A Bibliography of Publications on Floating-Point Arithmetic

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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`),
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- 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 BibTeX

Books, hardware oriented

[1721, 281, 1286, 1216, 3111, 3315, 1916, 841, 1164, 1000, 1457, 843, 1343, 7221, 7222, 1557]

Books, software oriented or theory

[1273, 466, 469, 470, 119, 1420, 2393, 908, 1049, 352, 2952, 2434, 2969, 2270, 320, 527, 7075]

Books, machine specific

[2175, 3217, 3113, 2436, 1767, 1903, 2289, 1935, 2471]

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

1 Choice of base, floating point formats

[498, 750, 752, 730, 727, 893, 1141, 1131, 2036, 2267, 2391, 2544, 2771, 2785]

1.1 Precision and Rounding

[433, 558, 745, 847, 881, 896, 964, 1032, 1041, 1045, 1194, 1296, 1435, 1376, 1538, 1729, 2280, 2456, 2529, 2842, 3158, 3280]

1.2 Determination of parameters of floating point arithmetic

[686, 823, 1636, 2273, 2201]

1.3 IEEE standards for floating point arithmetic

[993, 1197, 1223, 1206, 1234, 1196, 1203, 1340, 1326, 1327, 1280, 1300, 1458, 1385, 1409, 1387, 1725, 1824, 1862, 1863, 1860, 2087, 2172, 2339, 2573, 3053]

1.4 Floating point arithmetic, general and implementation issues

[633, 719, 1014, 1035, 1083, 1095, 1094, 1236, 1238, 1210, 1274, 1266, 1475, 1493, 1992, 2012, 2217, 2218, 2372, 2446, 2349, 2528, 2772, 2773, 2701, 2770, 3011]

1.5 Floating point packages

[1287, 1700, 1679, 1773, 1731, 1884, 1849, 1885, 1967, 2080, 2102, 2204, 2298, 2299, 2300, 2479, 2480, 1352]

1.6 Floating point units

[416, 1153, 1320, 1278, 1330, 1354, 1323, 1349, 1270, 1315, 1324, 1498, 1540, 1497, 1533, 1556, 1662, 1576, 1578, 1579, 1680, 1610, 1607, 1615, 1642, 1716, 1618, 1789, 1776, 1716, 1757, 1786, 1718, 1797, 2008, 1970, 1998, 1964, 2017, 1956, 1949, 1950, 2128, 2082, 2153, 2245, 2274, 2307, 2250, 2276, 2251, 2184, 2213, 2320, 2262, 2214, 2287, 2461, 2407, 2408, 2432, 2322, 2443, 2405, 2402, 2314, 2424, 2463, 2363, 2323, 2444, 2328, 2564, 2499, 2519, 2559, 2514, 2491, 2562, 2545, 2536, 2659, 2768, 2731, 2957, 2870, 2940, 3097, 3047, 3188, 3347]

1.7 Test of floating point routines

[500, 1454, 1726, 1870, 1869, 2020, 2021, 1965, 2106, 2469, 2597, 2605, 2673, 2672, 2788, 2767, 2753, 3052]

2 Addition and Subtraction

[375, 1513]

2.1 Floating-point Summation

[325, 345, 362, 361, 570, 639, 677, 831, 1661, 2275, 2352]

2.2 Multiplication

[680, 1246, 1260, 1476, 1543, 1516, 1574, 1601, 1593, 1619, 1676, 1591, 1758]

2.3 Division

[209, 238, 223, 322, 348, 438, 1017, 1064, 1311, 1403, 1567, 1645, 1623, 1606, 1770, 1890, 2015, 1994, 2387, 2777, 2722, 2967, 3016, 7243, 2949]

3 Elementary functions, general

[384, 398, 586, 650, 615, 1122, 1265, 1627, 1656, 1756, 1719, 1717, 1794, 1840, 7162, 1945, 2051, 2154, 2098, 2277, 7181, 2560, 2597, 2547, 3334, 2549, 2518, 2697, 2850, 2661, 2812, 2813, 2690, 3367, 3335]

3.1 Elementary functions, CORDIC and related algorithms

[190, 191, 248, 264, 373, 523, 551, 659, 651, 667, 733, 855, 1068, 1084, 1293, 1451, 1699, 1897, 1708, 1811, 1963, 2159, 2381, 2310, 2541, 2567, 2716, 2810, 3010, 3005, 3128, 3068, 3114]

3.2 Elementary functions, function approximation

[240, 241, 481, 623, 768, 767, 983, 1021, 1162, 2000, 2052, 2610, 2685, 2783, 2784]

3.2.1 Polynomial evaluation

[259, 279, 304, 426, 1061, 1228, 2351]

3.3 Square root, general

[1082, 1187, 1481, 1598, 1651, 2565, 2677]

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

[120, 153, 359, 1022, 1008, 1151, 1353, 1444, 1406, 1372, 1426, 1537, 1825, 1922, 1834, 1887, 1971, 1952, 2035, 1955, 2006, 2046, 2089, 2139, 2179, 2253, 2390, 2577, 2534, 2709, 3038]

3.3.2 Square root, Newton's method

[158, 280, 302, 374, 347, 343, 383, 451, 427, 513, 518, 532, 596, 585, 579, 581, 702, 1328, 1317, 1397, 1583, 2333, 3018, 2947]

3.4 Sine and Cosine

[180, 1068, 1018, 1023, 1176, 1398, 1544, 1666, 1665, 1765, 1853, 1953, 2120, 2231, 2606, 2961, 2958, 2880, 2980, 3074]

3.5 Logarithm

[154, 271, 331, 690, 998, 1112, 1299, 1529, 2107, 2108, 2607, 2735]

3.6 Exponential function

[141, 409, 1183, 1361, 1518, 1748, 1847, 2470, 2608, 3002]

3.7 Arctangent

[143, 160, 207]

3.8 Other transcendental functions

[499, 613, 161, 1024, 365, 275, 360, 2100, 1157, 2860, 3054]

4 Binary-decimal conversion

[189, 173, 222, 475, 576, 684, 1165, 1291, 1292, 1405, 1654, 1709, 2002, 1975, 2509, 2601, 2525, 2856]

5 BCD arithmetic

[674, 726, 777, 778, 779, 780, 781, 782, 783, 1382, 1492, 1705, 1640, 2037, 2646, 2960]

6 Multiple precision arithmetic

[292, 330, 410, 428, 632, 616, 953, 1002, 1099, 1098, 1265, 1350, 1430, 1542, 2805, 2789, 3033, 3224]

7 Conferences on computer arithmetic

[7101, 7111, 7116, 7125, 7128, 7141, 7159, 7160, 7202, 7232, 7240, 7234, 7266]

8 Additional contributions from Nelson H. F. Beebe

[121, 136, 169, 215, 297, 346, 367, 449, 752, 555, 848, 877, 921, 922, 974, 988, 1002, 1007, 1070, 1072, 1099, 1098, 1192, 1163, 1221, 1245, 1264, 1271, 1288, 1388, 1425, 1430, 1459, 1460, 7141, 1714, 1724, 1727, 1741, 1747, 1855, 1861, 1895, 1923, 1979, 2022, 2033, 2061, 2103, 2116, 2124, 2169, 2275, 2276, 2329, 2486, 7214, 2531, 2535, 2548, 2555, 2564, 2605, 2617, 7240, 2740, 2741, 2765, 2769, 2786, 2805, 2858, 2859, 2972, 3052, 3267, 208, 215, 216, 252, 282, 294, 306, 307, 311, 342, 362, 421, 440, 473, 492, 526, 570, 592, 616, 639, 710, 794, 827, 829, 845, 864],[897, 899, 904, 926, 947, 973, 975, 982, 984, 1016, 1063, 1071, 1252, 1283, 1357, 1430, 1437, 1461, 1464, 1559, 1564, 1624, 1638, 1647, 1648, 1703, 1744, 1784, 1788, 1807, 1808, 1813, 1815, 1832, 1843, 1844, 1936, 1968, 2013, 2024, 2097, 2141, 2170, 2186, 2249, 2264, 2279, 2301, 2360, 2371, 2375, 2457, 2481, 2487, 2532, 2579, 2593, 2656, 2666, 2702, 2746, 2797, 2861, 2928, 2934, 2968, 2994, 3002, 3037, 3090, 3098, 3176, 3190, 3193, 3237, 3278, 3325, 7072, 7109, 7117, 7126, 7127, 7152, 7164, 7161, 7207]

Title word cross-reference

#26 [5487].

$((2^n)^m)$ [3796]. $(10^{31} - 1)/9$ [1976]. (2^m) [4349, 4370, 4553, 4562, 4468]. $(2^n + 1)$ [1081, 4785, 3909]. $(2^n - 1)$ [5004]. $(2^n - 1, 2^{n+p}, 2^n + 1)$ [6267]. $(2^n 2^q 1)$ [6073]. $(2^n \pm 1)$ [5514, 4136]. $(2m)$ [4433]. $(2n + 3)$ [6522]. $(2n - (2p \pm 1))$ [4847]. $(a \cdot x) \cdot x?$ [6795]. (d, r) [789]. (M, p, k) [5800]. $(\mathcal{R})$ [2908]. (p) [4349, 4433].

