Math-2A
Lesson 8-2

Distance
And
The Pythagorean Theorem

Distance

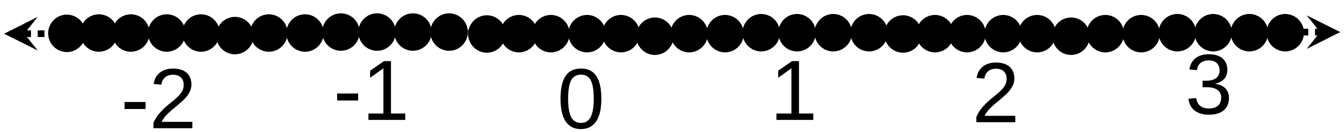
How do we represent the **Length of line segment** $\overline{AB}$ **?**

AB

We measure the Length of a line segment with a ruler.

Can a distance be negative?

distance formula $\text{distance}_{a \leftrightarrow b} = |a - b|$



The **distance between -2 and 3 on the number line**

$$\text{distance}_{-2 \leftrightarrow 3} = |a - b| = |(-2) - (3)| = |-5| = 5$$

$$= |(3) - (-2)| = |5| = 5$$

Find the distance:

$$\text{distance}_{a \leftrightarrow b} = |a - b|$$

between 10 and 3

$$= |(10) - (3)| = |7| = 7$$

between -10 and -3

$$= |(-10) - (-3)| = |-10 + 3| = 7$$

between 10 and -3

$$= |(10) - (-3)| = |10 + 3| = 13$$

between -10 and 3

$$= |(-10) - (3)| = |-13| = 13$$

Does the order of the numbers matter?

Why or why not?

What is the distance?

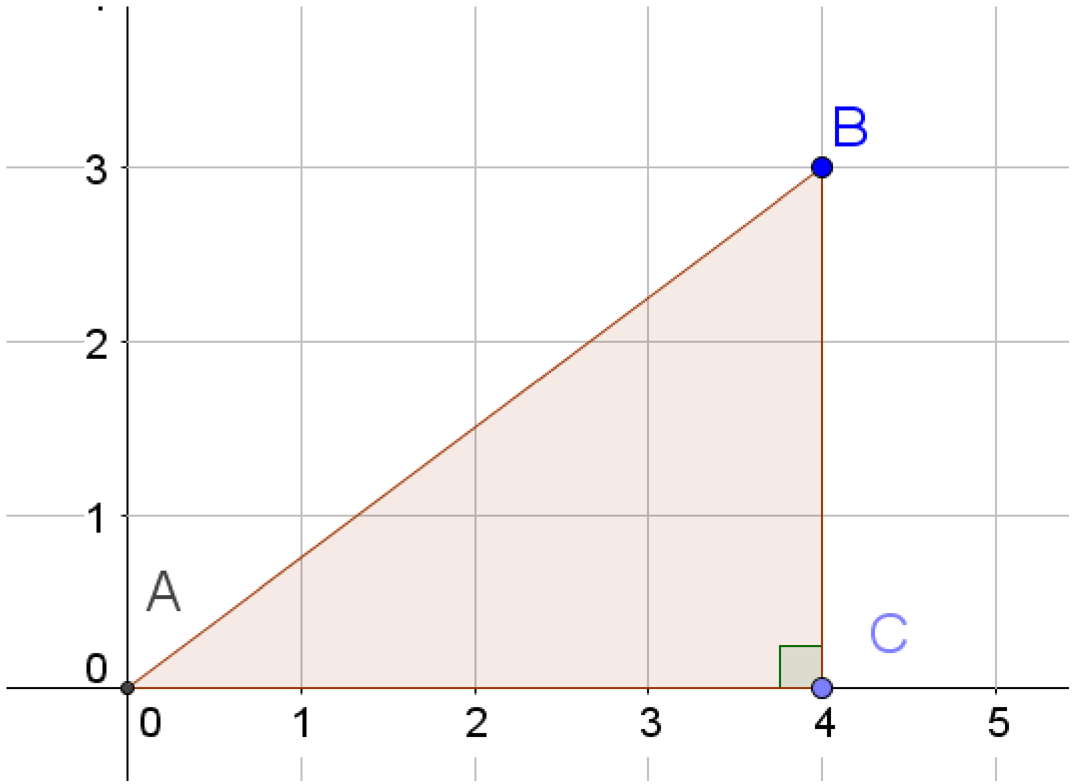
AC = ?

AC = 4

BC = ?

BC = 3

AB = ?



$\overleftrightarrow{AB}$ is NOT a number line. How can we find AB ?

Use the Pythagorean Theorem

Theorem is a statement that has been proven to be true.

