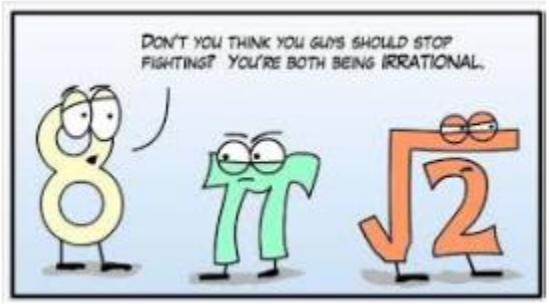
The Real Number System
and Pythagorean Theorem
Unit 9 Part C



Standards:

8.NS.1 Know that numbers that are not rational are called irrational. Understand informally that every number has a decimal expansion; for rational numbers show that the decimal expansion repeats eventually, and convert a decimal expansion which repeats eventually into a rational number.

8.NS.2 Use rational approximations of irrational numbers to compare the size of irrational numbers, locate them approximately on a number line diagram, and estimate the value of expressions.

8.EE.2 Use square root and cube root symbols to represent solutions to equations of the form x 2 = p and x 3 = p, where p is a positive rational number. Evaluate square roots of small perfect squares and cube roots of small perfect cubes. Know that √2 is irrational.

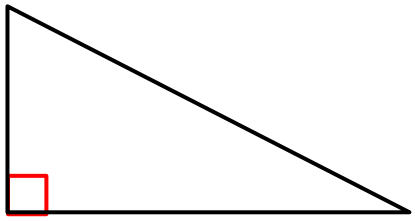
8.G.6 Explain a proof of the Pythagorean Theorem and its converse.

8.G.7 Apply the Pythagorean Theorem to determine unknown side lengths in right triangles in real-world and mathematical problems in two and three dimensions.

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

Name:_____ **Date:** _____ **Period:**_____

Lesson #95 Right Triangles

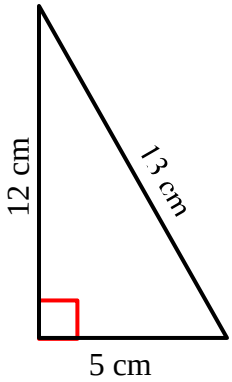


In a right triangle the sides that form the _____ are called _____.

The side opposite the _____ is called the _____.

In each of the following record the measures of the legs and the hypotenuse:

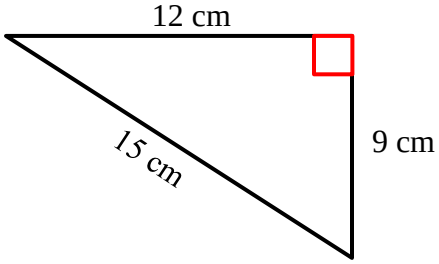
1.



Legs: _____

Hypotenuse: _____

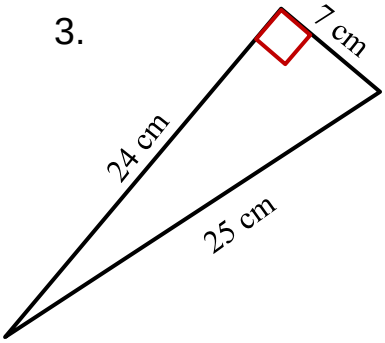
2.



Legs:_____

Hypotenuse: _____

3.



Legs: _____

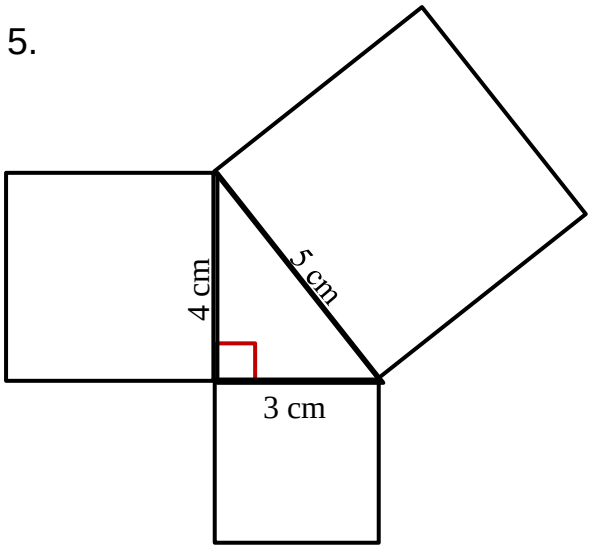
Hypotenuse: _____

What relationship do you see between the legs and the hypotenuse? _____

_____

In each of the following cases find the area of the squares attached to each side of the given right triangles:

5.



