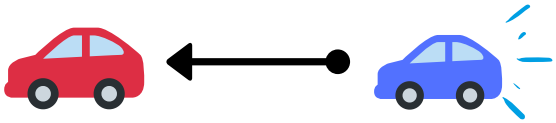
How will the movement of one car affect the movement of another?

High School



Predict:

Write - What do you think will happen and why do you think this?

Write out a step-by-step procedure of how we will test our scientific question. Be sure to include what we will control and what we will be measuring. Include your data table set-up and list of materials.

Set-up your experiment and record your data and observation in the boxes below:

What question(s) do you have after seeing the observations from your initial experiment?

Let's think about some things we know about cars on the road...

Even if you are not yet driving, you have probably seen the speedometer on a car (ask an adult to see one if you have not seen one) or you have seen the Speed Limit signs that change based on the area that surrounds the road.

1. What units of measurement are used on the speedometer or the speed limit signs?

2. How does the speed change based on the area that surrounds the road?

You should have noticed that the unit is miles per hour and that when there is more open area like an interstate road, the speed limit increases but for residential or special areas such as school zones, the speed decreases.

Miles are used to measure: _____ Hour is used to measure: _____

Vocabulary

Speed

Speed is the change in position over time. As indicated by the units of measurement for the speed limit - the amount of miles that will be covered in one hour. This is represented mathematically as distance divided by time.

Investigation of Speed:

Materials:

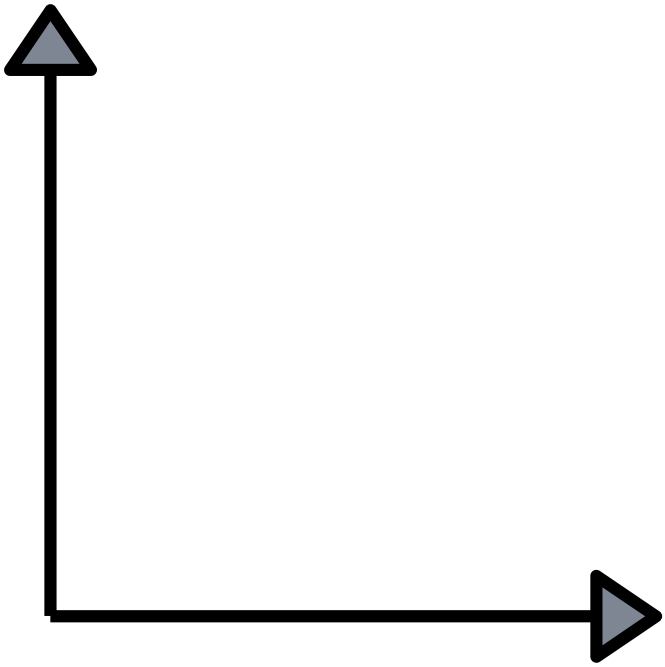
- Toy Car
- Ruler or measuring tape
- Timer (stop watch or cell phone)
- Masking tape

- Measure out different distances using the ruler and tape. Mark the distance (in cm) on the tape. (determine the increments you would like to use - every 5 cm? 10cm? - it is up to you to choose)
- Use the timer to determine the amount of time it takes to reach each marked distance.
- Graph your data. (Label your Axis Appropriately)

Data Table:

Distance (cm)	Time (seconds)

Title: _____

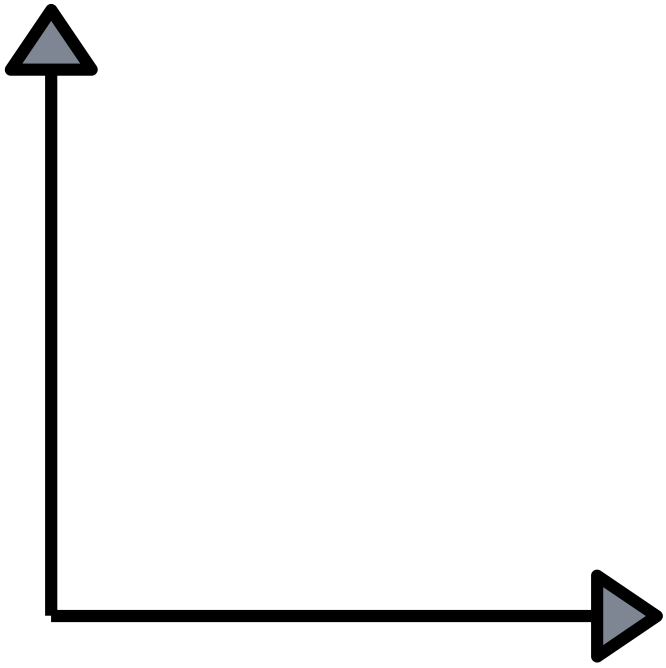


Review your data and graph. What patterns do you notice?

