# WEIGHTS AND MEASURES

OF

# ALL NATIONS.

LENGTHS, DISTANCES, WEIGHTS, COINS, THE
VARIOUS DIVISIONS OF TIME, AND THE RATES
OF EXCHANGE AMONG COMMERCIAL NATIONS.

### By W. S. B. WOOLHOUSE, F.R.A.S.

THE

# MEASURES, WEIGHTS, & MONEYS

OF

## ALL NATIONS;

AND AN ANALYSIS

OF THE

CHRISTIAN, HEBREW, AND MAHOMETAN

CALENDARS.

BY

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# PREFACE.

The measures, weights, and moneys, established throughout the world, are so diversified in their comparative values and systematic relations that a correct classification of them is a task of greater magnitude than would commonly be supposed. In the present work no labour has been spared to ascertain, in every case, the best attainable information, and the various details have been arranged with especial regard to facility of reference. With this object, the materials appertaining to each locality are uniformly tabulated in the same order, and opposite to each separate quantity or value the English equivalent is distinctly exhibited so as to obviate as much as possible the necessity of any calculation.

The comprehensive principles which influence the fluctuations of exchange are also briefly stated, and correct rules are given for computing the sterling value of coins and bullion.

The tables for the conversion of the standard linear and square measures of one country into those of another were before published in another form, and had recently become out of print. They are here enlarged and more conveniently arranged, and their utility will be fully appreciated by those who may have occasion to consult the architectural and other works of the continent.

The second part of the volume relates to the measurement of time, and comprises a detailed investigation of the Christian, Hebrew, and Mahometan Calendars, with formulæ, tables, and practical rules for performing the various calculations. We have been induced to go more at length into these subjects as they are imperfectly treated in chronological works generally.

We trust that the typographical accuracy of the volume may be effectually secured by the stereotype plates, and that our earnest endeavour to make it generally useful may in some degree be accomplished.

*September*, 1856.

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## MEASURES, WEIGHTS, AND COINS.

# MEASURES, WEIGHTS, AND COINS,

OF

## ALL NATIONS.

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### STANDARDS.

#### MEASURES AND WEIGHTS.

MEASURES are of three kinds, viz. measures of LENGTH, called Linear or Long measure; measures of SURFACE, called Square or Superficial measure; and measures of CAPACITY, called Solid or Cubic measure.

WEIGHT may be defined to be the quantity of ponderous matter contained in a solid or fluid substance, taking into account its bulk and the density or specific gravity of its parts, and is determined by the same being balanced in an accurate scale against some known or acknowledged weights placed in the opposite scale.

STANDARDS are carefully-constructed measures or weights of acknowledged authority, by which others are tested or adjusted.

Measures and Weights are of indispensable utility, and are continually employed both in commercial and scientific pursuits. For the latter of these, minute accuracy is particularly essential. There is, however, more difficulty than would at first be supposed, in establishing and preserving correct, uniform, and invariable standards of weights and measures, and a vast amount of scientific research, ingenuity, and labour has been expended upon its accomplishment.

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The origin of measures of length is to be found in parts of the human body. Their values, roughly estimated, as well as their names, establish this beyond a doubt. The foot, the digit, the palm, the span, the cubit, the nail, the arm, &c., are in all languages derived from the same source; and, in the popular view of measurement, they do not considerably differ in length. It is also unquestionable that in former times, when authenticated measures were not so easily to be obtained, the hands, arms, and feet were much more frequently used than they are at present, when every workman, however humble, is in possession of a measure.

Taking a well-proportioned man, the fathom is reckoned to equal his height or stature; the girth, or the pace, $\frac{1}{2}$ of his stature; the cubit, or measurement from the elbow to the ends of the extended fingers, $\frac{1}{4}$; the foot, $\frac{1}{6}$; the span, $\frac{1}{8}$; and the breadth of the palm, $\frac{1}{24}$.

The statute 17 Edward II. (A.D. 1324) provides that three barley-corns, round and dry, make an inch, 12 inches a foot, &c. But it is so difficult to know how much of the sharp end of a barley-corn must be cut or worn away before it becomes what was called " round," that this mode of measuring by the *lengths* of barley-corns is very indefinite.

The complete table of the sixteenth century is as follows:—
The *breadth* of 4 barley-corns make a digit, or finger-breadth; 4 digits make a palm (measured across the middle joints of the fingers); 4 palms are a foot; $1\frac{1}{2}$ foot is a cubit; 10 palms or $2\frac{1}{2}$ feet are a step (gressus); 2 steps, or 5 feet, are a pace (passus); 10 feet are a perch; 125 paces are an Italic stadium; 8 stadia, or 1000 paces, are an Italic mile; 4 Italic miles are a German mile; and 5 Italic miles are a Swiss mile. From this table it would appear that the foot was considerably less even than the ancient Roman foot of 11·6 English inches; the average human foot certainly has not that length.

In the year 1742, the Royal Society had a standard yard constructed; from a minute comparison of the standard ells

or yards of the reigns of Henry VII. and Elizabeth, kept at the Exchequer.

In the year 1758, a select Committee of the House of Commons was appointed to inquire into the state of English weights and measures, and were assisted in their researches by several eminent mechanists, among whom may be mentioned Mr. Bird, a celebrated optician, and Mr. Harris, the Assay Master of the Mint. This Committee prepared with great accuracy two standards, viz. the yard and the pound troy, which were afterwards carefully preserved and justly considered of the highest authority. The standard yard was copied from that of the Royal Society, and having been examined by the Committee was reported to be equal to the standard yard and marked as such.

Since that period no alteration has been made in these standards, though much attention has been paid to the subject, both in and out of Parliament, especially since the adoption of the metrical system of France.

In 1816, in consequence of an address from the House of Commons to the Prince Regent, his Royal Highness appointed a Commission, composed of Sir J. Banks, Sir G. Clerk, Davies Gilbert, Woolaston, Young, and Kater, to consider the subject of English weights and measures; to determine the length of the pendulum vibrating seconds in the latitude of London; and to settle the proportion between the long measures of England and France.

In the first Report, made in June, 1819, no alteration is proposed to be made in the English standards of long measure and of weight, those established by the Committee of 1758 having been found quite accurate.

The second Report, made in 1820, contains the final determination of the Commissioners on the standard of long measure, the length of the second's pendulum, and of that of the metre. The following are the concluding words of this decision:—

" We prefer the Parliamentary standard executed by Mr.

Bird, in 1760, both as being laid down in the most accurate manner, and as the best agreeing with the most extensive comparisons, which have been hitherto executed by various observers, and circulated throughout Europe; and in particular with the scale employed by the late Sir George Shuckburgh.

"We have, therefore, now to propose that this standard be considered as the foundation of all legal weights and measures; and that it be declared that the length of the pendulum vibrating seconds in a vacuum, on the level of the sea, in London, is 39·1393 inches, and that of the French metre, 39·37079 inches, the English standards being employed at 62° of Fahrenheit."

The third Report of the Royal Commission, made in 1821, contains a confirmation of the other two Reports, with respect to measures of length: and as to weights, the Parliamentary troy pound of 1758 is recommended to remain unaltered, and the pound avoirdupois to continue at 7000 troy grains. It is also announced, by new experiments, that a cubic inch of distilled water at 62° is 252·722 grains of the standard pound of 1758, when weighed in a vacuum.

The House of Commons again appointed a Committee in 1821, to which these Reports were submitted: this Committee agreed with the Commissioners, and a bill was introduced in 1823. A petition from the Chamber of Commerce at Glasgow to the House of Lords occasioned an investigation, when Dr. Kelly, as one of the witnesses before the Committee, called attention to certain difficulties and imperfections in the pendulum experiments, and expressed an opinion, supported by few others at the time, though now generally received, that "nature seems to refuse invariable standards; for, as science advances, difficulties are found to multiply, or at least they become more perceptible, and some appear insuperable." The House of Lords adjourned the question over till 1824; when the act 5 Geo. IV. c. 74, was passed. This act came into operation on January 1, 1826,

and made no change in the lineal and superficial measures, nor did it alter either the troy or avoirdupois weights previously established; but the measures of capacity underwent considerable change. The old Ale, Wine, and Dry measures were formerly the three authorized measures of capacity. The old Wine gallon contained 231 cubic inches; the Corn gallon, 268·8; and the old Ale gallon, 282. These measures were altered to the Imperial Gallon, containing 277·274 cubic inches.

The act also states that the pendulum vibrating seconds of mean time in the latitude of London in a vacuum at the level of the sea is 39·1393 inches of the standard; and that the cubic inch of distilled water, weighed in air by brass weights, at 62° of Fahrenheit, the barometer being at 30 inches, is equal to 252·458 grains, according to the brass weight or troy pound of 1758, declared to remain the original and genuine standard measure of weight.

Under this system, a gallon of water weighing 70,000 grains, or 10 lbs., it follows that

> " A pint of pure water
> Weighs a pound and a quarter ;"

where, of course, reference is made to imperial measures and the avoirdupois pound.

The Houses of Parliament were burnt in 1834, and it is remarkable that 5 and 6 Wm. IV. c. 63, which passed after the fire, takes no notice of the destruction of the standards, but refers to them as still in existence.

It was, however, fortunate that in the year 1832 the council of the Royal Astronomical Society caused a scale of one yard to be constructed for themselves, and obtained permission of the Speaker of the House of Commons to adjust and compare it with Bird's Imperial Standard of 1760. This was accomplished in 1834 by an extensive set of delicate experiments, ably conducted by Mr. Baily and Lieutenant Murphy (since deceased) ; and, after the subsequent loss of the Imperial Standard, it may now, perhaps, be re-

ferred to as the only measure of length from which the
standard scale of Great Britain can be satisfactorily deduced.
The Astronomical Society's scale was also compared with
the Royal Society's scale of 1742, having two scales in it
marked E and Exch.; a scale called Aubert's, the prototype
of one which was used in the Indian survey by Lambton;
one which had been used by Sir G. Shuckburgh; one belong-
ing to the town of Aberdeen; one belonging to Mr. T.
Jones; and four new ones made after the model of the So-
ciety's scale—one for the Danish government, one for the
Russian government, one for Mr. Baily, and one retained
for himself by Mr. Simms the constructor. The middle yard
of the Astronomical Society's scale being taken as 36 inches,
the various scales, according to the mean of many observa-
tions, were found to be as follows:—

| Scale. | Standard Portion. | Mean Inches of Ast. Soc. Scale. |
|---|---|---|
| Astron. Society | Centre yard | 36·000000 |
| Danish | Ditto | 35·999758 |
| Russian | Ditto | 26·000050 |
| Simms's | Ditto | 35 999903 |
| Baily's | Ditto | 35·999949 |
| Aberdeen | Ditto | 35·998615 |
| Jones's | Ditto | 35·999802 |
| Aubert's | 0 in. — 36 in. | 35·998447 |
| Shuckburgh | 0 in. — 36 in. | 36·000185 |
| Ditto | 10 in. — 46 in. | `35·999921 |
| Royal Society | Line " E." | 36·001473 |
| Ditto | Line " Exch." | 35·993684 |
| Imperial standard of Bird's, of 1760, afterwards destroyed in 1834 by the burning of the Houses of Parliament | | 35 999624 |

Thus the Astronomical Society's standard being ·000376
longer than the Imperial standard, and the standard tempe-
rature being 62°, it follows that the length of the former
standard, observed at 62°, and diminished by ·000376 of an
inch, will give the true standard of the law.

In the year 1838, the Government appointed a Commis-

sion " to consider the steps to be taken for the Restoration of the Standards of Weight and Measure, which had been destroyed and lost by the burning of the Houses of Parliament." The members of this commission were Messrs. Airy, Baily, Bethune, Davies Gilbert, Herschel, Lefevre, Lubbock, Peacock, and Sheepshanks; and the following is extracted from their valuable report made in 1841:—

" We are of opinion that the definition contained in the act 5 Geo. IV. c. 74, ss. 1 and 4, by which the standard yard and pound are declared to be respectively a certain brass rod and a certain brass weight therein specified, is the best which it is possible to adopt.

" Since the passing of the said act, it has been ascertained that several elements of reduction of the pendulum experiments therein referred to, are doubtful or erroneous. Thus, the reduction to the level of the sea was doubtful, the reduction for the weight of air was erroneous, the specific gravity of the pendulum was erroneously stated, the faults of the agate plates introduced some degree of doubt, and sensible errors were introduced in the operation of comparing the length of the pendulum with Shuckburgh's scale, used as the representative of the legal standard. It is evident, therefore, that the course prescribed by the act would not necessarily reproduce the length of the original yard. It appears also, that the determination of the weight of a cubic inch of distilled water is yet doubtful, the greatest difference among the best English, French, Austrian, Swedish, and Russian determinations being about $\frac{1}{1200}$ of the whole weight, whereas the mere operation of weighing may be performed to the accuracy of $\frac{1}{1000000}$ of the whole weight.

" Several measures, however, exist, which were most accurately compared with the former standard yard (in particular the Royal Astronomical Society's Scale, described in their Memoirs, vol. ix., and the iron bars belonging to the Board of Ordnance, in the custody of Colonel Colby); and several metallic weights exist which were most accurately compared

with the former standard pound : and by the use of these
the values of the original standards can be respectively re-
stored without sensible error. And we are fully persuaded
that, with reasonable precautions, it will always be possible
to provide for the accurate restoration of standards, by
means of material copies which have been carefully com-
pared with them, more securely than by reference to any
experiments referring to natural constants.

"From the evidence of persons best able to judge of the
comparative use of troy weight and avoirdupois weight, the
proportion does not exceed one set of troy weights to many
thousand sets of avoirdupois. The statements of medical
men and those of persons concerned in the trade of bullion,
show that even to them the troy pound is useless. The
avoirdupois pound, on the other hand, is universally known
through this kingdom ; and moreover, being now made
equal to 7000 grains, it is well adapted to subdivision by
the decimal scale,—an object which we think ought never
to be placed out of view in considering the changes (in
other respects producing no inconvenience) which may be
made in the weights and measures of the country. We
feel it our duty, therefore, to recommend that the *avoirdupois*
pound be adopted instead of the *troy* pound as the standard
of weight. With regard to the standard of length, we do
not feel the necessity of proposing any change.

"That two modes of estimating weight should coexist, is
undoubtedly an evil ; its bad effects are greatly increased by
the identity of the names used in the different scales for
describing weights of very different values. Thus we have
the *pound* in the avoirdupois scale, and the *pound* in the troy
or apothecaries' scale, the former being *greater* than the
latter in the proportion of 7000 to 5760 ; we have the *ounce*
in the avoirdupois scale, and the *ounce* in the troy or apothe-
caries' scale, the former being *less* than the latter in the
proportion of 7000 to 7680 ; we have the *dram* in the avoir-
dupois scale, and the *drachm* in the apothecaries' scale, the

former being *less* than the latter in the proportion of 7000 to 15,360.   In examining into the actual uses of these several denominations, we see at once that it is impossible to abrogate the avoirdupois pound and ounce, which are used so extensively by persons of every class, that they must be considered as being emphatically the British weights.   The avoirdupois dram, however, does not appear to be used at all.   The troy pound, as we have already mentioned, appears to be wholly useless : it is not used in contracts for gold and silver, or in medical prescriptions ; and we are not aware of any obstacle whatever to its entire abolition, except the existence of certain printed tables for the reduction of assays of the precious metals, in which the denominations of the larger weights are expressed by multiples of troy pounds.   We propose, with the view of removing the confusion caused by the existence of this pound, and at the same time of respecting the private interests which (though to a very inconsiderable extent) are concerned in the change, that the Government should compute and print, for the use of bullion merchants and assayers, a new edition of these tables, in which the larger weights shall be expressed by decimal multiples of the troy ounce, to the entire exclusion of the troy pound.   We are inclined to think that the troy ounce itself could not be abolished at present without some difficulty ; we think it right, however, that the persons using it should be imperatively required to describe it in such a manner that no confusion with the avoirdupois ounce can possibly occur. The remaining weights of the troy and apothecaries' scales may, for the present, be tolerated (for certain substances only), as leading to no ambiguity.   Still we think it desirable, that measures should now be taken which may ultimately tend to the removal of the troy scale; and remarking both the convenience of a decimal scale of subdivision of the avoirdupois pound, and the general willingness of bullion merchants to adopt a decimal scale, and remarking also, that by descending in such a scale we arrive at a small weight (7 grains), bearing

a simple relation to the grain on which the troy weight is based, we propose that the Government should use its influence for the introduction of such decimal scale.

"We beg leave to invite the attention of the Government to the advantage and the facility of establishing in this country a decimal system of coinage. In our opinion, no single change, which it is in the power of a Government to effect in our monetary system, would be felt by all classes as equally beneficial with this, when the temporary inconveniences attending the change had passed away. The facility consists in the ease of interposing between the sovereign (or pound) and the shilling, a new coin equivalent to two shillings (to be called by a distinctive name); of considering the farthing (which now passes as the $\frac{1}{960}$th part of the pound) as the $\frac{1}{1000}$th part of that unit; of establishing a coin of value equal to $\frac{1}{100}$th part of the pound; and of circulating, besides the principal members of a decimal coinage, other coins of values bearing a simple relation to them, including coins of the same value as the present shilling and sixpence. We do not feel ourselves at liberty further to enter into this subject; but we have felt it imperative on us to advert to it, because no circumstance whatever would contribute so much to the introduction of decimal scale in weights and measures, in those respects in which it is really useful, as the establishment of a decimal coinage."

The report contains also the following recommendations:— "That the standard of length be defined by the whole length of a certain piece of metal or other durable substance, supported in a certain manner, at a certain temperature; or, by the distance between two points or lines engraved upon the surface of a certain piece of metal or other durable substance, supported in a certain manner, at a certain temperature: but that the standard be in no way defined by reference to any natural basis, such as the length of a degree of meridian on the earth's surface in an assigned latitude, or the length of the pendulum vibrating seconds in a specified place.

" That the length of the new Parliamentary standard be one yard; there appearing no sufficient reason for departing from the length hitherto adopted for the standard.

" That the name *milyard*, or some other to be fixed by act of Parliament, be recognized as describing the measure of 1000 yards, without the necessity of further definition.

" That the standard of weight be defined by a certain piece of metal or other durable substance.

" That the standard of capacity be defined by the capacity which, under certain circumstances of the barometer and thermometer, contains a certain weight of distilled water, but that it be in no way defined by reference to the standard of length. That, nevertheless, the contents of the standard of capacity, as expressed in units and fractions of the cubical measure dependent on the standard of length, be stated by way of recital, as the best determination made by scientific men which has come to the knowledge of the Legislature, and as permitted for use when it is impracticable to refer to trial by the weight of distilled water.

" That no standard of capacity be constructed; the definition of the gallon as ' the capacity which contains 10 pounds' weight of distilled water weighed in air at the temperature of 62° Fahrenheit, the barometer being at 30 inches,' as specified in the act 5 Geo. IV., being still retained.

" That where it shall be impracticable to ascertain the contents of any vessel by the weight of distilled water which it contains, or by pouring water into it from a standard measure, it be permitted to ascertain the contents by gauging (the gallon being assumed to be 277·274 cubic inches), or by pouring seed into it from a standard measure.

" That a sufficient number of weights of multiples of grains be constructed (we would recommend 10 sets of 10, 100 and 1000 grains); and that their relative errors be found by comparison among themselves, and their absolute errors by comparison with the copies of the old troy pound of 5760 grains.

"That by the use of these, a platinum weight of 7000 grains be constructed; and that this be declared the Parliamentary standard of weight, by the name of the pound weight; the distinctive word 'avoirdupois' being hereafter omitted.

"That the avoirdupois dram be no longer recognized in any contract.

"That the troy pound be no longer recognized; and that the word 'pound,' or any letters or symbols commonly used to denote the pound, as applied to a weight, be always interpreted to mean the pound of 7000 grains (formerly called the avoirdupois pound).

"That the word 'ounce' be always interpreted to mean $\frac{1}{16}$th part of the pound, except it be described as the 'troy ounce.'

"That the name *millet*, or some other to be fixed by act of Parliament, be recognized as describing the thousandth part of the pound, without the necessity of further definition.

"That the only legal weights above one pound, be weights of multiples of 1 pound not exceeding 10 pounds; and weights of 10 pounds and its multiples, not exceeding 100 pounds.

"That the name *centner*, or some other to be fixed by act of Parliament, be recognized as describing the weight of 100 pounds, without the necessity of further definition.

"That the Exchequer standards of weight be 1 lb. and several multiples thereof, not exceeding 10 lbs.; 10 lbs. and several multiples thereof, not exceeding 100 lbs.; 100 lbs.; but no weight of 14 lbs. or any multiple of 14 lbs. except 70 lbs. Also the tenth, hundredth, and thousandth part of the pound, and several multiples of them. Also 1 troy ounce, 10 troy ounces, 100 troy ounces, and several multiples of each; 1000 troy ounces; but no weight of 12 troy ounces or any of its multiples (except those included in the decimal scale above described). Also 1 pennyweight, and several multiples of it. Also 1 grain, 10 grains, 100 grains, 1000 grains, 10,000 grains, and several multiples of each.

"That the Exchequer standards of weight be used in the trial of weights brought for examination in the same manner as at present; and that no greater error than $\frac{1}{20,000}$th part of the quantity weighed be tolerated.

"We would recommend that the influence of the Government be employed to introduce the use of the decimal sub-divisions of the acre; of which the first step is actually given by the square land-chain, and the others are contained in the numerical expression obtained in the first multiplication for finding the area of a piece of ground.

"Before leaving the subject of length-measures, we beg strongly to call the attention of Government to the importance of encouraging the use of the decimal scale, and especially of sanctioning its use where custom has already adopted it. We beg particularly to indicate the decimal subdivision of the foot (which is even now engraved on foot rules and levelling staves), as one extensively used in the practice of engineers, and one which we would recommend for the recognition of Government in every case."

Although the preceding recommendations of the Commission have not been carried out they are here inserted, as the subject is very important and worthy of being generally understood.

It is probable that the varieties of gallons arose from the varieties of pounds, since the original definition of the gallon depended upon the pound, and there is a close relation not only between the old gallons and the weights, but even between the different versions of the old gallons and the weights. There was a gallon of 282 cubic inches in the Exchequer as a standard; there was one of $272\frac{1}{4}$ inches in common use; there was one of 231 inches in common use; and there was one of 224 inches in the Guildhall. Now 282 and 232 are, as near as integers can represent it, in the proportion of the pound avoirdupois to the pound troy; and $272\frac{1}{4}$ and 224 are as nearly in the same proportion. It is unlikely that this should have been accidental.

The imperial weights and measures now in use are fixed by the act 5 Geo. IV. c. 74, of which the following is an abstract.

*Abstract of an Act of Parliament, 5 Geo. IV. c. 74, passed June 17, 1824, "for ascertaining and establishing Uniformity of Weights and Measures," which came into operation on the 1st of January, 1826.*

This is an act declaratory of the accuracy and legality of the existing standards, both of long measure and weight; but it orders the abolition of all measures of capacity for wine, ale, corn, coals, &c.; and the establishment of one only in their stead, which is to be called " Imperial Measure."

1. The standard yard is declared to be the distance between the centres of the two points on the gold studs in the straight brass rod now in the custody of the Clerk of the House of Commons, whereon is engraved " Standard Yard, 1760," the brass being at the temperature of 62° by Fahrenheit's thermometer. It is to be called " the Imperial Standard Yard."

2. The dimensions for measuring land are unaltered : they are the statute measure, of which the acre contains 4840 square yards.

3. The yard, if lost, defaced, or otherwise injured, may be restored by comparing it with the pendulum vibrating seconds of mean time, in the latitude of London, in a vacuum on the level of the sea, the yard being in the proportion of 36 inches to 39·1393 of the pendulum.

4. The standard pound is declared to be the standard brass weight of one pound troy weight made in the year 1758, and now in the custody of the Clerk of the House of Commons, and it is denominated " the Imperial Troy Pound."

5. If the imperial pound be lost, defaced, or otherwise

injured, it shall be restored by comparison with a cubic inch of distilled water, weighed in air by brass weights, at the temperature of 62° of Fahrenheit's thermometer, the barometer being at 30 inches. Such cubic inch of water is equal to 252·458 grains, the standard troy pound being 5760 such grains; and the avoirdupois pound 7000 such grains troy. All operations of restoring or correcting standards are to be made under the directions of the Lord High Treasurer, or the Commissioners of His Majesty's Treasury, or any three of them for the time being.

6. The standard measure of capacity, as well for liquids as for dry goods, not measured by heaped * measure, shall be the gallon, containing 10 lbs. avoirdupois weight of distilled water, weighed in air at the temperature of 62° of Fahrenheit's thermometer, the barometer being at 30 inches; and such brass measure shall be "the Imperial Standard Gallon," and is declared to be the unit and only standard measure of capacity from which all other measures of capacity for all sorts of liquids, as well as for dry goods not measured by heaped * measure, shall be derived; and that all measures shall be taken in parts and multiples, the quart, pint, peck, bushel, and quarter continuing in the same proportion as heretofore for dry measure.

7. That the standard measure of capacity for coals, culm, lime, fish, potatoes, or fruit, and all other goods and things commonly sold by heaped * measure, shall be the imperial bushel, containing 80 lbs. avoirdupois of water as aforesaid; the same being made round, with a plain and even bottom, and being 19½ inches from outside to outside.

8. That coals and other goods sold by heaped * measure shall be duly heaped up in the said bushel in the form of a cone, such cone to be of the height of at least 6 inches; and the outside of the bushel to be the extremity of the base of

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* Heaped measures have been abolished since 1st Jan. 1835 (4, 5, and 6 Will. IV. c. 49 and 63).

such cone; and that three bushels shall be a sack, and twelve such sacks a chaldron.

9. That for articles not sold by heaped * measure, such as corn, pulse, &c., the same shall be stricken with a round stick or roller, straight, and of the same diameter from end to end.

10. That this law of imperial measure is not to extend to Ireland for any articles hitherto sold by weight.

11. That copies and models of the standard of length, weight, and measure aforesaid, are to be made and verified within three months after passing the act, under the direction of the Lords of the Treasury; and that such copies or models shall be deposited in the office of the Chamberlain of the Exchequer at Westminster; and that copies shall be sent to the Lord Mayor of London, and the Chief Magistrate of Edinburgh and of Dublin, and to such other places or persons as the Lord High Treasurer or Commissioners of the Treasury may from time to time direct.

12. That His Majesty's justices of the peace, in every county of the British Empire, or every town or place, being a county within itself, shall, within six months after passing the act, purchase a model of each of the standards aforesaid, with their parts and multiples; and that such shall be compared and verified with the models deposited at the Exchequer, on payment of the usual fees; and that such verified copies shall be placed for custody and inspection with such persons as the magistrates shall choose to appoint; and that the same shall be produced by the keepers thereof, upon reasonable notice, the persons requiring such production paying the customary charges for the same.

13. The expenses of procuring models for magistrates, counties, &c., are to be raised by the usual modes of taxation.

14. That when reference cannot be easily had to verified copies of the standard measures of capacity, it may be lawful for any justice of the peace, or magistrate having jurisdiction, to ascertain the content of a measure of capacity, by direct

reference to the weight of pure or rain water which such measure is capable of containing; 10 lbs. avoirdupois weight of such water, at the temperature of 62° by Fahrenheit's thermometer, being the standard gallon ascertained by the act, the same being in bulk equal to 277·274 cubic inches.

15. That all contracts for sale, &c., by weight or measure, shall be according to the imperial standard, when no special agreement shall be made to the contrary; and in all cases where any special agreement shall be made, with reference to any weight or measure established by local custom, the proportion which every such local weight or measure shall bear to any of the said standard weights and measures, shall be expressly declared and specified, or otherwise such agreement shall be null and void.

16. That existing measures may be used, being marked so as to show the proportions which they have to the imperial measures; but that after the 1st of May, 1825, no person shall be permitted to make any weights or measures, otherwise than according to the provisions of the new act.

17. That for ascertaining rents, &c., payable in grain or malt in England or Ireland, the amount is to be ascertained according to the standard by this act established, by a jury of 12 substantial freeholders.

18. That for ascertaining rents, &c., payable in grain or malt in Scotland, such rents shall be determined according to the new standard, by such juries as strike the fiar prices of grain.

19. That tables of equalization shall be made and constructed under the Commissioners of the Treasury, showing the proportions between the weights and measures heretofore in use and those now established.

20. That tables shall be also constructed for the collection of the customs and excise, under the direction of the said Commissioners of the Treasury.

21. The present act may be enforced in England and

Scotland by all the regulations and penalties contained in the following statutes, except such parts of the said statutes as may be repealed or altered by this present act, viz. 29 Geo. II. c. 25; 31 Geo. II. c. 17; 35 Geo. III. c. 102; 55 Geo. III. c. 43.

22. The present act may be enforced in Ireland by all the regulations and penalties contained in the following statutes, except such parts of the said statutes as are repealed or altered by this act, viz. 4 Anne (*I.*); 11 Geo. II. (*I.*); 25 Geo. II. (*I.*); 27 Geo. III. (*I.*); 28 Geo. III. (*I.*)

23. The repeal of numerous laws is declared in this article; some of uncertain date before the reign of Edward the Third, and many since that period. These are chiefly statutes which fixed the weight and measure of certain kinds of goods, such as wool, cheese, salt, wine, beer, fish, fruit, &c.; and also the denominations which determine their quantity, as the sack, wey, load, tun, hogshead, barrel, &c. For the particulars of these statutes (which are now repealed either wholly or in part), recourse must be had to the originals, as referred to in the margin of the present act, and which amount to about 60 statutes.

24. That this act shall not extend to affect or alter the rights of the Dean and High Steward of Westminster, to appoint proper officers to sign and seal all weights and measures used in the said city and the liberties thereof.

25. That gaugeable liquors brought into the port of the city of London shall be gauged as heretofore by the Lord Mayor or his deputies; but the contents shall be ascertained by the standard measure directed by this act.

26. This act shall not extend to prohibit or diminish the right of the Lord Mayor and Commonalty of the city of London, concerning the office of gauger of any gaugeable liquors imported within the city of London, or the liberties thereof.

*Numerical relations appertaining to the foregoing Act for equalizing Measures.*

Weight of a cubic inch of distilled water, in a vacuum at the temperature 62° = 252·722 grains.

Consequently, a cubic foot = 62·3862 lbs. avoirdupois.

Weight of a cubic inch of distilled water in air at 62° of temperature with a mean height of the barometer = 252·458 grains.

Consequently, a cubic foot = 62·3206 lbs. avoirdupois.

And an ounce of water = 1·73298 cubic inches.

Cubic inches in the imperial gallon = 277·274.

Diameter of the cylinder, containing a gallon at one inch in depth = 18·78933 inches.

*Specific Gravity of Water at different temperatures, that at 62° being taken as unity.*

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 70° | 0·99913 | 61° | 1·00010 | 52° | 1·00076 | 43° | 1·00109 |
| 69 | 0·99925 | 60 | 1·00019 | 51 | 1·00082 | 42 | 1·00111 |
| 68 | 0·99936 | 59 | 1·00027 | 50 | 1·00087 | 41 | 1·00112 |
| 67 | 0·99947 | 58 | 1·00035 | 49 | 1·00091 | 40 | 1·00113 |
| 66 | 0·99958 | 57 | 1·00043 | 48 | 1·00095 | 39 | 1·00113 |
| 65 | 0·99969 | 56 | 1·00050 | 47 | 1·00099 | 38 | 1·00113 |
| 64 | 0·99980 | 55 | 1·00057 | 46 | 1·00102 | 37 | 1·00112 |
| 63 | 0·99990 | 54 | 1·00064 | 45 | 1·00105 | 36 | 1·00111 |
| 62 | 1·00000 | 53 | 1·00070 | 44 | 1·00107 | 35 | 1·00109 |

The difference of temperatures between 62° and 39°, where water attains its greatest density, will vary the bulk of a gallon of water rather less than the third of a cubic inch.

And assuming from the mean of numerous estimates the expansion of brass 0·00001044 for each degree of Fahrenheit's thermometer, the difference of temperatures from 62° to 39° will vary the content of a brass gallon measure just one-fifth of a cubic inch.

It appears that the specific gravity of clear water from the Thames exceeds that of distilled water at the mean tem-

perature, in the proportion of 1·0006 to 1, making a difference of about one-sixth of a cubic inch on a gallon.

Rain water does not differ from distilled water, so as to require any allowance for common purposes.

### Comparisons of Old and New Measures.

The foregoing calculation of the diameter of a cylinder, which contains 1 gallon for every inch in depth, will be found useful in constructing both corn and coal bushels on the new plan of imperial measure.

Thus the corn bushel, with the diameter 18·78933, and 8 inches deep, will answer to 2218·192 cubic inches, the imperial bushel; being about $\frac{1}{32}$ part more than the Winchester bushel, which is 2150·42 cubic inches.

The new coal bushel, with the above diameter and depth, and heaped as directed in Art. 8, the rim being about $\frac{2}{5}$ of an inch thick, and the diameter $19\frac{1}{2}$ inches from outside to outside, will measure 2816·459 cubic inches, which is only $1\frac{1}{4}$ inch more than the present coal bushel, viz. 2814·9 cubic inches.

The proportion between the old and new wine measures is very nearly as 5 to 6. Thus 5 imperial gallons equal 6 wine gallons and about $\frac{1}{4500}$ of a gallon over.

The proportion between the old and new ale measures is about as 60 to 59.

The following table will show the relative contents more accurately, both in measure and in weight, the latter having been computed according to the principles stated in the act.

*Table showing the Contents of the different Gallons, both in Measure and Weight.*

|  | Cubic Inches. | Avoirdupois Weight. | | | Troy Weight. | | | |
|---|---|---|---|---|---|---|---|---|
|  |  | lb. | oz. | dr. | lb. | oz. | dwt. | gr. |
| Imperial Gallon . . | 277·274 | 10 | 0 | 0 | 12 | 1 | 16 | 16 |
| Corn Gallon . . . | 268·8 | 9 | 10 | $1\frac{3}{4}$ | 11 | 9 | 7 | 12 |
| Wine Gallon . . . | 231 | 8 | 5 | $6\frac{1}{4}$ | 10 | 1 | 9 | 22 |
| Ale Gallon . . . | 282 | 10 | 2 | $11\frac{1}{2}$ | 12 | 4 | 6 | 8 |

These results will be found useful in comparing different vessels where gauging cannot be relied on; and although they are computed according to the conditions of temperature, &c., as stated in Art. 6, yet the proportions will answer with sufficient correctness for all common purposes of business, with any kind of fresh water; but where great accuracy is required, it may be determined at any other temperature by means of the table given on page 19. Thus to find the weight of the wine gallon at 56° Fahrenheit, multiply its weight at 62°, viz. 8·3311 by 1·0005, and the result will be 8·3353, the required weight.

The reduction of the different measures may be easily computed by means of *factors* or multipliers, given in the following table :—

*Table of Factors, for converting Old and New Measures.*

|  | By Decimals. | | | By Fractions. | | |
|---|---|---|---|---|---|---|
|  | Corn Measure. | Wine Measure. | Ale Measure. | Corn Measure. | Wine Measure. | Ale Measure. |
| To convert Old Measures into New . | ·96943 | ·83311 | 1·01704 | $\frac{33}{34}$ | $\frac{5}{6}$ | $\frac{60}{59}$ |
| To convert New Measures into Old . | 1·03153 | 1·20032 | ·98324 | $\frac{34}{33}$ | $\frac{6}{5}$ | $\frac{59}{60}$ |

EXAMPLE I.—Reduce 63 gallons wine measure to imperial measure.

$63 \times ·83311 = 52·486$; or $63 \times \frac{5}{6} = 52\frac{1}{2}$ imperial gallons nearly.

EXAMPLE II.—Reduce 8 bushels imperial measure to Winchester measure.

$8 \times 1·03153 = 8·25224$; or $8 \times \frac{33}{32} = 8\frac{1}{4}$ Winchester bushels nearly.

It should be observed, that the computations by the frac-

tions are only approximative, but they will be found suffi-
ciently correct for most purposes.

———

In France the new system of measures, now completely
established, was introduced in 1799, and is called metrical,
as derived from the measurement of the earth.   Its funda-
mental measure, the *metre*, is presumed to be the ten-mil-.
lionth part of a meridian line drawn from the pole to the
equator, and is 39·37079 English inches.   Taking the one-
hundredth of the metre, we obtain the *centimetre ;* and for
the standard of weight the *gramme* is a cubic centimetre of
distilled water at the temperature of maximum density, the
same being ·0022054 of an English avoirdupois pound, or
15·438 English grains.   All the multiples and subdivisions
of the current coins as well as of every measure and weight
are decimal, full details of which will be found under the
article " France."   The advantage of such a system, when
once established, is so great, that all who are capable of ap-
preciating its merits look forward with great interest to the
introduction of a similar one into Great Britain.

## COINS.

Coins are pieces of metal, mostly of a round and flat
shape, stamped by authority with certain impressions, which
are intended to give them a legal and current value, and also
to serve as a guarantee for their weight and fineness.

Gold and silver are the principal metals of which coins
are made, being found the fittest for that purpose, both on
account of their qualities and their scarcity.

Copper and billon are likewise used, but always for coins
of inferior value.

The proportional value of gold and silver is variable ; for

although they are generally considered as equivalents of other property, and standard measures of value by which commodities are bought, sold, and estimated, yet, being themselves also saleable articles, they are liable to constant fluctuation in price, as exchanged for each other, as well as with respect to all property.

Pure gold and silver are invariable in their qualities, from whatever mines they are produced. In their fine state they are considered too flexible to make coins fit for general wear; and hence the practice of mixing with them a certain proportion of harder metal, which is called *alloy*.

The coinage of William the Conqueror was after the plan established by Charlemagne, in France, in the eighth century, and is supposed to be derived from the Romans, with respect to dividing the pound into 20 shillings and the shilling into 12 pence.

The Saxon pound weight was adopted by King William, and was called the moneyer's pound; and from it 20 shillings were coined, which made $21\frac{1}{3}$ to the pound troy. This number was increased in succeeding reigns until the year 1665 (18th Charles II.), at which time it was settled at 62 shillings, and so continued until the year 1816, when it was altered to 66 shillings, its present rate.

In the early coinages the silver penny or sterling was minted with a deep cross. When it was broken into two parts, each was called a *halfpenny*, and when into four, each part was called a *fourth-thing*, or farthing. Larger silver pieces of fourpence were also coined, which were called *greats*, or *groats*, and also *grosses*. There were besides, silver halfpence and farthings minted; but no shillings until the reign of Henry VII. (1504), nor copper coins until the reign of Charles II. (1665.)

As to gold coins, the first after the Norman Conquest, according to Snelling, was struck by order of Henry III. in the year 1257. It weighed two silver pence, passed for twenty pence, and was called the *gold pennie*. The same

author observes, "that the king tried this expedient of coining gold through necessity, and that the city of London made a representation against this measure."

The next gold coinage in England was in the year 1344, when the florin was struck, which took its name from *Florence*, where it had been first minted in 1252. It was afterwards coined in most countries of Europe. In Germany and Holland it was called the *gulden*, on account of its having been originally gold. The florin, however, has been long a silver coin, and also a money of account.

The above coins are supposed to have been of pure gold; but those minted in the subsequent reigns down to that of Henry VIII. were 23 carats 3½ grains fine, with ½ grain of alloy. This was called the old standard to distinguish it from the new or the present standard, which was first called *crown gold*, as being minted into crown pieces in 1527.

The principal gold coins of the old standard were nobles of 6*s*. 8*d*. each, with halves and quarters: the latter were called *farthing nobles*. There were also marks of 13*s*. 4*d*., angels of 10 shillings, and sovereigns of 20 shillings each. Sovereigns were first minted by Henry VII., and were frequently altered during the four subsequent reigns; but in the 2nd of James I. they were fixed at 22 carats, at which fineness all gold coins have since been minted. The 20 shilling pieces first coined at this rate were called *unites*, and 33½ pieces were struck from the pound troy; but in the reign of Charles II. (1666) a new coinage of 44½ to the lb. was minted, and these were called *guineas*, on account of the country from which the gold was originally brought. The guinea varied in its current price from 20 shillings up to 30, until the year 1717, when, by the recommendation of Sir Isaac Newton, it was fixed at 21 shillings, its present rate.

The system of both metals being standard measures of value, which they were in virtue of each being a legal tender

to any amount, was the source of much disorder; for as their market prices were always subject to variation, one kind of coin had a constant tendency to drive the other out of circulation.

To remedy this great inconvenience, our present monetary system was established in 1816, at which time, as gold was the metal in which the principal payments were made in England, the following law was enacted:—" That gold coins shall be in future the sole standard measure of value, and legal tender of payment, without any limitation of amount, and that silver coins shall be a legal tender for the limited amount of forty shillings only, at any one time.".

In the same year a new coinage of 20 shilling pieces, called *sovereigns*, was minted, in due proportion to the guinea, viz. $46\frac{2}{8}$ sovereigns to the pound troy; and an extensive silver coinage also took place, at the new rate of 66 instead of 62 shillings to the troy pound, which affords a profit or *seignorage* of $6\frac{14}{31}$ per cent., but its actual amount must always depend on the market price of the metal.

The total existing quantity of gold when compared with that of silver is estimated to be nearly as 1 to 50, and the relative value of gold to silver is as about 16 to 1; consequently the value of the general silver currency of the world as compared with the gold currency is about 3 to 1. In Great Britain however, gold being the only legal tender for·sums above forty shillings, the metallic currency is essentially gold, and the silver and copper coins are only introduced as auxiliary tokens for the purpose of effecting the fractional and smaller payments. The circulation of silver coin, about 13,000,000*l.* sterling including our colonies, is therefore of inconsiderable amount when compared with that of other countries.

The following table, extracted from Kelly's Universal Cambist, exhibits the history of English coins in a condensed form. It should be observed that the last column is calculated according to the Mint proportions which overrate the metallic value of silver.

C

*Table showing the Alterations English Coins have undergone with respect to Weight and Fineness, and also the Comparative Value of Gold and Silver, from the Reign of* WILLIAM THE CONQUEROR *to that of* GEORGE IV.

| Date. | Reign. | SILVER. | | GOLD. | | Comparative Value of fine Gold and Silver. |
| --- | --- | --- | --- | --- | --- | --- |
| | | Fineness of Silver Coins. | Pound Troy of such Silver coined into | Fineness of Gold Coins. | Pound Troy of such Gold coined into | |
| | | oz. dwt. | £ s. d. | car. gr. | £ s. d. | Gold. Silver. |
| 1066 | William I. | 11 2 | 1 1 4 | ... ... | ... ... | ... ... |
| 1280 | 8 Edward I. | — — | 1 1 4 | ... ... | ... ... | ... ... |
| 1344 | 18 Edward III. | — — | 1 1 6 | 23 3½ | 14 0 10 | 1 to 12·584 |
| 1349 | 23 ——— | — — | 1 3 0 | — — | 14 18 8 | 1 — 11·571 |
| 1356 | 30 ——— | — — | 1 6 8 | — — | 16 0 0 | 1 — 11·158 |
| 1421 | 9 Henry V. | — — | 1 12 0 | — — | 17 16 0 | 1 — 10·331 |
| 1464 | 4 Edward IV. | — — | 2 0 0 | — — | 22 4 6 | 1 — 10·331 |
| 1465 | 5 ——— | — — | 2 0 0 | — — | 24 0 0 | 1 — 11·158 |
| 1470 | 49 Henry VI. | — — | 2 0 0 | — — | 24 0 0 | 1 — 11·158 |
| 1482 | 22 Edward IV. | — — | 2 0 0 | ... ... | 24 0 0 | 1 — 11·158 |
| 1509 | 1 Henry VIII. | — — | 2 0 0 | ... ... | 24 0 0 | 1 — 11·158 |
| 1527 | 18 ——— | — — | 2 2 8 | 22 0 | 24 0 0 | 1 — 11·268 |
| 1543 | 34 ——— | 10 0 | 2 8 0 | 23 0 | 28 16 0 | 1 — 10·434 |
| 1545 | 36 ——— | 6 0 | 2 8 0 | 22 0 | 30 0 0 | 1 — 6·818 |
| 1546 | 37 ——— | 4 0 | 2 8 0 | 20 0 | 30 0 0 | 1 — 5·000 |
| 1547 | 1 Edward VI. | 4 0 | 2 8 0 | 20 0 | 30 0 0 | 1 — 5·000 |
| 1549 | 3 ——— | 6 0 | 3 12 0 | 22 0 | 34 0 0 | 1 — 5·151 |
| 1551 | 5 ——— | 5 0 | 3 12 0 | 23 3½ | 34 0 0 | 1 — 11·000 |
| 1552 | 6 ——— | 11 1 | 3 0 0 | 22 0 | 36 0 0 | 1 — 11·050 |
| 1553 | 1 Mary. | 11 0 | 3 0 0 | 23 3½ | 36 0 0 | 1 — 11·057 |
| 1560 | 2 Elizabeth. | 11 2 | 3 0 0 | 22 0 | 36 0 0 | 1 — 11·100 |
| 1600 | 43 ——— | — — | 3 2 0 | 23 3½ | 36 10 0 | 1 — 10·904 |
| 1604 | 2 James I. | — — | 3 2 0 | 22 0 | 33 10 0 | 1 — 12·109 |
| 1626 | 2 Charles I. | — — | 3 2 0 | — — | 41 0 0 | 1 — 13·346 |
| 1666 | 18 Charles II. | — — | 3 2 0 | — — | 44 10 0 | 1 — 14·485 |
| 1717 | 3 George I. | — — | 3 2 0 | — — | 46 14 6 | 1 — 15·209 |
| 1816 | 56 George III. | — — | 3 6 0 | — — | 46 14 6 | 1 — 14·237 |
| 1821 | 2 George IV. | — — | 3 6 0 | — — | 46 14 6 | 1 — 14·287 |

By the above table it appears that silver coins have been diminished in value, during the last 500 years, in the ratio of 99 to 32, and gold coins nearly as 3¼ to 1.

In all regular governments, there has been a standard for coins fixed by law; that is, a certain proportion between the quantity of pure metal and its alloy. Thus, the established legal standard for gold in England is $\frac{22}{24}$ or $\frac{11}{12}$; that is, eleven parts of pure metal, and one of alloy. The fineness of gold is generally expressed in carats; the whole weight being supposed to be divided into 24 equal parts or

carats, 22 of which are of pure metal and 2 of alloy: and hence, the English standard gold is said to be 22 carats fine; and the carat is divided into 4 parts, called grains: but these proportions differ in other countries. Experiments have shown that the proportions of the British gold standard give the combination of the two metals[1] which possesses the greatest degree of hardness.

The carat is the 24th part of the pound troy, or 10 penny-weights; and therefore the carat grain is $2\frac{1}{2}$ pennyweights or 60 grains.

The English standard for silver is $\frac{222}{240}$ or $\frac{37}{40}$; it is ex-

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[1] Wrought gold has two legal standards; one is 22 carats, the same as the coin, and the other is 18 carats. The latter commenced in 1798, and is used chiefly in the manufacture of watch-cases and rings.

Wrought silver has also two legal standards; one the same as the coin, and the other 8 dwts. better, that is 11 oz. 10 dwts. The latter, called new-sterling, is seldom used.

All articles manufactured of gold and silver, except watch-cases, have to be taken to the Assay Office of the district, and if found of legal quality are stamped thus:—

*The Hall Mark,* showing the district where manufactured, or the hall where assayed, is at *Birmingham,* an anchor; *Chester,* three wheatsheaves, or a dagger; *Dublin,* a harp or figure of Hibernia; *Edinburgh,* a thistle, or castle and lion; *Exeter,* a castle with two wings; *Glasgow,* a tree, and a salmon with a ring in its mouth; LONDON, a leopard's head; *Newcastle-on-Tyne,* three castles; *Sheffield,* a crown; *York,* five lions and a cross.

*The Standard Mark* for gold of 22 carats, and silver of 11 oz. 2 dwts., is for England a lion passant; for Edinburgh, a thistle; for Glasgow, a lion rampant; for Ireland, a harp crowned. Gold of 18 carats fine, a crown and the figures 18. Silver of the new standard, figure of Britannia.

*The Duty Mark* is the head of the Sovereign, and indicates the duty has been paid.

*The Date Mark* is a letter of the alphabet, which is changed every year; it differs however in different companies. The Goldsmiths' company of London have used the following: from 1716 to 1755, Roman capital letters; 1756 to 1775, small Roman letters; 1776 to 1795, old English letters; 1796 to 1815, Roman capital letters, A to U; 1816 to 1835, small Roman letters a to u; 1836 to 1855, old English letters a to b. In 1856 a new Date Mark will be issued. (I and J are always regarded as one letter.)

pressed in troy ounces and pennyweights, that is, 11 oz. 2 dwt. of pure, and 18 dwt. of alloy, making together 1 pound troy.

The alloy of silver is mostly copper, and that of gold both silver and copper; but in the computation of coins the alloy is never reckoned of any value, being always allowed in order to save the trouble and expense that would be incurred in refining the metals to their highest degree of purity.

Besides this standard fineness of coins, there is also a legal weight fixed according to the mint regulation or rate of coinage of each country. Thus, in England a pound troy of standard gold is coined into $44\frac{1}{2}$ guineas, or $46\frac{29}{4}$ sovereigns, and a pound of standard silver into 66 shillings, with divisions and multiples in proportion; and hence, the mint price of standard gold is 3*l.* 17*s.* 10$\frac{1}{2}$*d.* per ounce, and that of standard silver, 66 pence per ounce. Before the year 1816, silver was coined at the rate of 62 pence per ounce; and this is sometimes reckoned the standard price in the valuation of foreign silver coins.

Copper money is coined in the proportion of 24 pence to the pound avoirdupois. Thus the penny should weigh 10$\frac{2}{3}$ drams or 291$\frac{2}{3}$ grains, and the other pieces in proportion.

Silver coin is a legal tender for the limited amount of 40 shillings; and copper to the amount of 12 pence.

According to the mint regulations of most countries, there is an allowance for deviation from the standard weight and fineness of coins, which is called the *remedy of the mint.* In some places the remedy is allowed in the weight, in others in the fineness; but mostly in both weight and fineness. It is considered generally as an allowance for the fallibility of workmanship. In some mints, however, it is made a source of emolument; and where governments issue coins at a rate above their intrinsic value, or the market price of the metal, the profit thus made is called *seignorage,* and charges for mint expenses are called *brassage.*

The *remedy of the mint,* according to the law of 1815, for gold coins is 12 grains per lb. in the weight, and $\frac{1}{16}$ of a

carat in the fineness; and for silver coins 1 dwt. per lb. in the weight, and the same in the fineness. The remedy for copper coins is $\frac{1}{40}$ of the weight.

The following tables exhibit the standard weights and fineness of British gold, silver, and copper coins; those marked † are not now in ordinary circulation :—

### British Gold Coins.

| Number of pieces in the Troy pound. | Standard Weight of each piece. | | Fine Gold in each piece. | | Alloy in each piece. | |
|---|---|---|---|---|---|---|
| | dwt. | gr. | dwt. | gr. | dwt. | gr. |
| 93$\frac{9}{20}$ Half sovereigns | 2 | 13·637 | 2 | 8·500 | .. | 5·137 |
| 46$\frac{29}{40}$ Sovereigns | 5 | 3·274 | 4 | 17·001 | .. | 10·273 |
| †23$\frac{29}{80}$ £2 pieces | 10 | 6·548 | 9 | 10·003 | .. | 20·545 |
| † 9$\frac{69}{200}$ £5 ,, | 25 | 16·372 | 23 | 13·008 | 2 | 3·364 |
| †178 ½ guineas | 1 | 8·3595 | 1 | 5·6629 | .. | 2·6966 |
| †133½ ⅓ ,, | 1 | 19·1460 | 1 | 15·5505 | .. | 3·5955 |
| 89 ½ ,, | 2 | 16·7190 | 2 | 11·3258 | .. | 5·3932 |
| 44 Guineas | 5 | 9·4382 | 4 | 22·6516 | .. | 10·7866 |
| † 22½ 2 guineas | 10 | 18·8764 | 9 | 21·3034 | .. | 21·5730 |
| † 8½ 5 guineas | 26 | 23·1910 | 24 | 17·2584 | 2 | 5·9326 |

Gold Standard $\left\{\begin{array}{l} 22 \text{ carats, or } \frac{1}{1}\frac{1}{2} \text{ fine gold} \\ 2 \quad,, \quad \frac{1}{12} \text{ alloy} \end{array}\right\}$ per pound troy.

### British Silver Coins.

| Number of pieces in the Troy pound. | Standard Weight of each piece. | | Fine Silver in each piece. | | Alloy in each piece. | |
|---|---|---|---|---|---|---|
| | dwt. | gr. | dwt. | gr. | dwt. | gr. |
| † 792 Pence | .. | 7·2727 | .. | 6·7272 | .. | 0·5455 |
| † 396 Twopences | .. | 14·5454 | .. | 13·4545 | .. | 1·0909 |
| 264 Threepences | .. | 21·8181 | .. | 20·1818 | .. | 1·6363 |
| 198 Fourpences | 1 | 5·0909 | 1 | 2·9090 | .. | 2·1819 |
| 132 Sixpences | 1 | 19·6363 | 1 | 16·3636 | .. | 3·2727 |
| 66 Shillings | 3 | 15·2727 | 3 | 8·7272 | .: | 6·5455 |
| 33 Florins | 7 | 6·5454 | 6 | 17·4544 | .. | 13·0910 |
| 26¾ Halfcrowns | 9 | 2·1818 | 8 | 9·8181 | .. | 16·3637 |
| 13⅕ Crowns | 18 | 4·3636 | 16 | 19·6363 | 1 | 8·7273 |

Silver Standard $\left\{\begin{array}{l} 11 \text{ oz. } 2 \text{ dwt. or } \frac{37}{40} \text{ fine silver} \\ 18 \quad,, \quad \frac{3}{40} \text{ alloy} \end{array}\right\}$ per pound troy.