$(x+y)*(x-y)$ [6668]. -2 [743, 183, 206, 949, 801]. $-\infty < n < +\infty$ [141, 160]. 0 [5632]. $0 < N < 1$ [161]. $0 \div 0$ [699]. **$1** [3739]. 1 [4984, 4342, 5149, 5633, 3694, 2165]. $1,000,000$ [618]. $1/\sqrt{x}$ [5771]. $1/t$ [2174]. 10 [530, 6004]. 116 [4018]. 128 [4853]. 15 [530]. 16 [2504, 4183, 4071]. 17×69 [3047]. 2 [1005, 4300, 2049, 5669, 3229, 3990, 618, 6037, 430, 4342, 5005, 3283, 3459, 1760, 3469, 3140, 3476, 5607, 3491, 530, 321, 3681, 3815, 4449, 3694, 5093, 3361, 4937]. $2,576,980,370,000$ [5634]. $22n+1$ [2146]. 256 [4436]. 27 [433]. $2^(n+1)+1\}$ [3967]. $2^{2n+1}-1$ [6019]. $2^{2n+2}-1$ [6019]. 2^{2q} [6009]. 2^8-1 [2856]. 2^k [4481, 4992, 5494, 5033, 5041]. 2^k+1 [866]. 2^{k-1} [4481]. 2^m [4554]. 2^n [1568, 6019, 3967]. 2^n+1 [3967, 4984, 5713, 4459]. $2^{n+1}-1$ [6512]. 2^{n+k} [6512]. $2^n-(2^{n-2}+1)$ [5336]. 2^N-1 [2987, 4820, 6512, 4212, 3967]. $2^q \pm 1$ [6009]. $2^q \pm 3$ [6009]. $2^x p^y \pm 1$ [6235]. 2×2 [5906]. 3 [377, 4986, 4177, 430, 4033, 4201, 4038, 5025, 4870, 321, 6204, 4117, 6596, 4934, 4935]. $3-j$ [298]. 32 [3983, 4436]. 3×3 [2493]. 4 [3967, 4314, 4657, 2521, 2522, 430, 3428, 5718, 5520, 4381, 4713, 2950, 4071, 4073, 2811, 3001, 1932, 3524, 3529]. **$49.95** [3706]. 5 [6009, 4797]. 54×54 [3483]. $6-j$ [298]. 64×64 [2278]. 8 [433, 3441, 4071, 3491]. 84 [307]. **$85.00** [4141, 4142]. 88062 [530]. $8k$ [6832]. 8×8 [5093]. $9-j$ [298]. $<$ [6212]. $>$ [6212]. $[0,1]$ [5149]. ^{0} [4355]. ^{2} [5731]. ^{4} [2796]. ^{5} [3896]. ^{e} [1159]. $^{\text{th}}$ [1159]. ^{TM} [4624]. $A(N+C)$ [1910]. $a+b$ [3638]. $a+b+c$ [6293]. $AB+CAB+C$ [6940]. $ab+cd$ [6088]. $ab+cd+e$ [7052]. $a \cdot (x \cdot \ x)$ [6795]. $A \cdot T$ [4064]. $\arctan Z$ [143]. $a \times b + c \times d$ [6293]. β [6324, 7026]. $C+AB^2$ [4279]. $c/\sqrt{(a^2+b^2)}$ [6275]. CLP(R) [2928]. $\cos^{-1}$ [3128]. $\cos N$ [180]. $\cos x$ [373]. $\cot^{-1} x$ [373]. d [4691, 5497, 3802]. Δ_2^0 [4938]. e [459]. e^n [141]. e^x [409]. ϵ [3472]. η_T [5661]. ηT [5241]. $\exp(x)$ [1361]. $\exp x$ [373]. $f(x)=0$ [1222]. G_α [809]. GF(2)[x] [5854]. $GF(2^m)$ [4403, 4770, 4386, 6038, 4971, 5427, 4902, 5858]. GF($2n$) [4198]. $GF(p^m)$ [4649]. H [5166]. I^2L [3238]. ∞/∞ [5012]. K [5435, 4300, 5908, 2107, 5992, 6324, 5949]. $k < m$ [6324]. L [4342]. L^2 [5249]. L^∞ [5248]. l_2 [6048]. $\ln(x)$ [1529]. $\ln x$ [373]. $\log n$ [1228]. $\log Z$ [143]. LU [6784, 6544]. M [4834, 180, 4131, 2626, 2631, 2640, 2918, 5330, 581, 6324]. $M^E \bmod N$ [2776]. $\mathbf{F}_2[X]$ [7025]. $\mathbf{f}_{2^m}$ [4228]. $\mathbf{F}_{5^{5n}}$ [5678]. $\mathbf{F}_{7^{7n}}$ [5678]. $\mathbf{R}^n$ [6893]. $\mathbf{Z}^2$ [4059, 5032]. GF(2) [5304, 1692]. $\text{GF}(2^4)^2$ [6151]. $\text{GF}(2^{4n})$ [3920]. $\text{GF}(2^8)$ [6151]. $\text{GF}(2^{\text{k}})$ [4959, 3767, 4917]. $\text{GF}(2^{\text{m}})$ [5477, 4670, 4977, 3872, 4525, 5138, 3581, 4531, 3883, 5506, 2896, 2897, 3751, 4857, 5304, 5167, 4712, 4384, 5029, 2428, 5428, 4602, 4743, 4903, 5432, 3198, 4279, 4932, 4769, 2308]. $\text{GF}(2^{\text{n}})$ [4991]. GF(p) [2081]. $\text{GF}(\text{p}^{\text{m}})$ [3487]. $\text{GF}(\text{p}_{\text{k}})$ [4645]. $\text{GF}(\text{q}^{\text{n}})$ [4693]. MECIPTI [282]. μ [1426, 4863, 4905, 2309]. μP [1610, 2008]. N [3962, 808, 2333, 2334, 160, 161, 180, 4573, 5065, 4923, 5949, 5680, 4158, 6048, 1294, 3622]. $n^{\text{ième}}$ [1159]. $N_0' = -N_0^{-1} \bmod W$ [4256]. $N \geq 32$ [5843]. $n \log(n)$ [6460]. $n \times n$ [3139]. $O(1)$ [6360]. $O(n)$ [1195, 3431, 1547]. $O(n^2)$ [2777, 2778]. $O(n \log n)$ [6509]. Ω [4919]. Arccos$x$ [207]. Arcsin$x$ [207]. Arctan$x$ [207]. mod$p$ [1915]. P [6500, 4634, 2059, 1130, 894, 1044, 1635, 7026, 4272, 4620, 3349]. p^k [6676]. π [1630, 2233, 2234, 4599, 268, 5634, 1693, 459]. $p \times p$ [4578, 4722]. q [5773]. $q*m-n$ [1628]. QR [6113]. R [3602, 3061, 1605, 1613, 6403, 5843]. $r = m^k$ [1438]. r^a [4942]. r^b-1 [4942]. r^c+1 [4942]. $\{r^n-2, r^n-1, r^n\}$ [5295].

$r \geq 8$ [5843]. s [4874]. sin(**BIG**) [5230]. $\sin^{-1}$ [3128]. $\sin N$ [180]. $\sin x$ [373]. $\sqrt{(a^2 + b^2)}$ [6275]. $\sqrt{(x)}$ [1481]. $\sqrt{(x/d)}$ [3844]. $\sqrt{2}$ [6969]. $\sqrt{x}$ [1307, 451]. $\sqrt{x^2 + y^2}$ [5669]. T [6560]. $\tan^{-1} x$ [373]. $\theta(\log N)$ [2354]. $\times$ [4064, 3914, 4130]. w [4730]. X [1542, 2893]. $x^2 + ny^2$ [3706]. x^n [5972, 3307]. y [4412]. Z [5327].

-2 [1004]. **-adic** [1130, 1044, 1635, 2059, 894]. **-approximations** [5248, 5249]. **-ary** [2918, 4131]. **-b** [3483]. **-Bit** [3983, 6832, 307, 5949, 5065]. **-body** [4573, 4923]. **-circulant** [6403]. **-Coordinate** [4412]. **-count** [6560]. **-D** [5669, 4177, 4201, 3283, 6204, 4117, 5093, 3361, 2165]. **-Depth** [3431]. **-Digit** [433]. **-Dimensional** [5497, 2049, 4691]. **-Fold** [5435]. **-Friendly** [5800]. **-function** [5166]. **-gram** [5680]. **-Matrix** [4834]. **-Moduli** [6009, 3967, 4657, 4797]. **-Norms** [6048]. **-Order** [3602]. **-Partition** [5992]. **-Real** [4938]. **-select** [4158]. **-sets** [3061]. **-spaces** [4874]. **-th** [5908, 3802, 5773, 2334]. **-transform** [5327]. **-Vectors** [6048].

.NET [6413, 5068].

/m [4863]. **/spl** [4863].

0.18-CMOS [5767]. **0.4.1rc** [6414]. **0.80pJ** [6548]. **0.80pJ/flop** [6548]. **'00** [7342, 7347, 2540]. **'01** [7356]. **'03** [7385]. **'04** [7394, 7402]. **'07** [7437, 7443, 7445, 7450]. **'08** [7454, 3032, 5375].

1 [217, 3547, 6634, 3412, 2876, 228, 63, 65, 67, 563, 3275, 6666, 4064, 4406, 1163, 5767, 1933, 3864]. **1-GHz** [6634, 4406, 5767]. **1-Output** [5341]. **1.0** [3865]. **1.24Tflop** [6548]. **1.24Tflop/sW** [6548]. **1.5** [5649]. **10** [5731]. **10-kA** [5731]. **10-kA/cm** [5731]. **10/20** [958]. **100** [2889, 2890]. **100-MFLOPS** [2889, 2890]. **1014** [6739]. **1057** [1981]. **10858** [1746]. **10967** [4360, 5155]. **10967-1** [3275]. **10967-2** [4360]. **10967-3** [5155]. **10th** [7152, 7486, 7234, 7363, 7376, 27, 7133, 2763]. **'11** [7481, 1110, 1391, 1507, 1408, 1312]. **11-bit** [4905]. **11/780** [2036, 1569, 1570, 1803, 1019]. **116** [270]. **1164/WTL** [2033]. **11i** [4920]. **11th** [7354, 7247, 7265, 7266, 3183]. **120B** [1120]. **128-bit** [6315, 4115]. **12th** [7397, 7463, 7108, 7289, 3454, 7449]. **13** [4319, 2090]. **132-Bit** [342]. **13th** [7382, 7124, 7308, 7278, 7436, 3843, 3771, 7506]. **14-Port** [3914]. **14th** [7269, 7353, 7384, 7435, 7347, 7333]. **15** [2766]. **15-b** [4451]. **15-bit** [4120]. **15C** [1629]. **15th** [7172, 7443, 7108, 7451, 7355, 7401]. **16-19** [7072]. **16-b** [6449]. **16-Bit** [4530, 6674, 6689, 7036, 6832, 3023, 1260, 1601, 4989, 3076, 1759, 6314, 1476]. **16-bit-** [1610]. **16-bit-Multiplikation** [1476]. **16-by-8-bit** [1645]. **16-Digit** [5361]. **160-ns** [2835]. **160-Word** [3914]. **1620** [255]. **164** [1815]. **167** [3491, 3529]. **16BST** [1817, 1733, 1734, 1736, 1740, 1750, 1763, 1772, 1689]. **16F/400** [917]. **16th** [7426, 7417, 4646, 7381, 7423]. **17** [287, 838]. **17-Bit** [648, 647]. **1788** [6536]. **1788-2015** [6062]. **17th** [7488, 7428, 7344, 7418, 7421]. **'18** [7499, 562]. **18-21** [7434]. **18.Mai** [1484]. **18th** [7453, 7442, 7448, 5467].

18th-Century [5467]. **1945** [61]. **1947** [7064]. **196** [5676, 5687]. **1962** [7072]. **1965** [7076, 7078]. **1967** [7083, 7085]. **1968** [7088]. **1969** [7086, 7087, 587]. **1971** [7098]. **1972** [7096, 4045]. **1973** [4122, 4123]. **1975** [7105]. **1976** [7106, 7108]. **1977** [7109, 7134, 1652]. **1979** [7114, 7117]. **1980** [7118, 7124, 1525, 7129, 7126]. **1981** [7131, 7136]. **1983** [7152]. **1984** [7161]. **1985** [7178]. **1987** [2087]. **1988** [7181, 7192]. **1989** [7205, 2579]. **1989-01** [2385]. **1989/Taipei** [7205]. **1991** [2635, 7227, 2763]. **1992** [2855, 7290]. **1993** [7258, 7301, 3183]. **1994** [7279]. **1994-12** [3275]. **1995** [7280, 7292, 3454]. **1998** [7318, 7320, 3891]. **1998-12** [3890]. **1999** [7330, 7331, 7336, 7338]. **19th** [7461, 7431]. **1st** [7315].

