

Biblical Weights and Measurements

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Weights and Measures

Hebrew Weights

HEBREW	NRSV	EQUIVALENCE	U.S. AVOIRDUPOIS	METRIC UNITS
<i>kikkar</i>	talent	60 minas	75.558 pounds	34.3 kilograms
<i>maneh</i>	mina	50 shekels	20.148 ounces	571.2 grams
<i>sheqel</i>	shekel	2 bekas	176.29 grains	11.42 grams
<i>pim (or payim)</i>	pim	.667 shekel	117.52 grains	7.61 grams
<i>beqa</i>	beka, half a shekel	10 gerahs	88.14 grains	5.71 grams
<i>gerah</i>	gerah		8.81 grains	.57 gram

Weights in the New Testament

GREEK	NRSV	EQUIVALENCE	U.S. AVOIRDUPOIS	METRIC UNITS
<i>talenton</i>	talent (Hebrew)	talent	75.558 pounds	34.3 kilograms
<i>mna</i>	pound (Hebrew)	mina	20.148 ounces	571.2 grams
<i>litra</i>	pound (Latin)	libra	0.719 pound	326.4 grams

Measures of Capacity

Hebrew Measures of Capacity: Liquid Measures

HEBREW	NRSV	EQUIVALENCE	U.S. MEASURES	METRIC UNITS
<i>kor</i>	measure, cor	10 baths	60.738 gallons	230 liters
<i>bat</i>	bath	6 hins	6.073 gallons	23 liters
<i>hin</i>	hin	3 kabs	1.012 gallons	3.829 liters
<i>qab</i>	kab	4 logs	1.4349 quarts	1.276 liters
<i>log</i>	log		0.674 pint	0.32 liter

Hebrew Measures of Capacity: Dry Measures

HEBREW	NRSV	EQUIVALENCE	U.S. MEASURES	METRIC UNITS
<i>homer</i>	homer	2 lethechs	6.524 bushels	229.7 liters
<i>kor</i>	measure, cor	2 lethechs	6.524 bushels	229.7 liters
<i>letek</i>	lethech, measure	5 ephahs	3.262 bushels	114.8 liters
<i>epah</i>	ephah, measure	3 seahs	20.878 quarts	22.9 liters
<i>tse'ah</i>	measure	3.33 omers	6.959 quarts	7.7 liters
<i>omer</i>	omer	1.8 kabs	2.087 quarts	2.3 liters
<i>issaron</i>	tenth part (of ephah)			
<i>qab</i>	kab		1.159 quarts	1.3 liters

Measures of Capacity in the New Testament

HEBREW	NRSV	EQUIVALENCE	U.S. MEASURES	METRIC UNITS
<i>batos</i>	measure	(Hebrew) bat	6.073 gallons	23 liters
<i>koros</i>	measure	(Hebrew) kor	60.738 gallons or 6.524 bushels	230 liters
<i>saton</i>	measure	(Hebrew) tse'ah	6.959 dry quarts	7.71 liters
<i>metretes</i>	measure		10.3 gallons	39 liters
<i>choenix</i>	quart		0.98 dry quart	1.079 liters
<i>modios</i>	bushel	(Latin) modius	7.68 dry quarts	8.458 liters
<i>xestes</i>	pot	(Latin) sextarius	0.96 dry pint or 1.12 fluid pints	0.53 liter

Lengths

Hebrew Lengths

HEBREW	NRSV	EQUIVALENCE	U.S. MEASURES	METRIC UNITS
<i>ammah</i>	cubit	2 spans	17.49 inches	0.443 meter
<i>zeret</i>	span	3 handbreadths	8.745 inches	0.221 meter
<i>topah, tepah</i>	handbreadth	4 fingers	2.915 inches	0.074 meter
<i>etsba</i>	finger		0.728 inch	0.019 meter

The cubit described in Ezekial 40.5; 43.13 is equal to seven (not six) handbreadths, or 20.405 inches.

Lengths in the New Testament

GREEK	NRSV	U.S. MEASURES	METRIC UNITS
<i>pechus</i>	cubit	about 1.5 feet	0.456 meter
<i>orguia</i>	fathom	about 72.44 inches	1.839 meters
<i>stadion</i>	stadia, or the equivalent in miles	about 606 feet	184.7 meters
<i>milion</i>	mile	about 4,854 feet	1.482 kilometers

I. Measures of Length: The Cubit.

The original measures of length were derived from the human body: the finger, hand, arm, span, foot, and pace. As these measures differ with each individual, they must be reduced to a certain definite standard for general use. The Hebrew system, therefore, had such a standard; the ell ("ammah") contained 2 spans ("zeret"), while each span was made up of 3 handbreadths ("tefah") of 4 fingers ("ezba' ") each. This division of the ell into 6 handbreadths was the one customarily employed in antiquity, but it was supplanted in Babylonia by the sexagesimal system. The Old Testament mentions two ells of different size. Ezekiel implies that in his measurement of the Temple the ell was equal to a "cubit and a handbreadth" (xl. 5, xliii. 13)—that is, one handbreadth larger than the ell commonly used in his time. Since among all peoples the ell measured 6 handbreadths, the proportion of Ezekiel's ell to the others was as 7 to 6. The fact that Ezekiel measured the Temple by a special ell is comprehensible and significant only on the assumption that this ell was the standard of measurement of the old Temple of Solomon as well. This is confirmed by the statement of the Chronicler that the Temple of Solomon was built according to "cubits after the first measure" (II Chron. iii. 3), implying that a larger ell was used at first, and that this was supplanted in the course of time by a smaller one.

