Math & Science In Action!

SixFlags®

AMERICA

Teacher's Resource Manual

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Dear Teachers & Students,

Our Physics, Math and Science Day programs continue to provide real-world learning in a thrilling, experiential environment. Our goal is to make learning fun. For years, these programs have become annual events in many of our theme parks nationwide. Our company is derived from students and teachers, like yourselves, who one day decided to branch off from common career paths to create an industry full of thrills that today continues to entertain hundreds of millions of visitors each year.

We deliver entertainment primarily through our rides that are founded upon physical and mathematical principles. There exists true science and math behind each unique design of every ride experience. Simple rides like carousels that have routine circular motions with predictable movements, mixed with sound, lights, and other actionable media have thrilled people of all ages for over a century.

Nowadays, extreme roller coaster rides and simulators create unpredictable motion with varying g-forces, speeds subject to weather conditions, and carriages designed to hold people safely in place are all designed by large networks of physicists, mathematicians, architectural & civil engineering designers.

I encourage you to view our industry from this perspective and hope your visit with us inspires the next generation of creative thinking that will carry the next genre of entertainment into the next definable dimension. We thank you for your past patronage and hope that you enjoy our product offering enough to return with your families and friends to experience the entire property.

Ride-on!

Rick Howarth

Six Flags America Park President

Elementary Math and Science Activities at Six Flags America

Amusement park rides are made to be fun for the riders. Some rides spin you around in a circle. Some move you up and down. Some of the rides speed you up and slow you down. The things you see, hear, and feel when you ride help to make the rides interesting.

In order to find the answers to the questions, you must watch the rides very carefully. Sometimes you will use a stopwatch to measure time. You may be asked to measure a distance. You may even be asked to make some simple calculations by estimating how fast you are going. Your teacher can help you do all this. It is the most interesting when you relate what is going on with the ride and think about how it makes you feel.

We hope you have a great time exploring all the science found in the park!

Have a great ***SIX FLAGS MATH & SCIENCE DAY!***

A NOTE TO THE TEACHERS:

A trip to Six Flags America is an amusing way of teaching science and mathematics to your students.

We have tried to incorporate this philosophy into this manual targeted for elementary and middle school children.

It is our intention to make this manual educational fun for you and your students. Please let us know anything you liked or disliked about the activities and write down any suggestions or extensions that may be helpful in improving this manual.

We believe that teachers should be the true editors of any activity aimed for students.

We have written activities for every ride at Six Flags America. It was not our intention to have every student observe or test every ride in the park. What it does do is give the teacher more flexibility and variety in deciding what they want the class to accomplish at Six Flags America. You may want to form small groups and assign certain rides for each group. Check the height and age level for each ride and read over the activities. Since some rides have similar questions, you may want to assign rides to a group based on the variety of science and mathematical activities.

Thank you so much for your experience and guidance.

Most of all, have fun on your trip to Six Flags America!

Pre-visit Preparation for Students

In order for students to understand some of the terms used on their worksheets and to help them know how to formulate appropriate responses to some of the questions, it is important to have a lesson or two in class before coming to the park.

A. DESCRIBING MOTION IN GENERAL

The various rides at Six Flags America move the riders in many different ways. Some rides move people horizontally (parallel to the ground), some move people vertically (up and down), and some rides do both. Sometimes the people are moved in straight lines and sometimes they are moved along curving paths (see Section B for more detail about circles). One way to describe motion, then, is to indicate its direction (horizontal or vertical, straight or curved). Another property of motion is the speed at which it occurs and whether that speed is increasing or decreasing.

Students should be shown some examples of moving objects (toys, for example) and asked to describe the direction of the motion and whether the object has a constant speed, is speeding up, or is slowing down.

B. DESCRIBING CIRCULAR MOTION

Objects moving in circles may be moving in vertical circles (a Ferris wheel, for example) or horizontal circles (like a merry-go-round). In either case there are two directions the object can be turning. As you stand facing a merry-go-round, the part of the ride closest to you may be moving from left to right in front of you or from right to left. To distinguish these two directions the terms clockwise and counter-clockwise are used. They refer to the direction that the hands on a clock turn when the clock is running. For an object moving in a horizontal circle, describe it as though you were looking down on it from above. Thus, if a merry-go-round was turning from left to right in front of you, it would move counter-clockwise when viewed from above.

By observing examples that you provide, students should practice describing objects moving in a circle by indicating whether the motion is a horizontal circle or a vertical circle and whether it is clockwise or counter-clockwise. They can also state whether the speed is increasing, decreasing, or staying the same.

C. ESTIMATING TIME

In some of the park activities, students are asked to measure the amount of time it takes for a certain motion or event to occur by using a stopwatch. In other activities students are asked to estimate the time. Estimating time can be done by counting “one, two, three, ” etc. if this is done at the correct pace. The proper pace can be approximated by saying the word “thousand” in front of each number or the word “Mississippi” after each number, for example, “thousand one, thousand two,” or “one Mississippi, two Mississippi”.

