Unit 9 – Radicals and Applying Similarity to Right Triangles

Day	Classwork	Day	Homework
Tuesday 1/2	Programming Activity	0	
Wednesday 1/3	Review of Radicals	1	HW 9.1
Thursday 1/4	Special Relationships within Right Triangles (Altitude Drawn to the Hypotenuse)	2	HW 9.2
Friday 1/5	Pythagorean Theorem **Unit 9 Quiz 1**	3	HW 9.3
Monday 1/8	Special Right Triangles (45-45-90 and 30-60-90)	4	HW 9.4
Tuesday 1/9	Review **Unit 9 Quiz 2**	5	Review Sheet
Wednesday 1/10	Review	6	Study
Thursday 1/11	**Unit 9 Test**	7	Midterm Review #1
1/12 – 1/19	Midterm Review		

Simplifying Radicals

A rational number is a number that ____

An irrational number is a number that ______________________________________

Radicals (like fractions) must always be reduced.
A radical is in simplest form when ____

1.) $\sqrt{8}$

2.) $\sqrt{54}$

3.) $\sqrt{48}$

4.) $3\sqrt{200}$

5.) $\frac{3}{4}\sqrt{80}$

6) $\frac{3}{2}\sqrt{28}$

Adding and Subtracting Radicals

*Radicals must have a common radicand and index to be added or subtracted.

1.) Simplify all radicals, if possible, to determine if the terms have a common radicand.
2.) Combine terms with common radicands by adding or subtracting the coefficients.

1.) $7\sqrt{5}+3\sqrt{5}$

2.) $4\sqrt{3}-\sqrt{3}$

3.) $\sqrt{2}+\sqrt{8}$

4.) $\sqrt{20}-2\sqrt{5}$

Multiplying and Dividing Radicals

Steps:

1.) Multiply or divide using the following rules:

$a\sqrt{b}\cdot c\sqrt{d} = ac\sqrt{bd}$	$\dfrac{a\sqrt{c}}{b\sqrt{d}} = \dfrac{a}{b}\sqrt{\dfrac{c}{d}}$

2.) Simplify radical, if possible.

1.) $\sqrt{5}\cdot\sqrt{20}$

2.) $-6\sqrt{2}\cdot 5\sqrt{8}$

3.) $9\sqrt{10x}\cdot\sqrt{30x^2}$

4.) $\frac{2}{5}\sqrt{20}\left(\frac{3}{4}\sqrt{10}\right)$

5.) $5\left(3+\sqrt{3}\right)$

6.) $2\sqrt{5}\left(2\sqrt{5}+3\right)$

7.) $7\sqrt{2}\left(\sqrt{8}+2\sqrt{20}\right)$

8.) $\left(2-\sqrt{3}\right)\left(4+\sqrt{3}\right)$

9.) $\left(3-\sqrt{5}\right)^2$

10.) $\left(\sqrt{2}+\sqrt{7}\right)\left(\sqrt{2}-\sqrt{7}\right)$

11.) $\sqrt{72}\div\sqrt{2}$

12.) $8\sqrt{48}\div 2\sqrt{3}$

13.) $\dfrac{25\sqrt{24}}{-5\sqrt{2}}$

Rationalizing Denominators

*A fraction is not considered simplified if there is a radical in the denominator.

*To **rationalize the denominator** of a fraction means to find an equivalent fraction in which the denominator is a rational number.

*Steps to rationalize a monomial denominator:

1.) Multiply the numerator and denominator of the fraction by the radical in the denominator to keep a perfect square in the denominator.

2.) Simplify the fraction, which will change the denominator to a rational number.