2 [2176, 6461, 2517, 1734, 64, 66, 68, 4360, 4034, 4571, 6421, 3917, 4888, 528, 2014, 3513, 4115, 4762, 2821, 3013]. **2-D** [3513]. **2-Digit** [4171]. **2-dimensional** [2988]. **2.0** [3618]. **2.44** [4033, 4201]. **20** [2665, 2399]. **20-MFLOPS** [2400, 2399]. **200-ns** [1485]. **'2000** [7341, 7340, 7341, 7347]. **2001** [7352, 7353, 7355, 4822, 7357, 7363, 7364]. **2002** [7366, 7367, 7369, 7370, 7371, 7378]. **2003** [7381, 7382, 7385, 7386]. **2004** [7393, 7394, 7396, 7402, 7403, 4880]. **2005** [7410, 7411, 7413, 7416, 7422]. **2006** [7425, 7426, 7429, 7433]. **2006Petrozavodsk** [7483]. **2007** [7437, 7439, 7440, 7442, 7445, 7447, 7457, 7452]. **2008** [7453, 7454, 5479, 7456, 6521, 5913, 5914, 6685, 5531, 5750, 5553]. **2009** [7459, 7463, 7466, 7467, 5512]. **2010** [7476, 7477, 7479]. **2011** [7482]. **2013** [7487]. **2015** [7490, 7491]. **2016** [7495]. **2017** [7496]. **2018** [6434]. **2019** [6487, 7501, 7502]. **2020** [6616, 6614, 6615, 6617, 6618, 6620, 6641, 7503, 6665]. **2020s** [6724]. **2021** [6724, 6725, 6726, 6727, 6735, 7507, 6781, 6799]. **2022** [6837, 6838, 6839, 7509, 6866, 6867]. **20th** [7465, 7505, 7484, 7446]. **21-23** [7463]. **2100** [2558]. **21064** [3341]. **210uW** [6384]. **210uW/MHz** [6384]. **21164** [3386]. **21st** [7471, 7399, 7343, 7487, 7460]. **22** [337]. **22-nm** [6634]. **22nd** [7491]. **22nm** [6548]. **23-28** [7430]. **23nd** [7495]. **23rd** [7217, 7474, 7477]. **24** [1127]. **24-26** [7383]. **24-bit** [2364]. **24.und** [7134]. **24732** [5157]. **248GOPS** [6812]. **248GOPS/W** [6812]. **24b** [2461]. **24th** [7496, 7316, 7319, 7373, 7479, 7134]. **25-28** [7342]. **256** [6272]. **25th** [7213, 7329, 7134, 7444, 7500]. **26-28** [7394]. **26th** [7479, 7502]. **27th** [7503, 7476]. **281** [3055]. **286** [3637]. **28nm** [6812]. **28th** [7507, 7324]. **29.95** [3706]. **29th** [7332, 7509]. **2B** [645]. **2DFFT** [1883]. **2nd** [7475, 4575, 7097]. **2Sum** [6127, 6234].

3 [3093, 5155, 6397, 2769, 6102]. **3-ps** [5767]. **30-bit** [2421]. **30-MFLOP** [2245]. **30-ns** [3469]. **300** [4201, 1229]. **300-MHz** [4201]. **300MHz** [4033]. **312** [432]. **3171** [2499]. **31st** [7186]. **32** [5111, 2061]. **32-** [6901]. **32-Bit** [3714, 2312, 2183, 2325, 5471, 4800, 3412, 1403, 5001, 1623, 2734, 2406, 2407, 2408, 2409, 2557, 1996, 2431, 3309, 2569, 3187, 3949, 2484, 3202]. **320** [3096]. **320-MFLOPS** [3097, 3096]. **320C25** [3287]. **32b** [2245]. **33** [2213]. **33rd** [7297, 7348, 7241]. **34** [512]. **34-MFLOP** [2484]. **360** [417, 418, 504, 383, 391, 392, 681, 439, 480, 1441, 6430, 537]. **3600** [302]. **36th**

[7261]. **370** [1945, 2036, 2478]. **37th** [7447]. **390** [4075, 3810, 3811, 4101, 4102]. **39th** [7437, 7454]. **3CT** [3381]. **3DNow** [3917, 4034]. **3DTV** [5756]. **3m** [6339]. **3rd** [7313, 7101, 7419]. **3X** [5433].

4 [3391, 4786]. **4-2** [1167]. **4-Input** [5341]. **4-Input/1-Output** [5341]. **4.4ns** [3483]. **40** [2408]. **40-MFLOPS** [2406, 2408]. **40-ns** [648]. **400** [917]. **4000** [497]. **400MHz** [3914]. **400th** [7290]. **4096-Core** [6826, 6712]. **40ns** [647]. **41** [443]. **432** [1856]. **44th** [7433]. **45th** [3758]. **48th** [7416]. **4d** [4668]. **4m** [6339]. **4th** [7111, 7342, 7236, 7364, 7510].

5 [3539, 6921]. **50** [2323]. **50-Megacycle** [149]. **50-MHz** [2323]. **501** [3775, 3628]. **50th** [7273]. **512** [6347, 6974]. **512-bit** [6852]. **528** [1118, 4016]. **53*53** [3261]. **53nd** [7472]. **54** [338]. **54-b** [2835]. **55-b** [3469]. **5th** [7380, 7462, 7128, 7431, 7287].

6.7-MFLOPS [2442, 2444]. **60** [605, 578, 410]. **600** [3982]. **600-MHz** [3982]. **6000** [3381, 2535, 636, 2560, 2564, 1242, 3363, 717]. **6000/7000** [1036, 1242]. **600MHz** [4075]. **601** [3341]. **603e** [3611]. **60M** [2634]. **60M-flops** [2634]. **64** [4775, 3989, 4163, 4024, 4189, 4190, 6507, 4235, 4111]. **64-active-instruction** [3525]. **64-b** [3637, 2957, 3525]. **64-Bit** [2432, 3914, 7022, 2320, 2323, 5382, 5124, 4983, 3069, 3429, 5149, 2711, 3443, 2399, 2400, 2545, 2404, 2924, 6901, 2768, 2259, 3323, 4921, 2033]. **64-bit-Universal-Floating-Point-ISA-Compute-Engine** [6507]. **6400** [1694]. **64b** [2322]. **65** [624]. **65-nm** [7022]. **65/6600** [624]. **650** [2089]. **651** [2048]. **65nm** [6384]. **6600** [731, 554, 624, 591, 1345]. **6600/7600** [731]. **665** [2201]. **68000** [1884]. **68000-Einplatinenrechner** [2080]. **693** [2805]. **6th** [7427, 4830, 7392, 7141, 7331, 7446, 7309, 7422, 7396].

7-9 [7465]. **70** [5672]. **7000** [1242]. **7094** [397, 472]. **7094-II** [472]. **714** [3052]. **715** [3054, 3665]. **719** [3033]. **722** [3053]. **7289** [6969]. **73** [1029]. **754** [3837, 5562, 2857, 4302, 3394, 6024, 3973, 4508, 5479, 6487, 6865, 3865, 4324, 6758, 4819, 6764, 6765, 1409, 6518, 6778, 6159, 1861, 6521, 2093, 3449, 3614, 5921, 5318, 4230, 5040, 5176, 6898, 6557, 7017, 7018, 2271, 6434, 6321, 7026, 1679, 4749, 3935, 5627, 2016, 1458, 6705, 7059, 3350, 5553, 5778, 7041]. **754-1985** [1860, 1861]. **754-2008** [5418, 5479, 6521, 5553]. **754-2019** [6520, 6487]. **754-Posit** [6898]. **754r** [5409, 5114, 5127, 5259, 5480, 5160, 5213, 5159, 5172, 5361]. **7600** [731]. **77** [1190, 4016, 1331]. **780** [2036, 1569, 1570, 1803]. **786** [3938]. **'79** [7114, 7117]. **7th** [7118, 7120, 7425, 7159, 7189, 7430].

8 [1295]. **8-Bit** [3804, 6824, 6953, 1967, 6987, 7006, 6907, 6445]. **8-to-64** [6548]. **80** [1483]. **80*87** [3014]. **80-bit** [1928]. **80-FLOPS** [2957]. **8000** [3443]. **80287** [1903]. **8080/8085** [1583, 1133, 1219]. **8080A** [1487]. **8085A** [2386]. **8086/80286** [1935]. **8087** [1629, 1315, 1903]. **8087/80287** [1935, 1903]. **8087/80287/80387** [2289]. **8088/8087** [1733]. **80960** [2241].

80960KB [2242]. **80b** [2443]. **80h** [1295]. **80's** [7123]. **814** [4439]. **8231A** [4140]. **826** [6384]. **'83** [7144]. **83S87** [2512]. **'84** [7153]. **842** [4994]. **'85** [7158, 480]. **854** [3401, 3402, 2087, 3473]. **854-1987** [2039, 2087]. **'86** [7165, 7166]. **86**^{TM} [3913]. **871** [5438]. **'88** [7187, 7188, 7191, 2305]. **881** [5495]. **'89** [7199, 7206]. **89/TI** [4452, 4453]. **8s** [765]. **8th** [7211, 7411, 7320, 7173, 5616].

9 [516, 695]. **9-11** [7439]. **9.4** [6812]. **'90** [7209, 7218, 7233, 4295, 3385, 4954, 4955, 2675, 3481, 4439, 3829]. **908** [5645]. **90nm** [4786]. **'91** [7230, 7233, 416, 395]. **'92** [7239, 7242, 7245, 7253, 4452, 4453]. **'93** [7256]. **'94** [7268, 7269, 7278]. **'95** [7285, 3842, 4435, 4746]. **954** [6040]. **'96** [7299, 7303]. **96-bit** [2255]. **97** [3707]. **'98** [7316, 7324, 3959, 7314]. **980A** [1015]. **'99** [7329, 7330, 7331]. **9th** [7202, 7477, 7434, 7136, 2356].

= [2799, 2800, 3343, 7098].

