



Curiosity Guide #403

Kinetic Energy

Accompanies Curious Crew, Season 4, Episode 3 (#403)

Design a Marble Roller Coaster

STEM Challenge

Description

Design and build a roller coaster that carries marbles from one end of the track to the other without stopping.

Materials for each individual or team

- Foam pipe insulation tubing at least six feet long
- Marble
- Tape
- Plastic cup
- Measuring tape
- Ruler
- Scissors
- Paper towel tubes for support
- Toilet paper tubes for support
- Small boxes for support
- Stopwatch

Procedure

1. Cut the foam tube into a six-foot length.
2. Cut the tube in half to make two semi-circular tracks.
3. Use the boxes, paper towel tubes, toilet paper tubes, and tape to build supports for the track and to secure it.
4. Use the marble as the car to travel the track.

5. Can you make the marble travel the whole length of the track without stopping?
6. Can you add in a loop?
7. Can you position the cup at the end of the track, so the ball can launch off the track and land in the plastic cup?
8. If your design doesn't work, how can you redesign the track so that it does?
9. Once your design is working, use the stopwatch to figure out the ball's velocity. $\text{velocity} = \text{distance traveled} \div \text{time}$.

NOTE: A good use of the My Results section is to keep track of the changes to your design and how the changes affected your results.

My Results

Explanation

The beginning of the track is higher, so that the marble has more gravitational potential energy to transfer into kinetic energy to make the marble move. If there is enough kinetic energy, the marble will travel the entire track, even with added loops and curves. To get enough kinetic energy, you might need to make the track higher.

Velocity is how quickly an object is moving. To determine your marble's velocity, measure the distance of the track in centimeters. Use the stopwatch to measure how long in seconds the marble takes to travel from the beginning to the end of the track. Then use this formula to find the speed, or velocity, that your marble is going. Velocity = centimeters divided by seconds, or $v = \text{cm} / \text{sec}$.

Think about this! Have you ever ridden on a roller coaster? Roller coasters often start with a motor pulling the cars up a steep hill. You may have heard the clickety clack of the wheels as you're going up. As the car goes up, the car is also gaining potential energy, with its maximum energy right at the peak of the hill. As the car starts to roll down the hill, its potential energy transfers into kinetic energy, which reaches the maximum amount right at the bottom of the hill. Throughout the ride, the energy changes from potential to kinetic energy. How energizing!

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