

Dr. Diabolical's Cliffhanger

Do some preliminary observations of the ride:

1. How many passengers does the train hold?
2. Where is the highest point of the ride?
3. Where will the train be going the fastest?

If we assume 60kg per passenger, what would be the mass of passengers in a full train?

If the empty train has a mass of 6165 kg, what is the total mass of a full train?

If you don't already have it, download Vernier *Graphical Analysis* to your device.

Open the *Graphical Analysis* file of Dr. D Cliffhanger. There will two graphs included. One will show ride data of altitude vs. time and the other will show ride data of x axis (vertical) acceleration vs. time. Go to the STEM Center if you need help using the app.

Use the altitude vs. time graph to determine the maximum height of the ride.

Calculate the Potential Energy of the train at the maximum height.

$$PE = mgh$$

Use the x acceleration vs. time graph to determine the maximum x axis (vertical) acceleration. Determine how many "g's" you experience at that point. Remember that 1 "g" = 9.8m/s^2 . Where on the ride does this take place?

Observe the train at the bottom of the first drop. Take your own video or download the one provided. Assume that the train is 5.1 m long, and that each frame of the video is 1/30 s. Advance the video frame by frame and calculate the velocity of the train at this point.

Use velocity of the train to calculate its Kinetic Energy at this point.

$$KE = mv^2/2$$

Use Conservation of Energy and discuss what happens with PE and KE.