

MAT.05.PT.4.GEOCA.F.429 Claim 4

Sample Item ID:	MAT.05.PT.4.GEOCA.F.429
Title:	Geocaching
Grade:	05
Primary Claim:	Claim 4: Modeling and Data Analysis Students can analyze complex, real-world scenarios and can construct and use mathematical models to interpret and solve problems.
Secondary Claim(s):	Claim 3: Communicating Reasoning Students can clearly and precisely construct viable arguments to support their own reasoning and to critique the reasoning of others. Claim 1: Concepts and Procedures Students can explain and apply mathematical concepts and carry out mathematical procedures with precision and fluency.
Primary Content Domain	Operations and Algebraic Thinking
Secondary Content Domain(s):	Geometry
Assessment Target(s):	4 F: Identify important quantities in a practical situation and map their relationships (e.g., using diagrams, two-way tables, graphs, flowcharts, or formulas). 3 E: Distinguish correct logic or reasoning from that which is flawed, and—if there is a flaw in the argument—explain what it is. 3 F: Base arguments on concrete referents such as objects, drawings, diagrams, and actions. 1 J: Graph points on the coordinate plane to solve real-world and mathematical problems.
Standard(s):	5G.2, 5OA.3, 4OA.3, 3G.6
Mathematical Practice(s):	1, 3, 8
DOK:	4
Item Type:	PT
Score Points:	12
Difficulty:	M
How this task addresses the “sufficient evidence” for this claim:	The student is prompted to determine the location of points in the first quadrant of a coordinate plane in a real-life context. The student is able to graph ordered pairs generated from patterns on a coordinate plane.
Target-specific attributes (e.g., accessibility issues):	Accommodations may be necessary for students who have fine-motor-skill challenges and language-processing challenges.
Stimulus/Source:	handouts, map, tables http://www.youtube.com/watch?v=-4VFeYZTTYs http://www.youtube.com/watch?v=gwYakJ9ENXQ
Notes:	“Geocaching” is an activity in which objects are hidden in secret locations for participants to find, using different tools.

Task Overview:	Students must create charts and maps to learn and complete a geocaching activity.
Teacher Preparation/ Resource Requirements:	<p>Option 1: The teacher will set up a 15-by-15 "Treasure Grid" and cut out and place picture "treasures" (from pictures shown) at the locations shown on a "Treasure Coordinates" handout. This grid should be placed in a separate location (bulletin board, wall, etc.) and accessed by students in Session 2 only. The size of the units used can be determined by the amount of space available.</p> <p>Option 2: The teacher provides the students with a "Treasure Grid" handout that contains a 15-by-15 grid with pictures graphed at coordinates shown on a "Treasure Coordinates" handout. The "Treasure Grid" handout is given to the students during Session 2 only.</p> <p>Option 3: The 15-by-15 "Treasure Grid" with pictures graphed at the specified coordinates is built into the computer interface. The "Treasure Grid" would be available to the students during Session 2 only.</p>
Teacher Responsibilities During Administration:	During the administration of the task, the teacher will monitor students and provide necessary accommodations.
Time Requirements:	Between 75 and 95 minutes for both sessions.

[If option 2 or 3 in the Teacher Preparation section is chosen, prework will be altered accordingly.]

Prework: In preparation for Session 2 of this task, a 15-by-15 "Treasure Grid" is created. Floor or ceiling tiles or other materials such as yarn or twine can be used to make the grid, which can be displayed on a wall in the classroom, the library, or in an activity room that students can access during Session 2. The teacher places pictures (shown at the end of this task) at the coordinates listed on the "Treasure Coordinates" table that follows. The students should not be able to see or interact with the grid until *Part C* of this task.

If possible, have students watch the video available at the link below prior to the start of the task. It provides a nice overview of what it means to "Geocache".

