pants were chosen from different disciplines" and selected particularly "because it was known that they had different viewpoints on the meaning and significance of measurement." Consequently, this volume "is a book of contrasts," not a unified collection of interrelated essays on measurement, and definitely not a textbook on measurement. At best it presents a broad picture of current thinking on the definition, nature, and functions of measurement, against a background of measurement needs and practices in various disciplines at the middle of the twentieth century. But the "picture" is not all in sharp focus. This is due not so much to differences in expository skill of the authors, as to differences in their objectives. Some seek sharpness of definition at the price of a narrow field of applicability; others demand a broad field of applicability at the sacrifice, if necessary, of sharpness of definition. Furthermore, much of the discussion is at a level of abstraction so far removed from the day-to-day practice of measurement in scientific and industrial laboratories that many who have devoted their lives to measurement of the properties of animate and inanimate things will find a large fraction of the volume very foreign to them, if not entirely unintelligible. Nevertheless, it is a volume that one will expect to find in the library of a university or college where research is conducted at the postgraduate level.

CHURCHILL EISENHART

National Bureau of Standards
Washington 25, D. C.

17[K, Z].—JAPANESE STANDARDS ASSOCIATION, *Random Number Generating Icosahedral Dice (20-face Dice)*, 6-1 Ginza-higashi, Chuo-ku, Tokyo. Price $2.50 per set of 3 dice + postage $.70 (up to 9 sets).

This device is a set of three icosahedral dice made of plastic material. The dice are different colors, red, yellow and blue, so that ordered triplets of digits may be generated. Each decimal digit appears on two faces of each die.

The dice were presumably intended to measure 15 millimeters between parallel faces. However, the casting was not particularly good and the measurements listed below were recorded between the ten pairs of faces on the new dice tested. This review was unaccountably lost for several months, and in the intervening period there has been considerable flow of the plastic material so that the measurements are currently considerably worse and actually meaningless, for the faces are clearly no longer plane.

Red	Yellow	Blue
14.74	14.90	15.09
14.97	14.96	14.71
14.82	14.95	14.93
14.88	14.97	14.93
14.94	15.05	14.93
14.76	14.95	14.83
14.85	15.07	15.09
14.96	14.97	14.74
14.83	14.93	14.87
14.79	14.90	15.03

When the dice were new they were tested by 800 rolls each on a level felt surface conforming to the specification of ordinary dice tables. Standard tests [1, 2] applied

to the individual dice and to the group of three detected no bias. Therefore, it seems reasonable to assume that the variations from a true regular icosahedron are minor in terms of the application intended.

Less meticulous samplings have been made with the aged dice, but it seems unlikely that a person generating random decimal digits at a rate which can be met by these dice would notice any serious bias.

The frequencies with which the digits appear can be changed slightly by the usual standard means. These would include weighting to displace the center of gravity (an awkward and cumbersome method at best, and, at worst, one which is difficult to disguise) or applying wax to one or more faces to increase the probability that the waxed face will be on the bottom after the throw.

C. B. TOMPKINS

University of California
Los Angeles 24, California

1. THE RAND CORP., *One Million Random Digits and 100,000 Normal Deviates*, The Free Press, Glencoe, Illinois, 1955.
2. C. B. TOMPKINS, RMT 11, *MTAC*, v. 10, 1956, p. 39–43.

18[L].—F. M. HENDERSON, *Elliptic Functions with Complex Arguments*, The University of Michigan Press, Ann Arbor, 1960, v + 38 p. + 160 unnumbered p., 29 cm. Price $8.00.

The tables and charts on the 160 unnumbered pages are in four equal parts, relating in turn to the functions $sn\ w$, $cn\ w$, $dn\ w$, and $E(w) = \int_0^w dn^2 w\, dw$, each for 19 values of the modular angle $\sin^{-1} k$, namely, 1°, 5°(5°)85°, 89°. Each opening has a table on the left and a corresponding chart on the right. If $w = u + iv$, the tables are all for $u/K = 0(.1)1$, $v/K' = 0(.1)1$, and the charts cover the same unit square on a scale such that the side of the square is about 16.2 cm. In Parts I–III, the quantities tabulated, to 4 figures without differences, are the real and imaginary parts x, y of $sn\ w$, $cn\ w$, $dn\ w$, respectively. In Part IV, if $E_R + iE_I = E(w)$, the relations $E(K) = E$, $E(K + iK') = E + i(K' - E')$ have led to the tabulation of the normalized quantities $E_R' = E_R/E$, $E_I' = E_I/(K' - E')$. The lines drawn on the charts are curves of constant x or y in Parts I–III, and curves of constant E_R' or E_I' in Part IV. Seven-figure values of the complete integrals are provided. The information given is sufficient to enable the four functions concerned to be evaluated for any point w in the complex plane.

The well-known tables of Spenceley and Spenceley [1] were used as a source of values for real w, whence the imaginary transformation and the addition formulas were used to compute the values of the functions of $u + iv$. The computation was mostly done on an IBM 650.

The Introduction contains enough information about elliptic integrals and functions to explain the tables and charts to anyone not previously acquainted with the subject. It also contains several applications to potential problems. It is pleasant to find such a valuable contribution to mathematical tabulation made by a civil engineer. The charts were constructed by a group of five Turkish naval officers at the University of Michigan.

One could wish that italic type (available and used in other contexts) had been used for mathematical symbols in the Introduction, but no such minor matter