

Art & Literature



Science



Student Guide

Name(s) _____

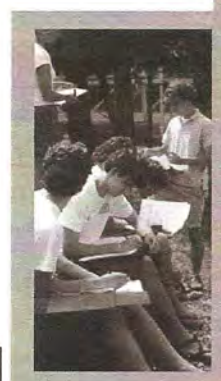
School Name _____ Date _____

Grade _____

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Cannon Ball Roller Coaster

A roller coaster is a great place to study energy transformation and speed. Watch the ride or hop on, then answer the following questions.

ENERGY TRANSFORMATION

1. What kind of energy do you think is driving the chain to lift the roller coaster to the top of the first hill? _____
2. What kind of energy is being stored as the cars are raised to the top of the hill?

3. As the car plunges down to the dips/valleys the stored energy is being converted into what kind of energy? _____
4. At what point of the ride do you feel like you're being lifted out of your seat? (simulating weightlessness) _____
Why? (Remember Newton's Laws of Motion)

5. At what point do you feel like you are being pressed down? (extra "g" forces)

Why? _____

CALCULATING SPEED

1. Using a stopwatch (or watch with a second hand), time how long it takes the roller coaster from the top of the first hill to the end.

2. What is the average speed? (The distance is 1847 feet. Speed = distance/time, so divide 1847 feet by your time in seconds to calculate the speed in ft./sec.)

3. Change that to miles/hours so it will mean more to you. (There are 5280 feet in a mile and 3600 (60 X 60) sec. in 1 hour, so multiply your answer by (5280/3600) to find your answer in miles/hour.)

4. Remember in science we like to try each measurement/experiment more than once and then average the numbers in order to verify our results and make our findings more reliable. Time the roller coaster 3 times and compare/average the times.

5. Metric practice: Remember that there is a little over 3 feet in a meter (39.25 inches) so divide 1847 (or your ft/sec. answer) by 3.3 to estimate the speed in m/sec.



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Cannon Ball Roller Coaster

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Additional Math

1. The Cannon Ball was built in 1967, so how old is it now? _____
2. As you know everything tends to wear out or break down (2nd Law of Thermodynamics), so the roller coaster has to be inspected daily or 100 times a year, how many times has it been inspected during its lifetime? _____
3. Lake Winnie has been around since 1925, so what year anniversary is it this year?

Weightlessness and G Forces*

If your group brought a bathroom scale, sit on it while riding a ride that has up and down motion but is slow enough to read the scale (such as the Ferris Wheel) .

1. How much does it read while sitting still?

2. How much and when does it read more?

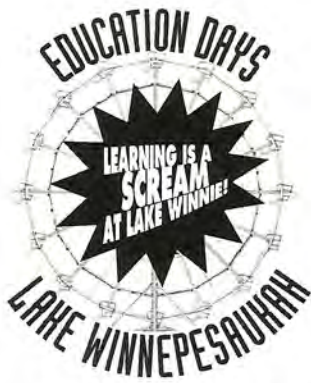
3. How much and when does it read less?

When you fall at the same rate as the object you are in you feel weightless (that's how astronauts practice). But, when you accelerate upward quickly, you feel more force pushing down on you (the "g" forces jet pilots have to deal with).

*optional

DID YOU KNOW...

LAKE WINNEPESAUKAH WAS USED BY THE CONFEDERATE AND UNION SOLDIERS DURING THE BATTLES OF CHICKAMAUGA AND MISSIONARY RIDGE. THE LAKE ORIGINALLY BELONGED TO THE NATIVE AMERICANS WHO BUILT A DAM AROUND SEVERAL SMALL SPRINGS. WINNEPESAUKAH MEANS, "BEAUTIFUL LAKE OF THE HIGHLANDS" OR "BOUNTIFUL WATERS".



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Pirate Ship

The pirate ship ride is like a pendulum. Watch the ride or hop on, then answer the following questions: (Circle the correct choice in the parentheses).

1. As it reaches the top of each swing, the ride has the maximum amount of (potential, kinetic) energy.

2. As it is passing through the lowest part of the swing (passing the platform), the ride has the maximum amount of (potential, kinetic) energy.

3. At which point is the rider moving the fastest?

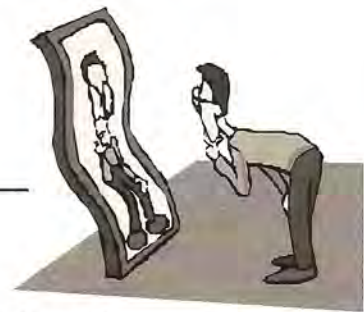
4. At which point, after the ride is underway, are the riders moving the slowest?

