Measurement of length, capacity and weight

Measurement is a way to find the actual length, weight or capacity of objects that we see around us. Measuring the length of an object means to see how long is that object. Measuring the weight of an object means to see how heavy is that object. Measuring the capacity of an object means to see how much of something (water, sugar, juice, etc.) that object can hold.

The common tools used to measure different things around us are the following: ruler, yardstick, scale, weighing machine, measuring cup, etc.

Measuring Length

If you want to know how long an object is, then you would measure the length of the object. In general, length is the distance from one point to another point.

Measuring tools to measure length

Ruler and measuring tape.

Length measuring units in the US Standard System

In the US Standard System, inches, feet, yards and miles are used to measure length.

Length Measurements US Standard System	
1 foot (ft)	**= 12 inches (in)**
1 yard (yd)	**= 3 feet (ft)**
1 yard (yd)	**= 36 inches (in)**
1 mile (mi)	**= 1760 yards (yd)**
1 mile (mi)	**= 5280 feet (ft)**

The smallest unit of length according to the US Standard System is inches.

Length measuring units in the Metric system

In the Metric system millimeters, centimeters, meters and kilometers, are used to measure length.

Length Measurements Metric System	
1 centimeter (cm)	**= 10 millimeters (mm)**
1 decimeter (dm)	**= 10 centimeters (cm)**
1 meter (m)	**= 10 decimeters (dm)**
1 meter (m)	**= 100 centimeters (cm)**
1 decameter (dm)	**= 10 meters (m)**
1 hectometer (hm)	**= 100 meters (m)**
1 Kilometer (km)	**= 1000 meters (m)**

The smallest unit of length in the metric system is millimeters.

Measuring Capacity

Capacity is a measure to find how much a container or a cup can hold when it is filled.

Say you have a milk mug. You can only fill a specific quantity of milk in it. If you try to fill more than it can hold, the milk will spill over. The total amount of milk you can fill in the mug is called the capacity of the mug.

In the US Standard System, fluid ounces, cups, pints, quarts, and gallons are used to measure capacity.

Measuring tools to measure capacity

You can measure capacity with spoons, measuring cups, and measuring jars.

Capacity measuring units in the US Standard System

Liquid Measurements US Standard System	
1 tablespoon (tbsp)	**= 3 teaspoons (tsp)**
1 fluid ounce (fl oz)	**= 2 tablespoons (tbsp)**
1 cup (c)	**= 8 fluid ounces (fl oz)**
1 pint (pt)	**= 2 cups (c)**
1 pint (pt)	**= 16 fluid ounces (fl oz)**
1 quart (qt)	**= 2 pints (pt)**
1 gallon (gal)	**= 4 quarts (qt)**
1 gallon (gal)	**= 128 fluid ounces (fl oz)**

Capacity measuring units in the Metric System

In the metric system, milliliters and liters are used to measure capacity.

Liquid Measurements Metric System	
1 liter (L)	**= 1000 milliliters (mL)**

Measuring Weight

Weight of an object is the measure used to find how heavy is the object. Say you want to know how heavy your camera is, you can measure its weight by weighing it.

Measuring tools to measure weight

You can measure the weight of solid objects with balances, weighing machines and scales.

Weight measuring units in the US Standard System

The most common units used to measure weight in the US are the following: ounces, pounds and tons.

Weight Measurements US Standard System	
1 pound (lb)	**= 16 ounces (oz)**
1 ton (tn)	**= 2000 pounds (lb)**

The smallest unit of weight according to the US Standard System is ounces.

Weight measuring units in the Metric System

The most common units used to measure weight in the metric system are the following: milligrams, grams and kilograms.

Weight Measurements Metric System	
1 gram (g)	**= 1000 milligrams (mg)**
1 kilogram (kg)	**= 1000 grams (g)**
1 tonne (t)	**= 1000 kilograms (kg)**

Ton Vs. Tonne

What does ton mean? A ton is a unit of weight. Americans measure nearly everything differently from the rest of the world, and weight is no exception.

In America, a ton, also called a short ton, is equal to 2,000 U.S. pounds (abbreviated lbs.).

