1.6 Diggin" It

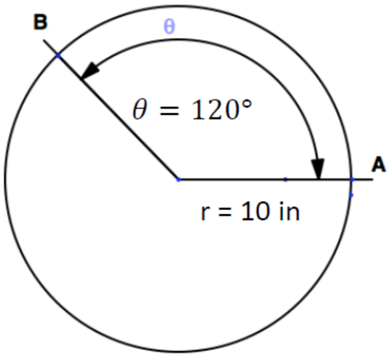
Practice

I. Finding the length of an arc using proportions.

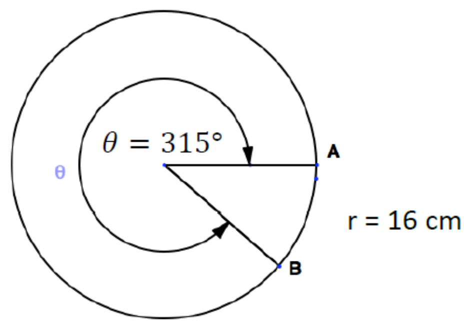
Use the given degree measure of the central angle to set up a proportion to find the length of arc AB.

Recall that $s = \frac{\theta}{360°}(d\pi)$.

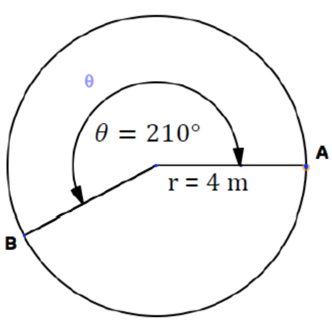
1.



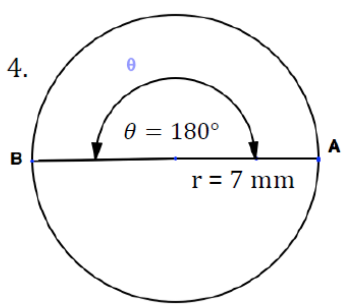
2.



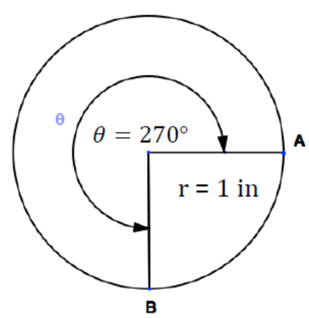
3.



4.



5.



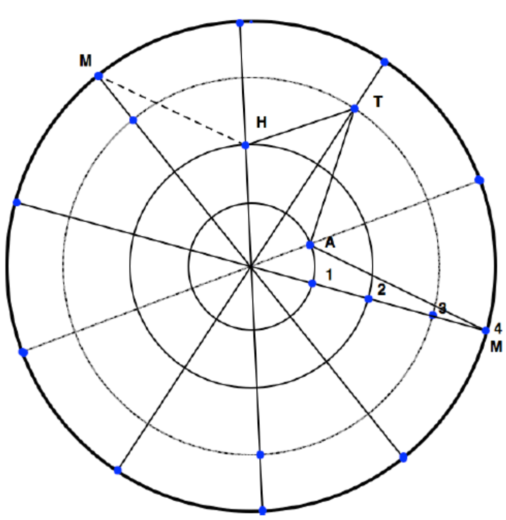
6. The circumference of circle A is 400 meters. The circumference of circle B is 800 meters. What is the relationship between the radius of circle A and the radius of circle B? Justify your answer.

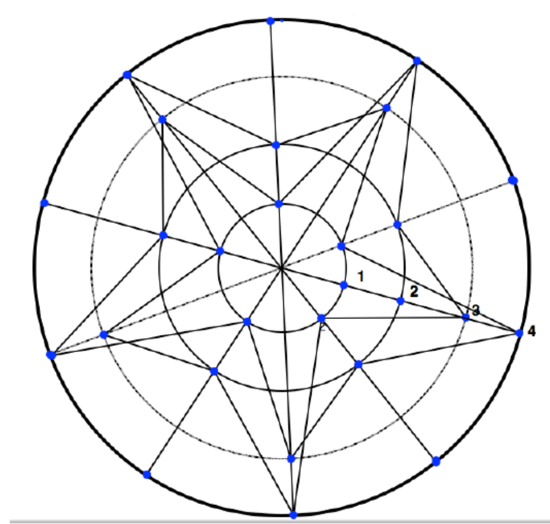
II. Describing the Location of a Point by the Angle of Rotation and Radius

It is possible to identify the location of a point on the edge of a circle in several different ways. In the following activity, you will be graphing "words" by graphing the letters around the circle while changing the radius. First select a word. Avoid words with 5 letters or multiples of 5. I am choosing the word MATH. Assign a number to each letter of your word according to the table below. The numbers correspond to the concentric circles. You can begin on any spoke. Move from one spoke to the next in a positive rotation. Make a dot at the intersection of the spoke and the circle that corresponds with the number of the letter you are 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.	
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 1. 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!

