

Name \_\_\_\_\_

Per: \_\_\_\_\_

How can I explain the causes of motion on an object?

Background: Sir Isaac Newton (1643-1727) an English scientist and mathematician born in Woolsthorpe, England was famous for his discovery of the law of gravity also discovered the three *laws of motion*. He published them in his book Philosophiae Naturalis Principia Mathematica (mathematic principles of natural philosophy) in 1687. Today these laws are known as *Newton's Laws of Motion* and describe the motion of all objects on the scale we experience in our everyday lives.

**1st Law: An object \_\_\_\_\_ stays \_\_\_\_\_ or an object \_\_\_\_\_, stays in \_\_\_\_\_ (in the same \_\_\_\_\_/at the same speed) unless acted upon by an \_\_\_\_\_ force**

Some Examples from Real Life

Two teams are playing tug of war. They are both exerting equal force on the rope in opposite directions. This balanced force results in no change of motion.

Why then, do we observe every day objects in motion slowing down and becoming motionless seemingly without an outside force?

*It's a force we sometimes cannot see \_\_\_\_\_*

• There are four main types of friction:

- \_\_\_\_\_ friction: ice skating, book sliding across the table
- \_\_\_\_\_ friction: bowling
- \_\_\_\_\_ friction (air or liquid): air or water resistance
- \_\_\_\_\_ friction: initial friction when moving an object

### **2nd Law**

*The net force of an object is equal to the product of its mass and acceleration, or  $F=M \times A$*

*What is a force and what does a force do?*

**One example of Newton's 2nd Law**

**3rd law: For every \_\_\_\_\_, there is an \_\_\_\_\_ and \_\_\_\_\_ reaction. (Forces are always paired)**

**Examples of third law**

## Recognizing motion

□ 7.P.1.1 Explain how the motion of an object can be described by its position, direction and speed compared to something else

- An object is in \_\_\_\_\_ when its \_\_\_\_\_ from another object is \_\_\_\_\_.
- Whether an object is moving or not depends on your \_\_\_\_\_.

### Motion and Reference Points

- An object is in \_\_\_\_\_ if it changes \_\_\_\_\_ relative to a \_\_\_\_\_ **point**. A reference point is a place or object used for \_\_\_\_\_ to determine if something is in motion.

### Measuring Motion

- \_\_\_\_\_ is the \_\_\_\_\_ an object travels per \_\_\_\_\_.
- If it takes you 1 hour to drive a total of 60 miles, then how fast were you going?
- \_\_\_\_\_.
- To calculate speed:
- Divide the \_\_\_\_\_ by the \_\_\_\_\_.

### Average Speed

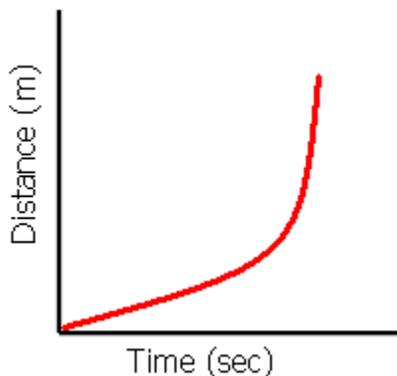
- Most objects do not move at constant speeds for very long. Think about how many stops you have to make on your way to school each day.
- To calculate average speed, is the \_\_\_\_\_ divided by the \_\_\_\_\_.

### Velocity

- Knowing the speed of an object will not tell you everything about its motion.
- Velocity is the \_\_\_\_\_ & \_\_\_\_\_ of an object.
- Velocity changes if \_\_\_\_\_ speed or direction changes.
- With storms, you need to know the \_\_\_\_\_ of its \_\_\_\_\_.

### Acceleration

- Acceleration is the \_\_\_\_\_ at which velocity \_\_\_\_\_.
- It refers to \_\_\_\_\_ (of course), \_\_\_\_\_ speed (deceleration), or \_\_\_\_\_ direction.



How do you know this graph shows acceleration?

7.P.1.3 I can use a graph to describe and interpret the motion of an object.

- On a motion graph your \_\_\_\_\_ variable (the thing you are measuring) is always on the vertical or the \_\_\_\_\_ and the thing you are changing the \_\_\_\_\_ variable is always on the horizontal or \_\_\_\_\_.
- The shape of the graph can tell you a lot about the motion of the object.



Moving or not? Why?

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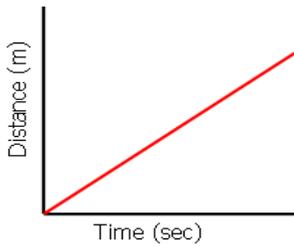
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Moving or not? How?

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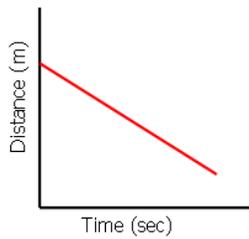
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Moving or not? How?

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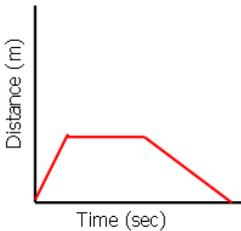
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Johnny's mother brought him to school and then came back home for 3 hours. Then she went to the store for 2 hours which was on her way to Johnny's school. After she was done shopping she continued to Johnny's school to pick him up and then went back home for the rest of the day.

Draw a graph to show Johnny's story