

<p>Claim 1: Concepts and Procedures Students can explain and apply mathematical concepts and carry out mathematical procedures with precision and fluency.</p>	
<p>Content Domain: Operations and Algebraic Thinking</p>	
<p>Target C [a]: Generate and analyze patterns. (DOK 2, 3)</p> <p>Tasks for this target will ask students to generate and analyze number and shape patterns. Analyses should include explanations of features of the pattern (other than the rule itself).</p>	
<p>Standards: 4.OA.C, 4.OA.C.5</p>	<p>4.OA.C Generate and analyze patterns.</p> <p>4.OA.C.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>
<p>Related Below-Grade and Above-Grade Standards for Purposes of Planning for Vertical Scaling:</p> <p>3.OA.D, 3.OA.D.9</p> <p>5.OA.B, 5.OA.B.3</p>	<p>Related Grade 3 Standards</p> <p>3.OA.D Solve problems involving the four operations, and identify and explain patterns in arithmetic.</p> <p>3.OA.D.9 Identify arithmetic patterns (including patterns in the addition table or multiplication table), and explain them using properties of operations. <i>For example, observe that 4 times a number is always even, and explain why 4 times a number can be decomposed into two equal addends.</i></p> <p>Related Grade 5 Standards</p> <p>5.OA.B Analyze patterns and relationships.</p> <p>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>
<p>DOK Levels:</p>	<p>2, 3</p>
<p>Achievement Level Descriptors:</p>	
<p>RANGE Achievement Level Descriptor (Range ALD) Target C: Generate and analyze patterns.</p>	<p>Level 1 Students should be able to extend a number or shape pattern that follows a given rule.</p>
	<p>Level 2 Students should be able to generate a number or shape pattern that follows a given rule.</p>
	<p>Level 3 Students should be able to analyze a pattern for apparent features that are not explicit in the rule itself.</p>
	<p>Level 4 No Descriptor.</p>

Evidence Required:	<ol style="list-style-type: none"> 1. The student generates number patterns. 2. The student generates shape patterns. 3. The student analyzes a number pattern or shape pattern, showing understanding of the pattern rule and features other than the pattern rule.
Allowable Response Types:	Drag and Drop; Hot Spot; Fill-in Table; Matching Tables; Equation/Numeric; Multiple Choice, single correct response
Allowable Stimulus Materials:	<p>whole number patterns using all four operations, fraction patterns using addition and subtraction with like denominators (limited to denominators of 2, 3, 4, 5, 6, 8, 10, 12 and 100), shape patterns with two-dimensional figures or pictures of objects</p> <p>Limitations on numbers in number patterns:</p> <ul style="list-style-type: none"> • Multiplication should never exceed 4-digit by 1-digit or 2-digit by 2-digit. • Multiplication should never involve decimals, but may involve multiplying a whole number by a fraction. • Division should never exceed 4-digit by 1-digit. • Division should never involve fractions or decimals.
Construct-Relevant Vocabulary:	pattern
Allowable Tools:	None
Target-Specific Attributes:	None
Non-Targeted Constructs:	None
Accessibility Guidance:	<p>Item writers should consider the following Language and Visual Element/Design guidelines¹ when developing items.</p> <p>Language Key Considerations:</p> <ul style="list-style-type: none"> • Use simple, clear, and easy-to-understand language needed to assess the construct or aid in the understanding of the context • Avoid sentences with multiple clauses • Use vocabulary that is at or below grade level • Avoid ambiguous or obscure words, idioms, jargon, unusual names and references <p>Visual Elements/Design Key Considerations:</p> <ul style="list-style-type: none"> • Include visual elements only if the graphic is needed to assess the construct or it aids in the understanding of the context • Use the simplest graphic possible with the greatest degree of contrast, and include clear, concise labels where necessary • Avoid crowding of details and graphics

¹ For more information, refer to the General Accessibility Guidelines at:

<http://www.smarterbalanced.org/wordpress/wp-content/uploads/2012/05/TaskItemSpecifications/Guidelines/AccessibilityandAccommodations/GeneralAccessibilityGuidelines.pdf>

	<p>Items are selected for a student's test according to the blueprint, which selects items based on Claims and targets, not task models.</p> <p>As such, careful consideration is given to making sure fully accessible items are available to cover the content of every Claim and target, even if some item formats are not fully accessible using current technology.²</p>
Development Notes:	None

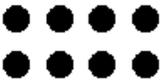
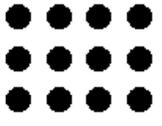
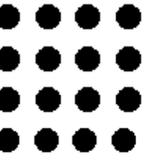
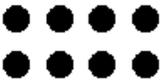
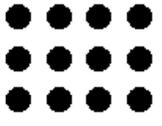
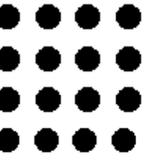
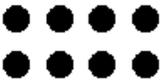
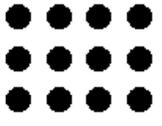
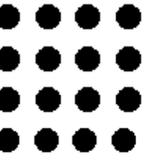
² For more information about student accessibility resources and policies, refer to http://www.smarterbalanced.org/wordpress/wp-content/uploads/2014/08/SmarterBalanced_Guidelines.pdf

<p>Task Model 1</p> <p>Response Type: Fill-in Table</p> <p>DOK Level 2</p> <p>4.OA.C.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> <p>Evidence Required: 1. The student generates number patterns.</p> <p>Tools: None</p>	<p>Prompt Features: The student is prompted to generate up to five terms of a number pattern.</p> <p>Stimulus Guidelines:</p> <ul style="list-style-type: none"> • Pattern rules fit the form of “[basic operation] [number]” (e.g., “add 2,” “multiply by 3”). • Item difficulty can be adjusted via these example methods: <ul style="list-style-type: none"> ○ Addition or subtraction patterns involving whole numbers ○ Addition or subtraction patterns involving fractions ○ Multiplication or division patterns involving whole numbers ○ Multiplication patterns involving fractions (multiplying a fraction by a whole number) <p>TM1 Stimulus: The student is presented with a number pattern rule and starting number.</p> <p>Example Stem: A pattern is generated using this rule: Start with the number 7 as the first term and add 5.</p> <p>Enter numbers into the boxes to complete the table.</p> <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th style="padding: 5px;">Term</th> <th style="padding: 5px;">Number</th> </tr> </thead> <tbody> <tr> <td style="padding: 5px;">First</td> <td style="padding: 5px; text-align: center;">7</td> </tr> <tr> <td style="padding: 5px;">Second</td> <td style="padding: 5px;"></td> </tr> <tr> <td style="padding: 5px;">Third</td> <td style="padding: 5px;"></td> </tr> <tr> <td style="padding: 5px;">Fourth</td> <td style="padding: 5px;"></td> </tr> <tr> <td style="padding: 5px;">Fifth</td> <td style="padding: 5px;"></td> </tr> </tbody> </table> <p>Rubric: (1 point) The student enters the correct numbers (e.g., 12, 17, 22, 27).</p> <p>Response Type: Fill-in Table</p>	Term	Number	First	7	Second		Third		Fourth		Fifth	
Term	Number												
First	7												
Second													
Third													
Fourth													
Fifth													

