Springfield Middle Incoming 6th Grade Summer Bridge: Science

Attached is practice work to help prepare students who are entering 6th grade. This will be a review of scientific principles, and other information that will help students be successful in 6th grade science. We recommend that students complete one activity a week during the summer. Students who turn in this packet to their science teacher on the first day of school will receive extra credit.

There are a variety of activities like reading passages with questions, matching activities, and links to videos. The answers for the packet can be found in the back, with the intention of parents checking their student's answers.

Contents:

Scientific Method Reading Passage (for reference) ……..page 1

Hypothesis Activity……..page 2

Scientific Method Matching Activity……page 3

Science Investigations and Safety Crossword Puzzle…….page 4

Graphing Practice (2 pages)……pages 5-6

Scientific Method Practice……..page 7

Scientific Variables parts 1 and 2……page 8

Types of Data and Making Inferences ……page 9

Nature of Science Reading and Activity……pages 10-11

The Scientific Method Reading with Questions……pages 12-13

Exploring the Scientific Method……pages 14-15

Answer Key for Parents……pages 16-18

The Scientific Method

The basic **scientific method** includes the steps scientists use and follow when trying to solve a problem or prove or disprove a theory. The methods are used by scientists all over the world. This is done so scientists can work together to solve some of the same problems.

There are usually five steps which are a part of the scientific method. The steps can occur in any order, but the first step is usually **observation**. An observation is the use of one or more of the five senses, which include seeing, hearing, feeling, smelling, and tasting. The five senses are used to learn about or identify an event or object the scientist wants to study. For example, while observing a spider a scientist may observe the pattern or size of the spider's web. Observations lead to questions.

The second step of the scientific method is the statement being researched, the **hypothesis**. A good hypothesis includes three things; the explanation for the observations, if it is able to be tested by other scientists, and it will usually predict new outcomes or conclusions. The scientist observing the spider building the web may have a question about the strength of the web. Usually a hypothesis is written as an "If…then…because" statement. An example of the hypothesis might be: If the spider is larger, then the web will be stronger because the silk is bigger. This hypothesis includes the explanation for the observation, it can be tested, and new conclusions may be reached.

The third step of the scientific method is the **experiment.** An experiment is a test which will either challenge or support the hypothesis. The hypothesis will then be true or false. Using the spider hypothesis, a scientist may experiment by measuring spider webs in relation to a spider's size.

Often, even when a hypothesis is disproved much can still be learned during the experiment. For example, while measuring the strength of spider webs the scientist may discover something new about them. It is important to test only one variable at a time. If we test several different things in an experiment it will be very difficult to understand which variable caused the change. We collect **data** during an experiment. Data can be recorded through written words, graphs, charts, and/or illustrations.

The final step in the scientific method is the **conclusion**. The conclusion will either clearly support the hypothesis or it will not. If the results (data) support the hypothesis, a conclusion can be written. If it does not support the hypothesis, the scientist may choose to change the hypothesis or write a new one based on what was learned during the experiment. In the example, if the scientist proves that larger spiders build stronger webs, then that is the conclusion. If it was not proven, the scientist may change the hypothesis to: The size of a spider has no bearing on the strength of its web.

The scientific method is used for simple experiments students may do in the classroom or very complex or difficult experiments being done all over the world. The spider experiment may be done by a scientist in Jacksonville, Washington D.C., or Brazil.

In summary, the **scientific method** includes the steps scientists use to solve a problem or to prove or disprove a theory. There are five basic steps involved with the scientific method. The usual steps include **observation, hypothesis, experiment, collecting data** and **making a conclusion.** The steps may not always be completed in the same order. Following the five steps, the results of the experiment will either support the hypothesis or will not support the hypothesis. Scientists are always free to change or write a new hypothesis and start the five steps all over again. The scientific method is used for simple experiments or for more difficult experiments.

Hypothesis Activity

The format for writing a hypothesis is…

If (describe specifically what you will do in the experiment) **then** (predict the outcome of the experiment based on your "if" statement.)

For each problem or question write a hypothesis.

Example: I wonder if chocolate may cause pimples?

If ___*I eat a chocolate candy bar*_____, then
_____*I will get pimples*_____.

1. Will plant growth may be affected by the color of the light?
If _____,
then _____.

2. Are there more bacteria on the toilet handle or on my science desk?
If _____,
then _____.

3. Which lunch will give me more energy, chicken sandwich or pizza?
If _____,
then _____.

4. Do birds with longer or shorter wings fly faster?
If _____,
then _____.

5. Does caterpillar poop weigh the same as the leaf it eats?
If _____,
then _____.

6. Bob wondered if giving detentions for missing homework would lower the amount of homework missed in his local middle school. He recorded the number of missed homework for 30 days, and then the school agreed to assign detentions for each missed homework assignment. He then compared the numbers to see if the policy had any effect.
If _____,
then _____.