Students should practice measuring time with a stopwatch before they go to the park. They should also practice estimating time by using the counting method until they can do so with some consistency.

D. ESTIMATING DISTANCE

While a meter stick can be used to measure distance or length, there are several ways to estimate distance when a meter stick is unavailable. The normal walking step of an elementary student is about one half meter; so, counting steps and dividing by two gives an estimate of the distance walked in meters. Another way to estimate distance is to realize that the distance between the hands of a student with arms outstretched to the sides is about one meter. A third way to estimate distance is to visualize meter sticks lying end to end covering the distance to be estimated.

Students need to practice estimating distances whose actual values are in the range of one-half meter to several meters.

Tips to the Teacher

1. Equipment needed in the park:
   a) Stopwatch (at least one per group)
   b) Accelerometers (doubling as clinometers for angles of elevation)
   c) Measuring string or knowledge of their pace
   d) Calculator, pen, pencil
   e) Ziploc™ bag for student workbook and equipment (for water rides)
   f) Dry clothes

2. Hand out tickets as they exit the bus. This speeds entry into the park.

3. Remind students to double-check the restraints on each ride. Be sure that they understand that safety is not a joke.

4. Check with park personnel for meal deals or catered outing. Be sure that students are aware that no outside food is allowed in the park.

5. Announce the lateness penalty for either boarding the bus at school or leaving the park.

6. If the student workbooks are due as the bus arrives back at school, you will get them on time but they will be more ragged than if they are due the next day. Have each team leave one copy of the workbook on the bus. That's the one that will be submitted for grading.

7. An interesting option is to allow students to design activities for rides that are not covered in the workbook.

8. Be sure that your students know how to identify your bus. Put a sign in the front window or a scarf on the antenna.

9. If you do not have students check in with you during the day, make a habit of being visible, and check Guest Relations every hour or so. Students can **leave notes for you** there.

10. Be sure you have a minimum of two adults on each bus in case you need someone to stay with an ill student.

11. Be sure to explain to students that stopwatches should be used for timing rides while **watching** and not **riding.**

Trip Checklist

- ❑ **Authorization. Obtain** this from both your school and the district administrator.
  Date of trip: _____

- ❑ **Transportation.** Contact the bus company.
  Total cost: _____Number of seats: _____
  Number of hours: _____From _____a.m. to_____ p.m.
  Deposit: $_____ Deadline for balance:_____

- ❑ **Tickets.** When you call the park, ask for Group
  Sales (301-249-1500 Ext. 3272 or 3700).
  $ per ticket: _____Deadline for order: _____
  One Complimentary ticket for every 15 pre-paid tickets.

- ❑ **Obtain permission slips or student contracts and make copies of them.** Be sure that emergency contact numbers cover all of the hours of the trip and that both parents and the administration each receive copies of the contract.

- ❑ **Collection of money and permission slips.** Have student's pay by check (made out to the school). Have them deposit the checks in a manila envelope and sign a numbered line on the outside of the envelope. This will provide you with an automatic count and will help to prevent loss of money. Don't accept ticket money without a permission slip. Don't accept cash under any circumstances.

- ❑ **Student workbooks.** Choose the appropriate activities and have the booklets reproduced.

- ❑ **Chaperones.** Ask school administrators, parents, and faculty to join you. Their tickets are usually complimentary.

- ❑ **Lesson plans.** Have an alternate activity for students who are unable to go on the trip. Try a workbook for which you supply typical data, so students can do the calculations.

- ❑ **Professional relations.** Leave a copy of the student workbook in the faculty lounge so that your colleagues will know what students will be doing and what you will be grading.

- ❑ **Public relations.** Invite representatives of the yearbook, school, local papers, and TV stations to attend your field trip. Pictures of students doing calculations next to the roller coasters can be very helpful in dispelling opposition to this type of field trip.

Math & Science Day Field Trip Student Contract

Faculty Sponsor: _____

On _____, students participating in the trip to Six Flags America will leave _____ School at _____a.m. by bus and return that day at about _____p.m. The cost of the trip will be $_____, which must be paid by check made out to the school. This agreement, when signed, informs those concerned that the following stipulations are understood and agreed upon prior to departure.

1. Completion of the Math & Science exercises and write-up is mandatory for each student.
2. Each student is responsible for being on time according to the day's schedule.
3. No student is to engage in any activity that might endanger individual safety or cause property damage.
4. No drugs (except those prescribed by a doctor) will be permitted on the trip.
5. Any violation of school district or park policy will result in appropriate disciplinary action. No line jumping is permitted and is reason for ejection from the theme park.