Data Analysis Practice:

Use the following data to create a graph and answer the following data analysis questions:

Time (seconds)	Position (meters)
0	0
1	6
2	12
3	18
4	24
5	30
6	36



1. What is the shape of the graph (linear or curved):

2. Which direction is the line (horizontal or diagonal)?

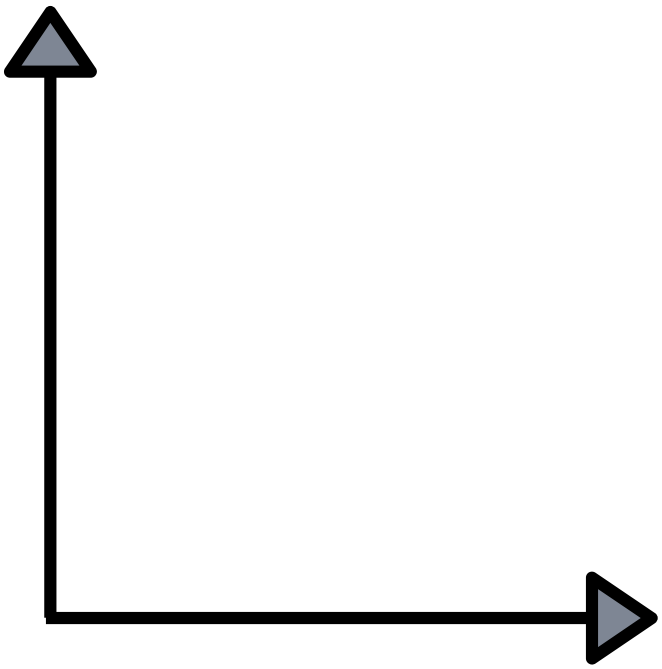
Use this space for calculations:

3.What is the slope of the line?

*Search a video for how to calculate slope if you need a reminder.

Use the following data to create a graph and answer the following data analysis questions:

Time (seconds)	Position (meters)
0	0
1	1
2	4
3	9
4	16
5	30
6	42



1. What is the shape of the graph (linear or curved):

2. Which direction is the line (horizontal or diagonal)?

3.What is the slope of the line?

How do the two graphs compare?

Look up videos explaining Position Versus Time Graphs.
Record notes about what you have learned below:

Speed Calculations Practice:

Remember that Speed is calculated as distance divided by time:

$$S = \frac{D}{T}$$

1. Use an internet search to determine how far your school is from your house then either use the estimated time from the GPS resource or the typical amount of time it takes you to get to school to determine the average speed of your trip. *We say average speed because you may be going faster or slower at a particular data point along your journey.

2. Calculate the speed for each data point from our original data:

Time (seconds)	Position (meters)
0	0
1	1
2	4
3	9
4	16
5	30
6	42

Watch an instructional video about calculating speed. Use the space below to record your notes:

You should have noticed from the two sets of data you looked at with position versus time graphs that even though the position of an object may change over time, the speed can remain the same.

Velocity

Velocity is the magnitude (measurement) of speed and direction. This means that even if you are moving at a constant rate of 60 meter per second...if you were originally travelling North and you are now traveling South, you have changed your velocity.

The formula for velocity will be the same but this time you would add a direction to the units such as 10 m/s North East. You can also have a negative number which indicates movement in the opposite direction from the origin.

The concept of velocity has been introduced because you are going to analyze the momentum of the car when it hit the car in front of it from the initial set up. In order to help you understand momentum, you will first need to know what inertia is. Use the next page to record notes about what you have learned about Inertia after searching for videos on the concept.

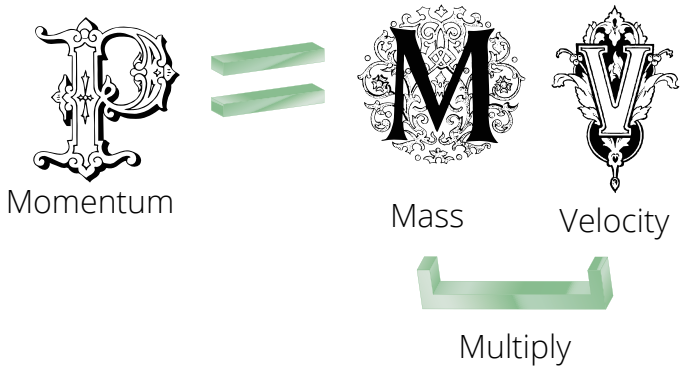
Watch a video about Inertia. Record your notes in the space below:

Use the information you have learned about Inertia to explain what is happpening with the two cars.

I need help!! *See Resource Page!

Momentum

Momentum is the measurement of how fast a particular amount of mass is going. The more momentum an object has, the "stronger" its Inertia is - the harder it is to stop it from moving or get it moving.



Set up your experiment again but this time add weight to the second car or change its velocity and see how it affects the outcome. Use the space below for your data and conclusion:

Watch a video about Momentum. Record your notes in the space below:

Use the information you have learned about Momentum to explain what is happening when you made changes to the car.

I need help!! *See Resource Page!