

Date: _____

Your Name: _____



**NEW ENGLAND
COMMON ASSESSMENT PROGRAM**

Released Science Inquiry Task

Testing Magnetic Strength

2016

Grade 4

Student Answer Booklet

SCIENCE

Organizing and Presenting Your Data

Directions: You will work **on your own** for this part of the inquiry task. You will use the results of your investigation to create one graph and to answer questions.

Word Bank

| | |
|----------------------------|---|
| Magnet | an object that produces an area of magnetic force called a magnetic field |
| Magnetic attraction | the pull between some metals and a magnet |
| Median | the middle number in a list of numbers arranged from smallest to largest Example: With a data set of 4 cm, 2 cm, and 5 cm, arrange the measures from smallest to largest: 2 cm, 4 cm, 5 cm. The median for this data set is 4 cm. |
| Trial | each time a test is repeated |

1. Copy Data Table 1 (including your labels) from page 6 in your Inquiry Booklet into Data Table 1 below.

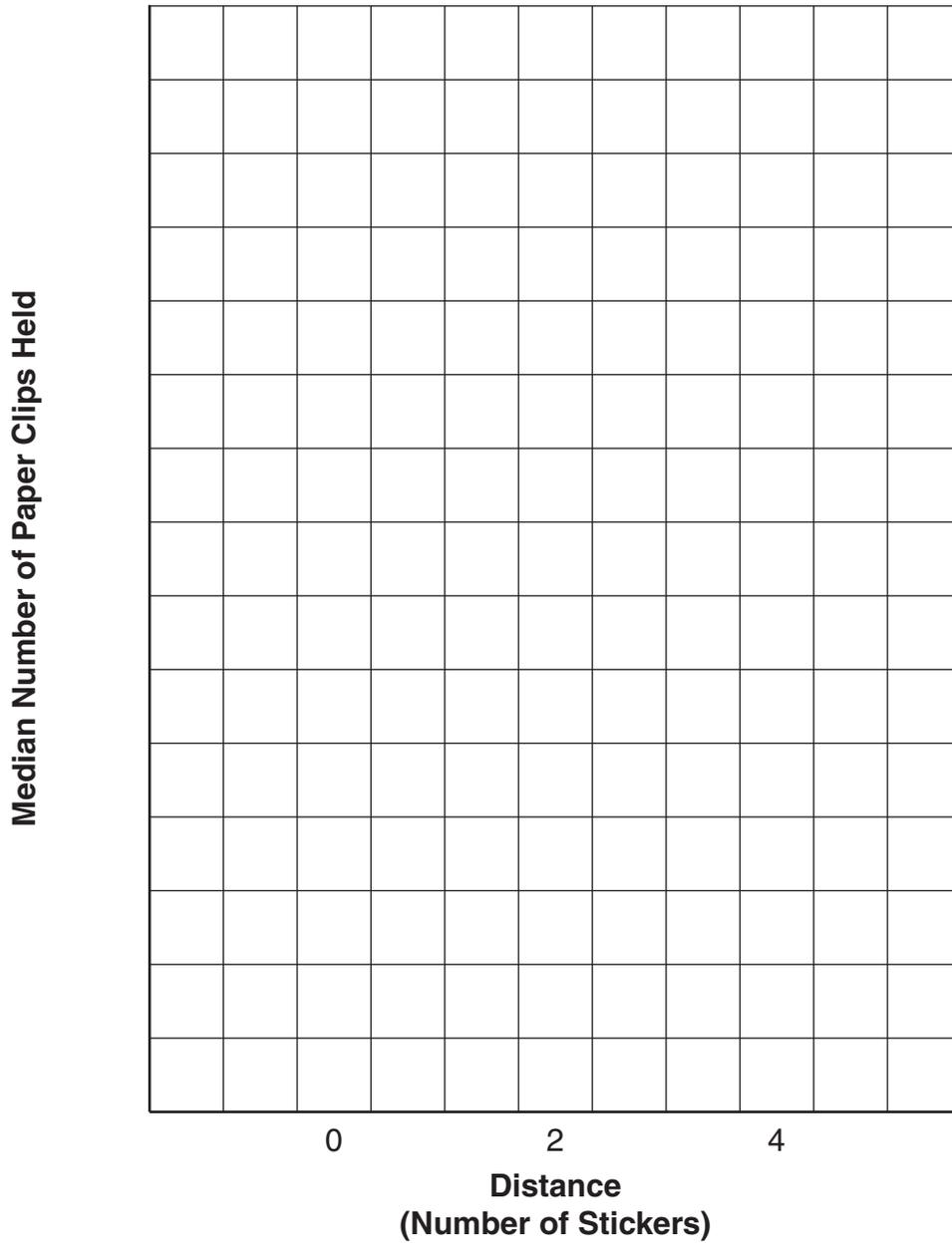
Data Table 1: Strength of Magnet at Three Distances

| | Number of Paper Clips Held at Three Distances | | | Median |
|--|---|--|--|--------|
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |

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2. Use the data that you recorded in Data Table 1 to create a bar graph that shows the **median** number of paper clips the magnet held for each of the three distances. Label and title your graph.

Title: _____



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Analyzing and Using Your Results

3. Describe what your graph on page 2 shows about the strength of a magnet.

The students notice a pattern in the magnet's strength when they add stickers to the bottom of their magnet.

4. Use evidence from Data Table 1 and your graph to describe a pattern in the data as the number of stickers increased.

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You investigated the following research question:

How does a magnet's attraction to a metal change as the distance from the metal increases?

Copy your prediction from page 3 in your Inquiry Booklet onto the lines below.

I predict

because

5. Check the box next to the statement that **best** describes whether your data and observations supported or did not support your prediction.

- Yes, the data **supported** my prediction.
- No, the data **did not support** my prediction.

Use evidence from your investigation to explain **why** your data and observations did or did not support your prediction.

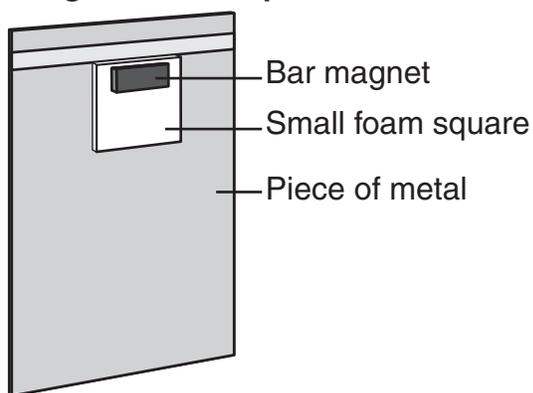
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Ana and Finn start to think about their art project again. They know that there are different sizes of artwork that need to hang on the walls.

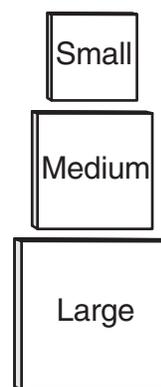
Since the students can use more than one magnet to hang the artwork, they decide to do a second investigation. They want to do the investigation without harming their artwork, so they use three different sizes of foam squares to represent the different sizes of artwork. The question that the students want to answer is this: **How does the size of the foam squares affect how strongly the magnet can hold an object?**

Each foam square in the investigation is the same type of foam and has the same thickness, but they are three different sizes. The students use three magnets that are the same size and shape and a piece of metal to represent the metal strip in the hallway. The setup and the different sizes of the foam squares are shown below.

Investigation 2 Setup



Three Foam Squares



First, Ana and Finn take the small foam square and observe how many magnets are needed to hold it on the piece of metal without the small foam square sliding or falling. Then they test the medium and large foam squares.

Their results are shown in Data Table 2 below.

Data Table 2: Number of Magnets Needed to Hold Different-Sized Foam Squares

| Size of Foam Square | Number of Magnets Needed | | | Median |
|---------------------|--------------------------|---------|---------|--------|
| | Trial 1 | Trial 2 | Trial 3 | |
| Small | 1 | 1 | 1 | 1 |
| Medium | 1 | 1 | 1 | 1 |
| Large | 2 | 2 | 2 | 2 |

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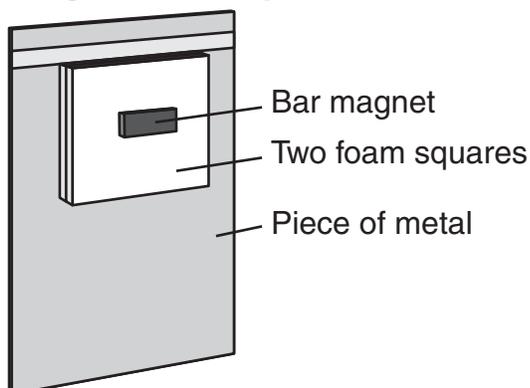
6. Use Data Table 2 to explain the relationship between the foam squares and the magnets.

