

A Visit to the County Fair Culminating Task:

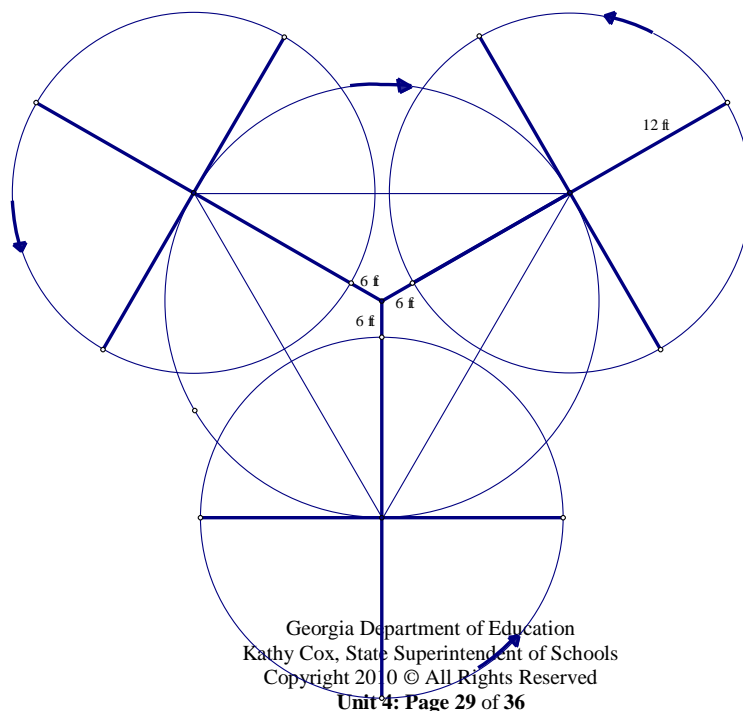
The County Fair is in town and a group of friends have decided to spend Saturday afternoon riding and playing the midway games. As they enter the fairgrounds, Daniel observes that almost all of the rides involve circular motion and says their Trig teacher could make a problem out of almost every one of the rides or games. Sydney tells him to stop and just have fun.

Bryce, August and Julia brought their younger siblings, Olivia, Mason and Emma, with them, so the group decides to go to the little kid area first.

1. At the Merry Go Round, Olivia and Mason each want to ride on the fastest horse. Julia tells them that it doesn't matter where they sit because all of the horses are moving at the same speed. Standing beside her, Bryce says, "Not exactly." Jack, the most math minded of the group, starts to explain about the difference between angular velocity and linear velocity. What did he explain?
2. Olivia and Mason choose horses on the outside of the Merry Go Round while Emma selects a pretty black horse on the inside who she says will win the race. The radius of the merry go round from the center panel to the outside horses is 10 feet while the radius to the inside horses is 5 feet. The ride lasts 3 minutes and all horses move through 12 complete rotations before stopping. Calculate the angular velocity of each of the three children. Calculate the linear velocity of each of the three children. Does this support the explanation from #1?
3. After leaving the Merry Go Round, Mason spots the pony rides and insists that the group go there next. There are seven ponies tethered to metal bars extending from a center post. Each bar is 8 feet long and the ponies are evenly spaced around the bar. As the ponies walk in a circular path around the pole, they complete 3.5 rotations during a two minute ride. How far apart is each pair of ponies? What is the linear velocity of a child sitting on one of the ponies?

4. At this point, the teenagers without younger siblings are getting pretty bored and decide to head to the other part of the fair where they will find the thrill rides. Unfortunately for some members of the group, on the way to the thrill rides they pass the Ferris Wheel and Sydney insists that they ride it. Now, Jack is totally bored and resorts to calculating velocities to keep from falling asleep on the ride. Jack quickly counts 16 gondolas on the Ferris Wheel and estimates the height of the Ferris Wheel at its peak is 100 feet from the entry point. As he looks across the fairground, he notices the children's Ferris Wheel with its five pumpkins gondolas and remembers that it wasn't very tall when they walked by earlier, maybe 12 feet total. The children's ride lasts 3 minutes and the regular ride lasts 8 minutes. The children's ride completes 8 loops while the regular ride completes 3 loops before stopping. Jack calculated the angular and linear velocities for both rides. What were his answers?
5. Leaving the Ferris Wheel, Daniel sees his friend, Jenna, riding the Super Swings. As he watches, she goes around 10 times in one minute. The sign on the ride claims that the swings travel 19mph. What is the diameter of the ride?
6. After waiting for Jenna, the group heads toward the Pirate Ship. This ride is a swinging pendulum with a maximum swing angle of 65° from the center of the ship in either direction. The arm of the pendulum holding the ship has a 40 ft radius and the ship is 22 feet long with the last seats positioned 1 foot from the end of the ship. What is the length of the arc traveled by the center of the ship between the two maximum points in one swing? What is the maximum height reached by the center of the ship?

7. The group’s last ride of the day is the Scrambler. Drew is really excited about riding the Scrambler and explains the ride to Julia, who has never ridden it, “It’s awesome! You spin one way while the whole thing spins the other way!” The setup for the Scrambler is that there are three beams with four cars on the end of each beam. While the three beams spin clockwise at 5 rpm, the four cars at the end of each beam spin counterclockwise at 10 rpm around the end point of the beam. The maximum distance the outside edge of any car can be from the center control pole is 30 feet. Using the diagram below and the information provided, label all angles of rotation and lengths of radii.
- Explain why the rules for this ride include keeping your arms inside the car at all times.
 - When the ride reaches normal operating speed, how fast are you traveling in feet per second?
 - The suggested time of this ride is 90 seconds (at normal speed). How many feet would you travel during this time?



8. On Monday, Daniel mentioned going to the fair to Mrs. Wheeler, the group's math teacher, and she responded with delight because there are so many ways to investigate trigonometry through rides at the fair. Needless to say, his friends were not very happy with him as Mrs. Wheeler assigned the following problem: One of the most common heights for a 16 gondola Ferris Wheel is 67ft. This is the diameter from the lowest point on the wheel to the highest point.
- Plot a model of a Ferris Wheel with these specifications on a coordinate grid, placing the center of the wheel at the origin.
 - Let the first gondola rest on the x-axis. What are the coordinates of this first gondola?
 - Use trigonometric functions to determine the location of the remaining 15 gondolas.
 - How far apart is each pair of gondolas on the wheel?