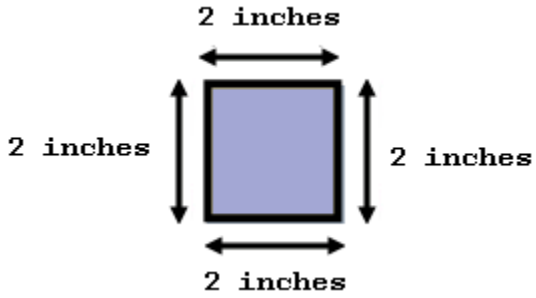
Most other industrialized nations have standardized around the metric system and use what is called the metric ton. A metric ton is equal to 1,000 kilograms (abbreviated kg). Thus, a metric ton is slightly larger than a U.S. ton—it converts to 2,204.6 pounds.

What does tonne mean? Tonne is an alternative spelling used to describe a metric ton. It is almost never used in American English, but it is widely used outside of the United States.

A tonne, also known as a metric ton, is a unit of measurement equal to 1,000 kilograms. A tonne is larger than a U.S. ton.

Perimeter

Perimeter is the distance around a plane figure. It can be calculated by adding the lengths of all the sides of a plane figure.



For example – The lengths of the sides of the square given above is 2 inches each. To calculate the perimeter, we just need to add the lengths of all the sides of the square together.

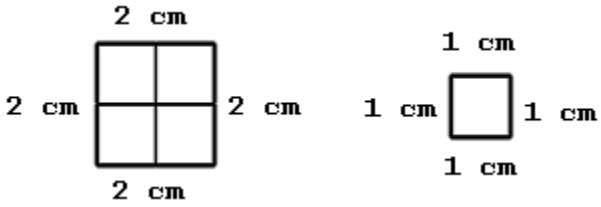
Perimeter = 2 inches + 2 inches + 2 inches + 2 inches

Perimeter = 8 inches

The perimeter of the square given above is 8 inches.

Area

Area is the number of square units needed to cover a plane figure. Let's say you have a square of 2 cm sides. Now think of a square of 1 cm sides – this is called a unit square. How many of the 1 cm squares can you fit in the 2 cm square?

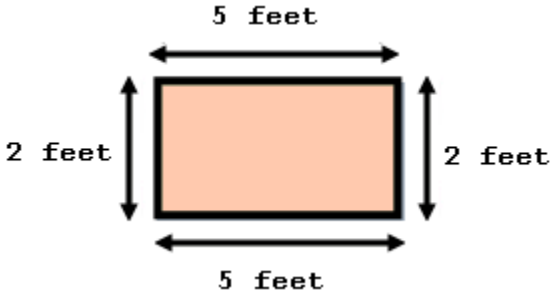


From the figures given above, you can see that you can fit four squares of 1 cm sides in the 2 cm square.

You need four 1 cm sides square to cover the 2 cm square. Hence, the area of the 2 cm square is 4 square cm.

The area of a plane figure can also be easily calculated by multiplying the length and width of the plane figure. Area is measured in square units.

For example – The measure of the sides of the rectangle given below are 2 feet, 5 feet, 2 feet and 5 feet.



Here the length of the rectangle is 5 feet

The width of the rectangle is 2 feet

Area = 5 feet x 2 feet

5 x 2 is 10.

Area = 10 square feet.

So, the area of the rectangle given above is 10 square feet.

Identifying proper measuring tools

We measure many types of things around us on a daily basis. For example, we look at a clock to check what time it is, we look at a calendar to check what day and month it is and we look at a thermometer to check what temperature it is. Here are some of the tools we use in day to day life to measure certain things:

A clock is used to measure and check time. For example, you check the clock to see if it's time to go to school.

A calendar is used to check dates, days and months. For example, you can check the calendar to see what day of the week would your birthday be on this year.

A thermometer is used to measure temperature. For example, you can check the outside temperature to decide what type of clothes you should wear to go outside to play.

A ruler is used to measure length, such as length of a rope or length of a book.

A weighing machine is used to measure weight, such as your body weight or weight of fruits.

A measuring cup is used to measure quantity of liquid, such as a cup of milk or a pint of water.

