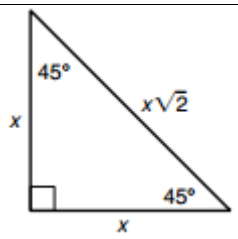
Geometry – H

7.4 – Special Right Triangles

Name: _____

Date: _____ Period: _____

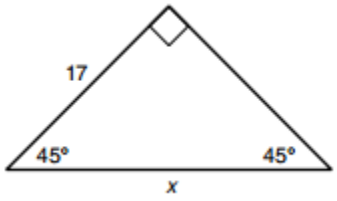
- I can apply special right triangle ratios to find unknown side lengths.
- I can use special right triangles in real world situations.

Theorem	Diagram
45° – 45°– 90° Triangle Theorem In a 45° – 45°– 90°, both legs are congruent and the length of the hypotenuse is $\sqrt{2}$ times the length of a leg	

Example 1: Find lengths in a 45° – 45°– 90° triangle

Find the value of x. Leave answer in simplest radical form.

a.



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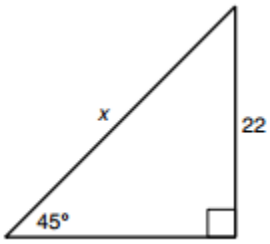

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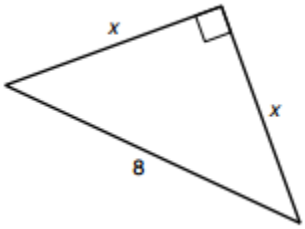

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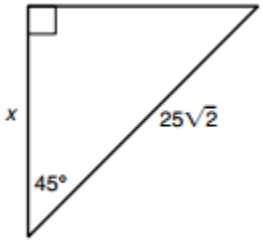
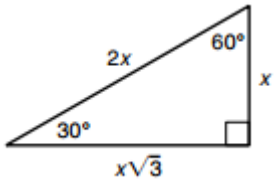


Example 2: Apply 45° – 45°– 90° Triangle Theorem

Find the area of the square whose diagonal is $7\sqrt{2}$ inches long.

Theorem	Diagram
30° – 60°– 90° Triangle Theorem In a 30° – 60°– 90°, the length of the hypotenuse is twice the length of shorter leg, and the longer leg is $\sqrt{3}$ times the length of the shorter leg.	

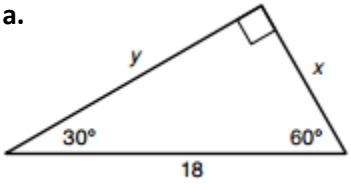
**Note – The short leg is always opposite the 30° angle!

- It is best to find the length of the short leg first (if it is not already given)

Example 3: Find lengths in a 30° – 60°– 90° triangle

Find the values of x and y. Leave answer in simplest radical form.

a.



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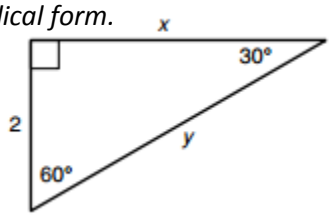

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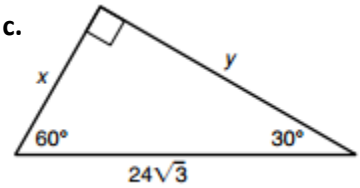

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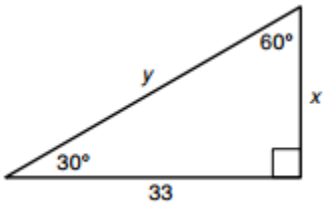
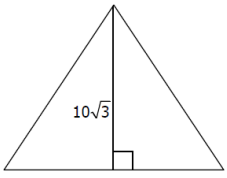


Example 4: Apply 30° – 60°– 90° Triangle Theorem

a. You make a guitar pick that resembles and equilateral triangle with side lengths of 32 mm. What is the approximate height of the pick?

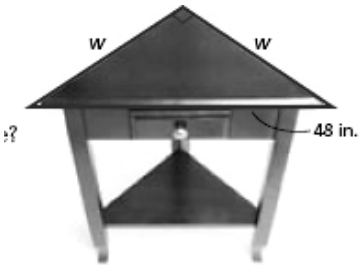
b. An equilateral triangle has a height of $10\sqrt{3}$. What is the length of a side of the triangle?



