



**NEW ENGLAND  
COMMON ASSESSMENT PROGRAM**

**Released Items  
2016**

**Grade 4  
Science**

# Science

- 1 A student wants to find out how adding salt affects the time it takes water to freeze. The table below gives the results of two trials.

**Effects of Salt on Freezing**

<b>Container (50 mL water at 25°C)</b>	<b>Amount of Salt Added</b>	<b>Time (Trial 1)</b>	<b>Time (Trial 2)</b>
Container X	0 g	45 min	43 min
Container Y	5 g	70 min	75 min
Container Z	10 g	120 min	118 min

How does adding salt affect how water freezes?

- A. Adding salt makes water form thick ice.
- B. Adding salt speeds up freezing.
- C. Adding salt slows down freezing.
- D. Adding salt makes water form small ice cubes.

- 2 A student has a ball of clay that weighs 3000 grams. She shapes the clay into three equal-sized cubes and weighs the clay again.

Which statement describes the three cubes of clay?

- A. Together, the cubes weigh 2000 grams.
  - B. Together, the cubes weigh 6000 grams.
  - C. Each cube of clay weighs 1000 grams.
  - D. Each cube of clay weighs 3000 grams.
- 3 A person makes pancakes in a frying pan. He slides the pancakes onto a plate and puts some butter on top of the pancakes. The butter soon melts.

In which direction does the heat flow so that the butter melts?

- A. from the butter to the pancakes
- B. from the pancakes to the butter
- C. from the plate to the butter
- D. from the butter to the frying pan

- 4 The table below shows the characteristics of four minerals.

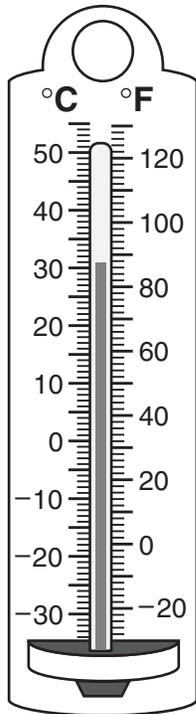
### Characteristics of Minerals

Mineral	Hard or Soft	Shiny or Dull	Weight
W	Soft	Shiny	4 g
X	Hard	Shiny	6 g
Y	Hard	Dull	3 g
Z	Hard	Dull	8 g

Which minerals are **most likely** the same kind?

- A. Minerals W and X
- B. Minerals X and Y
- C. Minerals Y and Z
- D. Minerals W and Z

- 5 The thermometer shown below gives the temperature on Day X. The chart next to the thermometer describes the types of days to expect at different temperatures.



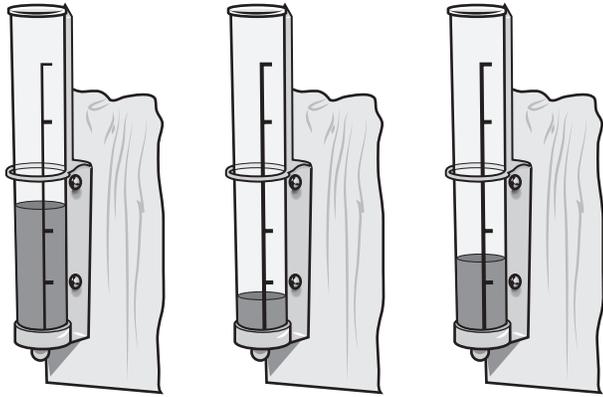
**Day X  
Temperature**

Temperature	Description
40°C/104°F	Heat wave
30°C/86°F	Good day for a swim
20°C/68°F	Nice day
10°C/50°F	A bit chilly—wear a light jacket
0°C/32°F	Time for a coat (water freezes)

Based on the temperature shown on the thermometer, which phrase from the chart describes Day X?

- A. “Heat wave”
- B. “Good day for a swim”
- C. “Nice day”
- D. “Time for a coat”

- 6 Rain gauges are set up outside three schools during the month of April. At the end of the month, the data are collected, as shown in the diagram below.



Front Street School

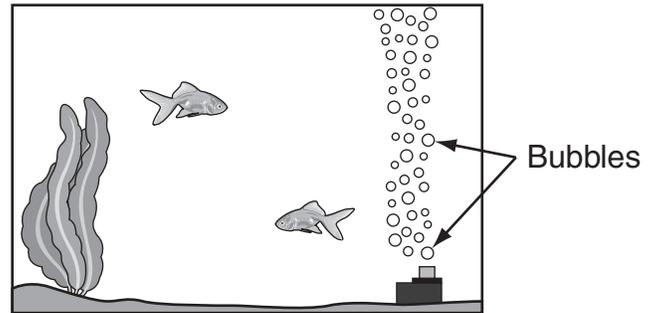
Bartlett School

Country Day School

The data collected from the rain gauges **best** supports which conclusion?

- A. More rain fell at Bartlett School than at Front Street School.
- B. Less rain fell at Country Day School than at Bartlett School.
- C. More rain fell at Country Day School than at Bartlett School.
- D. Less rain fell at Front Street School than at Bartlett School and Country Day School together.

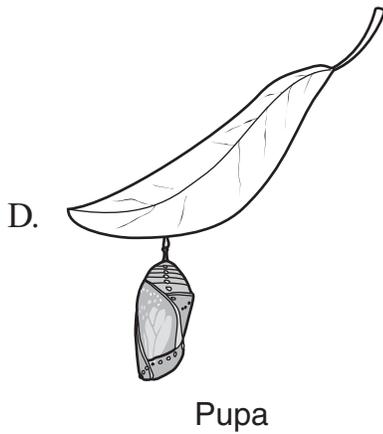
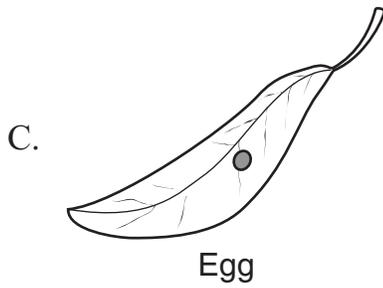
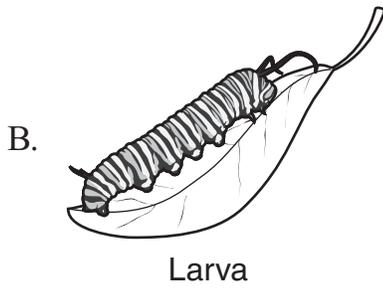
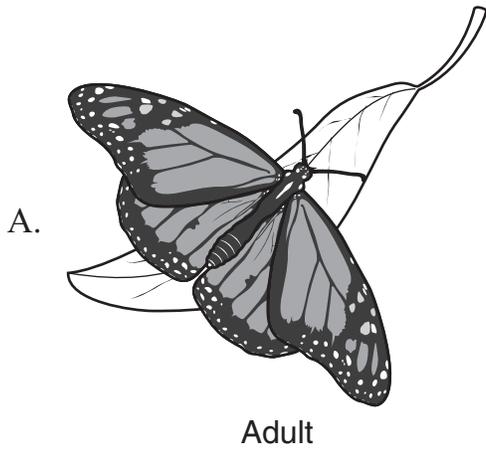
- 7 Many small fish tanks have a pump that blows bubbles into the water, as shown below.



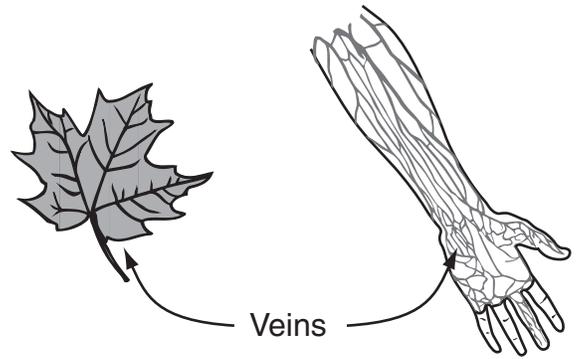
The bubbles help the fish survive. How do the bubbles help the fish survive?

- A. by adding food to the water
- B. by adding air to the water
- C. by keeping the water clean
- D. by keeping the water warm

8 During which stage in the life cycle of a butterfly does it eat plant leaves and grow the most?



9 Both plants and humans have veins, as shown in the diagram below.



Veins do almost the same job in plants and in humans. What job do veins do?

- A. give support
- B. break down food
- C. sense heat
- D. transport materials

- 10 Marc and John are alike in many ways. They are taller than anyone else in the class. They both enjoy playing soccer and reading. They both have curly black hair and blue eyes. They both play instruments in a band.
- a. Identify **three** characteristics that show that Marc and John might have the same birth parents. Explain your reasoning.
  
  - b. Identify **three** characteristics that Marc and John learned. Choose **one** and explain what a person has to do to learn this characteristic.



## **Test Administrator Instructions for Setup** **NECAP Science Grade 4 Inquiry Task: Testing Magnetic Strength**

The materials enclosed are for **1** setup, **5** setups, or **10** setups.

**Materials:** 1 setup (for 1, 2, or 3 students):

1 placemat for all materials (8.5" × 11")

1 magnet

1 paper clip for hook

4 stickers

14 paper clips

1 wooden clothespin stand

### **Procedure for Setting up the Investigation**

1. Place one placemat on each workspace for each small group of students.
2. Place one set of materials in each designated spot on the placemat.
3. Instruct the students not to touch the materials on the placement until instructed to do so.



## Grade 4 Placemat

Magnet

1 paper clip for hook

Wooden  
clothespin  
stand

14 paper clips

4 stickers



**NEW ENGLAND  
COMMON ASSESSMENT PROGRAM**

**Released Items  
Support Materials  
2016**

**Grade 4  
Science**

**NECAP 2016 RELEASED ITEMS  
GRADE 4 SCIENCE**

**Grade 4 Science Released Item Information**

Item Number	Big Idea <sup>1</sup>	Assessment Target	Depth of Knowledge Code	Item Type <sup>2</sup>	Answer Key	Total Possible Points
1	INQ	PS 1-1	2	MC	C	1
2	SAE	PS 1-3	2	MC	C	1
3	SAE	PS 2-6	2	MC	B	1
4	INQ	ESS 1-1	2	MC	C	1
5	INQ	ESS 1-3	2	MC	B	1
6	NOS	ESS 1-3	2	MC	C	1
7	SAE	LS 1-2	1	MC	B	1
8	POC	LS 1-3	2	MC	B	1
9	FAF	LS 4-8	1	MC	D	1
10	POC	LS 4-9	2	CR4		4

**Grade 4 Science Released Inquiry Task Information**

Item Number	Big Idea <sup>1</sup>	Inquiry Construct	Depth of Knowledge Code	Item Type <sup>2</sup>	Total Possible Points
1	INQ	3-8	2	SA	2
2	INQ	3-8	2	CR3	3
3	INQ	3-10	2	SA	2
4	INQ	4-12	2	SA	2
5	INQ	1-2	2	SA	2
6	INQ	4-11	2	SA	2
7	INQ	2-6	2	SA	2
8	INQ	4-12	3	CR3	3

<sup>1</sup>Big Idea: NOS = Nature of Science, SAE = Systems and Energy, MAS = Models and Scale, POC = Patterns of Change, FAF = Form and Function, INQ = Scientific Inquiry

<sup>2</sup>Item Type: MC = Multiple Choice, CR = Constructed Response, SA = Short Answer

**NECAP 2016 RELEASED ITEMS  
GRADE 4 SCIENCE**

**PS1 (K-4) INQ-1** Collect and organize data about physical properties in order to classify objects or draw conclusions about objects and their characteristic properties (e.g., temperature, color, size, shape, weight, texture, flexibility).

- 1 A student wants to find out how adding salt affects the time it takes water to freeze. The table below gives the results of two trials.

**Effects of Salt on Freezing**

<b>Container (50 mL water at 25°C)</b>	<b>Amount of Salt Added</b>	<b>Time (Trial 1)</b>	<b>Time (Trial 2)</b>
Container X	0 g	45 min	43 min
Container Y	5 g	70 min	75 min
Container Z	10 g	120 min	118 min

How does adding salt affect how water freezes?

- A. Adding salt makes water form thick ice.
- B. Adding salt speeds up freezing.
- C. Adding salt slows down freezing.
- D. Adding salt makes water form small ice cubes.

**NECAP 2016 RELEASED ITEMS  
GRADE 4 SCIENCE**

**PS1 (K-4) SAE-3** Use measures of weight (data) to demonstrate that the whole equals the sum of its parts.

- 2 A student has a ball of clay that weighs 3000 grams. She shapes the clay into three equal-sized cubes and weighs the clay again.

Which statement describes the three cubes of clay?

- A. Together, the cubes weigh 2000 grams.
- B. Together, the cubes weigh 6000 grams.
- C. Each cube of clay weighs 1000 grams.
- D. Each cube of clay weighs 3000 grams.

NECAP 2016 RELEASED ITEMS  
GRADE 4 SCIENCE

PS2 (K-4) SAE-6 Experiment, observe, or predict how heat might move from one object to another.

- 3 A person makes pancakes in a frying pan. He slides the pancakes onto a plate and puts some butter on top of the pancakes. The butter soon melts.

In which direction does the heat flow so that the butter melts?

- A. from the butter to the pancakes
- B. from the pancakes to the butter
- C. from the plate to the butter
- D. from the butter to the frying pan

**NECAP 2016 RELEASED ITEMS  
GRADE 4 SCIENCE**

**ESS1 (K-4) INQ-1** Given certain Earth materials (soils, rocks or minerals), use physical properties to sort, classify, and describe them.

- 4 The table below shows the characteristics of four minerals.

**Characteristics of Minerals**

<b>Mineral</b>	<b>Hard or Soft</b>	<b>Shiny or Dull</b>	<b>Weight</b>
W	Soft	Shiny	4 g
X	Hard	Shiny	6 g
Y	Hard	Dull	3 g
Z	Hard	Dull	8 g

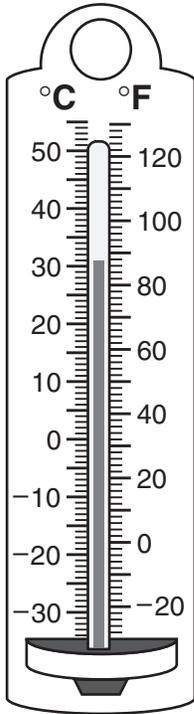
Which minerals are **most likely** the same kind?

