714, 325]. **suggestions** [5591, 1996]. **Suisse** [108]. **Suitability** [6939]. **Suitable** [6195, 5323, 7114, 5676, 3267, 2418, 689]. **Suite** [6170, 6832, 2109, 2250, 7086, 3461]. **Suits** [6735]. **sukzessive** [1835]. **Sulla** [137, 138]. **Sum** [3718, 6806, 6807, 1394, 3433, 744, 4880, 2123, 4905, 4906, 5077, 702, 3162, 4765, 213, 6747, 3530, 6379, 945, 5593, 6111, 4754, 292, 2123]. **Sum-of-Squares** [4880]. **summability** [3367]. **Summand** [1144]. **Summary** [53, 2261]. **Summation** [6043, 6148, 6654, 3974, 6895, 6516, 609, 865, 4691, 4834, 5918, 6067, 2358, 3431, 4706, 4846, 4848, 966, 678, 4230, 749, 6207, 6334, 1529, 571, 6342, 640, 3651, 2255, 1319, 6118, 836, 5201, 1662, 5085, 5453, 5454, 5455, 5561, 1076, 6641, 659, 7171, 5123, 5582, 5668, 2197, 2198, 116, 4538, 6172, 5291, 1117, 6929, 3598, 5843, 6083, 7049, 3098, 1625, 3912, 6328, 5857, 3473, 3645, 758, 759, 5865, 3659, 6122, 6123, 579, 3153, 5557, 2270, 1064, 5641, 5876, 1352]. **Summations** [3801, 6802, 6580, 5353, 6375]. **Summen** [1095, 2100, 836]. **Summer** [7385, 7379, 7324, 7280]. **Summierungsverfahren** [579]. **Summing** [373, 466]. **Sums** [5985, 6152, 1095, 5397, 6272, 1601, 5542, 5851, 832, 1652, 451, 4167, 100, 4385, 2100, 5616, 1994, 2420, 574, 836, 5212, 2014, 2599, 5656, 5246]. **Sumsets** [5217]. **Sun** [2026]. **sunity** [5188]. **super** [2197, 2198]. **superaccumulators** [6122, 6123]. **Superblock** [5403]. **Supercalculators** [2291]. **supercomputer** [3222, 2650, 2691, 5005, 5019, 1973, 5208]. **Supercomputers** [2322, 2810, 1491, 6127]. **Supercomputing** [7297, 7316, 7541, 7305, 7347, 2757, 7308, 7464, 7317, 6193, 2410, 6480, 2922]. **Supercomputing-Japan** [2922]. **Superefficient** [1594]. **superelliptic** [4546]. **superhighway** [7402]. **Supermicro** [1849]. **Superscalar** [3104, 3105, 2749, 3929, 4109, 3003, 4459, 3998, 3439, 2747, 2748, 3342]. **Superset** [3983, 4816]. **Supersingular** [5684]. **supplement** [6135]. **supplementary** [991]. **Support** [7315, 7008, 6489, 6386, 3857, 6781, 2654, 6675, 2345, 3061, 3881, 4341, 5286, 2215, 4715, 3601, 5740, 5846, 7055, 398, 2237, 1044, 5053, 1643, 5959, 7091, 7099, 994, 4112, 6981, 7120, 5567, 5106, 6647, 3970, 1571, 6266, 3880, 4010, 5996, 5175, 5177, 5533, 4723, 473, 3157, 1063, 5562, 2290, 5221, 5385]. **supported** [6660, 6666]. **Supporters** [6627]. **Supporting** [7014, 5902, 4195, 4117, 6868, 6831]. **Supports** [1654]. **Suppression** [3017, 1277]. **Supremum** [5495]. **Surd** [13]. **sure** [2285, 3713]. **Surface** [3415, 5215]. **surprising** [6512]. **surreal** [6610, 6610]. **surveillance** [545]. **Survey** [1010, 2654, 6676,

965, 4365, 628, 3637, 756, 1051, 2571, 530, 1180, 243, 7170, 719, 2312, 2343, 4064, 4914, 5663]. **Surveyor** [2891, 3020]. **Survival** [4240, 2308]. **Sussex** [7320]. **sustainable** [4943]. **sustained** [1853, 1437]. **SVD** [2056, 2201, 2750, 2830]. **SVE** [6796, 6903]. **Svoboda** [3927]. **sW** [6589]. **Sweden** [7436]. **Swiss** [108]. **switch** [2949]. **Switching** [733, 38, 42]. **Switzerland** [108, 7460, 7416, 1456, 7427]. **SWT** [1689]. **Sydney** [7306]. **Sylvester** [4316]. **Symbol** [6502, 403]. **Symbolic** [4303, 7558, 2199, 3740, 4351, 4025, 4199, 7431, 7416, 7177, 2772, 7234, 7507, 38, 42, 6137, 6138, 6619, 7467, 7370, 7597, 3580, 620, 6699, 2390, 2121, 2963, 6356, 1542, 4495, 7234]. **Symbolic-Algebraic** [4199]. **symbolically** [4850]. **Symbolics** [1927]. **Symbolics-Lisp** [1927]. **Symbols** [2953, 299]. **Symmetric** [6650, 1832, 5940, 1419, 750, 828, 4391, 2944, 5059, 5195, 5649, 3822, 3824, 4111, 4286, 4126, 5214]. **symmetrical** [4632]. **symmetrically** [2841]. **symmetries** [4533]. **symmetrizer** [2303]. **Symplectic** [4125, 4771]. **Symposia** [7442]. **Symposion** [1653, 7251, 7407]. **Symposium** [7216, 7235, 7385, 7397, 7443, 7468, 7510, 7511, 7527, 7554, 7571, 7409, 7410, 7355, 7237, 2641, 3721, 3858, 7514, 7357, 7399, 722, 1189, 1365, 7482, 4664, 7498, 7556, 7528, 7558, 7578, 3991, 7472, 7613, 7620, 7445, 7589, 1115, 2362, 7319, 7390, 7255, 7431, 7546, 7182, 7276, 1860, 7214, 7218, 7228, 7240, 7245, 7258, 7321, 7322, 7345, 7358, 7378, 7392, 7404, 7437, 7449, 7460, 7474, 7487, 7504, 7520, 7531, 7532, 7533, 7535, 7562, 7564, 7584, 7604, 7607, 7624, 7626, 7628, 7290, 3466, 7406, 4066, 7450, 7351, 7565, 7416, 3786, 7425, 7379, 7566, 7453, 7233, 7189, 7279, 7538, 7612, 2770, 7608, 7234, 7243, 7480, 7217]. **Symposium** [7419, 7426, 7440, 7493, 7552, 7568, 921, 1675, 7312, 7441, 7601, 7251, 7407, 7507, 7524, 7220, 3191, 7382, 7383, 7619, 7617, 7222, 7467, 7495, 7370, 7597, 7371, 7553, 7296, 7570, 7547, 7334, 7477, 7226, 7215, 7181, 7259]. **Symposiumsbericht** [7233]. **Synapses** [6726]. **sync** [5783]. **Synchronization** [4551]. **Synchronous** [239, 322, 3831, 1935, 2837, 4648]. **Synergistic** [5068, 5078]. **Syntactically** [5450]. **Syntax** [1525]. **Synthesis** [7457, 1565, 7018, 4682, 6174, 5152, 879, 3452, 4604, 7083, 2152, 6754, 5979, 5119, 5583, 4161, 4313, 3989, 3239, 3240, 3892, 4021, 3083, 4601, 6371, 6375, 5804, 6999]. **Synthesis-time** [7018]. **Synthesisable** [5269]. **synthesizable** [4891]. **Synthesized** [5584]. **Synthesizing** [5934, 2203]. **System** [4963, 5670, 2038, 6042, 7003, 417, 7201, 2318, 1487, 4661, 4971, 4972, 5476, 5677, 5678, 6499, 6665, 245, 109, 3395, 4977, 6780, 1574, 1576, 6160, 4520, 4521, 1719, 246, 32, 6901, 6519, 220, 5711, 2879, 5831, 5716, 6532, 3584, 3744, 4014, 4354, 6415, 2069, 1202, 3080, 5515, 3260, 177, 6078, 624, 1743, 253, 970, 5023, 469, 5734, 5314, 1133, 396, 1746, 2546, 3280, 7520, 3109, 1135, 398, 2237, 1419, 1632, 3464, 750, 828, 203, 5943, 634, 6107, 3790, 1048, 1231, 4732, 4076, 5053, 6586, 6839, 7076, 1434, 6591, 5341, 5196, 4595, 1149, 3141, 6952, 290, 359, 1650, 4604]. **System** [7394, 5072, 2772, 3491, 3665, 2782, 4431, 1325, 1907, 6969, 368, 587, 1164, 5878, 455, 485, 2146, 5562, 7523, 2150, 2603, 7465, 6983, 4632, 4457, 4458, 4633, 5097, 5098, 5099, 5224, 272, 938, 1248, 5372, 3959, 2299, 1251, 6634, 6381, 3368, 6756, 3712, 134, 2845, 5121, 4649, 1707, 2634, 1711, 4304, 4657, 3547, 297, 3037, 2642, 4662, 5896, 2043, 2321, 6264, 6392, 2181, 1089, 1262, 1489,