### British Copper Coins.

| Denomination of Coin. | Number of pieces in the Avoirdupois lb. | Value of 1 lb. | Number of pieces in a ton. |
|---|---|---|---|
| Pence | 24 | | 53,760 |
| Halfpence | 48 | | 107,520 |
| Farthings | 96 | 2s. | 215,040 |
| †½ Farthings | 192 | | 430,080 |
| †⅓ Farthings | 288 | | 645,120 |

Value of 1 ton of coined copper, £224.

The silver coins in circulation are considered only as tokens, payable by the government, and pass for more than their metallic value as compared with gold. Precaution is taken that it shall not be worth while to melt the silver coin into bullion, and it is so nearly worth its current value that imitation would not be ventured on so small a profit. The government will always receive back its tokens however worn they may be, provided they be not wilfully defaced or fraudulently reduced. But gold, being the sole standard measure of value, and legal tender of payment, circulates as a commodity ; and hence the necessity of government receiving it at value on its return to the mint, and making a deduction for loss of weight when the same exceeds the remedy of the mint. The wear and tear of the gold coinage is such, that very nearly 3 per cent. of the whole circulation goes out annually ; and the quantity which will suffice to throw a sovereign out of circulation is $\frac{257}{1000}$th parts or about one-fourth of a grain.

In 1853 a Select Committee was appointed to take into consideration, and report to Parliament, the practicability and advantages, or otherwise, that would arise from adopting a decimal system of coinage ; and the Report was made in the same year. The practical substance of this important document is conveyed in the following extracts.

" The first question to be decided is, what shall be the unit of the new system of coinage ; and your Committee have no hesitation in recommending the present pound sterling. Considering that the pound is the present standard,

and therefore associated with all our ideas of money value, and that it is the basis on which all our exchange transactions with the whole world rest, it appears to your Committee that any alteration of it would lead to infinite complication and embarrassment in our commercial dealings; in addition to which it fortunately happens, that its retention would afford the means of introducing the decimal system with the minimum of change. Its tenth part already exists in the shape of the florin or two-shilling piece, while an alteration of four per cent. in the present farthing will serve to convert that coin into the lowest step of the decimal scale which it is necessary to represent by means of an actual coin, viz. the thousandth part of a pound. To this lowest denomination your Committee propose, in order to mark its relation to the unit of value, to give the name of mil. The addition of a coin to be called a cent., of the value of 10 mils, and equal to the hundredth part of the pound, or the tenth part of the florin, would serve to complete the list of coins necessary to represent the monies of account, which would accordingly be pounds, florins, cents, and mils.

"As respects the coins, it will be necessary to withdraw from circulation certain of the coins at present in use, and to substitute in their place other coins, having reference to the decimal scale, before the decimal system can be considered as fully developed. Your Committee contemplate the retention under any circumstances, of the present sovereign (1000 mils), half-sovereign (500 mils), florin (100 mils), and shilling (50 mils, or 5 cents). The present sixpence, under the denomination of 25 mils, might be retained, and the crown, or piece of 250 mils, of which few are in circulation, need not be withdrawn. On the other hand, it will be desirable to withdraw the halfcrown, and the threepenny and fourpenny pieces, which are inconsistent with the decimal scale.

"With regard to the coins not in actual existence, but which it will be necessary eventually to introduce, it appears to your Committee, from the evidence taken by them on the

subject, that copper coins of 1, 2, and 5 mils, and silver coins of 20 and 10 mils, will be required, to which should be added such others as experience may show to be desirable.   It is important, however, to bear in mind, that the smaller the number of the coins with which it is practicable to effect purchases and exchanges, the better.

"Your Committee recommend that all the silver coins hereafter coined should have their value in mils marked upon them, in order that the public might, at the earliest possible period, associate the idea of the system with their different pecuniary transactions.   They further recommend that all the copper coins that may be issued under the decimal system, should also have their value in mils similarly marked upon them.   They believe that the necessary inconvenience attending a transition state will be far more than compensated by the great and permanent benefits which the change will confer upon the Public of this country, and of which the advantages will be participated in to a still greater extent by future generations."

Such is the decimal system recommended by the Committee, after having taken voluminous evidence upon the subject, and we must here accord to the report our full and unreserved approval, not only as regards the general principle, but in all its details.   It is precisely the system that must ere long be adopted, and it is indeed convenient that so little modification in existing coins will be requisite to bring it into operation.   The radical coins in circulation will be pounds, florins, cents, and mils; but it will not be absolutely essential to treat them as separate moneys of account.   There will be no necessity to employ any other denominations in accounts than the pound and mil.   For further details on this subject we must refer to Dr. Bowring's treatise on "The Decimal System," which also contains well executed wood-cut illustrations of English, French, Greek, and Roman coins, and an elaborate and interesting chapter on the numerals of different nations.

COMPUTATION OF COINS AND BULLION.

The value of bullion, or of a gold or silver coin, depends entirely upon the quantity of pure metal which, by a process called its assay, it is found to contain. The alloy which enters into its composition, is not estimated in the value, being always disregarded, and allowed as a compensation for the expense of refining.

Assays of gold are weighed in carats and carat grains, the carat being a nominal weight containing 4 carat grains. The carat weight is usually considered to be the 24th part of the pound troy = 10 dwts. = 240 grains troy; according to which the carat grain = 60 grains troy. It is not, however, requisite to give to it any fixed or absolute weight, as it is only used to determine the proportions of pure metal and alloy.

Assays of silver are weighed in ounces and pennyweights, the ounce being a nominal weight containing 20 pennyweights, and so far these weights are analogous to the troy table.

The British standard of gold is 22 carats fine; that is to say, 24 carats weight of the metal should contain just 22 carats of fine or pure gold, the same being $\frac{11}{12}$ of the total weight [1].

The British standard of silver is 11 oz. 2 dwts. fine; that is, 12 oz. weight of the metal should contain just 11 oz. 2 dwts. of fine or pure silver, being $\frac{222}{240}$ or $\frac{37}{40}$ of the total weight [1].

The reports of English assayers are made after comparing the ascertained weights with these standards, the difference being usually called the betterness or worseness of the metal, as the case may be. Thus gold found to be 23 carats 2 grains fine, is reported " better 1 carat 2 grains;" and gold of 20 carats 2 grains is reported " worse 1 carat 2 grains." Also pure silver, 12 oz. fine, would be reported

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[1] The British standards are also the mintage standards of the gold and silver coins of the realm.

"better 18 dwts.;" and silver ascertained to be 9 oz. 14 dwts. fine would be reported "worse 1 oz. 8 dwts."

*Gold.* Let $w$ denote the total weight of a piece of gold or gold coin, expressed in troy grains; and $g$ the number of carat grains in the fineness of the metal, as obtained from the assay report.

Then, as the British standard of fineness contains 88 carat grains, the proportion of standard gold contained in the metal is expressed by the fraction $\frac{g}{88}$. Consequently the actual weight, in troy grains, of standard gold contained in the piece $= \frac{wg}{88}$.

The same, in troy ounces, $= \frac{wg}{88} \times \frac{1}{480} = \frac{wg}{42240}$.

Now, the Mint value of a troy ounce of standard gold is $3l.$ $17s.$ $10\frac{1}{2}d.$, which, expressed in fractions of the pound sterling, $= \frac{623}{160}$.

Therefore the value of the piece of gold or coin, expressed in pounds sterling $=$

$$\frac{wg}{88} \times \frac{1}{480} \times \frac{623}{160} = \frac{6\cdot23}{67584} wg = \frac{wg}{10848}.$$

The same, in shillings sterling, $= \frac{10wg}{5424} = \frac{\cdot059}{32} wg.$

From the preceding the following practical rules are deduced:

(1.) From an assay report on gold metal to find the *fineness.*

*Rule.* Put down 22 carats and the report underneath it: add the report if "better," or substract it if "worse," and the sum or difference will be the "carats fine."

(2.) From an assay report and the weight of a piece of gold, or gold coin, to find the quantity of *fine* or *pure* gold it contains.

*Rule.* Find the fineness by (1), and reduce the same to

carat grains at the rate of 4 grains to the carat. Multiply the full weight of the metal by this number of carat grains, and divide by 96. The result will be the "fine weight."

(3.) To find the quantity of *standard* gold contained in the piece.

*Rule.* Proceed as in (2); only divide by 88 instead of 96, and the result will be the "standard weight."

Otherwise, multiply the weight of the piece by the number of carat grains in the assay report, "better or worse;" divide by 88, and add the quotient to the full weight, if "better," or subtract it if "worse."

(4.) To find the *value* of a piece of gold, or gold coin, in sterling money.

*Rule.* From the assay report determine the fineness by (1); reduce it at the rate of 4 grains to the carat, and multiply the number so found into the total weight of the metal, or coin, expressed in troy grains. Then divide the product by 10848, and the result will be the required value expressed in pounds sterling; or, otherwise, multiply the product by 59, divide by 4 and by 8, and finally cut off three decimals, and the result will be the required value expressed in shillings sterling.

The value, in shillings sterling, of a piece of gold, or gold coin, may be otherwise obtained from the calculated number of grains of fine gold it contains, by multiplying the same by ·177.

*Silver.* Let $w$ be the weight of a piece of silver, or silver coin, expressed in troy grains; $p$ the number of penny-weights contained in its degree of fineness.

Then, as the British standard of fineness contains 222 dwts., the proportion of standard silver is $\dfrac{p}{222}$, and the actual quantity of standard silver, in troy grains, $= \dfrac{wp}{222}$.

The same in troy ounces $= \dfrac{wp}{222} \times \dfrac{1}{480} = \dfrac{wp}{106560}$.

Thus, taking [1] 5s. or 60d. as the value of a troy ounce of standard silver, the value of the piece of silver or coin, expressed in pence sterling =

$$\frac{wp}{222} \times \frac{1}{480} \times 60 = \frac{wp}{1776}.$$

Hence the following practical rules for computations of silver:—

(1.) From an assay report on silver metal to find the *fineness*.

*Rule.* Put down 11 oz. 2 dwts., and the report underneath it; add the report if "better," or substract it if "worse," and the sum or difference will be the "fineness."

(2.) From an assay report and the weight of a piece of silver, or silver coin, to find the quantity of *fine* or *pure* silver it contains.

*Rule.* Find the fineness by (1), and reduce the same to dwts., at the rate of 20 dwts. to the ounce. Multiply the full weight of the metal by this number of dwts., and divide by 240, and the quotient will be the "fine weight" required.

(3.) To find the quantity of *standard* silver.

*Rule.* Proceed as in (2); only divide by 222 instead of 240, and the result will be the "standard weight."

Otherwise, multiply the weight of the piece by the number of dwts. in the assay report, "better" or "worse:" divide by 222, and add the quotient to the full weight, if "better," or substract it if "worse."

(4.) To find the *value* of a piece of silver, or silver coin.

*Rule.* From the assay report ascertain the fineness by (1); reduce it to dwts., at the rate of 20 dwts. to the ounce, and multiply the number so found into the total weight of the metal, or coin, expressed in troy grains. Divide the product by 1776 (or, if preferred, by 4, 4, and 111), and

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[1] The Mint price of standard silver, which was formerly 62d., is now 66d. per ounce; but this is above the average market value, which is considered to be about 60d., the price now usually adopted in the valuation of coins.

the result will be the required value expressed in pence sterling.

The value in pence sterling may be also obtained from the calculated number of grains of pure silver, by multiplying the same by 10, and then dividing by 74; or it may be obtained from the number of grains of standard weight, by simply dividing by 8.

*Note.*—In France and Holland assays are made on the decimal system, the *proportion* of fine metal estimated in thousandth parts of the whole weight being called MILLIÈMES. By some assay calculators the same proportion put down in hundredth parts, which, of course, expresses the pure metal as a per centage, is called the TOUCH.

Both the Bank and the Mint now receive decimal reports, which are both simple and convenient, and will ultimately supersede the unnecessary cumbrous system of carats and carat grains.

To calculate the fine weight from a decimal report it is only requisite to multiply the total weight by the millièmes and then to point off three decimals.

To obtain the value of coin from the fine weight :—

$$\left.\begin{array}{l}\text{Silver}\\ \text{Gold}\\ \quad,,\end{array}\right\}\text{ fine grains }\times\left\{\begin{array}{l}\frac{10}{74}\\ 2\frac{1}{4}\\ 0\cdot177\end{array}\right\}=\text{value in}\left\{\begin{array}{l}\text{pence}\\ \quad,,\\ \text{shillings}\end{array}\right\}\text{sterling.}$$

For bullion :—

$$\left.\begin{array}{l}\text{Silver}\\ \text{Gold}\end{array}\right\}\text{ fine ounces }\times\left\{\begin{array}{l}\frac{10}{37}\\ 4\frac{1}{4}\end{array}\right\}=\text{value in pounds sterling.}$$

With the gold, if worth while, deduct 1*d.* for every 8*l.* of value from this last calculation.

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To show by actual examples the practical application of the foregoing rules, the several calculations have been made with respect to various coins, and the results of these calculations are exhibited in the last four columns of the following table. These results are determined from the data given in the two preceding columns, viz. the Assay and the Weight.

## ASSAYS, WEIGHTS, AND VALUES OF GOLD AND SILVER COINS.

| Coin. | Assay. | Weight. | Fineness. | Fine weight, or pure metal. | Standard weight. | Value in sterling. |
|---|---|---|---|---|---|---|
| **GOLD.** | car. gr. | grains. | car. gr. | grains. | grains. | s. d. |
| Austria........ Ducat | B 1 2¾ | 54 | 23 2¾ | 53·30 | 58·14 | 9 5·2 |
| Baden ........ Ducat | B 1 2¾ | 47½ | 23 2¾ | 46·90 | 51·17 | 8 3·6 |
| England ...... Sovereign | Standard | 123¼ | 22 0 | 112·98 | 123·25 | 20 0 |
| France.......... Napoleon, or 20 franc piece | W 0 1¾ | 99½ | 21 2¼ | 89·40 | 97·52 | 15 9·9 |
| Hanover........ Ducat | B 1 3½ | 53¼ | 23 3¼ | 53·33 | 58·18 | 9 5·3 |
| ,,  Gold Florin | W 3 0½ | 50 | 18 3½ | 39·32 | 42·90 | 6 11·5 |
| Holland........ Ducat | B 1 2½ | 53¾ | 23 2½ | 52·77 | 57·57 | 9 4·1 |
| Milan .......... Sequin | B 1 3 | 53¼ | 23 3 | 53·19 | 58·03 | 9 5·0 |
| Naples ........ Oncetta, or 3 ducat piece (1818) | B 1 3½ | 58½ | 23 3½ | 57·95 | 63·21 | 10 3·1 |
| Prussia........ Frederick (1800) | W 0 2 | 103 | 21 2 | 92·27 | 100·66 | 16 4·0 |
| Russia ........ Ducat (1796) | B 1 2½ | 54 | 23 2½ | 53·16 | 57·99 | 9 4·9 |
| ,,  Imperial (1801) | B 1 2¼ | 185½ | 23 2¼ | 181·87 | 198·41 | 32 2·3 |
| Spain .......... Doubloon (1772) | W 0 2¼ | 416½ | 21 1½ | 372·03 | 405·85 | 65 10·2 |
| ,,  Pistole (1801) | W 1 1 | 104½ | 20 3 | 90·13 | 98·33 | 15 11·4 |
| Sweden ........ Ducat | B 1 2 | 53 | 23 2 | 51·90 | 56·61 | 9 2·2 |
| United States, Eagle | W 0 0½ | 270 | 21 3½ | 246·09 | 268·47 | 43 6·7 |
| **SILVER.** | oz. dwt. | dwt. gr. | oz. dwt. | grains. | grains. | s. d. |
| Austria........ Rixdollar (1800) ... | W 1 5 | 18 1 | 9 17 | 355·4 | 384·2 | 4 0 |
| ,,  Copfstuck, or 20 kreutzer piece ... | W 4 3 | 4 6½ | 6 19 | 59·4 | 64·2 | 0 8 |
| East Indies...Sicca Rupee, coined at Calcutta by the East India Company ......... | B 0 13 | 7 11½ | 11 15 | 175·8 | 190·0 | 1 11·8 |
| ,,  Rupee of later coinage ............. | B 0 4½ | 7 8½ | 11 6½ | 166·6 | 180·1 | 1 10·5 |
| ,,  Company's Rupee now in circulation .................. | W 0 2 | 7 12 | 11 0 | 165·0 | 178·4 | 1 10·3 |
| England ...... Shilling, or half-florin .............. | Standard | 3 21 | 11 2 | 86·0 | 93·0 | 0 11·6 |
| France ......... Franc (1818) | W 0 7 | 3 5½ | 10 15 | 69·4 | 75·1 | 0 9·4 |
| Hamburgh ... Rixdollar specie ... | W 0 10 | 18 18 | 10 12 | 397·5 | 429·7 | 4 5·7 |
| Holland ...... Florin, or Guilder. | W 0 4½ | 6 18 | 10 17½ | 146·8 | 158·7 | 1 7·8 |
| Milan .......... Lira | W 4 10 | 4 0 | 6 12 | 52·8 | 57·1 | 0 7·1 |
| Naples ........ Ducat | W 1 0 | 14 15 | 10 2 | 295·4 | 319·4 | 3 3·9 |
| Netherlands.. Florin (1816) | W 0 7½ | 6 22 | 10 14½ | 148·4 | 160·4 | 1 8 |
| Portugal ...... New Crusado (1809) | W 0 4 | 9 3 | 10 18 | 198·9 | 215·1 | 2 2·9 |
| Prussia........ Rixdollar (Convention) ................ | W 1 3 | 18 1 | 9 19 | 359·0 | 388·1 | 4 0·5 |
| Russia ........ Ruble (1805) | W 0 16 | 13 12 | 10 6 | 278·1 | 300·6 | 3 1·6 |
| ,,  10 Copec piece (1802) | W 0 13 | 1 8½ | 10 9 | 28·3 | 30·6 | 0 3·8 |
| Sardinia(Piedmont), 5 Franc piece (1801) ................ | W 0 8 | 16 1½ | 10 14 | 343·7 | 371·6 | 3 10·5 |
| Sicily............ Scudo .................. | W 1 4 | 17 14 | 9 18 | 348·1 | 376·4 | 3 11·0 |
| Spain........... Dollar .................. | W 0 8 | 17 8 | 10 14 | 370·9 | 401·0 | 4 2·1 |
| Sweden ........ Rixdollar | W 0 14½ | 18 17 | 10 7½ | 388·5 | 420·0 | 4 4·5 |
| Tuscany ...... Lira (1803)........... | B 0 7 | 2 8 | 11 9 | 53·4 | 57·8 | 0 7·2 |
| United States, Dollar.............. | W 0 8½ | 17 8 | 10 13½ | 370·1 | 400·1 | 4 2·0 |
| Venice ......... Ducato ............... | W 1 5 | 14 6 | 9 17 | 280·7 | 303·5 | 3 1·9 |

## GENERAL PRINCIPLES OF EXCHANGE.

A Bill of Exchange is a written order addressed by one person to another, directing the latter to pay on account of the former to some third person, or his order, or to the order of the person drawing the bill, a certain sum of money at a time therein specified. It is a mercantile contract, in which four persons are mostly concerned, viz.: —

The *drawer* and *seller* of the bill, who receives the value.

The *drawee*, his debtor, upon whom the bill is drawn. He is called the *acceptor*, when he writes his acceptance across the bill, and thereby engages to pay it when it becomes due.

The *payee*, or person to whom it is ordered to be paid, and who may, by indorsement, pass it to any other person.

The *buyer*, who gives value for the bill. Mercantile payments are, for the most part, made in bills of exchange, which generally pass from hand to hand, like any other circulating medium, until due. The person who at any time has a bill in his possession is called the *holder*, the payee being the holder in the first instance. When the holder of a bill disposes of it, he writes his name on the back, which is called *indorsing*. Any person may indorse a bill, and every indorser, as well as the acceptor or payee, is a security for the bill, and liable to be sued for payment.

Some bills are drawn at sight; others at a certain number of days, or months, after date, or after sight, and some at *usance*, which is meant to express the customary or usual term between different places. Days of grace are a certain number of days granted to the acceptor or payee, after the term of the bill is expired.

Inland exchange is the remittance of bills to places in the same country, by which means debts are discharged more conveniently than by cash remittances. Thus reciprocal debts, of equal amount, due between persons in different

parts of the country, may be discharged without remitting specie, and such an operation is recommended by general convenience; but when the debts are unequal, the debtor place must pay its balance, either by transmitting cash or bills; and as the latter mode is generally preferred, an increased demand for bills must be the consequence, which enhances their price, as it would that of any other article of sale or purchase.

This is the principle of exchange, and it is exemplified in the premium paid for inland bills on London. The metropolis is the grand emporium of commerce that supplies other places in the kingdom with foreign merchandise, and being also the seat of government to which the revenue is transmitted, and the residence of wealthy landlords, whose rents must be remitted to them from the country, it has generally a large balance of debt in its favour; and as this balance is chiefly paid in bills, a demand for them is created, and a premium is the consequence. The premium on inland bills is generally commuted for time; that is, for a certain number of days after date, or after sight, which date, or term, varies according to the demand and other circumstances.

Foreign exchange is essentially the same as that of inland, with respect to settling accounts by a transfer of claims, and also by the premium or price of bills being regulated by the proportion between the demand and the supply; but the mode of paying the premium for foreign bills is different, and the operation of adjustment is more complicated, owing to the introduction of the comparative values of different moneys, since different countries have different coins, different in denomination, in weight, and consequently in value.

In foreign exchange, one place always gives another a fixed sum, or piece, of money for a variable price, expressed by other coins; the former is called the *certain price*, and the latter the *uncertain price*. Thus London is said to

give to Paris the certain for the uncertain when the pound sterling is made exchangeable for a variable number of francs; and to Spain the uncertain for the certain when a variable number of pence sterling is exchangeable for the dollar of exchange. The uncertain price, as quoted at any time, is called the *rate*, or *course of exchange*.

When the demand in London for bills on Paris is great, a less number of francs is given for the pound sterling, and *vice versâ*. Again, if the course of exchange between London and Paris be 25 francs for the pound sterling, and if this number of francs contains the same quantity of pure silver as 20 shillings sterling, then the exchange is considered at par; but if Paris should give a higher price, the exchange is said to be against France, and in favour of England. This is the general mode of judging whether the exchange is favourable or unfavourable, though it is not always that on which merchants act or speculate.

The *intrinsic par* of exchange is the value of the money of one country compared with that of another, with respect both to weight and fineness according to accredited assays. It is, in effect, the metallic par; for though the moneys of exchange are many of them imaginary, their value is always deducible from that of the coins they represent, or to which they have an established relation.

The *commercial par* is the comparative value of the moneys of different countries, according to the weight, fineness, and market prices of the metals.

Thus two sums of different countries are *intrinsically* at par when they *contain* an equal quantity of the same kind of pure metal; and two sums of different countries are *commercially* at par when they can *purchase* an equal quantity of the same kind of pure metal.

The intrinsic par of exchange may be computed from gold or from silver coins. As a general rule, the measure of value should be of that metal in which the principal payments are made; and, therefore, in some countries the par

should be computed from gold, and in others from silver, according to the kind of money in which bills of exchange are paid. It is, however, obvious that the intrinsic par of exchange can be determined only between places which pay their bills in the same kind of metal. Even the same metal must differ considerably between two countries where one possesses mines, and supplies the other with materials of coinage, as between Spain and France, or between Portugal and England. The difference in all such cases is usually estimated according to the expenses of transporting the precious metals; and thus, from the intrinsic par and the various charges and prices, the commercial equivalence is computed.

The fluctuations of exchange are occasioned by various circumstances, both political and commercial. A greater or less demand for money in a stated place at a particular time may increase or diminish its commercial value without reference to its intrinsic value. The principal cause of fluctuation is generally stated to be the *balance of trade,* by which is meant the difference between the commercial exports and imports of one country with respect to another. The demand for bills of exchange arises out of the necessity of paying for importations. The supply arises out of the practice of drawing for the amount of exportations. If the supply and the demand be equal, if for every pound's worth of goods imported there be a pound's worth of exported goods to be drawn for, there will be no real exchange; that is, the real exchange, however much the nominal exchange may alter, will be at par. When, however, the importations are not equal to the exportations, exchange can no longer remain at par. An excess of importation would cause the exchange to advance against the importing country, and *vice versâ.* The exchange may, however, be unfavourable to a country when the balance of trade is greatly in its favour; for the demand for bills must chiefly depend on the balance of such debts as come into immediate liquidation, that is to say, on the

balance of payments. Besides, it does not follow that large exports are always successful, or quick in their returns; and even should this be the case, the balance of payments may be still unfavourable from political causes, such as foreign loans, subsidies, expeditions, or colonial establishments.

When any legal changes take place in the coinage or currency of a country, the exchange will of course vary, so as to keep pace or correspond with such alterations. The same remark is applicable to the debasement of coin through clipping and wear. This, however, cannot in either case be considered as an absolute change in the price of bills, but only in the money or medium through which they are bought or sold.

In times of peace, the course of exchange seldom remains long unfavourable to a country, at least beyond the expenses that might be incurred by the transportation of the precious metals; for bullion is considered the universal currency of merchants, and exchange gives it circulation, and thus tends to maintain the level of money throughout the commercial world. An unfavourable rate of exchange also operates as an encouragement to the exportation of goods, and as a check against the importation; for the exporter can afford to sell the goods cheaper in proportion to the premium which he receives for his bill, while the discount on bills from abroad operates as a tax or duty on importation. Thus exchange has always, in ordinary times, a natural tendency to restore an equilibrium.

## MEASURES, WEIGHTS, AND MONEY.

FOR the purpose of easy reference amongst the extensive
details contained under this head, the measures and weights
of Great Britain, and the tables appertaining to them, are
first enumerated and explained, and those of other countries
are afterwards given according to the alphabetical order of
the several places.    The English equivalents are uniformly
in relation to Imperial measures, and avoirdupois weights
are always to be understood, unless otherwise stated.    Troy
grains and avoirdupois grains are identical in value, though
the English grain has generally the former denomination,
being originally derived from the standard troy pound.    The
names of places given at the top of the pages always refer to
the contiguous matter immediately underneath them, this
arrangement being considered the clearest for rapid reference.

### GREAT BRITAIN.

The act, 5 Geo. IV. c. 74, for establishing uniformity of
weights and measures, came into operation on the 1st of
January, 1826.    The measures of capacity are the only ones
which it changed.    The old wine gallon contained 231 cubic
inches; the corn gallon, 268·8; and the old ale gallon, 282.
These were altered to the uniform imperial gallon, containing
277·274 cubic inches.

### Measures of Length.

| | | |
|---|---|---|
| 3 | barleycorns | make 1 inch. |
| 12 | inches | ,,    1 foot (12 inches). |
| 3 | feet | ,,    1 yard (36 inches). |
| 5½ | yards | ,,    1 rod, pole or perch (5½ yards or 16½ feet). |
| 4 | poles or 100 links | ,,    1 chain     (22 yards or   66 feet). |
| 10 | chains | ,,    1 furlong   (220 yards or   660 feet). |
| 8 | furlongs | ,,    1 mile     (1760 yards or 5280 feet). |

A line is the $\frac{1}{12}$th part of an inch.
A nail is 2¼ inches (used in measuring cloth).
A palm is 3 inches.
A hand is 4 inches (used for measuring the height of horses).

A span is 9 inches.
A cubit is 1½ foot.
A military pace is 2½ feet.
An itinerary pace is 5 feet.
A Scotch ell is 37·06 inches ⎫
An English ell is 45 inches ⎭ (used in measuring holland and other cloth).
A fathom is 2 yards or 6 feet (used in sounding depths).
A cable's length is 120 fathoms or 240 yards.
A league is 3 miles.
A degree of the equator is 69·1613 miles or 365172 feet.
A degree of the meridian is 69·046 miles or 364565 feet.

The old Scotch and Irish miles are $1\frac{1}{8}$ and $1\frac{3}{11}$ English.

Among ordinary mechanics, the inch is usually divided into eighths; but in scientific calculations it is mostly divided into decimals, or otherwise the foot is decimally divided.

### *Measures of Surface.*

| | | |
|---|---|---|
| 144 | square inches | make 1 square foot. |
| 9 | square feet | „ 1 square yard. |
| 30¼ | square yards | „ 1 pole, rod or perch (30¼ square yards). |
| 16 | poles | „ 1 chain (484 square yards). |
| 40 | poles | „ 1 rood (1210 square yards). |
| 4 roods, or 10 chains | | „ 1 acre (4840 square yards). |
| 640 acres | | „ 1 square mile. |

### *Measures of Capacity.*  1. *Dry Measure.*

| | | | |
|---|---|---|---|
| 4 gills | make 1 pint | (34·659 cubic inches). |
| 2 pints | „ 1 quart | (69·318 cubic inches). |
| 4 quarts | „ 1 gallon | (277·274 cubic inches). |
| 2 gallons | „ 1 peck | (2 gallons). |
| 4 pecks | „ 1 bushel | (8 gallons). |
| 4 bushels | „ 1 coomb | (4 bushels). |
| 2 coombs | „ 1 quarter | (8 bushels). |
| 5 quarters | „ 1 wey or load | (40 bushels). |
| 2 weys | „ 1 last | (80 bushels or 10 quarters). |

A pottle is 2 quarts or half a gallon.
A strike is 2 bushels.
A cubic foot is 1728 cubic inches.
A cubic yard is 27 cubic feet; which measure of earth is called a load.

## 2. *Wine and Spirit Measure.*

| | | | |
|---|---|---|---|
| 4 gills [1] | make | 1 pint | (34·659 cubic inches). |
| 2 pints | ,, | 1 quart | (69·318 cubic inches). |
| 4 quarts | ,, | 1 gallon | (277·274 cubic inches). |
| 36 gallons | ,, | 1 tierce | (36 gallons). |
| 1½ tierces | ,, | 1 hogshead | (54 gallons). |
| 2 hogsheads | ,, | { 1 pipe, butt, or puncheon | (108 gallons). |

The larger quantities, such as hogsheads, puncheons, &c. are gauged, and charged according to the actual contents.

## 3. *Ale, Beer, and Porter Measure.*

| | | | |
|---|---|---|---|
| 4 gills [1] | make | 1 pint. | |
| 2 pints | ,, | 1 quart. | |
| 4 quarts | ,, | 1 gallon | (277·274 cubic inches). |
| 9 gallons | ,, | 1 firkin | (9 gallons). |
| 2 firkins | ,, | 1 kilderkin | (18 gallons). |
| 2 kilderkins | ,, | 1 barrel | (36 gallons). |
| 3 kilderkins | ,, | 1 hogshead | (54 gallons). |
| 2 hogsheads | ,, | 1 butt | (108 gallons). |
| 2 butts | ,, | 1 tun | (216 gallons). |

To reduce cubic inches to bushels.
*Rule.* Multiply by 5, and divide by 11091.
To reduce cubic inches to gallons.
*Rule.* Multiply by 40, and divide by 11091.

### WEIGHTS.

#### *Troy Weight.*

| | | | |
|---|---|---|---|
| 24 grains | make | 1 pennyweight | (24 grains). |
| 20 pennyweights | ,, | 1 ounce | (480 grains). |
| 12 ounces | ,, | 1 pound | (5760 grains). |

By troy weight gold, silver, jewels, and precious stones are weighed. Diamonds and pearls are an exception; they

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[1] In London the gill is commonly called a "quartern;" in the North of England the gill is termed a "noggin," and a half-pint is called a "gill."

are weighed by the carat, which contains 4 grains; but 5 diamond grains are only equal to 4 troy grains; the ounce troy containing 150 diamond carats.

The imperial standard pound troy, made in the year 1758, is that from which all other weights are obtained: $\frac{1}{12}$th of it is the troy ounce; $\frac{1}{20}$th of the ounce is a pennyweight; and $\frac{1}{24}$th of the pennyweight is a grain; so that 5760 grains is a troy pound, and 7000 such grains is a pound avoirdupois, the grain in each case being identical.

### Apothecaries' Weight.

| | | | | | |
|---|---|---|---|---|---|
| 20 grains | make | 1 scruple | (20 grains) | sign | Э. |
| 3 scruples | ,, | 1 drachm | (60 grains) | sign | Ʒ. |
| 8 drachms | ,, | 1 ounce | (480 grains) | sign | ℥. |
| 12 ounces | ,, | 1 pound | (5760 grains) | sign | lb. |

Apothecaries compound their medicines by these weights, but buy and sell by avoirdupois.

The *pound, ounce,* and *grain,* are the same as in *troy* weight.

### Apothecaries' Fluid Measure.

| | | | |
|---|---|---|---|
| 60 minims (m) | make | 1 drachm | ($f$ Ʒ). |
| 8 drachms | ,, | 1 ounce | ($f$ ℥). |
| 20 ounces | ,, | 1 pint. | |
| 8 pints | ,, | 1 gallon. | |

### Avoirdupois Weight.

| | | | |
|---|---|---|---|
| 16 drachms | make | 1 ounce | (437½ grains). |
| 16 ounces | ,, | 1 pound | (7000 grains). |
| 14 pounds | ,, | 1 stone | (14 lbs.). |
| 2 stone | ,, | 1 quarter | (28 lbs.) |
| 4 quarters | ,, | 1 hundred | (cwt.) (112 lbs.). |
| 20 cwt. | ,, | 1 ton | (2240 lbs.). |

The new act declares that "all articles sold by weight shall be by avoirdupois weight, except gold, silver, platina, diamonds, and other precious stones, and drugs when sold by retail; and that such excepted articles, and none others, may be sold by troy weight."

The stone formerly varied from 8 lb. to 16 lb. in different places; but by the act passed in 1834, the stone is to consist of 14 lb. avoirdupois, and the cwt. of 8 stone; and all contracts made by any other measure are null and void.

### Hay and Straw.

| | | |
|---|---|---|
| 36 pounds | make | 1 truss of Straw. |
| 56 pounds | ,, | 1 truss of Old Hay. |
| 60 pounds | ,, | 1 truss of New Hay. |
| 36 trusses | ,, | 1 load. |
| 18 cwt. | ,, | 1 load of Old Hay. |
| 19 cwt. 32 lbs. | ,, | 1 load of New Hay. |
| 11 cwt. 64 lbs. | ,, | 1 load of Straw. |

1 cubic yard of New Hay weighs 6 stone.
1 ————— Oldish Hay ,, 8 stone.
1 ————— Old Hay ,, 9 stone.

Hay is considered as new for three months, and is called old on the 1st of September.

*To find the weight of Hay contained in a Stack.*—Multiply the length of the stack by its breadth, and multiply the result by its height, all in feet; divide the product by 27, which will give the number of cubic yards; this multiply by 6, 8, or 9, according to the age of the hay, as above, and the product will be the weight in stones. In measuring the height allow off two-thirds of the amount of feet from the eaves to the top.

### Coal.

| | | |
|---|---|---|
| 14 pounds | make | 1 stone. |
| 28 pounds | ,, | 1 quarter cwt. |
| 56 pounds | ,, | 1 half cwt. |
| 1 sack of 112 pounds | ,, | 1 cwt. |
| 1 double sack of 224 pounds | ,, | 2 cwt. |
| 20 cwt. or 10 large sacks | ,, | 1 ton. |
| 21 tons 4 cwt. | ,, | 1 barge or keel. |
| 20 keels, or 424 tons | ,, | 1 ship load. |
| 140 cwt. or 7 tons | ,, | 1 room. |

The Newcastle chaldron is a weight of 53 cwt.

By the 1st and 2nd of William IV., it is directed that all coals be sold by weight instead of measure; 10 sacks of 224 lbs. each to one ton.

*To calculate the weight of Cattle.*—Measure round the animal close behind the shoulder, then along the back, from the fore part of the shoulder-blade to the bone at the tail. Multiply the square of the girt by five times the length, both expressed in feet. Divide the product by 21, and you have the weight of the four quarters, in stones of 14 lbs. In very fat cattle, the weight is about a twentieth more than that ascertained in this manner, while very lean ones weigh about a twentieth less. The quarters are little more than half the weight of the living animal. The skin weighs about the eighteenth, and the tallow about the twelfth of the whole.

### *Miscellaneous Liquid Measures.*

| | |
|---|---|
| Hogshead of Claret | 46 gallons. |
| Butt of Sherry | 108 ,, |
| Pipe of Port or Masden | 115 ,, |
| Pipe of Madeira or Cape | 92 ,, |
| Pipe of Teneriffe | 100 ,, |
| Pipe of Lisbon or Bucellas | 117 ,, |
| Butt of Tent, Malaga or Mountain | 105 ,, |
| Aum of Hock, Moselle, and other German wines | 30 ,, |
| Double aum of ditto | 60 ,, |
| Pipe of Marsala or Bronti | 93 ,, |
| Puncheon of Scotch Whisky | 110 to 130 ,, |
| Puncheon of Brandy | 110 to 120 ,, |
| Hogshead of Brandy | 55 to 60 ,, |
| Puncheon of Rum | 90 to 100 ,, |

A hogshead is one-half  
A quarter cask is one-fourth ⎬ of a pipe, butt or puncheon.  
An octave is one-eighth  

**D**

### *Money Table.*

| | | | |
|---|---|---|---|
| 4 farthings make | 1 penny | (4 farthings). | |
| 12 pence    ,, | 1 shilling | (48 farthings). | |
| 20 shillings  ,, | { 1 pound   or sovereign } | (960 farthings). | |

Other coins in use :—

A half-sovereign is 10 shillings.
A crown is 5 shillings.
A half-crown is 2 shillings and 6 pence.
A florin is 2 shillings.
A sixpence or tester is 6 pence.
A fourpenny piece or groat is 4 pence.
A threepenny piece or bit is 3 pence.
A halfpenny is half a penny or 2 farthings.

Former coins now out of circulation :—

| | | | |
|---|---|---|---|
| Moidore | . . . | 27 | shillings. |
| Jacobus | . . . | 25 | ,, |
| Carolus | . . . | 23 | ,, |
| Guinea | . . . | 21 | ,, |
| Mark | . . . | 13 | shillings and 4 pence. |
| Half-guinea | . . | 10 | shillings and 6 pence. |
| Angel | . . . | 10 | shillings. |
| Seven shilling piece | . | 7 | shillings. |
| Noble | . . . | 6 | shillings and 8 pence. |

### *Proposed Decimal Coinage.*

(The mil = 0·24 penny = 0·96 farthing).

10 mils   make 1 cent  (2·4 pence).
10 cents  ,,   1 florin (24 pence).
10 florins  ,,   1 pound (240 pence).

The mil, cent, and their multiples are the only new coins required.

This simple and uniform system will soon be generally understood, and its advantages are obviously so great that it must eventually come into operation.

Scotland and Ireland. In all bill or money transactions relating to Scotland or Ireland, it is requisite to insert or mention the word *sterling*, to indicate that the established money values of England are intended.

## ABYSSINIA (AFRICA).

MEASURES.—The principal measure of length is the Turkish pic, which contains 26·8 English inches or 0·6804 metre of France.

The measure for grain is the ardeb :—

> At Gondar, in the interior, the ardeb contains 10 madegas ;
> „ Masuah, on the Red Sea, „ „ 24 „ ;
> and about 80 madegas make an English imperial bushel.

*Weight.*—The weights are the dirhem or drachm, the wakea or ounce, and the rottolo or pound :—

|  |  |  | ENGLISH VALUE. |
|---|---|---|---|
| 10 drachms | make | 1 wakea | 400 grains. |
| 12 wakeas | „ | 1 rottolo or liter | 4800 grains or 10 troy ounces. |
| 12 drachms | „ | 1 mocha | 480 grains or 1 oz. troy. |

*Money.*—Coins of other countries are in circulation, amongst which may be mentioned Venetian sequins, Spanish dollars and imperial or Austrian dollars. The last are called patakas or patacks :—

> 23 harfs make 1 pataka or dollar.
> 2¼ patakas „ 1 sequin.

Payments of large amount are usually made in ingots of gold, weighed by the wakea or Abyssinian ounce, containing 400 English grains. The pataka is also a money of account, of fluctuating value, and about 12 patakas are reckoned as the price of the wakea.

America; see United States.
Amsterdam; see Holland.
Ancona; see Roman States.
Antwerp; see Belgium.

### ARABIA.

*Measures.*—At Mocha the long measures are the guz (25 English inches) and the cobido or covid (19 inches). The baryd (4 farsakh) is 12 English miles.

### *Liquids.*

| | | ENGLISH VALUE. |
|---|---|---|
| 16 vakias | make 1 noosfia | ¼ imperial gallon. |
| 8 noosfias | ,, 1 gudda | 2 ,, gallons. |

For dry measure, 40 mecmedas or kellas make the teman or tomand, which, in rice, weighs 168 lbs. avoirdupois.

### *Weights.*

| | | |
|---|---|---|
| 40 vakias | make 1 maund | 3 lbs. avoirdupois. |
| 10 maunds | ,, 1 frazil | 30 ,, ,, |
| 15 frazils | ,, 1 bahar | 450 ,, ,, |

### *Money.*

80 caveers current make 1 piastre (3*s.* 8½*d.* sterling).

Payments are however commonly made in Spanish dollars, valued at 1⅕ piastre. The moneys coined in the country are commassees, which contain but little silver (only 7 carats), and pass at about 40 for the dollar, being used for small payments.

Archangel; see Russia.
Arragon; see Spain.
Athens; see Greece.
Augsburg; see Bavaria.

## AUSTRIA: VIENNA.

### Length.

|  |  |  | ENGLISH VALUE. |
|---|---|---|---|
| 12 punkte | make | 1 linie | 0·0864 inch. |
| 12 linien | ,, | 1 zoll | 1·0371 ,, |
| 12 zoll | ,, | 1 fuss | 12·445 inches or 1·0371 foot. |
| 6 fuss | ,, | 1 klafter | 6·2226 feet or 2·0742 yards. |
| 4000 klafter | ,, | 1 meile | 8297 yards or 4·7142 miles. |

The elle is 30·66 English inches or 2·555 feet.

*Surface.*—A joch, or day's work, supposed to be as much ground as can be ploughed with one team in a day, is 1600 Vienna square klafters or fathoms = 6884 square yards or 1·4223 acre, and it is divided into 3 metzen.

### Liquid Capacity.

| 2 pfiff | make | 1 seidel | 0·0779 imperial gallons. |  |
|---|---|---|---|---|
| 2 seidel | ,, | 1 kanne | 0·1557 | ,, ,, |
| 2 kannen | ,, | 1 mass | 0·3114 | ,, ,, |
| 10 mass | ,, | 1 viertel | 3·1143 | ,, ,, |
| 4 viertel | ,, | 1 eimer | 12·4572 | ,, ,, |
| 32 eimer | ,, | 1 fuder | 398·6304 | ,, ,, |

### Dry Capacity.

| 8 probmetzen | make | 1 becher | 0·0132 bushels. |  |
|---|---|---|---|---|
| 4 becher | ,, | 1 futtermassel | 0·0529 | ,, |
| 2 futtermassel | ,, | 1 muhlmassel | 0·1057 | ,, |
| 2 muhlmassel | ,, | 1 achtel | 0·2115 | ,, |
| 2 achtel | ,, | 1 viertel | 0·4230 | ,, |
| 4 viertel | ,, | 1 metze | 1·6918 | ,, |
| 30 metzen | ,, | 1 muth | 50·7536 | ,, or 6·3442 quarters |

### Weight, Commercial.

| 4 pfennig | make | 1 quentchen | 67·5 grains or 0·0096 lb. |  |
|---|---|---|---|---|
| 4 quentchen | ,, | 1 loth | 270·2 | ,, 0·0386 ,, |
| 2 loth | ,, | 1 unze | 540·4 | ,, 0·0772 ,, |
| 4 unzen | ,, | 1 vierding | 2161·6 | ,, 0·3088 ,, |
| 2 vierding | ,, | 1 mark | 4323·2 | ,, 0·6176 ,, |
| 2 mark | ,, | 1 pfund | 8646·4 | ,, 1·2352 ,, |

### Weight, Apothecaries'.

|  |  |  | ENGLISH VALUE. | |
|---|---|---|---|---|
| 20 gran | make | 1 scrupel | 22·52 grains or 0·0469 oz. troy. | |
| 3 scrupel | ,, | 1 drachme | 67·55 | ,, | 0·1407 ,, |
| 8 drachmen | ,, | 1 unze | 540·4 | ,, | 1·1258 ,, |
| 12 unzen | ,, | 1 pfund | 6484·8 | ,, | 13·510 ,, |

The mark (4333 grains) is the unit of gold and silver weight and the apothecaries' pound = 1½ mark.

### Money.

| 4 pfennige make 1 kreuzer | 0·4 penny sterling. |
|---|---|
| 60 kreuzer ,, 1 gulden or florin | 24 pence or 2 shillings. |
| 2 gulden ,, 1 thaler or rixdollar | 4 shillings. |

The gold ducat        = 9s. 5d. sterling.
,,   half-sovereign = 13s. 11d. ,,

The standard of money is called 20 guldenfuss, as 20 gulden are coined from the Cologne mark of fine silver.

See also Bohemia and Venetian Lombardy.

### BADEN (GERMANY).

### Length.

| 10 punkte make | 1 linie | 0·118 inches. | |
|---|---|---|---|
| 10 linien | ,, 1 zoll | 1·181 | ,, |
| 10 zoll | ,, 1 fuss | 11·811 | ,, or 0·9842 feet. |
| 10 fuss | ,, 1 ruthe | 118·110 | ,, 9·8425 ,, |

The ruthe is 3 French metres.

### Surface.

| 100 square ruthen make 1 viertel | 9688 square feet or 0·2224 acre. | |
|---|---|---|
| 4 viertel ,, 1 morgen | 38752 ,, ,, 0·8896 ,, | |

### Liquid Capacity.

| 10 glass make | 1 mass | 0·3301 gallons. | |
|---|---|---|---|
| 10 mass | ,, 1 stütze | 3·3014 | ,, |
| 10 stützen | ,, 1 ohm | 33·014 | ,, |
| 10 ohm | ,, 1 fuder | 330·140 | ,, |

The ohm is 15 French decalitres.

### Dry Capacity.

| | | | ENGLISH VALUE. | | |
|---|---|---|---|---|---|
| 10 becher | make | 1 mässlein | 0·0413 bushels. | | |
| 10 mässlein | ,, | 1 sester | 0·4127 | ,, | |
| 10 sester | ,, | 1 malter | 4·1268 | ,, | or 0·5158 quarters. |
| 10 malter | ,, | 1 zuber | 41·2680 | ,, | 5·1585 ,, |

The malter is 15 French decalitres.

### Weight.

| | | | | | |
|---|---|---|---|---|---|
| 10 ass | make | 1 pfennig | 7·7 grains. | | |
| 10 pfennig | ,, | 1 centass | 77·2 | ,, | |
| 10 centass | ,, | 1 zehnling | 772 | ,, | or 0·1103 lb. |
| 10 zehnling | ,, | 1 pfund | 7720 | ,, | 1·1029 ,, |

The pfund is ½ French kilogramme.

The mark of Cologne (3609 grains troy) is used for weighing gold and silver.

For apothecaries' weight, see Nürnberg.

Barbadoes; see West Indies.

Barcelona; see Spain.

Basle; see Switzerland.

Batavia; see Java.

## BAVARIA.

### Length.

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| The Bavarian | foot | | 11·42 inches or 0·9517 feet. | | | | |
| ,, ,, | ell | | 32·796 | ,, | 2·7330 | ,, | |
| ,, Augsburg | foot | | 11·65 | ,, | 0·9708 | ,, | |
| ,, ,, | long ell | | 24·00 | ,, | 2·0000 | ,, | |
| ,, ,, | short ell | | 23·32 | ,, | 1·9433 | ,, | |
| ,, Nuremberg | foot | | 11·96 | ,, | 0·9967 | ,, | |
| ,, ,, | ell | | 26·00 | ,, | 2·1667 | ,, | |

### Liquid Capacity.

| | | | | | |
|---|---|---|---|---|---|
| The Bavarian | eimer | = | 14·116 gallons. | |
| ,, Augsburg | mass | = | 0·326 | ,, |
| ,, ,, | muid | = | 15·080 | ,, |
| ,, Munich | eimer | = | 8·122 | ,, |
| ,, Nuremberg | ,, | visirmass | 14·963 | |
| ,, ,, | ,, | schenkmass | 13·964 | |

### *Dry Capacity.*

|  |  |  |  | ENGLISH VALUE. |
|---|---|---|---|---|
| The Bavarian | scheffel |  |  | 6·1172 bushels. |
| ,, | Augsburg | ,, |  | 12·087 ,, |
| ,, | ,, | ,, | (8 metzen) | 5·650 ,, |
| ,, | Munich | scheffel |  | 9·976 ,, |
| ,, | Nuremberg | malter |  | 4·598 ,, |

### *Weight.*

| The Bavarian |  |  | pound | 8642 grains or 1·2346 lb. |
|---|---|---|---|---|
| ,, | Augsburg |  | mark | 3643 ,, 0·5204 ,, |
| ,, | ,, | heavy | pound | 7580 ,, 1·0829 ,, |
| ,, | ,, | light | ,, | 7295 ,, 1·0421 ,, |
| ,, | Munich |  | pound | 8656 ,, 1·2366 ,, |
| ,, | Nuremberg |  | mark | 3670 ,, 0·5243 ,, |
| ,, | ,, |  | pound | 7870 ,, 1·1243 ,, |
| ,, | ,, | old troy | ,, | 7360 ,, 1·0514 ,, |
| ,, | ,, | apothecaries' | ,, | 5520 ,, 0·7886 ,, |

The Nuremberg apothecaries' pound is used for weighing medicines throughout Germany, and its subdivisions are the same as in England.—See Nürnberg.

### *Money (Austrian standard).*

| 60 kreuzers make 1 florin | 2s. sterling. |
|---|---|
| The rixdollar of 1800 | 4s. ,, |
| The florin of Nuremberg | 20d. ,, |

### BELGIUM.

The weights and measures are the same as those of France or Holland, though some of them are differently expressed, as aune for metre or ell, litron for litre or kannen, and livre for kilogramme or ponden.

### *Money.*

| 100 centimes make { 1 franc | 9·4d. sterling. |
|---|---|
| { 1 florin | 20d. ,, |

The value of Belgian money in francs is the same as that of France; and in florins, as well as the old Brabant money

in schillings and grotes, it is the same as that of Holland. In the division of the florin, the stiver is 5 cents, so that 20 stivers make the florin; and its value is about $2\frac{1}{9}$ francs.

> Bengal; see East Indies.
> Bergen; see Sweden and Norway.
> Berlin; see Prussia.
> Bermudas; see West Indies.
> Berne; see Switzerland.

## BIRMAH (ASIA): RANGOON.

### Length.

The paulgaut is 1 inch English.
The taim or cubit is 18 inches.
The saundaung or royal cubit is 22 inches.
The dha or bamboo is 7 royal cubits = 154 inches.
The dain or Birman league is 1000 dhas = 2·4306 miles.

### Weight.

| | | | ENGLISH VALUE. |
|---|---|---|---|
| 100 ticals or 3 catties | make 1 vis | | $3\frac{1}{2}$ lbs. avoirdupois. |
| 150 vis | „ 1 candy | | 500 „ „ |

The Birmans, like the Chinese, keep their accounts decimally, and have no coin. Silver bullion and lead are the currency of the country.

## BOHEMIA: PRAGUE.

The Prague foot measures 11·88 English inches; and the ell, 23·2 inches.

For the existing weights, measures and money, see Austria.

> Bologna; see Roman States.
> Bombay; see East Indies.
> Bonn; see Prussia.
> Boston; see United States.
> Bordeaux; see France.

### BRAZIL (SOUTH AMERICA).

The subdivisions of weights and measures are those of Portugal and the values are also identical, with some exceptions in the measures of capacity.

$$\begin{aligned}
\text{The medida} &= \tfrac{3}{4} \text{ English imperial gallon.} \\
\text{,, alqueire} &= 1\cdot1004 \text{ imperial bushel.} \\
&= 0\cdot1378 \qquad \text{,, quarter.} \\
\text{,, mark} &= 7\cdot3781 \text{ ounces troy.}
\end{aligned}$$

The rate of exchange for government estimates is 27 pence to the milreis (paper currency). At this rate of exchange to reduce milreis to English pounds, divide by 10 and to the quotient at its $\frac{1}{8}$th part.

For further information, see Portugal.

