

Key ACT Algebra Formulas

Lines & Linear Growth

Standard Form

$$Ax + By = C$$

Point-Slope Form

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

Slope-Intercept Form

$$y = mx + b$$

m = slope
 b = y-intercept

Slope

$$m = \frac{y_2 - y_1}{x_2 - x_1}$$

X-intercept

Where the line crosses the x-axis; $y = 0$.

Y-intercept

Where the line crosses the y-axis; $x = 0$.

Parallel lines

...have the same slope.

Ex. $y = 2x + 5$; $y = 2x - 7$

Perpendicular lines

...have negative reciprocal slopes.

Ex. $y = 2x + 5$; $y = -\frac{1}{2}x + 5$

Quadratic Equations

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

← discriminant

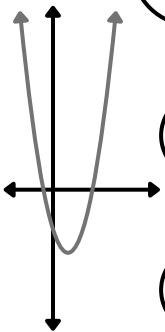
Quadratic Equation

$$y = a(x - h)^2 + k$$

Vertex Form

$$y = ax^2 + bx + c$$

Standard Form



$$\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$$

Equation of an Ellipse

$$x = -\frac{b}{2a}$$

Vertex of the Parabola
Substitute in this value of x to find the y coordinate.

Factoring Polynomials

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

Square of a Sum

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

Square of a Difference

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

Difference of Squares

$$a^3 - b^3 = (a - b)(a^2 + ab + b^2)$$

Difference of Cubes

Key ACT Algebra Formulas

Radicals & Exponents

$$x^a x^b = x^{a+b}$$

Product Rule

$$x^{1/a} = \sqrt[a]{x}$$

Fractional Exponent Rule

$$x^0 = 1$$

Zero Power Rule

$$(x^a)^b = x^{ab}$$

Power of a Power Rule

$$f(x) = a \times b^x$$

Exponential Function

...when $b > 0$
and $a \neq 0$.

