

Teacher Guide for the Lesson on **numerical pattern**

Standard:

5.4(D)

Content Objective:

We can recognize the difference between **additive** and **multiplicative numerical patterns** using tables and visual models.

Language Objective: Answer the following question in complete sentences using the sentence stem and the key vocabulary of the lesson:

How do **numerical patterns** help us understand the relationship between x and y coordinates on a **coordinate plane**?

*Numerical patterns help us understand the relationship between x and y coordinates on a **coordinate plane** by...*

Other key vocabularies: [input/output table](#), [coordinate plane](#)

ADDITIVE NUMERICAL PATTERN

input (x)	numerical expression	output (y)
1	$1 + 3$	4
2	$2 + 3$	5
3	$3 + 3$	6
4	$4 + 3$	6
5	$5 + 3$	8

additive pattern rule = $+ 3$

$y = x + 3$
 $4 = 1 + 3$
 $4 = 4$

MULTIPLICATIVE NUMERICAL PATTERN

input (x)	numerical expression	output (y)
1	8×1	8
2	8×2	16
3	8×3	24
4	8×4	32
5	8×5	40

multiplicative pattern rule = $8 \times$

$y = 8x$
 $8 = 8(1)$
 $8 = 8$

By studying this visual, students might:

Notice	Wonder
<ul style="list-style-type: none"> The numbers in the additive pattern are increasing by 3. 	<ul style="list-style-type: none"> Why is the additive pattern increasing slower than the multiplicative pattern?
<ul style="list-style-type: none"> The multiplicative pattern has much larger numbers. 	<ul style="list-style-type: none"> What would happen if the input number was 10?
<ul style="list-style-type: none"> The rule for each pattern is shown above the table. 	<ul style="list-style-type: none"> Can a pattern be both additive and multiplicative?

<ul style="list-style-type: none"> • The input and output labels help organize the numbers. 	<ul style="list-style-type: none"> • How do these patterns show up on a graph?
<ul style="list-style-type: none"> • Both patterns follow a consistent change. 	<ul style="list-style-type: none"> • What other rules could make a different pattern?

EXTENDING THE DISCUSSION

- After randomly calling on students, if there is anything from this list that was not mentioned, then ask the class, "Did anyone notice...?"
- After students have shared what they notice, ask the class, "Did anyone wonder...?" using the suggestions above or anything else you might think is interesting or relevant to the lesson.

Structured Conversation Prompts

OBSERVATIONAL	RELATIONAL	INFERENTIAL
<p>What is a numerical pattern?</p> <p>A numerical pattern is...</p>	<p>How is a numerical pattern related to input/output tables?</p> <p>A numerical pattern is related to input/output tables because...</p>	<p>How do numerical patterns help us understand the relationship between x and y coordinates on a coordinate plane?</p> <p>Numerical patterns help us understand the relationship between x and y coordinates on a coordinate plane by...</p>

Example Student Responses to the Observational Question

Low-Level	High-Level
<p>A numerical pattern is a set of numbers that follows a rule.</p>	<p>A numerical pattern is a repeated change in numbers based on a specific rule, and it helps us predict future numbers and see relationships in math.</p>

RESPONDING TO RESPONSES

Emphasize and celebrate each student's use of the key vocabulary to support a culture of "no wrong answers."

STRUCTURING STUDENT CONVERSATIONS

Have students list observations from the visual as a warm-up, then use the Q-SSS-A process to guide small-group conversations. In the slide decks, brackets can be moved to prepare the structured conversation. In the example to the right, students will be instructed: [Q-SSS-A](#).

- To put a thumb up, then lower their hand when they are ready to answer the question
- To share with their elbow/shoulder partner, and that the student with the darkest shoe will share first
- That they will be randomly called on after the conversation



[Here is an example](#) of structuring a conversation with Q-SSS-A.

Note: the inferential question is the same as the language objective. It is recommended that students answer the inferential question in a small-group discussion before answering it individually as the closure or exit ticket of the lesson.

Structured Reading

READING PURPOSE	PAT LIST	POST-READING DISCUSSION
<p>We're reading to learn how additive and multiplicative patterns show up in input/output tables and what they can teach us.</p>	<ul style="list-style-type: none"> • The rule each student uses • What the input/output table shows • How the numbers change in the additive pattern • How the numbers change in the multiplicative pattern • What the students learn from comparing the patterns 	<p>How can creating and comparing number patterns help us understand the relationship between inputs and outputs?</p> <p><i>Creating and comparing number patterns helps us understand inputs and outputs by...</i></p>

STRUCTURING THE READING

Communicate the purpose of reading to the students and instruct them to make a note every time they see something on the PAT ("Pay Attention To") list. How you have students note items on the PAT list is up to you. This could include:




- Putting an asterisk in the margin
- Underlining text that supports the PAT list
- Putting a comment in the margin

Follow the reading with the post-reading discussion. Structure this discussion using the Q-SSS-A process just like the structured conversations in this lesson.

Note: you might find the relational question is better discussed before or after the reading. This depends on whether the relational question is directly related to the reading or might make connections across units.

DIFFERENTIATING THE READING

You will notice that three different reading passages are provided with this lesson. Look at the shapes in the top-left of each passage to determine the grade level.

BELOW GRADE LEVEL	ON GRADE LEVEL	ABOVE GRADE LEVEL
 <p><i>Triangle is bottom-left</i></p>	 <p><i>Square is bottom-left</i></p>	 <p><i>Circle is bottom-left</i></p>

In a class with students at diverse reading level proficiencies, you can give the appropriate reading passage to different students, while having all students follow the same PAT list and post-reading discussion.