

The Rattler

- Record the time in seconds for five periods of the ride.
Trial 1: _____
Trial 2: _____
Trial 3: _____
Trial 4: _____
Average time: _____
Average period: _____
- If the ride acts as a simple pendulum, does the period of the ride depend on how many riders are on the ride? Explain.
- Calculate the angular frequency of the ride in rad/s.
- The length of the arm is _____. Using this and your average period, calculate an estimated value for g .
- Using a value of 9.8 m/s^2 , calculate your percent error.
- At what point(s) during the ride is potential energy at a maximum?
- At what point(s) during the ride is kinetic energy at a maximum?
- At what point(s) during the ride is potential energy at a minimum?
- At what point(s) during the ride is kinetic energy at a minimum?
- At its maximum displacement, the ride is 120° from the starting point. Calculate the vertical height the ride is from the ground at this point.
- Using the average period, calculate the average angular acceleration in rad/s^2 .



The Living Classroom

Physics

Double Shot

1. Freefall acceleration

- Record the time in seconds for the freefall portion of the ride.
Trial 1: _____
Trial 2: _____
Trial 3: _____
Trial 4: _____
Average time: _____
- Using a freefall distance of _____, calculate the acceleration in m/s^2 .
- Using a value of 9.8 m/s^2 , calculate your percent error.
- What is the potential energy of a fully loaded ride (maximum capacity = _____) at a height of _____?
- Assuming a value of 9.8 m/s^2 for the acceleration and no air resistance, what would be the velocity just before striking the ground for an object falling from _____?
- How much did the velocity decrease due to air resistance?

2. Apparent weight

- Record the time in seconds for the ride to travel from the bottom to the top.
Trial 1: _____
Trial 2: _____
Trial 3: _____
Trial 4: _____
Average time: _____
- Using a distance of _____, calculate the acceleration in the upward direction.
- What is the upward force on a 150 lb person on this ride? (1 lb = 4.45 N)
- What would be the net force on the 150 lb person?

Boomerang

Total length: 270 m

Maximum speed: 21 m/s

Capacity: 300 kg/coach, 7 coaches/train

- For a fully loaded train, calculate the power output for:
 - the first lift ($v = 1.6 \text{ m/s}$)
 - the second lift ($v = 1.3 \text{ m/s}$)
 - the maximum velocity (21 m/s)
- Calculate the potential energy of a fully loaded train at a height of _____.
- What is the maximum velocity at the bottom of the hill if the train rolls from a height of _____? (neglect friction)
- At the end of the ride, record the stopping time in seconds of the train.
Trial 1: _____
Trial 2: _____
Trial 3: _____
Trial 4: _____
Average time: _____
- Calculate the impulse needed to stop a fully-loaded train.
- If the train came into the station at maximum speed, what would be the stopping distance?
- What is the minimum speed needed for the train to complete the loop (radius = _____)?
- Draw a label a free-body diagram for the train at the top of the loop and at the bottom of the loop.