LESSON MAKER PRO

Arc Length Angles

Read radians as distances around a unit circle.

HIGH SCHOOL · HSF-TF.A.1

CCSS.Math.Content.HSF-TF.A.1 "Understand radian measure of an angle as the length of the arc on the unit circle subtended by the angle."

NAME _____ DATE _____

RADIANS ON THE UNIT CIRCLE

On a unit circle, the radian measure of a central angle equals the length of the arc it subtends. Because the radius is one unit, s = theta, where s is arc length and theta is angle measure in radians.

WORKED EXAMPLE

On a unit circle, a central angle subtends an arc 11/4 units long. Find the angle measure in radians.

1. On a unit circle, use s = theta.
2. Substitute s = 11/4: 11/4 = theta.
3. The angle measures 11/4 radians.

Answer: 11/4 radians

PRACTICE 6 problems

1 An arc on a unit circle has length 3pi/5 units. Find the central angle in radians.

ANSWER _____

2 An angle measures -7pi/6 radians on a unit circle. Find its signed arc length.

ANSWER _____

3 An arc on a unit circle has length 9/2 units. Find the central angle in radians.

ANSWER _____

4 An angle measures 5pi/3 radians on a unit circle. Find the arc length it subtends.

ANSWER _____

5 An arc on a unit circle has length 2pi units. Find the central angle in radians.

ANSWER _____

6 The minor arc subtended by a central angle on a unit circle has length pi/8 units. Find the angle measure in radians.

ANSWER _____

APPLY IT Show your work

1 In a game design class, a student models a turn dial as a unit circle. During one move, the marker travels counterclockwise along an arc of length 13pi/12 units. What angle does the marker sweep, in radians?

WORK SPACE

ANSWER _____

2 A fitness app models its circular progress ring as a unit circle. Its marker moves clockwise through an angle of -5pi/8 radians. What is the marker's signed arc length?

WORK SPACE

ANSWER _____

CHALLENGE One step up

CHALLENGE

A point starts at the rightmost point of a unit circle and travels counterclockwise along an arc of length 19pi/6 units. State its total angle measure in radians, then find a coterminal angle between 0 and 2pi. Explain your reasoning.

_____

_____

ANSWER KEY

Arc Length Angles

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PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	An arc on a unit circle has length 3pi/5 units. Find the central angle in radians.	**3pi/5 radians**
2	An angle measures -7pi/6 radians on a unit circle. Find its signed arc length.	**-7pi/6 units**
3	An arc on a unit circle has length 9/2 units. Find the central angle in radians.	**9/2 radians**
4	An angle measures 5pi/3 radians on a unit circle. Find the arc length it subtends.	**5pi/3 units**
5	An arc on a unit circle has length 2pi units. Find the central angle in radians.	**2pi radians**
6	The minor arc subtended by a central angle on a unit circle has length pi/8 units. Find the angle measure in radians.	**pi/8 radians**

PART 2 · APPLY IT

1. **13pi/12 radians** Because the dial is a unit circle, the arc length and radian measure are equal. The angle is 13pi/12 radians.
2. **-5pi/8 units** On a unit circle, signed arc length equals the signed angle measure in radians. The clockwise motion gives a negative arc length of -5pi/8 units.

CHALLENGE

Total angle measure: 19pi/6 radians. Coterminal angle: 7pi/6 radians, because 19pi/6 - 2pi = 19pi/6 - 12pi/6 = 7pi/6.

Accept equivalent fractions and equivalent forms of 2pi. For signed arc lengths, accept a negative value only when the direction is stated as clockwise or otherwise negative.