This agreement is meant to alleviate any misunderstanding that this trip is not a serious educational activity. Math & Science Day is an opportunity for students to experience math & science principles in a meaningful and enjoyable way.

Please have your parent(s) or guardian(s) read this agreement and sign it. Both signatures are necessary before space on the trip can be reserved for you.

Important notes:
No student is required to go on the rides in order to earn full credit. Many of the exercises can be done at ground level.

Please list here any medication currently prescribed for you or that you take routinely and any medical information, such as bee sting allergies, which might be needed by First Aid personnel.
Medication: _____

Other medical information: _____

Parent/guardian: _____ Signature: _____

Emergency contact #s: Business: _____ Home: _____

Safety Precautions

1. Medical records, including information about current medication, should be part of the permission slip. Be sure to carry the slips with you on the trip.

2. Be sure that students are aware of the location of Guest Relations. Let them know that they can leave messages for you there. Before the trip, let parents or guardians know that you will check with Guest Relations for messages periodically. Additionally, you should establish a phone number for students to call should they need you. You can also leave this contact number at Guest Relations should the park need to reach you in an emergency situation.

3. Form laboratory groups of four to six students.

4. Shoes or sneakers are a must. Sandals, loose footwear, loose jackets, and long hair are dangerous on some rides. Remind your students that they must observe any posted regulations.

5. Evaluate your measuring devices for safety before you leave school. Avoid anything with sharp ends. Devices must be lightweight and capable of being tethered to the wrist to avoid loss during a ride. Tethered devices are not allowed on round rides (i.e. teacups).

6. Remind students to check that seat belts and harnesses are secured. The rides are designed to be safe. Students should double-check for themselves.

7. The sun can be a problem. Sun block and sun visors are a must on what may be their first full day in the sun this year.

8. Remember -*No one is forced to ride.* Measurements can be taken from the ground and accelerometer readings can be shared.

9. Remind students to follow all safety guidelines listed on park map and at each attraction site. Disobeying safety rules is grounds for ejection from the park.

CONSCIOUS COMMUTING

As you ride to the amusement park, be conscious of some of the science on the way.

A. THINGS TO NOTICE AS YOU RIDE

1. As you start up, which way do you FEEL thrown, forward or backward?

2. If someone were watching from the side of the road, what would that person see happening to you in relation to the bus? What would that person see happening to you in relation to the ground underneath you?

3. How can you explain the difference between what **you feel** as the bus starts up and what **the observer** sees? (You may want to use the concept of FRAME OF REFERENCE.)

B. Going at a Constant Speed

THINGS TO NOTICE:

4. Describe the sensation of going at a constant speed. Do you feel as if you are moving? Why or why not? (Try to ignore the effects of road noise.)

5. Are there any forces acting on you in the direction that you are moving? Explain what is happening in terms of the principle of inertia.

C. Rounding Curves

THINGS TO NOTICE:

6. If your eyes are closed, how can you tell when the bus is going around a curve? Try it and report what you notice. (Do NOT fall asleep!)

7. As the bus rounds a curve, concentrate on a tree or a building that would have been STRAIGHT AHEAD. See if you can sense that you are

TRYING TO GO STRAIGHT but are being pulled into the curve by a centripetal force. What is supplying the centripetal force, the seat, your seatmate, the wall, or a combination?

How does this change when the curve is tighter or the bus is going faster?

Write a few sentences about this experience. How does it connect with what happens on the rides at the amusement park?

COYOTE CREEK

1. **RENEGADE RAPIDS**
2. **COYOTE CREEK CRAZY CARS**
3. **THE MIND ERASER**

10. RENEGADE RAPIDS

Activity:

A. Observational:

1. What prevents the boat from sinking on this ride?

   _____

   _____

2. What would make the boat:

   a) Speed up:
      _____

   b) Slow down:
      _____

3. What do you think causes the rapid current in the water?

   _____
   _____

2. COYOTE CREEK CRAZY CARS

Age Group: upper elementary & above (5th grade & above)

Activity:

Observational: Whenever we are in a collision, we feel our body is being pushed or pulled in some direction.

1. Have a collision where the front of your car gets hit. Which direction do you feel pulled when this collision happens? _____

2. Have a collision where the back of your car gets hit. Which direction do you feel pulled when this collision happens? _____

3. Have a collision where the side of your car gets hit. Which direction do you feel pulled when this collision happens?
   _____

4. From what happened in these three collisions, complete the following sentence: "In a collision, a person always feels pulled _____ (toward or away from) the collision point.

5. Can you find any clue as to what is used to power this ride?
   _____
   _____
   _____

3. THE MIND ERASER

Age Group: Middle School & above. (This activity is viewed from the ground and therefore can be done by elementary school children).