5. If the average person on the ride weighs 120 lbs., a ride of 24 people would add how much weight to the ride?

6. Based on your knowledge of pendulums, would the amount of people (overall weight) affect the speed or time of each swing?

(Try your hypothesis at home or in the classroom, using different weights on a pendulum.)
7. Calculate how many people can ride on the Pirate Ship at one time by counting how many fit on one row, then multiply by the number of rows.

8. How many trips will it take to have everyone in your school group ride once?



Trick Mirrors

Between the paddle boats and the gift shop are some curved mirrors on the sides of the building. Some are curved in (concave) and some are curved out (convex).

1. Which type of mirror makes you look short and fat?

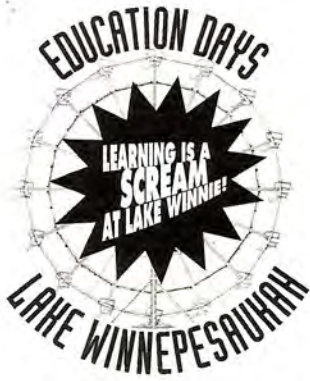
2. Which type of mirror makes you look tall and skinny?

Of course, it has to do with the angle at which the mirror reflects the incoming light back to your eyes.

DID YOU KNOW...

THE BIG FISH IN THE LAKE ARE CALLED CARP.





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Carrousel

Do all the horses go around the same distance at the same speed? Let's find out.

1. Pick a horse on the circle closest to the center and time how long it takes to make it once all the way around. Measure it again and compare (if your times are off by much, time it a third time.)
Average: _____
2. Finally time one of the horses on the very outside row at least twice (3 times if necessary). Average: _____
3. Do the times alone tell if the horses are going the same speed or which is faster? Not if their distances are different. Remember speed is distance/time.
4. To calculate the speeds then, we need to know the distances that each horse travels in one complete circle. The distance from the center (radius) is: inner circle - 14.5 ft., outer row - 22.7. You'll have to calculate the circumference (distance all the way around) by doubling the radius and multiplying the pie (3.14).
Inner: _____
Outer: _____
5. Divide the distances by the time to find the speed.

6. Conclusion: If you want a faster ride which horse should you choose? _____
7. If you would like to calculate the speeds of the horses in the middle rows the radius is:
2nd row - 16.5 ft. _____
3rd row - 19.2 ft. _____



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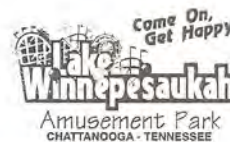
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Bumper Cars

The bumper cars are a good study of ELECTRICITY and MOTION

1. Look at the top of the pole sticking up behind the passengers. What kind of energy is powering the cars? _____
2. The electricity is running through the floor and the wire "roof". Why don't you get shocked when you step on the floor?

(It's not just your shoes, because you don't get shocked by accidentally touching the floor with your hands.)

3. Remember what you learned in school about electric circuits? What has to be true in order for electricity to flow through a circuit?

4. When you get hit from behind, what direction does your body/head want to go? Why?

5. When you get hit head on by someone, what direction does your body/head tend to go? Why? _____

Genie

1. When you start spinning rapidly in a circle, in what direction do you feel the force?

2. When the Genie starts to tilt up and you are facing down, why do you not fall out?

(Remember, objects in motion want to go in a straight line.)

3. In a circular space station how could you simulate gravity? Where would "down" be?

4. Calculate the speed of the Genie. The diameter is 40 ft. You'll need to calculate the circumference (3.14 times the diameter) and measure the time it takes for a person to go around once. (speed = distance divided by time) _____



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Wild Lightnin'

1. As you go around a curve, did you find yourself leaning to one side? _____
2. Does your body naturally want to go out or in on a curve? Why? _____

3. Why do you feel like you are losing your stomach, or all your blood is rushing to your head, when the car drops? _____

Paddle Boats

1. The food you ate is now being converted to motion energy. What other kind of energy are your muscles producing? (are you working up a sweat?) _____
2. Try loading 2 people into the paddle boats and timing how long it takes to go a certain distance. _____
3. Go back to the dock and load 1 more person on the back and time the same distance.

