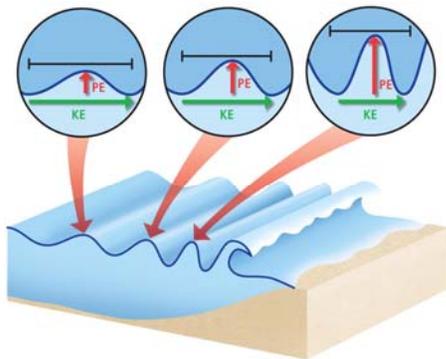


Your mission:

1. Use your understanding of energy transfer (potential to kinetic) to design a roller coaster that has enough kinetic energy to complete a full run.
2. Use your understanding of energy loss to design a roller coaster that dissipates enough energy (through friction) to stop safely at the end of its run.

Hi, I'm Madhu, Argonaut for Mission 2 of Operation: Infinite Potential.

To study tsunamis with Dr. Titov, I had to learn how energy is converted and transformed. To do that, we actually started by learning about roller coasters.



The science behind roller coasters and tsunamis is surprisingly similar. Rapid energy transfers between kinetic and potential energy make roller coasters thrilling. Those rapid transfers are the same reason tsunamis are so threatening.

Now it is your turn. Apply what you know about Potential and Kinetic Energy and Energy Transformation to build a fun (but safe) roller coaster.

I'll be with you each step of the way if you need help.

First, you will need to choose a design for your roller coaster car. Next, decide how many cars you want.

This is an important choice. Notice that mass is part of the potential energy equation. The more mass you have, the more energy you put in the system. More energy means you can achieve greater velocity, and with greater velocity, you can get a higher score. But be careful, because it also means your cars will be harder to slow down when it is time to stop the ride. If you don't transfer enough energy via friction, your cars will crash.



The gravity and height in the potential energy equation translate into the velocity of the kinetic energy equation.

The higher your hill, the faster your car can go.

To continue the excitement, the car is sent up another hill or loop. As the height of this next hill or loop increases, some of the kinetic energy is converted back into potential.

Once the car starts back down the hill or loop, the car quickly speeds up. This increase in speed indicates that potential energy is being converted back into kinetic.



$$PE = \text{Mass} \times g \times \text{Height} \quad KE = \frac{1}{2} \text{Mass} \times \text{Velocity}^2$$

Your Mission:

1. Apply the principles of energy transfer to establish potential energy that translates into enough kinetic energy to keep your roller coaster from getting stuck.
2. Use your knowledge of energy dissipation (via friction and sound) to bring the cars to a safe stop at the end of the track.

Good luck Argonaut. I will be with you each step of the way if you need help.