Measurement Units

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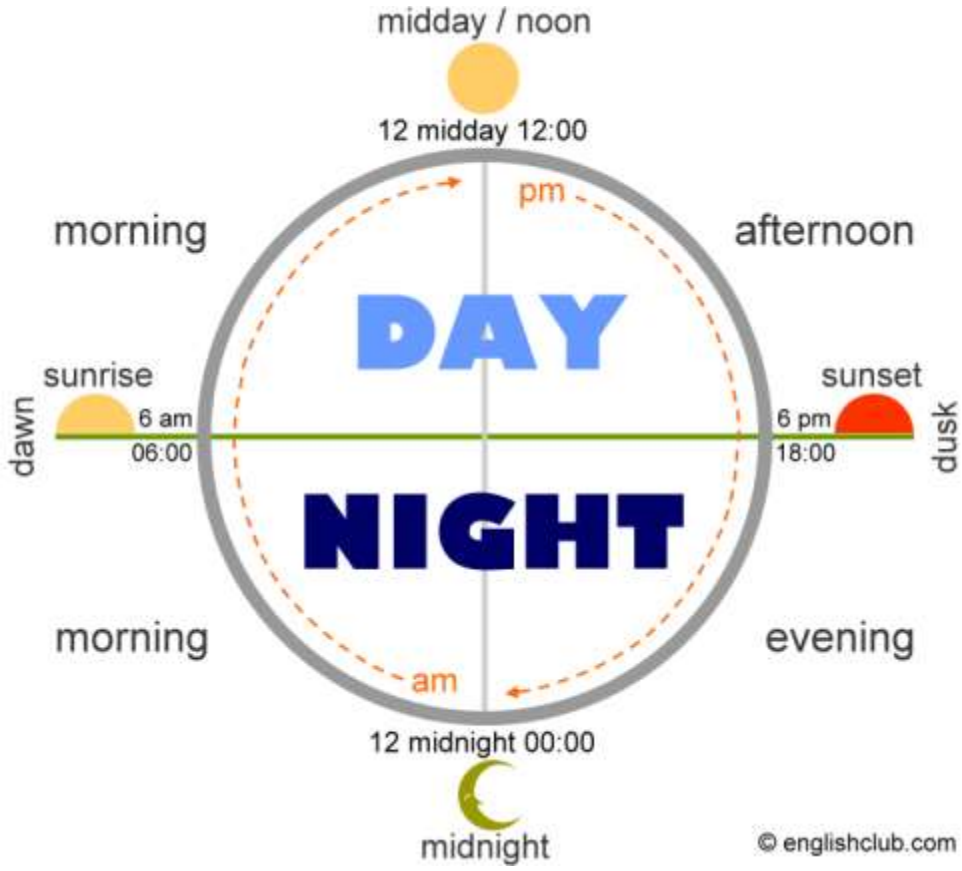
	Length	Weight	Capacity
Metric System	• Millimeters • Centimeters • Meters • Kilometers	• Grams • Kilograms • Tonnes	• Milliliters • Liters
US Standard System	• Inches • Feet • Yards • Miles	• Ounces • Pounds • Tons	• Fluid Ounces • Cups • Pints • Quarts • Gallon

Months of the Year:

Quarter	No.	Name	Days	Season
First Quarter 90 days/91 days	1	January	31	Winter
	2	February	28 (Leap years 29)	Winter
	3	March	31	Spring
Second Quarter 91 days	4	April	30	Spring
	5	May	31	Spring
	6	June	30	Summer
Third Quarter 92 days	7	July	31	Summer
	8	August	31	Summer
	9	September	30	Autumn
Fourth Quarter 92 days	10	October	31	Autumn
	11	November	30	Autumn
	12	December	31	Winter
Common Year: 365 days | Leap Year: 366 days				

Time Measurements	
60 seconds	**= 1 minute**
60 minutes	**= 1 hour**
24 hours	**= 1 day**
7 days	**= 1 week**
52 weeks and 1 day	**= 1 common year**
52 weeks and 2 days	**= 1 leap year**
1 year	**= 12 months**
Decade	**= 10 years**
Century	**= 100 years**
Millennium	**= 1000 years**


midday / noon
12 midday 12:00
pm
morning
afternoon
DAY
sunrise
sunset
dawn
6 am
06:00
6 pm
18:00
dusk
NIGHT
morning
evening
am
12 midnight 00:00
midnight
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Outdoor Temperature