4. Is it harder to paddle or does it take longer to go the same distance? _____
Why? _____

5. By the way, the boat (especially loaded with people) is very heavy. Why does it float and not sink? Of course it has to do with BUOYANCY. The boat has air spaces or styrofoam pieces, so an equal volume of water would actually weigh more. That means the boat will float.



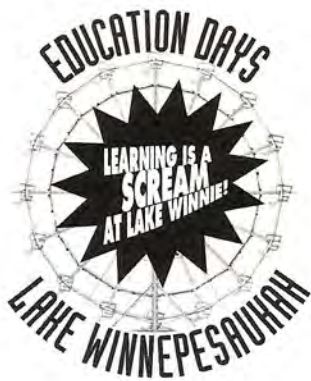
(It has to do with Newton's 2nd Law of Motion: more mass results in less acceleration.)

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Scrambler

1. Watch carefully as you wait in line. If you don't want to get squished by your bigger partner, which side of the car should you sit in?

2. Why do the people tend to press up against the side? Does it have to do with one of Newton's Laws of Motion? _____
Which one? _____

Super Slide

1. What is the advantage of using the burlap sack when going down the slide? _____

2. What happens when your skin touches the surface? _____

(Remember that besides friction being the force that works against motion and slows things down, it usually produces heat energy.)

3. Why do you slow down so quickly when you reach the carpet? _____



(It's the same reason the Boat Chute slows down so much when it hits the water.)

Miniature Golf

Have you ever played miniature golf?

1. Does the ball always go in the direction the putter intended it to? _____

Why not? Don't objects always go in the direction of the force (Newton's 2nd Law)?

Does the ball have a mind of its own, or is the person accidentally hitting it in the wrong direction? _____

2. Does the ball always go the right distance? Remember Newton's Law (more force means more acceleration). _____

3. In what direction does the ball bounce off of the edges? _____

Is it always in an equal but opposite direction than it came from (Newton's 3rd Law)? (angles of incidence and reflection) _____



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Jumbo Flying Elephants

1. Notice the metal rods sticking out of cylinders that make the elephants raise and lower. This is called hydraulics. According to Pascal's Law, the same pressure from a smaller piston is transmitted through a liquid to a larger

piston, but because the larger one has a bigger surface area it is able to apply more force. Name another ride that uses hydraulics.

Tilt-A-Whirl Balance

Think: Why does the Tilt-A-Whirl make you so dizzy?

1. Did you know there are semicircular canals in your inner ear that are filled with a fluid. And since objects at rest tend to stay at rest, guess what the fluid does when you start spinning?

2. And then what does the fluid do when you stop spinning (remember objects in motion tend to stay in motion)?

This balance mechanism is what contributes to making you dizzy.



Pipeline Plunge

1. By the way, a few of the rides get you wet. On a hot day people don't mind getting wet. Why is that? (Remember "evaporative cooling" - the water molecules absorb the energy from your skin in order to change from liquid to gas in the process of evaporation).

During hot days the park also has places where a mist is spraying to cool you off. If those are running today, name a location of one:



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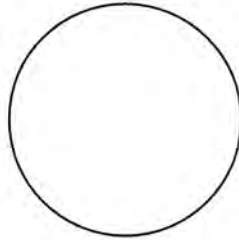


Clouds

Think: While you've been at the park have you noticed the sky?

1. Are there any clouds in the sky today? Perhaps you would like to rest on the sky ride chairs and get a good look at the clouds.

2. What percentage of the sky would you say has been covered by clouds most of the day? Make a pie graph in the circle below, showing how much of the sky is covered.



3. What type of clouds are they?

- cumulus (white fluffy cotton-like clouds)
- stratus (sheet-like less defined clouds)
- cirrus (high, thin, & wispy)

If they are in the middle you add also:

- altocumulus (higher puffy) or
- altostratus (higher layers) and

If it looks like rain you add nimbo:

- cumulonimbus (thunderstorms)
- nimbostratus (layer of rain clouds)

Undecided? Don't forget you can have combinations (Cumulostratus - puffy but layered across, Stratocirrus - high and thin but layered across)

Finances

Test your mathematical skills

1. The admission fee to Lake Winnie is \$26 for an unlimited pass. Let's say the average person buys a coke and something to eat, spending about \$5 on food. So how much does our average person spend at the park?



2. If the group rate for 25 or more people is \$21.00 per person, and the regular rate is \$26.00 for unlimited rides per person, per person, how much does a group of 80 save by coming to the park as a group?

3. Fridays are Buy One Get One Half unlimited rides with a Coke can. How much would the same group of 80 save by coming on a Friday versus coming as a group another day?