7. Does T.V. time seem to affect the reading scores of fourth graders?
If _____,
then _____.

8. Does wing length affect the distance a plane flies?
If _____,
then _____.

9. Bob wants to see if different smells travel at the same speed. He sprays a can of hairspray, peppermint air freshener, and insect repellant at the same time. Six friends stand around him in a large circle, five feet from the center of the circle where Bob stood.
If _____,
then _____.

Scientific Method

For each experiment, fill in the correct step of the Scientific Method on the blank line above the description. Use the words below.

Question/Problem	Hypothesis	Experiment	Collect & Analyze data	Conclusion

Bean Plants

1. _____
Measure the growth of the bean plants and determine how the plants in both environments progressed over the course of the three weeks. Find an average between the two indoor plants to determine the "typical" indoor plant growth, doing the same for the two outdoor plants to calculate the "typical" outdoor plant growth.

2. _____
I want to know if a bean plant will grow more quickly outside or inside.

3. _____
Based on the data you collected, determine if a bean plant placed inside or outside will grow more quickly.

4. _____
If I plant bean plants outside, then they will grow more quickly than if I planted them inside.

5. _____
Plant four bean plants in identical pots using the same type of soil. Place two of these in an outdoor location and place the other two in an indoor location. Choose locations where the plants will get a similar amount of sunlight. Care for the plants in an identical way, like giving the same amount of water. Then, each day for the three-week experimental period, observe and measure plant growth. Carefully record the size of each plant in a notebook.

Sugar Water & Plants

1. _____
Look at the time it took for each container of water to freeze. Write down your observations in a table and then graph your results in a line graph. Did the water with sugar added take a significantly longer or shorter amount of time to freeze?

2. _____
If water has sugar added to it, then it will not freeze as fast as plain water.

3. _____
Fill two identical containers with the same amount of room temperature water. Add a measured amount of sugar to one of the containers. Place the two containers into the freezer. At regular intervals of 15 minutes, open the freezer and observe the status of the water in each container. Continue until both have completely frozen. Write down the time it took for each container of water to reach a fully frozen level.

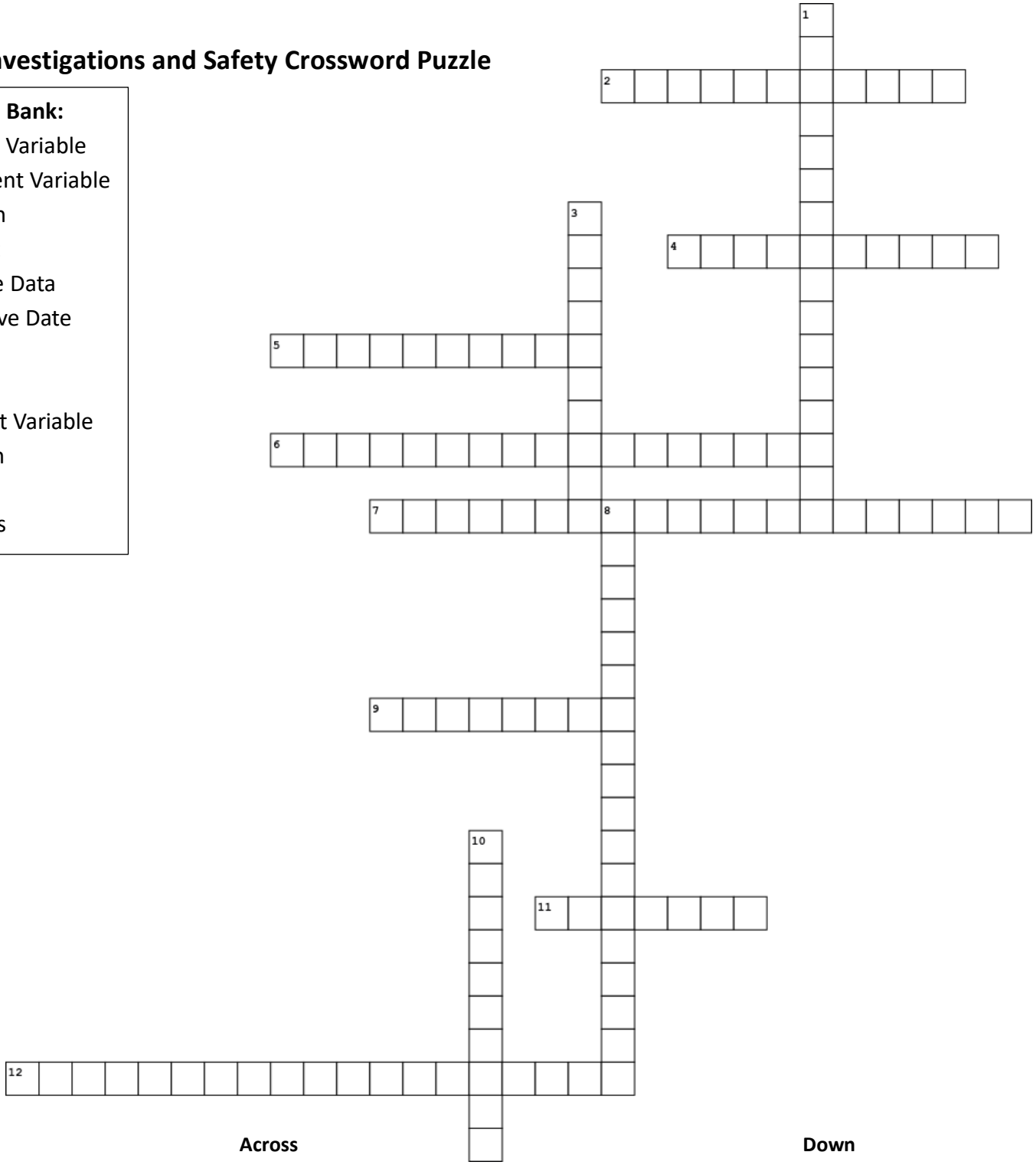
4. _____
Based on the results of your experiment, decide if water with sugar freezes faster, slower, or at the same rate as water without sugar added.

