

Vertical Progression:

<p>3rd Grade</p>	<p>3.OA.D Solve problems involving the four operations, and identify and explain patterns in arithmetic.</p> <ul style="list-style-type: none"> ○ 3.OA.D.9 Generate a number or shape pattern that follows a given rule. Identify apparent features of the pattern that were not explicit in the rule itself. <i>For example, given the rule “Add 3” and the starting number 1, generate terms in the resulting sequence and observe that the terms appear to alternate between odd and even numbers. Explain informally why the numbers will continue to alternate in this way.</i>
<p>4th Grade</p>	<p>4.OA.B Generate and analyze patterns.</p> <ul style="list-style-type: none"> ○ 4.OA.B.5 Generate a number or shape pattern that follows a given rule. Identify apparent features of the pattern that were not explicit in the rule itself. <i>For example, given the rule “Add 3” and the starting number 1, generate terms in the resulting sequence and observe that the terms appear to alternate between odd and even numbers. Explain informally why the numbers will continue to alternate in this way.</i>
<p>5th Grade</p>	<p>5.OA.B Analyze patterns and relationships.</p> <ul style="list-style-type: none"> ○ 5.OA.B.3 Generate two numerical patterns using two given rules. Identify apparent relationships between corresponding terms. Form ordered pairs consisting of corresponding terms from the two patterns, and graph the ordered pairs on a coordinate plane. <i>For example, given the rule “Add 3” and the starting number 0, and given the rule “Add 6” and the starting number 0, generate terms in the resulting sequences, and observe that the terms in one sequence are twice the corresponding terms in the other sequence. Explain informally why this is so.</i>
<p>6th Grade</p>	<p>6.EE.C Represent and analyze quantitative relationships between dependent and independent variables.</p> <ul style="list-style-type: none"> ○ 6.EE.C.9 Use variables to represent two quantities in a real-world problem that change in relationship to one another; write an equation to express one quantity, thought of as the dependent variable, in terms of the other quantity, thought of as the independent variable. Analyze the relationship between the dependent and independent variables using graphs and tables, and relate these to the equation. <i>For example, in a problem involving motion at constant speed, list and graph ordered pairs of distances and times, and write the equation $d = 65t$ to represent the relationship between distance and time.</i>

Students will demonstrate command of the ELG by:

- Generating number patterns using a given rule.
- Forming ordered pairs from number patterns.
- Graphing ordered pairs on a coordinate plane.
- Explaining and identifying the relationship between the numbers in a pattern.

Vocabulary:

- axis/axes
- coordinate plane
- coordinate system
- coordinates
- corresponding terms
- first quadrant
- ordered pairs
- origin
- vertical
- x-axis
- x-coordinate
- y-axis
- y-coordinate

Sample Instructional/Assessment Tasks:

1) Standard(s): 5.OA.B.3

Source: Illustrative Math

<https://www.illustrativemathematics.org/content-standards/5/OA/B/3/tasks/1895>

Item Prompt: Sidewalk Patterns

Cora and Cecilia each use chalk to make their own number patterns on the sidewalk. They make each of their patterns 10 boxes long and line their patterns up so they are next to each other.

Cora puts 1 in her first box and decides that she will add 3 every time to get the next number.

Cecilia puts 0 in her first box and decides that she will add 9 every time to get the next number.

Cora:

0	3								
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Cecilia:

0	9								
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- a. Complete each girl's sidewalk pattern.
- b. How many times greater is Cecilia's number in the 5th box than Cora's number in the 5th box? What about the numbers in the 8th box? The 10th box?
- c. What pattern do you notice in your answers for part b? Why do you think that pattern exists?
- d. If Cora and Cecilia kept their sidewalk patterns going, what number will be in Cora's box when Cecilia's corresponding box shows 153?

Correct Answer:

a.

Cora:

0	3	6	9	12	15	18	21	24	27
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Cecilia:

0	9	18	27	36	45	54	63	72	81
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b.

Cora:

0	3	6	9	12	15	18	21	24	27
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Cecilia:

0	9	18	27	36	45	54	63	72	81
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We can see that at the 5th, 8th and 10th boxes, Cecilia's number is always 3 times Cora's number. Cecilia's number will always be three times Cora's number, no matter which pair of corresponding boxes the girls stand on. Cora's box shows 0 and the multiples of 3. Cecilia's box shows 0 and the multiples of 9.

c.

