

The Scientific Method

Scientific Method – five step process used to carry out an investigation

- 1) **Problem** – determined through observation
 - states the questions which you try to answer through an experiment
- 2) **Hypothesis** – reasonable guess that can be made based on observations
 - predicted answer to the question you asked
 - **if/then** statement
- 3) **Experiment** – investigation which tries to explain why your results happened according to your hypothesis
- 4) **Analyze** – uses data (graphs, charts, pictures) to show what happened when you did your experiment

- 5) **Conclusion** – shows the steps you took to do your experiment
 - a) restate the hypothesis
 - b) supports or does not support the hypothesis – you infer this by drawing a conclusion based on what you observe
 - c) summarize your results
 - d) explain any errors that may have occurred
 - e) state any improvements that could be made



Variables in an Experiment

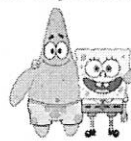
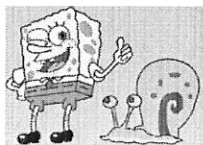
control – the group in an experiment that does not receive treatment by the researchers and is then used to measure how the other tested subjects do

variable – factors that can be changed in an experiment

a) **independent variable** – this is the one thing **changed** in the experiment (under your control)

b) **dependent variable** – changes as a result of the independent variable (what you are measuring)

constant – variable that is not changed in the experiment

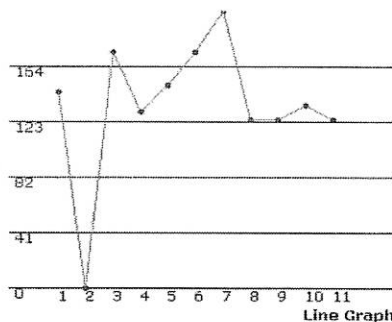


Let's have SpongeBob and friends help us determine which parts of an experiment are which!!

Line Graph

- shows the relationship between two variables
- both variables must be numbers
 - The independent variable is found on the **x axis**; these are values chosen by the experimenter (minutes, hours, days, etc.)
 - The dependent variable is found on the **y axis**; these numbers “depend” on the independent variable

Distance (feet) -
this is the y axis

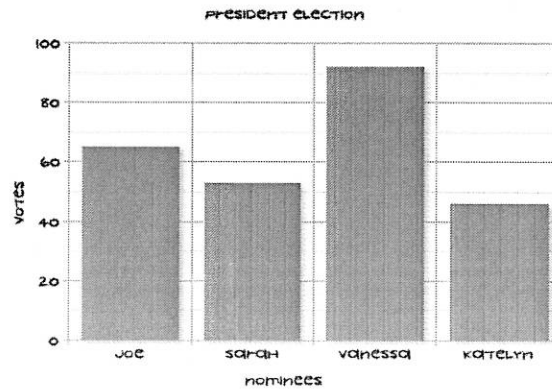


Time (hours) – this is the x axis

Bar Graph

- uses rectangular blocks or bars to show the relationships among variables
- X axis and Y axis
 - The **x axis** is some group divided into parts (persons, categories, etc.)
 - The **y axis** must be a number showing what is measured

y axis – this shows the results



x axis - This shows the people who voted

Name _____

Scientific Method - Controls and Variables

SpongeBob and his Bikini Bottom pals have been busy doing a little research. Read the description for each experiment and answer the questions.

1: Patty Power

Mr. Krabs wants to make Bikini Bottom a nicer place to live. He has created a new sauce he thinks will reduce the production of body gas associated with eating Krabby Patties from the Krusty Krab. He recruits 100 customers with a history of gas problems. He has 50 of them (Group A) eat the patties with the new sauce. The other 50 (Group B) eat patties with sauce that looks like the new sauce but is really just the regular sauce. Both groups were told they were getting the sauce that would reduce gas production. Two hours after eating the patties, 30 customers in group A reported having fewer gas problems and 6 customers in group B reported having fewer gas problems.

1. Which people are in the control group?
2. What is the independent variable?
3. What is the dependent variable?
4. What should Mr. Krabs' conclusion be?
5. Why do you think 6 people in group B reported feeling better?

2: Slimotosis

SpongeBob notices that his pal Gary is suffering from slimotosis, which occurs when the shell develops a nasty slime and gives off a horrible odor. His friend Patrick tells him that rubbing seaweed on the shell is the perfect cure while Sandy says drinking Dr. Kelp will be a better cure. SpongeBob rubs Gary's shell with seaweed for one week and the slimotosis does not get any better. He then has Gary drink Dr. Kelp for one week and the slime is gone and Gary's shell smells better.

1. What was the initial observation?
2. What is the independent variable?
3. What is the dependent variable?
4. What should SpongeBob's conclusion be?

3: SpongeBob Clean Pants

SpongeBob noticed that his favorite pants were not as clean as they used to be. Sandy told him he should try using CleanO detergent, a new brand of laundry soap she just started using. SpongeBob made sure to wash one pair of pants in plain water and another pair in water with the CleanO detergent. After washing both pairs of pants a total of three times, the pants washed in the CleanO did not appear to be any cleaner than the pants washed in plain water.