The Egyptians in like manner used two kinds of ells in exactly the same proportion to each other, namely, the smaller ell of 6 handbreadths and the larger "royal" ell, which was a handbreadth longer. The latter measures 525-528 millimeters, and the former 450 millimeters, estimating a handbreadth as 75 millimeters. It would seem at first sight that the Egyptian system of measurement had influenced the Hebrew, and the two Hebrew ells might naturally be considered identical with the Egyptian measures. This assumption is, however, doubtful. Since all the other measures were derived from Babylon, in all probability the ancient Hebrew ell originated there also. The length of the Babylonian ell is given on the famous statue of King Gudea (beginning of 3d millennium B.C.), found in Telloh in southern Babylonia. A scale is inscribed on this statue, according to which the ell may be reckoned at 495 millimeters, a measurement which is confirmed by certain Babylonian tablets. These measure, according to the Babylonian scale, $\frac{2}{3}$ ell, or, according to the metric system, 330 millimeters (1 foot) on each side. The ell of 495 millimeters seems to have been used also in Phenicia in measuring the holds of ships, but these computations cannot be discussed in detail here. The length of the ancient Hebrew ell cannot be determined exactly with the data now controlled by science; but it was either 525 or 495 millimeters, and this slight difference between the two figures is scarcely appreciable in an estimate of the size of Hebrew edifices, etc.

II. Measures of Capacity:

The Hebrew system here corresponds exactly with the Babylonian. In contradistinction to the Egyptian metrology, which shows the regular geometric progression—1, 10, 20, 40, 80, 160—the Hebrew and the Babylonian systems are based on the sexagesimal system. The unit of the Babylonian system was the "maris," a quantity of water equal in weight to a light royal talent. It contained, therefore, about 30.3 liters. The maris was divided into 60 parts, probably called "minæ" (= .505 liter). All the other measures are multiples of this mina: 12, 24, 60, 72 (60 + 12), 120, 720 minæ.

The Log.

In the Hebrew system the log (Lev. xiv. 10) corresponds to the mina. Since the Hellenistic writers equate the log with the Græco-Roman sextarius, whatever these writers say on the relation of the sextarius to other measures applies also to the relation of these measures to the log. The log and the sextarius, however, are not equal in capacity. The sextarius is estimated at .547 liter, while there is no reason to regard the log as larger than the Babylonian mina, especially as other references of the Greek metrologists support the assumption that the log was equal to the mina. The fact that in the Old Testament the log is mentioned only as a fluid measure may be merely accidental, for the dry measures, which are distinguished in all other cases from the liquid measures, also have the log as their unit. The corresponding dry measure may, however, have been known under a different name. The same possibility must be borne in mind in the case of the cab, the next larger measure, containing four logs and mentioned only as a dry measure. A differentiation of the dry and liquid measures gives two simple systems, as follows:

Dry Measures.

1 homer = 10 ephahs = 30 se'aim = 180 cabs = 720 logs = 364.4 lit.
 (cor) 1 ephah = 3 se'aim = 18 cabs = 72 logs = 36.44 lit.
 1 se'ah = 6 cabs = 24 logs = 12.148 lit.
 1 cab = 4 logs = 2.024 lit.
 1 log = 0.506 lit.

Liquid Measures.

1 cor = 10 baths = 60 hins = 180 cabs = 720 logs = 364.4 lit.
 1 bath = 6 hins = 18 cabs = 72 logs = 36.44 lit.
 1 hin = 3 cabs = 12 logs = 6.074 lit.
 1 cab = 4 logs = 2.024 lit.
 1 log = 0.506 lit.

In these tables that homer has been omitted which is, according to Ex. xvi. 36, one-tenth of an ephah, and which is, therefore, identical with the " 'issaron" (Num. xxviii. 5 *et al.*). The tenth part of a bath, for fluids, which is mentioned in Ezek. xlv. 14 without a special name, corresponds in content to the homer, or 'issaron, among the dry measures. The homer and its liquid equivalent do not belong to the original system, as may be seen by the proportion the homer bears to the other measures: $3\frac{1}{2}$ homers = 1 se'ah, $1\frac{1}{2}$ homers = 1 hin, 1 homer = $1\frac{1}{5}$ cabs = $7\frac{1}{5}$ logs. The tenth part of a bath is, furthermore, mentioned only in Ezekiel and in the Priestly Code. The old division of the ephah and the bath was into three parts; Ezekiel mentions also the sixth part of an ephah. At a later period the se'ah and the cab disappear as dry measures, so that the Priestly Code refers simply to the tenth part of the ephah. This new division into tenths may be connected with the appearance of the decimal system, which can be traced elsewhere, especially in weights and coins.

Babylonian Weight in the Form of a Lion with Inscription (= "royal maneh").(From Madden, "History of Jewish Coinage.")

Only one measure in addition to those enumerated above is mentioned in the Old Testament. This is the "letek," which occurs but once (Hosea iii. 2). It is a dry measure, and is uniformly designated in tradition as equal to $\frac{1}{3}$ homer, although it is doubtful whether a definite measure is implied by this term. The Septuagint translates "letek" in its single occurrence as $\nu\eta\beta\epsilon\lambda\omicron\upsilon\upsilon$ = "a skin of wine."

III. Measures of Weight:

It is evident from inscriptions that the Babylonian system of weight was used in Syria and Palestine even before the entrance of the Israelites into the country. The Egyptian inscription of Karnak records the tribute which the kings of Egypt exacted from their Syrian vassals. Although the sums are given according to Egyptian weight, the odd numbers clearly indicate that the figures were computed originally by some other system, which may easily be shown to have been the Babylonian.

The Mina.

The Babylonians reckoned weight in talents, minæ, and shekels. Layard found in the ruins of Nineveh several Babylonian units of weight, some in the form of a crouching lion and others in that of a duck, the former being twice as heavy as the latter. This proves that a heavy and a light talent were used in Babylon, the latter one-half the weight of the former. A heavy talent = 60,600 grams; 1 mina (1/60 talent) = 1,010 grams; 1 shekel = 16.83 grams; 1 light talent = 30,300 grams; 1 light mina = 505 grams; 1 light shekel = 8.41 grams. There was, in addition to this "royal" weight, another "common" weight which was somewhat lighter (compare the large "royal" ell and the "common" ell, mentioned above). According to this common weight the heavy talent weighed 58,944 grams; its mina 982.4 grams; its shekel 16.37 grams; and the light talent, mina, and shekel just one-half as much. The common heavy talent and its subdivisions were the weights current in Syria and Palestine, as Josephus expressly states ("Ant." xiv. 106, ed. Niese). According to him, 1 Jewish mina (of 50 shekels) was equal to $2\frac{1}{2}$ Roman pounds, or 818.62 grams; hence 1 shekel was equivalent to 16.37 grams, and 1 old mina of 60 shekels to 982.2 grams. There were also the half-shekel or bekah ("beqa,").

