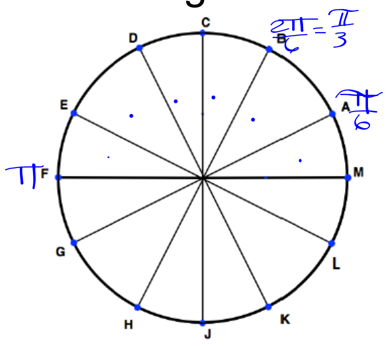
Name Trigonometric Functions 6.7

Warm-UP "Go"

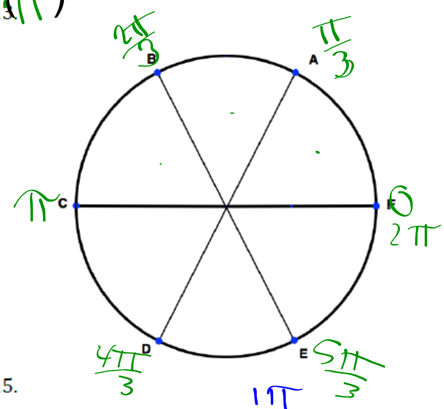
Label the figures below using a similar approach as the example.

Label angles in radian ($\pi$)

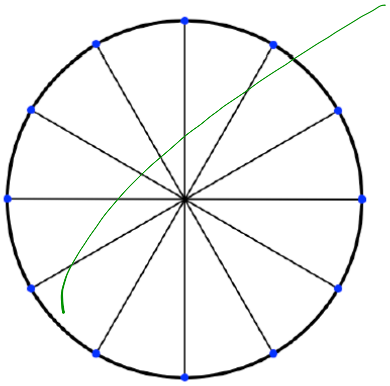
12.



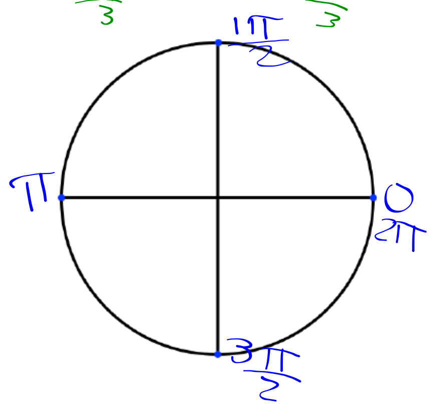

13.