5. _____
I have noticed that popsicles that have lots of sugar don't seem to freeze as fast plain ice cubes. I wonder if the amount of sugar has an effect on freezing time.

Science Investigations and Safety Crossword Puzzle

Word Bank:

Controlled Variable
Independent Variable
Replication
Consistent
Qualitative Data
Quantitative Date
Repetition
Evidence
Dependent Variable
Conclusion
Durable
Hypothesis



Across

2. repeating another scientist's experiment to test its validity

4. testable idea or explanation that leads to a scientific investigation

5. the same throughout and easy to reproduce

6. observations that are made in number form - usually from timing, counting, or measuring

7. factor that is deliberately changed

9. all the measurements and data scientists gather in support of a scientific explanation

11. very long lasting

12. the part of an experiment that is kept the same.

Down

1. observations in the written form that are usually descriptions of features like color, texture, smell, taste.

3. doing an experiment many times to increase its validity

8. the factor being measured or observed

10. a decision arrived at by logical reasoning

Graphing Practice (page 1 of 2)

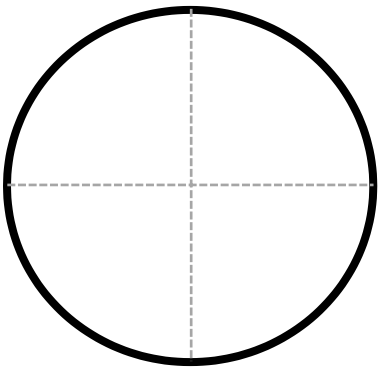
Watch the following StudyJams: Bar Graphs, Circle Graphs, and Choosing the Correct Graph. Follow the instructions below for each of the sections.

Construct a Pie Chart A pie chart is useful when you want to show data for parts of a whole (for example, groups of students within a class). The following data table shows the results from a survey done from a class of 30 students.

Favorite App	Percentage of Class
Facebook	10%
Instagram	20%
SnapChat	30%
TikTok	40%

Directions:

- Use the data table to the right to construct a pie chart
- Include a title and key
- The dotted lines have divided the chart into 25% sections, so use these lines to help you estimate where to draw lines. **Your chart does not have to use these lines.**



Key:

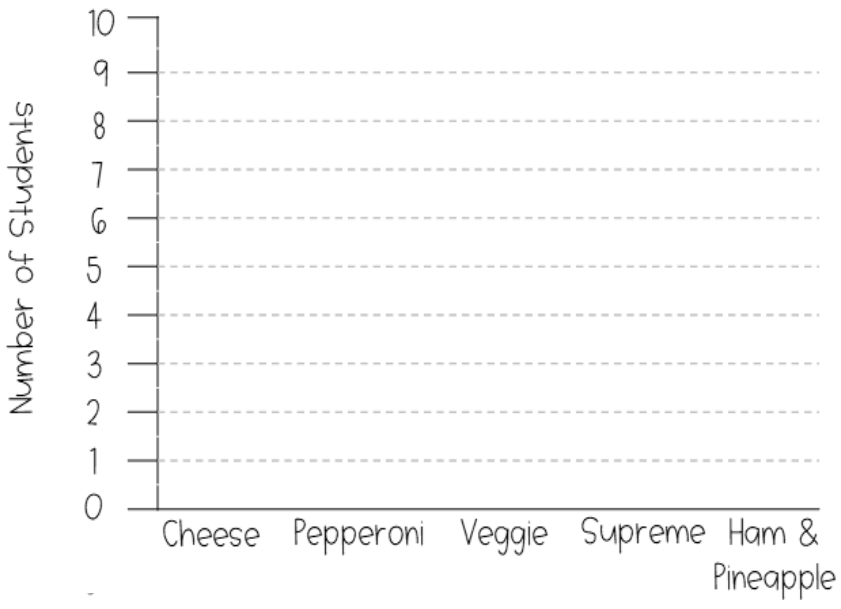
- ☐ Facebook
- ☐ Instagram
- ☐ SnapChat
- ☐ TikTok

Construct a Bar Chart Bar charts are useful when you want to show comparison between groups, such as comparing how many students like different kinds of pizza. The following data table shows the results of a survey done from a class of 30 students.

