

# Mathematics Reference Sheet

## Conversions

### U.S. Customary to Metric

1 inch = 2.54 centimeters  
1 foot  $\approx$  0.30 meter  
1 mile  $\approx$  1.61 kilometers  
1 quart  $\approx$  0.95 liter  
1 gallon  $\approx$  3.79 liters  
1 cup  $\approx$  237 milliliters  
1 pound  $\approx$  0.45 kilogram  
1 ounce  $\approx$  28.3 grams  
1 gallon  $\approx$  3785 cubic centimeters

### Metric to U.S. Customary

1 centimeter  $\approx$  0.39 inch  
1 meter  $\approx$  3.28 feet  
1 kilometer  $\approx$  0.62 mile  
1 liter  $\approx$  1.06 quarts  
1 liter  $\approx$  0.26 gallon  
1 kilogram  $\approx$  2.2 pounds  
1 gram  $\approx$  0.035 ounce  
1 cubic meter  $\approx$  264 gallon

### Temperature

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

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

## Number Properties

Commutative Properties of Addition and Multiplication

$$a + b = b + a$$

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

Associative Properties of Addition and Multiplication

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

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

Addition Property of Zero

$$a + 0 = a$$

Multiplication Properties of Zero and One

$$a \cdot 0 = 0$$

$$a \cdot 1 = a$$

Distributive Property:

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

$$a(b - c) = ab - ac$$

## Properties of Equality

Addition Property of Equality

$$\text{If } a = b, \text{ then } a + c = b + c.$$

Subtraction Property of Equality

$$\text{If } a = b, \text{ then } a - c = b - c.$$

Multiplication Property of Equality

$$\text{If } a = b, \text{ then } a \cdot c = b \cdot c.$$

Division Property of Equality

$$\text{If } a = b, \text{ then } a \div c = b \div c, c \neq 0.$$

Squaring both sides of an equation

$$\text{If } a = b, \text{ then } a^2 = b^2.$$

## Properties of Exponents

Product of Powers Property:  $a^m \cdot a^n = a^{m+n}$

Quotient of Powers Property:  $\frac{a^m}{a^n} = a^{m-n}, a \neq 0$

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

Power of a Product Property:  $(ab)^m = a^m b^m$

Power of a Quotient Property:  $\left(\frac{a}{b}\right)^m = \frac{a^m}{b^m}, b \neq 0$

Zero Exponents:  $a^0 = 1, a \neq 0$

Negative Exponents:  $a^{-n} = \frac{1}{a^n}, a \neq 0$

Rational Exponents:  $\sqrt[n]{a} = a^{1/n}$

## Properties of Square Roots

Product Property of Square Roots

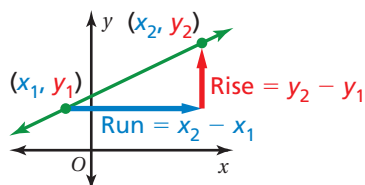
$$\sqrt{xy} = \sqrt{x} \cdot \sqrt{y}, x \geq 0 \text{ and } y \geq 0$$

Quotient Property of Square Roots

$$\frac{\sqrt{x}}{\sqrt{y}} = \frac{\sqrt{x}}{\sqrt{y}}, x \geq 0 \text{ and } y > 0$$

## Slope

$$m = \frac{\text{rise}}{\text{run}}$$
$$= \frac{\text{change in } y}{\text{change in } x}$$
$$= \frac{y_2 - y_1}{x_2 - x_1}$$



## Factoring

Difference of Two Squares Pattern

$$a^2 - b^2 = (a + b)(a - b)$$

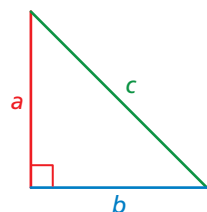
Perfect Square Trinomial Pattern

$$a^2 + 2ab + b^2 = (a + b)^2$$

$$a^2 - 2ab + b^2 = (a - b)^2$$

## Pythagorean Theorem

$$a^2 + b^2 = c^2$$



## Distance Formula

$$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$

## Volume

**Prism**



$$V = Bh = \ell wh$$

**Cylinder**



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

**Cone**



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

**Sphere**



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

## Equations of Lines

Slope-intercept form

$$y = mx + b$$

Standard form

$$ax + by = c, a, b \neq 0$$

Point-slope form

$$y - y_1 = m(x - x_1)$$

## Forms of Quadratic Functions

Standard form

$$y = ax^2 + bx + c, a \neq 0$$

Vertex form

$$y = a(x - h)^2 + k, a \neq 0$$

## Quadratic Formula

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

← discriminant

## Sequences

**Arithmetic**

$$a_n = a_1 + (n - 1)d \quad \text{Explicit equation}$$

$$a_n = a_{n-1} + d \quad \text{Recursive equation}$$

**Geometric**

$$a_n = a_1 r^{n-1} \quad \text{Explicit equation}$$

$$a_n = r \cdot a_{n-1} \quad \text{Recursive equation}$$