- A. Minerals W and X
- B. Minerals X and Y
- C. Minerals Y and Z
- D. Minerals W and Z

**NECAP 2016 RELEASED ITEMS  
GRADE 4 SCIENCE**

**ESS1 (K-4) INQ-3** Explain how the use of scientific tools helps to extend senses and gather data about weather (i.e., weather/wind vane: direction; wind sock: wind intensity; anemometer: speed; thermometer: temperature; meter sticks/rulers: snow depth; rain gauges: rain amount in inches).

- 5 The thermometer shown below gives the temperature on Day X. The chart next to the thermometer describes the types of days to expect at different temperatures.



**Day X  
Temperature**

Temperature	Description
40°C/104°F	Heat wave
30°C/86°F	Good day for a swim
20°C/68°F	Nice day
10°C/50°F	A bit chilly—wear a light jacket
0°C/32°F	Time for a coat (water freezes)

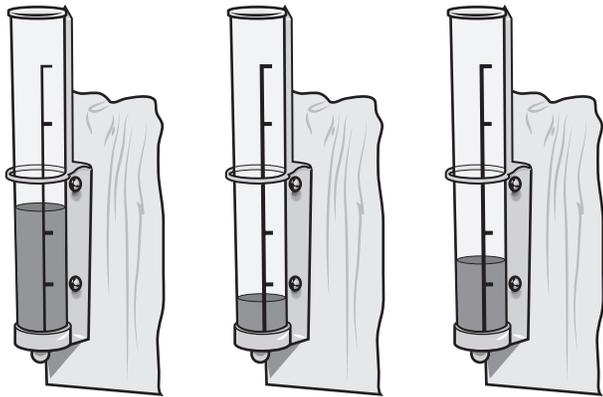
Based on the temperature shown on the thermometer, which phrase from the chart describes Day X?

- A. “Heat wave”
- B. “Good day for a swim”
- C. “Nice day”
- D. “Time for a coat”

NECAP 2016 RELEASED ITEMS  
GRADE 4 SCIENCE

ESS1 (K-4) NOS-3 Use results from an experiment to draw conclusions about how water interacts with earth materials (e.g., percolation, erosion, frost heaves).

- 6 Rain gauges are set up outside three schools during the month of April. At the end of the month, the data are collected, as shown in the diagram below.



Front Street School

Bartlett School

Country Day School

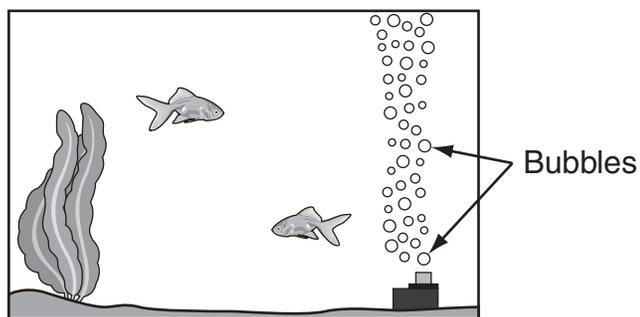
The data collected from the rain gauges **best** supports which conclusion?

- A. More rain fell at Bartlett School than at Front Street School.
- B. Less rain fell at Country Day School than at Bartlett School.
- C. More rain fell at Country Day School than at Bartlett School.
- D. Less rain fell at Front Street School than at Bartlett School and Country Day School together.

NECAP 2016 RELEASED ITEMS  
GRADE 4 SCIENCE

LS1 (K-4) SAE-2 Identify the basic needs of plants and animals in order to stay alive. (i.e., water, air, food, space).

- 7 Many small fish tanks have a pump that blows bubbles into the water, as shown below.



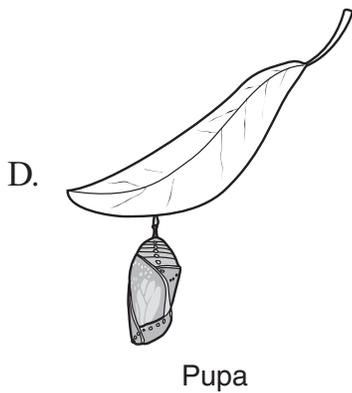
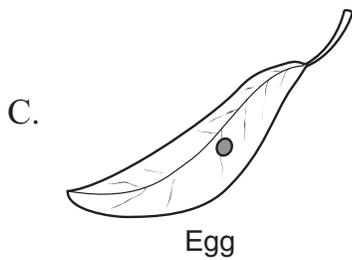
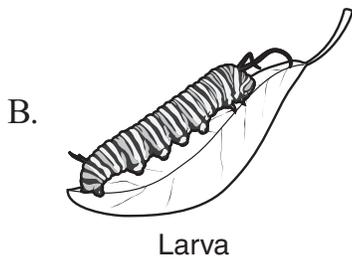
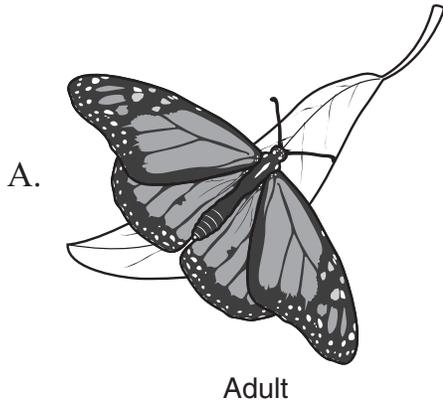
The bubbles help the fish survive. How do the bubbles help the fish survive?

- A. by adding food to the water
- B. by adding air to the water
- C. by keeping the water clean
- D. by keeping the water warm

NECAP 2016 RELEASED ITEMS  
GRADE 4 SCIENCE

**LS1 (K-4) POC-3** Predict, sequence or compare the life stages of organisms—plants and animals (e.g., put images of life stages of an organism in order, predict the next stage in sequence, compare two organisms).

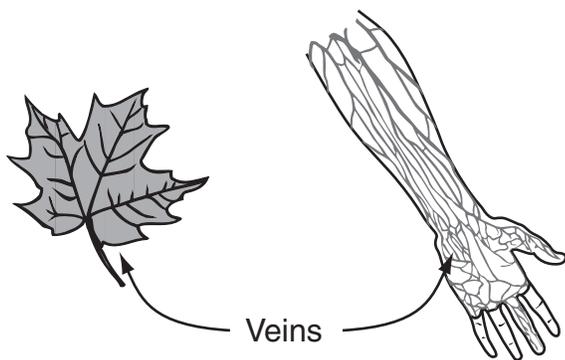
- 8 During which stage in the life cycle of a butterfly does it eat plant leaves and grow the most?



NECAP 2016 RELEASED ITEMS  
GRADE 4 SCIENCE

LS4 (K-4) FAF-8 Identify what the physical structures of humans do (e.g., sense organs—eyes, ears, skin, etc.) or compare physical structures of humans to similar structures of animals.

- 9 Both plants and humans have veins, as shown in the diagram below.



Veins do almost the same job in plants and in humans. What job do veins do?

- A. give support
- B. break down food
- C. sense heat
- D. transport materials

**NECAP 2016 RELEASED ITEMS  
GRADE 4 SCIENCE**

**LS4 (K-4) POC-9** Distinguish between characteristics of humans that are inherited from parents (i.e., hair color, height, skin color, eye color) and others that are learned (e.g., riding a bike, singing a song, playing a game, reading).

- 10 Marc and John are alike in many ways. They are taller than anyone else in the class. They both enjoy playing soccer and reading. They both have curly black hair and blue eyes. They both play instruments in a band.
- a. Identify **three** characteristics that show that Marc and John might have the same birth parents. Explain your reasoning.
  
  - b. Identify **three** characteristics that Marc and John learned. Choose **one** and explain what a person has to do to learn this characteristic.

**NECAP 2016 RELEASED ITEMS  
GRADE 4 SCIENCE**

**Scoring Guide**

<b>Score</b>	<b>Description</b>
<b>4</b>	The response demonstrates a thorough understanding of characteristics that are inherited from parents versus characteristics that are learned. The response lists three examples of inherited characteristics and explains the reasoning that supports that the students have the same birth parents. The response also includes three examples of learned characteristics and explains what a person has to do to develop a learned characteristic.
<b>3</b>	The response demonstrates a general understanding of characteristics that are inherited from parents versus characteristics that are learned. The overall response is general.
<b>2</b>	The response demonstrates a limited understanding of characteristics that are inherited from parents versus characteristics that are learned. The overall response is limited.
<b>1</b>	The response demonstrates a minimal understanding of characteristics that are inherited from parents versus characteristics that are learned. The overall response is minimal.
<b>0</b>	The response is incorrect or irrelevant to the skill or concept being measured.
<b>Blank</b>	No response

Part a: Height - tall; hair color - black; hair texture - curly; eye color - blue  
Inherited characteristics are passed from birth parents to children.

Part b: Traits that are learned - reading, playing soccer, playing instruments  
Learned characteristics develop because children have been taught or have practiced how to do something.

10 (A) The kids are tall and you inherit tallness it doesn't just happen. Curly black hair is also a thing you inherit. Blue eyes is something you inherit too! These are all things you get from your birth parents.

(B) The kids learned how to read in school, they couldn't read when they were newborns. They also learned to play in a band, but they had to practice to get better. If they like soccer they didn't inherit soccer from their parents for all I know their parents hate soccer.

The response demonstrates a thorough understanding of characteristics that are inherited from parents versus characteristics that are learned. In part (a), the response lists correct characteristics and explains that the kids receive these characteristics from their parents. In part (b), the response gives three correct characteristics with the explanation that the kids would need to learn how to read in school or practice soccer to learn how to play.

10

A. Three characteristics that show Marc and John might have the same birth parents are they both are taller than anyone else in the class. They both have curly black hair. They both have blue eyes.

B. Three characteristics that Marc and John learned are they play soccer and they play a instrument then they like reading. You have to learn to play a instrument by taking lessons.

The response demonstrates a general understanding of characteristics that are inherited from parents versus characteristics that are learned. In part (a), the response provides the correct characteristics, but the explanation is insufficient. In part (b), three correct characteristics are given with the explanation that you would have to take lessons to be able to play an instrument. With only an explanation missing in part (a), this response demonstrates general understanding.

NECAP 2016 RELEASED ITEMS  
GRADE 4 SCIENCE

SCORE POINT 2

⑩ Three characteristics that show Marc and John have the same birth Parents are they both have blue eyes, black curly hair, and they are both tall.

Three characteristics that they learned are they both play instruments, and they play soccer, also they enjoy reading. they just like to play soccer.

The response demonstrates a limited understanding of characteristics that are inherited from parents versus characteristics that are learned. In each part, the correct characteristics are listed, but there is no explanation for either part of the question.

NECAP 2016 RELEASED ITEMS  
GRADE 4 SCIENCE

SCORE POINT 1

10

they both have curly  
black hair, there both tall,  
have blue eyes

The response demonstrates a minimal understanding of characteristics that are inherited from parents versus characteristics that are learned. Three inherited traits are grouped together, but no explanations are provided, and there is no attempt at part (b).

SCORE POINT 0

10 Marc and John enjoy scorr and reading  
they dooth have dobacks hair and blue eyes  
They have interments in a band the might  
have the same birth parents because every  
thing they have incoming. They both are tall in  
their class, have cruly blacks hair, enjoy playing  
sports. They both are tall in their class  
they meares how tall they are so thats  
how they know they are both tall in their class.

The response is incorrect or irrelevant to the skill or concept being measured. The traits have not been grouped in a way that demonstrates understanding.

**NECAP 2016 RELEASED INQUIRY TASK  
GRADE 4 SCIENCE**

<b>Broad Area of Inquiry:</b>	<b>Conducting Investigations</b>
<b>Inquiry Construct 8:</b>	Use accepted methods for organizing, representing, and manipulating data.

- 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

**Scoring Guide**

Score	Description
<b>2</b>	The response demonstrates a general understanding of using accepted methods for organizing, representing, and manipulating data. The response includes a data table to record the median number of paper clips that one magnet held at three different distances.
<b>1</b>	The response demonstrates a limited understanding of using accepted methods for organizing, representing, and manipulating data. The overall response is limited.
<b>0</b>	The response is incorrect or irrelevant to the skill or concept being measured.
<b>Blank</b>	No response

**NECAP 2016 RELEASED INQUIRY TASK  
GRADE 4 SCIENCE**

A general understanding can be exemplified by the following sample response, including the data:

**Data Table 1: Strength of Magnet at Three Distances**

Number of Stickers	Number of Paper Clips Held at Three Distances			Median
	Trial 1	Trial 2	Trial 3	
0	8	8	7	8
2	4	4	4	4
4	2	2	2	2

**SCORE POINT 2**

- 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**

# of Stickers	Number of Paper Clips Held at Three Distances			Median
	Trial 1	Trial 2	Trial 3	
zero	4	8	8	8
two	8	7	6	7
four	5	4	5	5

The response demonstrates a general understanding of using accepted methods for organizing, representing, and manipulating data. The response includes a completed data table with appropriate labels and organized data.

NECAP 2016 RELEASED INQUIRY TASK  
GRADE 4 SCIENCE

SCORE POINT 1

- 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

trial one 0 stickers	Number of Paper Clips Held at Three Distances			Median
	10	10	9	
trial 2 2 stickers	4	6	8	10
trial 3 4 stickers	5	3	4	6
				4

The response demonstrates a limited understanding of using accepted methods for organizing, representing, and manipulating data. The response includes a completed data table with some appropriate labels and organized data, but the data are shifted up one row, making the median values misaligned with the data.

