Name:_____   Period ____   11/10/2008 GL
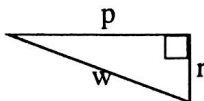
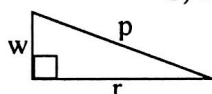Introduction to Pythagorean Theorem

I.   Pythagorean Theorem

In a _____ triangle, you can use the _____ _____ to solve for any missing side as long as you know the other _____ sides. The Pythagorean Theorem is _____, where ____ is the _____ (longest side).
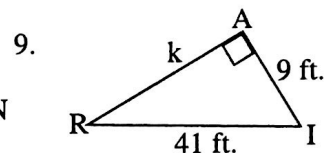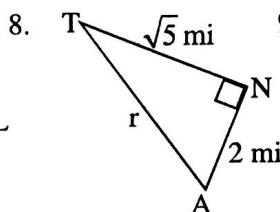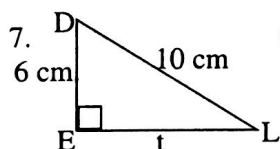
Ex. 1a) What variable represents the hypotenuse?

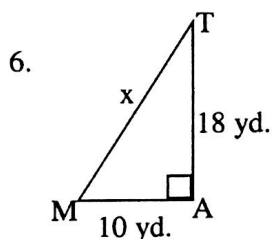b) If p = 8 and r = 15 then w = ____.

Ex. 2a) What variable represents the hypotenuse?

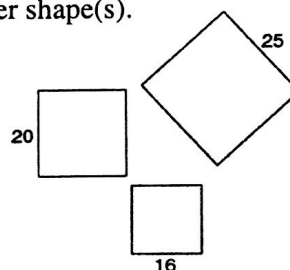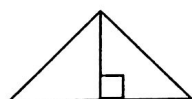b) If p = 25 and r = 24 then w = ____.

6.

7.

8.

9.

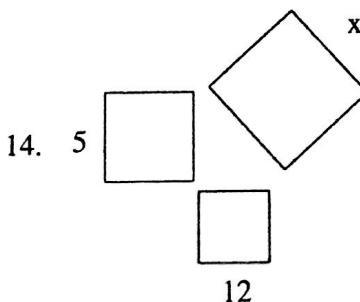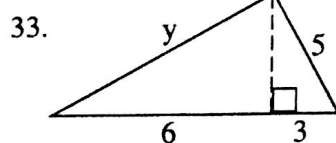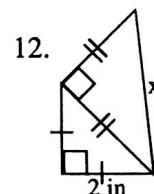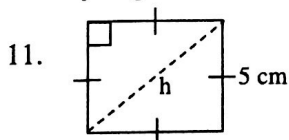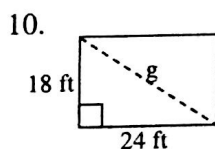**II.   Hidden and Double Pythagorean Theorem - Round all answers to the nearest hundredths.**

Sometimes the _____ triangle can be _____ inside of another shape(s).

Other times, you might have to do the Pythagorean Theorem more than _____.

10.

11.

12.

33.

14.

15.
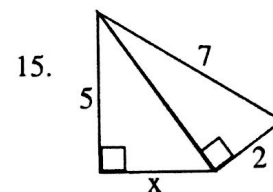
Recall: By the Triangle Inequality Theorem, the sum of any two side lengths of a triangle is greater than the third side length.

III.   Determining if a triangle is a right triangle.

A triangle is a _____ triangle if _____ + _____ = _____, when ___ is the longest side.

Ex. 1)   5, 16, 15   Ex. 2)   3, 5, $\sqrt{34}$

Tell whether each triangle described is a right triangle. The lengths of the three sides are given.

1) 4, 5, 6   2) 6, 8, 10   3) 3, 7, 5

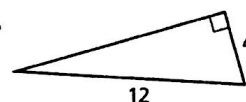4) 1, 2, $\sqrt{5}$ 5) 6, 9, 6   6) $\sqrt{2}$, $\sqrt{3}$, $\sqrt{5}$

IV.   Pythagorean Triples

A set of three nonzero whole numbers a, b, and c such that $a^2 + b^2 = c^2$ is called a **Pythagorean triple**.

