

Math Formula Cheat Sheet

Distance/Velocity problems

Distance = (velocity)(time)

Average velocity = $\frac{\text{total distance traveled}}{\text{total time}}$

*Important formula

Graphing formulas

$$y = mx + b$$

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

Distance between two points = make a right triangle and solve for the hypotenuse

Midpoint = average together the x values and the y values, or:

$$M = \left(\frac{X_1 + X_2}{2}, \frac{Y_1 + Y_2}{2} \right)$$

Conversions

$$K = ^\circ C + 273$$

$$^\circ F = \frac{9}{5}(^\circ C) + 32$$

$$1 \text{ in} = 2.5 \text{ cm}$$

$$1 \text{ m} = 1.1 \text{ yd}$$

$$1 \text{ lb} = 454 \text{ g}$$

$$1 \text{ kg} = 2.2 \text{ lbs}$$

Exponent Rules

- $(X^b)(Y^b) = (XY)^b$
- $(X^b/Y^b) = (X/Y)^b$
- $(X^n)(X^m) = X^{n+m}$
- $X^n/X^m = X^{n-m}$

Log Rules

- $\log(X) + \log(Y) = \log(XY)$
- $\log(X) - \log(Y) = \log(X/Y)$
- $n \cdot \log(X) = \log(X^n)$
- When solving a log problem, remember:
 - $\log X = b$ can be solved as $X = 10^b$

Percent Increase/Decrease:

$$[(X_2 - X_1)/X_1] \cdot 100\% = \text{percent change}$$

Probability and Statistics

Combination vs. Permutation:

You use *combination* when the order does not matter.

You use *permutation* when the order does matter.

$$\text{Combination formula} = \frac{n!}{(n-r)! \times r!}$$

$$\text{Permutation formula} = \frac{n!}{(n-r)!}$$

$$st. dev = \sigma = \sqrt{\frac{\sum (x - x_{avg})^2}{N}}$$

$$\text{variance} = \sigma^2$$

In a normal (or Gaussian) distribution, 68% of the data fall within 1 standard deviation of the mean. 95% of the data fall within 2 standard deviations of the mean, and 99.7% of the data fall within 3 standard deviations of the mean.

Geometry

Area formulas

$$\text{Circle} = \pi r^2$$

$$\text{Sphere} = 4 \pi r^2$$

$$\text{Hollow cylinder} = 2 \pi r h$$

$$\text{Ellipse} = \pi a b$$

$$\text{Triangle} = (1/2) b h$$

$$\text{Rhombus} = b h$$

$$\text{Equilateral triangle} = \frac{s^2 \sqrt{3}}{4}$$

S = side of triangle

$$\text{Area of a regular polygon} = (1/2) \cdot N \cdot \sin(360/N) \cdot S^2$$

$$\text{Sum of interior angles} = (N-2) \cdot 180$$

N = number of sides, S = length from center to a corner

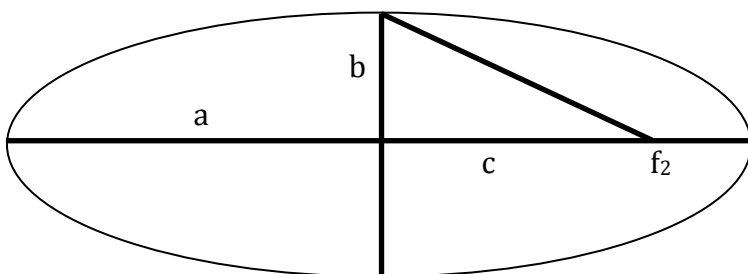
Volume Formulas

$$\text{Sphere} = (4/3) \pi r^3$$

$$\text{Cylinder} = \pi r^2 h$$

Ellipse

Assuming the major axis is the x-axis



a = major axis

b = minor axis

c = distance from center to focus (f₂ in this example)

$$\text{Area of Ellipse} = \pi a b$$

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

$$c^2 = a^2 - b^2$$

Trigonometry

$\sin A = \frac{\text{opposite}}{\text{hypotenuse}}$	$\csc A = \frac{\text{hypotenuse}}{\text{opposite}} = \frac{1}{\sin A}$
$\cos A = \frac{\text{adjacent}}{\text{hypotenuse}}$	$\sec A = \frac{\text{hypotenuse}}{\text{adjacent}} = \frac{1}{\cos A}$
$\tan A = \frac{\text{opposite}}{\text{adjacent}}$	$\cot A = \frac{\text{adjacent}}{\text{opposite}} = \frac{1}{\tan A}$

$$\frac{\sin A}{\cos A} = \tan A$$

$$\begin{aligned}\sin A &= \cos(90^\circ - A) \\ \cos A &= \sin(90^\circ - A)\end{aligned}$$