Example 5: Applications of Special Right Triangles

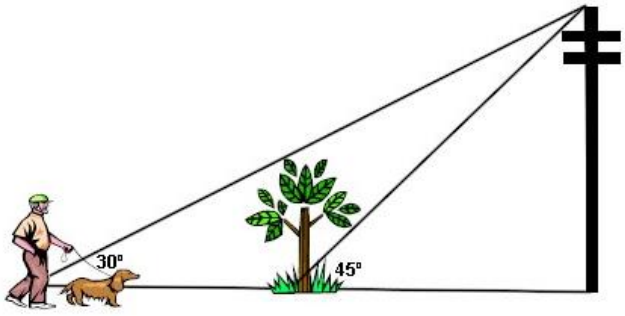
a. Regulation billiard balls are 2.25 inches in diameter. The rack used to group 15 billiard balls is in the shape of an equilateral triangle. What is the approximate height of the triangle formed by the rack? Leave answer in simplest radical form and round to the nearest quarter of an inch.

b. This tabletop is an isosceles right triangle. The length of the front edge of the table is 48 inches. What is the length *w* of each side edge? Round your answer to the nearest tenth of an inch.



c. The perimeter of a square is 120 cm. Find the length of the diagonal of the square. Give your answer in simplest radical form.

d. A man is walking his dog on level ground in a straight line with the dog's favorite tree. The angle of elevation from the man's present position to the top of a nearby telephone pole is 30°. The angle of elevation from the tree to the top of the telephone pole is 45°. If the telephone pole is 40 feet tall, how far is the man with the dog from the tree? Express your answer to the nearest tenth of a foot.



Geometry –H

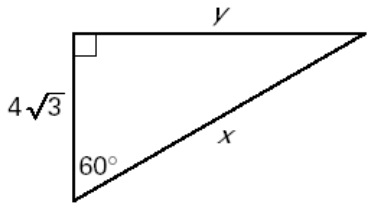
7.4 – Special Right Triangles HOMEWORK

Name: _____

Date: _____ Period: _____

Find the value of each variable. Write your answer in simplest radical form.

1.



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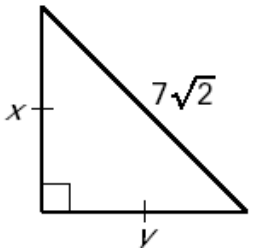

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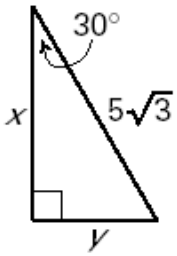

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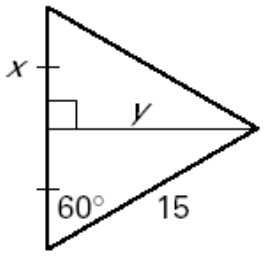

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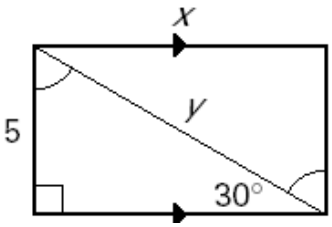

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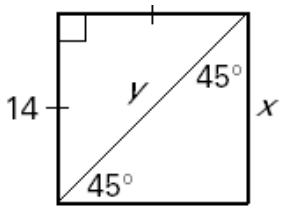

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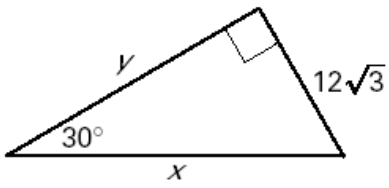

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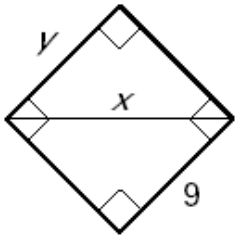

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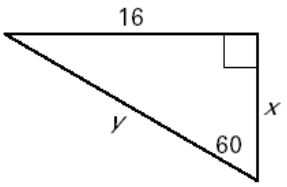

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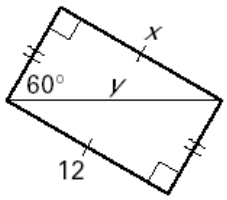

