

Resource Packet for: PIE Learning Pathway Neighborhood 5.RA.A.1-2

Contents

Patterns

(Neighborhood 5.RA.A.1-2)..... 2

Represent and analyze patterns and relationships2

Insights From Research

and Data From Missouri Students 2

Learning Pathway: Neighborhood View..... 3

Learning Pathway: Level Clusters View 4

Dive Into the Content of the Standards 5

Learning Pathway for 5.RA.A.1.a

Generate two numeric patterns given two rules.....5

Learning Pathway for 5.RA.A.1.b

Translate two numeric patterns into two sets of ordered pairs.....6

Learning Pathway for 5.RA.A.1.c

Graph numeric patterns on the Cartesian coordinate plane 7

Learning Pathway for 5.RA.A.1.d

Identify the relationship between two numeric patterns.....8

Learning Pathway for 5.RA.A.2

Write a rule to describe or explain a given numeric pattern.....9

Helpful Hints

Level 1 Cluster10

Growing and Shrinking Patterns..... 10

Identify Pattern Rules..... 10

Organize a Pattern in a Table 10

Level 2 Cluster11

Extend and Generate Patterns..... 11

Organize Pattern Values in a Table 11

Explain Ordered Pairs 11

Level 3 Cluster12

Translate Values Into Ordered Pairs 12

Relationship Between Pattern Terms 13

Resource Packet for: PIE Learning Pathway Neighborhood 5.RA.A.1-2

Patterns (Neighborhood 5.RA.A.1-2)

This packet focuses on standards that relate to the “Patterns” neighborhood (5.RA.A.1-2), which covers five learning pathways.

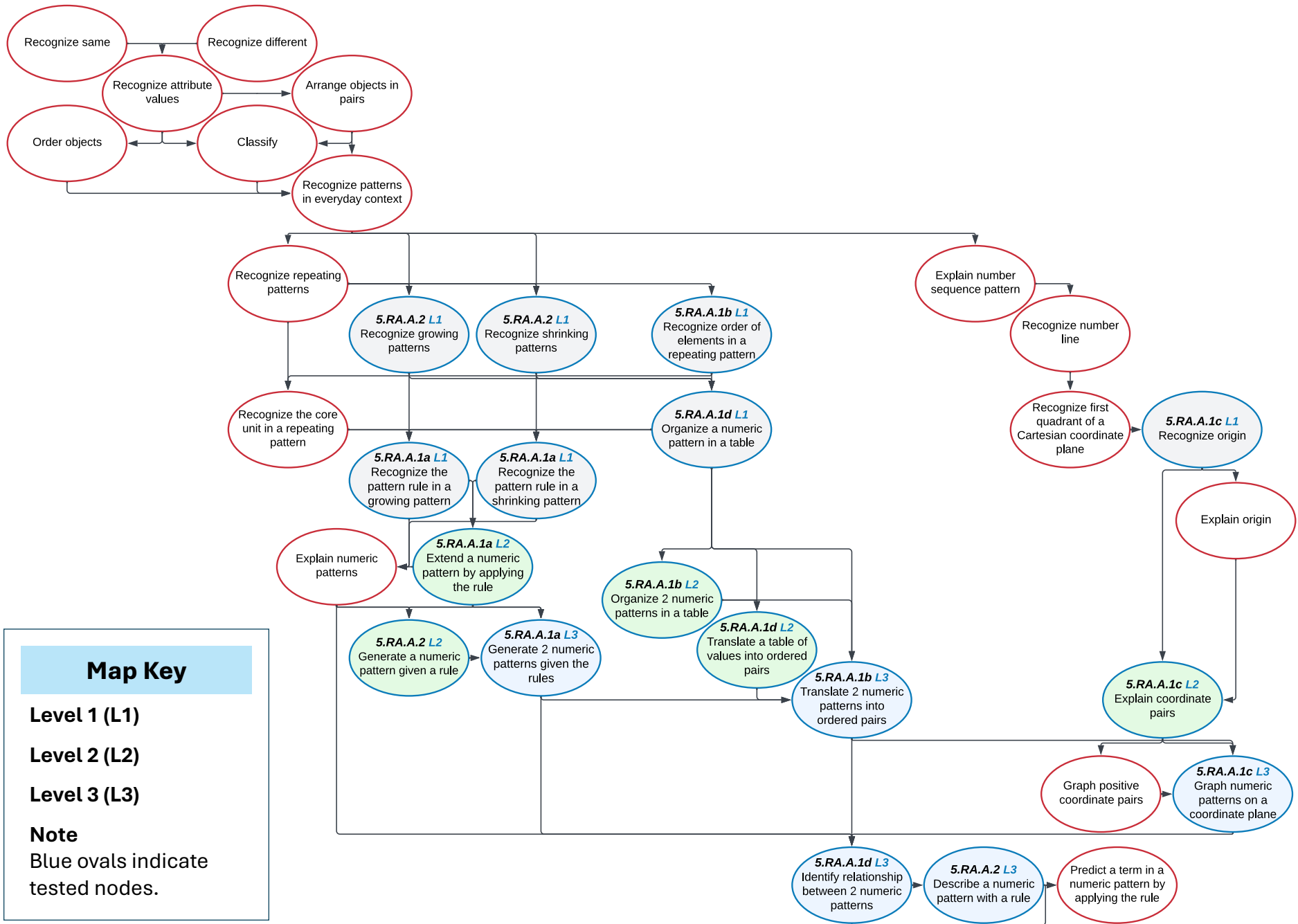
Represent and analyze patterns and relationships