Example 3B: Identifying Pythagorean Triples

Find the missing side length. Tell if the side lengths form a Pythagorean triple. Explain.

Common Pythagorean Triples
3, 4, 5   5, 12, 13,   8, 15, 17   7, 24, 25

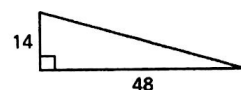**Example 3A: Identifying Pythagorean Triples**

Find the missing side length. Tell if the side lengths form a Pythagorean triple. Explain.

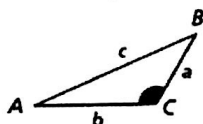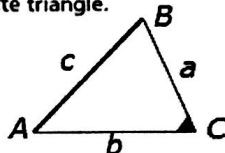## V.   Pythagorean Inequalities

Theorems 5-7-2 (Pythagorean Inequalities Theorem)

In △ABC, c is the length of the longest side.

If $c^2 > a^2 + b^2$, then △ABC is an obtuse triangle.

If $c^2 < a^2 + b^2$, then △ABC is an acute triangle.

Tell if the measures can be the side lengths of a triangle. If so, classify the triangle as acute, obtuse, or right.

1.   5, 7, 10

2.   5, 8, 17

3.   7, 12, 16

4.   11, 18, 34

5.   3.8, 4.1, 5.2

VI. 45-45-90 NOTES

A diagonal of a square divides it into two congruent isosceles right triangles. Since the base angles of an isosceles triangle are congruent, the measure of each acute angle is 45°. So another name for an isosceles right triangle is a 45°-45°-90° triangle.

A 45°-45°-90° triangle is one type of _____ _____ _____.

Theorem 5-8-1 | 45°-45°-90° Triangle Theorem

In a 45°-45°-90° triangle, both legs are congruent, and the length of the hypotenuse is the length of a leg times $\sqrt{2}$.

$$AC = BC = \ell \qquad AB = \ell\sqrt{2}$$
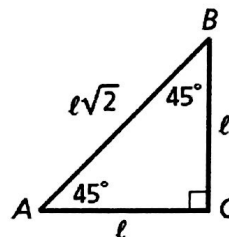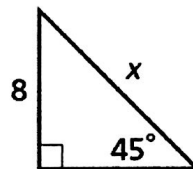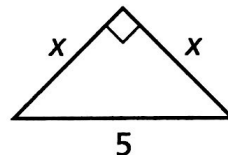
Example 1A: Finding Side Lengths in a 45°- 45°- 90° Triangle

Find the value of x. Give your answer in simplest radical form.

Example 1B:

Find the value of x. Give your answer in simplest radical form.

Example 2:

Jana is cutting a square of material for a tablecloth. The table's diagonal is 36 inches. She wants the diagonal of the tablecloth to be an extra 10 inches so it will hang over the edges of the table. What size square should Jana cut to make the tablecloth? Round to the nearest inch.
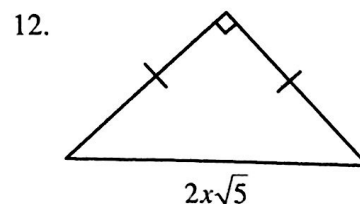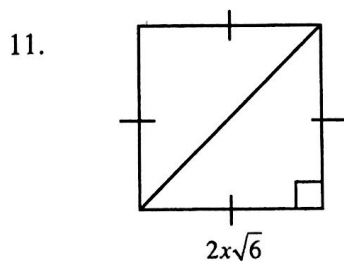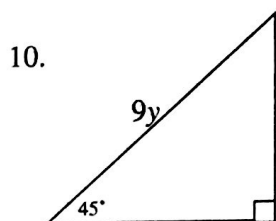
Name:_____Period:_____

