



Educational Packet

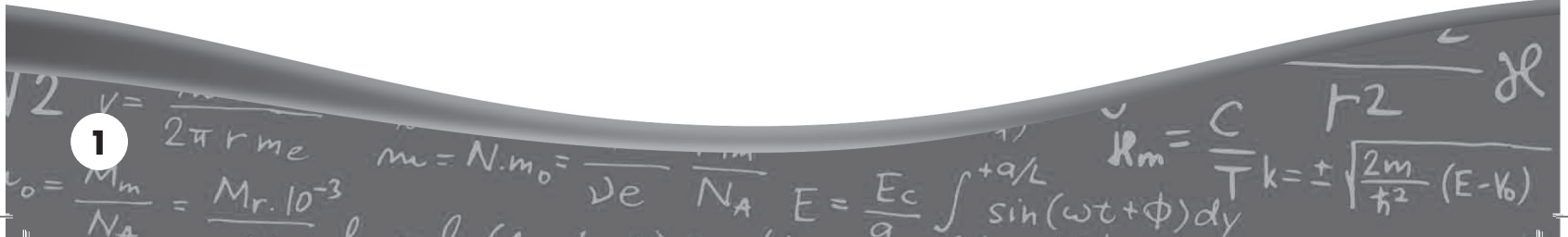
Grades 7-9



The Comet

1. Why is the first hill on the Comet Roller Coaster the highest hill on the ride?
2. What kind of energy do the cars have when they are at the top of the first hill?
3. What kind of energy do the cars have at the lowest elevations of the ride?
4. The Comet's track is 4,200 feet long. If the ride takes 135 seconds, what is the average speed for the ride in feet/second?

Raging River

5. What is the force that keeps the boats in Raging River from sinking?
 6. Why must passengers in Raging River spread out around the boat?
 7. Why are the boats in Raging River designed to hold very little water, and to get rid of the water as quickly as possible?
 8. Why is the conveyor that brings the boat to the top of Raging River made of wood and rubber rather than a chain, like some other rides?
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Sasquatch

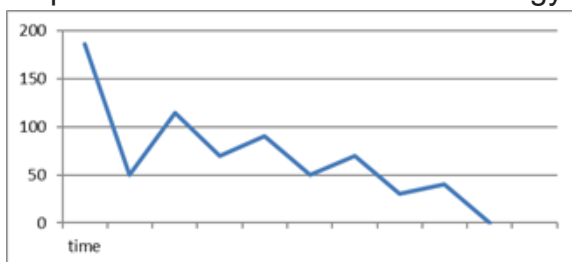
- Each tower can hold 12 riders. If the average mass of each rider is 45 kilograms, what is the total weight (N) of the riders on one tower?
(assuming the acceleration due to gravity is 10 m/s²)?
- Discuss the potential and kinetic energy of Tower A (drop) with respect to the carriage's positions during the ride.
- Draw a displacement vs. time graph for Tower A for the first 5 seconds of the ride.
(displacement should only be in the vertical direction).
- In various instances, friction is generating what kind of energy? In terms of this particular ride, what is happening to this energy?

Flying Trapeze

- While waiting for the ride to start, you play with the chain and make it ripple. Is this a physical or chemical change? How do you know?
- Early in the morning before the sun has had an effect on the chains, the chains will feel cool to the touch. Explain why they feel cool and what will happen if you hold the chains for a long time?
- Why might the front chains covered in white plastic tubing?

Answer Key

- At the highest point, the maximum amount of potential energy required to make it through the entire roller coaster is reached.
- Potential energy (accept gravitational potential energy).
- Kinetic energy, theoretically, all of the potential energy is converted into kinetic energy or lost to friction.
- 31.1 feet/second
 $4,200 \text{ feet} \div 135 \text{ seconds} = 31.1 \text{ feet/second}$
- Buoyant force, the buoyant force is equal to the weight of the amount of water displaced by the boat. This force pushes upward on the boat to keep it afloat.
- Equally distribute force of gravity on the boat so it doesn't tip over during the ride. This is the same principle as a balanced lever system. Basically keeping a balance in every horizontal direction will prevent the boat from tipping.
- Water adds weight to the boat which would require more force to keep from sinking. A greater weight on the boat will require a greater buoyant force in order to keep the boat afloat.
- A metal chain would rust when added to water. Some students may reference that wood expands when wet. However, it is the difference between a rusting chain and a wooden conveyor that really makes the difference.
- $12 \text{ riders} * 45\text{kg} * 10 \text{ m/s}^2 = 5400 \text{ N}$
- Top-all potential, no kinetic; just below top-mostly potential, some kinetic; midpoint-half potential, half kinetic; just above bottom-mostly kinetic, some potential. It's worth noting that all of the energies mentioned have due to with gravitation. Some will refer to potential energy as gravitational potential energy.
- Some will write "distance" for the y-axis label, which is acceptable even though displacement is the correct terminology.



- Heat energy is created as a result of rolling friction; some is released into the atmosphere while some is absorbed by the ride.
- Physical-the change is not permanent and has not changed the chemical composition of the chain.