$$x^{-a} = \frac{1}{x^a}$$

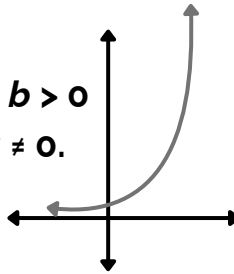
Negative Power Rule

$$\frac{x^a}{x^b} = x^{a-b}$$

Quotient Rule

$$f(x) = a(1+r)^t$$

Exponential Growth



$$\sqrt[n]{xy} = \sqrt[n]{x} \sqrt[n]{y}$$

Multiplication Property

$$\sqrt[n]{\frac{x}{z}} = \frac{\sqrt[n]{x}}{\sqrt[n]{z}}$$

Division Property

$$f(x) = a(1-r)^t$$

Exponential Decay

a : initial amount
 r : growth rate
 t : time

$$\sqrt[n]{x^m} = x^{m/n}$$

Radical to Exponent

Sequences & Series

$$a_n = a_1 + (n-1)d$$

Arithmetic Sequence

$$a_n = a_1 \cdot r^{n-1}$$

Geometric Sequence

Coordinate Geometry

$$M = \left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2} \right)$$

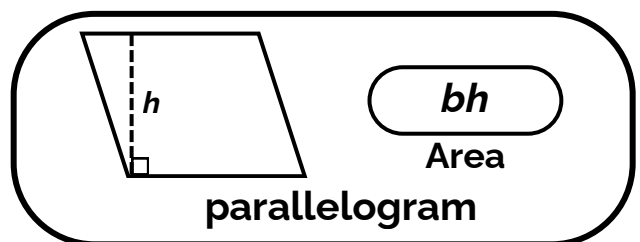
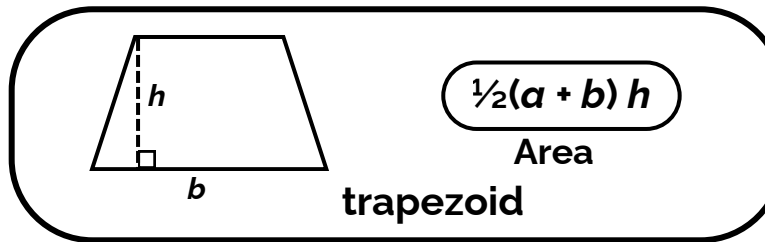
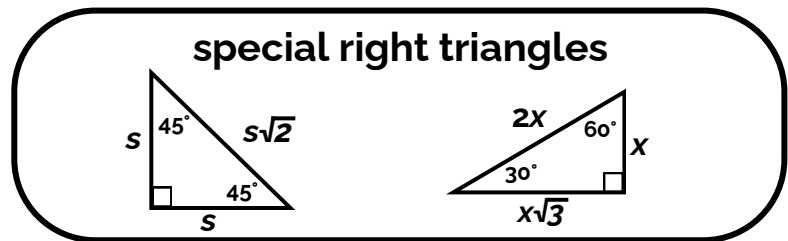
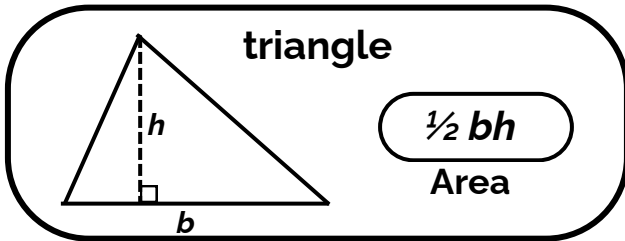
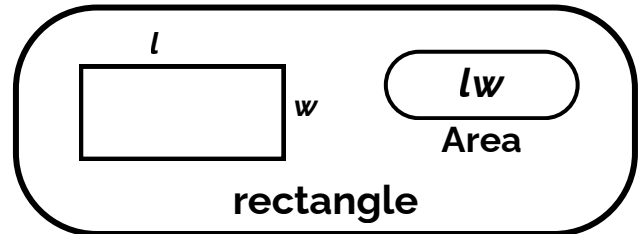
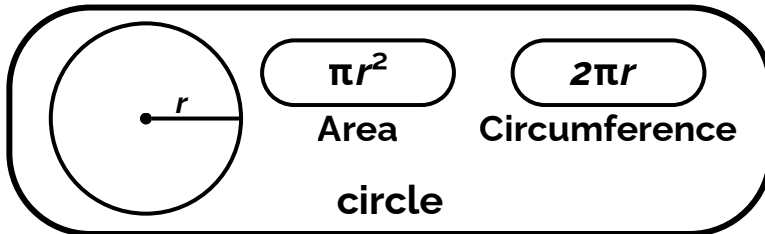
Midpoint

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

Distance

Key ACT Geometry & Trigonometry Formulas

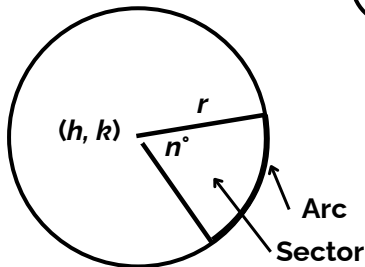
Area



Angles

Equation of a Circle

$$(x-h)^2 + (y-k)^2 = r^2$$

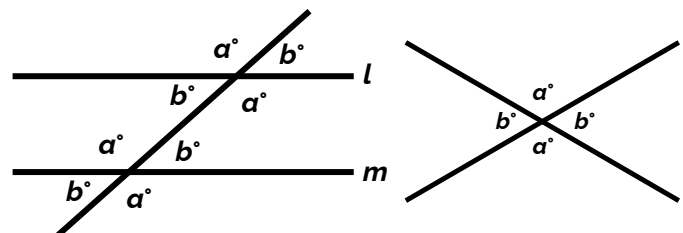


$$\left(\frac{n^\circ}{360^\circ}\right) \times 2\pi r$$

Length of the Arc

$$\left(\frac{n^\circ}{360^\circ}\right) \times \pi r^2$$

Area of the Sector



$$a^\circ + b^\circ = 180^\circ$$

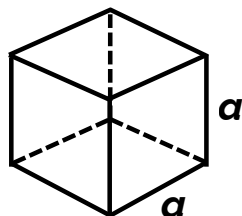
Sum of the Interior Angles of a Polygon

Triangle: 180°
 Quadrilateral: 360°
 Pentagon: 540°

Hexagon: 720°
 Any polygon: $(n - 2) \times 180^\circ$
 ($n = \# \text{ sides}$)