In the course of time the sexagesimal system was superseded in Babylonia also, perhaps under Egyptian influence. The mina of 60 shekels was replaced throughout Asia Minor by the mina of 50 shekels. The shekel remained the same, forming the unit of weight, while the mina and talent were reduced, containing respectively 50 shekels = 818.6 grams and 3,000 shekels = 49,110 grams.

Money.

The period of these changes is unknown. In the Old Testament the first reference occurs in Ezekiel; if the Septuagint is correct in its translation of Ezek. xlv. 12, that passage reads, "You shall count the manhe [mina] as fifty shekels." There is other evidence in Ex. xxxviii. 25 (Priestly Code), where the tax levied upon 603,550 men at $\frac{1}{2}$ shekel each was computed to be 100 talents and 1,775 shekels, whence 1 talent equaled 3,000 shekels, and 1 mina was equivalent to 850 shekels. These measures were further changed in the currency, which was also reckoned in talents, minas, and shekels. In Jewish silver 1 shekel = 14.55 grams, 1 mina = 50 shekels = 727.5 grams, 1 talent = 3,000 shekels = 43,659 grams. What bearing this change—which was confined to silver—had upon the relative values of gold and silver, and how far it was conditioned by the demands of exchange day by day, can not be discussed in detail here (comp. Benzinger, "Arch." pp. 192 et seq.). With this silver shekel the shekel of weight must not be confounded. In the Pentateuch the heavy shekel of weight is called, in contradistinction to the silver shekel, the "holy shekel, the shekel of 20 gerahs" (Ex. xxx. 13; Lev. xxvii. 25; Num. iii. 47). This refers to the tax payable to the Sanctuary, which, it is expressly stated, must not be paid in silver shekels, but according to weight, conforming with ancient custom.

The division of the shekel into 20 gerahs is mentioned only in the passages just quoted and in Ezek. xlv. 12 (LXX.). Otherwise the Old Testament refers only to quarters and halves of shekels. [See Money](#); [Numismatics](#).

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E. G. H. I. Be. Domestic and Foreign Elements.—In Rabbinical Literature:

The weights and measures of Talmudic literature are a combination of those of the ancient Hebrew system with foreign elements; and it was especially Greek and Roman metrology which became current among the Jews in the post-Biblical period. These two elements, the domestic and the foreign, were, however, so intimately fused that it is often difficult to distinguish between them. In the course of time the Biblical weights and measures underwent various changes which are recorded in the Talmud, where an endeavor is made to determine the original values. The Talmudic system of metrology is especially important since it affords an evaluation of the Biblical units. Talmudic sources deduce the value of Biblical weights and measures by comparing them with those which were current in the period of the Talmud, and the units of this system may often be determined by a comparison with their Greek and Roman equivalents. Talmudic metrology is therefore of importance for the history of civilization, since it bears upon conditions prevailing among the classic peoples of ancient times. The weights and measures mentioned in Talmudic sources are as follows:

Gerah (גרה) or Ma'ah (מעיה): Units of Weight.

In the Talmud the gerah is mentioned as a unit of weight only with reference to the Bible. Raba makes it the equivalent of a ma'ah, and names as an authority for this equation Onkelos, the translator of the Pentateuch, who rendered the term "twenty gerahs" (Ex. xxx. 13) by "twenty ma'ot" (Bek. 50a). This ma'ah must be the Tyrian obol or ma'ah; for Bek. 50a says: "Six silver ma'ot are equal to a denarius." Inasmuch as four denarii are equivalent to one sela', it follows that twenty-four ma'ot are also equal to one sela'; and this equation was used for the Tyrian sela' (comp. Boeckh, "Metrologische Untersuchungen über Gewichte, Münzfüsse, und Maasse des Alterthums in Ihrem Zusammenhange," p. 59, Berlin, 1838). The Talmud does not indicate the actual weight of the ma'ah, but from Tyrian silver coins still extant its value may be determined. The heaviest Tyrian silver coin in existence weighs 14.34 grams, and $\frac{1}{24}$ of this, or 0.5975 gram, is therefore the weight of a ma'ah. This deduction has been based upon the weight of the heaviest Tyrian silver coin because in those that are lighter the loss in weight is evidently due to handling and use.

Shekel (שקל; Greek, σίκλος, σίγλος):

This is the next highest unit of weight. The Bible designates the value of the shekel as "twenty gerahs" (Ex. xxx. 13); whence, according to the weight already given for the gerah or ma'ah, the shekel should weigh 20×0.5975 gram, or 11.95 grams. The Jerusalem Talmud, however (Shek. 46d), mentions another weight for the shekel, stating that half a shekel is equal to six ; and the same value is given in Tan., Ki Tissa, ed. Buber, p.