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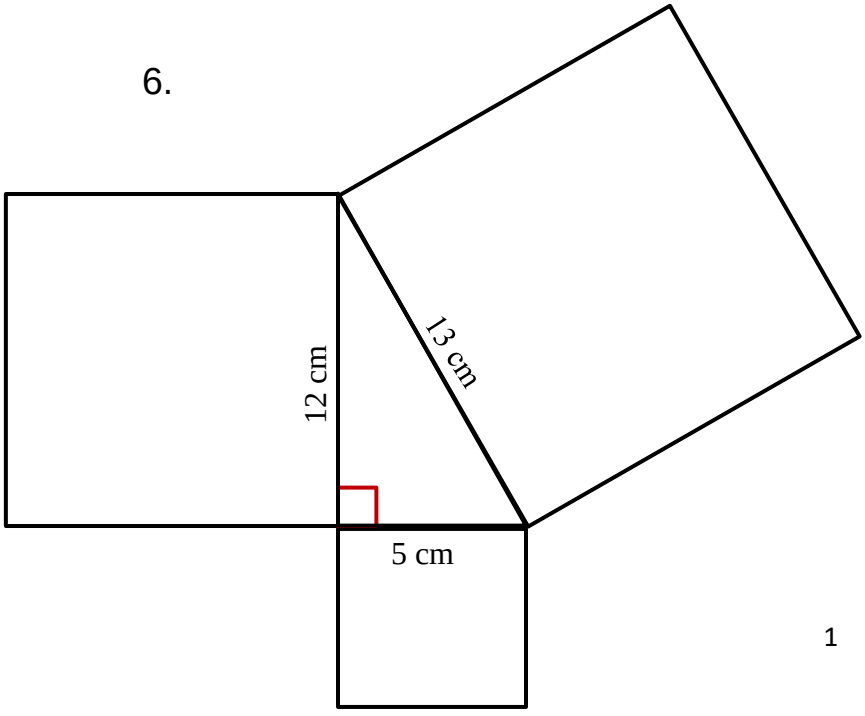

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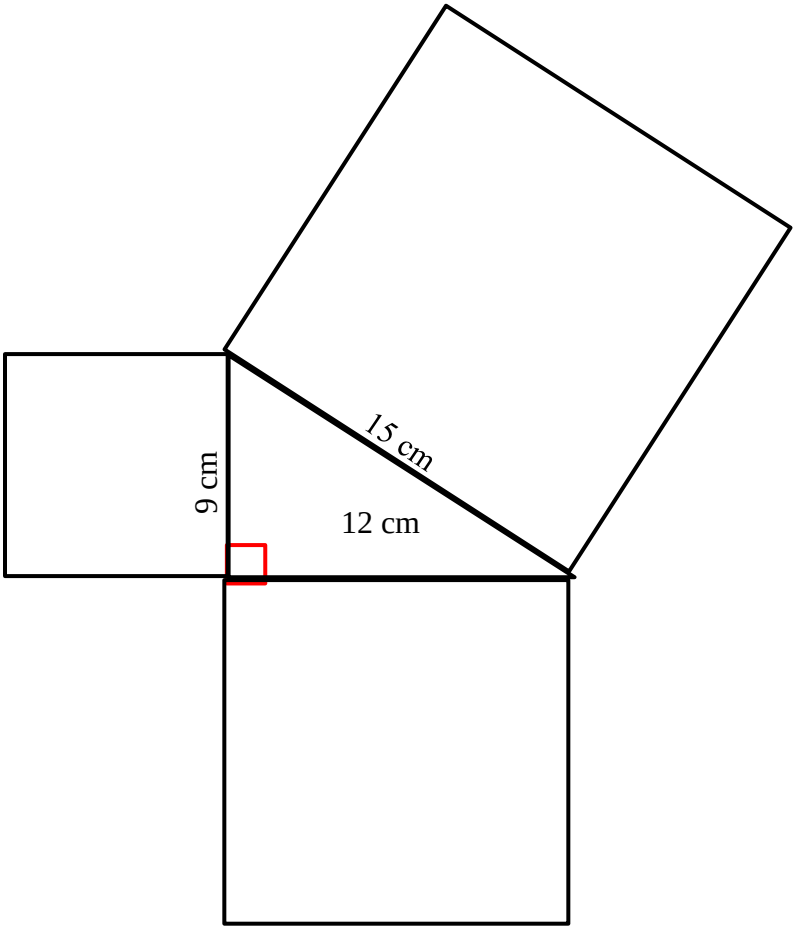


9. Now, what relationship do you see between the lengths of the legs and the length of the hypotenuse?

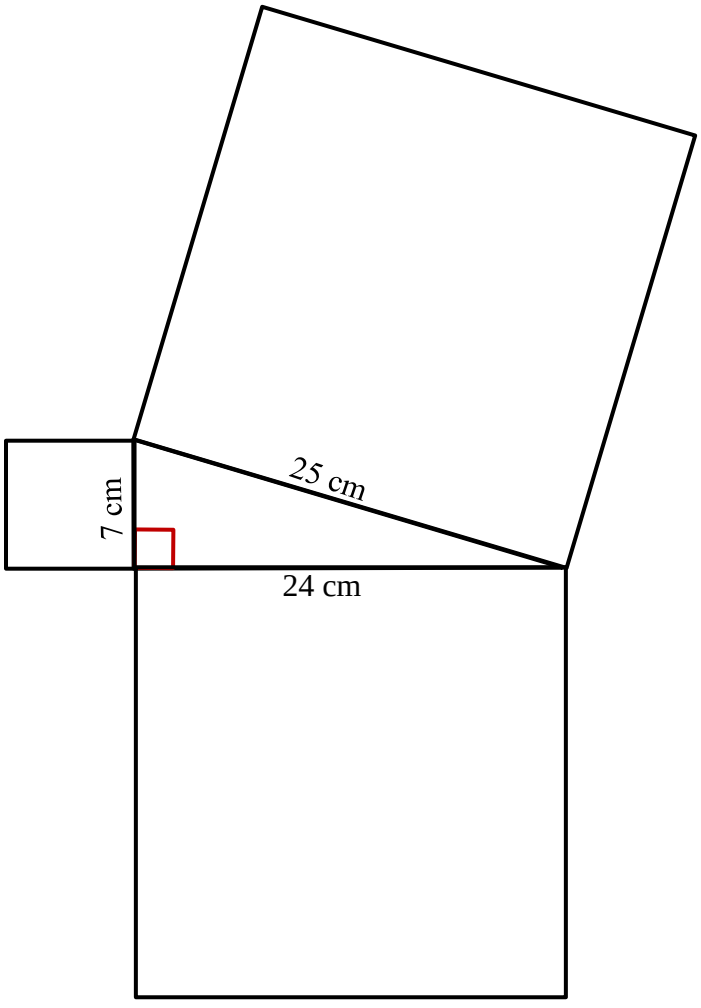
_____

_____

_____

_____

8.