Activity:

A. Observational:

1. Are any of the loops or hills taller than the first hill?

_____
_____
_____

2. What is different about the first hill other than its height?

_____
_____
_____

3. How many different times are the riders upside down?

_____
_____

4. Is this ride a true coaster? Explain your answer.

_____
_____
_____

GOTHAM CITY

4. **RIDDLE ME THIS**
5. **SUPERMAN – RIDE OF STEEL**
6. **BATWING**
7. **THE PENGUIN'S BLIZZARD RIVER**

4. RIDDLE ME THIS

Age Group: Upper elementary & up (5th grade & up)

Activity:

A. Observational:

1. Which way do you feel pushed in the beginning of the ride?

   _____

   _____

2. Which way do you feel pushed as the ride tips?

   _____

   _____

3. What happens to the speed as this ride tips and falls?

   _____

   _____

4. When ride tips, what sensations does your body feel?

   _____

   _____

5. Does this ride go clockwise or counter-clockwise?

   _____

   _____

5. SUPERMAN - RIDE OF STEEL

Age group: Middle School

Activity:

A. Observational

1. How long is the ride from the time the train leaves the station until the time the train gets to the brakes?

_____

1. The total track is 5350’ long. What is the average speed of the entire ride?

_____

2. How long is the ride in seconds from the time the train leaves the top of the hill until the time the train stops?

_____

3. The track is 4002’ long from the top of the hill to the station. What is the average speed of the train after it leaves the lift hill?

_____

6. BATWING

Age group: Early Primary

Activity:

A. Observational

1. What are some reasons this ride is scary to some people?

_____

2. Is this coaster a suspended coaster?

_____

7. THE PENGUIN'S BLIZZARD RIVER

Age Group: Upper elementary & up (5th grade & up)

OVERVIEW

A raft 2.40 m in diameter is lifted up a hill and then descends down a flume and through two twists before splashing into Chiller Bay. Spectators can fire water cannons at the riders as they pass through Chiller Bay.

GOALS

Observing
Measuring
Collecting Data
Applying Data
Identifying Variables

MATERIALS

Stopwatch
Paper
Pencil

DIRECTIONS/ACTIVITY

1. Select a spot near the Penguin's Blizzard River to observe one of the rafts. Make sure you have a clear view.
2. Using a stopwatch, determine the time it takes the raft to pass a point at the top of the flume and at the bottom of the flume.
3. Time at least 3 different rafts.
4. Create a data table to display your observations.

5. Did you get the same results for each raft?
6. What variables contribute to the difference in times?
7. Could you get the same results each time? How?

EXTENSIONS/ENRICHMENT

1. Why is there water on the slide and not just at the bottom?

2. At what point on this ride is the speed the greatest?

3. What causes the raft to rotate as it moves down the flume?

LOONEY TUNES MOVIE TOWN

8. **Looney Tunes Prop Warehouse**

9. **Elmer's Around the World in 80 Seconds**

10. **Foghorn Leghorn's Tinsel Town Train**

11. **Taz's Film Works**

12. **Pepe Le Pew's Tea Party**

13. **Yosemite Sam's Hollywood Flight School**

8. LOONEY TUNES PROP WAREHOUSE

Age Level: Kindergarten to 4th grade

Activity:

A) Observational and Recall:

1. One part of Looney Tunes Prop Warehouse is a large number of punching bags hanging on ropes. The bags are of different colors. How many different colors can you see? _____

2. Write down the colors you see_____

   _____

3. The colors in the rainbow are red, orange, yellow, green, blue, and violet. What color in a rainbow is missing at the Looney Tunes Prop Warehouse?
   _____

9. ELMER'S AROUND THE WORLD IN 80 SECONDS

Age Level: Kindergarten to 3rd grade

Activities:

A) Observational:

1. Put a check by each thing that happens to you during this ride.
   _____ Move up
   _____ Move down
   _____ Move backward
   _____ Move forward
   _____ Move upside down
   _____ Move in a circle
   _____ Swing out
   _____ Swing in

2. What happens to you as the ride speeds up (do you feel anything)? _____

   _____

B) Determining the Change in Period:

1. Pick a person on this ride. Using your stopwatch, find how long it takes this person to go around once when the seats are leaning outward the most.

   Time = _____ seconds.

2. When the seats point straight down, is the ride moving faster or slower? _____

3. Finish this statement: When the seats of this ride leaned outward the most, the ride was moving (faster or slower) _____, and the time it took the person to go around once was (longer or shorter) _____ .

10. FOGHORN LEGHORN'S TINSEL TOWN TRAIN

Age Level: Kindergarten to 2nd grade

Activities:

A) Estimating Length:

1. Do you know how big a meter stick is? If not, ask your teacher or a chaperone. Imagine that meter sticks are laid end to end next to the train. How many sticks would it take to equal the length of the train? Train = _____ meters.

