

<b>Name:</b>
<b>Period:</b>

**2.1 Section Review**

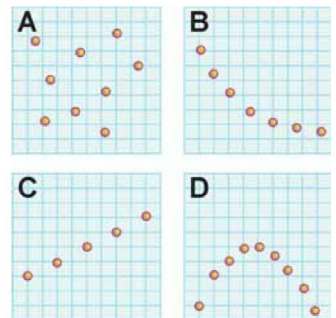
1. An engineer designing a house needs to know how much force it takes to break different size beams of wood (Figure 2.10). List at least five variables important for figuring out this information.



**Figure 2.10:** The wood beam in question 1.


2. Let the variable  $m$  be the mass of a student. Which of the following is NOT a possible value that  $m$  can have?

- a) 51 kilograms.
- b) 51,000 grams.
- c) 51 meters.



**Figure 2.11:** Four different graphs.

3. Figure 2.11 shows four different graphs.
- ( ) Which one shows a direct relationship?
  - ( ) Which one shows an inverse relationship?
  - ( ) Which one shows a complex relationship?
  - ( ) Which one shows no relationship?

4. A student does an experiment that measures the temperature at which water freezes when different amounts of salt are mixed in.

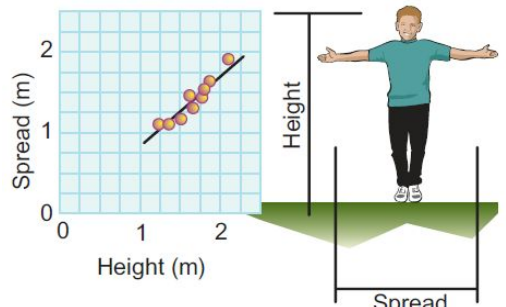
What is the independent variable in the experiment?

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What is the dependent variable?

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5. A student collects data on the distance between people's outstretched fingertips and their height. The data are shown in the graph in Figure 2.12. If a person's height is 1.7 meters, what is the most probable distance between his outstretched fingertips?



**Figure 2.12:** A graph showing the spread of people's arms compared with

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6. On a car trip, the distance you travel is equal to the speed you go multiplied by the time that you are driving. Write this relationship as a formula, using  $d$  to represent distance,  $v$  to represent speed, and  $t$  to represent time.

## 2.2 Section Review

1. Georgiana has the idea that salt water heats up faster than fresh water. Which of the following would be acceptable scientific proof of her hypothesis?

- a. Three of her friends believe it.
- b. She read on an Internet website that it was so.
- c. She did an experiment that showed it.

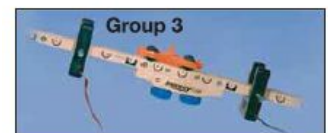
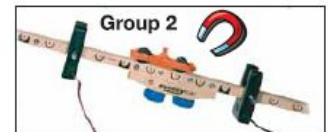
2. A careful description of how an experiment is conducted is called

- a. a data table.
- b. a procedure.
- c. an analysis.
- d. a conclusion.

3. Explain why all variables but one should be controlled in a well designed experiment.

4. Is it possible to measure the true value of a physical property, such as mass? Explain why or why not.

5. Three groups do the same experiment rolling a car through two photogates. The track is set at the same angle and all other variables are kept the same for each group. The data is shown in Figure 2.20. The first group does the experiment in the daylight. The second group does it under a magnet. The third group does the experiment in the dark. Group 2 claims that its experiment shows that magnets make the car go faster. Is their claim supported by the evidence? Explain why or why not.



6. Which of these sets of data has an average of 10.5?

- a. 8.5, 9.5, 10.5, 11.5.
- b. 9.0, 10.0, 11.0, 12.0.
- c. 10.0, 10.5, 11.0, 11.5.
- d. 10.5, 10.6, 10.7, 10.8.

7. What does it mean when two values are different but not significantly different?

Group 1	Group 2	Group 3
Time A to B	Time A to B	Time A to B
0.343	0.339	0.341
0.346	0.338	0.337
0.341	0.345	0.344
0.340	0.341	0.340
0.349	0.339	0.339

Figure 2.20: The three experiments of question 5.

# Vocabulary

Place the best term in the brackets ( ) to complete the sentences.

- |                    |                       |            |         |
|--------------------|-----------------------|------------|---------|
| variable           | independent variable  | procedure  | average |
| dependent variable | experiment            | conclusion | graph   |
| control variable   | experimental variable |            |         |

## Section 2.1

- ( ) A mathematical picture that may show a pattern between two variables is a \_\_\_\_.
- ( ) On a graph of two variables, the variable that causes changes in the other is the \_\_\_\_.
- ( ) A quantity which can have many values is a \_\_\_\_.
- ( ) The variable on a graph which is most often represented on the y-axis is the \_\_\_\_.