NECAP 2016 RELEASED INQUIRY TASK  
GRADE 4 SCIENCE

SCORE POINT 0

- 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
	trial 1	4 clips	no stickers	
	trial 2	7 clips	0 stickers	2 3
	trial 3	3 clips	0 stickers	7
	trial 4	3 clips	all stickers	3

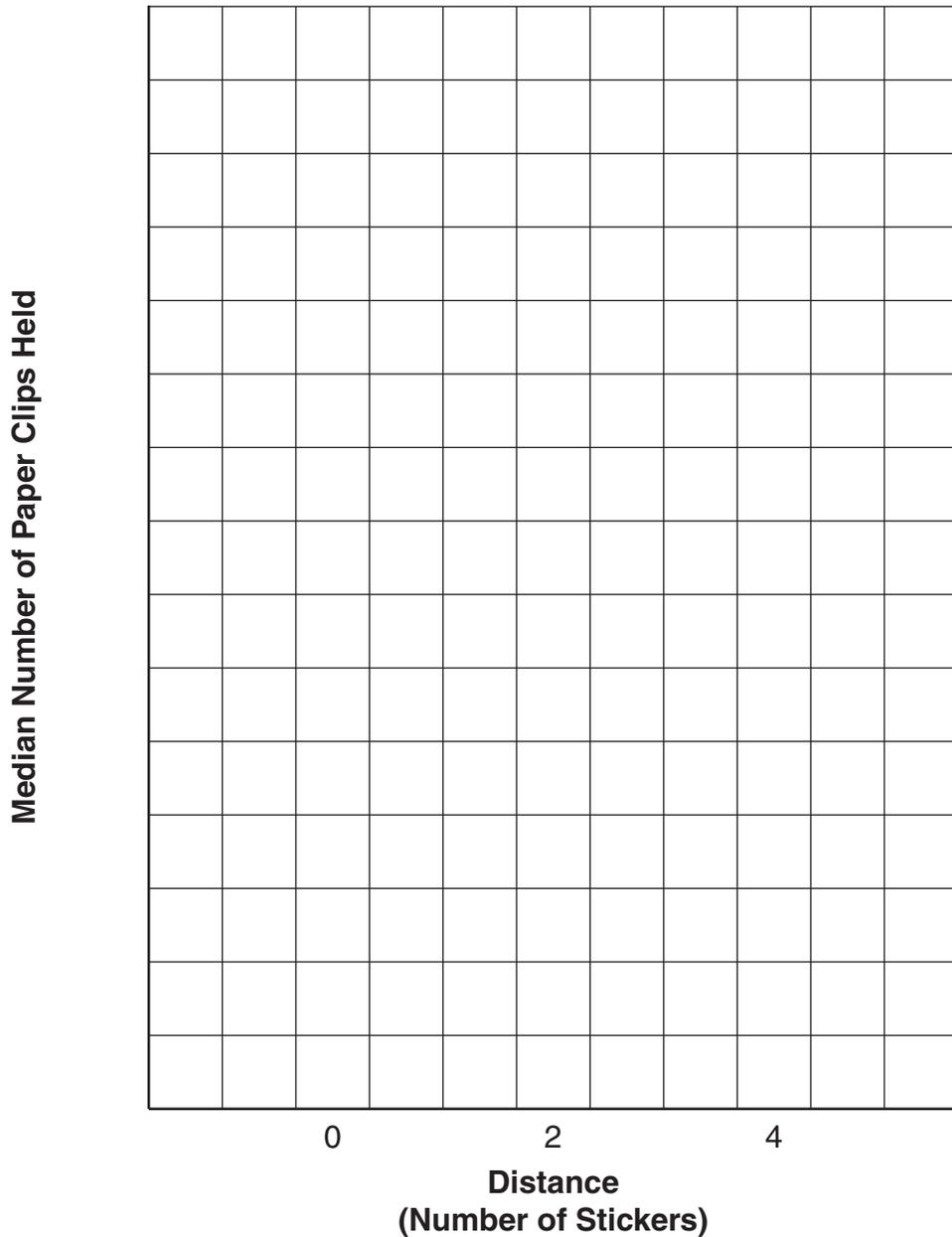
The response does not demonstrate understanding of using accepted methods for organizing, representing, and manipulating data. The data table is not filled out in an organized way and is difficult to decipher.

**NECAP 2016 RELEASED INQUIRY TASK  
GRADE 4 SCIENCE**

<b>Broad Area of Inquiry:</b>	<b>Conducting Investigations</b>
<b>Inquiry Construct 8:</b>	Use accepted methods for organizing, representing, and manipulating data.

- 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:** \_\_\_\_\_



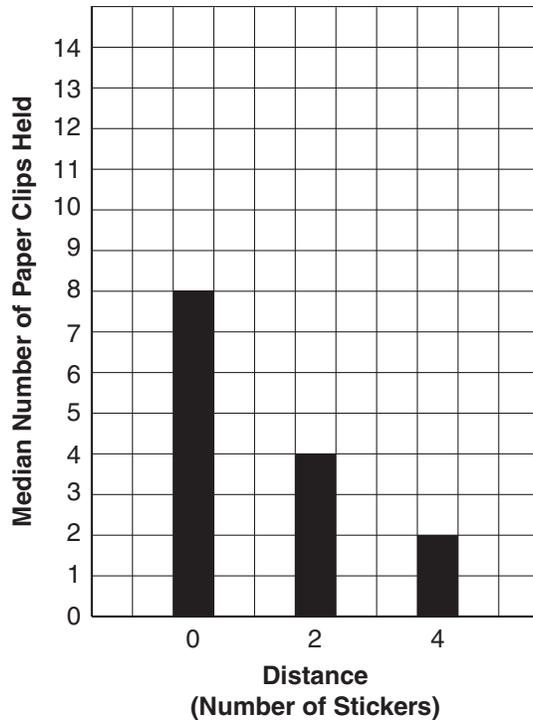
**NECAP 2016 RELEASED INQUIRY TASK  
GRADE 4 SCIENCE**

**Scoring Guide**

Score	Description
<b>3</b>	The response demonstrates a thorough understanding of using accepted methods for organizing, representing, and manipulating data. The response uses the data 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. The response includes a title and labels.
<b>2</b>	The response demonstrates a general understanding of using accepted methods for organizing, representing, and manipulating data. The overall response is general.
<b>1</b>	The response demonstrates a limited understanding of using accepted methods for organizing, representing, and manipulating data. The overall response is limited.
<b>0</b>	The response is incorrect or irrelevant to the skill or concept being measured.
<b>Blank</b>	No response

A thorough understanding can be exemplified by including the following in the sample response:

**Median Number of Paper Clips  
Held at Three Distances**  
Title: \_\_\_\_\_



- Median data used for the three trials of distances of 0, 2, and 4 stickers
- Appropriate title
- Range from zero to maximum number of paper clips held

NECAP 2016 RELEASED INQUIRY TASK  
GRADE 4 SCIENCE

SCORE POINT 3

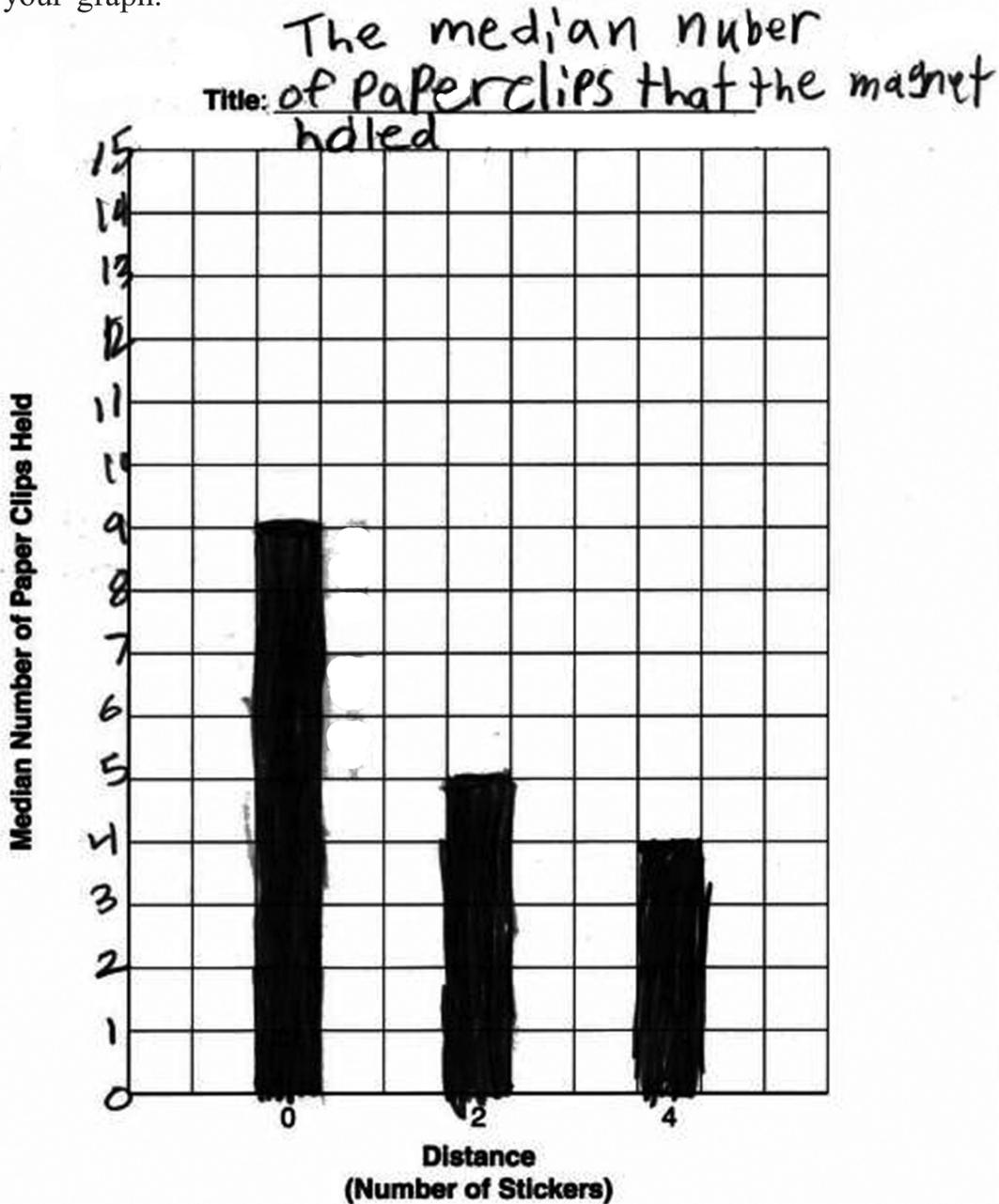
- ① Copy Data Table 1 (including your labels) from page 6 in your Inquiry Booklet into Data Table 1 below.

	Number of Paper Clips Held at Three Distances			Median
	1 <sup>st</sup>	2 <sup>nd</sup>	3 <sup>rd</sup>	
without sticker	7	10	9	9
2 sticker	4	5	6	5
1 sticker	4	4	4	4

NECAP 2016 RELEASED INQUIRY TASK  
GRADE 4 SCIENCE

SCORE POINT 3 (CONTINUED)

- 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.



The response demonstrates a thorough understanding of using accepted methods for organizing, representing, and manipulating data. The response uses the data 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. The response includes an appropriate title, y-axis scale, and correctly graphed values.

NECAP 2016 RELEASED INQUIRY TASK  
GRADE 4 SCIENCE

SCORE POINT 2

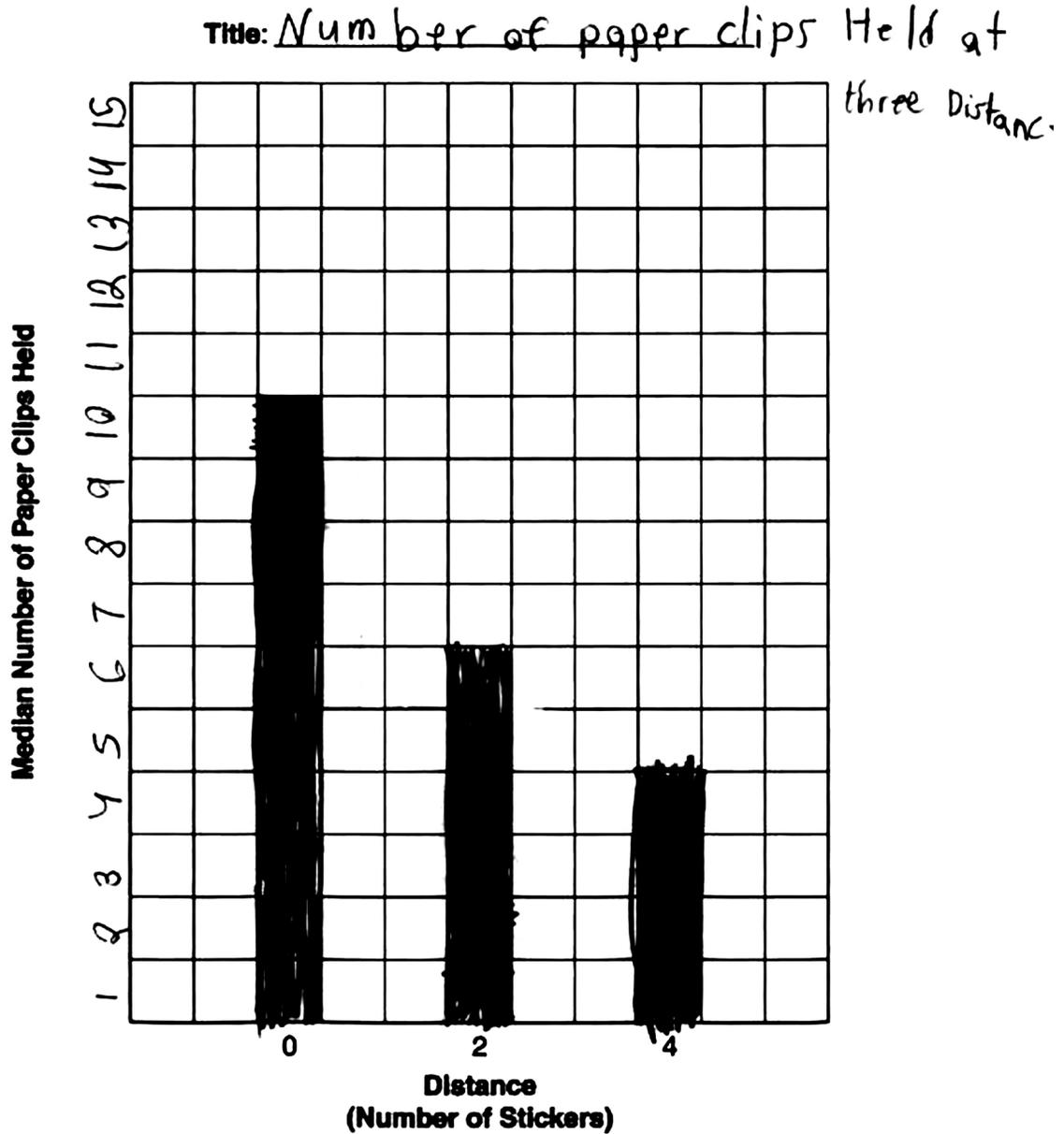
- ① Copy Data Table 1 (including your labels) from page 6 in your Inquiry Booklet into Data Table 1 below.

