

The Scientific Method

Study Guide

KEY TERMS

- **Analysis**- a study of the data looking for patterns, errors and meaning.
- **Conclusion**- a judgment that tells whether the data does or does not support the hypothesis
- **Data table**- an organized chart to record and keep data from the experiment.
- **Data**- a collection of facts - usually numbers.
- **Dependent variable**- the changes that are measured in an experiment.
- **Experiment**- testing an idea or hypothesis through a controlled investigation.
- **Hypothesis**- an educated guess that answers your question.
- **Independent variable**- what causes the changes measured in an experiment.
- **Inference**- drawing a conclusion or judgment based on data.
- **Observation**- making and recording measurements
- **Scientific method**- method of problem solving by testing a hypothesis.
- **Trial**- each test performed in an experiment.
- **Variable**- things that change or can be changed in an experiment.

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The Scientific Method is the way scientists get answers to their questions.

GOALS

#1: I will be able to write a hypothesis that can be tested by the scientific method.

#2: I will be able to identify the independent and dependent variables in an experiment.

#3: I will be able to record and graph data from an experiment.

#4: I will be able to use data collected in an experiment to decide if a hypothesis has been proven.

#5: I will be able to make observations using tools like thermometers, graduated cylinders and triple beam balances.

#6: I will be able to plan and carry out an experiment to test my own hypothesis and write procedures that others can follow.



The Basic Steps of the Scientific Method

1. State the problem
2. Research
3. Form a hypothesis
4. Test the hypothesis
5. Record and analyze data
6. State the conclusion

Things to know:

- Steps of the scientific method **IN ORDER**
- The details of each step
 - Example:
 - Why we do an experiment (to see if the hypothesis is right or wrong)
 - Variables (*independent*—what you change during an experiment; *dependent*—what you measure because of the change in an experiment)
 - Repeated trials (reduces chance of mistakes & makes sure your results are accurate)

Things to study:

- Scientific method worksheets and notes
- How-To handouts for scientific method, variables and hypothesis
- THIS STUDY GUIDE!
- Self-check tutorials and games on my web site (www.lincnet.org/joseph)

Things to do:

- Pay attention in class
- Do the homework
- Ask 1 question per class
- Read over class handouts and labs frequently!
- Schedule a **PTS** (personal training session) with me
- **R & R** (Revise & Review your work)
- Have friends, siblings and parents quiz you once a week

Test Prep- *similar questions like the ones below will be on the unit test*

1. What is a hypothesis?
2. Write a hypothesis about a paper towel that could be **tested** by an experiment.
3. What is one way you could **test** your hypothesis?
4. What should you do with the data (results) of your experiment?
5. Why do we use the scientific method?
6. What do you do with the results (data) of your experiment?
7. What is the difference between independent and dependent variable?
8. What are the steps of the scientific method? (You also need to know what happens in each step)
9. How is data organized in an experiment?
10. What is qualitative data?
11. What is quantitative data?
12. What is an inference?
13. Study the hypotheses and results of the scientific investigations below.

Hypothesis: *If I increase the air pressure in a basketball, then it will make it bounce higher.*

Independent variable: _____ Dependent variable: _____

Data:

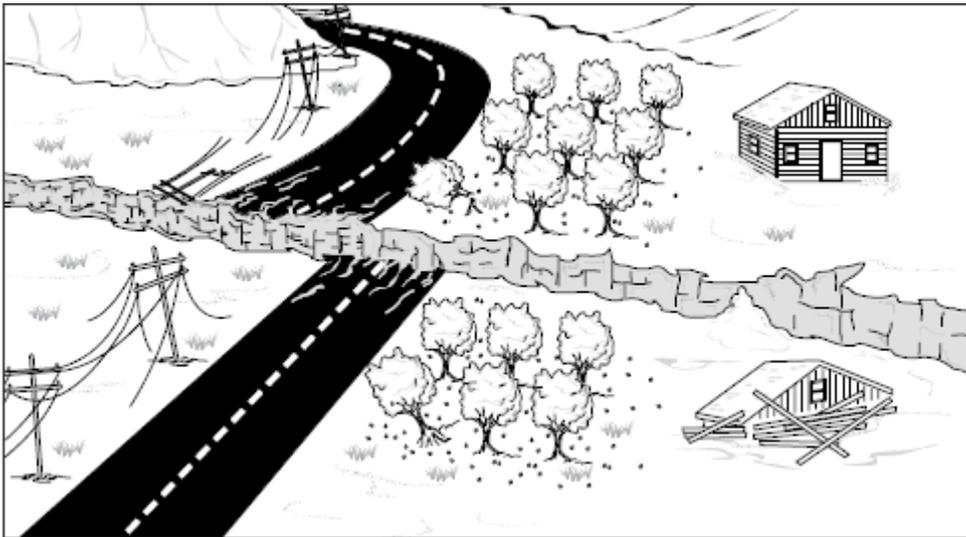
Height of Bounce			
Drop	4 lbs. Air pressure	8 lbs. of Air pressure	12 lbs. of air pressure
#1	53 cm	131 cm	176 cm
#2	51 cm	140 cm	171 cm
#3	52 cm	136 cm	173 cm
#4	56 cm	133 cm	180 cm
Average	53 cm	135 cm	175 cm