A-Priori [2100]. **A.K** [4663]. **a.k.a** [5526]. **A/D** [3881, 905, 3343, 4120, 4451, 801]. **A/D-konverter** [3343]. **A1** [1098, 1192]. **Aarhus** [7141, 7141]. **Abacus** [202, 1026, 5530]. **Abbreviating** [7]. **abc}** [4804]. **ABE** [546]. **ABI** [6833]. **abnormal** [6013]. **Abotec** [3177]. **Absolute** [3388, 3389, 2759, 2249, 432]. **Abstract** [5570, 4536, 5603, 525, 5324, 5838, 6334, 4831, 2908, 2111, 5839, 4883, 4895, 2982]. **abstraction** [5466, 5817, 1329]. **abstraction-based** [5466]. **Abstracts** [7257, 7348]. **Abu** [407]. **Acadiana** [7320]. **ACBAM** [6919]. **ACBAM-Accuracy-Configurable** [6919]. **Accelerate** [6568, 6266, 4573]. **Accelerated** [6763, 5007, 5478, 5684, 6416, 6941, 7035]. **Accelerating** [5458, 6018, 4792, 3860, 5693, 6873, 6762, 6150, 7001, 4229, 6682, 6305, 4720, 6310, 5759]. **Acceleration** [6656, 6784, 6175, 6777, 6406]. **Accelerator** [6020, 6736, 6467, 5676, 6973, 5712, 6986, 6283, 6888, 6301, 2250, 6421, 7016, 5994, 6916, 4903, 7034, 6934, 6594, 6361, 2263]. **Accelerators** [6877, 6979, 6530, 6789, 7008, 6425, 7040, 4765, 6945, 5271, 3497]. **Acceptance** [3481]. **Access** [2142, 5102, 3394, 4576, 4630, 6941]. **Accessibility** [7409]. **Account** [3]. **Accumulate** [6482, 4978, 6383, 6780, 6402, 6691, 6924, 5943, 3818, 6607, 6715, 4500, 6547, 3666]. **Accumulated** [1367, 574, 976]. **Accumulation** [6238, 2055, 1958, 179, 5910, 6166, 5300, 6068, 5537, 4422, 77, 453, 1071, 3701, 5798, 3727, 3751, 5738, 573, 5534, 2762, 95, 5441]. **accumulations** [4229]. **Accumulator** [3854, 4758, 6211, 379, 2692, 1031, 3309, 5768, 5853, 4760]. **Accumulators** [6475, 6303, 370, 1072]. **accuracies** [2599]. **Accuracy** [4638, 217, 6215, 6957, 6847, 1714, 5463, 860, 1014, 4790, 5382, 6747, 6748, 2673, 5882, 6030, 3235, 5889, 6138, 5267, 5135, 6145, 1840, 227, 228, 7049, 433, 389, 1289, 1851, 3604, 4545, 4357, 2377, 6393, 1745, 1980, 2539, 1620, 6988, 1983, 5905, 6279, 1627, 2397, 3114, 752, 5170, 6680, 831, 5175, 3786, 6919, 5765, 3160, 6200, 165, 6924, 1684, 2020, 2021, 6705, 410, 3521, 6822, 6936, 493, 6716, 6717, 5373, 6947, 5865, 5656, 5797, 1812, 4652, 5880, 6247, 6755, 6035, 6880, 3090, 1744, 6668, 2543, 2097, 1993, 5169, 5827, 5171, 6415, 3779, 1755, 5333, 6095, 7023, 1678, 107]. **accuracy** [2457, 1688, 1921, 1784, 6332, 2296, 3190, 6444, 3834,

544, 5107, 2051, 1210, 3642, 650, 1352, 2567]. **accuracy-adjustable** [7023]. **accuracy-guaranteed** [5333]. **Accurate** [5564, 5111, 1804, 2645, 2648, 2864, 1384, 4334, 4520, 4521, 4522, 4673, 4814, 4815, 3732, 4338, 5967, 6140, 6252, 4001, 5272, 2690, 6040, 4688, 4827, 4829, 5278, 2697, 5397, 5502, 5508, 4354, 6519, 6061, 5904, 5587, 5730, 5908, 5909, 3280, 5910, 6166, 230, 2547, 2236, 6889, 6540, 3294, 904, 570, 3464, 639, 5748, 6556, 7162, 4886, 4887, 5058, 5995, 2973, 1535, 5066, 5434, 5435, 5436, 5540, 5617, 5935, 5936, 3674, 3807, 3809, 4914, 5082, 4110, 2605, 6003, 6819, 3016, 597, 5950, 4480, 1794, 5787, 3045, 5245, 3236, 3415, 4674, 4168, 2361, 5501, 6258, 4195, 5903, 1867, 5906, 2730, 3118, 757, 758]. **accurate** [2948, 4727, 2956, 4729, 6093, 4244, 2145, 4443, 5208, 3003, 2837, 5451, 5227, 1094]. **Accurately** [3555, 6480, 2509, 5728, 5026, 2601, 4913, 6481, 6242, 4801, 4802, 5600, 5624]. **ACE** [945, 5099]. **achieved** [3020]. **Achieving** [6012, 5382, 5674, 6255, 1840, 4733, 5846]. **ACL2** [7366, 4261]. **ACL2-2002** [7366]. **ACM** [7181, 7268, 7393, 7394, 7409, 7410, 7424, 7437, 7453, 7454, 7429, 7356, 7372, 2090, 7378, 7395, 2343, 7286, 7233]. **ACM/IEEE** [7424]. **ACM/SIGDA** [7393, 7410]. **ACM/SIGPLAN** [7395]. **Acoustics** [7165, 7231, 7385, 7402]. **Acousto** [1906]. **Acousto-Optic** [1906]. **acquisition** [2498, 2665]. **ACRITH** [1980, 1812, 2539, 1983, 1869, 2102]. **ACRITH-XSC** [2539]. **across** [5318]. **ACSSC** [7457]. **ACT8837** [2335]. **ACTION** [6891]. **Activation** [6640]. **Activations** [6286]. **active** [5756, 3525]. **Activity** [5863]. **Actual** [5311, 6471]. **acyclic** [3205]. **Ada** [7268, 7211, 7247, 1872, 7268, 2318, 2641, 2642, 2866, 2867, 3225, 2502, 2658, 3418, 2349, 2073, 6042, 2523, 7247, 1525, 1749, 2103, 1756, 3634, 2764, 2137, 2808, 1701, 2836, 1483]. **Ada-Europe** [7247]. **Ada83** [3036]. **adaptable** [4326]. **Adaptation** [2869, 4396, 6807]. **adapted** [5976]. **Adapting** [2928, 4016]. **Adaptive** [5809, 6525, 4216, 3109, 1633, 2918, 6679, 6787, 6182, 2445, 1769, 3679, 3680, 3812, 1462, 1549, 6934, 2173, 1947, 1582, 1720, 4799, 4970, 6389, 5150, 2389, 3773, 3905, 1755, 2425, 6083, 2959, 3144, 5764, 3691, 5635]. **ADC** [4350, 2450, 4130, 4941]. **ADCOM** [7443]. **Add** [6464, 5464, 3047, 4655, 4968, 6238, 4317, 5476, 6141, 5146, 2536, 6662, 5296, 3444, 6399, 3892, 4378, 5314, 5315, 5316, 3120, 5745, 5538, 5614, 5425, 5426, 5065, 6920, 4750, 6204, 6343, 6606, 6490, 4481, 2327, 4794, 3051, 3579, 4999, 4022, 5006, 6155, 4550, 5010, 4563, 4864, 4063, 5983, 5043, 4729, 3148, 5623, 4757, 4928, 1704, 4632, 4772]. **add/sub** [3579]. **Addendum** [1230, 762]. **Adder** [6019, 3714, 3965, 4301, 4800, 5475, 4974, 1102, 5261, 2885, 335, 6876, 1124, 5724, 6397, 5731, 753, 3781, 6561, 5928, 5993, 3790, 3655, 6562, 5336, 5337, 4421, 4261, 4909, 5627, 6928, 533, 589, 936, 5357, 5553, 6821, 6442, 6342, 5364, 5556, 133, 5226, 5371, 802, 2183, 4969, 2674, 5963, 3059, 2882, 3252, 5707, 4544, 2900, 3105, 3106, 3107, 3108, 1428, 2747, 5923, 2111, 4872, 5750, 2953, 4242, 2791, 6921, 1167, 5768, 5853, 4612, 5439, 4921, 2478, 5779]. **Adder-Based** [6019, 3105, 3106, 3107, 3108]. **Adder/Subtractor** [5724, 6397, 6821, 4872, 5750]. **Adders** [6012, 4298, 607, 5673, 3048, 4155, 5473, 866, 6759, 6760, 6379, 5701, 2075, 2077, 5585, 5399, 5514, 4212, 5017, 4049, 4373, 6067, 6408, 6177, 6790, 5177, 7007, 7056, 6687, 2001, 6694, 2782, 3802, 4266, 4437, 5361, 4459, 1180, 1191, 1494, 2331, 2660, 3857, 3990, 2725, 1899, 5754, 4731, 4080,