B) Estimating Speed:

1. Using a stopwatch, see how many seconds it takes the entire train to go past you. Time = _____ seconds.

2. As the train goes around and around the track, does its speed seem to change?

   If the train moved faster, would it take more or less seconds to go past you?

C) Mathematical:

1. How many total seats are on this train? _____

   What is the maximum amount of people that can ride this train? _____

11. TAZ'S FILM WORKS

Age Level: Early Primary (1st grade)

Activities:

A) Observational:

1. Stand so you're looking toward the ride. Which way does the ride turn? Do the riders closest to you move from left to right or from right to left?
_____

2. While looking at the ride:

   a) Which direction do the seats hang when the ride is not moving? _____

   b) Which direction do seats hang when ride is moving? _____

   c) What makes the swings move into that position?

B) Using Your Stopwatch

1. Find the time it takes a rider to go once around on this ride. Time = _____ seconds

2. Does this ride seem to go around at the same speed all the time?

C) Mathematical Activity:

1. By standing in one spot and watching the ride, how many seats do you think there are? _____

2. Using your stopwatch, time how many minutes this ride lasts.

3. In 10 turns, how many children could get on this ride? Assume all seats are taken.) _____

12. PEPE LE PEW'S TEA PARTY

Age Group: Early Primary (Kindergarten, 1st grade)

Activity:

A) Observational:

1. This ride gives the rider three different motions all at the same time. Describe the three motions:

   a) _____

   b) _____

   c) _____

13. YOSEMITE SAM'S HOLLYWOOD FLIGHT SCHOOL:

Age Group: Early Primary (Kindergarten to 1st grade)

Activities:

A) Observational:

1. How many different kinds of sounds can you hear that come from this ride? Describe each kind of sound you hear. (Note: the operator may have sound turned off.)
   _____
   _____
   _____
   _____

2. Does the "plane sound" change or just stay the same? _____

B) Estimation Time: How long does it take a plane to go around once on this ride?

Here are three ways to determine this:

1. Guessing: Pick a plane (look at its number). Guess how many seconds it takes this plane to go around the circle. Choose the answer that seems the closest:
   a) 2 seconds b) 10 seconds c) 20 seconds d) 60 seconds

2. Ask your teacher how to estimate seconds by counting. Using this way of counting, see how long it takes the plane to go around once. _____

3. Using your stopwatch, time how many seconds it takes the plane to go around once. _____ seconds

4. Which of the three answers are the same? _____

5. Which answer do you think is the best? _____

CHESAPEAKE

14. Shipwreck Falls

15. Cyclone

16. Carousel

17. Tea Cups

18. Flying Carousel

19. Pirates Flight

20. High Seas

21. Roar

14. SHIPWRECK FALLS

Age Group: Middle Primary and Above (third grade & above)

Activities:

A. Observational:

1. Draw a picture that most resembles the path of the splash.

2. In a football game, at what times do you see the football following this path?_____

_____

What about in a baseball game?

_____

_____

3. Does the splash always hit the same mark?

_____

4. If not, what do you think would cause it to differ?

_____

_____

B. Mathematical:

1. How long does the ride take from start to finish? _____ seconds

2. What is the time delay between rides? _____ seconds

3. What is the maximum number of people that can ride in the boat?
   _____

4. Determine the maximum number of people that can ride Shipwreck Falls in one hour.
   _____

15. CYCLONE

Age Group: Upper Elementary & Above (5th grade & up)

Activities:

A) Observational:

1. Identify the two circular motions of this ride.

   a) _____

   b) _____

2. Measure the time it takes to go around the big circle once. _____

3. Are the cars turning in the same direction? _____
   Describe:

4. While on the ride, name all the directions you feel pushed:

5. What geometric figure do you find your body is making in the seat as you ride the Cyclone?

16. CAROUSEL

Age Level: All ages with adult supervision.

Activities:

A) Observational

1. How many different kinds of animals are on the outside row of this ride? _____
   Name them. _____

   _____

2. There are mirrors around the center of the ride. As the ride is moving, look at the legs of the animals in the mirrors. What do they appear to be doing? _____

   _____

   What about the mirrors might cause this effect? _____

   Have you ever seen mirrors like this before? _____

B) Determining the speed of your favorite animal:

1. While standing near the ride, pick out your favorite animal on the outside row. Start your stopwatch when that animal passes directly in front of you. Stop the watch when the animal passes in front of you again.

   Write your answer here. _____ seconds

   This is the amount of time it took your animal and the ride to go around once. In science, this is known as the period.

2. Now determine how far this animal moves when it goes around one time. We are going to assume that a person's average step or pace is half a meter long.