### BREMEN (GERMANY).

#### *Length.*

|  |  |  | ENGLISH VALUE. |
|---|---|---|---|
| 10 linien make | 1 zoll | (inch) | 0·95 inches. |
| 12 zoll ,, | 1 fuss | (foot) | 11·38 ,, or 0·9483 feet. |
| 2 fuss ,, | 1 elle | (ell) | 22·76 ,, 1·8967 ,, |
| 8 ellen ,, | 1 ruthe (rod) | | 15·174 feet or 5·058 yards. |
| The klafter is 3 ellen | | | 5·69 feet. |
| The meile is 20,000 Rhenish feet | | | 6865 yards or 3·9006 miles. |

Surveyors divide the fuss decimally.

#### *Surface.*

The morgen is 120 square ruthen (3070 square yards or 0·6343 acre).

#### *Liquid Capacity.*

| 4 mingel | make 1 quartier | 0·1772 gallons. |
|---|---|---|
| 9 quartier | ,, 1 viertel | 1·5953 ,, |
| 5 viertel | ,, 1 anker | 7·9763 ,, |
| 4 anker | ,, 1 ohm | 31·9052 ,, |
| 6 ohm | ,, 1 fuder | 191·4315 ,, |
| The stübchen (gallon) is 4 quartier | | 0·709 ,, |
| ,, oxhoft (hogshead) is 6 anker | | 47·858 ,, |

## *Dry Capacity.*

| | | | ENGLISH VALUE. |
|---|---|---|---|
| 4 spinte | make | 1 viertel | 0·5094 bushels. |
| 4 viertel | ,, | 1 scheffel | 2·0377 ,, |
| 40 scheffel | ,, | 1 last | 81·5088 ,, or 10·1886 quarters. |

## *Weight.*

| | | | | |
|---|---|---|---|---|
| 4 ort | make | 1 quentchen | 60·1 grains or | 0·1373 oz. |
| 4 quentchen | ,, | 1 loth | 240·3 ,, | 0·5493 ,, |
| 2 loth | ,, | 1 unze | 480·6 ,, | 1·0986 ,, |
| 8 unzen | ,, | 1 mark | 3845 ,, | 0·5493 lb. |
| 2 mark | ,, | 1 pfund | 7690 ,, | 1·0986 ,, |

Gold and silver are weighed by the mark of Cologne (3609 grains troy). For apothecaries' weights, see Nürnberg.

## *Money.*

| | | | |
|---|---|---|---|
| 5 schwaren | make | 1 grot | 0·55d. sterling. |
| 72 grot | ,, | 1 rixdollar or thaler } | 39·4d. ,, |
| 48 grot (silver piece) | | | 27d. ,, |

British Islands; see Great Britain.

### BRITISH POSSESSIONS IN NORTH AMERICA.

Throughout the United Canadas, New Brunswick, Nova Scotia, Prince Edward's Island, Newfoundland and the territories of the Hudson's Bay Company, the weights and measures are those of Great Britain, but generally with the old measures of capacity in wine gallons and Winchester bushels, and therefore the same as in the United States.

The moneys of account are either in pounds, shillings and pence sterling, in the same denominations of money in a nominal currency, or in dollars and cents.

According to the Halifax currency, which prevails throughout these provinces, the Spanish or American dollar is valued at 5s. or 60d. currency, and what is called sterling is the

valuation of the dollar at the former standard of 4*s*. 6*d*., and between this and the Halifax currency, the proportion is as 9 to 10, making 90*l*. nominal sterling (in dollars at 4*s*. 6*d*.) equal to 100*l*. in Halifax currency.

But if the sterling value of the dollar be estimated at 4*s*. 2*d*., the par of exchange should be 83*l*. 6*s*. 8*d*. nominal sterling for 100*l*. Halifax currency, the same being in the proportion of 5 to 6.  This proportion exists in New Brunswick.  In Canada and Nova Scotia it is 4 to 5.  In Newfoundland the dollar passes for 5*s*., and its assumed value is 4*s*. 4*d*. sterling, making the par of exchange 86*l*. 13*s*. 4*d*. nominal sterling for 100*l*. currency, being in the proportion of 13 to 15; but as the dollar is here overrated as to its sterling value, bills on England usually bear a premium of about 5 per cent.

The decimal coinage of the United States has been recently adopted.

In Lower Canada, wheat is measured by the minot, an old French measure (1·0736 imperial bushel).  Land is measured by the arpent, another old French measure (0·8449 acre).

<center>BRUNSWICK (GERMANY).</center>

<center>*Length.*</center>

<center>ENGLISH VALUE.</center>

| | | |
|---|---|---|
| 12 zoll make 1 schuh (shoe or foot) | 11·23 inches or 0·9358 feet. | |
| 2 schuh  „   1 elle | 22·46    „     1·8717  „ | |
| The meile (34424 Rhineland feet) = | 11816 yards or 6·7140 miles. | |

<center>*Surface.*</center>

<center>The morgen (30720 square schuh) = 26904 square feet or 0·6176 acre.</center>

<center>*Liquid Capacity.*</center>

| | | |
|---|---|---|
| 2 nössel    make 1 quartier | 0·205 gallons. | |
| 4 quartier   „   1 stübchen | 0·82   „ | |
| 40 stübchen   „   1 ohm | 32·80   „ | |
| The fuder (4 oxhoft) of wine = 240 stübchen | 196·8 gallons. | |
| The fass  (4 tonnen) of beer = 108    „ | 88·56  „ | |

## Dry Capacity.

| | | | ENGLISH VALUE. |
|---|---|---|---|
| 4 becher or löchers make | 1 vierfass | 0·2139 bushels. |
| 4 vierfass | „ | 1 himt | 0·8556 „ |
| 10 himt | „ | 1 scheffel | 8·5560 „ or 1·0695 quarter. |

## Weight.

| | | | | |
|---|---|---|---|---|
| 2 heller | make 1 pfennig | 14·1 grains. |
| 4 pfennig | „ 1 quentchen | 56·3 „ |
| 4 quentchen | „ 1 loth | 225·3 „ or 0·515 oz. |
| 16 loth | „ 1 mark | 3605 „ 0·515 lb. |
| 2 mark | „ 1 pfund | 7210 „ 1·030 „ |

| | |
|---|---|
| The liespfund is 14 Brunswick pfund | 14·42 lbs. |
| The centner „ 114 „ „ | 117·42 „ |
| The schiffpfund (ship-pound) is 20 liespfund | 288·40 „ |

Gold and silver are weighed by the mark of Cologne (3609 grains troy).

For apothecaries' weights, see Nürnberg.

Brussels; see Belgium.
Cadiz; see Spain.
Cairo; see Egypt.
Calcutta; see East Indies.
Canada; see Great Britain, and British Possessions in North America.

### CANARY ISLANDS (IN ATLANTIC).

The measures, weights and coins are from Spain, but several of them are somewhat variable and depreciated in value.

For long measure the pié is the Castilian foot (11·128 English inches).

The standard libra, or pound, is 1·0148 lb. avoirdupois.

## CANDIA (IN MEDITERRANEAN).

|  |  | ENGLISH VALUE. |
|---|---|---|
| The pic or ell | = | 25·11 inches. |
| The mistate (for oil) | = | 2·456 gallons. |
| The carga (for corn) | = | 4·189 bushels. |
| The cantaro of 100 rottoli or 44 occas | | 116¼ lbs. |
| 40 paras make 1 piastre | | 2¼d. sterling. |

Canton; see China.

### CAPE OF GOOD HOPE (BRITISH COLONY).

For measures and weights, see Great Britain, page 44.

*Money.*—British currency is also used; and occasionally the former Dutch currency, according to which,

| 6 stivers | make 1 skilling | 2¼d. sterling. |
|---|---|---|
| 8 skillings | „ 1 rixdollar | 18d. „ |

Cape Verd Islands (in Atlantic); see Portugal.
Cassel (Germany); see Hesse Cassel.
Castile; see Spain.

### CEYLON (INDIA): COLUMBO.

The parrah is 5·62 gallons; and the seer 1 quart.
The candy or bahar weighs 500 lbs. avoirdupois.

Measures of length and surface are the same as in England.

Since 1825, by order in council, the public accounts are kept in British money, with the following values of the coin in circulation:—

| The rixdollar . . . . . | 1s. 6d. sterling. |
|---|---|
| The Spanish dollar . . . . | 4s. 2d. „ |
| The Sicca rupee . . . : | 2s. „ |
| The rupee of Madras and Bombay . | 1s. 10d. „ |

But the Sicca rupee has superseded the sterling currency in all commercial transactions.

Christiana; see Sweden and Norway.

## CHINA.

### *Length.*

|  |  |  | ENGLISH VALUE. |
|---|---|---|---|
| 10 fans | make | 1 tsun | 1·41 inches. |
| 10 tsuns | ,, | 1 chik or covid | 14·1 ,, |
| 10 chiks | ,, | 1 cheüng or fathom | 141 ,, or 11·75 feet. |
| 10 cheüngs | ,, | 1 yan | 117·5 feet. |
| Surveyors and engineers' chik |  |  | 12·70 inches. |
|  | Itinerary | ,, | 12·17 ,, |
|  | Pekin | ,, | 13·12 ,, |
|  | Canton (commercial) | ,, | 14·70 ,, |
|  | Imperial | ,, | 12·612 ,, |

The li or mile (1800 itinerary chiks) = 1826 English feet.

### *Capacity.*

| 10 kops | make | 1 shing tsong | 0·12 gallons or 0·96 pints. |
|---|---|---|---|
| 10 shings | ,, | 1 tau (12 catties) | 1·2 ,, 9·6 ,, |
| 10 taus | ,, | 1 hwŭh | 12·0 ,, 96·0 ,, |

The measures of dry capacity are nearly ⅓ greater than these.

### *Weight.*

| 16 taels | make | 1 catty or pound | 1⅓ avoirdupois lbs. |
|---|---|---|---|
| 100 catties | ,, | 1 pecul or tam | 133⅓ ,, ,, |

Therefore the tael or ounce (10 mace) = $\frac{1}{12}$lb. or 583 grains.

### *Money.*

| 10 cash ("le") | make | 1 candereen ("fun") | ¾d. sterling. |
|---|---|---|---|
| 10 candereens | ,, | 1 mace ("tsëen") | 7½d. ,, |
| 10 mace | ,, | 1 tael ("lëang") | 75d. ,, |

These moneys, excepting the cash, are imaginary, and are formed from weights of Sysee silver, under the same denominations; and the tael in the money and commercial weights are alike. The touch or fineness of Sysee silver is 0·980. The cash are casts of common metal with a square hole in the middle, through which they are strung like beads in various numbers. Silver ingots from ½

to 100 taels are used as money; but gold is considered as merchandise, and is sold in ingots, called shoes. If the metals be sysee or pure, 10 taels of silver are given for 1 of gold.

Coblentz; see Prussia.

### COLOGNE (PRUSSIA).

In 1816 a uniform system of weights and measures was decreed for all the Prussian dominions, for which see Prussia. The Rhineland foot was adopted as the standard unit for measures of length, and the Cologne mark as the unit for weights. As the system of weights previously established at Cologne is still in use throughout Germany, it is here inserted for reference.

### Weight.

| | | | ENGLISH VALUE. | | |
|---|---|---|---|---|---|
| 4 pfennig | make | 1 quentchen | 56·4 grains. | | |
| 4 quentchen | ,, | 1 loth | 225·56 | ,, | |
| 2 loth | ,, | 1 unze | 451·12 | ,, | |
| 8 unzen | ,, | 1 mark | 3609 | ,, | or 0·51557 lb. |
| 2 mark | ,, | 1 pfund | 7218 | ,, | 1·03114 ,, |

The standard copy of the Cologne mark in use at Hamburg has been ascertained to weigh 3608 English grains, being 1 grain lighter than the average of the Prussian standards.

Constantinople; see Turkey.
Copenhagen; see Denmark.
Corsica (in Mediterranean); see France.

### CRACOW (POLAND).

The Cracow foot = 14·032 inches or 1·1693 foot.

Cremona (Italy); see Venetian Lombardy.
Cuba; see West Indies.
Dantzic; see Prussia.
Demerara; see West Indies.
Damascus; see Ottoman Asia.

## DENMARK.

### Length.

|  |  |  | ENGLISH VALUE. |
|---|---|---|---|
| 12 linien | make | 1 tomme | 1·03 inches. |
| 12 tommen | „ | 1 fod | 12·357 „ or 1·0298 feet. |
| 2 fod | „ | 1 aln | 24·714 „ 2·0595 „ |
|  | The miil is 12000 aln |  | 24,714 feet or 4·6807 miles. |

### Liquid Capacity.

|  |  | pott = | 0·2126 gallons. |
|---|---|---|---|
| 2 pott | make | 1 kande | 0·4252 „ |
| 2 kanden | „ | 1 stübchen | 0·8504 „ |
| 2 stübchen | „ | 1 viertel | 1·7008 „ |
| 4⅞ viertel = 39 pott | „ | 1 anker | 8·2914 „ |

### Dry Capacity.

|  |  | pott = | 0·02657 bushels. |
|---|---|---|---|
| 18 pott | make | 1 skieppe | 0·47835 „ |
| 2 skieppen | „ | 1 fjerding | 0·9567 „ or 0·1196 quarter. |
| 4 fjerding | „ | 1 tonne | 3·8268 „ 0·47835 „ |
| 22 tonnen | „ | 1 last | 84·188 „ 10·5235 „ |

The liquid and dry pott measures are identical in capacity.

### Weight.

|  |  |  |  |
|---|---|---|---|
| 4 ort | make | 1 quintin | 60·3 grains or 0·1378 oz. |
| 4 quintin | „ | 1 lod | 241·2 „ 0·5514 „ |
| 2 lod | „ | 1 unze | 482·5 „ 1·1029 „ |
| 8 unzen | „ | 1 mark | 3860 „ 0·5514 lb. |
| 2 mark | „ | 1 pund | 7720 „ 1·1029 „ |
|  | The lispund is 16 pund |  | 17·646 lbs. |
|  | The skippund is 20 lispund |  | 352·914 „ or 3·151 cwt. |

For gold and silver the pound is 7266 English grains, and is divided the same as the preceding.

For apothecaries' weight, see Nürnberg.

## Money.

| | | | ENGLISH VALUE. |
|---|---|---|---|
| 16 skillinge | make 1 mark | | 4·4*d.* sterling. |
| 6 mark | „ 1 { rigsbank or rix-banco } dollar | | 26·35*d.* „ |
| | The Danish specie dollar | | 51·4*d.* „ |

Dresden ; see Saxony.

### EAST INDIES.

#### 1. BENGAL : CALCUTTA.

##### Length.

| 3 jows or barleycorns make | 1 unglee or finger | ¾ inch. |
|---|---|---|
| 4 unglees | „ 1 moot or hand | 3 inches. |
| 3 hands | „ 1 span | 9 „ |
| 2 spans | „ 1 haut or cubit | 18 „ |
| 2 cubits | „ 1 guz or yard | 36 „ or 3 feet. |
| 2 yards | „ 1 fathom | 6 feet. |
| 1000 fathoms | „ { 1 Bengal coss or mile } | 6000 „ or 1$\frac{3}{11}$ mile. |

Liquids and grain are measured by weight.

##### Weight.

| | | FACTORY. | BAZAAR. |
|---|---|---|---|
| 5 siccas | make 1 chittack | 0·1167 lbs. | 0·1283 lbs. |
| 16 chittacks | „ 1 seer | 1·8667 „ | 2·0533 „ |
| 40 seers | „ 1 maund | 74·667 „ | 82·133 „ |
| | 30 maunds = | 20 cwt. | 22 cwt |

These are the avoirdupois values of the Factory and Bazaar weights, the latter being 10 per cent. heavier than the former. The new Indian sicca weight or tola (180 grains), established in 1833, is ⅓ grain heavier than the above, and it corresponds with the weight of the Company's silver rupee, and also with that of the gold mohur.

##### Money.

| | | |
|---|---|---|
| 12 pie or pice make 1 anna | | 1·4*d.* sterling. |
| 16 annas „ 1 Company's rupee | | 22·4*d.* „ |
| The Sicca rupee | = | 23·8*d.* „ |
| The gold mohur of 16 sicca rupees | | 32*s.* „ |

80 silver rupees, or 36 copper annas, weigh 80 new Indian tolas, or 1 seer, which proportions suggest a ready and available means of testing the correctness of the Bazaar weights.

## 2. MADRAS.

*Length.*—The covid for cloth measure is 18·6 inches; but the English yard is generally used.

### Capacity.

| | | | ENGLISH VALUE. |
|---|---|---|---|
| 8 ollucks | make | 1 measure or puddy | 0·338 gallons. |
| 8 measures | ,, | 1 marcal | 2·704 ,, |
| 5 marcals | ,, | 1 parah or chunam | 13·52 ,, |
| 80 parahs | ,, | 1 garce, weighing } 8400 lbs. } | 135·2 bushels or 16·9 quarters. |

### Weight.

| | | | |
|---|---|---|---|
| 10 pagodas | make | 1 pollam | 0·078 lbs. avoirdupois. |
| 8 pollams | ,, | 1 seer | 0·625 ,, ,, |
| 5 seers | ,, | 1 vis | 3·125 ,, ,, |
| 8 vis | ,, | 1 maund | 25 lbs. |
| 20 maunds | ,, | 1 candy | 500 ,, |

*Money.*—Same as Bengal.

## 3. BOMBAY.

### Length.

| | | | |
|---|---|---|---|
| 16 tussoos | make | 1 hath | 18 inches. |
| 24 tussoos | ,, | 1 guz | 27 ,, |

### Capacity.

| | | | |
|---|---|---|---|
| 16 adoulies | make | 1 parah | 3·03 bushels. |
| 8 parahs | ,, | 1 candy | 24·24 ,, |

### Weight.

| | | | |
|---|---|---|---|
| 30 pice or 72 tanks | make | 1 seer | 0·7 lb. |
| 40 seers | ,, | 1 maund | 28 lbs. or ¼ cwt. |
| 20 maunds | ,, | 1 candy | 560 ,, 5 ,, |

### *Money.*

| | | |
|---|---|---|
| 100 reas | make 1 quarter | 5·6*d.* sterling. |
| 4 quarters <br> or 16 annas } | „ 1 rupee | 22·4*d.* „ |

The gold mohur or 15 rupee piece is of the same weight and purity as the silver rupee, 15 alloy and 165 fine grains, and its value at the British mintage rate is 1*l.* 9*s.* 2*d.* The gold pagoda star is valued at 7*s.* 4*d.* sterling.

A lac is 100,000 and a crore is 10 millions of rupees.

At Singapore the Spanish dollar circulates at 2·18 rupees or 4*s.* 1*d.* sterling.

See also Ceylon.

### EGYPT (AFRICA).

*Length.*—4 derahs make 1 gasab (2·832 English yards).

The principal measure for cloth and silk is the pic (26·8 English inches).

#### *Ancient Measures.*

The natural cubit (24 Egyptian fingers) is 17·71 inches.
„ royal „ (28 „ „ ) 20·66 „

*Surface.*—The feddan al risach, or acre, is 400 square gasab = 3208 square yards or 0·6628 acre.

*Capacity.*—24 robs make 1 ardeb (4·9 imperial bushels or 0·6125 quarter).

### *Weight.*

| | | ENGLISH VALUE. |
|---|---|---|
| 144 drachmas or meticals make 1 rotl or pound | | 1·008 lbs. |
| 100 rottoli „ 1 cantaro | | 100·8 „ |
| The oke is 400 drachmas | | 2·8 „ |

*Money.*—40 paras make 1 piastre (2¼*d.* sterling).

Elsinore; see Denmark.
England; see Great Britain.
Finland; see Russia.
Flanders; see Belgium.
Florence; see Tuscany.

# FRANCE.

## 1. METRICAL SYSTEM NOW IN USE.

### Length.

| | ENGLISH VALUE. |
|---|---|
| Millimètre (1000th of a mètre) | 0·03937 inches. |
| Centimètre (100th of a mètre) | 0·39371 ,, |
| Décimètre (10th of a mètre) | 3·93708 ,, |
| Mètre (unit of length) | 39·3708 ,, or 3·2809 feet. |
| Décamètre (10 mètres) | 32·809 feet. 10·9363 yards. |
| Hectomètre (100 mètres) | 328·09 ,, 109·3633 ,, |
| Kilomètre (1000 mètres) | 1093·63 yards or 0·62138 miles. |
| Myriamètre (10,000 mètres) | 10936·33 ,, 6·21382 ,, |

### Surface.

| | |
|---|---|
| Centiare { (100th of an are or a square mètre) } | 1·1960 square yards. |
| Are { (square décamètre and unit of surface) } | 119·6033 ,, ,, or 0·0247 acres. |
| Decare (10 ares) | 1196·033 ,, ,, 0·2474 ,, |
| Hectare (100 ares) | 11960·33 ,, ,, 2·4736 ,, |

### Capacity.

| | |
|---|---|
| Millitre { (1000th of a litre or cubic centimètre) } | 0·06103 cubic inches. |
| Centilitre (100th of a litre) | 0·61027 ,, ,, |
| Décilitre (10th of a litre) | 6·10270 ,, ,, |
| Litre { (cubic decimètre and unit of capacity) } | 61·02705 ,, ,, or 1·7608 pints. |
| Décalitre (10 litres) | 610·2705 ,, · ,, 2·2010 gallons. |
| Hectolitre (100 litres) | 3·53166 cubic feet 22·0097 ,, |
| Kilolitre { (1000 litres or cubic mètre) } | 35·31658 ,, ,, 220·0967 ,, |
| Myrialitre (10,000 litres) | 353·1658 ,, ,, 2200·9667 ,, |

### Solid.

| | |
|---|---|
| Décistère (10th of a stère) | 3·5317 cubic feet. |
| Stère (cubic mètre) | 35·3166 ,, ,, |
| Décastère (10 stères) | 353·1658 ,, ,, |

## Weight.

|  | | ENGLISH VALUE. |
|---|---|---|
| Milligramme | (1000th of a gramme) | 0·0154 grains. |
| Centigramme | (100th of a gramme) | 0·1544 ,, |
| Décigramme | (10th of a gramme) | 1·5440 ,, |
| Gramme | (unit of weight) | 15·44 ,, |
| Décagramme | (10 grammes) | 154·4 ,, |
| Hectogramme | (100 grammes) | 1544 grains $\begin{cases} 3·2167 \text{ oz. troy, or} \\ 3·5291 \text{ oz. avoirdupois.} \end{cases}$ |
| Kilogramme | (1000 grammes) | 32¼ oz. troy or 2·2057lbs.   ,, |
| Myriagramme | (10,000 grammes) | 321¾  ,,    22·057  ,,    ,, |

## 2. "SYSTÈME USUEL."

### (Formerly in use, but interdicted since 1840.)

### Length.

| | | | |
|---|---|---|---|
| 12 lignes make 1 pouce | | 1·094 inches. | |
| 12 pouces ,, | 1 "pied usuel" | 13·124 ,, | or 1·0936 feet. |
| 3 pieds ,, | 1 mètre | 39·371 ,, | 3·2809 ,, |
| 2 mètres ,, | 1 toise | 78·742 ,, | 6·5618 ,, |
| The aune is $\begin{cases} 12 \text{ decimétres} \\ 1\frac{1}{5} \text{ mètre} \end{cases}$ | | 47·245 ,, | 3·9371 ,, |

### Weight.

| | | | | |
|---|---|---|---|---|
| 72 grains make | 1 gros | 60·31 grains troy. | | |
| 8 gros ,, | 1 once | 482·5 ,, | = 1·0052 oz. troy. | |
| 8 onces ,, | 1 mark | 3860 ,, | = 8·0417 ,, | |
| 2 marks ,, | 1 livre $\Big\}$ | 7720 ,, | $\begin{cases} = 1·3403 \text{ lb. troy,} \\ \text{or } 1·1029 \text{ ,, avoird.} \end{cases}$ | |
| | = 500 grammes | | | |

## 3. ANCIENT SYSTEM.

### Length.

| | | | |
|---|---|---|---|
| 12 lignes make 1 pouce or inch | | 1·066 inches. | |
| 12 pouces ,, | 1 "pied de Roi" (0·3249 mètre) | 12·79 ,, | |
| 6 pieds ,, | 1 toise (1·9492 ,, ) | 6·395 feet. | |
| | The aune (1·1880 ,, ) | 46·85 inches. | |
| "Lieue de poste" (2000 toises) | | 4263 yards or 2·4222 miles. | |

## Weight.

| | | ENGLISH VALUE. |
|---|---|---|
| 72 grains make 1 gros | | 59·0 grains troy. |
| 8 gros ,, 1 once | | 472·2 ,, ,, =0·9837 oz. troy. |
| 8 onces ,, 1 mark | | 3777·5 ,, ,, =7·8698 ,, |
| 2 marks ,, 1 poids de marc | | 7555 ,, ,, {1·3116 lb. troy, or {1·0793 ,, avoirdupois. |

## Money.

| | | |
|---|---|---|
| 10 décimes } 100 centimes } make 1 franc | | 9·4d. sterling. |
| 5 franc piece in silver | | 3s. 11d. ,, |
| 10 franc piece in gold | | 7s. 11d. ,, |
| 20 franc piece or Napoleon | | 15s. 10d. ,, |

## FRANKFORT-ON-THE-MAINE (GERMANY).

### Length.

The foot measures 11·27 English inches, and the ell 21·54 inches.

### Liquid Capacity

| | | |
|---|---|---|
| 4 eich-mass } 4½ neu-mass } make 1 viertel | | 1·5784 gallons. |
| 20 viertel ,, 1 ohm | | 31·5674 ,, |
| 6 ohm ,, 1 fuder | | 189·4044 ,, |

The mass is also divided into 4 schoppen.

### Dry Capacity.

| | | |
|---|---|---|
| 4 schrot make 1 mässchen | | 0·01233 bushels. |
| 4 mässchen ,, 1 gescheid | | 0·04932 ,, |
| 4 gescheid ,, 1 sechter | | 0·1973 ,, |
| 2 sechter ,, 1 metze | | 0·3946 ,, |
| 2 metzen ,, 1 simmer | | 0·7892 ,, |
| 4 simmer ,, 1 malter or achtel | | 3·1568 ,, |

## Weight.

| | | | ENGLISH VALUE. |
|---|---|---|---|
| 2 heller | make | 1 pfennig | 14·1 grains or 0·0322 oz. |
| 4 pfennig | ,, | 1 quentchen | 56·4 ,, 0·1289 ,, |
| 4 quentchen | ,, | 1 loth | 225·6 ,, 0·5157 ,, |
| 2 loth | ,, | 1 unze | 451·2 ,, 1·0314 ,, |
| 8 unzen | ,, | 1 mark | 3610 ,, 0·5157 lb. |
| 2 mark | ,, | 1 pfund | 7220 ,, 1·0314 ,, |

The heavy weight is 8 per cent. more than this table; and the zoll-centner is 110·24 lbs. avoirdupois.

Apothecaries' weight is the same as at Nürnberg.

## Money.

| | | | |
|---|---|---|---|
| 4 heller or pfenninge | make | 1 kreuzer | 0·3d. sterling. |
| 4 kreuzer | ,, | 1 batzen | 1·3d. ,, |
| 15 batzen or 60 kreuzer | ,, | 1 gulden or florin | 19·9d. ,, |
| 1½ florin 90 kreuzer | ,, | 1 thaler or rixdollar | 29·85d. ,, |

The mark weight of fine silver (value 487·8d. sterling) is rated at 24½ florins or gulden.

The gold ducat is about 9s. 4d. sterling.

Frankfort-on-the-Oder; see Prussia.
Gallen, St. Gall; see Switzerland.
Geneva; see Switzerland.
Genoa; see Sardinia.

## GERMANY.

See Austria, Baden, Bavaria, Bohemia, Bremen, Brunswick, Frankfort, Hamburg, Hanover, Hesse, Lübec, Prussia and Saxony.

## GIBRALTAR.

The weights and measures are those of Great Britain.

## Money.

| | | | |
|---|---|---|---|
| 16 quartos | make | 1 real | 4·2d. sterling. |
| 12 reals | ,, | 1 dollar (Spanish) | 4s. 2d. ,, |
| 16 dollars | ,, | 1 doubloon (Spanish) | 66s. 8d. ,, |

The Spanish hard dollar is a legal tender at this rate in all the British Colonies. By an order in council, issued in 1845, it was directed that Spanish, Mexican, and South American dollars shall be legal tenders at 4s. 2d. sterling; and that gold doubloons, or 16 dollar pieces, of the same countries, shall pass for 3l. 6s. 8d. Mercantile operations are carried on in dollars and cents.

## GREECE.

### Length.

|  | ENGLISH VALUE. |
|---|---|
| The short picha (used for silks) | 25 inches. |
| ,, long ,, (woollens and linens) | 27 ,, |
| Ancient Greek foot (16 Egyptian fingers) | 11·81 ,, |
| ,, Attic or Olympic foot | 12·10 ,, |
| ,, Pythic foot | 9·75 ,, |

The cubit is 1½ feet and the stadium 400 cubits or 600 feet.

### Capacity.

The kila measures 0·9152 bushel or 0·1144 quarter.
The staro, of 3 bachels, measures 2·259 bushels.
The ancient keramion or metretes is 8·488 gallons.

### Weight.

The pound is 6168 grains or 0·8811 lb. avoirdupois.
The cantaro, of 40 okes, is 112 lbs. or 1 cwt.

The French metrical system is also used.

### Money.

| The silver drachma (=100 lepta or centimes) | 8·4d. sterling. |
|---|---|
| The 5 drachma silver piece | 3s. 6d. ,, |
| The 10 drachma ,, ,, | 7s. 0d. ,, |
| The 20 drachma gold piece | 14s. 2d. ,, |

## GUINEA (AFRICA).

*Length.*—The jacktan = 12 English feet.

E

## Weight.

| | | | ENGLISH VALUE. |
|---|---|---|---|
| 2 media-tabla | make | 1 aguïrage | 62 grains. |
| 2 aguïrages | „ | 1 piso or uzan | 124 „ |
| 4 pisos | „ | 1 benda-offa | 496 „ |
| 2 benda-offas | „ | 1 benda | 992 „ |
| The quinto is 3 media-tabla | | | 93 „ |
| „ seron „ 6 „ „ | | | 186 „ |
| „ eggĕba „ 10¾ „ „ | | | 330 „ |

*Money.*—100 cents make 1 dollar (50*d.* sterling).

The decimal system was introduced in 1839, the previous money being that of Holland, of which 3 guilders were to represent 1 dollar currency.

### HAMBURG (GERMANY).

| 8 achtel | make | 1 zoll | 0·94 inches. | |
|---|---|---|---|---|
| 12 zoll | „ | 1 fuss | 11·29 „ | or 0·9408 feet. |
| 2 fuss | „ | 1 elle | 22·58 „ | 1·8817 „ or 0·6272 yard. |
| The Rhenish foot | | | 12·357 „ | 1·0298 feet. |

Engineers and surveyors use the Rhenish foot and inch, decimally divided.

The meile is 24000 Rhenish feet = 4·6807 English miles.

*Surface.*—The morgen is 117600 square fuss = 2·3895 acres.

## Liquid Capacity.

| 2 össel | make | 1 quartier | 55·2 cubic inches or 0·1992 gallons. | | |
|---|---|---|---|---|---|
| 2 quartier | „ | 1 kanne | 110·4 „ | „ | 0·3983 „ |
| 2 kannen | „ | 1 stübchen | 220·9 „ | „ | 0·7967 „ |
| 2 stübchen | „ | 1 viertel | 441·8 „ | „ | 1·5934 „ |
| 5 viertel | „ | 1 anker | 2209 „ | „ | 7·9668 „ |
| 4 anker | „ | 1 ohm | 8836 „ | „ | 31·867 „ |
| 6 ohm | „ | 1 fuder | 53016 „ | „ | 191·202 „ |
| The eimer is 4 viertel | | | 6·3734 gallons. | | |
| The tonne is 24 „ | | | 38·2404 „ | | |
| The oxhoft is 30 „ | | | 47·8096 „ | | |

## Dry Capacity.

|  |  |  | ENGLISH VALUE. |  |  |  |
|---|---|---|---|---|---|---|
| 4 spinte | make 1 himt | 1606·5 cubic inches or 0·7242 bushels. |  |  |  |  |
| 2 himt | ,, 1 fass | 3213 | ,, | ,, | 1·4485 | ,, |
| 2 fass | ,, 1 scheffel | 6426 | ,, | ,, | 2·8969 | ,, |
| 10 scheffel | ,, 1 wispel | 64260 | ,, | ,, | 28·9694 | ,, |
| 3 wispel | ,, 1 last | 192780 | ,, | ,, | 86·9083 | ,, } |
|  |  |  |  | or | 1·0864 lasts. | } |

## Weight.

| 4 pfennig | make 1 quentchen | 58·4 grains. |  |  |
|---|---|---|---|---|
| 4 quentchen | ,, 1 loth | 233·6 | ,, |  |
| 2 loth | ,, 1 unze | 467·2 | ,, | or 1·068 oz. |
| 8 unzen | ,, 1 mark | 3738 | ,, | 8·544 ,, |
| 2 mark | ,, 1 pfund | 7476 | ,, | 1·068 lbs. |

The schiffpfund or 20 liespfund is 280 pfund.

Gold and silver are weighed by the Cologne mark; and medicine by Nürnberg apothecaries' weight.

## Money.

| 12 pfennige | make 1 schilling | 0·9d. sterling. |
|---|---|---|
| 16 schillinge | ,, 1 mark | 1s. 2⅓d. ,, |
| 3 mark } ,, | 1 rixdollar } | 3s. 7d. ,, |
| 48 schillinge } | (nominal) } |  |
| The mark banco (imaginary) | | 1s. 5½d. ,, |
| The rixdollar specie | | 4s. 5·7d. ,, |
| The gold ducat | | 9s. 4d. ,, |

The weight of the Cologne mark, according to the Hamburg standard, is 3608 English troy grains. This weight of *fine* silver is coined into 34 marks, and its value, at the rate of 5s. sterling per ounce standard, is 40s. 7d.; hence the value of the "mark current" as above. Banco is a nominal valuation of the Cologne mark of silver at 27¾ marks Banco, according to which the estimated value of the "mark banco" is 17½d. sterling.

## HANOVER (GERMANY).

### Length.

ENGLISH VALUE.

| | | |
|---|---|---|
| 12 linien<br>= 8 achtel } make 1 zoll | | 0·95 inches. |
| 12 zoll | „ 1 fuss | 11·45 „ or 0·9542 feet. |
| 2 fuss | „ 1 elle | 22·9 „ 1·9083 „ |
| 8 ellen | „ 1 ruthe | 183·2 „ 15·2667 „ |
| The meile (25,400 fuss) = | | 24236 feet 4·5901 miles. |

*Surface.*—The morgen of Calenberg is 30720 square fuss = 3108 square yards or 0·6438 acre.

### Liquid Capacity.

| | | |
|---|---|---|
| 2 nössel | make 1 quartier | 0·214 gallons. |
| 2 quartier | „ 1 kanne | 0·428 „ |
| 2 kannen | „ 1 stübchen | 0·856 „ |
| 2 stübchen | „ 1 viertel | 1·7118 „ |
| 5 viertel | „ 1 anker | 8·559 „ |
| 4 anker | „ 1 ohm | 34·236 „ |
| 6 ohm | „ 1 fuder | 205·416 „ |
| The eimer is 8 viertel | | 13·6944 „ |
| The oxhoft is 30 viertel | | 51·354 „ |

### Dry Capacity.

| | | |
|---|---|---|
| 4 vierfass<br>= 3 drittel } make 1 himt | | 0·8556 bushels. |
| 6 himt | „ 1 malter | 5·1337 „ or 0·6417 quarters. |
| 8 malter | „ 1 wispel | 41·07 „ 5·1337 „ |
| 2 wispel | „ 1 last | 82·14 „ 10·2675 „ |

### Weight.

| | | |
|---|---|---|
| 4 örtchen | make 1 quentchen | 58·7 grains or 0·1341 oz. |
| 4 quentchen | „ 1 loth | 234·8 „ 0·5366 „ |
| 2 loth | „ 1 unze | 469·5 „ 1·0731 „ |
| 8 unzen | „ 1 mark | 3756 „ 0·5366 lb. |
| 2 mark | „ 1 pfund | 7512 „ 1·0731 „ |

Gold and silver are weighed by the Cologne mark; and medicine by Nürnberg apothecaries' weight.

Havannah; see West Indies.

Hayti or Haiti (St. Domingo); see West Indies.

### HESSE-CASSEL (GERMANY).

#### Length.

|  | ENGLISH VALUE. |
|---|---|
| 12 linien make 1 zoll | 0·9437 inches. |
| 12 zoll „ 1 (standard) fuss | 11·324 „ or 0·9437 foot. |
| The (surveyors') fuss | 11·217 „ 0·9347 „ |

*Surface.*—The acker (29400 square surveyors' fuss) = 2854 square yards or 0·5897 acre.

#### Liquid Capacity.

| 4 schoppen make 1 mass | 0·44 gallons. |
|---|---|
| 4 mass „ 1 viertel | 1·76 „ |
| 20 viertel „ 1 ohm | 35·2 „ |
| 6 ohm „ 1 fuder | 211·2 „ |

#### Dry Capacity.

| 4 mässchen make 1 metze | 0·276 bushels. |
|---|---|
| 4 metzen „ 1 himt | 1·105 „ |
| 2 himt „ 1 scheffel | 2·21 „ |

#### Weight.

| 4 quentchen make 1 loth | 234 grains or 0·535 oz. |
|---|---|
| 2 loth „ 1 unze | 468 „ 1·07 „ |
| 16 unzen „ 1 pfund | 7490 „ 1·07 lb. |

Gold and silver by the Cologne mark; and apothecaries' weight the same as at Nürnberg.

### HESSE-DARMSTADT (GERMANY).

#### Length.

| 10 linien make 1 zoll | 0·984 inches. |
|---|---|
| 10 zoll „ 1 fuss | 9·843 „ (¼ French metre). |
| 10 fuss „ 1 klafter | 98·427 „ = 8·2022 feet ⎱ or 2·7341 yards. ⎰ |

*Surface.*—The morgen is 40,000 square fuss or 400 square klafter = 2990 square yards or 0·6178 acre.

### Liquid Capacity.

| | | ENGLISH VALUE. |
|---|---|---|
| 4 schoppen make 1 mass | | 0·44 gallons. |
| 4 mass „ 1 viertel | | 1·76 „ |
| 20 viertel „ 1 ohm | | 35·2 „ |
| 6 ohm „ 1 fuder | | 211·2 „ |

### Dry Capacity.

| | | |
|---|---|---|
| 4 mässchen make 1 gescheid | | 0·055 bushels. |
| 4 gescheid „ 1 kümpf | | 0·22 „ |
| 4 kümpf „ 1 simmer | | 0·88 „ |
| 4 simmer „ 1 malter | | 3·52 „ |

### Weight.

| | | |
|---|---|---|
| 4 pfennig make 1 quentchen | | 60·3 grains. |
| 4 quentchen „ 1 loth | | 241·1 „ or 0·5511 oz. |
| 32 lothe · „ 1 pfund | | 7716 „ 1·1023 lb. |

Previously to 1821 the weights and measures were those of Frankfort.

Hindoostan (Asia); see East Indies.

### HOLLAND.

With the exception of the old nomenclature, the weights and measures of Holland, since 1817, have been according to the metrical system of France.

### Length.

| | | | |
|---|---|---|---|
| The streep is the millimètre | | 0·03937 inches. | |
| „ duim „ centimètre | | 0·39371 „ | |
| „ palm „ decimètre | | 3·93708 „ | |
| „ elle „ mètre | | 39·3708 „ or 3·2809 feet. | |
| „ roede „ décamètre | | 32·809 feet or 10·9363 yards. | |
| „ mijle „ kilomètre | | 1093·63 yards or 0·6214 mile. | |

## *Liquid Capacity.*

| | | | |
|---|---|---|---|
| The vingerhoed is the centilitre | | | 0·61027 cubic inches. |
| „ maatje | „ | decilitre | 6·10270 „ „ |
| „ kan | „ | litre | 61·02705 „ „ or 1·7608 pints. |
| „ vat | „ | hectolitre | 3·53166 cubic feet or 22·0097 gallons. |

## *Dry Capacity.*

| | | | |
|---|---|---|---|
| The maatje | is the decilitre | | 6·10270 cubic inches. |
| „ kop | „ | litre | 61·02705 „ „ |
| „ schepel | „ | decalitre | 610·2705 „ „ or 0·27512 bushels. |
| „ mudde or zak | „ | hectolitre | 3·53166 cubic feet or 2·7512 „ |
| „ last | is | 30 mudde | 82·536 bushels or 10·317 quarters or 1·0317 last imperial. |

## *Weight.*

| | | | |
|---|---|---|---|
| The korrel is the decigramme | | | 1·544 grains. |
| „ wigtje | „ | gramme | 15·44 „ |
| „ lood | „ | decagramme | 154·4 „ |
| „ ons | „ | hectogramme | 1544 „ or 3·5291 oz. |
| „ pond | „ | kilogramme | 15440 „ 2·2057 lbs. |

Apothecaries' weight is similar to that of Great Britain.

## *Money.*

| | | ENGLISH VALUE. |
|---|---|---|
| 5 cents | make 1 stiver | 1*d.* sterling. |
| 20 stivers / 100 cents | „ 1 florin or guilder | 1*s.* 8*d.* „ |
| The rixdollar (nominal) | is { 50 stivers / 2½ florins } | 4*s.* 2*d.* „ |
| 12 groot | make { 1 schilling / Flemish } | 6*d.* „ |
| The ducatoon | | 5*s.* 5*d.* „ |
| The gold-ducat | | 9*s.* 5*d.* „ |
| „ „ 10 florin piece | | 16*s.* 6½*d.* „ |
| „ „ ryder | | 25*s.* 1*d.* „ |

Holstein; see Denmark.
Hungary; see Austria.

### IONIAN ISLANDS (IN MEDITERRANEAN).

Since 1817, the weights and measures have been those of Great Britain with Italian designations.

The libbra sottile is the pound troy; the libbra grossa the pound avoirdupois; the centinajo is 100 libbre.

The dicotoli is the English pint; the chilo the bushel; the barile is 16 gallons; the stadio is the chain (22 yards), &c.

*Money.*—104 oboli make 1 Spanish dollar (50*d.* sterling).

Ireland; see Great Britain.
Jamaica; see West Indies.

### ITALY.

See Modena, Naples, Parma, Roman States, Sardinia, Sicily, Tuscany, and Venetian Lombardy.

### JAPAN (ASIA).

The long measure of Japan is the inc (6¼ English feet).

The weights and moneys are nearly the same as those of China.

#### ISLAND OF JAVA: BATAVIA.

*Length.*—The ell is 27¾ English inches; the foot is the Rhineland foot (12·357· inches); the ikje (3 ells) is 83¼ inches.

*Capacity.*—The kanne is about ⅖ of an English gallon.

*Weight.*—The weights are those of China.

*Money.*—The old florin of Batavia is valued at 19¾*d.* sterling; the rixdollar 37½*d.*; and the new gulden or florin of the Netherlands is valued at 20*d.* sterling. See Holland.

Kiel; see Denmark.
Königsberg; see Prussia.
Leghorn; see Tuscany.

Leipzic; see Saxony.
Lille; see France.
Lisbon; see Portugal.
Lombardo-Veneto; see Venetian Lombardy.
London; see Great Britain.

## LÜBECK (GERMANY).

### Length.

| | | ENGLISH VALUE. | |
|---|---|---|---|
| 12 punkte make 1 linie | | 0·16 inches. | |
| 6 linien ,, 1 zoll | | 0·95 ,, | |
| 12 zoll ,, 1 fuss | | 11·45 ,, | or 0·9542 feet. |
| 2 fuss ,, 1 elle | | 22·90 ,, | 1·9084 ,, |

### Liquid Capacity.

| | | | |
|---|---|---|---|
| 2 ort make 1 planke | | 0·0996 gallons or 0·7968 pints. | |
| 2 planken ,, 1 quartier | | 0·1992 ,, | 1·5936 ,, |
| 2 quartier ,, 1 kanne | | 0·3985 ,, | 3·188 ,, |
| 2 kannen ,, 1 stübchen | | 0·797 ,, | |
| 2 stübchen ,, 1 viertel | | 1·594 ,, | |
| 5 viertel ,, 1 anker | | 7·97 ,, | |
| 4 anker ,, 1 ohm | | 31·88 ,, | |
| 6 ohm ,, 1 fuder | | 191·28 ,, | |
| The eimer is 4 viertel | | 6·376 ,, | |
| The oxhoft is 30 ,, | | 47·82 ,, | |

### Dry Capacity (Wheat, &c.).

| | | | |
|---|---|---|---|
| 4 fass make 1 scheffel | | 0·92 bushels. | |
| 4 scheffel ,, 1 tonne | | 3·68 ,, | |
| 3 tonnen ,, 1 drömt | | 11·04 ,, | or 1·38 quarters. |
| 8 drömt ,, 1 last | | 88·32 ,, | 11·04 ,, |

The corresponding measures for oats are ⅙th larger.

### Weight.

| | | | |
|---|---|---|---|
| 4 pfennig make 1 quentchen | | 58·4 grains or 0·1336 oz. | |
| 4 quentchen ,, 1 loth | | 233·7 ,, | 0·5343 ,, |
| 2 loth ,, 1 unze | | 467·5 ,, | 1·0686 ,, |
| 8 unzen ,, 1 mark | | 3740 ,, | 0·5343 lb. |
| 2 mark ,, 1 pfund | | 7480 ,, | 1·0686 ,, |

Gold and silver are weighed by the Cologne mark (3609 grains); and apothecaries' weight is the same as Nürnberg.

### Money (*Hamburg standard*).

| | | |
|---|---|---|
| 12 pfennige make 1 schilling | | 1·1*d.* sterling. |
| 16 schillinge „ 1 mark | | 17·6*d.* „ |

Lucca (Italy); see Tuscany.
Lucerne; see Switzerland.
Lyons; see France.
Madeira (in Atlantic); see Portugal.
Madras; see East Indies.
Madrid; see Spain.
Malaga; see Spain.

### MALTA (IN MEDITERRANEAN).

*Length.*—The foot is 11·17 English inches; the palmo is 10·3 inches; and the canna is 8 palmi or 82·4 inches.

### Capacity.

| | ENGLISH VALUE. |
|---|---|
| The caffiso of oil is | 4·580 gallons imperial. |
| „ barile of wine is | 9·160 „ „ |
| „ salma of corn is | 7·969 bushels. |

### Weight.

| | |
|---|---|
| The rottolo of 30 ounces is | 1¾ lbs. avoirdupois. |
| „ cantaro of 100 rottoli is | 175 „ „ |
| 64 rottoli make | 1 cwt. |

### Money.

| | | |
|---|---|---|
| 20 grani make 1 tari | | 1·65*d.* sterling. |
| 12 tari „ 1 scudo | | 20*d.* „ |
| 2½ scudo } „ 1 pezza, } = 30 tari } Sicilian dollar } | | 50*d.* „ |

As dollars and doubloons here form the principal circulating medium, it was ordered, in 1845, that the Spanish or South American dollar should pass for 4*s.* 2*d.* or 30 tari,

and the Sicilian dollar for 4*s.* or 28 tari and 16 grani. But the pezza or dollar of Sicily is usually valued at 50*d.* as above stated.

Marseilles ; see France.

### MAURITIUS (IN INDIAN SEA).

For weights and measures, see Great Britain; and also France ("ancient system ").

*Money.*—100 cents make 1 current dollar (50*d.* sterling).

The Spanish dollar is valued at 4*s.* 4*d.* sterling, and is divided into halves, quarters, eighths, and sixteenths.

In 1843, an order in council established the pound sterling as the money for public accounts, and gave to the coins circulating in the colony, the following values :—

| | | |
|---|---|---|
| Dollars of Spain, Mexico, and South America } | 4*s.* 2*d.* = 1·04⅛ Mauritius dollars. | |
| East India Company's rupee | 1*s.* 10*d.* = 0·45⅝ „ | „ |
| „  „  „  gold mohur | 29*s.* 2*d.* = 7·29⅜ „ | „ |
| 5 francs  .  .  .  . | 3*s.* 10*d.* = 0·96²³⁄₂₉ „ | „ |
| Napoleon of 20 francs  .  . | 15*s.* 10*d.* = 3·95⅝ „ | „ |

To obviate fractions, the population freely pass rupees at two to the Mauritius dollar; which, therefore, represents only 3*s.* 8*d.* instead of 4*s.* Thus British coins are practically excluded, excepting in government transactions, and rupees have become the principal currency.

### MECKLENBURG-SCHWERIN (GERMANY).

The weights and measures are the same as Hamburg, with the exception of measures of capacity which are those of Lübeck.

### MECKLENBURG-STRELITZ (GERMANY).

The same as Hamburg, excepting measures of capacity which are those of Lübeck.

Memel; see Prussia.

### MEXICO (NORTH AMERICA).

The weights and measures of Mexico are those of Spain, with some local variations difficult to ascertain and enumerate. See Spain.

Accounts are kept in pesos or dollars of 8 reals, the real being usually valued at 6 pence sterling.

> Milan (Italy); see Venetian Lombardy.
> Mocha; see Arabia.

### MODENA (ITALY).

#### *Length.*

The piede, or foot, is 20·592 English inches.
6 piedi make 1 cavezzo (123·55 inches = 10·296 feet
                                    =  3·432 yards).
The braccio (2½ Genoa palmi) = 24·52 inches.

*Surface.*—The biolca, of 72 tavole (288 square cavezzi) = 3392 square yards or 0·7009 acre.

#### *Liquid Capacity.*

|  |  | ENGLISH VALUE. |
|---|---|---|
| 2 boccali make 1 fiasco | | 0·4584 gallons. |
| 20 fiasci „ 1 barile | | 9·1680 „ |

#### *Dry Capacity.*

| 2 staja make 1 sacco | 3·876 bushels or 0·4845 quarter. |
|---|---|

#### *Weight.*

| 16 ferlini make 1 oncia | 411 grains or 0·9394 oz. |
|---|---|
| 12 oncie „ 1 libbra or lira | 4932 „ 0·7046 lb. |

> Montpelier; see France.

### MOROCCO (AFRICA).

| The cubit or canna | 21 inches. |
|---|---|
| The pic | 26 „ |
| The commercial pound | 1·190 lb. |
| The market pound | 1·785 „ |

The principal coins in circulation are Spanish dollars and doubloons.

> Moscow; see Russia.
> Munich; see Bavaria.
> Munster; see Prussia.
> Nantes; see France.

## NAPLES, THE TWO SICILIES (ITALY).

### Length.

|  |  | ENGLISH VALUE. |
|---|---|---|
| 5 minuti make 1 oncïa | | 0·865 inches. |
| 12 oncie ,, 1 palmo | | 10·382 ,, or 0·8652 feet. |
| 8 palmi ,, 1 canna | | 83·055 ,, 6·9213 ,, |
| The pertica or passo is 7½ palmi | | 77·865 ,, 6·4887 ,, |
| The míglio is 7000 palmi | | 6056 feet or 1·1470 mile. |

### Surface.

| The mòggio is 900 square passi or 50625 square palmi | 37898 square feet or 0·8700 acre. |
|---|---|

### Liquid Capacity (Wine, Spirits, &c.).

| 60 caraffi make 1 barile | 9·174 gallons. |
|---|---|
| 12 barili ,, 1 botte | 110·088 ,, |
| 2 botti ,, 1 carro | 220·176 ,, |

### Liquid Capacity (Oil).

| 6 misurelle make 1 quarto | 0·1392 gallons. |
|---|---|
| 16 quarti ,, 1 stájo | 2·228 ,, |
| 16 staja ,, 1 salma | 35·647 ,, |

The stájo is also divided into 20 pignate.

### Dry Capacity.

| 24 misure make 1 tomolo | 1·407 bushels. |
|---|---|
| 36 tomoli ,, 1 carro | 50·660 ,, or 6·332 quarters. |

## Weight (*Troy and Apothecaries'*).

|  |  | ENGLISH VALUE. |
|---|---|---|
| 20 accini make 1 trapeso or scrupolo | 13¾ grains. |  |
| 3 scrupoli „ 1 dramma | 41¼ „ |  |
| 10 dramme „ 1 oncia | 412½ „ . or 0·8594 oz. troy. |  |
| 12 oncie „ 1 libbra | 4950 „ 0·8594 lb. „ |  |
| The rotolo grosso is 33½ oncie | 1·9643 lb. avoirdupois. |  |
| The rotolo piccolo 18 oncie | 1·0607 „ „ |  |

## *Money.*

| 10 grani make 1 carlino | 4d. sterling. |
|---|---|
| 2 carlini „ 1 taro | 8d. „ |
| 5 tari   }   „ 1 ducat | 39¾d. „ |
| 100 grani } | |
| The gold oncetta (1818) | 10s, 3d. „ |

See also Sicily.

Netherlands; see Holland.
Neuchâtel or Neufchâtel; see Switzerland.
New York; see United States.
Nice (Italy); see Sardinia.
North America; see United States.
Norway; see Sweden and Norway.

●

## NÜRNBERG, OR NUREMBERG (BAVARIA).

The apothecaries' weight of Nürnberg is used for medicines throughout Germany. Its pfund is ¾ of the old Nürnberg money pound, or 1½ old Nürnberg mark, and is subdivided thus:—

| 20 gran make 1 scrupel | 19·2 grains. |  |
|---|---|---|
| 3 scrupel „ 1 drachme | 57·5 „ |  |
| 8 drachmen „ 1 unze | 460 „ or 0·9583 oz. troy. |  |
| 12 unzen „ 1 pfund | 5520 „ 11½ „ „ |  |

For further particulars of the weights, measures, and money of Nürnberg, see Bavaria.