1) $\frac{2}{\sqrt{5}}$

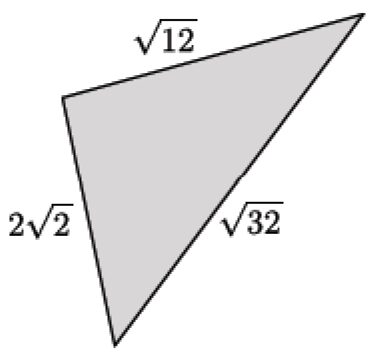
2) $\frac{4}{\sqrt{18}}$

3) $\frac{3}{2\sqrt{3x}}$

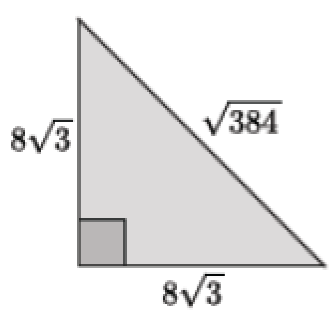
4) $\frac{3\sqrt{50}}{4\sqrt{8}}$

Area and Perimeter with Radicals

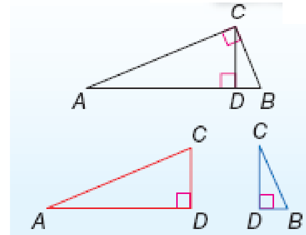
1.) What is the perimeter of the triangle shown below?



2.) Determine the area and perimeter of the triangle shown.

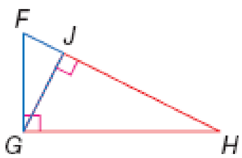


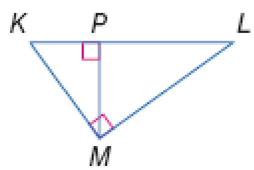
Altitude Drawn to the Hypotenuse in a Right Triangle

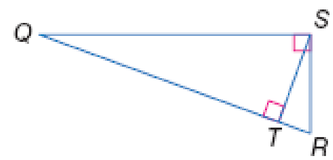
Theorem		
Words	*Example*	*Figures*
If the altitude is drawn to the hypotenuse of a right triangle, then the two triangles formed are similar to the original triangle and to each other.		

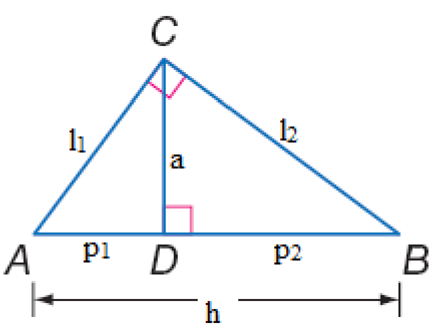
Examples

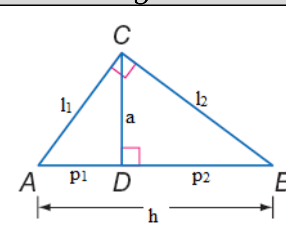
Write a similarity statement identifying the three similar right triangles in the figure.

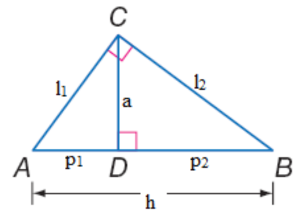
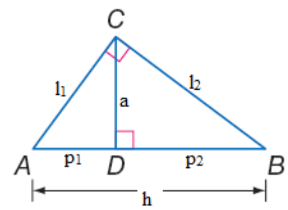
1. 

2. 

3. 



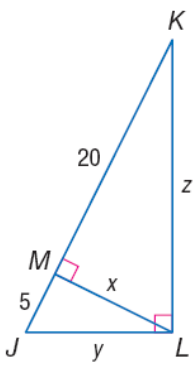
Right Triangle Geometric Mean Theorems			
Theorem	*Words*	*Example*	*Figures*
Geometric Mean (Altitude) Theorem (PAP)	The altitude drawn to the hypotenuse of a right triangle separates the hypotenuse into two segments. The length of this altitude is the geometric mean between the lengths of these two segments.		

Geometric Mean (Leg) Theorem (HELP)	The altitude drawn to the hypotenuse of a right triangle separates the hypotenuse into two segments. The length of a leg of this triangle is the geometric mean between the length of the hypotenuse and the segment of the hypotenuse adjacent to the leg.		
(HALL)	In a right triangle, the product of the hypotenuse and the altitude equals the product of the lengths of the two legs.		

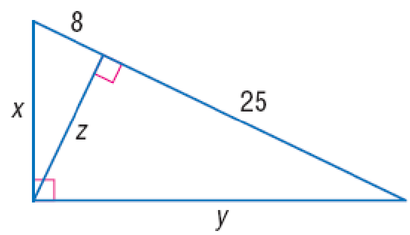
Examples

Find x, y, and z for each of the following.