Key ACT Geometry & Trigonometry Formulas

Surface Area & Volume



cube

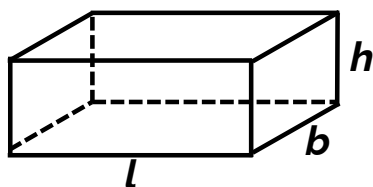
$$6a^2$$

total sa

$$4a^2$$

lateral sa

$$V=a^3$$



rectangular prism

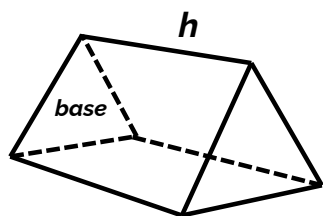
$$2(lb + bh + hl)$$

total sa

$$2h(l + b)$$

lateral sa

$$V=lwh$$



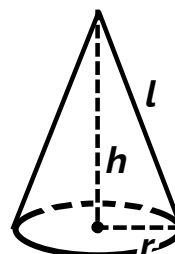
triangular prism

$$\text{lat. SA} + 2(\text{base area})$$

total sa

$$\text{base perimeter} \times h$$

lateral sa



cone

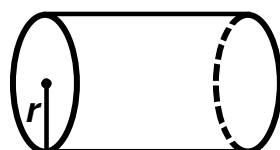
$$\pi r^2 + 2\pi rh$$

total sa

$$\pi rl$$

lateral sa

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



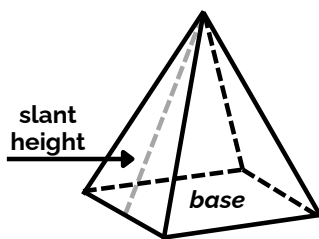
cylinder

$$2\pi r^2 + 2\pi rh$$

total

$$2\pi rh$$

lateral



pyramid

$$\text{lat. SA} + \text{base area}$$

total sa

$$\frac{1}{2} (\text{base perimeter}) \times \text{slant height}$$

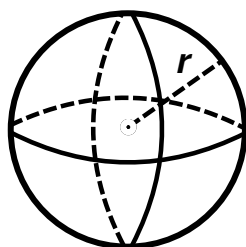
lateral sa

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

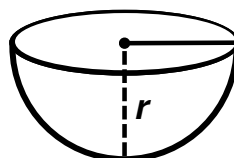
$$4\pi r^2$$

total sa

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



sphere



hemisphere

$$3\pi r^2$$

total sa

$$2\pi r^2$$

lateral sa

Key ACT Geometry & Trigonometry Formulas

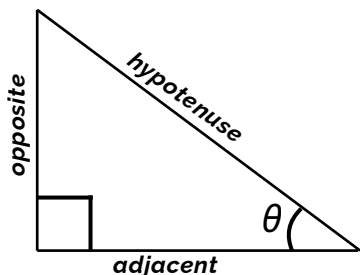
Trigonometry

"SOHCAHTOA"