Favorite Pizza Topping	Number of Students
Cheese	9
Pepperoni	10
Veggie	3
Supreme	6
Ham & Pineapple	2

Directions:

- Use the data table to the right to construct a bar chart
- Include a title



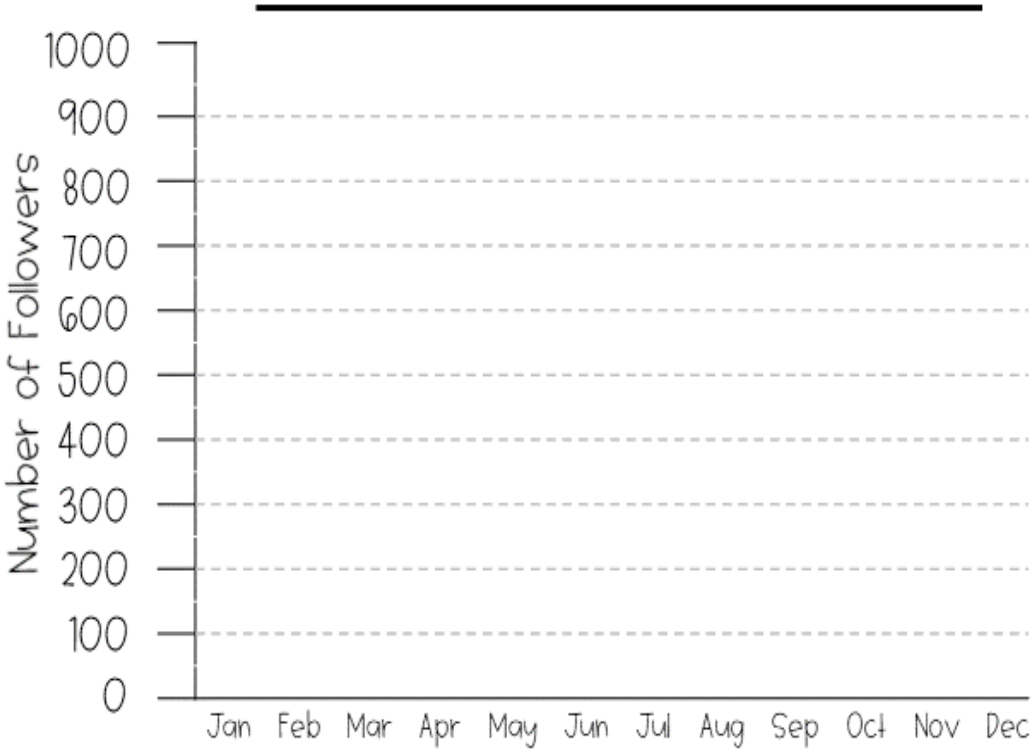
Graphing Practice (page 2 of 2)

Construct a Line Graph Line graphs are useful when you want to show change in data over time, such as showing how the number of followers you have on social media changes over time.

Directions:

- Use the data table on the right to construct a line graph
- Include a title

Month	Number of Followers
January	65
February	100
March	120
April	250
May	600
June	750
July	650
August	800
September	950
October	900
November	850
December	1,000



Scientific Method Practice The scientific method is a process that scientists follow in order to determine the answer to a problem. You are probably familiar with learning the scientific method as a process with a fixed number of steps, but the actual steps a scientist takes may change depending on the type of experiment that they are performing. The scientific method can be flexible, but usually follows the same basic order.

Directions: Put the steps of the scientific method in order from 1 to 8.

_____Do Research

_____ Design an experiment

_____Modify of repeat experiments

_____ State the problem

_____Determine if the hypothesis is rejected or accepted

_____ Analyze data

_____ Form a hypothesis

_____ Perform Experiment

Using your knowledge of the scientific method, match the steps to the parts of the scenario below.

A. State the problem
B. Do research
C. Form a hypothesis
D. Design an experiment
E. Perform experiment
F. Analyze data
G. Determine if hypothesis is rejected or accepted
H. Modify or repeat experiment

_____1. Katie makes a bar graph showing the number of times her brother eats all, part of, or none of each category of snack.

_____2. Katie is a nice sister who always fixes a snack for her little brother after school. One day, he does not want to eat the snack that she prepared. She wonders why.

_____ 3. Katie plans a menu for the next two weeks, dividing each snack two categories: “sweet” or “salty”. She prepares a data table, where she will mark if he eats all, part, or none of his snack.

_____4. Looking over her data, Katie sees that there is no clear trend as to whether her brother prefers sweet or salty snacks. She decides that she was wrong.

_____5. After determining that her original hypothesis was wrong, Katie decides that she will next measure how her brother eats after days he has gym class. Perhaps he is hungrier after gym class. She plans a new menu and makes a new data table to fill out.

_____6. Katie looks in the kitchen cabinets at home to see what food is available. She makes a list of all the snacks that she has prepared for her brother over the last month.

_____7. She hypothesizes that her brother prefers salty snacks.

_____8. Katie follows the menu for two weeks and makes observations after her brother finishes eating. She marks on her data table whether he eats all, part, or none of his snack.