- Investigate the relationship between two numeric patterns.
 - » Generate two numeric patterns given two rules.
(5.RA.A.1.a)
 - » Translate two numeric patterns into two sets of ordered pairs.
(5.RA.A.1.b)
 - » Graph numeric patterns on the Cartesian coordinate plane.
(5.RA.A.1.c)
 - » Identify the relationship between two numeric patterns.
(5.RA.A.1.d)
- Write a rule to describe or explain a given numeric pattern.
(5.RA.A.2)

Insights From Research and Data From Missouri Students

This document is informed by research on student learning in mathematics and effective instructional strategies to promote student learning of concepts in this neighborhood. The [Helpful Hints](#) section uses findings from research on mathematics learning to provide instructional suggestions and strengths to build on. The Common Student Errors section is based on results from pilot studies with fifth-grade students in Missouri (in 2024 and 2025) who completed assessments for these standards. At least 25% of students made these errors when responding to multiple-choice items that assessed mastery of the corresponding knowledge or skill.

Learning Pathway: Neighborhood View

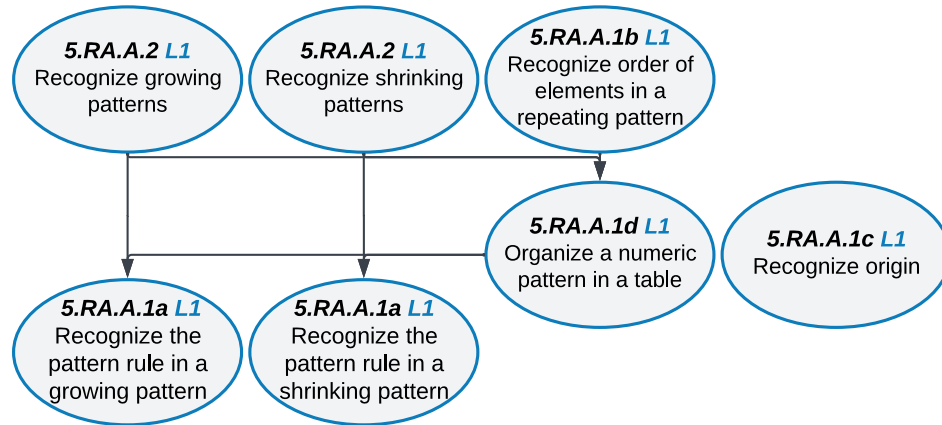


Learning Pathway: Level Clusters View

The neighborhood (on page 3) contains three level clusters. Level 1 Cluster integrates the Level 1 concepts and skills, Level 2 Cluster integrates the Level 2 concepts and skills, and Level 3 Cluster integrates the Level 3 concepts and skills from each of the learning pathways. Each level cluster is summarized below.

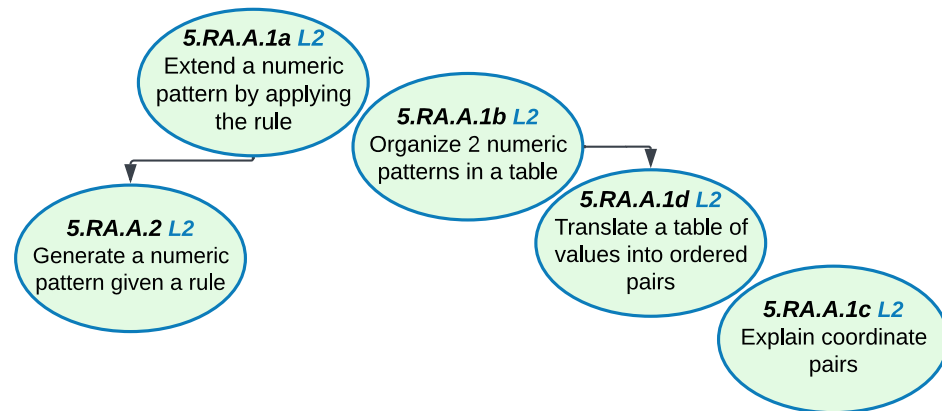
Level 1 Cluster

(more information on pg. 10)