2047, 2325, 3230, 1949, 3048, 3049, 1714, 4167, 3865, 2504, 2870, 6268, 3733, 4675, 4816, 2196, 4170, 4522, 4817, 3411, 2057, 4677, 5271, 2338, 2512, 2672, 1723, 2513, 3239, 3240, 3575]. **system** [3576, 3577, 3993, 2683, 423, 4182, 2880, 5713, 1109, 1110, 4350, 2353, 2889, 3072, 3252, 3253, 3585, 3743, 3886, 4703, 4026, 4356, 4029, 4196, 2371, 2899, 2372, 3894, 2373, 2375, 1847, 2379, 2380, 6303, 3605, 562, 3446, 3447, 2384, 5169, 2911, 5739, 1411, 3903, 5533, 2392, 101, 2914, 6196, 4379, 1523, 1524, 1985, 2234, 1040, 473, 4233, 5424, 2734, 231, 4878, 1528, 3124, 1992, 2245, 2418, 2931, 4882, 2421, 2746, 2422, 1230, 3788, 3920, 4409, 4078, 4243, 5192, 978, 6110, 2945, 4248, 4249, 4250, 4411, 4412, 4594, 4890, 4081, 4251, 5863, 2431, 981, 3145, 1763, 5630, 6733, 5073, 2963]. **system** [236, 4425, 4746, 5, 3322, 3323, 2972, 4096, 4262, 4263, 183, 206, 4434, 4755, 527, 2456, 2591, 4276, 1537, 1910, 2010, 4442, 1241, 2144, 4622, 4925, 4119, 5093, 1918, 2149, 5797, 2811, 2996, 3952, 4123, 1000, 1688, 1782, 1783, 2019, 2020, 5094, 2999, 3000, 4630, 3354, 5221, 5462, 324, 3837, 4938, 3527, 3704, 1931, 2300, 2027, 5233, 2827, 3840, 1176, 716, 795, 2032, 3365, 5382, 4481, 5803, 2839, 3211, 3212, 3378, 3379, 4147, 4148, 4149, 4487, 4488, 4646, 4647, 4648, 2846, 2847, 2632, 4955, 801, 3028, 6878, 481, 1946, 1101, 418, 419, 2878, 384, 392, 393]. **System** [2541, 472, 682, 972, 2105, 2566, 2570, 1442, 3327, 3328, 4607, 187, 6372, 538, 3373, 4647]. **system-based** [4594, 4890]. **system-definition** [2371]. **System-Level** [3109, 5716]. **System/360** [417, 396, 481, 418, 419, 384, 392, 393, 682, 1442, 538, 472]. **System/370** [2038, 1746, 1946, 1101, 972, 2105]. **System/390** [2879, 2880, 2878]. **System/6000** [2546, 3280, 2541, 2566, 2570, 3373]. **Systematic** [5998, 82, 5418, 5192, 1439, 2972, 3327, 3328, 4917, 1451, 2999, 3000, 3386, 3387, 5845, 2562, 2592]. **Systematizations** [5488]. **Systeme** [1936]. **Systemen** [1237]. **Systems** [7315, 7457, 1081, 6880, 7133, 1485, 7458, 3722, 3723, 4508, 6892, 3863, 4314, 497, 666, 804, 857, 725, 806, 1091, 1577, 1372, 4322, 6509, 728, 3233, 302, 7588, 1820, 7300, 7318, 7329, 5705, 7544, 4001, 2519, 2520, 7589, 1393, 5917, 7143, 7500, 3586, 7545, 3075, 6289, 7424, 875, 1204, 430, 1605, 4030, 877, 4853, 512, 6293, 4551, 885, 179, 6557, 2083, 6191, 5313, 1522, 972, 7204, 7257, 7321, 7322, 7378, 7391, 7448, 7460, 7474, 7488, 7518, 7532, 7533, 7534, 7536, 7548, 7549, 7559, 7563, 7573, 7582, 7584, 7594, 5746, 6708, 1865, 4568, 683, 744, 3633, 5181, 7272, 6939, 1138, 1424, 1876]. **Systems** [5618, 753, 5855, 5947, 3917, 6720, 5045, 5189, 288, 1143, 5770, 7380, 6585, 5341, 7439, 7452, 7463, 7479, 7492, 7506, 7574, 7586, 7615, 1148, 1889, 5061, 4254, 4896, 4255, 2960, 3489, 6846, 2776, 919, 3494, 2970, 3325, 1440, 2580, 3334, 3162, 3501, 5213, 1674, 6854, 407, 6856, 7250, 7312, 3511, 7494, 3688, 1917, 2148, 3691, 4121, 7367, 7408, 4286, 1169, 2609, 7220, 7466, 2610, 7427, 4939, 2029, 3842, 7540, 5378, 1558, 243, 3208, 7371, 3019, 1078, 797, 3214, 5391, 1005, 3386, 3387, 4961, 7001, 2042, 2319, 3861, 4795, 45, 1488, 3561, 2183, 1264, 2646, 1811, 2332, 5590]. **systems** [3988, 1816, 6401, 2200, 956, 5270, 2673, 2674, 2675, 2676, 4680, 4528, 4529, 1827, 5152, 3747, 1837, 1278, 7265, 387, 2700, 2701, 4196, 2703, 2705, 3597, 226, 337, 2532, 5303, 2374, 2710, 4714, 1035, 1210, 3448, 4565, 2724, 2391, 1867, 1039, 1415, 1416, 2919, 3110, 3463, 3629, 257, 1420, 3113, 3114, 3115, 3116, 7064, 2417, 2930, 1877, 1989, 1990, 1991, 2246, 2419, 2745,

2933, 5190, 1755, 4888, 4250, 4413, 575, 5774, 4743, 1317, 2765, 5344, 1891, 5345, 3926, 5435, 4424, 697, 2451, 2971, 5352, 5354, 5438, 3157, 406, 3331, 3332, 3499, 4911, 1770, 5209, 6226, 4435, 3815]. **systems** [2978, 2979, 3502, 3676, 4275, 3940, 2138, 2458, 1450, 1242, 1334, 5789, 5967, 5968, 4623, 5791, 1542, 2470, 4122, 4124, 7524, 4773, 5368, 5369, 3006, 2608, 3007, 1463, 1550, 5658, 2827, 3840, 2302, 4140, 4294, 4639, 2162, 2031, 3363, 3364, 148, 3015, 6039, 1560, 947, 1183, 4148, 4789, 1943, 1253, 3709, 2053, 1759, 1237, 1936, 801]. **Systolic** [2044, 5480, 1815, 2197, 2198, 3057, 5272, 2517, 4996, 2696, 7040, 2711, 3898, 2083, 2393, 4572, 2409, 3299, 4072, 4401, 3141, 7163, 2130, 2134, 2801, 1915, 3186, 1698, 2161, 3205, 5887, 2169, 1940, 2181, 2207, 4688, 2686, 2883, 3070, 2695, 2904, 1858, 4234, 2419, 2744, 4730, 4239, 4403, 4582, 5048, 4410, 2000, 2972, 2267, 2468, 3523, 2031, 3206, 4296, 4951, 4787, 2314, 2689]. **Szabo** [510]. **Szeged** [7445].

T [6703, 930, 6248, 2223, 6465, 6865]. **T-count** [6465, 6865]. **T-depth** [6865]. **T-Series** [2223]. **T.** [930, 2471]. **T4** [6565]. **T800** [3085, 2084]. **T9000** [2738]. **Tabellenzugriff** [2036]. **Table** [6260, 6662, 6775, 6888, 5827, 1582, 52, 4836, 4028, 2538, 1743, 4209, 3443, 6091, 24, 4391, 5042, 4414, 5060, 4085, 2126, 2128, 2129, 4439, 3816, 3683, 3822, 1545, 999, 4126, 3838, 6629, 2476, 2613, 2614, 2819, 2820, 3010, 1706, 2036, 3382, 4345, 5000, 5833, 6531, 2668, 5507, 3440, 4047, 101, 4869, 2958, 4745, 3329, 3330, 4097, 3158, 3958, 6153, 4734]. **Table-assisted** [1706]. **Table-Based** [5827, 4209, 4085, 5833, 6531, 4836, 4745]. **Table-Driven** [3816, 2476, 2613, 3010, 2538, 2614]. **Table-Lookup** [2819, 2820, 3158]. **Tables** [1720, 3243, 54, 7074, 5072, 3933, 5970, 6365, 3168, 3512, 3821, 3824, 4111, 4933, 5101, 4534, 3871, 6540, 2559, 410, 4956]. **tabular** [5841]. **tackles** [1970]. **Tackling** [6309]. **tactics** [3223]. **Tagged** [6804]. **Tahoe** [7561, 7583]. **Tails** [5942]. **Taipei** [7322, 7520, 7584]. **Taiwan** [7322, 7584, 7520]. **take** [3392]. **Taken** [10]. **Takes** [3419, 2323]. **Taking** [18, 6055, 3978, 188, 5570]. **Tale** [3486, 3351, 3487]. **Talk** [6086, 6107, 6132, 5610]. **talks** [6151, 7516]. **Tall** [6125]. **Tall-Skinny** [6125]. **Tampa** [7541]. **Tanaka** [510]. **Tang** [6197, 6121]. **Tangent** [6679, 6329, 5058, 1158]. **Tapered** [7018, 642, 2321, 5158]. **Tapia** [7567, 7567]. **Tar** [7213]. **Target** [3785]. **Targeted** [6927]. **Targeting** [6635]. **targets** [3356]. **Task** [1459, 1461, 1339]. **Taub** [340, 341]. **Taylor** [2680, 1728, 3581, 977, 5082, 5875, 4626, 5214, 6137, 6138, 6619]. **TC** [4372, 4067]. **TC2** [7248, 7423]. **TC2/WG** [7423]. **TCCA** [7214]. **TDC** [5794]. **Teaching** [2647, 2033, 2626, 1712, 2648, 4705]. **Tech.** [1484]. **Technical** [4505, 3857, 2664, 7204, 7239, 7240, 7303, 3620, 7396, 7322, 7403, 4256, 2261, 918, 7325, 7421, 7456, 344, 207]. **Technik** [124]. **Technique** [1261, 224, 617, 6977, 190, 4657, 4325, 90, 3072, 2728, 3294, 2733, 2100, 3465, 2436, 453, 4749, 5093, 2149, 5797, 3535]. **Techniques** [329, 3997, 3588, 3760, 1985, 569, 233, 351, 2563, 2433, 5072, 1901, 1661, 2801, 370, 709, 3683, 2813, 5798, 167, 2029, 1089, 2191, 3733, 5270, 3579, 6426, 5020, 626, 437, 2086, 1221, 2234, 5612, 2422, 4400, 3303, 5056, 2252, 4246, 2765, 3926, 3152, 2971, 3679, 487, 3363, 3364, 5149]. **techniques/floating**