55a. The term designates a scruple (γραμμῆριον), which is equal to 1/24 ounce (comp. Mussafia, "Musaf he-'Aruk," s.v.). Inasmuch as the Roman pound contains twelve ounces, a half-shekel becomes the equivalent of 1/48 Roman pound, and a whole shekel = 1/24. According to Boeckh, the Roman pound weighed 327.434 grams, and a shekel would accordingly weigh 13.643 grams. In another passage of the Talmud the weight of a shekel is given as 14.34 grams, or the equivalent of the Tyrian silver coin already mentioned. The Talmud states that the silver coin recorded in the Pentateuch was identical with the Tyrian mintage (Bek. 50b); and the Tosefta likewise declares that the silver coin of Jerusalem was identical with that of Tyre (Tosef., Ket. xiii. 3). A shekel was therefore identical with the Tyrian sela' (Rashi on Bek. *l.c.*), and its weight was accordingly 14.34 grams. The difference between the weight given by the Jerusalem Talmud (13.643 grams) and that deduced by identifying the shekel with the Tyrian sela' (14.34 grams) amounts to 0.7 gram only; and it may be explained

by assuming that the statement in the Jerusalem Talmud, which makes a half-shekel equal to six $\frac{1}{2}$, is only approximate. On the other hand, the difference between the weight of the shekel given in the Bible (11.95 grams), and that of the Tyrian sela' of 14.34 grams, with which the Biblical shekel is identified in the Mishnah (Bek. viii. 7) and the Babylonian Talmud (*ib.* 50a), as well as in Yerushalmi (*Ḳid.* 59d), is too large to be attributed to inaccuracy in reckoning. The divergence finds its explanation, however, in the Talmudic statement that the shekel was enlarged, the Biblical shekel being originally equivalent to 3½ denarii, and being later increased one-fifth, thus becoming equal to four denarii, so that, instead of its original value of twenty gerahs, it later became equivalent to twenty-four. The Biblical shekel weighed 11.95 grams, and the addition of one-fifth (2.39 grams) gives 14.34 grams as the weight of the later coin, which then became equal to the Tyrian sela'. In addition to this shekel, which was called "the shekel of the sanctuary," and which was equal to a sela', the Mishnah (Ned. iii. 1) and the Talmud (B. M. 52a) mention another shekel, which was the equivalent of half a sela', or half a "shekel of the sanctuary," and which was probably called the common shekel. This indicates that the value of the shekel varied at different times (on the reasons for these changes and the periods at which they took place see Frankel in "Monatsschrift," 1855, pp. 158 *et seq.*; Zuckermann, "Ueber Talmudische Gewichte und Münzen," p. 13).

Maneh or Mina (מנא; Greek, μινᾶ):

In the Mishnah, as well as in the Talmud, the mina is often mentioned as a unit of weight for figs, spices, wool, meat, and the like (Ket. v. 8; 'Eduy. iii. 3; *Ḥul.* 137b; Ker. 6a; *et passim*). In the Mishnah it is sometimes called

or "Italian mina" (Sheb. i. 2, 3), the designation "Italki" helping to determine its weight. The Italian mina contained 100 denarii, while the Roman pound contained only ninety-six. A mina was therefore equivalent to 1 1/24 Roman pounds, and since the Roman pound equaled 327.434 grams, the Italian maneh was equal to 341.077 grams, the weight assigned it in the Talmud. From a passage in Ber. 5a it appears that a mina equaled twenty-five shekels; and since, according to the passage already cited from the Jerusalem Talmud (Sheḳ. 46d), a shekel was equal to twelve scruples, a mina was equivalent to 25 × 12, or 300 scruples. The Roman pound contained only 288 scruples, and the mina was therefore equal to 1 1/24 Roman pounds. Besides this mina of twenty-five shekels, the Talmud (*Ḥul.* 137b-138a) mentions another, which was equal to forty shekels or sela'im.

Liṭra (ליטרא; Greek, λίτρα):

The liṭra, which originally corresponded to the Italian "libra," is mentioned in the Mishnah (Shebu. vi. 3; Bek. v. 1; Tem. iii. 5) and in the Talmud ('Er. 29a; Ket. 67b; *et passim*) as a unit of weight for figs, vegetables, meat,

fish, gold, and silver. The Jerusalem Talmud (Ter. 47b) defines the liṭra as equal to 100 zinin, the zin ($\frac{1}{100}$)

being the same as the zuz ($\frac{1}{100}$), since the Mishnah (Ter. x. 8) uses the term "zuz" in the passage parallel to that in which the Tosefta (Ter. ix.) employs the word "zin." A liṭra was therefore equal to 100 zuzim. From this it follows that a liṭra was equivalent to a mina, since the Talmud also calls a denarius a zuz, which makes a liṭra = 100 zuzim = 100 denarii. As has been stated above, a mina equaled twenty-five shekels, and a shekel was equivalent to four denarii, thus making the mina = 100 denarii = 1 liṭra. In addition to the whole liṭra, pieces of weight of the value of a half, third, and quarter of a liṭra are also mentioned (Tosef., Kelim, B. M. ii.; B. B. 89a; Sifre, Deut. 294 [ed. Friedmann, p. 126b]).

Kikkar (ככר):

The term "kikkar," generally rendered "talent" (Greek, *τάλαυτον*), usually denotes in Talmudic sources a weight for gold and silver (Suk. 51b; 'Ab. Zarah 44a *et passim*). It is evident from the Talmud (Bek. 5a) that a kikkar contained sixty minæ. In the Jerusalem Talmud (Sanh. 19d) the value of the kikkar is given as sixty liṭras,

which is the equivalent of sixty minæ; and the same passage refers to a kikkar as being equal to 100 minæ, although this statement must allude to the Attic mina, which was equal to $\frac{3}{5}$ Hebrew mina, rather than to the Hebrew weight itself.

Other Weights:

Smaller weights also are indicated by coins, as, for example, the **denarius** (Tosef., Men. xii.; Shab. ix.) and the **zuz** (Shab. 110a). In the Jerusalem Talmud (Ta'an. 68a), as well as in Gen. R. (lxxix. 9) and other midrashic

passages, the **ounce** () occurs. In the Mishnah (Sanh. viii. 2) mention is likewise made of the **tarṭimar** (

), which, according to the Talmud (Sanh. 70a), was equivalent to half a mina. The term is a corruption of the Greek τριτημόριον (= "one-third"), and probably indicated $\frac{1}{3}$ Alexandrian mina, which contained 150 denarii (comp. Boeckh, *l.c.* pp. 155 *et seq.*). One-third of this mina, or fifty denarii, was equal to half of the Hebrew mina, which contained only 100 denarii (comp. Zuckermann, *l.c.* p. 8). A minute unit of weight, designated as one-sixteenth of a weight in Pumbedita, is also mentioned in the Talmud (Shab. 79a; Giṭ. 22a; B. M. 105b).

