Seabreeze PHYSICS

Seabreeze Park
Rochester NY

Developed in Cooperation with Physics Teachers at

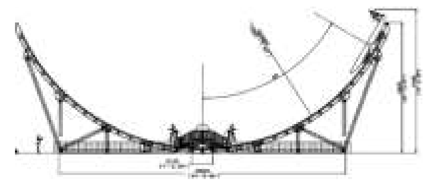
Eastridge High School &
Rush-Henrietta High School
Greece Arcadia High School
Rochester NY

Labs Available for your Use:

- On The Road
- Carousel
- Revolution 360
- Whirlwind
- Sea Dragon
- Music Express
- Bumper Cars
- Yo Yo
- Log Flume
- Train
- Flying Scooters
- Jack Rabbit
- Anxiety Factor

SEABREEZE PHYSICS

REVOLUTION 360°



Ride Specifications:

Power: 105,000 Watts
Mass of Gondola: 9,342 kg
Passengers: 24 riders each with a mas of 68 kg
Maximum Ride Height: 14 m

Questions:

1) Calculate the total mass of the gondola and passengers.

2) Determine the total weight of the gondola and passengers.

3) Calculate the work done to lift the gondola and passengers to the top of the ride.

4) Determine the time it takes the motor to lift the gondola and passengers to the top of the ride.

5) Assuming the ride is operated at 440 V, determine the following:
   A. Current used by the Revolution 360.

   B. Resistance of the Revolution 360.

   C. Electrical energy used in one 10-hour day of operation (in units of kWhr).

   D. The cost to run the Revolution 360 for one 10-hour day at $0.09/kWhr.

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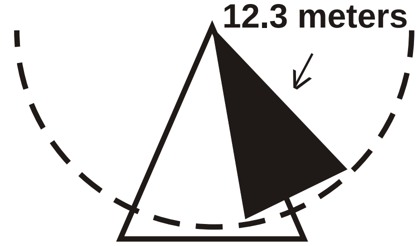
SEA DRAGON



Use the accelerometer while on the Sea Dragon to determine the acceleration at the bottom of the swing.

From the ground, determine how long it takes for 5 complete oscillations for the Sea Dragon.

Data:

Time for 5 oscillations: ______ seconds

Acceleration at bottom: ______

Questions:

1) Calculate the period of oscillation using data from above.

2) Assume that the Sea Dragon behaves like a simple pendulum. Use the equation:

$$T = 2\pi\sqrt{\frac{L}{g}}$$

and calculate the period of oscillation of the Sea Dragon.

3) Which of the values (1 or 2, above) is the more reliable and why do you think so? (Include in your discussion, sources of error.)

4) Using conservation of energy principles, calculate the velocity of the Sea Dragon at the bottom of its swing.

5) Calculate the centripetal acceleration of the Sea Dragon at the bottom of its swing.

6) Compare the acceleration measured while on the ride with the value calculated above. Which value do you feel is more reliable and why? (Discuss sources of error in justification.)

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MUSIC EXPRESS

Ride Specifications:

Weight of 1 car and 3 passengers: 4,310N

Radius of ride: 3.13 m

Length of Ride: 156 s

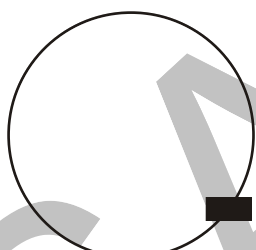
Data:

Number of Revolutions during length of ride: ________

Qualitative Questions:

1) You are riding the Music Express with your younger brother. Where would you prefer to sit (the seat closer to the center or the seat closer to the outside)? Why?

2) Draw a vector representing the centripetal acceleration and the centripetal force acting on you at the position shown.



3) The ride suddenly comes to a complete stop after rotating clockwise when you are in the position shown above. Draw a vector representing your velocity at this position.

Questions:

1) Calculate the period of revolution.

2) Calculate the linear velocity (speed).

3) Calculate the centripetal acceleration.

4) Calculate the mass of one car and three passengers.

5) Calculate the centripetal force acting on one car and three passengers.

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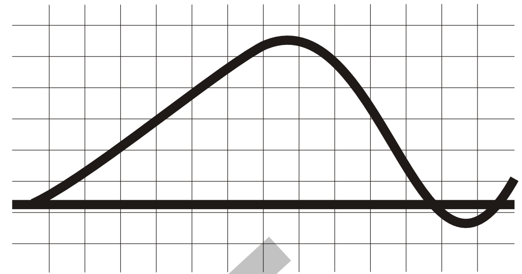
JACK RABBIT



Ride Specifications:

Length of whole track: 655 meters
Length of track, top of first hill to brake application: 570 meters
Weight of 1 car in train: 295 kilos
Number of cars in train: 5

Questions:

1) By triangulation, determine the height of the first hill.

2) What is the maximum gravitational potential energy at the top of the first hill?

3) What is the maximum velocity at the bottom of the first drop? Assume the conservation of energy.

4) What is the average velocity of the train measured from the top of the first hill to the point where the brakes are applied?

5) How much power is developed as the train and passengers are lifted from the base to the top of the first hill?

6) At the bottom of the first drop, the track makes as almost circular arc. Determine the radius of the circle and the centripetal acceleration of the train. How many "g"s of acceleration are experienced at the bottom of the drop?

7) How does the calculated centripetal acceleration compare to the centripetal acceleration measured using the accelerometer?

8) Determine the angle of ascent and descent for the first hill. Calculate the acceleration down the first hill based on the angle of descent.