Cora:

0 x 3	1 x 3	2 x 3	3 x 3	4 x 3
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Cecilia:

0 x 3 x 3	1 x 3 x 3	2 x 3 x 3	3 x 3 x 3	4 x 3 x 3
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The image above shows us the 3 as a factor in each of Cora's terms in her path. It also shows the 9 as a factor in each of Cecilia's terms in her path, though 9 is being represented as 3 x 3. This allows us to see that Cora's factor of 3 is contained in each of Cecilia's terms, as well as one extra factor of 3. This is why Cecilia's term will always be three times Cora's corresponding term in her path.

d.

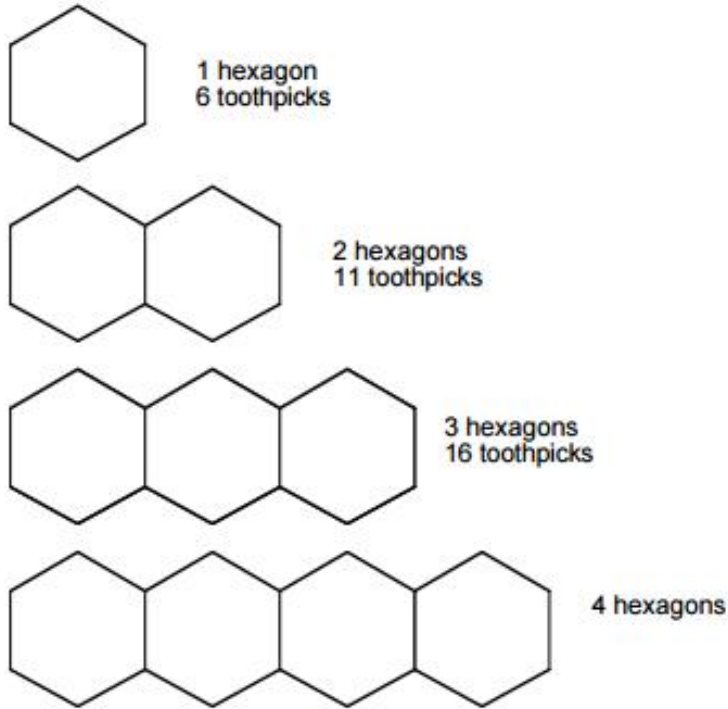
If Cecilia's box shows 153, then Cora's corresponding box must have 51. We know that Cecilia's box will always show three times as much as Cora's corresponding box, so Cora's box must show 51.

2) Standard(s): 5.OA.B.3

Source: <http://www.insidemathematics.org/assets/common-core-math-tasks/hexagons%20in%20a%20row.pdf>

Item Prompt: Hexagons in a Row (Task 1)

Joe uses toothpicks to make hexagons in a row.



Joe begins to make a table to show his results.

Number of hexagons in a row	1	2	3	4
Number of toothpicks	6	11		

1. Fill in the empty spaces in Joe's table of results.
2. How many toothpicks does Joe need to make 5 hexagons? Explain how you figured it out.
3. How many toothpicks does Joe need to make 12 hexagons? Explain how you figured it out.
4. Joe has 76 toothpicks. How many hexagons in a row can he make? Explain how you figured it out.

Correct Answer:

Hexagons in a Row	Rubric	
<p>The core elements of performance required by this task are:</p> <ul style="list-style-type: none"> • find a pattern in a sequence of diagrams • use the pattern to make a prediction <p>Based on these, credit for specific aspects of performance should be assigned as follows</p>	points	section points
1. Gives correct answers: 16 and 21	1	1
2. Gives correct answer: 26 Gives correct explanation such as: I added on 5: accept diagrams	1 1	2
3. Gives correct answer: 61 Gives correct explanation such as: The first hexagon needs 6 toothpicks; each extra needs 5. $6 + 11 \times 5 =$ Accept diagrams or adding on.	1 1	2
4. Gives correct answer: 15 Gives correct explanation such as: The first hexagon needs 6 toothpicks; each extra needs 5. $76 - 1 = 75$, $75 \div 5 = 15$ Accept diagrams	1 1 1	3
Total Points		8

Work Samples available in the link.