Another small weight, the **riṭel** (), is mentioned in the Jerusalem Talmud (Yoma 41d). This was probably a small copper coin which derived its name from the red color (Latin, "rutilus") of the metal of which it was composed.

It must be borne in mind that the values of the weights often varied in different parts of the country. The Mishnah (Ter. x. 8; Ket. v. 9; etc.) accordingly states that the weights used in Judea had but half the value they possessed in Galilee, so that ten Judean sela'im were equal to five Galilean; and the same assertion is made by Sifre, Deut. 166, and by the Talmud (Hul. 137b; comp. Zuckermann, *l.c.* pp. 11-12).

Ezba' (אצבע = "fingerbreadth"): Measures of Length.

The smallest measure of length; it is mentioned as a unit even in the Biblical period (Jer. lii. 21; [see Weights and Measures](#), Biblical Data). The Mishnah often alludes to the ezba' as a measure (Kil. vii. 1; Yoma v. 2; Men. xi. 4; Oh. iv. 3; Miḳ. vi. 7), although no value is assigned it. Its length may, however, be deduced from a Talmudic passage; and Zuckermann has found by calculation that the Talmudic ezba' was equal to 2.33411 cm. In the Talmud the term "ezba' " refers to the thumb as well as to the middle and little fingers. The Talmud therefore draws a distinction between the breadth of the thumb and that of the middle and little fingers, by stating (Men. 41b): "The handbreadth [״ṭefah״] mentioned in the Talmud is equal to four thumbbreadths, or six little-finger breadths, or five middle-finger breadths." The size of an ezba' as given above (2.33411 cm.) refers to the breadth of a thumb. From the proportionate dimensions of the thumb, middle finger, and little finger, according to the Talmudic passage already cited, the breadth of the middle finger would be 1.867288 cm., and that of the little finger 1.556 cm.

Ṭefah (= "handbreadth"):

The measure next in size to the ezba'; it was used as a measure of length in the Bible. The size of the handbreadth is described in the Talmud (Bek. 39b) as equal to four thumbbreadths; and in the passage previously quoted (Men. 41b) this statement is amplified by making it the equivalent of four thumbbreadths, or six little-finger breadths, or five middle-finger breadths. From this proportion of the ṭefah to the breadth of the fingers, its size, according to the measurements given above, appears to have been 9.336443 cm. In addition to the normal handbreadth the Talmud mentions two others (Suk. 7a): one formed by holding the fingers loosely (״ṭefah soḥek״), and the other produced by pressing the fingers firmly together (״ṭefah 'azeb״), although the divergence between these handbreadths and the normal is not determined.

Ell:

In addition to the Mosaic ell, which was equal to the mean ell ("ammat benonit") and consisted of six handbreadths (comp. Zuckermann, *l.c.* p. 17), the Mishnah (Kelim xvii. 9) mentions two others, one of which was half a fingerbreadth and the other a whole fingerbreadth longer than the mean ell. The standards used for measuring both these ells were said to have been kept in a special place in the Second Temple. The Talmud explains the introduction of these two ells in addition to the mean or Mosaic ell (see Pes. 86a; Men. 98a), and mentions also an ell which contained only five handbreadths (Er. 3b). The mean ell, equivalent to six handbreadths, was, according to the measurement of the handbreadth given above, equal to 56.018658 cm. The ell which was half a fingerbreadth longer was, therefore, 57.185375 cm. in length, and that which was a

whole fingerbreadth longer was 58.352 cm. The Mishnah (Tamid iii. 6) mentions still another ell, called , which was measured from the tip of the middle finger to the armpit. Inasmuch as the ell which measured six handbreadths was equal to the length of the forearm, and the length of the latter is to the arm as 6 is to 10, it

follows that the "ammat sheḥi" measured ten handbreadths, or 93.36443 cm. In the Midrash (Gen. R. xxxvii.)

an ell is mentioned under the name ἄμμη, by which the Theban ell (θηβαϊκόν) is probably meant. For another

meaning of the term ἄμμη see Zuckermann, *l.c.* p. 21.

Garmida (גַּרְמִידָא):

Repeatedly mentioned in the Talmud (Shab. 110a; 'Er. 50b; Pes. 111b; *et passim*), without any indication of its size. It is noteworthy, however, that the Talmud (B. B. 27a) uses this term to indicate a square ell, without designating it as a square measure, while in 'Er. 14b "garmida" indicates a cubic ell, although the customary term denoting "cubic" is omitted.

Zeret (זֵרֵת = "span"):

This measure, mentioned in the Bible (Ex. xxviii. 16) without any indication of its size, is described in the Tosefta (Kelim, B. M. vi. 12) as "half an ell of six handbreadths." Its measure was, accordingly, 28.009329 cm.

Hasit (הַסִּיט, רוחב הסיט, טלא הסיט = "content and width of the hasit"):

This term occurs as a measure of length in the Mishnah ('Orlah iii. 2, 3; Shab. xiii. 4), in the Tosefta (Shab. ix.), and in the Talmud (Shab. 79a, 106a), without any indication of its size and without being compared with any other measure. According to Maimonides ("Yad," Shabbat, ix. 7-10), the breadth of the hasit equals the opening between the thumb and the index-finger, which is about the equivalent of $\frac{2}{3}$ zeret, or two handbreadths. This appears to be correct, since a Greek measure called "dichas" (διχάς) equaled two handbreadths, and was called two-thirds of a span. The hasit was identical with this dichas (comp. Zuckermann, *l.c.* p. 24), and its size was accordingly 18.672886 cm.

Hebel (הַבֵּל = "cord"):

A measure described in the Mishnah ('Er. v. 4) as a cord of fifty ells in length, and in the Talmud ('Er. 58b) as one of four ells.

