



## Exemplar 9 : Number Patterns

- Objectives :**
- (1) To explore the patterns of number sequences
  - (2) To describe number patterns using algebraic expressions

**Key Stage :** 3

**Learning Unit :** Formulating Problems with Algebraic Language

**Materials Required :** Worksheets

**Prerequisite Knowledge :** Fundamental Operations of Integers

**Description of the Activity :**

1. The teacher starts the activity by posing the following question to the whole class:  
“Given the number sequence: 1, 4, 9, 16, ..., what are the 6<sup>th</sup> and 8<sup>th</sup> terms ?”
2. The teacher asks students to derive an algebraic expression to represent the sequence. Some students are asked to use the expression to work out the first few terms of the sequence so as to verify that it is correct.
3. The teacher distributes the worksheet and students are requested to work in pairs so that they can discuss with each other when they have problems.
4. In Question 3, students are encouraged to guess the next few terms in each sequence to have an idea of how the sequence moves on. After recognizing the pattern of the sequence, they can work out the algebraic expression. Finally, they should verify their answers by using the algebraic expression to find the first few terms.
5. If the verification fails, students should go back to the sequence and work out another algebraic expression.

**Worksheet : Number Patterns of '3'**

1. Write down the 6<sup>th</sup> and 8<sup>th</sup> terms of the sequence: 3, 6, 9, 12, ...

The 6<sup>th</sup> term is \_\_\_\_\_.

The 8<sup>th</sup> term is \_\_\_\_\_.

2. Find an algebraic expression that represents the sequence in Question 1. Verify your answer by using the algebraic expression to find the 6<sup>th</sup> and 8<sup>th</sup> terms and compare them with the answers you obtained in Question 1.

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3. The following sequences are patterns related to '3'. Find an algebraic expression that contains '3' for each of the following sequences. Verify your answers by finding the first few terms and compare them with those in the given sequence.

(a) -3, -6, -9, -12, ...

(b) 3, 9, 27, 81, ...

(c) -3, -9, -27, -81, ...

(d) -3, 9, -27, 81, ...

(e)  $\frac{1}{3}, \frac{1}{6}, \frac{1}{9}, \frac{1}{12}, \dots$

(f)  $-\frac{1}{3}, -\frac{1}{6}, -\frac{1}{9}, -\frac{1}{12}, \dots$

(g) 6, 12, 18, 24, ...

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**Notes for Teachers :**

1. Answers to the worksheet:

Question 1 The 6<sup>th</sup> term is 18 .

The 8<sup>th</sup> term is 24 .

Question 2  $3n$

Question 3 (a)  $-3n$

(b)  $3^n$

(c)  $-3^n$

(d)  $(-3)^n$

(e)  $\frac{1}{3n}$

(f)  $-\frac{1}{3n}$

(g)  $2(3n)$  or  $6n$

2. The teacher can provide more questions for the students by changing the sequences in the worksheet to sequences of 4's or any other numbers for consolidation.
3. As an enrichment activity, the teacher may introduce the sequence: 1, 1, 2, 3, 5, 8, 13, ... and ask students to find an expression (or expressions) to represent this sequence.
4. More information about the above sequence can be found in Exemplar 2 in *Teaching Package on SI-5 Mathematics 2: Catering for Learner Differences*, Exemplar 4 on *Teaching Package on SI-5 Mathematics 3: Fostering High Order Thinking Skills* and Exemplars 10, 11 in this package.