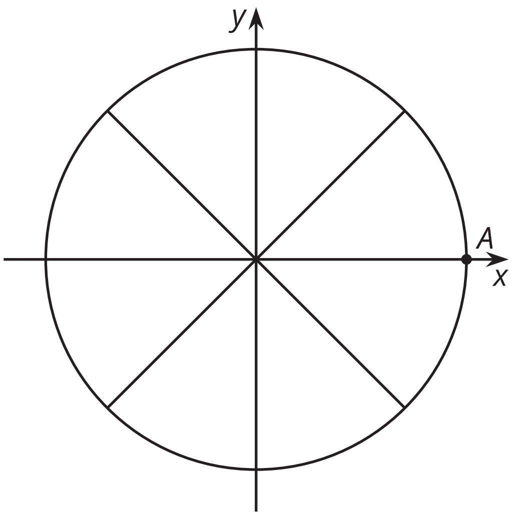
Unit 6 Lesson 10: Beyond 2π

1 All the Way Around (Warm up)

Student Task Statement

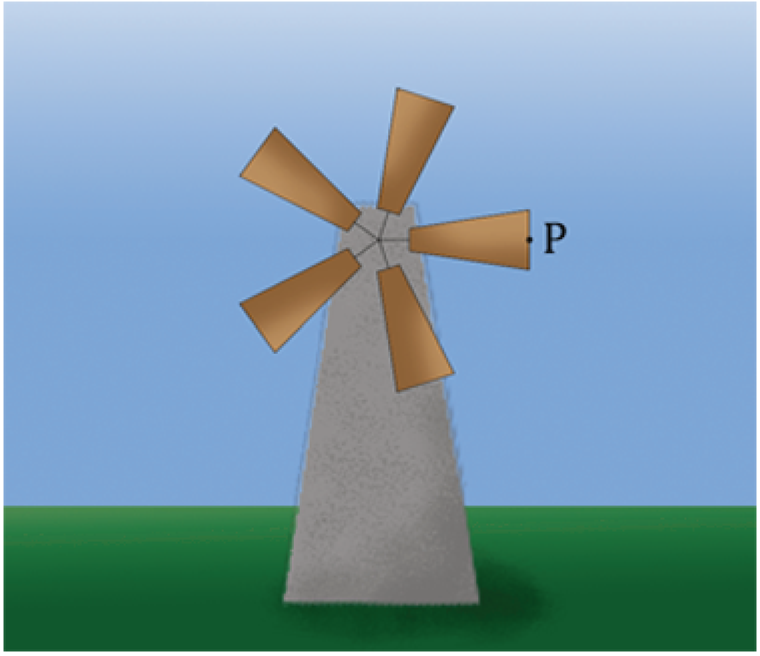
Here is a unit circle with a point A marked at $(1, 0)$. For each angle of rotation listed here, mark the new location of A on the unit circle. Be prepared to explain your reasoning.



1. B, $\frac{\pi}{3}$
2. C, $\frac{4\pi}{3}$
3. D, $\frac{7\pi}{4}$
4. E, $\frac{5\pi}{2}$
5. F, $\frac{6\pi}{2}$

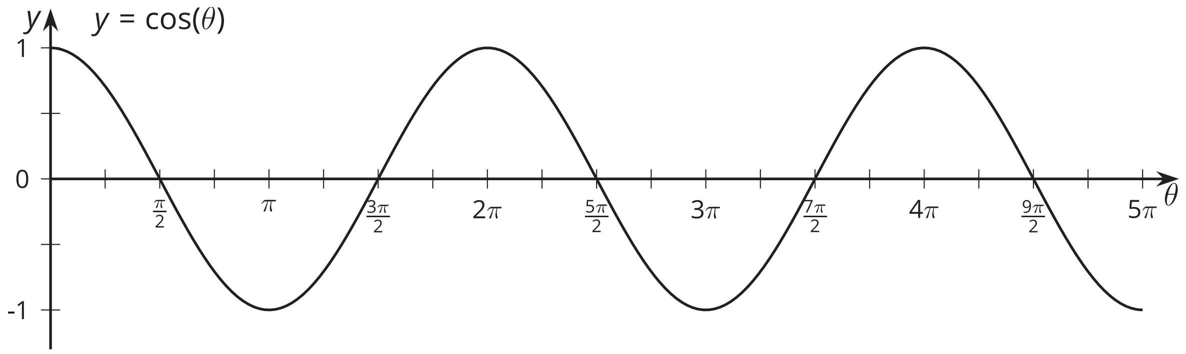
2 Going Around and Around and Around

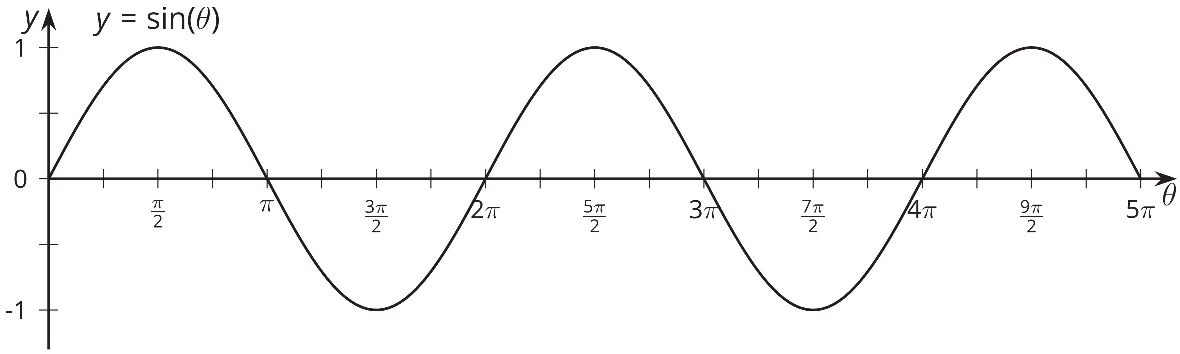
Images for Launch



Student Task Statement

The center of a windmill is $(0, 0)$ and it has 5 blades, each 1 meter in length. A point P is at the end of the blade that is pointing directly to the right of the center. Here are graphs showing the horizontal and vertical distances of point P relative to the center of the windmill as the blades rotate counterclockwise.



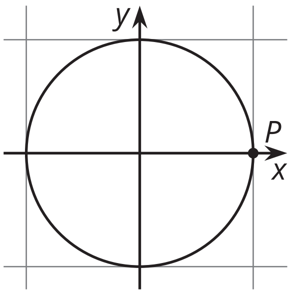


1. How many full rotations are shown by the graphs? Explain how you know.
2. What do the values of the graphs at $\theta = 3\pi$ mean in this context?
3. List some different angles of rotation that bring P to the highest point in its circle of rotation. What do you notice about these angles?
4. How many angles show point P at a height of 0.71 meters? Explain or show your reasoning.

3 Back to Where We Started

Student Task Statement

1. The point P on the unit circle has coordinates $(1, 0)$. For each angle of rotation, state the number of rotations defined by the angle and then identify the coordinates of P after the given rotation.



rotation in radians	number of rotations	horizontal coordinate	vertical coordinate
$\frac{3\pi}{2}$	0.75	0	-1
$\frac{25\pi}{12}$			
$\frac{5\pi}{2}$			
$\frac{7\pi}{3}$			
$\frac{49\pi}{12}$			
5π			

2. In general, if θ is greater than 2π radians, explain how you can use the unit circle to make sense of $\cos(\theta)$ and $\sin(\theta)$.

Images for Activity Synthesis