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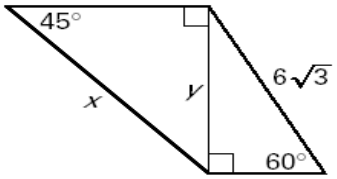

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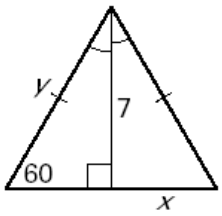
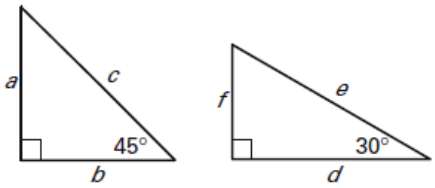


13. Multiple Choice In the diagrams below, $a = \frac{4}{3}f$. Which side length is the longest?

A. *b*
B. *c*
C. *d*
D. *f*

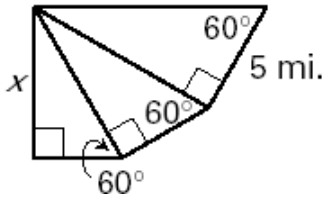


14. Perimeter The altitude of an equilateral triangle is 12 centimeters. Find the perimeter of the triangle. Round to the nearest tenth.

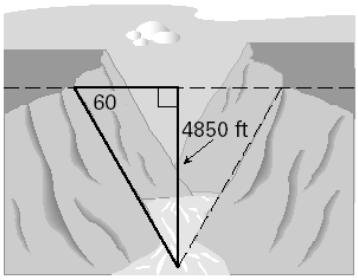
15. Area The diagonal of a square is 12 inches. Find the area. Leave answer in simplest radical form, if necessary.

16. Altitude The perimeter of an equilateral triangle is 45 meters. Find the length of the altitude. Leave answer in simplest radical form.

17. Each figure below is a 30°-60°-90° right triangle. Find the value of x. Leave answer in simplest radical form.



In Exercises 18-20, use the diagram and the following information.
A symmetrical canyon is 4850 feet deep. A river runs through the canyon at its deepest point. The angle of depression from each side of the canyon to the river is 60°. Round your answers to the nearest tenth.

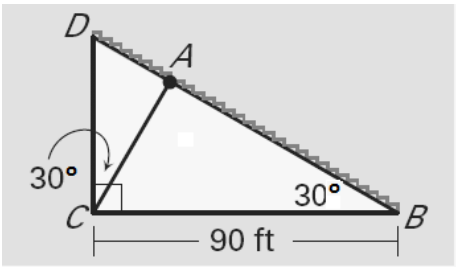


18. Find the distance across the canyon.

19. Find the length of the canyon wall from the edge to the river.

20. Is it more or less than a mile across the canyon? (5280 feet = 1 mile)

In Exercises 21 – 23, use the diagram and the following information.
A fan at a sporting event is sitting at point *A* in the bleachers. The bleacher seating has an angle of elevation of 30° and a base length of 90 feet. Round your answers to the nearest tenth.



21. Find the height *CD* of the bleachers.

22. Find the height of the fan sitting at point *A* from the ground.

23. Find the distance *AB* that the fan is sitting from the base, point *B*.

Answer Key

1. $x = 8\sqrt{3},\ y = 12$
2. $x = 7,\ y = 7$
3. $x = \frac{15}{2},\ y = \frac{5\sqrt{3}}{2}$
4. $x = \frac{15}{2},\ y = \frac{15\sqrt{3}}{2}$
5. $x = 5\sqrt{3},\ y = 10$
6. $x = 14,\ y = 14\sqrt{2}$
7. $x = 24\sqrt{3},\ y = 36$
8. $x = 9\sqrt{2},\ y = 9$
9. $x = \frac{16\sqrt{3}}{3},\ y = \frac{32\sqrt{3}}{3}$
10. $x = 12,\ y = 8\sqrt{3}$
11. $x = 9\sqrt{2},\ y = 9$
12. $x = \frac{7\sqrt{3}}{3},\ y = \frac{14\sqrt{3}}{3}$
13. B
14. $24\sqrt{3}$ cm
15. 72 in^2
16. $\frac{15\sqrt{3}}{2}$ m
17. $3.75\sqrt{3}$ mi.
18. 5600.3 ft
19. 5600.3 ft
20. More
21. 52.0 ft
22. 39.0 ft
23. 77.9 ft