4. How much would the same group save by coming on a Friday versus coming individually to the park? _____



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Game Balls

Test your mathematical skills

1. At one of the games, 1 ball costs \$1, but 3 balls cost only \$2. How much cheaper is each ball if you buy 3?

2. If you go ahead and buy 8 balls at once, the cost is only \$5. In that case, how much does each ball cost?

Trees Scavenger Hunt

There are a number of trees common to the Southeast in the park. Find the following

TREE

__1. American Elm



LOCATION

A) To right of Antique Cars, over creek.

__2. Sycamore



B) Pirate Ship points into it.

__3. Eastern White Pine



C) Just inside of main entrance or at entrance of Antique Cars.

__4. Silver Maple



D) Over Alpine entrance or left of Cannon Ball entrance.

__5. Red Maple



E) Over Scrambler or by Matterhorn.

__6. Black/Pin Oak



F) Left of Pipeline entrance or right of Cannon Ball entrance.

__7. Willow Oak



G) Between Carrousel and Wacky Worm ride.

__8. Post Oak



H) Between Carrousel Cafe and Carrousel.

__9. Sweet Gum



I) Between mini-golf and Jukebox Junction or over Boat Chute entrance.

__10. Bradford Pear



J) Over stream by mini-golf or by Genie entrance.



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The Five Senses – Sight, Touch, Hearing, Taste, Smell



Sight

What you see affects how you feel. Experiment by riding part of a ride with your eyes closed and part with your eyes open. Record the difference.

Because you have two eyes **you can judge distances and shapes of objects better**. Try riding a motion ride with both eyes open, then with one eye open. What is the difference?

How fast are your eyes? When you observe the ride **notice the speed of each ride**. Are there rides which go too fast for you to see clearly without seeing just a blur? Do your eyes have trouble focusing when you are accelerating rapidly? Name the rides that look blurry to you.

The colored iris of your eye contains a pupil which closes to a small dot in bright sunlight. Watch a friend's eyes and notice any changes that occur when **level of light changes**. Which eyes seem to be more sensitive to light? ___ Brown eyes ___ Blue eyes



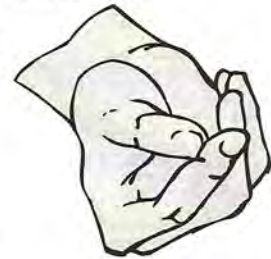
The Five Senses – Sight, Touch, Hearing, Taste, Smell

Touch

Your sense of touch can tell you the strength and direction of any force you feel. By the feel of the wind against your face, for example, you can guess the speed of the ride.

Notice the downward pressure you feel against your body when you ride a fast ride and are pressed into the seat.

1. What force is acting upon you to cause this pressure?
2. The pressure you feel tells you how strong the force is.
What ride has the strongest force of this kind? _____
What ride has the weakest force? _____



Hearing



Listen to the Cannon Ball as it goes by. Does the sound change pitch from higher to lower? ___Yes ___No

This sound change tells you how fast the ride is moving. The change of pitch (from higher to lower sounding) is called the Doppler Shift.

What other objects illustrate the Doppler Shift in the park?

What about outside the park? _____

Taste

When you eat your lunch or snack today take a few bites of food and notice how the food smells when you eat it. Now hold your nose and take two bites. Does the food taste different when you cannot smell it? ___Why? _____

Search through the various food and snack items available and find something from each of the taste categories: sweet, salty, bitter, sour.

Salty _____ Sour _____
Sweet _____ Bitter _____

What is your favorite taste? _____





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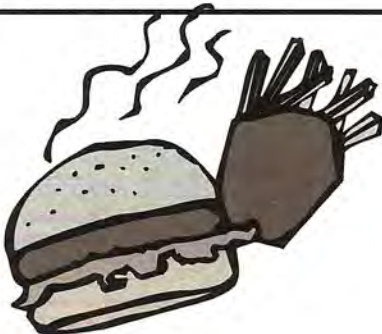
The Five Senses – Sight, Touch, Hearing, Taste, Smell



Smell

Your sense of smell is one that your brain uses to gather much information about your environment. Oftentimes, however, we do not think of smell as one of our most valuable senses. When you are in the park, sniff for the following scents. Record where you find them. See if you and your friends have the same sense of smell. Can you smell some things better than others?

Items	Location Found
Hamburgers	
French Fries	
Funnel Cakes	
Water	
Popcorn	
Cotton candy	
Gasoline	
Flowers	



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