

## Activity 5: Evaluating Experiment Conclusions

Name \_\_\_\_\_

Date \_\_\_\_\_

Class \_\_\_\_\_

### Part 1

#### The Magnet Experiment

Recall the experiment described in the Practice for Activity 3. A student performs an experiment to determine if larger magnets are stronger than smaller magnets.

To measure the strength of each magnet, he holds the magnet and determines how many small paper clips he can hang from it before the last one falls off. (See picture at the right.) He repeats his measurement four times for each magnet and records his data in the following table. He also calculates averages for the trials.

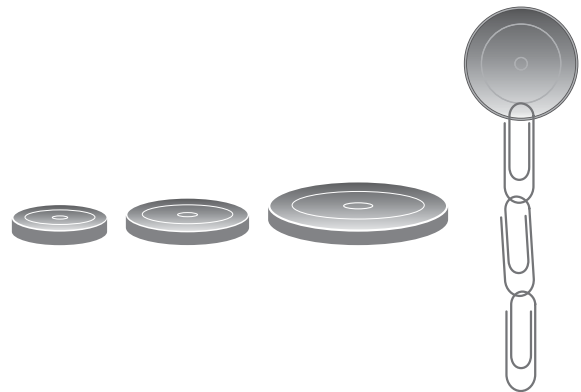


Table: Number of Paper Clips Magnet Could Hold			
Trials	Size of Magnets		
	Small Magnet	Medium Magnet	Large Magnet
Trial 1	2	3	5
Trial 2	1	3	4
Trial 3	2	5	4
Trial 4	2	3	5
Average	1.75	3.5	4.5

In this experiment, the manipulated variable is the size of the magnets. The responding variable is the number of paper clips each magnet can hold. In performing the experiment, he first ensured that all of the magnets were made from the same material and that the paper clips were identical.

He writes the following conclusion with reasons for this experiment:

*“I believe that there is no relationship between the size of a magnet and its strength because in one of my trials, I found that the middle-sized magnet held more paper clips than either the small-sized or large-sized magnet. Also, I believe the strength of a magnet really doesn’t have anything to do with size, but instead depends on what material the magnet is made out of.”*

1. Use *How To Analyze an Experiment Design and Determine if the Experiment is a Fair Test* to determine whether the experiment he performed is a fair test. Write your conclusion on the next page.

His experiment \_\_\_\_\_ (*is, is not*) a fair test because \_\_\_\_\_

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2. The student’s reasons for his conclusion are poor. He says, “In one of my trials, I found that the middle-sized magnet held more paper clips than either the small-sized or large-sized magnet.” Which of the following responses tells why his reason is poor?

Write your choice on the lines below.

- It is based on an opinion rather than the evidence from the experiment.
- It uses just part of the available data.

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3. He also says, “I believe the strength of a magnet really doesn’t have anything to do with size, but instead on what material the magnet is made out of.” Which of the following responses tells why his reason is poor? Write your choice on the lines below.

- It is based on an opinion rather than the evidence from the experiment.
- It uses just part of the available data.

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## Part 2

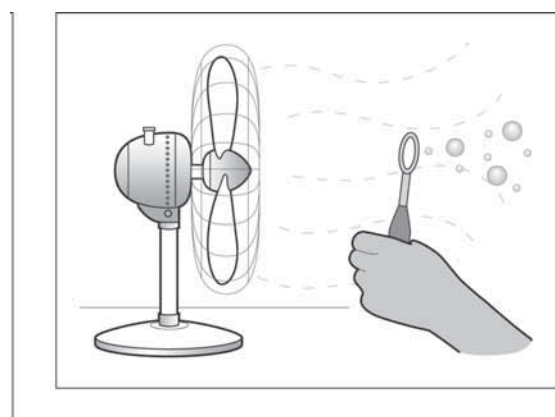
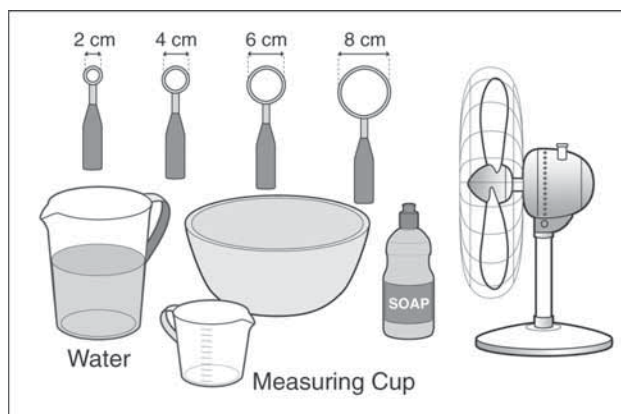
### The Bubble Experiment

As part of the scenery for your school play, the stage crew needs to blow lots of soap bubbles onto the stage for the final scene. They want to figure out the best size wand for blowing soap bubbles.