3328, 5213, 7059, 2474, 4456, 4763]. **adders/subtractors** [7059]. **Addictive** [1871]. **Adding** [1382, 3391, 2324, 3865]. **Addition** [1360, 6451, 2038, 1086, 803, 1371, 6963, 463, 550, 4312, 4968, 3722, 4154, 4317, 1823, 4975, 1107, 671, 6373, 1393, 5579, 5275, 3072, 1513, 506, 4992, 6147, 1125, 1612, 3433, 5586, 6522, 5299, 743, 4856, 1873, 4374, 4052, 5911, 6073, 4714, 4866, 5031, 1143, 4873, 362, 3139, 1438, 5930, 1443, 5336, 4085, 921, 922, 3158, 2275, 1675, 2138, 454, 3807, 5071, 6927, 786, 213, 932, 3817, 4110, 3184, 5547, 5217, 6443, 5557, 414, 1705, 376, 5103, 4136, 3221, 4151, 4309, 4794, 3856, 4660, 3566, 4161, 4667, 6376, 2520, 4681, 1512, 1968, 508, 6651, 2895, 3255, 4198]. **addition** [2915, 4862, 2737, 3630, 4229, 1647, 1648, 3642, 2760, 3919, 2260, 3795, 4082, 4250, 2583, 2974, 652, 710, 4910, 926, 3689, 375, 845, 1927, 3190, 3694, 492, 3831, 2627]. **Addition-based** [4992]. **Addition-Related** [5930]. **Addition/Subtraction** [4154, 5911, 4714, 6927, 3856, 4660]. **additional** [3365]. **additions** [3609, 3456, 1936]. **Additive** [4516, 5033, 5748, 484, 3591, 1663]. **Additively** [6559]. **Address** [2671]. **Addressable** [5053, 1560]. **adds** [1372, 6080]. **Adelaide** [7333]. **adequate** [2186]. **Adiabatic** [4758]. **adic** [1130, 1044, 1635, 2059, 894]. **Adjustable** [2103, 5544, 7023]. **adjustment** [3731]. **Ado** [2091]. **ADPCM** [3171, 3172]. **ADSP** [2558, 2942]. **ADSP-2100** [2558, 2942]. **Advance** [6783, 4792]. **Advanced** [3842, 4341, 5290, 3443, 7443, 4560, 7177, 7300, 7334, 7345, 7374, 7388, 7405, 3471, 3481, 5538, 7248, 7237, 1540, 2286, 933, 5219, 4466, 1812, 6852, 7427, 2031, 7361, 7420]. **Advances** [7066, 7077, 1220]. **Advancing** [2328]. **Advection** [6848]. **Adversarial** [6776]. **Aerospace** [7379]. **AES** [6730, 6151, 6433]. **af** [1367]. **Affair** [3407]. **affiliated** [7366]. **Affine** [6463, 4581, 6604, 4811, 5251, 4686, 5717, 5326, 5196]. **Affirmative** [3]. **AFIPS** [7070, 7157]. **after** [2014, 3688]. **Afternotes** [3688]. **Again** [6373, 1908]. **Against** [6341, 4401, 4585, 4587, 4730, 4631]. **Age** [5002]. **aggregation** [5335, 5419]. **aggressive** [4063]. **ago** [6099]. **Ahead** [5212, 802, 605]. **Ahmad** [407]. **ähnliche** [1699]. **AI** [6880, 6883, 6420, 7030, 7032, 6824, 5879]. **AI/ML** [6883]. **Aid** [14, 681, 5054, 1561]. **Aided** [7460, 7286, 7356, 7403, 7235, 7303]. **Aiken** [4122]. **air** [4548]. **Aircraft** [51]. **Airy** [5879]. **Aizu** [7338]. **Aizu-Wakamatsu** [7338]. **al** [407, 407, 407]. **al-Fusul** [407]. **al-Hasan** [407]. **al-Hindi** [407]. **al-Uqlidisi** [407]. **ALA'01** [4822]. **Alabama** [7245]. **Alamos** [2750]. **Alan** [7412, 703]. **Albena** [7232]. **Albuquerque** [7230]. **Alegre** [7439]. **Alessandro** [7337]. **Algebra** [3546, 4499, 1580, 7158, 7270, 4334, 6375, 4822, 6792, 3481, 7030, 5955, 6237, 2066, 3876, 4696, 6669, 6670, 5831, 832, 2954]. **Algebraic** [7441, 7114, 5126, 429, 2366, 4182, 7314, 388, 5294, 5729, 3761, 3625, 7299, 4380, 2143, 7390, 1070, 3819, 5207, 7350, 5093, 7253, 7480, 7075, 7081, 4286, 45, 5247, 1826, 514, 515, 4220, 4379, 3300, 2117, 7117, 5845, 2968, 1678, 5196, 4764, 457]. **Algebraic-integer** [2366]. **Algebraicznych** [457]. **ALGOL** [578, 734, 757, 578, 491, 539, 272, 410]. **algorism** [4669, 1026]. **Algorithm** [1708, 5232, 1709, 1260, 3958, 4950, 6459, 3035, 3218, 3712, 3848, 1806, 3038, 725, 6847, 5241, 1372, 807, 1492, 2048, 5465, 6355, 6627, 6469, 6739, 1098, 1814, 3398, 4967, 3557, 1497, 5677, 3722, 814, 5681, 1820, 2200, 5258, 3981, 2339, 2059, 1017, 1825, 2869, 5132, 2347, 1831, 3068, 4001, 5694, 6381, 1115, 1835,

428, 4012, 4829, 6148, 5503, 3431, 4844, 3601, 3753, 4028, 4546, 4030, 4199, 4200, 6517, 2381, 2716, 1617, 5008, 5716, 5718, 740, 3447, 972, 5516, 2090, 5732, 1630, 1873, 5304, 3288, 2735, 828, 6888, 5915, 6071, 3457, 313, 5309, 5310, 4059, 2421, 5033, 1048, 5599]. **Algorithm** [2105, 569, 2107, 262, 640, 4723, 2113, 6899, 762, 2947, 1649, 1890, 2115, 2254, 5330, 2566, 6184, 6424, 1654, 1897, 4410, 2774, 2960, 4412, 1532, 1661, 2777, 2778, 3660, 5994, 4894, 5424, 5758, 1157, 2589, 6100, 4900, 923, 2139, 924, 775, 4608, 1243, 2015, 5628, 6002, 372, 3814, 4112, 3184, 4117, 4447, 5085, 1693, 6205, 456, 4455, 2822, 3518, 2155, 489, 5552, 5773, 5857, 5945, 595, 3698, 1478, 244, 3206, 3531, 5104, 4278, 2630, 1710, 603, 2173, 2040, 4780, 6460, 3549, 3849, 5237, 6354, 3399, 1582, 1720, 4799, 2661, 2662, 3403, 5125, 3229, 2669, 2507, 3979, 3567, 3412, 5686, 3726]. **algorithm** [3415, 3238, 4331, 4332, 3869, 3870, 6252, 3578, 3070, 465, 4680, 4682, 4990, 4007, 3579, 1204, 5283, 4833, 2215, 5815, 5700, 6258, 1971, 3883, 4193, 3257, 3436, 3437, 4198, 2899, 514, 515, 2715, 4031, 3888, 5906, 4706, 5015, 2398, 748, 5734, 2732, 2733, 5163, 2550, 2736, 6678, 5828, 4564, 3459, 4567, 4568, 3627, 3777, 5036, 2937, 2246, 5834, 573, 4876, 761, 577, 1762, 2948, 4879, 5045, 1891, 983, 5415, 5988, 3305, 6317, 2776, 5843, 3145, 5536, 2779, 2967, 1907, 2968, 2448, 4738, 5423, 2131, 2583, 4599, 4744, 4904, 997, 1064, 3336, 3176, 3684, 3513, 1922, 3514, 2602, 293, 1927, 2811]. **algorithm** [3001, 5086, 4761, 5445, 5446, 4275, 3190, 6444, 659, 2483, 3199, 3361, 4768, 5451, 5101, 6008, 3371, 7061, 4939, 6644, 3033, 3550, 2048, 6739, 1192, 2201, 3052, 3053, 3054, 3055, 384, 6040, 1118, 1205, 4994, 5495, 432, 4016, 512, 6388, 564, 2089, 3665, 5438, 270, 2805, 3938, 4439, 5645, 6786]. **algorithm-based** [2246, 3513, 3199, 3361, 3371]. **Algorithmen** [2393, 2231, 2567, 1699, 2300]. **Algorithmes** [4672, 5319, 4340, 2756]. **Algorithmic** [5810, 7430, 3896, 252, 3656, 2796]. **Algorithmics** [7015, 4478, 5081]. **Algorithmique** [5081, 4478]. **Algorithms** [850, 2037, 6613, 4141, 4142, 722, 1805, 3847, 855, 665, 1011, 6846, 7411, 3223, 5378, 5665, 6234, 1265, 1375, 5384, 5386, 1584, 275, 3055, 6243, 3862, 4666, 1105, 5803, 2874, 4518, 4519, 4672, 3243, 4520, 3728, 6037, 1022, 1023, 1024, 1112, 6874, 5395, 3072, 4006, 4172, 6496, 5138, 2071, 2359, 6764, 6765, 5494, 3074, 467, 3738, 736, 823, 877, 6652, 1517, 6047, 5501, 883, 4189, 5148, 2534, 7455, 4197, 4356, 3604, 4545, 3605, 3887, 1519, 1412, 1521, 3273, 4204, 4703, 4704, 3098, 3099, 5723, 2541, 3100, 6165, 6671, 2393, 2231, 4213, 827, 521, 1420, 3898, 7478, 522, 6676, 3111]. **Algorithms** [4555, 3289, 4375, 630, 5826, 5311, 2930, 1528, 4060, 3120, 2933, 3295, 7300, 7420, 1049, 6794, 3636, 1639, 1887, 686, 1640, 690, 1641, 4875, 7178, 7192, 4397, 5042, 4580, 3299, 447, 356, 476, 360, 3643, 5046, 4403, 2567, 3789, 7011, 4407, 1322, 3792, 3315, 1440, 3796, 1443, 4248, 1444, 1770, 5995, 2789, 3801, 7249, 5997, 6808, 5935, 5936, 7237, 6923, 4606, 774, 2456, 3502, 5342, 925, 711, 3682, 373, 4111, 1341, 2603, 2812, 2813, 5771, 5856, 3005, 939, 2824, 3827, 1699, 2300, 5555, 3359, 1473, 3367, 7060, 5103, 5372, 551, 3209, 1083, 3548, 5458, 5955, 4495, 4961, 4307, 5121]. **algorithms** [6127, 6232, 6741, 6850, 7200, 2664, 2199, 221, 3858, 1960, 419, 3988, 1827, 1199, 2681, 3060, 3416, 4814, 2205, 1836, 3246, 4679, 6878, 3425, 225, 5140, 5143, 6050, 6385, 7227, 4022, 4699, 5710, 1299, 3269, 5298, 1982,