[2234]. **Technologies** [6525, 1613, 7271, 7556, 7402, 7460, 7584]. **Technology** [3855, 7386, 7328, 7373, 7429, 4805, 1982, 2546, 3280, 7580, 7322, 7461, 7503, 7592, 7405, 7551, 3932, 1903, 1660, 7395, 3161, 2311, 3246, 2384, 3905, 7563, 1747, 3285, 3906, 4223, 4377, 5174, 5533, 5746, 6708, 2758, 2263, 2266, 2277, 124, 456, 3194, 3195, 7007, 510]. **Teeth** [1213]. **Teil** [2082, 2304, 2305, 2306, 2485, 2486]. **telco** [4531]. **Telecommunications** [7359]. **teleoperator** [822]. **Telephone** [75]. **Telephony** [3753]. **Tempe** [7240]. **temporal** [6672]. **Ten** [843, 2658, 6931, 4131]. **ten-thousandfold** [6931]. **Tend** [661]. **Tensor** [6505, 6461, 6737, 6813, 6427, 5215]. **TensorFlow** [6961]. **Tenth** [7495]. **Terabytes** [7489]. **Teraflop** [5765]. **Term** [6703, 6571, 6107, 7082, 7160, 5066, 6239, 5378, 3368, 5703, 6434, 6706, 2590]. **Termination** [1374, 4628, 5092]. **Terms** [241, 4669, 5709, 1625]. **Ternary** [5471, 5670, 1012, 6159, 5696, 5831, 5016, 738, 6448, 4632, 3246, 465]. **Terry** [44]. **Tesla** [7007, 7122]. **Test** [3040, 5394, 4653, 5812, 5585, 4967, 549, 4809, 5706, 2680, 3060, 3062, 394, 7392, 7530, 3460, 2105, 5545, 7157, 2109, 2250, 2563, 983, 4100, 4270, 5447, 2279, 1455, 2814, 5242, 6394, 4319, 4670, 5407, 4035, 3603, 3759, 2721, 4382, 4400, 5345, 4918, 3940, 2808, 3518, 3525, 2617, 2618, 2619, 4149, 5126, 4650, 4790, 5916]. **Testability** [5242]. **Testable** [1604, 1778, 2543, 3803, 5446, 3338, 2139]. **Testbase** [2721]. **Testing** [5812, 7024, 1504, 881, 5539, 6720, 2788, 2475, 2611, 7285, 4141, 3713, 7171, 501, 5289, 880, 3461, 5326, 4588, 2253, 7177, 2433, 2584, 2139, 5644, 2815, 5222, 4474, 4475]. **Tests** [395, 1984, 6594, 1764, 5207, 3303, 3002, 3207, 3371]. **Tetrahedron** [4383]. **Texas** [7255, 7218, 7277, 7435, 7604, 7415, 7350, 7273, 1016, 7518, 7350, 3195]. **Textbook** [3857]. **TH** [6296, 2340, 5939, 5349, 582, 3817, 5800, 2339, 180]. **Their** [1259, 135, 4513, 3755, 5943, 909, 913, 6469, 1676, 3695, 2819, 2820, 4640, 3392, 6408, 29, 1967, 625, 3265, 5533, 2394, 1883, 707, 4284, 2468, 373, 791, 2024, 3008, 5232, 3198]. **them** [6190]. **Theorem** [4655, 7398, 7483, 7470, 3997, 475, 4430, 6973, 4626, 548, 2332, 3579, 5166, 5656]. **Theorems** [4736]. **Theoretic** [1306, 692, 1153, 4100, 4270, 1262, 1989, 1991, 5233]. **Theoretical** [6414, 179, 748, 4395, 3938, 1554, 1225, 17]. **Theorie** [7233, 6273, 7215]. **Theories** [7307, 2275, 5639, 7369]. **théorique** [17]. **Theory** [7216, 7554, 7571, 5587, 7201, 4972, 7288, 3744, 4014, 1027, 338, 1126, 41, 1212, 4041, 7572, 7432, 7320, 5426, 7232, 526, 7233, 318, 5628, 2452, 1672, 1673, 2996, 2475, 7184, 7185, 7190, 7215, 3030, 3720, 6273, 7231, 956, 2511, 2204, 2206, 1840, 7344, 5417, 7547, 4378, 2930, 3124, 1426, 5336, 5546, 3650, 291, 987, 7418, 1908, 3007, 1173, 7191]. **there** [6512, 3486]. **therefor** [5339]. **Thereof** [6319]. **Things** [4166, 7118]. **Third** [7315, 7357, 7400, 4370, 7392, 7452, 7586, 3684, 243, 7590, 7350, 7483, 7625, 921, 7496]. **Thirteenth** [7527]. **Thirty** [7424, 7439, 7452, 7463, 7479, 7492, 7506]. **Thirty-Fifth** [7479]. **Thirty-First** [7424]. **Thirty-Fourth** [7463]. **Thirty-Second** [7439]. **Thirty-Seventh** [7506]. **Thirty-Third** [7452]. **Thomas** [7259, 5016]. **Thomson** [24]. **thousandfold** [6931]. **thread** [6779]. **thread-safe** [6779]. **Threading** [5849]. **threads** [3493]. **threats** [4680]. **Three** [7, 5260, 811, 7025, 4022, 4189, 876, 6304, 6193, 919, 1908, 4617, 185, 4109, 2155, 1930, 2821, 5983, 6434, 6706, 2, 3705]. **Three-dimensional** [2821, 3705].

Three-Input [7025]. **Three-Moduli** [6304]. **Three-Rail** [2155]. **three-term** [6434, 6706]. **Three-Way** [4109]. **Threshold** [250, 1043, 6739, 5710, 3707]. **thresholding** [3510]. **Throughput** [5586, 6397, 6323, 6327, 5044, 7068, 5638, 6614, 1182, 3570, 3356]. **throughputs** [6540]. **Thumb** [4430]. **Thyrite** [113]. **TI** [934, 3194, 4469, 4470]. **TI-89** [4469, 4470]. **TI-89/TI-92** [4469, 4470]. **TI-92** [4469, 4470]. **Tick** [3018]. **tidal** [3392]. **Ties** [6784]. **Tight** [6318, 6213, 6956, 5782, 4752, 5798, 3732, 3713]. **til** [1740, 646]. **Tiling** [2055]. **Time** [3029, 6149, 6492, 330, 3228, 464, 7139, 1821, 1589, 6282, 4351, 111, 431, 969, 2537, 564, 7536, 4230, 4068, 1229, 5764, 128, 6585, 4593, 5343, 2002, 6738, 1668, 2136, 239, 165, 2148, 3833, 6632, 3013, 3196, 2161, 377, 459, 2170, 2631, 5392, 7001, 2636, 1486, 2042, 606, 7018, 2665, 4676, 2338, 2512, 5830, 2516, 6412, 2888, 3745, 4198, 2373, 5843, 6550, 6702, 6429, 3276, 5857, 3148, 3488, 2960, 1900, 3951, 6746, 6371, 2837, 3846, 6039, 1178, 4955]. **Time-Division** [128, 165]. **time-domain** [3951]. **Time-Optimum** [2161]. **Time-Redundant** [2170]. **Time-Sharing** [111]. **time-varying** [2636, 2042]. **Timed** [4172, 3481, 6849, 3992, 3236, 3604, 4074, 3797, 2168, 2842]. **timer** [5783]. **Times** [790, 1491]. **Timing** [6767, 3939, 7123, 6046, 6322, 2841]. **Tiny** [6875, 5923, 6781]. **Tiny-FPU** [6781]. **TinyML** [6943]. **Titan** [2810]. **Title** [6889, 6890, 6261, 6262, 6663, 6664, 6776, 6630]. **TM** [4110]. **TMR** [4198]. **TMS** [3297]. **TMS320** [7293, 2274, 2824, 2825]. **TMS32010** [2151]. **TMS32020** [2064]. **TMS320C30** [3134, 2268]. **TMS320C3x** [3839, 4941]. **TMS320C60000** [4173]. **TMS320C67x** [4637]. **TMS34082** [2823, 2826]. **TMS390C602A** [2519, 2520]. **Today** [1245, 1491, 3671, 3195]. **Todd** [340, 341]. **Toeplitz** [5530]. **together** [586]. **Tokyo** [7282, 7242, 7503]. **Tolerance** [3405, 3612, 4043, 5425, 7380, 2207, 3751, 2252, 3525, 3381]. **Tolerant** [6165, 6683, 5734, 3109, 6338, 2134, 6473, 6988, 7001, 2181, 3048, 3049, 4198, 3597, 4565, 2971, 3331, 3332, 3523, 2827, 3840, 3207, 3371]. **Tolerating** [6524]. **Tomography** [1343]. **Tompkins** [340, 341]. **tonal** [5]. **Tool** [1107, 4832, 5284, 5395, 1813, 4837, 5762, 7070, 1638, 2826, 4474, 4475]. **Toolbox** [6494, 3420, 3421, 3582, 6089, 2915, 4593, 5645]. **toolkit** [2914]. **Tools** [7004, 7175, 6785, 6676, 7267, 7474, 6632, 6754, 4025, 2726, 3354, 2825, 4593]. **toolset** [4343]. **Toom** [5261, 5666]. **Toom'n'Half** [5685]. **ToonTalk** [4873]. **Top** [6496]. **Topics** [53, 7188]. **topological** [5300]. **Topologies** [5356, 6381]. **Topology** [5981]. **TOPS** [7089]. **TOPS/W** [7089]. **Toronto** [7254, 7429, 7330, 7256, 7348, 7438]. **Total** [5225]. **totally** [2264]. **Tour** [3232]. **Tower** [4840]. **Towers** [7348, 7461]. **Town** [7283, 7304, 7346]. **TPHOLs** [7470]. **TPUs** [6644]. **TR** [3906, 5533, 5176]. **TR2** [3905]. **tracer** [6402, 5783]. **Traces** [3551]. **tracing** [6804]. **Tracking** [3260, 6649, 4023, 4025, 6691, 7042, 7146, 4887]. **Trade** [6520, 1610, 4054, 634, 6236, 3247, 7000, 2516, 4183, 1309, 4750, 3846]. **Trade-Off** [634, 6520, 4054, 3247, 1309]. **Trade-Offs** [6236, 7000, 2516, 4183, 4750, 3846]. **Tradeoff** [6348, 3820, 4175]. **Tradeoffs** [5600, 3122, 4425, 3698, 3699, 4641, 4784, 3389, 1717, 5412, 2437, 4746]. **Trading** [7029]. **Traditional** [5119, 4425]. **Trailing** [1195, 964, 1129, 3422]. **Trailing-1** [3422]. **Training** [6490, 6897, 7029, 6411, 6823, 6569, 6586,

