

Physics Blizzard Bag Assignment – Day 7




Mrs. Sauder

Part 1: Complete the following questions to check your understanding of forces and motion: *(Check Your Understanding: How does an external force affect speed and direction?*

Forces and Motion activity #1 - 9/10/2014 Loeblein)

1. Joe has just been promoted and is pushing a file cabinet down the hall to his new office. He begins by looking at the file cabinet and considering how to best go about his task (scene 1). He then begins pushing on the file cabinet, which, at first, does not move at all (scene 2). Eventually the file cabinet begins to slide across the floor, slowly moving towards Joe's new office.




a. Draw all the forces you think are acting on the file cabinet in each scene.

Scene 1: Man not pushing	Scene 2: Man pushing but file cabinet not moving	Scene 3: Man pushing and file cabinet moving to right
		

b. Why do you think the file cabinet moves in scene 3 but not in scene 1 or 2?

2. When Annette finishes her physics homework, she closes her book and shoves it (scene 1) to the other end of the table. The book slows down as it crosses the table (scene 2) until it eventually stops (scene 3).

a. Draw all the forces you think are acting on the book in each scene.

Scene 1: Annette pushing book and book moving (to the right)	Scene 2: Book moving (to right) across table	Scene 3: Book stopped at end of table
		

- b. Why do you think the book moves when Annette pushes it (scene 1)?
 - c. Why do you think the book continues to move when she takes her hand away from the book (scene 2)?
 - d. Why do you think the book eventually stops moving (scene 3)
3. *At the park, Emily is sliding into home plate. Inside the ice rink, Fran fell and is sliding across the ice.*
- a. Draw a picture of both Emily and Fran sliding.
 - b. On your pictures above, draw the forces you think are acting on Emily and Fran.
 - c. Describe what will happen to each one's speed and direction and explain why sliding on dirt different from sliding on frictionless ice.

Part 2: Test your predictions from above using the simulation here:

<http://phet.colorado.edu/en/simulation/forces-and-motion>

Click "run now" to start the simulation

1. Use **Forces and Motion** simulation to create Joe's situation from the **Check Your Understanding** questions above.
 - a. Talk about how your force drawings compare to the free body diagram window for each scene and adjust your sketches with a new color if necessary.
 - b. Look at your reasoning from **1b** above. Have your thoughts changed now that you run the experiment? Explain your answer.
2. Use the simulation to verify or correct your drawings and reasoning for Annette's book. Make changes in a new color.

3. Explain how you could use the simulation to study Emily and Fran's situations even though there are no people in the simulation. Test your ideas and make corrections to your page in a new color.

Part 3: Use the simulation to predict how applying a force affects an object's speed and direction

1. Start with a short investigation using the file cabinet. In an organized fashion, **record observations** in the space below about how pushing on the cabinet changes its speed and direction of motion. **Include the free body diagrams.** *For example, you might test the following:*
Does a push from the right always make the file cabinet go right? What role does friction play? How can you use the free body diagram to help you make predictions?

OBSERVATIONS:

2. Using your observations, summarize how you could predict what happens to the speed and direction of a file cabinet when a force is applied.
3. Test how well your understanding applies in specific situations. For each, make a prediction, and then test your ideas using the simulation. Make a table to record your **prediction, observations,** and draw the **free body diagram.** Include **comments** about whether the test supports or refutes your summary in question 2.
 - a. How much force does it take to make the cabinet move from rest with friction on?
 - b. What's different with the friction off?
 - c. What happens if you change the cabinet to a book and also to a refrigerator?
 - d. If the cabinet is moving when the force is applied, what do you need to consider? Are there different things to consider if you switch the cabinet to a dog or crate?
 - e. Think of other experiments that would help you verify your ideas. Describe your experiments and continue to fill in your table.

DRAW YOUR TABLE HERE

4. Write a final summary of how you can predict, with the help of free body diagrams, what effects an external force will have on the speed and direction of an object's motion.