<http://www.youtube.com/watch?v=-4VFeYZTTYs>

Treasure Coordinates

(1, 1)	Motorcycle
(1, 4)	Printer
(1, 6)	Guitar
(1, 8)	Cap/baseball
(1, 15)	Boots
(2, 4)	Sibling
(2, 5)	Pickup truck
(2, 12)	Hair dryer
(3, 1)	In-line skates
(3, 2)	Helicopter
(3, 3)	Shirt
(3, 4)	Ring
(3, 5)	Sailboat
(3, 9)	Sweatshirt
(3, 14)	Barbecue grill
(4, 1)	Skateboard
(4, 4)	Perfume
(4, 5)	Mirror
(4, 7)	Socks
(4, 14)	Jacket
(5, 4)	Stove
(5, 7)	Belt
(5, 12)	Football
(6, 2)	Paper
(6, 5)	Food
(6, 9)	Car
(6, 14)	Leaves
(7, 2)	Microwave
(7, 4)	Gloves
(7, 7)	Game
(7, 8)	T-shirt
(7, 10)	Fish

(8, 5)	Tie
(8, 10)	Headphones
(8, 11)	Video camera
(8, 12)	Music
(8, 13)	Magazines
(8, 14)	Tractor
(9, 3)	Vacation
(9, 8)	Raincoat
(9, 13)	Surfboard
(10, 4)	Pens
(10, 7)	Lawn mower
(10, 10)	Rain boots
(10, 14)	Musical instruments
(11, 1)	Boat
(11, 3)	Computer
(11, 9)	Ice skates
(11, 12)	Jeans
(12, 2)	Cat
(12, 4)	Laptop
(12, 14)	Refrigerator
(13, 6)	Watch
(13, 7)	Van
(13, 8)	Flowers
(13, 9)	Roses
(13, 10)	Tree
(14, 4)	Bicycle
(14, 10)	CDs
(14, 13)	Dog
(15, 1)	Pants
(15, 5)	House
(15, 9)	Purse
(15, 15)	Basketball

Geocaching

Geocaching is an indoor or outdoor treasure-seeking game. You can use different tools to find "treasure." A treasure seeker attempts to find the hidden treasure, or "geocache," by calculating the location using clues.



In this activity, a geocache is the hidden treasure that you must find using a set of clues. These clues will help you to determine the location of the geocache.

To complete this activity, you will:

- decipher the clues.
- create a map on a grid of where the geocache can be found.
- use the map to locate the geocache.
- locate new geocaches.
- create clues for a new geocaching task.

[The teacher distributes copies of the clues shown below.]

<input type="radio"/>	
	<i>Geocaching Clues:</i>
	1. To find your way to treasure, you must know your “origin.”
	2. To find the “right” moves to make, you must always add 3.
	3. To move “up” in the world of treasure hunting, you should start with the “1st” step and always move 1 step
<input type="radio"/>	at a time.
	4. If you “chart” out your course, finding treasure is easy.
	5. When you can “picture” your hunt, finding treasure is like “following a map.”
	6. There are fewer than 10 geocaches to find with these clues.
	7. The number of geocaches for which you strive is the number that rhymes with the word that follows “you.”
<input type="radio"/>	

Session 1

Deciphering the Clues

To begin geocaching, you will need to decipher clues to make your map. The map you will use for geocaching will be a coordinate grid. You will start at the origin and apply the clues to determine the location of the first treasure. You will then apply the same clues, starting at the previous location, to determine the location of the next treasure.

Part A

On a coordinate grid, what are the coordinates for the origin?

(,)

[The student receives immediate feedback after entering his or her coordinates of the origin.

If the student enters (0, 0), he or she is prompted with "Good job, that is correct!"

If the student enters anything other than (0, 0), he or she is prompted with "Sorry, but that is incorrect. The coordinates for the origin are (0, 0)."

If the student enters nothing and tries to move on, he or she is prompted with "Sorry, you must enter in the coordinates of the origin before moving on to the next step."]

Use the Geocaching Clues to answer the following questions.

How many geocache treasures are you to find using the clues?
Explain how you got your answer.

What number of units should you move along the x-axis to find each geocache? Explain how you got your answer.

What number of units should you move along the y-axis to find each geocache? Explain how you got your answer.

Apply the Geocaching Clues to fill in the table below.

