



**NEW ENGLAND  
COMMON ASSESSMENT PROGRAM**

**Released Items  
Support Materials  
2015**

**Grade 4  
Science**

**NECAP 2015 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	POC	PS 1-2	1	MC	C	1
2	SAE	PS 2-5	1	MC	A	1
3	SAE	PS 2-6	2	MC	A	1
4	SAE	PS 3-7	2	CR4		4
5	INQ	ESS 1-1	2	MC	C	1
6	INQ	ESS 1-2	2	MC	D	1
7	POC	ESS 1-5	2	MC	B	1
8	POC	LS 1-1	2	MC	A	1
9	SAE	LS 3-7	2	MC	A	1
10	POC	LS 4-9	2	MC	A	1

**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	2-6	2	SA	2
2	INQ	3-8	2	SA	2
3	INQ	3-8	2	CR3	3
4	INQ	3-9	2	SA	2
5	INQ	4-12	3	SA	2
6	INQ	3-10	2	SA	2
7	INQ	4-13	3	SA	2
8	INQ	1-2	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 2015 RELEASED ITEMS  
GRADE 4 SCIENCE**

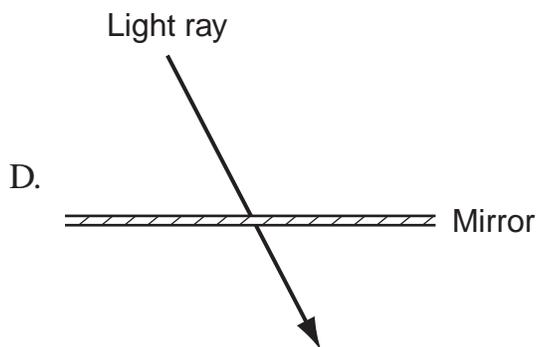
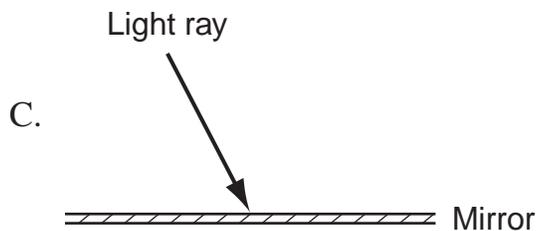
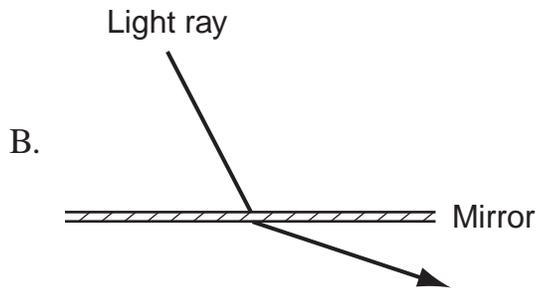
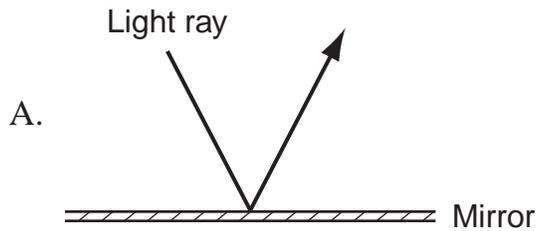
**PS1 (K-4) POC-2** Make a prediction about what might happen to the state of common materials when heated or cooled or categorize materials as a solid, liquid, or gas.

- 1 When a clear ice cube melts, which of its characteristics changes?
- A. color
  - B. odor
  - C. shape
  - D. weight

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PS2 (K-4) SAE-5 Use observations of light in relation to other objects/substances to describe the properties of light (can be reflected, refracted, or absorbed).

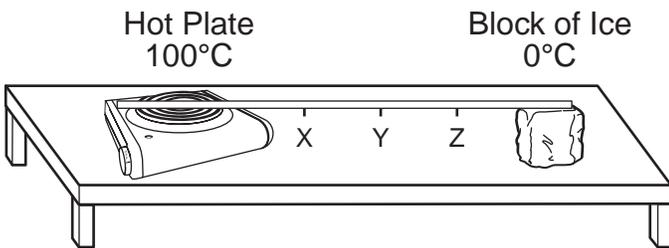
- 2 Which diagram shows the reflection of a light ray striking a mirror?



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GRADE 4 SCIENCE

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

- 3 The temperature of a metal rod is  $25^{\circ}\text{C}$ .  
A student places one end of the rod on a hot plate that is  $100^{\circ}\text{C}$  and the other end of the rod on a block of ice that is  $0^{\circ}\text{C}$ . The diagram below shows the setup of the experiment.



After five minutes, the temperature of the rod at points X, Y, and Z is measured.

What are the **most likely** temperatures of the rod at points X, Y, and Z?

- A. 

$75^{\circ}\text{C}$	$50^{\circ}\text{C}$	$25^{\circ}\text{C}$
X	Y	Z
- B. 

$75^{\circ}\text{C}$	$25^{\circ}\text{C}$	$50^{\circ}\text{C}$
X	Y	Z
- C. 

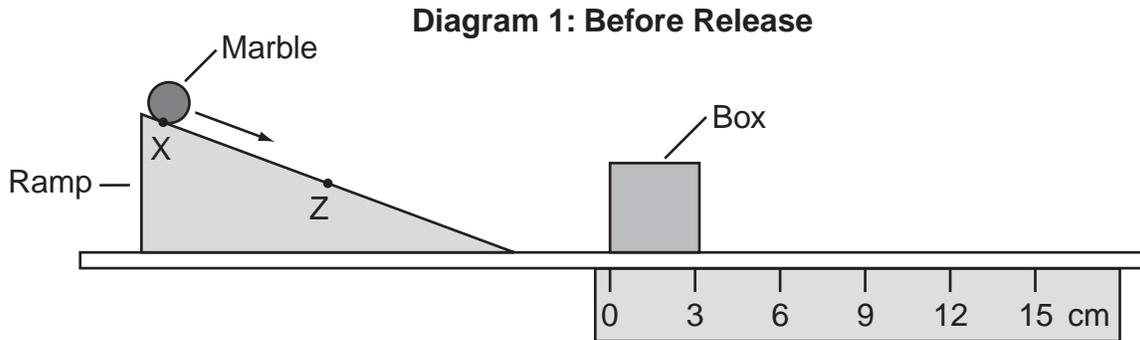
$25^{\circ}\text{C}$	$50^{\circ}\text{C}$	$75^{\circ}\text{C}$
X	Y	Z
- D. 

$25^{\circ}\text{C}$	$25^{\circ}\text{C}$	$25^{\circ}\text{C}$
X	Y	Z

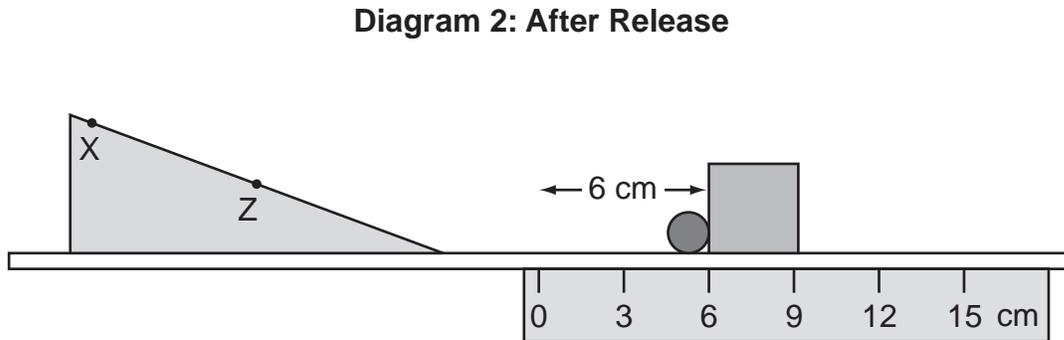
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PS3 (K-4) SAE-7 Use data to predict how a change in force (greater/less) might affect the position, direction of motion, or speed of an object (e.g., ramps and balls).

- 4 A student holds a marble on a ramp at point X, as shown in Diagram 1.



The student releases the marble, and it rolls down the ramp. The marble hits the box at the bottom of the ramp and pushes the box 6 cm, as shown in Diagram 2.



- a. Predict how far the marble will push the box if the marble is released from point Z in Diagram 1 instead of from point X. Explain your reasoning.
- b. Describe **one** change the student could make to the experiment to cause a marble to push a box more than 6 cm. Explain your reasoning.

**NECAP 2015 RELEASED ITEMS  
GRADE 4 SCIENCE**

**Scoring Guide**

<b>Score</b>	<b>Description</b>
<b>4</b>	The response demonstrates a thorough understanding of using data to predict how a change in force might affect the position of an object. The response also predicts how far the box will move if the marble rolls from point Z on the ramp instead of point X and explains the reasoning. The response describes one change that would cause the marble to move the box more than 6 cm and explains the reasoning.
<b>3</b>	The response demonstrates a general understanding of using data to predict how a change in force might affect the position of an object. The overall response is general.
<b>2</b>	The response demonstrates a limited understanding of using data to predict how a change in force might affect the position of an object. The overall response is limited.
<b>1</b>	The response demonstrates a minimal understanding of using data to predict how a change in force might affect the position of an object. 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: A thorough response includes a prediction and an explanation. A thorough response may be exemplified by the following sample response: The box would move less than 6 cm because the marble started rolling from a lower position on the ramp and, therefore, is rolling more slowly and has a smaller push on the box. [Any prediction less than 6 cm is acceptable.]

