

Math Formulas for ACT

Using points
 (x_1, y_1) &
 (x_2, y_2)

Slope of a line (m)

$$\text{slope} = \frac{\text{rise}}{\text{run}} \quad m = \frac{y_2 - y_1}{x_2 - x_1}$$

Equations of a line
 Slope-intercept form

$$y = mx + b$$

↑ slope ↑ y-intercept

Point-slope form

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

y-value of point slope x-value of point

Standard form

$$Ax + By = C$$

(A, B & C must be integers)
 (A must be positive)

$$\text{slope} = -\frac{A}{B} \quad \text{y-int} = \frac{C}{B}$$

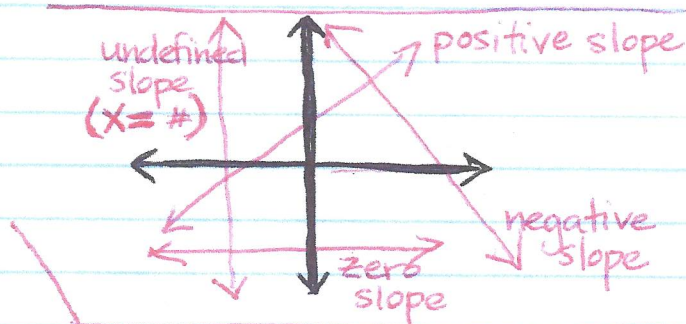
Distance formula (d)

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

Mid-point formula (x_m, y_m)

$$x_m = \frac{x_1 + x_2}{2} \quad y_m = \frac{y_1 + y_2}{2}$$

Slope orientations
 (positive, negative, zero, undefined)



Parallel slope //

Slopes are equal,
Y-intercepts are different

Perpendicular slope \perp

Slopes are negative reciprocals

$$\text{Ex: } y = 2x + 7$$

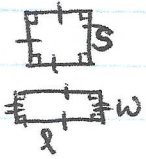
$$y = -\frac{1}{2}x - 2$$

Math Formulas for ACT

Perimeter (definition)

Perimeter equals the sum of all sides of a shape

Formulas:



Perimeter of a square
Perimeter of a rectangle

$$P_{\square} = 4s$$

$$P_{\square} = 2l + 2w$$



d = diameter
r = radius

Circumference (= perimeter of a circle) formula:

$$C = \pi d \text{ or}$$

$$C = 2\pi r$$

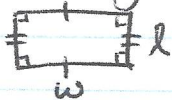
Area formulas:

Square



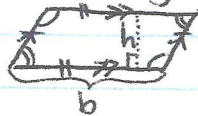
$$A = s^2$$

Rectangle



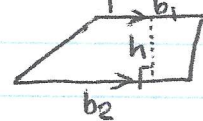
$$A = l \cdot w$$

Parallelogram



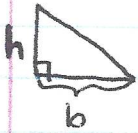
$$A = b \cdot h$$

Trapezoid



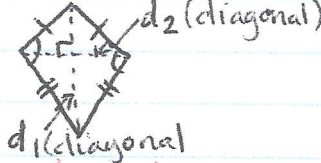
$$A = \frac{(b_1 + b_2)}{2} \cdot h$$

Triangle



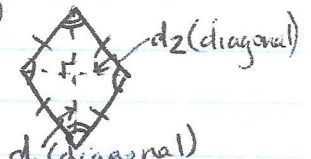
$$A = \frac{1}{2} b \cdot h$$

Kite



$$A = \frac{1}{2} d_1 \cdot d_2$$

Rhombus



$$A = \frac{1}{2} d_1 \cdot d_2$$

Circle formulas:

Circumference

Area

Volume

$$C = 2\pi r \text{ or } C = \pi d$$

$$A = \pi r^2$$

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

Volume formulas:



Cube, Rectangular Prism, Cylinder

$$V = A \cdot h$$

Volume =
Area of base
x height



Pyramid, Cone



$$V = \frac{1}{3} A \cdot h$$

Math Formulas for ACT

Exponent rules:

$$x^a \cdot x^b$$

$$x^{a+b}$$

$$(x^a)^b$$

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

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

$$x^{a-b}$$

$$x^{-a}$$

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

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

$$x^a$$

$$\left(\frac{x}{y}\right)^a$$

$$\frac{x^a}{y^a}$$

$$(xy)^a$$

$$x^a y^a$$

$$x^1$$

$$x$$

$$x^0$$

$$1$$

$$x^{a/b}$$

$$\sqrt[b]{x^a}$$

$$x^{1/2}$$

$$\sqrt{x}$$

Powers of i ($i = \sqrt{-1}$)