Geocache Locations

	x	y
Cache 1		
Cache 2		
Cache 3		
Cache 4		
Cache 5		

Create Your Map

Now you are ready to create your map. To create your map, you will need to plot a star at each location of a geocache on your map.

Part B

You will use this map to find the geocaches on the Treasure Grid.

To graph a location, click on the gold star, then click on a location on the grid.

To remove a star from the grid, locate the star and click on it.

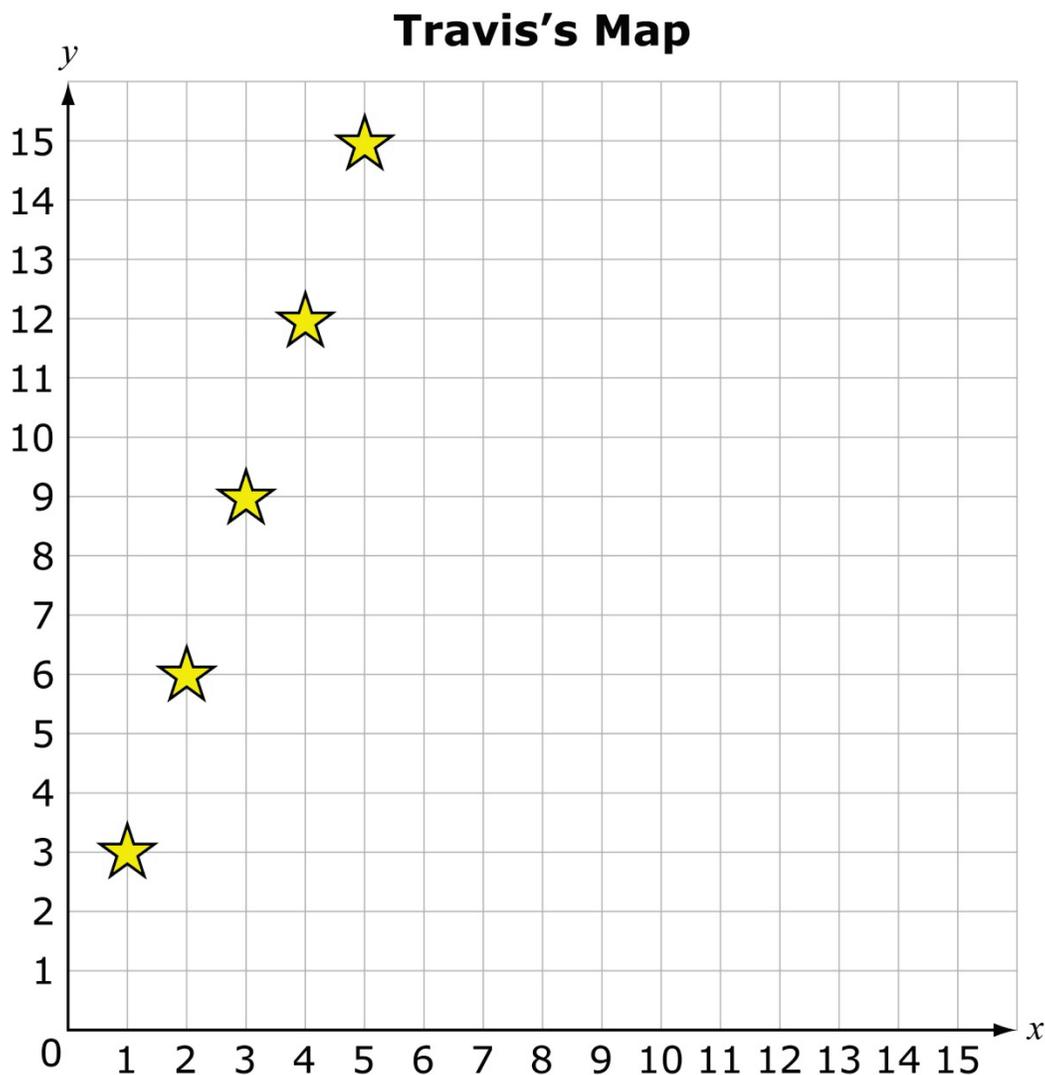


Session 2

[The teacher directs the students to either copy this information on the map created in Part B or print their map, as resources permit.]