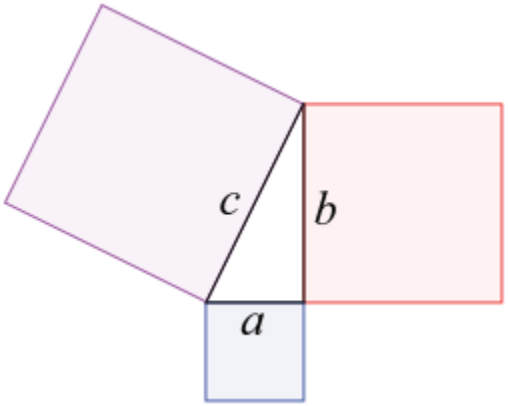
10. If the legs of all right triangles are named a and b and the hypotenuse is called c, write an equation the represents the relationship between a, b and c.

_____

HW #95 Pythagorean Triples

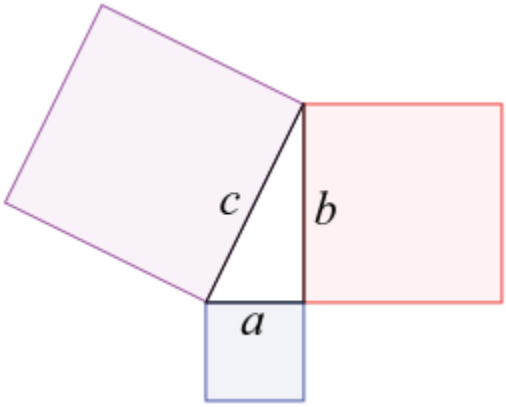
Given the diagram and the values for a, b, and c find the area of the squares attached to each side of the given right triangles:

1. a = 11 b = 60 c = 61



Which side is the Hypotenuse? _____

2. a = 8 b = 15 c = 17



A **Pythagorean Triple** is a set of three numbers, listed as a, b, c, that form right triangles. Any multiple of a Pythagorean Triple will have measurements that will also form right triangles.

Common Triples

3, 4, 5	5, 12, 13	7, 24, 25
$3^2 + 4^2 = 5^2$	$5^2 + 12^2 = 13^2$	$7^2 + 24^2 = 25^2$
9 + 16 = 25	25 + 144 = 169	49 + 576 = 625

3. Give a multiple of 3, 4, 5 and show that it also forms a right triangle.

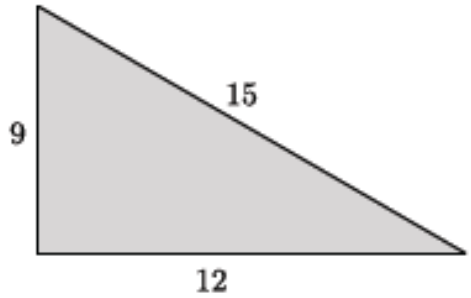
4. Will the measurements 8, 12, 19 form a right triangle? Justify your answer.

Lesson #96 Pythagorean Triples

Pythagorean's Theorem can be used to determine if a triangle is a right triangle or not, by substituting the measurements of the legs and hypotenuse into the theorem and checking to make sure it works. If the values satisfy the formula the triangle has to be right, if not it is not right.

Use Pythagorean's Theorem to determine if the given triangles are right triangles.

1.



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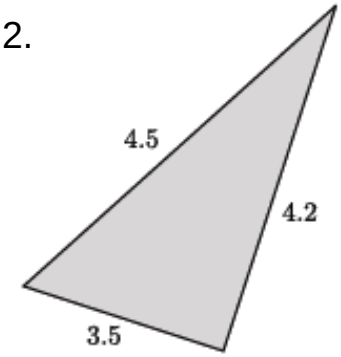

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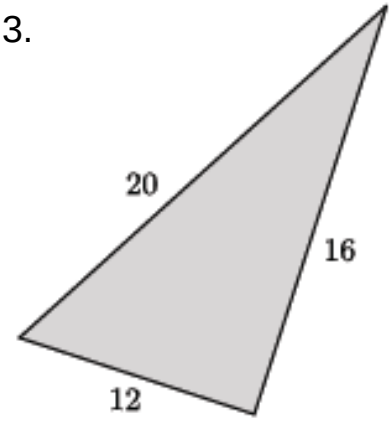

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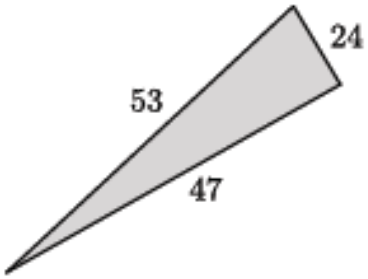


Will the following sets of lengths form right triangles? Show work to prove your answers.