Part b: A thorough response includes one description and explanation. A thorough response may be exemplified by one of the following sample responses:

- Make the ramp steeper because the ball will roll faster and push on the box harder
- Push the marble instead of letting it roll freely because the ball will roll faster and push on the box harder
- Use a heavier marble because the marble will push harder on the box
- Use a lighter-weight box because it will take a smaller push to move the box so it will move farther
- Use a smoother surface for the ramp because the ball will roll faster and push on the box harder
- Place the box on a smoother surface because it will take a smaller push to move the box so it will move farther
- Move the box closer to the end of the ramp because the marble will be rolling the fastest at the end of the ramp and push on the box harder

4 If the marble is released at point Z it would only push the box 3 cm instead of 6 cm because if the marble is released at half way down the ramp the marble would have less power so it wouldn't push the box as far as if it started at point X. If the student wanted it to go farther like 6 or  $>$  cm it could have put the box right at the end of the ramp so that it wouldn't have to roll on any flat surface that meaning it wouldn't slow down and it will hit the box a full speed which would make it go farther.

The response demonstrates a thorough understanding of using data to predict how a change in force might affect the position of an object. The response also predicts that the box will move 3 cm if the marble rolls from point Z on the ramp instead of point X and explains the reasoning. The response describes one change (move the box closer to the end of the ramp) that would cause the marble to move the box more than 6 cm and explains the reasoning.

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SCORE POINT 3

4 I predict that since point Z is half-way down the ramp, the marble will go half as far. So I think the marble when released will push the box to 3 cm instead of 6 cm. A change the student could make to make the marble go farther is either make the ramp longer or tilt the ramp upwards. Both methods give the marble more force.

The response demonstrates a general understanding of using data to predict how a change in force might affect the position of an object. The response has a valid prediction for how far the marble might move if released from point Z, but no explanation. The response has a correct change described (tilt the ramp upwards) with an explanation that the marble will have more force.

SCORE POINT 2

4 I predict if the marble was released at point Z it would push the box 3 cm. The student could move the ramp closer and the box would go farther.

The response demonstrates a limited understanding of using data to predict how a change in force might affect the position of an object. The response has a valid prediction and change described in each part, but does not explain either answer.

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SCORE POINT 1

4 I predict the marble push the box 12 cm instead of 6 cm, if it were to start at point 2 because point 2 is half as far from the box which means there will be more force to push the box. One change the student could do is elevate the ramp more. I say to do that because at higher elevation the ball will go faster.

The response demonstrates a minimal understanding of using data to predict how a change in force might affect the position of an object. The prediction and explanation are not realistic. The response does demonstrate minimal understanding by giving a valid change in Part B, but the explanation does not link increased speed to increased force.

SCORE POINT 0

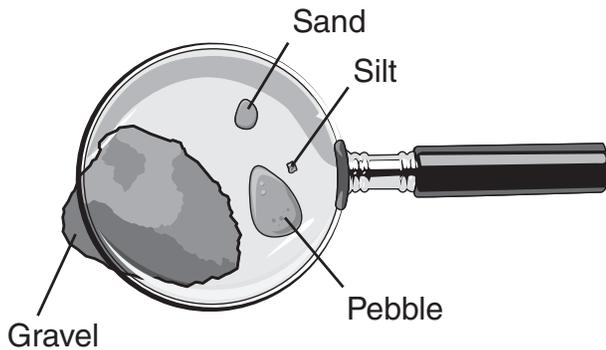
4 IF you make 3 cm more from 6 cm it will be on 15 cm. The box will move. You will see much better. When it is going to roll something can stop it. From going down.

The response is incorrect or irrelevant to the skill or concept being measured.

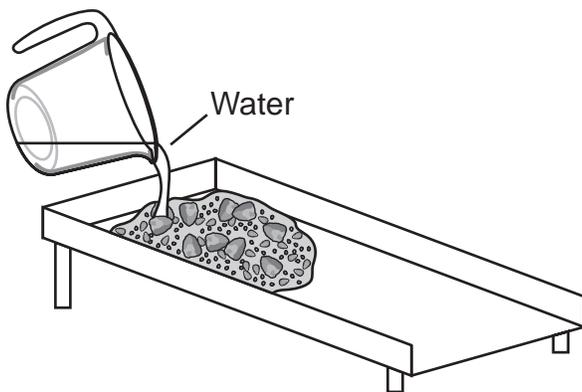
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ESS1 (K-4) INQ-1 Given certain Earth materials (soils, rocks or minerals), use physical properties to sort, classify, and describe them.

- 5 The picture below shows the particle size of four kinds of earth materials.



During an investigation, a student set up a stream table, as shown in the diagram below.



The student placed the four earth materials at the top of the stream table. Then the student poured water to represent a flowing stream.

Which earth material will be carried down the stream table the farthest?

- A. gravel
- B. sand
- C. silt
- D. pebble

NECAP 2015 RELEASED ITEMS  
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ESS1 (K-4) INQ-2 Use results from an experiment to draw conclusions about how water interacts with earth materials (e.g. percolation, erosion, frost heaves).

- 6 A student adds 50 g each of small rocks, gravel, sand, and clay to a large jar of water. He closes the jar, shakes it, and then turns it upside down and lets it sit. The result of his investigation is shown below.



This investigation models which process?

- A. formation of soil
- B. volcanic eruption
- C. carving of a canyon by a river
- D. settling of particles in water

NECAP 2015 RELEASED ITEMS  
GRADE 4 SCIENCE

ESS1 (K-4) POC-5 Based on data collected from daily weather observations, describe weather changes or weather patterns.

- 7 The table below shows the weather forecast for four days.

Mon.	Tue.	Wed.	Thurs.	Fri.
		?		
Partly cloudy	Sunny	?	Partly cloudy	Scattered showers
73°F	73°F	?	61°F	56°F

Based on the table, what is the **most likely** weather forecast for Wednesday?

- A. sunny and 45°F
- B. sunny and 72°F
- C. partly cloudy and 85°F
- D. scattered showers and 50°F

**NECAP 2015 RELEASED ITEMS  
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**LS1 (K-4) POC-1** Sort/classify different living things using similar and different characteristics. Describe why organisms belong to each group or cite evidence about how they are alike or not alike.

- 8 A student used information from the table below to develop a conclusion about whales.

**Facts about Whales**

Type of Whale	Length	Weight (mass)	Diet	Type of Animal
Blue	23–35 m	99,000 kg	Small ocean organisms	Mammal
Humpback	12–14 m	36,000 kg	Small ocean organisms	Mammal
Right	10–16 m	106,000 kg	Small ocean organisms	Mammal
Orca	9–10 m	9,500 kg	Fish, seals, penguins	Mammal

Which statement is the **best** conclusion?

- A. All whales are mammals.
- B. All whales are about the same length.
- C. All whales have about the same weight.
- D. All whales eat small ocean organisms.

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**LS3 (K-4) SAE-7** Using information (data or scenario), explain how changes in the environment can cause organisms to respond (e.g., survive there and reproduce, move away, die).

- 9 A piping plover is a small bird that nests in sand on ocean beaches. People are not allowed to walk on some beaches during the plover nesting season.

What is the **most likely** result of this rule?

- A. More plover chicks will hatch.
- B. Fewer plover chicks will hatch.
- C. Adult plovers will leave their nests.
- D. Adult plovers will eat different food.

**NECAP 2015 RELEASED ITEMS  
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**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 A student is tall, likes to play basketball, enjoys hip-hop music, and has long hair.

Which characteristic did she inherit?

- A. being tall
- B. liking to play basketball
- C. enjoying hip-hop music
- D. having long hair

**NECAP 2015 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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- ❶ In the walkway investigation on page 4 in your Inquiry Booklet, Claire and Thomas test their frost heave model.

Identify the materials that Claire and Thomas used for the walkway investigation. Explain how using these materials was an appropriate model to show how frost heaves form.

**Scoring Guide**

<b>Score</b>	<b>Description</b>
<b>2</b>	The response demonstrates a general understanding of providing reasoning for the appropriateness of materials, tools, and procedures used in an investigation. The response identifies the materials in the walkway investigation and explains how using these materials was an appropriate model to show how frost heaves form.
<b>1</b>	The response demonstrates a limited understanding of providing reasoning for the appropriateness of materials, tools, and procedures 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:

The materials that Claire and Thomas used in the walkway investigation were earth materials, water, plaster, and put in the freezer. Using these materials was appropriate because conditions in the freezer represent conditions in the soil underground in winter, the soil and water represented the soil and water under the walkway, and the plaster represented the cement walkway. By placing the container in the freezer, the students modeled the freezing of the water in the soil, which cracked the plaster like the frost heaves “cracked” the walkway.

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SCORE POINT 2

- 1 In the walkway investigation on page 4 in your Inquiry Booklet, Claire and Thomas test their frost heave model.

Identify the materials that Claire and Thomas used for the walkway investigation. Explain how using these materials was an appropriate model to show how frost heaves form.

The materials they used were: earth material, water, container, and plaster. The plaster was a good replica of the pavement on the sidewalk, the earth material as the earth material under the pavement, and water as rain water.

Demonstrates general understanding. The response names the correct materials, and discusses how the materials are good analogs of the actual walkway materials.

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GRADE 4 SCIENCE

SCORE POINT 1

- 1 In the walkway investigation on page 4 in your Inquiry Booklet, Claire and Thomas test their frost heave model.

Identify the materials that Claire and Thomas used for the walkway investigation. Explain how using these materials was an appropriate model to show how frost heaves form.

They used earth material and water and plaster.  
Because it cracked. Because it worked the way they  
needed it to.

The response names correct materials, but the explanation about how these materials were appropriate for a model is vague.

NECAP 2015 RELEASED INQUIRY TASK  
GRADE 4 SCIENCE

SCORE POINT 0

- 1 In the walkway investigation on page 4 in your Inquiry Booklet, Claire and Thomas test their frost heave model.

Identify the materials that Claire and Thomas used for the walkway investigation. Explain how using these materials was an appropriate model to show how frost heaves form.

The materials they used for the walkway investigation were stones, ~~damaged~~ stones with grass on the ending of the damaged stones. It was an appropriate model to show how frost heaves form because they started with the new ones then showed a picture of the damaged ones in order.

Incorrect experiment materials named, and explanation is too vague for credit.

**NECAP 2015 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 Copy Data Table 1 (including your title and labels) from page 8 in your Inquiry Booklet into Data Table 1 below.

