In this section we will discuss

* Pythagorean Theorem.
* Special Triangles
* The Distance and Midpoint Formula

## Pythagorean Theorem

Given any Right Triangle with hypotenuse, c and sides of length a and b:

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

## Special Triangles:

The 45-45-90:

From Geometry we know that the length of a side of any triangle will correspond to its angle.

So if we have a 45-45-90, then we must have a \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ triangle

Isosceles

Given the 45-45-90 triangle with hypotenuse of length x, find the length of any of its sides.

The 30-60-90:

Given any 30-60-90 triangle with hypotenuse of length 2x, the length of the shortest side will be x. Find the length of the longer side.

## The Distance Formula:

How might we find the distance of any two points on a number line. (remember that distance is always positive)

So, given the two points on the x-axis $x\_{1} \& x\_{2}$ the distance between them is

$$\left|x\_{2}-x\_{1}\right|=\sqrt{\left(x\_{2}-x\_{1}\right)^{2}}$$

Then the distance between two points in 2-D can be found using the Pythagorean theorem.

Find the distance between two points $\left(x\_{1},y\_{1}\right) \& \left(x\_{2},y\_{2}\right)$.

Ex: Find the distances between the points $\left(3,4\right) \& (6,8)$

Ex: Find all points that are a distance of 2 away from the points$\left(0,-1\right) and (x,3)$

## The Midpoint Formula:

If the endpoints of a segment are $\left(x\_{1},y\_{1}\right) \& \left(x\_{2},y\_{2}\right),$ then the coordinates of the midpoint are $\left(\frac{x\_{2}+x\_{1}}{2},\frac{y\_{2}+y\_{1}}{2}\right)$.

This means that the midpoint is the average of the x and y coordinates respectively.