Theorems are usually written in
“IF _hypothesis___, THEN _conclusion____” format.

If the hypothesis is true then we know the conclusion is true.

We exchange the hypothesis and conclusion to get a converse.

Theorem:

IF (it is a) dog, THEN (it) barks

Converse of the Theorem:

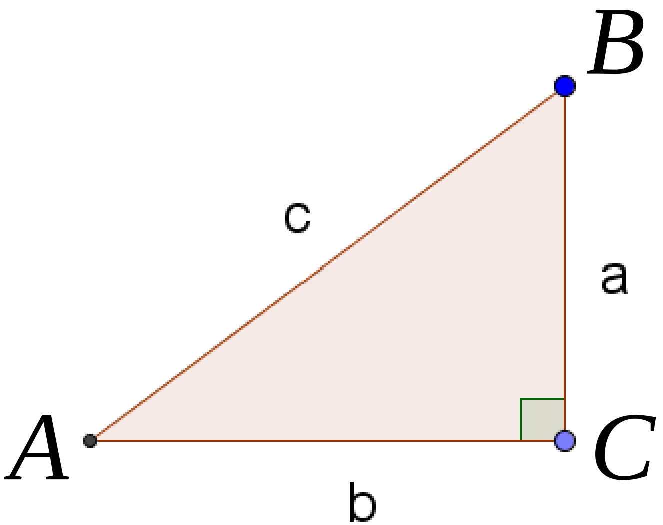
IF (it) barks, THEN (it is a) dog

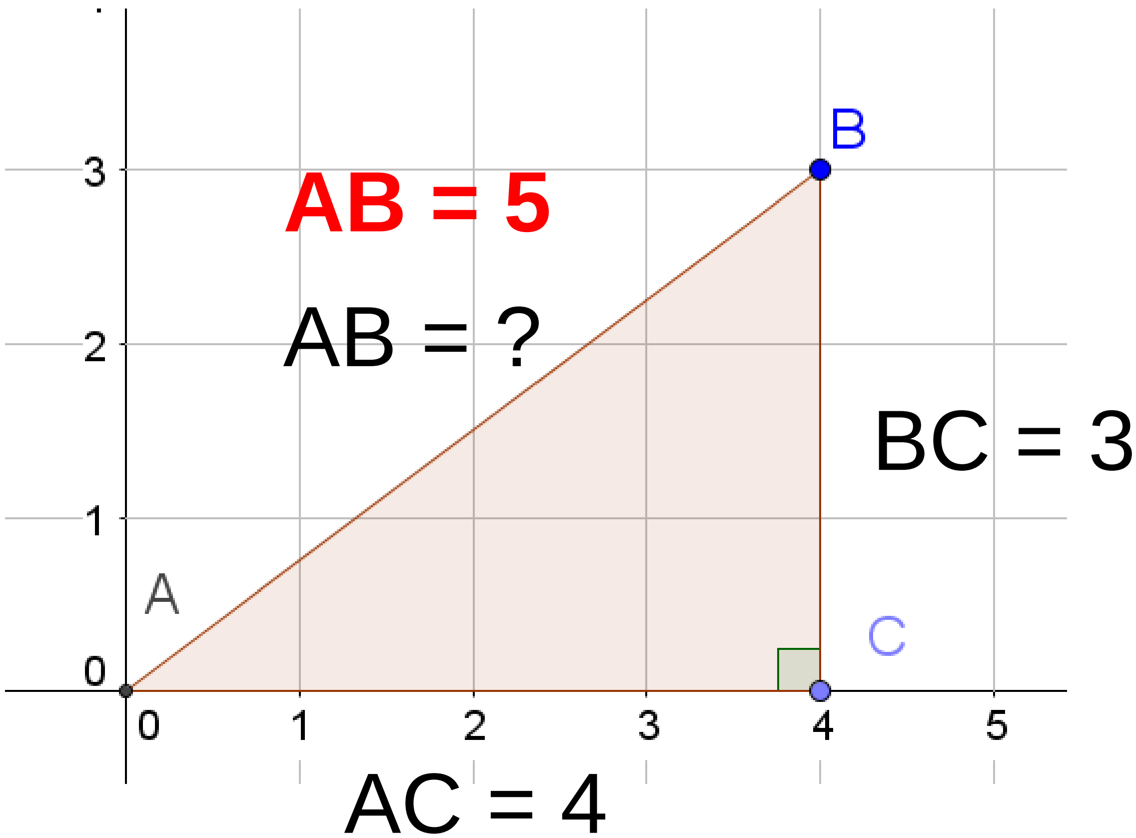
The Pythagorean Theorem:
IF the triangle is a right triangle,
THEN the lengths of the sides are related by: $a^2 + b^2 = c^2$

The converse of this theorem is also the true (but this doesn't work for all theorems).