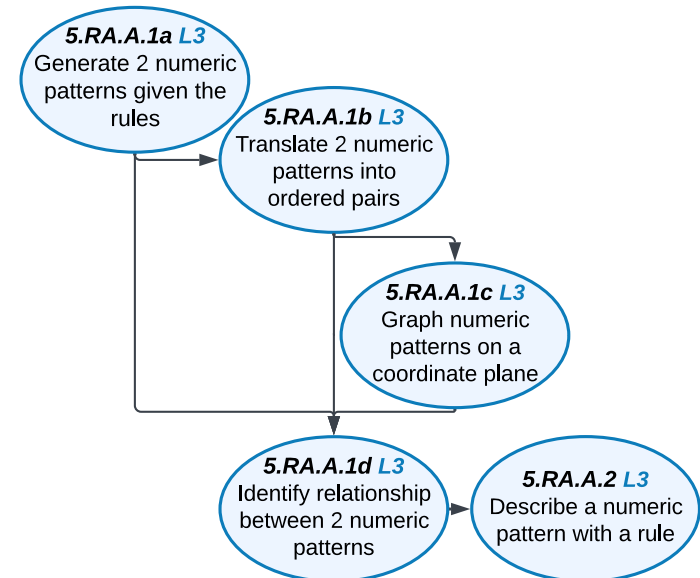
Level 2 Cluster

(more information on pg. 11)



Level 3 Cluster

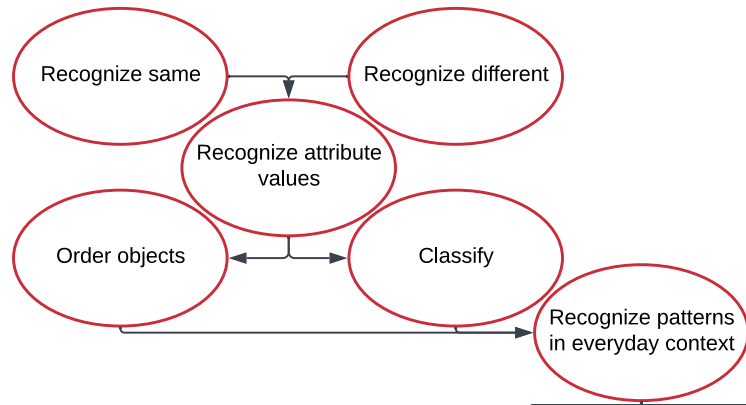
(more information on pgs. 12–13)



Dive Into the Content of the Standards

Learning Pathway for 5.RA.A.1.a

Generate two numeric patterns given two rules.



Map Key

Level 1 (L1)

Recognize the rule in a numeric pattern.

Level 2 (L2)