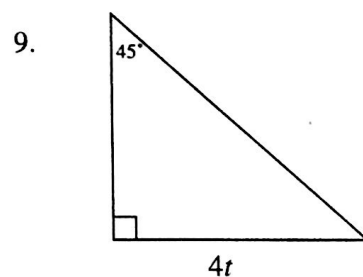## 45-45-90 Triangles   **Don't forget your book work!!**

I. Complete the following table for the 45-45-90 triangles using exact simplified radical values.

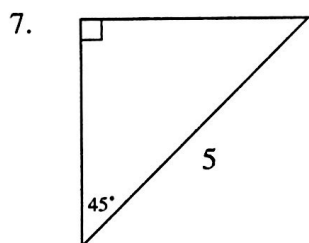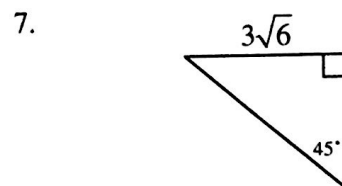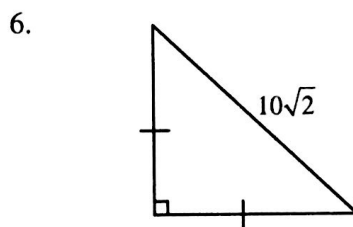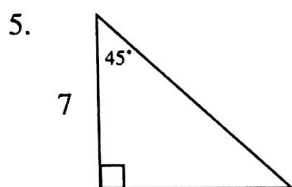|	Leg 1	Leg 2	Hypotenuse
Ratios			
1.	3		
2.			$8\sqrt{2}$
3.			5
4.	$4\sqrt{2}$		

II. Fill in the length of each segment in the following figures.

5.

6.

7.

7.

8.

9.

10.

11.

12.
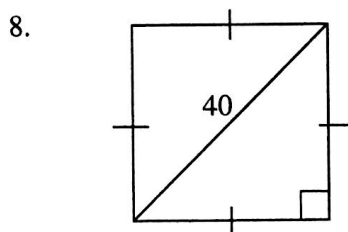
*For 13 – 15, tell if the given values could be the sides of a 45°-45°-90° triangle.*

13. $3\sqrt{70}$, $3\sqrt{70}$, $12\sqrt{35}$ 14. $\sqrt{10}$, $\sqrt{10}$, $2\sqrt{5}$ 15. $\sqrt{6}$, $\sqrt{6}$, $\sqrt{3}$

16. Sam has a square backyard divided into 2 sections along the 40 foot diagonal. One of these sections is used as a garden. What is the approximate **area** of the garden?

17. A guy wire supporting a radio tower is positioned 145 feet up the tower. It forms a 45° angle with the ground. About how long is the wire?
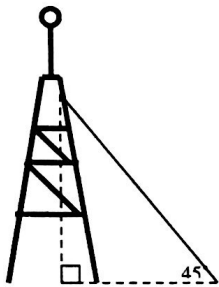
18. Find the perimeter and area of a 45°-45°-90° triangle with a hypotenuse length 12 inches. Give your answers in simplest radical form.

19. Find the perimeter and area of a square with diagonal length 18 meters. Give your answers in simplest radical form.

20. This triangle loom is made from wood strips shaped into a 45°-45°-90° triangle. Pegs are placed every $\frac{1}{2}$ inch along each leg. Suppose you make a loom with an 18-inch hypotenuse. Approximately how many pegs will you need?

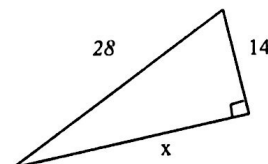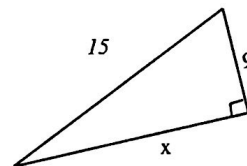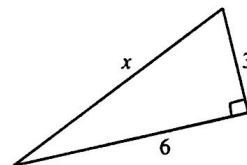21. Find the value of x in simplest radical form.
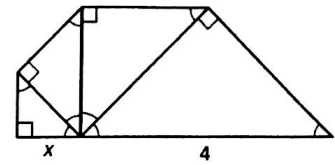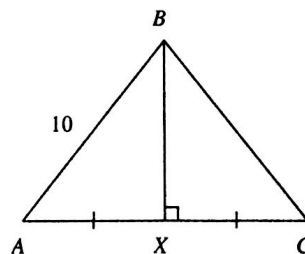
22. Each edge of the cube has length e.