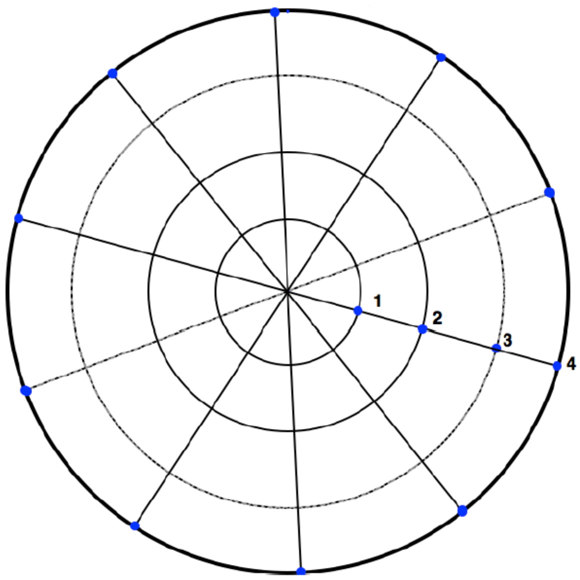


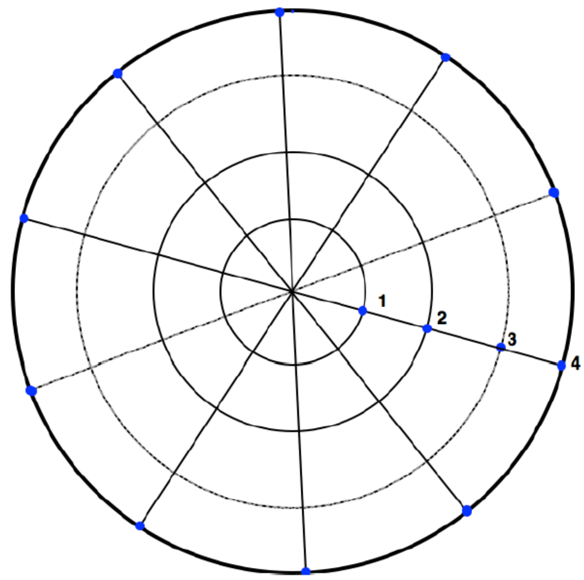


Now it's your turn. Select a word. Short ones are best. Assign the numbers and begin. There is a large example of a blank graph on the last page and an interactive version in GeoGebra at: https://www.geogebra.org/classic/G6YkeBeU

7. Word:

8. Word:





9. What is the angle of rotation for your graphs?

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

11. How many degrees did it take to graph MATH and begin with M again?

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

13. How many rotations did it take?

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

III. Converting Angles Between Radians and Degrees

Recall that there are 360 **degrees** in a full circle and 2π **radians** in a full circle. Thus, $360° = 2\pi$ radians. If you divide both sides of the equation by 2, you create another identity $180° = 1\pi$ radians. You can use this identity to convert degrees to radians or radians to degrees.

Since $180° = \pi$ radians, it follows that $\frac{\pi \text{ radians}}{180°} = \frac{180°}{\pi \text{ radians}} = 1$.

If you want to convert 72° into radian measure, then you need the unit of degrees to cancel.

Example 1: $72° \cdot \frac{\pi \text{ radians}}{180°} = \frac{72\pi \text{ radians}}{180} = \frac{\pi}{5}$ radians.

The unit *radians* is usually left off. Hence, an angle that measures 72º is equivalent to a radian measure of $\frac{\pi}{5}$.

Convert the following angles from degrees to radians or radians to degrees.

14. $45° =$

15. $15° =$

16. $54° =$

17. $135° =$

18. $300° =$

19. $270° =$

20. $\frac{5\pi}{6} =$

21. $\frac{\pi}{8} =$

22. $\frac{3\pi}{4} =$

23. $\frac{7\pi}{5} =$

24. $\frac{\pi}{18} =$

25. $\frac{13\pi}{12} =$

IV. Assessment – Khan Academy

1. Complete the following online worksheet in the Trigonometry unit of Khan Academy's Algebra 2 course:
   a. https://www.khanacademy.org/math/algebra2/trig-functions/intro-to-radians-alg2/e/degrees_to_radians