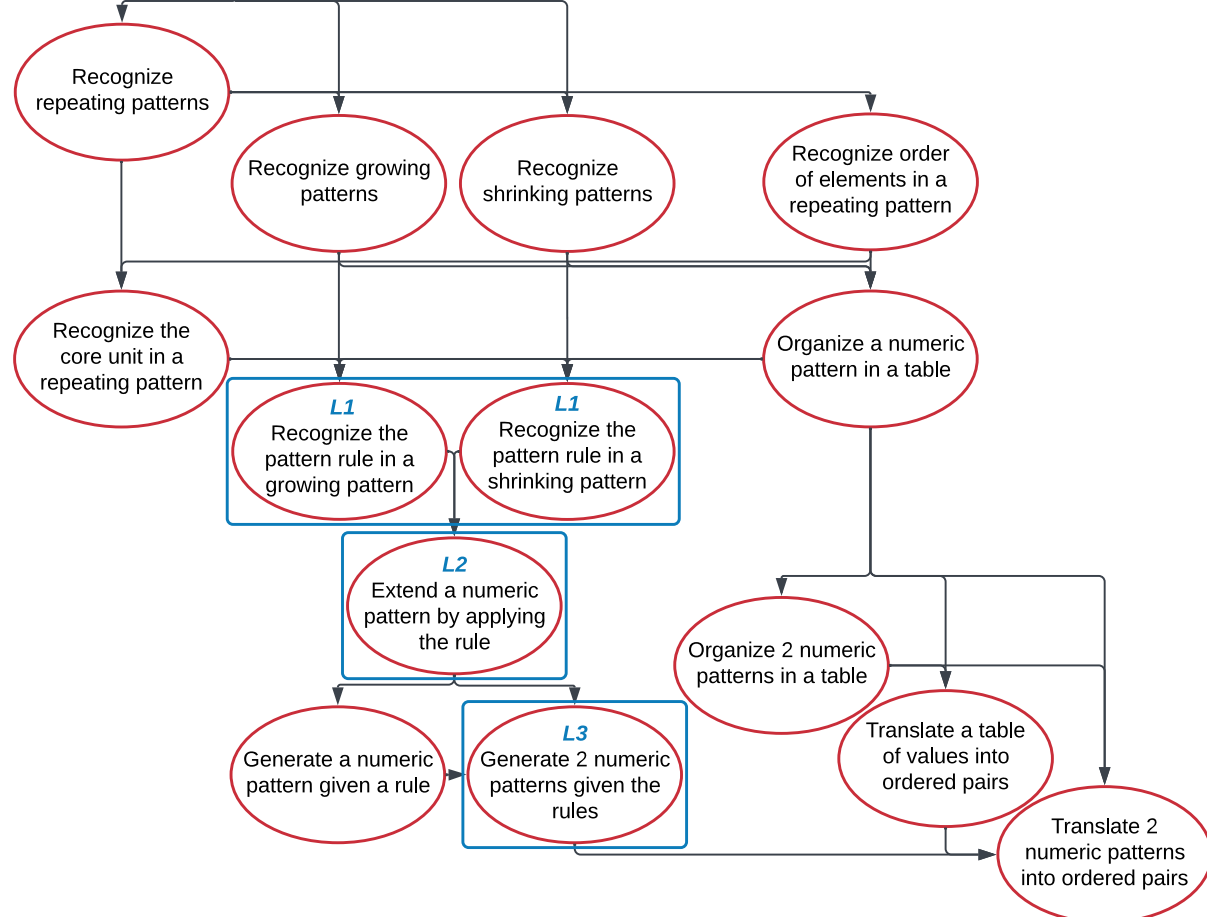
Extend a numeric pattern by applying the rule.

Level 3 (L3)

Generate two numeric patterns given the rules.

