The State Fair of TEXAS Curriculum

THE MIDWAY & GAMES

GRADE 5 STEM

SPEEDING AROUND

DETERMINING THE SPEED & ENERGY OF THE DENTZEL CAROUSEL

STATE FAIR OF TEXAS®

TEACHER

The Midway & Games

GRADE: Five

STEM

Speeding Around Determining the Speed & Energy of The Dentzel Carousel

In this lesson students will:

- ★ Explore the types of energy that make the carousel go around.
- ★ Observe how light is reflected in mirrors, and how the reflected image appears.
- ★ Use strategies and methods for rational number computation, in order to determine the speed of a carousel.
- ★ Design their own version of a carousel, based on their experience at the Fair.

Carousels can be found at almost any amusement park or midway area, and they attract people of all ages. Use your mathematical skills to find out how fast the carousel and other rides are moving. Then, find out how light, sound, and mechanical energy combined with reflected surfaces to create a 1914 masterpiece that is still attracting riders today!

Standards

- ★ Math TEKS: 5.1 (A), 5.1(B), 5.1(C), 5.1(F), 5.1(I), 5.2(C), 5.3(A), 5.3(E)
- ★ Science TEKS: 5.6(A), 5.6(C)
- ★ Art TEKS: 5.1(A), 5.2(A), 5.4(A)

Before You Go

Review with students that energy is the ability to do work and that there are multiple types of energy.

- ★ Watch this review video on sound.
- ★ Watch this review video on light.
- ★ Discuss reflection and watch this video further discussing how light travels.

How can you determine the speed at which an object is moving?

- ★ Scientists use these terms:
  - * Speed describes how fast something moves.
  - * Velocity describes how fast something moves in a particular direction.
  - * One time around a carousel is a *full rotation* or a *revolution*. You can learn more about rotations by visiting this website.
- ★ What other objects have rotational movement?
- ★ Discuss rotational movement of the earth, planets, moons, tires, etc.
- ★ How do you think the speed of these objects is calculated?

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Did you know?

These two expressions mean the same thing.

Revolutions in one minute

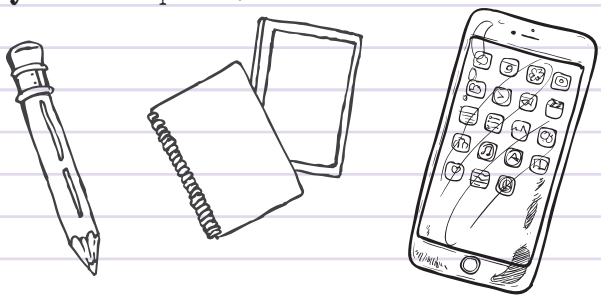
Revolutions PER minute

Plan Your Route.

- ★ Start at the Texas Star Ferris Wheel.
- ★ Walk down Martin Luther King Blvd toward the Midway until you find the Dentzel Carousel.

Optional Materials to Bring

- ★ Smart Phone or Tablet
- ★ Pencil & Notepad
- ★ Sketchbook for Arts Connection
- ★ Stopwatch (or use the Stopwatch function on your Smartphone)



While You're There

The objective of your visit is to gather information about the carousel and other "revolutionary" rides, to use for your projects back at school!

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A HIGH-ENERGY CAROUSEL

- Watch the carousel in motion.
- Make notes or take photos and videos of how the carousel uses mechanical, light, and sound energy to attract people.
- If you use a video recorder, narrate the types of energy you observe.

REFLECTING ON LIGHT ENERGY

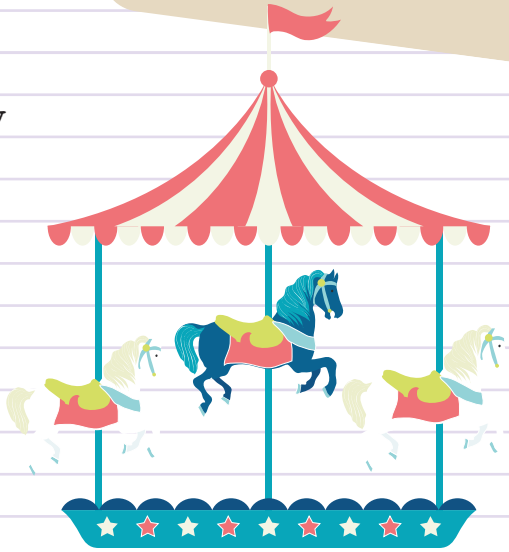
- Locate a reflective surface on the Carousel.
- Take pictures of the reflections you see.
- How is light reflected off the surface?

