

PHET Force & Motion Sim Lab

Purpose: Explore Newton's Laws of Motion, friction, and what balanced/unbalanced forces do to motion

Part 1 Use the **MOTON** tab; **CHECK ALL THE BOXES**

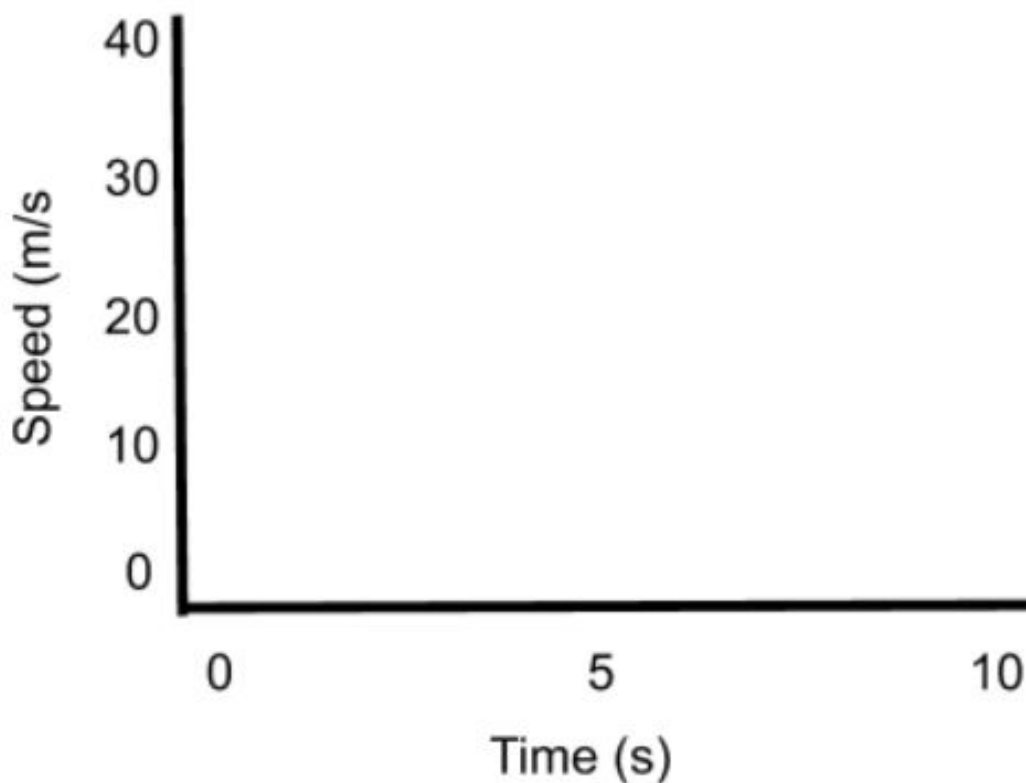
Note: Use the pause button in the simulation to start/stop as you count time



Make a speed/time graph of motion from the simulation to compare acceleration as mass and applied force is changed.

Data Table: Motion

	Applied force: 250N Speed after 5 sec	Applied force: 250N Speed after 10 sec	Calculated acceleration (m/s/s)
Refrigerator (___ kg)			
Trashcan (___ kg)			
	Applied force: 500N Speed after 5 sec	Applied force: 500N Speed after 10 sec	Calculated acceleration (m/s/s)
Refrigerator (___ kg)			
Trashcan (___ kg)			



Analysis Questions: Motion Section

1. In your own words, describe what “Applied Force” is.
2. What happened to the pushing man when the speed became too high?
3. Once the pushing man stopped pushing, what happened to the object? How does this relate to the 1st law of motion & inertia?
4. If the applied force is the same, which has the higher rate of acceleration: a low mass object or a high mass object?
5. What does the slope of the line of the speed/time graph tell you?
6. How was it possible for the trashcan and the refrigerator to accelerate at the same rate? Explain using $F=ma$.

Part 2 Use the FRICION tab; CHECK ALL THE BOXES

Run the sim with the friction bar set in the middle. Use the pause and reset buttons as needed!

Data Table: Friction

Object (mass)	Minimum Applied Force (N) needed to cause the object to <u>begin moving</u>	Frictional Force (N) Acting on the Object <u>when it is at rest</u>	Frictional Force (N) Acting on the Object <u>when it is in motion</u>	Sum of Forces (Net Force to the right) to cause the object to begin moving	Sum of Forces (Net Force) needed to keep object moving <u>at a constant velocity once it starts moving</u>
Child (___ kg)					
Box (___ kg)					
Trashcan (___ kg)					
Refrigerator (___ kg)					

Analysis Questions: Friction Section

7. What is friction?
8. What did the object do when balanced forces acted on it? What did it do when unbalanced forces acted on it?
9. Which is higher: static friction or moving friction? Use data from one object as evidence.
10. Once the pushing man stopped pushing, what happened to the object? How does this relate to the 1st law of motion & inertia?
11. As the mass of an object increases, what happens to the amount of force needed to begin moving the object? Explain.
12. Do you have to continue applying force on an object to keep it moving? Explain why.
13. Run the sim with friction set to “none”. Think about your answer to the last question- do you still have to continue applying force to an object to keep it moving? Explain using the idea of inertia.