Trials	Number of Paper Clips Held at Three Distances			Median
	0 stickies	2 stickies	4 stickies	
Trial 1	11	6	4	10
Trial 2	10	6	4	6
Trial 3	10	6	4	4

NECAP 2016 RELEASED INQUIRY TASK  
GRADE 4 SCIENCE

SCORE POINT 2 (CONTINUED)

- 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.



The response demonstrates a general understanding of using accepted methods for organizing, representing, and manipulating data. The response includes an appropriate title and correctly graphed values, but the scale on the y-axis is not aligned to the grid lines.

NECAP 2016 RELEASED INQUIRY TASK  
GRADE 4 SCIENCE

SCORE POINT 1

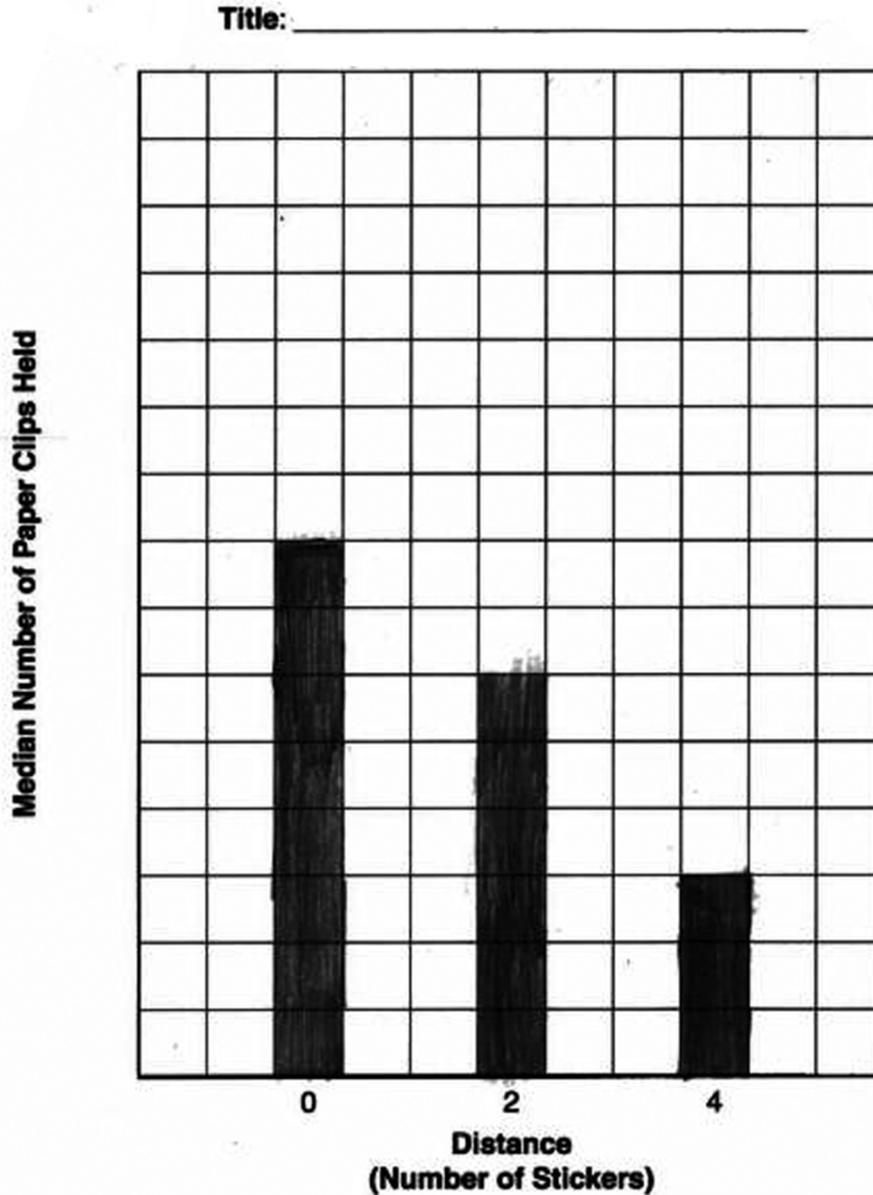
- ① Copy Data Table 1 (including your labels) from page 6 in your Inquiry Booklet into Data Table 1 below.

	Number of Paper Clips Held at Three Distances			Median
	trial 1	trial 2	trial 3	
NO stickers	11 clips	8 clips	10 clips	8 clips
2 stickers	4 clips	6 clips	3 clips	6 clips
4 stickers	3 clips	3 clips	4 clips	3 clips

NECAP 2016 RELEASED INQUIRY TASK  
GRADE 4 SCIENCE

SCORE POINT 1 (CONTINUED)

- 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.



The response demonstrates a limited understanding of using accepted methods for organizing, representing, and manipulating data. The response contains correctly graphed values, assuming that each box represents one paper clip. There is no title and no scale for the y-axis.

NECAP 2016 RELEASED INQUIRY TASK  
GRADE 4 SCIENCE

SCORE POINT 0

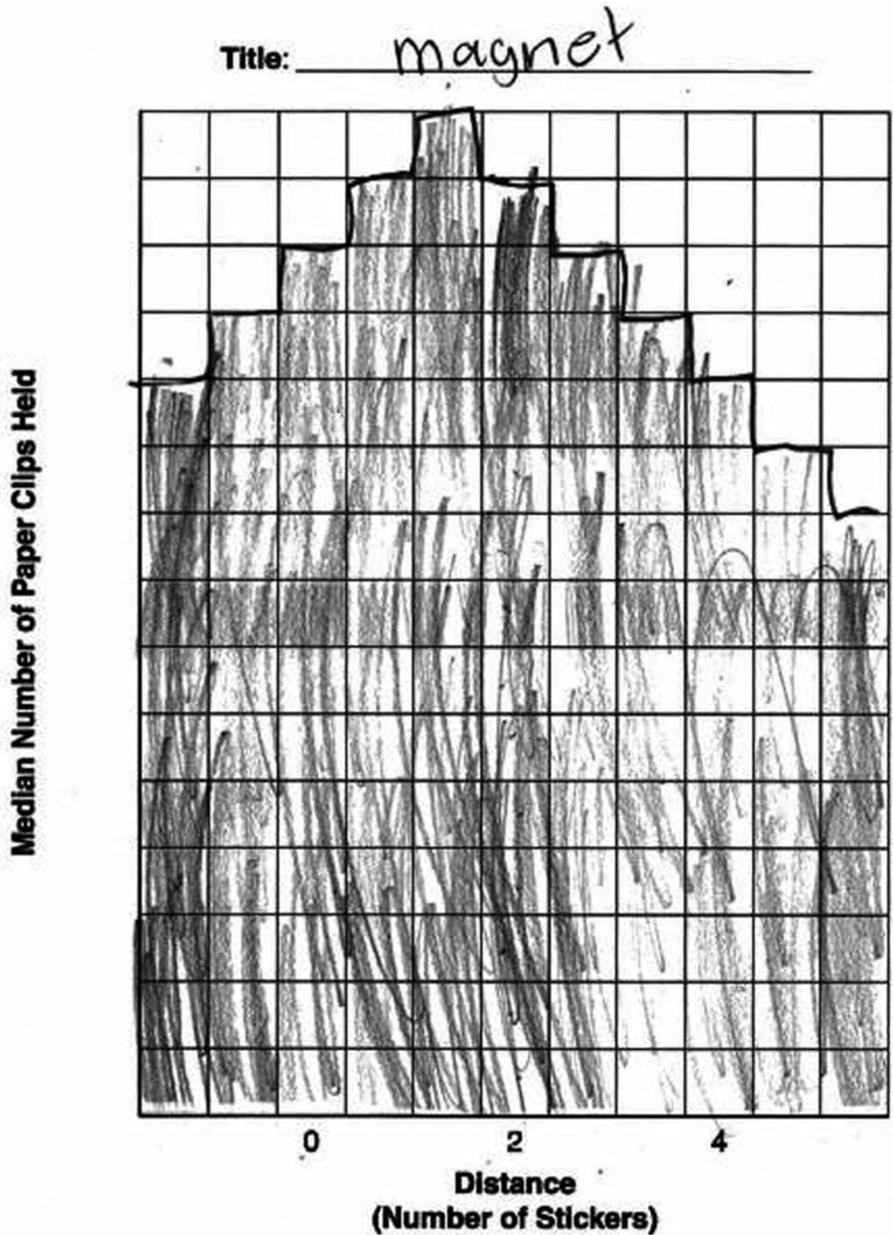
- ① Copy Data Table 1 (including your labels) from page 6 in your Inquiry Booklet into Data Table 1 below.

14	Number of Paper Clips Held at Three Distances			Median
	14	3	5	
13	6	4	5	3
12	7	5	6	4
11	5	3	1	5

NECAP 2016 RELEASED INQUIRY TASK  
GRADE 4 SCIENCE

SCORE POINT 0 (CONTINUED)

- 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.



The response is incorrect or irrelevant to the skill or concept being measured. The data are not graphed correctly, and the title "magnet" is not enough to demonstrate understanding.

**NECAP 2016 RELEASED INQUIRY TASK  
GRADE 4 SCIENCE**

<b>Broad Area of Inquiry:</b> <b>Inquiry Construct 10:</b>	<b>Conducting Investigations</b> Summarize results based on data.
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3 Describe what your graph on page 2 shows about the strength of a magnet.

**Scoring Guide**

<b>Score</b>	<b>Description</b>
<b>2</b>	The response demonstrates a general understanding of summarizing results based on data. The response describes what the graph on page 2 shows about the strength of a magnet.
<b>1</b>	The response demonstrates a limited understanding of summarizing results based on data. The overall response is limited.
<b>0</b>	The response is incorrect or irrelevant to the skill or concept being measured.
<b>Blank</b>	No response

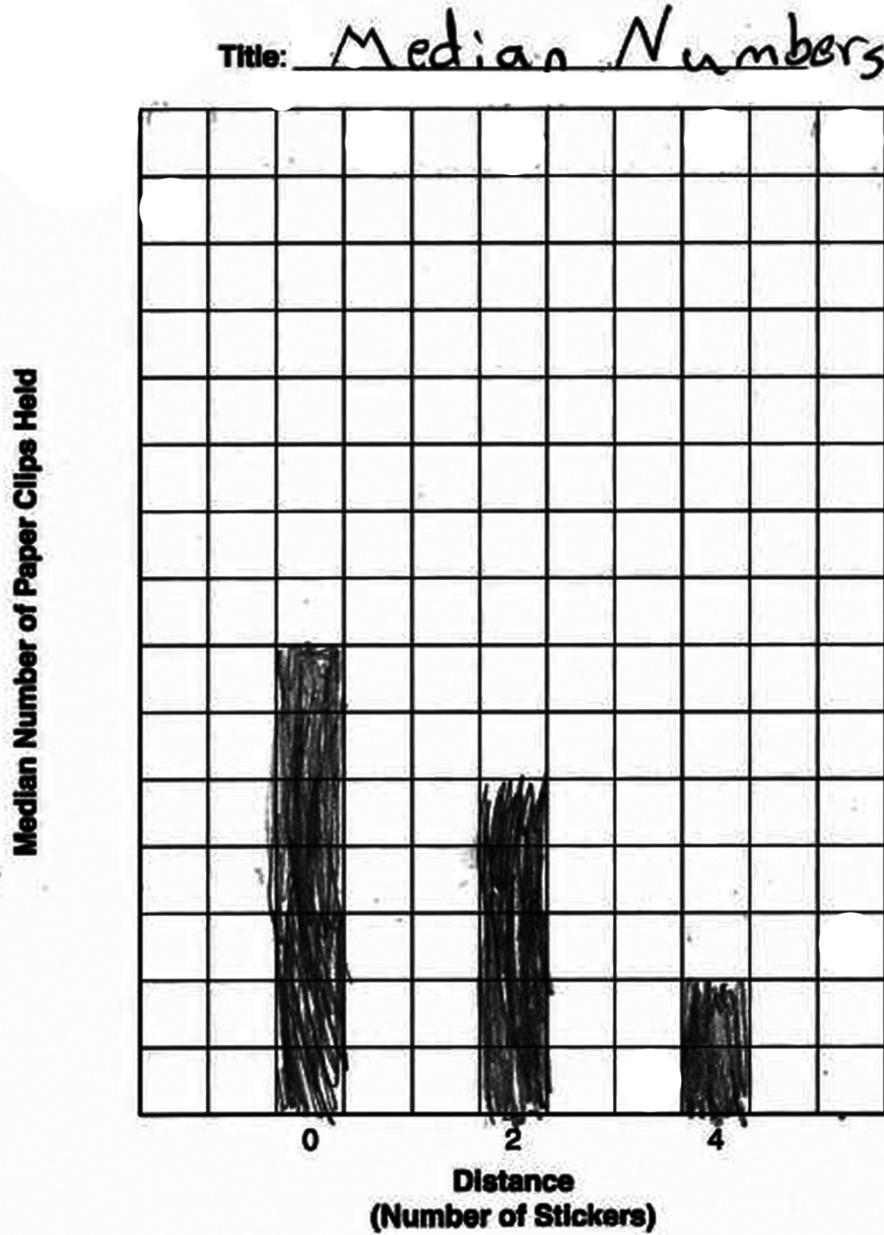
A general understanding can be exemplified by the following sample response:

As the distance from a magnet increases, the strength of the magnet decreases.