Part C

Travis created the following map.



Did Travis apply the clues correctly to determine the locations of the geocaches? Explain why or why not.

Part D**Locating the Geocache**

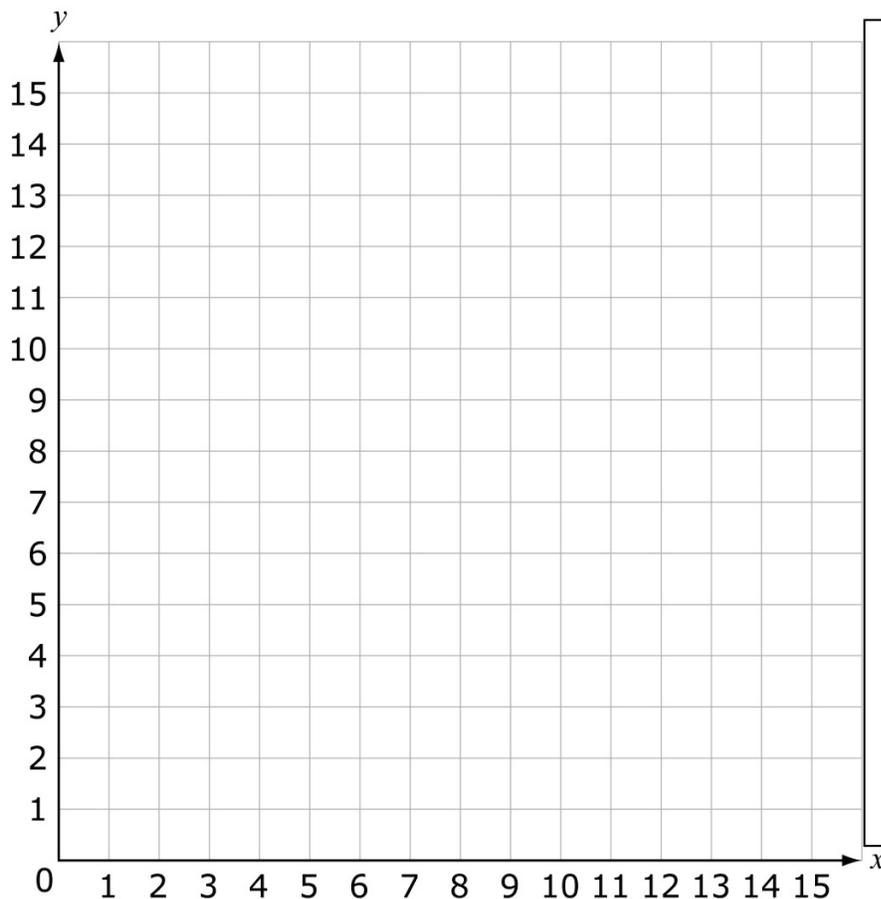
[If Option 2 or 3 in the Teacher Preparation section is chosen, the teacher prompt will be altered accordingly.]

Teacher says:

Now you can use the map you created to find the treasures located on the Treasure Grid. Remember, you are not allowed to touch or change the location of any of the treasures on the Treasure Grid. Your goal is to identify the treasure found at the locations you have determined on your map. You will need to record the object that is at each location. You may not discuss your search with any other student.

Map Worksheet

Student Name: _____



List of Geocaches

Teacher says:

Write down the name of the item found at each location on your map. If there is not an item at a location you mapped, write that the geocache was empty. You will now need to return to your computer station to enter your findings.

[The teacher facilitates, allowing students to go to the Treasure Grid one or two at a time. The teacher ensures that the geocaches are not moved. The student returns to his or her desk to electronically enter the data into the table using the information collected on the printout of his or her map or notes, depending on the availability of resources.]

Part E

Teacher says:

Your next task is to plan for the next group of geocaching treasure-seekers. Write the coordinates for each of the items shown below.

[The teacher writes these items in the order below on the board or makes this list accessible to each student. The teacher then facilitates as the students go to the Treasure Grid to locate the new treasures shown below.]

