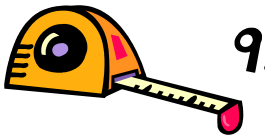
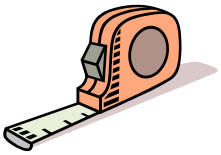


9.5 The Distance Formula



9.4 Warm Up

The Pythagorean Converse

If c is the length of the longest side of a triangle and...

$c^2 = a^2 + b^2$ then the triangle is right

$c^2 < a^2 + b^2$ then the triangle is acute

$c^2 > a^2 + b^2$ then the triangle is obtuse

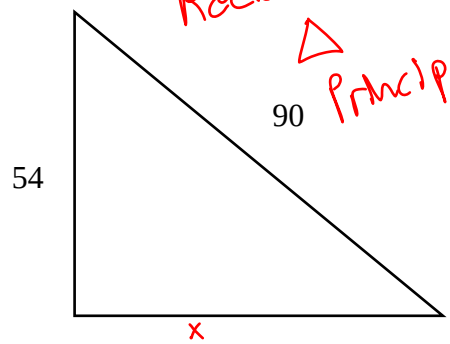
What kinds of triangles are these?

24, 26, 10 right

7, 9, 3 obtuse

4, 2, 7 impossible!

Solve for the missing side of the triangle.



Reduced △ Principle

$54^2 + x^2 = 90^2$

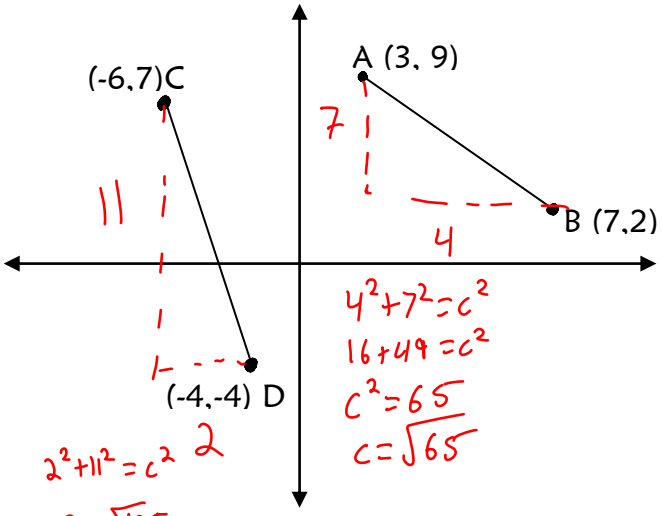
18 18

$3^2 + x^2 = 5^2$

$x = 4 \cdot 18 = 72$

The Distance Formula

In the diagram below, use the Pythagorean Theorem to find the distance between A and B as well as the distance between C and D.



$4^2 + 7^2 = c^2$

$16 + 49 = c^2$

$c^2 = 65$

$c = \sqrt{65}$

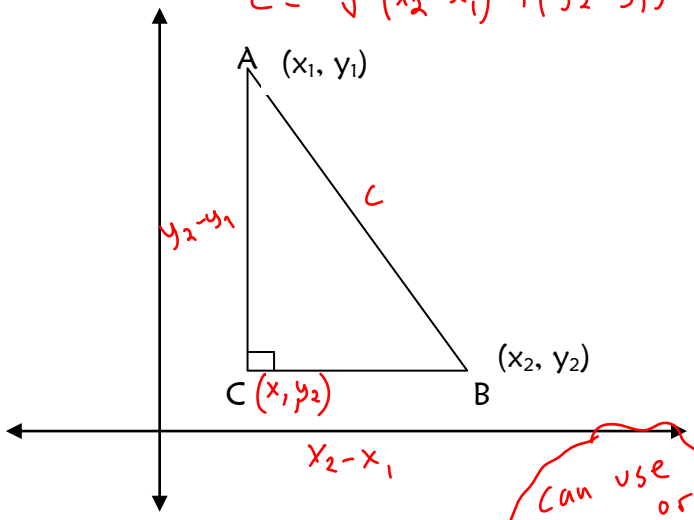
$2^2 + 11^2 = c^2$

$c = \sqrt{125}$

$c = 5\sqrt{5}$

How can we find the distance between A and B in this diagram?

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



Can use $y_1 - y_2$ or $y_2 - y_1$.

The Distance Formula

Given A: (x_1, y_1)
B: (x_2, y_2)

distance A to B (or c) =

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

Distance Formula Practice

Find the distance between the two points:

1. (2, 6) and (5, 10)

$\sqrt{4^2+3^2}$

5

2. (4, -8) and (-1, -3)

$\sqrt{(-3+8)^2+(-1-4)^2}$

$\sqrt{5^2+(-5)^2}$

$\sqrt{50}$

$5\sqrt{2}$

Want a challenge?

3. If the distance between $(-2, y_1)$ and $(6, 8)$ is $4\sqrt{5}$, find the missing y value.

$4\sqrt{5} = \sqrt{(8-y_1)^2+(6-(-2))^2}$

$(4\sqrt{5})^2 = (8-y_1)^2 + 64$

$80 = (8-y_1)^2 + 64$

$16 = (8-y_1)^2$

$16 = 64 - 16y_1 + y_1^2$

$y_1^2 - 16y_1 + 48$

$y_1 = 4, y_1 = 12$

4. If the point (x, 4) is equidistant from the points (-2, -3) and (6, 1), find x.

$\sqrt{(-3-4)^2+(-2-x)^2} = \sqrt{(1-4)^2+(6-x)^2}$

$(\sqrt{\quad})^2 + (-2-x)^2 = (-3)^2$

$+4x = -8$

$x = -1/2$