1. What was the problem SpongeBob wanted to investigate?
2. What is the independent variable?
3. What is the dependent variable?
4. What should SpongeBob's conclusion be?

4: Marshmallow Muscles

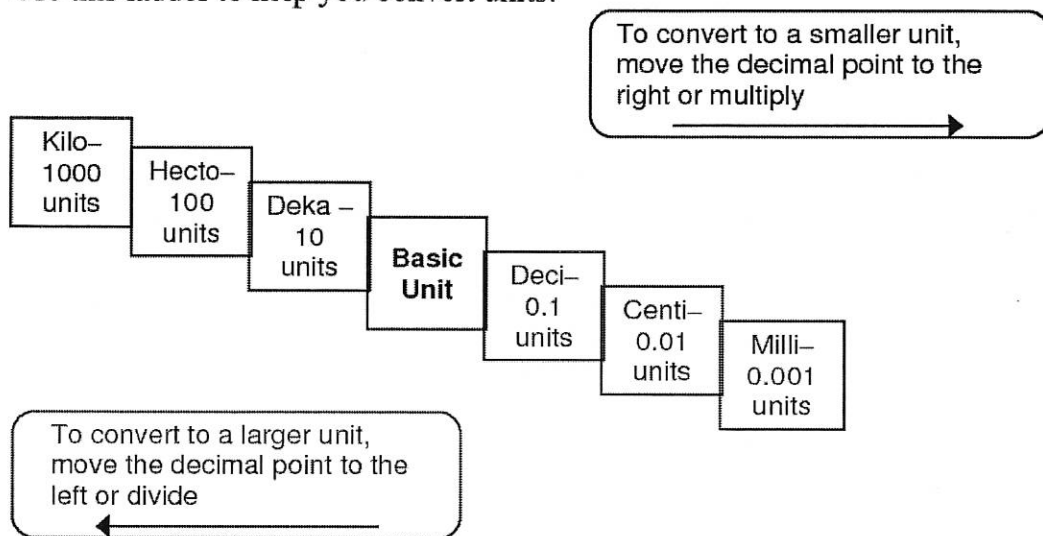
Larry the Lobster was told a certain muscle cream was the newest best thing on the market and claims to double a person's muscle power when used as part of a muscle-building workout. Interested in this product, he buys the special muscle cream and recruits SpongeBob and Patrick to help him with an experiment. Larry develops a special marshmallow weight lifting program for Patrick and SpongeBob. He meets with them once every day for two weeks and keeps track of their results. Before each session, Patrick's arms and back are lathered in the muscle cream while SpongeBob's arms and back are lathered with baby lotion.

Time	Patrick	SpongeBob
Start Day	18	5
After 1 weeks	25	1
After 2 weeks	38	8

1. Which person is in the control group?
2. What is the independent variable?
3. What is the dependent variable?
4. What should Larry's conclusion be?

Metric Conversions

Use this ladder to help you convert units:



Practice with these conversions:

- 1) 3000 mg = _____ g
- 2) 105 km = _____ m
- 3) 500 cm = _____ m
- 4) 15.6 kg = _____ g
- 5) 10 mm = _____ cm
- 6) 7 L = _____ ml
- 7) 198 g = _____ kg
- 8) 65 ml = _____ L
- 9) 60 cm = _____ m
- 10) 7.6 m = _____ cm
- 11) 19 cm = _____ mm
- 12) 1500 m = _____ km
- 13) 25 g = _____ mg
- 14) 8.3 cm = _____ mm
- 15) 130 mg = _____ g

Here's an easy way to remember the metric units:

King Henry Died Monday Drinking Chocolate Milk

Conversion Challenge

Write the correct abbreviation for each metric unit.

1) Kilogram _____

4) Milliliter _____

7) Kilometer _____

2) Meter _____

5) Millimeter _____

8) Centimeter _____

3) Gram _____

6) Liter _____

9) Milligram _____

Try these conversions, using the ladder method.

1) 2000 mg = _____ g

6) 5 L = _____ mL

11) 16 cm = _____ mm

2) 104 km = _____ m

7) 198 g = _____ kg

12) 2500 m = _____ km

3) 480 cm = _____ m

8) 75 mL = _____ L

13) 65 g = _____ mg

4) 5.6 kg = _____ g

9) 50 cm = _____ m

14) 6.3 cm = _____ mm

5) 8 mm = _____ cm

10) 5.6 m = _____ cm

15) 120 mg = _____ g

Compare using <, >, or =.

16) 63 cm ○ 6 m

17) 5 g ○ 508 mg

18) 1,500 mL ○ 1.5 L

19) 536 cm ○ 53.6 dm

20) 43 mg ○ 5 g

21) 3.6 m ○ 36 cm

Name _____

Graphing Activity

Purpose: This activity is designed to test your graphing skills.