5. 3 mi, 8 mi, $\sqrt{73}$ mi

6. 9 in, 9 in, $5\sqrt{7}$ in

7. $2\sqrt{7}$ cm, 6 cm, 8 cm

8. $\sqrt{3}$ cm, 9 cm, $\sqrt{84}$ cm

9. $\sqrt{7}$ km, 5 km, $\sqrt{48}$ km

10. 3 in, 6 in, $\sqrt{45}$ in

11. 1 ft, $\sqrt{3}$ ft, 2 ft

12. 12 in, 18in, $6\sqrt{13}$ in

HW #96 Pythagorean Triples

Will the following sets of lengths form right triangles? Show work to prove your answers.

1. 4 mi, 12 mi, $\sqrt{180}$ mi

2. 10 in, 15 in, $5\sqrt{14}$ in

3. $6\sqrt{10}$ cm, 9 cm, 22 cm

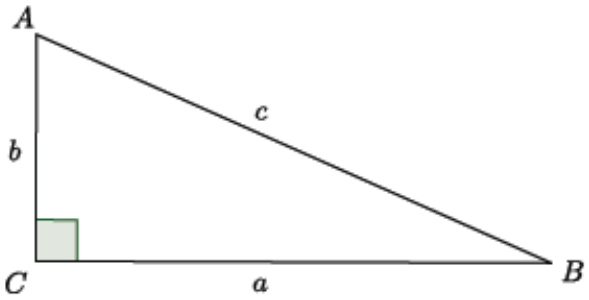
4. $12\sqrt{2}$ cm, $4\sqrt{7}$ cm, 16 cm

5. Give a multiple of 5, 12, 13 and show that it also forms a right triangle.

6. Give a multiple of 7, 24, 25 and show that it also forms a right triangle.

Lesson #97 Pythagorean's Theorem: Find the length of the Hypotenuse

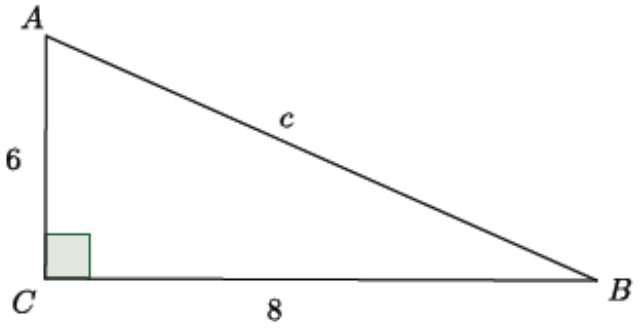
Pythagorean's theorem states that If the lengths of the legs of a right triangle are $\boldsymbol{a}$ and $\boldsymbol{b}$, and the length of the hypotenuse is $\boldsymbol{c}$, then $\boldsymbol{a^2 + b^2 = c^2}$.



Use Pythagorean's theorem to determine the length of the hypotenuse of the right triangle in simplest form and to the nearest tenth if necessary.

Examples:

1.



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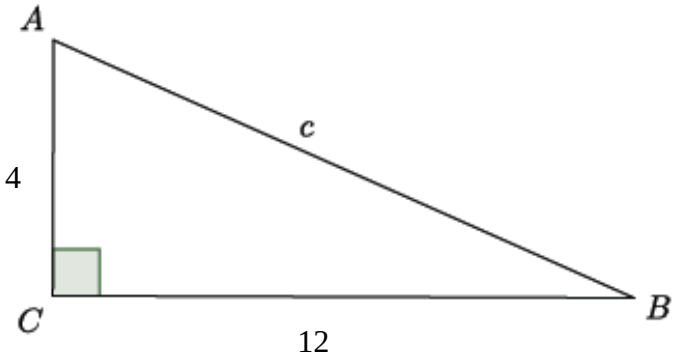

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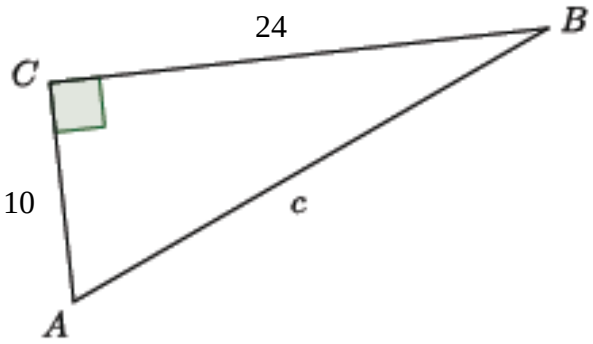

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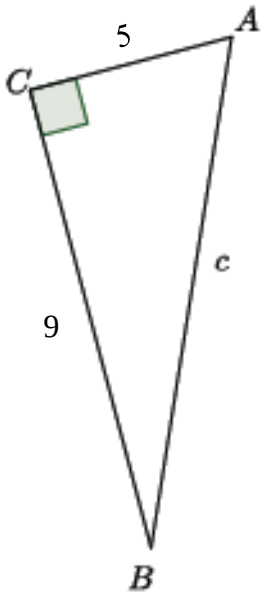

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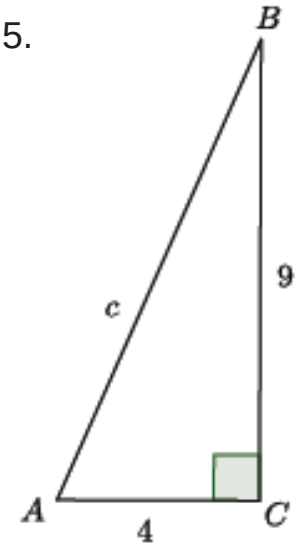