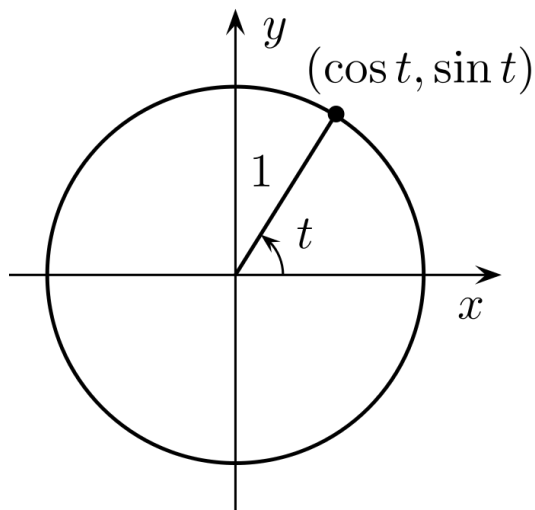
$$\begin{aligned}\sin(-A) &= -\sin A \\ \cos(-A) &= \cos(A)\end{aligned}$$

$$\begin{aligned}\sin 2A &= 2(\sin A)(\cos A) \\ \cos 2A &= \cos^2 A - \sin^2 A\end{aligned}$$

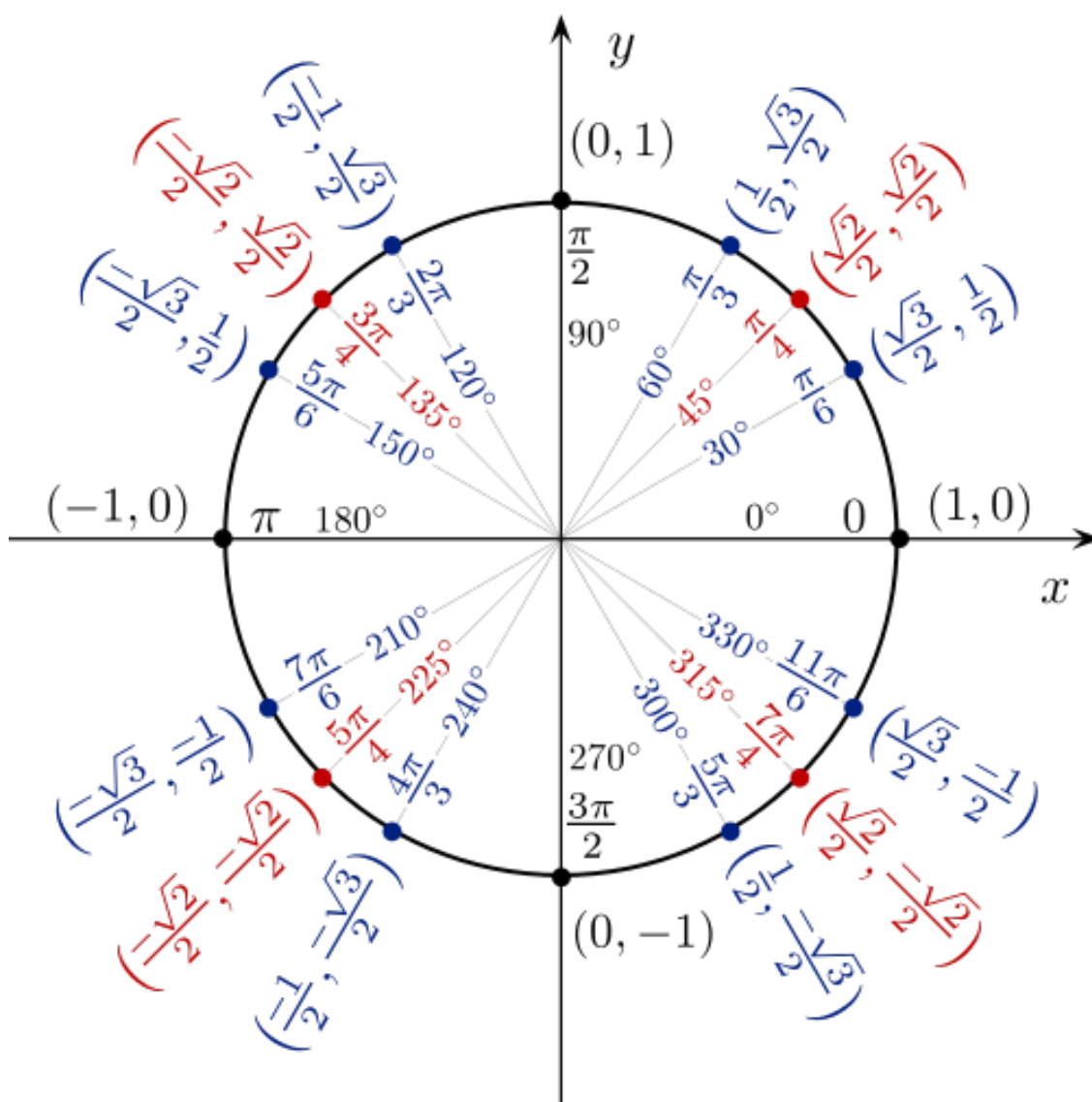
$$\sin^2 A + \cos^2 A = 1$$

*Know how to rearrange this identity, for example dividing this identity by $\sin^2 A$ gives:

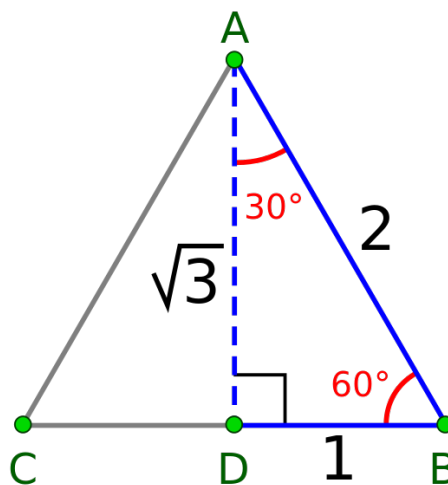
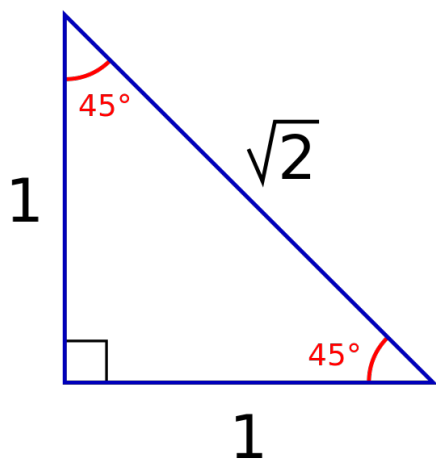
$$1 + \cot^2 A = \csc^2 A$$



Unit Circle

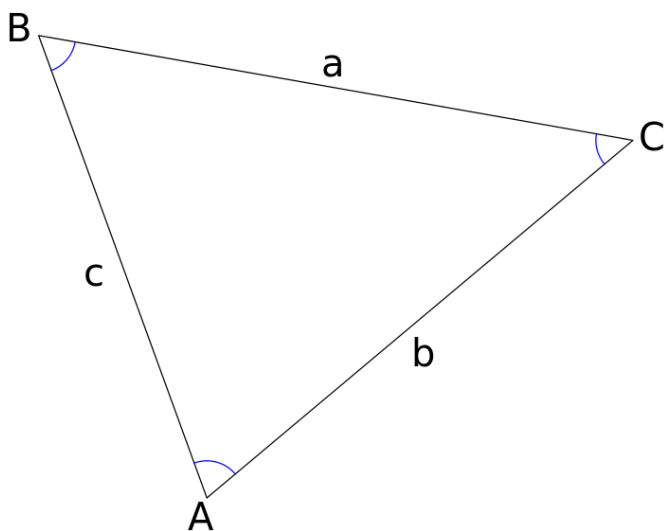


Must know triangles



Law of Sines

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



Combined Work Questions

Ex. "If Tom gets a job done in 4 hours (t_1) and Jerry gets it done in 3 hours (t_2), how many hours does it take to get the job done working together (t_{total})?"

$$\frac{1}{t_1} + \frac{1}{t_2} + \frac{1}{t_3} \dots = \frac{1}{t_{total}}$$

Simple and Compound Interest

Simple Interest

$$I = PRT$$

I = interest

P = principal

R = annual rate

T = time in years

Compound Interest

$$FV = PV \times (1+r)^n$$

FV = future value

PV = present value

r = annual interest rate

n = number of periods

ex. If the interest is compounded quarterly (every 3 months), and the length of the investment is one year, then $n = 4$ periods.