a. Find the diagonal length d if $e = 1$, $e = 2$, and $e = 3$. Give the answers in simplest radical form.
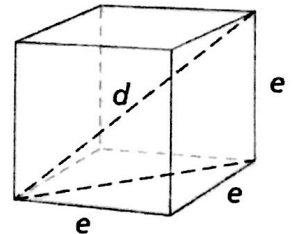
23. Solve for the following. Leave answer in simplest radical form.

24. Given AC = 10, find BX in simplest radical form.

I. 30-60-90 NOTES

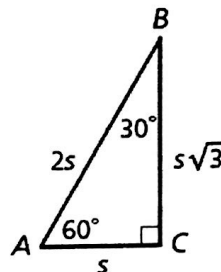A 30°-60°-90° triangle is another special right triangle.

Theorem 5-8-2 | **30°-60°-90° Triangle Theorem**

In a 30°-60°-90° triangle, the length of the hypotenuse is is 2 times the length of the shorter leg, and the length of the longer leg is the length of the shorter leg times $\sqrt{3}$.
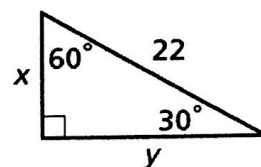
$AC = s$ $\qquad$ $AB = 2s$ $\qquad$ $BC = s\sqrt{3}$

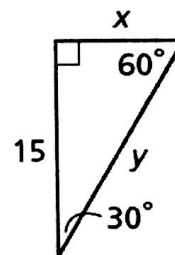**Example 1A:** Finding Side Lengths in a 30°-60°-90° Triangle

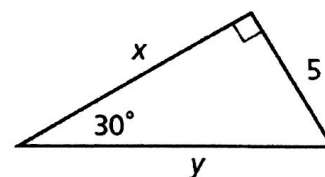Find the values of x and y. Give your answers in simplest radical form.

Example 1B:

Find the values of x and y. Give your answers in simplest radical form.

Example 1C:

Find the values of x and y. Give your answers in simplest radical form.

Example 1D:

Find the values of x and y. Give your answers in simplest radical form.

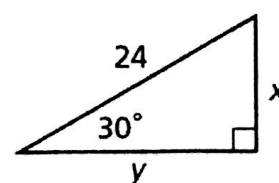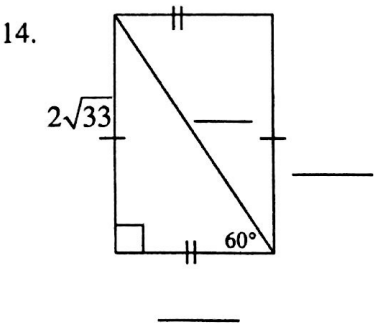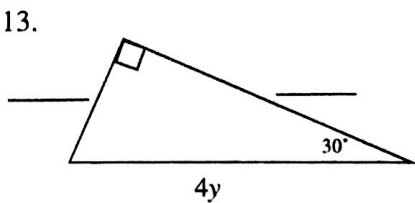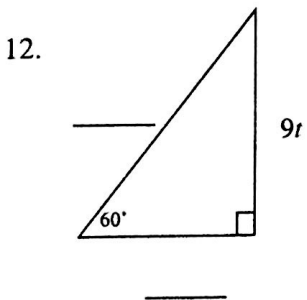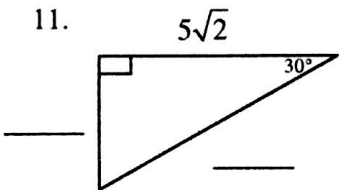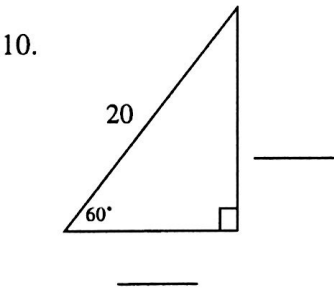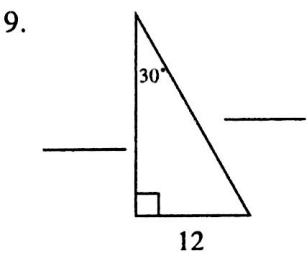Name:_____Period:_____