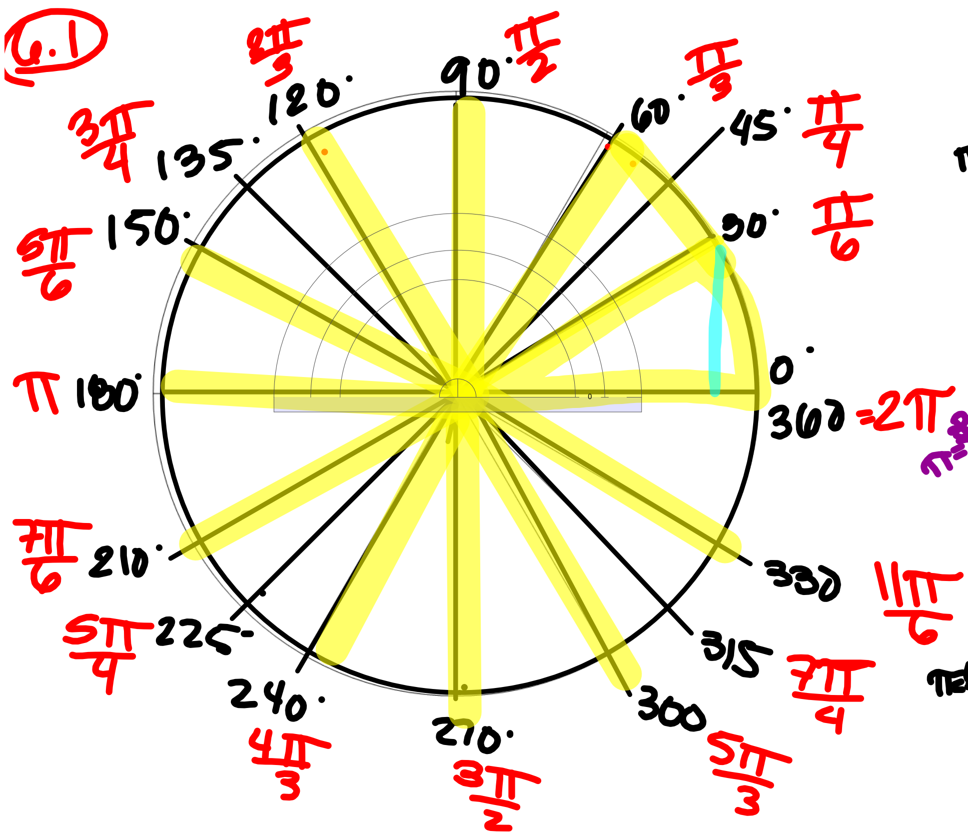

14.

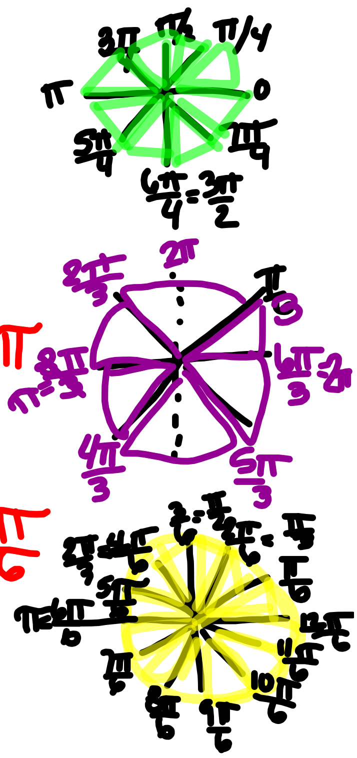


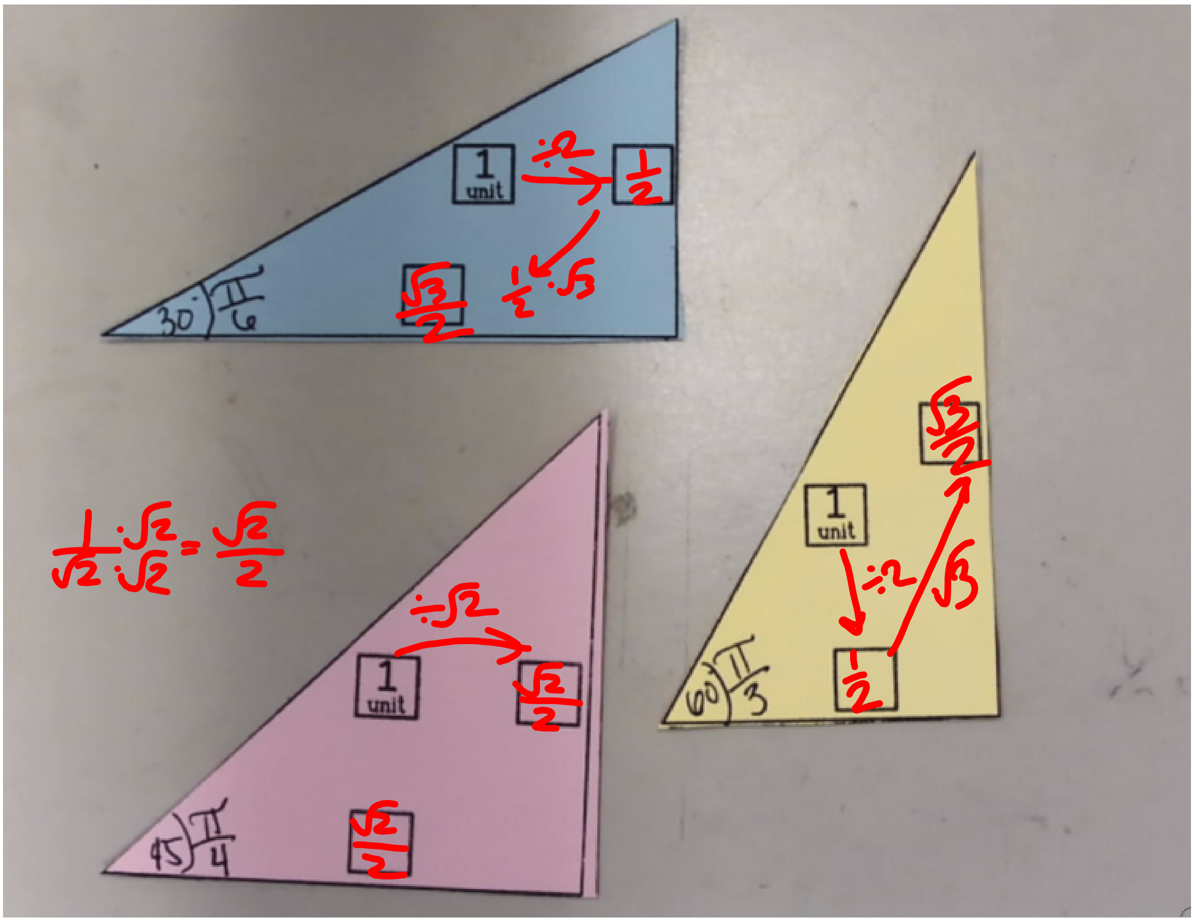
15.

