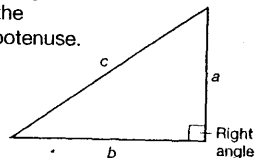




SKILL 21: The Pythagorean Theorem

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.

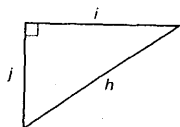
The **Pythagorean Theorem** states that the sum of the squares of the lengths of the legs of a right triangle is equal to the square of the length of the hypotenuse. This can be written algebraically as $a^2 + b^2 = c^2$.



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.

Substitute 9 for a and 12 for b .

Square 9 and 12.

Add.

Find $\sqrt{225}$.

The length of the hypotenuse is 15 cm.

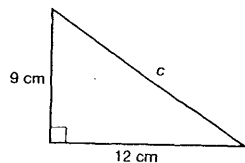
$$a^2 + b^2 = c^2$$

$$9^2 + 12^2 = c^2$$

$$81 + 144 = c^2$$

$$225 = c^2$$

$$15 = c$$



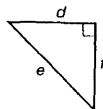
Guided Practice

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

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

So, the hypotenuse is side ____.

b. The legs of the right triangle are sides ____ and ____.



2. Find the missing length in the right triangle.

Use the Pythagorean Theorem.

Substitute 4 for b and 5 for c .

Replace each squared number with its value.

Undo the addition. Subtract ____ from both sides.

To find a , find the square root of 9.

The missing length is ____ in.

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

$$a^2 + \underline{\quad} = \underline{\quad}$$

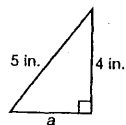
$$a^2 + 16 = 25$$

$$a^2 + 16 - 16 = 25 - 16$$

$$a^2 = \underline{\quad}$$

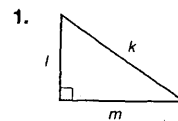
$$\sqrt{9} = \underline{\quad}$$

$$a = \underline{\quad}$$



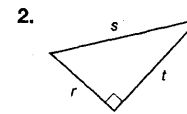
SKILL 21: Practice

Name the hypotenuse and legs of each right triangle.



Hypotenuse: ____

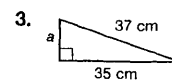
Legs: ____ and ____



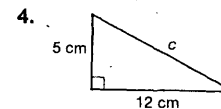
Hypotenuse: ____

Legs: ____ and ____

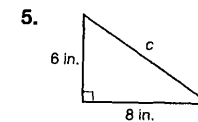
Find the missing length in each right triangle.



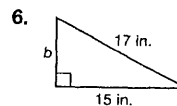
$a = \underline{\quad}$



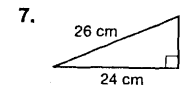
$c = \underline{\quad}$



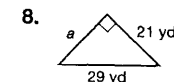
$c = \underline{\quad}$



$b = \underline{\quad}$

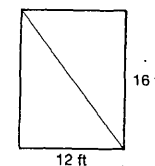


$b = \underline{\quad}$



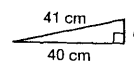
$a = \underline{\quad}$

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



TEST PREP

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



A 1 cm

B 7 cm

C 9 cm

D 11 cm

Skill 21

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

F 60

G 20

H 68

J 144

Skill 20