ROUND AND ROUND WE GO!

- Decide which horse or object on the Carousel you will use as your "starting point."
- Once the ride starts, start your stopwatch (or use that function on your phone)
- Determine how many revolutions (full rotations) the carousel is able to make in one minute.
- Write down your observations in your notepad as the number of revolutions in one minute.
- You may need to make an estimation for the total number of revolutions. The horse or object you use as a starting point may not end up at your starting point when one minute has passed.
- Be as accurate as possible!!
- And don't forget to get ON the ride and enjoy it yourself!

Once you've written down the information for the carousel, try determining the speed of other rides, like the Gravitron or Texas Star, using the same method.

★ Would you be able to determine the number of revolutions on every ride at the State Fair? Why or why not?



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After the Fair

When you return to class following your State Fair visit, you will:

★ Compare your measurements to the measurements given in the chart below.

* How do you think scientists were able to determine the speed of these objects?

★ Use mathematics to determine how many revolutions each ride would make in one hour.

* What formula will you use to determine this?

ARTS CONNECTION

- Observe the various horses that make up the carousel.
- What unique traits do you notice about each one?
- Which ones are you drawn to? Why?
- Do you notice that the fairgoers are drawn to specific horses? If so, why do you think that is?
- Pay attention to how the colors of the horses are dispersed throughout.
- Listen to the type of music that plays as the carousel is moving.
- Be sure to take note of these details so you can reference them later.

I watched a carousel rotate 3 ¾ times in 1 minute. How many times will that carousel rotate in 1 hour?

Revolutions per Minute

What	RPM
Earth's rotation	0.000696
Category 5 hurricane	0.055
Clock's second hand	1
Saltstraumen whirlpool	21.2
12-inch vinyl album	33 ⅓
Apache helicopter rotors	292
Compact disc	500
Ceiling fan	509
Salad spinner	950
Model T engine	1,600
Washing machine	1,600
Curveball	1,800
747 turbofan	11,000
F1 V6 engine	15,000
Large Hadron Particle Collider	674,700
Ultrasonic dental drill	800,000

Arts Connection: Carousel Creations

In this lesson, students will:

★ Examine the equine sculptures that are part of the Carousel at the State Fair of Texas.

★ Design their own version of a carousel, based on their experience at the Fair.

★ Present and defend the creative choices they made with their classmates regarding their carousel design.

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While You're There

Refer to the main lesson for instructions.

Before You Go

Discuss with the students some of the history of the carousel at the State Fair.

- ★ The carousel caretaker dates it back to 1924.
- ★ National Carousel Association says parts of it could have been made as early as 1914.
- ★ It is one of six classic carousels in Texas and one of 275 in the nation.
- ★ It was brought to Dallas in 1951, and remains one of the favorite rides of fairgoers today.
- ★ Each of the animals is hand-carved and painted. They are all horses.
- ★ This link from the website of The National Carousel Association contains wonderful close up images of horses on the carousel at the State Fair. As you click through the images with your class, ask them questions, such as:
  - * What do you see in each of these horses?
  - * How are they different?
  - * How are they similar?
  - * Also, discuss how the artist has utilized color and balance. Why would that be important in this work?

After the Fair

When you return to the classroom, it's your turn to design a carousel for the State Fair!

- ★ Think back to the discussion about the examples that you looked at in class.
- ★ Be sure to have your notes and sketches handy that you created when you visited the carousel.
- ★ As you sketch out your design ideas, think about some of the following questions:
  - * What sorts of animals do I think would work best on a carousel for the State Fair?
  - * What kinds of colors do I want to use?
  - * Will there be different sizes?
  - * How many animals should I include on my carousel?
  - * What kind of music would play?
  - * What sorts of symbols or shapes will I decorate the animals with?
- ★ Be sure to create some preliminary sketches before working on your final design.
  - * Using colored pencils might work best for this project so you can be sure to get details into each of your carousel animals.
- ★ When you are finished, display your work for your peers to critique, and explain why you designed your carousel the way that you did.