Fahrenheit	Celsius	Kelvin	Weather
100°F	37°C	310 K	Heat Wave
90°F	32°C	305 K	Very Hot
80°F	26°C	299 K	Hot
72°F	22°C	295 K	Room Temperature
60°F	15°C	288 K	Warm
50°F	10°C	283 K	Mild
40°F	4°C	277 K	Cool
32°F	0°C	273 K	Water Freezes
20°F	−6°C	266 K	Cold
10°F	−12°C	260 K	Very Cold
0°F	−17°C	255 K	Frigid

Abbreviation	Unit	Value	Size (in bytes)
b	bit	0 or 1	1/8 of a byte
B	bytes	8 bits	1 byte
KB	kilobytes	1,000 bytes	1,000 bytes
MB	megabyte	$1{,}000^2$ bytes	1,000,000 bytes
GB	gigabyte	$1{,}000^3$ bytes	1,000,000,000 bytes
TB	terabyte	$1{,}000^4$ bytes	1,000,000,000,000 bytes
PB	petabyte	$1{,}000^5$ bytes	1,000,000,000,000,000 bytes
EB	exabyte	$1{,}000^6$ bytes	1,000,000,000,000,000,000 bytes
ZB	zettabyte	$1{,}000^7$ bytes	1,000,000,000,000,000,000,000 bytes
YB	yottabyte	$1{,}000^8$ bytes	1,000,000,000,000,000,000,000,000 bytes

Prefiks	Symbol	Multiplying factor
yotta	Y	1 000 000 000 000 000 000 000 000 = 10^{24}
zetta	Z	1 000 000 000 000 000 000 000 = 10^{21}
exa	E	1 000 000 000 000 000 000 = 10^{18}
peta	P	1 000 000 000 000 000 = 10^{15}
tera	T	1 000 000 000 000 = 10^{12}
giga	G	1 000 000 000 = 10^{9}
mega	M	1 000 000 = 10^{6}
kilo	k	1 000 = 10^{3}
hecto	h	100 = 10^{2}
deka	da	10 = 10^{1}
deci	d	0,1 = 10^{-1}
centi	c	0,01 = 10^{-2}
milli	m	0,001 = 10^{-3}
mikro	μ	0,000 001 = 10^{-6}
nano	n	0,000 000 001 = 10^{-9}
piko	p	0,000 000 000 001 = 10^{-12}
femto	f	0,000 000 000 000 001 = 10^{-15}
atto	a	0,000 000 000 000 000 001 = 10^{-18}
zepto	z	0,000 000 000 000 000 000 001 = 10^{-21}
yocto	y	0,000 000 000 000 000 000 000 001 = 10^{-24}