**Data Table 1: Amount of Water that Moves  
through Three Different Earth Materials**

Amount of Water that Moved Through				
				<b>Median (mL)</b>

**Scoring Guide**

Score	Description
2	The response demonstrates a general understanding of how to use accepted methods for organizing, representing, and manipulating data. The response includes a data table to record the median amount of water that moves through three different earth materials, and the median amount of water that moved through each earth material.
1	The response demonstrates a limited understanding of how to use accepted methods for organizing, representing, and manipulating data. The overall response is limited.
0	The response is incorrect or irrelevant to the skill or concept being measured.
<b>Blank</b>	No response

**NECAP 2015 RELEASED INQUIRY TASK  
GRADE 4 SCIENCE**

A general understanding can be exemplified by the following sample response including their data.

**Data Table 1: Amount of Water that Moves through Three Different Earth Materials**

	Amount of Water that Moved Through			
Earth Material	TRIAL 1 (mL)	TRIAL 2 (mL)	TRIAL 3 (mL)	Median (mL)
X	12	13	12	12
Y	0	6	3	3
Z	10	10	11	10

**SCORE POINT 2**

- 2 Copy Data Table 1 (including your title and labels) from page 8 in your Inquiry Booklet into Data Table 1 below.

**Data Table 1: Amount of Water that Moves through Three Different Earth Materials**

	Amount of Water that Moved Through			
materials	Trial 1	Trial 2	Trial 3	Median (mL)
x	13ml	12ml	16ml	13ml
y	2ml	4ml	1ml	2ml
z	3ml	3ml	7ml	3ml

Demonstrates general understanding of organizing, representing, and manipulating data. The data table is filled out in an organized manner, and contains appropriate labels, units, and medians.

NECAP 2015 RELEASED INQUIRY TASK  
GRADE 4 SCIENCE

SCORE POINT 1

- 2 Copy Data Table 1 (including your title and labels) from page 8 in your Inquiry Booklet into Data Table 1 below.

**Data Table 1: Amount of Water that Moves  
through Three Different Earth Materials**

	Amount of Water that Moved Through			Median (mL)
X	11 mill	1 mill	11 mill	11 mill
Y	2 mill	0 mill	2 mill	2 mill
Z	12 mill	14 mill	15 mill	14 mill

Demonstrates a limited understanding of organizing, representing, and manipulating data. The data table is filled out in an organized manner, contains some material labels, somewhat correct units, and medians. The response does not include trial labels and it is not clear what X, Y, and Z represent.

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GRADE 4 SCIENCE

SCORE POINT 0

- 2 Copy Data Table 1 (including your title and labels) from page 8 in your Inquiry Booklet into Data Table 1 below.

**Data Table 1: Amount of Water that Moves  
through Three Different Earth Materials**

	Amount of Water that Moved Through			Median (mL)
Hills	15	27	32	
	5	1	10	5
	5	4	14	4
	5	4	12	14

ix  
27  
32

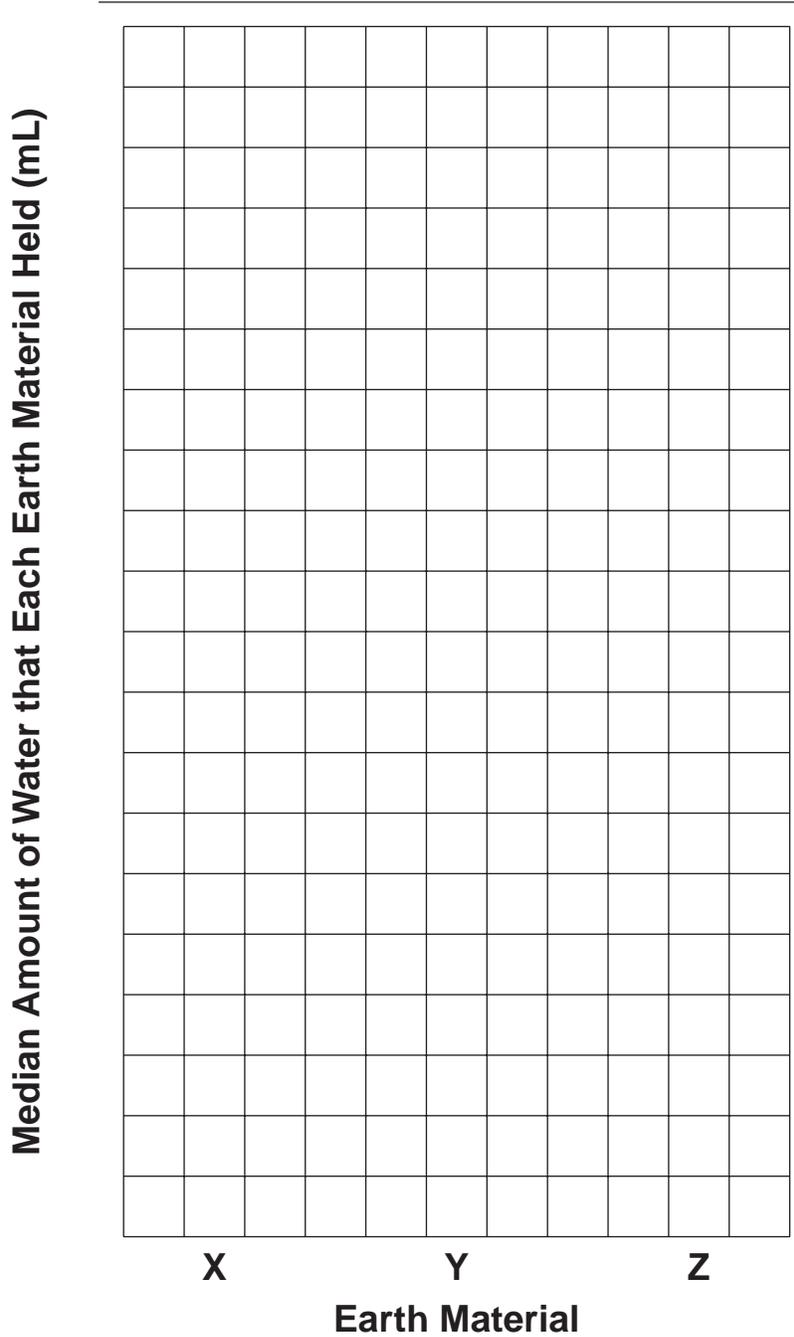
The data are not organized or labeled in a clear manner. The table does not demonstrate understanding of organizing, representing, and manipulating data.

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**Broad Area of Inquiry:**  
**Inquiry Construct 8:**

**Conducting Investigations**  
Use accepted methods for organizing, representing, and manipulating data.

- 3 Use the data you recorded in **Data Table 2** to create a bar graph that shows the **median** amount of water that each earth material held. Label and title your graph.

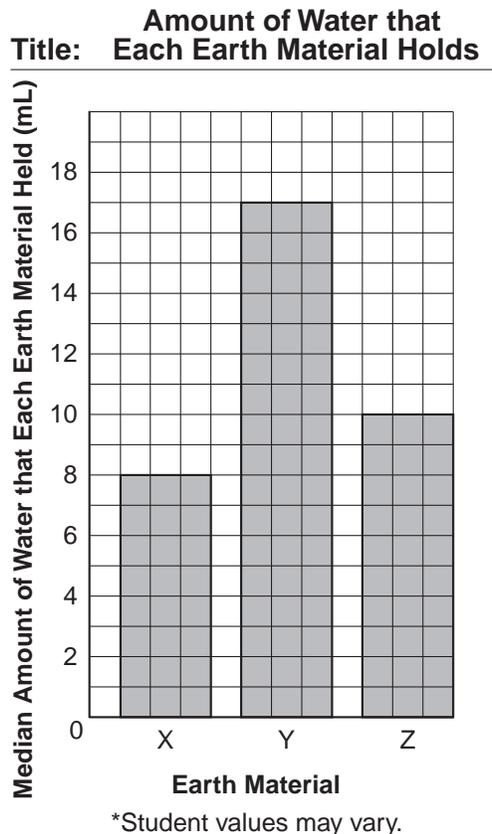


**NECAP 2015 RELEASED INQUIRY TASK  
GRADE 4 SCIENCE**

**Scoring Guide**

Score	Description
<b>3</b>	The response demonstrates a thorough understanding of how to accurately represent data in a graph. The response includes a bar graph of the median amount of water that each earth material held with proper axes, title, and data points.
<b>2</b>	The response demonstrates a general understanding of how to accurately represent data in a graph. The overall response is general.
<b>1</b>	The response demonstrates a limited understanding of how to accurately represent data in a graph. 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 data used for Material X, Y, Z data sets
- Appropriate title
- Range from zero to maximum amount of water that each earth material held on y-axis

**NECAP 2015 RELEASED INQUIRY TASK  
GRADE 4 SCIENCE**

**SCORE POINT 3**

3 Claire and Thomas needed to find out how much water that each earth material held.

Find the median amount of water that each earth material held by subtracting the median amount of water that moved through the earth material from the 20 mL of water you poured into the earth material, as shown in the example below.

**Example**

Amount of Water Poured into the Earth Material	Median Amount of Water that Moved through the Earth Material	Median Amount of Water that the Earth Material Held
20 mL	9 mL	11 mL
Calculation example: 20 mL – 9 mL = 11 mL		

Use the median data from Data Table 1 to complete Data Table 2 below.