NECAP 2016 RELEASED INQUIRY TASK  
GRADE 4 SCIENCE

SCORE POINT 2

- 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.



NECAP 2016 RELEASED INQUIRY TASK  
GRADE 4 SCIENCE

SCORE POINT 2 (CONTINUED)

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

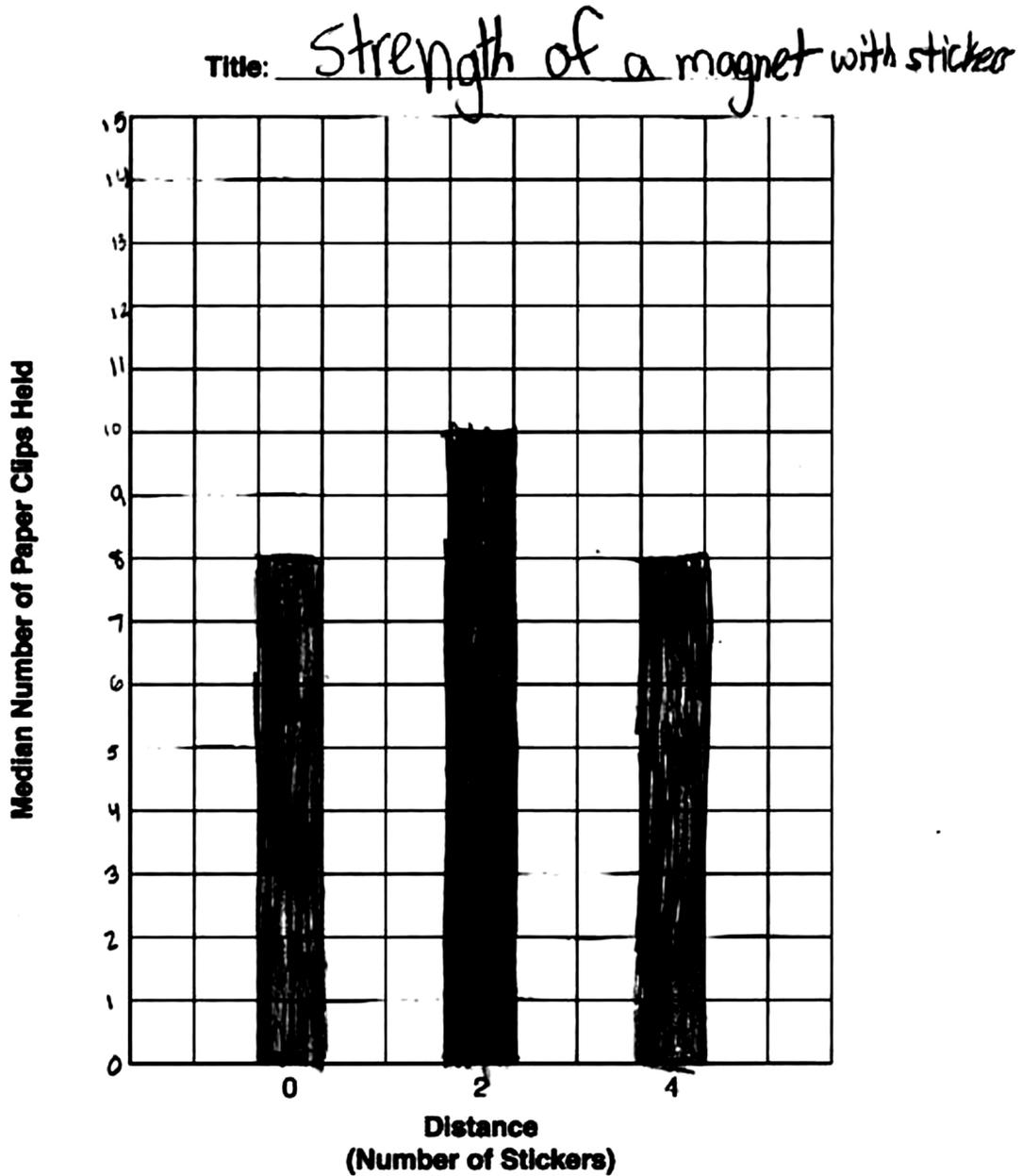
The strength of a magnet decreases as you put things like stickers in the way of the paper clip and the actual magnet.

The response demonstrates a general understanding of summarizing results based on data. The response provides a logical conclusion describing the trend represented by the data.

NECAP 2016 RELEASED INQUIRY TASK  
GRADE 4 SCIENCE

SCORE POINT 1

- 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.



NECAP 2016 RELEASED INQUIRY TASK  
GRADE 4 SCIENCE

SCORE POINT 1 (CONTINUED)

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

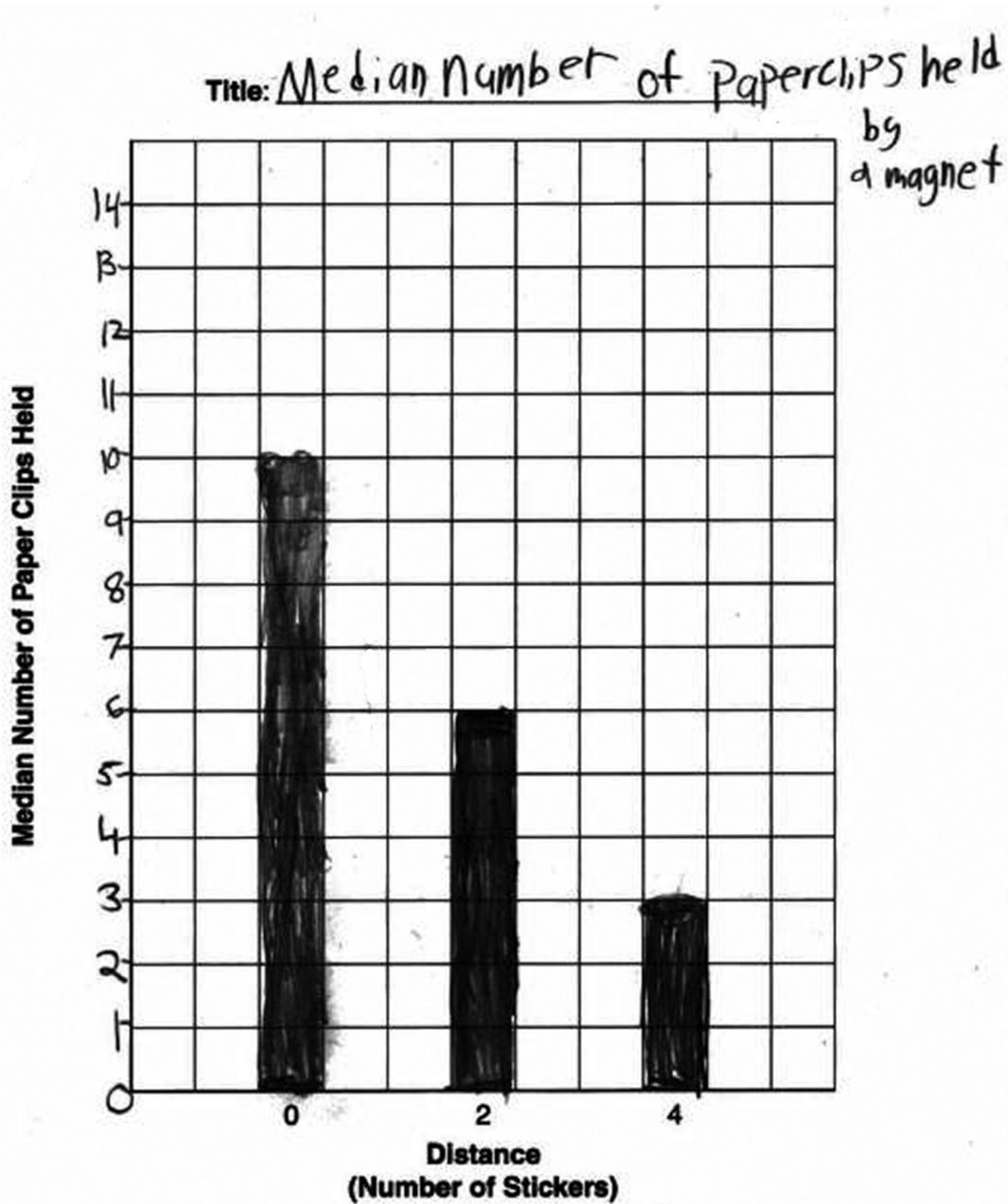
The <sup>graph</sup> shows 0 stickers held 8 as a median,  
2 stickers held 10 as a median, and  
4 stickers held 8 as a median.

The response demonstrates a limited understanding of summarizing results based on data. The response cites the relevant data from the investigation without identifying a trend.

NECAP 2016 RELEASED INQUIRY TASK  
GRADE 4 SCIENCE

SCORE POINT 0

- 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.



NECAP 2016 RELEASED INQUIRY TASK  
GRADE 4 SCIENCE

SCORE POINT 0 (CONTINUED)

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

On page 12 i made the numbers go to  
14 on the side and on the title i wrote  
Median number of paperclips held by a  
magnet. Last in the graph i colored  
in the median's of the investigation.

The response is incorrect or irrelevant to the skill or concept being measured. The response describes the procedure rather than identifying a trend in the data.

**NECAP 2016 RELEASED INQUIRY TASK  
GRADE 4 SCIENCE**

<b>Broad Area of Inquiry:</b> <b>Inquiry Construct 12:</b>	<b>Developing and Evaluating Explanations</b> Use evidence to support and justify interpretations and conclusions or explain how the evidence refutes the hypothesis.
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- 4 Use evidence from Data Table 1 and your graph to describe a pattern in the data as the number of stickers increased.

**Scoring Guide**

<b>Score</b>	<b>Description</b>
<b>2</b>	The response demonstrates a general understanding of using evidence to support and justify interpretations and conclusions or explain how the evidence refutes the hypothesis. The response uses evidence from Data Table 1 and the student's graph to describe a pattern in the data as the number of stickers increased.
<b>1</b>	The response demonstrates a limited understanding of using evidence to support and justify interpretations and conclusions or explain how the evidence refutes the hypothesis. The overall response is limited.
<b>0</b>	The response is incorrect or irrelevant to the skill or concept being measured.
<b>Blank</b>	No response

A general understanding can be exemplified by the following sample response:

In the Magnet Strength Investigation, as the numbers of stickers increased, the number of paper clips that one magnet could hold went down. When there were no stickers, the magnet could hold 8 paper clips. When there were two stickers, the magnet could hold 4 paper clips. When there were 4 stickers, the magnet could only hold 2 paper clips.

NECAP 2016 RELEASED INQUIRY TASK  
GRADE 4 SCIENCE

SCORE POINT 2

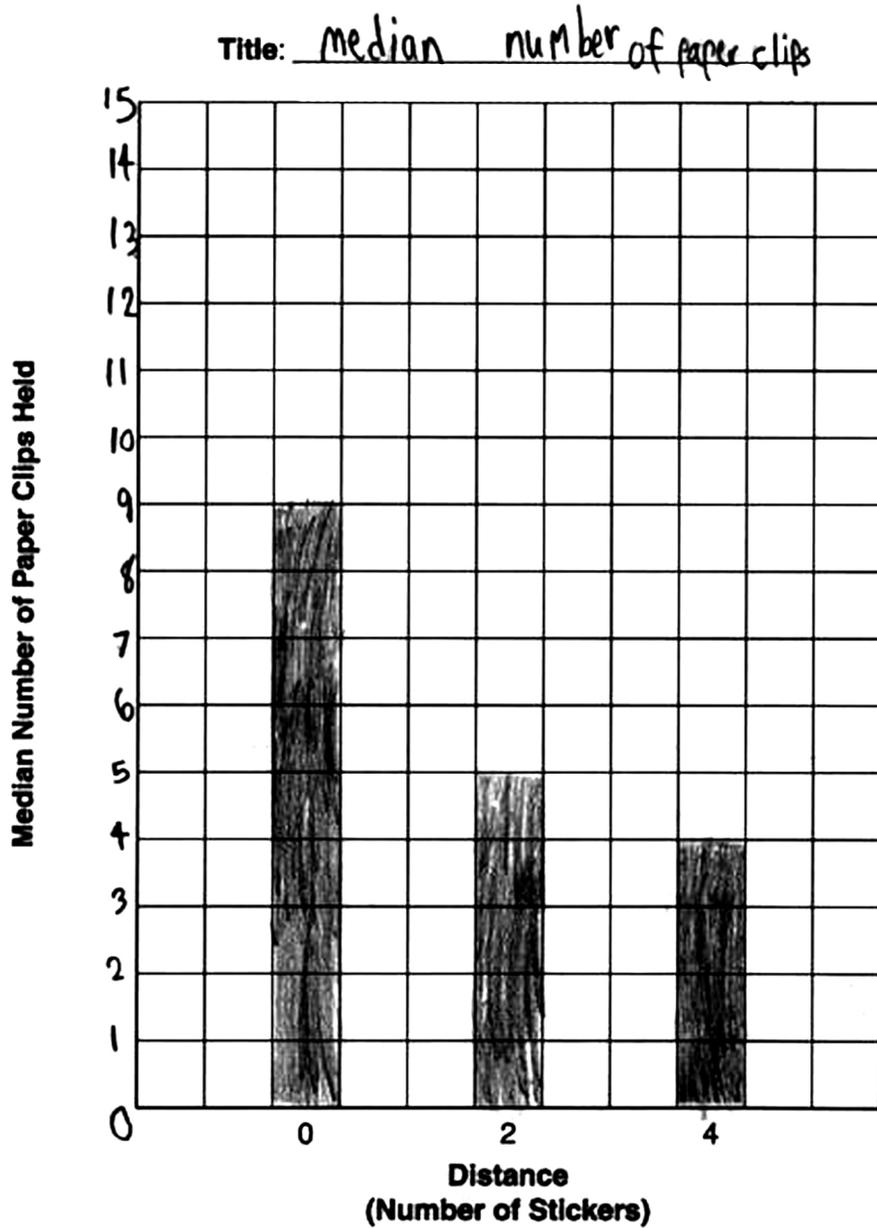
- ① Copy Data Table 1 (including your labels) from page 6 in your Inquiry Booklet into Data Table 1 below.

number of stickers	Number of Paper Clips Held at Three Distances			Median
	trial 1	trial 2	trial 3	
0 stickers	9 paper clips	7 paper clips	9 paper clips	9
2 stickers	5 paper clips	5 paper clips	5 paper clips	5
4 stickers	3 paper clips	4 paper clips	4 paper clips	4

NECAP 2016 RELEASED INQUIRY TASK  
GRADE 4 SCIENCE

SCORE POINT 2 (CONTINUED)

- 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.



