Name _____ Date _____

9.1 The Pythagorean Theorem

For use with Exploration 9.1

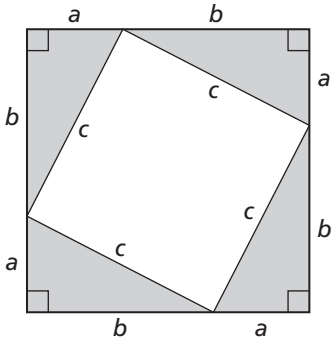
Essential Question How can you prove the Pythagorean Theorem?

1 EXPLORATION: Proving the Pythagorean Theorem without Words

Work with a partner.

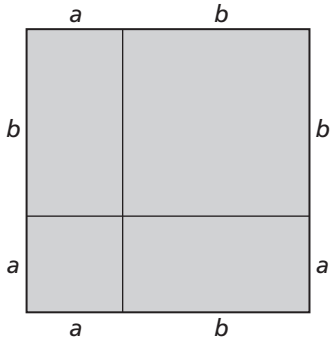
a. Draw and cut out a right triangle with legs a and b, and hypotenuse c.

b. Make three copies of your right triangle. Arrange all four triangles to form a large square as shown.



c. Find the area of the large square in terms of a, b, and c by summing the areas of the triangles and the small square.

d. Copy the large square. Divide it into two smaller squares and two equally-sized rectangles, as shown.



e. Find the area of the large square in terms of a and b by summing the areas of the rectangles and the smaller squares.

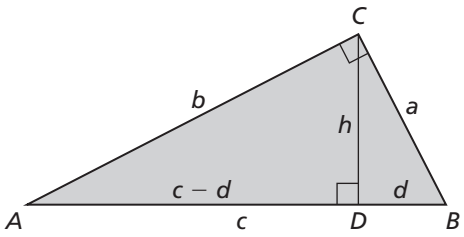
f. Compare your answers to parts (c) and (e). Explain how this proves the Pythagorean Theorem.

9.1 The Pythagorean Theorem (continued)

2 EXPLORATION: Proving the Pythagorean Theorem

Work with a partner.

a. Consider the triangle shown.



b. Explain why $\triangle ABC$, $\triangle ACD$, and $\triangle CBD$ are similar.

c. Write a two-column proof using the similar triangles in part (b) to prove that $a^2 + b^2 = c^2$.

Communicate Your Answer

3. How can you prove the Pythagorean Theorem?

4. Use the Internet or some other resource to find a way to prove the Pythagorean Theorem that is different from Explorations 1 and 2.

Name _____ Date _____

9.1 Notetaking with Vocabulary

For use after Lesson 9.1

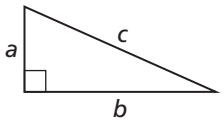
In your own words, write the meaning of each vocabulary term.

Pythagorean triple

Theorems

Theorem 9.1 Pythagorean Theorem

In a right triangle, the square of the length of the hypotenuse is equal to the sum of the squares of the lengths of the legs.



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

Notes:

Core Concepts

Common Pythagorean Triples and Some of Their Multiples

3, 4, 5	**5, 12, 13**	**8, 15, 17**	**7, 24, 25**
6, 8, 10	10, 24, 26	16, 30, 34	14, 48, 50
9, 12, 15	15, 36, 39	24, 45, 51	21, 72, 75
$3x$, $4x$, $5x$	$5x$, $12x$, $13x$	$8x$, $15x$, $17x$	$7x$, $24x$, $25x$

The most common Pythagorean triples are in bold. The other triples are the result of multiplying each integer in a bold-faced triple by the same factor.

Notes:

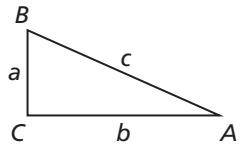
Name_____ Date _____

9.1 Notetaking with Vocabulary (continued)

Theorems

Theorem 9.2 Converse of the Pythagorean Theorem

If the square of the length of the longest side of a triangle is equal to the sum of the squares of the lengths of the other two sides, then the triangle is a right triangle.



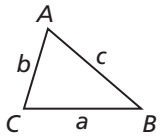
If $c^2 = a^2 + b^2$, then $\triangle ABC$ is a right triangle.

Notes:

Theorem 9.3 Pythagorean Inequalities Theorem

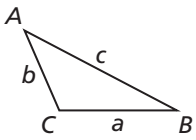
For any $\triangle ABC$, where c is the length of the longest side, the following statements are true.

If $c^2 < a^2 + b^2$, then $\triangle ABC$ is acute.



$c^2 < a^2 + b^2$

If $c^2 > a^2 + b^2$, then $\triangle ABC$ is obtuse.



$c^2 > a^2 + b^2$

Notes:

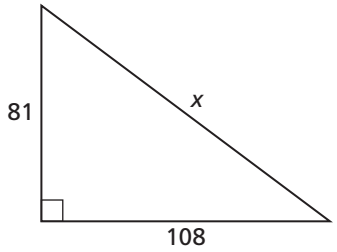
Name _____ Date _____

9.1 Notetaking with Vocabulary (continued)

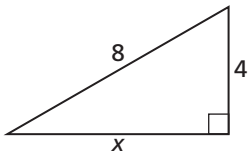
Extra Practice

In Exercises 1–6, find the value of *x*. Then tell whether the side lengths form a Pythagorean triple.

1.



2.



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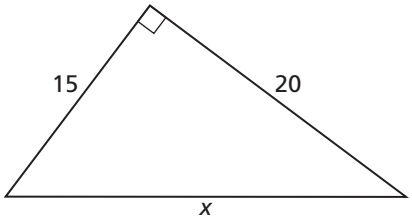
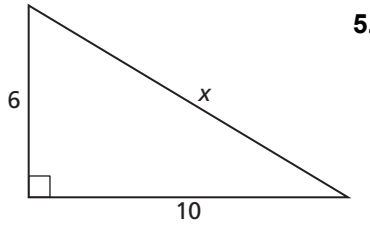
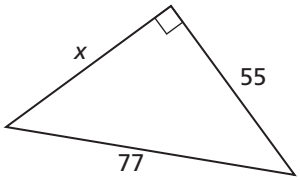


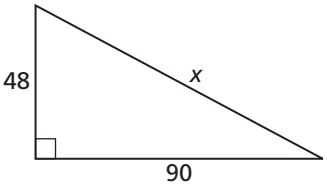
4.



5.



6.



7. From school, you biked 1.2 miles due south and then 0.5 mile due east to your house. If you had biked home on the street that runs directly diagonal from your school to your house, how many fewer miles would you have biked?

In Exercises 8 and 9, verify that the segment lengths form a triangle. Is the triangle *acute*, *right*, or *obtuse*?

8. 90, 216, and 234

9. 1, 1, and $\sqrt{3}$