

Momentum and Impulse

Recorder:

Time keeper:

Goal: Move the balls around the course as quickly as possible.

Rules:

1. Move the ball by touching it only with the bristles of the broom.
2. The ball must stay within the boundaries of the course.
3. The ball cannot touch the 'posts'.
4. The ball must start and end within the box.
5. First rule infraction = 1 sec. penalty; Second rule infraction = 2 sec penalty.....
6. Each team member must take at least one trip around the course.

Pre-activity questions and hypotheses:

Examine the balls.

Which has the greatest mass?

Which will have the greatest momentum?

Which will be the most difficult to change directions?

Which will be the most difficult to stop?

Examine the course. What problems do you anticipate having with the bowling ball?
(hypothesis #1)

What problems do you anticipate having with the other ball? (hypothesis #2)

Consider how the concept of Impulse ($I = \Delta M = \Delta mv = Ft$) will affect your technique. As you try to change the momentum of the ball, try applying the same amount of force over different amounts of time and observe how the ball reacts in each situation.

Post-activity analysis:

How did the amount of time over which the Force was applied (Impulse) affect the motion of the ball? Was it the same effect for both balls?

How well did your hypotheses predict the problems you encountered?

What unexpected difficulties did you have? How can you explain these using the ideas discussed in class?

How do you think your results would have been different if the course had been set up on the grass?

Interaction of Forces

Recorder:

Time keeper:

Goal: Design a balloon rocket that will transport 5 pennies the length of the string in the shortest possible time.

Rules:

1. At least 5 pennies must be attached to a single balloon.
2. Release the air to propel the balloon along the horizontal string.
3. Use the supplies provided or ask for more.
4. If no balloon makes the entire distance, measure the time taken to travel the longest distance.

Pre-activity questions and hypotheses:

What is the mass of the balloon?

What is the mass of the air in the balloon?

Explain how air escaping from a balloon can move a mass.

What variables do you expect will influence the speed or distance traveled by your balloon.

Design and sketch at least 2 possible configurations for your balloon rocket.
On each sketch, draw arrows showing the approximate direction and magnitude of each of the forces acting on your system.

Design sketch #1

Design sketch #2

Post-activity analysis:

Which factors played the most important role in controlling the speed of your rocket?

How can you explain this using the concepts covered in class?