$20\text{mL} - 4\text{mL} = 16\text{mL}$

**Data Table 2**

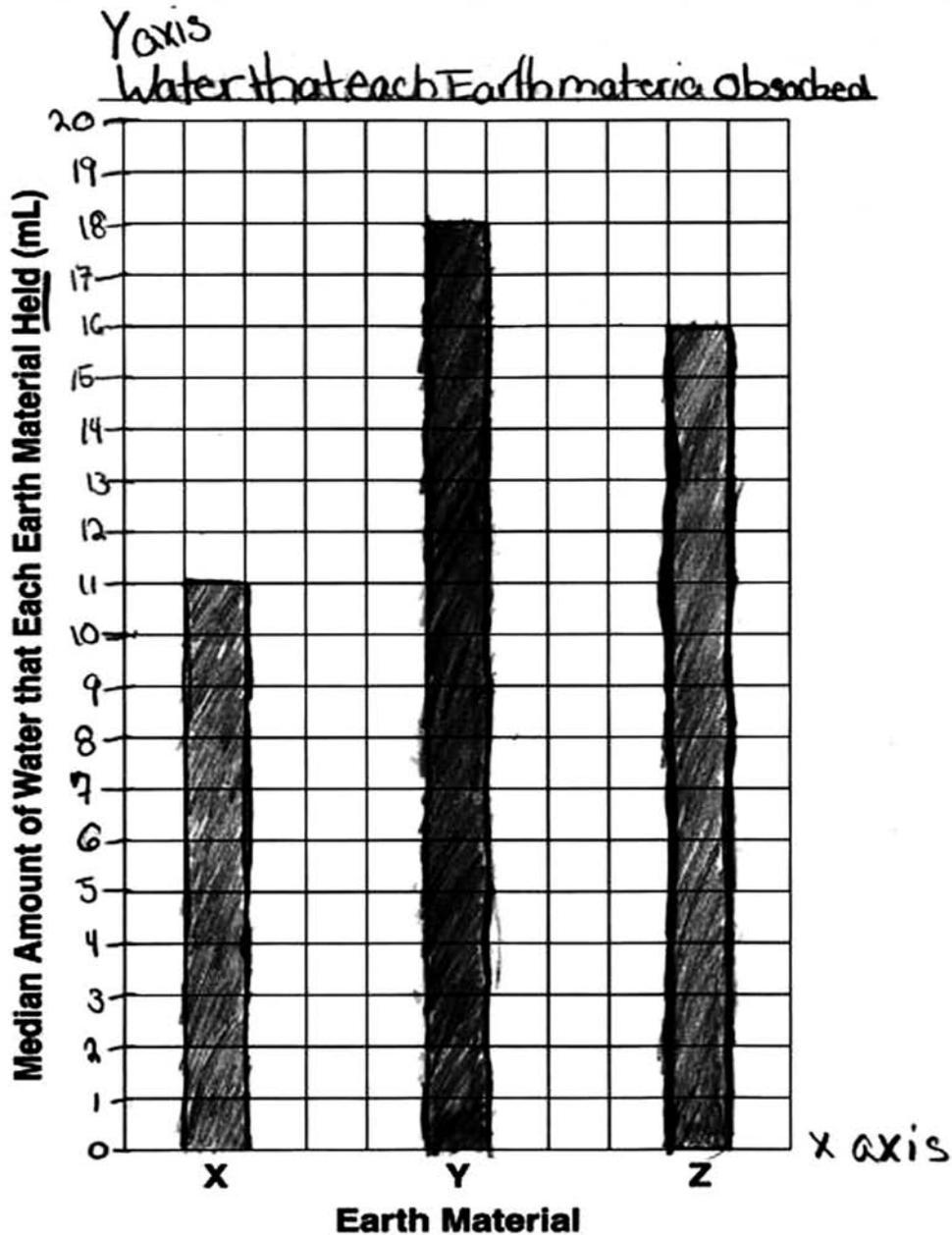
$20\text{mL} - 9\text{mL} = 11\text{mL}$   
 $20\text{mL} - 2\text{mL} = 18\text{mL}$

Earth Material	Amount of Water Poured into the Earth Material	Median Amount of Water that Moved through the Earth Material	Median Amount of Water that the Earth Material Held
X	20 mL	9 mL	11 mL
Y	20 mL	2 mL	18 mL
Z	20 mL	4 mL	16 mL

NECAP 2015 RELEASED INQUIRY TASK  
GRADE 4 SCIENCE

SCORE POINT 3 (CONTINUED)

- 3 Use the data you recorded in **Data Table 2** to create a bar graph that shows the **median** amount of water that each earth material held. Label and title your graph.



The response demonstrates a thorough understanding of how to accurately represent data in a graph. The response includes a bar graph of the median amount of water that each earth material held with proper axes, title, and data points. The scale is appropriate and contains no errors.

NECAP 2015 RELEASED INQUIRY TASK  
GRADE 4 SCIENCE

SCORE POINT 2

- 3 Claire and Thomas needed to find out how much water that each earth material held.

Find the median amount of water that each earth material held by subtracting the median amount of water that moved through the earth material from the 20 mL of water you poured into the earth material, as shown in the example below.

Example

Amount of Water Poured into the Earth Material	Median Amount of Water that Moved through the Earth Material	Median Amount of Water that the Earth Material Held
20 mL	9 mL	11 mL
Calculation example: $20 \text{ mL} - 9 \text{ mL} = 11 \text{ mL}$		

Use the median data from Data Table 1 to complete Data Table 2 below.

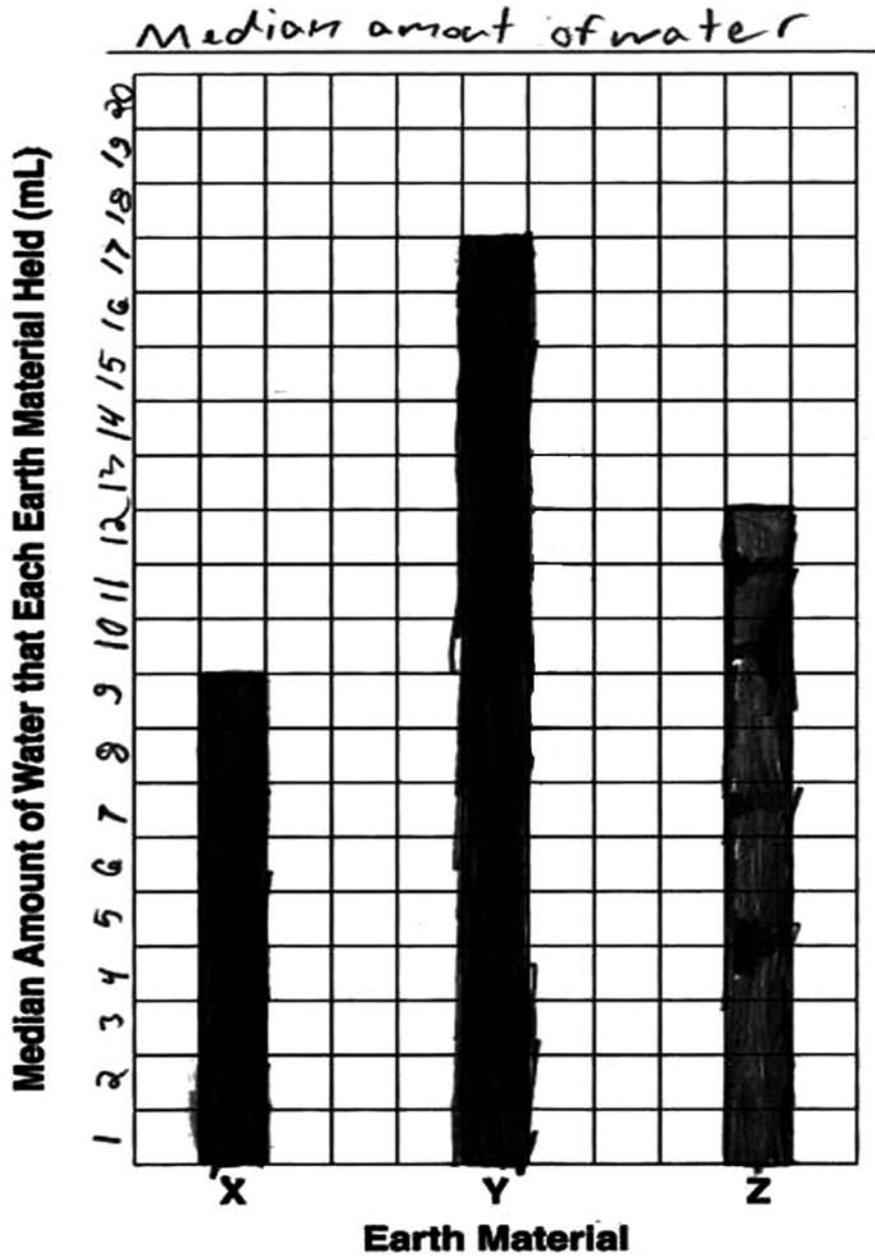
**Data Table 2**

Earth Material	Amount of Water Poured into the Earth Material	Median Amount of Water that Moved through the Earth Material	Median Amount of Water that the Earth Material Held
X	20 mL	11 ml	9 ml
Y	20 mL	3 ml	17 ml
Z	20 mL	12 ml	8 ml

NECAP 2015 RELEASED INQUIRY TASK  
GRADE 4 SCIENCE

SCORE POINT 2 (CONTINUED)

- 3 Use the data you recorded in **Data Table 2** to create a bar graph that shows the **median** amount of water that each earth material held. Label and title your graph.



The response demonstrates a general understanding of how to accurately represent data in a graph. The data points for 2/3 of the bars are correct, and the scale is mostly correct. However, the scaling numbers are misaligned to grid lines, the median for "z" is incorrectly graphed, and the title is weak.

**NECAP 2015 RELEASED INQUIRY TASK  
GRADE 4 SCIENCE**

**SCORE POINT 1**

- 3 Claire and Thomas needed to find out how much water that each earth material held. Find the median amount of water that each earth material held by subtracting the median amount of water that moved through the earth material from the 20 mL of water you poured into the earth material, as shown in the example below.

**Example**

Amount of Water Poured into the Earth Material	Median Amount of Water that Moved through the Earth Material	Median Amount of Water that the Earth Material Held
20 mL	9 mL	11 mL
Calculation example: 20 mL – 9 mL = 11 mL		

Use the median data from Data Table 1 to complete Data Table 2 below.