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3651, 3653, 3655, 3793, 3794, 4076, 5059, 2569, 2962, 2570, 5930, 4413, 2777, 2778, 5418, 7019, 2003]. **Floating** [644, 1058, 1324, 2573, 2262, 4252, 6190, 645, 6695, 1156, 1234, 1326, 5932, 5994, 5613, 2127, 7022, 701, 4255, 4421, 5995, 2266, 2785, 2786, 3152, 2007, 6566, 5538, 837, 2789, 2973, 1772, 6099, 2582, 3155, 4897, 5614, 5425, 5426, 2008, 6430, 6431, 2272, 991, 2976, 2273, 1238, 3669, 921, 922, 6193, 2274, 993, 3158, 2275, 4603, 5615, 2276, 6195, 2797, 5066, 5434, 5435, 5617, 5937, 4261, 6698, 6436, 1540, 6327, 1679, 453, 1680, 6328, 3930, 3931, 5068, 1543, 4093, 2594, 1454, 1775, 4908, 5070, 5342, 2282, 4101, 4267, 4437, 4750, 5071, 5766, 4610, 5073, 2983, 1685, 7032, 1776, 5627, 5852, 2595]. **Floating** [3680, 4912, 2461, 269, 212, 2147, 2984, 2017, 5769, 1546, 2463, 787, 1686, 2805, 2990, 3178, 3179, 3180, 3342, 3685, 3686, 2287, 5942, 6203, 6928, 3343, 6104, 6105, 6578, 2020, 2021, 1689, 1690, 2995, 5943, 2601, 4913, 5201, 5202, 5203, 5204, 5439, 5440, 5441, 5442, 5443, 2809, 2996, 843, 1338, 1458, 1459, 1785, 5544, 3940, 3941, 5084, 1340, 2291, 4112, 2025, 5855, 4270, 6204, 3943, 1786, 5546, 2470, 2607, 2608, 3002, 5087, 5088, 1465, 5547, 6705, 1789, 5211, 5355, 3517, 4920, 6107, 6591, 4120, 592, 3347, 4454, 6334, 6003, 7039, 6441, 1072, 5356, 2027, 3826, 848, 5357, 5548, 2822]. **Floating** [3190, 3518, 2824, 6707, 3350, 6335, 2826, 2827, 1349, 5091, 1075, 5549, 5857, 3695, 1350, 3829, 3193, 6209, 6442, 6443, 2299, 3947, 215, 6343, 1469, 1701, 2617, 1702, 5097, 5220, 5364, 5365, 5556, 5557, 5638, 5641, 6445, 1556, 1354, 1471, 1472, 1473, 1474, 3951, 2033, 5778, 7041, 2034, 3011, 3012, 5947, 216, 3201, 2302, 6211, 2836, 4280, 6112, 134, 1797, 5223, 5948, 2625, 799, 1357, 3019, 1706, 3529, 5371, 5781, 4135, 948, 1941, 6712, 6826, 6827, 5950, 6606, 5104, 5560, 5645, 5105, 5372, 5229, 6608, 5576, 5690, 5884, 4622, 6338, 4278, 1937, 2172, 3375, 5373, 662, 2851, 1943]. **floating** [1944, 6447, 3956, 1564, 5648, 6213, 3023, 3705, 3841, 5453, 5454, 6013, 6116, 6014, 720, 296, 1485, 2492, 2634, 3029, 3214, 3380, 3381, 3382, 3383, 4487, 6349, 6456, 6457, 6954, 2493, 1085, 1010, 5653, 1800, 2312, 1801, 1802, 1362, 2314, 1569, 1570, 2041, 2315, 4780, 6120, 4144, 1487, 2496, 2861, 3037, 5566, 5871, 2043, 1368, 1807, 2180, 2497, 2181, 5872, 4299, 2045, 2319, 6958, 2643, 3221, 3039, 2320, 4302, 5239, 5240, 1091, 2182, 1370, 2323, 5797, 4784, 2498, 1190, 5120, 3851, 2324, 6230, 2325, 2186, 2646, 2647, 3045, 1813, 4307, 4502, 4651, 4787, 4788]. **floating** [4789, 5121, 5243, 5957, 6232, 3717, 1716, 299, 2187, 666, 5246, 5568, 4310, 3852, 1015, 4792, 5381, 5569, 6965, 7048, 2188, 1016, 1193, 6358, 5801, 6631, 3226, 4969, 3556, 1815, 2190, 2656, 6360, 1954, 6476, 1377, 6477, 3401, 6239, 1378, 4799, 4970, 2661, 3228, 379, 1585, 6362, 3855, 4973, 1818, 2056, 2665, 3723, 3857, 5878, 1380, 1722, 2200, 2335, 4508, 5476, 3978, 3979, 5960, 4801, 4802, 3982, 1589, 5478, 5684, 6133, 4161, 2674, 1104, 1961, 3988, 4669, 4515, 421, 5481, 3412, 5686, 2342, 2870, 2871, 2872, 3865, 3994, 3237, 6249, 2679, 6250, 5390, 5391, 959, 1276, 2681]. **floating** [6372, 5963, 5691, 3059, 2878, 3241, 3416, 4521, 4674, 4814, 6137, 6035, 3997, 3061, 249, 4818, 5134, 5264, 4335, 961, 4524, 5577, 6646, 5136, 2516, 5269, 2517, 4983, 2348, 4168, 2882, 5270, 2205, 502, 1733, 1734, 2884, 4000, 1202, 5272, 5137, 5489, 734, 1116, 4989, 4173, 4174, 6878, 4684, 4685, 5580, 1512, 1968, 2360, 1736, 1969, 819, 508, 3737, 1204, 5279, 1029, 6255, 2890, 2364, 4832, 6651, 4691, 5811, 4692, 282,

3076, 3252, 4694, 4835, 3077, 2526, 621, 879, 1030, 1208, 1283, 1739, 3428, 2892, 3078, 1031, 2702, 1843, 5499, 1844, 2530, 1845, 5700, 2370, 4838, 4839]. **floating** [1846, 5397, 5972, 6049, 6502, 1287, 2371, 252, 178, 3881, 2375, 1850, 4350, 4842, 3882, 2532, 4021, 6658, 6659, 3080, 4022, 5001, 3593, 5817, 6982, 4023, 4539, 4698, 6506, 2894, 2895, 3595, 6389, 3083, 3434, 3596, 1291, 1407, 1213, 1974, 3598, 2219, 3435, 1408, 1297, 3260, 3090, 4029, 2220, 4547, 2900, 2535, 3091, 2711, 5292, 5293, 1744, 2903, 6394, 6519, 6663, 5714, 2084, 5715, 516, 826, 1215, 2383, 5717, 681, 2385, 1218, 1863, 1746, 3275, 3608, 5155, 5156, 5158, 5512, 2223, 2224, 4033, 4550, 3607, 1133, 1219, 1866, 2386, 4705, 5903, 2906, 5725, 5726, 1624, 3278, 5974, 6163, 6276]. **floating** [6277, 6400, 201, 2088, 3611, 5975, 6404, 2227, 2911, 3102, 3279, 5976, 2229, 2395, 2396, 2230, 3103, 2092, 2093, 3449, 3614, 3615, 4209, 4211, 5731, 4707, 2915, 3281, 3451, 3617, 3282, 6066, 628, 473, 744, 2399, 2400, 2401, 2402, 746, 747, 1224, 2235, 2097, 1632, 311, 520, 4858, 4859, 2734, 1225, 1226, 2406, 2408, 2409, 1751, 1874, 1527, 1752, 5594, 6784, 3623, 3900, 4377, 3115, 3290, 4862, 5596, 2924, 3456, 5307, 829, 897, 973, 1993, 4221, 5914, 6070, 4863, 2551, 3292, 899, 975, 2926, 6993, 2241, 2242, 5916, 6409, 6289, 3903, 3904, 5827, 5171, 7053, 6174, 755, 2741]. **floating** [2928, 3117, 4565, 5830, 6076, 5979, 5920, 4867, 3776, 4391, 4571, 351, 4573, 3907, 4868, 524, 571, 5600, 1757, 5318, 3630, 5601, 5922, 1638, 5320, 5321, 4229, 5983, 4870, 6547, 2247, 1050, 1995, 1313, 2941, 3637, 573, 640, 757, 758, 401, 688, 689, 574, 5984, 2249, 4872, 1996, 1997, 980, 909, 3126, 1434, 2561, 4578, 4722, 6083, 3129, 2251, 2114, 2756, 5043, 2252, 5323, 3135, 6684, 7006, 1646, 1647, 1648, 695, 2563, 5750, 5838, 3473, 5325, 4879, 5045, 5327, 5328, 5329, 5413, 5532, 6901, 2564, 1999, 3913, 5048, 5415, 319, 1894, 2255, 2435, 2438, 2762, 3647, 5989, 2954, 2955, 917]. **floating** [7013, 2441, 2442, 984, 4242, 3309, 4729, 2259, 3144, 6187, 3310, 3311, 3919, 2446, 3795, 4888, 6912, 3316, 580, 4889, 5333, 5844, 6189, 480, 4244, 3146, 3147, 5334, 5536, 6095, 5845, 985, 4247, 4082, 4250, 5756, 765, 986, 3798, 4083, 4735, 3323, 6097, 4892, 1327, 2004, 5757, 2263, 208, 700, 989, 2264, 2968, 2265, 3800, 7023, 2267, 2579, 3325, 526, 7024, 3492, 2268, 7063, 2583, 2791, 2975, 4898, 2271, 3328, 4086, 5760, 2451, 2586, 2795, 2587, 2588, 1773, 2135, 1332, 5063, 6807, 992, 528, 1240, 1241, 1333, 706, 1062, 2977, 1063, 3329, 1677, 483, 4904, 3496, 773, 5934, 5619]. **floating** [5620, 5847, 6198, 5763, 3927, 3928, 4090, 1336, 4905, 4605, 1913, 3159, 107, 5764, 5623, 6437, 997, 2978, 2457, 3929, 5624, 3672, 3332, 776, 2013, 2279, 2593, 2141, 7028, 4906, 6001, 709, 710, 3170, 3810, 4102, 4749, 5541, 2459, 3932, 4438, 4910, 4911, 5767, 3934, 3677, 2799, 2800, 2981, 2982, 2801, 3339, 3175, 2284, 3679, 3812, 4611, 926, 3176, 3505, 2016, 3506, 1065, 3936, 5197, 4109, 4439, 6701, 3813, 2466, 1688, 1921, 2994, 4613, 2288, 1169, 2467, 2468, 4440, 4441, 4615, 5078, 5079, 5080, 5205, 5206, 5347, 5348, 5349, 5350, 1784, 1460, 292, 1461, 2024, 4757]. **floating** [3689, 4115, 375, 323, 4759, 845, 2817, 2818, 3186, 3187, 5086, 1928, 3690, 147, 1464, 1787, 1930, 2294, 1934, 1788, 3003, 5210, 6332, 3004, 1696, 846, 3346, 4451, 4921, 1071, 3348, 1346, 4121, 4276, 7059, 1791, 3692, 1792, 1697, 1936, 4124, 4277, 2029, 941, 6336, 4924, 4925, 715, 794, 3693, 1793, 2615, 2476, 2478, 4457, 4458, 2031, 5218, 1351, 2829, 2160, 492, 3196, 2481, 849, 3949, 2484, 3007, 4766, 4930, 5219, 5366,

