



Mathematical Sciences: MMSC4
LESSON 14

UNIT STANDARD: 7448
Topic: NUMBER PATTERNS

By the end of this lesson, you should be able to:

- Use general rule to generate patterns.

1. INTRODUCTION

Number pattern is a **pattern** or sequence in a series of **numbers**. This **pattern** generally establishes a common relationship between all **numbers**. For example; try to see the difference between consecutive **numbers**, it will help us understand the relationship between the **numbers**.

EXAMPLE 1

Consider the below number pattern and determine the general formula



Method 1,

$$T_n = d(n) + c$$

Where $d(n)$ = common difference multiplying by n

c = constant

$$d = -2$$

$$T_n = -2(n) + c$$

$$T_1 = -2(1) + c$$

$$14 = -2(1) + c$$

$$14 = -2 + c$$



$$c = 14 + 2$$

$$c = 16$$

Therefore,

$$T_n = -2(n) + 16$$

Method 2,

$$T_n = d(n) + T_0$$

Where $d(n)$ = common difference multiplying by n

T_0 = term before T_1 that is term before first term of given sequence

$$d = -2$$

$$T_0 = T_1 - d$$

$$T_0 = 14 - (-2)$$

$$T_0 = 14 + 2$$

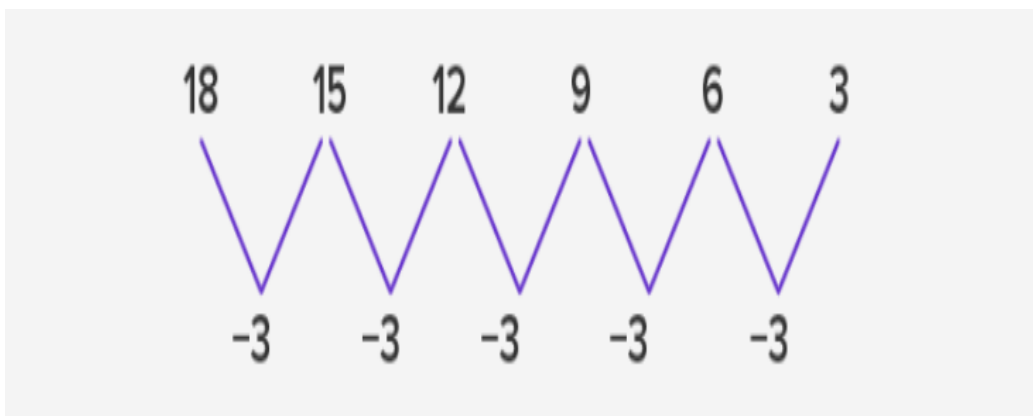
$$T_0 = 16$$

Therefore,

$$T_n = -2(n) + 16$$

EXAMPLE 2

Consider the below number pattern and determine the general formula



Method 1,



$$T_n = d(n) + c$$

Where $d(n)$ = common difference multiplying by n

c = constant

$$d = -3$$

$$T_n = -3(n) + c$$

$$T_1 = -3(1) + c$$

$$18 = -3(1) + c$$

$$18 = -3 + c$$

$$c = 18 + 3$$

$$c = 21$$

Therefore,

$$T_n = -3(n) + 21$$

Method 2,

$$T_n = d(n) + T_0$$

Where $d(n)$ = common difference multiplying by n

T_0 = term before T_1 that is term before first term of given sequence,

$$d = -3$$

$$T_0 = T_1 - d$$

$$T_0 = 18 - (-3)$$

$$T_0 = 18 + 3$$

$$T_0 = 21$$

Therefore,

$$T_n = -3(n) + 21$$



ACTIVITY 1

Generate the patterns in the following statements.

Example: Start at 64 and create a pattern with the rule subtract 3.

What is the fourth number in the pattern? Underline the required number.

EXAMPLE: 64; 61; 58; 55

1.1 Start at 46 and create a pattern with the rule add 7.

What is the sixth number in the pattern?

1.2 Start at 3 and create a pattern with the rule subtract 2 and add 5.

What is the fifth number in the pattern?

1.3 Start at 23 and create a pattern with the rule subtract 2.

What is the sixth number in the pattern?

1.4 Start at 3 and create a pattern with the rule multiply by 2.

What is the fourth number in the pattern?



ACTIVITY 2

2.1 Consider the pattern with general term: $T_n = 3n + 2$

Write down the first THREE (3) terms by substituting $n = 1, 2$ and 3 .