Sellina's List

	Treasure	Coordinates
1	Printer	
2	Sibling	
3	Ring	
4	Perfume	
5	Hair dryer	

Use words and numbers to create clues that the next group of geocachers could use to accurately find the items listed in the table above.

To create clues:

- First, determine the coordinates of a starting point.
- Then, use a numerical expression that describes how to get to the next coordinate, given the starting coordinate.
- Next, be able to repeat a numerical expression to determine the location of each item in the table.

*Sample Top-Score Response:**Part A* $(0, 0)$

5, because the word that comes after the word "you" in the clue is "strive," and "five" is the only number less than 10 that rhymes with "strive."

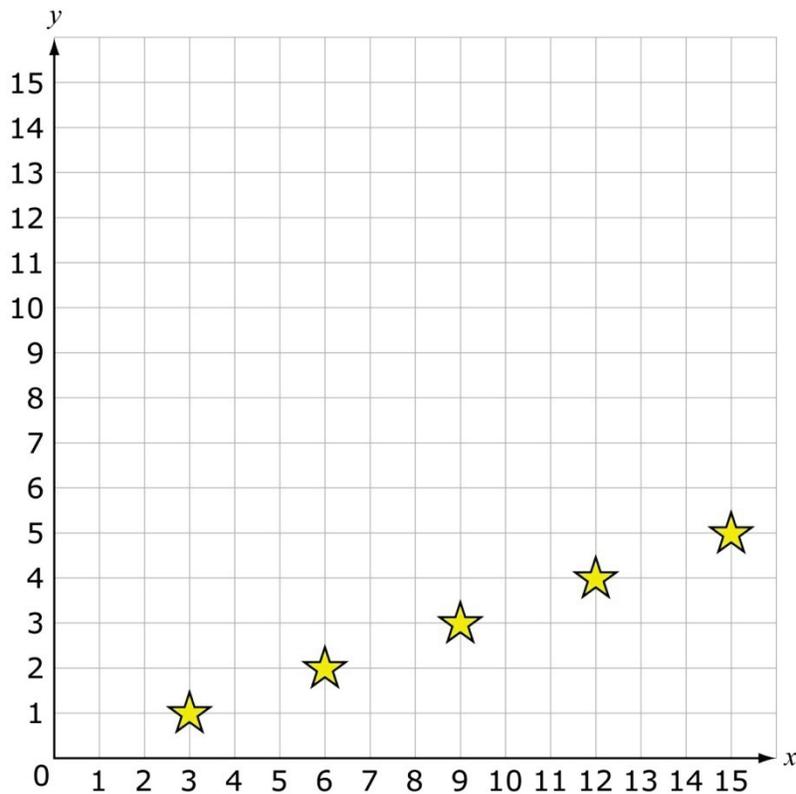
3 units, because clue number 3 says to move 3 units to the right.

1, because clue number 4 says to move up 1 step.

Geocache Locations

	x	y
Cache 1	3	1
Cache 2	6	2
Cache 3	9	3
Cache 4	12	4
Cache 5	15	5

Part B



Part C

No, because he switched the x- and y-coordinates when he plotted the stars onto the graph.

Part D

Rollerblades, Paper, Vacation, Laptop, House

Part E

Sellina's List

	Treasure	Coordinates
1	Printer	(1, 4)
2	Sibling	(2, 4)
3	Ring	(3, 4)
4	Perfume	(4, 4)
5	Hair dryer	(5, 4)

1. Start at the origin.
2. Then, add 4 to the value of the y-coordinate, add 1 to value of the x-coordinate, and find a geocache.
3. Then, apply $x + 1$.
4. Then, repeat the previous expression 3 times.

Scoring Rubric:

Responses to this item will receive 0–12 points, based on the following:

Part A

4 points: The student enters (0, 0). The student provides 5, 3, and 1. The student explains each answer clearly and precisely by constructing viable arguments to support his or her answer. The student provides values to correctly complete the table.

3 points: The student does not enter (0, 0). The student provides 5, 3, and 1. The student explains each answer clearly and precisely by constructing viable arguments to support his or her answer. The student provides values to correctly complete the table.