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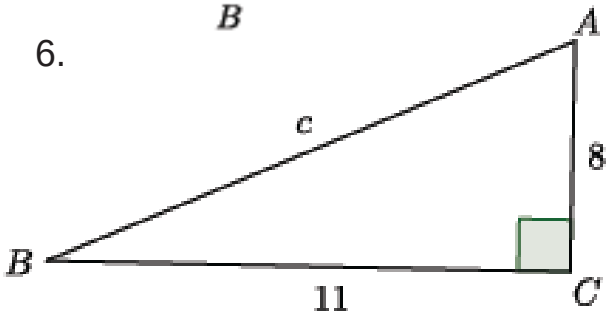

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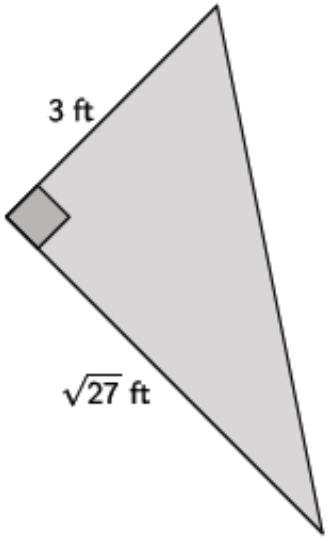
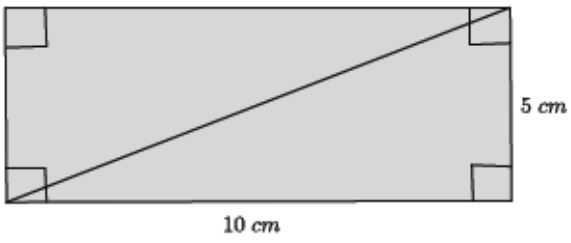


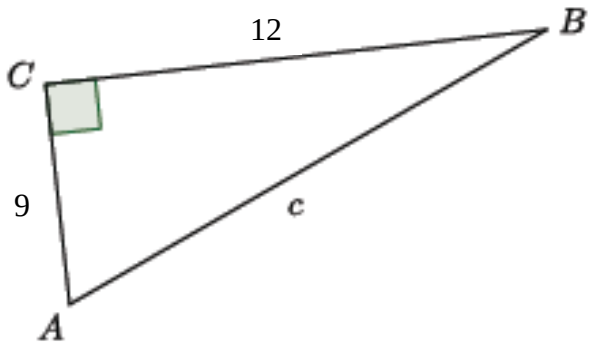
8. Given a rectangle with dimensions 5 cm and 10 cm, as shown, find the length of the diagonal in simplest radical form.



HW #97 Pythagorean's Theorem

Use Pythagorean's theorem to determine the length of the hypotenuse of the right triangle in simplest form and to the nearest tenth if necessary.

1.



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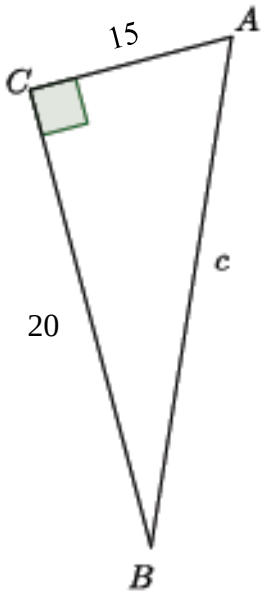

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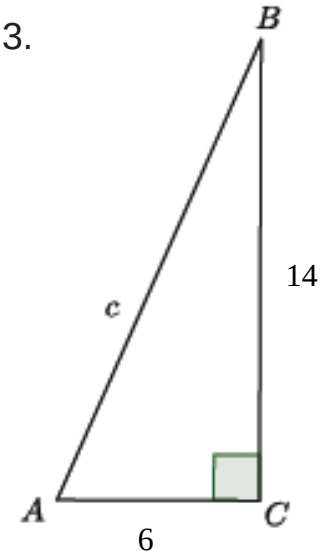

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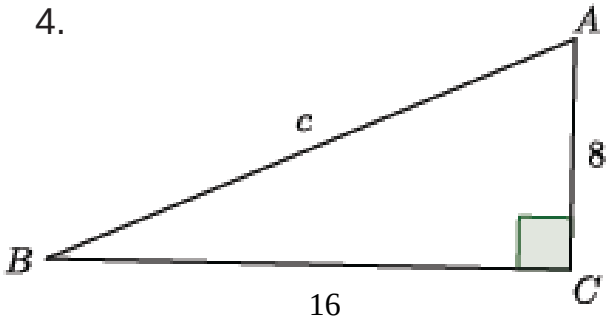
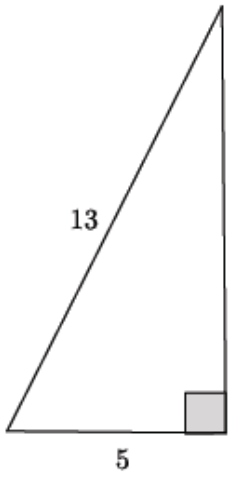


5. The side lengths of a rectangular room are 9 feet by 40 feet. The room is going to be split in half on a diagonal using a string. Find the length of a piece of string needed in simplest radical form and to the nearest tenth of a foot.

Lesson #98 More Pythagorean's Theorem: Find the leg of a right triangle

Use Pythagorean's Theorem to find the length of the missing leg in simplest form for each diagram.

1.