   When the ride is over, count how many steps (paces) it takes you to walk around the edge of the ride once. Number of steps (paces): _____

   If we assume that each step is ½ meter, the distance around the ride is:
   # of steps _____ x ½ meter = _____total meters animal moved around the ride

   You have just determined the **Perimeter** of this circle or its **Circumference!**

3. To find out the speed of your animal, just divide the distance by the time.
   Average speed (meters/second)
   Time for once around (seconds)
   Distance around the ride (meters)

4. Did your animal go faster or slower than 4 meters/second? _____

C) Additional mathematical activity (percentage):

1. What percentage of the animals in the outer row are elephants? (Show your work.)

17. TEA CUPS

Age Level: Middle primary & up (2nd grade & up)

Activities:

A) Observational:

1. Name the three different size circles this ride makes:

   a)

   b)

   c)

2. If you viewed this ride from above, draw the different size circles you would see:

3. As you watch the ride and the different size circles, label in the picture which circles are:
   a) Always going "clockwise"
   b) Always going "counter-clockwise"
   c) Goes both "clockwise and counter-clockwise"

B) Mathematical:

1. Compare how long it takes a cup to complete a:

   a) Big circle = _____ seconds
   b) Small circle =_____ seconds

   This is called the **Period** of the circle.

2. Now pick a different cup and determine the period for:

   a) Big circle = _____ seconds
   b) Small circle = _____seconds

3. In comparing the periods of the big circle and the small circle, which period seems to vary more in its speed? _____

18. FLYING CAROUSEL

Age Level: 4th grade & up.

Activity:

A) Observational:

1. As the ride is moving, do large people seem to fly out further than small people? _____

2. Does an empty seat fly out further than one with a person? _____

3. Do inner seats fly out further than outer seats? _____

4. What do the colors on the ceiling of the ride remind you of? _____

5. Starting with the red stripe of color, list all the colors your see, in order, until you get to the next red stripe. _____
   _____

6. Can you think of somewhere else that you have seen these colors in the same order? _____

7. What do you notice about the motion of the middle section of this ride compared to the motion of the ceiling where the swings are attached? _____
   _____
   _____
   _____

19. PIRATES FLIGHT

Age Group = Middle elementary & Above (4th grade & above)

Activity:

A. Observational:

1. When the ride is not moving, is the seat pointing straight down?

   _____

   How does the position of this seat change once you are moving?

   _____

   What do you think determines how far this position changes?

   _____

2. When the ride is in motion, what direction is your head tilting?

   _____

   What direction do you feel pushed? _____

3. When the ride touches ground, which way do you feel pulled?

   _____

   Why do you think this is so?

   _____

20. HIGH SEAS

Grade Level: Upper elementary & above (5th grade & above)

Activities:

A. Observational:

1. Determining the period of the swing (swing time)

   Time how long a back & forth swing takes at various stages during the ride. This is known as the period of the swing. Take at least four different readings.

   a. _____seconds
   b. _____seconds
   c. _____seconds
   d. _____seconds

2. Does the swing time vary during this ride?

   _____

3. At what point during the ride did your weight feel the lightest?

   _____

   When does it feel the heaviest? _____

B. Critical Thinking

If your teacher has talked about Potential Energy and Kinetic Energy, see if you can answer the next two questions.

1. At what point on this ride is Potential Energy the highest?

   _____

2. At what point is Kinetic Energy the greatest?

   _____

21. ROAR (ROLLER COASTER)

Age Group: Middle School & above. This activity should not be done by elementary school children since it must be done on the ride.

Activity:

A. Observational:

1. How many times do you feel your body pushed to the left and the right during the ride? _____

2. During which part of the ride do you feel lifted off your seat?
_____

3. Describe your sensations of weight when you are:

   a) climbing a hill

   b) at the top of a hill

   c) going down a hill

   d) at the bottom of the hill

MARDI GRAS

22. Voodoo Drop

23. The Wild One

24. Zydeco Zinger

25. Big Easy Speedway (Go Karts)

22. VOODOO DROP

Age Group: Middle School & above (This activity is viewed from the ground and therefore can be done by elementary school children.)

Activity:

A) Observational:

1. Does this ride go up at constant speed?

2. Does this ride go down at constant speed?

3. What makes the ride go up?

4. What makes the ride come down?

5. What device have you ridden that reminds you of this ride?

6. When does the ride stop falling freely?

7. When do you think you are moving the fastest on this ride?

8. If your teacher has talked about "Potential Energy," when is it the highest on this ride?

9. If your teacher has talked about "Kinetic Energy," when is it the highest on this ride?

23. THE WILD ONE

Age Group: Middle School and above (This activity is viewed from the ground and therefore can be done by elementary school children.)

Activities:

A) Critical Thinking:

1. The roller coaster does not have a motor or engine on the train. At some spots, the train is pulled along by a chain under the track. What part of this ride is the train being pulled by this chain?