## Section 2.2

- ( ) A situation set up to investigate the relationship between certain variables is called a(n) \_\_\_\_.
- ( ) A statement of what was learned in an experiment is called a(n) \_\_\_\_.
- ( ) The description of how an experiment is done, including equipment, techniques used and the type of data collected is the \_\_\_\_.
- ( ) The variable that you change in an experiment is called the \_\_\_\_.
- ( ) In an experiment, variables that are NOT allowed to change are \_\_\_\_ variables.
- ( ) The sum of all measured values divided by the number of measurements is called the \_\_\_\_ value.

# Concepts

## Section 2.1

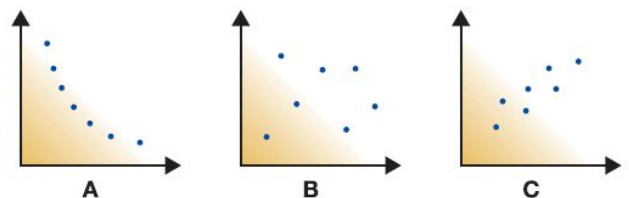
1. Name four types of variables you might commonly use in doing an experiment. For each variable, name a unit and an instrument or tool that could be used to make that measurement.

An example is force-newton-spring scale; where force is the variable, newton is the unit, and spring scale is the measuring instrument.

Variable (force)	unit (Newton)	Instrument (spring Scale)

2. Identify the relationship for each graph pictured as either direct, inverse, or no relationship.

A	
B	



C	
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3. You have designed an experiment to test whether stretching a spring farther will cause it to shoot a marble a greater distance. You record the distances the spring is stretched, and the distances the marble travels with each release.

Answer the following questions about your experiment.

a. Name the independent variable.

b. Name the dependent variable.

c. Name the variable you would graph on the x-axis.

d. Name the variable you would graph on the y-axis.

**Section 2.2**

4. Write an X next to each hypothesis that could be tested by experiment.

	Steeper ramps result in higher speeds.
	Red apples taste better than green apples.
	Alien life forms are hiding on Earth.
	A parallel universe exists that cannot be detected

5. Celia designs an experiment to test if the speed of a wagon changes as masses are added when a constant force is applied for 2 meters. As masses are added to the wagon, she measures decreasing values of speed. She draws a graph that shows that the mass and speed are inversely related.

Based on the description of Celia's experiment:

a. Identify a control variable mentioned in the procedure.

b. Identify the experimental variable in the procedure.

c. Write a hypothesis for this experiment.

d. Identify the data in this experiment.

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e. State a conclusion for this experiment.

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## Problems

### Section 2.1

1. A graph is 20 boxes by 20 boxes. Time is plotted on the x-axis and its range is 0 to 40 minutes. Position is plotted on the y-axis and the range is 0 to 20 meters. What should the scale be for each axis of this graph?

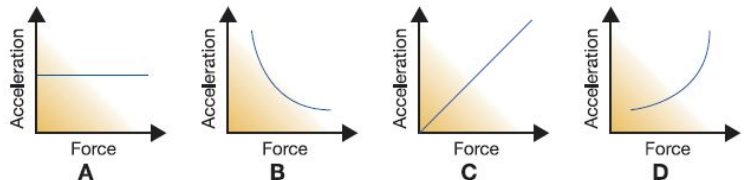
X	
Y	

2. The density of a material is calculated by dividing the mass of the material by its volume. If **d** represents density, **m** represents mass, and **V** represents volume, write a formula to represent this relationship. Is the relationship between density and volume direct or inverse?

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3. Which of the following graphs shows an inverse relationship?

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4. The graph to the right represents the position of a rocket above the ground as time passes.

a. What is the position of the rocket after 3.0 seconds?

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b. Does this graph show a direct or inverse relationship?

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### Section 2.2

5. If the width of a machine part should be 4.00 cm with an acceptable error of +/- 0.03 cm. Put an X in the box of any that are significantly different.

	4.04 cm
	3.98 cm

	4.29 cm
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6. Jaden measured the mass of a 2002 penny on a mass balance 4 different times. Kylie repeated the same measurement 4 times using the same penny and the same mass balance. Their results are shown:

Trial	Jaden	Kylie
1	2.45 g	2.51 g
2	2.49 g	2.50 g
3	2.55 g	2.49 g
4	2.51 g	1.70 g

a. What is the average of Jaden's measurements? Of Kylie's measurements?

Jaden	
Kylie	

b. Who had the most accurate measurements? Explain your reasoning.

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c. What is the "true" mass of the penny?

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