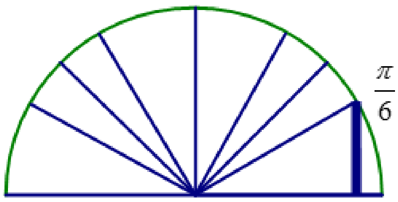


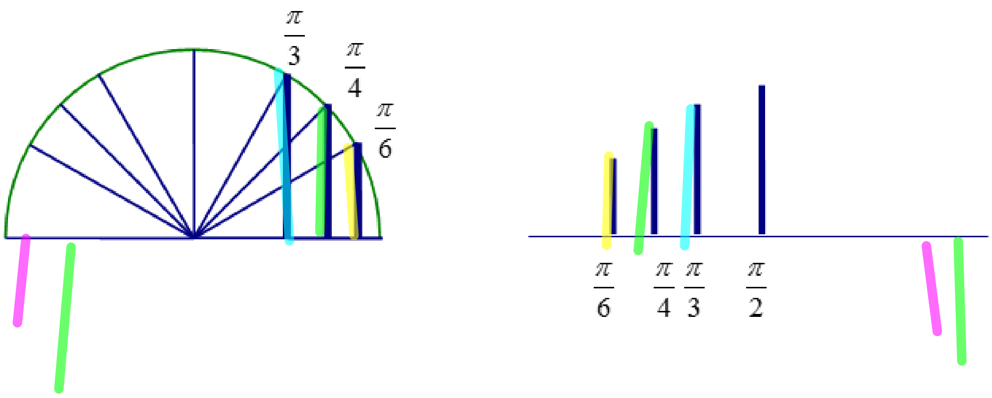
6.1





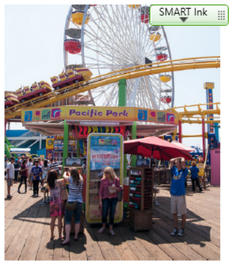

1 unit
$\div 2$
$\frac{1}{2}$
$\frac{1}{2}\cdot\sqrt{3}$
$\frac{\sqrt{3}}{2}$
$30°$ $\frac{\pi}{6}$
$\frac{1}{\sqrt{2}} \cdot \frac{\sqrt{2}}{\sqrt{2}} = \frac{\sqrt{2}}{2}$
$\div\sqrt{2}$
1 unit
$\frac{\sqrt{2}}{2}$
$45°$ $\frac{\pi}{4}$
$\frac{\sqrt{2}}{2}$
$\frac{\sqrt{3}}{2}$
1 unit
$\div 2$
$\sqrt{3}$
$\frac{1}{2}$
$60°$ $\frac{\pi}{3}$


