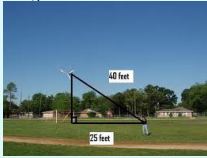


October 5, 2015

EQ: How is the Pythagorean Theorem used to find distance?



MCC8.G.8 Apply the Pythagorean Theorem to find the distance between two points in a coordinate system.

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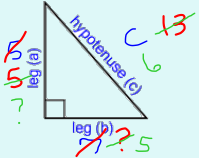
## Warm-up

Solve for x.

- $16 + 9 = x^2$   
 $25 = x^2$   
 $\sqrt{25} = x$   
 $5 = x$
- $10^2 + 7^2 = x^2$   
 $149 = x^2$   
 $\sqrt{149} = x$   
 $x = 12.2$
- $64 + x^2 = 289$   
 $-64 \quad -64$   
 $x^2 = 225$   
 $x = \sqrt{225}$   
 $x = 15$
- $x^2 + 6^2 = 9^2$   
 $x^2 + 36 = 81$   
 $-36 \quad -36$   
 $x^2 = 45$   
 $x = \sqrt{45}$   
 $x = 6.7$

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Definition of Pythagorean Theorem - a theorem that relates the length of the hypotenuse of a right triangle (c) to the lengths of its legs (a and b). The theorem is  $a^2 + b^2 = c^2$ .



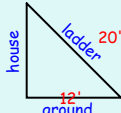
$a^2 + b^2 = c^2$

Find the missing side lengths of the triangle.

- $a = 5; b = 7; c = \underline{\quad}$   
 $5^2 + 7^2 = c^2$   
 $74 = c^2$   
 $\sqrt{74} = c$   
 $c = 8.6$
- $a = 5; c = 13; b = \underline{\quad}$   
 $5^2 + b^2 = 13^2$   
 $25 + b^2 = 169$   
 $b^2 = 144$   
 $b = \sqrt{144} = 12$
- $b = 5; c = 6; \text{ find } a = \underline{\quad}$   
 $a^2 + 5^2 = 6^2$   
 $a^2 + 25 = 36$   
 $a^2 = 11$   
 $a = \sqrt{11} = 3.3$

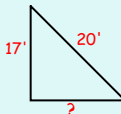
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4.a. A house painter places the bottom of his 20-foot ladder 12 feet from a house. The top of the ladder rests against the house. How far up the house does the ladder reach? Sketch a picture first.



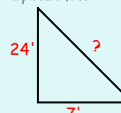
$a^2 + 12^2 = 20^2$   
 $a^2 + 144 = 400$   
 $a^2 = 256$   
 $a = \sqrt{256} = 16'$

b. Now, the painter places the same ladder so that it reaches 17 feet up the side of the house. How far from the base of the house is the ladder placed? Sketch a picture first.



$17^2 + b^2 = 20^2$   
 $289 + b^2 = 400$   
 $b^2 = 111$   
 $b = \sqrt{111} = 10.5'$

c. His ladder breaks and he has to borrow a ladder. The new ladder reaches 24 feet up the house and is 7 feet from the base of the house. How long is the ladder? Sketch a picture first.



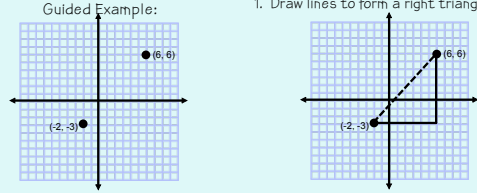
$24^2 + 7^2 = c^2$   
 $625 = c^2$   
 $c = \sqrt{625} = 25'$

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How can we use the Pythagorean theorem to find the distance between two points in the coordinate plane?

Guided Example:

- Draw lines to form a right triangle.

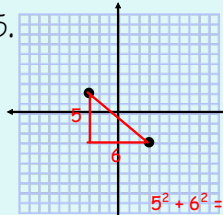


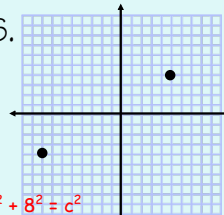
- Find the distance of a and b.
- Use the Pythagorean theorem to calculate c.

$8^2 + 9^2 = c^2$   
 $64 + 81 = c^2$   
 $145 = c^2$   
 $12.04 \approx c$

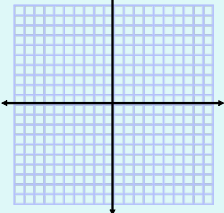
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### You Try:

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$5^2 + 6^2 = c^2$   
 $61 = c^2$   
 $c = \sqrt{61} = 7.8$
- 

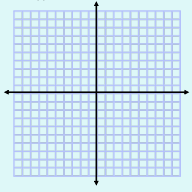
$13^2 + 8^2 = c^2$   
 $233 = c^2$   
 $c = \sqrt{233} = 15.3$
- Challenge: Find the distance between (3, -7) and (-2, 5).



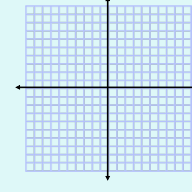
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Applications:

8. Tyler and Tommy have mapped out locations for a game of tag. Tyler's position is represented by the point  $(-2, 1)$ . Tommy's position is represented by the point  $(7, 9)$ . Each unit is equivalent to 100 feet. What is the approximate distance between Tyler and Tommy?

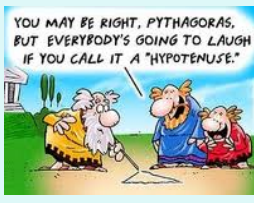


9. Kevin is standing 2 miles due north of the school. Julie is standing 4 miles due west of the school. What is the distance between Kevin and Julie?



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Homework:  
Complete the Worksheet



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