TABLE 4, $D = 3640387$

	13	31	43	53	73	109	173	193	227	239	281	337	617
I		S					S	S				S	
II			S	S	S							S	
III										S	S	S	S
IV	S					S			S			S	
V	S		S				S				S		
VI					S	S	S			S			
VII				S			S		S				S
VIII		S		S		S					S		
IX	S	S			S								S
X		S	S						S	S			
XI			S			S		S					S
XII					S			S	S		S		
XIII	S			S				S		S			

Since the infrastructure-Tschirnhausen method is quite efficient, and does not require much trial-and-error, one does not need a high-speed computer for D of this size, and I worked out these equations on a *nonprogrammable* HP-45 hand computer. One principal feature of the method is that as each cubic equation comes forth there is no need to show that it gives a field different than the others. That is automatic. I may publish this method elsewhere.

D. S.

1. I. O. ANGELL, "A table of complex cubic fields," *Bull. London Math. Soc.*, v. 5, 1973, pp. 37–38.

2. H. DAVENPORT & H. HEILBRONN, "On the density of discriminants of cubic fields. II," *Proc. Roy. Soc. London Ser. A*, v. 322, 1971, pp. 405–420.

3. DANIEL SHANKS & RICHARD SERAFIN, "Quadratic fields with four invariants divisible by 3," *Math. Comp.*, v. 27, 1973, pp. 183–187; "Corrigenda," *ibid.*, p. 1012.

4. DANIEL SHANKS & PETER WEINBERGER, "A quadratic field of prime discriminant requiring three generators for its class group, and related theory," *Acta Arith.*, v. 21, 1972, pp. 71–87. MR 46 #9003.

5. DANIEL SHANKS, "New types of quadratic fields having three invariants divisible by 3," *J. Number Theory*, v. 4, 1972, pp. 537–556. MR 47 #1775.

6. F. DIAZ Y DIAZ, "Sur les corps quadratiques imaginaires dont le 3-rang du groupe des classes est supérieur à 1." (To appear.)

7. DANIEL SHANKS, "The infrastructure of a real quadratic field and its applications," *Proceedings of the* 1972 *Number Theory Conference*, (Univ. of Colorado, Boulder, 1972), pp. 217–224.

8. T. CALLAHAN, "The 3-class groups of non-Galois cubic fields. II," *Mathematika*, v. 21, 1974, pp. 168–188.

9. DANIEL SHANKS, "Systematic examination of Littlewood's bounds on $L(1, \chi)$," *Proc. Sympos. Pure Math.*, vol. 24, Amer. Math. Soc., Providence, R. I., 1973, pp. 267–283.

10. MARSHALL HALL, JR., *Combinatorial Theory*, Blaisdell, Waltham, Mass., 1967, Chapter 10. MR 37 #80.

34 [9].—E. D. TABAKOVA, *A Numerical Investigation of Kummer Cubic Sums* (in Russian), Institute of Applied Mathematics of the USSR Academy of Sciences, Moscow, preprint No. 98, 1973 (22 pages).

We use the notation of Shanks's review [1] of Fröberg's recent table. The author has evaluated S_p for the first 21100 primes $p \equiv 1 \pmod 6$, that is for $p < 509757$. (Fröberg, at about the same time, had gone to $p < 200000$.) The number of S_p in the intervals I_1, I_2, I_3 are 5748, 6933, 8419 giving proportions 27.2%, 32.9% and 39.9%, respectively. Since 27.2% > 4/15, this goes to support Shanks's scepticism about Fröberg's conjecture that the asymptotic proportions should be 4 to 5 to 6.

There are two tables. The first gives the number of primes p in each consecutive 100 for which S_p is in I_1, I_2, I_3 together with the cumulative totals and their proportions (to 6 significant figures). Although there are minor fluctuations the proportion of S_p in I_1 has a rising upward trend and the proportion in I_3 has a decreasing trend. The second table lists for $n = 100000(100000)500000$ and for $x = -1(0.05)+1$ the proportion of the primes $p < n$ for which $S_p < (2p^{1/2})x$ together with the value $1/2 + (\arcsin x)/\pi$ to which it would tend under the hypothesis of equidistribution. To the naked eye there is quite a good fit but perhaps this is not a severe test.

In the introduction the author briefly discusses the method of computation and how it was organized to minimize computer time. The residue r_x of x^3 modulo p is computed by the recurrence relation

$$r_{x+1} \equiv 2r_x - r_{x-1} + 6x \pmod p, \qquad 0 \leqslant r_{x+1} < p.$$

The value of $\cos(2\pi r_x/p)$ is then computed by interpolation between the values $\cos(2\pi j/1024)$ with integral j. This requires $O(p)$ calculations for each p, but so, as the author points out, does the reviewer's method [2]. As a check she has considered the intervals investigated by the reviewer and points to a discrepancy of one unit in one of his tables. The computations were done on a BESM-6 and in all required machine time "of the order of 24 hours".

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1. C.-E. FRÖBERG, "Kummer's Förmodan," *Math. Comp.*, v. 29, 1975, p. 331. UMT 5.

2. J. W. S. CASSELS, "On the determination of generalized Gauss sums," Arch. Math. (Brno), v. 5, 1969, pp. 79–84.

35 [12].— RICHARD V. ANDRÉE, JOSEPHINE P. ANDRÉE & DAVID D. ANDREE, *Computer Programming: Techniques, Analysis and Mathematics*, Prentice-Hall, Inc., Englewood Cliffs, N. J., 1973, xvii + 549 pp., 24 cm. Price $12.95.

Despite the title, this text is largely an elementary introduction to FORTRAN programming. The first 220 pages provide a rather leisurely introduction to basic FORTRAN: integer and real variables, arrays, DO loops, and the elementary statement types. The approach is to work largely from example problems, motivating the need for each language feature and, at the same time, studying in detail the various difficulties that arise in problem formulation and analysis prior to coding. The remainder of the book consists of chapters on simulation, random number generation and Monte Carlo techniques (60 pages), errors in numerical computations (50 pages), FORTRAN subprograms (40 pages), and assembly language programming on the IBM 1130 (45 pages), followed by 100 pages of answers to problems.

The strength of the text lies in an interesting collection of problems (each chapter is based on a set of example problems and also ends with an extensive problem set). Also important is the early and continued emphasis on careful problem analysis before