Teḥum Shabbat (תְּחוּם שַׁבָּת = "Sabbath-way"):

The extreme distance which a Jew might go in any one direction from his home on the Sabbath. It is defined in the Mishnah ('Er. iv. 3) and in the Talmud ('Er. 51a) as 2,000 Hebrew ells, and it was therefore equal to

112,037.316 cm. This was also the length of the mile (מִילָה), with which the Mishnah (Yoma vi. 18) and both Talmudim (Pes. 93b, 94a; Yer. Yoma 40b) indicated distances. In the Talmud (Yoma 67a) it is explicitly stated that the mile is equal to the teḥum Shabbat; the Hebrew mile was therefore shorter than the Roman, with which it must not be confused.

Pesi'ah (פְּסִיעָה = "pace"):

The pace is used as a measure of length in the Talmud ('Er. 42b), and its value is defined as one ell (56.018658 cm.).

Ris (רִיס = "stadium"):

The Mishnah uses the term "ris" to indicate distance, and defines its length as $\frac{2}{15}$ mile. The Talmud (B. M. 33a) also states that its length was $\frac{2}{15}$ mile, or $266\frac{2}{3}$ ells. According to Frankel (in "Monatsschrift," 1856, p.

383), the term "ris" is Persian, as is also the term پارسنگ ("parasang"), used in the Talmud as a measure of

length (comp. Tos. B. B. 23a, s.v. פָּרַסַּנְגָּ), and defined as equal to four miles, or 8,000 ells (Pes. 93b-94a).

Day's Journey (יֵרֵךְ יוֹם):

The Talmud defines a day's journey for a man of medium gait as ten parasangs, or 80,000 ells.

Superficial Measures.

Measurements of fields are generally indicated in the Talmud by the amount of seed sown in them. The term

סֵאֵי, for example, indicates a field in which one se'ah can be sown; the term סֵאֵי שְׁנַיִם, one which requires two se'aim. The latter space is defined in the Talmud ('Er. 23b) as equal to 5,000 Hebrew square ells, or to 15,690,445.095 sq. cm., and this can be used as a basis for the determination of other superficial measures given in the Talmud.

Solid Measures.

The Talmud mentions separate systems of solid measures for dry and for liquid substances, although some units were used for both. The Mishnah states that the measures were enlarged at some time or other. In

addition to the Biblical measure, which is called "desert measure" (מִדְבָּר) in Talmudic sources, the Mishnah

(Men. vii. 1) mentions a "Jerusalem measure" (), which was equal to $1\frac{1}{5}$ "desert measures," and also

alludes ('Er. 82a) to a "Sepphoric measure" (), which was equal to $1\frac{1}{5}$ "Jerusalem measures." One se'ah "desert measure" was therefore equal to $\frac{25}{36}$ se'ah "Sepphoric measure," and one se'ah "Jerusalem measure" equaled $\frac{30}{36}$ se'ah "Sepphoric measure." With regard to the names of the units, it must be noted that the hollow vessels used as measures also served as ordinary utensils; and the name of the vessel

likewise designated the measure. The Biblical **log** is defined by the Talmud (Pes. 109a) as equal to the (= Greek ξήστρις), and was therefore equivalent to 549.338184 cu. cm. (comp. Zuckermann, *l. c.* pp. 6-10); this aids in the evaluation of several other Talmudic measures.

Bezah (ביצה = "egg"):

The egg is often used in the Talmud as a standard of measurement; and in the Mishnah (Kelim xvii. 6) a method is given by which to determine its size. The Jerusalem Talmud (Ter. 43c) defines the egg as equal to $\frac{1}{24}$ cab; and the same value may be deduced from the Babylonian Talmud ('Er. 83a), where a se'ah is described as the equivalent of six cabs, or 144 eggs. Inasmuch as a cab was equal to four logs, it follows that

an egg equaled $\frac{1}{6}$ log, or 91.565223 cu. cm. The expression ("laughing eggs") occurs as a term for eggs of larger size ('Er. 83a), although the difference between these and ordinary eggs is not stated.

Cab (קב; Greek, χάβος):

The cab is often mentioned as a measure in Talmudic sources (Kil. ii. 1; Ket. v. 8; Naz. 52b; Soṭah 8b *et passim*), and its halves, quarters, and eighths are frequently recorded (comp. RaSHBaM on B. B. 89b, s.v.

). The size of the cab is given in the Jerusalem Talmud (Ter. 47b), where it is said that a se'ah is equal to twenty-four logs. Since a se'ah is equal to six cabs, a cab is equivalent to four logs, or 2,197.406683 cu. cm. The Talmud (Pes. 48a) records also a large cab, containing $1\frac{1}{4}$ "Sepphoric cabs," and a "Nehardean cab" is

likewise mentioned (Ket. 54a), although no indication of its size is given. The expression "terkab" (; Greek, τρίαβος = "three cabs") also occurs frequently in the Talmud (Ḥag. 23b; Ta'an. 10a; Giṭ. 30a; *et passim*).

Ḳapiza (קפיוזא):

A small vessel often used as a measure and mentioned in several Talmudic passages (Shab. 10b; Pes. 48b; Giṭ. 70a; *et passim*). That the ḳapiza was smaller than the cab is clear both from Ḥul. 25a and from Shab. 103a, as well as from the discussion in B. B. 90b. The commentaries disagree as to its size, one defining it as a quarter, and another as three-quarters, of a cab, while in one passage in Menaḥot (78a) Rashi makes it equivalent to $\frac{1}{2}$ cab. In that case it would be identical with the Persian "kawiz" (Greek, καπιθη), which was equal to a choenix = 2 xestes = 2 logs = $\frac{1}{2}$ cab. The Talmud relates that a new measure which contained three

ḳapizot was introduced by R. Papa b. Samuel into Pafonya, where it was called ("Papa's secret"; B. B. 90b).

