Grade 5 Numerical Patterns

5.PR.1	
Determine the pattern rule to make predictions about subsequent elements.	1. Extend a pattern with and without concrete materials, and explain how each element differs from the proceeding one. 2. Describe, orally or in writing, a pattern using mathematical language, such as one more, one less, five more. 3. Write a mathematical expression to represent a pattern, such as r + 1, r - 1, r + 5 4. Describe the relationship in a table or chart using a mathematical expression. 5. Determine and explain why a number is or is not the next element in a pattern. 6. Predict subsequent elements in a pattern. 7. Solve a problem by using a pattern rule to determine subsequent elements. 8. Represent a pattern visually to verify predictions.

Clarification of the outcome:

- The outcome concerns simple numerical patterns that involve one arithmetic operation (e.g. multiply by 3). It is essentially a repeat of the grade 4 outcome except that algebraic description of patterns is part of the outcome (e.g.: the pattern is a + 2).

Required close-to-at-hand prior knowledge:

- Mental arithmetic skills, including automaticity of basic facts of arithmetic.
- Understand the input/output rule.
- Skip counting skills.

SET SCENE stage

The problem task to present to students:

Using pattern blocks or a paint/drawing program, have students create a design that has a pattern. Have them write a brief description of the pattern.

Comments

The purpose of the SET SCENE task is to revisit what patterning means.

DEVELOP stage

Comments

The recommendation here is, after activity #1, redo the grade 4 DEVELOP lesson by using similar contexts. Ensure students can express patterns using algebraic language (e.g.: R - 2; 3B, etc.)

Activity 1: Revisits SET SCENE and addresses indicator 2.

- Revisit the SET SCENE task by asking students to present and discuss the patterns they made.
- If a pattern is numerical in nature, have students extend the pattern for three more numbers.

Continue by redoing the grade 4 outcome using different contexts and problems for which the numerical pattern involves ONLY one arithmetic operation.

- Refer to Gr 4 Numerical Patterns .
- Refer to the sample activity on the next page for a change in context and problem example.

Sample grade 5 activity

- Provide students with clay and toothpicks that will be used to construct skeletons of pyramids. Ask them to construct a triangular pyramid (base is an equilateral triangle), a square pyramid (base is a square), a pentagonal pyramid (base is a regular pentagon), and a hexagonal pyramid (base is a regular hexagon).
- Have students count the number of clumps of clay needed to build each type of pyramid. [Note that the number of clumps of clay is equivalent to the number of vertices.]
- Have them count the number of faces of each pyramid. [Note that the faces are imaginary in the sense that a face is the open area bordered by sticks.]
- Have them construct two T-charts of the data. The first chart has pyramid number and number of clumps of clay as headings. The second chart has pyramid number and number of faces as headings.
- Ask students to identify the two kinds of patterns in each T-chart: the input/output rule (horizontal pattern) and the pattern between consecutive output values. [See sample T-charts and patterns.]

pyramid #	clay
#1 (triangle)	4
#2 (square)	5
#3 (pentagon)	6
#4 (hexagon)	7

Input/Output rule is: P + 3
Vertical pattern is: add 1

pyramid #	faces
#1 (triangle)	4
#2 (square)	5
#3 (pentagon)	6
#4 (hexagon)	7

Input/Output rule is: P + 3
Vertical pattern is: add 1

- Ask them to determine the number of clumps of clay and the number of faces for pyramid #18 (has a 20-sided regular polygon as its base), using the input/output rules (the horizontal patterns) they identified. Have them construct pyramid #18 to verify their predictions.