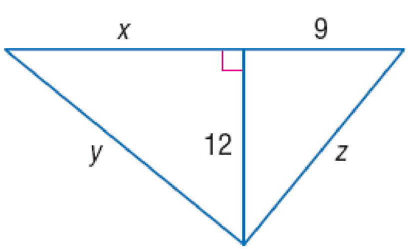
1.



2.

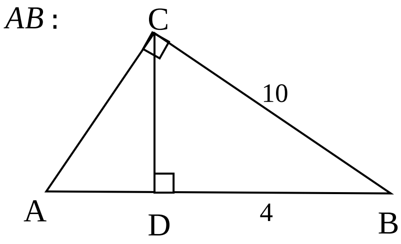


3.

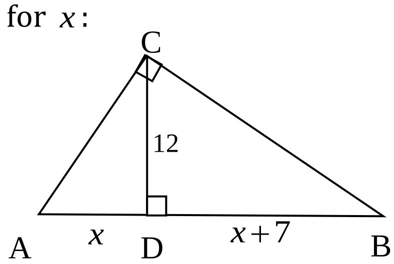


More Practice

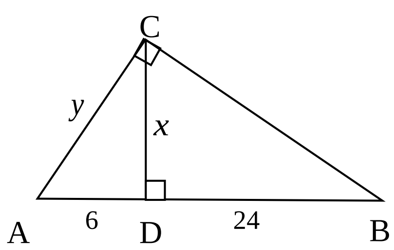
1.) Find AB:



2.) Solve for x:



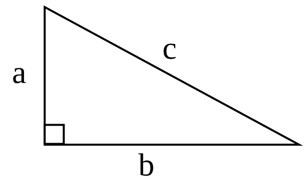
3.) Solve for x and y:



Pythagorean Theorem

***Only works for right triangles.**
***The longest side, called the hypotenuse (c), can be found across from the right angle.**

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



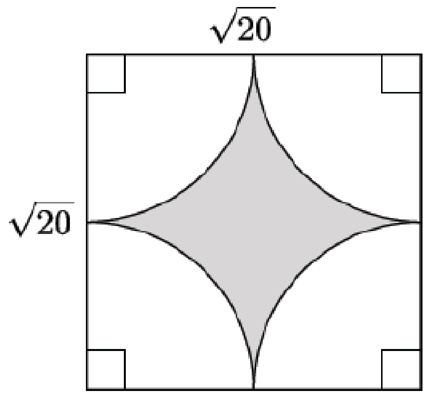
1.) The sides of a triangle measure $\sqrt{7}$, $2\sqrt{6}$, and $\sqrt{31}$. Is it a right triangle?

2.) The perimeter of a square is 16. Find the length of the diagonal of the square.

3.) The side of a rhombus measures 10 and its shorter diagonal is 12.
Find the length of the longer diagonal.

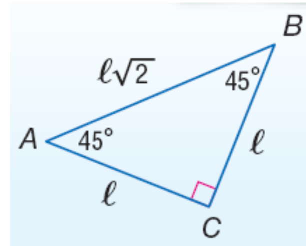
4.) The length of a rectangle is 7 more than the width. The diagonal is 8 more than the width.
Find the dimensions of the rectangle.

5.) Determine the exact area of the shaded region shown.



6.) Prove the Pythagorean Theorem using similar triangles. Provide a well-labeled diagram to support your justification.

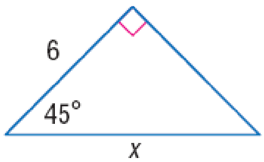
SPECIAL RIGHT TRIANGLES

45° - 45° - 90° Triangle Theorem		
Words	*Example*	*Figure*
In a 45° - 45° - 90° triangle, the legs *l* are congruent and the length of the hypotenuse *h* is $\sqrt{2}$ times the length of the leg.		

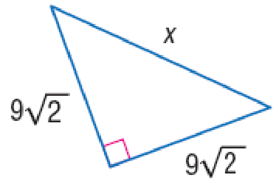
Finding the Hypotenuse length

Find x.

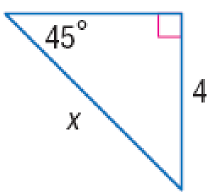
a.



