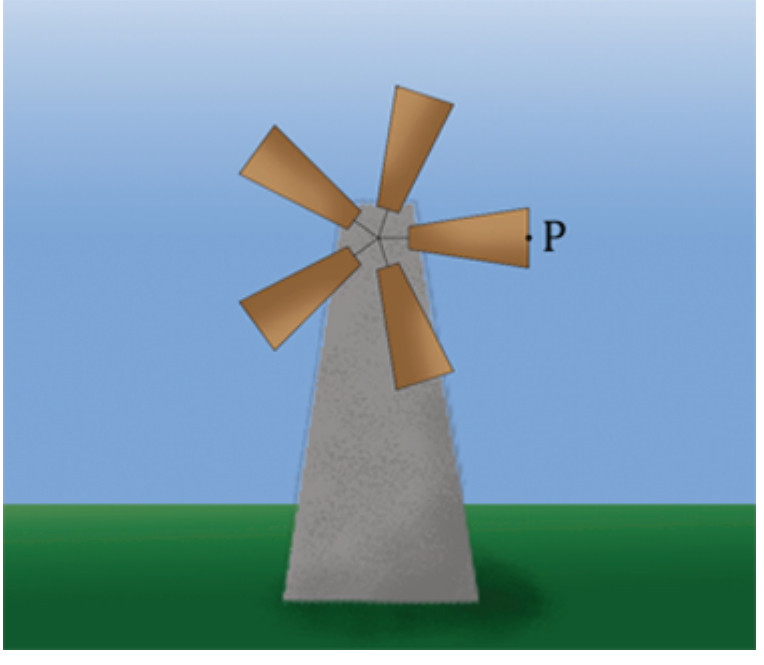
Unit 6 Lesson 11: Extending the Domain of Trigonometric Functions

1 Rewind to the Windmill (Warm up)

Images for Launch



Student Task Statement

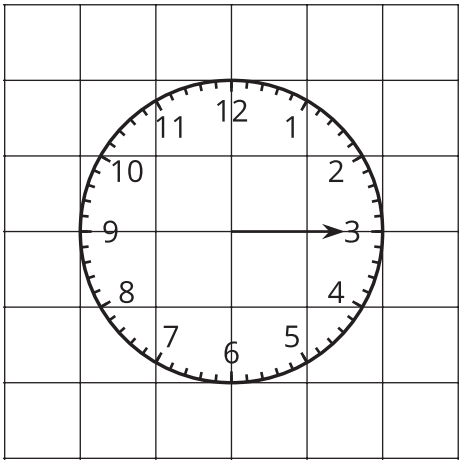
Priya is thinking about the windmill in an earlier lesson. That windmill had a point P at $(1, 0)$ at the end of the blade that starts at 0 radians pointing directly to the right. Priya says that if the blade rotates $-\frac{\pi}{2}$ radians, then P will be at the lowest point in its circle of rotation.

What do you think Priya means by rotating $-\frac{\pi}{2}$ radians? Do you agree with Priya? Be prepared to explain your reasoning.

2 Math Talk: The Hour Hand

Student Task Statement

Here is a clock showing an hour hand at 3 p.m.



Your teacher will give you a time. Identify the radian angle measure that the hour hand rotates through if it starts at 3 p.m.

3 The Big Picture for Cosine and Sine

Student Task Statement

1. Create a visual display for the following functions. Include a graph of the function from at least -4π to 4π radians, the maximum and minimum value of the function, and the period of the function. Label any intersections the graph of the function has with the axes.
   a. $y = \cos(\theta)$

   b. $y = \sin(\theta)$

2. The y-axis is a line of symmetry for one of the two graphs. Which one? Explain how you know.

4 Cosine and Sine Together (Optional)

Student Task Statement

Use graphing technology to graph the functions $y = \cos(\theta)$ and $y = \sin(\theta)$ on the same axes.

1. Identify two points where the graphs intersect—one with a negative θ-coordinate, and one with a positive θ-coordinate. What is the exact θ-coordinate for each point? Explain or show how you know.
2. What are the y-coordinates of the points of intersection? Explain or show how you know.
3. What could be the value of $\cos(\theta)$ if $\sin(\theta) = 0$? Explain your reasoning.

Activity Synthesis