

**English standard measures of length**

MEASURES OF LENGTH

- 1 mile = 1760 yards = 5280 feet.
- 1 yard = 3 feet = 36 inches.
- 1 foot = 12 inches.
- The following measures of length are also used occasionally:
- 1 mil = 0.001 inch. 1 fathom = 2 yards = 6 feet.
- 1 rod = 5.5 yards = 16.5 feet. 1 hand = 4 inches. 1 span = 9 inches.

SURVEYOR'S MEASURE

- 1 mile = 8 furlongs = 80 chains.
- 1 furlong = 10 chains = 220 yards.
- 1 chain = 4 rods = 22 yards = 66 feet = 100 links.
- 1 link = 7.92 inches.

SQUARE MEASURE

- 1 square mile = 640 acres = 6400 square chains.
- 1 acre = 10 square chains = 4840 square yards = 43,560 square feet.
- 1 square chain = 16 square rods = 484 square yards = 4356 square feet.
- 1 square rod = 30.25 square yards = 272.25 square feet = 625 square links.
- 1 square yard = 9 square feet.
- 1 square foot = 144 square inches.
- An acre is equal to a square, the side of which is 208.7 feet.

**English standard measures of volume**

CUBIC MEASURE

- 1 cubic yard = 27 cubic feet.
- 1 cubic foot = 1728 cubic inches.
- The following measures are also used for wood and masonry:
- 1 cord of wood = 4 x 4 x 8 feet = 128 cubic feet.
- 1 perch of masonry = 16 1/2 x 15 x 1 foot = 24 1/2 cubic feet.

DRY MEASURE

- 1 bushel (U. S. or Winchester struck bushel) = 1.2445 cubic foot = 2150.42 cubic inches.
- 1 bushel = 4 pecks = 32 quarts = 64 pints.
- 1 peck = 8 quarts = 16 pints.
- 1 quart = 2 pints.
- 1 heaped bushel = 1 1/2 struck bushels.
- 1 cubic foot = 0.8036 struck bushel.
- 1 British Imperial bushel = 8 Imperial gallons = 1.2837 cubic foot = 2218.19 cubic inches.

LIQUID MEASURE

- 1 U. S. gallon = 0.1337 cubic feet = 231 cubic inches = 4 quarts = 8 pints.
- 1 quart = 2 pints = 8 gills.
- 1 pint = 4 gills.
- 1 British Imperial gallon = 1.2003 U. S. gallon = 277.27 cubic inches.
- 1 cubic foot = 7.48 U. S. gallons.

**English standard measures of weight**

AVOIRDUPOIS OR COMMERCIAL WEIGHT

- 1 gross or long ton = 2240 pounds.
- 1 net or short ton = 2000 pounds.
- 1 pound = 16 ounces = 7000 grains.
- 1 ounce = 16 drachms = 437.5 grains.

CIRCULAR AND ANGULAR MEASURE

- 60 seconds (") = 1 minute (').
- 60 minutes = 1 degree (°).
- 360 degrees = 1 circumference (C).

**Metric system of measurements**

MEASURES OF LENGTH

- 10 millimeters (mm.) = 1 centimeter (cm.).
- 10 centimeters = 1 decimeter (dm.).
- 10 decimeters = 1 meter (m.).
- 1000 meters = 1 kilometer (Km.).

SQUARE MEASURE

- 1000 square millimeters (mm.<sup>2</sup>) = 1 square centimeter (cm.<sup>2</sup>).
- 100 square centimeters = square decimeter (dm.<sup>2</sup>).
- 100 square decimeters = 1 square meter (m.<sup>2</sup>).

SURVEYOR'S SQUARE MEASURE

- 100 square meters (m.<sup>2</sup>) = 1 are (ar.).
- 100 ares = 1 hectare (har.).
- 100 hectares = 1 square kilometer (Km.<sup>2</sup>).

CUBIC MEASURE

- 1000 cubic millimeters (mm.<sup>3</sup>) = 1 cubic centimeter (cm.<sup>3</sup>).
- 1000 cubic centimeters = 1 cubic decimeter (dm.<sup>3</sup>).
- 1000 cubic decimeters = 1 cubic meter (m.<sup>3</sup>).