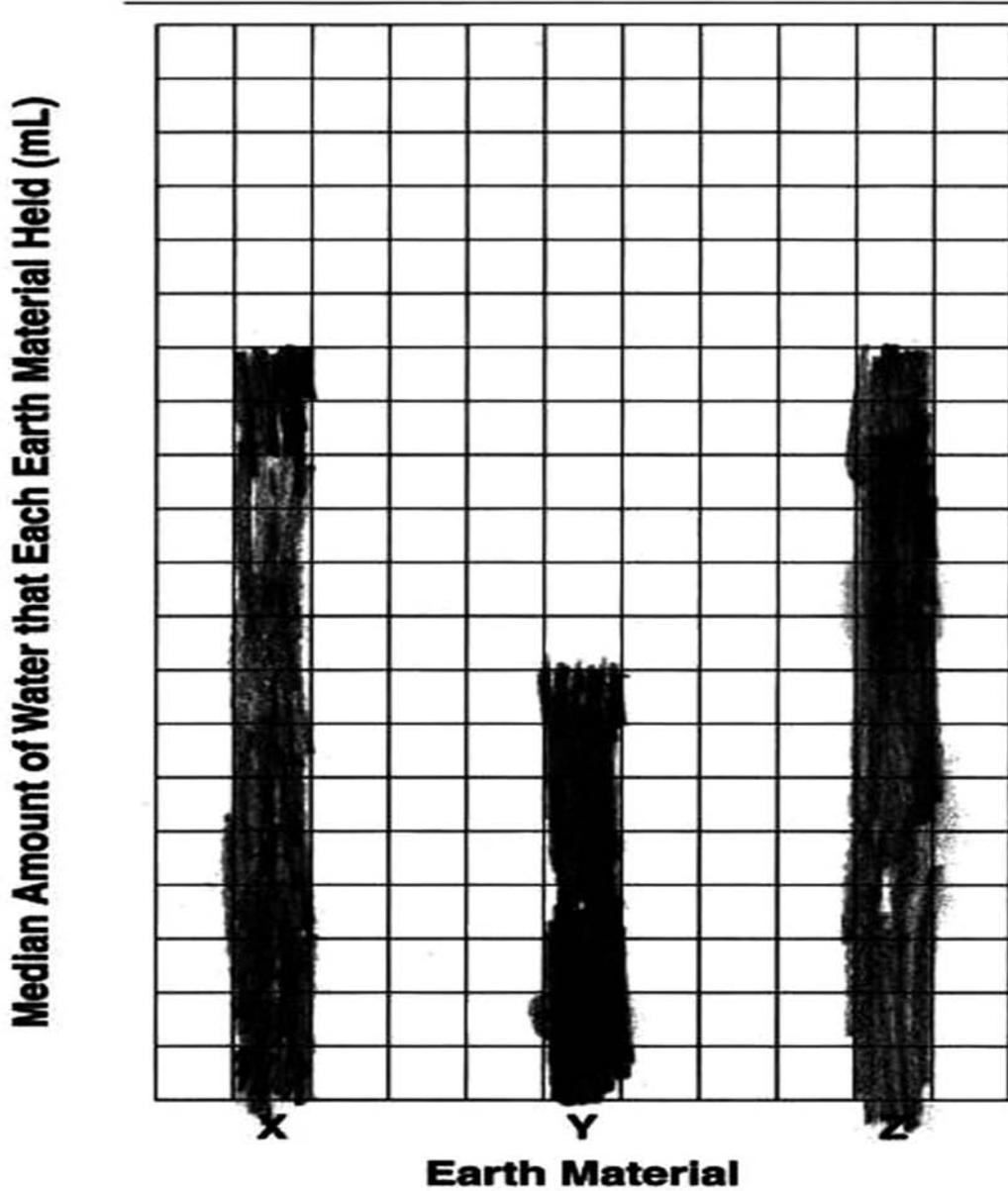
**Data Table 2**

Earth Material	Amount of Water Poured into the Earth Material	Median Amount of Water that Moved through the Earth Material	Median Amount of Water that the Earth Material Held
X	20 mL	6	14
Y	20 mL	12	8
Z	20 mL	6	14

NECAP 2015 RELEASED INQUIRY TASK  
GRADE 4 SCIENCE

SCORE POINT 1 (CONTINUED)

- 3 Use the data you recorded in **Data Table 2** to create a bar graph that shows the **median** amount of water that each earth material held. Label and title your graph.



The response demonstrates a limited understanding of how to accurately represent data in a graph. Counting boxes correctly align with data given in table, but there are no other labels.

NECAP 2015 RELEASED INQUIRY TASK  
GRADE 4 SCIENCE

SCORE POINT 0

- 3 Claire and Thomas needed to find out how much water that each earth material held.

Find the median amount of water that each earth material held by subtracting the median amount of water that moved through the earth material from the 20 mL of water you poured into the earth material, as shown in the example below.

**Example**

Amount of Water Poured into the Earth Material	Median Amount of Water that Moved through the Earth Material	Median Amount of Water that the Earth Material Held
20 mL	9 mL	11 mL
Calculation example: $20 \text{ mL} - 9 \text{ mL} = 11 \text{ mL}$		

Use the median data from Data Table 1 to complete Data Table 2 below.

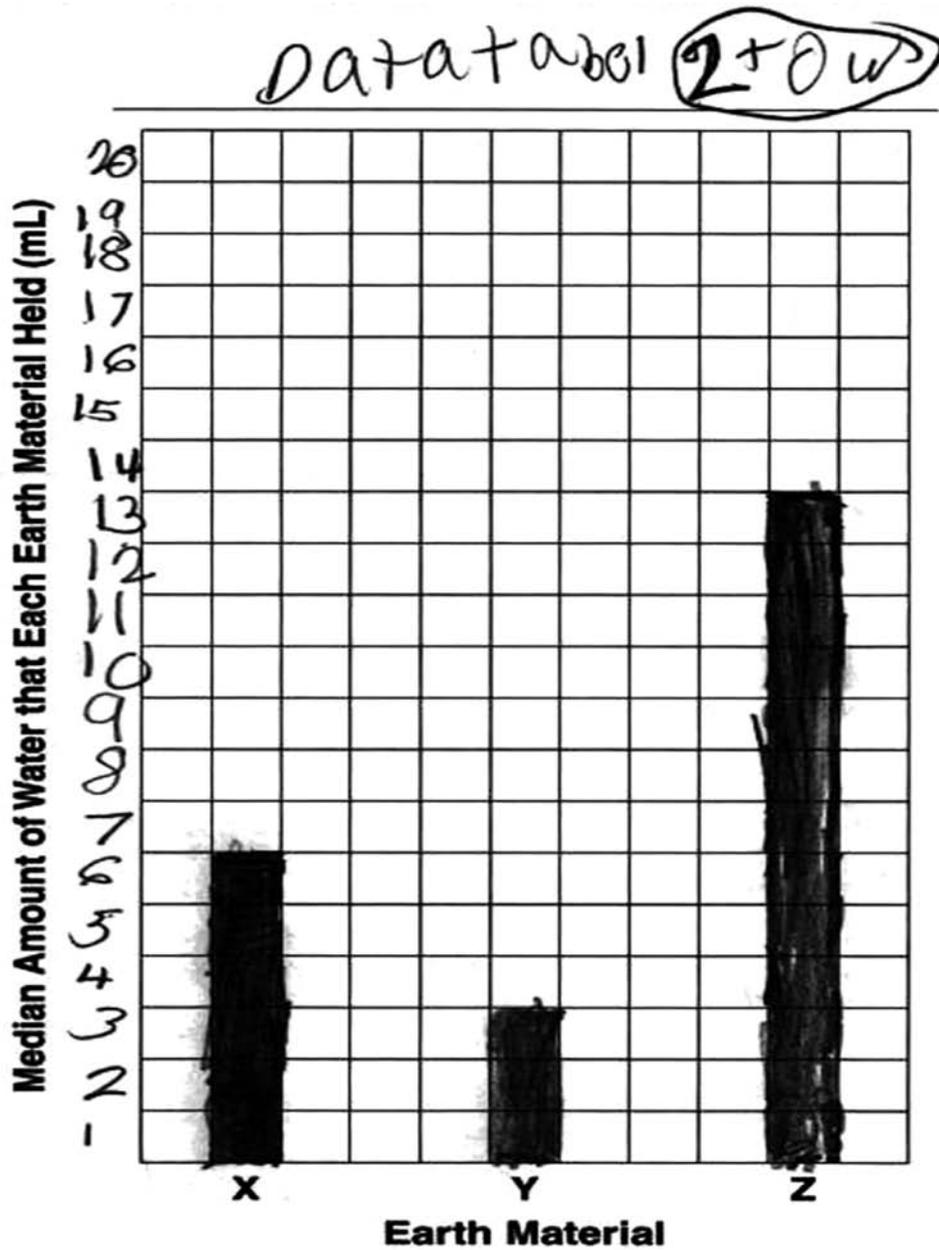
 **Data Table 2**

Earth Material	Amount of Water Poured into the Earth Material	Median Amount of Water that Moved through the Earth Material	Median Amount of Water that the Earth Material Held
X	20 mL		
Y	20 mL		
Z	20 mL		

NECAP 2015 RELEASED INQUIRY TASK  
GRADE 4 SCIENCE

SCORE POINT 0 (CONTINUED)

- 3 Use the data you recorded in **Data Table 2** to create a bar graph that shows the **median** amount of water that each earth material held. Label and title your graph.



The response is incorrect or irrelevant to the skill or concept being measured. There are no data given in table, therefore there is no way to assess if data given in graph is graphed correctly.

**NECAP 2015 RELEASED INQUIRY TASK  
GRADE 4 SCIENCE**

<b>Broad Area of Inquiry:</b> <b>Inquiry Construct 9:</b>	<b>Conducting Investigations</b> Collect sufficient data to study question, hypothesis, or relationships.
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- 4 Explain why it was important to perform three trials in this investigation. Support your reasoning with evidence (data and observations) from your investigation.

**Scoring Guide**

<b>Score</b>	<b>Description</b>
<b>2</b>	The response demonstrates a general understanding of whether the data are sufficient to study the hypothesis. The response explains why it was important to perform three trials in this investigation. Reasoning is supported with evidence from the investigation.
<b>1</b>	The response demonstrates a limited understanding of whether the data are sufficient to study 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:

Three trials were important to use because the data was not the same for each trial.