$T_1 =$ _____

$T_2 =$ _____

$T_3 =$ _____

Now calculate the common difference between the terms in the following way:

$T_2 - T_1 =$ _____ OR $T_3 - T_2 =$ _____

Your answers should be the same!! This is the value that we add each time to get the next term. We say the **common difference** is **constant**.

What do you notice about the common difference and the coefficient of n in $T_n = 3n + 2$?

2.2 Consider the pattern with general term: $T_n = -2n + 3$

Write down the first THREE (3) terms by substituting $n = 1, 2$ and 3 .



$T_1 =$ _____

$T_2 =$ _____

$T_3 =$ _____

Now calculate the common difference between the terms in the following way:

$T_2 - T_1 =$ _____ OR $T_3 - T_2 =$ _____

Are your answers the same? _____ The common difference is therefore _____

What do you notice about the common difference and the coefficient of n in
 $T_n = -2n + 3$



ACTIVITY 3

Consider the pattern: 9; 15; 21; ...

3.1 Is the pattern increasing or decreasing? _____

3.2 Show, through calculation, that a general rule for this pattern can be given by $T_n = 6n + 3$ (Use any method).

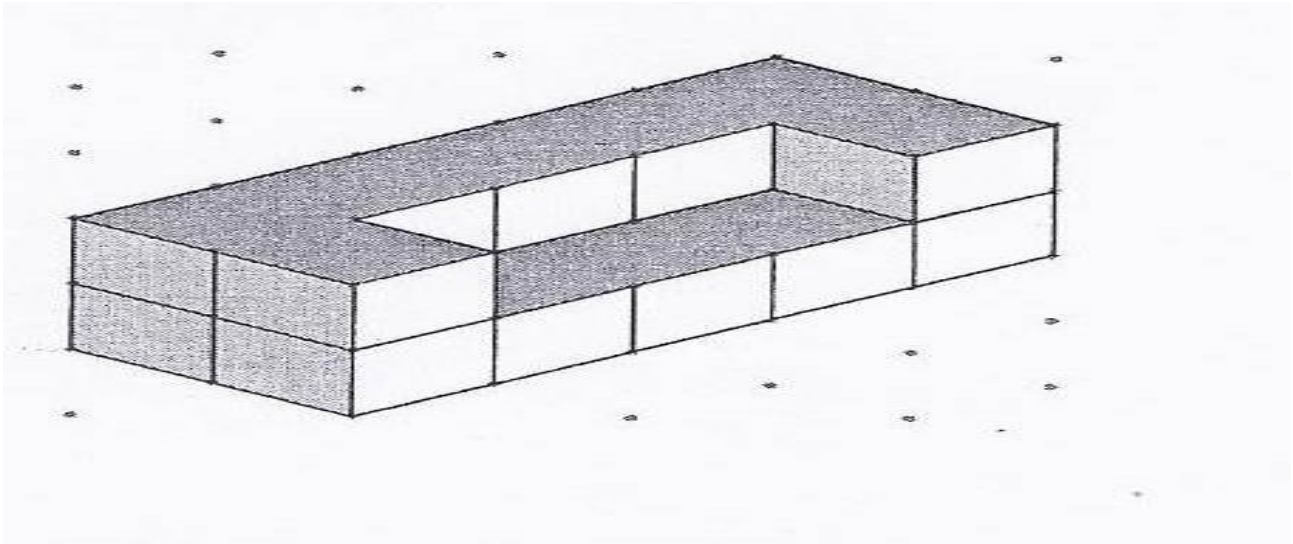
3.3 Use this general rule to determine T_{31} .

3.4 Use $T_n = 6n + 3$ to determine what term in this pattern will be equal to 45.



ACTIVITY 4

A shop that sells second hand furniture sells coaches made out of foam-rubber rectangular prisms. The diagram below shows their three seat design couch which uses 17 rectangular prisms to make.



4.1 Copy and complete the table below

Number of seats in couch (n)	1	2	3	4	5
Number of rectangular prisms(c)			17		

4.2 Describe the rule in words.

.....

.....

4.3 The general term of the pattern is given as $T_n = d(n) + c$ where d is the common difference, c is the constant and n is the number of terms. Use the values in the table in QUESTION 4.1 to calculate the following:

.....



$$d = T_2 - T_1$$

$$d = T_4 - T_3$$

- 4.4 Using the completed table in QUESTION 4.1, write down the value of c , then determine the first term
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- 4.5 Find the general rule using the formula

$$T_n = d(n) + c$$

- 4.6 Determine how many rectangular prisms will be needed to make the 13th seater design couch.



4.7 What number of seats can a couch have if you use 128 rectangular prisms?

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