$$i^1 = i^5 = i^9 = i^{13} \dots$$

$$i^2 = i^6 = i^{10} = i^{14} \dots$$

$$i^3 = i^7 = i^{11} = i^{15} \dots$$

$$i^4 = i^8 = i^{12} = i^{16} \dots$$

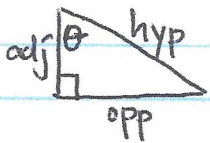
$$\sqrt{-1} \text{ or } i$$

$$-1$$

$$-i \text{ or } -\sqrt{-1}$$

$$1$$

Math Formulas for ACT



Trig ratios

$$\sin \theta = \frac{\text{opp}}{\text{hyp}}$$

$$\cos \theta = \frac{\text{adj}}{\text{hyp}}$$

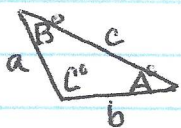
$$\tan \theta = \frac{\text{opp}}{\text{adj}}$$

$$\csc \theta = \frac{1}{\sin \theta} = \frac{\text{hyp}}{\text{opp}}$$

$$\sec \theta = \frac{1}{\cos \theta} = \frac{\text{hyp}}{\text{adj}}$$

$$\cot \theta = \frac{1}{\tan \theta} = \frac{\text{adj}}{\text{opp}}$$

Soh Cah Toa
 i n p y o d y a p d
 n p p s j p n p j



Law of Sines

$$\frac{\sin A}{a} = \frac{\sin B}{b} = \frac{\sin C}{c}$$

Law of Cosines

$$c^2 = a^2 + b^2 - 2ab \cos C$$

Trig identities

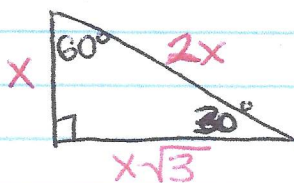
$$\sin^2 \theta + \cos^2 \theta = 1$$

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

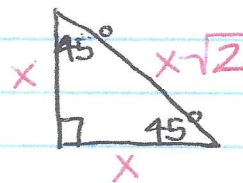
$$1 + \cot^2 \theta = \csc^2 \theta$$

Special triangles

30°-60°-90°



45°-45°-90°



Regular polygon (definition)

All sides are congruent & all angles are congruent

Sum of interior angles

in a triangle

$$180^\circ$$

in a square

$$360^\circ$$

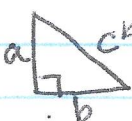
in any polygon

$$180^\circ (n-2) \quad n = \# \text{ of sides}$$



Sum of exterior angles (every polygon)

$$360^\circ$$



Pythagorean theorem

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

Math Formulas for ACT

Quadratic formula for
 $ax^2+bx+c=0$

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

Line of symmetry for
a parabola $ax^2+bx+c=0$

$$x = -b/2a$$

Discriminant of a parabola

$$b^2 - 4ac$$

Meaning of discriminant

if $b^2 - 4ac = 0$, then
one real solution

if $b^2 - 4ac > 0$, then
two real solutions

if $b^2 - 4ac < 0$, then
two complex solutions

Relationship of speed, time, and
distance

$$s = \frac{d}{t}$$

Direct variation with
constant k

$$y = kx \quad \begin{array}{l} \text{as } y \uparrow, x \uparrow \\ \text{as } y \downarrow, x \downarrow \end{array}$$

Inverse variation with
constant k

$$y = \frac{k}{x} \quad \begin{array}{l} \text{as } y \uparrow, x \downarrow \\ \text{as } y \downarrow, x \uparrow \end{array}$$

Arithmetic versus geometric
series & sequences

arithmetic means
addition or subtraction

geometric means
multiplication or division

Math Formulas for ACT

Logarithms:

$$\log_b a = x \text{ means}$$

$$b^x = a \leftarrow \begin{array}{l} \text{exponent} \\ \text{"answer"} \\ \text{base} \end{array}$$

Base 10 log shown as

$$\log a = x \Rightarrow 10^x = a$$

$\ln a = x$ means
and is called

$$e^x = a \leftarrow \begin{array}{l} \text{exponent} \\ \text{"answer"} \end{array}$$

natural log

Absolute value equations & inequalities:

$$|\text{expression}| = \text{something}$$

example: $|5x - 3| = 2$
is rewritten to solve as:

$$\begin{array}{l} \text{expression} = \text{something} \\ \& \text{expression} = -\text{something} \end{array}$$
$$5x - 3 = 2 \quad 5x - 3 = -2$$

$$|\text{expression}| < \text{or } \leq \text{or } > \text{or } \geq \text{something}$$

is rewritten to solve as:

example $|6x^2 + 5x| \geq 1$

$$6x^2 + 5x \geq -1 \quad 6x^2 + 5x \leq 1$$

change sign
↓

flip
↑
inequality

Mean, median, and mode:
For a group of numbers,
Mean =

average
mean = $\frac{\text{sum of all #'s}}{\text{number of #'s}}$

Median =

middle
the value of the middle number (after the group has been ordered least to greatest)

Mode =

most
the value of the number that occurs the most in the group