$$\sin \theta = \frac{\text{opposite}}{\text{hypotenuse}}$$

$$\cos \theta = \frac{\text{adjacent}}{\text{hypotenuse}}$$

$$\tan \theta = \frac{\text{opposite}}{\text{adjacent}}$$



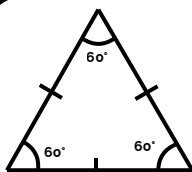
Reciprocal Identities

$$\sin^2(\theta) + \cos^2(\theta) = 1$$

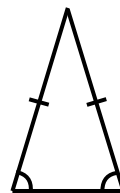
$$\tan^2(\theta) + 1 = \sec^2(\theta)$$

$$1 + \cot^2(\theta) = \csc^2(\theta)$$

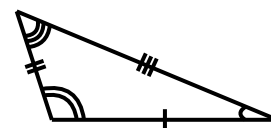
Types of Triangles



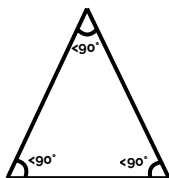
equilateral



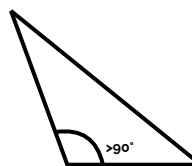
isosceles



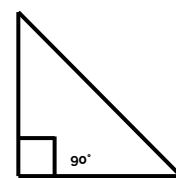
scalene



acute

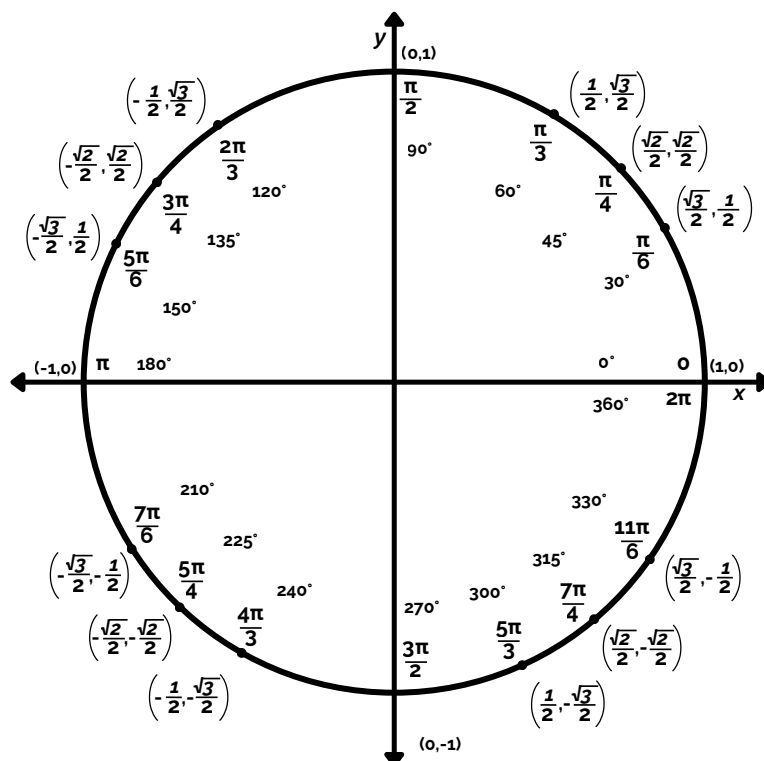


obtuse



right

Unit Circle & Radians



Key ACT Statistics & Probability Formulas

Mean: *Average* = $\frac{\text{Sum of terms}}{\text{Number of terms}}$

Median: *Middle value in a list.*

Mode: *Value that appears the most often in a list.*

Range: *Difference between the greatest and lowest values.*

Standard Deviation: *How far values deviate from the mean.*

$$\frac{\# \text{ desired outcomes}}{\# \text{ possible outcomes}}$$

Probability Formula

$$\frac{\text{Part}}{\text{Whole}} = \frac{\%}{100}$$

Percentage Formula

$$I = PRT$$

Basic Interest Rate Formula

I: Interest R: Rate
P: Principal T: Time

$$nPr = \frac{n!}{(n-r)!}$$

Permutations

$$nCr = \frac{n!}{r!(n-r)!}$$

Combinations

$$E(X) = \sum(x_i \cdot P(x_i))$$

Expected Value

$$\text{Total outcomes} = \text{Option}_1 \cdot \text{Option}_2 \cdot \text{Option}_3 \dots$$

Fundamental Counting Principle