Three trials gave us more accurate information.

The evidence from my investigation was with earth material X, the water that moved through was 12 mL, 13 mL, and 12 mL, and the median was 12 mL. The amount of water that earth material X held was 8 mL, 7 mL, and 8 mL and the median was 8 mL.

NECAP 2015 RELEASED INQUIRY TASK  
GRADE 4 SCIENCE

SCORE POINT 2

- 4 Explain why it was important to perform three trials in this investigation. Support your reasoning with evidence (data and observations) from your investigation.

It was important to perform three trials in this investigation because you may not get the same result as the last trial. I learned that never just do one test. For example, for "Data Table 1" group X's numbers were mixed-up. Trial 1 was 10 ml. Trial 2 was 2 ml. Finally Trial 3, was 0 ml.

The response demonstrates a general understanding of whether the data are sufficient to study the hypothesis. The response explains the importance of three trials using evidence from the investigation.

SCORE POINT 1

- 4 Explain why it was important to perform three trials in this investigation. Support your reasoning with evidence (data and observations) from your investigation.

It was important because you can see if anything changes and why. Also your data is not always going to be the same.

The response demonstrates a limited understanding of whether the data are sufficient to study the hypothesis by showing understanding that data can change from trial to trial.

NECAP 2015 RELEASED INQUIRY TASK  
GRADE 4 SCIENCE

SCORE POINT 0

- 4 Explain why it was important to perform three trials in this investigation. Support your reasoning with evidence (data and observations) from your investigation.

Before the liquid of the water was clear  
now it's frozen after a long time it  
got damage.

The response is incorrect or irrelevant to the skill or concept being measured.

**NECAP 2015 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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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.

**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 the investigation to explain why the data did or did not support the prediction.
<b>1</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 the investigation to explain why the data did or did not support the prediction.
<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 supports my prediction because the earth material that held the most water was earth material Y. In the winter, if the soil holds water, then the water in the soil will freeze, and frost heaves may form. Response should be supported by values from the investigation.

Note: Students can receive full credit if the response states that the investigation did not include freezing.

NECAP 2015 RELEASED INQUIRY TASK  
GRADE 4 SCIENCE

SCORE POINT 2A

You investigated the following research question:

Does the amount of rainwater that an earth material can hold affect how frost heaves form?

Copy your prediction and explanation from page 5 in your Inquiry Booklet onto the lines below.

I predict that the amount of rainwater an earth material can hold will affect how frost heaves form because the more water the material holds, the more water that could freeze, so it makes a bigger frost heave.

NECAP 2015 RELEASED INQUIRY TASK  
GRADE 4 SCIENCE

SCORE POINT 2A (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.

The data did support my predictions because the median amount of water that Z held is 1 ml of water so that frost heave would be larger than X which held  $2\frac{1}{2}$  ml of water. I my prediction I believed so to be true.

The response demonstrates a general understanding of using evidence to support and justify interpretations and conclusions. The response uses quantitative evidence from the investigation to explain why the data supported the prediction.

NECAP 2015 RELEASED INQUIRY TASK  
GRADE 4 SCIENCE

SCORE POINT 2B

You investigated the following research question:

**Does the amount of rainwater that an earth material can hold affect how frost heaves form?**

Copy your prediction and explanation from page 5 in your Inquiry Booklet onto the lines below.

I predict ~~the~~ the amount of rainwater a earth material affect how frost heave's form  
because the more water it holds the bigger the frost heave will get.

- 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 data did not support my prediction because one test was not trying to see how frost heaves form.

The response demonstrates a general understanding of using evidence to explain how the evidence refutes the hypothesis. The response references evidence from the investigation to explain why the data did not support the prediction.

NECAP 2015 RELEASED INQUIRY TASK  
GRADE 4 SCIENCE

SCORE POINT 1

You investigated the following research question:

Does the amount of rainwater that an earth material can hold affect how frost heaves form?

Copy your prediction and explanation from page 5 in your Inquiry Booklet onto the lines below.

I predict the smaller rocks will hold more water and have worse frost heaves because the smaller rocks do not have lots of space for the water to get thrown

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.

it supported my answer because I put in 20 ml and it held 20 ml

The response demonstrates a limited understanding of using evidence to support and justify interpretations and conclusions. The response provides a reasonable argument with quantitative data from the investigation, but is considered limited since it is unclear which material the response is referencing.

NECAP 2015 RELEASED INQUIRY TASK  
GRADE 4 SCIENCE

SCORE POINT 0

You investigated the following research question:

Does the amount of rainwater that an earth material can hold affect how frost heaves form?

Copy your prediction and explanation from page 5 in your Inquiry Booklet onto the lines below.

I predict I think it would affect how frost heaves form.

because Its gonna have a lot of perasher because theres gonna be a lot of water.

- 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.

It did because I said yes / it would. Because for all my trys there was some that did and did not. There was a lot of water so I was right so I would say I got it right

Discussion of pressure is not relevant to the experiment conducted.

**NECAP 2015 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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- 6 Describe what your graph on page 3 shows about the median amount of water that each of the three earth materials held.

**Scoring Guide**

<b>Score</b>	<b>Description</b>
<b>2</b>	The response demonstrates a general understanding of how to provide a reasonable explanation that accurately reflects data. The response describes what the results in the graph show about the amount of water that each of the three earth materials held.
<b>1</b>	The response demonstrates a limited understanding of how to provide a reasonable explanation that accurately reflects 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

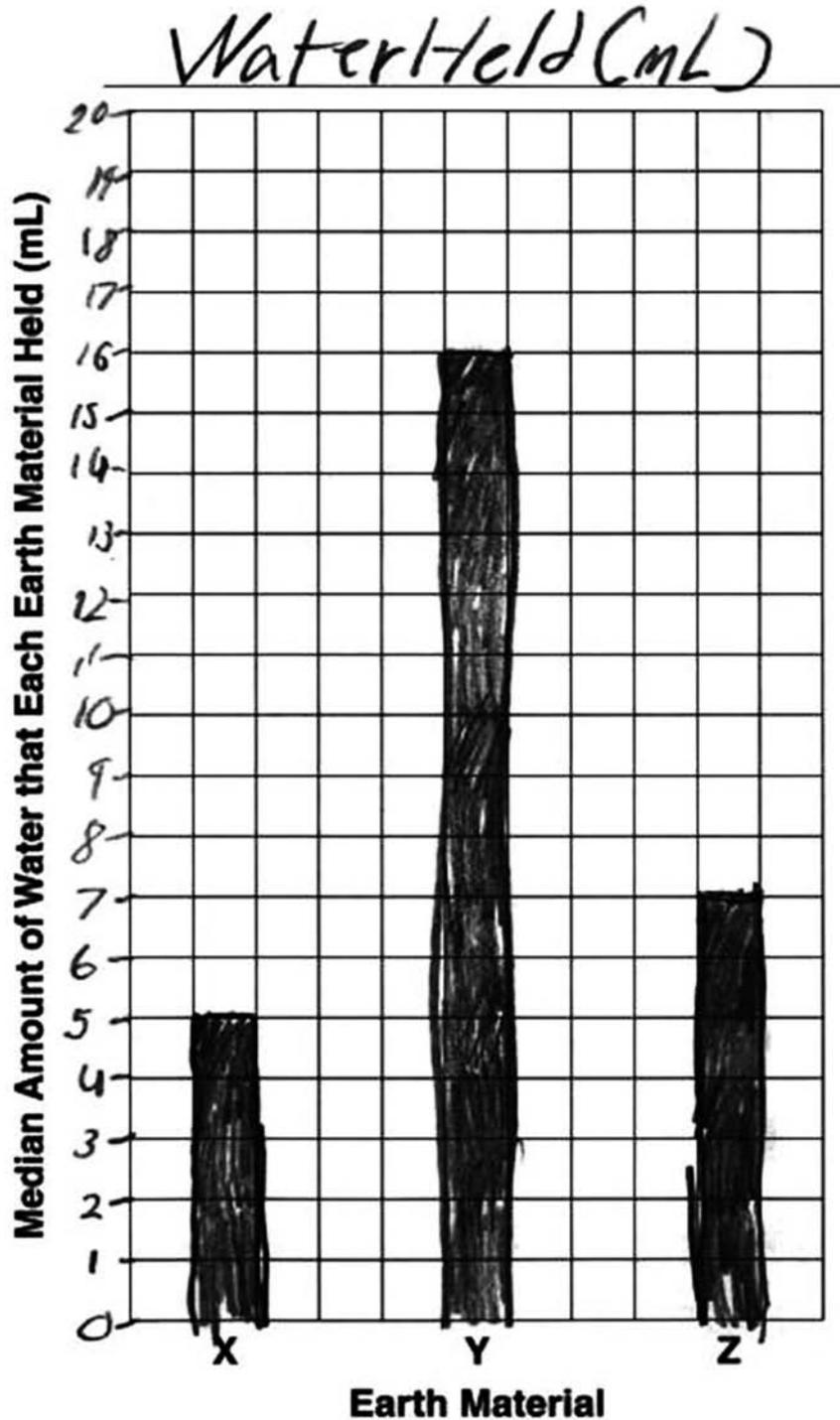
A general understanding can be exemplified by the following sample response:

Earth material Y held the most water, 17 mL; earth material Z held a medium amount, 10 mL; and earth material X held the least, 8 mL.

NECAP 2015 RELEASED INQUIRY TASK  
GRADE 4 SCIENCE

SCORE POINT 2

- 3 Use the data you recorded in **Data Table 2** to create a bar graph that shows the **median** amount of water that each earth material held. Label and title your graph.



NECAP 2015 RELEASED INQUIRY TASK  
GRADE 4 SCIENCE

SCORE POINT 2 (CONTINUED)

- 6 Describe what your graph on page 3 shows about the median amount of water that each of the three earth materials held.