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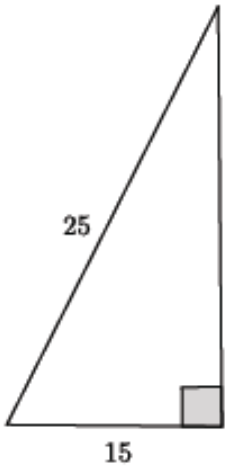


3. a = 6, b = ?, c = 18

4. a = ?, b = 8 , c = 16

5. a = 9, b = ?, c = 14

6. a = ?, b = 10, c = 17

7. a = ?, b = 24, c = 25

8. a = 3, b = ?, c = 9

For the problems below draw a picture that represents the scenario, then use Pythagorean's theorem to find the answer.

7. You have a 15-foot ladder and need to reach exactly 9 feet up the wall. How far away from the wall should you place the ladder so that you can reach your desired location?

8. Jamie is flying a kite. He lets out 40 feet of string. If Jamie's friend Ryan is standing 24 feet from him directly under the kite, find the height of the kite.

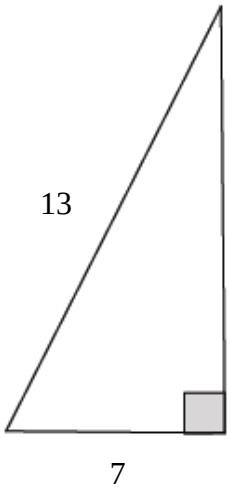
9. A barn roof covers a span that is 32 feet across. The peak of the roof is 23 feet above the walls. Find the length of each side of the slanted roof?

10. The base of a pyramid is 280 cm. Rachel finds that the length of the slant is 500 cm. Find the height of the pyramid

HW #98 More Pythagorean's Theorem

Use Pythagorean's Theorem to find the length of the missing leg in each diagram.

1.



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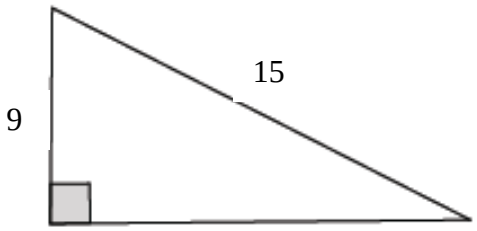

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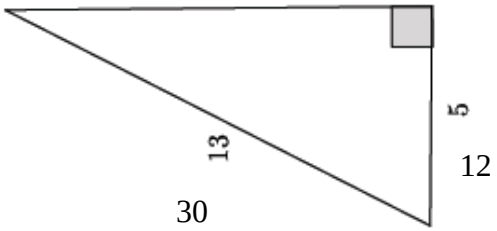

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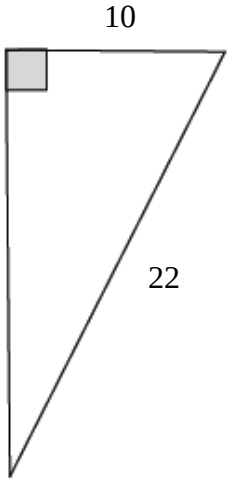


5. A baseball diamond has the shape of a square with the bases at the vertices of the square. If the distance from home plate to first base it 90 feet, approximate, in simplest radical form and to the nearest tenth of a foot, the distance from home plate to second base.

Lesson #99 Pythagorean Theorem to Calculate Distance on coordinate plane

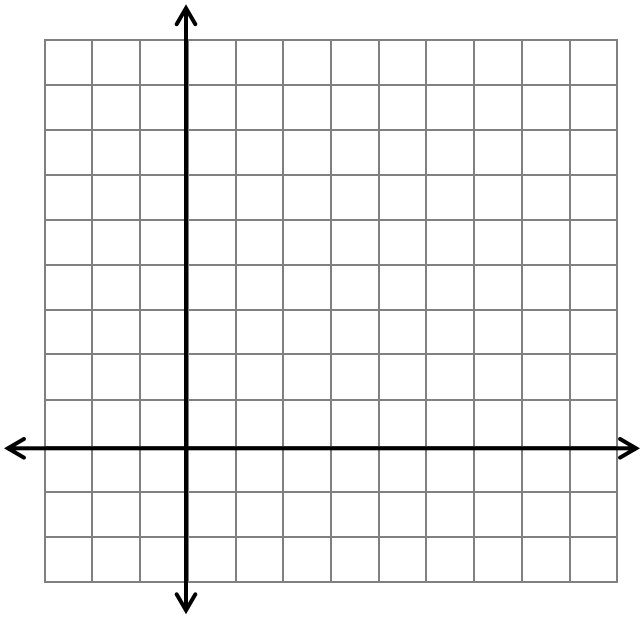
Procedure:

1. Plot the given _____.
2. Connect the coordinates.
3. Draw a right triangle, such that the _____ drawn in step two serves as its _____.
4. Use Pythagorean's Theorem to find the _____ between the coordinates.