<p>Task Model 2a</p> <p>Response Type: Matching Tables</p> <p>DOK Level 2</p> <p>4.OA.C.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> <p>Evidence Required: 2. The student generates shape patterns.</p> <p>Tools: None</p>	<p>Prompt Features: The student is prompted to identify up to six terms of a shape pattern.</p> <p>Stimulus Guidelines:</p> <ul style="list-style-type: none"> • Item difficulty can be adjusted via these example methods: <ul style="list-style-type: none"> ○ A simple repetitive shape pattern involving no more than four shapes ○ Shapes that grow, diminish, or rotate ○ A combination shape/number pattern involving a shape rule (as described above) and a number rule (as described in TM1) <p>TM2a Stimulus: The student is presented with a shape pattern rule.</p> <p>Example Stem: A shape pattern is generated by repeating the pattern of “Star, Circle, Circle.” Click in the table to show the first six terms of the pattern, starting with Star.</p> <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th></th> <th style="text-align: center;">Star</th> <th style="text-align: center;">Circle</th> </tr> </thead> <tbody> <tr> <td>First term</td> <td></td> <td></td> </tr> <tr> <td>Second term</td> <td></td> <td></td> </tr> <tr> <td>Third term</td> <td></td> <td></td> </tr> <tr> <td>Fourth term</td> <td></td> <td></td> </tr> <tr> <td>Fifth term</td> <td></td> <td></td> </tr> <tr> <td>Sixth term</td> <td></td> <td></td> </tr> </tbody> </table> <p>Rubric: (1 point) The student correctly identifies the first six terms of the pattern (e.g., Star, Circle, Circle, Star, Circle, Circle).</p> <p>Response Type: Matching Tables</p>		Star	Circle	First term			Second term			Third term			Fourth term			Fifth term			Sixth term		
	Star	Circle																				
First term																						
Second term																						
Third term																						
Fourth term																						
Fifth term																						
Sixth term																						

<p>Task Model 2b</p> <p>Response Type: Multiple choice, single correct response</p> <p>DOK Level 2</p> <p>4.OA.C.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> <p>Evidence Required: 2. The student generates shape patterns.</p> <p>Tools: None</p>	<p>Prompt Features: The student is prompted to identify a specific term of a shape pattern.</p> <p>Stimulus Guidelines: Same as for TM2a.</p> <p>TM2b Stimulus: The student is presented with a shape pattern rule.</p> <p>Example Stem: A shape pattern is generated by repeating the pattern of “Star, Circle, Square, Triangle” as shown.</p> <table border="1"> <tr> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>First term</td> <td>Second term</td> <td>Third term</td> <td>Fourth term</td> <td>Fifth term</td> <td>Sixth term</td> <td>Seventh term</td> <td>Eighth term</td> </tr> </table> <p>This pattern continues for 100 terms. Select the shape that represents the 98th term.</p> <p>A. </p> <p>B. </p> <p>C. </p> <p>D. </p> <p>Rubric: (1 point) The student correctly identifies the indicated term (e.g., B).</p> <p>Response Type: Multiple Choice, single correct response</p>									First term	Second term	Third term	Fourth term	Fifth term	Sixth term	Seventh term	Eighth term
																	
First term	Second term	Third term	Fourth term	Fifth term	Sixth term	Seventh term	Eighth term										

