MA.3.AR.3.3

Overarching Standard: MA.3.AR.3 *Identify numerical patterns, including multiplicative patterns.*

Benchmark of Focus

MA.3.AR.3.3: Identify, create and extend numerical patterns.

Example: Bailey collects 6 baseball cards every day. This generates the pattern 6, 12, 18, … How many baseball cards will Bailey have at the end of the sixth day?

Benchmark Clarifications:

Clarification 1: The expectation is to use ordinal numbers (1^{st}, 2^{nd}, 3^{rd}, …) to describe the position of a number within a sequence.

Clarification 2: Problem types include patterns involving addition, subtraction, multiplication or division of whole numbers.

Related Benchmark/Horizontal Alignment

- MA.3.NSO.2.2/2.4

Vertical Alignment

Previous Benchmarks	Next Benchmarks
MA.K.NSO.1.3	MA.4.AR.3.2

Purpose and Instructional Strategies

The purpose of this benchmark is for students to identify, create and extend numerical patterns using all four operations. Understanding of ordinal numbers from Kindergarten is the foundation for describing the sequence of numbers in a pattern.

- "Identifying" a numerical pattern requires students to determine when a pattern exists in a sequence of numbers, and to potentially determine a rule that can be used to find each term in the sequence. For example, students may be asked whether a pattern exists in the numbers 20, 17, 14, 11,… and to discuss possible rules used to determine the next term.
- "Creating" a numerical pattern requires students to write a pattern given a rule and starting value. For example, students may be asked to write the first five terms of a sequence that begins with 500 and then create each successive term by subtracting 35 from the previous term.
- Finally, "extending" asks students to identify a future term in a sequence when provided with a rule. For example, students may be asked to find the next three terms in which each term is multiplied by 2 to get the next term 2: 1, 2,_____,_____,_____ (MTR.2.1, MTR.5.1).

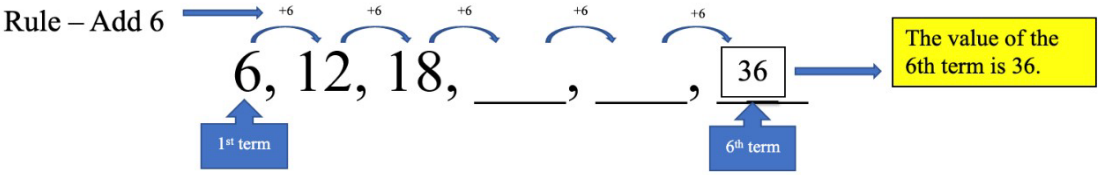
- Instruction of this standard can begin by relating patterns to skip-counting to explore patterns in sequences of numbers and look for relationships in the patterns and be able to describe and make generalizations. When exploring patterns, teachers should allow for students to describe pattern rules flexibly. For example, in the pattern 6, 12, 18,..., one student may describe the pattern's rule as "add 6." Another student may describe the rule as, "add 7, then subtract 1" or "list the multiples of 6." Classroom discussion could compare these rules (MTR.2.1, MTR.4.1).
- Instruction should be limited to whole numbers and operations that are appropriate for Grade 3.
- This foundation for identifying and using patterns extends into Grades 4 and 5 to build algebraic thinking for functions in middle and high school.

Common Misconceptions or Errors

- Students can confuse a term's number and its value in the sequence. For example, in the pattern 6, 12, 18,..., students can struggle to understand that even though 12 is the 2nd term, 6 is being added to it to find the value of the 3rd term (18). Encourage students to use precise vocabulary while describing patterns to address this confusion.

Strategies to Support Tiered Instruction

- Instruction includes explicit vocabulary instruction regarding patterns (first term, second term, third term..., rule, value, etc.). Instruction also includes relating the pattern to skip counting where appropriate.
    - Example:



- For example, a 100 chart may be a referent that can be used for arithmetic patterns. The teacher makes connections between the rule and counting on the 100s chart.

1	2	3		5	6	7	8	9	
11	12	13	14	15		17	18	19	20
21		23	24	25	26	27		29	30
31	32	33		35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100

Rule – Add 6

Value of the 6th Term – 34

Questions to ask students:

Ask students to identify the next 3 numbers in a pattern when starting with 3 following the rule "add 5".

- *Sample answer that indicates understanding:* The next three numbers in the pattern are 8, 13, 18.
- *Sample answer that indicates incomplete understanding or a misconception:* Students may only find the next number in the pattern (8).

Deepen students' understanding by asking what features they notice about the pattern above (3, 8, 13, 18)?

- *Sample answer that indicates understanding:* There is an alternating odd and even repetition, a growing sequence, or alternating of the digits 8 and 3 in the ones place value.
- *Sample answer that indicates incomplete understanding or a misconception:* Students may only repeat the rule without looking at any other relationships within the number pattern.

Ask students to determine the first 3 multiples of 4 and to explain how they know.

- *Sample answer that indicates understanding:* The first 3 multiples of 4 are 4, 8, and 12. The first multiple is the product of 1×4=4, the second multiple is the product of 2×4=8, and the third multiple is the product of 3×4=12.

Instructional Tasks

Instructional Task 1

Part A. Write a pattern that shows the first 10 multiples of 6.
Part B. What do you notice about the ones digits of the pattern's numbers?
Part C. What would you expect the ones digit of the 12th multiple to be? Explain how you know using the pattern you observed.

Instructional Items

Instructional Item 1

What are the fourth and fifth terms of the sequence below that follows the rule "subtract 4"?

34, 30, 26,___, _____

Achievement Level Descriptors

Benchmark	Context	Assessment Limits
MA.3.AR.3.3 Identify, create, and extend numerical patterns. Example: Bailey collects 6 baseball cards every day. This generates the pattern 6, 12, 18, How many baseball cards will Bailey have at the end of the sixth day Clarification 1: The expectation includes using ordinal numbers (1st, 2nd, 3rd …) to describe the position of a number within a sequence. Clarification 2: Problem types include patterns involving addition, subtraction, multiplication or division of whole numbers.	Both	Items involving multiplication and division are limited to multiplication factors within 12 and related division facts. Items will include one procedural operation.

ALD 2	ALD 3	ALD 4	ALD 5
identifies numerical patterns.	identifies and extends numerical patterns.	identifies, creates, and extends numerical patterns.	identifies, creates, explains, and extends numeric patterns

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Additional Resources:

CPALMS Resources

Resources/Tasks to Support Your Child at Home:

Choose a number from 1-10 and have your child skip count by that given number to determine the multiples. Then have your child record the list of multiples as a pattern and explain the pattern.
Khan Academy: Finding Patterns in Numbers
Khan Academy: Recognizing Number Patterns
LearnZillion Video: Find the Rule for a Function Machine using a Vertical Table