$\frac{\pi}{6}$


$\frac{\pi}{3}$
$\frac{\pi}{4}$
$\frac{\pi}{6}$
$\frac{\pi}{6}$
$\frac{\pi}{4}$
$\frac{\pi}{3}$
$\frac{\pi}{2}$

# 6.1 George W. Ferris' Day Off

*A Develop Understanding Task*



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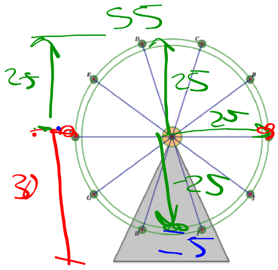
Perhaps you have enjoyed riding on a Ferris wheel at an amusement park. The Ferris wheel was invented by George Washington Ferris for the 1893 Chicago World's Fair.

Carlos, Clarita and their friends are celebrating the end of the school year at a local amusement park. Carlos has always been afraid of heights, and now his friends have talked him into taking a ride on the amusement park Ferris wheel. As Carlos waits nervously in line he has been able to gather some information about the wheel. By asking the ride operator, he found out that this wheel has a radius of 25 feet, and its center is 30 feet above the ground. With this information, Carlos is trying to figure out how high he will be at different positions on the wheel.




1. How high will Carlos be when he is at the top of the wheel? (To make things easier, think of his location as simply a point on the circumference of the wheel's circular path.)

   55

2. How high will he be when he is at the bottom of the wheel?

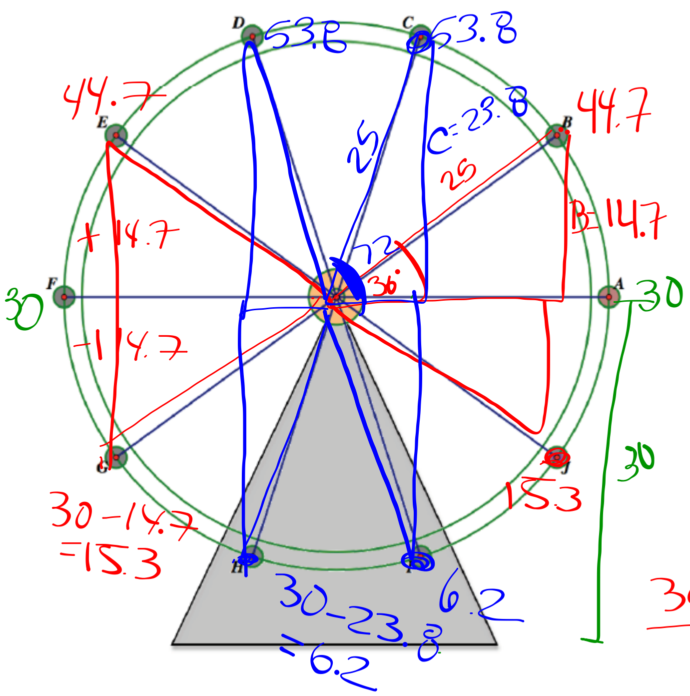
   5

3. How high will he be when he is at the positions farthest to the left or the right on the wheel?

   30

Because the wheel has ten spokes, Carlos wonders if he can determine the height of the positions at the ends of each of the spokes as shown in the diagram. Carlos has just finished studying right triangle trigonometry, and wonders if that knowledge can help him.

4. Find the height of each of the points labeled A-J on the Ferris wheel diagram on the following page. Represent your work on the diagram so it is apparent to others how you have calculated the height at each point.




