Lesson 6

Diggin' It

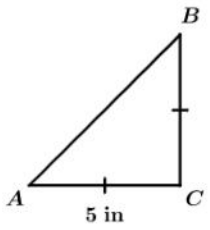
Develop Understanding

Ready

Use the given information to find the missing sides and the missing angles.

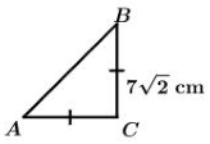
Triangle ABC is a right triangle. Angle C is the right angle. Write the **exact** values for the sides.

1.



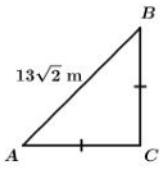
$BC = 5$ in, $AB = 5\sqrt{2}$ in,
$\angle A = \angle B = 45^\circ$

2.



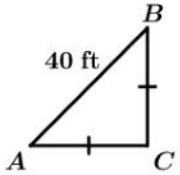
$AB = 14$ cm, $AC = 7\sqrt{2}$ cm,
$\angle A = \angle B = 45^\circ$

3.



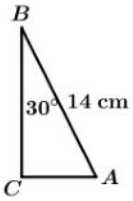
$BC = 13$ m, $AC = 13$ m
$\angle A = \angle B = 45^\circ$

4.



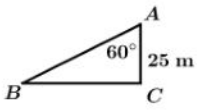
$BC = 20\sqrt{2}$ ft, $AC = 20\sqrt{2}$ ft
$\angle A = \angle B = 45^\circ$

5.



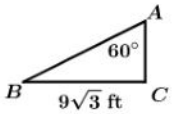
A $C = 7$ cm, $BC = 7\sqrt{3}$ cm,
$\angle A = 60^\circ$

6.



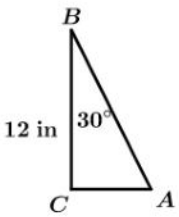
$BC = 25\sqrt{3}$ m, $AB = 50$ m
$\angle B = 30^\circ$

7.



$BA = 18$ ft, $AC = 9$ ft
$\angle B = 30^\circ$

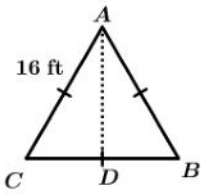
8.



$BA = 8\sqrt{3}$ in, $AC = 4\sqrt{3}$ in

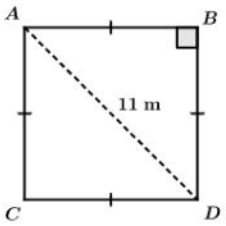
$\angle A = 60^\circ$

9. Find AD.



$AD = 8\sqrt{3}$ ft

10. Find AB.



$AB = 5.5\sqrt{2}$ m

Remember that π is a number.

11. If you purchased π gallons of gasoline, about how many gallons of gas did you buy?

3.14 gallons

12. If you were paid 5π dollars per hour, about how many dollars would you make in 8 hours?

$125.66

13. If you slept 2π hours each night, about how many hours of sleep would you get per night?

6.28 hours

Set

It is possible to identify the location of a point on the edge of a circle in several different ways. One way is to use rectangular coordinates (x, y). In this activity you will use a different method. You will be graphing "words" by using letters to identify points around a circle. The size of the rotation or θ will be the same while the length of the radius will change.

1. First select a word. Avoid words containing 5 letters or multiples of 5. I am choosing the word MATH.
2. Assign a number to each letter of your word according to the table below.
3. The numbers correspond to the concentric circles.
4. You can begin on any spoke.
5. Move from one spoke to the next in a positive rotation (counterclockwise).
6. Make a dot at the intersection of the spoke and the circle corresponding with the number of the letter you are on.

7. Keep graphing the same word until the last letter of the word lands on the spoke that you started on. You will need to make more than one rotation of the circle in order to close your figure.

Circle numbers and their corresponding letters. The letters for "MATH" are underlined.

Circle 1: A, D, K, L, N, V, Z

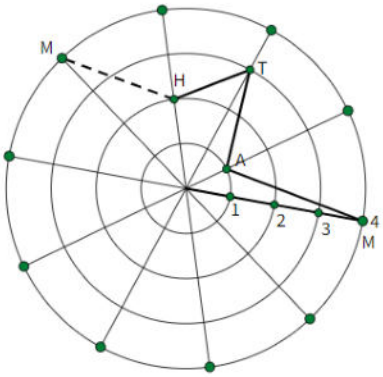
Circle 2: E, U, G, H, Q, U, X

Circle 3: I, C, F, J, T, S, Y

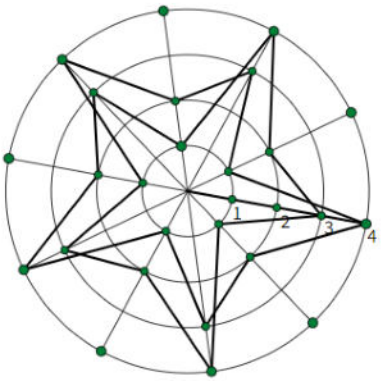
Circle 4: O, B, E, M, R, P, W

The word MATH will use the numbered circles **4 1 3 2** in that order. You can begin on any spoke. I began on the spoke with the numbers. I made a dot on 4, rotated to the next spoke and made a dot on 1. I connected the two dots. Then I moved to circle 3, made a dot, connected the segment, and moved to circle 2. You can see MATH marked on the diagram. After marking H, I started over with M on the next spoke. (See the dotted line.) Continue spelling MATH and rotating around the circle until the figure is closed and the path repeats itself. The figure at the right is the completed **graph** of the word MATH. I always knew MATH was beautiful!

M A T H: 4 1 3 2



The graph of the word MATH.



Now it's your turn. Select a word. Short ones are best. Assign the numbers and begin.

14. Word: answers will vary

Graph: answers will vary based on words chosen.

15. Word: answers will vary

Graph: answers will vary based on words chosen.

16. What is the angle between each spoke in the grid above?

$$\frac{360^\circ}{10} = 36^\circ$$

17. How many degrees did it take to graph MATH once? (From M to H?)

$$3 \cdot 36^\circ = 108^\circ$$

18. How many degrees did it take to graph MATHM? (From M to the M again)

$$4 \cdot 36^\circ = 144^\circ$$

19. How many times did I need to spell the word MATH to complete the graph?

5 times

20. **a.** How many revolutions did it take?

2 revolutions

b. Can you figure out the answer to this question without counting? Explain.

Yes. There are 10 spokes. The word MATH uses 4 spokes each time it is spelled. So we need the least common multiple of 10 and 4. That would be 20. Since $\frac{20}{4} = 5$, we can spell MATH 5 times. But we will need two revolutions to have 20 spokes.

Go

21. Divide out the common factors. $\frac{6x^2-30x}{3x^2-75}$

$$\frac{2x}{x+5}$$

Perform the indicated operations. Divide out all common factors in your answers.

22. $\frac{9x^3}{8x+32} \cdot \frac{2x+8}{-3x^4}$

$$\frac{3}{-4x}$$

23. $\frac{6x}{2x^2+3x-9} \div \frac{8x^4}{4x^2-9}$

$$\frac{3(2x+3)}{4x^3(x+3)}$$

24. $\frac{3x}{x-5} + \frac{x}{5-x}$

$$\frac{2x}{x-5}$$

25. $\frac{x^2-8x}{x^2+10x+16} + \frac{3x-14}{x^2+10x+16}$

$$\frac{x-7}{x+8}$$