Scientific Variables Read the paragraph below, then identify the variables in each experiment.

Being able to identify the scientific variables in an experiment is an important skill for any scientist. When designing an experiment, it is important that you only test one variable at a time. The variable that you are testing is known as the independent variable, or IV. The part of the experiment that responds to the IV is known as the dependent variable, or DV. The dependent variable is usually the part of the experiment that you measure to see if your hypothesis worked or not.

Independent variable – part of the experiment that is tested or changed by the scientist (starts with the letter 'i'; "I change") Dependent variable – part of the experiment that responds to changes in the independent variable; is measured for results

1. You decide to test whether charcoal helps purify water or not. You design a filter that contains charcoal and run water from a nearby stream through the filter. Afterward, you test the water for contaminants.

   Independent variable: _____

   Dependent variable: _____

2. You decide to test whether an insect repellant is effective or not. You apply insect repellant to your right arm and count how many insects land on your arm over an hour.

   Independent variable: _____

   Dependent variable: _____

Scientific Variables (Part 2) Identify the variables in the experiment.

You decide to test whether plants help prevent erosion of soil or not. You take two samples of soil, and plant grass in one of the samples. Once the grass has taken root, you pour water through both soil samples and measure how much soil is removed from each sample.

1. If you were to perform this experiment, what would your hypothesis be?

   _____

   _____

2. Independent Variable:

   _____

3. Dependent Variable:

   _____

4. Control: _____

5. Constants: _____

Definitions:
Independent variable – part of the experiment that is tested or changed by the scientist (starts with the letter 'i'; "I change")
Dependent variable – part of the experiment that responds to changes in the independent variable; is measured for results
Control– part of the experiment that is used for comparison (does not interact with the independent variable).
Constant– part of the experiment that must remain the same

Different Types of Data

Read the paragraph below, then identify each data set as quantitative (write the letter N) or qualitative (write the letter L).

In an experiment, a scientist can collect different kinds of data. Sometimes data is measured with a tool like a thermometer or ruler. This kind of data is called quantitative data. Some examples of quantitative data include the number of leaves on a plant or the temperature of a liquid. Sometimes data consists of observations that cannot be measured. This kind of data is called qualitative data. Some examples of qualitative data include the color of a leaf or smell of a mineral.

_____1. Length of a piece of rope

_____2. Amount of food a dog eats

_____3. Color of a mineral

_____4. Number of insects attracted to a location

_____5. Density of a liquid

_____6. Shape of a cloud

_____7. Temperature of a substance

_____8. How a student feels after taking a test

_____9. Scent of a leaf

_____10. How many students like each type of pizza topping

_____11. If an animal's fur is soft or spiky

_____12. Mass of a rock

Making Inferences

Read the paragraph below, then write an inference based on each observation.

Sometimes scientists must consider facts and draw conclusions based on those facts. When a scientist does this, a scientist is making an inference. For example, you might walk into your classroom and see an empty candy wrapper on your teacher's desk. You observe the candy wrapper and infer that your teacher just ate a candy bar, even though you didn't see it.

Write inferences based on the observations below.

1. Looking at your desk, there is a ring of liquid on the desk.

   _____

2. When you walk into your classroom, you see a person that you don't recognize at the teacher's desk.

   _____

3. When you leave school, the sidewalk and roads are wet.

   _____

4. When you get home from school, the house smells like tacos.

   _____

5. You hear someone honking their car horn in the parking lot.

   _____

6. When you get to gym class, you see basketballs on the floor.

   _____

7. You see cat hair on someone's shirt.

   _____

Nature of Science Reading and Activity (Page 1 of 2)

Read the passage below and then answer the questions.

What is the NATURE OF SCIENCE?

When you hear someone talk about the Nature of Science, just what do they mean? That is a very good question. The Nature of Science is all about how science works and why is it important. The Nature of Science helps us to understand who scientists are and what scientists do. The Nature of Science is the background information that will help us to understand where scientific knowledge comes from. As you can probably tell, the Nature of Science means a lot of different things.

What is SCIENCE?

Science is what we call it when people use evidence (observations) to answer questions. Sometimes these questions are big questions and sometimes they are small questions. An example of a big science question is: How do living things change over time from generation to generation. An example of a small science question is: What kinds of vegetables grow well in Bend, Oregon during the summer? Gathering data or making observations can answer both of these questions.

Why is SCIENCE important?

Science is important because it is one of the most powerful ways that we can learn things about our World. By gathering evidence and using it to answer questions, science helps us to create knowledge. This knowledge can help us to do many new things, such as creating new medicines, discovering other planets, travel into space, understand why people get sick, and create new technology and many other things! Without science, we would not have cell phones, computers, electricity, light bulbs and many other things we use every day.

What are the BACKGROUND rules of science?

In order to better understand the things we learn from science, you should know that there are a few important rules of science.

