chains. An *addition chain for n* is a sequence

$$1 = a_0, a_1, \ldots, a_r = n$$

such that

$$a_i = a_j + a_k \quad \text{for some } k \leqq j < i.$$

Most work on addition chains is concerned with the calculation of $l(n)$, the length of the shortest addition chain for n. The relationship of these chains to computer algorithms is that an $l(n)$-chain gives a way to form x^n, arbitrary x and integral n, with fewest multiplications. Of special interest to mathematicians is the still unanswered "Scholz-Brauer conjecture"

$$l(2^n - 1) \leqq n - 1 + l(n).$$

Knuth's paper consolidates relevant mathematical and empirical work on addition chains; it is certainly of more interest to the mathematician than to the computer scientist. Recent computer work by Knuth (appearing in the second printing) has turned up the remarkable fact that $l(12509) < l^*(12509)$—an l^*-chain is one in which $j = i - 1$.

4. For various reasons, many of them nontechnical and extraneous, the interaction between mathematics and computer science over the past two decades has been less than one might expect. This has been and is unfortunate as each field can significantly benefit from and contribute to the other. The real importance of Knuth's work is that it represents a truly positive step towards eliminating the existing breach between mathematicians and computer scientists.

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REFERENCES

1. D. E. Knuth, *A class of projective planes*, Trans. Amer. Math. Soc. **115** (1965), 541–549. MR **34** #1916.

2. D. E. Knuth and R. H. Bigelow, *Programming languages for automata*, J. Assoc. Comput. Mach. **14** (1967), 615–635.

3. John Riordan, "Generating functions," Chapter 3 in *Applied combinatorial mathematics*, edited by E. F. Beckenbach, Wiley, New York, 1964.

4. R. W. Hamming, Review (18,478) of *Seminumerical algorithms.* Vol 2, by D. E. Knuth, Comput. Rev. **11** (1970), 99.

5. R. R. Coveyou, "Random number generation is too important to be left to chance," in *Studies in applied mathematics*, SIAM, Philadelphia, Pa., 1969, pp. 70–111.

6. W. A. Beyer, R. B. Roof and D. Williamson, *The lattice structure of multiplicative congruential pseudo-random vectors,* Math. Comp. **25** (1971), 345–363.

7. E. D. Cashwell and C. J. Everett, *A practical manual on the Monte Carlo method for random walk problems*, Pergamon, New York, 1959. MR **21** #5269.

8. J. H. Halton, *A retrospective and prospective survey of the Monte Carlo methods*, SIAM Rev. **12** (1970), 1–63. MR **41** #2878.

Structure and Representations of Jordan Algebras, by Nathan Jacobson. American Mathematical Society Colloquium Publications, vol. 39. American Mathematical Society, Providence, R. I., 1968. x + 453 pp. $11.30 (Member Price $8.48).