6839, 6726, 6351, 7091, 6967, 7098, 6853, 7119, 6486, 6871, 6990, 6872, 6761, 6750]. **Trans** [2092]. **Transactions** [7263]. **transceiver** [5169]. **Transcendental** [2697, 385, 4040, 2101, 524, 3477, 1657, 4127, 5574, 7022, 4935]. **Transcendental-Function** [524]. **Transcendentals** [5528, 3789, 3921, 5128]. **Transcription** [812, 6189]. **Transfer** [4278, 2005, 3942]. **Transform** [2720, 1244, 1073, 2029, 3031, 1827, 4026, 4356, 3267, 3275, 2395, 2107, 3479, 1998, 5346, 2272, 4918, 4276, 3685, 2031, 3367, 543, 3211, 3212, 6997, 6670, 7024, 2663]. **Transformation** [6167, 6063, 3902, 6576, 569, 632, 84, 6637, 5121, 6283, 5856, 5548, 5963, 6223]. **Transformations** [3723, 275, 3900, 3094, 3268, 3102, 3861, 7038, 6290, 4558, 365]. **Transformer** [1878]. **Transforms** [6927, 1306, 1153, 2634, 1262, 816, 2057, 3585, 3886, 3622, 1989, 1991, 907, 910, 5233, 4947, 4782, 4661]. **Transistor** [2411, 3495, 1703]. **Transistorized** [313, 165]. **transition** [2890]. **Transitions** [3430]. **translate** [4567]. **Translation** [2865, 3041, 666]. **Translator** [3297, 187]. **translators** [2632]. **Transmission** [1779, 4411, 4890, 6120, 3527, 3705]. **Transparent** [6210]. **Transport** [4994, 4685]. **Transposition** [812]. **Transprecision** [6913, 6589]. **Transputer** [2084, 2738, 3085]. **transversal** [2419]. **transzendenter** [385]. **Trap** [4165, 345, 3360]. **traps** [5223]. **Treating** [3633]. **Treatment** [1281, 205, 5064, 5358]. **Tree** [5418, 4439, 3271, 1928]. **Trees** [4802, 6927, 2938, 3545, 5404, 3598, 4385, 2961]. **Trench** [1200]. **Trends** [6829, 6963, 4944, 7524, 4943]. **Treviso** [19]. **tria** [2]. **Trial** [1894]. **Triangle** [5903, 4225, 6951, 3192, 3694]. **Triangular** [5045, 184, 1983, 5336, 5546, 2302]. **Triangularization** [1385, 2517]. **Triangularizations** [2974]. **Triangulator** [3694]. **Tribonacci** [6443]. **Trick** [3566]. **Tricks** [3730, 1610]. **Tridiagonal** [5059, 5195, 2683, 998]. **Trig** [2455, 3193, 784]. **Trigger** [6942, 7067]. **Trigonometric** [5827, 1024, 1025, 3082, 6930, 4205, 139, 1666, 1667, 6365, 1545, 3522, 190, 2888, 2538, 201, 5915]. **Trimming** [1964]. **Trinomial** [4978]. **Trinomials** [6337, 5451, 5010, 5172, 4129]. **Triple** [6177, 6537, 343, 5868, 5703, 6831, 5046, 5863]. **triple-base** [5863]. **triple-double** [5046]. **Triple-Precision** [343]. **Triple-Word** [6537]. **Triplex** [579, 1094, 579]. **Triplex-ALGOL** [579, 579]. **trivariate** [5215]. **trivial** [3165]. **TRON** [2408, 7312]. **True** [1573, 60, 6824]. **Truncated** [6790, 2061, 6287, 5998, 5724, 6572, 7158, 5213, 3173, 4116, 5976, 4132, 4641, 4783, 4948, 5115, 4297, 4482, 2849, 4672, 7152]. **Truncation** [346, 3780, 371, 326, 1005, 3409, 423, 3587, 1879, 684, 6636]. **trust** [2550]. **Trusted** [6881, 1297]. **Truth** [1743, 3440, 4719]. **Truth-Table** [1743]. **TSAM** [111]. **Tschebyscheff** [514]. **Tschebyscheff-** [514]. **TSQRT** [3566]. **Tube** [3397, 50]. **Tubingen** [7407, 1653, 7601, 7251, 159]. **Tübinger** [159, 7407]. **Tukey** [6670]. **Tunable** [6466, 6602, 6034, 5094]. **Tung** [3927]. **Tuning** [6672, 6277, 6579, 5966, 6858, 7038, 6543, 6231, 7130]. **Tunnel** [277]. **Turbo** [3121, 3121]. **turbulence** [5311, 5312]. **Turin** [7365]. **Turing** [6565, 7529, 1855, 704]. **Turku** [5551]. **Turns** [6459]. **Tutorial** [5030, 4750, 6498, 6414, 4055, 4057, 4058, 1162]. **TVM** [7130]. **Twelfth** [7510]. **Twenty** [7300, 7318, 7329, 7271, 7394, 7367, 7408]. **Twenty-eighth** [7271]. **Twenty-fourth** [7329]. **Twenty-Ninth** [7408]. **Twenty-second** [7300, 7318].

Twenty-Seventh [7394]. **Twenty-sixth** [7367]. **Twin** [5810]. **Twin-float** [5810]. **Two** [3038, 3224, 1087, 1806, 1573, 726, 808, 811, 7028, 221, 3873, 332, 1604, 621, 879, 4200, 884, 4368, 7048, 6558, 1218, 1874, 631, 829, 5764, 3303, 1756, 912, 1150, 3486, 1656, 4101, 3674, 53, 123, 1914, 1166, 4280, 5564, 3351, 5365, 5103, 5372, 5655, 168, 5112, 4480, 6038, 1002, 4143, 3982, 4980, 4808, 2347, 3587, 4698, 3769, 3449, 3487, 5073, 985, 6224, 2272, 5212, 5644, 2598, 1918, 5973, 5364, 789, 4123, 5225, 3017, 3026]. **two-digit** [5073]. **Two-Dimensional** [1806, 1150, 1656, 5112, 6038, 985, 6224, 2272, 1918, 3017]. **Two-Input** [7048]. **Two-Layer** [7028]. **two-level** [4123]. **Two-Point** [3674]. **Two-Way** [631, 5644]. **Two's** [1829, 1247]. **Two's-Complement** [1829, 1247]. **TX** [7475, 7310]. **Type** [6152, 6667, 3979, 6507, 3087, 6546, 106, 255, 6718, 893, 7066, 4580, 2771, 5559, 483, 2140, 589, 3352, 5887, 5270, 5926, 6443, 4730, 3133, 72, 5556, 108, 4463, 6502, 6437, 6453]. **Type-2** [6502]. **Type-2-Based** [6667]. **Type-3** [6437]. **Typed** [3087]. **Types** [5038, 3647, 3188, 3044, 1510, 4362, 2900, 3086, 2778, 6986]. **Tyson** [7385].