One member of the crew, Clark, collects four bubble wands of different sizes, a bowl, water, liquid soap, a measuring cup, and a fan. To make the soap solution, he pours 1 cup water and 1/4 cup liquid soap into the bowl.

To do the experiment, Clark dips each wand into the solution, holds the wand in front of the fan (the fan is on the lowest setting), then counts the number of bubbles that form. He does this three times for each wand. Halfway through the experiment, just after he finishes testing the 4 cm wand, Clark spills the soap solution in the bowl. To make more soap solution, he mixes together 2 cups water and 1/4 cup liquid solution, then collects data for the remaining two wands.

The best values from Clark's measurements are shown in the table at right.



Wand size (cm)	Average number of bubbles blown
2	9
4	7
6	5
8	3

**PRACTICE** Activity 5: **Evaluating Experiment Conclusions**

Read and evaluate Clark’s conclusion and reasons. Use *How To Evaluate an Experiment Conclusion* to decide whether the conclusion he wrote is valid or not.

1. Clark wrote:

**Conclusion** - *I conclude that, when the size of the bubble wand increases, the number of bubbles made decreases.*

**Reason** - *When we increased the size of our bubble wand from 2 cm to 4 cm to 6 cm to 8 cm, the average number of bubbles blown decreased from 9 to 7 to no bubbles for the biggest two wands.*

Use the Criteria	Evaluate the Conclusion
<p><b>Step 1</b></p> <p>The experiment is a fair test.    Yes    No</p> <p>If it is a fair test, go to Step 2. If it is not, go to Step 3.</p> <p><b>Step 2</b></p> <p>Each supporting reason is based on evidence, not opinion.    Yes    No</p> <p>The supporting reasons use all the available evidence (data), not just part of the evidence.    Yes    No</p>	<p><b>Step 3</b></p> <p>We think Clark’s conclusion _____valid, because (is, is not)</p> <p>_____</p> <p>_____</p> <p>_____</p> <p>_____</p> <p>_____</p> <p>_____</p> <p>_____</p>

**A Different Bubble Experiment**

Another stage crew conducted a similar bubble experiment. Assume that they conducted the experiment so that it was a fair test. The class averages for their data are shown below:

Wand size (cm)	Average number of bubbles blown
2	9
4	7
6	5
8	3

Read and evaluate the following student's conclusion and reasons.

2. Mary wrote:

**Conclusion** - *I conclude that, when size of the bubble wand increases, the number of bubbles made decreases.*

**Reason** - *Because the average number of bubbles for the 2 cm wand was 9 bubbles, and the average number of bubbles for the 6 cm wand was 5 bubbles.*

Use the Criteria	Evaluate the Conclusion
<p><b>Step 1</b></p> <p>The experiment is a fair test.    Yes    No</p> <p>If it is a fair test, go to Step 2. If it is not, go to Step 3.</p> <p><b>Step 2</b></p> <p>Each supporting reason is based on evidence, not opinion.    Yes    No</p> <p>The supporting reasons use all the available evidence (data), not just part of the evidence.    Yes    No</p>	<p><b>Step 3</b></p> <p>We think Mary's conclusion _____valid, because (is, is not)</p> <p>_____</p> <p>_____</p> <p>_____</p> <p>_____</p>

3. Xuan wrote:

**Conclusion** - *I conclude that, when size of the bubble wand increases, the number of bubbles made decreases.*

**Reason** - *Because I think smaller bubbles will look better on stage.*

Use the Criteria	Evaluate the Conclusion
<p><b>Step 1</b></p> <p>The experiment is a fair test.    Yes    No</p> <p>If it is a fair test, go to Step 2. If it is not, go to Step 3.</p> <p><b>Step 2</b></p> <p>Each supporting reason is based on evidence, not opinion.    Yes    No</p> <p>The supporting reasons use all the available evidence (data), not just part of the evidence.    Yes    No</p>	<p><b>Step 3</b></p> <p>We think Xuan’s conclusion _____valid, because (is, is not)</p> <p>_____</p> <p>_____</p> <p>_____</p> <p>_____</p>

4. Carlos wrote:

**Conclusion** - *I conclude that, when size of the bubble wand increases, the number of bubbles made decreases.*

**Reason** - *In looking at all of the data collected, as the wand size continually increased (from 2 to 8 cm), the average number of bubbles continually decreased from (9 to 3).*

Use the Criteria	Evaluate the Conclusion
<p><b>Step 1</b></p> <p>The experiment is a fair test.    Yes    No</p> <p>If it is a fair test, go to Step 2. If it is not, go to Step 3.</p> <p><b>Step 2</b></p> <p>Each supporting reason is based on evidence, not opinion.    Yes    No</p> <p>The supporting reasons use all the available evidence (data), not just part of the evidence.    Yes    No</p>	<p><b>Step 3</b></p> <p>We think Carlos’s conclusion _____valid, because (is, is not)</p> <p>_____</p> <p>_____</p> <p>_____</p> <p>_____</p>