10.1 Pythagorean Theorem Notes – Day 1
Geometry 3313

Name Key
Date ____________ Period ____________

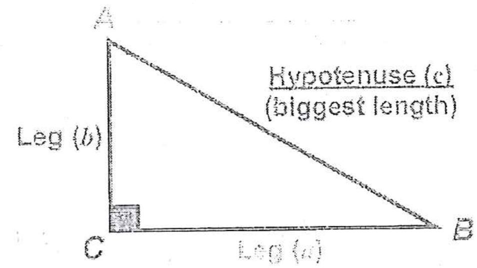
Recall: In a right triangle, the sides that form the right angle are called *LEGS* (a and b).

The side opposite of the right angle is called the *HYPOTENUSE* (c).

The Pythagorean Theorem

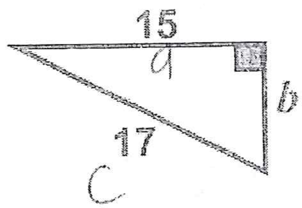
$(\text{leg})^2 + (\text{leg})^2 = (\text{hypotenuse})^2$

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



Example: Find the lengths of the unknown sides.

1.



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

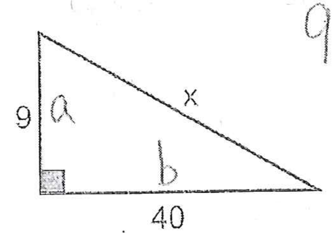
$225 + b^2 = 289$

$-225 \qquad -225$

$\sqrt{b^2} = \sqrt{64}$

b = 8

2.



$9^2 + 40^2 = x^2$

$81 + 1600 = x^2$

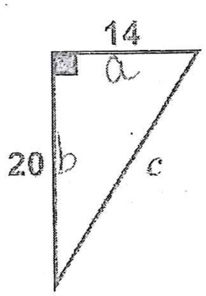
$\sqrt{1681} = \sqrt{x^2}$

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.



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

$196 + 400 = c^2$

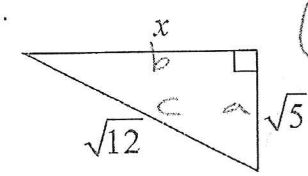
$\sqrt{596} = \sqrt{c^2}$

$596 \to 2 \cdot 298$

$298 \to 2 \cdot 149$

c = $2\sqrt{149}$

4



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

$5 + x^2 = 12$

$-5 \qquad -5$

$\sqrt{x^2} = \sqrt{7}$

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

6. $\sqrt{63}$

3 21
3 7

7. $\sqrt{162}$

2 81
9 9
3 3 3 3

$3 \cdot 3\sqrt{2}$

8. $\sqrt{98}$

2 49
7 7

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

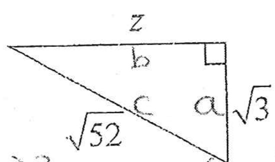
$\sqrt{63} =$ $3\sqrt{7}$

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

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

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.



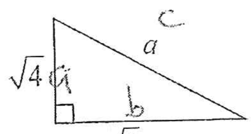
$(\sqrt{3})^2 + z^2 = (\sqrt{52})^2$

$3 + z^2 = 52$

$-3 \qquad -3$

$\sqrt{z^2} = \sqrt{49}$

10.



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

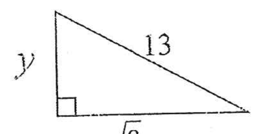
$4 + 8 = a^2$

$\sqrt{12} = \sqrt{a^2}$

$\sqrt{12}$

2 6
2 3

11.



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

$y^2 + 8 = 169$

$-8 \qquad -8$

$\sqrt{y^2} = \sqrt{161}$

7 23

Simplest Radical Form

z = 7

a = $2\sqrt{3}$

y = $\sqrt{161}$

Rounded Value

z ≈ 7

a ≈ 3.5

y ≈ 12.7

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

$(\sqrt{3})^2 + a^2 = (\sqrt{28})^2$

$3 + a^2 = 28$

$\sqrt{a^2} = \sqrt{25}$

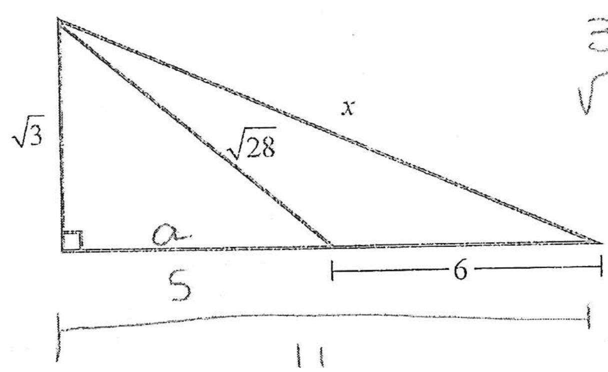
$a = 5$

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

$3 + 121 = x^2$

$\sqrt{124} = \sqrt{x^2}$

2 62
2 31



x = $2\sqrt{31}$