U [1673, 2393]. **U.S.** [3638, 6480]. **U880** [1886]. **überlauffreie** [548]. **UCBTEST** [3454, 3461]. **Ugly** [3881, 6529, 4010]. **UK** [7470, 7471, 7613, 7587, 7285]. **ulfjack** [6489]. **ulfjack/ryu** [6489]. **Ulp** [5775, 5069, 4154]. **ulps** [7020, 7021, 6280]. **Ulrich** [1672]. **ultimate** [4829, 5001]. **Ultimately** [5455, 5561]. **Ultra** [2040, 5995, 6809, 1510, 1511, 6735, 6603, 6750, 1343, 6987, 6758, 7000, 4648]. **Ultra-arithmetic** [1510, 1511]. **Ultra-efficient** [6758, 7000]. **Ultra-Fast** [6603]. **Ultra-High-Speed** [1343]. **Ultra-Low** [6735, 6750]. **Ultra-Low-Power** [6987, 5995, 6809]. **ultra-wideband** [4648]. **Ultraefficient** [6874]. **ultrasonic** [2338, 2512]. **ultrasonics** [1782]. **UltraSPARC** [3439]. **ultrawide** [4146]. **UMFS** [484]. **Umwandlung** [2003]. **un-normalized** [477]. **Unabridged** [5897]. **Unambiguous** [5448]. **Unary** [5947, 1902, 6977]. **Unbalanced** [5685, 5666]. **Unbiased** [5284, 6340, 6484, 4837, 3197]. **Unbiasedness** [6902]. **Uncertain** [5538, 6248]. **Uncertainty** [3691, 6645, 5270]. **Unconstrained** [4599, 6291]. **Uncoupled** [6760]. **Uncovered** [5547]. **Undebuggability** [5848]. **Undebuggable** [5422]. **Undefined** [5889]. **Under-** [6499]. **under/overflow** [5332]. **Underflow** [4966, 1389, 4009, 1393, 1730, 1122, 1281, 1034, 1286, 2076, 345, 5030, 1436, 1899, 6145, 1969, 3592, 5158, 1430, 3132, 4937]. **Underflow-Free** [3027, 1435, 2848]. **underflow-induced** [3132]. **underflowing** [4669, 5709]. **underflows** [1128]. **Understand** [6535]. **Understandable** [935]. **Understanding** [6069]. **uneven** [4437]. **Ungleichun** [548]. **UniCalc** [3673]. **Unicode** [5551]. **Unidirectional** [4996, 944, 4688]. **Unified** [5586, 1085, 4159, 5688, 6913, 737, 4366, 5024, 7050, 7151, 5535, 1138, 893, 1044, 1651, 3334, 994, 4450, 6247, 4666, 3237, 3414, 6797, 3264, 2233, 2401, 2402, 1063, 1352, 660, 6593, 929]. **unifies** [3656]. **Uniform** [2054, 1106, 818, 4013, 4372, 6025, 698]. **Uniformly** [2328, 850]. **Unifying** [4851, 2580, 5207]. **Unit** [7002, 6881, 4320, 6897, 6506, 5686, 2052, 3055, 6671, 6899, 4332, 6674, 2199, 3573, 4334, 6404, 6904, 1387, 1591, 3999, 6913, 277, 4997, 5506, 3077, 5601, 6928, 432, 5721, 1971, 4034, 1402,

1403, 390, 5315, 5740, 5846, 518, 3104, 3105, 4218, 4156, 3456, 4054, 2551, 5541, 1044, 1425, 1754, 2102, 4880, 902, 5328, 5544, 3304, 5333, 5334, 5335, 7073, 5862, 6589, 7076, 5956, 2256, 403, 2568, 5068, 4423, 5780, 6734, 6736, 6737, 5078, 6740, 6027, 5969, 4109, 1455, 4117, 4769, 6614, 6978, 7111, 5796, 5974, 6239, 934, 3357, 5375, 5377, 6382, 149, 5383, 5888, 5980, 6648, 6761, 2172, 663, 7001, 417]. **unit** [3859, 1802, 1803, 4798, 2502, 2649, 2326, 4331, 4814, 4992, 610, 4525, 5497, 3059, 4838, 4712, 4854, 5840, 3085, 1846, 1611, 5025, 3270, 2541, 3099, 1858, 4049, 4567, 4569, 3623, 2405, 2406, 3294, 2241, 1635, 2244, 4881, 2932, 4882, 4070, 3125, 3126, 6456, 4887, 1314, 5955, 3797, 2258, 3143, 696, 2570, 2958, 3311, 7162, 3320, 3154, 3155, 838, 839, 993, 2985, 2012, 6232, 3509, 5646, 4925, 3825, 4118, 2808, 5223, 5225, 5367, 1465, 3358, 2478, 1348, 5571, 5807, 929]. **Unit-ALU** [5796]. **Unitary** [3268]. **United** [7423, 7320, 7628, 7241]. **Units** [5674, 5675, 5818, 5819, 546, 7026, 3875, 7029, 3750, 5513, 1396, 1606, 6423, 824, 1287, 6819, 6553, 6554, 6710, 3907, 4578, 1880, 233, 287, 5769, 4255, 913, 144, 6845, 7084, 7085, 6221, 3663, 3809, 2131, 5210, 5559, 4615, 370, 4621, 322, 5792, 6236, 4765, 4284, 6240, 457, 5240, 5242, 4145, 1004, 5808, 1480, 5914, 5472, 5479, 2189, 3990, 5995, 4352, 5155, 4190, 3259, 6003, 3088, 6709, 2737, 3920, 4079, 5062, 3313, 4908, 4264, 6031, 5791, 3350, 1000]. **unity** [2964]. **Univariate** [6213, 5427]. **univariées** [5427]. **Universal** [6497, 4306, 547, 872, 1738, 6075, 1290, 3758, 1615, 6548, 4219, 6438, 6457, 6583, 6945, 6966, 5783, 4918, 1538]. **Universe** [6536]. **Universeller** [1538]. **Universitat** [1653, 7266, 7243, 7251]. **University** [7343, 7181, 4157, 4158, 722, 7558, 7431, 7269, 7276, 7580, 7320, 7218, 7240, 7245, 7258, 7434, 7447, 7503, 7306, 7291, 7225, 7379, 7278, 7226, 4927, 7251, 7507, 108, 7220, 7222, 7467, 7281, 7215, 484, 3701]. **UNIX** [2603, 3073]. **unknown** [6356]. **Unleashed** [5931]. **Unlimited** [411, 3264]. **unmodified** [6687]. **Unnormalized** [169, 298, 290, 356, 359, 328, 2184, 2503, 2185, 468, 448, 357, 358]. **unprecedented** [1943]. **UNRAU** [929]. **Unraveled** [4339]. **Unrestricted** [4311, 1266, 1961, 448]. **Unrolling** [4447]. **Unsafe** [6059, 4642]. **unscaled** [3733]. **Unsigned** [7135, 6059, 6566, 6946, 5084, 4280, 4480, 4143, 3547, 2324, 1624]. **Unsolved** [618]. **unsung** [5610]. **Unum** [6048, 6393, 6502, 6667, 6508, 6424, 6085, 6189, 6309, 6437, 6453, 6217, 6266, 6506, 6507, 6194, 6718]. **Unum-Type-II-Based** [6718]. **Unums** [6360]. **unveils** [2498]. **Unwinding** [6431]. **Up/Down** [2130, 3831]. **Updated** [4939, 4516]. **Updating** [5131, 5173, 3152]. **upon** [3625, 2134]. **upper** [5192, 4752]. **ups** [548]. **Upwind** [6896]. **Uqlidisi** [408]. **Urbana** [7276]. **URR** [1615, 3326]. **US$35** [3391]. **US$50** [3391]. **US4338675** [1326]. **USA** [7510, 7511, 7527, 7554, 7570, 7528, 7620, 7501, 7545, 7488, 7604, 7607, 7612, 7248, 7464, 7495, 7315, 7468, 7526, 7541, 7355, 7386, 7373, 7578, 7289, 7319, 7228, 7239, 7303, 7402, 7461, 7489, 7535, 3786, 7425, 7462, 7478, 7491, 7505, 7522, 7537, 7310, 7538, 7274, 7507, 7381, 7420, 7617, 7280, 7341]. **Use** [720, 135, 546, 805, 4513, 6517, 2680, 4184, 4354, 3753, 5606, 881, 7047, 1620, 3283, 202, 4389, 2929, 4584, 146, 3673, 370, 2142, 1677, 941, 1075, 1174, 5114, 3019, 1559, 4792, 2356, 880, 252, 679, 1409, 5744, 1039, 5620, 1639, 4891, 50, 2956, 364, 6218, 6463, 8, 772, 410, 6372, 1698, 3196]. **used** [27, 2306].