2. Watch the ride. How does the train get up the hills where it is not getting a pull by the chain?

3. Why is this ride called a "Coaster?"

B) Mathematical:

1. What is the maximum number of people that can ride this roller coaster?_____

24. ZYDECO ZINGER

Grade Level: Upper Elementary & Above (5th grade and above)

Activity:

A) Observational:

1. When during this ride do you feel the heaviest (when you feel pushed hardest against the seat)?

   _____

   _____

2. When during this ride do you feel the lightest?

   _____

   _____

3. What other feelings do you have at different parts of this ride?

   _____

   _____

4. What is it about this ride that causes the feelings you described above?

   _____

   _____

25. BIG EASY SPEEDWAY (Go Karts)

Age level: Middle School & above (This activity is viewed from the ground & therefore can be done by elementary school children.)

Activities:

A) Observational:

4. Does it appear that the cars are going at the same speed all the time?

   If not, where on the track do the cars seem to slow down?

   Where do they usually speed up?

B) Mathematical:

1. Pick out a moving car. Using a timer, time it for one lap and then for a second lap.

   Time for 1^{st} lap = _____ seconds

   Time for 2^{nd} lap = _____ seconds

   Is the car speeding up or slowing down? _____

BACK AT SCHOOL

Summary Questions:

Why is it more exciting to ride these rides than it is to take a trip in a car?
Why or why not?

What were some of the most unusual feelings you experienced today?

RIDE SPECIFICATIONS/INFORMATION

THE SPECS	*Superman – Ride of Steel*
Introduced	2000
Height	200 feet tall - 20 stories! 190 foot first drop
Length	5,350 feet of track (more than 1 mile)
Top Speed	75 mph (maximum acceleration on first drop)
Ride Duration	3 minutes, 20 seconds
Number of Trains	2
Number of Passengers	32
Manufacturer	Intamin

THE SPECS	*The Mind Eraser*
Introduced	May 1995
Height	115 feet
Length	2,170 feet
Top Speed	55 mph
Ride Duration	2 minutes, 5 seconds
Number of Trains	2
Number of Passengers	16
Special Features	A wicked corkscrew sequence following an inverted steel loop.
Height Restriction	Minimum 52"
Manufacturer	Vekoma, Inc.

THE SPECS	*ROAR*
Introduced	1998
Height	90 feet
Length	3,200 feet
Top Speed	50 mph
Number of Trains	2
Number of Passengers	24
Colors	Bare Wood

Special Features	Features a half-mile track with 6 reversals and 20 crossovers, plus a 180-degree spiraling second drop that subjects riders to several moments of weightlessness and a 230-foot roofed tunnel.
G-Force	3.5
Manufacturer	Great Coasters International, Inc.

THE SPECS *The Wild One*

Introduced	1986
Height	98 feet
Length	4,000 feet
Top Speed	60 mph
Ride Duration	2 minutes, 30 seconds
Number of Trains	2
Number of Passengers	24
Height Restriction	Minimum 48"
Manufacturer	Charles Dinn

THE SPECS *Batwing*

Introduced	2001
Height	115 feet tall!
Length	3,340 feet
Top Speed	More than 50 mph
Ride Duration	2 minutes, 20 seconds
Number of Trains	3
Number of Passengers	24 per train
Manufacturer	Vekoma International

Additional Ride Specifications

The Wild One	< Height of the first hill ***29.9 m*** < Track height at bottom of first hill ***5.2 m*** < Track height at top of second hill ***20.4 m*** < Height of hill before the horizontal loop ***11.6 m*** < Exit height of the horizontal loop ***4.6 m*** < Radius of the horizontal loop ***12.2 m*** < Length of passenger train ***14.5 m*** < Angle of lift incline ***19.5 degrees*** < Length of lift incline ***89.6 m***
Superman Ride of Steel	< Height of the first hill ***61.0 m*** < Track height at bottom of first hill ***1.2 m*** < Track height at top of second hill ***52.1 m*** < Radius of curvature at top of second hill ***25m*** < Height at entrance of first horizontal loop ***4.9 m*** < Radius of first horizontal loop ***30.5 m*** < Height at exit of first horizontal loop ***6.1 m*** < Height at entrance of second horizontal loop ***5.5 m*** < Radius of second horizontal loop ***22.9 m*** < Height at exit of second horizontal loop ***9.4 m*** < Angle of lift incline ***30.0degrees*** < Length of lift incline ***122 m*** < Length of train ***16.2 m***
Roar	< Height of the first hill ***27.4 m*** < Track height at bottom of first hill ***3.4 m*** < Track height at top of second hill ***21.0 m*** < Angle of lift incline ***25.0 degrees*** < Length of lift incline ***64.8 m*** < Length of train ***18.1 m***

