

Properties of Addition and Multiplication

Addition

$$a + b = b + a$$

$$(a + b) + c = a + (b + c)$$

$$a + 0 = 0 + a = a$$

$$a + (-a) = 0$$

Commutative

Associative

Identity

Inverse

Multiplication

$$a \cdot b = b \cdot a$$

$$(a \cdot b) \cdot c = a \cdot (b \cdot c)$$

$$a \cdot 1 = 1 \cdot a = a$$

$$a \cdot \frac{1}{a} = 1 \quad (a \neq 0)$$

Distributive Property of Multiplication over Addition $a(b + c) = a \cdot b + a \cdot c$

Rule for Exponents

For any real number a and integers m and n :

The exponent 1: $a^1 = a$

The exponent 0: $a^0 = 1 \quad (a \neq 0)$

Product Rule: $a^m \cdot a^n = a^{m+n}$

Power Rule: $(a^m)^n = a^{mn}$

Quotient Rule: $\frac{a^m}{a^n} = a^{m-n} \quad (a \neq 0)$

Negative exponents: $a^{-n} = \frac{1}{a^n} \quad (a \neq 0)$

Absolute Value

If x is positive or 0, then $|x| = x$.

If x is negative, then $|x| = -x$.

Square Roots

For positive real numbers a and b ,

$$\sqrt{ab} = \sqrt{a} \cdot \sqrt{b}$$

$$\sqrt{\frac{a}{b}} = \frac{\sqrt{a}}{\sqrt{b}}$$

Scientific Notation

$$3.6 \times 10^{-4} = 0.00036$$

$$9500 = 9.5 \times 10^3$$

Consumer Formulas

The Percent Formula: $R \cdot B = A$

Simple Interest: $I = Prt$

Compound Interest: $A = P \left(1 + \frac{r}{n} \right)^{nt}$

Inflation: $A = P(1 + r)^t$

Depreciation: $V = P(1 - r)^t$

First-Degree Equation (or Linear Equation) in x

$$ax + b = c$$

Linear Equation in Two Variables

$$Ax + By = C$$

Linear Inequalities in x

$$ax + b < d$$

$$ax + b > c$$

$$ax + b \leq d$$

$$ax + b \geq c$$

$$c < ax + b < d$$

$$c \leq ax + b \leq d$$

Properties of Inequalities

If $a < b$ and $b < c$ then $a < c$

If $a < b$ then $a + c < b + c$

If $a < b$ and $c > 0$ then $ac < bc$

If $a < b$ and $c < 0$ then $ac > bc$

U.S. Customary and Metric Equivalents

In the following tables, the equivalents are rounded.

U.S. to Metric

Length Equivalents

1 in.	= 2.54 cm (exact)
1 ft	= 0.305 m
1 yd	= 0.914 m
1 mi	= 1.61 km

Area Equivalents

1 in. ²	= 6.45 cm ²
1 ft ²	= 0.093 m ²
1 yd ²	= 0.836 m ²
1 acre	= 0.405 ha

Volume Equivalents

1 in. ³	= 16.387 cm ³
1 ft ³	= 0.028 m ³
1 qt	= 0.946 L
1 gal	= 3.785 L

Mass Equivalents

1 oz	= 28.35 g
1 lb	= 0.454 kg

Metric to U.S.

1 cm	= 0.394 in.
1 m	= 3.28 ft
1 m	= 1.09 yd
1 km	= 0.62 mi

1 cm ²	= 0.155 in. ²
1 m ²	= 10.764 ft ²
1 m ²	= 1.196 yd ²
1 ha	= 2.47 acres

1 cm ³	= 0.06 in. ³
1 m ³	= 35.315 ft ³
1 L	= 1.06 qt
1 L	= 0.264 gal

1 g	= 0.035 oz
1 kg	= 2.205 lb

Celsius and Fahrenheit Equivalents

$$C = \frac{5(F - 32)}{9}$$

$$F = \frac{9 \cdot C}{5} + 32$$

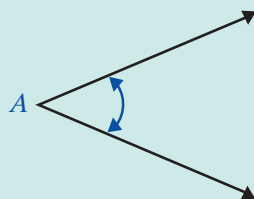
Celsius

Fahrenheit

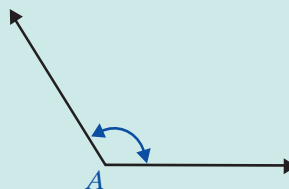
100°	← water boils at sea level →	212°
95°		203°
90°		194°
85°		185°
80°		176°
75°		167°
70°		158°
65°		149°
60°		140°
55°		131°
50°		122°
45°		113°
40°		104°
35°		95°
30°	} comfort range	86°
25°		77°
20°		68°
15°		59°
10°		50°
5°		41°
0°	← water freezes at sea level →	32°