NECAP 2016 RELEASED INQUIRY TASK  
GRADE 4 SCIENCE

SCORE POINT 2 (CONTINUED)

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

The pattern is that the median kept getting lower and lower. My evidence is that my data table has 9 as the first median 5 as the second and 4 as the third so they kept on getting lower.

The response demonstrates a general understanding of using evidence to support and justify interpretations and conclusions or explain how the evidence refutes the hypothesis. The response describes the median as getting lower and lower, and supports the conclusion with specific evidence from the data table and graph.

NECAP 2016 RELEASED INQUIRY TASK  
GRADE 4 SCIENCE

SCORE POINT 1

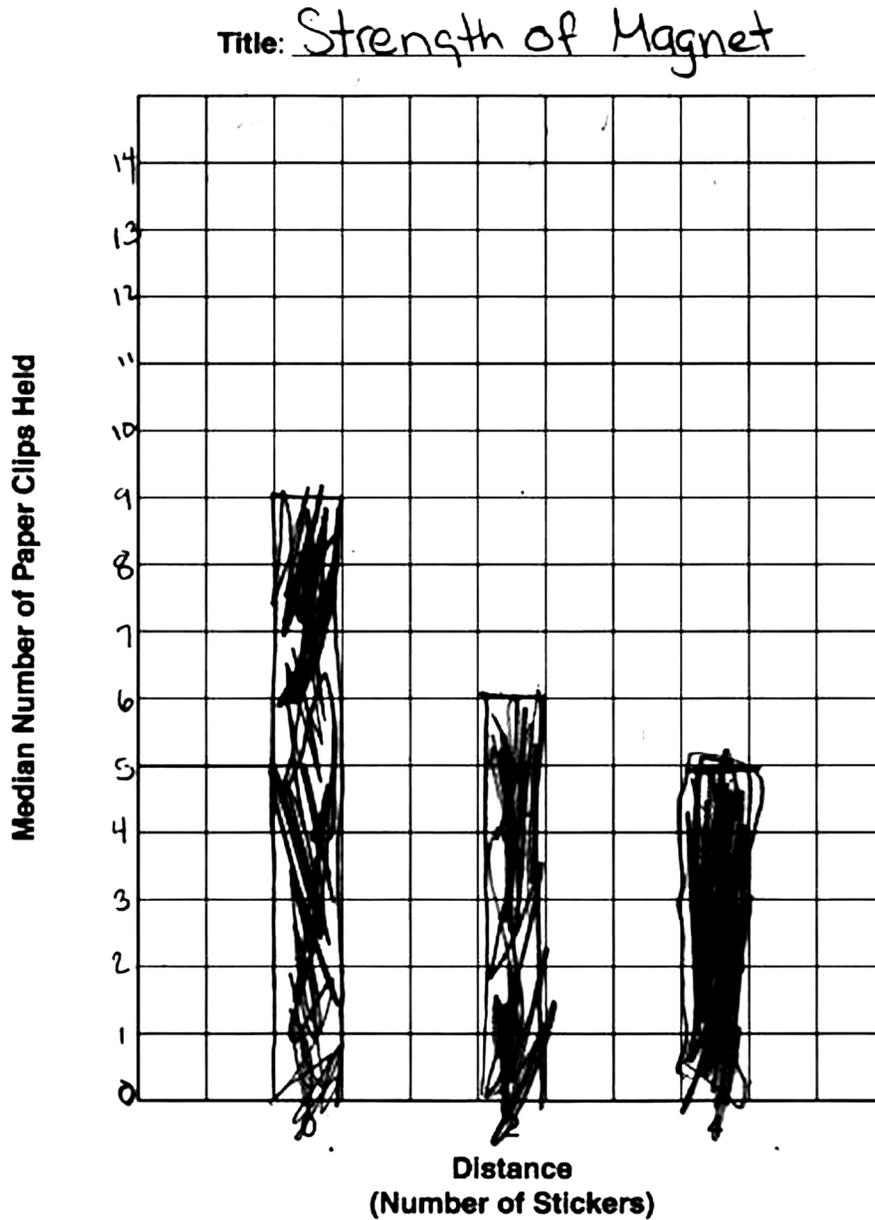
- ① Copy Data Table 1 (including your labels) from page 6 in your Inquiry Booklet into Data Table 1 below.

	Number of Paper Clips Held at Three Distances			Median
	Trial 1	Trial 2	Trial 3	
0	8	9	12	9
2	6	6	6	6
4	4	5	5	5

NECAP 2016 RELEASED INQUIRY TASK  
GRADE 4 SCIENCE

SCORE POINT 1 (CONTINUED)

- 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.



NECAP 2016 RELEASED INQUIRY TASK  
GRADE 4 SCIENCE

SCORE POINT 1 (CONTINUED)

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

As the number of stickers increased  
the number of paper clips decreased.

The response demonstrates a limited understanding of using evidence to support and justify interpretations and conclusions or explain how the evidence refutes the hypothesis. The response correctly describes a pattern in the data but does not use specific evidence in support of the pattern.

NECAP 2016 RELEASED INQUIRY TASK  
GRADE 4 SCIENCE

SCORE POINT 0

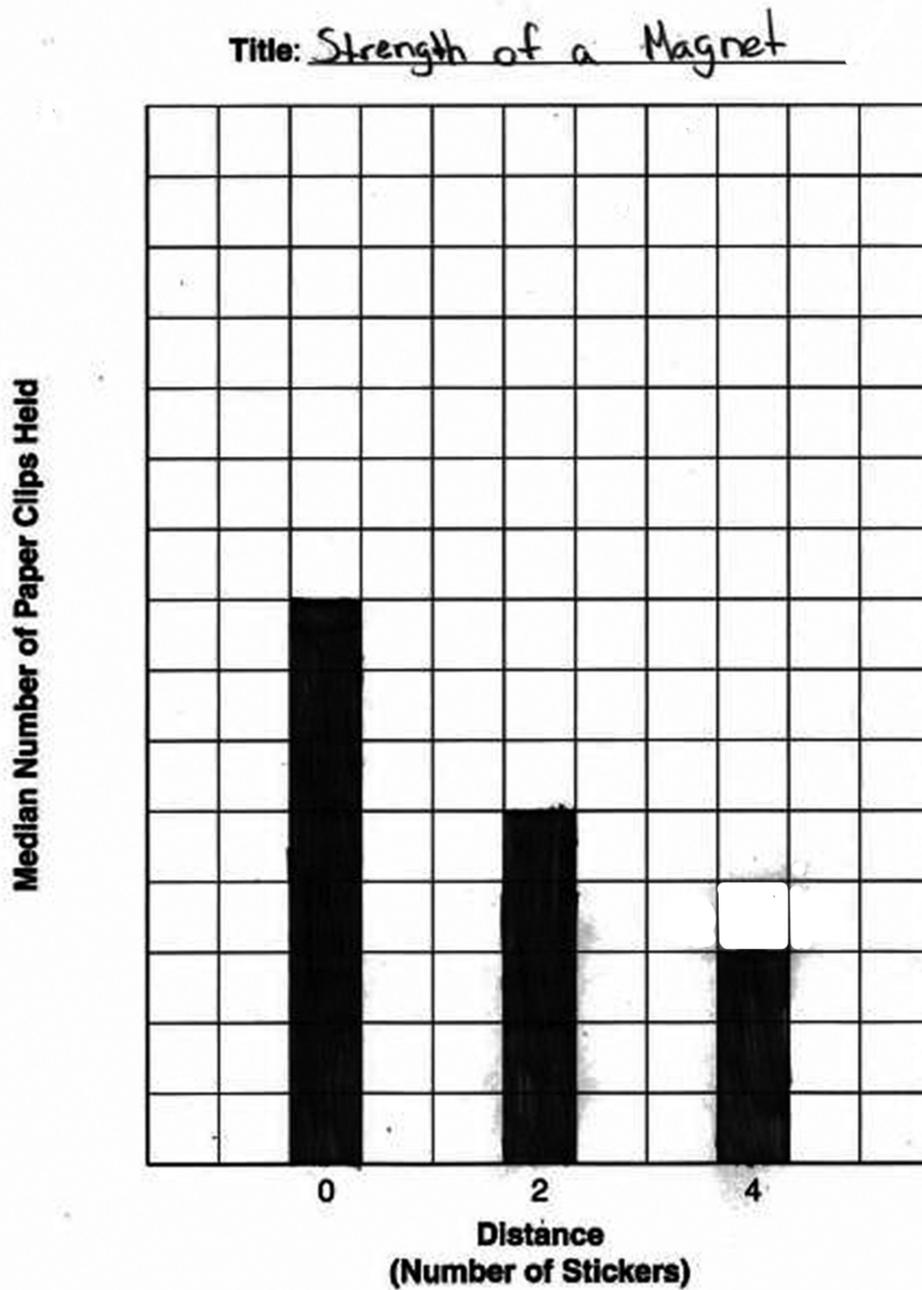
- ① Copy Data Table 1 (including your labels) from page 6 in your Inquiry Booklet into Data Table 1 below.

Number of stickers	Number of Paper Clips Held at Three Distances			Median
	Trail 1	Trail 2	Trail 3	
0 stickers	8 clips	8 clips	9 clips	8 clips
2 stickers	5 clips	5 clips	4 clips	5 clips
4 stickers	2 clips	3 clips	4 clips	3 clips

NECAP 2016 RELEASED INQUIRY TASK  
GRADE 4 SCIENCE

SCORE POINT 0 (CONTINUED)

- 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.



NECAP 2016 RELEASED INQUIRY TASK  
GRADE 4 SCIENCE

SCORE POINT 0 (CONTINUED)

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

The Data Table 1 is 0, 2, and 4.

The response is incorrect or irrelevant to the skill or concept being measured. The response lists the number of stickers for each trial, which is irrelevant to the question.

**NECAP 2016 RELEASED INQUIRY TASK  
GRADE 4 SCIENCE**

<b>Broad Area of Inquiry:</b> <b>Inquiry Construct 2:</b>	<b>Formulating Questions &amp; Hypothesizing</b> Construct coherent argument in support of a question, hypothesis, prediction.
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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.

**Scoring Guide**

Score	Description
2	The response demonstrates a general understanding of constructing coherent arguments in support of a prediction. The response describes whether the prediction is supported or not supported and explains why the data and observations did or did not support the prediction.
1	The response demonstrates a limited understanding of constructing coherent arguments in support of a prediction. The overall response is limited.
0	The response is incorrect or irrelevant to the skill or concept being measured.
<b>Blank</b>	No response

A general understanding can be exemplified by the following sample response:

I predicted that the magnet's attraction will decrease as the distance from the magnet increases. The data did support my prediction because when there were no stickers, the magnet held the most paper clips (8). When there were 2 stickers, the magnet held 4 paper clips, and when there were 4 stickers, the magnet only held 2 paper clips.

NECAP 2016 RELEASED INQUIRY TASK  
GRADE 4 SCIENCE

SCORE POINT 2

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 that the magnet's attraction  
will decrease

because the farther away the magnet is  
to the metal, the smaller the magnetic  
field becomes.

NECAP 2016 RELEASED INQUIRY TASK  
GRADE 4 SCIENCE

SCORE POINT 2 (CONTINUED)

5 Check the box next to the statement that **best** describes whether your data and observations supported your prediction.

The data **supported** my prediction.

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.

My data supported my prediction because each time I added more stickers, the less clips could hang. Without stickers, 9 clips hung, with 2 stickers, 5 clips hung, and with 4 stickers, 3 clips hung.

The response demonstrates a general understanding of constructing coherent arguments in support of a prediction. The response describes that the prediction is supported and uses specific evidence from the investigation to explain why the data and observations supported the prediction.

NECAP 2016 RELEASED INQUIRY TASK  
GRADE 4 SCIENCE

SCORE POINT 1

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 that the magnets strength  
will become weak

because it is a longer distance it  
would become weak.

- 5 Check the box next to the statement that **best** describes whether your data and observations supported your prediction.

- The data **supported** my prediction.  
 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.

The magnet became weaker because  
we put stickers on it. The stickers  
blocked the magnetic field  
coming through.

The response demonstrates a limited understanding of constructing coherent arguments in support of a prediction. The response explains that the magnet "became weaker" as stickers were added but does not support the conclusion with specific evidence from the investigation.

NECAP 2016 RELEASED INQUIRY TASK  
GRADE 4 SCIENCE

SCORE POINT 0

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 that when a magnet, is so strong that when it is magnetice than it will stay,  
because I think that when the magnet has force ut goes on something that will stay

5 Check the box next to the statement that **best** describes whether your data and observations supported your prediction.

- The data **supported** my prediction.
- 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.

I think that it supported it because I said in my prediction that when the metal was stronger with it touching the magnet It would stick

The response is incorrect or irrelevant to the skill or concept being measured. The prediction and conclusion are related to the strength of the magnet itself, not the distance from the magnetic strip.

**NECAP 2016 RELEASED INQUIRY TASK  
GRADE 4 SCIENCE**

<b>Broad Area of Inquiry:</b> <b>Inquiry Construct 11:</b>	<b>Developing and Evaluating Explanations</b> Analyze data, including determining if data are relevant, artifact, irrelevant, or anomalous.
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- 6 Use Data Table 2 to explain the relationship between the foam squares and the magnets.