Odessa; see Russia.
Oporto; see Portugal.
Ostend; see Belgium.

OTTOMAN ASIA: ALEPPO, SMYRNA, &c.

The Turkish pic (26·8 inches) is used for measures of length, and the oke for weight. At Damascus the pic is 23 inches.

### Weight.

| | | | | |
|---|---|---|---|---|
| 6 okes | make | 1 batman | | 16·974 lbs. |
| 7½ batman | „ | 1 cantaro | | 127·305 „ |

Ottoman Empire; see Turkey.
Padua (Italy); see Venetian Lombardy.
Palermo (Sicily); see Sicily.
Paris; see France.

## PARMA (ITALY).

### Length.

ENGLISH VALUE.

| | | | | | |
|---|---|---|---|---|---|
| 12 atomi | make | 1 punto | 0·15 inches. | | |
| 12 punti | „ | 1 oncia | 1·78 „ | | |
| 12 oncie | „ | 1 braccio di legno | 21·34 „ | or | 1·7783 feet. |
| 6 braccia | „ | 1 pertica | 128·04 „ | | 10·6700 „ |
| The pié or foot | | = | 22·428 „ | | 1·8690 „ |

*Surface.*—The biolca, of 6 stari (288 square pertica) = 3643 square yards or 0·7527 acre.

*Liquid Capacity.*—See Milan.

### Dry Capacity.

| | | | | |
|---|---|---|---|---|
| 8 quartaròli | make | 1 mina | | 0·7066 bushels. |
| 2 mine | „ | 1 stájo | | 1·4132 „ |

### Weight.

| | | | | | |
|---|---|---|---|---|---|
| 24 grani | make | 1 denaro | 17·5 grains. | | |
| 24 denari | „ | 1 oncia | 419·8 „ | | |
| 12 oncie | „ | 1 libbra | 5038 „ | or | 0·7197 lb. |
| 25 libbre | „ | 1 rubbio | 17·99 lbs. | | |

For gold and silver weight, see Venetian Lombardy.

### Money.

| | | |
|---|---|---|
| The 5 lire silver piece (1815) | | 3s. 11d. sterling. |
| „ 20 „ „ „ | | 15s. 10d. „ |
| The gold sequin (zecchino) | | 9s. 5d. „ |

## PERSIA (ASIA).

### Length.

The royal guerze, or monkelser, is 37½ English inches.
The common guerze is ⅔ the royal, or 25 „ „
The arish is 38·27 English inches.

### Capacity.

| | | | ENGLISH VALUE. | |
|---|---|---|---|---|
| 4 sextarios | make | 1 chenicas | 80·26 cubic inches. | |
| 2 chenicas | „ | 1 capichas | 160·52 „ | „ |
| 25 capichas | „ | 1 artaba | 4013 „ | „ or 1·809 bushels. |

### Weight.

| | | | | |
|---|---|---|---|---|
| 2 mascais | make | 1 dirhem | 0·0423 lbs. or | 0·0211 lbs. |
| 50 dirhems | „ | 1 rattel | 2·1136 „ | 1·0568 „ |
| 6 rattels | „ | 1 batman | 12·6816 „ | 6·3408 „ |

Both sorts of weights are used with these divisions.
The batman of Shirez is 12·6816 lbs. avoirdupois.
„ „ Tauris „ 6·3408 „ „;
The dirhem used for weighing gold and silver = 150 grains troy.

### Money.

| | | | | |
|---|---|---|---|---|
| 5 dinars simple make | 1 kasbequis | 0·216d. | sterling. | |
| 2 kasbequis | „ | 1 dinars-bisti | 0·432d. | „ |
| 5 dinars-bisti | „ | 1 shatree | 2·16d. | „ |
| 2 shatrees | „ | 1 mamoodi | 4·32d. | „ |
| 2 mamoodi | „ | 1 abassi | 8·64d. | „ |
| 50 abassi | „ | 1 toman | 1l. 16s. | „ |
| The silver rupee | | | 1s. 11d. | „ |
| „ gold „ | | | 1l. 9s. 2d. | „ |

The above dinar and toman are imaginary moneys of account, not represented by coins. The Persian gold toman is worth about 11s. sterling; and the silver rupee about 18d.

Petersburg ; see Russia.
Philadelphia ; see United States.
Piedmont ; see Sardinia.
Pondicherry (Asia) ; see France.


PORTUGAL.

## *Length.*

|  |  |  | ENGLISH VALUE. |
|---|---|---|---|
| 12 pontos | make | 1 linha or line | 0·090 inches. |
| 12 linhas | ,, | { 1 pollegada, thumb, or inch } | 1·082 ,, |
| 8 pollegadas | ,, | 1 palmo or span | 8·656 ,, or 0·7214 feet. |
| 5 palmos | ,, | 1 vara or yard | 43·28 ,, 3·6067 ,, |
| 2 varas | ,, | { 1 braça or fathom } | 86·56 ,, 7·214 ,, |

| The grao (of barley, in width) is | 2 linhas | 0·1803 inches |
|---|---|---|
| ,, dedo or finger | ,, 8 linhas | 0·7213 ,, |
| ,, covada or cubit | ,, 3 palmos | 25·968 ,, or 2·164 feet. |

The commercial covada measures 27 inches.

The Portuguese mile is 1·2786 miles English.

To reduce Portuguese palmos to English feet. Take $\frac{5}{7}$ths and increase the same by its $\frac{1}{100}$th part.

*Surface.*—The square palmo = 74·926 square inches or 0·5203 square feet.

The geira is 4840 square vara = 62959 square feet or 1·4453 acres.

## *Liquid Capacity.*

|  |  |  | LISBON. | OPORTO. |  |
|---|---|---|---|---|---|
| 4 quartilhos make | 1 canada | | 0·3034 | 0·46 | |
| 6 canadas | ,, | { 1 pote, cantaro, or alqueire } | 1·8202 | 2·76 | } gallons. |
| 2 potes | ,, | 1 almŭde | 3·6405 | 5·52 | |

The almŭde of $\begin{cases} \text{Lisbon} = 3\cdot6405 \\ \text{Oporto} = 5\cdot5200 \end{cases}$ imperial gallons.

### Dry Capacity.

| | | ENGLISH VALUE. | |
|---|---|---|---|
| | | LISBON. | OPORTO. |
| 8 outavas | make 1 alqueire | 0·3720 | 0·4696 |
| 4 alqueires | „ 1 fanga | 1·4878 | 1·8782 |
| 15 fangas | „ 1 moio | 22·317 | 28·173 |

bushels.

The fanga of $\begin{array}{l}\text{Lisbon} = 1\text{·}4878 \\ \text{Oporto} = 1\text{·}8782\end{array}\Big\}$ imperial bushel.

Timber is measured in cubic polegadas; masónry in cubic palmas; earthwork in cubic braças.

A cubic palmo = 648·56 cubic inches or 0·37532 cubic foot.

### Weight.

| 24 graos | make | 1 scropulo | 18·45 grains. |
|---|---|---|---|
| 3 scropulos | „ | 1 outava | 55·34 „ |
| 8 outavas | „ | 1 onça | 442·69 „ |
| 16 onça | „ | 1 arratel or pound | 7083 „ or 1·01186 lb. |
| 32 arratels | „ | 1 arroba | 32·3795 lbs. |
| 4 arrobas | „ | 1 quintal | 129·518 „ |

Gold and silver are weighed by the marco of 8 onças; and medicines are weighed by a libra of 12 onças = $\frac{3}{4}$ arratel.

### Money.

| 1 vintem | = | 20 reas | 1·1 pence sterling. | |
|---|---|---|---|---|
| 1 testoon | = | 100 „ | 5·6 „ | „ |
| 1 patàca | = | 320 „ | 17·9 „ | „ |
| 1 crusàdo | = | 400 „ | 22·4 „ | „ |
| 1 sello or new crusàdo | = | 480 „ | 26·9 „ | „ |
| Silver crown, 1 milrea | = | 1000 „ | 56·0 „ | „ |
| „ Brazillian dollar | = | 1920 „ | 107·5 „ | „ |
| Gold crown, 5 milreas | = | 5000 „ | 1l. 3s. 4d. | „ |
| Moeda of 4000 gold | = | 9000 „ | 2l. 2s. 0d. | „ |
| „ 6400 „ | = | 16000 „ | 3l. 14s. 8d. | „ |
| Milrea of Madeira | | | 50d. | „ |
| „ „ Azores | | | 41·6d. | „ |

The rei is an imaginary coin of reckoning, and the milrea =1000 reis is usually written 1$000; also 1000 milreis, or one million of reis, is called a conto of reis, and written 1 : 000$000.

In 1834, foreign moneys were ordered to be received as a legal tender at the rate of 4120 reis for an English sovereign, and 870 reis for a Spanish or Mexican dollar.

Prague ; see Bohemia.

Presburg ; see Vienna.

## PRUSSIA.

### Length.

|  |  |  | ENGLISH VALUE. |
|---|---|---|---|
| 12 scrupel | make | 1 linie | 0·086 inches. |
| 12 linien | ,, | 1 zoll | 1·03 ,, |
| 12 zoll | ,, | 1 fuss<br>Rhein-fuss | 12·357 ,, or 1·0298 feet. |
| 12 Rhein-fuss | ,, | 1 ruthe | 12·357 feet or 4·119 yards. |
| 2000 ruthen | ,, | 1 post-meile | 8238 yards or 4·6807 miles. |
| The elle is 25½ zoll or 2⅛ Rhein-fuss | | | 26·258 inches = 2·1882 feet<br>or 0·7294 yard. |

### Surface.

The morgen is 180 square ruthen | 3054 square yards or 0·6310 acre.

### Liquid Capacity.

| 2 össel | make | 1 quartier | 70 cubic inches or 0·252 gallons. |
|---|---|---|---|
| 30 quartier | ,, | 1 anker | 2096 ,, ,, 7·559 ,, |
| 2 anker | ,, | 1 eimer | 4192 ,, ,, 15·118 ,, |
| 2 eimer | ,, | 1 ohm | 8384 ,, ,, 30·237 ,, |
| 6 ohm | ,, | 1 fuder | 50304 ,, ,, 181·4 ,, |

### Dry Capacity.

| 4 mässchen | make | 1 metze | 209·6 cubic inches or 0·0945 bushels. |
|---|---|---|---|
| 4 metzen | ,, | 1 viertel | 838·5 ,, ,, 0·3780 ,, |
| 4 viertel | ,, | 1 scheffel | 3354 ,, ,, 1·5121 ,, |
| 12 scheffel | ,, | 1 malter | 18·145 bushels or 2·2681 quarters. |
| 6 malter | ,, | 1 last | 108·870 ,, 1·3609 last. |
| The wispel is 18 scheffel | | | 27·2175 ,, 3·4022 quarters. |

### Weight.

| 4 quentchen | make | 1 loth | 225·6 grains or 0·5156 oz. |
|---|---|---|---|
| 2 loth | ,, | 1 unze | 451·1 ,, 1·0311 ,, |
| 8 unzen | ,, | 1 mark<br>(Cologne) | 3609 ,, 0·5156 lbs. |
| 2 mark | ,, | 1 pfund | 7218 ,, 1·0311 ,, |

The pfund is $\frac{1}{66}$ of a Rhineland cubic foot of distilled water, weighed, and reduced to a vacuum, at the temperature of 15° Reaumur or 65¾° Fahrenheit.

| | | | ENGLISH VALUE. |
|---|---|---|---|
| The liespfund | is 16½ pfund | | 17·014 lbs. |
| The centner } = 5 stein | „ 110 „ | | 113·426 „ |
| The schiffpfund } = 3 centner | „ 330 „ | | 340·277 „ |

### For weighing Gold and Silver.

288 grains make 1 Cologne mark = 3609 English grains.

### Apothecaries' Weight.

| 20 gran | make 1 scrupel | 18·8 grains or 0·039 oz. troy. |
|---|---|---|
| 3 scrupel | „ 1 drachme | 56·4 „ 0·117 „ „ |
| 8 drachmen | „ 1 unze | 451·1 „ 0·940 „ „ |
| 12 unzen | „ 1 pfund | 5413·5 „ 11·278 „ „ |

### Money.

| 12 pfennige | make 1 groschen | 1½d. sterling. |
|---|---|---|
| 30 silver groschen | „ 1 rix dollar } or thaler | 2s. 10¾d. „ |

The dollar used formerly to be divided into 24 good groschen.

The Cologne mark weight of *fine* silver is coined into 14 Prussian dollars, from which the above sterling value is calculated.

The gold ducat is estimated at 9s. 3d., and the Frederick at 16s. 4d. sterling.

> Quebec ; see Great Britain.
> Revel ; see Russia.
> Riga ; see Russia.
> Rio de Janeiro ; see Brazil.
> Rochelle ; see France.

## ROMAN STATES (ITALY).

### 1. ROME.

#### Length (Commercial).

|  |  | ENGLISH VALUE. |
|---|---|---|
| The pié or foot measures | | 11·592 inches or 0·966 feet. |
| The palmo | ,, | 8·796  ,,  0·733 ,, |
| The canne | ,, | 78·4  ,,  6·533 ,, |
| The braccio | ,, | 30·732  ,,  2·561 ,, |

#### For Cloth, &c.

| The palmo | measures | 8·347 inches. |
|---|---|---|
| The fathom of 3 palmi | ,, | 25·041 ,, |
| The fathom of 4 palmi | ,, | 33·388 ,, |

#### Length (Architects, &c.).

| 10 decimi | make | 1 oncia | 0·73 inches. |
|---|---|---|---|
| 12 oncie | ,, | 1 palmo | 8·79  ,,  or 0·7325 feet. |
| 10 palmi | ,, | 1 canna | 87·9  ,,  7·3250 ,, |
| The pié | is | 16 oncie | 11·72  ,,  0·9767 ,, |
| The catèna<br>10 stajol o | ,, 57½ palmi | | 42·119 feet. |
| The ancient foot | = | | 11·62 inches. |

#### Liquid Capacity.

| 4 quartucci | make | 1 foglietta | 0·1003 gallons. |
|---|---|---|---|
| 4 fogliette | ,, | 1 boccale | 0·4012 ,, |
| 32 boccali | ,, | 1 barile | 12·84 ,, |
| 16 barili | ,, | 1 botte | 205·44 ,, |

#### Dry Capacity.

| 4 quartucci | make | 1 scorzo | 0·3682 bushels. |
|---|---|---|---|
| 1¾ scorzi | ,, | 1 starello | 0·5063 ,, |
| 4 starelli | ,, | 1 quarta | 2·0251 ,, |
| 4 quarte | ,, | 1 rubbio | 8·1004 ,, |
| The stairo | is | ⅓ quarta | 0·6750 ,, |

#### Weight.

| 24 grani | make | 1 denaro | 18·2 grains. |
|---|---|---|---|
| 24 denari | ,, | 1 oncia | 436·2  ,,  or 0·9970 oz. |
| 12 oncie | ,, | 1 libbra | 5234  ,,  ,, 0·7477 lb. |
| The ancient libbra | | | 4966  ,, 0·7094 ,, |

## Money.

|  |  | ENGLISH VALUE. |
|---|---|---|
| 10 bajocchi make 1 paolo |  | 5d. sterling. |
| 10 paoli „ 1 Roman scudo (silver crown) |  | 50½d. „ |
| The 10 scudi gold piece | = | 42s. 8d. „ |
| The gold sequin | = | 9s. 2d. „ |
| „ „ pistole | = | 13s. 6d. „ |

## 2. BOLOGNA.

### Liquid Capacity.

| 4 fogliette | make | 1 boccale | 0·288 gallons. |
|---|---|---|---|
| 15 boccali | „ | 1 quarterone | 4·32 „ |
| 4 quarteroni | „ | 1 corba | 17·28 „ |

### Dry Capacity.

| 4 quarticini | make | 1 quarterone | 0·27 bushels. |
|---|---|---|---|
| 4 quarteroni | „ | 1 stájo | 1·08 „ |
| 2 staja | „ | 1 corba | 2·16 „ |

The capacity of the corba is the same in both liquid and dry measure.

### Weight.

| 4 grani | make | 1 carato | 2·9 grains. |  |
|---|---|---|---|---|
| 10 carati | „ | 1 ferlino | 29·1 „ |  |
| 2 ferlini | „ | 1 ottavo | 58·2 „ |  |
| 8 ottavi | „ | 1 oncia | 465·5 „ | or 1·064 oz. |
| 12 oncie | „ | 1 libbra | 5586 „ | 0·798 ℔. |

## 3. ANCONA.

| The foot | measures | 15·384 inches or 1·282 feet. |  |
|---|---|---|---|
| „ braccio or ell | „ | 25⅓ „ | 2⅛ „ |
| „ soma | „ | 18·9 gallons. |  |
| „ rubbio | „ | 7·73 bushels. |  |
| „ commercial libbra weighs | | 5094 grains or 0·7277 ℔. |  |

Rotterdam; see Holland.
Rouen; see France.

RUSSIA.

## Length.

|  |  | ENGLISH VALUE. |
|---|---|---|
| 16 verschoks make 1 archine | | 28 inches. |
| 3 archines ,, 1 sachine | | 7 feet. |
| 500 sachines ,, 1 verst or werst | | 3500 ,, or 0·6629 miles. |
| The Lithuania meile is 28530 Rhein-fuss | | 9793 yards or 5·5641 ,, |

## Liquid Capacity.

| 100 tscharkeys make 1 vedro | 750 cubic inches or 2·7049 gallons. |
|---|---|
| 3 vedros ,, 1 anker | 2250 ,, ,, 8·1147 ,, |
| 40 vedros ,, 1 sarokowaja | 324·588 ,, |

## Dry Capacity.

| 2 garnetz make 1 tschetwerka | 400 cubic inches or 0·1803 bushels. |
|---|---|
| 4 tschetwerkas ,, 1 tschetwerik | 1600 ,, ,, 0·7213 ,, |
| 2 tschetweriks ,, 1 pajak | 3200 ,, ,, 1·4426 ,, |
| 2 pajaks ,, 1 osmin | 6400 ,, ,, 2·8852 ,, |
| 2 osmins ,, tschetwert | 12800 ,, ,, 5·7704 ,, |

## Weight.

| 96 doli make 1 zolotnic | 65·8 grains or 0·1504 oz. |
|---|---|
| 3 zolotnics ,, 1 loth | 197·4 ,, 0·4513 ,, |
| 8 zolotnics ,, 1 lana | 526·5 ,, 1·2035 ,, |
| 12 lanas ⎱ ,, 1 funt or ⎱ (32 loths) ⎰ pound ⎰ | 6318·5 ,, 0·90264 lbs. |
| 40 funts ,, 1 pud | 36·1056 lbs. |
| 10 puds ,, 1 berkowitz | 361·056 ,, |
| 3 berkowitz ,, 1 packen | 1083·168 ,, |

## Money.

100 copecs make 1 silver ruble (37½d. sterling).

| The gold ducat | (1796) | 9s. 5d. sterling. |
|---|---|---|
| ,, ,, imperial | (1801) | 32s. 2d. ,, |

St. Domingo (Hayti); see West Indies.

St. Gall, or St. Gallen; see Switzerland.

St. Petersburg; see Russia.

## SARDINIA (ITALY).

### 1. GENOA.

#### *Length.*

ENGLISH VALUE.

| | | | | |
|---|---|---|---|---|
| 12 atomi | make | 1 punto | 0·140 inches. | |
| 12 punti | ,, | 1 oncia | 1·686 ,, | |
| 12 oncie | ,, | 1 piede liprando | 20·228 ,, | or 1·6857 foot. |
| 8 oncie | ,, | 1 piede manuale | 14·712 ,, | 1·2260 ,, |
| 5⅓ oncie | ,, | 1 palmo | 9·808 ,, | 0·8173 ,, |
| 2⅓ palmi | ,, | 1 braccio | 22·885 ,, | 1·9071 ,, |
| 9 palmi nearly | ,, | 1 canna | 87·60 ,, | 7·30 ,, |

#### *Liquid Capacity.*

| | | | |
|---|---|---|---|
| 90 amole or 50 pinte | make 1 barile | 16·337 gallons. | |
| 2 barili | ,, 1 mezzaruòla | 32·674 ,, | |

#### *Dry Capacity.*

| | | | |
|---|---|---|---|
| 12 gombette | make | 1 quarto | 0·415 bushels. |
| 8 quarti | ,, | 1 mina | 3·321 ,, |

#### *Weight.*

| | | | | |
|---|---|---|---|---|
| 24 grani | make | 1 denaro | 17 grains. | |
| 24 denari | ,, | 1 oncia | 407·7 ,, | or 0·8494 oz. troy. |
| 12 oncie | ,, | 1 libbra | 4892 ,, | 0·8494 lb. ,, |
| 18 oncie | ,, | 1 rottolo | 7338 ,, | 1·0483 ,, avoirdupois. |

*Money.*—100 centesimi make 1 lira nuova (9·4*d.* sterling).

### 2. PIEDMONT: TURIN.

#### *Length.*

| | | | |
|---|---|---|---|
| 12 atomi | make | 1 punto | 0·140 inches. |
| 12 punti | ,, | 1 oncia | 1·686 ,, |
| 12 oncie | ,, | 1 piede liprando | 20·228 ,, |
| 6 piede liprando | ,, | 1 trabucco | 10·114 feet. |
| 2 trabucci | ,, | 1 pertica | 20·228 ,, |
| The raso or ell is 14 oncie | | | 23·60 inches. |
| The míglio is 4333⅓ piedi liprando | | | 7305 feet or 1·3835 miles. |

*Surface.*—The giornata is 100 square pertica or 14400 square piedi liprando = 40917 square feet or 0·9393 acre.

### Liquid Capacity.

|                |       |           | ENGLISH VALUE. |          |
|----------------|-------|-----------|----------------|----------|
| 2 quartini     | make  | 1 boccale | 0·1722         | gallons. |
| 2 boccali      | „     | 1 pinta   | 0·3444         | „        |
| 6 pinte        | „     | 1 rubbio  | 2·0664         | „        |
| 6 rubbi        | „     | 1 brenta  | 12·3984        | „        |
| 10 brente      | „     | 1 carro   | 123·984        | „        |

### Dry Capacity.

| 20 cucchiari | make | 1 copello    | 0·066 | bushels. |
|--------------|------|--------------|-------|----------|
| 4 copelli    | „    | 1 quartière  | 0·264 | „        |
| 2 quartieri  | „    | 1 mina       | 0·527 | „        |
| 2 mine       | „    | 1 stájo      | 1·054 | „        |
| 3 staja      | „    | 1 sacco      | 3·162 | „        |

### Weight.

| 24 granotini | make | 1 grano   | 0·8 grains. |                       |
|--------------|------|-----------|-------------|-----------------------|
| 24 grani     | „    | 1 denaro  | 19·8 „      |                       |
| 3 denari     | „    | 1 ottavo  | 59·3 „      |                       |
| 8 ottavi     | „    | 1 oncia   | 474·4 „     | or 0·9883 oz troy.    |
| 12 oncie     | „    | 1 libbra  | 5693 „      | 0·9883 lb. „          |
| The marco    | is   | 8 oncie   | 3795 „      | 0·6589 „ „            |

For gold and silver the carato is 4 grani.
The apothecaries' pound is 1¼ marco.

Savoy ; see Sardinia.

### SAXONY (GERMANY): DRESDEN AND LEIPZIC.

### Length.

| 10 linien make 1 zoll           | 0·929 inches.              |
|---------------------------------|----------------------------|
| 12 zoll      „      1 fuss       | 11·148 „   or 0·9290 foot. |
| 2 fuss       „      1 elle       | 1·858 feet     0·6193 yards. |
| 8 ellen      „      1 ruthe      | 14·864 „       4·9547 „     |
| The post-meile is 24000 fuss    | 7432 yards or 4·2237 miles. |
| Leipzic (architects') fuss      | 11·13 inches or 0·9275 foot. |

F

## *Liquid Capacity.*

|  |  |  | ENGLISH VALUE. |
|---|---|---|---|
| 4 quartier | make | 1 nössel | 0·1325 gallons. |
| 2 nössel | ,, | 1 kanne | 0·2650 ,, |
| 63 kannen | ,, | 1 eimer | 16·6942 ,, |
| 2 eimer | ,, | 1 ohm | 33·3883 ,, |
| 6 ohm | ,, | 1 fuder | 200·330 ,, |
| The anker is | 54 kannen |  | 14·309 ,, |
| ,, oxhoft | ,, | 3 eimer | 50·083 ,, |
| ,, fass | ,, | 5 ,, | 83·471 ,, |

The Dresden liquid measures are $\frac{1}{9}$th less.

## *Dry Capacity.*

| 4 mässchen | make | 1 metze | 0·1786 bushels. |  |
|---|---|---|---|---|
| 4 metzen | ,, | 1 viertel | 0·7146 ,, |  |
| 4 viertel | ,, | 1 scheffel | 2·8583 ,, | or 0·3573 quarters. |
| 12 scheffel | ,, | 1 malter | 34·3 ,, | 4·2875 ,, |
| 2 malter | ,, | 1 wispel | 68·6 ,, | 8·5750 ,, |

## *Weight.*

| 15 gran | make | 1 pfennig | 14·1 grains. |  |
|---|---|---|---|---|
| 4 pfennig | ,, | 1 quentlein | 56·4 ,, | or 0·1289 oz. |
| 4 quentlein | ,, | 1 loth | 225·5 ,, | 0·5154 ,, |
| 2 loth | ,, | 1 unze | 451 ,, | 1·0309 ,, |
| 8 unzen | ,, | 1 mark | 3608 ,, | 0·5154 lb. |
| 2 mark | ,, | 1 pfund | 7216 ,, | 1·0309 ,, |

## *Money (same standard as Prussia).*

| 12 pfennige | make 1 neu-groschen | $1\frac{1}{6}d$. sterling. |
|---|---|---|
| 30 neu-groschen | ,,   1 dollar or thaler | $34\frac{3}{4}d$. ,, |
|  | The gold ducat | 9s. 5d. ,, |

Seville ; see Spain.

## SIAM (ASIA).

## *Length.*

| 2 soks | make | 1 ken | 3·153 English feet. |
|---|---|---|---|
| 2 kens | ,, | 1 vouah | 6·306 ,, ,, |
| The roëneng of 2000 vouahs = |  |  | 12612 feet or 2·3886 miles. |

### Capacity.

| | | | ENGLISH VALUE. |
|---|---|---|---|
| 40 sats | make | 1 sesti | ⅓ bushel. |
| 40 sesti | ,, | 1 cohi | 13⅓ bushels. |

### Weight.

| | | | |
|---|---|---|---|
| 4 ticals | make | 1 tael | 904 grains or 0·1291 lb. |
| 20 taels | ,, | 1 catty | 2·583 lbs. |
| 50 catties | ,, | 1 pecul | 129·14 ,, |

*Money.*—The coins are gold ticals, which pass for 10 silver ticals, each of the latter being worth about 26*d*.

Siberia; see Russia.

### SICILY.

### Length.

The palmo is 9·53 inches.
The canna (8 palmi) is 76·25 inches.
Archimedes foot     ,,  8·76   ,,

### Capacity.

The salma of Messina  is 19·226 gallons.
,,     ,,     Syracuse is 16·823   ,,
,,     ,,     grossa  (dry measure) is 9·472 bushels.
,,     ,,     generale       ,,     ,, 7·630   ,,

### Weight.

The libbra of 12 oncie        is     0·7 lb.
,,    rottolo grosso of 33 oncie   ,,     1·925 lb.
,,     ,,     sottile of 30 oncie   ,,     1·75  ,,

### Money.

| | | | |
|---|---|---|---|
| 20  grani | make | 1 taro | 4·1*d*. sterling. |
| 12  tari | ,, | 1 scudo | 4*s*. 1·4*d*.  ,, |
| 2½ scudi = 30 tari | ,, | 1 oncia | 10*s*. 3½*d*.   ,, |

Smyrna (Asia); see Turkey.

## SPAIN: MADRID AND CASTILE.

### Length.

| | | ENGLISH VALUE. | |
|---|---|---|---|
| 12 puntos | make 1 linea | 0·077 inches. | |
| 12 lineas | ,,    1 pulgada | 0·927 ,, | |
| 6 pulgadas | ,,    1 sesma | . 5·564 ,, | |
| 2 sesmas | ,,    1 pie (foot) | 11·128 ,, | or 0·9273 feet. |
| 3 pie | ,,    1 vara | 33·384 ,, | 2·782 ,, |
| 4 varas | ,,    1 estadal | 133·536 ,, | 11·128 ,, |
| The dedo | is    9 lineas | 0·6955 ,, | |
| The palmo | ,,    12 dedos | 8·346 ,, | |
| The legua | ,, 8000 vara | 22256 feet or 4·2152 miles. | |

### Liquid Capacity (Wine, &c.).

| | | | |
|---|---|---|---|
| 4 copas | make 1 quartillo | 0·1105 gallons. | |
| 4 quartillos | ,,    1 azumbre | 0·4422 ,, | |
| 8 azumbres | ,,    1 arróba or } cantaro } | 3·5380 ,, | |

The arróba for oil contains 2·78 English gallons and is divided into 4 quartillos or 100 panillas. The standards of the arróba are 34 libras of water and 25 libras of oil.

### Dry Capacity.

| | | | |
|---|---|---|---|
| 4 ochavillos | make 1 racion | 0·0081 bushels. | |
| 4 raciones | ,,    1 quartillo | 0·0323 ,, | |
| 2 quartillos | ,,    1 medio | 0·0646 ,, | |
| 2 medios | ,,    1 almude | 0·1292 ,, | |
| 12 almudes | ,,    1 fanega | 1·5503 ,, | |
| 12 fanegas | ,,    1 cahiz | 18·6034 ,, or 2·3254 quarters. | |

### Weight.

| | | | |
|---|---|---|---|
| 12 granos | make 1 tomin | 9·2 grains. | |
| 3 tomines | ,,    1 adarme | 27·7 ,, | |
| 2 adarmes | ,,    1 ochava or } dracma } | 55·5 ,, | |
| 8 ochavas | ,,    1 onza | 443·8 ,, | or 0·0634 lb. |
| 8 onzas | ,,    1 marco | 3550·5 ,, | 0·5072 ,, |
| 2 marcos | ,,    1 libra | 7101 ,, | 1·0144 ,, |

## *Money.*

20 reals vellon or ⎫
10⅝ reals of plate ⎭ make ⎰ 1 duro, piastre, ⎱ (50*d.* sterling).
⎱ or hard dollar ⎰

The reals are each of them divided into 34 maravedises.

The legal money of Spain is founded on the reals vellon which are now more commonly divided into 10 decimas or 100 centenas.

The Spanish dollar is by law also divided into 100 cents, which may in the course of time gradually supersede the above more complicated relations.

The gold pistole  is estimated at 15*s.* 11*d.* sterling.
  „  „  doubloon  „  „  65*s.* 10*d.*  „

Stockholm; see Sweden and Norway.

Strasburg; see France.

## SWEDEN AND NORWAY.

### *Length.*

| | | | ENGLISH VALUE. |
|---|---|---|---|
| 12 linies make | 1 tum | | 0·9742 inches. |
| 12 tums | „ | 1 fot | 11·6904  „  or 0·9742 foot. |
| 2 fots | „ | 1 aln | 23·3808  „  1·9484 . „ |
| 3 alns | „ | 1 famn | 5·8452 feet. |
| The stång is | 8 aln | | 15·5872  „ |
| The mil | „ 6000 famn | | 11630 yards or 6·6423 miles. |

The fot is now decimally divided.

### *Liquid Capacity.*

| | | | |
|---|---|---|---|
| 4 jungfrus make | 1 qwarter | | 0·5756 pints. |
| 4 qwarters | „ | 1 stop | 2·3024  „ |
| 2 stops | „ | 1 kanna | 4·6048  „  or 0·5756 gallon. |
| 48 kannas | „ | 1 tunna . | 27·6288 gallons. |

### *Dry Capacity.*

| | | | |
|---|---|---|---|
| 4 orts | make | 1 qwarter | 0·0090 bushels. |
| 4 qwarters | „ | 1 stop . | 0·0360  „ |
| 2 stops | „ | 1 kanna | 0·0720  „ |
| 7 kannas | „ | 1 fjerding | 0·5038  „ |
| 4 fjerdings | „ | 1 spann | 2·0150  „ |
| 2 spanns | „ | 1 tunna of ⎫ 32 kappe ⎭ | 4·0300  „  or 0·50375 quarter. |

## Weight (Commercial).

The smallest denomination of weight in Sweden is the as
= 0·7418 English grain.

**ENGLISH VALUE.**

| | | | |
|---|---|---|---|
| 4 qwintin make 1 lod | | 205·1 grains. | |
| 2 lods | „ 1 untz | 410·2 „ | |
| 16 untzs | „ 1 skälpund<br>= 8848 as | 6563·2 „ | or 0·9376 lb. |
| The lispund | is 20 skälpunds | 18·752 lbs. | |
| The skeppund is 400 skälpunds | | 375·040 „ | |

## Weight (Gold and Silver).

| | | | |
|---|---|---|---|
| 4 qwintin make 1 lod | | 203·2 grains or 0·4234 oz. troy. | |
| 2 lods | „ 1 untz | 406·5 „ | 0·8469 „ „ |
| 8 untzs | „ 1 mark<br>= 4384 as | 3252 „ | 6·7750 „ „ |

## Apothecaries' Weight.

| | | | |
|---|---|---|---|
| 20 grains make 1 scrupel | | 19·1 grains or 0·0398 oz. troy. | |
| 3 scrupels | „ 1 drachma | 57·3 „ | 0·1194 „ „ |
| 8 drachmas | „ 1 untz | 458·4 „ | 0·9550 „ „ |
| 12 untzs | „ 1 skalpund<br>= 7416 as | 5501 „ | 11·4604 „ „ |

## Money.

| | | | |
|---|---|---|---|
| 12 runstycken make 1 skilling | | 1·1d. sterling. | |
| 48 skillings | „ 1 riksdaler<br>(silver specie) | 53d. „ | |
| The gold ducat | | 9s. 2d. „ | |

The riksdaler banco is only $\frac{3}{8}$ the above value.

In Norway the riksdaler is divided into 120 skillings.

The measures, weights and currency of Sweden and Norway, are about to be established on the decimal system, which will hereafter supersede the preceding.

## SWITZERLAND.

### 1. BERNE.

#### Length.

|  |  |  | ENGLISH VALUE. |  |
|---|---|---|---|---|
| 12 secundes make | 1 linie | | 0·08 inches. | |
| 12 linien | ,, | 1 zoll | 0·96 ,, | |
| 12 zoll | ,, | 1 fuss | 11·54 ,, | or 0·9617 feet. |
| 10 fuss | ,, | 1 ruthe | 115·40 ,, | 9·6167 ,, |
| The ell | = | | 21·40 ,, | 1·7833 ,, |
| The Swiss meile is 26666⅔ fuss = | | | 8548 yards or 4·8568 miles. | |

*Surface.*—The juchart or feld acker, is 400 square ruthen = 4110 square yards or 0·8492 acre.

#### Liquid Capacity.

| 2 bechers | make | 1 vierteli | 0·0919 gallons. |
|---|---|---|---|
| 4 vierteli | ,, | 1 mass | 0·3676 ,, |
| 25 mass | ,, | 1 eimer | 9·19 ,, |
| 4 eimer | ,, | 1 saum | 36·76 ,, |
| 6 saum | ,, | 1 landfass | 220·56 ,, |

#### Dry Capacity.

| 2 sechszehnerli make | 1 achterli | 0·0482 bushels. |
|---|---|---|
| 2 achterli | ,, | 1 immi | 0·0964 ,, |
| 2 immi | ,, | 1 mässli | 0·1927 ,, |
| 2 mässli | ,, | 1 mäss | 0·3854 ,, |
| 12 mäss | ,, | 1 mütt | 4·6250 ,, |

#### Weight (Commercial).

| 4 pfennig make | 1 quent | 63 grains. | |
|---|---|---|---|
| 4 quent | ,, | 1 loth | 251·9 ,, |
| 2 loth | ,, | 1 unze | 503·7 ,, or 1·1514 oz. |
| 16 unzen | ,, | 1 pfund | 8060 ,, 1·1514 lb. |

#### Weight (Gold and Silver).

| 4 pfennig make | 1 quent | 59·5 grains. | |
|---|---|---|---|
| 4 quent | ,, | 1 loth | 238·1 ,, or 0·4961 oz. troy. |
| 2 loth | ,, | 1 unze | 476·3 ,, 0·9923 ,, ,, |
| 8 unzen | ,, | 1 marc | 3810·3 ,, 7·9381 ,, ,, |
| 2 mare | ,, | 1 pfund | 7620·6 ,, 15·8762 ,, ,, |

F 4

## Apothecaries' Weight.

|  |  |  | ENGLISH VALUE. |  |
|---|---|---|---|---|
| 20 gran | make | 1 scrupel | 19·05 grains. |  |
| 3 scrupel | ,, | 1 drachma | 57·15　　,, |  |
| 8 drachmen | ,, | 1 unze | 457·2　　,,　　or 0·9525 oz. troy. |  |
| 12 unzen | ,, | 1 pfund | 5486·4　　,,　　　11·430　,,　　,, |  |

## Money.

| The silver franc (1803) | 1s. 2d. sterling. |
|---|---|
| ,,　gold ducat | 9s. 2d.　　,, |
| ,,　　,,　pistole | 18s. 10d.　,, |

### 2. LUCERNE.

*Length.*—The elle is 2 schuh (or Rhein-fuss) = 24·714 inches or 2·0595 feet.

## Liquid Capacity.

| 10 primas | make | 1 schoppen | 0·0951 gallons. |
|---|---|---|---|
| 4 schoppen | ,, | 1 mass | 0·3803　　,, |
| 100 mass | ,, | 1 saum | 38·035　　,, |
| The ohm | is | 30 mass | 11·410　　,, |

## Dry Capacity.

| 10 primas | make | 1 becher | 0·0598 bushels. |
|---|---|---|---|
| 16 primas | ,, | 1 immi | 0·0956　　,, |
| 10 immi | ,, | 1 viertel | 0·9561　　,, |
| 4 viertel | ,, | 1 mütt | 3·8245　　,, |
| 4 mütt | ,, | 1 malter | 15·2980　　,, |

## Weight.

| 4 quentchen | make | 1 loth | 226 grains or 0·5167 oz. |
|---|---|---|---|
| 36 loth | ,, | 1 pfund | 8138　　,,　　1·1626 lb. |

### 3. ZURICH.

## Length.

| 12 linien | make | 1 zoll | 0·984 inches. |
|---|---|---|---|
| 12 zoll | ,, | 1 fuss | 11·81　　,,　　or 0·9842 foot. |
| (Builders) | ,, |  | 11·86　　,,　　　0·9883　　,, |
| The ell |  | = | 23·64　　,,　　　1·9700　　,, |

### Liquid Capacity.

|  |  |  | ENGLISH VALUE. |
|---|---|---|---|
| 2 stotzen | make | 1 quärtli | 0·1807 gallons. |
| 2 quärtli | „ | 1 mass | 0·3614 „ |
| 15 mass | „ | 1 viertel | 5·421 „ |
| 4 viertel | „ | 1 cimer | 21·684 „ |
|  | The kopt is 2 mass | | 0·7228 „ |

The land-mass measures are $\frac{1}{9}$th greater.

### Dry Capacity.

| 2¼ immi | make | 1 mässli | 0·0355 bushels. |
|---|---|---|---|
| 4 mässli | „ | 1 vierling | 0·1422 „ |
| 4 vierling | „ | 1 viertel | 0·5688 „ |
| 4 viertel | „ | 1 mütt | 2·275 „ |
| 4 mütt | „ | 1 malter | 9·10 „ |

### Weight.

| 12 quenten | make | 1 loth | 226 grains or 0·5167 oz. |
|---|---|---|---|
| 2 loth | „ | 1 unze | 452 „ 1·0334 „ |
| 18 unzen | „ | 1 pfund | 8138 „ 1·1626 lb, |

### Money.

| The silver crown (1781) | 3s. 8d. sterling. |
|---|---|
| „ gold ducat | 6s. 4d. „ |

### 4. GENEVA.

### Length.

| The foot | = | 23·028 inches or 1·9190 feet. |
|---|---|---|
| The ell | = | 45·04 „ 3·7533 „ |

### Liquid Capacity.

| 2 pots | make | 1 quarteron | 0·415 gallons. |
|---|---|---|---|
| 24 quarterons | „ | 1 setïer | 9·954 „ |
| 12 setïers | „ | 1 char | 119·448 „ |

**Dry Capacity.**—The coupe (or sack) = 2·135 bushels.

### Weight.

| 24 grains | make | 1 dernier | 19·7 grains. |
|---|---|---|---|
| 24 dernier | „ | 1 unze | 472·2 „ or 1·0794 oz. |
| 18 unzen | „ | 1 pfund | 8500 „ 1·2143 lb. |

*Money (same as France).*—100 cents make one lira nuova (franc) (9½d. sterling).

### 5. BASLE OR BÂLE.

#### Length.

|  |  | ENGLISH VALUE. |
|---|---|---|
| The foot | = | 11·74 inches or 0·9783 feet. |
| The aune (large ell) | | 46·4 ,, 3·8667 ,, |
| The brasse (small ell) | | 21·4 ,, 1·7833 ,, |

#### Liquid Capacity.

| 32 pott make 1 ohm | 11 gallons. |
|---|---|
| 3 ohm ,, 1 saum | 33 ,, |

#### Dry Capacity.

| 2 becher make 1 köpflein | ⅑ bushel. |
|---|---|
| 32 köpflein ,, 1 coupe or sack | 3⅖ bushels. |

#### Weight.

| 72 grains make 1 gros | 59·4 grains. |
|---|---|
| 8 gros ,, 1 unze | 475 ,, or 1·0857 oz. |
| 16 unzen ,, 1 pfund | 7600 ,, 1·0857 lb. |

#### Money.

| 100 raps make 1 Swiss frank | 13¼d. sterling. |
|---|---|
| The silver crown | 3s. 6d. ,, |

### 6. ST. GALLEN.

#### Length.

| The ell for cloth | = | 24·2 inches. |
|---|---|---|
| ,, ,, silks | = | 31·6 ,, |

*Liquid Capacity.*—The eimer (containing 32 mass) = 11 gallons.

*Dry Capacity.*—The mütt (containing 4 viertel) = 2·1 bushels.

#### Weight.

| The heavy pound | = | 9016 grains or 1·288 lb. |
|---|---|---|
| The light ,, | = | 7175 ,, 1·025 ,, |

*Money.*—60 kreuzers make 1 florin or guilder (20¼*d.* sterling).

## 7. NEUFCHÂTEL.

|  |  | ENGLISH VALUE. |
|---|---|---|
| The foot | = | 11·81 inches. |
| The ell | = | 43·80 ,, |

Toulon; see France.

Trieste; see Austria.

### TRIPOLI (BARBARY).

#### *Length.*

The Turkish dreah or pik = 3 palmi, is 26·42 English inches.
The arbi dreah or lesser pic is 19·03 ,, ,,

*Liquid Capacity.*—The barile = 24 bozze, is 3956 cubic inches or 14·267 imperial gallons.

#### *Dry Capacity.*

| 2 nufs-orbah make | 1 orbah | 409·4 cubic inches or 0·1846 bushels. |
|---|---|---|
| 4 orbahs ,, | 1 temen | 1637·7 ,, ,, 0·7383 ,, |
| 4 temen ,, | 1 ueba | 6551 ,, ,, 2·9533 ,, |

#### *Weight.*

| 16 kharoubas make | 1 dram | 48 grains. |
|---|---|---|
| 10 drams ,, | 1 okie (ounce) | 480 ,, or 1 oz. troy. |
| 16 okies ,, | 1 rottol | 7680 ,, 1⅓ lb. ,, |
| 100 rottols ,, | 1 cantar | 109⅞ lb. avoirdupois or 133⅓ lbs. troy. |

The metical (for gold and silver) is 73·6 grains.

Turin; see Sardinia.

### TURKEY.

*Length.*—The pic or pike is 26·8 inches.

#### *Liquid Capacity.*

The almud is 319·4 cubic inches or 1·152 imperial gallon.
The almud of oil should weigh 8 okes or 22⅔ lbs. avoirdupois.

## Dry Capacity.

The killow contains 2023 cubic inches or 0·912 bushel.
The fortin is 4 killows = 8092 cubic inches or 3·648 bushels.

The killow of rice is supposed to weigh 10 okes.

## Weight.

|  |  |  | ENGLISH VALUE. |
|---|---|---|---|
| 100 drams | make | 1 chequee | 4950 grains or 0·7072 lbs. |
| 4 chequees | ,, | 1 oke | 19800 ,, 2·8286 ,, |
| 45 okes | ,, | 1 kintal or cantaro | 127·3 lbs. |
| The rotolo of 18 drams | | | 8910 grains or 1·2729 lbs. |

*Money.*—40 paras make 1 piastre (2¼*d.* sterling).
  Piastre of Selim (1801) (13*d.* ,, ).
  ,, - - - (1818) ( 9*d.* ,, ).

### TUSCANY (ITALY): FLORENCE AND LEGHORN.

## Length.

| 12 denari | make | 1 soldo | 1·15 inches. |
|---|---|---|---|
| 10 soldi | ,, | 1 palmo | 11·49 ,, or 0·9575 feet. |
| 2 palmi | ,, | 1 braccio | 22·98 ,, 1·9150 ,, |
| 4 braccia | ,, | 1 canna | 7·66 feet or 2·5533 yards. |
| 5 braccia | ,, | 1 canna architects and surveyors | 9·575 ,, 3·1916 ,, |
| The míglio is 2833½ braccia | | | 5426 ,, 1·0277 mile. |

## Liquid Capacity (Wine, &c.).

| 2 quartucci | make | 1 mezzetta | 0·1254 gallons. |
|---|---|---|---|
| 2 mezzette | ,, | 1 boccale | 0·2508 ,, |
| 2 boccali | ,, | 1 fiasco | 0·5016 ,, |
| 20 fiasci | ,, | 1 barile weighing 133½ libbre | 10·032 ,, |

## Liquid Capacity (Oil).

| 2 boccali | make | 1 fiasco | 0·5016 gallons. |
|---|---|---|---|
| 16 fiasci | ,, | 1 barile weighing 120 libbre | 8·026 ,, |
| 2 barili | make | 1 soma | 16·052 ,, |

The barile of spirits also weighs 120 libbre.

### Dry Capacity.

|  |  |  | ENGLISH VALUE. |  |
|---|---|---|---|---|
| 2 bussoli | make | 1 quartuccio | 0·0105 bushels. | |
| 2 quartucci | ,, | 1 mezzetta | 0·0210 ,, | |
| 2 mezzette | ,, | 1 metadella | 0·0419 ,, | |
| 4 metadelle | ,, | 1 quarto | 0·1676 ,, | |
| 2 quarti | ,, | 1 mina | 0·3352 ,, | |
| 2 mine | ,, | 1 stájo | 0·6704 ,, | |
| 3 staja | ,, | 1 sacco | 2·0112 ,, | |
| 8 sacci | ,, | 1 mòggio | 16·0896 ,, | or 2·0112 quarters. |

### Weight.

| 24 grani | make | 1 denaro | 18·2 grains or 0·0026 lb. |
|---|---|---|---|
| 3 denari | ,, | 1 dramma | 54·6 ,, 0·0078 ,, |
| 8 dramme | ,, | 1 oncia | 436·7 ,, 0·0624 ,, |
| 12 oncie | ,, | 1 libbra | 5240·2 ,, 0·7486 ,, |

### Money.

100 centesimi make 1 lira (7·82d. sterling).
The gold sequin is estimated at 9s. 5d. sterling.
,, ,, rosini ,, 17s. ,,
,, ,, rusponi ,, 28s. 5d. ,,

### UNITED STATES (NORTH AMERICA).

The weights and measures of the United States are precisely the same as those of Great Britain, with the exception of the measures of capacity, for which the old standards are still retained. Thus the unit of DRY CAPACITY is the old Winchester bushel = 2150·42 cubic inches = 7·75556 imperial gallons = 0·96944 [1] imperial bushel.

Also the unit of LIQUID CAPACITY is the old Wine gallon = 231 cubic inches = 0·83311 [1] imperial gallon.

### Money.

| | ENGLISH VALUE. |
|---|---|
| 100 cents make 1 dollar | 50d. sterling. |
| The gold eagle, 10 dollar piece | 2l. 3s. 6d. ,, |

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[1] $0·96944 = 1 - \frac{1}{36}\left(1 + \frac{1}{10}\right)$, and $0·83311 = 1 - \frac{1}{6}\left(1 + \frac{1}{1000}(1 + \frac{1}{3})\right)$
which expressions may expedite reductions to English imperial measures.

In mercantile transactions between the United States and Great Britain, the dollar is valued at a fixed par of 4s. 6d. sterling, making 444·44 dollars, equal to 100l. sterling; and the variation of exchange is made by a corresponding per centage, premium or discount, on the sterling amounts.    But by an Act of Congress, passed July 27, 1842, the Custom-house valuation is fixed at the rate of 4·84 dollars to the pound sterling, thereby making the value of the dollar about 4s. 1·6d.   This compared with the par of 4s. 6d. per dollar is equal to a premium of nearly 9 per cent.—See British Possessions in North America.

Valencia; see Spain.

### VENETIAN LOMBARDY: MILAN AND VENICE.

#### Length.

|  |  | ENGLISH VALUE. |
|---|---|---|
| 12 atomi make 1 punto | | 0·16 inches. |
| 12 punti   ,,    1 oncia | | 1·95   ,, |
| 12 oncie   ,,    1 braccio | | 23·42   ,, |
| Milan foot | | 15·62   ,, |
| Venice  ,, | | 13·69   ,, |

#### New Decimal System introduced in 1803.

| | | |
|---|---|---|
| 10 atomi make 1 dito | | 0·394 inches. |
| 10 diti    ,,     1 palmo | | 3·937   ,, |
| 10 palmi  ,,     1 metro or braccio | | 39·3708  ,,   or 3·2809 feet. |
| 1000 metri  ,,     1 miglio | | 1093 63 yards or 0·6214 mile. |

*Surface.*—100 square palmi make 1 tornatura, identical with the French *are*, 119·6 square yards or nearly $\frac{1}{40}$ acre.

#### Capacity.

| | | |
|---|---|---|
| 10 coppi make 1 pinta | | 0·2201 gallon or 0·0275 bushel. |
| 10 pinte   ,,    1 mina | | 0·2751 bushels. |
| 10 mine   ,,    1 soma | | 2·7512   ,,     or 0·3439 quarter. |

#### Weight.

| | | |
|---|---|---|
| 10 grani  make 1 denaro | | 0·0353 oz. |
| 10 denari   ,,    1 grosso | | 0·3527  ,, |
| 10 grossi   ,,    1 oncia | | 3·5274  ,, |
| 10 oncie    ,,    1 libbra metrica | | 2·2046 lbs. |

### *For Gold and Silver.*

|  |  | ENGLISH VALUE. |
|---|---|---|
| 24 grani make 1 denaro | | 18·9 grains. |
| 24 denari  ,,  1 oncia | | 453·4  ,,  or 0·9445 oz. troy. |
| 8 oncie  ,,  1 marco | | 3627  ,,  7·5562 ,, ,, |

### *Money.*

| 5 centesimi | make 1 soldo Austriaca | (0·4d. sterling). |
|---|---|---|
| 20 soldi Austriachi | ,,  1 lira Austriaca | (8·1d.  ,,  ). |

The value of the lira is the same as the 20 kreuzer piece, or ⅓rd of the Austrian florin; and therefore the 3 lire piece is of the same value as the florin.

| The silver ducat is estimated at | 3s. 2d. sterling. |
|---|---|
| ,,  gold sequin (zecchino) ,, | 9s. 5d.  ,, |
| ,,  ,,  pistole  ,, | 15s. 7d.  ,, |

Venice; see Venetian Lombardy.
Verona; see Venetian Lombardy.
Vienna; see Austria.
Warsaw (Poland); see Russia.

### WEST INDIES.

The weights and measures are generally those of Great Britain.

*Money.*—100 cents make 1 dollar (50d. sterling). Pounds, shillings, and pence sterling are also used in accounts, the dollar being reckoned at the government par of 4s. 2d., as above, and the 16 dollar piece (Spanish onza), known as the doubloon, at 64s. sterling.

In most of the West India islands, a fixed valuation was established between the currency and nominal sterling, and the variations of exchange were effected by a per centage on the actual sterling, as at present in the Halifax currency. The legislature, in Jamaica, declared, in 1838, that 166l. 13s. 4d., Jamaica currency, should represent 100l. sterling, the same being in the proportion of 5 to 3, and the

Spanish coinage was regulated accordingly. The late currencies have, however, been abolished in all the islands.

The British currency was established in Bermuda in 1842, and all existing contracts were directed to be settled at the rate of 1⅔*l.* currency per pound sterling, which corresponds with the rate of currency at Jamaica.