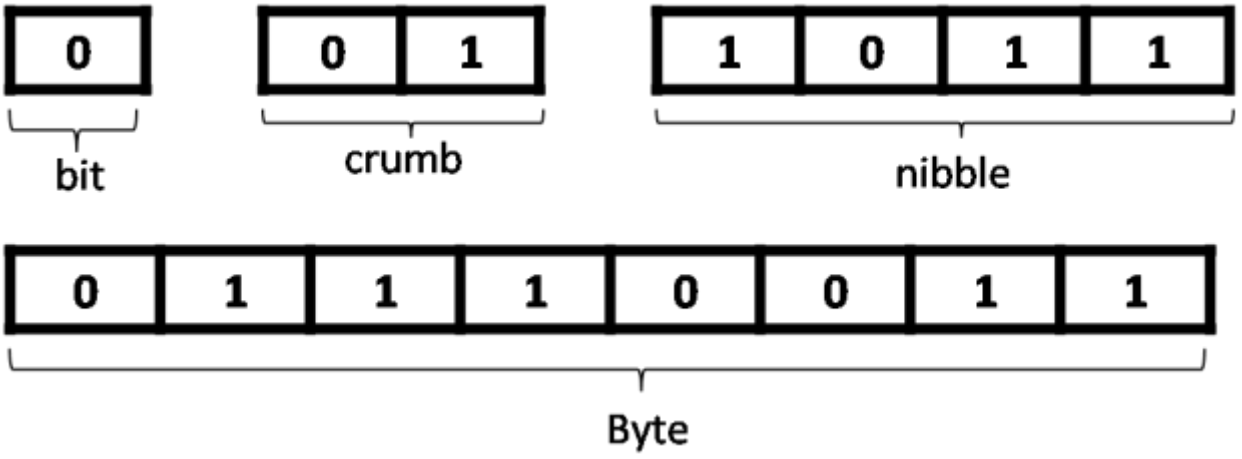
Binary Number System

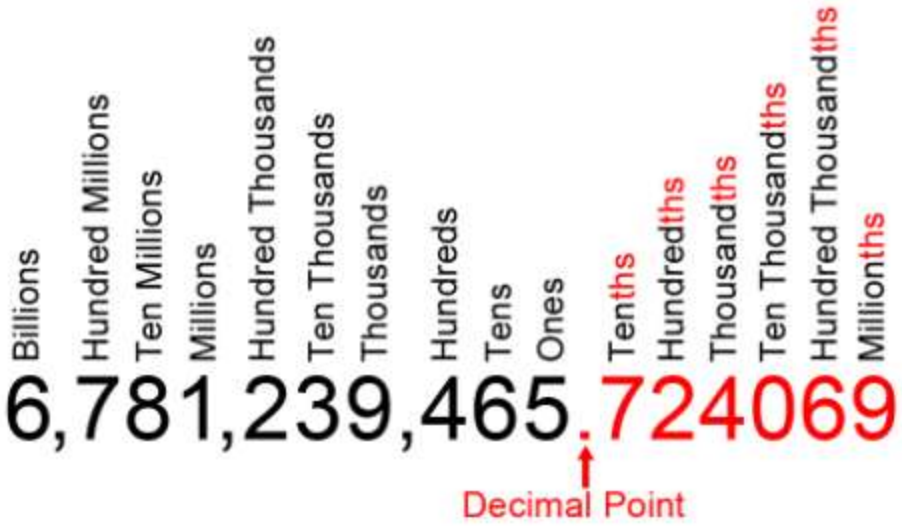
A bit
- Stands for binary digit is a single place or position in a binary number.

Nibble
- A four bit binary number.

Byte
- An eight bit (2 nibble) binary number.

Word
- Is a string of bits whose size (the word length) may be equal to one byte, two bytes, four bytes and more.





million		$= 1x10^{6}$
billion		$= 1x10^{9}$
trillion		$= 1x10^{12}$
quadrillion		$= 1x10^{15}$
quintillion		$= 1x10^{18}$
sextillion		$= 1x10^{21}$
septillion		$= 1x10^{24}$
octillion		$= 1x10^{27}$
nonillion		$= 1x10^{30}$
decillion		$= 1x10^{33}$
undecillion		$= 1x10^{36}$
duodecillion		$= 1x10^{39}$
tredecillion		$= 1x10^{42}$
quattuordecillion		$= 1x10^{45}$
quindecillion		$= 1x10^{48}$
sexdecillion		$= 1x10^{51}$
septemdecillion		$= 1x10^{54}$
octodecillion		$= 1x10^{57}$
novemdecillion		$= 1x10^{60}$
vigintillion		$= 1x10^{63}$
unvigintillion	(or vigintunillion)	$= 1x10^{66}$
duovigintillion	(or vigintiduoillion)	$= 1x10^{69}$
trevigintillion	(or vigintitrillion)	$= 1x10^{72}$
quattuorvigintillion	(or vigintiquadrillion)	$= 1x10^{75}$
quinvigintillion	(or vigintiquintrillion)	$= 1x10^{78}$

HOW TO READ LARGE NUMBERS

Numbers are separated into groups: ones, tens, hundreds, thousands, millions, and so on. Each group contains three subgroups: ones, tens, and hundreds. When writing or reading a large number, begin at the left with the largest group, and proceed to the right. For instance, 7,482 is read as seven thousand, four hundred, eighty-two. The following chart can help in reading large numbers.

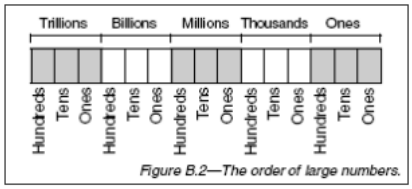


Figure B.2—The order of large numbers.

Example 1 - How do you read 10,956,501?

The answer is: ten million, nine hundred fifty-six thousand, five hundred, one.