IF the lengths of the sides of a triangle are related by $a^2 + b^2 = c^2$

THEN the triangle is a right triangle





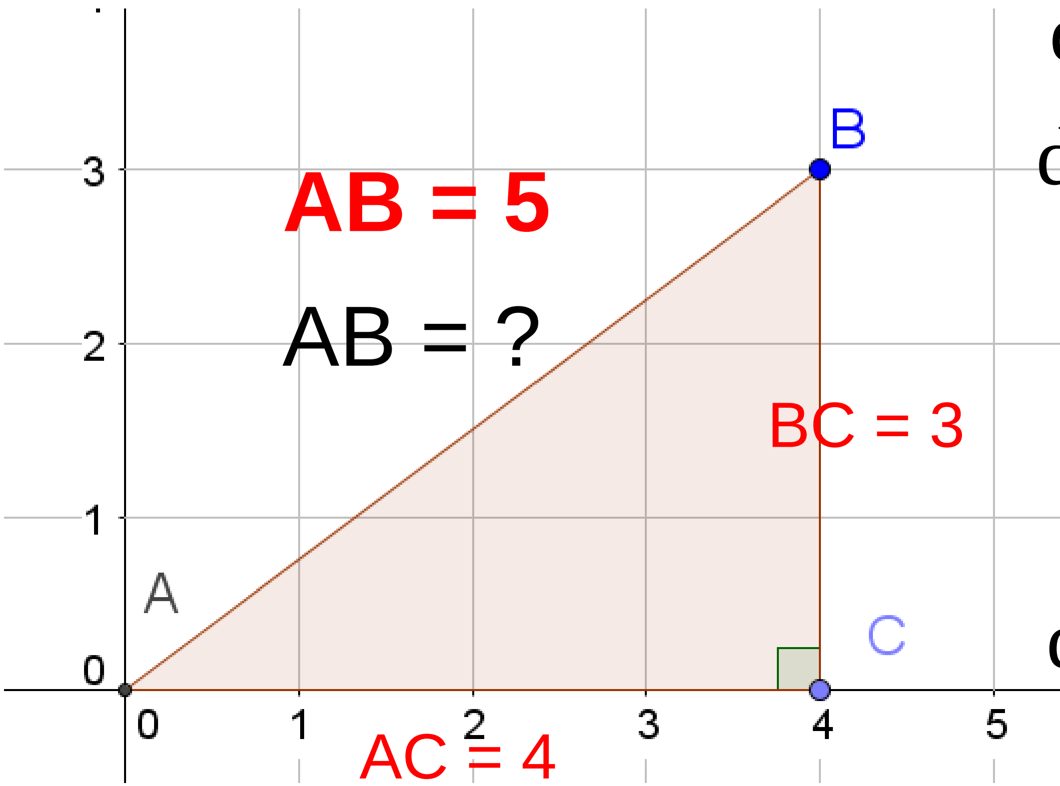
$$a^2 + b^2 = c^2$$

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

$$\sqrt{(3)^2 + (4)^2} = c$$

$$\sqrt{9 + 16} = c$$

$$5 = c$$



$$\text{distance}_{\text{B}\leftrightarrow\text{C}} = |B - C|$$

$$\text{distance}_{\text{B}\leftrightarrow\text{C}} = |x_b - x_c|$$

$$\text{distance}_{\text{B}\leftrightarrow\text{C}} = |3 - 0|$$

BC = 3

$$\text{distance}_{\text{A}\leftrightarrow\text{C}} = |A - C|$$

$$\text{distance}_{\text{A}\leftrightarrow\text{C}} = |y_a - y_b|$$

$$\text{distance}_{\text{A}\leftrightarrow\text{C}} = |0 - 4|$$

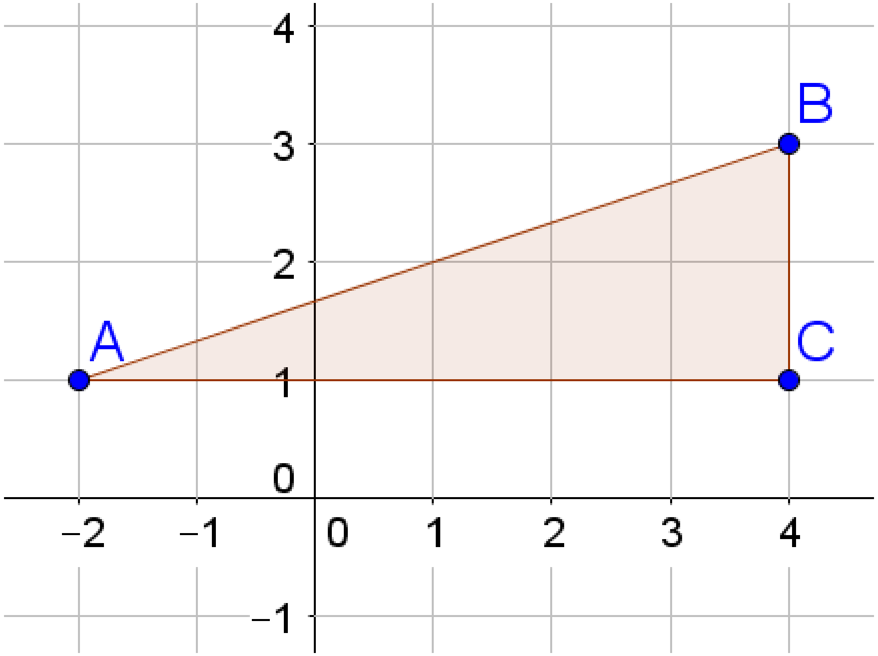
AC = 4

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