Height to B:

$25 \sin 36 = \frac{B}{\cancel{25}}$

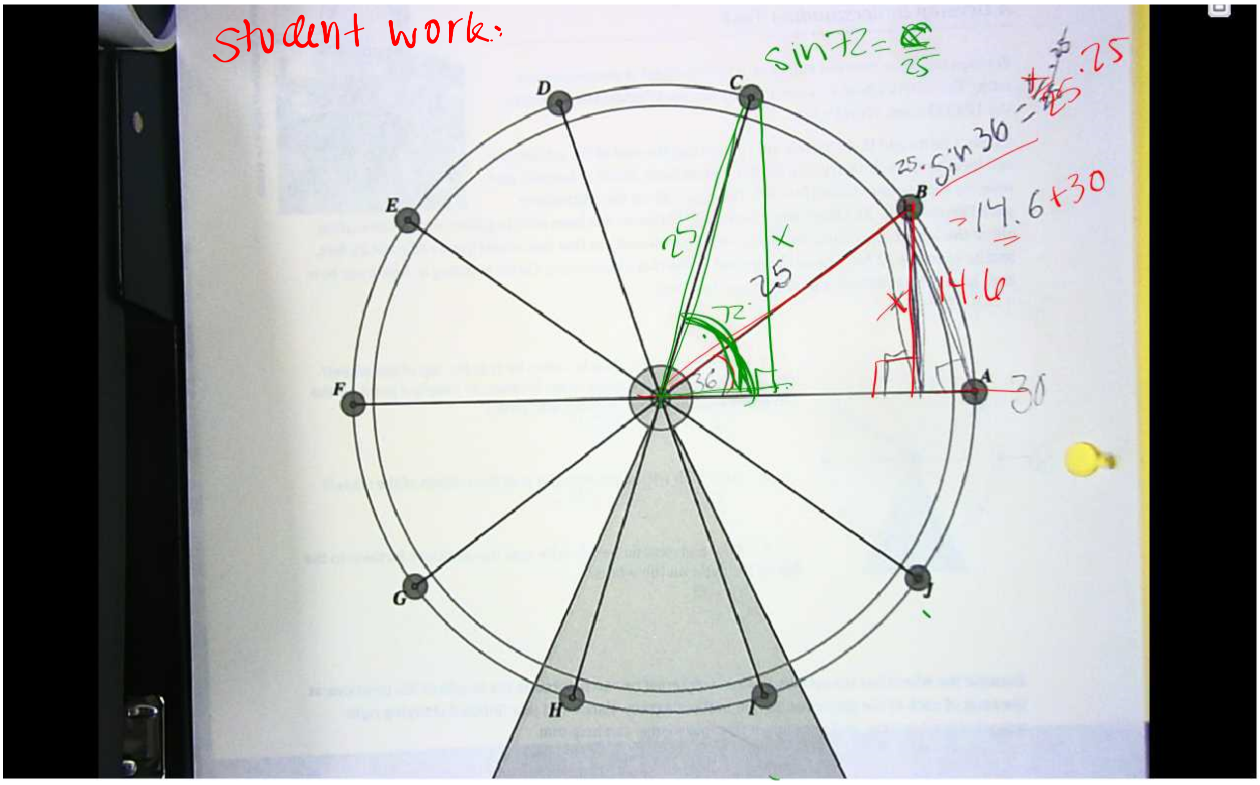
$B = 14.7 + 30 = 44.7$

Height to C:

$25(\sin 72) = \frac{C}{\cancel{25}}$

$C = 23.8 + 30 = 53.8$

$\frac{360°}{10} = 36°$




Name Trigonometric Functions | 6.1

## Ready, Set, Go!


### Ready

Topic: Revolutions and Angular and Linear Speed.

rotating amount

The number of degrees an object passes through during a given amount of time is called *angular speed.* For instance, the second hand on a clock has an angular speed of $\frac{360°}{min}$ while the minute hand on a clock has an angular speed of $\frac{360°}{hr}$.

(Remember that a revolution is a full circle or 360º.)

1. What is the angular speed of the second hand on a clock in degrees per second? $\frac{360}{60 sec} = \frac{6}{sec}$
2. What is the angular speed of the minute hand on a clock in degrees per second?
3. What is the angular speed of the hour hand in degrees per hour?

