Patterns Learning Strategies

What should students be able to do within this interactive?

- Select a pattern type and create an expression representing its terms.
- Select the number of terms for the pattern.
- Understand how each value of \( n \) is substituted into the expression to create a term.
- Understand how the pattern is generated and be able to interpret it.
- Recognize the pictorial connection between the pattern and its terms.

Common mistakes made by students:

- Not understanding the expression.
- Not understanding how the terms are found from the expression.
- Not understanding the connection between the pattern and the pictorial representation.
- Not recognizing how the pattern is created.
- Not recognizing how to extend the pattern.

Curriculum Connections:

- Please note all of the following correlations match outcomes in the new Mathematics Kindergarten to Grade 9 Program of Studies (2007).

Grade 6 Patterns and Relations SO3: Represent generalizations arising from number relationships, using equations with letter variables.

Grade 7 Patterns and Relations SO1: Demonstrate an understanding of oral and written patterns and their equivalent linear relations.

Grade 7 Patterns and Relations SO5: Evaluate an expression, given the value of the variable(s).

Grade 9 Patterns and Relations SO1: Generalize a pattern arising from a problem-solving context, using a linear equation, and verify by substitution.

Print Activity notes:

*Note: The Print Activity is not intended to be an assessment piece

It is necessary for students to use the “Explore It” mode to work through the Print Activity. Students will be asked to select a pattern type, expression and the number of terms to generate. They will be expected to understand the step(s) of the substitution of \( n \) into the expression for a term. The student will expected to see the pattern formed by the terms and be able to recognize how the pattern is created. They are expected to recognize the connection between the pattern and its pictorial representation.
The Print Activity may be opened in Word Format instead of PDF so that changes to questions can be made.

**Patterns Print Activity**

**Use the “Explore It” mode to answer the following questions:**

1. Select **PATTERN 1**.
   
   a. The objects representing the pattern are _acorns_.
   
   b. Without changing the slider values, the expression for the pattern is __1n + 0__.
   
   c. In the expression, n denotes the ___number of terms____.
   
   d. Move the sliders to create the expression __2n + 3__.
      i. When _n=1_, the first term of the pattern is _2(1) + 3 = 5_.
      ii. When _n=2_, the second term of the pattern is _2(2) + 3 = 7_.
      iii. The third term of the pattern is _2(3) + 3 = 9_.
      iv. The first 6 terms of the pattern are _5_, __7_, __9_, __11_, __13_, __15_.
      v. Each successive term is found by adding __2__ to the previous term.
      vi. Following the pattern, the 12th term in the pattern would be __27__.

2. Select **PATTERN 2** and **EXPRESSION -2n + 1**.
   
   a. The objects representing the pattern are ___thermometers__.
   
   b. The first three terms of the pattern are __-1__, __-3__, __-5__.
   
   c. Each term represents the ___temperature/reading/value___ on the thermometer.
   
   d. The 7th term in the pattern is __-13__.
   
   e. Each successive term is found by subtracting __2__ from the previous term.
3. Select \( \text{PATTERN 3} \) and \( 4n + 1 \).
   a. The first term is \( 4(\_1\_) + 1 = 5 \).
   b. The second term is \( 4(\_2\_) + 1 = 9 \) and it represents the number of \( \text{toothpicks} \) used to create the shape.
   c. Use the diagram to answer the following:
      i. This represents the \( 3^\text{rd} \) term.
      ii. This term is found by using the expression \( 4(\_3\_) + 1 = 13 \).
      iii. There are \( 13 \) total toothpicks in the diagram.
   d. This pattern \( 5, 9, 13, 17, 21, 25 \) represents the first \( 6 \) terms and represents \( 25 \) total toothpicks in the diagram for this expression.
   e. Each successive term is found by adding \( 4 \) to the previous term.

4. Select \( \text{PATTERN 4} \) and \( 3n + 2 \).
   a. The first term is \( 3(\_1\_) + 2 = 5 \).
   b. The 3D object has a total of 6 sides but only \( 5 \) sides can be seen from all directions (above ground).
   c. The \( 2^\text{nd} \) term is \( 3(\_2\_) + 2 = 8 \) and there are \( 8 \) sides that are exposed.
   d. Use the diagram below to answer the following:
      i. This represents the \( 5^\text{th} \) term in the pattern.
      ii. There are \( 17 \) sides exposed.
iii. The expression for the diagram is $3(_5) + 2 = 17$.

iv. Complete the next three terms of the pattern 26, 29, 32, _35_, _38_, _41_.

5. Select [PATTERN S] and $n^2 + 0$.

a. The first three terms are $(_1)^2 + 0 = 1$, $(_2)^2 + 0 = 4$, $(_3)^2 + 0 = 9$.

b. Use the diagram below to answer the following:

i. This diagram represents the 5th term and has 5 rows.

ii. The corresponding expression is $(_5)^2 + 0$.

iii. The value of the expression is 25 and represents how many acorns appear in the diagram.

c. The expression for the diagram below is $(_5)^2 + 3$.


d. The expression for the diagram below is $(_3)^2 + 7$.
6. Select \(2n\left(\frac{n+1}{2}\right)\) and \(\text{EXPRESSION}\)

a. The first term is \(2(1)\left(\frac{1+1}{2}\right) = 2(-1\_)(-1\_) = 2\).

b. The second term of the pattern is \(2(2)\left(\frac{2+1}{2}\right) = 2(-2\_)(1.5) = 6\).

c. The third term of the pattern is \(2(3)\left(\frac{3+1}{2}\right) = 2(-3\_)(2\_) = 12\).

d. The first 6 terms of the pattern are __2__, __6__, __12__, __20__, __30__, __42__.

e. The difference between each successive term is increased by __2__.

f. Each term represents the total number of __cubes__ in the diagram.

8. Complete the following patterns:

a. 0, -2, -4, -6, -8, -10.
   How did you determine the next terms? By subtracting 2 from the previous term.

b. 6, 11, 16, __21__, __26__, __31__.
   How did you determine the next terms? By adding 5 to the previous term______.

c. 8, 14, 20, __26__, __32__, __42__.
   How did you determine the next terms? By adding 6 to the previous term______.

d. 7, 10, 15, __22__, __31__, __42__.
   How did you determine the next terms? By increasing the difference between each term by 2.

e. 3, 9, 18, __30__, __45__, __63__.
   How did you determine the next terms? By increasing the difference between each term by 3.