Ana and Finn think about what they learned in Investigation 1 about magnet strength and distance and what they learned in Investigation 2 about the number of magnets needed to hold different-sized foam squares. They wonder how many magnets they will need to have enough strength to hold the artwork. Because some of the artwork is thicker than others, the students decide to do a third investigation. They want to find out the answer to this question: **How does the thickness of the foam squares affect how strongly the magnet can hold an object?**

The students want to test if having thicker artwork would affect the strength of the magnets. They use foam squares again to represent the thicknesses of the artwork and used the piece of metal to represent the metal strip in the hallway. This time, all of the foam squares are the same size and have the same thickness. The magnets are identical.

First, Ana and Finn take one foam square. They observe the smallest number of magnets that will hold the foam square to the piece of metal without the foam square sliding or falling. After Ana and Finn test one thickness, they test thicknesses of two and then three foam squares. The setup for two foam squares is shown below.

Investigation 3 Setup



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The students' results are shown in Data Table 3 below.

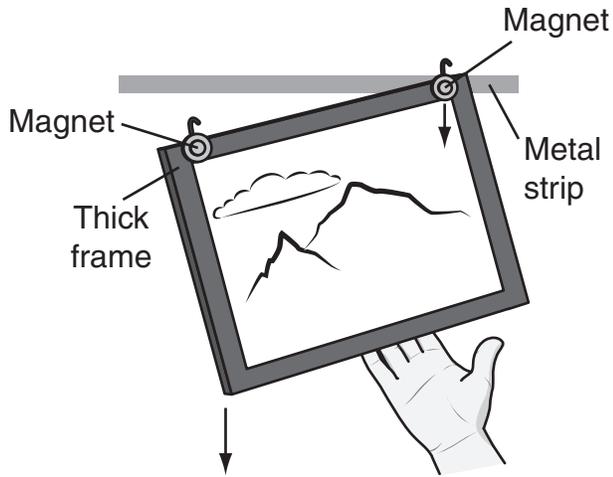
**Data Table 3:
Number of Magnets Needed to Hold Different Thicknesses**

| Number of Foam Squares (thickness) | Number of Magnets Needed | | | Median |
|------------------------------------|--------------------------|---------|---------|--------|
| | Trial 1 | Trial 2 | Trial 3 | |
| 1 | 1 | 1 | 1 | 1 |
| 2 | 1 | 1 | 1 | 1 |
| 3 | 3 | 3 | 3 | 3 |

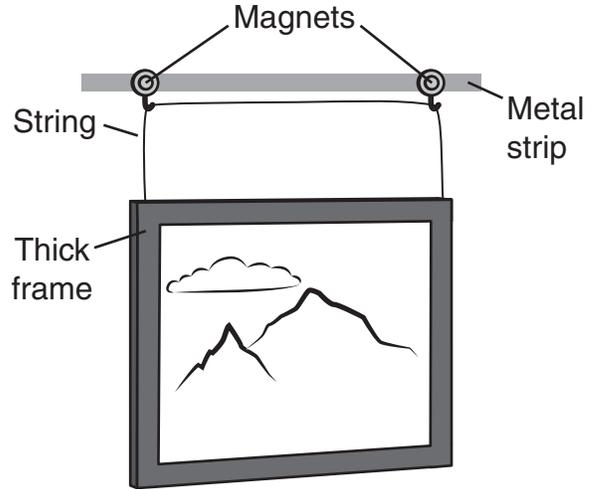
- 7.** Use Data Table 3 to explain why it was important for the students to keep the size and thickness of each foam square the same in Investigation 3 to be able to test how strongly a magnet can hold an object.

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Finn has a thick cardboard frame along the top of his art piece. He found two magnets with hooks in the classroom. Mr. Blagg tells Finn that the two magnets are the same strength. Finn tries using the two magnets on the corners of the frame to attach the art to the metal strip. The magnets do not hold the art to the metal strip, as shown below.



Therefore, Finn decides to connect one piece of string to the corners of the frame. He hangs the art piece from the hooks on the same two magnets, as shown below.



This solution works; it holds the art piece!

8. Explain why the first way Finn tries to hang his art piece does not work, but the second way does. Use evidence from the investigation you performed **and** the investigations you read about to support your answer.