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

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

The distance formula is just the Pythagorean Theorem



AC = ?

AC = 6

BC = ?

BC = 2

AB = ?

$$AB = \sqrt{(6)^2 + (2)^2}$$

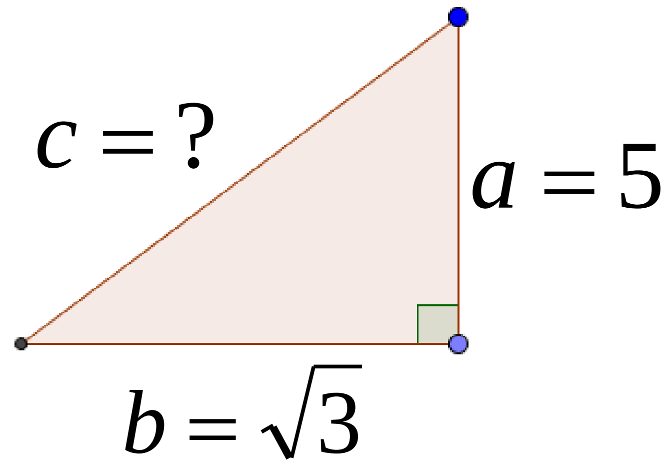
$$AB = \sqrt{40}$$

$$AB = 2\sqrt{10}$$

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

$$(\quad)^2 + (\quad)^2 = (\quad)^2$$

$$(\sqrt{3})^2 + (5)^2 = c^2$$



$$3 + 25 = c^2$$

$$28 = c^2$$

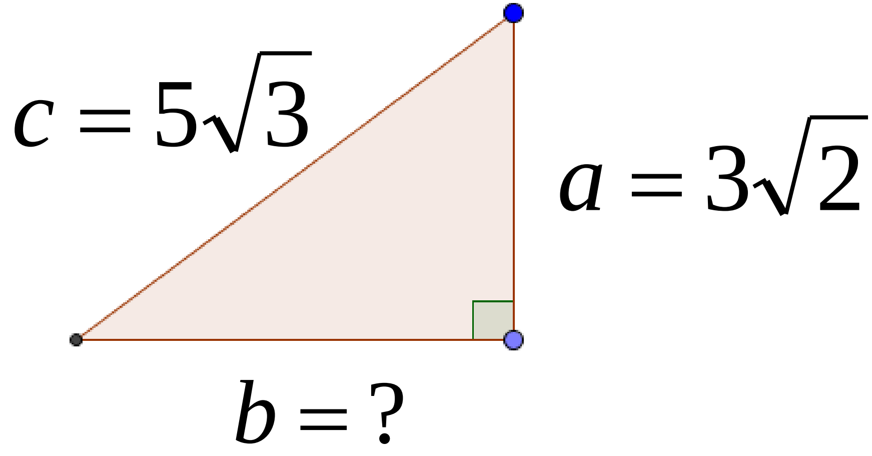
$$c = \sqrt{28}$$

$$c = \sqrt{4}\sqrt{7}$$

$$c = 2\sqrt{7}$$

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

$$(\quad)^2 + (\quad)^2 = (\quad)^2$$



$$(3\sqrt{2})^2 + b^2 = (5\sqrt{3})^2$$

Power of a Product Property

$$(3)^2 * (\sqrt{2})^2 + b^2 = (5)^2 * (\sqrt{3})^2$$

$$18 + b^2 = 75$$

$$b = \sqrt{57}$$