Examples:

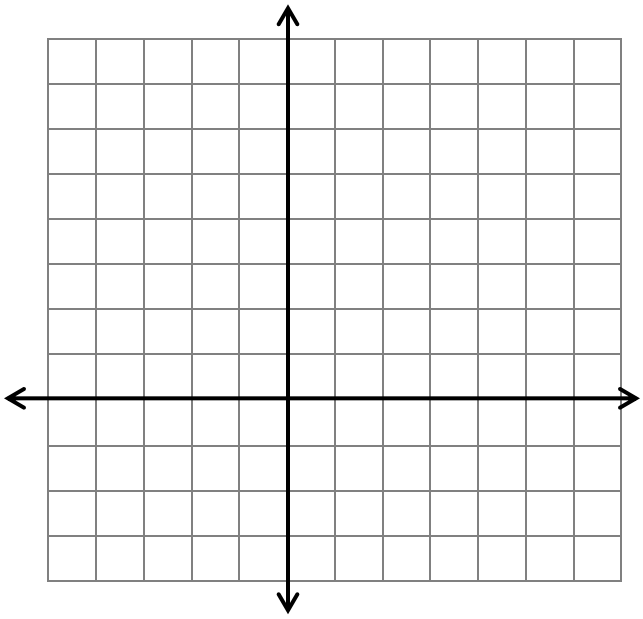
1. Find the distance between

   (-2, 9) and (6, -3)



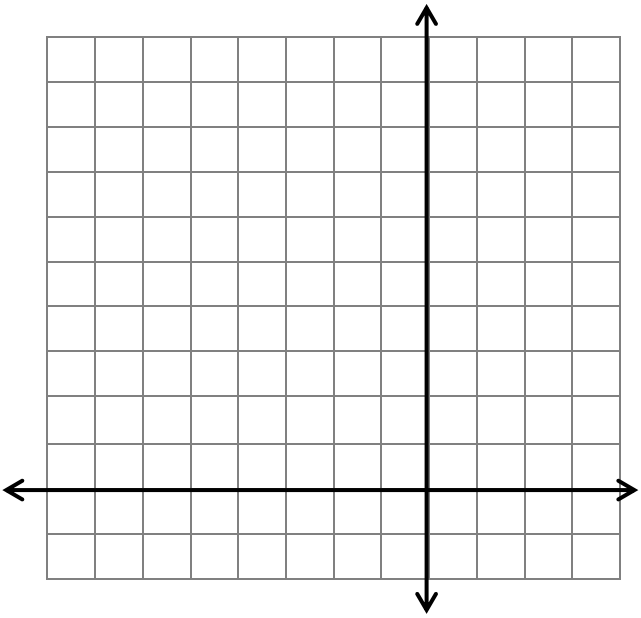
2. Find the distance between

   (-4, -3) and (4, 6)



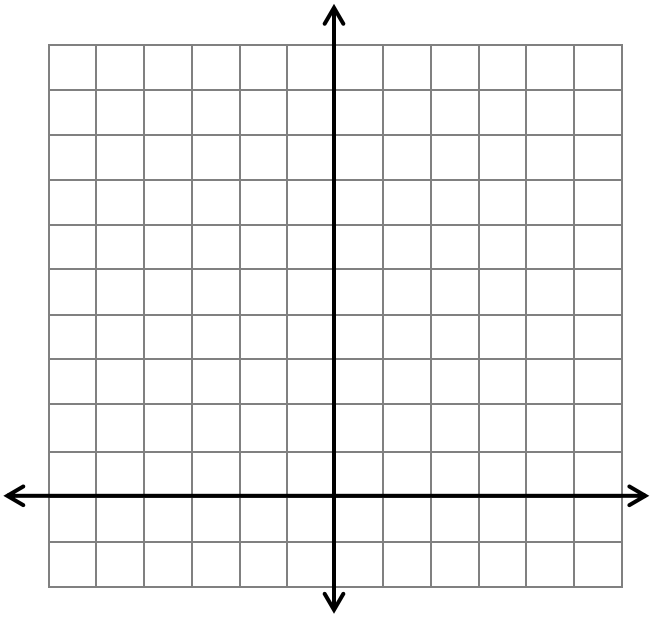
3. Find the distance between

   (-6, -1) and (3, 10)



4. Find the distance between

   (-4, 8) and (1, 1)



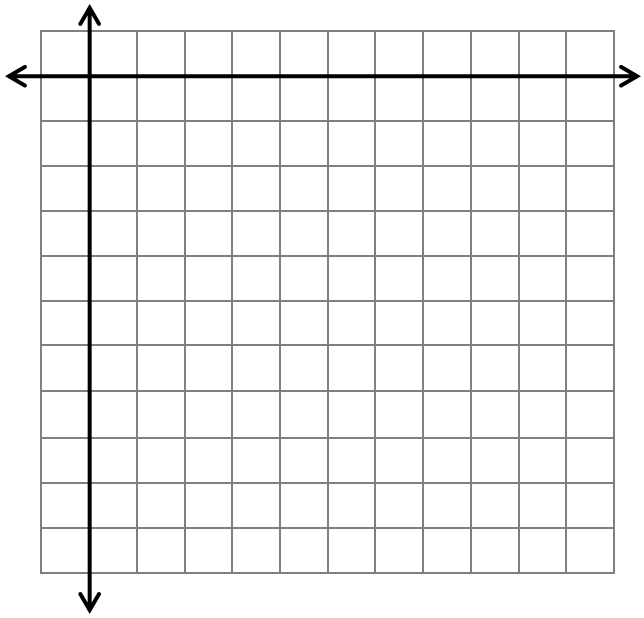
5. Missy rides her bike 8 miles south and 14 miles east to visit her friend, Leah. What is the shortest distance between Missy's house and Leah's house?

6. Luke drives 24 miles south, 18 miles east and 6 miles south again to reach his destination. What is the shortest distance between his starting point and end point?

