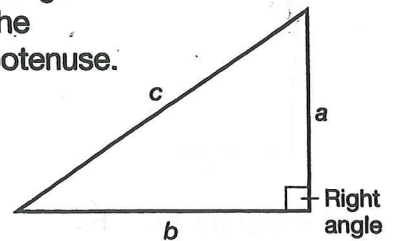Name _Key_   Date _____   Class _____

SKILL 21: The Pythagorean Theorem

The **hypotenuse** of a right triangle is the side opposite the right angle and is the longest side. The other two sides are called **legs**. In the triangle at the right, sides a and b are the legs. Side c is the hypotenuse.
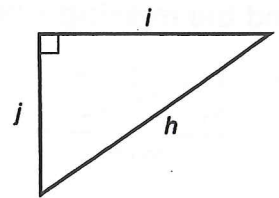
The **Pythagorean Theorem** states that the sum of the squares of the lengths of the legs of a right triangle is equal to the square of the length of the hypotenuse. This can be written algebraically as $a^2 + b^2 = c^2$.

Example 1

Name the hypotenuse and legs of the right triangle.
Side h is opposite the right angle, so it is the hypotenuse.
Sides i and j are the legs.

Example 2

Find the length of side c.

Use the Pythagorean Theorem.	$a^2 + b^2 = c^2$
Substitute 9 for a and 12 for b.	$9^2 + 12^2 = c^2$
Square 9 and 12.	$81 + 144 = c^2$
Add.	$225 = c^2$
Find $\sqrt{225}$.	$15 = c$

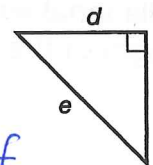The length of the hypotenuse is 15 cm.
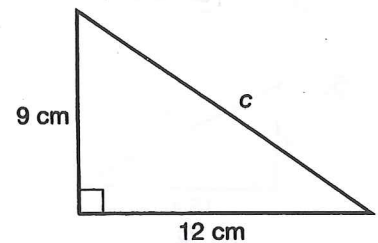
Guided Practice

1. Name the hypotenuse and legs of the right triangle.

   a. The side opposite the right angle is side __e__.

      So, the hypotenuse is side __e__.

   b. The legs of the right triangle are sides __d__ and __f__.

2. Find the missing length in the right triangle.

   Use the Pythagorean Theorem. $a^2 + b^2 = c^2$

   Substitute 4 for b and 5 for c. $a^2 + \underline{4^2} = \underline{5^2}$

   Replace each squared number with its value. $a^2 + 16 = 25$

   Undo the addition. Subtract __16__ from both sides. $a^2 + 16 - 16 = 25 - 16$

                                                $a^2 = \underline{9}$

   To find a, find the square root of 9. $\sqrt{9} = \underline{3}$

   The missing length is __3__ in. $a = \underline{3}$
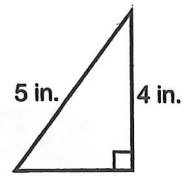
SKILL 21: Practice

Name the hypotenuse and legs of each right triangle.

1.
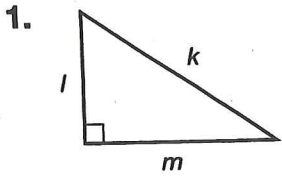
Hypotenuse: _K_

Legs: _L_ and _m_

2.
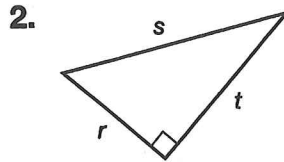
Hypotenuse: _s_

Legs: _r_ and _t_

Find the missing length in each right triangle.

3.

37 cm
35 cm

$a =$ _12 cm_

4.

5 cm   c
12 cm

$c =$ _13 cm_

5.

6 in.   c
8 in.

$c =$ _10 in._

6.

17 in.
b
15 in.

$b =$ _8 in._

7.

26 cm   b
24 cm

$b =$ _10 cm_

8.

a   21 yd
29 yd
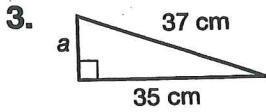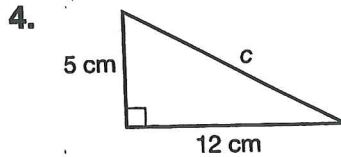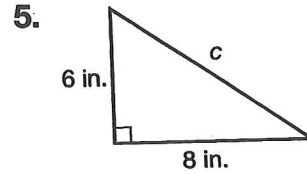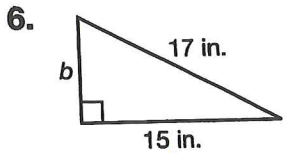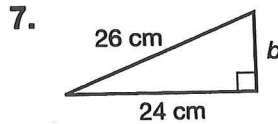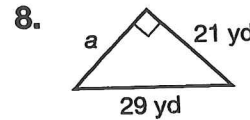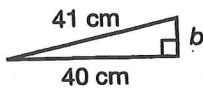
$a =$ _20 yd_

9. A courtyard that is 12 feet by 16 feet has a diagonal walkway. What is the length of the walkway?   _20 ft_

16 ft
12 ft
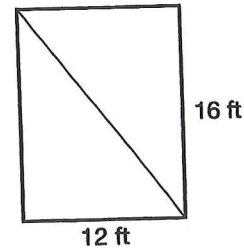
TEST PREP

10. What is the length of side b of the right triangle?

Skill 21

41 cm   b
40 cm

A 1 cm   **C** 9 cm

B 7 cm   **D** 11 cm

11. Evaluate $4 + x^2$ for $x = 8$.

Skill 20

F 60   **H** 68

G 20   **J** 144

Section C: Rational Numbers and Exponents