The graph shows that material X held very little water (5mL) and that material Y held the most (16mL) so the median amount would be material Z (7mL)

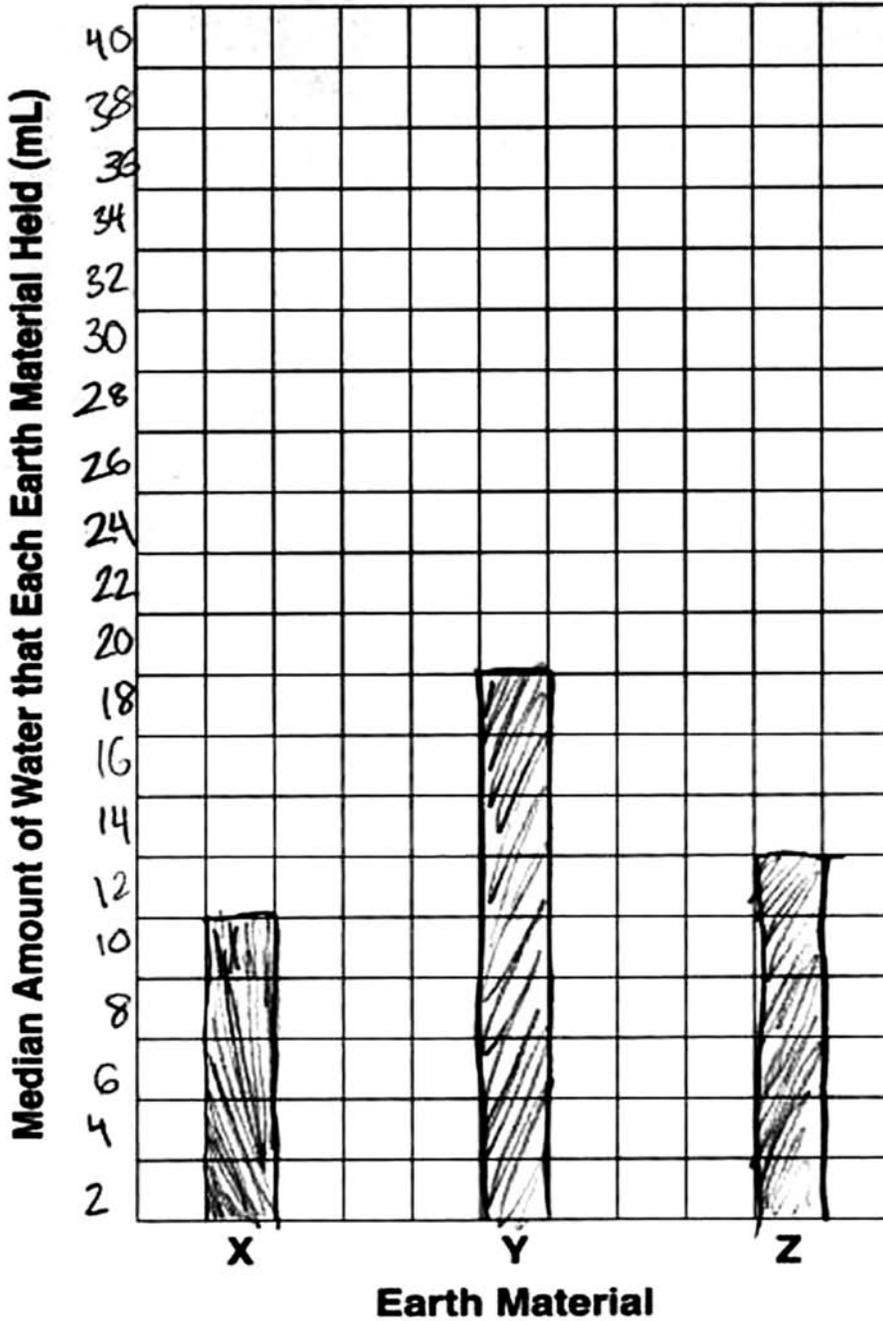
The response demonstrates a general understanding of how to provide a reasonable explanation that accurately reflects data. The response compares water retention of 3 materials with support from the graph.

NECAP 2015 RELEASED INQUIRY TASK  
GRADE 4 SCIENCE

SCORE POINT 1

- 3 Use the data you recorded in **Data Table 2** to create a bar graph that shows the **median** amount of water that each earth material held. Label and title your graph.

How much water did it hold?



NECAP 2015 RELEASED INQUIRY TASK  
GRADE 4 SCIENCE

SCORE POINT 1 (CONTINUED)

- 6 Describe what your graph on page 3 shows about the median amount of water that each of the three earth materials held.

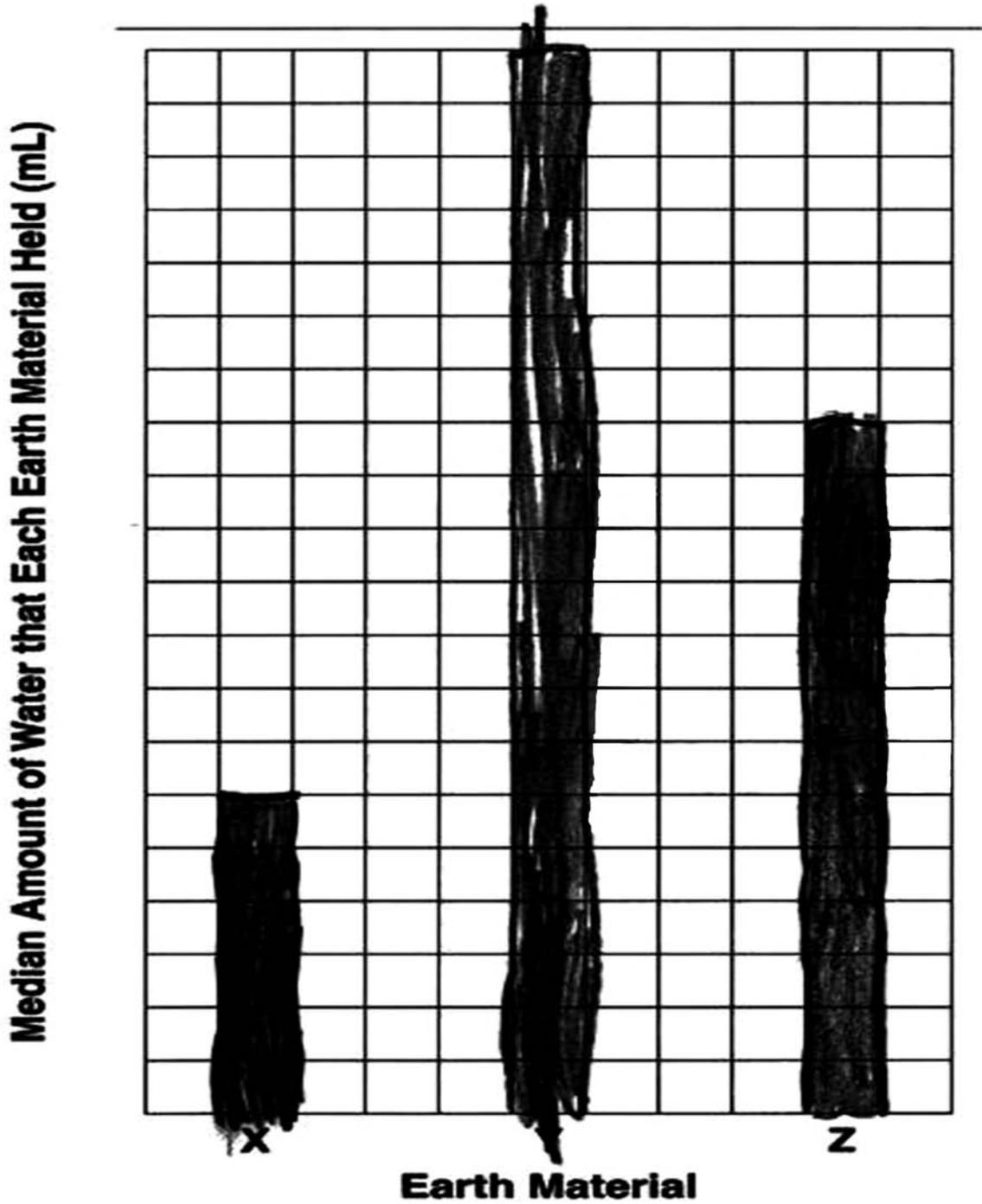
It shows that the medians  
for X is 10 for Y it is 18 and  
for Z it shows 12.

The response demonstrates a limited understanding of how to provide a reasonable explanation that accurately reflects data. The response states what values the graph shows without any description.

NECAP 2015 RELEASED INQUIRY TASK  
GRADE 4 SCIENCE

SCORE POINT 0

- 3 Use the data you recorded in **Data Table 2** to create a bar graph that shows the **median** amount of water that each earth material held. Label and title your graph.



NECAP 2015 RELEASED INQUIRY TASK  
GRADE 4 SCIENCE

SCORE POINT 0 (CONTINUED)

- 6 Describe what your graph on page 3 shows about the median amount of water that each of the three earth materials held.

Y is in the median because  
it is between 20 and 6

The response is incorrect or irrelevant to the skill or concept being measured.

**NECAP 2015 RELEASED INQUIRY TASK  
GRADE 4 SCIENCE**

<b>Broad Area of Inquiry:</b> <b>Inquiry Construct 13:</b>	<b>Developing and Evaluating Explanations</b> Communicate how scientific knowledge applies to explain results, propose further investigations or construct and analyze alternative explanations.
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- 7 Use evidence from both the story and your investigation to explain why the railroad tracks from the Lackawanna Coal Mine became crooked over the past 100 years.

**Scoring Guide**

<b>Score</b>	<b>Description</b>
<b>2</b>	The response demonstrates a general understanding of how to communicate how scientific knowledge applies to explain results. The response uses evidence from the story and the investigation to explain why the railroad tracks became crooked over the past 100 years.
<b>1</b>	The response demonstrates a limited understanding of how to communicate how scientific knowledge applies to explain results. 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:

Over the years, water percolated into the soil under the railroad tracks. The soil under the tracks must have held the water, like earth material Y. During the cold seasons, water trapped in the soil froze and thawed, which caused the water to expand, pushing the soil in different directions. Over time, this caused the railroad tracks to become crooked. The walkway investigation testing the frost heave model showed this, and our investigation of earth materials showed that some earth materials hold water more than others, and the tracks must have been built on earth materials like earth material Y.