HW #99 Using Pythagorean Theorem to Calculate Distance

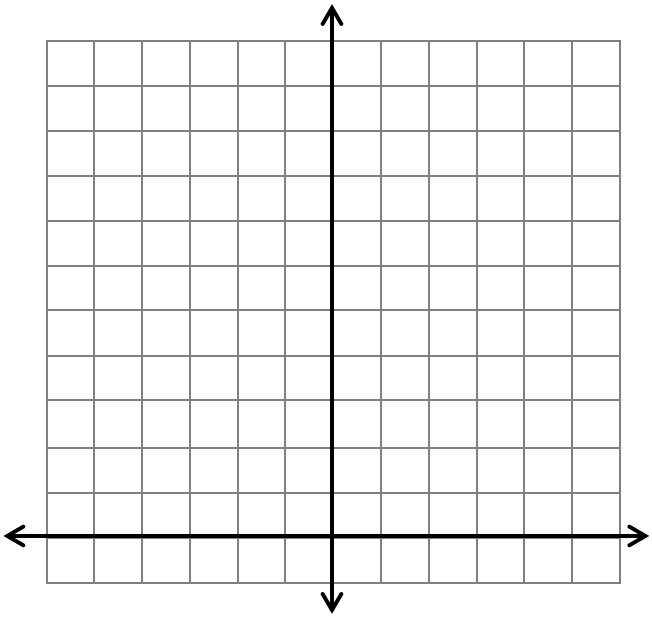
1. Find the distance between

   (1, -1) and (10, -10)



2. Find the distance between

   (-5, 8) and (5, 0)



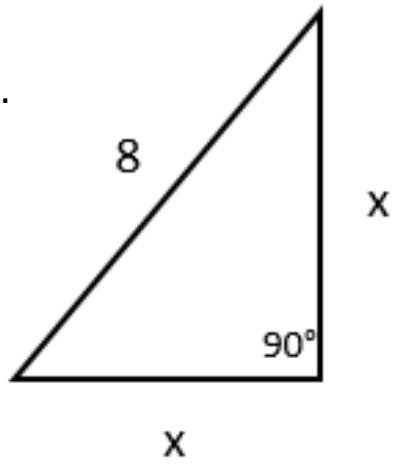
3. Mason rides his motorcycle 12 miles south and 18 miles east to visit his friend, Rachel. What is the shortest distance between Mason's house and Rachel's house? Express your answer in simplest form.

4. Samantha drives 20 miles south, 9 miles east and 11 miles south again to reach her destination. What is the shortest distance between her starting point and end point? Express your answer in simplest form.

Lesson #100 Use Pythagorean Theorem to Solve for x

Solve for x in each case below and find each missing side.

1.



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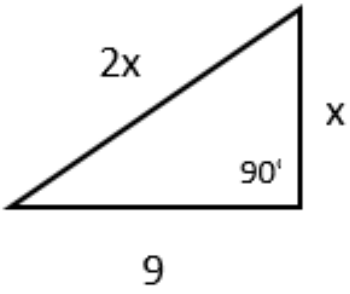

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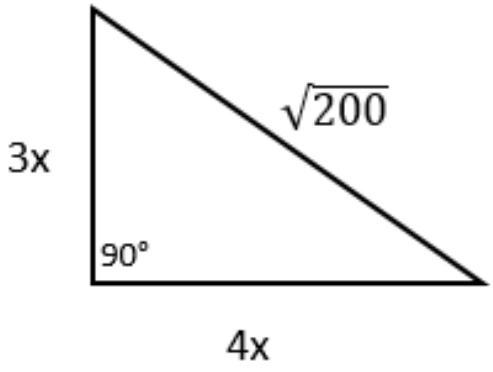

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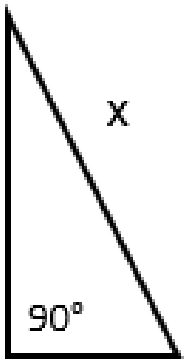
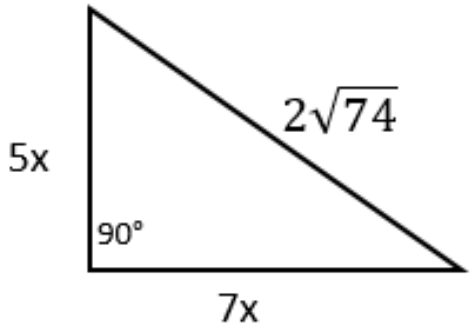
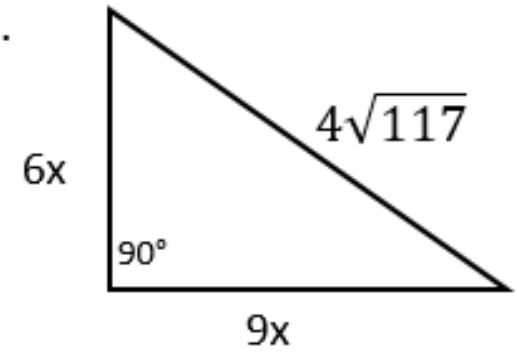


$\frac{1}{2}x$

5.



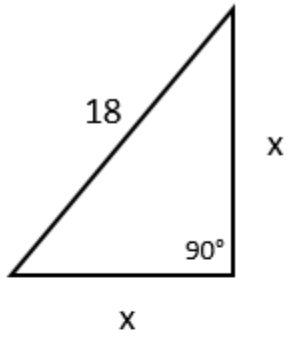
6.



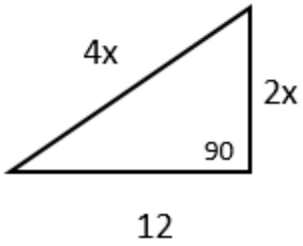
HW #100 Use Pythagorean Theorem to Solve for x

Solve for x in each case below and find each missing side.

1.



2.



3.