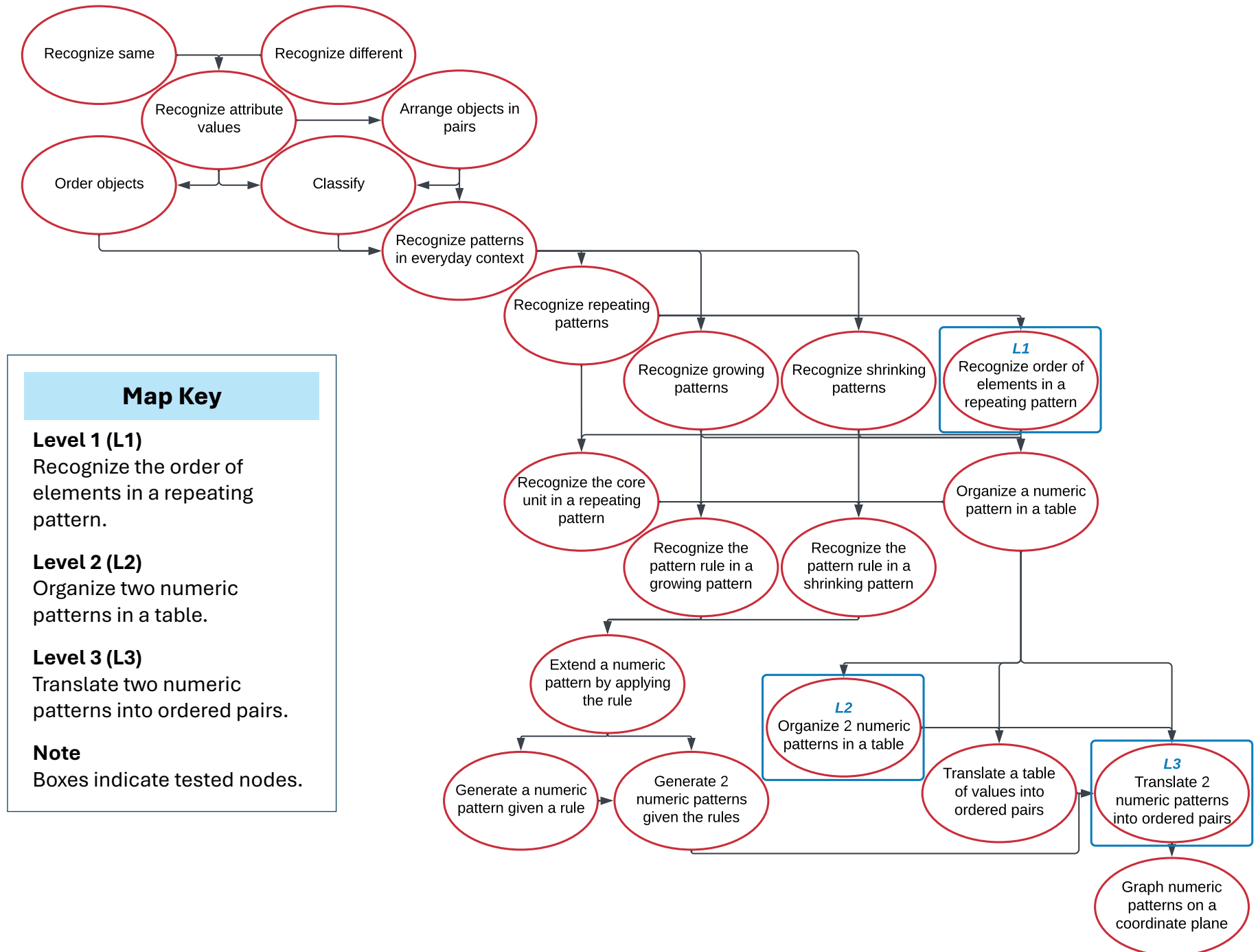
Note

Boxes indicate tested nodes.



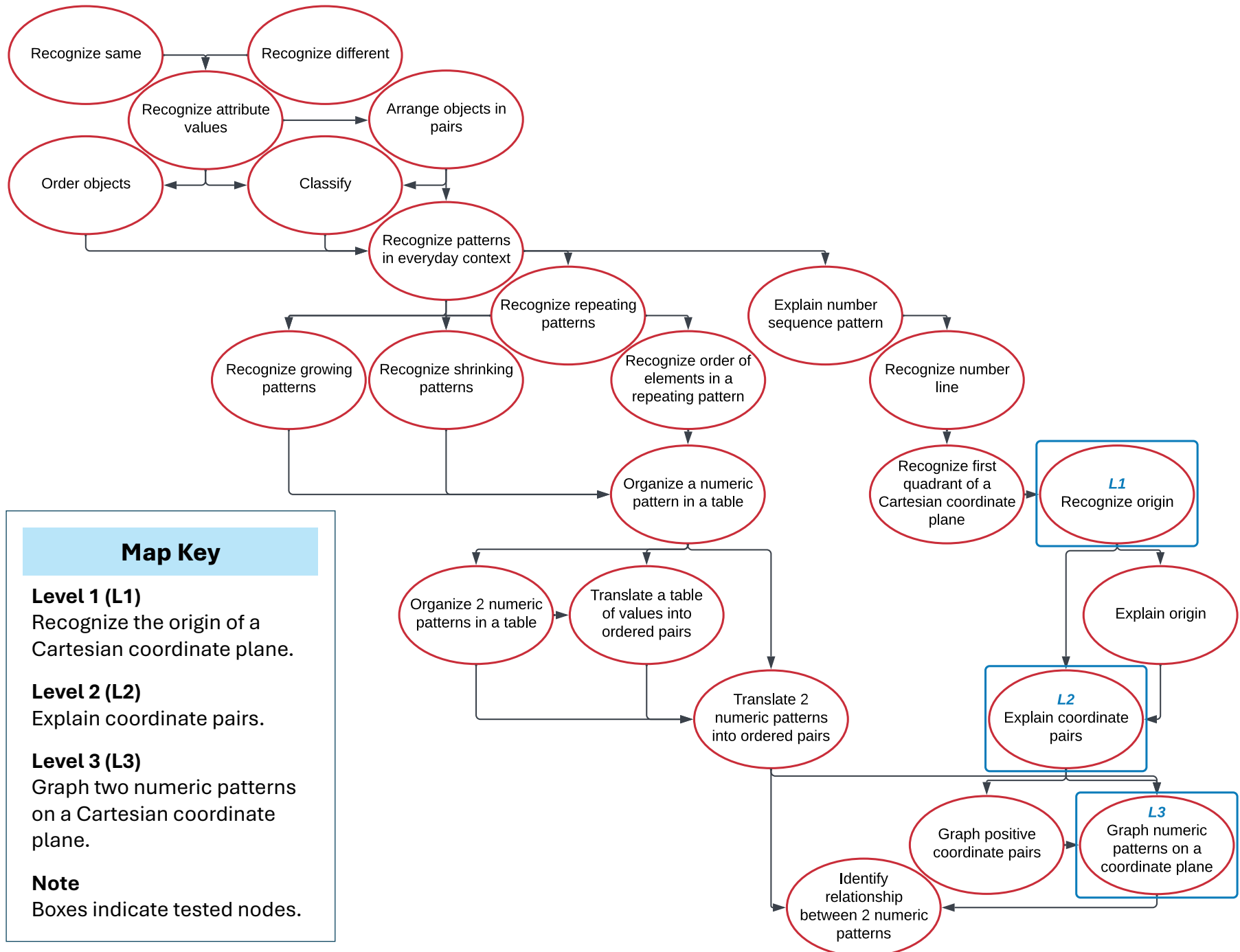
Learning Pathway for 5.RA.A.1.b

Translate two numeric patterns into two sets of ordered pairs.