Useful [3571, 3101, 7154, 891, 5371, 2642, 3204]. **USENIX** [7341]. **User** [7008, 1577, 1375, 7330, 3092, 1996, 1896, 2120, 2262, 2442, 2443, 2445, 3508, 3839, 4941, 1469, 2518, 1134, 1220, 1867, 2433, 2117, 1895, 2441, 2444, 1689, 2824, 2825, 2826, 847]. **User-oriented** [1996, 847]. **User-to-User** [3508]. **Users** [7359]. **uses** [1521, 778]. **Using** [3040, 5394, 6650, 6652, 1361, 2638, 1261, 6250, 3722, 4305, 4661, 6665, 5134, 3725, 5135, 1573, 1012, 5480, 6265, 6507, 5397, 6784, 864, 4329, 5401, 6519, 5403, 5405, 5701, 5490, 3573, 4334, 6404, 1821, 3574, 1823, 5277, 1385, 3997, 6679, 3581, 5278, 5501, 224, 6169, 6281, 277, 4342, 4999, 5913, 1022, 5285, 5718, 6415, 7035, 6071, 6177, 5719, 6420, 4187, 7038, 5296, 425, 508, 431, 5723, 338, 2901, 1849, 6185, 6186, 253, 558, 5530, 4212, 4371, 6191, 1131, 3277, 5316, 3456, 5318, 973, 6566, 6200, 1136, 3290, 5756, 5179, 4231, 3295, 3464, 6937, 1527, 4387, 4388, 3117, 5323, 141]. **Using** [160, 161, 180, 6575, 113, 286, 895, 1045, 6448, 2104, 7066, 4580, 754, 4400, 6453, 6836, 7069, 4587, 4076, 2939, 4591, 6583, 570, 6586, 6839, 181, 6343, 6590, 5194, 7076, 4894, 3481, 5627, 1999, 913, 318, 356, 3144, 2955, 1650, 266, 1055, 1150, 6355, 5554, 6219, 5072, 1656, 5436, 3662, 3491, 2782, 2970, 2126, 6604, 2974, 3672, 5206, 988, 1156, 184, 4436, 2789, 4439, 5081, 3162, 3503, 703, 2278, 584, 1775, 6133, 1161, 4443, 6608, 6361, 3507, 371, 267, 186, 4626, 3178, 6860, 1919, 2150, 4772, 713, 5102, 6749, 1071, 4128, 132, 2155, 1933, 4466, 1073, 214]. **Using** [2029, 1251, 2829, 594, 5378, 5574, 6037, 7126, 944, 4641, 4783, 5115, 5116, 5384, 6038, 6991, 3536, 150, 133, 1181, 544, 1257, 4483, 5119, 3024, 3377, 7129, 6646, 6995, 3543, 5124, 6998, 5715, 1795, 7000, 3853, 5251, 4498, 1565, 5584, 7003, 3031, 4304, 4657, 5892, 461, 4978, 3044, 5256, 2181, 1811, 3048, 3049, 5138, 2869, 5262, 4984, 7138, 6672, 4330, 6900, 3733, 4674, 4988, 4170, 6275, 4990, 4678, 3873, 4174, 4525, 3239, 3240, 3576, 3577, 3993, 3579, 2344, 6680, 5499, 5708, 2681, 4003, 4683, 4006, 6527, 6906, 1827, 1963, 3422, 4182, 2349, 5148, 3583, 5713, 6411, 5504, 2686]. **using** [3246, 5408, 5409, 2688, 4013, 2353, 6926, 6072, 3892, 4021, 4356, 4027, 5300, 4198, 3894, 4855, 3598, 7043, 3262, 2713, 2538, 4718, 5166, 2902, 6549, 1214, 1975, 4215, 5168, 4045, 2907, 2384, 626, 515, 516, 565, 2226, 1411, 5742, 1412, 2390, 4048, 1621, 1868, 3622, 1524, 1985, 6009, 6010, 6568, 6715, 1040, 3294, 4726, 3296, 630, 3912, 6718, 2741, 1877, 1989, 1990, 1991, 2245, 2931, 2745, 1879, 4730, 3788, 4074, 3126, 684, 3473, 2429, 1757, 5624, 1761, 4411, 4413, 5955, 3479, 2564, 2950, 981, 3136, 6116, 2764, 7080, 2436, 5553, 6954, 6121, 6023, 6732, 2121, 2962, 2122, 7162, 6122]. **using** [6123, 3322, 3323, 3495, 3668, 581, 5204, 5782, 4910, 4607, 3670, 3158, 3331, 3332, 3499, 3812, 6849, 1770, 6969, 7098, 3504, 2135, 2277, 2456, 4276, 6852, 4759, 7103, 6231, 5642, 5643, 5968, 7167, 5879, 3167, 709, 3510, 6367, 4625, 3341, 1918, 1168, 5973, 2466, 5797, 2994, 1067, 2020, 2999, 3000, 2294, 4934, 5226, 4289, 1463, 1550, 4778, 5373, 1935, 6632, 5658, 1347, 5233, 1176, 5466, 2031, 2303, 5660, 5801, 4782, 5112, 3845, 3846, 3964, 3965, 2489, 4949, 413, 5117, 2167, 2841, 2494, 2844, 3023, 5241, 3211, 3212, 3969, 4643, 4644, 5387, 5243, 4646, 4647, 4955, 5245, 194, 7422, 5809, 2852, 3213]. **using** [4827]. **UT** [7398]. **Utah** [7298]. **utilisant** [4357]. **Utilising** [2634]. **utilities** [1819]. **Utilization** [2677, 5716, 3247]. **utilize** [2973]. **Utilizing** [1905, 2903, 1356].

UX [4408, 4589, 4780, 4939]. **UYK-17** [839].

V [6508, 4061, 6130, 839, 6660, 7013, 6781, 6897, 6675, 6796, 6904, 6810, 6930, 6815, 6816, 7149, 2386, 6939, 6940, 7066, 7379, 6589, 7076, 6947, 6948, 6949, 6597, 7089, 7094, 7096, 7099, 6854, 782, 6744, 7116, 7190, 6633, 6866, 6987, 6988, 7130, 6994, 6758, 6874]. **V/sub** [2386]. **v1.0** [6495]. **v1.4.0** [4636]. **v2** [4939]. **V3** [6854]. **v3.0** [5244]. **v5** [6286]. **v5.0** [5581]. **Vāriyar** [4042]. **VA** [7381]. **Vaclav** [7132]. **vacuum** [50]. **Vail** [7472]. **Valid** [4520, 4521]. **validate** [4587]. **Validated** [3854, 3721, 7445, 5595, 3066, 3741, 7476, 7566, 7410, 7555, 4325, 4343, 5522, 7477, 5082, 5226]. **Validating** [3581, 3687, 7340, 4945, 2585, 5807]. **Validation** [3030, 1966, 2067, 5539, 2563, 4916, 6083, 6425, 5338, 6223, 2035]. **Validity** [5426, 5944]. **Valley** [7514, 7399, 7419, 7426, 7440]. **Value** [4169, 3746, 4355, 433, 7209, 179, 3102, 5608, 3636, 3785, 1887, 4090, 3674, 6132, 4792, 4185, 3754, 2975]. **Value-based** [4169]. **Valued** [1276, 3080, 7404, 7449, 7564, 1628, 7441, 3966, 3296, 1527, 3670, 4622, 2020]. **Values** [1573, 4043, 5047, 2766, 3657, 6235, 6275, 4824, 4825, 3762, 5183, 452, 4428, 5098, 5225, 5367]. **VAMP** [4320]. **Vancouver** [7397, 7390]. **vanilla** [6549]. **variability** [6700]. **Variable** [7134, 3857, 6507, 248, 6924, 174, 6179, 7149, 4046, 4216, 4217, 4867, 1131, 1856, 1980, 3283, 349, 5331, 5767, 5768, 6725, 3474, 6599, 5634, 6734, 6736, 6737, 3667, 988, 1156, 4101, 5443, 5785, 771, 1243, 4452, 4764, 3514, 4281, 5102, 6749, 5374, 4948, 5664, 4297, 3027, 2043, 2336, 2337, 1272, 5926, 735, 1291, 2725, 1420, 5952, 6728, 5434, 2012, 3167, 777, 3347, 3513, 5238, 2848]. **Variable-Correction** [4297]. **Variable-Length** [1131, 3027, 2043, 5434, 2848]. **Variable-Precision** [6507, 6179, 4216, 4217, 4867, 5767, 5768, 3474, 6737, 771, 3514, 4281, 5331, 2725, 1420, 5952, 3347, 3513]. **Variable-Radix** [6725]. **Variables** [5592, 3634, 6011, 6727, 3482, 2118, 2260, 3493]. **Varian** [1030]. **Varian-73** [1030]. **Variance** [7037, 7144, 4984, 1585, 2255, 789]. **variances** [831]. **Variant** [6421, 6660, 4698, 4642]. **Variants** [6924]. **Variations** [6720, 6739]. **variety** [2138]. **Various** [549, 550, 728, 6441, 531, 5590, 760, 2315]. **Varity** [6720]. **Varying** [3187, 593, 2636, 2042, 2065]. **Västerås** [7436]. **VAX** [2037, 1570, 1571, 1804, 2659, 1111, 1020, 1392, 1313, 2426, 1327, 1328, 1466]. **VAX-11** [2037, 1570, 1571, 1804, 1111, 1020, 1392, 1313]. **VAX-11/780** [2037, 1570, 1571, 1804, 1020]. **Vector** [4505, 1946, 6044, 3388, 6386, 3222, 3400, 7013, 1093, 2655, 2871, 6675, 4007, 6913, 4997, 971, 7055, 4218, 5758, 5541, 2099, 6940, 1884, 5068, 2450, 6734, 1658, 1901, 7099, 2146, 4110, 2152, 3003, 4133, 3357, 2038, 3401, 3865, 3053, 5487, 6900, 6680, 2516, 2683, 2373, 1973, 1853, 3267, 4049, 6936, 2233, 2401, 2402, 3912, 2242, 3473, 6111, 3316, 2447, 2448, 2472, 4778, 3358, 2032, 2449]. **Vector-Arithmetic** [3357, 3358]. **Vector-Processing** [4218]. **Vector-Radix** [1884]. **Vector-Reduction** [1901]. **Vector/Matrix** [2450, 2447, 2448, 2449]. **Vector/Scalar** [5758, 2233, 2401, 2402]. **Vector/SIMD** [4997]. **Vectoring** [3976, 4159, 3785, 4295]. **vectorizable** [6400]. **Vectorization** [6250, 2239, 2240, 5056, 5139, 6109]. **Vectorized** [7013, 7018, 6903, 6745, 6418, 5802]. **Vectorizing**