Se'ah (סאה; Greek, πάτον):

The Biblical se'ah recurs as a measure in the Mishnah, from which it appears (Parah i. 1; Ter. iv. 7; Men. vii. 1) that it was equal to six cabs, or 13,184.44 cu. cm. Another se'ah, which was used in Arbela and called an

"Arbelian se'ah" (), is mentioned in the Jerusalem Talmud (Pe'ah 20a; Soṭah 17b), although no comparison is drawn between it and the ordinary se'ah.

Modius (מודיא):

A measure mentioned in the Talmud, although its value is not designated (Giṭ. 57a; Yer. Shab. 13c; Pes. 30a). In one passage, however ('Er. 83a), the term is taken as a synonym of "se'ah" (comp. Zuckermann, *l. c.* pp. 40-41).

Tuman (תומן = "an eighth"):

Mentioned in the Talmud as a dry measure (B. B. 89b), its value being defined as one-eighth of a cab.

'Ukla (עוכלא):

A dry measure mentioned in the Talmud, its value being given by RaSHBaM as $\frac{1}{20}$ cab = $\frac{1}{5}$ log. According to another interpretation, the 'ukla was equal to $\frac{1}{32}$ cab, or $\frac{1}{8}$ log, as stated by Rashi ('Er. 29a, s.v. "'Ukla"). The

first interpretation, however, is the correct one; and an 'ukla was therefore equal to $\frac{1}{5}$ log = 109.8743 cu. cm. (comp. Zuckermann, *l.c.* p. 42).

Ephah (איפה):

The Biblical ephah is mentioned in the Mishnah (Men. vii. 1), where its value is defined as three se'aim.

Cor (כור):

The Biblical cor is defined in the Talmud (B. B. 86b, 105a; comp. Men. 77a) as equal to thirty se'aim.

Letek (לתך):

Although the letek is mentioned in the Bible as a measure, no value is assigned it. From examples given in the Mishnah (Sheb. vi. 3) and in the Talmud (Sheb. 43a; B. M. 80a, b), however, it appears that it was equal to $\frac{1}{2}$ cor = 15 se'aim (comp. Hos. iii. 2 in the Greek versions).

Pesikta (פסיקתא; Greek, ψυκτήρα):

A measure mentioned in the Mishnah (Tamid v. 5) as the equivalent of a letek.

Ardaba (ארדב, ארדב):

Among its measures the Talmud alludes to the , which is the of the Shulḥan 'Aruk, and consequently the ardaba used by the Egyptians and Persians (or Medes). The context in the Talmudic passage (B. M. 80b)

does not show which ardaba was equivalent to the there mentioned, but it is at least clear that the latter was not the ancient Egyptian measure (comp. Zuckermann, *l.c.* pp. 46-47).

Ḳomez (קמץ) or Kuna (כונא):

In the Talmud the handful is often mentioned as a measure, especially for medical purposes. The term varies, however, in the different passages. In Shab. 110b, 'Er. 29b, and Giṭ. 69b-70a it is called "buna," but in Giṭ. 69a,

Ket. 99b, and 'Ar. 21b, "kuna." The hollow form of the hand was called "kuna," from (= "basin"), and this term designated the quantity which one could hold in the palm of his hand. The ḳomez mentioned in the Bible (Lev. ii. 2, v. 12) con-notes, according to the Talmud, the quantity one can grasp between the palm of the hand and the three middle fingers.

Geriwa (גריוא):

A weight frequently mentioned in the Talmud as a measure for solids ('Er. 29b; Pes. 32a; Ned. 50b; B. Ḳ. 96a; *et passim*), but without any indication of its value. A single passage, however ('Er. 14b), states that 2,000 baths, which were equal to 6,000 se'aim, were equivalent to 6,000 geriwoṭ. It would follow, therefore, that a geriwa was identical with a se'ah.

Gerib (גריב):

This measure, which in name resembles the geriwa, is mentioned in the Talmud (Giṭ. 69b) as a measure for solids (comp. Rashi *ad loc.*, where he identifies it with the geriwa). A cask or a jar serving as a large measure

for fluids also was called "gerib" (Shab. 13b), and the Mishnah (Ter. x. 8) mentions a ("garab") containing two se'aim.

Liquid Measures.

Besides the log, the Talmud mentions also half-logs and quarter-logs, as well as eighths, sixteenths, and sixty-fourths of a log. The quarter-log was often called simply "quarter" ("rebi'it"; comp. RaSHBaM on B. B. 89b), and

was likewise designated by the term (τέταρτον; Yer. Pes. 37c, where "teṭarton" or "rebia" must be understood; comp. Zuckermann, *l.c.* pp. 48-49).

Anṭel (אנטל; Greek, ἀντηλήτης):

A measure frequently mentioned in the Talmud as containing $\frac{1}{4}$ log (B. B. 58b). Hūl. 107a alludes to a "naṭla" (= anṭel), which had the same capacity. "Anṭel" is the name of a utensil, which was also used as a measure.

Ambiga (אמביג, אמבג or נבנא):

In the Talmud the anpaḳ and anbag are compared with the anṭel (B. B. 58b), whence it may be inferred that, like it, they were equivalent to $\frac{1}{4}$ log.

Measures of Weight

	Talent.	Mina.	Italian Mina.	Tarṭimar.	Shekel of Sanctuary.	of the Common Shekel.	Zuz.	Gerah.
Talent	1							
Mina	37½	1						

	Talent.	Mina.	Italian Mina.	Tarṭimar.	Shekel of Sanctuary.	of the Common Shekel.	Zuz.	Gerah.
Italian Mina	60	1 $\frac{3}{5}$	1					
Tarṭimar	120	3 $\frac{1}{5}$	2	1				
Shekel of the Sanctuary	1,500	40	25	12 $\frac{1}{2}$	1			
Common Shekel	3,000	80	50	25	2	1		
Zuz	6,000	160	100	50	4	2	1	
Gerah	36,000	960	600	300	24	12	6	1
Grams	21,510	573.6	358.5	179.25	14.34	7.17	3.585	.5975

Measures of Length.