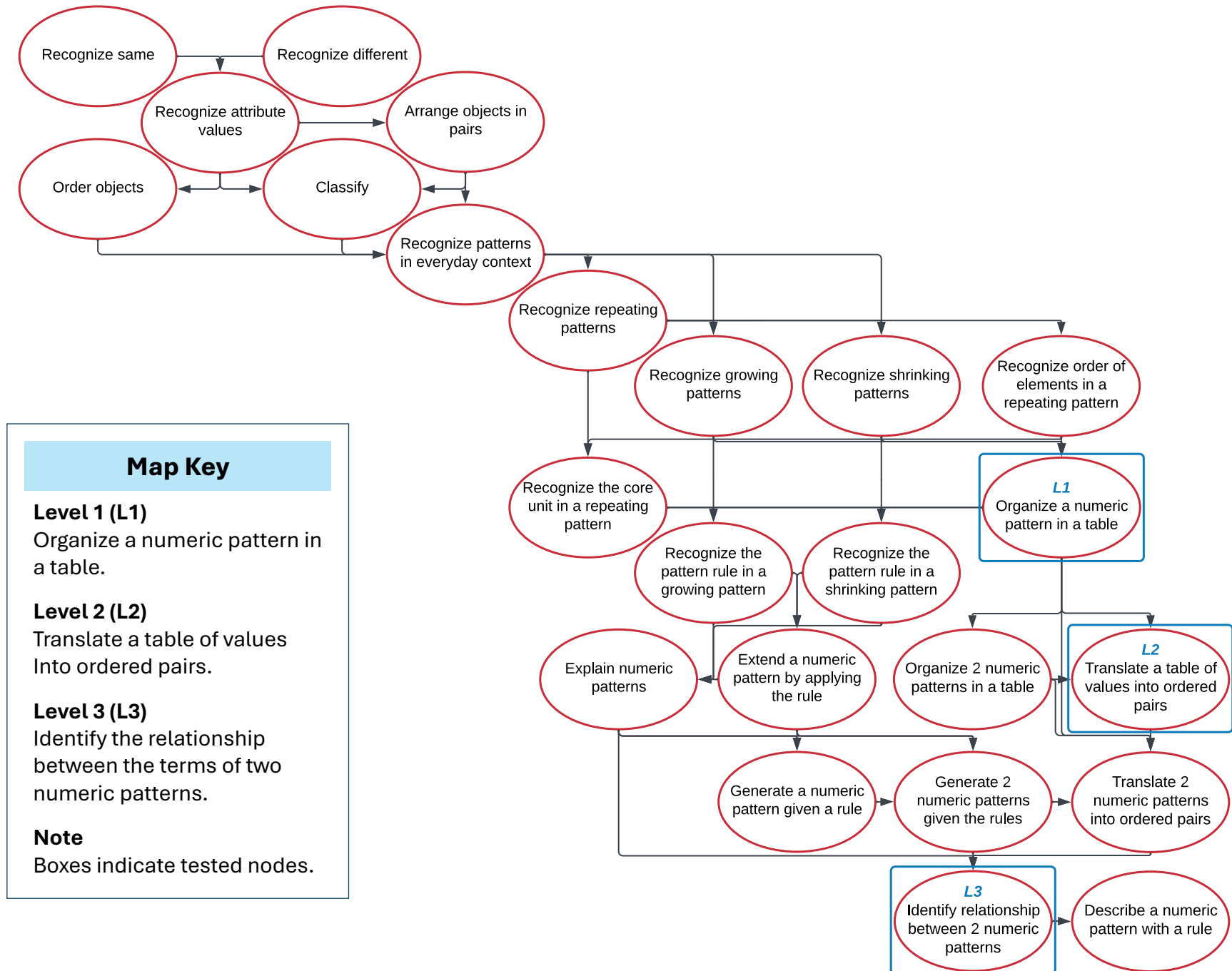
Learning Pathway for 5.RA.A.1.c

Graph numeric patterns on the Cartesian coordinate plane.