5777, 6210, 2485, 1795, 1703, 1355, 1796, 540, 541, 542, 2162, 2301, 5098, 795, 2486, 2487, 1255, 294, 1704, 2163, 3202, 3365, 1938, 1559, 2304, 2488]. **floating** [1356, 2621, 4128, 1798, 1560, 4933, 5225, 5559, 5779, 947, 2624, 4130, 4281, 4934, 4935, 5780, 598, 797, 2841, 6941, 194, 2843, 2307, 2489, 2845, 2846, 3205, 3836, 7061, 5227, 4940, 4941, 5106, 5108, 4632, 4772, 4773, 2309, 6718, 6946, 5130, 2345, 2682, 1252, 6467, 1731, 3891, 4865, 1884, 3644, 3188, 2298, 2299, 2300, 2479, 2480, 1475, 5575, 995]. **floating-** [5373, 5878]. **Floating-Decimal** [134]. **Floating-Point** [2039, 6955, 3954, 2629, 4635, 4945, 5233, 5785, 5562, 4636, 6951, 4946, 3958, 6451, 6952, 6215, 4641, 5114, 6348, 6350, 6619, 6953, 5651, 5652, 5791, 5792, 5868, 6731, 4956, 3388, 3965, 4146, 4147, 4148, 1949, 4496, 2322, 6734, 2499, 3716, 5663, 860, 1014, 1094, 2047, 2649, 2864, 5244, 5665, 5873, 6021, 6022, 6023, 6355, 6737, 3396, 3397, 2050, 6024, 2501, 2051, 727, 2328, 5875, 6128, 1266, 1267, 1376, 4312, 6359, 6630, 6968, 3555, 6475, 5468, 247, 864, 5676, 3227, 3402, 5124, 6634, 2659, 1583, 5570, 2663, 3561, 4317, 5471, 5802, 6854, 1270, 6241, 730, 1385, 1502, 1725]. **Floating-Point** [2339, 3053, 3983, 6132, 3985, 1198, 1274, 1726, 5881, 3862, 3989, 5127, 5259, 5479, 5480, 2869, 4320, 3410, 3411, 3570, 2061, 6139, 6135, 4325, 6753, 2513, 2514, 6643, 4327, 4812, 616, 5887, 5888, 6033, 6758, 6871, 5267, 5135, 6492, 4338, 1965, 2065, 6141, 3874, 1732, 2883, 2885, 5394, 504, 6649, 4526, 5275, 5491, 3421, 4006, 4172, 1837, 6144, 2211, 1278, 6764, 6765, 1511, 6145, 4178, 6977, 2213, 6498, 4993, 5809, 1279, 2214, 2889, 4528, 5696, 3739, 1970, 5497, 877, 4018, 880, 1284, 6770, 2700, 2701, 4695, 5396, 5900, 6256, 6653, 1402, 1609, 6654, 4347, 4536]. **Floating-Point** [5502, 306, 2217, 2218, 2372, 1849, 4184, 6980, 5706, 6772, 4843, 969, 391, 392, 5287, 3884, 2534, 6774, 5585, 1975, 970, 6515, 2538, 2712, 2902, 6156, 6271, 1300, 5296, 5818, 3887, 1131, 6159, 1618, 6520, 1860, 1861, 1862, 2086, 2087, 6521, 5157, 5721, 6665, 3096, 3097, 4201, 342, 5586, 6063, 5904, 5516, 5727, 5729, 5905, 5907, 6275, 6401, 4363, 3892, 5517, 1221, 6165, 6279, 6671, 1627, 5910, 6166, 344, 1223, 1307, 1416, 1986, 2913, 3759, 3893, 3894, 4210, 4364, 4552, 4851, 4852, 5013, 5403, 4367, 3761, 742, 745, 5300, 1870, 2545, 6530, 890, 1041, 3287, 5520, 827, 2407, 2921, 5305]. **Floating-Point** [5306, 5823, 3768, 750, 751, 893, 1045, 5913, 3291, 6537, 6538, 6889, 6890, 6287, 6169, 6292, 6075, 5028, 2742, 6171, 4866, 5031, 6172, 6295, 6540, 1528, 440, 5314, 5315, 6996, 6998, 2105, 5174, 5981, 831, 904, 1430, 570, 5742, 6177, 3295, 2934, 2935, 2245, 2424, 6303, 2746, 4880, 2555, 6548, 639, 686, 2557, 5924, 6420, 1640, 2753, 7004, 5835, 6793, 4577, 525, 576, 1148, 3471, 5605, 4399, 7007, 7056, 982, 5531, 5324, 2432, 5533, 1763, 6182, 641, 1895, 2116, 2256, 2436, 2437, 3141, 5049, 5609, 6184, 6423, 1151, 2765, 2443, 2444, 6425, 6561, 6689, 915, 5056, 5183]. **Floating-Point** [5332, 2774, 4077, 3653, 3655, 3793, 2962, 5930, 2777, 2778, 5418, 7019, 2003, 644, 1324, 2573, 2262, 6695, 5994, 7022, 701, 4255, 5995, 2785, 2786, 3152, 6566, 5538, 4897, 5614, 5425, 5426, 6431, 2272, 2273, 1238, 3669, 921, 922, 6193, 2274, 993, 3158, 2275, 4603, 2276, 2797, 5066, 5434, 5435, 5617, 5937, 6698, 6436, 1680, 6328, 3931, 1543, 4093, 1454, 1775, 4908, 5070, 5342, 4437, 4750, 5071, 5766, 5073, 2983, 7032, 5627, 5852, 3680, 2461, 212, 2984, 2805, 2990, 3178, 3179, 3342, 3685, 3686, 2287, 5942, 6203, 6928, 6104, 6105,

6578, 2020, 2995, 2601, 4913, 1458, 1459, 1785, 5544, 5084]. **Floating-Point** [1340, 5855, 1786, 5546, 2470, 2607, 2608, 3002, 1465, 5547, 6705, 1789, 3517, 4920, 6107, 6591, 4120, 592, 3347, 6334, 6003, 7039, 5356, 2027, 848, 5548, 2822, 3518, 2824, 6707, 3350, 6335, 5857, 3829, 3193, 6209, 6443, 2299, 215, 1469, 1701, 2617, 5097, 5220, 5364, 5365, 5556, 5557, 5641, 1354, 2033, 3012, 216, 3201, 2302, 6211, 5223, 2625, 799, 3019, 1706, 5371, 4135, 6826, 6827, 6606, 5104, 5560, 5645, 5105, 5372, 5229, 6608, 5690, 5884, 4622, 6338, 4488, 6949, 4483, 2170, 2171, 416, 3215, 1947, 4296, 6465, 2326, 6962, 6963, 1578, 1579, 1718, 5249, 6472, 4794, 4968, 2503, 6361]. **Floating-point** [2666, 2667, 2668, 5959, 6026, 1501, 1824, 2202, 2062, 3726, 5265, 4677, 1394, 4686, 2524, 2368, 307, 3745, 5147, 1296, 5511, 1298, 3890, 6987, 4206, 4205, 4038, 3283, 258, 2920, 4558, 895, 6068, 6286, 4563, 4864, 6677, 2417, 6789, 6416, 1759, 3639, 979, 3127, 6899, 6309, 2253, 3914, 2117, 2570, 5613, 2007, 2008, 6195, 3930, 4267, 4912, 2147, 2463, 2291, 2025, 4270, 6204, 3826, 5357, 3190, 2826, 2827, 1075, 3695, 1350, 6442, 1471, 1472, 1473, 1474, 5948, 6712, 5576, 1937, 2172, 3375, 2851, 3956, 1564, 6213, 5454, 6116, 720, 1485, 2634, 3029, 3380, 3381, 3382, 4487, 6349, 6456]. **floating-point** [2493, 1085, 5653, 1800, 2312, 1801, 1802, 6120, 4144, 2861, 3037, 5566, 5871, 5872, 2319, 6958, 2643, 2320, 4302, 5239, 5240, 2182, 2323, 5797, 4784, 5120, 2325, 2186, 2646, 3045, 1813, 4307, 4787, 4788, 5121, 5957, 6232, 3717, 2187, 5246, 5568, 4310, 1015, 4792, 5381, 5569, 6965, 2188, 1016, 1193, 6358, 5801, 6631, 3226, 4969, 2190, 6476, 1377, 3401, 4970, 1585, 6362, 4973, 2056, 2665, 3857, 4508, 3979, 3982, 1589, 5478, 5684, 6133, 1961, 3988, 4669, 5481, 2342, 2870, 2871, 2872, 3994, 6250, 5390, 5391, 2681, 6372, 5691, 3059, 4521, 3997, 3061, 249, 4818, 5134, 5264]. **floating-point** [4335, 961, 4524, 5136, 4983, 2348, 4168, 2882, 5270, 502, 1733, 1734, 5272, 734, 1116, 4174, 6878, 1968, 1736, 1969, 819, 508, 5279, 1029, 6255, 2890, 2364, 4832, 6651, 4691, 4694, 4835, 3077, 621, 879, 1030, 1208, 1283, 1739, 3428, 2892, 3078, 1843, 5499, 1844, 2530, 1845, 5700, 4838, 4839, 5972, 6049, 6502, 1287, 252, 178, 1850, 4350, 4842, 6658, 6659, 5001, 3593, 5817, 4023, 4539, 4698, 2894, 2895, 3434, 3596, 1407, 1213, 1974, 3435, 3260, 4547, 2535, 5292, 5293, 1744, 6394, 6519, 6663, 5714, 2084, 5715, 1215, 5717, 2385, 1218, 1863, 1746, 3608, 5156, 5158, 5512, 2223, 2224]. **floating-point** [4033, 1133, 1219, 1866, 4705, 5903, 2906, 5725, 5726, 1624, 5974, 6163, 6276, 6277, 6400, 5975, 2229, 2395, 2396, 3103, 2092, 2093, 3449, 3614, 3615, 4209, 4211, 5731, 4707, 2915, 3281, 3451, 3282, 628, 473, 744, 2399, 2400, 2401, 2402, 4858, 2734, 2406, 2408, 2409, 1527, 1752, 5594, 6784, 3623, 3900, 4862, 5596, 3456, 829, 897, 973, 4221, 5914, 6070, 4863, 2551, 3292, 6993, 2241, 2242, 5916, 6409, 6289, 3903, 3904, 5827, 6174, 755, 2741, 2928, 3117, 4565, 6076, 5979, 5920, 4867, 4391, 4571, 4573, 3907, 4868, 524, 571, 5600, 1757, 5318, 5601, 5922, 1638, 4229, 5983, 4870, 6547, 1050]. **floating-point** [1995, 573, 640, 757, 758, 401, 688, 574, 5984, 4872, 1996, 1997, 1434, 6083, 2251, 2114, 2756, 5043, 5323, 1647, 1648, 695, 2563, 5750, 5838, 3473, 5325, 4879, 5045, 5327, 5328, 5329, 5413, 5532, 6901, 2564, 1999, 3913, 5048, 5415, 1894, 2255, 2435, 2438, 2762, 3647, 5989, 2954, 2955, 7013, 2441, 2442, 984, 4242, 4729, 2259, 3144, 6187, 3311, 3919, 6912, 4889, 5333, 5844, 6189, 480, 4244, 3146, 5334, 5536, 5845, 985,