1. When doing science, you need to use plenty of IMAGINATION and CREATIVITY. These two important skills help us to see things differently and come up with better inferences. By the way, an inference is when you put all of the clues together to make an explanation.
2. What we learn from science can change over time – our understanding grows! As we discover new ideas and technology we are able to get more evidence that can help us to make better inferences. An example is Pluto. Scientists used to call Pluto a planet, and then they got more evidence that helped them to decide that it really did not deserve to be called a planet.

3. Because we all have different backgrounds, we all see things a little bit differently. No two scientists think the exact same way. This is important because as a team, we can come together and share our ideas to come up with the best possible explanation

4. There is no such thing as the Scientific Method. What this means is that there are many different steps that are used when you do science. You don't always have to do those steps in a particular order to do science.

5. Science has nothing to do with believing. Science is based on evidence, not the supernatural. Scientists must use data and evidence to support their conclusions.

6. The more evidence you have, the stronger your explanation will be.

7. A scientific theory is not just a guess. Scientific theories are strong inferences that are based on multiple lines of evidence. Examples of scientific theories include evolution, gravity, and atomic theory.

Nature of Science Reading and Activity (Page 2 of 2)

Who are SCIENTISTS?

There are many different kinds of scientists in the world. Scientists are people who work in their own special area of science, based on years of college training. Most scientists finish high school and then go to college from four to ten years in order to get trained to become scientists. Scientists are problem solvers who love to answer questions that help us better understand things. Here are just a few different types of scientists:

- Astronomers - study space
- Archaeologists -study ancient cultures
- Biologists -study living things
- Ecologists -study living things and the environment
- Geneticists –study genetics
- Herpetologists -study reptiles
- Lepidopterists -study butterflies
- Marine Biologists -study life in the sea
- Paleontologists -study ancient life and fossils
- Chemists -study atoms, elements, and chemistry
- Geologists - study what the Earth is made of and how it changes over time.
- Oceanographers -study the ocean and its currents
- Computer Scientists –study computers
- Physicists –study forces, motion, and really small things like atoms.
- Criminologists –study crime
- Zoologists – study animals

Reading Comprehension Questions

1. When you hear someone say, "The Nature of Science", what are they talking about?

   _____
   _____
   _____
   _____

2. What do scientists use to answer questions?

   _____

3. What is an inference?

   _____
   _____

4. Does scientific knowledge ever change? (circle one) Yes No
5. Give an example to support your last answer:

   _____
   _____

6. Do scientists use their imaginations (circle one) Yes No
7. What is the difference between a scientific theory and a guess?

   _____
   _____

8. List four different names of scientists that you have never heard of before. Also, write down what it is that they study.

   _____
   _____
   _____
   _____

The Scientific Method Reading with Questions (Page 1 of 2)

Read the passage and then answer the questions.

You may not realize it, but you are a scientist. Even though you do not have college or university training, you practice scientific skills everyday of your life. Every time you wonder how to fix or repair something, you are being a scientist.

Observations are a large part of science, but there is more to science than observation. The word science is from the Latin word "scire," which means "to know." Scientists attempt to know things. They want answers to questions.

After facts are studied, observations taken, and experiments done, a theory is developed. A theory is the most logical explanation of events that occur in nature. A theory must be tested over and over again. When a theory has been tested many times and is accepted as true, it is called a law. Sometimes theories have to be changed, based on new evidence from observation and experimentation. But this is the heart of science: Allow questions to be asked and new scientific explanations to be developed. When scientists try to solve a problem they do it in an orderly and systematic way. The method the use is called the scientific method. The steps are described in the paragraphs below.

Suppose you tried to start your car on a cold morning. The car will not start and you notice ice frozen on the pavement underneath the car. You realize that you forgot to put anti-freeze in the car.

Step one: Stating a problem or question clearly. Why does anti-freeze mixed with water in the engines cooling system keep the water from freezing and cracking the block of the car? This is the type of questions that a scientist would ask.

Step two: Research your problem. Use the library, the Internet, and interview people. You may have an answer without testing.

Step three: Form a hypothesis. Once the problem has been stated and researched, a hypothesis is formed. A hypothesis is an educated guess to a possible solution to the question or problem being studied. It should be in the form "I think _____, because _____." For example, your hypothesis could be: "I think that anti-freeze keeps the water from freezing and cracking the block, because the chemicals create a chemical reaction causing heat."

Step four: Design and perform experiments. Next, a scientist will test the hypothesis by performing one or more experiments. In the experiment, a scientist attempts to test only one variable at a time. This is called the INDEPENDENT VARIABLE – it is the only variable that you change in an experiment. The DEPENDENT variable is the variable that you measure in the experiment. It is important to keep EVRYTHING ELSE THE SAME IN AN EXPERIMENT. These are called "control" or "control variables" which is the part of the experiment that is not changed) This is done so that any results can be attributed to the one and only variable – the independent variable. The also experiment consists of a complete materials list and a set of detailed, step by step procedures which allow scientists to carry out the experiment.

Step five: Recording and analyzing data and results. In any experiment, the scientist observes and records data. (Use the rules you have learned about making data tables and graphs) Charts and graphs might be used. Computers are helpful when there is a large amount of data to be recorded. The scientist would then study the data in order to make a conclusion.