**Scoring Guide**

<b>Score</b>	<b>Description</b>
<b>2</b>	The response demonstrates a general understanding of analyzing data, including determining if data are relevant, artifact, irrelevant, or anomalous. The response uses Data Table 2 to explain the relationship between the foam squares and the magnets.
<b>1</b>	The response demonstrates a limited understanding of analyzing data, including determining if data are relevant, artifact, irrelevant, or anomalous. The overall response is limited.
<b>0</b>	The response is incorrect or irrelevant to the skill or concept being measured.
<b>Blank</b>	No response

A general understanding can be exemplified by the following sample response:

As the size of the foam squares increased, more magnets were needed to hold up the square without it sliding down. When the students added magnets, it made the force stronger to hold up the large foam square.

NECAP 2016 RELEASED INQUIRY TASK  
GRADE 4 SCIENCE

SCORE POINT 2

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

The medium & the small foam only need one magnet to hold them up but the big foam piece needs two magnets to hold it up. Probably because the big foam piece is heavier than the other two foam pieces.

The response demonstrates a general understanding of analyzing data, including determining if data are relevant, artifact, irrelevant, or anomalous. The response uses Data Table 2 to explain the relationship between the foam squares and the magnets, and explains that the weight of the larger piece of foam is why more magnets were needed to hold it up.

SCORE POINT 1

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

The small and medium foam pieces are about the same size so they need 1 magnet. The large foam needs 2.

The response demonstrates a limited understanding of analyzing data, including determining if data are relevant, artifact, irrelevant, or anomalous. The response describes the relationship between the foam squares and the magnets but provides only a limited explanation.

NECAP 2016 RELEASED INQUIRY TASK  
GRADE 4 SCIENCE

SCORE POINT 0

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

The foam squares are put up against  
the metal plate and the magnet is  
touching the foam to keep it  
connected to the metal.

The response is incorrect or irrelevant to the skill or concept being measured. The response explains the procedure rather than the relationship.

**NECAP 2016 RELEASED INQUIRY TASK  
GRADE 4 SCIENCE**

<b>Broad Area of Inquiry:</b> <b>Inquiry Construct 6:</b>	<b>Planning and Critiquing of Investigations</b> Provide reasoning for appropriateness of materials, tools, procedures, and scale used in the investigation.
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- 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.

**Scoring Guide**

<b>Score</b>	<b>Description</b>
<b>2</b>	The response demonstrates a general understanding of providing reasoning for appropriateness of materials, tools, procedures, and scale used in the investigation. The response explains 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.
<b>1</b>	The response demonstrates a limited understanding of providing reasoning for appropriateness of materials, tools, procedures, and scale used in the investigation. The overall response is limited.
<b>0</b>	The response is incorrect or irrelevant to the skill or concept being measured.
<b>Blank</b>	No response

A general understanding can be exemplified by the following sample response:

It was important to have the size and the thickness of the foam squares the same to make it a fair test (constant). The only variable was the number of foam squares. If the students used squares of different thicknesses, the magnetic force could not be measured as accurately.

NECAP 2016 RELEASED INQUIRY TASK  
GRADE 4 SCIENCE

SCORE POINT 2

**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.

Because it won't be a fair test because one will be lighter than all the other ones and the other ones are heavy once you change something you can't change something else because it won't be a fair test.

The response demonstrates a general understanding of providing reasoning for appropriateness of materials, tools, procedures, and scale used in the investigation. The response explains that in order to conduct a fair test, only one variable should be changed at a time.

NECAP 2016 RELEASED INQUIRY TASK  
GRADE 4 SCIENCE

SCORE POINT 1

**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.

so it's a fair test and not  
the wrong answer,

The response demonstrates a limited understanding of providing reasoning for appropriateness of materials, tools, procedures, and scale used in the investigation. The response identifies that it's important to keep the size and thickness the same so it will be a fair test, but the explanation is limited.

NECAP 2016 RELEASED INQUIRY TASK  
GRADE 4 SCIENCE

SCORE POINT 0

**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.

When there was more foam squares you could put more magnets on. For example 1 foam square = 1 magnet and 3 foam squares = 3 magnets.

The response is totally irrelevant to the skill or concept being measured. The response does not address the importance of controlling variables.

**NECAP 2016 RELEASED INQUIRY TASK  
GRADE 4 SCIENCE**

<b>Broad Area of Inquiry:</b> <b>Inquiry Construct 12:</b>	<b>Developing and Evaluating Explanations</b> Use evidence to support and justify interpretations and conclusions or explain how the evidence refutes the hypothesis.
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- 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.

**Scoring Guide**

Score	Description
3	The response demonstrates a thorough understanding of using evidence to support and justify interpretations and conclusions or explain how the evidence refutes the hypothesis. The response explains why the first way Finn tries to hang his art piece does not work, but the second way does. The response identifies information from the investigations to support the answer.
2	The response demonstrates a general understanding of using evidence to support and justify interpretations and conclusions or explain how the evidence refutes the hypothesis. The overall response is general.
1	The response demonstrates a limited understanding of using evidence to support and justify interpretations and conclusions or explain how the evidence refutes the hypothesis. The overall response is limited.
0	The response is incorrect or irrelevant to the skill or concept being measured.
<b>Blank</b>	No response

A thorough understanding can be exemplified by the following sample response:

The first way to hang the art does not work because the frame is too thick, which keeps the magnets too far away from the metal strip. The second way works because it allows the magnet to be directly against the metal strip where it has a stronger magnetic force. In the investigation, the students learned that thicker art pieces represented by foam squares could not be held by the magnets they had. However, they observed magnets holding different sizes of art pieces. These observations suggest that when the magnet is closer to the metal strip, it can hold a piece of art.

NECAP 2016 RELEASED INQUIRY TASK  
GRADE 4 SCIENCE

SCORE POINT 3

- 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.

The first way Finn tries to hang his art piece does not work, because the cardboard is too thick for the magnet to stick to the metal. The second way works because the magnets are on the metal, with string holding up the art. This is similar to the investigation I performed. With the 4 stickers, the hook couldn't hold many paper clips. With no stickers, it held quite a few.

The response demonstrates a thorough understanding of using evidence to support and justify interpretations and conclusions or explain how the evidence refutes the hypothesis. The response explains why the thickness of the frame was interfering with the ability of the magnets to hold up the art work and uses evidence from the investigations to support the answer.

NECAP 2016 RELEASED INQUIRY TASK  
GRADE 4 SCIENCE

SCORE POINT 2

- 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.

I think the magnets he used were not strong enough for the force of the magnets to go through the thick frame so he put the magnets on the metal strip and put string on the hooks then attached it to the thick frame.

The response demonstrates a general understanding of using evidence to support and justify interpretations and conclusions or explain how the evidence refutes the hypothesis. The response identifies the thickness of the frame as the problem in the first attempt and the string as the method of reducing the distance between the magnets and the bar, but the answer is not supported with evidence from the performed investigation.

NECAP 2016 RELEASED INQUIRY TASK  
GRADE 4 SCIENCE

SCORE POINT 1

- 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.

It didn't work because the thick frame stoped the magnetic force from getting to the metal.

The response demonstrates a limited understanding of using evidence to support and justify interpretations and conclusions or explain how the evidence refutes the hypothesis. The response addresses why the first attempt to hang the artwork did not work but does not include evidence from any of the investigations or readings.

SCORE POINT 0

- 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.

it did not work because he did not use magnets with the same strength.

The response is totally incorrect. The response contains the misconception that the magnets are different strengths.

Date: \_\_\_\_\_

Your Name: \_\_\_\_\_

Name(s) of Partner(s): \_\_\_\_\_



**NEW ENGLAND  
COMMON ASSESSMENT PROGRAM**

**Released Science Inquiry Task**

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**Testing Magnetic Strength**

**2016**

**Grade 4**

**Inquiry Booklet**

# Science

## Directions:

You will read a story about students using science to solve a problem. You and your partner will do one of the same investigations as the students in the story.

## Word Bank

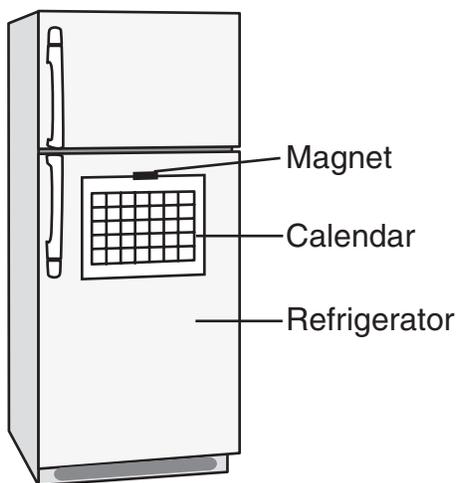
<b>Magnet</b>	an object that produces an area of magnetic force called a magnetic field
<b>Magnetic attraction</b>	the pull between some metals and a magnet
<b>Median</b>	the middle number in a list of numbers arranged from smallest to largest <b>Example:</b> With a data set of 4 cm, 2 cm, and 5 cm,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

## Testing Magnetic Strength

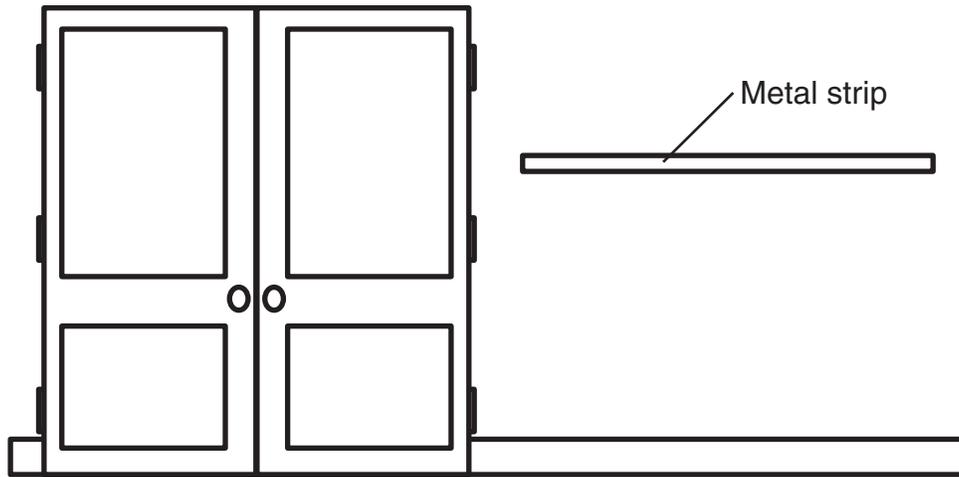
A fourth-grade art class is working on different types of wall art for a school art show. The winner of the art show will go to the Metropolitan Museum of Art in New York City.

For the judges to review the art pieces, the students need to hang them along the walls of the school hallways without damaging the walls. However, the art pieces are different sizes. Some pieces are large and will need a lot of support to hold them on a wall. The students want to use the same materials to hang all the art pieces so the art looks organized.

Ana observes a calendar hanging on a refrigerator in the cafeteria. The following picture shows the calendar attached to the refrigerator with a magnet.



Ana knows that magnets are attracted to some metals. As she walks back to the classroom, she notices a long, thin strip of metal that starts at one end of the hall and ends at the other end. The picture below shows part of the metal strip in the hallway.



Ana talks with her friend Finn, and they think that hanging the art pieces from the metal strip with magnets will be a good way to display the art for their show. They suggest this idea to the class. The students have seen other papers held up by magnets on the metal strip. The students think about the different sizes of artwork.

Ana knows that artwork on a piece of paper could be held by one magnet, but Finn’s artwork has a cardboard frame that makes it much thicker on top. She is not sure if it could be held by one magnet.

The students are studying magnets in their science class.

Mr. Blagg, their science teacher, tells the class that there are different types of magnets with different strengths. However, for the investigation that they will be doing in today’s class, he has a box of identical magnets that the students will use. Ana asks Finn, “If we are going to test the strength of one magnet, how will we test for the different thicknesses of the artwork?”

Ana and Finn realize that if they learn about the strength of one magnet, they can figure out how many magnets the students will need to hold up their art pieces.

## Conducting an Investigation

The class decides to investigate the answer to this research question:

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

## Making a Prediction—What Do You Think?

Make a prediction **on your own** about the research question below.

**Research Question:**

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

Use the information from the story about the students and what you know about magnets to make and explain your prediction.

I predict

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because

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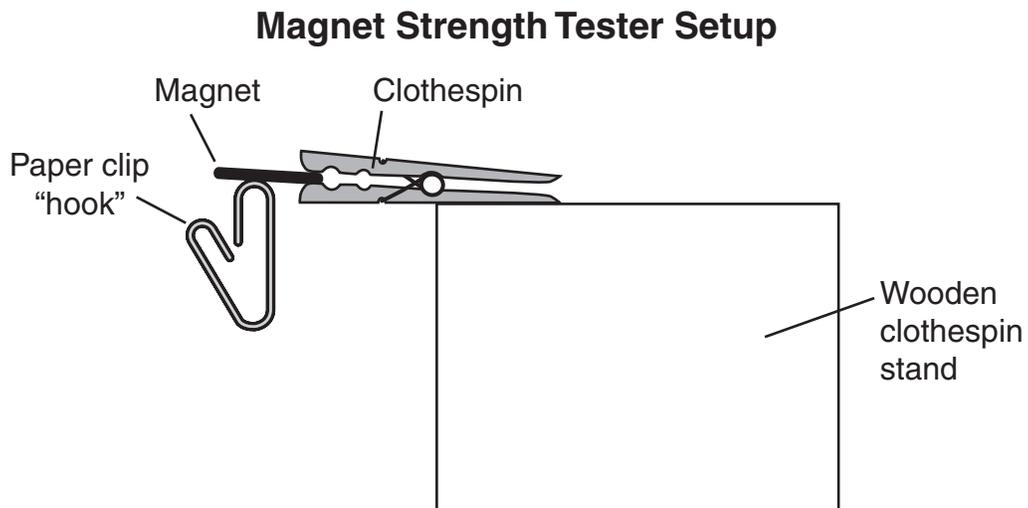
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DO NOT GO ON.