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1716, 299, 2187, 1718, 666, 5246, 5568, 4310, 3852, 1015, 4792, 5249, 5381, 5569, 6965, 7048, 2188, 1016, 1193, 6472, 4794, 4968, 6358, 5801, 6631, 3226, 4969, 3556, 2503, 1815, 4795, 2190, 2656, 6360, 6361, 1954, 6476, 1377, 6477, 3401, 6239, 1378, 4799, 4970, 2661, 3228, 379, 1585, 2662, 6362, 3855, 4973, 1818, 2056, 2665, 3723, 3857, 5878, 1380, 1722, 2200, 2666, 2667, 2668, 5959, 6026, 2335, 3050, 4508, 5476, 3978, 3051, 3979, 5960, 4801, 4802, 3982, 1501, 1589, 1824, 2202, 5478, 5684, 6133, 4161, 2674, 1104, 1961, 3988, 4669, 4515, 421, 2062]. **point** [5481, 3412, 5686, 3726, 2342, 2870, 2871, 2872, 3865, 3994, 3237, 6249, 2679, 6250, 5390, 5391, 959, 1276, 2681, 6372, 5963, 5691, 3059, 2878, 3241, 3416, 4521, 4674, 4814, 6137, 6035, 3997, 3061, 249, 4818, 5134, 5264, 5265, 4335, 4677, 961, 4524, 5577, 6646, 5136, 2516, 5269, 2517, 4983, 2348, 4168, 2882, 5270, 2205, 502, 1733, 1734, 1832, 2884, 4000, 1202, 1394, 5272, 5137, 5489, 734, 1116, 4989, 4173, 4174, 6878, 4684, 4685, 5580, 4686, 1512, 1968, 2360, 1736, 4687, 1969, 735, 819, 508, 821, 3737, 6650, 6978, 1204, 5279, 1029, 2073, 6255, 2890, 2364, 4832, 2524, 6651, 4691]. **point** [5811, 4692, 282, 3076, 3252, 4694, 4835, 5812, 3077, 2526, 621, 879, 1030, 1208, 1283, 1739, 3428, 2368, 2892, 3078, 1031, 2702, 1843, 5499, 967, 1844, 2530, 1845, 5700, 2370, 4838, 4839, 1846, 5397, 5972, 6049, 6502, 1287, 1610, 2371, 252, 178, 307, 2706, 3881, 2375, 1850, 4350, 4842, 3882, 2532, 4021, 6658, 6659, 3080, 4022, 3745, 5001, 3593, 5817, 6982, 4023, 4539, 4698, 6506, 3750, 5147, 2894, 2895, 3255, 3595, 4191, 6389, 1036, 3083, 3434, 3596, 1291, 1407, 5006, 1213, 1974, 3598, 2219, 3435, 1408, 1296, 3260, 3090, 4029, 2220, 3440, 5511, 4547, 2900, 2535, 3091]. **point** [1298, 2711, 5292, 5293, 1744, 6661, 2903, 6394, 6519, 6663, 5714, 3265, 3266, 2084, 5715, 516, 2717, 826, 1215, 2383, 5717, 681, 2385, 3890, 1218, 1863, 6987, 1746, 3275, 3608, 4206, 5155, 5156, 5158, 5512, 2223, 2224, 4033, 4550, 5298, 3607, 1133, 4205, 1219, 1866, 2386, 4705, 5903, 2906, 5725, 5726, 1624, 3278, 5974, 6163, 6276, 6277, 6400, 2389, 201, 2088, 4038, 3611, 5975, 6404, 2227, 2911, 3102, 3279, 5976, 2229, 2395, 2396, 2230, 3103, 1985, 626, 2092, 2093, 3449, 3614, 3615, 4209, 4211, 5731, 4707, 2915, 3281, 3451, 3617, 3282, 6066, 628, 473, 744, 2399, 2400, 3283, 3284, 2401]. **point** [2402, 746, 747, 1224, 258, 5018, 2546, 2235, 2097, 1632, 311, 520, 4858, 4859, 2734, 1225, 1226, 2406, 2408, 2409, 2920, 1751, 1874, 1527, 1752, 5594, 6784, 3623, 3900, 4377, 3115, 3290, 1987, 4862, 5596, 4558, 895, 2924, 3456, 5307, 829, 897, 973, 1993, 6068, 4221, 5914, 6070, 4863, 2551, 3292, 899, 975, 2926, 6993, 2241, 2242, 6286, 5916, 6409, 4563, 4864, 6289, 6677, 3903, 3904, 5827, 5171, 7053, 6174, 349, 755, 2417, 2741, 2928, 3117, 4565, 5830, 6076, 5979, 5920, 6789, 4867, 3776, 4391, 4571, 351, 6416, 4573, 3907, 4868, 524, 571, 683, 5600, 1757, 5318, 3630, 5601, 5922, 1638, 5320]. **point** [5321, 4229, 5983, 4870, 6547, 2247, 1889, 1050, 1995, 1313, 1759, 2941, 3637, 573, 640, 757, 758, 401, 3639, 688, 689, 979, 574, 5984, 2249, 4872, 1996, 1997, 980, 909, 3126, 6179, 3127, 1434, 2561, 4578, 4722, 5749, 6083, 3129, 2251, 2114, 6899, 6309, 2756, 5043, 2252, 5323, 3135, 6684, 7006, 1646, 6685, 3138, 1647, 1648, 695, 2563, 2253, 5750, 5838, 3473, 5325, 4879, 5045, 5327, 5328, 5329, 5413, 5532, 6901, 2564, 1999, 3913, 5048, 5415, 319, 1894, 2255, 2435, 2438, 2440, 2762, 3647, 5989, 1437, 3914, 2117, 2954, 2955, 917, 5611, 7013, 5416, 2441, 2442, 984].

point [4242, 3309, 4729, 2959, 2259, 3144, 6187, 3310, 3311, 3919, 4076, 2446, 3795, 4888, 6912, 2570, 3316, 580, 4889, 5333, 5844, 6189, 480, 4244, 3146, 3147, 5334, 5536, 6095, 5845, 985, 4247, 4082, 4250, 5756, 765, 986, 3798, 4083, 4735, 3323, 6097, 4892, 645, 1327, 2004, 5757, 5613, 2263, 208, 700, 989, 2264, 2968, 2265, 3800, 7023, 2266, 2267, 2579, 3325, 2007, 526, 7024, 3492, 2268, 837, 7063, 2583, 2791, 2975, 4898, 2008, 2271, 3328, 4086, 5760, 2451, 2586, 2795, 2976, 2587, 2588, 1773, 2135, 1332, 5063, 6807, 992, 528, 1240, 1241, 1333, 706, 1062, 2977, 1063, 3329, 1677, 483]. **point** [4904, 3496, 773, 5934, 6195, 5619, 5620, 5847, 6198, 5763, 3927, 3928, 4090, 1336, 4905, 4605, 1913, 3159, 107, 5764, 5623, 6437, 997, 2978, 2457, 3929, 3930, 5624, 3672, 3332, 776, 2013, 2279, 2593, 2141, 7028, 4906, 6001, 780, 709, 710, 3170, 3810, 4102, 4749, 5541, 3932, 4267, 4438, 4910, 4911, 5767, 3934, 3677, 2799, 2800, 2981, 2982, 2801, 1685, 3339, 3175, 5941, 2284, 3679, 3812, 4611, 4912, 926, 3340, 3176, 3505, 2016, 3506, 2147, 1065, 3936, 5197, 1546, 2463, 787, 4109, 4439, 6701, 3813, 2466, 1688, 1921, 2994, 4613, 1690, 2288, 1169, 2467, 2468, 4440]. **point** [4441, 4615, 5078, 5079, 5080, 5201, 5202, 5203, 5204, 5205, 5206, 5347, 5348, 5349, 5350, 5439, 5440, 5441, 5442, 5443, 2809, 2996, 1784, 1460, 2291, 292, 1461, 2024, 2025, 4757, 3689, 4115, 375, 323, 4270, 4759, 845, 2817, 2818, 3186, 3187, 6204, 5086, 1928, 3690, 4760, 4118, 147, 1464, 1787, 1930, 2294, 1934, 1788, 3003, 5210, 6332, 3004, 1696, 846, 3346, 4451, 4921, 1071, 3348, 1346, 4121, 4276, 7059, 1791, 3692, 1792, 3826, 5357, 1697, 1936, 3190, 4124, 4277, 2029, 941, 6336, 2826, 2827, 4924, 4925, 715, 794, 3693, 1075, 5549, 1793, 2615, 2476, 2478, 3695, 4457, 4458, 1350]. **point** [2031, 6442, 5218, 1351, 2829, 2160, 492, 2481, 849, 1702, 3949, 2484, 3007, 4766, 4930, 5219, 5366, 5777, 6006, 6210, 2485, 1795, 1471, 1472, 1473, 1474, 1703, 1355, 1796, 540, 541, 542, 3951, 2162, 2301, 5098, 795, 2034, 2486, 2487, 1255, 294, 1704, 2163, 3202, 3365, 1938, 1559, 2304, 2836, 2488, 1356, 2621, 2622, 4128, 5222, 1798, 1560, 4933, 5225, 5559, 5779, 5948, 947, 2624, 4130, 4281, 4934, 4935, 7043, 5780, 598, 797, 1357, 2841, 6941, 194, 2843, 2307, 6712, 2489, 2845, 2846, 3205, 3836, 7061, 5227, 4940, 4941, 5106, 5108, 4632, 4772, 4773, 2309, 6718, 6946, 5130, 5576, 5885, 6031]. **point** [2345, 2682, 1252, 1937, 5575, 6467, 1731, 3891, 4865, 1884, 3188, 2298, 2299, 2300, 2479, 2480, 1475, 995]. **Point-Targeted** [6876]. **Point/Integer** [2344]. **point/logarithmic** [2294]. **Pointers** [3481]. **Points** [2051, 5800, 5729, 3662, 3956, 6966, 3644]. **Poisoning** [6833]. **Poland** [7357, 7506]. **Polar** [6604]. **Polish** [457]. **Polyhedra** [4001]. **Polyhedron** [3600, 4027]. **Polymath** [1321]. **Polymorphic** [901]. **Polynomapproximation** [768]. **Polynome** [1061]. **Polynomial** [4634, 4958, 6463, 6736, 3044, 5380, 6357, 5469, 4154, 5257, 5258, 4334, 6491, 279, 6038, 5138, 818, 426, 883, 3602, 5727, 3285, 5304, 1139, 6888, 1877, 5310, 5599, 4237, 4877, 6900, 476, 5752, 836, 916, 1443, 5187, 768, 4742, 1914, 2146, 372, 271, 4112, 7042, 2628, 4774, 415, 4495, 4648, 3040, 3041, 5242, 4654, 5248, 5383, 6029, 2207, 5137, 5489, 6767, 4828, 3585, 619, 5501, 561, 5719, 5587, 5730, 5908, 5410, 6892, 2110, 447, 3138, 983, 1233, 3487, 5338, 2005, 481, 4902, 2457, 1453, 5196, 2596, 2804, 2986, 2988, 4118, 4621, 4625, 3368, 3369, 3020, 1252]. **Polynomial** [4589]. **Polynomials** [5953, 6459, 4790, 420, 4318, 3999, 5967, 5274, 304, 6151,

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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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- 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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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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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.

This code is designed as an add-on to Victor Shoup's arbitrary-precision arithmetic package NTL, and implements a new type XR, to complement NTL's ZZ and RR integer and real types.

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- branch and bound algorithms for global optimization,
- 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.

The information on the Interval Computations homepage is basically a mirror image of the Kluwer one (the only difference is that the fonts are fancier).

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Kraemer:2001:SCV

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