[6796]. **Vectors** [6081, 5628, 5447, 2693, 6929, 4918]. **Vedic** [5878]. **Vegas** [7193, 7203, 7528, 7414, 7274]. **Veldhoven** [7375]. **Veltkamp** [5140, 7173]. **Veltkamp/Dekker** [5140, 7173]. **Vendors** [3753]. **Venice** [7380, 7384]. **venue** [7320]. **Verallgemeinerung** [548]. **Verarbeitung** [2942, 2943]. **Verfahren** [514, 2100, 836, 1237, 1599, 1165, 35]. **Verificarlo** [6068, 6173]. **Verification** [4653, 4964, 6388, 6390, 6778, 4320, 5263, 5484, 5689, 6054, 7577, 4330, 7139, 3573, 3872, 7374, 733, 6292, 4033, 5525, 5731, 3442, 4204, 4205, 4206, 5306, 4384, 5539, 7061, 3777, 6832, 3471, 6017, 2256, 6595, 6596, 3655, 4420, 5869, 2579, 6472, 6032, 4103, 5642, 5643, 4278, 5970, 6973, 4626, 5793, 4461, 5378, 6380, 4142, 3716, 3385, 7372, 4303, 5989, 3737, 7544, 6001, 3764, 4717, 5166, 4378, 4569, 5029, 4725, 4064, 4400, 6460, 3154, 3155, 4918, 4625]. **Verified** [3564, 5485, 5902, 6056, 5503, 4015, 7145, 4030, 3612, 6114, 6643, 7079, 6954, 6358, 1938]. **Verifying** [5584, 6149, 6503, 3579, 3997, 3765, 6206, 6222, 4093, 6268, 4231, 5347, 5348, 5432]. **Verilog** [4934]. **VeriTracer** [6402]. **verlassen** [1137]. **VERROU** [6180]. **vers** [5127]. **versa** [2196, 402]. **versatile** [6797]. **Version** [7008, 5897, 3753, 1741, 563, 2912, 6454, 441, 6220, 3150, 3001, 7111, 4469, 4470, 3370, 6666, 548, 2913, 5620, 2765, 3145]. **Versions** [3857]. **Versus** [6430, 2797, 3740, 4544, 5751, 4226, 4228, 2418, 6959, 6531, 6636]. **Verteilung** [777]. **vertex** [5739]. **Vertices** [5518]. **verwendeten** [2306]. **Very** [3976, 4159, 6893, 5482, 4171, 3079, 3256, 387, 1517, 5763, 3470, 4070, 2956, 4084, 3859, 3871, 4678, 1625, 5950, 3486, 4419, 5666]. **Very-High** [3976, 4159, 3256, 3470, 4419]. **VFloat** [5664, 5634]. **VFP11** [5269]. **VFP9** [4505]. **VFP9-S** [4505]. **VHDL** [4832, 4694, 5153, 3769, 2741, 4891, 5784, 5796]. **VI** [7375, 7417, 7596, 783, 7191, 7369]. **Via** [5294, 1208, 5084, 1191, 5593, 6524, 4685, 4994, 2685, 3068, 3251, 465, 3585, 5156, 5510, 4699, 5513, 509, 6291, 6699, 5528, 3097, 6563, 5752, 6565, 4385, 7062, 2100, 6942, 7067, 6106, 6012, 6585, 6349, 6600, 1766, 4428, 5353, 5080, 5789, 6616, 6378, 4495, 6764, 6540]. **vice** [2196, 402]. **Victoria** [7571, 7377]. **Video** [495, 6971, 5233, 5759]. **View** [3392, 3242, 1651, 2521, 3384]. **VII** [7547, 784]. **VIIIfx** [5625]. **Villa** [7290]. **VIP** [6388, 6472]. **Virginia** [7385]. **Virgule** [2563, 2004, 702, 4807, 2217, 2763, 990]. **Virtex** [4515, 4784]. **Virtex-II** [4515]. **virtual** [7624, 7626]. **Visibility** [3493]. **Vision** [6487]. **Visual** [3145]. **visualization** [2911]. **vital** [1491]. **VLIW** [5672, 5497, 5768, 5953, 6013, 4079]. **VLSI** [7511, 7570, 7556, 7375, 7322, 7435, 7437, 7486, 7531, 7548, 7563, 7594, 7453, 4651, 1563, 1711, 2637, 2642, 1807, 3400, 1576, 1811, 1949, 3984, 2052, 2191, 7299, 2192, 2661, 5697, 2196, 2203, 1821, 2204, 5406, 2354, 3076, 7375, 1838, 1604, 4551, 2715, 2079, 4044, 2384, 2226, 1858, 1413, 1522, 7333, 7283, 7304, 7323, 7335, 7345, 7348, 7360, 7517, 2729, 3624, 4724, 2405, 2406, 2408, 2419, 3788, 3920, 3639, 3794, 2752, 7380, 7294, 2430, 2113, 2434, 2761, 2762, 2951, 3139, 1317, 2763, 3491, 1903, 2266, 4749, 4750, 1660, 1534, 1663, 2267, 3329, 3330, 2131, 2274, 1668, 7366, 2801, 1912, 1453, 4108]. **VLSI** [1777, 2148, 1778, 7524, 2152, 2020, 2473, 2474, 1928, 1552, 1792, 1698, 3208, 4788, 4152]. **VMX** [5290]. **voice** [2058]. **Vol** [1484, 5818, 5819, 63, 64, 65, 66, 67, 68, 7293, 7206, 7394]. **Volatile** [6726]. **Volta** [7454]. **Voltage** [7011, 478, 6739, 4048].

Volume [5837, 3280, 4383, 4503, 7184, 7185, 7186, 7188, 7190, 7191]. **volumes** [6135]. **voor** [492, 540]. **Voronoi** [4709, 5518]. **vortex** [3042]. **Vorträge** [1653, 7251]. **VPCLMULQDQ** [6418, 7103]. **VPFPAP** [5768]. **VPMADD** [6575]. **VRML** [3753]. **vs** [6189, 3454, 6451, 322, 4944].

W [7331, 5610, 1672, 1673, 531, 372, 801, 458, 7089, 6860]. **W.** [742]. **WADAS** [7385]. **Wafer** [1823, 7393]. **Waiting** [1245]. **Wakamatsu** [7455]. **wall** [6387]. **Wallace** [5665]. **Wallis** [1484]. **Wanted** [6176]. **Warn** [6535]. **Warsaw** [7474]. **was** [606]. **Washing** [2795]. **Washington** [7216, 7385, 7263, 7363, 7491, 7341, 7589]. **wastewater** [5358]. **watchers** [2795]. **Water** [6717, 3953]. **Waterloo** [7558]. **Watson** [7259]. **Wave** [5904, 205, 3491, 3392, 1277, 1879, 840]. **Waveguide** [1650]. **wavelet** [4782]. **wavelets** [3705]. **Waves** [184]. **Way** [2077, 631, 6596, 4109, 5004, 3508, 5644]. **Ways** [6441]. **weak** [3713]. **weakly** [3969]. **Weather** [6574, 6717, 5303, 6593]. **WEID** [6742]. **Weierstrass** [3711]. **Weight** [5276, 5277, 6423, 4624, 5037, 7156, 3303, 5, 5388]. **Weight-Sharing** [6423]. **weighted** [1711, 3952, 4124]. **Weights** [6325, 6429]. **Weil** [4744]. **Weitek** [2326]. **Weiteres** [1812]. **well** [1943]. **well-informed** [1943]. **Wellington** [7587]. **Wendisch-Rietz** [7231]. **Werner** [272]. **Wescon** [7286, 7314, 7342, 7230]. **Wescon/86** [7286]. **Wescon/88** [7314]. **Wescon/90** [7342]. **West** [7261, 6607]. **West-83** [7261]. **Westin** [7361]. **WFTA** [2296]. **WG** [7600, 7423]. **WG14** [5175, 5176, 5177]. **Wharf** [7504]. **whether** [2094]. **which** [4036]. **while** [5401, 2138]. **Whilhelm** [1467]. **White** [7326]. **who** [3095, 3096, 2, 5653]. **Whose** [2554, 6023, 5164, 5556, 6356]. **WhyMP** [7079]. **Wide** [5482, 4034, 2760, 6400, 4712, 5337]. **Wideband** [1907, 4648]. **wider** [5850]. **Width** [5764, 4748, 5572, 4851, 3803, 5352, 1943]. **Width-** [4748]. **Wiener** [5435]. **Wigner** [2713]. **Wild** [6607]. **Wiley** [3720]. **Wilhelm** [159, 1653, 7251, 7407, 4865, 3465, 1167, 7407, 1322]. **Wilkinson** [389, 5992, 6594]. **Will** [3753, 6190, 5714, 1191]. **Willard** [1672]. **William** [7251, 6189, 159, 3949, 3950, 3849]. **Wilson** [262]. **Win** [4269]. **windowed** [2042, 3316]. **Windows** [3188, 2765, 3145, 3508]. **Windsor** [3191, 7382, 7383]. **Winnipeg** [2377]. **Winograd** [3144, 1244, 596]. **Winter** [7341]. **wire** [6003]. **Wired** [261, 2835, 3200]. **Wired-In** [261]. **wireless** [4889, 4594]. **Wiring** [1165]. **Wisconsin** [7226]. **Wise** [7118, 716, 795]. **Wisely** [6279]. **Wissenschaftsgeschichte** [7251, 1653]. **Within** [411, 6392, 3951, 5462, 6868]. **Without** [7016, 729, 1106, 6180, 2221, 2222, 5167, 4060, 4870, 1894, 5636, 186, 933, 5228, 214, 4517, 5907, 3578, 6409, 5004, 2364, 2526, 2527, 4057, 3147, 7087, 4273, 5223, 3530, 3375]. **Witt** [3408]. **Wizard** [5784]. **Wizard-based** [5784]. **wongledif** [5004]. **Wooley** [5572]. **Word** [6891, 3573, 4171, 3580, 1726, 1825, 174, 6537, 390, 6318, 6956, 3929, 6850, 6851, 7118, 5651, 6631, 4678, 674, 1037, 6824, 3291, 3463, 521, 5083, 4952]. **Word-Based** [5651]. **Word-Length** [4171, 6631, 4678, 6824]. **Word-length-independent** [1726, 1825]. **Word-Level** [3573, 3580, 5083]. **Word-Wise** [7118]. **Wordlengths** [5080]. **Words** [2953]. **Work** [6585, 2138, 2461]. **Workaround** [3453]. **Working** [7385, 3857, 7006, 7423, 5509, 513, 7057, 7248, 1786, 2886]. **Workloads** [7111, 7113, 6875].