2 points: The student does not enter (0, 0). The student provides 5, 3, and 1. The student shows little or no explanation for each answer. The student provides values to correctly complete the table. **OR** The student enters (0, 0). The student provides up to two answers correctly (from 5, 3, and 1). The student explains each answer clearly and precisely by constructing viable arguments to support his or her answer. The student partially completes the table.

1 point: The student enters (0, 0). The student does not provide 5, 3, and 1. The student does not explain each answer clearly and precisely by constructing viable arguments to support his or her answer. The student does not provide values to correctly complete the table.

0 points: The student enters something other than (0, 0). The student does not provide 5, 3, and 1. The student does not explain each answer clearly and precisely by constructing viable arguments to support his or her answer. The student does not provide values to correctly complete the table.

Part B

2 points: The student analyzes the real-world situation to graph exactly 5 points correctly in the coordinate plane.

1 point: The student analyzes the real-world situation to correctly graph 3 or more points in the coordinate plane with up to 1 additional incorrect point.

0 points: The student analyzes the real-world situation to graph 2 or fewer points accurately in the coordinate plane.

Part C

2 points: The student answers “No” and clearly and precisely constructs viable arguments to critique the reasoning of others by clearly explaining why the graph was plotted incorrectly.

1 point: The student answers “No” and constructs little or no argument to critique reasoning by explaining why the graph was plotted incorrectly.

0 points: The student answers “No” and has no explanation; the student answers yes; or the student does not answer.

Part D

1 point: The student lists all of the correct treasures (In-line Skates, Paper, Vacation, Laptop, House) in correct order.

0 points: The student lists all of the correct treasures (In-line Skates, Paper, Vacation, Laptop, House) and not in the correct order.

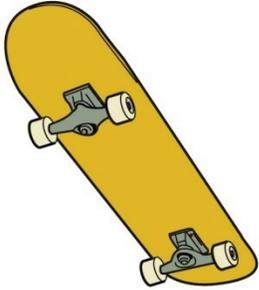
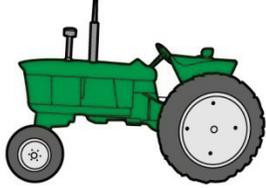
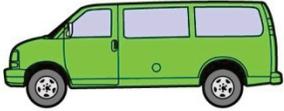
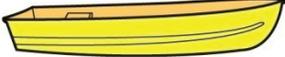
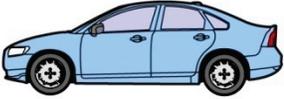
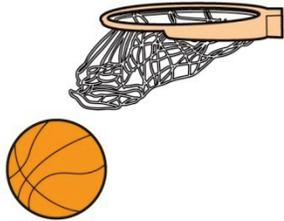
Part E

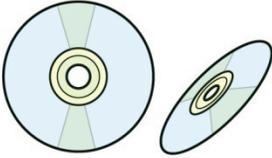
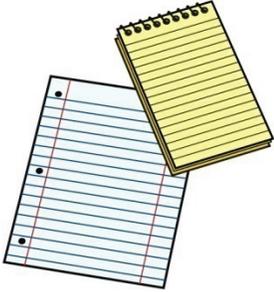
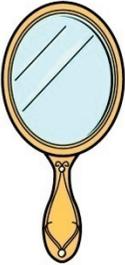
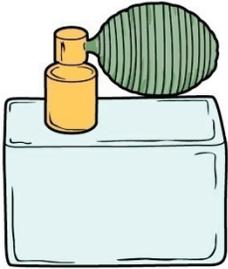
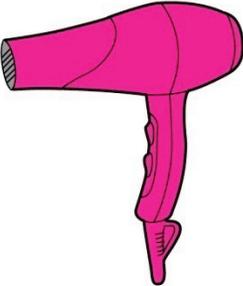
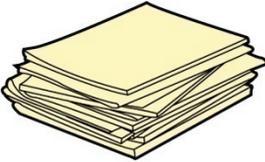
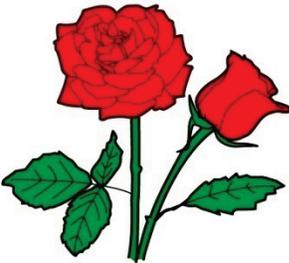
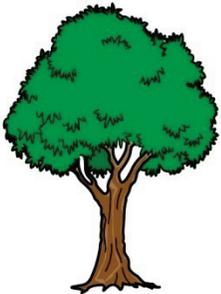
3 points: The student shows the ability to identify important quantities in a practical situation by identifying a starting point. The student describes movement from one point to the next using an expression that could be repeated to obtain the location of the remaining geocache locations.