30-60-90 Triangles

1. In a 30°-60°-90° triangle, the short leg is located across from what angle?_____

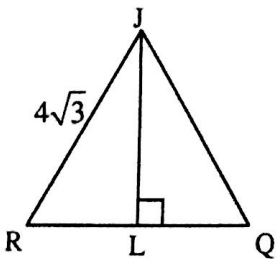Complete the table for a 30°-60°-90° triangle using exact (radical) values.

	Short Leg	Long Leg	Hypotenuse
Ratios			
2.	5		
3.			14
4.		$6\sqrt{3}$	
5.	$2\sqrt{3}$		
6.		9	
7.			$10y\sqrt{3}$
8.	$7ab\sqrt{2}$		

Fill in the blanks for the special right triangles.

9.

10.

11. $5\sqrt{2}$

12.

13.

14.

15. ΔRJQ is equilateral.

JQ = _____
RL = _____
LQ = _____
JL = _____

16. ΔABC is equilateral.
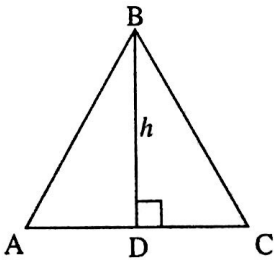
AD = _____
DC = _____
AB = _____
BC = _____

For 17 – 20, tell if the given values could be the sides of a 30°-60°-90° triangle.

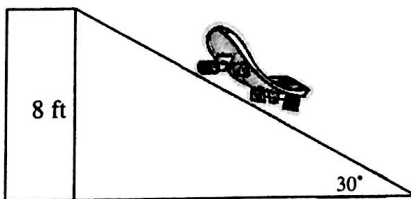17. $2, 2\sqrt{3}, 4$ 18. $9, 3, 3\sqrt{3}$ 19. $\sqrt{3}, 3, \sqrt{6}$ 20. $4\sqrt{6}, 2\sqrt{6}, 6\sqrt{2}$

21. The hypotenuse of a 30-60-90 triangle is $12\sqrt{2}$ ft. Find the **area** of the triangle.

27. Find QR and PS. Answer in simplest radical form.

22. Find the perimeter and area of a 30°-60°-90° triangle with hypotenuse length 28 centimeters.

23. Find the perimeter and area of an equilateral triangle with side length 4 feet.

28. Solve for the following. Leave answer in simplest radical form.

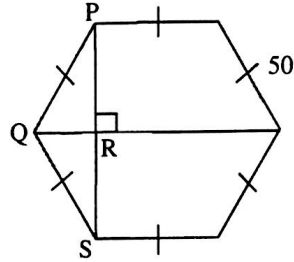24. Find the perimeter and area of an equilateral triangle with height 30 yards.

25. A skate board ramp must be set up to rise from the ground at 30°. If the height from the ground to the platform is 8 feet, how far away from the platform must the ramp be set?
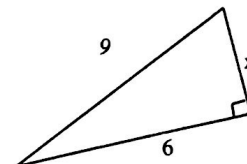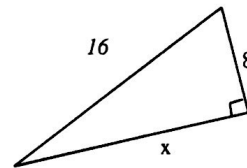

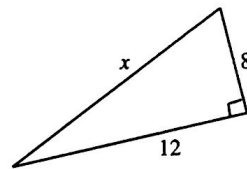29. The perimeter of a rectangle is 60 in. The length is four times the width. What is the length of the diagonal?