Types of Angles

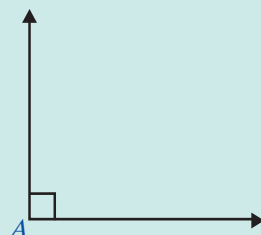
1. **Acute** $0^\circ < m\angle A < 90^\circ$



3. **Obtuse** $90^\circ < m\angle A < 180^\circ$



2. **Right** $m\angle A = 90^\circ$



4. **Straight** $m\angle A = 180^\circ$



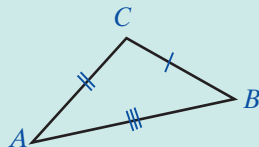
Triangles

Two Important Statements about Any Triangle:

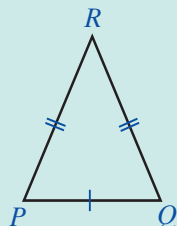
1. The sum of the measures of the angles is 180° .
2. The sum of the lengths of any two sides must be greater than the length of the third side.

Triangles Classified by Sides

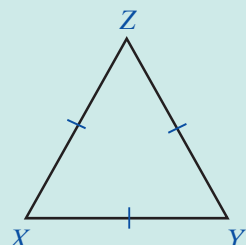
1. **Scalene** No two sides are equal.



2. **Isosceles** Two sides are equal.

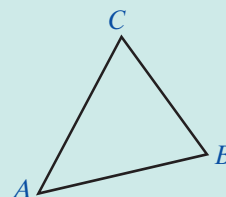


3. **Equilateral** All three sides are equal.

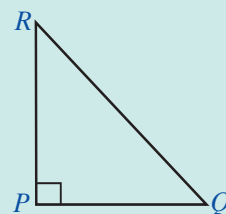


Triangles Classified by Angles

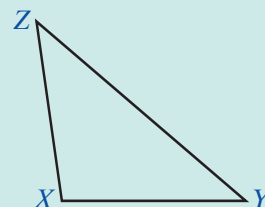
1. **Acute** All three angles are acute.



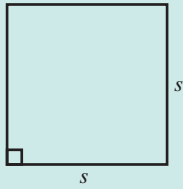
2. **Right** One angle is a right angle.



3. **Obtuse** One angle is an obtuse angle.



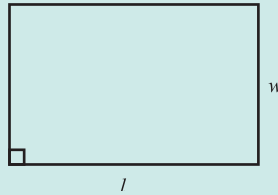
Perimeter and Area



Square

$$A = s^2$$

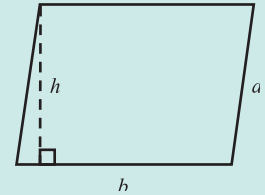
$$P = 4s$$



Rectangle

$$A = lw$$

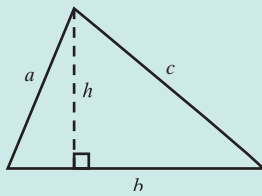
$$P = 2l + 2w$$



Parallelogram

$$A = bh$$

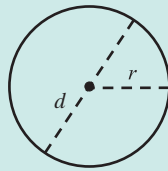
$$P = 2a + 2b$$



Triangle

$$A = \frac{1}{2}bh$$

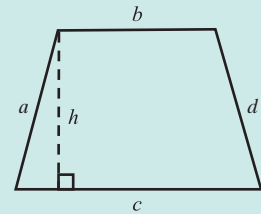
$$P = a + b + c$$



Circle

$$A = \pi r^2$$

$$P = 2\pi r = \pi d$$

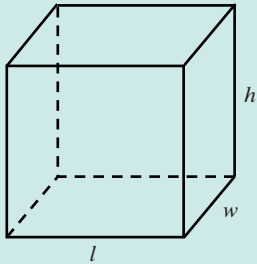


Trapezoid

$$A = \frac{1}{2}h(b + c)$$

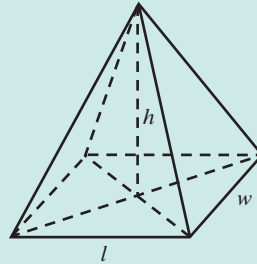
$$P = a + b + c + d$$

Volume



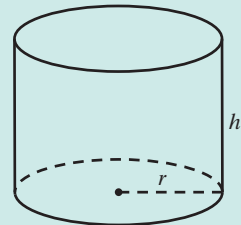
Rectangular Solid

$$V = lwh$$



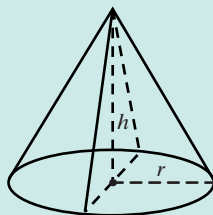
Rectangular Pyramid

$$V = \frac{1}{3}lwh$$



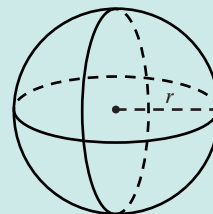
Right Circular Cylinder

$$V = \pi r^2 h$$



Right Circular Cone

$$V = \frac{1}{3}\pi r^2 h$$



Sphere

$$V = \frac{4}{3}\pi r^3$$