<p>Task Model 3a-b</p> <p>Response Type: Matching Tables</p> <p>DOK Level 3</p> <p>4.OA.C.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> <p>Evidence Required: 3. The student analyzes a number pattern or shape pattern, showing understanding of the pattern rule and features other than the pattern rule.</p> <p>Tools: None</p>	<p>Prompt Features: The student is prompted to identify features of a number pattern.</p> <p>Stimulus Guidelines:</p> <ul style="list-style-type: none"> • Pattern rules should fit the form of "[<i>basic operation</i>] [<i>number</i>]" (e.g., "add 2," "multiply by 3"). • Item difficulty can be adjusted via this example method: <ul style="list-style-type: none"> ◦ Whether the answer choice statements refer to terms in general or to specific terms • Items should be equally distributed across these types: <ul style="list-style-type: none"> ◦ Addition or subtraction patterns involving whole numbers ◦ Addition or subtraction patterns involving fractions ◦ Multiplication or division patterns involving whole numbers ◦ Multiplication patterns involving fractions (multiplying a fraction by a whole number) <p>TM3a</p> <p>Stimulus: The student is presented with a number pattern rule and starting number.</p> <p>Example Stem: A pattern is generated using this rule: Start with the number 5 as the first term and add 2. Select True or False for each statement about the pattern.</p> <table border="1"> <thead> <tr> <th></th> <th>True</th> <th>False</th> </tr> </thead> <tbody> <tr> <td>The terms alternate between even and odd numbers.</td> <td></td> <td></td> </tr> <tr> <td>Each term is greater than the term before it.</td> <td></td> <td></td> </tr> <tr> <td>All possible multiples of 5 are terms in the pattern.</td> <td></td> <td></td> </tr> </tbody> </table> <p>Rubric: (1 point) The student correctly identifies all three statements as True or False (e.g., F, T, F).</p> <p>Response Type: Matching Tables</p>		True	False	The terms alternate between even and odd numbers.			Each term is greater than the term before it.			All possible multiples of 5 are terms in the pattern.		
	True	False											
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<p>Task Model 3a-b</p> <p>Response Type: Matching Tables</p> <p>DOK Level 3</p> <p>4.OA.C.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> <p>Evidence Required: 3. The student analyzes a number pattern or shape pattern, showing understanding of the pattern rule and features other than the pattern rule.</p> <p>Tools: None</p> <p>Version 3 Update: Edited TM3b to show four terms of the pattern and changed the questions in the table.</p>	<p>Prompt Features: The student is prompted to identify features of a shape pattern.</p> <p>Stimulus Guidelines:</p> <ul style="list-style-type: none"> • Statements describe features of the pattern, not the rule of the pattern. • True statements will name a strategy that can be used to find the nth term that is <i>not</i> a direct application of the rule itself. • Item difficulty can be adjusted via this example method: <ul style="list-style-type: none"> ◦ Whether the answer choice statements refer to terms in general or to specific terms • Items should be equally distributed across these types: <ul style="list-style-type: none"> ◦ Simple repetitive shape pattern involving no more than three shapes ◦ Shapes that grow, diminish, or rotate ◦ A combination shape/number pattern involving a shape rule (as described above) and a number rule (as described in TM3a) <p>TM3b Stimulus: The student is presented with a shape pattern rule.</p> <p>Example Stem: The first four terms of a shape pattern are shown. Each term is generated by following the same rule.</p> <table border="1" style="width: 100%; text-align: center; border-collapse: collapse;"> <tr> <td style="padding: 5px;"></td> <td style="padding: 5px;"></td> <td style="padding: 5px;"></td> <td style="padding: 5px;"></td> </tr> <tr> <td style="padding: 5px;">First term (4 dots)</td> <td style="padding: 5px;">Second term (8 dots)</td> <td style="padding: 5px;">Third term (12 dots)</td> <td style="padding: 5px;">Fourth term (16 dots)</td> </tr> </table> <p>Decide whether each statement can be used to describe the dot pattern shown. Select Yes or No for each statement.</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 80%;"></th> <th style="width: 10%; text-align: center;">Yes</th> <th style="width: 10%; text-align: center;">No</th> </tr> </thead> <tbody> <tr> <td style="padding: 5px;">The difference between the number of dots in each term is 8.</td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> </tr> <tr> <td style="padding: 5px;">The number of dots in the 7th term is 28.</td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> </tr> <tr> <td style="padding: 5px;">The digit in the ones place of the number of dots repeats in the following pattern: 4, 8, 2, 6, 0.</td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> </tr> </tbody> </table> <p>Rubric: (1 point) The student correctly selects yes or no for each method (e.g., N, Y, Y).</p> <p>Response Type: Matching Tables</p>					First term (4 dots)	Second term (8 dots)	Third term (12 dots)	Fourth term (16 dots)		Yes	No	The difference between the number of dots in each term is 8.	<input type="checkbox"/>	<input type="checkbox"/>	The number of dots in the 7 th term is 28.	<input type="checkbox"/>	<input type="checkbox"/>	The digit in the ones place of the number of dots repeats in the following pattern: 4, 8, 2, 6, 0.	<input type="checkbox"/>	<input type="checkbox"/>
																					
