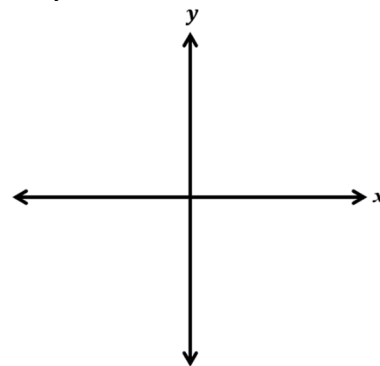


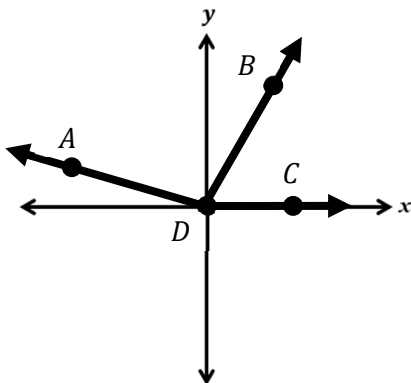
Write your questions
and thoughts here!

We are accustomed to finding coordinate points in a coordinate plane. But what about an angle in a coordinate plane? An angle is in *standard position* when the vertex coincides with the origin and one ray coincides with the positive x -axis. The other ray is called the *terminal ray*.

- Draw a positive 45° angle in standard position and label the initial ray and the terminal ray.
- Draw a negative 225° angle in standard position.
- Label Quadrants I, II, III, and IV.



1. Name all the angles that are in standard position. Give the initial ray and terminal ray of each angle.



Angle: _____

Initial ray: _____

Terminal ray: _____

Angle: _____

Initial ray: _____

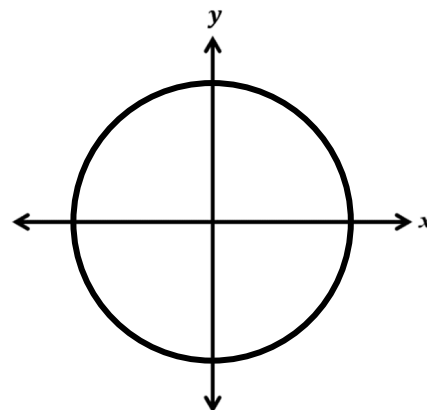
Terminal ray: _____

We are not going to measure things in degrees in this course or next year in AP Calculus. There is another way of measuring angles. That unit of measurement is called a _____. We will discuss the definition of a radian later, but first we have an important formula to learn.

Use the circle and sketch an angle with the terminal ray in QII. The rays of the angle will be touching the circle. The fancy way of saying this is that the arc of the circle is _____ by the angle. Label the circle's arc length between these rays as s . Label the radius of the circle as r . We then have

$$\theta =$$

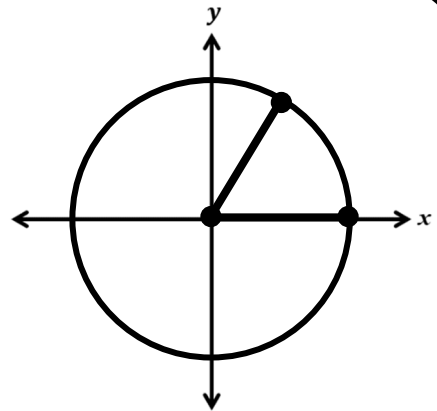
where θ is the angle measure in radians, s is the arc length subtended by rays of the angle, and r is the radius of the circle.



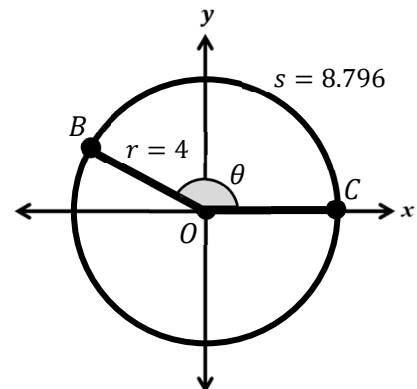
What is a Radian?

An angle of one radian is when the angle creates an arc length on a circle that is equal to the radius of the circle. This means $s = r$ and $\theta = 1$.

Can you estimate how many radians are in one circle?
We will answer this later in the lesson.



2. The figure gives an angle in standard position and a circle with radius 4 in the xy -plane. The length of the minor arc subtended by the angle is 8.796. Find the measure of the angle.



3. If an angle measure is 1.4π radians and the radius of the circle is 2.7, what is the length of the arc subtended by the angle?
4. Given an angle measure of 0.625π radians with an arc length of 3.125π , what is the radius of the circle?

Unit Circle: A circle with _____.

If we have a Unit Circle, then the formula for the radians simplifies.

