Learning Objective:

To recognize the terms generated from an expression form a pattern that can be represented in pictorial form.

To recognize the terms generated from any expression are found by substituting the values \( n = 1, \ n = 2, \ n = 3, \) etc.

To recognize that any term of the pattern can be found by substituting its position into the expression. e.g. \( 3^{rd} \) term is \( n = 3, \ 10^{th} \) term is \( n = 10, \ 20^{th} \) term is \( n=20, \) etc.

To identify the connection between each of the 6 object(s) patterns and the corresponding numeric pattern.

Helpful Hints:

1. **Definition:**

   Pattern – a set of numbers or objects arranged in a certain order.

2. An expression generates a pattern that can be represented in pictorial form.

3. By substituting values for \( n \), the terms of a pattern can be formed.

   - Term 1: \( n = 1 \)
     \[
     4(1) + 3 = 7
     \]
   - Term 2: \( n = 2 \)
     \[
     4(2) + 3 = 11
     \]
   - Term 3: \( n = 3 \)
     \[
     4(3) + 3 = 15
     \]
   - Term 4: \( n = 4 \)
     \[
     4(4) + 3 = 19
     \]

   The first 4 terms of the pattern are 7, 11, 15, 19.
4. Any term can be found by substituting its position into the expression.

   e.g. The first 10 terms of the pattern are:
   
   $7, 11, 15, 19, 23, 27, 31, 35, 39, 43$

   Term 10: $n=10$
   
   $4(10) + 3 = 43$

5. Given at least 3 terms of a pattern, successive terms can be determined.

   e.g. $5, 9, 13, \ldots$

   Add 4  Add 4

   Each term is found by adding 4 to the previous term.

   The pattern would be $5, 9, 13, 17, 21, 25$.

   e.g. $2, -1, -4, \ldots$

   Subtract 3  Subtract 3

   Each term is found by subtracting 3 from the previous term.

   The pattern would be $2, -1, -4, -7, -10, -13$.

   e.g. $3, 6, 11, \ldots$

   Add 3  Add 5

   The next term would be found by adding 7, then adding 9, adding 11, etc.

   The pattern would be $3, 6, 11, 18, 27, 38$. 
6. When objects are used to represent the pattern, you can use the first three terms to help determine what the pattern represents.

The terms of the pattern represent the total number of toothpicks used to form the shape.

The pattern is 3, 5, 7, …

The terms of the pattern represent the total number of exposed sides that can be seen from any direction.

The pattern is 6, 10, 14, …