Materials: pen/pencil and ruler

Procedure: Use the attached graph paper to create two separate graphs for the following sets of data. Make sure to label all parts of the graph and include a title for the graph.

Baby chicks require a constant source of food. As chicks grow, more energy is required for daily activities. The following table gives the grams of food eaten by the chick over a five day period.

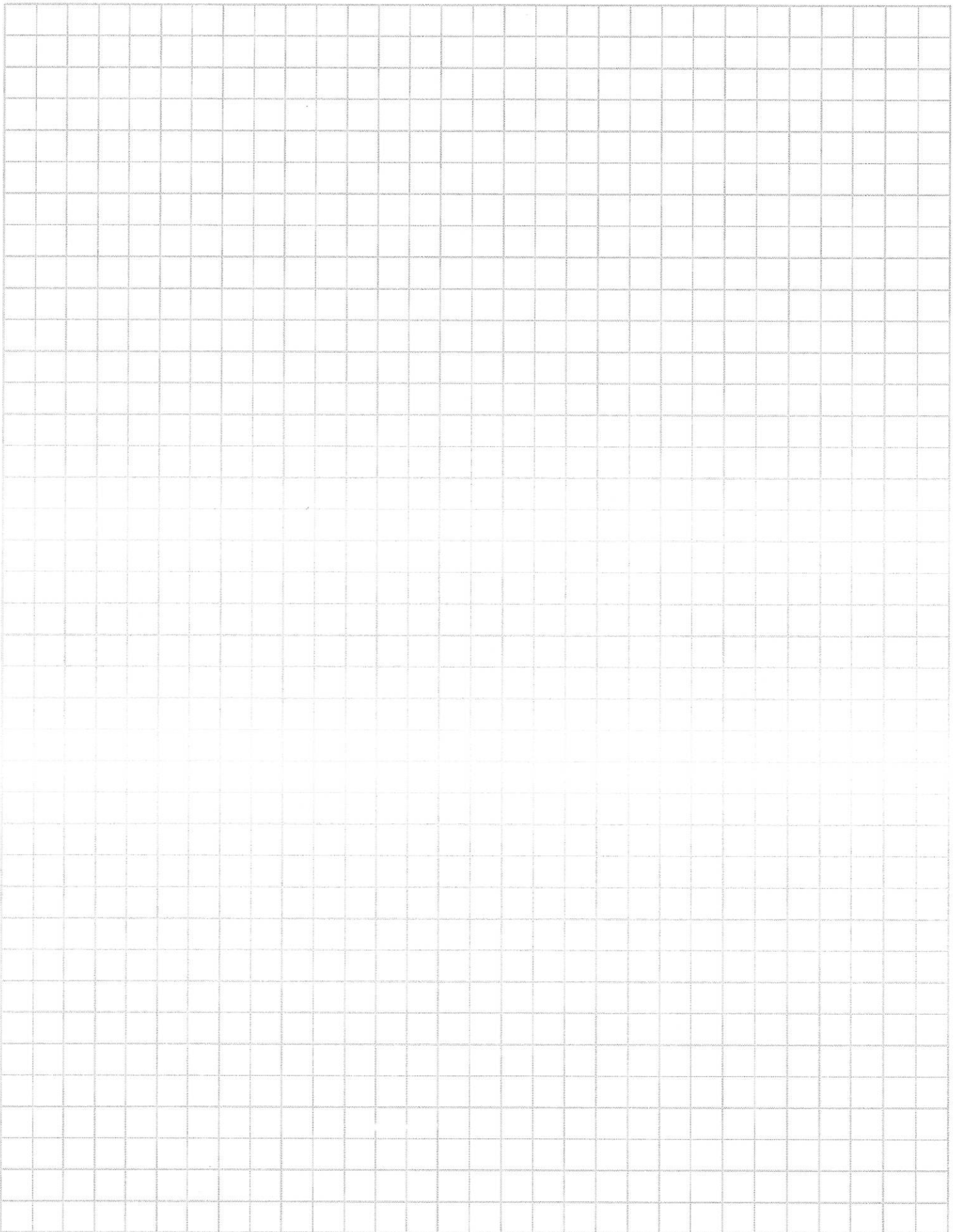
Number of Days	Food Eaten (grams)
0	0.0
1	1.0
2	3.0
3	7.0
4	11.0
5	15.0

1. Create a line graph for the above data using the graph paper provided. Make sure to label the x axis and y axis. Give the graph a title.

2. What is the independent variable?

3. What is the dependent variable?

3. How much grain did the chicks eat over 5 days?



Five students had to share a jumbo size bag of M & M's. Plot a graph for the following data to show the number of M & M's eaten by each student.

Student	Number of M & M's
Bridget	37
Susan	18
Alice	26
Mary	11
Jane	46

1. Create a bar graph for the above data using the graph paper provided. Make sure to label the x axis and y axis. Give the graph a title.
2. What is the independent variable?
3. What is the dependent variable?
4. What is the total number of M & M's eaten by the girls?