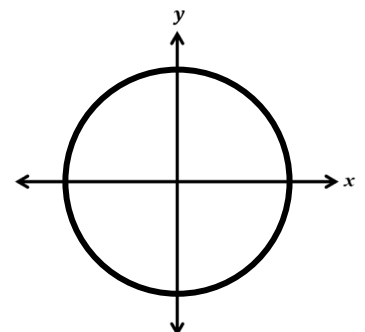
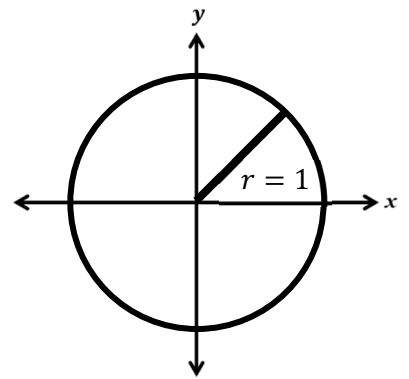
$$\theta = s$$

The radian measure of the angle is the same as the length of the subtended arc.

For a unit circle, one full revolution would be the length of the circumference.

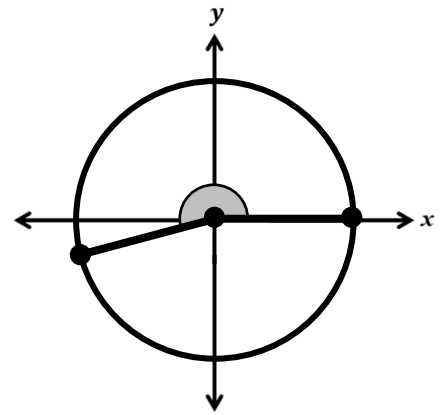
$$C = 2\pi r$$

- In other words, one revolution represents _____ radians. Was your estimate from the top of the page close?
- Half a revolution is _____ radians.
- A quarter of a revolution is _____ radians.



Write your questions and thoughts here!

5. Give an estimate of how many radians the angle represents. For simplification, leave your answer in terms of π and round the coefficient to only one or two decimal places.



Angles in standard position that share a terminal ray differ by an integer number of revolutions.

6. An angle with a measure of 4.3π would have a terminal ray in which quadrant?
Hint: Subtract or add 2π until you get a value in the interval $0 \leq \theta \leq 2\pi$.

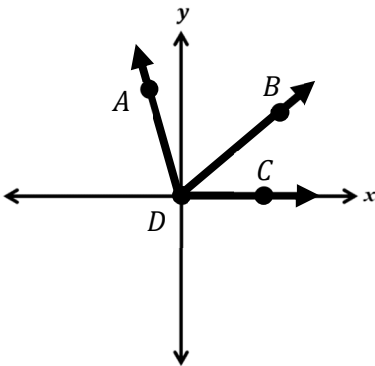
3.2A Radians

AP Precalculus

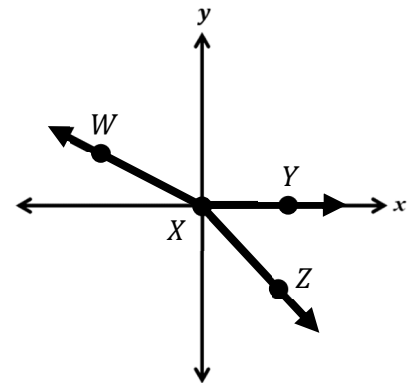
3.2A Practice

For each set of axes, name all the angles that are in standard position. Give the initial ray and terminal ray of each angle.

1.

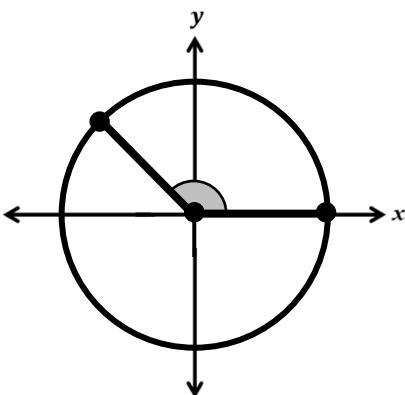


2.

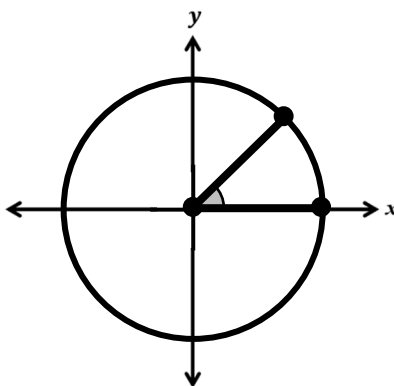


Give an estimate of how many radians the angle represents. For simplification, leave your answer in terms of π and round the coefficient to one or two decimal places.

