4. DANIEL SHANKS, "On the conjecture of Hardy and Littlewood concerning the number of primes of the form $n^2 + a$," *Math. Comp.*, v. 14, 1960, pp. 321–332.
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113[F].—SIDNEY KRAVITZ & JOSEPH S. MADACHY, *Divisors of Mersenne Numbers*, $20{,}000 < p < 100{,}000$, ms. of 2 typewritten pages + 48 computer sheets, deposited in the UMT File.

The authors computed all prime factors $q < 2^{25}$ of all Mersenne numbers $M_p = 2^p - 1$ for all primes p such that $20{,}000 < p < 100{,}000$. The computation took about one-half an hour on an IBM 7090. There are 2864 such factors q. These are listed on 48 sheets of computer printout in the abbreviated form: k vs. p, where $q = 2pk + 1$. A reader interested in statistical theories of such factors may wish to examine the following summary that the reviewer has tallied from these lists. Out of the 7330 primes p in this range, M_p has 0, 1, 2, 3, or 4 prime divisors $q < 2^{25}$, according to the following table

0	1	2	3	4
4920	2006	356	46	2

The two values of p with four such factors are $p = 26{,}681$ and $68{,}279$.

The authors do not indicate whether or not any of these factors q is a multiple factor, that is, whether $q^2 \mid M_p$. Heuristically, the probability of a multiple factor here is quite low. Such a q has not been previously found [1], but, on the other hand, no convincing heuristic argument has ever been offered for the conjecture [1] that they do not exist. The alleged proof given in [2] is certainly fallacious, and for the quite closely analogous ternary numbers $\frac{1}{2}(3^p - 1)$ one finds a counterexample almost at once.

For earlier tables of factors of M_p see [1], [3] and the references cited there.

D. S.

1. JOHN BRILLHART, "On the factors of certain Mersenne numbers. II," *Math. Comp.*, v. 18, 1964, pp. 87–92.
2. E. KARST, "Faktorenzerlegung Mersennescher Zahlen mittels programmgesteuerter Rechengeräte," *Numer. Math.*, v. 3, 1961, pp. 79–86, esp. p. 80.
3. DONALD B. GILLIES, "Three new Mersenne primes and a statistical theory," *Math. Comp.*, v. 18, 1964, pp. 93–97.

114[F].—H. C. WILLIAMS, R. A. GERMAN & C. R. ZARNKE, *Solution of the Cattle Problem of Archimedes*, copy of the number T, 42 computer sheets, deposited in the UMT File.

There is deposited here the number T, the total number of cattle in Archimedes' problem, the computation of which is discussed elsewhere in this issue. This enormous integer comprises 206,545 decimal digits and is nicely printed on 42 computer sheets. Lessing's version of Archimedes' "epigram", in which the problem is given, may also be found in the convenient reference [1], while for interesting historical commentary the reader should examine [2].

Although the authors' title proudly suggests that the problem is solved, we must add, in candor, that they have merely given the number T. The breakdown of this into the numbers of white bulls, black bulls, spotted cows, yellow cows, etc. is not given, although by the authors' own statement this constitutes part of the problem. Perhaps, though, they conceive of this as an exercise which is left to the reader. Actually, it would appear that there are 1.397 bulls for each cow, a ratio that could lead to serious difficulties, particularly under such crowded conditions.

The calculation was done on IBM computers in the English part of Canada. Conceivably, had the computation been done in Quebec instead, the investigators may have been more inclined to use the machines of L'Compagnie Bull, a choice which, in one way, might seem more appropriate.

D. S.

1. JAMES NEWMAN, *The World of Mathematics*, Vol. 1, Simon and Schuster, New York, 1956, pp. 197–198.
2. T. L. HEATH, *The Works of Archimedes*, Dover (reprint), New York, undated, pp. xxxiv–xxxv, pp. 319–326.

115[G].—P. S. ALEXANDROFF, *Introduction à la Théorie des Groupes*, Dunod, Paris, 1965, xi + 128 pp., 22 cm. Price 13 francs (paperbound).

This is an introductory book for the use of first-year college or last-year high school students. It is a clear and straightforward account of the basic facts of group theory, illustrated mainly by a few permutation groups and the groups of the regular polyhedra. For the investigation of these, the imagination is supported by a fair number of good drawings. Lagrange's Theorem (but not Cauchy's Theorem) is proved, and the book proper ends with the first theorem of homomorphism. A first appendix gives an outline of the elementary theory of sets, and a second one contains a proof of the simplicity of the alternating groups on more than four symbols, which follows the one given in Van der Waerden's *Algebra*.

There is a lucid introduction which presents group theory as part of the science (or art) of calculating.

On the whole, applications or unusual examples are absent. Apart from the use of the additive (instead of the multiplicative) notation for the composition of group elements, the text and the material are pretty much standard. The corollary to the homomorphism theorem (p. 109) is somewhat misleading. That a homomorphism is an isomorphism if and only if the kernel is trivial follows from the very definition of isomorphism and without the homomorphism theorem. As it stands, the corollary may give the reader the erroneous idea that the homomorphic image of a group G can be isomorphic to G if and only if the kernel is trivial.

As a well-written truly elementary introduction to group theory, the book may be expected to be very welcome to many people.

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