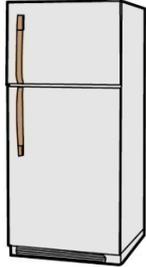
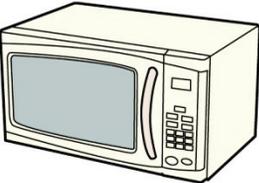
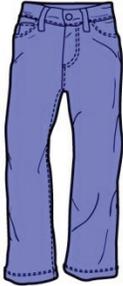
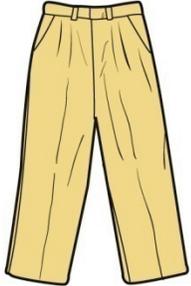
2 points: The student shows some ability to identify important quantities in a practical situation by identifying a starting point. The student describes a movement from one point to the next using an expression that is repeated to obtain the location of the remaining incorrect geocache.

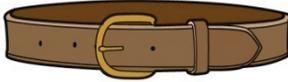
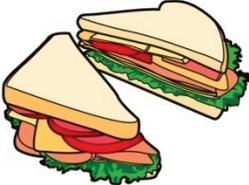
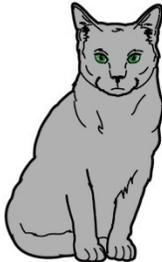
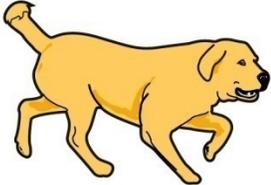
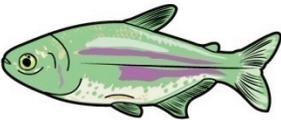
1 point: The student does not show an ability to identify important quantities in a practical situation by identifying an incorrect starting point. The student describes a movement from one point to the next using an expression. The expression cannot be repeated to obtain the location of the remaining geocache.

0 points: The student does not show an ability to identify important quantities in a practical situation by identifying an incorrect starting point. The student does not describe a movement from one point to the next using an expression.

skateboard 	motorcycle 	pickup truck 	tractor 
van 	bicycle 	boat 	car 
helicopter 	sailboat 	in-line skates 	ice skates 
basketball 	football 	surfboard 	game 

<p>laptop</p> 	<p>CDs</p> 	<p>computer</p> 	<p>paper</p> 
<p>printer</p> 	<p>pens</p> 	<p>mirror</p> 	<p>perfume</p> 
<p>hair dryer</p> 	<p>headphones</p> 	<p>magazines</p> 	<p>music</p> 
<p>video camera</p> 	<p>flowers</p> 	<p>roses</p> 	<p>tree</p> 

<p>lawn mower</p> 	<p>leaves</p> 	<p>stove</p> 	<p>refrigerator</p> 
<p>microwave</p> 	<p>barbecue grill</p> 	<p>watch</p> 	<p>shirt</p> 
<p>jacket</p> 	<p>T-shirt</p> 	<p>jeans</p> 	<p>pants</p> 
<p>sweatshirt</p> 	<p>tie</p> 	<p>rain boots</p> 	<p>ring</p> 

<p>purse</p> 	<p>socks</p> 	<p>belt</p> 	<p>boots</p> 
<p>cap/baseball</p> 	<p>gloves</p> 	<p>raincoat</p> 	<p>guitar</p> 
<p>musical instruments</p> 	<p>food</p> 	<p>cat</p> 	<p>dog</p> 
<p>fish</p> 	<p>house</p> 	<p>vacation</p> 	<p>sibling</p> 