Batwing	<	Height at top of first hill ***35.1 m***
	<	Height of the bottom of the vertical loop ***1.2 m***
	<	Height of the top of the vertical loop ***22.6 m***
	<	Radius of curvature of the bottom the vertical loop ***20.0 m***
	<	Radius of curvature of the top of the vertical loop ***6.0 m***
	<	Angle of lift incline ***32.0 degrees***
	<	Length of lift incline ***66.2 m***
	<	Length of train ***15.3 m***
The Mind Eraser	<	Height of the first hill ***30.5 m***
	<	Height at bottom of first hill ***4.6 m***
	<	Radius of curvature at bottom first hill ***15m***
	<	Radius of curvature at top and bottom of station loop ***17.0 m***
	<	Radius of curvature at top of station loop ***6.0m***
	<	Height at bottom of vertical loop ***5.5 m***
	<	Height at top of vertical loop ***21.6 m***
	<	Angle of lift incline ***32.0 degrees***
	<	Length of lift incline ***57.6 m***
	<	Radius of helix ***8.2 m***
	<	Length of train ***15.0 m***
Shipwreck Falls	<	Length of barge ***6.1 m***
	<	Length of incline ***52.4 m***
	<	Angle of incline ***25 degrees***
Voodoo Drop	<	Length of free fall ***38.4 m***
	<	Total height ***42.7 m***
	<	Time of free fall ***2.1sec***
	<	Maximum speed ***24.9 m/s***
Riddle Me This	<	Radius of ride ***4.2 m***
	<	Maximum angle of tilt ***48 degrees***
Pirate's Flight	<	Radius of rotation ***10.4 m***
	<	Length of chains suspending the gondola *6.2 m*
High Seas	<	Length of boat ***14.5 m***
	<	Distance from pivot to center of boat ***12.2 m***
	<	Maximum angle ***75 degrees***
Carousel	<	Radius of inner circle of horses ***4.4 m***
	<	Radius of outer circle of horses ***7.2 m***
Flying Carousel	<	Radius for inner chairs at maximum angular velocity ***7.3 m***
	<	Radius for outer chairs at maximum angular velocity ***8.2 m***

GLOSSARY OF TERMS

Motion: takes place whenever an object changes its location. Any object which is not staying in the same place is moving, even if it later comes back to the same place.

Vertical: up and down. A telephone pole or a tree trunk is usually an example of a vertical line.

Horizontal: side to side. A flat road or the surface of a calm lake forms a horizontal line.

Cycle: one complete pattern of any event or motion which repeats itself. For a ride which involves moving in a circle, a cycle is one complete trip around the circle.

Period: the amount of time it takes for a repeating event to complete one cycle. If it takes 15 seconds for a carousel to make one revolution, the period of the carousel is 15 s.

Clockwise: used for circular motion to describe which way the object moves around the circle. If you look at a clock which has hands that rotate, the direction that the hands rotate is called clockwise. A carousel is said to be turning clockwise if, as you stand near it and watch, the riders closest to you are moving from right to left.

Counter-clockwise: moving around a circle in the direction opposite to the manner described in the previous description.

Speed: a measure of the rate at which an object changes position. Speed is measured in meters/second. An object with a steady speed of 2 m/s moves a distance of 2 meters in one second. You can determine the speed of an object by measuring the amount of time it takes the object to move some measured distance. When you divide the distance by the time it takes to move that distance, you get the average speed of the object.

Rainbow colors: the colors which occur in a natural rainbow. These colors (not all of them are always clearly visible) occur in the same order in all rainbows. The six colors in order are: red, orange, yellow, green, blue, and violet. The color "indigo" is sometimes included between blue and violet, but this color is often omitted since it is less familiar.

Activities by Grade Level

*These guideline are to help you find activities best-suited to **YOUR** students

You know them best – feel free to use as you desire!!

Early Primary – Grades K-4	
Batwing – p 21	Looney Tunes Prop Warehouse – p 25
Elmer's Around the World in 80 Seconds – p 26	Foghorn Leghorn's Tinsel Town Train – p 27
Taz's Film Works – p 28	Pepe LePew's Tea Party - p29
Yosemite Sam's Flight School – p 30	Carousel – p 35

Mid Primary – Grades 3-6	
Shipwreck Falls – p 31	Carousel – p 35
Tea Cups – p 37	Flying Carousel – p 39
Pirate's Flight – p 40	
***and all activities on previous grade levels**	

Elementary – Grades K-6	
Conscious Commuting – p12	Coyote Creek Crazy Cars – p16
Mind Eraser – p 17	Carousel – p35
***and all activities on previous grade levels**	

Upper Primary – Grades 5 & Up	
Riddle Me This – p19	The Penguin's Blizzard River – p22
Cyclone – p34	High Seas – p41
Zydeco Zinger – p46	Big Easy Speedway – p47
***and all activities on previous grade levels**	

Middle School – Grades 6 & Up	
Superman - Ride of Steel – p20	Roar – p42
VooDoo Drop – p44	The Wild One – p45
***and all activities on previous grade levels**	