

Various Formulas

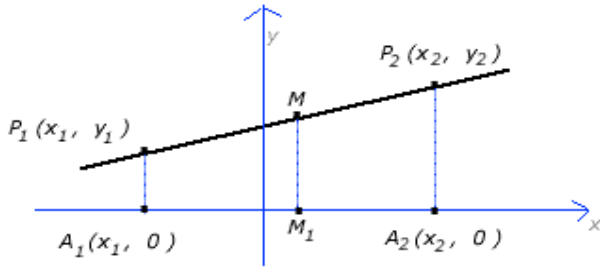
Midpoint Formula

The Midpoint formula is used when you need the point that is exactly between two other points. The midpoint formula is applied when you need to find a line that bisects a specific line segment. Essentially, the 'middle point' is called the "midpoint".

The midpoint of M of the line segment from $P_1(x_1, y_1)$ to $P_2(x_2, y_2)$

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

The lines through P_1 and P_2 parallel to the y -axis intersect the x axis at $A_1(x_1, 0)$ and $A_2(x_2, 0)$. The line through M parallel to the y -axis bisects the segment A_1A_2 at point M_1



M_1 is halfway from A_1 to A_2 , the x -coordinate of M_1 is:

$$\begin{aligned} x_1 + \frac{1}{2}(x_2 - x_1) &= x_1 + \frac{1}{2}x_2 - \frac{1}{2}x_1 \\ &= \frac{1}{2}x_1 + \frac{1}{2}x_2 \\ &= \frac{x_1 + x_2}{2} \end{aligned}$$

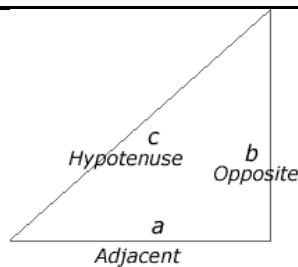
Trigonometric Formula

Useful trig formulas for learning trigonometric concepts.

$$\sin A = \frac{\text{Opposite}}{\text{Hypotenuse}}$$

$$\cos A = \frac{\text{Adjacent}}{\text{Hypotenuse}}$$

$$\tan A = \frac{\text{Opposite}}{\text{Adjacent}}$$



Triangle ABC is any triangle with side lengths a, b, c

Law of Cosines

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

Law of Sines

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

Slope Formula

The formula for the slope of the straight line going through the points (x_1, y_1) and (x_2, y_2) is given by:

$$M = \frac{Y_2 - Y_1}{X_2 - X_1}$$

The subscripts refer to the two points.

(m =rise/run)

Note:

Parallel lines have equal slope.
Perpendicular lines have negative reciprocal slopes.

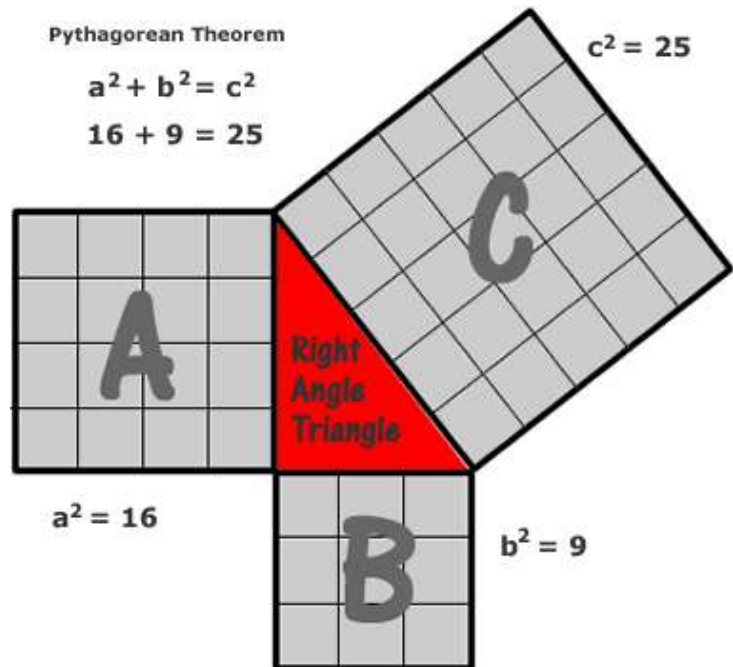
Pythagorean Theorem

Pythagorean Theorem

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

$$16 + 9 = 25$$

$$c^2 = 25$$



Trigonometry Identities: The Basics

$$\csc x = \frac{1}{\sin x}$$

$$\sec x = \frac{1}{\cos x}$$

$$\cot x = \frac{1}{\tan x}$$

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

$$\cot x = \frac{\cos x}{\sin x}$$

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

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

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

What is an Identity?

An identity is an equation that is true for all of the possible values of its variables. Trig identities are important, they involve the sums or differences of angles.

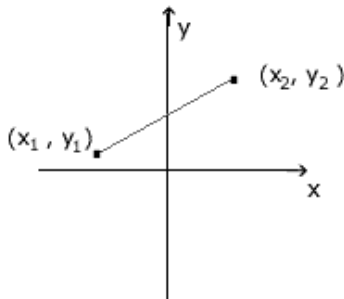
What are the Trigonometric Identities?

These identities can be used to determine that other trigonometric equations are also identities. To do so, you will need to use your algebraic background to show that the expression on one side of the equals sign can be changed into the expression on the other side of the equals sign.

Distance Formula

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

The distance formula can be obtained by creating a triangle and using the Pythagorean Theorem to find the length of the hypotenuse. The hypotenuse of the triangle will be the distance between the two points.



The subscripts refer to the first and second points; it doesn't matter which points you call first or second.

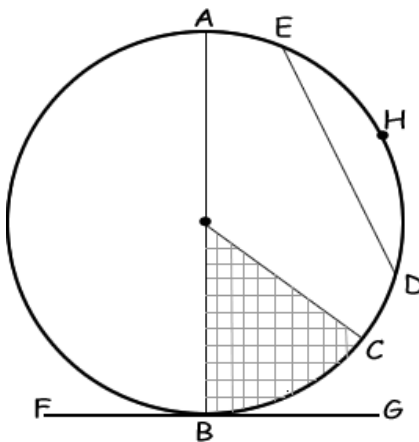
x2 and **y2** are the **x,y** coordinates for one point

x1 and **y1** are the **x,y** coordinates for the second point

d is the distance between the two points

Circles

The circumference of a circle is the actual length around the circle, which is equal to 360° . Pi (π) is the number needed to compute the circumference of the circle. Pi is Greek and has been around for over 2000 years!



π is equal to 3.14.

AB = Diameter

Must pass through the center of the circle. The Diameter is equal to twice the radius.

OC = Radius

The radius is a line segment that begins from the center and touches any point on the circle.

ED = Chord

The chord joins any two points on a circle.

FG = Tangent

A line with one point common to the circle.

EHD = Arc

Only the portion of the circle that is between two points on the circle.

ADB = Semicircle

Also considered to be an arc that is exactly half of the circle.

OCB = Sector

The area between two radii and the arc.

COB = Central Angle

Formed by two radii.

In circles the AREA is equal to 3.14

(π) times the radius (r) to the power of 2. Thus the formula looks like: $A = \pi r^2$.

In circles the CIRCUMFERENCE is 3.14 (π) times the Diameter. Thus the formula looks like: $2\pi r$ or πd .