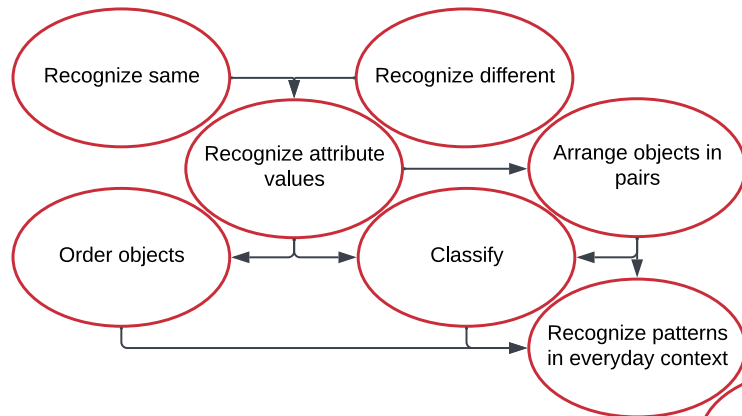
Learning Pathway for 5.RA.A.1.d

Identify the relationship between two numeric patterns.



Learning Pathway for 5.RA.A.2

Write a rule to describe or explain a given numeric pattern.



Map Key

Level 1 (L1)

Recognize growing and shrinking patterns.

Level 2 (L2)

Generate a numeric pattern given a rule.

Level 3 (L3)

Write a rule to describe or explain a given numeric pattern.

Note

Boxes indicate tested nodes.

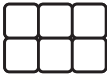
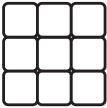
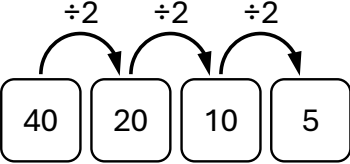


Patterns: Helpful Hints

Growing and Shrinking Patterns

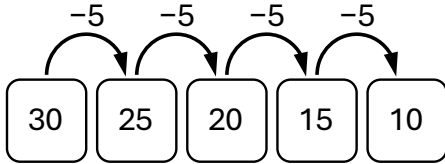
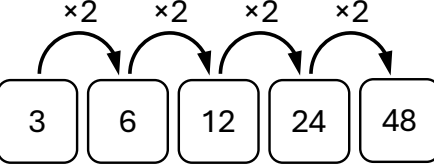
Students should understand that pattern elements are ordered from left to right.

Students should be able to compare consecutive terms in geometric and numeric patterns, recognize changes between consecutive terms, and determine whether patterns are growing or shrinking.

Growing Pattern			Shrinking Pattern	
				
Design 1	Design 2	Design 3		
3, 6, 9...increasing by 3 [+3]				

Identify Pattern Rules

Students should be able to identify the pattern rule of a given pattern. When students identify more than one pattern rule, they should consider whether the pattern rule applies to all terms in the pattern.

Pattern Rule (Example 1)	Pattern Rule (Example 2)
	
	

This rule does *not* apply to the next term.

Level 1 Cluster

Identify Pattern Rules (cont.)

Strengths to Build On

- Students use pattern blocks, color tiles, or other materials to model geometric (visual) patterns.
- Students make connections between geometric patterns and numerical representations.
- Students compare possible rules and evaluate whether those rules consistently apply across the pattern.

Common Student Errors

- When identifying a pattern rule, students recognized the pattern changed by a specific amount, but students identified a pattern rule based on reading the pattern from right to left instead of left to right.

Organize a Pattern in a Table

Students should connect each term value to its corresponding position in the pattern and organize the pattern in a table.

3	6	9	Term Number	Term
↑	↑	↑	1	3
Term 1	Term 2	Term 3	2	6
			3	9

[Return to the Cluster View on pg. 4](#)

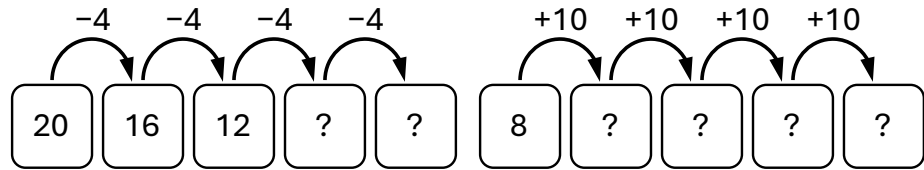
Patterns: Helpful Hints

Level 2 Cluster

Extend and Generate Patterns

Extend Patterns

Students should be able to identify the pattern rule and then extend the pattern to determine the next term(s) by applying the rule.

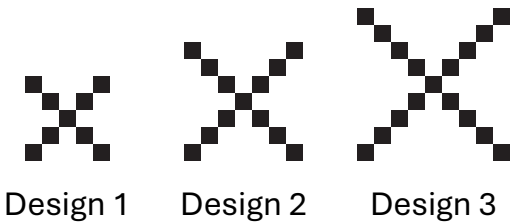


Generate Patterns

Students should be able to generate patterns using a starting value and the pattern rule.
A pattern starts with the number 8. The pattern rule is to add 10.