NECAP 2015 RELEASED INQUIRY TASK  
GRADE 4 SCIENCE

SCORE POINT 2

- 7 Use evidence from both the story and your investigation to explain why the railroad tracks from the Lackawanna Coal Mine became crooked over the past 100 years.

I think the tracks from the Lackawanna Coal mine became crooked because of frost heaves. I think this because in the story, it said that frost heaves damaged Claire's walkway. That might have happened to the tracks. My investigation shows that some earth materials can hold more water than others. The tracks may have been built on an earth material that can hold more water, creating more frost heaves. This is why I think that the tracks from the Lackawanna Coal Mine became crooked because of frost heaves.

The response demonstrates a general understanding of how to communicate how scientific knowledge applies to explain results. The response uses evidence from the story and the investigation to explain why the railroad tracks became crooked over the past 100 years.

NECAP 2015 RELEASED INQUIRY TASK  
GRADE 4 SCIENCE

SCORE POINT 1

- 7 Use evidence from both the story and your investigation to explain why the railroad tracks from the Lackawanna Coal Mine became crooked over the past 100 years.

The reason why the Lackawanna Coal Mine became crooked over the past 100 years is from frost heaves. Frost heaves push the ground their under up. So if their under the railroad tracks the ground gets pushed and the tracks get crooked.

The response demonstrates a limited understanding of how to communicate how scientific knowledge applies to explain results. The response identifies and discusses frost heaves with no connection to the investigation.

SCORE POINT 0

- 7 Use evidence from both the story and your investigation to explain why the railroad tracks from the Lackawanna Coal Mine became crooked over the past 100 years.

because the wind

The response is totally incorrect.

**NECAP 2015 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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- 8 Identify two ways that Claire and Thomas could change the **materials** or the **procedure** to improve their frost heave model. Explain your answer.

**Scoring Guide**

Score	Description
3	The response demonstrates a thorough understanding of developing an organized and logical approach to investigating the question, including controlling variables. The response identifies two ways that Claire and Thomas could change the <b>materials</b> or the <b>procedure</b> to improve their frost heave model with explanations.
2	The response demonstrates a general understanding of developing an organized and logical approach to investigating the question, including controlling variables. The overall response is general.
1	The response demonstrates a limited understanding of developing an organized and logical approach to investigating the question, including controlling variables. The overall response is limited.
0	The response is incorrect or irrelevant to the skill or concept being measured.
<b>Blank</b>	No response

**NECAP 2015 RELEASED INQUIRY TASK  
GRADE 4 SCIENCE**

A thorough understanding can be exemplified by two of the following sample responses:

To improve the frost heave model, Claire and Thomas could change (materials)

- Amount of water, because adding more water would produce more cracks in the plaster
- Size of pan, because a larger or smaller pan would hold a greater or lesser amount of soil and water and create larger or smaller cracks in the plaster
- Add holes in the bottom of the container, because the amount of water in the soil changes the amount of cracking of the plaster
- Type of soil, because different types of soil can hold more water to create more cracks in the plaster
- Type of “plaster,” because a different material may crack in a more similar way to cement or asphalt
- Thickness of plaster, because a thinner layer may crack more than a thicker layer

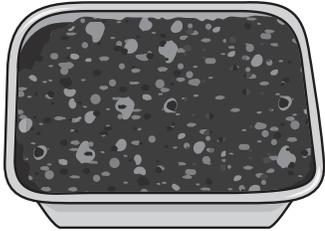
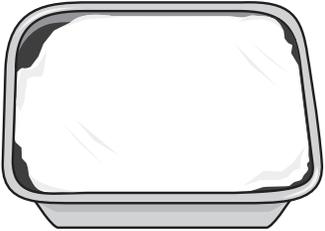
To improve the frost heave model, Claire and Thomas could change (procedure)

- Increase number of times of freezing and thawing, because more cracks may be created when the water in the soil freezes and thaws more than once
- Increase number of trials of creating the model to improve reliability

NECAP 2015 RELEASED INQUIRY TASK  
GRADE 4 SCIENCE

SCORE POINT 3

Claire and Thomas review their investigations again. They decide that the frost heave model that they made to investigate how frost heaves affect a walkway could be improved. Claire and Thomas's frost heave model is shown below.

Fill container with earth material and water.	<b>Before Freezing:</b> In the container filled with earth material and water, put a thin layer of plaster on top.	<b>After Freezing:</b> Observe the container filled with earth material and water with a thin layer of plaster on top.
		

- 8 Identify two ways that Claire and Thomas could change the **materials** or the **procedure** to improve their frost heave model. Explain your answer.

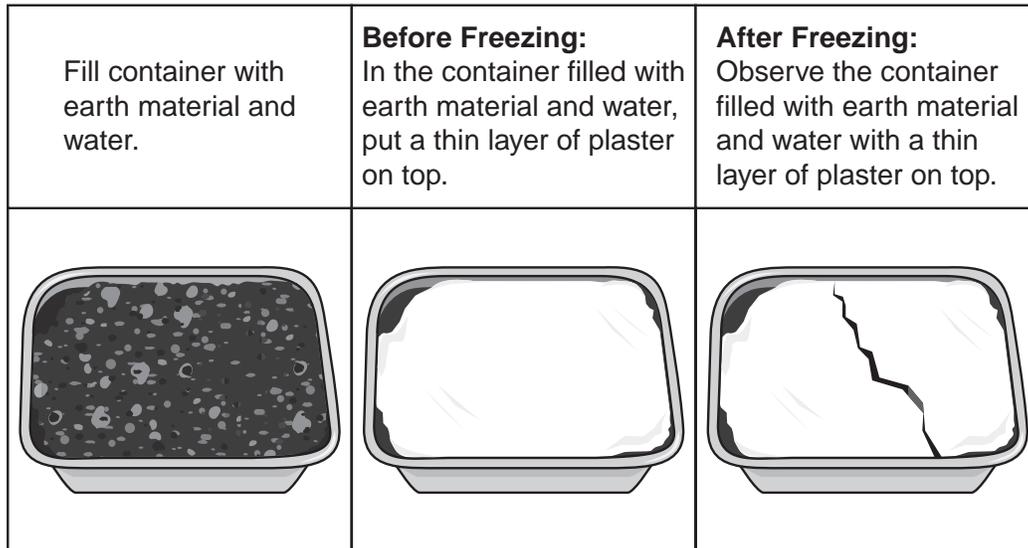
Claire and Thomas could put a thicker layer of plaster on their frost heave model, because a walkway isn't very thin, so it would make it more realistic, and then they could see if it cracked less. They could also use a different earth material and see if it made the plaster crack more or less, judging by how much water the earth material holds.

The response demonstrates a thorough understanding of developing an organized and logical approach to investigating the question. The response identifies two ways that Claire and Thomas could change the materials to improve their frost heave model with explanations.

NECAP 2015 RELEASED INQUIRY TASK  
GRADE 4 SCIENCE

SCORE POINT 2

Claire and Thomas review their investigations again. They decide that the frost heave model that they made to investigate how frost heaves affect a walkway could be improved. Claire and Thomas's frost heave model is shown below.



- 8 Identify two ways that Claire and Thomas could change the **materials** or the **procedure** to improve their frost heave model. Explain your answer.

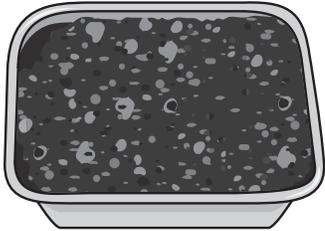
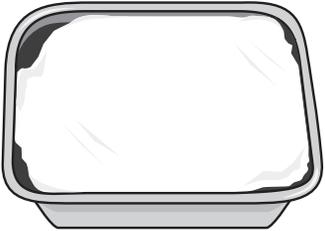
Some ways they could improve their frost heave model is they could put a even thinner piece of plaster so they can get more cracks because they only got one crack so that would make them be able to get more cracks.

The response demonstrates a general understanding of developing an organized and logical approach to investigating the question by explaining one change to the materials.

NECAP 2015 RELEASED INQUIRY TASK  
GRADE 4 SCIENCE

SCORE POINT 1

Claire and Thomas review their investigations again. They decide that the frost heave model that they made to investigate how frost heaves affect a walkway could be improved. Claire and Thomas's frost heave model is shown below.

Fill container with earth material and water.	<b>Before Freezing:</b> In the container filled with earth material and water, put a thin layer of plaster on top.	<b>After Freezing:</b> Observe the container filled with earth material and water with a thin layer of plaster on top.
		

- 8 Identify two ways that Claire and Thomas could change the **materials** or the **procedure** to improve their frost heave model. Explain your answer.

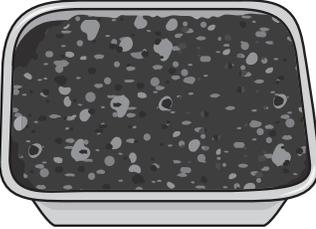
2 ways that Claire and Thomas could change materials is: instead of a thin layer of plaster how about a thicker layer, and maybe different earth materials.

The response demonstrates a limited understanding by listing two possible changes to the materials, but does not explain how either change would help to improve the model.

NECAP 2015 RELEASED INQUIRY TASK  
GRADE 4 SCIENCE

SCORE POINT 0

Claire and Thomas review their investigations again. They decide that the frost heave model that they made to investigate how frost heaves affect a walkway could be improved. Claire and Thomas's frost heave model is shown below.

Fill container with earth material and water.	<b>Before Freezing:</b> In the container filled with earth material and water, put a thin layer of plaster on top.	<b>After Freezing:</b> Observe the container filled with earth material and water with a thin layer of plaster on top.
		

- 8 Identify two ways that Claire and Thomas could change the **materials** or the **procedure** to improve their frost heave model. Explain your answer.

So they filled up a container with water and they froze it and it began to crack and get messed up.

The response is irrelevant to the prompt.