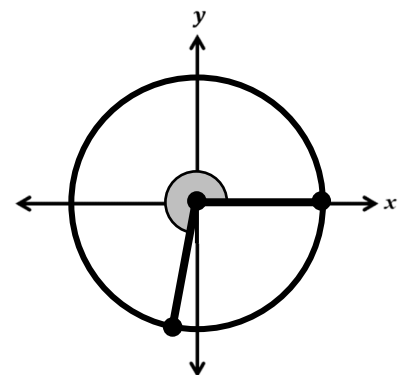
3.



4.



5.



The measurement of an angle in standard position is listed. In which quadrant is the terminal ray?

6. $\theta = 2.9\pi$

7. $\theta = 8.2\pi$

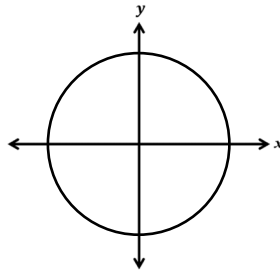
8. $\theta = 7.2\pi$

9. $\theta = -5.2\pi$

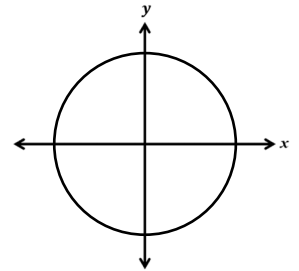
10. $\theta = -8.1\pi$

Below are various measurements of a circle's radius, an angle within the circle, or the arc subtended by the angle. SKETCH the approximate angle on the axes and find the missing value.

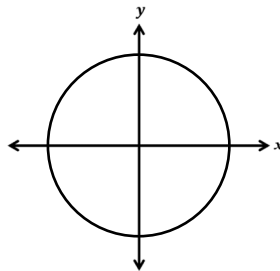
11. Radius is 2.4 and the length of an arc subtended by an angle is 1.32. Find the measure of the angle.



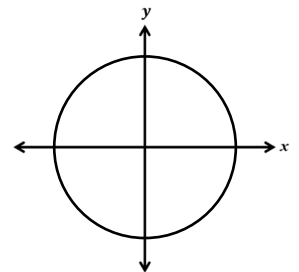
12. Radius is 1.45 and an angle is 1.4π radians. Find the length of the arc subtended by the angle.



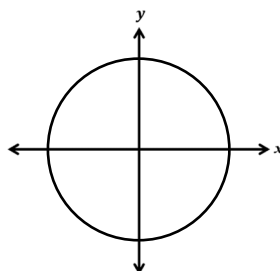
13. An angle is 0.8π radians and the length of an arc subtended by the angle is 16.9. What is the radius of the circle?



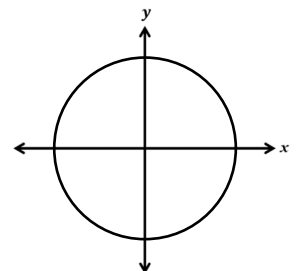
14. Radius is 6.1 and an angle is 0.5π radians. Find the length of the arc subtended by the angle.



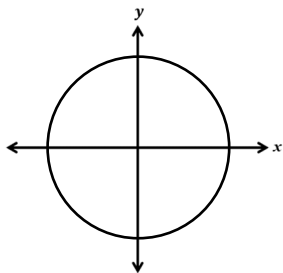
15. Radius is 6.11 and the length of an arc subtended by an angle is 30.6. Find the measure of the angle.



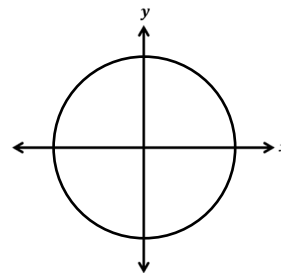
16. Radius is 6.18 and an angle is 1.7π radians. Find the length of the arc subtended by the angle.



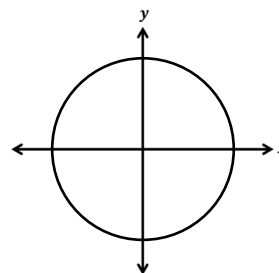
17. An angle is 4.11 radians and the length of an arc subtended by the angle is 26. What is the radius of the circle?



18. Radius is 7.8 and the length of an arc subtended by an angle is 17.94. Find the measure of the angle.



19. An angle is 3.06 radians and the length of an arc subtended by the angle is 29.47. What is the radius of the circle?



3.2A Radians

3.2A Test Prep

20. An angle with a measure of 5.7π would be equivalent to which of the following angle measures?

- (A) 2.7π (B) -1.7π (C) -5.7π (D) -0.3π