Organize Pattern Values in a Table

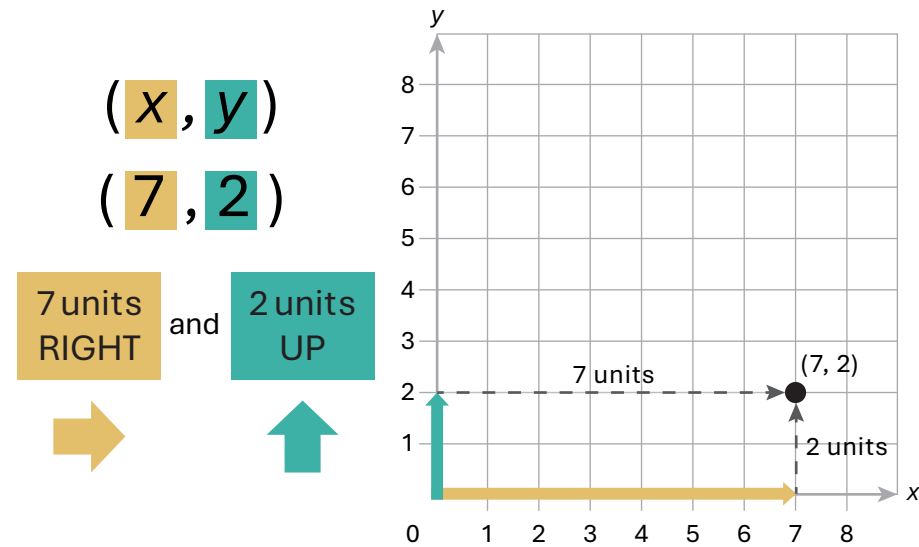
Students should understand that the term number and pattern values can be organized in a vertical or horizontal table.



Design	Number of Blocks
1	9
2	13
3	17

Explain Ordered Pairs

Students should understand that the first number, x , in an ordered pair (x, y) represents the horizontal distance from the y -axis and the second number, y , represents the vertical distance from the x -axis.
Students should be able to describe the location of an ordered pair in relation to the origin on the coordinate plane.



Strengths to Build On

- Students use the structure of ordered pairs and understand that ordered pairs use the notation (x, y) .
- Students use ordered pairs to represent real-world contexts.

Common Student Errors

- When explaining the location of an ordered pair relative to the origin, students described the x -value as the vertical distance and the y -value as the horizontal distance.

[Return to the Cluster View on pg. 4](#)

Patterns: Helpful Hints

Level 3 Cluster

Translate Values into Ordered Pairs

Students should be able to create ordered pairs based on two numerical patterns represented in various ways.

Table A

x	0	2	4	6	(0, 8)
y	8	18	28	38	(2, 18)
					(4, 28)
					(6, 38)

Table B

x	y	
1	6	(1, 6)
2	12	(2, 12)
3	18	(3, 18)
4	24	(4, 24)

Strengths to Build On

- Students use the structure of (x, y) when writing ordered pairs to understand that an ordered pair has an x -value and a corresponding y -value.
- Students use real-life situations to compare patterns.
- Students describe how ordered pairs represent both direction and distance from the origin.

Common Student Errors

- When identifying an ordered pair from a table of values, students identified two consecutive x -values or two consecutive y -values from the table. For example, in Table A, students selected $(0, 2)$ or $(18, 28)$ instead of $(0, 8)$ and $(4, 28)$.
- When identifying an ordered pair from a table of values, students identified an ordered pair that corresponded to the pattern rule for x as the x -coordinate and the pattern rule for y as the y -coordinate. For example, from Table A, students selected $(2, 10)$ because the x -values increase by 2 and y -values increase by 10.

[Return to the Cluster View on pg. 4](#)

Patterns: Helpful Hints

Level 3 Cluster

Relationship Between Pattern Terms

- Students should be able to graph numeric patterns on a coordinate plane.
- Students should be able to describe the relationship between corresponding terms of two patterns.

Strengths to Build On

- Students use multiple representations (e.g., tables, lists, ordered pairs) to organize and analyze numerical patterns.
- Students use repeated reasoning to identify and describe a pattern rule that consistently applies to all terms of a pattern.

Common Student Errors

- Students identified relationships in a single ordered pair instead of analyzing the consistent relationship across the set of ordered pairs.
- Students misinterpreted the first x-value or y-value as the relationship between terms. For example, in Table C, students interpreted that the cost increased by 4 for each ticket because the first y-value is 4.

[Return to the Cluster View on pg. 4](#)

Table C

Tickets (#)	2	4	6	8
Cost (\$)	4	8	12	16

The cost increases by 2 for every ticket.

Table D

Tickets (#)	1	2	3	4
Cost (\$)	3	6	9	12

The cost increases by 3 for every ticket.

Ticket Cost

