Distance in the Coordinate Plane

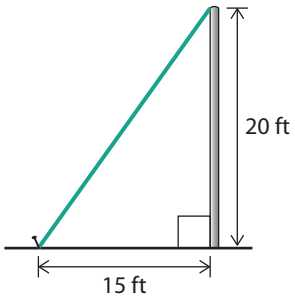
Name: _____

Prerequisite: Solve Problems Using the Pythagorean Theorem

Study the example problem showing how to use the Pythagorean Theorem. Then solve problems 1–5.

Example

A wire stretches from the top of a 20-foot pole to the ground. The wire is secured to the ground 15 feet from the base of the pole. How long is the wire?



The pole, the ground, and the wire form a right triangle. Use the Pythagorean Theorem to find the length of the wire.

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

$20^2 + 15^2 = c^2$ Replace a with 20 and b with 15.

$400 + 225 = c^2$ Simplify.

$625 = c^2$ Add.

$\sqrt{625} = c$ Take the square root of each side.

$25 = c$ Simplify.

The wire is 25 feet long.

1 In the example, how do you know which sides are the legs and which side is the hypotenuse?

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2 Are the side lengths of the triangle in the example a Pythagorean triple? Explain.

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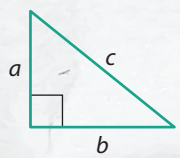
_____

Vocabulary

Pythagorean Theorem in any right triangle, the sum of the squares of the lengths of the legs, a and b, is equal to the square of the length of the hypotenuse, c.

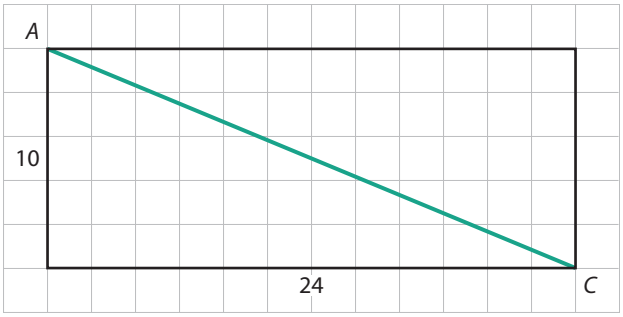
$a^2 + b^2 = c^2$



Solve.

3 Find the length of diagonal *AC* in the rectangle at the right.

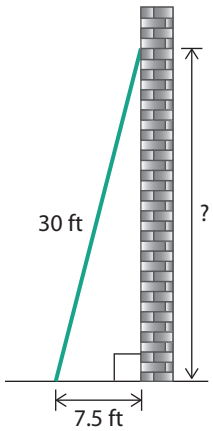
Show your work.



Solution: _____

4 The bottom of a 30-foot ladder is 7.5 feet from the bottom of a wall of a building. Explain how you can find the height at which the ladder touches the wall. Then find that height to the nearest foot.

Show your work.



Solution: _____

5 A scalene right triangle has a hypotenuse with a length of 50 centimeters. The length of one leg is twice the length of the other. What are the lengths of the legs of the triangle to the nearest tenth of a centimeter?

Show your work.

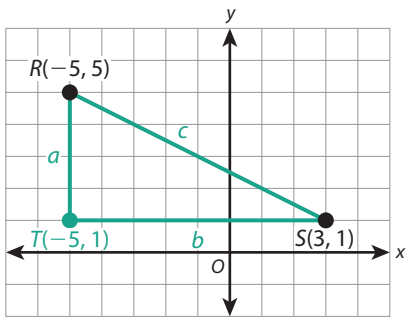
Solution: _____

Name: _____

Find the Distance Between Two Points

Study the example problem showing how to find the distance between two points. Then solve problems 1–6.

Example



What is the distance between points R and S?

Sketch right triangle RST by drawing a vertical line segment from R, a horizontal line segment from S, and a line segment connecting R and S.

Find the lengths a and b of the legs.

$a = |5 - 1| = 4$ $\quad b = |-5 - 3| = 8$

Then use the Pythagorean Theorem to find c.

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

$c^2 = 4^2 + 8^2$

$c^2 = 16 + 64$

$c^2 = 80$

$c = \sqrt{80} \approx 8.9$

The distance between points R and S is about 8.9 units.

1 Describe a method other than the one used in the example that you could use to find a.

_____

2 Explain how you know that $\triangle RST$ is a right triangle.

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_____

3 Suppose point S in the example was at (4, 1). Would the distance between points R and S be greater than or less than 8.9? Explain.

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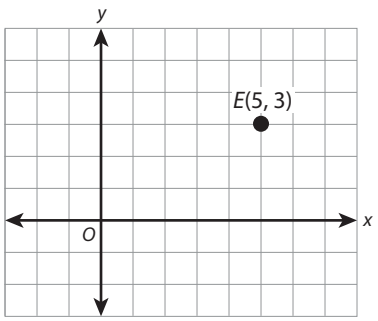
Solve.