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The digit in the ones place of the number of dots repeats in the following pattern: 4, 8, 2, 6, 0.	<input type="checkbox"/>	<input type="checkbox"/>																			

<p>Task Model 3c</p> <p>Response Type: Equation/Numeric</p> <p>DOK Level 3</p> <p>4.OA.C.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> <p>Evidence Required: 3. The student analyzes a number pattern or shape pattern, showing understanding of the pattern rule and features other than the pattern rule.</p> <p>Tools: None</p>	<p>Prompt Features: The student is prompted to analyze features of a number pattern.</p> <p>Stimulus Guidelines:</p> <ul style="list-style-type: none"> • All items are limited to addition or multiplication of whole numbers only. • Item difficulty can be adjusted via this example method: <ul style="list-style-type: none"> ◦ Whether the student is prompted to consider the pattern's terms in general or specific terms in the pattern • Number pattern rules fit the form of "[basic operation] [number]" (e.g., "add 2," "multiply by 3"). <p>TM3c Stimulus: The student is presented with a rule and starting number.</p> <p>Example Stem: A pattern is generated using this rule: Start with 42 and add 5. Enter one number in each response box that makes this sentence correct: The ones digit for every term in the pattern is either ____ or ____.</p> <p>Rubric: (1 point) The student correctly names the values between which the identified place's digits alternate (e.g., 2, 7).</p> <p>Response Type: Equation/Numeric (2 response boxes)</p>
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<p>Task Model 3d</p> <p>Response Types: Drag and Drop; Hot Spot</p> <p>DOK Level 3</p> <p>4.OA.C.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> <p>Evidence Required: 3. The student analyzes a number pattern or shape pattern, showing understanding of the pattern rule and features other than the pattern rule.</p> <p>Tools: None</p> <p>Accessibility Note: Drag and Drop and Hot Spot items are not currently able to be Brailled. Minimize the number of items developed to this TM.</p>	<p>Prompt Features: The student is prompted to analyze features of a number pattern.</p> <p>Stimulus Guidelines:</p> <ul style="list-style-type: none"> All items are limited to addition or multiplication of whole numbers only. Item difficulty can be adjusted via this example method: <ul style="list-style-type: none"> Whether the student is prompted to consider the pattern’s terms in general or specific terms in the pattern Number pattern rules fit the form of “[<i>basic operation</i>] [<i>number</i>]” (e.g., “add 2,” “multiply by 3”). <p>TM3d Stimulus: The student is presented with a rule and starting number.</p> <p>Example Stem: A pattern is generated using this rule: Start with the number 7 as the first term and add 5.</p> <p>Part A: Drag numbers into the boxes to show the next six terms of this pattern.</p> <table border="1" style="margin: 10px auto; border-collapse: collapse; text-align: center;"> <tr> <td style="width: 30px; height: 30px;">7</td> <td style="width: 30px; height: 30px;"></td> </tr> <tr> <td>First term</td> <td>Second term</td> <td>Third term</td> <td>Fourth term</td> <td>Fifth term</td> <td>Sixth term</td> <td>Seventh term</td> </tr> </table> <p>Part B: Based on what you observe about the first seven terms, which numbers below are also in the pattern? Select all of the numbers that are in the pattern.</p> <p style="text-align: center; margin: 10px 0;">377 955 1022 9992</p> <p>Interaction: In Part A, the student drags digits 0-9 to boxes to create the next six terms in the number pattern. In Part B, the student clicks on the numbers that are in the pattern.</p> <p>Rubric: Part A: (1 point) The student correctly names the next six terms of the pattern (e.g., 12, 17, 22, 27, 32, 37). Response Type: Drag and Drop</p> <p>Part B: (1 point) The student correctly identifies other terms from the pattern (e.g., 377, 1022, 9992). Response Type: Hot Spot</p>	7							First term	Second term	Third term	Fourth term	Fifth term	Sixth term	Seventh term
7															
First term	Second term	Third term	Fourth term	Fifth term	Sixth term	Seventh term									