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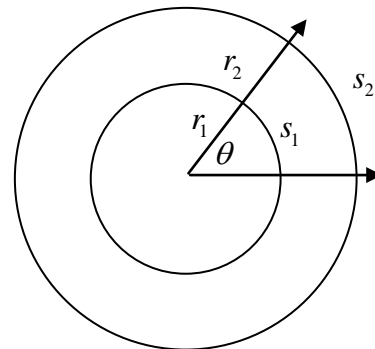
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RADIAN MEASURE OF ANGLES
ALGEBRA 2 HONORS

The only unit of measure for angles (which are rotations) that you've had exposure to in math thus far is **degrees**. However, in most mathematical work, angles are measured in **radians**. Thus, it is important for you to understand what "radian" measure is and how it relates to "degree" measure.

The key to understanding the radian system is the idea that all circles are **similar** so the ratio of any two corresponding lengths will **always** be equal. Say we have two circles with the same center and a central angle given by θ , then, because all circles are similar, we can say that for this angle:

$$\frac{s_1}{r_1} = \frac{s_2}{r_2}$$



Since for any given angle, θ , this ratio will always be the same, we will actually use this ratio as a measurement of the rotation/angle. In other words:

$$\theta = \frac{s}{r} \quad (\text{alternatively } s = \theta \cdot r)$$

Exercise #1: How many radians are there in a full rotation? Consider that in a full rotation, the arc length must be equal to the circle's circumference.

Exercise #2: How many radians are in an equivalent rotation of 180° ? 90° ?

More generally, we need to be able to convert between rotations specified in radians to rotations specified in degrees and vice versa.

Exercise #3: Convert each of the following angles, given in degrees, to radians. Leave your answers in terms of pi.

(a) 60° (b) 45° (c) 210°

Exercise #4: Convert each of the following angles, given in degrees, to radians. Round your answers to the nearest *hundredth* of a radian.

(a) 100°

(b) 275°

(c) -132°

Exercise #5: Convert each of the following angles, given in radians, to degrees. Round your answers to the nearest *tenth* of a degree if the answer is not an integer.

(a) $\frac{3\pi}{4}$

(b) $-\frac{7\pi}{6}$

(c) 2.15

We should also be able to use the definition of radian measure, i.e. $\theta = \frac{s}{r}$ or $s = \theta \cdot r$, to solve for arc lengths, angles, and even radii.

Exercise #6: A central angle has an intercepted arc with length 9 *cm*. If the radius of the circle is 3 *cm*, what is the radian measure of the central angle?

Exercise #7: A large clock above a bell tower has a radius of 9 feet. If the minute hand on the clock has rotated through an angle of 2.64 radians, how far, to the nearest tenth of a foot, has the tip of the minute hand traveled around the clock?

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RADIAN MEASURE
ALGEBRA 2 HONORS HOMEWORK

1. Convert each of the following degree measures to its equivalent radian measure. Leave in reduced form and in terms of π .

a. 30°

b. 240°

c. -120°

d. -330°

2. Convert each of the following degree measures to its equivalent radian measure. Round your answer to the nearest hundredth.

a. 100°

b. 225°

c. 81°

d. -316°

3. Convert each of the following radian measures to its equivalent degree measure. Give answers to the nearest degree.

a. $\frac{5\pi}{4}$

b. $-\frac{4\pi}{3}$

c. 5.12

d. 0.88

e. 1

f. 6

g. $\frac{11\pi}{6}$

h. $\frac{13\pi}{18}$

4. **Important angles to memorize.** There are certain radian angles that you will want to have memorized for later use. Convert each of the following radian measures to degrees and then work on memorizing them.

(a) $\frac{\pi}{2}$

(b) π

(c) $\frac{3\pi}{2}$

(d) 2π

(e) $\frac{\pi}{6}$

(f) $\frac{\pi}{4}$

(g) $\frac{\pi}{3}$

5. A wheel rolls a distance of 500π feet in making 125 revolutions. The number of feet in the radius of the wheel is

- (1) 1.5 (2) 2 (3) 2π (4) 4

6. The length of an arc is 8π cm. If the radius of the circle is 16 cm, what is the exact radian measure of the central angle subtended by the arc?

7. Merkle cuts wedge-shaped piece of pizza from a circular pie. The radius of the pizza is 8 inches. The rounded edge of the crust of the piece measures 5.6 inches. To the nearest *tenth*, find the angle of the pointed end of the piece of pizza, in radians.

8. Through how many radians does the minute hand of a clock turn in 36 minutes? (Hint, think of how many radians corresponds to 30 minutes and use this to convert)

- (1) 0.6π (2) 1.2π (3) 0.36π (4) 1.5π

9. In the accompanying diagram, the radian measure of \widehat{ABC} is $\frac{5\pi}{3}$ radians. Recall that the measure of an inscribed angle is always one-half of the measure of the intercepted arc. What is the degree measure of $\angle ABC$?

- (1) 45° (2) 60° (3) 30° (4) 25°