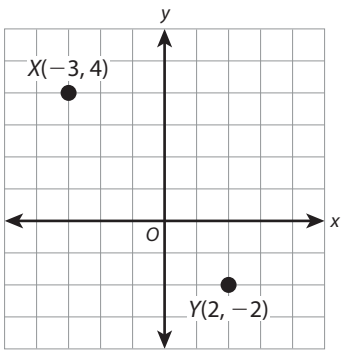
4 How far is point $E(5, 3)$ from the origin?

Show your work.



Solution: _____

5 Connie says that she can use the equation $6^2 + 5^2 = c^2$ to find the distance between points X and Y in the diagram at the right.



a. Do you agree with Connie? Explain why or why not.

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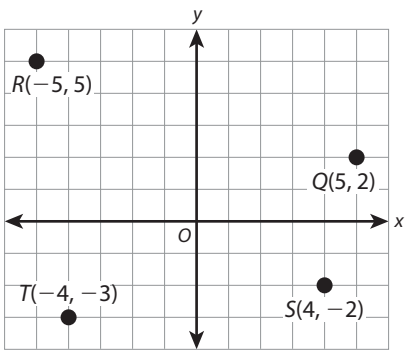
b. What is the distance between points X and Y?

_____

6 Which point in the diagram at the right has a distance of $\sqrt{130}$ from point R? Explain how you found your answer.



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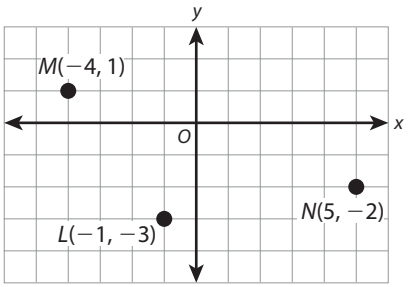
Name: _____

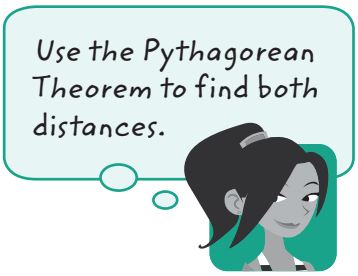
Distance in the Coordinate Plane

Solve the problems.

1 Find the distance between points *L* and *M*. Then find the distance between points *L* and *N*. Which distance is greater? How much greater?

Show your work.





Solution: _____

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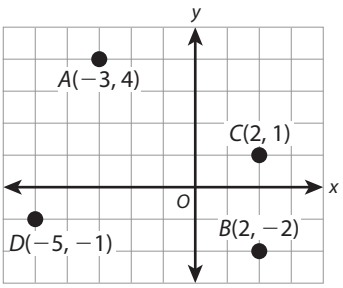
2 Which point has a distance of $\sqrt{5}$ units from the origin?

A Point *A*

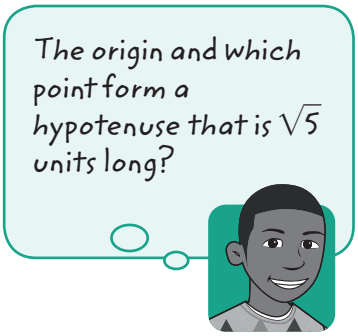
B Point *B*

C Point *C*

D Point *D*



Ken chose **A** as the correct answer. How did he get that answer?



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Solve.

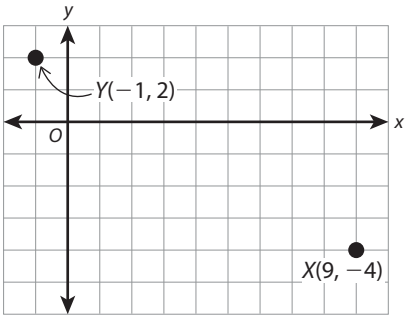
3 What is the distance from point *X* to point *Y*?

A 8

B 10

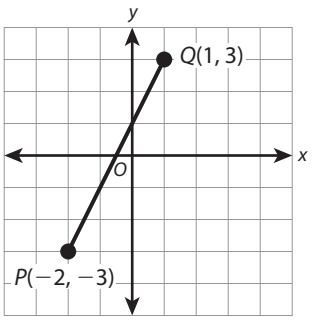
C $\sqrt{117}$

D $\sqrt{136}$



How can drawing a right triangle help you?

4 Segment *PQ* is one leg of isosceles triangle *PQR*.



What do you know about the legs of an isosceles triangle?

Part A

Name a point *R* in quadrant IV that could be the third vertex of the isosceles triangle, and draw the point on the coordinate plane. Explain your reasoning.

Part B

What are the side lengths of the triangle, to the nearest tenth of a unit? What is the perimeter of the triangle, to the nearest tenth of a unit?