## WÜRTEMBURG (GERMANY).

### *Length.*

| | | | ENGLISH VALUE. |
|---|---|---|---|
| 10 punkte make 1 linie | | | 0·1126 inches. |
| 10 linien ,, 1 zoll | | | 1·126 ,, |
| 10 zolle ,, 1 fuss | | | 11·26 ,, or 0·9383 foot. |
| The klafter (6 fuss) | = | | 5·63 feet. |
| The ruthe (10 fuss) | = | | 9·3833 ,, |
| The (Stuttgart) elle | = | | 24·18 inches or 2·015 feet. |

*Surface.*—The morgen (38400 square fuss)=3757 square yards or 0·7763 acre.

### *Liquid Capacity.*

| | | |
|---|---|---|
| 4 schoppen make 1 mass | | 0·4043 gallons. |
| 10 mass ,, 1 immi | | 4·0432 ,, |
| 16 immi ,, 1 eimer | | 64·692 ,, |
| 6 eimer ,, 1 fuder | | 388·15 ,, |

### *Dry Capacity.*

| | | |
|---|---|---|
| 4 viertelein make 1 ecklein | | 0·0192 bushels. |
| 2 ecklein ,, 1 mässlein | | 0·0384 ,, |
| 2 mässlein ,, 1 achtel | | 0·0767 ,, |
| 2 achtel ,, 1 viertel | | 0·1534 ,, |
| 4 viertel ,, 1 simri | | 0·6136 ,, |
| 8 simri ,, 1 scheffel | | 4·9090 ,, |

*Weight.*—See Prussia; and for apothecaries' weight, see Nürnberg.

Zurich; see Switzerland.

# GENERAL TABLES.

In reducing foreign measures to the corresponding values in other denomi-
nations, architects, engineers, and practical men generally, of different
countries, often experience considerable perplexity, in consequence of the
necessity of frequent and varied references, and the tediousness of arithme-
tical calculation. The following Tables are designed to simplify and ex-
pedite all such reductions. Table I. contains a list of the principal linear
measures of the various countries, states, and cities throughout Europe,
arranged in an alphabetical order. The names of the places occupy the
first column, and the columns of figures on the right exhibit, to four places
of decimals, the value of an unit of each respective measure, when estimated
in English inches, English feet, Florence braccia, French metres, French
pieds, Napolitan palmi, Rhineland feet, Roman palmi, Venice feet, and
Vienna feet. Thus, in the line opposite the "Ancona foot," we read that
it is equivalent to 15·384 English inches, 1·2820 English feet, 0·6695 parts
of a Florence braccio, 0·3908 parts of a metre, 1·2029 French feet, 1·4818
Napolitan palmi, or 1·2449 Rhineland feet, &c. Table II. shows the com-
parisons of square or superficial measures, on precisely the same plan as
Table I.

The following examples will practically exemplify their use.

Example 1. Reduce 326 Bergamo linear feet to the corresponding
measure in Rhineland feet.

In Table I., opposite to Bergamo foot, and under Rhineland feet, we see
that a Bergamo foot is equal to 1·3896 Rhineland feet. Therefore, multi-
plying 1·3896 by 326, we get 453·0 for the required measure in Rhineland
feet.

Example 2. Reduce 218·54 Frankfort feet into English feet.

Referring to Table I., opposite Frankfort foot, and in the second column
under English feet, we observe that a Frankfort foot is equal to 0·9392 parts
of an English foot. Therefore, multiplying 218·54 by 0·9392, the result is
205·25 English feet.

Example 3. Reduce 215·36 Malta square feet into Venice square feet.

In Table II., opposite Malta foot and under Venice feet, we take out
0·6656 for the parts of a Venice foot which are measured by one Malta foot.
Consequently by multiplying 215·36 by 0·6656, the answer is 143·34 Venice
superficial feet.

Example 4. Reduce 562·18 Palermo square palmi to English feet.

Referring to Table II., as before, we find a Palermo square palmo is
equal to 0·6308 parts of an English square foot. Hence multiply 562·18
by 0·6308, and the required result is found to be 354·62 English square
feet.

# TABLE I.

| Linear Measure. | English | | Florence | French | |
| | Inches. | Feet. | Braccia. | Mètres. | Pieds. |
|---|---|---|---|---|---|
| Aix-la-Chapelle foot | 11·410 | 0·9508 | 0·4966 | 0·2898 | 0·8921 |
| Amsterdam foot | 11·150 | 0·9292 | 0·4853 | 0·2832 | 0·8719 |
| Ancona foot | 15·384 | 1·2820 | 0·6695 | 0·3908 | 1·2029 |
| Anspach foot | 11·720 | 0·9767 | 0·5101 | 0·2977 | 0·9164 |
| Antwerp foot | 11·240 | 0·9367 | 0·4892 | 0·2855 | 0·8789 |
| Aquileia foot | 13·530 | 1·1275 | 0·5888 | 0·3437 | 1·0579 |
| Augsburg foot | 11·650 | 0·9708 | 0·5070 | 0·2959 | 0·9109 |
| Austria foot | 12·445 | 1·0371 | 0·5416 | 0·3161 | 0·9731 |
| Baden foot | 11·811 | 0·9842 | 0·5140 | 0·3000 | 0·9235 |
| Basle foot | 11·740 | 0·9783 | 0·5109 | 0·2982 | 0·9179 |
| Bavaria foot | 11·420 | 0·9517 | 0·4970 | 0·2901 | 0·8930 |
| Bergamo foot | 17·172 | 1·4310 | 0·7473 | 0·4362 | 1·3427 |
| Berlin foot | 12·190 | 1·0158 | 0·5305 | 0·3096 | 0·9531 |
| Berne foot | 11·540 | 0·9617 | 0·5022 | 0·2931 | 0·9024 |
| Bohemia foot | 11·670 | 0·9725 | 0·5079 | 0·2964 | 0·9125 |
| Bologna foot | 14·928 | 1·2440 | 0·6497 | 0·3792 | 1·1672 |
| Bremen foot | 11·380 | 0·9483 | 0·4952 | 0·2890 | 0·8898 |
| Brescia foot | 18·720 | 1·5600 | 0·8147 | 0·4755 | 1·4637 |
| ———— braccio | 25·104 | 2·0920 | 1·0925 | 0·6376 | 1·9629 |
| Breslau foot | 11·190 | 0·9325 | 0·4870 | 0·2842 | 0·8750 |
| Brunswick foot | 11·230 | 0·9358 | 0·4887 | 0·2852 | 0·8781 |
| Brussels foot | 11·450 | 0·9542 | 0·4983 | 0·2908 | 0·8953 |
| Cagliari palmo | 7·970 | 0·6642 | 0·3469 | 0·2024 | 0·6232 |
| Calenberg foot | 11·500 | 0·9583 | 0·5005 | 0·2921 | 0·8992 |
| Carrara palmo | 9·808 | 0·8173 | 0·4268 | 0·2491 | 0·7669 |
| Chamberry foot | 13·284 | 1·1070 | 0·5781 | 0·3374 | 1·0387 |
| China math. foot | 13·120 | 1·0933 | 0·5710 | 0·3332 | 1·0258 |
| ———— imp. foot | 12·612 | 1·0510 | 0·5489 | 0·3203 | 0·9861 |
| Clêves foot | 11·660 | 0·9717 | 0·5075 | 0·2962 | 0·9117 |
| Cologne foot | 10·830 | 0·9025 | 0·4713 | 0·2751 | 0·8468 |

# TABLE I.

## CONVERSION OF STANDARD LINEAR MEASURES.

| Linear Measure. | | Napolitan Palmi. | Rhineland Feet. | Roman Palmi. | Venice Feet. | Vienna Feet. |
|---|---|---|---|---|---|---|
| Aix-la-Chapelle | foot | 1·0990 | 0·9233 | 1·2971 | 0·8334 | 0·9168 |
| Amsterdam | foot | 1·0740 | 0·9023 | 1·2676 | 0·8145 | 0·8960 |
| Ancona | foot | 1·4818 | 1·2449 | 1·7489 | 1·1237 | 1·2361 |
| Anspach | foot | 1·1289 | 0·9484 | 1·3324 | 0·8561 | 0·9418 |
| Antwerp | foot | 1·0827 | 0·9096 | 1·2779 | 0·8210 | 0·9032 |
| Aquileia | foot | 1·3032 | 1·0949 | 1·5382 | 0·9883 | 1·0872 |
| Augsburg | foot | 1·1221 | 0·9427 | 1·3244 | 0·8509 | 0·9361 |
| Austria | foot | 1·1987 | 1·0071 | 1·4148 | 0·9090 | 1·0000 |
| Baden | foot | 1·1376 | 0·9557 | 1·3426 | 0·8627 | 0·9490 |
| Basle | foot | 1·1308 | 0·9500 | 1·3346 | 0·8575 | 0·9433 |
| Bavaria | foot | 1·1000 | 0·9242 | 1·2983 | 0·8342 | 0·9177 |
| Bergamo | foot | 1·6540 | 1·3896 | 1·9522 | 1·2543 | 1·3798 |
| Berlin | foot | 1·1741 | 0·9864 | 1·3858 | 0·8904 | 0·9795 |
| Berne | foot | 1·1116 | 0·9339 | 1·3120 | 0·8429 | 0·9273 |
| Bohemia | foot | 1·1241 | 0·9443 | 1·3267 | 0·8524 | 0·9377 |
| Bologna | foot | 1·4379 | 1·2080 | 1·6971 | 1·0904 | 1·1995 |
| Bremen | foot | 1·0961 | 0·9209 | 1·2937 | 0·8312 | 0·9144 |
| Brescia | foot | 1·8031 | 1·5148 | 2·1281 | 1·3674 | 1·5042 |
| ——— | braccio | 2·4180 | 2·0314 | 2·8539 | 1·8337 | 2·0172 |
| Breslau | foot | 1·0778 | 0·9055 | 1·2721 | 0·8174 | 0·8991 |
| Brunswick | foot | 1·0816 | 0·9087 | 1·2766 | 0·8202 | 0·9023 |
| Brussels | foot | 1·1029 | 0·9266 | 1·3017 | 0·8364 | 0·9201 |
| Cagliari | palmo | 0·7677 | 0·6450 | 0·9061 | 0·5822 | 0·6404 |
| Calenberg | foot | 1·1076 | 0·9306 | 1·3073 | 0·8400 | 0·9240 |
| Carrara | palmo | 0·9447 | 0·7936 | 1·1150 | 0·7164 | 0·7881 |
| Chamberry | foot | 1·2794 | 1·0750 | 1·5102 | 0·9703 | 1·0674 |
| China | math. foot | 1·2637 | 1·0616 | 1·4915 | 0·9583 | 1·0542 |
| ——— | imp. foot | 1·2148 | 1·0206 | 1·4338 | 0·9212 | 1·0134 |
| Clêves | foot | 1·1231 | 0·9436 | 1·3256 | 0·8517 | 0·9369 |
| Cologne | foot | 1·0432 | 0·8764 | 1·2312 | 0·7911 | 0·8702 |

| Linear Measure. | English Inches. | Feet. | Florence Braccia. | French Mètres. | Pieds. |
|---|---|---|---|---|---|
| Constantinople pic | 26·800 | 2·2333 | 1·1663 | 0·6807 | 2·0955 |
| Copenhagen foot | 12·357 | 1·0298 | 0·5378 | 0·3139 | 0·9663 |
| Cracow foot | 14·032 | 1·1693 | 0·6107 | 0·3564 | 1·0972 |
| Dantzic foot | 11·290 | 0·9408 | 0·4913 | 0·2868 | 0·8828 |
| Denmark foot | 12·357 | 1·0298 | 0·5378 | 0·3139 | 0·9663 |
| Dordrecht foot | 14·160 | 1·1800 | 0·6162 | 0·3597 | 1·1072 |
| Dresden foot | 11·150 | 0·9292 | 0·4853 | 0·2832 | 0·8719 |
| Embden foot | 11·660 | 0·9717 | 0·5075 | 0·2962 | 0·9117 |
| England foot | 12·000 | 1·0000 | 0·5222 | 0·3048 | 0·9383 |
| Farrari foot | 15·804 | 1·3170 | 0·6878 | 0·4014 | 1·2357 |
| Florence foot | 11·940 | 0·9950 | 0·5196 | 0·3033 | 0·9336 |
| ———— braccio | 22·978 | 1·9148 | 1·0000 | 0·5836 | 1·7966 |
| France foot | 12·790 | 1·0658 | 0·5566 | 0·3249 | 1·0000 |
| ———— mètre | 39·371 | 3·2809 | 1·7134 | 1·0000 | 3·0784 |
| Frankfort foot | 11·270 | 0·9392 | 0·4905 | 0·2863 | 0·8813 |
| Geneva foot | 23·028 | 1·9190 | 1·0022 | 0·5849 | 1·8006 |
| Genoa palmo | 9·808 | 0·8173 | 0·4268 | 0·2491 | 0·7669 |
| ———— canna | 87·600 | 7·3000 | 3·8123 | 2·2250 | 6·8495 |
| Gottingen foot | 11·450 | 0·9542 | 0·4983 | 0·2908 | 0·8953 |
| Gotha foot | 11·320 | 0·9433 | 0·4926 | 0·2875 | 0·8851 |
| Greece foot | 11·810 | 0·9842 | 0·5140 | 0·3000 | 0·9235 |
| Groningen foot | 11·490 | 0·9575 | 0·5000 | 0·2918 | 0·8984 |
| Hamburg foot | 11·290 | 0·9408 | 0·4913 | 0·2868 | 0·8828 |
| Hanover foot | 11·450 | 0·9542 | 0·4983 | 0·2908 | 0·8953 |
| Harlem foot | 11·250 | 0·9375 | 0·4896 | 0·2857 | 0·8797 |
| Heidelberg foot | 10·960 | 0·9133 | 0·4770 | 0·2784 | 0·8569 |
| Hildesheim foot | 11·050 | 0·9208 | 0·4809 | 0·2807 | 0·8640 |
| Inspruck foot | 12·500 | 1·0417 | 0·5440 | 0·3175 | 0·9774 |
| Königsberg foot | 12·110 | 1·0092 | 0·5270 | 0·3076 | 0·9469 |
| Leghorn foot | 11·904 | 0·9920 | 0·5181 | 0·3024 | 0·9308 |
| Leipsic foot | 11·130 | 0·9275 | 0·4844 | 0·2827 | 0·8703 |
| Leyden foot | 12·340 | 1·0283 | 0·5370 | 0·3134 | 0·9649 |
| Liege foot | 11·320 | 0·9433 | 0·4926 | 0·2875 | 0·8851 |
| Lindau com. foot | 11·400 | 0·9500 | 0·4961 | 0·2896 | 0·8914 |
| ———— long foot | 12·400 | 1·0333 | 0·5396 | 0·3149 | 0·9695 |

| Linear Measure. | | Napolitan Palmi. | Rhineland Feet. | Roman Palmi. | Venice Feet. | Vienna Feet. |
|---|---|---|---|---|---|---|
| Constantinople | pic | 2·5814 | 2·1687 | 3·0467 | 1·9575 | 2·1534 |
| Copenhagen | foot | 1·1903 | 1·0000 | 1·4049 | 0·9026 | 0·9930 |
| Cracow | foot | 1·3515 | 1·1355 | 1·5952 | 1·0249 | 1·1275 |
| Dantzic | foot | 1·0874 | 0·9136 | 1·2835 | 0·8246 | 0·9072 |
| Denmark | foot | 1·1903 | 1·0000 | 1·4049 | 0·9026 | 0·9930 |
| Dordrecht | foot | 1·3639 | 1·1458 | 1·6098 | 1·0343 | 1·1378 |
| Dresden | foot | 1·0740 | 0·9023 | 1·2676 | 0·8145 | 0·8960 |
| Embden | foot | 1·1231 | 0·9436 | 1·3256 | 0·8517 | 0·9369 |
| England | foot | 1·1558 | 0·9710 | 1·3642 | 6·8765 | 0·9642 |
| Farrari | foot | 1·5223 | 1·2789 | 1·7967 | 1·1544 | 1·2699 |
| Florence | foot | 1·1501 | 0·9662 | 1·3574 | 0·8721 | 0·9594 |
| ———— | braccio | 2·2132 | 1·8593 | 2·6122 | 1·6783 | 1·8463 |
| France | foot | 1·2319 | 1·0350 | 1·4540 | 0·9342 | 1·0277 |
| ———— | mètre | 3·7922 | 3·1859 | 4·4758 | 2·8757 | 3·1635 |
| Frankfort | foot | 1·0856 | 0·9120 | 1·2813 | 0·8232 | 0·9056 |
| Geneva | foot | 2·2181 | 1·8635 | 2·6179 | 1·6821 | 1·8504 |
| Genoa | palmo | 0·9447 | 0·7936 | 1·1150 | 0·7164 | 0·7881 |
| ———— | canna | 8·4376 | 7·0886 | 9·9586 | 6·3985 | 7·0388 |
| Gottingen | foot | 1·1029 | 0·9266 | 1·3017 | 0·8364 | 0·9201 |
| Gotha | foot | 1·0903 | 0·9160 | 1·2869 | 0·8268 | 0·9096 |
| Greece | foot | 1·1376 | 0·9557 | 1·3426 | 0·8627 | 0·9490 |
| Groningen | foot | 1·1067 | 0·9298 | 1·3062 | 0·8393 | 0·9233 |
| Hamburg | foot | 1·0874 | 0·9136 | 1·2835 | 0·8246 | 0·9072 |
| Hanover | foot | 1·1029 | 0·9266 | 1·3017 | 0·8364 | 0·9201 |
| Harlem | foot | 1·0836 | 0·9104 | 1·2789 | 0·8217 | 0·9040 |
| Heidelberg | foot | 1·0556 | 0·8868 | 1·2459 | 0·8005 | 0·8806 |
| Hildesheim | foot | 1·0643 | 0·8941 | 1·2562 | 0·8071 | 0·8879 |
| Inspruck | foot | 1·2040 | 1·0115 | 1·4211 | 0·9131 | 1·0044 |
| Königsberg | foot | 1·1665 | 0·9800 | 1·3768 | 0·8846 | 0·9731 |
| Leghorn | foot | 1·1466 | 0·9633 | 1·3533 | 0·8695 | 0·9565 |
| Leipsic | foot | 1·0720 | 0·9006 | 1·2653 | 0·8130 | 0·8943 |
| Leyden | foot | 1·1886 | 0·9985 | 1·4028 | 0·9013 | 0·9915 |
| Liege | foot | 1·0903 | 0·9160 | 1·2869 | 0·8268 | 0·9096 |
| Lindau | com. foot | 1·0980 | 0·9225 | 1·2960 | 0·8327 | 0·9160 |
| ———— | long foot | 1·1943 | 1·0034 | 1·4096 | 0·9057 | 0·9963 |

| Linear Measure. | English Inches. | Feet. | Florence Braccia. | French Mètres. | Pieds. |
|---|---|---|---|---|---|
| Lisbon    archit. foot | 13·331 | 1·1109 | 0·5802 | 0·3386 | 1·0424 |
| ————    com. foot | 12·960 | 1·0800 | 0·5640 | 0·3292 | 1·0134 |
| Lombardy   arch. foot | 15·611 | 1·3009 | 0·6794 | 0·3965 | 1·2206 |
| Lorraine    foot | 11·300 | 0·9417 | 0·4918 | 0·2870 | 0·8836 |
| Lübeck     foot | 11·450 | 0·9542 | 0·4983 | 0·2908 | 0·8953 |
| Lucca      braccio | 23·496 | 1·9580 | 1·0225 | 0·5968 | 1·8372 |
| Luneburg    foot | 11·450 | 0·9542 | 0·4983 | 0·2908 | 0·8953 |
| Macedonia   foot | 13·918 | 1·1598 | 0·6057 | 0·3535 | 1·0882 |
| Magdeburg   foot | 11·160 | 0·9300 | 0·4857 | 0·2835 | 0·8726 |
| Malta      foot | 11·170 | 0·9308 | 0·4861 | 0·2837 | 0·8734 |
| Manheim  .   foot | 11·410 | 0·9508 | 0·4966 | 0·2898 | 0·8921 |
| Mantua     braccio | 25·104 | 2·0920 | 1·0925 | 0·6376 | 1·9629 |
| ————     brasso | 18·252 | 1·5210 | 0·7943 | 0·4636 | 1·4272 |
| Maestricht   foot | 11·050 | 0·9208 | 0·4809 | 0·2807 | 0·8640 |
| Mentz      foot | 11·850 | 0·9875 | 0·5157 | 0·3010 | 0·9266 |
| Middleburg   foot | 11·810 | 0·9842 | 0·5140 | 0·3000 | 0·9235 |
| Milan      foot | 15·620 | 1·3017 | 0·6798 | 0·3968 | 1·2214 |
| ————   dec. foot | 10·260 | 0·8550 | 0·4465 | 0·2606 | 0·8023 |
| ————     braccio | 23·420 | 1·9517 | 1·0192 | 0·5949 | 1·8313 |
| ————   metro-braccio | 39·371 | 3·2809 | 1·7134 | 1·0000 | 3·0784 |
| Modena     foot | 20·592 | 1·7160 | 0·8962 | 0·5230 | 1·6101 |
| Monaco     foot | 9·250 | 0·7708 | 0·4025 | 0·2349 | 0·7232 |
| Moscow     foot | 13·170 | 1·0975 | 0·5732 | 0·3345 | 1·0298 |
| Munich     foot | 11·490 | 0·9575 | 0·5000 | 0·2918 | 0·8984 |
| Naples      palmo | 10·382 | 0·8652 | 0·4518 | 0·2637 | 0·8118 |
| Naples      canna | 83·055 | 6·9213 | 3·6146 | 2·1096 | 6·4942 |
| Neufchâtel   foot | 11·810 | 0·9842 | 0·5140 | 0·3000 | 0·9235 |
| Normandy   foot | 11·720 | 0·9767 | 0·5101 | 0·2977 | 0·9164 |
| Nuremberg   foot | 11·960 | 0·9967 | 0·5205 | 0·3038 | 0·9352 |
| Oldenburg   .foot | 11·650 | 0·9708 | 0·5070 | 0·2959 | 0·9109 |
| Osnaburg    foot | 11·000 | 0·9167 | 0·4787 | 0·2794 | 0·8601 |
| Padua⸫     foot | 13·930 | 1·1608 | 0·6062 | 0·3538 | 1·0892 |
| Palæste     foot | 12·138 | 1·0115 | 0·5283 | 0·3083 | 0·9491 |
| Palermo    palmo | 9·530 | 0·7942 | 0·4148 | 0·2421 | 0·7452 |
| Parma      foot | 22·428 | 1·8690 | 0·9761 | 0·5697 | 1·7537 |

| Linear Measure. | | Napolitan Palmi. | Rhineland Feet. | Roman Palmi. | Venice Feet. | Vienna Feet. |
|---|---|---|---|---|---|---|
| Lisbon | archit. foot | 1·2840 | 1·0787 | 1·5155 | 0·9737 | 1·0712 |
| ———— | com. foot | 1·2483 | 1·0487 | 1·4733 | 0·9466 | 1·0414 |
| Lombardy | arch. foot | 1·5036 | 1·2632 | 1·7747 | 1·1402 | 1·2544 |
| Lorraine | foot | 1·0885 | 0·9144 | 1·2847 | 0·8254 | 0·9080 |
| Lübeck | foot | 1·1029 | 0·9266 | 1·3017 | 0·8364 | 0·9201 |
| Lucca | braccio | 2·2631 | 1·9013 | 2·6711 | 1·7162 | 1·8880 |
| Luneburg | foot | 1·1029 | 0·9266 | 1·3017 | 0·8364 | 0·9201 |
| Macedonia | foot | 1·3405 | 1·1262 | 1·5822 | 1·0166 | 1·1183 |
| Magdeburg | foot | 1·0749 | 0·9031 | 1·2687 | 0·8152 | 0·8967 |
| Malta | foot | 1·0759 | 0·9039 | 1·2698 | 0·8159 | 0·8975 |
| Manheim | foot | 1·0990 | 0·9233 | 1·2971 | 0·8334 | 0·9168 |
| Mantua | braccio | 2·4180 | 2·0314 | 2·8539 | 1·8337 | 2·0172 |
| ———— | brasso | 1·7580 | 1·4770 | 2·0750 | 1·3332 | 1·4666 |
| Maestricht | foot | 1·0643 | 0·8941 | 1·2562 | 0·8071 | 0·8879 |
| Mentz | foot | 1·1414 | 0·9589 | 1·3472 | 0·8656 | 0·9522 |
| Middleburg | foot | 1·1376 | 0·9557 | 1·3426 | 0·8627 | 0·9490 |
| Milan | foot | 1·5046 | 1·2640 | 1·7758 | 1·1410 | 1·2551 |
| ———— | dec. foot | 0·9883 | 0·8303 | 1·1664 | 0·7494 | 0·8244 |
| ———— | braccio | 2·2558 | 1·8952 | 2·6625 | 1·7107 | 1·8819 |
| ———— | metro-braccio | 3·7922 | 3·1859 | 4·4758 | 2·8757 | 3·1635 |
| Modena | foot | 1·9834 | 1·6663 | 2·3410 | 1·5041 | 1·6546 |
| Monaco | foot | 0·8909 | 0·7485 | 1·0315 | 0·6756 | 0·7432 |
| Moscow | foot | 1·2685 | 1·0657 | 1·4972 | 0·9620 | 1·0582 |
| Munich | foot | 1·1067 | 0·9298 | 1·3062 | 0·8393 | 0·9233 |
| Naples | palmo | 1·0000 | 0·8402 | 1·1803 | 0·7584 | 0·8343 |
| Naples | canna | 8·0000 | 6·7210 | 9·4421 | 6·0667 | 6·6738 |
| Neufchâtel | foot | 1·1376 | 0·9557 | 1·3426 | 0·8627 | 0·9490 |
| Normandy | foot | 1·1289 | 0·9484 | 1·3324 | 0·8561 | 0·9418 |
| Nuremberg | foot | 1·1520 | 0·9678 | 1·3597 | 0·8736 | 0·9610 |
| Oldenburg | foot | 1·1221 | 0·9427 | 1·3244 | 0·8509 | 0·9361 |
| Osnaburg | foot | 1·0596 | 0·8902 | 1·2506 | 0·8035 | 0·8839 |
| Padua | foot | 1·3417 | 1·1272 | 1·5836 | 1·0175 | 1·1193 |
| Palæste | foot | 1·1692 | 0·9822 | 1·3799 | 0·8866 | 0·9753 |
| Palermo | palmo | 0·9180 | 0·7712 | 1·0835 | 0·6961 | 0·7658 |
| Parma | foot | 2·1603 | 1·8149 | 2·5497 | 1·6382 | 1·8021 |

| Linear Measure. | | English | | Florence | French | |
| | | Inches. | Feet. | Braccia. | Mètres. | Pieds. |
|---|---|---|---|---|---|---|
| Parma | braccio | 21·340 | 1·7783 | 0·9287 | 0·5420 | 1·6686 |
| Pavia | foot | 18·480 | 1·5400 | 0·8042 | 0·4694 | 1·4450 |
| —— | braccio | 18·300 | 1·5250 | 0·7964 | 0·4648 | 1·4309 |
| Persia | arish | 38·270 | 3·1892 | 1·6655 | 0·9721 | 2·9924 |
| Phileterian | foot | 13·937 | 1·1614 | 0·6065 | 0·3540 | 1·0897 |
| Piacenza | foot | 22·428 | 1·8690 | 0·9761 | 0·5697 | 1·7537 |
| Piedmont liprando ft. | | 20·228 | 1·6857 | 0·8803 | 0·5138 | 1·5817 |
| ———— common ft. | | 13·484 | 1·1237 | 0·5868 | 0·3425 | 1·0544 |
| Poland | foot | 14·032 | 1·1693 | 0·6107 | 0·3564 | 1·0972 |
| Pomerania | foot | 11·500 | 0·9583 | 0·5005 | 0·2921 | 0·8992 |
| Portugal archit. foot | | 13·331 | 1·1109 | 0·5802 | 0·3386 | 1·0424 |
| Prague | foot | 11·880 | 0·9900 | 0·5170 | 0·3018 | 0·9289 |
| Prussia | foot | 12·357 | 1·0298 | 0·5378 | 0·3139 | 0·9663 |
| Pythian | foot | 9·749 | 0·8124 | 0·4243 | 0·2476 | 0·7623 |
| Ratsburg | foot | 11·450 | 0·9542 | 0·4983 | 0·2908 | 0·8953 |
| Revel | foot | 10·530 | 0·8775 | 0·4583 | 0·2675 | 0·8234 |
| Reggio | braccio | 20·850 | 1·7375 | 0·9074 | 0·5296 | 1·6303 |
| Rhineland | foot | 12·357 | 1·0298 | 0·5378 | 0·3139 | 0·9663 |
| Riga | foot | 10·790 | 0·8992 | 0·4696 | 0·2741 | 0·8437 |
| Rimini | braccio | 21·390 | 1·7825 | 0·9309 | 0·5433 | 1·6725 |
| Rome   common foot | | 11·592 | 0·9660 | 0·5045 | 0·2944 | 0·9064 |
| ——    archit. foot | | 11·720 | 0·9767 | 0·5101 | 0·2977 | 0·9164 |
| ——    palmo | | 8·796 | 0·7330 | 0·3828 | 0·2234 | 0·6878 |
| ——    braccio | | 30·732 | 2·5610 | 1·3375 | 0·7806 | 2·4030 |
| ——- palmo d'archit. | | 8·790 | 0·7325 | 0·3825 | 0·2233 | 0·6873 |
| Rome canna d'archit. | | 87·900 | 7·3250 | 3·8254 | 2·2326 | 6·8731 |
| Rostock | foot | 11·380 | 0·9483 | 0·4952 | 0·2890 | 0·8898 |
| Rotterdam | foot | 12·357 | 1·0298 | 0·5378 | 0·3139 | 0·9663 |
| Russia | foot | 13·750 | 1·1458 | 0·5984 | 0·3492 | 1·0751 |
| Sardinia | palmo | 9·808 | 0·8173 | 0·4268 | 0·2491 | 0·7669 |
| Sicily | palmo | 9·530 | 0·7942 | 0·4148 | 0·2421 | 0·7452 |
| —— Archimedes' ft. | | 8·760 | 0·7300 | 0·3812 | 0·2225 | 0·6850 |
| Sienna | foot | 14·868 | 1·2390 | 0·6471 | 0·3776 | 1·1625 |
| Spain | foot | 11·130 | 0·9275 | 0·4844 | 0·2827 | 0·8703 |
| Stade | foot | 11·450 | 0·9542 | 0·4983 | 0·2908 | 0·8953 |

| Linear Measure. | Napolitan Palmi. | Rhineland Feet. | Roman Palmi. | Venice Feet. | Vienna Feet. |
|---|---|---|---|---|---|
| Parma braccio | 2·0555 | 1·7268 | 2·4260 | 1·5587 | 1·7147 |
| Pavia foot | 1·7800 | 1·4954 | 2·1009 | 1·3498 | 1·4849 |
| —— braccio | 1·7627 | 1·4808 | 2·0804 | 1·3367 | 1·4704 |
| Persia arish | 3·6862 | 3·0968 | 4·3507 | 2·7954 | 3·0751 |
| Phileterian foot | 1·3424 | 1·1278 | 1·5844 | 1·0180 | 1·1199 |
| Piacenza foot | 2·1603 | 1·8149 | 2·5497 | 1·6382 | 1·8021 |
| Piedmont liprando ft. | 1·9484 | 1·6369 | 2·2996 | 1·4775 | 1·6254 |
| —— common ft. | 1·2988 | 1·0912 | 1·5330 | 0·9849 | 1·0835 |
| Poland foot | 1·3515 | 1·1355 | 1·5952 | 1·0249 | 1·1275 |
| Pomerania foot | 1·1076 | 0·9306 | 1·3073 | 0·8400 | 0·9240 |
| Portugal archit. foot | 1·2840 | 1·0787 | 1·5155 | 0·9737 | 1·0712 |
| Prague foot | 1·1443 | 0·9613 | 1·3506 | 0·8678 | 0·9546 |
| Prussia foot | 1·1903 | 1·0000 | 1·4049 | 0·9026 | 0·9930 |
| Pythian foot | 0·9390 | 0·7889 | 1·1083 | 0·7121 | 0·7833 |
| Ratsburg foot | 1·1029 | 0·9266 | 1·3017 | 0·8364 | 0·9201 |
| Revel foot | 1·0143 | 0·8521 | 1·1971 | 0·7691 | 0·8461 |
| Reggio braccio | 2·0083 | 1·6872 | 2·3703 | 1·5229 | 1·6753 |
| Rhineland foot | 1·1903 | 1·0000 | 1·4049 | 0·9026 | 0·9930 |
| Riga foot | 1·0393 | 0·8732 | 1·2267 | 0·7882 | 0·8670 |
| Rimini braccio | 2·0603 | 1·7309 | 2·4317 | 1·5624 | 1·7187 |
| Rome common foot | 1·1166 | 0·9380 | 1·3178 | 0·8467 | 0·9315 |
| —— archit. foot | 1·1289 | 0·9484 | 1·3324 | 0·8561 | 0·9418 |
| —— palmo | 0·8472 | 0·7118 | 1·0000 | 0·6425 | 0·7068 |
| —— braccio | 2·9601 | 2·4869 | 3·4937 | 2·2448 | 2·4694 |
| —— palmo d'archit. | 0·8467 | 0·7113 | 0·9993 | 0·6421 | 0·7063 |
| Rome canna d'archit. | 8·4666 | 7·1130 | 9·9929 | 6·4205 | 7·0630 |
| Rostock foot | 1·0961 | 0·9209 | 1·2937 | 0·8312 | 0·9144 |
| Rotterdam foot | 1·1903 | 1·0000 | 1·4049 | 0·9026 | 0·9930 |
| Russia foot | 1·3244 | 1·1126 | 1·5631 | 1·0043 | 1·1048 |
| Sardinia palmo | 0·9447 | 0·7936 | 1·1150 | 0·7164 | 0·7881 |
| Sicily palmo | 0·9180 | 0·7712 | 1·0835 | 0·6961 | 0·7658 |
| —— Archimedes' ft. | 0·8438 | 0·7089 | 0·9959 | 0·6399 | 0·7039 |
| Sienna foot | 1·4322 | 1·2031 | 1·6902 | 1·0860 | 1·1947 |
| Spain foot | 1·0720 | 0·9006 | 1·2653 | 0·8130 | 0·8943 |
| Stade foot | 1·1029 | 0·9266 | 1·3017 | 0·8364 | 0·9201 |

| Linear Measure. | | English | | Florence | French. | |
|---|---|---|---|---|---|---|
| | | Inches. | Feet. | Braccia. | Mètres. | Pieds. |
| Stettin | old foot | 11·120 | 0·9267 | 0·4840 | 0·2825 | 0·8695 |
| Strasburg | foot | 11·390 | 0·9492 | 0·4957 | 0·2893 | 0·8906 |
| Stuttgard | foot | 11·260 | 0·9383 | 0·4900 | 0·2860 | 0·8804 |
| Sweden | foot | 11·690 | 0·9742 | 0·5088 | 0·2969 | 0·9141 |
| Trent | foot | 14·412 | 1·2010 | 0·6272 | 0·3661 | 1·1269 |
| Turin | liprando foot | 20·228 | 1·6857 | 0·8803 | 0·5138 | 1·5817 |
| —— | common foot | 13·484 | 1·1237 | 0·5868 | 0·3425 | 1·0544 |
| —— | ras | 23·496 | 1·9580 | 1·0225 | 0·5968 | 1·8372 |
| Turkey | pic | 26·800 | 2·2333 | 1·1663 | 0·6807 | 2·0955 |
| Ulm | foot | 11·390 | 0·9492 | 0·4957 | 0·2893 | 0·8906 |
| Utrecht | foot | 10·740 | 0·8950 | 0·4674 | 0·2728 | 0·8398 |
| Venice | foot | 13·691 | 1·1409 | 0·5958 | 0·3477 | 1·0705 |
| Verona | foot | 13·404 | 1·1170 | 0·5833 | 0·3405 | 1·0481 |
| Vicenza | foot | 13·632 | 1·1360 | 0·5933 | 0·3463 | 1·0659 |
| Vienna | foot | 12·445 | 1·0371 | 0·5416 | 0·3161 | 0·9731 |
| Warsaw | foot | 11·725 | 0·9771 | 0·5103 | 0·2978 | 0·9168 |
| —— | Cracow foot | 14·032 | 1·1693 | 0·6107 | 0·3564 | 1·0972 |
| Wismar | foot | 11·580 | 0·9650 | 0·5040 | 0·2941 | 0·9055 |
| Würtemberg | foot | 11·260 | 0·9383 | 0·4900 | 0·2860 | 0·8804 |
| Zell | foot | 11·450 | 0·9542 | 0·4983 | 0·2908 | 0·8953 |
| Ziriczee | foot | 12·210 | 1·0175 | 0·5314 | 0·3101 | 0·9547 |
| Zurich | foot | 11·810 | 0·9842 | 0·5140 | 0·3000 | 0·9235 |

| Linear Measure. | Napolitan Palmi. | Rhineland Feet. | Roman Palmi. | Venice Feet. | Vienna Feet. |
|---|---|---|---|---|---|
| Stettin old foot | 1·0711 | 0·8999 | 1·2642 | 0·8123 | 0·8936 |
| Strasburg foot | 1·0971 | 0·9217 | 1·2949 | 0·8320 | 0·9153 |
| Stuttgard foot | 1·0845 | 0·9111 | 1·2800 | 0·8224 | 0·9047 |
| Sweden foot | 1·1260 | 0·9460 | 1·3290 | 0·8539 | 0·9394 |
| Trent foot | 1·3882 | 1·1662 | 1·6384 | 1·0527 | 1·1580 |
| Turin liprando foot | 1·9484 | 1·6369 | 2·2996 | 1·4775 | 1·6254 |
| —— common foot | 1·2988 | 1·0912 | 1·5330 | 0·9849 | 1·0835 |
| —— ras | 2·2631 | 1·9013 | 2·6711 | 1·7162 | 1·8880 |
| Turkey pic | 2·5814 | 2·1687 | 3·0467 | 1·9575 | 2·1534 |
| Ulm foot | 1·0971 | 0·9217 | 1·2949 | 0·8320 | 0·9153 |
| Utrecht foot | 1·0345 | 0·8691 | 1·2210 | 0·7845 | 0·8630 |
| Venice foot | 1·3187 | 1·1079 | 1·5564 | 1·0000 | 1·1001 |
| Verona foot | 1·2911 | 1·0847 | 1·5238 | 0·9791 | 1·0770 |
| Vicenza foot | 1·3130 | 1·1031 | 1·5497 | 0·9957 | 1·0954 |
| Vienna foot | 1·1987 | 1·0071 | 1·4148 | 0·9090 | 1·0000 |
| Warsaw foot | 1·1294 | 0·9488 | 1·3330 | 0·8564 | 0·9421 |
| —— Cracow foot | 1·3515 | 1·1355 | 1·5952 | 1·0249 | 1·1275 |
| Wismar foot | 1·1154 | 0·9371 | 1·3165 | 0·8458 | 0·9305 |
| Würtemberg foot | 1·0845 | 0·9111 | 1·2800 | 0·8224 | 0·9047 |
| Zell foot | 1·1029 | 0·9266 | 1·3017 | 0·8364 | 0·9201 |
| Ziriczee foot | 1·1761 | 0·9880 | 1·3881 | 0·8918 | 0·9811 |
| Zurich foot | 1·1376 | 0·9557 | 1·3426 | 0·8627 | 0·9490 |

# TABLE II.

| Square Measure. | English | | Florence | French | |
| | Square Inches. | Square Feet. | Square Braccia. | Square Mètres. | Square Pieds. |
| --- | --- | --- | --- | --- | --- |
| Aix-la-Chapelle foot | 130·19 | 0·9040 | 0·2466 | 0·0840 | 0·7959 |
| Amsterdam foot | 124·32 | 0·8634 | 0·2355 | 0·0802 | 0·7602 |
| Ancona foot | 236·67 | 1·6435 | 0·4482 | 0·1527 | 1·4470 |
| Anspach foot | 137·36 | 0·9539 | 0·2602 | 0·0886 | 0·8398 |
| Antwerp foot | 126·34 | 0·8774 | 0·2393 | 0·0815 | 0·7725 |
| Aquileia foot | 183·06 | 1·2713 | 0·3467 | 0·1181 | 1·1192 |
| Augsburg foot | 135·72 | 0·9425 | 0·2570 | 0·0876 | 0·8297 |
| Austria foot | 154·88 | 1·0756 | 0·2933 | 0·0999 | 0·9469 |
| Baden foot | 139·48 | 0·9686 | 0·2642 | 0·0900 | 0·8528 |
| Basle foot | 137·83 | 0·9571 | 0·2610 | 0·0889 | 0·8426 |
| Bavaria foot | 130·42 | 0·9057 | 0·2470 | 0·0841 | 0·7974 |
| Bergamo foot | 294·88 | 2·0478 | 0·5585 | 0·1902 | 1·8029 |
| Berlin foot | 148·60 | 1·0319 | 0·2814 | 0·0959 | 0·9084 |
| Berne foot | 133·17 | 0·9249 | 0·2522 | 0·0859 | 0·8143 |
| Bohemia foot | 136·19 | 0·9458 | 0·2579 | 0·0879 | 0·8326 |
| Bologna foot | 222·85 | 1·5475 | 0·4221 | 0·1438 | 1·3624 |
| Bremen foot | 129·50 | 0·8993 | 0·2453 | 0·0835 | 0·7917 |
| Brescia foot | 350·44 | 2·4335 | 0·6637 | 0·2261 | 2·1425 |
| ——— braccio | 630·21 | 4·3764 | 1·1936 | 0·4066 | 3·8530 |
| Breslau foot | 125·22 | 0·8696 | 0·2372 | 0·0808 | 0·7656 |
| Brunswick foot | 126·11 | 0·8757 | 0·2388 | 0·0814 | 0·7710 |
| Brussels foot | 131·10 | 0·9105 | 0·2483 | 0·0846 | 0·8016 |
| Cagliari palmo | 63·52 | 0·4412 | 0·1203 | 0·0410 | 0·3884 |
| Calenberg foot | 132·25 | 0·9183 | 0·2505 | 0·0853 | 0·8085 |
| Carrara palmo | 96·20 | 0·6680 | 0·1822 | 0·0621 | 0·5881 |
| Chamberry foot | 176·46 | 1·2255 | 0·3342 | 0·1138 | 1·0789 |
| China math. foot | 172·13 | 1·1953 | 0·3260 | 0·1110 | 1·0523 |
| ——— imp. foot | 159·06 | 1·1046 | 0·3013 | 0·1026 | 0·9725 |
| Clêves foot | 135·96 | 0·9442 | 0·2575 | 0·0877 | 0·8313 |
| Cologne foot | 117·29 | 0·8145 | 0·2221 | 0·0757 | 0·7171 |

# TABLE II.

## CONVERSION OF STANDARD SQUARE MEASURES.

| Square Measure. | Napolitan Square Palmi. | Rhineland Square Feet. | Roman Square Palmi. | Venice Square Feet. | Vienna Square Feet. |
|---|---|---|---|---|---|
| Aix-la-Chapelle foot | 1·2078 | 0·8524 | 1·6824 | 0·6945 | 0·8405 |
| Amsterdam foot | 1·1535 | 0·8141 | 1·6069 | 0·6633 | 0·8027 |
| Ancona foot | 2·1957 | 1·5497 | 3·0587 | 1·2627 | 1·5281 |
| Anspach foot | 1·2744 | 0·8995 | 1·7753 | 0·7329 | 0·8869 |
| Antwerp foot | 1·1722 | 0·8273 | 1·6329 | 0·6741 | 0·8158 |
| Aquileia foot | 1·6984 | 1·1987 | 2·3660 | 0·9767 | 1·1820 |
| Augsburg foot | 1·2591 | 0·8887 | 1·7540 | 0·7241 | 0·8762 |
| Austria foot | 1·4369 | 1·0142 | 2·0017 | 0·8263 | 1·0000 |
| Baden foot | 1·2941 | 0·9134 | 1·8027 | 0·7442 | 0·9006 |
| Basle foot | 1·2786 | 0·9024 | 1·7811 | 0·7353 | 0·8898 |
| Bavaria foot | 1·2100 | 0·8540 | 1·6856 | 0·6959 | 0·8421 |
| Bergamo foot | 2·7358 | 1·9309 | 3·8110 | 1·5733 | 1·9039 |
| Berlin foot | 1·3785 | 0·9730 | 1·9203 | 0·7928 | 0·9594 |
| Berne foot | 1·2356 | 0·8721 | 1·7212 | 0·7106 | 0·8599 |
| Bohemia foot | 1·2635 | 0·8918 | 1·7601 | 0·7266 | 0·8793 |
| Bologna foot | 2·0675 | 1·4592 | 2·8800 | 1·1889 | 1·4388 |
| Bremen foot | 1·2014 | 0·8480 | 1·6736 | 0·6909 | 0·8361 |
| Brescia foot | 3·2512 | 2·2947 | 4·5290 | 1·8696 | 2·2626 |
| —— braccio | 5·8468 | 4·1267 | 8·1448 | 3·3623 | 4·0689 |
| Breslau foot | 1·1617 | 0·8199 | 1·6183 | 0·6681 | 0·8085 |
| Brunswick foot | 1·1699 | 0·8257 | 1·6297 | 0·6728 | 0·8142 |
| Brussels foot | 1·2164 | 0·8585 | 1·6945 | 0·6995 | 0·8465 |
| Cagliari palmo | 0·5894 | 0·4160 | 0·8210 | 0·3389 | 0·4102 |
| Calenberg foot | 1·2269 | 0·8659 | 1·7091 | 0·7055 | 0·8538 |
| Carrara palmo | 0·8924 | 0·6299 | 1·2431 | 0·5132 | 0·6210 |
| Chamberry foot | 1·6372 | 1·1555 | 2·2807 | 0·9415 | 1·1394 |
| China math. foot | 1·5969 | 1·1271 | 2·2245 | 0·9183 | 1·1113 |
| —— imp. foot | 1·4757 | 1·0415 | 2·0557 | 0·8486 | 1·0270 |
| Clêves foot | 1·2614 | 0·8903 | 1·7572 | 0·7254 | 0·8778 |
| Cologne foot | 1·0882 | 0·7680 | 1·5159 | 0·6258 | 0·7573 |

| Square Measure. | English | | Florence | French | |
| | Square Inches. | Square Feet. | Square Braccia. | Square Mètres. | Square Pieds. |
|---|---|---|---|---|---|
| Constantinople pic | 718·24 | 4·9877 | 1·3603 | 0·4634 | 4·3912 |
| Copenhagen foot | 152·70 | 1·0605 | 0·2892 | 0·0985 | 0·9336 |
| Cracow foot | 196·90 | 1·3673 | 0·3729 | 0·1270 | 1·2038 |
| Dantzic foot | 127·46 | 0·8851 | 0·2414 | 0·0822 | 0·7793 |
| Denmark foot | 152·70 | 1·0605 | 0·2892 | 0·0985 | 0·9336 |
| Dordrecht foot | 200·51 | 1·3924 | 0·3798 | 0·1294 | 1·2259 |
| Dresden foot | 124·32 | 0·8634 | 0·2355 | 0·0802 | 0·7602 |
| Embden foot | 135·96 | 0·9442 | 0·2575 | 0·0877 | 0·8313 |
| England foot | 144·00 | 1·0000 | 0·2727 | 0·0929 | 0·8804 |
| Farrari foot | 249·77 | 1·7345 | 0·4731 | 0·1611 | 1·5271 |
| Florence foot | 142·56 | 0·9900 | 0·2700 | 0·0920 | 0·8716 |
| ———— braccio | 527·99 | 3·6664 | 1·0000 | 0·3406 | 3·2279 |
| France foot | 163·58 | 1·1360 | 0·3098 | 0·1055 | 1·0000 |
| ———— mètre | 1550·08 | 10·7640 | 2·9358 | 1·0000 | 9·4768 |
| Frankfort foot | 127·01 | 0·8821 | 0·2406 | 0·0819 | 0·7766 |
| Geneva foot | 530·29 | 3·6826 | 1·0044 | 0·3421 | ·3·2422 |
| Genoa palmo | 96·20 | 0·6680 | 0·1822 | 0·0621 | 0·5881 |
| ———— canna | 7673·76 | 53·2900 | 14·5340 | 4·9506 | 46·9160 |
| Gottingen foot | 131·10 | 0·9105 | 0·2483 | 0·0846 | 0·8016 |
| Gotha foot | 128·14 | 0·8898 | 0·2427 | 0·0827 | 0·7834 |
| Greece foot | 139·48 | 0·9686 | 0·2642 | 0·0900 | 0·8528 |
| Groningen foot | 132·02 | 0·9168 | 0·2500 | 0·0852 | 0·8072 |
| Hamburg foot | 127·46 | 0·8851 | 0·2414 | 0·0822 | 0·7793 |
| Hanover foot | 131·10 | 0·9105 | 0·2483 | 0·0846 | 0·8016 |
| Harlem foot | 126·56 | 0·8789 | 0·2397 | 0·0817 | 0·7738 |
| Heidelberg foot | 120·12 | 0·8341 | 0·2275 | 0·0775 | 0·7343 |
| Hildesheim foot | 122·10 | 0·8479 | 0·2312 | 0·0788 | 0·7465 |
| Inspruck foot | 156·25 | 1·0851 | 0·2960 | 0·1008 | 0·9553 |
| Königsberg foot | 146·65 | 1·0185 | 0·2778 | 0·0946 | 0·8967 |
| Leghorn foot | 141·71 | 0·9841 | 0·2684 | 0·0914 | 0·8664 |
| Leipsic foot | 123·88 | 0·8602 | 0·2346 | 0·0799 | 0·7574 |
| Leyden foot | 152·28 | 1·0574 | 0·2884 | 0·0982 | 0·9309 |
| Liege foot | 128·14 | 0·8898 | 0·2427 | 0·0827 | 0·7834 |
| Lindau com. foot | 129·96 | 0·9025 | 0·2461 | 0·0838 | 0·7945 |
| ———— long foot | 153·76 | 1·0677 | 0·2912 | 0·0992 | 0·9400 |

| Square Measure. | Napolitan Square Palmi. | Rhineland Square Feet. | Roman Square Palmi. | Venice Square Feet. | Vienna Square Feet. |
|---|---|---|---|---|---|
| Constantinople pic | 6·6635 | 4·7031 | 9·2824 | 3·8320 | 4·6372 |
| Copenhagen    foot | 1·4168 | 1·0000 | 1·9736 | 0·8147 | 0·9860 |
| Cracow        foot | 1·8267 | 1·2893 | 2·5446 | 1·0505 | 1·2712 |
| Dantzic       foot | 1·1825 | 0·8346 | 1·6473 | 0·6800 | 0·8229 |
| Denmark       foot | 1·4168 | 1·0000 | 1·9736 | 0·8147 | 0·9860 |
| Dordrecht     foot | 1·8602 | 1·3129 | 2·5913 | 1·0697 | 1·2946 |
| Dresden       foot | 1·1535 | 0·8141 | 1·6069 | 0·6633 | 0·8027 |
| Embden        foot | 1·2614 | 0·8903 | 1·7572 | 0·7254 | 0·8778 |
| England       foot | 1·3360 | 0·9429 | 1·8611 | 0·7683 | 0·9297 |
| Farrari       foot | 2·3173 | 1·6355 | 3·2280 | 1·3326 | 1·6126 |
| Florence      foot | 1·3226 | 0·9335 | 1·8425 | 0·7606 | 0·9204 |
| ————      braccio | 4·8983 | 3·4572 | 6·8234 | 2·8168 | 3·4088 |
| France        foot | 1·5176 | 1·0711 | 2·1141 | 0·8727 | 1·0561 |
| ————      mètre | 14·3810 | 10·1500 | 20·0330 | 8·2699 | 10·0080 |
| Frankfort     foot | 1·1785 | 0·8318 | 1·6416 | 0·6777 | 0·8201 |
| Geneva        foot | 4·9199 | 3·4725 | 6·8536 | 2·8293 | 3·4239 |
| Genoa        palmo | 0·8924 | 0·6299 | 1·2431 | 0·5132 | 0·6210 |
| ————      canna | 71·1930 | 50·2480 | 99·1745 | 40·9410 | 49·5450 |
| Gottingen     foot | 1·2164 | 0·8585 | 1·6945 | 0·6995 | 0·8465 |
| Gotha         foot | 1·1888 | 0·8390 | 1·6560 | 0·6836 | 0·8273 |
| Greece        foot | 1·2941 | 0·9134 | 1·8027 | 0·7442 | 0·9006 |
| Groningen     foot | 1·2248 | 0·8645 | 1·7062 | 0·7044 | 0·8524 |
| Hamburg       foot | 1·1825 | 0·8346 | 1·6473 | 0·6800 | 0·8229 |
| Hanover       foot | 1·2164 | 0·8585 | 1·6945 | 0·6995 | 0·8465 |
| Harlem        foot | 1·1742 | 0·8287 | 1·6357 | 0·6752 | 0·8171 |
| Heidelberg    foot | 1·1143 | 0·7865 | 1·5523 | 0·6408 | 0·7755 |
| Hildesheim    foot | 1·1328 | 0·7995 | 1·5780 | 0·6514 | 0·7883 |
| Inspruck      foot | 1·4487 | 1·0232 | 2·0195 | 0·8337 | 1·0089 |
| Königsberg    foot | 1·3607 | 0·9604 | 1·8955 | 0·7825 | 0·9469 |
| Leghorn       foot | 1·3147 | 0·9279 | 1·8314 | 0·7560 | 0·9149 |
| Leipsic       foot | 1·1493 | 0·8111 | 1·6010 | 0·6609 | 0·7998 |
| Leyden        foot | 1·4127 | 0·9971 | 1·9679 | 0·8124 | 0·9831 |
| Liege         foot | 1·1888 | 0·8390 | 1·6560 | 0·6836 | 0·8273 |
| Lindau   com. foot | 1·2057 | 0·8510 | 1·6796 | 0·6934 | 0·8391 |
| ————    long foot | 1·4265 | 1·0068 | 1·9871 | 0·8203 | 0·9927 |

