

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

Slope of a line (m)

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

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

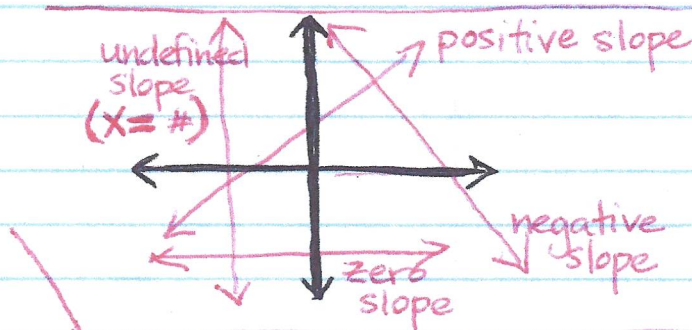
Distance formula (d)

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

Mid-point formula  $(x_m, y_m)$

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

Slope orientations  
(positive, negative, zero, undefined)



Parallel slope //

Slopes are equal,  
y-intercepts are different

Perpendicular slope ⊥

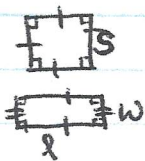
Slopes are negative reciprocals

Ex:  $y = 2x + 7$   
 $y = -\frac{1}{2}x - 2$

Perimeter (definition)

Perimeter equals the sum of all sides of a shape

Formulas:



Perimeter of a square  
Perimeter of a rectangle

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

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

Circumference (= perimeter of a circle) formula:

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

$$C = 2\pi r$$



d = diameter  
r = radius

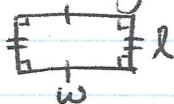
Area formulas:

Square



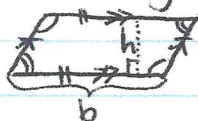
$$A = s^2$$

Rectangle



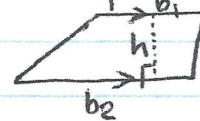
$$A = l \cdot w$$

Parallelogram



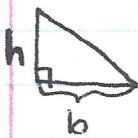
$$A = b \cdot h$$

Trapezoid

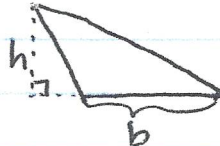


$$A = \frac{(b_1 + b_2)}{2} \cdot h$$

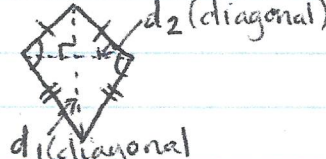
Triangle



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

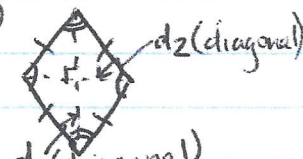


Kite



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

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



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



Exponent rules:

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

$$x^{a+b}$$

$$(x^a)^b$$

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

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

$$x^{a-b}$$

$$x^{-a}$$

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

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

$$x^a$$

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

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

$$(xy)^a$$

$$x^a y^a$$

$$x^1$$

$$x$$

$$x^0$$

$$1$$

$$x^{a/b}$$

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

$$x^{1/2}$$

$$\sqrt{x^1}$$

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

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

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

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

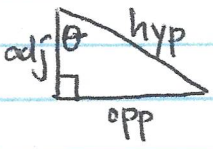
$$i^4 = i^8 = i^{12} = i^{16} \dots$$

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

$$-1$$

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

$$1$$



Trig ratios

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

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

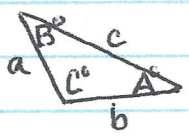
$$\tan \theta = \frac{\text{opp}}{\text{adj}}$$

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

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

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

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



Law of Sines

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

Law of Cosines

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

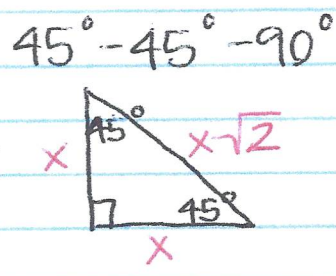
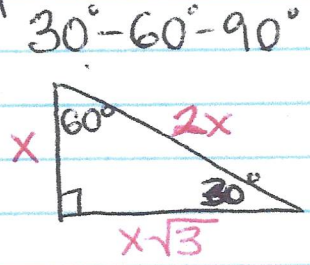
Trig identities

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

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

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

Special triangles



Regular polygon (definition)

All sides are congruent & all angles are congruent

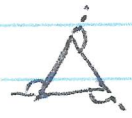
Sum of interior angles

in a triangle  
in a square  
in any polygon

$$180^\circ$$

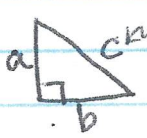
$$360^\circ$$

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



Sum of exterior angles (every polygon)

$$360^\circ$$



Pythagorean theorem

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



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

Logarithms:

$\log_b a = x$  means

$b^x = a$  ← "answer"  
base ← exponent

Base 10 log shown as

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

$\ln a = x$  means  
and is called

$e^x = a$  ← "answer"  
natural log

Absolute value equations & inequalities =

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

example:  $|5x - 3| = 2$

is rewritten to solve as:

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

&  $\text{expression} = -\text{something}$

$5x - 3 = 2$      $5x - 3 = -2$

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

is rewritten to solve as:

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

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

change sign ↓

flip ↑ inequality

Mean, median, and mode:

For a group of numbers,

Mean =

average

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

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