Your grandparents probably enjoyed music just as much as you do, but they didn't have IPods or MP3 players. They had vinyl records and phonographs. Vinyl records came in 3 speeds. A record could be a 45, $33\frac{1}{3}$, or a 78. These numbers referred to the rpms or *revolutions per minute.*

4. Calculate the *angular speed* of a 45 *rpm*, $33\frac{1}{3}$ *rpm*, *and* 78 rpm record in degree per minute.
   45 *rpm* 45 rotation × 360° each rotation = 16200° per min
   $33\frac{1}{3}$ *rpm*
   78 *rpm*

*Angular speed* describes how fast something is turning. *Linear speed* describes how far it travels while it is turning. *Linear speed* depends on the circumference of a circle ($C = 2\pi r$) and the number of revolutions per minute.

Vinyl records were not the same size. A 45 *rpm* record had a diameter of 7 inches, a $33\frac{1}{3}$ a diameter of 12 in. and a 78 a diameter of 10 inches.

5. If a fly were sitting on the outer edge of a 45 *rpm* record, how far would it travel in one minute? How far for a $33\frac{1}{3}$ *rpm* record? A 78 *rpm* record?

45

7

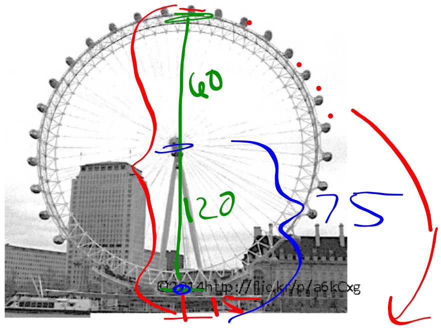
3.5

45 × 22in
turns each turn
= 990in

C = 2πr
C = 2π(3.5)
C = 7π
C = 21.98
≈ 22in

Name Trigonometric Functions | 6.1

**Set** Topic: Using trig ratios to solve problems




Perhaps you have seen *The London Eye* in the background of a recent James Bond movie or on a television show. When it opened in March of 2000, it was the tallest Ferris wheel in the world. The passenger capsule at the very top is 135 meters above the ground. The diameter is 120 meters.

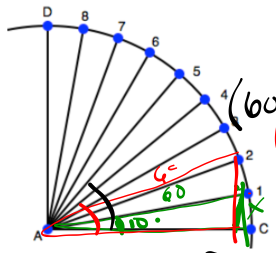
6. How high is the center of the Ferris wheel? 75

7. How far from the ground is the very bottom passenger capsule? 15

8. Assume there are 36 passenger capsules, evenly spaced around the circumference. Find the height from the ground of each of the numbered passenger capsules. Use the figure at the right to help you think about the problem.

$\frac{360}{36} = 10^\circ$ $\quad 60(\sin 10) = \frac{x}{60}$

$x = 10.4$



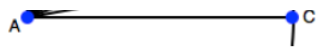

$(60 \cdot \sin 30) + 75$

$60 \sin 20 + 75 = 95.5$

$60 \sin 10 + 75 = 85.4$

75

$\boxed{60 \sin 10x + 75}$




**Go** Topic: Trigonometric Ratios

$4^2 + x^2 = 5^2$

$\sqrt{x^2} = \sqrt{9}$ $\quad x = 3$

**Find the other two trig ratios based on the one that is given.**

| | | |
|---|---|---|
| 9. $\sin\theta = \frac{4}{5} \frac{O}{H}$ | $\cos\theta = \frac{3}{5}$ | $\tan\theta = \frac{4}{3}$ |
| 10. $\sin\theta =$ | $\cos\theta = \frac{5}{13}$ | $\tan\theta =$ |
| 11. $\sin\theta =$ | $\cos\theta =$ | $\tan\theta = 1$ |
| 12. $\sin\theta = \frac{1}{2}$ | $\cos\theta =$ | $\tan\theta =$ |
| 13. $\sin\theta =$ | $\cos\theta = \frac{9}{41}$ | $\tan\theta =$ |
| 14. $\sin\theta = \frac{O}{H} \frac{\sqrt{3}}{2}$ | $\cos\theta = \frac{A}{H} = \frac{1}{2}$ | $\tan\theta = \sqrt{3}$ $\frac{O}{A}$ $\frac{\sqrt{3}}{1}$ |

$1^2 + \sqrt{3}^2 = c^2$

$1 + 3$

$\sqrt{4} = \sqrt{c^2}$

$c = 2$