| Square Measure. | English | | Florence | French | |
|---|---|---|---|---|---|
| | Square Inches. | Square Feet. | Square Braccia. | Square Mètres. | Square Pieds. |
| Lisbon archit. foot | 177·72 | 1·2341 | 0·3366 | 0·1147 | 1·0865 |
| ———— com. foot | 167·96 | 1·1664 | 0·3181 | 0·1084 | 1·0269 |
| Lombardy arch.ft. | 243·70 | 1·6923 | 0·4616 | 0·1572 | 1·4899 |
| Lorraine foot | 127·69 | 0·8868 | 0·2419 | 0·0824 | 0·7807 |
| Lübeck foot | 131·10 | 0·9105 | 0·2483 | 0·0846 | 0·8016 |
| Lucca braccio | 552·06 | 3·8337 | 1·0456 | 0·3562 | 3·3752 |
| Luneburg foot | 131·10 | 0·9105 | 0·2483 | 0·0846 | 0·8016 |
| Macedonia foot | 193·71 | 1·3451 | 0·3669 | 0·1250 | 1·1842 |
| Magdeburg foot | 124·55 | 0·8649 | 0·2359 | 0·0803 | 0·7614 |
| Malta foot | 124·77 | 0·8664 | 0·2363 | 0·0805 | 0·7628 |
| Manheim foot | 130·19 | 0·9040 | 0·2466 | 0·0840 | 0·7959 |
| Mantua braccio | 630·21 | 4·3764 | 1·1936 | 0·4066 | 3·8530 |
| ———— brasso | 333·14 | 2·3134 | 0·6310 | 0·2149 | 2·0368 |
| Maestricht foot | 122·10 | 0·8479 | 0·2312 | 0·0788 | 0·7465 |
| Mentz foot | 140·42 | 0·9752 | 0·2660 | 0·0906 | 0·8585 |
| Middleburg foot | 139·48 | 0·9686 | 0·2642 | 0·0900 | 0·8528 |
| Milan foot | 243·98 | 1·6944 | 0·4621 | 0·1574 | 1·4918 |
| —— dec. foot. | 105·27 | 0·7310 | 0·1994 | 0·0679 | 0·6436 |
| —— braccio | 548·50 | 3·8091 | 1·0389 | 0·3539 | 3·3535 |
| —— met.-braccio | 1550·08 | 10·7640 | 2·9358 | 1·0000 | 9·4768 |
| Modena foot | 424·03 | 2·9447 | 0·8031 | 0·2736 | 2·5925 |
| Monaco foot | 85·56 | 0·5941 | 0·1620 | 0·0552 | 0·5231 |
| Moscow foot | 173·45 | 1·2045 | 0·3285 | 0·1119 | 1·0604 |
| Munich foot | 132·02 | 0·9168 | 0·2500 | 0·0852 | 0·8072 |
| Naples palmo | 107·79 | 0·7486 | 0·2042 | 0·0695 | 0·6591 |
| ———— canna | 6898·30 | 47·9050 | 13·0653 | 4·4504 | 42·1754 |
| Neufchâtel foot | 139·48 | 0·9686 | 0·2642 | 0·0900 | 0·8528 |
| Normandy foot | 137·36 | 0·9539 | 0·2602 | 0·0886 | 0·8398 |
| Nuremberg foot | 143·04 | 0·9934 | 0·2709 | 0·0923 | 0·8746 |
| Oldenburg foot | 135·72 | 0·9425 | 0·2570 | 0·0876 | 0·8297 |
| Osnaburg foot | 121·00 | 0·8403 | 0·2292 | 0·0781 | 0·7398 |
| Padua foot | 194·04 | 1·3475 | 0·3675 | 0·1252 | 1·1853 |
| Palæste foot | 147·33 | 1·0232 | 0·2790 | 0·0951 | 0·9008 |
| Palermo palmo | 90·82 | 0·6308 | 0·1720 | 0·0586 | 0·5553 |
| Parma foot | 503·02 | 3·4932 | 0·9527 | 0·3245 | 3·0754 |

| Square Measure. | Napolitan Square Palmi. | Rhineland Square Feet. | Roman Square Palmi. | Venice Square Feet. | Vienna Square Feet. |
|---|---|---|---|---|---|
| Lisbon archit. foot | 1·6488 | 1·1637 | 2·2968 | 0·9482 | 1·1474 |
| —— com. foot | 1·5583 | 1·0998 | 2·1705 | 0·8961 | 1·0844 |
| Lombardy arch. ft. | 2·2609 | 1·5957 | 3·1495 | 1·3002 | 1·5734 |
| Lorraine foot | 1·1847 | 0·8362 | 1·6504 | 0·6813 | 0·8245 |
| Lübeck· foot | 1·2164 | 0·8585 | 1·6945 | 0·6995 | 0·8465 |
| Lucca braccio | 5·1218 | 3·6149 | 7·1348 | 2·9454 | 3·5643 |
| Luneburg foot | 1·2164 | 0·8585 | 1·6945 | 0·6995 | 0·8465 |
| Macedonia foot | 1·7970 | 1·2684 | 2·5033 | 1·0334 | 1·2506 |
| Magdeburg foot | 1·1555 | 0·8155 | 1·6096 | 0·6645 | 0·8041 |
| Malta foot | 1·1575 | 0·8170 | 1·6124 | 0·6656 | 0·8055 |
| Manheim foot | 1·2078 | 0·8524 | 1·6824 | 0·6945 | 0·8405 |
| Mantua braccio | 5·8468 | 4·1267 | 8·1448 | 3·3623 | 4·0689 |
| —— brasso | 3·0907 | 2·1814 | 4·3055 | 1·7774 | 2·1509 |
| Maestricht foot | 1·1328 | 0·7995 | 1·5780 | 0·6514 | 0·7883 |
| Mentz foot | 1·3028 | 0·9195 | 1·8148 | 0·7492 | 0·9067 |
| Middleburg foot | 1·2941 | 0·9134 | 1·8027 | 0·7442 | 0·9006 |
| Milan foot | 2·2637 | 1·5977 | 3·1534 | 1·3018 | 1·5754 |
| —— dec. foot. | 0·9767 | 0·6893 | 1·3605 | 0·5616 | 0·6797 |
| —— braccio | 5·0889 | 3·5917 | 7·0890 | 2·9264 | 3·5414 |
| —— met.-braccio | 14·3810 | 10·1500 | 20·0330 | 8·2699 | 10·0080 |
| Modena foot | 3·9340 | 2·7766 | 5·4802 | 2·2624 | 2·7378 |
| Monaco foot | 0·7937 | 0·5620 | 1·1057 | 0·4565 | 0·5524 |
| Moscow foot | 1·6092 | 1·1357 | 2·2416 | 0·9254 | 1·1199 |
| Munich· foot | 1·2248 | 0·8645 | 1·7062 | 0·7044 | 0·8524 |
| Naples palmo | 1·0000 | 0·7059 | 1·3932 | 0·5751 | 0·6960 |
| —— canna | 64·0000 | 45·1710 | 89·1540 | 36·8040 | 44·5390 |
| Neufchâtel foot | 1·2941 | 0·9134 | 1·8027 | 0·7442 | 0·9006 |
| Normandy foot | 1·2744 | 0·8995 | 1·7753 | 0·7329 | 0·8869 |
| Nuremberg foot | 1·3272 | 0·9367 | 1·8488 | 0·7632 | 0·9236 |
| Oldenburg foot | 1·2591 | 0·8887 | 1·7540 | 0·7241 | 0·8762 |
| Osnaburg foot | 1·1227 | 0·7924 | 1·5639 | 0·6456 | 0·7813 |
| Padua ` foot | 1·8002 | 1·2706 | 2·5077 | 1·0352 | 1·2528 |
| Palæste foot | 1·3669 | 0·9648 | 1·9041 | 0·7861 | 0·9513 |
| Palermo palmo | 0·8427 | 0·5948 | 1·1739 | 0·4846 | 0·5864 |
| Parma foot | 4·6668 | 3·2938 | 6·5010 | 2·6837 | 3·2477 |

| Square Measure. | English Square Inches. | English Square Feet. | Florence Square Braccia. | French Square Mètres. | French Square Pieds. |
|---|---|---|---|---|---|
| Parma        braccio | 455·40 | 3·1624 | 0·8625 | 0·2938 | 2·7842 |
| Pavia        foot | 341·51 | 2·3716 | 0·6468 | 0·2203 | 2·0880 |
| ———         braccio | 334·89 | 2·3256 | 0·6343 | 0·2161 | 2·0475 |
| Persia       arish | 1464·59 | 10·1710 | 2·7740 | 0·9449 | 8·9545 |
| Phileterian foot | 194·24 | 1·3488 | 0·3679 | 0·1253 | 1·1875 |
| Piacenza    foot | 503·02 | 3·4932 | 0·9527 | 0·3245 | 3·0754 |
| Piedmont  lipr. ft. | 409·17 | 2·8416 | 0·7750 | 0·2640 | 2·5017 |
| ———        com. ft. | 181·82 | 1·2627 | 0·3444 | 0·1173 | 1·1117 |
| Poland       foot | 196·90 | 1·3673 | 0·3729 | 0·1270 | 1·2038 |
| Pomerania foot | 132·25 | 0·9183 | 0·2505 | 0·0853 | 0·8085 |
| Portugal   arch. ft. | 177·72 | 1·2341 | 0·3366 | 0·1147 | 1·0865 |
| Prague      foot | 141·13 | 0·9801 | 0·2673 | 0·0911 | 0·8629 |
| Prussia      foot | 152·70 | 1·0605 | 0·2892 | 0·0985 | 0·9336 |
| Pythian     foot | 95·04 | 0·6600 | 0·1800 | 0·0613 | 0·5811 |
| Ratsburg   foot | 131·10 | 0·9105 | 0·2483 | 0·0846 | 0·8016 |
| Revel        foot | 110·88 | 0·7700 | 0·2100 | 0·0715 | 0·6779 |
| Reggio      braccio | 434·72 | 3·0188 | 0·8233 | 0·2805 | 2·6578 |
| Rhineland foot | 152·70 | 1·0605 | 0·2892 | 0·0985 | 0·9336 |
| Riga          foot | 116·42 | 0·8086 | 0·2205 | 0·0751 | 0·7119 |
| Rimini      braccio | 457·53 | 3·1773 | 0·8666 | 0·2952 | 2·7973 |
| Rome   com. foot | 134·37 | 0·9332 | 0·2545 | 0·0867 | 0·8216 |
| ———    archit. foot | 137·36 | 0·9539 | 0·2602 | 0·0886 | 0·8398 |
| ———    palmo | 77·37 | 0·5373 | 0·1465 | 0·0499 | 0·4730 |
| ———    braccio | 944·46 | 6·5587 | 1·7888 | 0·6093 | 5·7743 |
| ———palmo d'arch. | 77·26 | 0·5366 | 0·1463 | 0·0498 | 0·4724 |
| Rome canna d'arc. | 7726·41 | 53·6560 | 14·6340 | 4·9847 | 47·2390 |
| Rostock    foot | 129·50 | 0·8993 | 0·2453 | 0·0835 | 0·7917 |
| Rotterdam foot | 152·70 | 1·0605 | 0·2892 | 0·0985 | 0·9336 |
| Russia       foot | 189·06 | 1·3129 | 0·3581 | 0·1220 | 1·1558 |
| Sardinia    palmo | 96·20 | 0·6680 | 0·1822 | 0·0621 | 0·5881 |
| Sicily       palmo | 90·82 | 0·6308 | 0·1720 | 0·0586 | 0·5553 |
| ———Archimedes' ft. | 76·74 | 0·5329 | 0·1453 | 0·0495 | 0·4692 |
| Sienna      foot | 221·06 | 1·5351 | 0·4187 | 0·1426 | 1·3515 |
| Spain   .   foot | 123·88 | 0·8602 | 0·2346 | 0·0799 | 0·7574 |
| Stade       foot | 131·10 | 0·9105 | 0·2483 | 0·0846 | 0·8016 |

| Square Measure. | Napolitan Square Palmi. | Rhineland Square Feet. | Roman Square Palmi. | Venice Square Feet. | Vienna Square Feet. |
|---|---|---|---|---|---|
| Parma        braccio | 4·2249 | 2·9819 | 5·8855 | 2·4296 | 2·9402 |
| Pavia        foot | 3·1684 | 2·2362 | 4·4137 | 1·8220 | 2·2050 |
| ——          braccio | 3·1070 | 2·1929 | 4·3281 | 1·7867 | 2·1622 |
| Persia       arish | 13·5880 | 9·5905 | 18·9290 | 7·8141 | 9·4563 |
| Phileterian foot | 1·8020 | 1·2719 | 2·5103 | 1·0363 | 1·2541 |
| Piacenza   foot | 4·6668 | 3·2938 | 6·5010 | 2·6837 | 3·2477 |
| Piedmont  lipr. ft. | 3·7963 | 2·6794 | 5·2883 | 2·1831 | 2·6419 |
| ——          com. ft. | 1·6869 | 1·1906 | 2·3500 | 0·9701 | 1·1740 |
| Poland      foot | 1·8267 | 1·2893 | 2·5446 | 1·0505 | 1·2712 |
| Pomerania foot | 1·2269 | 0·8659 | 1·7091 | 0·7055 | 0·8538 |
| Portugal   arch. ft. | 1·6488 | 1·1637 | 2·2968 | 0·9482 | 1·1474 |
| Prague      foot | 1·3094 | 0·9242 | 1·8241 | 0·7530 | 0·9113 |
| Prussia      foot | 1·4168 | 1·0000 | 1·9736 | 0·8147 | 0·9860 |
| Pythian     foot | 0·8817 | 0·6223 | 1·2283 | 0·5071 | 0·6136 |
| Ratsburg   foot | 1·2164 | 0·8585 | 1·6945 | 0·6995 | 0·8465 |
| Revel        foot | 1·0287 | 0·7261 | 1·4330 | 0·5916 | 0·7159 |
| Reggio       braccio | 4·0331 | 2·8466 | 5·6182 | 2·3193 | 2·8067 |
| Rhineland foot | 1·4168 | 1·0000 | 1·9736 | 0·8147 | 0·9860 |
| Riga         foot · | 1·0802 | 0·7624 | 1·5048 | 0·6212 | 0·7518 |
| Rimini       braccio | 4·2448 | 2·9960 | 5·9132 | 2·4411 | 2·9541 |
| Rome       com. foot | 1·2467 | 0·8799 | 1·7367 | 0·7169 | 0·8676 |
| ——          archit. foot | 1·2744 | 0·8995 | 1·7753 | 0·7329 | 0·8869 |
| ——          palmo | 0·7178 | 0·5066 | 1·0000 | 0·4128 | 0·4995 |
| ——          braccio | 8·7623 | 6·1844 | 12·2060 | 5·0389 | 6·0979 |
| ——          palmo d'arch. | 0·7168 | 0·5059 | 0·9986 | 0·4122 | 0·4989 |
| Rome canna d'arc. | 71·6840 | 50·5940 | 99·8570 | 41·2230 | 49·8360 |
| Rostock    foot | 1·2014 | 0·8480 | 1·6736 | 0·6909 | 0·8361 |
| Rotterdam foot | 1·4168 | 1·0000 | 1·9736 | 0·8147 | 0·9860 |
| Russia      foot | 1·7540 | 1·2379 | 2·4433 | 1·0086 | 1·2206 |
| Sardinia   palmo | 0·8924 | 0·6299 | 1·2431 | 0·5132 | 0·6210 |
| Sicily       palmo | 0·8427 | 0·5948 | 1·1739 | 0·4846 | 0·5864 |
| —-Archimedes' ft. | 0·7119 | 0·5025 | 0·9917 | 0·4094 | 0·4955 |
| Sienna     foot | 2·0509 | 1·4475 | 2·8569 | 1·1794 | 1·4272 |
| Spain        foot | 1·1493 | 0·8111 | 1·6010 | 0·6609 | 0·7998 |
| Stade        foot | 1·2164 | 0·8585 | 1·6945 | 0·6995 | 0·8465 |

| Square Measure. | | English Square Inches. | Square Feet. | Florence Square Braccia. | French Square Mètres. | Square Pieds. |
|---|---|---|---|---|---|---|
| Stettin | old foot | 123·65 | 0·8588 | 0·2342 | 0·0798 | 0·7561 |
| Strasburg | foot | 129·73 | 0·9010 | 0·2457 | 0·0837 | 0·7932 |
| Stuttgard | foot | 126·79 | 0·8804 | 0·2401 | 0·0818 | 0·7751 |
| Sweden | foot | 136·66 | 0·9491 | 0·2588 | 0·0882 | 0·8356 |
| Trent | foot | 207·71 | 1·4424 | 0·3934 | 0·1340 | 1·2699 |
| Turin | liprando foot | 409·17 | 2·8416 | 0·7750 | 0·2640 | 2·5017 |
| —— | com. foot | 181·82 | 1·2627 | 0·3444 | 0·1173 | 1·1117 |
| —— | ras | 552·06 | 3·8337 | 1·0456 | 0·3562 | 3·3752 |
| Turkey | pic | 718·24 | 4·9877 | 1·3603 | 0·4634 | 4·3912 |
| Ulm | foot | 129·73 | 0·9010 | 0·2457 | 0·0837 | 0·7932 |
| Utrecht | foot | 115·35 | 0·8010 | 0·2185 | 0·0744 | 0·7052 |
| Venice | foot | 187·44 | 1·3017 | 0·3550 | 0·1209 | 1·1460 |
| Verona | foot | 179·67 | 1·2477 | 0·3403 | 0·1159 | 1·0984 |
| Vicenza | foot | 185·83 | 1·2905 | 0·3520 | 0·1199 | 1·1362 |
| Vienna | foot | 154·88 | 1·0756 | 0·2933 | 0·0999 | 0·9469 |
| Warsaw | foot | 137·48 | 0·9547 | 0·2604 | 0·0887 | 0·8405 |
| —— Cracow foot | | 196·90 | 1·3673 | 0·3729 | 0·1270 | 1·2038 |
| Wismar | foot | 134·10 | 0·9312 | 0·2540 | 0·0865 | 0·8199 |
| Würtemberg | foot | 126·79 | 0·8804 | 0·2401 | 0·0818 | 0·7751 |
| Zell | foot | 131·10 | 0·9105 | 0·2483 | 0·0846 | 0·8016 |
| Ziriczee | foot | 149·08 | 1·0353 | 0·2824 | 0·0962 | 0·9115 |
| Zurich | foot | 139·48 | 0·9686 | 0·2642 | 0·0900 | 0·8528 |

| Square Measure. | Napolitan Square Palmi. | Rhineland Square Feet. | Roman Square Palmi. | Venice Square Feet. | Vienna Square Feet. |
|---|---|---|---|---|---|
| Stettin          old foot | 1·1473 | 0·8098 | 1·5982 | 0·6598 | 0·7984 |
| Strasburg       foot | 1·2037 | 0·8496 | 1·6768 | 0·6922 | 0·8377 |
| Stuttgard       foot | 1·1762 | 0·8302 | 1·6385 | 0·6764 | 0·8185 |
| Sweden          foot | 1·2679 | 0·8949 | 1·7663 | 0·7292 | 0·8824 |
| Trent            foot | 1·9270 | 1·3601 | 2·6844 | 1·1082 | 1·3410 |
| Turin   liprando foot | 3·7963 | 2·6794 | 5·2883 | 2·1831 | 2·6419 |
| ——       com. foot | 1·6869 | 1·1906 | 2·3500 | 0·9701 | 1·1740 |
| ——       ras | 5·1218 | 3·6149 | 7·1348 | 2·9454 | 3·5643 |
| Turkey          pic | 6·6635 | 4·7031 | 9·2824 | 3·8320 | 4·6372 |
| Ulm             foot | 1·2037 | 0·8496 | 1·6768 | 0·6922 | 0·8377 |
| Utrecht         foot | 1·0701 | 0·7553 | 1·4907 | 0·6154 | 0·7447 |
| Venice          foot | 1·7390 | 1·2274 | 2·4225 | 1·0000 | 1·2102 |
| Verona          foot | 1·6669 | 1·1765 | 2·3220 | 0·9586 | 1·1600 |
| Vicenza         foot | 1·7241 | 1·2169 | 2·4017 | 0·9915 | 1·1998 |
| Vienna          foot | 1·4369 | 1·0142 | 2·0017 | 0·8263 | 1·0000 |
| Warsaw          foot | 1·2755 | 0·9002 | 1·7768 | 0·7335 | 0·8876 |
| ——   Cracow foot | 1·8267 | 1·2893 | 2·5446 | 1·0505 | 1·2712 |
| Wismar          foot | 1·2441 | 0·8781 | 1·7331 | 0·7155 | 0·8658 |
| Würtemberg   foot | 1·1762 | 0·8302 | 1·6385 | 0·6764 | 0·8185 |
| Zell             foot | 1·2164 | 0·8585 | 1·6945 | 0·6995 | 0·8465 |
| Ziriczee        foot | 1·3831 | 0·9762 | 1·9267 | 0·7954 | 0·9625 |
| Zurich          foot | 1·2941 | 0·9134 | 1·8027 | 0·7442 | 0·9006 |

# TABLE III.

| Distance. | | English | |
|---|---|---|---|
| | | Yards. | Miles. |
| Arabia | mile, 6000 Arabian feet . . | 2146 | 1·2193 |
| ,, | baryd, of 4 farsakh . . . . | 21120 | 12·0000 |
| Austria | mile, post, 24,000 Vienna feet | 8297 | 4·7142 |
| ,, | ,, marine, 60 to the degree | 2025 | 1·1508 |
| Baden | ,, . . . . . . . . . | 9721 | 5·5234 |
| ,, | ,, post, 14,815 Baden feet | 4860 | 2·7617 |
| Bavaria | ,, 25,046 Bavarian feet . | 8059 | 4·5792 |
| ,, | ,, of Anspach . . . . | 9443 | 5·3652 |
| Belgium | ,, old measure . . . . | 2132 | 1·2111 |
| ,, | ,, marine, 60 to the degree | 2025 | 1·1508 |
| ,, | ,, metrical (kilomètre) . | 1094 | 0·6214 |
| ,, | league, 20 to the degree . . | 6076 | 3·4522 |
| Berne, Switzerland, league, 18,000 Berne feet | | 5770 | 3·2784 |
| Birmah | dain or league, 1000 dhas . . | 4278 | 2·4306 |
| Bohemia | league, 16 to the degree . . | 7595 | 4·3154 |
| ,, | ,, 12 ,, ,, . . | 10126 | 5·7534 |
| Brabant | ,, 20 ,, ,, . . | 6076 | 3·4522 |
| Brazil | ,, 18 ,, ,, . . | 6751 | 3·8360 |
| Bremen | mile, 20,000 Rhenish feet . | 6865 | 3·9006 |
| Brunswick | ,, 34,424 ,, ,, . . | 11816 | 6·7140 |
| China | li, or mile . . . . . . | 609 | 0·3458 |
| Dantzic | mile, 27,000 Dantzic feet . | 8467 | 4·8110 |
| Denmark | ,, 12,000 alns . . . . . | 8238 | 4·6807 |
| ,, | league, 14½ to the degree . . | 8381 | 4·7618 |
| East Indies : | Bengal coss or mile, 1000 fathoms | 2000 | 1·1364 |
| England | mile, statute . . . . . . | 1760 | 1·0000 |
| ,, | ,, geographical, 60 to the degree | 2025 | 1·1508 |
| ,, | league ,, 20 ,, ,, | 6076 | 3·4523 |
| Flanders | ,, 20,000 Rhein-fuss . . | 6865 | 3·9006 |
| France | mile, old measure . . . . | 2132 | 1·2111 |
| ,, | ,, marine, 60 to the degree | 2025 | 1·1508 |
| ,, | ,, metrical (kilomètre) . | 1094 | 0·6214 |
| ,, | league, post, 2000 ancient toises | 4263 | 2·4222 |
| ,, | post (2 post leagues) . . . | 8527 | 4·8445 |

| Distance. | | English Yards. | Miles. |
|---|---|---|---|
| France | league, common, 25 to the degree | 4861 | 2·7617 |
| „ | „ marine, 20 „ „ | 6076 | 3·4521 |
| „ | „ mean, 2450 toises | 5223 | 2·9674 |
| Genoa | post, of 4000 French toises . | 8527 | 4·8445 |
| Germany | mile, geographical, 15 to the degree | 8101 | 4·6030 |
| „ | post (2 German miles) . . . | 16203 | 9·2060 |
| „ | mile long, 12 to the degree . . | 10126 | 5·7534 |
| „ | „ short . . . . . . | 6859 | 3·8972 |
| Greece | „ 5000 Greek feet. . . . | 1640 | 0·9320 |
| Hamburg | „ 24,000 Rhenish feet . . | 8238 | 4·6807 |
| Hanover | „ old measure, 18,192 elles . | 11572 | 6·5750 |
| „ | „ (since 1818) 11,700 „ . | 7442 | 4·2287 |
| „ | „ of 25,400 Calenberg feet . | 8114 | 4·6102 |
| Hebrew ancient | Eastern mile of 4000 cubits | 2432 | 1·3820 |
| Holland | mile, old measure, 19 to the degree | 6396 | 3·6340 |
| „ | „ marine, 20 „ „ | 6076 | 3·4521 |
| „ | „ legal (Netherlandic) . . | 1094 | 0·6214 |
| Holstein | „ 12,000 alns . . . . . | 8238 | 4·6807 |
| Hungary | „ league, 13½ to the degree | 9002 | 5·1145 |
| India | Bengal coss or mile, 1000 fathoms | 2000 | 1·1364 |
| „ | league . . . . . 30 to the degree | 4051 | 2·3015 |
| „ | Carnatic league, 35 „ „ | 3472 | 1·9727 |
| Ireland | old mile, 320 poles of 7 yards | 2240 | 1·2727 |
| Italy | mile, 60 to the degree . . . | 2025 | 1·1508 |
| „ | post, of 8 Italian miles . . | 16203 | 9·2062 |
| Lithuania | league, 12·44 to the degree . | 9769 | 5·5503 |
| Livonia | „ 17 to the degree . . | 7148 | 4·0615 |
| Lombardo-Veneto, metrical mile (kilomètre) | | 1094 | 0·6214 |
| Lübeck | mile, marine . . . . . . | 2028 | 1·1520 |
| Mecklenburg | „ . . . . . . . | 8238 | 4·6807 |
| „ | league, 12 to the degree . . | 10126 | 5·7534 |
| Naples | mile, of 7000 palmi . . . . | 2018 | 1·1468 |
| Netherlands | „ metrical (kilomètre) . . | 1094 | 0·6214 |
| Norway | „ . . . . . . . . | 12182 | 6·9216 |
| Oldenberg | „ 30,000 Oldenberg feet . | 9708 | 5·5160 |
| Persia | parasang, 20 to the degree . | 6076 | 3·4522 |
| Piedmont | post, of 4000 French toises . | 8527 | 4·8445 |
| Poland | league, long, 15 to the degree | 8101 | 4·6028 |
| „ | „ short, 20 „ „ | 6076 | 3·4521 |
| Portugal | mile . . 54 „ „ | 2250 | 1·2787 |

| Distance. | | English | |
|---|---|---|---|
| | | Yards. | Miles. |
| Portugal | mile, marine, 60 to the degree | 2025 | 1·1508 |
| „ | league (3 miles), 18 „ „ | 6751 | 3·8360 |
| „ | „ marine, 20 „ „ | 6076 | 3·4521 |
| Prussia | mile, of 24,000 Rhineland feet | 8238 | 4·6807 |
| „ | „ geographical, 15 to the degree | 8101 | 4·6028 |
| Rome | „ 74½ to the degree . . | 1630 | 0·9261 |
| „ | „ metrical (kilomètre) . . | 1094 | 0·6214 |
| „ | „ geographical, 60 to the degree | 2025 | 1·1508 |
| „ | ancient millārium, 1000 Roman-passus or paces, or 5000 ancient feet . . . . . | 1614 | 0·9170 |
| Russia | werst or verst, 500 sachines . | 1167 | 0·6629 |
| „ | Lithuania mile, 28,530 Rhein-fuss | 9793 | 5·5641 |
| Sardinia | mile, 4333⅓ piede liprando . | 2435 | 1·3834 |
| Saxony | post mile, 24,000 fuss . . . | 7432 | 4·2227 |
| „ | league, 12½ to the degree . . | 9853 | 5·5985 |
| Scotland | old mile, 1920 Scotch ells . . | 1977 | 1·1230 |
| Siam, Asia | roëneng, 2000 vouahs . . . | 4204 | 2·3886 |
| Silesia | mile . . . . . . . . | 7086 | 4·0260 |
| „ | league, 1125 Silesian ells, being 17 to the degree . . . | 7148 | 4·0615 |
| Spain | mile . . . . . . . . | 1522 | 0·8648 |
| „ | „ marine, 60 to the degree | 2025 | 1·1508 |
| „ | league, common, 8000 varas . | 7419 | 4·2152 |
| „ | „ legal, 5000 „ 26¼ to the degree | 4637 | 2·6345 |
| „ | „ marine, 20 „ „ | 6076 | 3·4523 |
| Suabia or Swabia: | mile, 12 „ „ | 10126 | 5·7534 |
| Sweden | mile, 6000 Swedish fathoms . | 11690 | 6·6423 |
| Switzerland | mile, 26,666⅔ fuss . . . . | 8548 | 4·8568 |
| „ | league, 13·3 to the degree . . | 9137 | 5·1915 |
| Tuscany | mile, 2833⅓ bracci . . . . | 1809 | 1·0277 |
| Turkey | berri, 66½ to the degree . . | 1827 | 1·0383 |
| United States of North America . . . . | | 1760 | 1·0000 |
| Weimar | mile . . . . . . . . | 7443 | 4·2292 |
| Westphalia | league, 10 to a degree . . . | 12152 | 6·9046 |
| Würtemberg | mile, 26,000 Stuttgard feet . | 8132 | 4·6206 |

## MEASURES OF TIME.

TIME, in the abstract, is truly measured by the space or distance described by a moving body or machine when the velocity of the same is sustained with perfect uniformity.

A SOLAR DAY is measured by the duration of a complete rotation of the earth round its axis with respect to the sun. The motion of the earth's rotation in space is uniform; but as it is here estimated with reference to the sun, it is affected by the movement of the earth in its orbit round the sun, the velocity of which is subject to a gradual acceleration and retardation, both on account of the ellipticity of the orbit and of the perturbations produced by the planets. To obviate this fluctuation, clocks are adjusted to an average or mean solar day, which is subdivided as follows :—

> 60 seconds  make 1 minute
> 60 minutes   „   1 hour
> 24 hours     „   1 day.

In astronomical reckoning the day is supposed to commence at noon, and is counted throughout the twenty-four hours.

In civil reckoning the day commences at midnight, and is divided into two equal portions of twelve hours each, called morning and evening.

A WEEK is a period of seven days, and has been in use amongst eastern countries to the remotest periods of antiquity. The English names of these days are Sunday, Monday, Tuesday, Wednesday, Thursday, Friday, and Saturday.

A SOLAR YEAR, also called a tropical or civil year, is determined by a revolution of the earth in its orbit round the sun, estimated with respect to the sun and the equinox. In ordinary phraseology it is the time in which the sun moves from the vernal equinox to the vernal equinox again,

and its average value, called a MEAN SOLAR YEAR, has been found by astronomers to be 365·24222 mean solar days, or 365 days 5 hours 48 min. 48 sec.

A CALENDAR MONTH is an interval varying from 28 to 31 days, and was probably first derived from the synodic revolution of the moon, or lunar month according to the periodical phases, the mean value of which period has been found to be 29·5305887 days, or 29 days 12 hours 44 min. 2·8 sec. The year is divided into twelve calendar months, each of which consists of an integral number of days, viz. :—

| | | |
|---|---|---|
| January | 31 | days |
| February | 28 | „ |
| March | 31 | „ |
| April | 30 | „ |
| May | 31 | „ |
| June | 30 | „ |
| July | 31 | „ |
| August | 31 | „ |
| September | 30 | „ |
| October | 31 | „ |
| November | 30 | „ |
| December | 31 | „ |

365 days.

A BISSEXTILE YEAR, frequently called *leap-year*, consists of 366 days, an additional day being intercalated in the month of February, which is then made 29 days. This is occasionally required for the purpose of adjusting the calendar, so that the course of the seasons and the labours of agriculture, which depend on the situation of the sun, shall be correctly indicated. Before the time of Julius Cæsar, the Roman calendar was in great confusion, and, guided by Sosigenes, his astronomer, he adjusted it by making every fourth civil year into a bissextile of 366 days. The correction so made is called the *Julian correction*, and the

length of a mean Julian year, or year of the Julian Calendar, is hence 365¼ or 365·25 days.

In the Ecclesiastical Calendar the intercalary day is placed between the 24th and 25th of February; in the Civil Calendar it is accounted the 29th.

## THE GREGORIAN CALENDAR.

Independently of the gradual and progressive improvement in astronomical knowledge and astronomical data, the length of the mean Julian year was practically ascertained to be in excess of the actual mean solar or tropical year, which contains only 365·24222 days; and it was found that the vernal equinox, which, at the Council of Nice, in the year 325, was supposed to correspond to the 21st of March [1], after the lapse of about 1200 years, had retrograded to the 11th. To get rid of the accumulated error, and so restore the equinox to its supposed former place, Pope Gregory XIII., in 1582, directed ten days to be suppressed in the calendar, by calling the 5th of October the 15th for that year; and as the error of the Julian intercalation, according to the calculations of Aloysius Lilius, a celebrated astronomer and physician of Naples, was found to amount to about three days in 400 years, it was ordered that the intercalations on centenary years should thenceforward be omitted, excepting those which are multiples of 400. This important adjustment is usually called the *reformation of the calendar*, and it has since been adopted in almost all Christian countries, under the name of the *Gregorian Calendar*, or *New Style*, the Julian Calendar formerly in use being called the *Old Style*.

For the sake of distinctness we shall here state the Gregorian rule of intercalation.

1. For years that are not even centuries:

If the year, when divided by 4, leaves a remainder, such

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[1] There is some slight inaccuracy in this; but it is of no consequence.

year is ordinary; if there be no remainder, the year is bis-
sextile.

2. For years that are even centuries:

If the number of centuries, when divided by 4, leaves a
remainder, the year is ordinary; if there be no remainder, it
is bissextile.

Thus, 1857, 1858, 1859, 1861 are ordinary;
       1856, 1860, 1864, 1868 are bissextile.

Also, 1900, 2100, 2200, 2300 are ordinary;
      2000, 2400, 2800, 3200 are bissextile.

Hence every period of 400 years consists of
      97 bissextile years or 35502 days,
    303 ordinary    ,,    110595  ,,
                       ——————
                      146097 days;

and therefore, taking the 400th part of this number, an
average or mean Gregorian year is 365·24250 days.

Now the actual value of the mean solar or tropical year
is 365·24222 days, so that the Gregorian rule causes the
year to be only 0·00028 day in excess, which will amount
to a day in about 3600 years[2]. This small error might be
corrected by carrying the rule one step further and changing
multiples of 4000 into ordinary years instead of bissex-
tiles.

The Gregorian Calendar was immediately adopted in Den-
mark, France, Holland, Italy, Portugal, and Spain, as well as
by Catholics in other countries. It was established in Ger-
many and Switzerland in 1700, and was not adopted in Great
Britain until the year 1752, no less than 170 years after its
first formation.

The Act of Parliament passed in 1751, and is entitled " An
Act for regulating the Commencement of the Year, and for
correcting the Calendar now in use." The preamble recites,

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[2] The Julian error (0·00778 day in excess) amounts to a day in 129
years.

that according to the legal supputation in England, the year began on the 25th of March; that this practice had produced various inconveniences, not only from its differing from the usage of neighbouring nations, but also from the legal computation in Scotland, and from the common usage throughout the whole kingdom; that the Julian Calendar then in use had been discovered to be erroneous, by means whereof the vernal or spring equinox, which at the time of the General Council of Nice, A.D. 325, happened on the 21st of March, now fell on the 9th or 10th of that month; that this error was still increasing; that a method of correcting the calendar had been received and established, and was generally practised by almost all other nations of Europe; and that it would be of general convenience to merchants and others corresponding with foreign nations if the like correction were received and established in his Majesty's dominions. It was therefore enacted,

1. That throughout all his Majesty's dominions in Europe, Asia, Africa, and America, the supputation according to which the year of our Lord began on the 25th of March shall not be used after the last day of December, 1751, and that the 1st day of January next following shall be reckoned as the 1st day of the year 1752, and so in all future years.

2. That from and after the 1st day of January, 1752, the several days of each month shall go on and be reckoned and numbered in the same order, and the feast of Easter and other moveable feasts thereon depending shall be ascertained according to the same method, as they now are, until the 2nd of September, 1752; that the natural day next immediately following the 2nd of September, 1752, shall be called and reckoned as the *fourteenth* day of September, omitting the eleven intermediate nominal days of the common calendar; that the days which follow next after the said 14th of September shall be reckoned in numerical order from that day; and all public and private proceedings whatsoever after the 1st of January, 1752, were ordered to be dated accordingly.

3. That the several years of our Lord 1800, 1900, 2100, 2200, 2300, or any other hundredth years of our Lord which shall happen in time to come (excepting only every fourth hundredth year of our Lord, whereof the year 2000 shall be the first), shall not be deemed Bissextile or Leap-years, but shall be considered as common years, consisting of 365 days only; and that the years of our Lord 2000, 2400, 2800, and every other fourth hundredth year of our Lord, from the year 2000 inclusive, and also all other years of our Lord, which by the present supputation are considered bissextile or leap-years, shall for the future be esteemed bissextile or leap-years, consisting of 366 days.

4. That whereas according to the rule then in use for calculating Easter-day, that feast was fixed to the first Sunday after the first full moon next after the 21st of March; and if the full moon happens on a Sunday, then Easter-day is the Sunday after, which rule had been adopted by the General Council of Nice, A.D. 325; but as the method of computing the full moons then used in the Church of England, and according to which the table to find Easter prefixed to the Book of Common Prayer was formed, had become considerably erroneous, it was enacted that the said method should be discontinued, and that from and after the 2nd of September, 1752, Easter-day, and the other moveable and other feasts, were henceforward to be reckoned according to the Calendar, Tables, and Rules annexed to the Act, and attached to the Books of Common Prayer.

DIFFERENCE OF STYLE.—From 1582 to 1700 the difference of style continued to be 10 days; but 1700 being bissextile in the Julian Calendar and ordinary in the Gregorian, the difference of the styles from 1700 to 1800 was 11 days. The Julian leap-year 1800 was also ordinary in the Gregorian Calendar, and therefore the difference during the present century is 12 days. After 1900 it will be 13 days, and will so continue till 2100, because the year 2000 will be a leap-

year in both styles. Thus if $c$ denote the number of completed centuries, the number of days' difference between the old and new styles, which has accumulated since the second century, will be correctly represented by the formula,

$$c - \left(\frac{c}{4}\right)_w - 2,$$

where $w$ denotes the integral quotient of $\frac{c}{4}$, rejecting any fraction or remainder.

Hence the following table, the extension of which is evident without calculation :—

| Date. | Difference. | Date. | Difference. |
|-------|-------------|-------|-------------|
| 1500 to 1700 | 10 days | 2900 to 3000 | 20 days |
| 1700 „ 1800 | 11 „ | 3000 „ 3100 | 21 „ |
| 1800 „ 1900 | 12 „ | 3100 „ 3300 | 22 „ |
| 1900 „ 2100 | 13 „ | 3300 „ 3400 | 23 „ |
| 2100 „ 2200 | 14 „ | 3400 „ 3500 | 24 „ |
| 2200 „ 2300 | 15 „ | 3500 „ 3700 | 25 „ |
| 2300 „ 2500 | 16 „ | 3700 „ 3800 | 26 „ |
| 2500 „ 2600 | 17 „ | 3800 „ 3900 | 27 „ |
| 2600 „ 2700 | 18 „ | 3900 „ 4100 | 28 „ |
| 2700 „ 2900 | 19 „ | &c. | &c. |

The difference requires to be added to the day of the month according to the old style to deduce the same day in the new style, and *vice versâ*. Thus 1872, June 10, old style, is the same day as 1872, June 22, new style.

DOMINICAL LETTER.—The dominical or Sunday letter is one of the first seven letters of the alphabet, and is used for the purpose of determining the day of the week corresponding to any given date. In the Ecclesiastical Calendar the first letter A is placed opposite to the first day of the year or January 1, the second letter B is placed opposite the second day or January 2, and so on through the seven letters ; after which they are in like manner repeated over and over again

to the end of the year. Then the letter which falls opposite the first Sunday in the year will also fall opposite every following Sunday throughout the year, because the number of letters is the same as the number of days in the week. In ordinary years the letter so indicated is the dominical letter. But in bissextile or leap-years an interruption takes place in the order of the letters on account of the intercalary day, and it is made as a matter of convenience in chronological tabulations. As the intercalary day falls on the 24th of February, the 24th and 25th days are denoted by the same letter, so that after the 24th day of February the dominical letter goes back one place. In the Civil Calendar, however, according to which calculations are generally made, the intercalary day is supposed to be added at the end of February, so that the change of letter takes place on entering March.

As an ordinary year contains 365 days or 52 weeks and 1 day over, and a bissextile year contains 52 weeks and 2 days over, it is evident from the foregoing account that for a series of consecutive years the dominical letters stand in a retrograde order, and go back one letter after every ordinary year and two letters after a bissextile year, the first change in the latter case occurring at the intercalary day, and the second at the end of the year. Thus a bissextile or leap-year has always two dominical letters, one to be used before and the other after the intercalary day.

For any proposed year $Y$ of the Gregorian Calendar, at any near or remote period of time, let $c$ denote the number of completed centuries and $y$ the year of the current century, so that $Y = 100\,c + y$; then the number of bissextile years, from the year 1 of the calendar up to the year $Y$ inclusive, will be $\left(\dfrac{Y}{4}\right)_w - c + \left(\dfrac{c}{4}\right)_w$, and the dominical letter may always be found from the simple and general formula,

$$L = 2\left(\frac{c}{4}\right)_r + 2\left(\frac{y}{4}\right)_r + 4\left(\frac{y}{7}\right)_r + 1 \text{ (rejecting sevens)};$$

where the small letter *r* is placed to indicate that it is the *remainder* of each division that enters into the calculation. The resulting number *L* may be called the *dominical number*, as it will indicate the numerical order of the required letter.

Thus if *L* be     1 | 2 | 3 | 4 | 5 | 6 | 7 |
The letter will be  A | B | C | D | E | F | G |

If the proposed year be bissextile, the letter so calculated will be the second letter of the year, or that which applies after the intercalary day in February.

The preceding formula may be put down in the following rule :—

*Rule.*—Divide the number of centuries by 4; the years of the current century by 4, and the same by 7 : put down the three remainders ; multiply them respectively by 2, 2, 4; add together the three products with an additional unit, and the sum after rejecting sevens, if necessary, will be the dominical number, or the ordinal number in which the dominical letter stands in the alphabet.

*Example.*—Required the dominical letter for the year 1942. The centuries are here 19, and the years of the current century 42; the three remainders are therefore 3, 2, 0; the three products are 6, 4, 0; which added together with an additional unit give 11; therefore rejecting 7, the ordinal number of the required letter is 4; it is therefore D, the fourth letter of the alphabet.

The dominical letter or letters of any proposed year may be obtained, by inspection, from the following table, to which an auxiliary table is added, showing the means by which the dominical letter is made to indicate the day of the week answering to any given date.

## PERPETUAL TABLE OF DOMINICAL LETTERS.

| Year of the Current Century ($y$). | | | Completed Centuries ($c$). | | | |
|---|---|---|---|---|---|---|
| | | | $\left(\dfrac{c}{4}\right)r = 1$ 1700 2100 &c. | $\left(\dfrac{c}{4}\right)r = 2$ 1800 2200 &c. | $\left(\dfrac{c}{4}\right)r = 3$ 1900 2300 &c. | $\left(\dfrac{c}{4}\right)r = 0$ 2000 2400 &c. |
| 0 | | | C | E | G | BA |
| 1 | 29 | 57 | 85 | B | D | F | G |
| 2 | 30 | 58 | 86 | A | C | E | F |
| 3 | 31 | 59 | 87 | G | B | D | E |
| 4 | 32 | 60 | 88 | FE | AG | CB | DC |
| 5 | 33 | 61 | 89 | D | F | A | B |
| 6 | 34 | 62 | 90 | C | E | G | A |
| 7 | 35 | 63 | 91 | B | D | F | G |
| 8 | 36 | 64 | 92 | AG | CB | ED | FE |
| 9 | 37 | 65 | 93 | F | A | C | D |
| 10 | 38 | 66 | 94 | E | G | B | C |
| 11 | 39 | 67 | 95 | D | F | A | B |
| 12 | 40 | 68 | 96 | CB | ED | GF | AG |
| 13 | 41 | 69 | 97 | A | C | E | F |
| 14 | 42 | 70 | 98 | G | B | D | E |
| 15 | 43 | 71 | 99 | F | A | C | D |
| 16 | 44 | 72 | | ED | GF | BA | CB |
| 17 | 45 | 73 | | C | E | G | A |
| 18 | 46 | 74 | | B | D | F | G |
| 19 | 47 | 75 | | A | C | E | F |
| 20 | 48 | 76 | | GF | BA | DC | ED |
| 21 | 49 | 77 | | E | G | B | C |
| 22 | 50 | 78 | | D | F | A | B |
| 23 | 51 | 79 | | C | E | G | A |
| 24 | 52 | 80 | | BA | DC | FE | GF |
| 25 | 53 | 81 | | G | B | D | E |
| 26 | 54 | 82 | | F | A | C | D |
| 27 | 55 | 83 | | E | G | B | C |
| 28 | 56 | 84 | | DC | FE | AG | BA |

## TABLE SHOWING THE DAY OF THE WEEK.

| Month. | Dominical Letter. | | | | | | |
|---|---|---|---|---|---|---|---|
| | A | B | C | D | E | F | G |
| Jan.    Oct. | A | B | C | D | E | F | G |
| Feb. Mar. Nov. | D | E | F | G | A | B | C |
| Apr. July | G | A | B | C | D | E | F |
| May | B | C | D | E | F | G | A |
| June | E | F | G | A | B | C | D |
| August | C | D | E | F | G | A | B |
| Sept. Dec. | F | G | A | B | C | D | E |
| 1   8 15 22 29 | Sun. | Sat. | Frid. | Thur. | Wed. | Tues. | Mon. |
| 2   9 16 23 30 | Mon. | Sun. | Sat. | Frid. | Thur. | Wed. | Tues. |
| 3 10 17 24 31 | Tues. | Mon. | Sun. | Sat. | Frid. | Thur. | Wed. |
| 4 11 18 25 | Wed. | Tues. | Mon. | Sun. | Sat. | Frid. | Thur. |
| 5 12 19 26 | Thur. | Wed. | Tues. | Mon. | Sun. | Sat. | Frid. |
| 6 13 20 27 | Frid. | Thur. | Wed. | Tues. | Mon. | Sun. | Sat. |
| 7 14 21 28 | Sat. | Frid. | Thur. | Wed. | Tues. | Mon. | Sun. |

CYCLE OF THE SUN.—As the number of dominical letters, or days in the week, is seven, and as every fourth year is bissextile or leap-year, the same order of dominical letters for a specified year of the Julian Calendar only returns after 4 times 7, or 28 years, which is the period of the solar cycle. The cycle is considered as having commenced nine years before the era, so that the number or year of the cycle corresponding to any year $Y$ of the Julian Calendar, is determined by the formula,

$$s = \left( \frac{Y + 9}{28} \right)_r,$$

which may be stated in the following rule :—

*Rule.*—Add 9 to the given year; divide the sum by 28 ;

H 2

the quotient is the number of cycles elapsed, and the remainder is the number or year of the cycle: if there be no remainder, the number is 28, the last of the current cycle.

If preferred, the calculation may be modified thus:—

*Second Rule.*—Having, as before, added 9 to the year, divide by 4, and the integral quotient again by 7; then the first remainder added to 4 times the second remainder will give the number of the solar cycle. If there be no remainder to either division, the required number is 28.

*Example.*—Required the number of the solar cycle for the year 1942.

The year, augmented by 9, is 1951.

1951, divided by 4, gives 487, with first   remainder 3;

  487    „      7   „   69   „ second    „    4;

and adding 3 to 4 times 4, the number of the solar cycle is 19.

The cycle of the sun, or more properly the *Sunday cycle*, was invented for the purpose of determining the dominical letter or letters for any given year of the Julian Calendar, by means of a short and convenient table exhibiting the same for each of the 28 years of one cycle.

But according to the Gregorian Calendar now in general use in every Christian country, with the exception of Russia, the order of the letters is necessarily interrupted by the first suppression of a centenary leap-year, and the table of dominical letters must therefore, after every such year, be reconstructed for the next following century. We have however found, page 140, that the complete intercalary period of 400 Gregorian years consists of 146,097 days. As this number is divisible by 7 without a remainder, and therefore comprises exactly 20,871 weeks, it follows that the same order of dominical letters and days of the week will recur after this period of 400 years, which is therefore

the complete Sunday cycle of the Gregorian Calendar. The purport of these remarks may perhaps receive further elucidation from an examination of the perpetual table of dominical letters already given, which extends through a complete cycle of 400 years, and will therefore in future calculations supersede the use of the solar cycle.

GOLDEN NUMBER. — The cycle of the moon or lunar cycle, sometimes called the Metonic cycle, after the name of its original inventor, Meton, is a period of *nineteen* years, after which the new moons fall on the same days of the Julian year, within an hour and a half. The number which any given year occupies in the current cycle was called the *golden number*, from the circumstance of its being usually marked in letters of gold in ancient calendars, and it was used for the purpose of determining the days of new moon, and of thereby fixing the date of Easter-day, on which the other moveable feasts of the ecclesiastical calendar are made to depend. The year of the birth of our Saviour is reckoned the first of the lunar cycle, and therefore the golden number for any year $Y$ is determined by the formula,

$$g = \left( \frac{Y+1}{19} \right)_r$$

which may be expressed by the following rule :—

*Rule.*—Add 1 to the year; divide the sum by 19; the quotient is the number of completed cycles, and the remainder is the golden number. If 0 remains, the number is 19, the year being in that case the 19th or last of the cycle.

By this rule the following table has been calculated, and the golden number for any proposed year can be taken from it by inspection.