26. Find the value of x in simplest radical form.

Name:_____Period:_____

Mixed Applications – Problem Solving

I. For each problem:
      1) Determine if you should use Pythagorean Theorem, 30°-60°-90°, or 45°-45°-90°
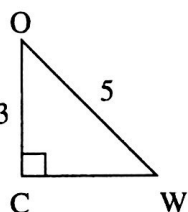   2) Write the equation or pattern you will use
      3) Show work and find all the missing segment lengths
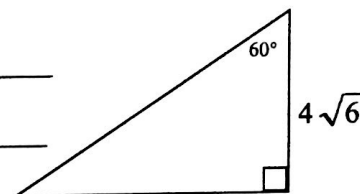
1. Use: _____

    Formula: _____
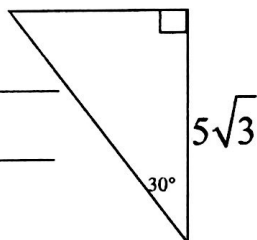   Work and Answer(s):

2. Use: _____

    Formula: _____
    Work and Answer(s):

3. Use: _____

    Formula: _____
    Work and Answer(s):

4. Use: _____

    Formula: _____
    Work and Answer(s):
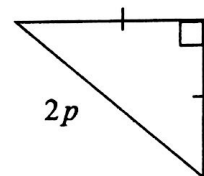
5. Use: _____

    Formula: _____
    Work and Answer(s):
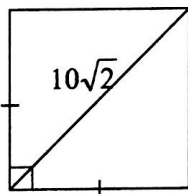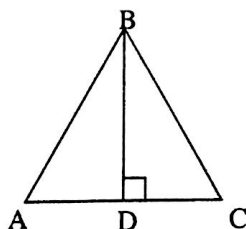
6. Use: _____

    Formula: _____
    Work and Answer(s):
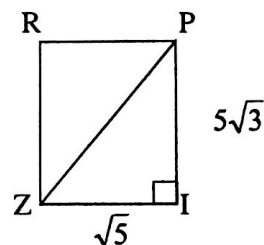
7. △ABC is equilateral with perimeter 36y units. Find the length of each side and the height.
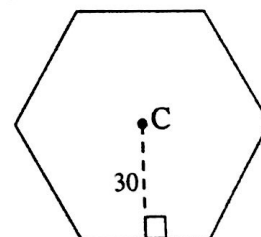
    Use: _____

    Formula: _____
    Work and Answer(s):

8. C is the center of a regular hexagon. Find the length of each side.

    Use: _____

    Formula: _____
    Work and Answer(s):

Draw a picture if one is not given and solve the problem.

9. The four blades of a helicopter meet at right angles and are all the same length. The distance between the tips of two adjacent blades is 36 ft. How long is each blade? Round your answer to the nearest tenth.

10. An escalator lifts people to the second floor, 25 ft. above the first floor. The escalator rises at a 30° angle. How far does a person travel from the bottom to the top of the escalator?

11. A slide was installed at the local swimming pool, as shown here
   What is the length of the slide?
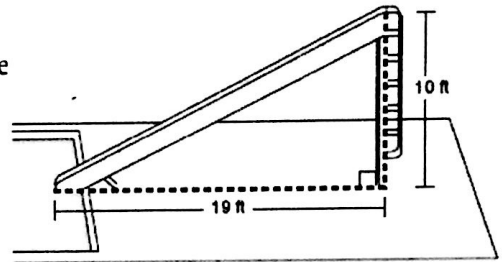
12. After heavy winds damaged a house, workers placed a 6 m. brace against its side at a 45° angle. Then, at the same spot, they placed a second, longer brace to make a 30° angle with the side of the house.

   a. How far away from the house are the braces placed on the ground?

   b. How long is the longer brace?

   c. How much higher on the house does the longer brace reach than the shorter brace?
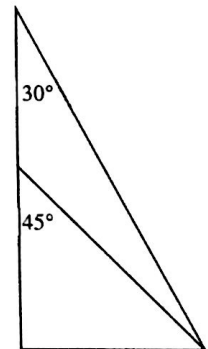
*13. Magic Plumbing is needing to ship out a new water pipe to replace a broken one in the Smith's house. The only box they could find has dimensions of 20 in x 16 in x 12in. The pipe they need to ship is 24 inches long. Will it fit in the box? Explain your answer.