	Day's Journey.	Ris (Parasang)	Sabbath Day's Journey.	Ris (Stadium).	Ammah (Pesi'ah).	Zeret.	Hasit.	Ṭefah.	Ezba'.
Day's Journey	1								
Ris (Parasang)	10	1							
Sabbath Day's Journey	40	4	1						
Ris (Stadium)	300	30	7 $\frac{1}{2}$	1					
Ammah (Pesi'ah)	80,000	8,000	2,000	266 $\frac{2}{3}$	1				
Zeret	320,000	32,000	8,000	533 $\frac{1}{3}$	2	1			
Hasit	480,000	48,000	12,000	800	3	1 $\frac{1}{2}$	1		
Ṭefah	960,000	96,000	24,000	1,600	6	3	2	1	
Ezba	3,840,000	384,000	96,000	6,400	24	12	8	4	1
Centimeters	4,481,492.64	448,149.264	112,037.316	14,938.3088	56.018656	28.009328	18.672888	9.336448	2.334112

Dry Measures.

	Cor.	Letek (Pesiḳta).	Ephah.	Se'ah (Geriwa).	Cab.	Ḳapiza.	Log.	Tuman.	'Ukla.	Bezah.
Cor	1									
Letek (Pesiḳta)	2	1								
Ephah	10	5	1							
Se'ah (Geriwa)	30	15	3	1						
Cab	180	90	18	6	1					
Ḳapiza	360	180	36	12	2	1				
Log	720	360	72	24	4	2	1			
Tuman	1,440	720	144	48	8	4	2	1		
'Ukla	3,600	1,800	360	120	20	10	5	2 $\frac{1}{2}$	1	
Bezah	4,320	2,160	432	144	24	12	6	3	1 $\frac{1}{5}$	1
Cubic Centimeters	395,533.2	197,766.6	39,553.32	13,184.44	2,197.40668	1,098.78264	549.39132	274.69566	109.87826	91.565232

Cor. Letek (Pesikt Ephah. a). Se'ah (Geriwa Cab.). Kapiza. Log. Tuman. 'Ukla. Bezah.

ers

Liquid Measures.

	Meṭarta	Kuza.	Log Xestes).	(Kaisa, Antel Anbag. Kuza).	(Naṭla. Anpak, Barzina. Kuza).	Anpak, Barzina.	Ḳorṭab.
Meṭarta	1						
Kuza	12	1					
Log (Kaisa, Xestes).	72	6	1				
Anṭel (Naṭla, Anpak Anbag, Kuza)	288	24	4	1			
Barzina	2,304	192	32	8		1	
Ḳorṭab	4,608	384	64	16		2	1
Cubic Centimeters	39,553.32	3,296.11	549.391338	137.347834		17.168479	8.584239

Tamnita (תמונית = "eighth"):

In the Talmud (Pes. 109a) R. Johanan mentions the old "eighth" of Tiberias, which was about ¼ log larger than the new "eighth"; and the Jerusalem Talmud (Pes. 37c) likewise alludes to an old "eighth" of Sepphoris, which was equal to half the "eighth" of Tiberias.

Ḳorṭab (קורטב):

A small measure mentioned in the Mishnah and in the Talmud (Men. xii. 4; Miḳ. iii. 1; R. H. 13a; B. B. 90a), its capacity being defined as 1/64 log (Tosef., B. B. v. 10).

Kuṭit (קוטית) and **Zir** (זיר):

In the Sifra, Ḳiddushin, a large measure is mentioned under the name of , while a smaller one is

designated as . The Romans had a large oblong cask, called "seria," which they used for wine and oil; while a small tub for the same purpose was termed "guttus." Both these vessels are mentioned in the Sifra as equivalents of the Biblical "mesurah."

Ḳaisa (קייסא):

A measure mentioned in the Talmud (Ber. 44b), though without any indication of its value. According to Rashi *ad loc.*, it was the equivalent of a log.

Hemina (המינא; Greek, ἡμίνα):

A measure mentioned in Targum Sheni to Esther i. 8. It was probably identical with the Roman "termina," which was used for both liquids and solids (comp. Boeckh, *l.c.* pp. 201, 203).

Meṭarta (; Greek, μετρητής):

A measure mentioned in the Talmud ('Ab. Zarah 10b), and corresponding to the Attic metretes = 72 xestes. Although the metretes is a liquid measure, the meṭarta is mentioned in the Talmud (*l.c.*) as being used for dry substances, no strict distinction being drawn between dry and liquid measures.

Barzina ():

Mentioned in the Talmud (Shab. 109b) as a small measure, no value being indicated. The Shulḥan 'Aruk (s.v.) regards it as equal to 1/32 log.

Kuza (; Greek, χοῦς):

A measure mentioned both in the Mishnah (Tamid iii. 6) and in the Talmud (Shab. 33b; B. M. 40a; B. B. 96b), and probably equal to the Attic χοῦς. The Talmud records another kuza, which was introduced by R. Ashi in Huza, and was equivalent to ¼ log (Ḥul. 107a). There were accordingly two kuzot, one the equivalent of the χοῦς = 6 xestes = 3,296.11 cu. cm., and the other equal to ¼ log = ¼ xestes = 137.337917 cu. cm.

Ḳesustaban (; Greek, ξεστίον):

A measure mentioned in the Jerusalem Talmud (B. M. 10c), the context indicating that it was of small size. Its name is probably a diminutive of ξέστης.

Tarwad ():

A measure mentioned several times in the Talmud, its size being indicated in Naz. 50b. According to one opinion it was the equivalent of a heaping handful, while according to another it equaled an ordinary handful.

Shorgash ():

A measure mentioned in the Talmud ('Er. 29b). According to the 'Aruk it was well known in Pumbedita.

Kizba ():

A measure mentioned in the Talmud (Men. 69b), and, according to Rashi (*ad loc.*) and the Shulḥan 'Aruk (s.v.), equal to a handbreadth.

In addition to the units enumerated in this article, the Talmud employs several indefinite measures, such as the sizes of various fruits (olives, pomegranates, and the like), to indicate certain quantities.

The foregoing tables sum up the results reached in the present investigation.

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