What does the data tell you about the hypothesis? Explain _____

Match the word with the definitions by putting a letter in front of each number

- | | |
|-----------------------------|--|
| ___ 1. Hypothesis | A. Prediction about the outcome of an experiment |
| ___ 2. Dependent Variable | B. What you measure or observe to obtain your results |
| ___ 3. Independent Variable | C. Measurements and other observations |
| ___ 4. Observation | D. Statement that sums up what you learn from |
| ___ 5. Data | E. Factor that is changed in an experiment |
| ___ 6. Conclusion | F. What the person performing the activity sees, hears, feels, smells, |

Use the picture below to answer the following questions.



1. Write at least 3 observations:

2. Write at least 2 inferences:

3. Is the following statement an observation or an inference? *"The house collapsed at the same time that the poles fell down."* _____ **Explain** _____

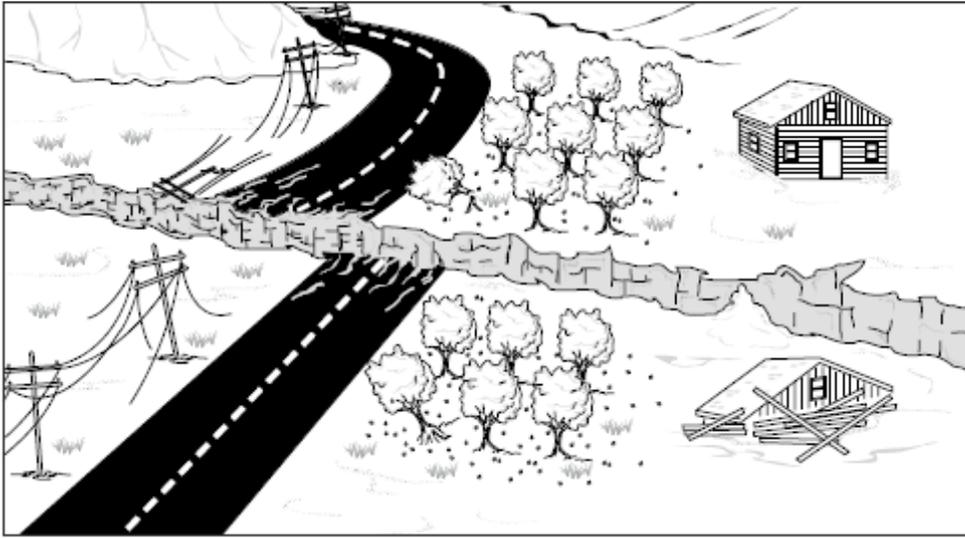
4. Is the following statement an observation or an inference? *"The road damage is serious, and it will be very expensive to repair."* _____ **Explain** _____

5. Is the following statement an observation or an inference? *"The house is built on unstable land."*
_____ **Explain** _____

6. Is the following statement an observation or an inference? *"The damage at this scene was caused by an explosion."*
_____ **Explain** _____

ANSWER KEY

Use the picture below to answer the following questions.



1. Write at least 3 observations:

Sample: Ground is broken. One house has collapsed. The highway is broken. Some telephone poles are tilted. Some wires are down.

2. Write at least 2 inferences: **Answers will vary. Sample inference: An earthquake has occurred.**

3. Is the following statement an observation or an inference? "The house collapsed at the same time that the poles fell down." **Explain. Inference. The illustration does not show the order of events.**

4. Is the following statement an observation or an inference? "The road damage is serious, and it will be very expensive to repair." **Explain Inference. The statement relies on cost information not shown in the illustration. Also—you didn't see it happen**

5. Is the following statement an observation or an inference? "The house is built on unstable land." **Explain Inference. The illustration does not show whether the land is stable or unstable.**

6. Is the following statement an observation or an inference? "The damage at this scene was caused by an explosion." **Explain Inference. The illustration does not show what caused the damage.**