workmen [4417]. **Works** [7184, 7185, 7186, 7188, 7190, 7191]. **Workshop** [7428, 7398, 7483, 7387, 7223, 7501, 7344, 7432, 7257, 7487, 7488, 7536, 7549, 7379, 7380, 7353, 7454, 7365, 7366, 5639, 7375, 7204, 7334, 7241, 7415]. **Workshops** [7614, 7350]. **Workstation** [2720, 3391, 1988, 2271, 2026, 3356]. **workstations** [1998]. **World** [7616, 7576, 7386, 1096, 6805, 7395, 7250, 7343, 4037, 6306]. **Worst** [5305, 3783, 4404, 4735, 5191, 5428, 6742, 4634, 4774, 5102, 4465, 6143, 5249, 3915, 4734, 5100]. **Worst-Case** [3783, 6143, 6742]. **would** [1491]. **Writing** [3882, 2694, 5935]. **writings** [235, 801]. **Written** [1630]. **WSI** [2827, 3840]. **WTL** [2034, 2166]. **WTL3170** [2505]. **WTL3170/3171** [2505]. **Wuppertal** [7410]. **Würzburg** [7244]. **Wurzeln** [1095, 2583]. **Wurzelziehen** [1835].

X [7462, 6786, 5545, 5069, 1483, 2342, 2460, 1553]. **X-MP** [2460]. **X-MP/Model** [2460]. **X2** [3204]. **x200** [6296]. **X3.198** [2862]. **X8** [5619, 587]. **x86** [5830, 4904, 6227, 5969, 5361, 5793, 6145]. **x86-64** [6145]. **XB** [839]. **XB-1** [839]. **Xeon** [5911, 6296, 5911]. **XI** [7478, 1160]. **XII** [7491, 1160]. **XIII** [7505]. **Xilinx** [7009, 6102]. **XIV** [7599, 7522]. **Xlinx** [3031]. **XMX** [3802]. **XpulpNN** [6815, 6816]. **XR** [4328]. **XSC** [3563, 3089, 2545, 2735, 2736, 2925, 3118, 5853]. **XScale** [4723]. **XT** [2477, 2477]. **XV** [7458, 7537]. **Xvpfloat** [7149]. **XXX** [2345].

Y-MP [2553]. **Yamaguchi** [7482]. **YBC** [7027]. **Year** [7405]. **Years** [7512, 1456, 7251, 5250, 6530, 6512, 1230, 6132, 7442]. **Yielding** [265, 3887, 4548]. **yields** [3868, 3595]. **Yokohama** [7599]. **Yonsei** [7447]. **York** [3720, 4157, 4158, 7283, 7304, 7536, 7225, 7195, 7260, 7326]. **Ypsilanti** [7453]. **Yugoslavia** [7208]. **Yun** [7099].

Z [1119, 1206, 4868]. **z/Architecture** [4868]. **z10** [5562, 5468]. **z13** [6211]. **z15** [6740]. **Z4** [1338, 108, 124]. **Z80** [1427, 1592, 1594, 1602, 1427]. **Z8000** [1288]. **Z8070** [1616, 1681]. **z9** [5289]. **z900** [4332, 4627]. **z990** [4814, 4854]. **Zahlen** [654, 801]. **Zahlen-systems** [801]. **Zahlenformat** [3344]. **Zahlensysteme** [2700]. **Zandvoort** [7364]. **Zaokragleń** [458]. **zEnterprise** [5700, 5711]. **zEnterprise-196** [5700]. **Zero** [6784, 307, 4062, 6962, 2130, 4451, 4285, 5578, 945, 6145, 863, 955, 1277, 391, 3445, 2541, 4579, 6113, 3797, 5062, 3148, 3488, 3810, 3702, 2842]. **zero-finding** [863, 955]. **zero-input** [1277, 3445]. **zero-overhead** [3797, 2842]. **Zero-Sum** [945]. **Zeros** [5985, 1122, 4397, 3712, 4695, 5300, 5416, 1038, 5744, 2006, 4462, 5570, 192, 193]. **ZFP** [6533]. **zieht** [2583]. **Zilog** [1616, 1681]. **Zimmermann** [5890, 5891]. **zip** [1799]. **Zipf** [5682, 5704, 4361, 826, 3771, 5074, 4437, 2275]. **ZipfAllocation** [5759]. **Ziv** [5916]. **ZKCM** [5972]. **Zoned** [675]. **Zufallsgröße** [777]. **zum** [1485, 7407]. **Zur** [836, 1812, 1599, 514, 2100, 1886, 801, 35, 274, 2700, 2381, 777]. **Zurich** [7416, 108, 7427, 108]. **Zuse** [124, 1380, 124]. **Zuse-calculator** [124]. **Zuse-Rechenautomaten** [124]. **Zweites** [7407].

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1. Table 5 (page 124):

insert `k <-- 0` after assertion, and also delete `k <-- 0` from Table 6.

2. Table 9 (page 125):
   for `-1:USER!("");`
   substitute `-1:USER!("0");`
   and delete the comment.
3. Table 10 (page 125):
   for `fill(-k, "0")`
   substitute `fill(-k-1, "0")`

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- hardware and software systems for interval computations, and
- fuzzy logic.

Actual applications described in the book include:

- economic input-output models,
- quality control in manufacturing design,
- a computer-assisted proof in quantum mechanics,
- medical expert systems,
- and others.

A realistic view of interval computations is taken: the articles indicate when and how overestimation and other challenges can be overcome. An introductory chapter explains the content of the papers in terminology accessible to mathematically literate graduate students. The style of the individual, refereed contributions has been made uniform and understandable, and there is an extensive book-wide index. Audience: Valuable to students and researchers interested in automatic result verification. Detailed information, including contents, contributors, and an order form can be found:

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Industry immediately started to investigate the failure." From the report: "The internal SRI software exception was caused during execution of a data conversion from 64-bit floating point to 16-bit signed integer value. The floating point number which was converted had a value greater than what could be represented by a 16-bit signed integer. This resulted in an Operand Error. The data conversion instructions (in Ada code) were not protected from causing an Operand Error, although other conversions of comparable variables in the same place in the code were protected.".

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result. Interval arithmetic is an improvement on this, but still not an ideal solution because if the final interval is larger than desired, there is no simple way to restart the computation at higher precision. By contrast, in XR no precision level is set in advance, and no computation takes place until a final request takes place for some output. Despite this, programming with XR is no different from MPFP, except for the declaration of critical variables as type 'XR'.

The main aim is to produce a usably efficient implementation, which can be easily interfaced with existing C++ code. This contrasts with previous implementations in functional languages (Haskell, Miranda etc.), which, although theoretically important, seem to be rather too slow for real use.

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[7372] Ernst Adams and Ulrich Kulisch, editors. *Scientific computing with automatic result verification*, volume 189 of *Mathematics in science and engineering*. Academic Press, New York, NY, USA, 1993. ISBN 0-12-044210-8. x + 612 pp. LCCN QA76 .S368 1993. URL `http://lccn.loc.gov/92247371`.

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- constraint propagation,
- solution sets of linear systems,
- hardware and software systems for interval computations, and
- fuzzy logic.

Actual applications described in the book include:

- economic input-output models,
- quality control in manufacturing design,
- a computer-assisted proof in quantum mechanics,
- medical expert systems,
- and others.

A realistic view of interval computations is taken: the articles indicate when and how overestimation and other challenges can be overcome. An introductory chapter explains the content of the papers in terminology accessible to mathematically literate graduate students. The style of

the individual, refereed contributions has been made uniform and understandable, and there is an extensive book-wide index. Audience: Valuable to students and researchers interested in automatic result verification. Detailed information, including contents, contributors, and an order form can be found:

- on Kluwer homepage `http://www.wkap.nl`, or
- on the Interval Computations homepage `http://cs.utep.edu/interval-comp/main.html`, in the "Books" section.

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