The class designs an investigation to test the strength of one magnet. The students make a Magnet Strength Tester out of a magnet and a clothespin. The setup is shown below.



The students create a "hook" out of a paper clip and add paper clips to the hook one at a time. Eventually, the weight of the paper clips is more than the magnet can hold, and the paper clips fall.

The students record the number of paper clips the magnet held. They write their data in a data table. The students do this test for three trials. They then add two stickers to the bottom of the magnet and repeat the steps for three trials with the hook and paper clips.

The students repeat the steps in a third test with four stickers on the bottom of the magnet. They do three trials and then find the median number of paper clips the magnet held for each distance.

You will do the same investigation as the students in the story. You have the same materials the students used on the placemat in front of you.

### Materials for Investigation 1:

1 magnet  
1 paper clip for hook  
4 stickers  
14 paper clips  
1 wooden clothespin stand

**Safety: DO NOT** put science materials in your mouth or nose or on any other body parts of yourself or your partner.

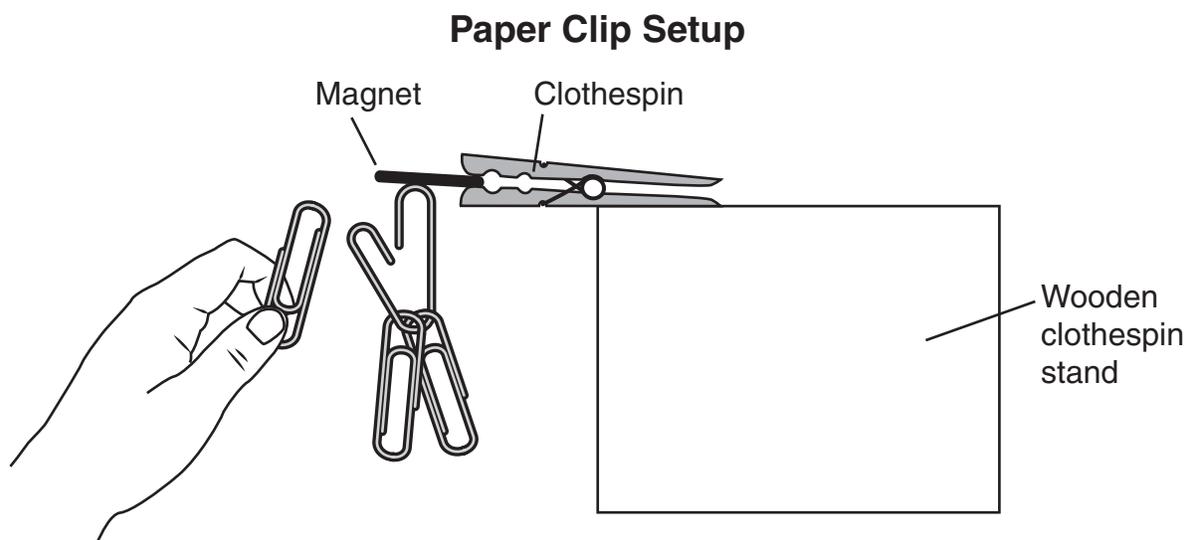
## Procedure:

- You and your partner(s) will work together to do this investigation.
- You will test the strength of a magnet at three distances.
- You will each record all of the data in your own Inquiry Booklet.

Read Steps 1–12, which begin below. Then add labels to the rows and columns in Data Table 1 on page 6 to collect the data from your investigation. You will record your data in Data Table 1.

### Test the strength of a magnet as distance increases and record your data in Data Table 1.

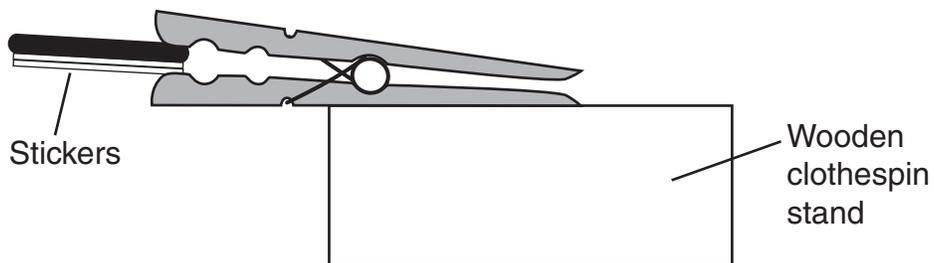
1. Place the magnet in the clothespin.
2. Make the hook by bending the paper clip as shown in the Magnet Strength Tester Setup on page 4.
3. Touch the top of the hook to the bottom of the magnet.
4. Add paper clips to the hook one by one as shown in the Paper Clip Setup below.



5. Count the number of paper clips that can hang from the hook before the paper clips fall.
6. Record the number of paper clips in Data Table 1 for Trial 1 for zero stickers.
7. Repeat steps 4 through 6 two more times for Trials 2 and 3.

8. Next, place two stickers on the bottom of your magnet, as shown below.

### Strength of a Magnet



9. Repeat steps 4 through 7 with the two stickers to see how many paper clips can hang from the hook before the paper clips fall. (Make sure the hook touches the bottom sticker, not the magnet.)

10. Next, add two more stickers to the bottom of the magnet.

11. Repeat steps 4 through 7 with four stickers.

12. Record the median number of paper clips for each distance you recorded in Data Table 1.

Remember to add labels to the rows and columns.

**Data Table 1: Strength of Magnet at Three Distances**

	Number of Paper Clips Held at Three Distances			Median

**After finishing the investigation, follow your teacher's instructions to clean up your area.**

You will complete the rest of the task in your Student Answer Booklet **on your own**.



Date: \_\_\_\_\_

Your Name: \_\_\_\_\_



**NEW ENGLAND  
COMMON ASSESSMENT PROGRAM**

**Released Science Inquiry Task**

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**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

<b>Magnet</b>	an object that produces an area of magnetic force called a magnetic field
<b>Magnetic attraction</b>	the pull between some metals and a magnet
<b>Median</b>	the middle number in a list of numbers arranged from smallest to largest <b>Example:</b> 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.
<b>Trial</b>	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.

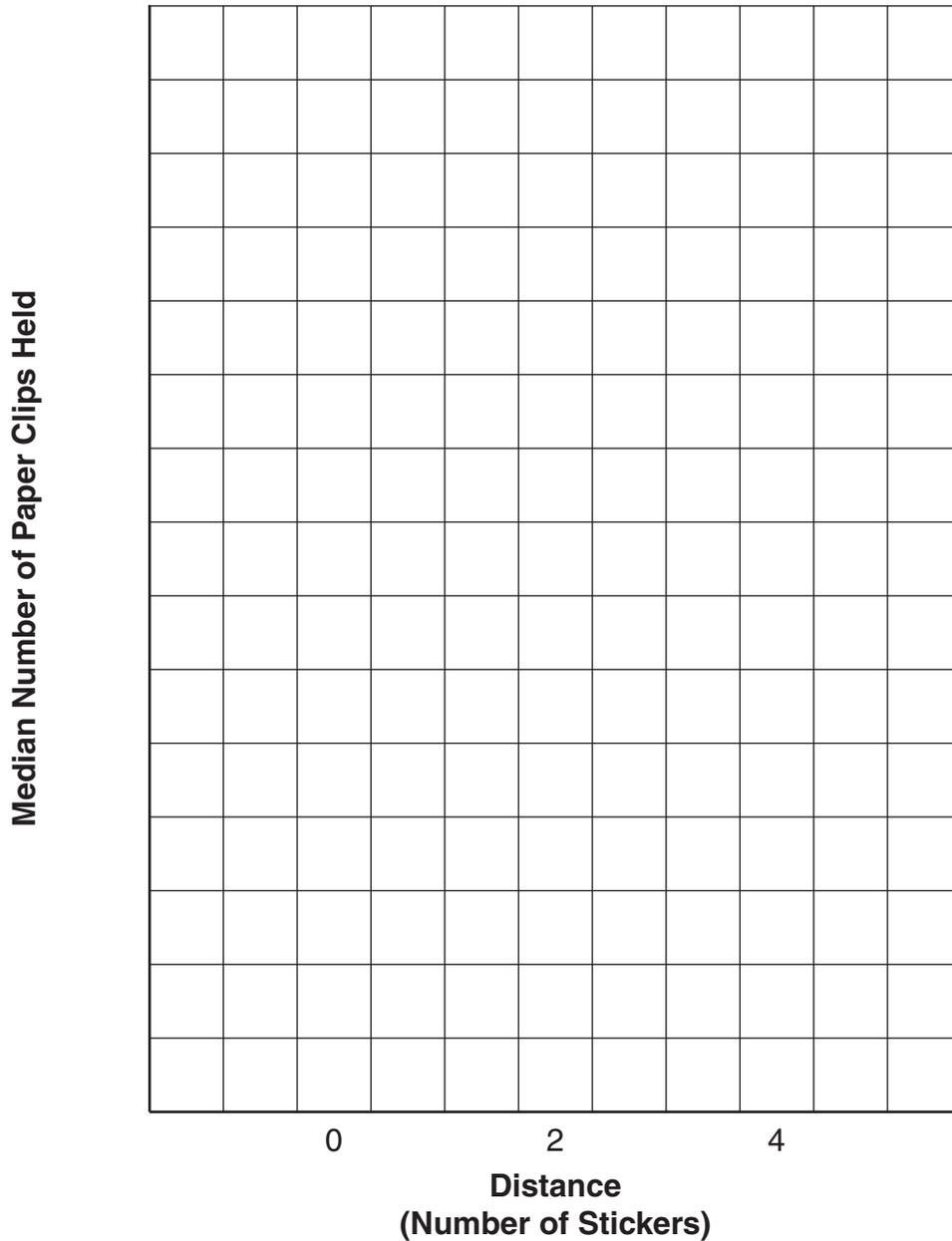
**Data Table 1: Strength of Magnet at Three Distances**

	Number of Paper Clips Held at Three Distances			Median

# SCIENCE

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: \_\_\_\_\_



## SCIENCE

### Analyzing and Using Your Results

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

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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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## SCIENCE

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

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because

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**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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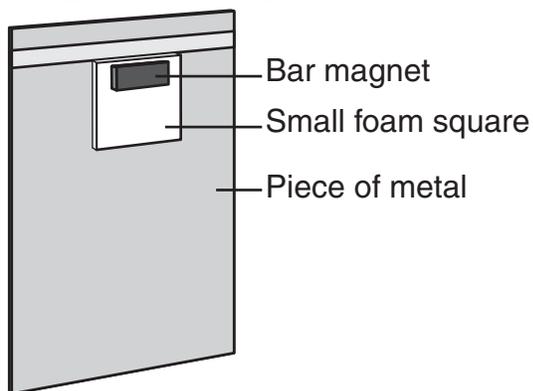
## SCIENCE

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.

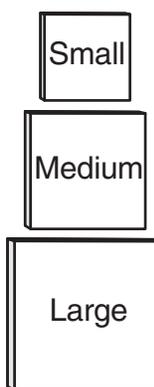
Since the students can use more than one magnet to hang the artwork, they decide to do a second investigation. They want to do the investigation without harming their artwork, so they use three different sizes of foam squares to represent the different sizes of artwork. The question that the students 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

## SCIENCE

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

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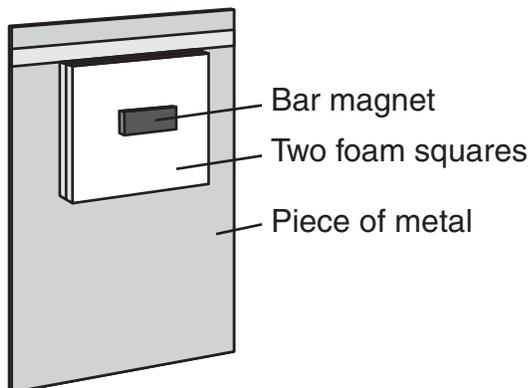
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Ana and Finn think about what they learned in Investigation 1 about magnet strength and distance and what they learned in Investigation 2 about the number of magnets needed to hold different-sized foam squares. They wonder how many magnets they will 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**



## SCIENCE

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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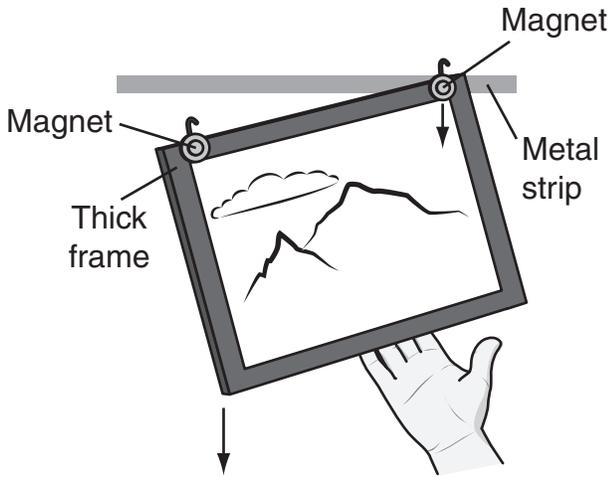
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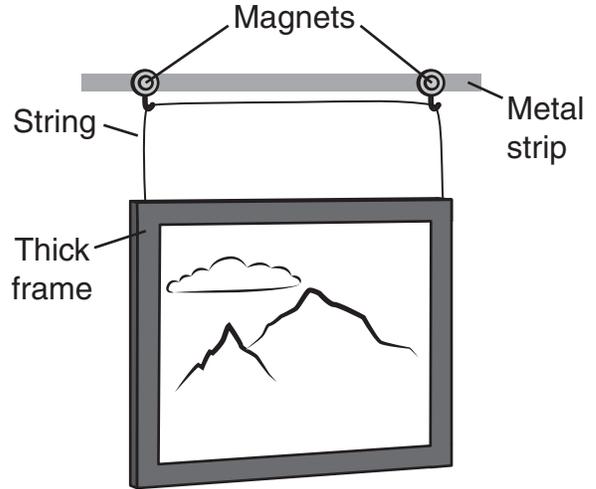
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# SCIENCE

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.

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