## PERPETUAL TABLE OF

|  |  |  |  |  |  | Centuries. | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Year of the Century. | | | | | | 0 | 100 | 200 | 300 | 400 | 500 | 600 | 700 | 800 |
|  | | | | | | 1900 | 2000 | 2100 | 2200 | 2300 | 2400 | 2500 | 2600 | 2700 |
|  | | | | | | 3800 | 3900 | 4000 | 4100 | 4200 | 4300 | 4400 | 4500 | 4600 |
|  | | | | | | 5700 | 5800 | 5900 | 6000 | 6100 | 6200 | 6300 | 6400 | 6500 |
|  | | | | | | 7600 | 7700 | 7800 | 7900 | 8000 | 8100 | 8200 | 8300 | 8400 |
|  | | | | | | Golden Number ($g$). | | | | | | | | |
| 0 | 19 | 38 | 57 | 76 | 95 | 1 | 6 | 11 | 16 | 2 | 7 | 12 | 17 | 3 |
| 1 | 20 | 39 | 58 | 77 | 96 | 2 | 7 | 12 | 17 | 3 | 8 | 13 | 18 | 4 |
| 2 | 21 | 40 | 59 | 78 | 97 | 3 | 8 | 13 | 18 | 4 | 9 | 14 | 19 | 5 |
| 3 | 22 | 41 | 60 | 79 | 98 | 4 | 9 | 14 | 19 | 5 | 10 | 15 | 1 | 6 |
| 4 | 23 | 42 | 61 | 80 | 99 | 5 | 10 | 15 | 1 | 6 | 11 | 16 | 2 | 7 |
| 5 | 24 | 43 | 62 | 81 |  | 6 | 11 | 16 | 2 | 7 | 12 | 17 | 3 | 8 |
| 6 | 25 | 44 | 63 | 82 |  | 7 | 12 | 17 | 3 | 8 | 13 | 18 | 4 | 9 |
| 7 | 26 | 45 | 64 | 83 |  | 8 | 13 | 18 | 4 | 9 | 14 | 19 | 5 | 10 |
| 8 | 27 | 46 | 65 | 84 |  | 9 | 14 | 19 | 5 | 10 | 15 | 1 | 6 | 11 |
| 9 | 28 | 47 | 66 | 85 |  | 10 | 15 | 1 | 6 | 11 | 16 | 2 | 7 | 12 |
| 10 | 29 | 48 | 67 | 86 |  | 11 | 16 | 2 | 7 | 12 | 17 | 3 | 8 | 13 |
| 11 | 30 | 49 | 68 | 87 |  | 12 | 17 | 3 | 8 | 13 | 18 | 4 | 9 | 14 |
| 12 | 31 | 50 | 69 | 88 |  | 13 | 18 | 4 | 9 | 14 | 19 | 5 | 10 | 15 |
| 13 | 32 | 51 | 70 | 89 |  | 14 | 19 | 5 | 10 | 15 | 1 | 6 | 11 | 16 |
| 14 | 33 | 52 | 71 | 90 |  | 15 | 1 | 6 | 11 | 16 | 2 | 7 | 12 | 17 |
| 15 | 34 | 53 | 72 | 91 |  | 16 | 2 | 7 | 12 | 17 | 3 | 8 | 13 | 18 |
| 16 | 35 | 54 | 73 | 92 |  | 17 | 3 | 8 | 13 | 18 | 4 | 9 | 14 | 19 |
| 17 | 36 | 55 | 74 | 93 |  | 18 | 4 | 9 | 14 | 19 | 5 | 10 | 15 | 1 |
| 18 | 37 | 56 | 75 | 94 |  | 19 | 5 | 10 | 15 | 1 | 6 | 11 | 16 | 2 |

As the lunar months in the construction of the calendar must necessarily be estimated in integral days, and as the mean value of the lunar synodical month is over 29½ days, it is evident that the calendar lunations must consist mainly of 30 and 29 days alternately, but that on the whole there should be rather more of the former than the latter. Now 19 ordinary years of 365 days make 6935 days; these are distributed into 235 calendar lunations in the following manner.

The lunations are made to consist of 30 and 29 days alternately, so that each lunar year of 12 lunations thus

## GOLDEN NUMBERS.

| Year of the Century. | | | | | | Centuries. | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | 900 2800 4700 6600 8500 | 1000 2900 4800 6700 8600 | 1100 3000 4900 6800 8700 | 1200 3100 5000 6900 8890 | 1300 3200 5100 7000 8900 | 1400 3300 5200 7100 9000 | 1500 3400 5300 7200 9100 | 1600 3500 5400 7300 9200 | 1700 3600 5500 7400 &c. | 1800 3700 5600 7500 &c. |
| | | | | | | Golden Number (*g*). | | | | | | | | | |
| 0 | 19 | 38 | 57 | 76 | 95 | 8 | 13 | 18 | 4 | 9 | 14 | 19 | 5 | 10 | 15 |
| 1 | 20 | 39 | 58 | 77 | 96 | 9 | 14 | 19 | 5 | 10 | 15 | 1 | 6 | 11 | 16 |
| 2 | 21 | 40 | 59 | 78 | 97 | 10 | 15 | 1 | 6 | 11 | 16 | 2 | 7 | 12 | 17 |
| 3 | 22 | 41 | 60 | 79 | 98 | 11 | 16 | 2 | 7 | 12 | 17 | 3 | 8 | 13 | 18 |
| 4 | 23 | 42 | 61 | 80 | 99 | 12 | 17 | 3 | 8 | 13 | 18 | 4 | 9 | 14 | 19 |
| 5 | 24 | 43 | 62 | 81 | | 13 | 18 | 4 | 9 | 14 | 19 | 5 | 10 | 15 | 1 |
| 6 | 25 | 44 | 63 | 82 | | 14 | 19 | 5 | 10 | 15 | 1 | 6 | 11 | 16 | 2 |
| 7 | 26 | 45 | 64 | 83 | | 15 | 1 | 6 | 11 | 16 | 2 | 7 | 12 | 17 | 3 |
| 8 | 27 | 46 | 65 | 84 | | 16 | 2 | 7 | 12 | 17 | 3 | 8 | 13 | 18 | 4 |
| 9 | 28 | 47 | 66 | 85 | | 17 | 3 | 8 | 13 | 18 | 4 | 9 | 14 | 19 | 5 |
| 10 | 29 | 48 | 67 | 86 | | 18 | 4 | 9 | 14 | 19 | 5 | 10 | 15 | 1 | 6 |
| 11 | 30 | 49 | 68 | 87 | | 19 | 5 | 10 | 15 | 1 | 6 | 11 | 16 | 2 | 7 |
| 12 | 31 | 50 | 69 | 88 | | 1 | 6 | 11 | 16 | 2 | 7 | 12 | 17 | 3 | 8 |
| 13 | 32 | 51 | 70 | 89 | | 2 | 7 | 12 | 17 | 3 | 8 | 13 | 18 | 4 | 9 |
| 14 | 33 | 52 | 71 | 90 | | 3 | 8 | 13 | 18 | 4 | 9 | 14 | 19 | 5 | 10 |
| 15 | 34 | 53 | 72 | 91 | | 4 | 9 | 14 | 19 | 5 | 10 | 15 | 1 | 6 | 11 |
| 16 | 35 | 54 | 73 | 92 | | 5 | 10 | 15 | 1 | 6 | 11 | 16 | 2 | 7 | 12 |
| 17 | 36 | 55 | 74 | 93 | | 6 | 11 | 16 | 2 | 7 | 12 | 17 | 3 | 8 | 13 |
| 18 | 37 | 56 | 75 | 94 | | 7 | 12 | 17 | 3 | 8 | 13 | 18 | 4 | 9 | 14 |

comprises 354 days, which is 11 days short of the ordinary calendar year of 365 days. To correct this accumulating deficiency, 6 embolismic months of 30 days each are introduced in the course of the cycle of 19 years, and one of 29 days is added at the termination of the cycle. In this way the 235 lunations become divided thus:

| | | | | |
|---|---|---|---|---|
| 120 calendar lunations of | | | 30 days = 3600 days | |
| 115 | ,, | ,, | 29 ,, = 3335 ,, | |
| 235 | ,, | ,, | 30 and 29 ,, = 6935 days. | |

Furthermore, in every bissextile year the intercalary day is also added to the days of the lunation in which it happens to be included, making the same 30 instead of 29 days, so that the 235 lunations thus distributed will then accurately measure 19 Julian years. Thus, as the intercalary day of the Julian Calendar occurs uniformly once in every four years without interruption, the average number of such days, distributed in periods of 19 years, will be $4\frac{3}{4}$ days, which, added to the 6935 days, give $6939\frac{3}{4}$ days for the mean value of the entire cycle so formed, and this is exactly equal to 19 mean Julian years of $365\frac{1}{4}$ days.

There are two objections, in point of accuracy, to the permanency of this lunar-solar period. In the first place, the Julian year, employed as the basis of calculation, does not correctly represent either the mean solar or the Gregorian year; as compared with the latter, the accumulated error after any stated epoch will be represented by the augmentation of the requisite correction for reducing the old to the new style. In the second place, the period of $6939\frac{3}{4}$ days is nearly an hour and a half in excess of 235 mean astronomical lunations, and therefore the correct time of new moon will in successive cycles happen so much earlier, and will retrograde a day in every 308 years. For the purpose of correcting and adjusting the errors whenever they amount to one day, by an established system of calculation, Lilius introduced another set of numbers called Epacts.

EPACT.—The epact for any year is a number designed to represent the age of the moon on the first day, that is, on the 1st day of January, of that year.

Suppose, for the first year of a lunar cycle, a new moon to happen on the 1st day of January; then the age on the day of new moon being 0, the epact for that year will be 0. Now the civil year containing 365 days, and the lunar year only 354 days, the new moon will at the end of the year have retrograded 11 days, and this will be the same if the civil

year be a bissextile of 366 days, because in that case the intercalary day is also included in the lunations, causing the lunar year to consist of 355 days. It therefore follows that the moon's age on the 1st of January of the second year of the cycle, or the epact of the second year, will be 11 days. Similarly the epact for the third year will be 22 days. Another addition of 11 would give 33 for the fourth year; but in consequence of the insertion of the embolismic month of 30 days, the epact for the fourth year is reduced to 3. In like manner the epacts of the following years are deduced by successively adding 11 and rejecting 30 whenever the sum exceeds that number, excepting at the termination of the cycle, where the last embolismic month being only 29 days, the same number is deducted, and we again have 0 for the epact of the first year of the next cycle. The order of the epacts throughout each cycle is therefore as follows:—

| Year of the Cycle, or Golden Number (g). | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 |
| * | 11 | 22 | 3 | 14 | 25 | 6 | 17 | 28 | 9 | 20 | 1 | 12 | 23 | 4 | 15 | 26 | 7 | 18 |
| Epact (e). | | | | | | | | | | | | | | | | | | |

This table will exhibit the epacts correctly from the year 1700 to the year 1900, the mathematical relations being,

$$g = \left(\frac{Y+1}{19}\right)_r, \qquad \varepsilon = \left(\frac{11(g-1)}{30}\right)_r.$$

But it has been explained under the article *Golden Number*, that in the course of centuries the astronomical new moon will deviate from the preceding deductions, from two causes, viz. the small error of the cycle of 235 calendar lunations as compared with 235 mean astronomical lunations, and the gradual shifting of dates on account of the difference between the Julian and Gregorian styles. We now proceed to in-

vestigate the principles on which these irregularities are calculated and adjusted.

To determine the error on account of the inaccurate measure of the lunations, we have

$$
\left.\begin{array}{l}
\text{19 mean Julian years,} \\
\quad \text{each } 365 \cdot 25 \text{ days}
\end{array}\right\} \quad \cdot \quad 6939 \cdot 75 \quad \text{ days}
$$

$$
\left.\begin{array}{l}
\text{235 astronomical lunations,} \\
\quad \text{each } 29 \cdot 5305887 \text{ days}
\end{array}\right\} \quad 6939 \cdot 68834 \quad \text{,,}
$$

$$
\overline{\hspace{3cm} 0 \cdot 06166 \text{ day.}}
$$

The excess of the established period of the lunar cycle of the Julian Calendar over the astronomical lunations is therefore 0·06166 day, or about 1 h. 28·8 min. Thus after every cycle of 19 years the times of new moon will happen 1 h. 28·8 min. earlier than in the preceding cycle, and therefore the age of the moon will become periodically *increased* by the same quantity, which will amount to a day in about 308 years. In the construction of the calendar it has been assumed to amount to 8 days in 25 centuries, and, when computed from the year 1700, to be determined by the formula,

$$
a = \left(\frac{c-17}{25}\right)_w, \quad \text{correction} = \left(\frac{c-a}{3}\right)_w - 5.
$$

Thus after a period of 25 centuries,

$c$ will be augmented by 25,

$a$ ,, ,, ,, 1,

$c - a$ ,, ,, ,, 24;

therefore the correction $\left(\dfrac{c-a}{3}\right)_w - 5$ will give exactly 8 days in every 25 centuries, and this reduces the lunar error to less than a day in 270,000 years.

To obtain the correction on account of difference of style, if $c$, as before, denote the number of completed centuries in the proposed year $Y$, we have ascertained that the number

of days' difference between the old and new styles will then have amounted to $c - \left(\dfrac{c}{4}\right)_w - 2$. When $c = 17$ it is 11 days for the year 1700; therefore, from 1700 to the given year $Y$, the divergence on account of style will be $c - \left(\dfrac{c}{4}\right)_w - 13$, and the age of the moon or epact for the year will thereby be *diminished* by the number of days represented by this last formula, which expresses, in fact, the number of centenary years passed over that are not made bissextile.

For the complete correction of the epact or moon's age, it will hence be requisite to add $\left(\dfrac{c - a}{3}\right)_w - 5$, and to subtract $c - \left(\dfrac{c}{4}\right)_w - 13$, or to apply the difference of these corrections, viz. $8 + \left(\dfrac{c}{4}\right)_w + \left(\dfrac{c - a}{3}\right)_w - c$. Thus in the new style or Gregorian Calendar, the general formulæ for determining the epact for any year $Y$ are

$$a = \left(\frac{c - 17}{25}\right)_w$$

$$e = \varepsilon + 8 + \left(\frac{c}{4}\right)_w + \left(\frac{c - a}{3}\right)_w - c$$

$$= \left(\frac{11\,(g - 1)}{30}\right)_r + 8 + \left(\frac{c}{4}\right)_w + \left(\frac{c - a}{3}\right)_w - c.$$

Should the calculation of this expression come out negative, an embolismic month of 30 days must be added to the result to make it positive.

*Example.*—Required the epact for the year 1942.

Here $Y = 1942$ and $c = 19$.

$Y + 1 = 1942 + 1 = 1943$, which on being divided by 19 leaves as remainder the golden number $g = 5$.

$11\,(g - 1) = 11 \times 4 = 44$, which divided by 30 leaves as remainder $\varepsilon = 14$.

$c - 17 = 2$, which divided by 25, the whole number of the quotient is $a = 0$: (this will always be 0 until the year 4200.)

Therefore the required epact $= \epsilon + 8 + \left(\dfrac{c}{4}\right)_w + \left(\dfrac{c-a}{3}\right)_w - c = 14 + 8 + 4 + 6 - 19 = 13$.

By first taking out the golden number from the table, page 150, the epact for any given year may be obtained by inspection from the following table, in the column under the completed centuries.

### TABLE OF EPACTS.

| Golden Number ($y$). | Last Completed Century ($c$). | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1500 1600 | 1700 1800 | 1900 2000 2100 | 2200 2400 | 2300 2500 | 2600 2700 2800 | 2900 3000 | 3100 3200 3300 | 3400 3600 | 3500 3700 | 3800 3900 4000 |
| 1 | 1 | * | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 |
| 2 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 |
| 3 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 |
| 4 | 4 | 3 | 2 | 1 | * | 29 | 28 | 27 | 26 | 25 | 24 |
| 5 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 |
| 6 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 |
| 7 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | * | 29 | 28 | 27 |
| 8 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 |
| 9 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 |
| 10 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | * |
| 11 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 |
| 12 | 2 | 1 | * | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 |
| 13 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 |
| 14 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 |
| 15 | 5 | 4 | 3 | 2 | 1 | * | 29 | 28 | 27 | 26 | 25 |
| 16 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 |
| 17 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 |
| 18 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | * | 29 | 28 |
| 19 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 |

NUMBER OF DIRECTION.—The number of direction is the number of days that Easter-day falls later than the 21st of March. Easter, as ordained by the Council of Nice, is the first Sunday after the first full moon which happens upon or

next after the 21st day of March; and if the full moon happens on a Sunday, then Easter-day is the Sunday after. This last condition was introduced to avoid the celebration of Easter at the same time as the Jewish Passover; notwithstanding which, this coincidence will sometimes happen, and will next occur in the year 1903. The moon on which Easter immediately depends is called the *paschal moon*, and the full moon is defined to be the 14th day of the moon, that is, 13 days after the preceding day of new moon.

Now the epact, $e$, is the age of the moon on January 1; and therefore January $(31 - e)$ is a day of new moon. And as the months January and February together comprise the same number of days as two alternate lunations of 29 and 30 days, it follows that March $(31 - e)$ must likewise be a day of new moon. Adding 13 days, the 14th day of this moon will fall on March $(44 - e)$, and this will be upon or later than the 21st day of March, and therefore be the paschal full moon, provided $e$ be less than 24. When $e$ is 24 or greater than 24 the next following moon will be the paschal moon, and the date so found will require to be increased by 29 or 30 days respectively as the period of the current lunation. The reason of this distinction is, that the epacts 24 and 25 are made to occupy the same day in the calendar whenever the lunation is required to pass from 29 to 30 days, which is the case in April. The number of days from March 21 to the day of the paschal full moon, which for uniformity we shall designate the *Paschal Direction* and denote by $P$, is therefore thus determined :—

$$\text{When } e < 24, \ P = 23 - e;$$
$$\text{,, } \quad e = 24, \ P = 28;$$
$$\text{,, } \quad e > 24, \ P = 53 - e.$$

Next, to find the Sunday following the paschal full moon, if $L$ denote the dominical number, $L + 4 + 7m$ days after March 21 will be a Sunday, and the number of days which intervene between the day of the paschal full moon and this

Sunday will be $L + 3 + 7m - P$. Therefore the number of days which intervene between the paschal full moon and the immediately following Sunday, or Easter, will be the least positive remainder of $L + 3 + 7m - P$ when divided by 7; and, denoting these intervening days by $p$,

$$\text{when } P = 23 - e, \ p = \left(\frac{L + e + 7m - 20}{7}\right)_r = \left(\frac{L + e + 1}{7}\right)_r$$

$$\text{,, } P = 28, \quad p = \left(\frac{L + 3}{7}\right)_r$$

$$\text{,, } P = 53 - e, \ p = \left(\frac{L + e + 7m - 50}{7}\right)_r = \left(\frac{L + e - 1}{7}\right)_r.$$

Hence if $N$ be the number of direction, $N = P + 1 + p$, and we obtain the following general formulæ for its computation :—

$$\text{When } e < 24, \ N = 24 - e + \left(\frac{L + e + 1}{7}\right)_r$$

$$\text{,, } \quad e = 24, \ N = 29 \quad + \left(\frac{L + 3}{7}\right)_r$$

$$\text{,, } \quad e > 24, \ N = 54 - e + \left(\frac{L + e - 1}{7}\right)_r.$$

*Example.*—Find by calculation the number of direction for the year 1942.

The dominical number, page 145, has been found to be $L = 4$; and, page 156, the epact to be $e = 13$.

Therefore, $e$ being less than 24,

$$N = 24 - e + \left(\frac{L + e + 1}{7}\right)_r$$

$$= 24 - 13 + \left(\frac{4 + 13 + 1}{7}\right)_r$$

$$= 11 + \left(\frac{18}{7}\right)_r = 11 + 4 = 15.$$

This calculation however may in all cases be dispensed with by entering the following table with the epact and dominical letter.

*Perpetual Table for finding the* NUMBER OF DIRECTION (*N*) *from the Epact and Dominical Letter.*

| Epact (*e*). | Dominical Letter. | | | | | | |
|---|---|---|---|---|---|---|---|
| | **A** | **B** | **C** | **D** | **E** | **F** | **G** |
| * | 26 | 27 | 28 | 29 | 30 | 24 | 25 |
| 1 | 26 | 27 | 28 | 29 | 23 | 24 | 25 |
| 2 | 26 | 27 | 28 | 22 | 23 | 24 | 25 |
| 3 | 26 | 27 | 21 | 22 | 23 | 24 | 25 |
| 4 | 26 | 20 | 21 | 22 | 23 | 24 | 25 |
| 5 | 19 | 20 | 21 | 22 | 23 | 24 | 25 |
| 6 | 19 | 20 | 21 | 22 | 23 | 24 | 18 |
| 7 | 19 | 20 | 21 | 22 | 23 | 17 | 18 |
| 8 | 19 | 20 | 21 | 22 | 16 | 17 | 18 |
| 9 | 19 | 20 | 21 | 15 | 16 | 17 | 18 |
| 10 | 19 | 20 | 14 | 15 | 16 | 17 | 18 |
| 11 | 19 | 13 | 14 | 15 | 16 | 17 | 18 |
| 12 | 12 | 13 | 14 | 15 | 16 | 17 | 18 |
| 13 | 12 | 13 | 14 | 15 | 16 | 17 | 11 |
| 14 | 12 | 13 | 14 | 15 | 16 | 10 | 11 |
| 15 | 12 | 13 | 14 | 15 | 9 | 10 | 11 |
| 16 | 12 | 13 | 14 | 8 | 9 | 10 | 11 |
| 17 | 12 | 13 | 7 | 8 | 9 | 10 | 11 |
| 18 | 12 | 6 | 7 | 8 | 9 | 10 | 11 |
| 19 | 5 | 6 | 7 | 8 | 9 | 10 | 11 |
| 20 | 5 | 6 | 7 | 8 | 9 | 10 | 4 |
| 21 | 5 | 6 | 7 | 8 | 9 | 3 | 4 |
| 22 | 5 | 6 | 7 | 8 | 2 | 3 | 4 |
| 23 | 5 | 6 | 7 | 1 | 2 | 3 | 4 |
| 24 | 33 | 34 | 35 | 29 | 30 | 31 | 32 |
| 25 | 33 | 34 | 35 | 29 | 30 | 31 | 32 |
| 26 | 33 | 34 | 28 | 29 | 30 | 31 | 32 |
| 27 | 33 | 27 | 28 | 29 | 30 | 31 | 32 |
| 28 | 26 | 27 | 28 | 29 | 30 | 31 | 32 |
| 29 | 26 | 27 | 28 | 29 | 30 | 31 | 25 |

EASTER-DAY.—The date of Easter-day is obtained by simply adding the number of direction to March 21. It is therefore March ($N + 21$), or April ($N - 10$); and by

employing the foregoing values of $N$ we deduce the following formulæ for its determination:—

$$\text{When } e < 24, \text{ Easter is } \begin{cases} \text{March } (45 - e) \\ \text{April } (14 - e) \end{cases} + \left(\frac{L + e + 1}{7}\right)_r$$

$$\text{,, } \quad e = 24, \quad \text{,,} \quad \text{,,} \quad \text{April } 19 \ + \left(\frac{L + 3}{7}\right)_r$$

$$\text{,, } \quad e > 24 \quad \text{,,} \quad \text{,,} \quad \text{April } (44 - e) + \left(\frac{L + e - 1}{7}\right)_r .$$

By entering the following table with the epact and the dominical letter the date of Easter-day may always be ascertained by inspection.

*Perpetual Table for determining* EASTER-DAY *from the Epact and Dominical Letter.*

| Epact (e). | A | B | C | D | E | F | G |
|---|---|---|---|---|---|---|---|
| • | Apr. 16 | Apr. 17 | Apr. 18 | Apr. 19 | Apr. 20 | Apr. 14 | Apr. 15 |
| 1 | ,, 16 | ,, 17 | ,, 18 | ,, 19 | ,, 13 | ,, 14 | ,, 15 |
| 2 | ,, 16 | ,, 17 | ,, 18 | ,, 12 | ,, 13 | ,, 14 | ,, 15 |
| 8 | ,, 16 | ,, 17 | ,, 11 | ,, 12 | ,, 13 | ,, 14 | ,, 15 |
| 4 | ,, 16 | ,, 10 | ,, 11 | ,, 12 | ,, 13 | ,, 14 | ,, 15 |
| 5 | ,, 9 | ,, 10 | ,, 11 | ,, 12 | ,, 13 | ,, 14 | ,, 15 |
| 6 | ,, 9 | ,, 10 | ,, 11 | ,, 12 | ,, 13 | ,, 14 | ,, 8 |
| 7 | ,, 9 | ,, 10 | ,, 11 | ,, 12 | ,, 13 | ,, 7 | ,, 8 |
| 8 | ,, 9 | ,, 10 | ,, 11 | ,, 12 | ,, 6 | ,, 7 | ,, 8 |
| 9 | ,, 9 | ,, 10 | ,, 11 | ,, 5 | ,, 6 | ,, 7 | ,, 8 |
| 10 | ,, 9 | ,, 10 | ,, 4 | ,, 5 | ,, 6 | ,, 7 | ,, 8 |
| 11 | ,, 9 | ,, 3 | ,, 4 | ,, 5 | ,, 6 | ,, 7 | ,, 8 |
| 12 | ,, 2 | ,, 3 | ,, 4 | ,, 5 | ,, 6 | ,, 7 | ,, 8 |
| 13 | ,, 2 | ,, 3 | ,, 4 | ,, 5 | ,, 6 | ,, 7 | ,, 1 |
| 14 | ,, 2 | ,, 3 | ,, 4 | ,, 5 | ,, 6 | Mar. 31 | ,, 1 |
| 15 | ,, 2 | ,, 3 | ,, 4 | ,, 5 | Mar. 30 | ,, 31 | ,, 1 |
| 16 | ,, 2 | ,, 3 | ,, 4 | Mar. 29 | ,, 30 | ,, 31 | ,, 1 |
| 17 | ,, 2 | ,, 3 | Mar. 28 | ,, 29 | ,, 30 | ,, 31 | ,, 1 |
| 18 | ,, 2 | Mar. 27 | ,, 28 | ,, 29 | ,, 30 | ,, 31 | ,, 1 |
| 19 | Mar. 26 | ,, 27 | ,, 28 | ,, 29 | ,, 30 | ,, 31 | ,, 1 |
| 20 | ,, 26 | ,, 27 | ,, 28 | ,, 29 | ,, 30 | ,, 31 | Mar. 25 |
| 21 | ,, 26 | ,, 27 | ,, 28 | ,, 29 | ,, 30 | ,, 24 | ,, 25 |
| 22 | ,, 26 | ,, 27 | ,, 28 | ,, 29 | ,, 23 | ,, 24 | ,, 25 |
| 23 | ,, 26 | ,, 27 | ,, 28 | ,, 22 | ,, 23 | ,, 24 | ,, 25 |
| 24 | Apr. 23 | Apr. 24 | Apr. 25 | Apr. 19 | Apr. 20 | Apr. 21 | Apr. 22 |
| 25 | ,, 23 | ,, 24 | ,, 25 | ,, 19 | ,, 20 | ,, 21 | ,, 22 |
| 26 | ,, 23 | ,, 24 | ,, 18 | ,, 19 | ,, 20 | ,, 21 | ,, 22 |
| 27 | ,, 23 | ,, 17 | ,, 18 | ,, 19 | ,, 20 | ,, 21 | ,, 22 |
| 28 | ,, 16 | ,, 17 | ,, 18 | ,, 19 | ,, 20 | ,, 21 | ,, 22 |
| 29 | ,, 16 | ,, 17 | ,, 18 | ,, 19 | ,, 20 | ,, 21 | ,, 15 |

INDICTION.—The Roman Indiction is a mode of measuring time by a cycle of 15 years, formerly used by the Romans for some time after the Emperor Constantine, but the precise time of its first adoption has not been ascertained with certainty beyond the fact that the year 313 of the Christian era was a first year of a cycle of indiction.

To find the indiction, we must therefore observe the following rule.

*Rule.*—Add 3 to the year; divide the sum by 15, and the remainder will be the Indiction. If there be no remainder, the Indiction is 15.

DIONYSIAN PERIOD.—The Dionysian is a period of 532 years, formed from the product of the lunar cycle 19, and the solar cycle 28, and invented by Dionysius Exiguus about the time of the Council of Nice, to include all the varieties of the new moons and dominical letters; so that after every 532 years they were expected to recur in the same order. This would have been very convenient for fixing the date of Easter and of the other days of the calendar by a table calculated for the years of one cycle; but as the measure of the lunar cycle was supposed to be exact, which is not the case, and as the Sunday cycle is now interrupted at the centenary years that are not bissextile, the Dionysian Period is no longer used in such calculations.

To find the year of the Dionysian Period.

*Rule.*—Add 457 to the year of Christ; divide the sum by 532, and the remainder will be the number required. Or for any year, from the present time up to the year 2203,

Year of the Dionysian = 129 + (Year − 1800).

When divided by 28 the remainder is the solar cycle; when divided by 19 the remainder is the lunar cycle or golden number.

JULIAN PERIOD.—The Julian Period is a large cycle of 7980 years, formed by multiplying together the lunar cycle of 19 years, the solar cycle of 28, and the indiction of 15, and its commencement goes back 4714 years beyond the Christian era.

To determine the number for any year.

*Rule.*—Add 4713 to the given year; divide the sum by 7980; the remainder will be the year of the Julian Period. Or for any year from the present time up to the year 3267,

Year of the Julian Period = 6513 + (Year − 1800).

If the year of the Julian Period be divided by 19, the remainder will be the *golden number;* if it be divided by 28, the remainder will be the *solar cycle;* and if it be divided by 15, the remainder will be the *indiction* for the corresponding year. Also, if it be divided by 532, the remainder will be the year of the Dionysian.

MOON'S AGE.—The age of the moon on any given date may be approximately deduced by adding to the epact the day of the month and the number below for the month, rejecting 30's if necessary.

| Jan. | Feb. | Mar. | Apr. | May | June | July | Aug. | Sept. | Oct. | Nov. | Dec. |
|------|------|------|------|-----|------|------|------|-------|------|------|------|
| 0    | 1    | 0    | 1    | 2   | 3    | 4    | 5    | 7     | 7    | 9    | 9    |

MOVEABLE FEASTS.—These are in general made to depend on the date of Easter-day. The following are some of the principal Sundays :—

Septuagesima Sunday is  9 ⎫
Shrove Sunday          „  7 ⎬ weeks before Easter.
1 Sunday in Lent       „  6 ⎪
Midlent Sunday         „  3 ⎭

Rogation Sunday   is  5 ⎫
Whit-Sunday       „   7 ⎬ weeks after Easter.
Trinity Sunday    „   8 ⎭

Advent Sunday is the nearest Sunday to November 30, whether before or after.

Also,

First day of Lent is 3 days after Shrove Sunday.
Good Friday    ,, 2  ,, before Easter.
Ascension-day   ,, 4  ,, after Rogation Sunday.

The number of days which *intervene* between Epiphany (January 6) and Septuagesima Sunday is $10 + N$ in ordinary years, and $11 + N$ in bissextile years, $N$ denoting the number of direction. Therefore, as the Epiphany Sundays are included in this interval,

$$\text{Sundays after Epiphany} = \left(\frac{10 + N}{7}\right)_w \text{ in ordinary years}$$

$$\text{,, \qquad ,, \qquad ,,} = \left(\frac{11 + N}{7}\right)_w \text{ ,, bissextile ,,}$$

Also the number of days *intervening* between Trinity Sunday and November 27, the earliest possible date of Advent Sunday, $= 194 - N$. Therefore,

$$\text{Sundays after Trinity} = \left(\frac{194 - N}{7}\right)_w$$

$$= 22 + \left(\frac{40 - N}{7}\right)_w.$$

To determine the elements of the Christian calendar, for any given year, it is only requisite to take out, by inspection,

the Dominical Letter    from the table, page 146
,,  Golden Number     ,,     ,,    ,,   150
,,  Epact             ,,     ,,    ,,   156
,,  Number of Direction ,,     ,,    ,,   159

When the number of direction has thus been ascertained, the moveable feasts and other articles of the calendar will be shown by the following tables.

*Table of the* EARLIER MOVEABLE FEASTS, *&c. for* ORDINARY
YEARS, *according to the Number of Direction.*

| Number of Direction (N). | Dominical Letter. | Sundays after Epiphany. | Septuagesima Sunday. | Shrove Sunday. | First Day of Lent. | 1 Sunday in Lent. |
|---|---|---|---|---|---|---|
| 1  | D | 1 | Jan. 18 | Feb. 1  | Feb. 4  | Feb. 8  |
| 2  | E | 1 | „ 19    | „ 2     | „ 5     | „ 9     |
| 3  | F | 1 | „ 20    | „ 3     | „ 6     | „ 10    |
| 4  | G | 2 | „ 21    | „ 4     | „ 7     | „ 11    |
| 5  | A | 2 | „ 22    | „ 5     | „ 8     | „ 12    |
| 6  | B | 2 | „ 23    | „ 6     | „ 9     | „ 13    |
| 7  | C | 2 | „ 24    | „ 7     | „ 10    | „ 14    |
| 8  | D | 2 | „ 25    | „ 8     | „ 11    | „ 15    |
| 9  | E | 2 | „ 26    | „ 9     | „ 12    | „ 16    |
| 10 | F | 2 | „ 27    | „ 10    | „ 13    | „ 17    |
| 11 | G | 3 | „ 28    | „ 11    | „ 14    | „ 18    |
| 12 | A | 3 | „ 29    | „ 12    | „ 15    | „ 19    |
| 13 | B | 3 | „ 30    | „ 13    | „ 16    | „ 20    |
| 14 | C | 3 | „ 31    | „ 14    | „ 17    | „ 21    |
| 15 | D | 3 | Feb. 1  | „ 15    | „ 18    | „ 22    |
| 16 | E | 3 | „ 2     | „ 16    | „ 19    | „ 23    |
| 17 | F | 3 | „ 3     | „ 17    | „ 20    | „ 24    |
| 18 | G | 4 | „ 4     | „ 18    | „ 21    | „ 25    |
| 19 | A | 4 | „ 5     | „ 19    | „ 22    | „ 26    |
| 20 | B | 4 | „ 6     | „ 20    | „ 23    | „ 27    |
| 21 | C | 4 | „ 7     | „ 21    | „ 24    | „ 28    |
| 22 | D | 4 | „ 8     | „ 22    | „ 25    | Mar. 1  |
| 23 | E | 4 | „ 9     | „ 23    | „ 26    | „ 2     |
| 24 | F | 4 | „ 10    | „ 24    | „ 27    | „ 3     |
| 25 | G | 5 | „ 11    | „ 25    | „ 28    | „ 4     |
| 26 | A | 5 | „ 12    | „ 26    | Mar. 1  | „ 5     |
| 27 | B | 5 | „ 13    | „ 27    | „ 2     | „ 6     |
| 28 | C | 5 | „ 14    | „ 28    | „ 3     | „ 7     |
| 29 | D | 5 | „ 15    | Mar. 1  | „ 4     | „ 8     |
| 30 | E | 5 | „ 16    | „ 2     | „ 5     | „ 9     |
| 31 | F | 5 | „ 17    | „ 3     | „ 6     | „ 10    |
| 32 | G | 6 | „ 18    | „ 4     | „ 7     | „ 11    |
| 33 | A | 6 | „ 19    | „ 5     | „ 8     | „ 12    |
| 34 | B | 6 | „ 20    | „ 6     | „ 9     | „ 13    |
| 35 | C | 6 | „ 21    | „ 7     | „ 10    | „ 14    |

*Table of the* EARLIER MOVEABLE FEASTS, *&c. for* BISSEXTILE YEARS, *according to the Number of Direction.*

| Number of Direction (N). | Dominical Letters. | Sundays after Epiphany. | Septuagesima Sunday. | Shrove Sunday. | First Day of Lent. | 1 Sunday in Lent. |
|---|---|---|---|---|---|---|
| 1 | ED | 1 | Jan. 19 | Feb. 2 | Feb. 5 | Feb. 9 |
| 2 | FE | 1 | ,, 20 | ,, 3 | ,, 6 | ,, 10 |
| 3 | GF | 2 | ,, 21 | ,, 4 | ,, 7 | ,, 11 |
| 4 | AG | 2 | ,, 22 | ,, 5 | ,, 8 | ,, 12 |
| 5 | BA | 2 | ,, 23 | ,, 6 | ,, 9 | ,, 13 |
| 6 | CB | 2 | ,, 24 | ,, 7 | ,, 10 | ,, 14 |
| 7 | DC | 2 | ,, 25 | ,, 8 | ,, 11 | ,, 15 |
| 8 | ED | 2 | ,, 26 | ,, 9 | ,, 12 | ,, 16 |
| 9 | FE | 2 | ,, 27 | ,, 10 | ,, 13 | ,, 17 |
| 10 | GF | 3 | ,, 28 | ,, 11 | ,, 14 | ,, 18 |
| 11 | AG | 3 | ,, 29 | ,, 12 | ,, 15 | ,, 19 |
| 12 | BA | 3 | ,, 30 | ,, 13 | ,, 16 | ,, 20 |
| 13 | CB | 3 | ,, 31 | ,, 14 | ,, 17 | ,, 21 |
| 14 | DC | 3 | Feb. 1 | ,, 15 | ,, 18 | ,, 22 |
| 15 | ED | 3 | ,, 2 | ,, 16 | ,, 19 | ,, 23 |
| 16 | FE | 3 | ,, 3 | ,, 17 | ,, 20 | ,, 24 |
| 17 | GF | 4 | ,, 4 | ,, 18 | ,, 21 | ,, 25 |
| 18 | AG | 4 | ,, 5 | ,, 19 | ,, 22 | ,, 26 |
| 19 | BA | 4 | ,, 6 | ,, 20 | ,, 23 | ,, 27 |
| 20 | CB | 4 | ,, 7 | ,, 21 | ,, 24 | ,, 28 |
| 21 | DC | 4 | ,, 8 | ,, 22 | ,, 25 | ,, 29 |
| 22 | ED | 4 | ,, 9 | ,, 23 | ,, 26 | Mar. 1 |
| 23 | FE | 4 | ,, 10 | ,, 24 | ,, 27 | ,, 2 |
| 24 | GF | 5 | ,, 11 | ,, 25 | ,, 28 | ,, 3 |
| 25 | AG | 5 | ,, 12 | ,, 26 | ,, 29 | ,, 4 |
| 26 | BA | 5 | ,, 13 | ,, 27 | Mar. 1 | ,, 5 |
| 27 | CB | 5 | ,, 14 | ,, 28 | ,, 2 | ,, 6 |
| 28 | DC | 5 | ,, 15 | ,, 29 | ,, 3 | ,, 7 |
| 29 | ED | 5 | ,, 16 | Mar. 1 | ,, 4 | ,, 8 |
| 30 | FE | 5 | ,, 17 | ,, 2 | ,, 5 | ,, 9 |
| 31 | GF | 6 | ,, 18 | ,, 3 | ,, 6 | ,, 10 |
| 32 | AG | 6 | ,, 19 | ,, 4 | ,, 7 | ,, 11 |
| 33 | BA | 6 | ,, 20 | ,, 5 | ,, 8 | ,, 12 |
| 34 | CB | 6 | ,, 21 | ,, 6 | ,, 9 | ,, 13 |
| 35 | DC | 6 | ,, 22 | ,, 7 | ,, 10 | ,, 14 |

*Table of the* LATER MOVEABLE FEASTS *for* ALL YEARS, *according to the Number of Direction.*

| Number of Direction (*N*). | Midlent Sunday. | Good Friday. | Easter Day. | Rogation Sunday. | Ascension. | Whit-Sunday. | Trinity Sunday. | Sundays after Trinity. | Advent Sunday. |
|---|---|---|---|---|---|---|---|---|---|
| 1 | Mar. 1 | Mar. 20 | Mar. 22 | Apr. 26 | Apr. 30 | May 10 | May 17 | 27 | Nov. 29 |
| 2 | ,, 2 | ,, 21 | ,, 23 | ,, 27 | May 1 | ,, 11 | ,, 18 | 27 | ,, 30 |
| 3 | ,, 3 | ,, 22 | ,, 24 | ,, 28 | ,, 2 | ,, 12 | ,, 19 | 27 | Dec. 1 |
| 4 | ,, 4 | ,, 23 | ,, 25 | ,, 29 | ,, 3 | ,, 13 | ,, 20 | 27 | ,, 2 |
| 5 | ,, 5 | ,, 24 | ,, 26 | ,, 30 | ,, 4 | ,, 14 | ,, 21 | 27 | ,, 3 |
| 6 | ,, 6 | ,, 25 | ,, 27 | May 1 | ,, 5 | ,, 15 | ,, 22 | 26 | Nov. 27 |
| 7 | ,, 7 | ,, 26 | ,, 28 | ,, 2 | ,, 6 | ,, 16 | ,, 23 | 26 | ,, 28 |
| 8 | ,, 8 | ,, 27 | ,, 29 | ,, 3 | ,, 7 | ,, 17 | ,, 24 | 26 | ,, 29 |
| 9 | ,, 9 | ,, 28 | ,, 30 | ,, 4 | ,, 8 | ,, 18 | ,, 25 | 26 | ,, 30 |
| 10 | ,, 10 | ,, 29 | ,, 31 | ,, 5 | ,, 9 | ,, 19 | ,, 26 | 26 | Dec. 1 |
| 11 | ,, 11 | ,, 30 | Apr. 1 | ,, 6 | ,, 10 | ,, 20 | ,, 27 | 26 | ,, 2 |
| 12 | ,, 12 | ,, 31 | ,, 2 | ,, 7 | ,, 11 | ,, 21 | ,, 28 | 26 | ,, 3 |
| 13 | ,, 13 | Apr. 1 | ,, 3 | ,, 8 | ,, 12 | ,, 22 | ,, 29 | 25 | Nov. 27 |
| 14 | ,, 14 | ,, 2 | ,, 4 | ,, 9 | ,, 13 | ,, 23 | ,, 30 | 25 | ,, 28 |
| 15 | ,, 15 | ,, 3 | ,, 5 | ,, 10 | ,, 14 | ,, 24 | ,, 31 | 25 | ,, 29 |
| 16 | ,, 16 | ,, 4 | ,, 6 | ,, 11 | ,, 15 | ,, 25 | June 1 | 25 | ,, 30 |
| 17 | ,, 17 | ,, 5 | ,, 7 | ,, 12 | ,, 16 | ,, 26 | ,, 2 | 25 | Dec. 1 |
| 18 | ,, 18 | ,, 6 | ,, 8 | ,, 13 | ,, 17 | ,, 27 | ,, 3 | 25 | ,, 2 |
| 19 | ,, 19 | ,, 7 | ,, 9 | ,, 14 | ,, 18 | ,, 28 | ,, 4 | 25 | ,, 3 |
| 20 | ,, 20 | ,, 8 | ,, 10 | ,, 15 | ,, 19 | ,, 29 | ,, 5 | 24 | Nov. 27 |
| 21 | ,, 21 | ,, 9 | ,, 11 | ,, 16 | ,, 20 | ,, 30 | ,, 6 | 24 | ,, 28 |
| 22 | ,, 22 | ,, 10 | ,, 12 | ,, 17 | ,, 21 | ,, 31 | ,, 7 | 24 | ,, 29 |
| 23 | ,, 23 | ,, 11 | ,, 13 | ,, 18 | ,, 22 | June 1 | ,, 8 | 24 | ,, 30 |
| 24 | ,, 24 | ,, 12 | ,, 14 | ,, 19 | ,, 23 | ,, 2 | ,, 9 | 24 | Dec. 1 |
| 25 | ,, 25 | ,, 13 | ,, 15 | ,, 20 | ,, 24 | ,, 3 | ,, 10 | 24 | ,, 2 |
| 26 | ,, 26 | ,, 14 | ,, 16 | ,, 21 | ,, 25 | ,, 4 | ,, 11 | 24 | ,, 3 |
| 27 | ,, 27 | ,, 15 | ,, 17 | ,, 22 | ,, 26 | ,, 5 | ,, 12 | 23 | Nov. 27 |
| 28 | ,, 28 | ,, 16 | ,, 18 | ,, 23 | ,, 27 | ,, 6 | ,, 13 | 23 | ,, 28 |
| 29 | ,, 29 | ,, 17 | ,, 19 | ,, 24 | ,, 28 | ,, 7 | ,, 14 | 23 | ,, 29 |
| 30 | ,, 30 | ,, 18 | ,, 20 | ,, 25 | ,, 29 | ,, 8 | ,, 15 | 23 | ,, 30 |
| 31 | ,, 31 | ,, 19 | ,, 21 | ,, 26 | ,, 30 | ,, 9 | ,, 16 | 23 | Dec. 1 |
| 32 | Apr. 1 | ,, 20 | ,, 22 | ,, 27 | ,, 31 | ,, 10 | ,, 17 | 23 | ,, 2 |
| 33 | ,, 2 | ,, 21 | ,, 23 | ,, 28 | June 1 | ,, 11 | ,, 18 | 23 | ,, 3 |
| 34 | ,, 3 | ,, 22 | ,, 24 | ,, 29 | ,, 2 | ,, 12 | ,, 19 | 22 | Nov. 27 |
| 35 | ,, 4 | ,, 23 | ,, 25 | ,, 30 | ,, 3 | ,, 13 | ,, 20 | 22 | ,, 28 |

LAW TERMS.—The Law Terms and Returns are regulated by statute 1 William IV. cap. 70, passed the 22nd of July, 1830, entitled "An Act for the more effectual Administration of Justice in England and Wales," and the following is an abstract of clause VI. of the Act:—

"VI. And be it enacted, That in the year of our Lord one thousand eight hundred and thirty-one, and afterwards, Hilary Term shall begin on the eleventh and end on the thirty-first

day of January ; Easter Term shall begin on the fifteenth day of April, and end on the eighth day of May ; Trinity Term shall begin on the twenty-second day of May, and end on the twelfth day of June ; and Michaelmas Term shall begin on the second and end on the twenty-fifth day of November ; and that the Essoign and General Return Days of each Term shall, until further provision be made by Parliament, be as follows ; that is to say, the first Essoign or General Return day for every Term shall be the fourth day before the day of the commencement of the Term, both days being included in the computation ; the second Essoign day shall be the fifth day of the Term ; the third shall be the fifteenth day of the Term ; and the fourth and last shall be the nineteenth day of the Term, the first day of the Term being already included in the computation ; with the same relation to the commencement of each Term as they now bear, and shall be distinguished by the day of the Term on which they respectively fall, the Monday being in all cases substituted for the Sunday when it shall happen that the day would fall on Sunday, except always that in Easter Term there shall be but four Returns instead of five, the last being omitted ; provided that in case the day of the month on which any Term according to the Act aforesaid is to end shall fall to be on a Sunday, then the Monday next after such day shall be deemed and taken to be the last day of the Term ; and that if the whole or any number of the days [1] intervening *between* the *Thursday before and the Wednesday next after Easter-day* shall fall within Easter Term, there shall be no Sittings in Banc on any of such intervening days, but the Term shall in such case be prolonged and continue for such number of *days of business* as shall be equal to the number

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[1] The intervening days, exclusive of Easter-day, are

> Good Friday,
> Saturday,
> Easter Monday,
> Easter Tuesday.

of the intervening days before mentioned exclusive of Easter-day, and the commencement of the ensuing Trinity Term shall in such case be postponed, and its continuance prolonged for an equal number of *days of business*."

The wording of the Act is somewhat confused and obscure, and its correct interpretation and practical application require some little consideration. In order to obviate this, we annex the following table, in which the dates of the commencement and ending of the several Terms are made to depend simply on the Number of Direction.

*Table of* LAW TERMS, *according to the Number of Direction.*

| No. of Direction (N). | Name. | | Begins. | Ends. | No. of days. |
|---|---|---|---|---|---|
| 1, 2, 3, 5, 8, 9, 10, 12, 15, 16, 17, 19, 22 | Hilary | Term | Jan. 11 | Jan. 31 | 21 |
| | Easter | ,, | Apr. 15 | May 8 | 24 |
| | Trinity | ,, | May 22 | June 12 | 22 |
| | Michaelmas | ,, | Nov. 2 | Nov. 25 | 24 |
| 4 11 18 | Hilary | Term | Jan. 11 | Jan. 31 | 21 |
| | Easter | ,, | Apr. 15 | May 8 | 24 |
| | Trinity | ,, | May 22 | June 12 | 22 |
| | Michaelmas | ,, | Nov. 2 | Nov. 26 | 25 |
| 6 13 20 | Hilary | Term | Jan. 11 | Jan. 31 / Feb. 1 (bis.) | 21 / 22 |
| | Easter | ,, | Apr. 15 | May 9 | 25 |
| | Trinity | ,, | May 22 | June 13 | 23 |
| | Michaelmas | ,, | Nov. 2 | Nov. 25 | 24 |
| 7 14 21 | Hilary | Term | Jan. 11 | Feb. 1 / Jan. 31 (bis.) | 22 / 21 |
| | Easter | ,, | Apr. 15 | May 8 | 24 |
| | Trinity | ,, | May 22 | June 12 | 22 |
| | Michaelmas | ,, | Nov. 2 | Nov. 25 | 24 |
| 23 | Hilary | Term | Jan. 11 | Jan. 31 | 21 |
| | Easter | ,, | Apr. 15 | May 9 | 25 |
| | Trinity | ,, | May 23 | June 13 | 22 |
| | Michaelmas | ,, | Nov. 2 | Nov. 25 | 24 |
| 24 | Hilary | Term | Jan. 11 | Jan. 31 | 21 |
| | Easter | ,, | Apr. 15 | May 10 | 26 |
| | Trinity | ,, | May 24 | June 14 | 22 |
| | Michaelmas | ,, | Nov. 2 | Nov. 25 | 24 |

*Table of* LAW TERMS, *according to the Number of Direction.*

| No. of Direction (N). | Name. | | Begins. | Ends. | No. of days. |
|---|---|---|---|---|---|
| 25 | Hilary | Term | Jan. 11 | Jan. 31 | 21 |
| | Easter | ,, | Apr. 15 | May 10 | 26 |
| | Trinity | ,, | May 24 | June 14 | 22 |
| | Michaelmas | ,, | Nov. 2 | Nov. 26 | 25 |
| 26 | Hilary | Term | Jan. 11 | Jan. 31 | 21 |
| | Easter | ,, | Apr. 15 | May 11 | 27 |
| | Trinity | ,, | May 25 | June 15 | 22 |
| | Michaelmas | ,, | Nov. 2 | Nov. 25 | 24 |
| 27 34 | Hilary | Term | Jan. 11 | Jan. 31 / Feb. 1 (bis.) | 21 / 22 |
| | Easter | ,, | Apr. 15 | May 12 | 28 |
| | Trinity | ,, | May 26 | June 16 | 22 |
| | Michaelmas | ,, | Nov. 2 | Nov. 25 | 24 |
| 28 35 | Hilary | Term | Jan. 11 | Feb. 1 / Jan. 31 (bis.) | 22 / 21 |
| | Easter | ,, | Apr. 15 | May 13 | 29 |
| | Trinity | ,, | May 27 | June 17 | 22 |
| | Michaelmas | ,, | Nov. 2 | Nov. 25 | 24 |
| 29, 30, 31 | Hilary | Term | Jan. 11 | Jan. 31 | 21 |
| | Easter | ,, | Apr. 15 | May 13 | 29 |
| | Trinity | ,, | May 27 | June 17 | 22 |
| | Michaelmas | ,, | Nov. 2 | Nov. 25 | 24 |
| 32 | Hilary | Term | Jan. 11 | Jan. 31 | 21 |
| | Easter | ,, | Apr. 15 | May 12 | 28 |
| | Trinity | ,, | May 26 | June 16 | 22 |
| | Michaelmas | ,, | Nov. 2 | Nov. 26 | 25 |
| 33 | Hilary | Term | Jan. 11 | Jan. 31 | 21 |
| | Easter | ,, | Apr. 15 | May 12 | 28 |
| | Trinity | ,, | May 26 | June 16 | 22 |
| | Michaelmas | ,, | Nov. 2 | Nov. 25 | 24 |

UNIVERSITY TERMS.—The University Terms may also be obtained simply from the Number of Direction by means of the following formulary table:—

<div align="center">OXFORD.</div>

$$\text{The Act, July } 1 + \left(\frac{N+5}{7}\right)_r$$

| | | |
|---|---|---|
| Hilary | Term begins Jan. 14 <br> Jan. 15 if the Act be July 3 <br> or in leap year July 2 | ends Mar. 13 + $N$ <br> or Mar. 15 + $N$ (if $N=12$) |
| Easter | ,,    ,,    Apr. $N$ <br> or Apr. 1+$N$ (if $N=25,31$) | ,,    May 8 + $N$ <br> or May 7+$N$ (if $N=21,34$) |
| Trinity | ,,    ,,    May 12 + $N$ <br> or May 13+$N$ (if $N=17,30$) | ,,    The Act + 4 |
| Michaelmas | ,,    ,,    Oct. 10 <br> ,,    ,,    Oct. 11 if the <br> Act be July 6 | ,,    Dec. 17 <br> ,,    Dec. 18 if the <br> ,,    Act be July 4. |

<div align="center">CAMBRIDGE.</div>

$$\text{Commencement, July } 1 + \left(\frac{N+5}{7}\right)_r$$

| | | |
|---|---|---|
| Hilary | Term begins Jan. 13,  ends Mar. 12 + $N$ |
| Easter | ,,    ,,    Apr. $N$    ,, Comm. + 3 |
| Michaelmas | ,,    ,,    Oct. 10    ,, Dec. 16 |

| | | |
|---|---|---|
| Hilary | Term divides  .... Feb. 11 + $\frac{1}{2} N$ <br> in leap year  . Feb. 11 + $\frac{1}{2}(N+1)$ |
| Easter | ,,    divides  .... May 17 + $\frac{1}{2}(N+\text{Comm.})$ |
| Michaelmas | ,,    ,,    .... Nov. 12$\frac{1}{2}$ <br> or Nov. 12 midnight. |

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# HEBREW CALENDAR.

The Jews date their calendar from the Creation, which is considered by them to have occurred 3760 years and 3 months before the commencement of the Christian era. The year is luni-solar, and, according as it is ordinary or embolismic, consists of twelve or thirteen lunar months, each of which has 29 or 30 days. It is occasionally made a day more or less than the mean value in order that certain festivals may fall on proper days of the week for their due observance. The days of the respective months, according to the number comprised in the different years, are distributed as follows :—

| Month. | Ordinary year. | | | Embolismic year. | | |
|---|---|---|---|---|---|---|
| | Imperfect. | Common. | Perfect. | Imperfect. | Common. | Perfect. |
| Tisri | 30 | 30 | 30 | 30 | 30 | 30 |
| Hesvan | 29 | 29 | 30 | 29 | 29 | 30 |
| Kislev | 29 | 30 | 30 | 29 | 30 | 30 |
| Tebet | 29 | 29 | 29 | 29 | 29 | 29 |
| Sebat | 30 | 30 | 30 | 30 | 30 | 30 |
| Adar | 29 | 29 | 29 | 30 | 30 | 30 |
| (Veadar) | .. | .. | .. | (29) | (29) | (29) |
| Nisan | 30 | 30 | 30 | 30 | 30 | 30 |
| Yiar | 29 | 29 | 29 | 29 | 29 | 29 |
| Sivan | 30 | 30 | 30 | 30 | 30 | 30 |
| Tamuz | 29 | 29 | 29 | 29 | 29 | 29 |
| Ab | 30 | 30 | 30 | 30 | 30 | 30 |
| Elul | 29 | 29 | 29 | 29 | 29 | 29 |
| No. of days in the year | 353 | 354 | 355 | 383 | 384 | 385 |

The intercalary month, Veadar, is introduced that Pass-over, the 15th day of Nisan, may be kept at its proper season, which is the full moon of the vernal equinox, or that which takes place after the sun has entered the sign Aries. The distribution of the embolismic years is determined by a cycle of 19 years, according to the following rule.

