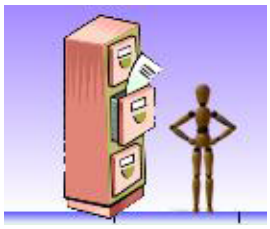
Forces and Motion activity #1 Name:_____
Check Your Understanding: How does an external force affect speed and direction?

Use this link: https://phet.colorado.edu/en/simulation/legacy/forces-1d

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. On your paper, draw a picture of both Emily and Fran sliding.

b. 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.

Teacher sign off:_____

Once the teacher has signed off on your paper you may get a computer out and test your predictions.

Forces and Motion activity 1: How does an external force affect speed and direction?

http://phet.colorado.edu → Googel PhET Forces and Motion

Learning Goals: Students will be able to Predict, qualitatively, how an external force will affect the speed and direction of an object's motion

Explain the effects with the help of a free body diagram

1. Use Forces and Motion simulation to create Joe's situation from the Check Your Understanding page.

   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 1b. Have your thoughts changed now that you run the experiment? Explain your answer.

2. Use the simulation to verify or correct your drawings and reasonings 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.

You have thought about how a force can make something move or stop. Now you'll want develop a more complex understanding. Remember, the goal is to predict how applying force effects an object's speed and direction.

4. Start with a short investigation using the file cabinet. In an organized fashion, record observations about how pushing on the cabinet changes it's 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 roll does friction play? How can you use the free body diagram to help you make predictions?

5. Using your observations, summarize how you could predict what happens to the speed and direction of a file cabinet when a force is applied.

6. 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 5.

   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.

7. 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.