DRY AND LIQUID MEASURE

- 10 milliliters (ml.) = 1 centiliter (cl.).
- 10 centiliters = 1 deciliter (dl.).
- 10 deciliters = 1 liter (l.).
- 100 liters = 1 hectoliter (hl.).

1 liter = 1 cubic decimeter = the volume of 1 kilogram of pure water at a temperature of 39.2 degrees F.

MEASURES OF WEIGHT

- 10 milligram (mg.) = 1 centigram (cg.).
- 10 centigrams = 1 decigram (dg.).
- 10 decigrams = 1 gram (g.).
- 10 grams = 1 decagram (Dg.).
- 10 decagrams = 1 hectogram (Hg.).
- 10 hectograms = 1 kilogram (Kg.).
- 1000 kilograms = (metric) ton (T.).

**Miscellaneous information**

To find the diameter of a circle multiply the circumference by .31831.

To find the circumference of a circle multiply the diameter by 3.1416.

To find the area of a circle multiply the square of the diameter by .7854.

To find the surface of a ball multiply the square of the diameter by 3.1416.

To find the side of an equal square multiply the diameter by .8662.

To find the cubic inches in a ball multiply the cube of the diameter by .5236.

To double the diameter of a pipe increases its capacity four times.

Double riveting is from 16 to 20 per cent stronger than single.

One cubic foot of anthracite coal weighs about 53 pounds.

One cubic foot of bituminous coal weighs from 47 to 50 pounds.

One ton of coal is equivalent to two cords of wood for steam purposes.

A gallon of water (U. S. standard) weighs 8 1/8 pounds and contains 231 cubic inches.

A standard or Winchester bushel contains 2150.4 cubic inches.

There are 9 square feet of heating surface to each square foot of grate surface.

A cubic foot of water contains 7 1/2 gallons, 1728 cubic inches and weighs 62 1/2 pounds.

Each nominal horse power of a boiler requires 30 to 35 pounds of water per hour.

A horse power is equivalent to raising 33,000 pounds 1 foot per minute or 550 pounds 1 foot per second.

The average consumption of coal for steam boilers is 12 pounds per hour for each square foot of grate surface.

To find the pressure in pounds per square inch of a column of water multiply the height of the column in feet by .434.

Steam rising from water at its boiling point (212 degrees) has a pressure equal to the atmosphere (14.7 pounds to the square inch).

To evaporate one cubic foot of water requires the consumption of 7 1/2 pounds of ordinary coal, or about 1 pound of coal to 1 gallon of water.

The right amount of water for cement mixtures of varying strength is shown in the following table:

**Correct amount of water**

Cement	Sand	Gravel	Water per Sack of Cement
1 sack	1 1/2 cu. ft.	2 1/2 cu. ft.	5 to 5 1/2 gal.
1 sack	1 1/2 cu. ft.	3 cu. ft.	5 1/2 to 6 gal.
1 sack	2 cu. ft.	3 cu. ft.	5 1/2 to 6 1/2 gal.
1 sack	2 cu. ft.	4 cu. ft.	6 to 6 1/2 gal.
1 sack	2 1/2 cu. ft.	5 cu. ft.	7 1/2 to 7 1/2 gal.
1 sack	3 cu. ft.	6 cu. ft.	8 1/2 to 8 1/2 gal.

Below is a table which shows that improper quantities of water wastes the strength of cement.

**Not enough water**

- 10% too little water wastes 27% of the cement strength.
- 6% too little water wastes 10% of the cement strength.

**Too much water**

- 7% too much water wastes 10% of the cement strength.
- 12% too much water wastes 20% of the cement strength.
- 18% too much water wastes 30% of the cement strength.
- 25% too much water wastes 40% of the cement strength.
- 31% too much water wastes 50% of the cement strength.
- 42% too much water wastes 60% of the cement strength.
- 63% too much water wastes 70% of the cement strength.
- 80% too much water wastes 70% of the cement strength.

**Properties of circles**

Diameter being given, to find the circumference, multiply diameter by 3.1416.

Diameter given, to find area, square the diameter and multiply the product by .7854; or multiply one-half the diameter by one-half the circumference.

Area given, to find the diameter, divide the area by .7854 and extract the square root of the quotient.

Diameter given, to find side of a square containing same area, multiply the diameter by .8662.