Divide the Hebrew year by 19, the quotient is the number of the last completed cycle, and the remainder is the year of the current cycle; should it be 3, 6, 8, 11, 14, 17, or 19 (0), the year is embolismic; if any other it is ordinary.

Or if $Y$ denote the year, and

$$R = \left(\frac{7Y + 13}{19}\right)_r;$$

the year is embolismic when $R > 11$.

The calendar is constructed by assuming the mean luna-tion to be 29 days 12 hours 44 min. 3½ sec., and that the year commences on, or immediately after, the new moon

following the autumnal equinox. The mean solar year is also assumed to be 365 days 5 hours 55 min. $25\frac{2}{5}\frac{5}{7}$ sec.[1], so that a cycle of nineteen of such years contains 6939 days 16 hours 33 min. $3\frac{1}{3}$ sec., the exact measure of 235 of the assumed lunations. The year 5606 was the first of a cycle, and the computed new moon answering to the 1st of Tisri for that year was 1845, Oct. 1, 15h. 42m. $43\frac{1}{3}$s., according to Lindo, adopting the civil mode of reckoning from the previous midnight. The future times of new moon are consequently deduced by successively adding 29 days 12h. 44m. $3\frac{1}{3}$s. to this date.

Or to compute the times of new moon which belong to the commencement of successive years, we must in passing from an ordinary year, deduce the new moon of the following year by subtracting the interval that twelve lunations fall short of the corresponding Gregorian year of 365 or 366 days; and for an embolismic year we must add the excess of thirteen lunations over the Gregorian year; that is, to get the new moon of Tisri for the year immediately following any given year $Y$, we must,

for an ordinary  year, subtract $\begin{Bmatrix} 10 \\ 11 \end{Bmatrix}$ days 15h. 11m. 20s.,

„    embolismic  „    add    $\begin{Bmatrix} 18 \\ 17 \end{Bmatrix}$ days 21h. 32m. $43\frac{1}{3}$s.,

the second mentioned number of days being used whenever the year $Y$ is divisible by 4 without a remainder, or, more correctly, when the following or new Gregorian year is bissextile.

Thus, by knowing which of the years are embolismic, from their ordinal position in the cycle, according to the rule before stated, the times of the commencement of successive years may be carried on indefinitely without much trouble.

[1] This being 6 min. 37 sec. in excess of the mean solar year, the dates of commencement of future Jewish years so calculated will advance forward from the equinox a day in error in every 218 years. The lunations, it will be observed, are estimated with greater precision.

We annex a few by way of example, and have distinguished by a * the years which are embolismic and bissextile.   The hours are counted from the previous midnight, according to the civil reckoning.

| Year 5606, | year of cycle | 1, | date 1845 | Oct. | d. 1 | h. 15 | m. 42 | s. 43¼ |
|---|---|---|---|---|---|---|---|---|
| 5607 | ,, | ,, | 2, | ,, 1846 | Sept. | 21 | 0 | 31 | 23½ |
| 5608 | ,, | ,, | *3, | ,, 1847 | ,, | 10 | 9 | 20 | 3¼ |
| 5609 | ,, | ,, | 4, | ,, *1848 | ,, | 28 | 6 | 52 | 46⅔ |
| 5610 | ,, | ,, | 5, | ,, 1849 | ,, | 17 | 15 | 41 | 26⅔ |
| 5611 | ,, | ,, | *6, | ,, 1850 | ,, | 7 | 0 | 30 | 6¾ |
| 5612 | ,, | ,, | 7, | ,, 1851 | ,, | 25 | 22 | 2 | 50 |
| 5613 | ,, | ,, | *8, | ,, *1852 | ,, | 14 | 6 | 51 | 30 |
| 5614 | ,, | ,, | 9, | ,, 1853 | Oct. | 3 | 4 | 24 | 13⅓ |
| &c. | | | | &c. | | | | &c. | |

But it must be observed, for the reasons before assigned, to avoid certain festivals falling on incompatible days of the week, that the year must not begin on a Sunday, Wednesday, or Friday, so that if the computed conjunction falls on one of these days the new year is to be fixed on the day after.   The following conditions also require to be attended to :—

If the computed new moon be after 12h. the following day is to be taken, and if that happen to be Sunday, Wednesday, or Friday, it must be postponed one day more.

If in an ordinary year the new moon is on Tuesday, as late as 9h. 11m. 20s., it is not to be observed thereon; and, as it may not be held on Wednesday, it is to be postponed to Thursday.

If in a year immediately following an embolismic year the new moon is on Monday, as late as 15h. 30m. 52s., the new year is to be fixed on Tuesday.

The number of days contained in any given Jewish year, and the day of the week on which it commences, may be readily calculated by means of the following tables, the use of which will be best explained by an example.

*Example.*—Required the character of the Jewish year 5640.

Having found the next less year in the table of completed cycles, the calculation is as follows:—

| | | | |
|---|---|---|---|
| Proposed year | .... 5640 | | |
| 296 cycles | ..... 5624 | Number | 2525,480 |
| Year of cycle.. | 16 | ($R = 11$) | 2278,271 |
| | | Sum | 4803,751 |

Referring to the third table in the column under $R = 11$, the number next less to this sum is 4743,996, and it stands opposite to " 354 Thur.," showing that the year is ordinary, contains 354 days, and begins on a Thursday[1].

By the second table the approximate date of commencement is 17 Sept., and the corresponding year of our Lord is 5640 — 3761 = 1879. Now, referring to the table, page 146, the Dominical letter for this year is E, and 17 Sept. is Wednesday. Therefore, as the Jewish year has been found to begin on a Thursday, the true date of commencement is 18 Sept. 1879.

The Gregorian epact being the age of the moon of Tebet at the beginning of the year, it represents the day of Tebet which corresponds to Jan. 1 ; and the approximate date of Tisri 1 may be otherwise deduced by subtracting the epact

from $\left\{ \begin{array}{l} \text{Sept. 24} \\ \text{Oct. 24} \end{array} \right\}$ after an $\left\{ \begin{array}{l} \text{ordinary} \\ \text{embolismic} \end{array} \right\}$ year.

The result so obtained would in general be more accurate than the Jewish calculation, and it may differ a day from the latter, as fractions of a day are omitted in these computations. The difference may, however, be adjusted as before by means of the day of the week.

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[1] Formulæ for computing the character of the years of the Hebrew Calendar were given by Mr. Herschell Filipowski in the " Lady's and Gentleman's Diary" for the year 1850.

| Completed Cycles. | Year. | Number. |
|---|---|---|
| 295 | 5605 | 1200,895 |
| 296 | 5624 | 2525,480 |
| 297 | 5643 | 402,705 |
| 298 | 5662 | 1727,290 |
| 299 | 5681 | 3051,875 |
| 300 | 5700 | 929,100 |
| 301 | 5719 | 2253,685 |
| 302 | 5738 | 130,910 |
| 303 | 5757 | 1455,495 |
| 304 | 5776 | 2780,080 |
| 305 | 5795 | 657,305 |
| 306 | 5814 | 1981,890 |
| 307 | 5833 | 3306,475 |
| 308 | 5852 | 1183,700 |
| 309 | 5871 | 2508,285 |
| 310 | 5890 | 385,510 |
| 311 | 5909 | 1710,095 |
| 312 | 5928 | 3034,680 |
| 313 | 5947 | 911,905 |
| 314 | 5966 | 2236,490 |
| 315 | 5985 | 113,715 |
| 316 | 6004 | 1438,300 |
| 317 | 6023 | 2762,885 |
| 318 | 6042 | 640,110 |
| 319 | 6061 | 1964,695 |
| 320 | 6080 | 3289,280 |

| Year of Cycle. | R. | Number. | Approximate Commencement (Tisri 1). |
|---|---|---|---|
| 1 | 1 | 722,076 | 2 Oct. * |
| 2 | 8 | 2872,800 | 21 Sept. |
| 3 | 15 | 1576,164 | 10 ,, |
| 4 | 3 | 1033,315 | 29 ,, |
| 5 | 10 | 3184,039 | 18 Sept. |
| 6 | 17 | 1887,403 | 8 ,, |
| 7 | 5 | 1344,554 | 27 ,, |
| 8 | 12 | 47,918 | 15 ,, |
| 9 | 0 | 2952,429 | 4 Oct. |
| 10 | 7 | 1655,793 | 23 Sept. |
| 11 | 14 | 359,157 | 12 ,, |
| 12 | 2 | 3263,668 | 1 Oct. |
| 13 | 9 | 1967,032 | 20 Sept. |
| 14 | 16 | 670,396 | 9 ,, |
| 15 | 4 | 127,547 | 28 Sept. |
| 16 | 11 | 2278,271 | 17 ,, |
| 17 | 18 | 981,635 | 6 ,, |
| 18 | 6 | 438,786 | 25 ,, |
| 19 | 13 | 2589,510 | 14 ,, |

\* The corresponding year of our Lord is obtained by subtracting 3761 from the Jewish year, and *vice versâ;* and the approximate date of commencement may be adjusted to the accurate date by means of the true day of the week taken from the next table.

| | Ordinary Years. | | | Embolismic Years. | |
|---|---|---|---|---|---|
| Character. | R = 0 ... 4 | R = 5, 6 | R = 7 ... 11 | R = 12 ... 18 | Character. |
| 353 Mon. | 0 | 0 | 0 | 0 | 383 Mon. |
| 355 Mon. | 311,676 | 311,676 | 311,676 | 542,849 | 385 Mon. |
| 354 Tues. | 934,591 | 934,591 | 984,960 | 984,960 | 384 Tues. |
| 354 Thur. | 1296,636 | 1296,636 | 1296,636 | 1477,440 | 383 Thur. |
| 355 Thur. | 2281,596 | 2281,596 | 2281,596 | 1839,485 | 385 Thur. |
| 353 Sat. | 2462,400 | 2462,400 | 2462,400 | 2462,400 | 383 Sat. |
| 355 Sat. | 2593,272 | 2774,076 | 2774,076 | 3005,249 | 385 Sat. |
| 353 Mon. | 3447,360 | 3447,360 | 3447,360 | 3447,360 | 383 Mon. |
| 355 Mon. | 3759,036 | 3759,036 | 3759,036 | 3990,209 | 385 Mon. |
| 354 Tues. | 4381,951 | 4381,951 | 4432,320 | 4432,320 | 384 Tues. |
| 354 Thur. | 4743,996 | 4743,996 | 4743,996 | 4924,800 | 383 Thur. |
| 355 Thur. | 5728,956 | 5728,956 | 5728,956 | 5286,845 | 385 Thur. |
| 353 Sat. | 5909,760 | 5909,760 | 5909,760 | 5909,760 | 383 Sat. |
| 355 Sat. | 6040,632 | 6221,436 | 6221,436 | 6452,609 | 385 Sat. |

The annexed table exhibits the principal fasts and festivals, and it is followed by a table of the dates, &c. of Jewish years up to the year 2072, and the completion of the 307th cycle. When the date of commencement and number of days contained in a year are known, the number of days contained in the several months are shown in the table, page 171, and the construction of a detailed calendar for that year is obvious.

### *Principal Days of the* JEWISH CALENDAR.

| | | |
|---|---|---|
| Tebet | 1 | 1st of Tebet. |
| ,, | 10 Fast | Fast; Siege of Jerusalem. |
| Sebat | 1 | 1st of Sebat. |
| Adar | 1 | 1st of Adar. |
| ,, | 13, or 11 if Tisri 1 be Thursday } | Fast of Esther } In Embol Years substitute *Veadar*, and same days. |
| ,, | 14 } Purim | { Purim |
| ,, | 15 } | { Second Day |
| Veadar | 1 | 1st of Veadar (if Embolismic Year). |
| Nisan | 1 | 1st of Nisan. |
| ,, | 15 } Passover | { Passover. |
| ,, | 16 } | { Second Day. |
| Yiar | 1 | 1st of Yiar. |
| Sivan | 1 | 1st of Sivan. |
| ,, | 6 } Sebuot | { Pentecost. |
| ,, | 7 } | { Second Day. |
| Tamuz | 1 | 1st of Tamuz. |
| ,, | 17, or 18 if Tisri 1 be Monday } | Fast; Taking of Jerusalem. |
| Ab | 1 | 1st of Ab. |
| ,, | 9, or 10 if Tisri 1 be Monday } | Fast; Destruction of the Temple. |
| Elul | 1 | 1st of Elul. |
| TISRI | 1 New Year | 1st of Tisri (Yr . . . . begins). |
| ,, | 2 | Second Day. |
| ,, | 3, or 4 if Tisri 1 be Thursday } | Fast of Guedaliah. |
| ,, | 10 Kipur | Fast of Expiation. |
| ,, | 15 } Tabernacle. | { Feast of Tabernacles. |
| ,, | 16 } | { Second Day. |
| ,, | 21 Hosana Raba | Last day of the Festival. |
| ,, | 22 } 8th day | { Feast of the 8th day. |
| ,, | 23 } | { Rejoicing of the Law. |
| Hesvan | 1 | 1st of Hesvan. |
| Kislev | 1 | 1st of Kislev. |
| | 25 Hanuca | Dedication of the Temple. |
| Tebet | 1 | 1st of Tebet. |
| | &c. | &c. |

## Table of HEBREW YEARS.

| Jewish Year. | Number of Days. | Commencement (1st of Tisri). | | | Jewish Year. | Number of Days. | Commencement (1st of Tisri). | | |
|---|---|---|---|---|---|---|---|---|---|
| 296 Cycle | | | | | 298 Cycle | | | | |
| 5606 | 354 | Thur. | 2 Oct. | 1845 | 5644 | 354 | Tues. | 2 Oct. | 1883 |
| 07 | 355 | Mon. | 21 Sept. | 1846 | 45 | 355 | Sat. | 20 Sept. | 1884 |
| 08 | 383 | Sat. | 11 Sept. | 1847 | 46 | 385 | Thur. | 10 Sept. | 1885 |
| 09 | 354 | Thur. | 28 Sept. | 1848 | 47 | 354 | Thur. | 30 Sept. | 1886 |
| 10 | 355 | Mon. | 17 Sept. | 1849 | 48 | 353 | Mon. | 19 Sept. | 1887 |
| 11 | 385 | Sat. | 7 Sept. | 1850 | 49 | 385 | Thur. | 6 Sept. | 1888 |
| 12 | 353 | Sat. | 27 Sept. | 1851 | 50 | 354 | Thur. | 26 Sept. | 1889 |
| 13 | 384 | Tues. | 14 Sept. | 1852 | 51 | 383 | Mon. | 15 Sept. | 1890 |
| 14 | 355 | Mon. | 3 Oct. | 1853 | 52 | 355 | Sat. | 3 Oct. | 1891 |
| 15 | 355 | Sat. | 23 Sept. | 1854 | 53 | 354 | Thur. | 22 Sept. | 1892 |
| 16 | 383 | Thur. | 13 Sept. | 1855 | 54 | 385 | Mon. | 11 Sept. | 1893 |
| 17 | 354 | Tues. | 30 Sept. | 1856 | 55 | 353 | Mon. | 1 Oct. | 1894 |
| 18 | 355 | Sat. | 19 Sept. | 1857 | 56 | 355 | Thur. | 19 Sept. | 1895 |
| 19 | 385 | Thur. | 9 Sept. | 1858 | 57 | 384 | Tues. | 8 Sept. | 1896 |
| 20 | 354 | Thur. | 29 Sept. | 1859 | 58 | 355 | Mon. | 27 Sept. | 1897 |
| 21 | 353 | Mon. | 17 Sept. | 1860 | 59 | 353 | Sat. | 17 Sept. | 1898 |
| 22 | 385 | Thur. | 5 Sept. | 1861 | 60 | 384 | Tues. | 5 Sept. | 1899 |
| 23 | 354 | Thur. | 25 Sept. | 1862 | 61 | 355 | Mon. | 24 Sept. | 1900 |
| 24 | 383 | Mon. | 14 Sept. | 1863 | 62 | 383 | Sat. | 14 Sept. | 1901 |
| 297 Cycle | | | | | 299 Cycle | | | | |
| 5625 | 355 | Sat. | 1 Oct. | 1864 | 5663 | 355 | Thur. | 2 Oct. | 1902 |
| 26 | 354 | Thur. | 21 Sept. | 1865 | 64 | 354 | Tues. | 22 Sept. | 1903 |
| 27 | 385 | Mon. | 10 Sept. | 1866 | 65 | 385 | Sat. | 10 Sept. | 1904 |
| 28 | 353 | Mon. | 30 Sept. | 1867 | 66 | 355 | Sat. | 30 Sept. | 1905 |
| 29 | 354 | Thur. | 17 Sept. | 1868 | 67 | 354 | Thur. | 20 Sept. | 1906 |
| 30 | 385 | Mon. | 6 Sept. | 1869 | 68 | 383 | Mon. | 9 Sept. | 1907 |
| 31 | 355 | Mon. | 26 Sept. | 1870 | 69 | 355 | Sat. | 26 Sept. | 1908 |
| 32 | 383 | Sat. | 16 Sept. | 1871 | 70 | 383 | Thur. | 16 Sept. | 1909 |
| 33 | 354 | Thur. | 3 Oct. | 1872 | 71 | 354 | Tues. | 4 Oct. | 1910 |
| 34 | 355 | Mon. | 22 Sept. | 1873 | 72 | 355 | Sat. | 23 Sept. | 1911 |
| 35 | 383 | Sat. | 12 Sept. | 1874 | 73 | 385 | Thur. | 12 Sept. | 1912 |
| 36 | 355 | Thur. | 30 Sept. | 1875 | 74 | 354 | Thur. | 2 Oct. | 1913 |
| 37 | 354 | Tues. | 19 Sept. | 1876 | 75 | 353 | Mon. | 21 Sept. | 1914 |
| 38 | 385 | Sat. | 8 Sept. | 1877 | 76 | 385 | Thur. | 9 Sept. | 1915 |
| 39 | 355 | Sat. | 28 Sept. | 1878 | 77 | 354 | Thur. | 28 Sept. | 1916 |
| 40 | 354 | Thur. | 18 Sept. | 1879 | 78 | 355 | Mon. | 17 Sept. | 1917 |
| 41 | 383 | Mon. | 6 Sept. | 1880 | 79 | 383 | Sat. | 7 Sept. | 1918 |
| 42 | 355 | Sat. | 24 Sept. | 1881 | 80 | 354 | Thur. | 25 Sept. | 1919 |
| 43 | 383 | Thur. | 14 Sept. | 1882 | 81 | 385 | Mon. | 13 Sept. | 1920 |

## *Table of* HEBREW YEARS.

| Jewish Year. | Number of Days. | Commencement (1st of Tisri). | | | Jewish Year. | Number of Days. | Commencement (1st of Tisri). | | |
|---|---|---|---|---|---|---|---|---|---|
| 5682 | 355 | Mon. | 3 Oct. | 1921 | 5720 | 355 | Sat. | 3 Oct. | 1959 |
| 83 | 353 | Sat. | 23 Sept. | 1922 | 21 | 354 | Thur. | 22 Sept. | 1960 |
| 84 | 384 | Tues. | 11 Sept. | 1923 | 22 | 383 | Mon. | 11 Sept. | 1961 |
| 85 | 355 | Mon. | 29 Sept. | 1924 | 23 | 355 | Sat. | 29 Sept. | 1962 |
| 86 | 355 | Sat. | 19 Sept. | 1925 | 24 | 354 | Thur. | 19 Sept. | 1963 |
| 87 | 383 | Thur. | 9 Sept. | 1926 | 25 | 385 | Mon. | 7 Sept. | 1964 |
| 88 | 354 | Tues. | 27 Sept. | 1927 | 26 | 353 | Mon. | 27 Sept. | 1965 |
| 89 | 385 | Sat. | 15 Sept. | 1928 | 27 | 385 | Thur. | 15 Sept. | 1966 |
| 300 Cycle. 90 | 353 | Sat. | 5 Oct. | 1929 | 302 Cycle. 28 | 354 | Thur. | 5 Oct. | 1967 |
| 91 | 354 | Tues. | 23 Sept. | 1930 | 29 | 355 | Mon. | 23 Sept. | 1968 |
| 92 | 385 | Sat. | 12 Sept. | 1931 | 30 | 383 | Sat. | 13 Sept. | 1969 |
| 93 | 355 | Sat. | 1 Oct. | 1932 | 31 | 354 | Thur. | 1 Oct. | 1970 |
| 94 | 354 | Thur. | 21 Sept. | 1933 | 32 | 355 | Mon. | 20 Sept. | 1971 |
| 95 | 383 | Mon. | 10 Sept. | 1934 | 33 | 383 | Sat. | 9 Sept. | 1972 |
| 96 | 355 | Sat. | 28 Sept. | 1935 | 34 | 355 | Thur. | 27 Sept. | 1973 |
| 97 | 354 | Thur. | 17 Sept. | 1936 | 35 | 354 | Tues. | 17 Sept. | 1974 |
| 98 | 385 | Mon. | 6 Sept. | 1937 | 36 | 385 | Sat. | 6 Sept. | 1975 |
| 99 | 353 | Mon. | 26 Sept. | 1938 | 37 | 353 | Sat. | 25 Sept. | 1976 |
| 5700 | 385 | Thur. | 14 Sept. | 1939 | 38 | 384 | Tues. | 13 Sept. | 1977 |
| 5701 | 354 | Thur. | 3 Oct. | 1940 | 5739 | 355 | Mon. | 2 Oct. | 1978 |
| 02 | 355 | Mon. | 22 Sept. | 1941 | 40 | 355 | Sat. | 22 Sept. | 1979 |
| 03 | 383 | Sat. | 12 Sept. | 1942 | 41 | 383 | Thur. | 11 Sept. | 1980 |
| 04 | 354 | Thur. | 30 Sept. | 1943 | 42 | 354 | Tues. | 29 Sept. | 1981 |
| 05 | 355 | Mon. | 18 Sept. | 1944 | 43 | 355 | Sat. | 18 Sept. | 1982 |
| 06 | 383 | Sat. | 8 Sept. | 1945 | 44 | 385 | Thur. | 8 Sept. | 1983 |
| 07 | 354 | Thur. | 26 Sept. | 1946 | 45 | 354 | Thur. | 27 Sept. | 1984 |
| 08 | 385 | Mon. | 15 Sept. | 1947 | 46 | 383 | Mon. | 16 Sept. | 1985 |
| 301 Cycle. 09 | 355 | Mon. | 4 Oct. | 1948 | 303 Cycle. 47 | 355 | Sat. | 4 Oct. | 1986 |
| 10 | 353 | Sat. | 24 Sept. | 1949 | 48 | 354 | Thur. | 24 Sept. | 1987 |
| 11 | 384 | Tues. | 12 Sept. | 1950 | 49 | 383 | Mon. | 12 Sept. | 1988 |
| 12 | 355 | Mon. | 1 Oct. | 1951 | 50 | 355 | Sat. | 30 Sept. | 1989 |
| 13 | 355 | Sat. | 20 Sept. | 1952 | 51 | 354 | Thur. | 20 Sept. | 1990 |
| 14 | 383 | Thur. | 10 Sept. | 1953 | 52 | 385 | Mon. | 9 Sept. | 1991 |
| 15 | 354 | Tues. | 28 Sept. | 1954 | 53 | 353 | Mon. | 28 Sept. | 1992 |
| 16 | 355 | Sat. | 17 Sept. | 1955 | 54 | 355 | Thur. | 16 Sept. | 1993 |
| 17 | 385 | Thur. | 6 Sept. | 1956 | 55 | 384 | Tues. | 6 Sept. | 1994 |
| 18 | 354 | Thur. | 26 Sept. | 1957 | 56 | 355 | Mon. | 25 Sept. | 1995 |
| 19 | 383 | Mon. | 15 Sept. | 1958 | 57 | 383 | Sat. | 14 Sept. | 1996 |

## Table of HEBREW YEARS.

| Jewish Year. | Number of Days. | Commencement (1st of Tisri). | | | Jewish Year. | Number of Days. | Commencement (1st of Tisri). | | |
|---|---|---|---|---|---|---|---|---|---|
| 5758 | 354 | Thur. | 2 Oct. | 1997 | 5796 | 354 | Thur. | 4 Oct. | 2035 |
| 59 | 355 | Mon. | 21 Sept. | 1998 | 97 | 353 | Mon. | 22 Sept. | 2036 |
| 60 | 385 | Sat. | 11 Sept. | 1999 | 98 | 385 | Thur. | 10 Sept. | 2037 |
| 61 | 353 | Sat. | 30 Sept. | 2000 | 99 | 354 | Thur. | 30 Sept. | 2038 |
| 62 | 354 | Tues. | 18 Sept. | 2001 | 5800 | 355 | Mon. | 19 Sept. | 2039 |
| 63 | 385 | Sat. | 7 Sept. | 2002 | 01 | 383 | Sat. | 8 Sept. | 2040 |
| 64 | 355 | Sat. | 27 Sept. | 2003 | 02 | 354 | Thur. | 26 Sept. | 2041 |
| 65 | 383 | Thur. | 16 Sept. | 2004 | 03 | 385 | Mon. | 15 Sept. | 2042 |
| 304 Cycle. 66 | 354 | Tues. | 4 Oct. | 2005 | 306 Cycle. 04 | 353 | Mon. | 5 Oct. | 2043 |
| 67 | 355 | Sat. | 23 Sept. | 2006 | 05 | 355 | Thur. | 22 Sept. | 2044 |
| 68 | 383 | Thur. | 13 Sept. | 2007 | 06 | 384 | Tues. | 12 Sept. | 2045 |
| 69 | 354 | Tues. | 30 Sept. | 2008 | 07 | 355 | Mon. | 1 Oct. | 2046 |
| 70 | 355 | Sat. | 19 Sept. | 2009 | 08 | 353 | Sat. | 21 Sept. | 2047 |
| 71 | 385 | Thur. | 9 Sept. | 2010 | 09 | 384 | Tues. | 8 Sept. | 2048 |
| 72 | 354 | Thur. | 29 Sept. | 2011 | 10 | 355 | Mon. | 27 Sept. | 2049 |
| 73 | 353 | Mon. | 17 Sept. | 2012 | 11 | 355 | Sat. | 17 Sept. | 2050 |
| 74 | 385 | Thur. | 5 Sept. | 2013 | 12 | 383 | Thur. | 7 Sept. | 2051 |
| 75 | 354 | Thur. | 25 Sept. | 2014 | 13 | 354 | Tues. | 24 Sept. | 2052 |
| 76 | 385 | Mon. | 14 Sept. | 2015 | 14 | 385 | Sat. | 13 Sept. | 2053 |
| 5777 | 353 | Mon. | 3 Oct. | 2016 | 5815 | 355 | Sat. | 3 Oct. | 2054 |
| 78 | 354 | Thur. | 21 Sept. | 2017 | 16 | 354 | Thur. | 23 Sept. | 2055 |
| 79 | 385 | Mon. | 10 Sept. | 2018 | 17 | 383 | Mon. | 11 Sept. | 2056 |
| 80 | 355 | Mon. | 30 Sept. | 2019 | 18 | 355 | Sat. | 29 Sept. | 2057 |
| 81 | 353 | Sat. | 19 Sept. | 2020 | 19 | 354 | Thur. | 19 Sept. | 2058 |
| 82 | 384 | Tues. | 7 Sept. | 2021 | 20 | 383 | Mon. | 8 Sept. | 2059 |
| 83 | 355 | Mon. | 26 Sept. | 2022 | 21 | 355 | Sat. | 25 Sept. | 2060 |
| 84 | 383 | Sat. | 16 Sept. | 2023 | 22 | 385 | Thur. | 15 Sept. | 2061 |
| 305 Cycle. 85 | 355 | Thur. | 3 Oct. | 2024 | 307 Cycle. 23 | 354 | Thur. | 5 Oct. | 2062 |
| 86 | 354 | Tues. | 23 Sept. | 2025 | 24 | 353 | Mon. | 24 Sept. | 2063 |
| 87 | 385 | Sat. | 12 Sept. | 2026 | 25 | 385 | Thur. | 11 Sept. | 2064 |
| 88 | 355 | Sat. | 2 Oct. | 2027 | 26 | 354 | Thur. | 1 Oct. | 2065 |
| 89 | 354 | Thur. | 21 Sept. | 2028 | 27 | 355 | Mon. | 20 Sept. | 2066 |
| 90 | 383 | Mon. | 10 Sept. | 2029 | 28 | 383 | Sat. | 10 Sept. | 2067 |
| 91 | 355 | Sat. | 28 Sept. | 2030 | 29 | 354 | Thur. | 27 Sept. | 2068 |
| 92 | 354 | Thur. | 18 Sept. | 2031 | 30 | 355 | Mon. | 16 Sept. | 2069 |
| 93 | 383 | Mon. | 6 Sept. | 2032 | 31 | 383 | Sat. | 6 Sept. | 2070 |
| 94 | 355 | Sat. | 24 Sept. | 2033 | 32 | 355 | Thur. | 24 Sept. | 2071 |
| 95 | 385 | Thur. | 14 Sept. | 2034 | 33 | 384 | Tues. | 13 Sept. | 2072 |

### MAHOMETAN CALENDAR.

The Mahometan era, or era of the Hegira, employed in Turkey, Persia, Arabia, &c., is dated from the flight of Mahomet from Mecca to Medina, which was in the night of Thursday the 15th of July, A.D. 622, and it commenced on the day following. The years of the Hegira are purely lunar, and always consist of twelve lunar months commencing with the approximate new moon, without any intercalation to keep them to the same season with respect to the Sun, so that they retrograde through all the seasons in about $32\frac{1}{2}$ years. They are also partitioned into cycles of 30 years, 19 of which are common years of 354 days each, and the other 11 are intercalary years having an additional day appended to the last month. The mean length of the year is therefore $354\frac{11}{30}$ days or 354 days 8 hours 48 min., which divided by 12 gives $29\frac{191}{360}$ days or 29 days 12 hours 44 min. as the time of a mean lunation, and this differs from the astronomical mean lunation by only 3 seconds. This small error will not amount to a day in less than 2300 years.

To find if a year is intercalary or common, divide it by 30; the quotient will be the number of completed cycles and the remainder will be the year of the current cycle; if this last be one of the numbers 2, 5, 7, 10, 13, 16, 18, 21, 24, 26, 29, the year is intercalary and consists of 355 days; if it be any other number, the year is ordinary.

Or if $Y$ denote the number of the year, and

$$R = \left(\frac{11\,Y + 14}{30}\right)_r;$$

the year is intercalary when $R < 11$.

Also the number of intercalary years from the year 1 up to the year $Y$ inclusive $= \left(\dfrac{11\,Y + 14}{30}\right)_w$; and the same, exclusive of the year $Y$, $= \left(\dfrac{11\,Y + 3}{30}\right)_w.$

To find the day of the week on which any year of the Hegira begins, we observe that the year 1 began on a Friday, and that after every common year of 354 days, or 50 weeks and 4 days, the day of the week must necessarily become postponed 4 days, besides the additional day of each intercalary year.

Hence if $w = 1$ | 2 | 3 | 4 | 5 | 6 | 7 |
indicate Sun. | Mon. | Tues. | Wed. | Thur. | Frid. | Sat. |

the day of the week on which the year $Y$ commences will be

$$w = 2 + 4 \left(\frac{Y}{7}\right)_r + \left(\frac{11\,Y + 3}{30}\right)_w \text{ (rejecting sevens)};$$

which admits of being reduced to the more convenient formula

$$w = 7 - \left(\frac{Y}{7}\right)_r + 3 \left(\frac{11\,Y + 3}{30}\right)_r \text{ (rejecting sevens),}$$

the values of which obviously circulate in a period of 7 times 30 or 210 years.

Let $C$ denote the number of completed cycles, and $y$ the year of the cycle; then $Y = 30\,C + y$, and

$$w = 5 \left(\frac{C}{7}\right)_r + 6 \left(\frac{y}{7}\right)_r + 3 \left(\frac{11\,y + 3}{30}\right)_r \text{ (rejecting sevens).}$$

From this formula the following table has been constructed:—

| Year of the Current Cycle ($y$). | | | | Number of the Period of Seven Cycles $= \left(\frac{C}{7}\right)_r$ | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 0 | 1 | 2 | 3 | 4 | 5 | 6 |
| 0 | 8 | | | Mon. | Sat. | Thur. | Tues. | Sun. | Frid. | Wed. |
| 1 | 9 | 17 | 25 | Frid. | Wed. | Mon. | Sat. | Thur. | Tues. | Sun. |
| *2 | *10 | *18 | *26 | Tues. | Sun. | Frid. | Wed. | Mon. | Sat. | Thur. |
| 3 | 11 | 19 | 27 | Sun. | Frid. | Wed. | Mon. | Sat. | Thur. | Tues. |
| 4 | 12 | 20 | 28 | Thur. | Tues. | Sun. | Frid. | Wed. | Mon. | Sat. |
| *5 | *13 | *21 | *29 | Mon. | Sat. | Thur. | Tues. | Sun. | Frid. | Wed. |
| 6 | 14 | 22 | 30 | Sat. | Thur. | Tues. | Sun. | Frid. | Wed. | Mon. |
| *7 | 15 | 23 | | Wed. | Mon. | Sat. | Thur. | Tues. | Sun. | Frid. |
| | *16 | *24 | | Sun. | Frid. | Wed. | Mon. | Sat. | Thur. | Tues. |

To find from this table the day of the week on which any year of the Hegira commences, the rule to be observed will be as follows :—

*Rule.*—Divide the year of the Hegira by 30; the quotient is the number of cycles, and the remainder is the year of the current cycle. Next divide the number of cycles by 7, and the second remainder will be the Number of the Period, which being found at the top of the table, and the year of the cycle on the left hand, the required day of the week is immediately shown.

The intercalary years of the cycle are distinguished by an asterisk.

For the computation of the Christian date, the ratio of a mean year of the Hegira to a solar year is

$$\frac{\text{Year of Hegira}}{\text{Mean solar year}} = \frac{354\frac{11}{30}}{365\cdot24222} = 0\cdot970224.$$

The year 1 began 16 July, 622, Old Style, or 19 July, 622, according to the New or Gregorian Style. Now the day of the year answering to the 19th of July is 200 which, in parts of the solar year, is 0·5476, and the number of years elapsed $= Y - 1$. Therefore, as the intercalary days are distributed with considerable regularity in both calendars, the date of commencement of the year $Y$ expressed in Gregorian years is

$$0\cdot970224 \ (Y-1) + 622\cdot5476,$$
$$\text{or} \ \ 0\cdot970224 \ Y + 621\cdot5774.$$

This formula gives the following rule for calculating the date of the commencement of any year of the Hegira, according to the Gregorian or New Style.

*Rule.*—Multiply 970224 by the year of the Hegira, cut off six decimals from the product, and add 621·5774. The

sum will be the year of the Christian era, and the day of the year will be found by multiplying the decimal figures by 365.

The result may sometimes differ a day from the truth as the intercalary days do not occur simultaneously; but as the day of the week can always be accurately obtained from the foregoing table, the error, if any, can be readily adjusted.

*Example.*—Required the date on which the year 1362 of the Hegira begins.

$$
\begin{array}{r}
970224 \\
1362 \\
\hline
1940448 \\
5821344 \\
2910672 \\
970224 \\
\hline
1321{\cdot}445088 \\
621{\cdot}5774 \\
\hline
1943{\cdot}0225 \\
365 \\
\hline
1125 \\
1350 \\
675 \\
\hline
8{\cdot}2125
\end{array}
$$

Thus the date is the 8th day, or 8 January, of the year 1943.

To find, as a test, the accurate day of the week, the proposed year of the Hegira divided by 30 gives 45 cycles and remainder 12, the year of the current cycle.

Also 45 divided by 7 leaves a remainder 3 for the number of the period.

Therefore, referring to 3 at the top of the table and 12 on the left, the required day is Friday.

The tables, pages 146-7, show that 8 Jan. 1943 is a Friday; therefore the date is exact.

For any other date of the Mahometan year it is only requisite to know the names of the consecutive months, and the length of each; these are,

| Muharram | . | . | . | 30 | Shaaban | . | . | . | . | 29 |
| Saphar | . | . | . | 29 | Ramadân | . | . | . | 30 |
| Rabia I. | . | . | . | 30 | Shawall | . | : | . | . | 29 |
| Rabia II. | . | . | . | 29 | Dulkaada | . | . | . | 30 |
| Jomada I. | . | . | . | 30 | Dulheggia | . | . | . | 29 |
| Jomada II. | . | . | . | 29 | and, in intercalary | | |
| Rajab | . | . | . | . | 30 | years, 30 days. | | |

The ninth month, Ramadân, is the month of Abstinence observed by the Turks.

The Turkish calendar may evidently be carried on indefinitely by successive addition, observing only to allow for the additional day that occurs in the bissextile and intercalary years; but for any remote date the computation according to the preceding rules will be most efficient, and such computation may be usefully employed as a check on the accuracy of any considerable extension of the calendar by induction alone.

The following table shows the dates of commencement of Mahometan years for 1845 up to 2047, or from the 43rd to the 49th cycle inclusive, which form the whole of the seventh period of seven cycles. Throughout the next period of seven cycles, and all other like periods, the days of the week will recur in exactly the same order.

All the tables hitherto published, of this kind, which extend beyond the year 1900 of the Christian era, are erroneous, not excepting the celebrated French work, *L'Art de vérifier les Dates*, so justly regarded as the greatest authority in chronological matters. The errors have probably arisen from a continued excess of 10 in the discrimination of the intercalary years, and they have been faithfully transcribed by other authors.

## *Table of* MAHOMETAN YEARS.

| 43rd Cycle. | | | | 44th Cycle. | | | |
|---|---|---|---|---|---|---|---|
| Year of Hegira. | Commencement (1st of Muharram). | | | Year of Hegira. | Commencement (1st of Muharram). | | |
| 1261 | Frid. | 10 Jan. | 1845 | 1291 | Wed. | 18 Feb. | 1874 |
| 1262* | Tues. | 30 Dec. | 1845 | 1292* | Sun. | 7 Feb. | 1875 |
| 1263 | Sun. | 20 Dec. | 1846 | 1293 | Frid. | 28 Jan. | 1876 |
| 1264 | Thur. | 9 Dec. | 1847 | 1294 | Tues. | 16 Jan. | 1877 |
| 1265* | Mon. | 27 Nov. | 1848 | 1295* | Sat. | 5 Jan. | 1878 |
| 1266 | Sat. | 17 Nov. | 1849 | 1296 | Thur. | 26 Dec. | 1878 |
| 1267* | Wed. | 6 Nov. | 1850 | 1297* | Mon. | 15 Dec. | 1879 |
| 1268 | Mon. | 27 Oct. | 1851 | 1298 | Sat. | 4 Dec. | 1880 |
| 1269 | Frid. | 15 Oct. | 1852 | 1299 | Wed. | 23 Nov. | 1881 |
| 1270* | Tues. | 4 Oct. | 1853 | 1300* | Sun. | 12 Nov. | 1882 |
| 1271 | Sun. | 24 Sept. | 1854 | 1301 | Frid. | 2 Nov. | 1883 |
| 1272 | Thur. | 13 Sept. | 1855 | 1302 | Tues. | 21 Oct. | 1884 |
| 1273* | Mon. | 1 Sept. | 1856 | 1303* | Sat. | 10 Oct. | 1885 |
| 1274 | Sat. | 22 Aug. | 1857 | 1304 | Thur. | 30 Sept. | 1886 |
| 1275 | Wed. | 11 Aug. | 1858 | 1305 | Mon. | 19 Sept. | 1887 |
| 1276* | Sun. | 31 July | 1859 | 1306* | Frid. | 7 Sept. | 1888 |
| 1277 | Frid. | 20 July | 1860 | 1307 | Wed. | 28 Aug. | 1889 |
| 1278* | Tues. | 9 July | 1861 | 1308* | Sun. | 17 Aug. | 1890 |
| 1279 | Sun. | 29 June | 1862 | 1309 | Frid. | 7 Aug. | 1891 |
| 1280 | Thur. | 18 June | 1863 | 1310 | Tues. | 26 July | 1892 |
| 1281* | Mon. | 6 June | 1864 | 1311* | Sat. | 15 July | 1893 |
| 1282 | Sat. | 27 May | 1865 | 1312 | Thur. | 5 July | 1894 |
| 1283 | Wed. | 16 May | 1866 | 1313 | Mon. | 24 June | 1895 |
| 1284* | Sun. | 5 May | 1867 | 1314* | Frid. | 12 June | 1896 |
| 1285 | Frid. | 24 April | 1868 | 1315 | Wed. | 2 June | 1897 |
| 1286* | Tues. | 13 April | 1869 | 1316* | Sun. | 22 May | 1898 |
| 1287 | Sun. | 3 April | 1870 | 1317 | Frid. | 12 May | 1899 |
| 1288 | Thur. | 23 Mar. | 1871 | 1318 | Tues. | 1 May | 1900 |
| 1289* | Mon. | 11 Mar. | 1872 | 1319* | Sat. | 20 April | 1901 |
| 1290 | Sat. | 1 Mar. | 1873 | 1320 | Thur. | 10 April | 1902 |

## Table of MAHOMETAN YEARS.

| 45th Cycle. | | | | 46th Cycle. | | | |
|---|---|---|---|---|---|---|---|
| Year of Hegira. | Commencement (1st of Muharram). | | | Year of Hegira. | Commencement (1st of Muharram). | | |
| 1321 | Mon. | 30 Mar. | 1903 | 1351 | Sat. | 7 May | 1932 |
| 1322* | Frid. | 18 Mar. | 1904 | 1352* | Wed. | 26 April | 1933 |
| 1323 | Wed. | 8 Mar. | 1905 | 1353 | Mon. | 16 April | 1934 |
| 1324 | Sun. | 25 Feb. | 1906 | 1354 | Frid. | 5 April | 1935 |
| 1325* | Thur. | 14 Feb. | 1907 | 1355* | Tues. | 24 Mar. | 1936 |
| 1326 | Tues. | 4 Feb. | 1908 | 1356 | Sun. | 14 Mar. | 1937 |
| 1327* | Sat. | 23 Jan. | 1909 | 1357* | Thur. | 3 Mar. | 1938 |
| 1328 | Thur. | 13 Jan. | 1910 | 1358 | Tues. | 21 Feb. | 1939 |
| 1329 | Mon. | 2 Jan. | 1911 | 1359 | Sat. | 10 Feb. | 1940 |
| 1330* | Frid. | 22 Dec. | 1911 | 1360* | Wed. | 29 Jan. | 1941 |
| 1331 | Wed. | 11 Dec. | 1912 | 1361 | Mon. | 19 Jan. | 1942 |
| 1332 | Sun. | 30 Nov. | 1913 | 1362 | Frid. | 8 Jan. | 1943 |
| 1333* | Thur. | 19 Nov. | 1914 | 1363* | Tues. | 28 Dec. | 1943 |
| 1334 | Tues. | 9 Nov. | 1915 | 1364 | Sun. | 17 Dec. | 1944 |
| 1335 | Sat. | 28 Oct. | 1916 | 1365 | Thur. | 6 Dec. | 1945 |
| 1336* | Wed. | 17 Oct. | 1917 | 1366* | Mon. | 25 Nov. | 1946 |
| 1337 | Mon. | 7 Oct. | 1918 | 1367 | Sat. | 15 Nov. | 1947 |
| 1338* | Frid. | 26 Sept. | 1919 | 1368* | Wed. | 3 Nov. | 1948 |
| 1339 | Wed. | 15 Sept. | 1920 | 1369 | Mon. | 24 Oct. | 1949 |
| 1340 | Sun. | 4 Sept. | 1921 | 1370 | Frid. | 13 Oct. | 1950 |
| 1341* | Thur. | 24 Aug. | 1922 | 1371* | Tues. | 2 Oct. | 1951 |
| 1342 | Tues. | 14 Aug. | 1923 | 1372 | Sun. | 21 Sept. | 1952 |
| 1343 | Sat. | 2 Aug. | 1924 | 1373 | Thur. | 10 Sept. | 1953 |
| 1344* | Wed. | 22 July | 1925 | 1374* | Mon. | 30 Aug. | 1954 |
| 1345 | Mon. | 12 July | 1926 | 1375 | Sat. | 20 Aug. | 1955 |
| 1346* | Frid. | 1 July | 1927 | 1376* | Wed. | 8 Aug. | 1956 |
| 1347 | Wed. | 20 June | 1928 | 1377 | Mon. | 29 July | 1957 |
| 1348 | Sun. | 9 June | 1929 | 1378 | Frid. | 18 July | 1958 |
| 1349* | Thur. | 29 May | 1930 | 1379* | Tues. | 7 July | 1959 |
| 1350 | Tues. | 19 May | 1931 | 1380 | Sun. | 26 June | 1960 |

*Table of* MAHOMETAN YEARS.

| 47th Cycle. | | | 48th Cycle. | | |
|---|---|---|---|---|---|
| Year of Hegira. | Commencement (1st of Muharram). | | Year of Hegira. | Commencement (1st of Muharram). | |
| 1381 | Thur. | 15 June 1961 | 1411 | Tues. | 24 July 1990 |
| 1382* | Mon. | 4 June 1962 | 1412* | Sat. | 13 July 1991 |
| 1383 | Sat. | 25 May 1963 | 1413 | Thur. | 2 July 1992 |
| 1384 | Wed. | 13 May 1964 | 1414 | Mon. | 21 June 1993 |
| 1385* | Sun. | 2 May 1965 | 1415* | Frid. | 10 June 1994 |
| 1386 | Frid. | 22 April 1966 | 1416 | Wed. | 31 May 1995 |
| 1387* | Tues. | 11 April 1967 | 1417* | Sun. | 19 May 1996 |
| 1388 | Sun. | 31 Mar. 1968 | 1418 | Frid. | 9 May 1997 |
| 1389 | Thur. | 20 Mar. 1969 | 1419 | Tues. | 28 April 1998 |
| 1390* | Mon. | 9 Mar. 1970 | 1420* | Sat. | 17 April 1999 |
| 1391 | Sat. | 27 Feb. 1971 | 1421 | Thur. | 6 April 2000 |
| 1392 | Wed. | 16 Feb. 1972 | 1422 | Mon. | 26 Mar. 2001 |
| 1393* | Sun. | 4 Feb. 1973 | 1423* | Frid. | 15 Mar. 2002 |
| 1394 | Frid. | 25 Jan. 1974 | 1424 | Wed. | 5 Mar. 2003 |
| 1395 | Tues. | 14 Jan. 1975 | 1425 | Sun. | 22 Feb. 2004 |
| 1396* | Sat. | 3 Jan. 1976 | 1426* | Thur. | 10 Feb. 2005 |
| 1397 | Thur. | 23 Dec. 1976 | 1427 | Tues. | 31 Jan. 2006 |
| 1398* | Mon. | 12 Dec. 1977 | 1428* | Sat. | 20 Jan. 2007 |
| 1399 | Sat. | 2 Dec. 1978 | 1429 | Thur. | 10 Jan. 2008 |
| 1400 | Wed. | 21 Nov. 1979 | 1430 | Mon. | 29 Dec. 2008 |
| 1401* | Sun. | 9 Nov. 1980 | 1431* | Frid. | 18 Dec. 2009 |
| 1402 | Frid. | 30 Oct. 1981 | 1432 | Wed. | 8 Dec. 2010 |
| 1403 | Tues. | 19 Oct. 1982 | 1433 | Sun. | 27 Nov. 2011 |
| 1404* | Sat. | 8 Oct. 1983 | 1434* | Thur. | 15 Nov. 2012 |
| 1405 | Thur. | 27 Sept. 1984 | 1435 | Tues. | 5 Nov. 2013 |
| 1406* | Mon. | 16 Sept. 1985 | 1436* | Sat. | 25 Oct. 2014 |
| 1407 | Sat. | 6 Sept. 1986 | 1437 | Thur. | 15 Oct. 2015 |
| 1408 | Wed. | 26 Aug. 1987 | 1438 | Mon. | 3 Oct. 2016 |
| 1409* | Sun. | 14 Aug. 1988 | 1439* | Frid. | 22 Sept. 2017 |
| 1410 | Frid. | 4 Aug. 1989 | 1440 | Wed. | 12 Sept. 2018 |

## Table of MAHOMETAN YEARS.

| 49th Cycle. | | | | | |
|---|---|---|---|---|---|
| Year of Hegira. | Commencement (1st of Muharram). | | Year of Hegira. | Commencement (1st of Muharram). | |
| 1441 | Sun. | 1 Sept. 2019 | 1456* | Tues | 21 Mar. 2034 |
| 1442* | Thur. | 20 Aug. 2020 | 1457 | Sun. | 11 Mar. 2035 |
| 1443 | Tues. | 10 Aug. 2021 | 1458* | Thur. | 28 Feb. 2036 |
| 1444 | Sat. | 30 July 2022 | 1459 | Tues. | 17 Feb. 2037 |
| 1445* | Wed. | 19 July 2023 | 1460 | Sat. | 6 Feb. 2038 |
| 1446 | Mon. | 8 July 2024 | 1461* | Wed. | 26 Jan. 2039 |
| 1447* | Frid. | 27 June 2025 | 1462 | Mon. | 16 Jan. 2040 |
| 1448 | Wed. | 17 June 2026 | 1463 | Frid. | 4 Jan. 2041 |
| 1449 | Sun. | 6 June 2027 | 1464* | Tues. | 24 Dec. 2041 |
| 1450* | Thur. | 25 May 2028 | 1465 | Sun. | 14 Dec. 2042 |
| 1451 | Tues. | 15 May 2029 | 1466* | Thur. | 3 Dec. 2043 |
| 1452 | Sat. | 4 May 2030 | 1467 | Tues. | 22 Nov. 2044 |
| 1453* | Wed. | 23 April 2031 | 1468 | Sat. | 11 Nov. 2045 |
| 1454 | Mon. | 12 April 2032 | 1469* | Wed. | 31 Oct. 2046 |
| 1455 | Frid. | 1 April 2033 | 1470 | Mon. | 21 Oct. 2047 |

## Table of EPOCHS of the PRINCIPAL ERAS AND PERIODS.

| Name. | Christian Date of Commencement. | Name. | Christian Date of Commencement. |
|---|---|---|---|
| Grecian Mundane era . . . . | 1 Sept 5598 B.C. | Sidonian era . . | Oct. 110 B.C. |
| Civil era of Constantinople . | 1 Sept. 5508 ,, | Cæsarean era of Antioch . . | 1 Sept. 48 ,, |
| Alexandrian era . | 29 Aug. 5502 ,, | Julian year . . | 1 Jan. 45 ,, |
| Ecclesiastical era of Antioch . | 1 Sept. 5492 ,, | Spanish era . . | 1 Jan. 38 ,, |
| Julian Period . | 1 Jan. 4713 ,, | Actian era . . | 1 Jan. 30 ,, |
| Mundane era . | Oct. 4008 ,, | Augustan era . | 14 Feb. 27 ,, |
| Jewish Mundane era . . . . | Oct. 3761 ,, | Vulgar Christian era . . . . | 1 Jan. 1 A.D. |
| Era of Abraham | 1 Oct. 2015 ,, | Destruction of Jerusalem . . | 1 Sept. 69 ,, |
| Era of the Olympiads . . . | 1 July 776 ,, | Era of Maccabees | 24 Nov. 166 ,, |
| Roman era . . | 24 April 753 ,, | ,, ,, Dioclesian | 17 Sept. 284 ,, |
| Era of Nabonassar | 26 Feb. 747 ,, | ,, ,, Ascension | 12 Nov. 295 ,, |
| Metonic Cycle . | 15 July 432 ,, | ,, ,, the Armenians . . | 7 July 552 ,, |
| Grecian or Syro-Macedonian era | 1 Sept. 312 ,, | Mahometan era of the Hegira . | 16 July 622 ,, |
| Tyrian era . . | 19 Oct. 125 ,, | Persian era of Yezdegird . . . | 16 June 632 ,, |

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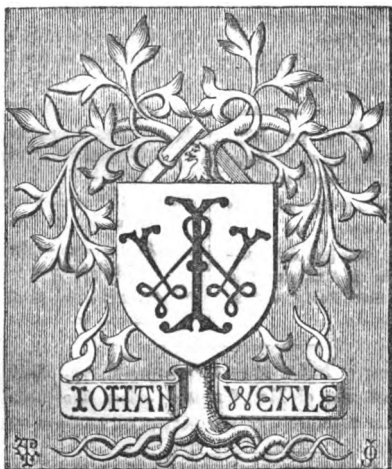
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