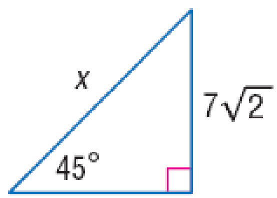
b.



c.



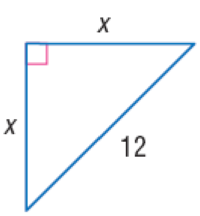
d.



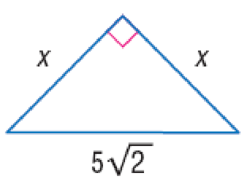
Finding the Leg length

Find x.

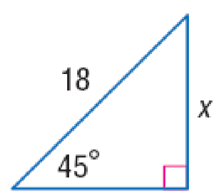
e.

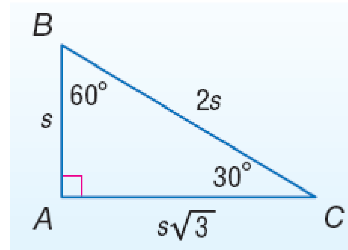


f.



g.

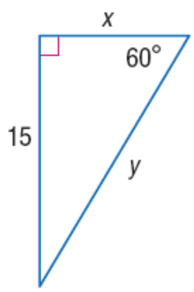


30° - 60° - 90° Triangle Theorem		
Words	*Example*	*Figure*
In a 30° - 60° - 90° triangle, the length of the hypotenuse *h* is 2 times the length of the shorter leg *s*, and the length of the longer leg *l* is $\sqrt{3}$ times the length of the shorter leg.		

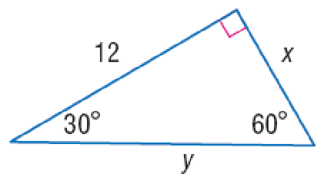
Examples

Find x and y.

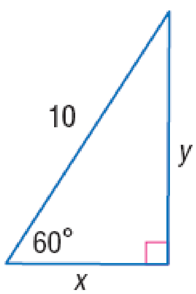
a.



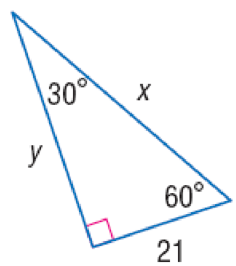
b.



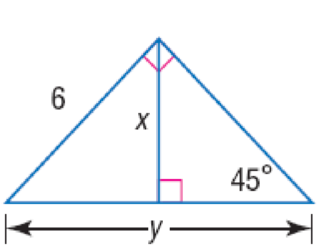
c.



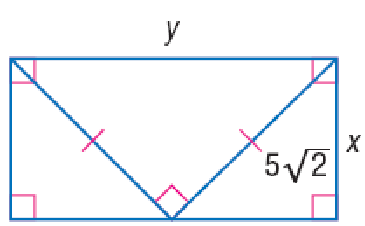
d.



e.



f.



More Practice with Special Right Triangles

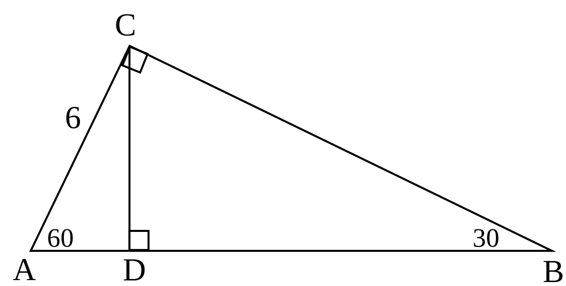
1) Find the length of a side of an equilateral triangle if its altitude is $7\sqrt{3}$.

2) Find the altitude of an isosceles triangle if its vertex angle is 120 and its legs measure 8.

3) In a rhombus with a $60°$ angle, one side measures 12. Find the length of both diagonals.

4) Find all missing segments:

AD =
CD =
BC =
BD =
AB =



5) Find the perimeter of a square whose diagonal is $9\sqrt{2}$.

6) In an isosceles triangle with a base angle of 45, one leg measures $5\sqrt{2}$. Find the altitude.

7) If $PT = 8$, find all missing segments:

PS =
ST =
RT =
RS =