The Scientific Method Reading with Questions (Page 2 of 2)

Step Six: Stating a conclusion. A scientist will run an experiment over and over again. When the data seem to be accurate, a conclusion can be reached. A conclusion states whether or not the hypothesis was correct. A conclusion also includes an analysis of errors which occurred during the experiment. After a conclusion has been reached, there are usually other questions that arise. And the scientific method is used again to answer these new questions.

Questions:

1. What is a theory that is accepted as true called? _____

2. What is the name of the process that scientists use to solve problems?

_____

3. What is a hypothesis? _____

4. Provide an example of a hypothesis about anything. _____

_____

5. What is the independent variable? _____

6. Why should there be only one independent variable in an experiment? _____

_____

7. What is the dependent variable? _____

8. "What are controls" or "control variables"? _____

_____

9. Why is it so important to have control variables? _____

_____

10. When can a conclusion be made? _____

_____

11-15. List the steps of the scientific method in order.

11. _____ 12. _____

13._____ 14. _____

15._____

Exploring the Scientific Method (page 1 of 2) Read the passage and answer the questions about the Scientific Method.

The ***scientific method*** is a process that scientists use to better understand the world around them. It includes making observations and asking a question, forming a hypothesis, designing an experiment, collecting and analyzing data, and drawing a conclusion. This, is sometimes also referred to as scientific inquiry. A ***hypothesis*** is a possible explanation for an observation. A good scientist will design a controlled experiment to test their hypothesis. In a ***controlled experiment***, only one variable is tested at a time. It is called the manipulated or ***independent variable***. The experimental group will test the independent variable. The ***control group*** will be left alone, so you have something to compare your results to. The variable that determines the data is the responding, or ***dependent variable***. It responds to the manipulated variable. All other variables in the experiment should remain the same, because if you change more than one variable, you will not know which variable explained your results. Once something has been tested many different times by many different scientists, it can become a ***scientific theory***. It is different from a ***scientific law***, which describes what will happen every time under a particular set of conditions.

Questions:

True or False If the answer is true, write "true" on the line. If the answer is false, replace the underlined word or phrase with one that will make the sentence correct. Write the new words on the line.

1. _____ *Forming a hypothesis* is the first step of the scientific method
2. _____ A scientific law is different from a *scientific theory* because it describes something in nature without attempting to explain it.
3. _____ In order for a *hypothesis* to be testable, scientists need to be able carry out investigations that will either support or disprove it
4. _____ The *experimental group* is the group that is left alone during the experiment
5. _____ The *manipulated variable* is the same thing as the independent variable.

Matching Match the word to the definition. Write the letter on the line.

6._____Scientific inquiry

7. _____ Hypothesis

8. _____Control Group

9. _____Experimental Group

10. _____ Independent Variable

11. _____ Dependent Variable

12. _____Scientific Theory

13. _____Scientific Law

A. This group shows the effect of the variable being tested

B. This is the one variable that is changed

C. A well tested explanation for experimental results

D. The many ways in which scientists study the natural world

E. A possible answer to a scientific question

F. This describes an observed pattern in nature

G. This group is left alone and not experimented on

H. This is the variable that gets measured

Exploring the Scientific Method (page 2 of 2)

Identifying Read through the following scenarios. Identify the control group, the experimental group, the independent variable, and the dependent variable.

Scenario	Independent Variable	Dependent Variable	Experimental Group	Control Group
A company wants to test a new dog food that is supposed to help overweight dogs lose weight. 50 dogs are chosen to get the new food, and 50 more continue their normal diets. After one month, the dogs are checked to see if they lost any weight.	14.	15.	16.	17.
A new sunscreen has been developed that is supposed to be more effective at preventing sunburn. 30 participants spray one arm with the new formula, and spray the other arm with the leading formula. After 4 hours in the sun, their skin is evaluated for any redness.	18.	19.	20.	21.
A student wants to study the effect of sunlight on plant growth. In his experiment, 12 plants receive normal amounts of sunlight, but half of them are kept under bright sun lamps all night long. After 6 weeks, the plants' heights are measured.	22.	23.	24.	25.

Answer Key This is for parents to use to check their student's work.

Page 2: Student answers will vary depending on scenario.

Page 3:

Bean Plants:

1. Collect & Analyze Data
2. Question/Problem
3. Conclusion
4. Hypothesis
5. Experiment

Sugar Water & Plants:

1. Collect & Analyze Data
2. Hypothesis
3. Experiment
4. Conclusion
5. Question/Problem

Page 4:

