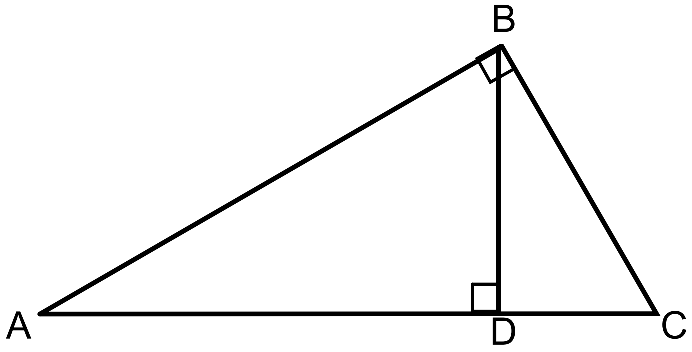
Warm-Up

Which of the triangles in picture below are similar?
Write a similarity statement for each pair.



Objectives

The Pythagorean Theorem and its Converse

a. I can apply the Pythagorean Theorem to solve for missing values
b. I can write radicals in simplest radical form

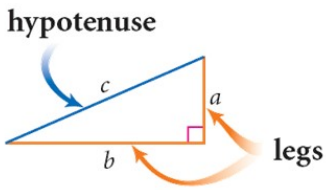
$a^2 + b^2 = c^2$

LESSON 10.1

The Pythagorean Theorem and Its Converse

In a right triangle, the side opposite the right angle is called the **hypotenuse**. The other two sides are called **legs**. In the figure below, a and b represent the lengths of the legs, and c represents the length of the hypotenuse.

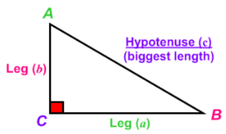
There is a special relationship between the lengths of the legs and the length of the hypotenuse. This relationship is known today as the **Pythagorean Theorem**.



The Pythagorean Theorem

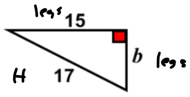
$(\text{leg})^2 + (\text{leg})^2 = (\text{hypotenuse})^2$

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



Example: Find the lengths of the unknown sides.

1.



$15^2 + b^2 = 17^2$

$225 + b^2 = 289$

$-225 \qquad -225$

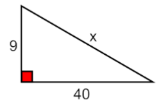
$b^2 = 64$

b = 8 $\quad b = \sqrt{64}$

$b = \pm 8$

Just use positive length

2.



$\underbrace{9^2 + 40^2}= x^2$

$1681 = x^2$

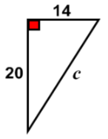
$41 = x$

x = 41

Often, the missing length will not simplify as a whole number (as in the problems above). Instead, you will be required to write your answers in **simplest radical form**. When you do this, you leave no perfect square factors under the **radical**.

Example: Find the lengths of the unknown sides. Instead of rounding, write your answer in simplest radical form.

3.



$14^2 + 20^2 = c^2$

$196 + 400 = c^2$

$596 = c^2$

$\sqrt{596} = c$

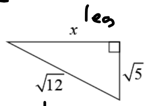
2 298

2 149

c = $2\sqrt{149}$

4.

leg



leg

hyp

$x^2 + \sqrt{5}^2 = \sqrt{12}^2$

$x^2 + 5 = 12$

$x^2 = 7$

$x = \sqrt{7}$

x = $\sqrt{7}$

Practice writing radicals in simplest radical form using the examples below. You may use any method with which you are most comfortable.

5. $\sqrt{24}$

2 12

2 6

2 3

$\sqrt{24} = 2\sqrt{6}$

6. $\sqrt{63}$

7 9

3 3

$\sqrt{63} = 3\sqrt{7}$

7. $\sqrt{162}$

2 81

9 9

3 3 3 3

$\sqrt{162} = 9\sqrt{2}$

8. $\sqrt{98}$

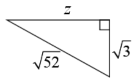
14 7

7 2

$\sqrt{98} = 7\sqrt{2}$

Now that you are more comfortable simplifying radicals, find the missing values in the right triangles below. Write your answer in **simplest radical form** first. Then, round each answer to the nearest tenth.

9.



$z^2+\sqrt{3}^2=\sqrt{52}^2$

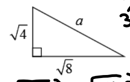
$z^2+3=52$

$z^2=49$

z = 7

z ≈ 7

10.



12
3 4
2 2

$\sqrt{4}^2+\sqrt{8}^2=a^2$

$4+8=a^2$

$12=a^2$

$\sqrt{12}=a$

Simplest Radical Form

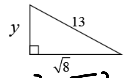
a = $2\sqrt{3}$

exact

Rounded Value

a ≈ 3.5

11.



$y^2+\sqrt{8}^2=13^2$

$y^2+8=169$

$y^2=161$

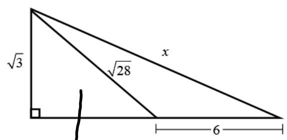
$y=\sqrt{161}$

7 23

y = $\sqrt{161}$

y ≈ 12.7

12. Now, use all of your skills to find the value of x. Keep your answer in **simplest radical form**.

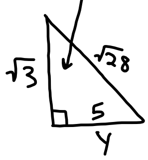


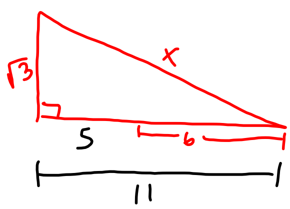
$\sqrt{3}^2+y^2=\sqrt{28}^2$

$3+y^2=28$

$y^2=25$

$y=5$





124
2 62
2 31

x = $2\sqrt{31}$

$\sqrt{3}^2+11^2=x^2$

$3+121=x^2$

$124=x^2$

$\sqrt{124}=x$

Assignment: 10.1 Pythagorean Theorem HW Day 1