1: Qualitative-data

2: Replication

3: Repetition

4: Hypothesis

5: Consistent

6: Quantitative-data

7: Independent-variable

8: Dependent-variable

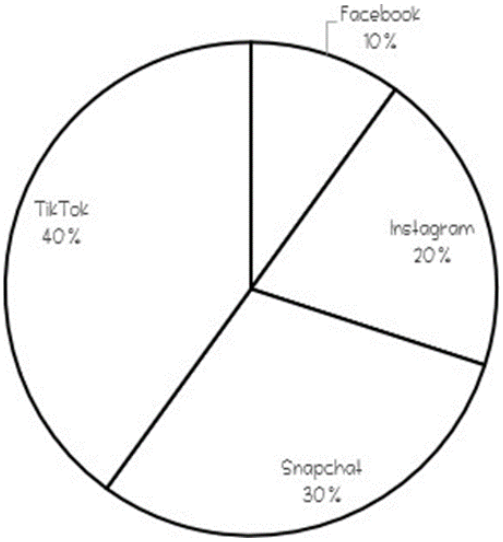
9: Evidence

10: Conclusion

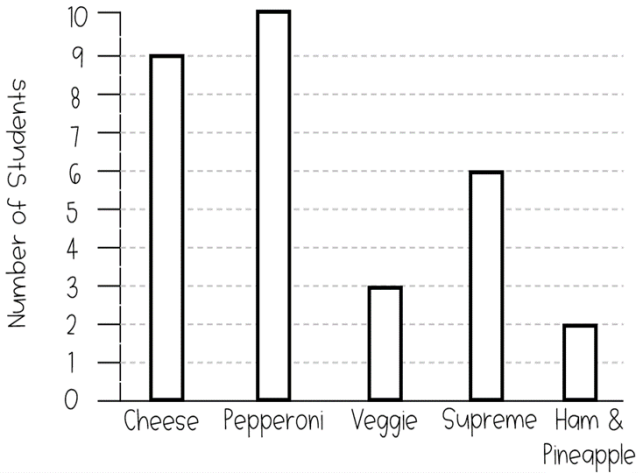
11: Durable

12: Controlled-variable

Pages 5-6: Note that students' charts may look slightly different. Titles may also vary.

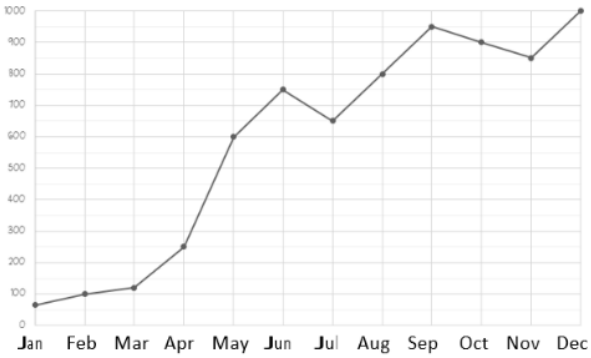


Pie chart



Bar chart

Line graph



Answer Key Page 2

Page 7:

___2___Do Research
___4___ Design an experiment
____8__Modify of repeat experiments
____1___ State the problem
___7____Determine if the hypothesis is rejected or accepted
____6___ Analyze data
____3___ Form a hypothesis
___5_____ Perform Experiment

1. F
2. A
3. D
4. G
5. H
6. B
7. C
8. E

Page 8:

1: Independent Variable: Charcoal filter Dependent Variable: Contaminants in water
2: Independent Variable: Insect repellant Dependent Variable: Number of insects that land on your arm

Part 2:

1. Answers will vary
2. Grass roots, soil with roots
3. Amount of soil that is removed
4. Soil sample with no plant
5. Type of soil, type of container, amount of water…

Page 9:

Types of Data:

1. N
2. N
3. L
4. N
5. N
6. L
7. N
8. L
9. L
10. N
11. L
12. N

Making Inferences: Note that there will be a variety in answers.

1. The person who sat here before had a cold drink.
2. There is a substitute for your class.
3. It rained while you were in school.
4. Your mom is cooking tacos for dinner.
5. Someone's ride just got here.
6. You are playing basketball in gym class.
7. That person owns a cat

Page 11:

1. How science works and why is it important
2. Evidence
3. When you put all of the clues together to make an explanation
4. Yes
5. Answers will vary
6. Yes
7. Scientific theories are strong inferences that are based on multiple lines of evidence.
8. Answers will vary

Answer Key Page 3

Page 13:

1. A scientific law
2. The scientific method
3. An educated guess to a possible solution to the question or problem being studied
4. Answers will vary
5. The only variable that you change in an experiment
6. So that any results can be attributed to the one and only variable – the independent variable
7. The variable that you measure in the experiment
8. The parts of the experiment that is not changed
9. So that any results can be attributed to the one and only variable – the independent variable
10. After the experiment has been run over and over again, and the data seems to be accurate.
11. State the problem
12. Research your problem
13. Form a hypothesis
14. Design and perform experiments
15. Start a conclusion

Page 14:

1. False; making an observation
2. True
3. True
4. False; control group
5. True
6. D
7. E
8. G
9. A
10. B
11. H
12. C
13. F

Page 15:

14. New dog food
15. Weight lost
16. Dogs on new food
17. Dogs on normal diet
18. New sunscreen
19. Redness
20. Arm with new formula
21. Arm with leading formula
22. Sunlight
23. Plant height/growth
24. Plants kept under lamps
25. Plants getting just normal sun