SUBJECT and GRADE	MATHEMATICS GRADE 10	
TERM 3	Week 4	
TOPIC	PATTERNS	
AIMS OF LESSON	Recognise a linear pattern. Find the general term of the pattern Find a term in the given position of a linear pattern	
RESOURCES	***Paper based resources***	***Digital resources***
	Textbook chapter on Patterns	https://www.youtube.com/watch?v=V02nV_qR_xQ https://www.youtube.com/watch?v=Yd80NCXBINU
INTRODUCTION	In the previous grades you were introduced to numeric number patterns which is a sequence of numbers that follow a specific pattern. An example of a **linear pattern** is one where there is a **constant difference between consecutive terms.** In other words, the **same number** will be added to, or subtracted from each consecutive term.	

Look at the following sequences:

Example 1.

2; 4; 6; 8; . . .

n	T_n : general term
1	2 = 2(1) = 2
2	2+2 = 2(2) = 4
3	2+2+2 = 2(3) = 6
4	2+2+2+2 = 2(4) = 8
10	= 2(10) = 20
100	= 2(100) = 200
n	= $\mathbf{2(n)}$

Multiples of 2 = $\mathbf{2(n)}$
Even numbers

Odd numbers = $\mathbf{2n-1}$

Example 2.

3; 6; 9; 12; . . .

n	T_n : general term
1	3 = 3(1) = 3
2	3+3 = 3(2) = 6
3	3+3+3 = 3(3) = 9
4	3+3+3+3 = 3(4) = 12
10	= 3(10) =30
100	= 3(100) = 300
n	=$\mathbf{3(n)}$

Multiples of 3 = $\mathbf{3(n)}$

Example 3.

2; 4; 8; 16; . . .

n	T_n : general term
1	$2 = 2^1 = 2$
2	$2 \times 2 = 2^2 = 4$
3	$2 \times 2 \times 2 = 2^3 = 8$
4	$2 \times 2 \times 2 \times 2 = 2^4 = 16$
10	$= 2^{10} = 1024$
100	$= 2^{100}$
n	$\mathbf{= 2^n}$

Powers of 2 = $\mathbf{2^n}$

Example 4.

1; 4; 9; 16; . . .

n	T_n : general term
1	$1 \times 1 = 1^2$
2	$2 \times 2 = 2^2 = 4$
3	$3 \times 3 = 3^2 = 9$
4	$4 \times 4 = 4^2 = 16$
10	$= 10^2 = 100$
100	$= 100^2 = 10000$
n	$\mathbf{= n^2}$

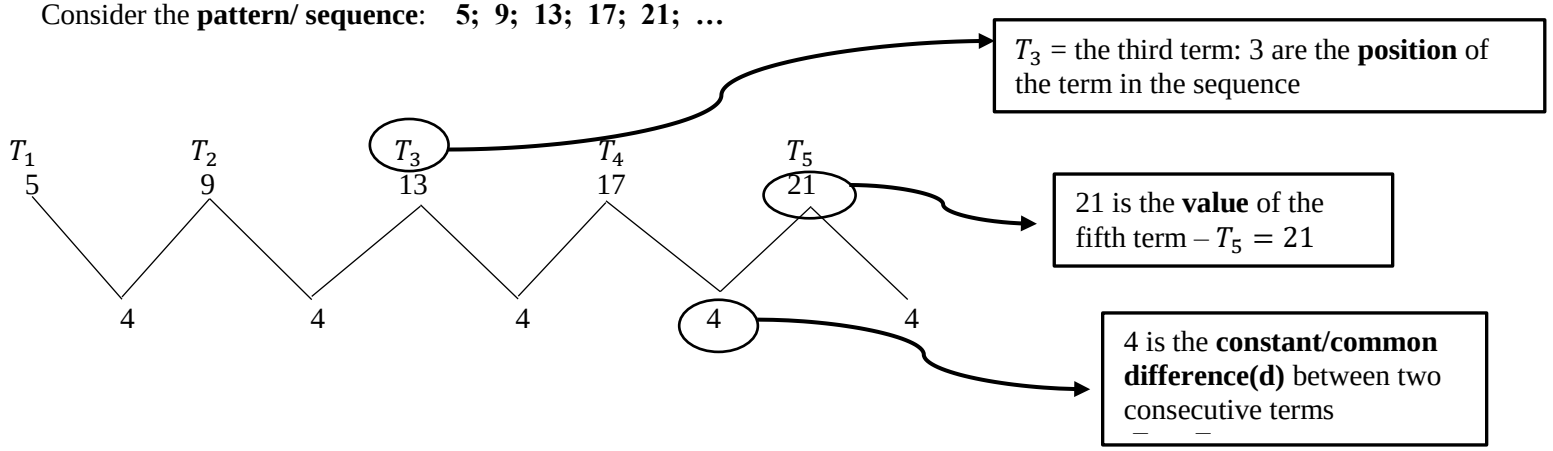
Squares of natural numbers= $\mathbf{n^2}$

Cubes of natural numbers = $\mathbf{n^3}$

Linear Patterns:

An example of a **linear pattern** is one where there is a **constant difference between consecutive terms.** In other words, the **same number** will be added to, or subtracted from each consecutive term.

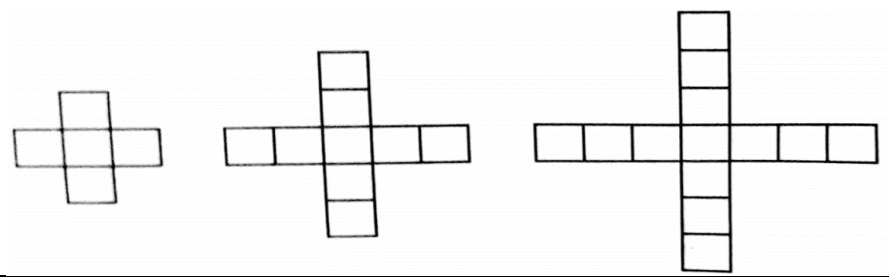
Example 5. Consider the **pattern/ sequence**: **5; 9; 13; 17; 21; …**



The sequence can be described in words as follows: The 1st term is 5. Add 4 to the 1st term to obtain the 2nd term which is 9. Continue adding 4 to each term to obtain the next term.

- The constant difference is 4
- The next three terms is 25; 29; 33
- The value of $T_4 = 17 \rightarrow$17 is the term in the 4th position
- The 2nd term $\rightarrow T_2 = 9$ is the value of 2nd term

Example 6: Consider the **pattern** of squares:



We can represent the pattern of squares on a table.

Constant difference $d = T_2 - T_1 = 9 - 5 = \mathbf{4}$

n	Number of squares	T_n : general term
1	5 = 5	= 5+**4**(0)
2	5+ 4 = 9	= 5+**4**(1)
3	5+4+4 = 13	= 5+**4**(2)
4	5+4+4+4 = 17	= 5+**4**(3)
n	5+4+4+4+4+ … +4	= 5+**4**$(n-1)$

Example 7:

Given the pattern: -2; 1; 4; 7

a) Determine the general rule to determine any term in the pattern.

b) Use the general rule to determine the 50th term in the pattern.

c) Which term in the pattern will be equal to 55.

Solution:

Constant difference $d = T_2 - T_1 = 1 - (-2) = \mathbf{3}$

n	T_n : general term	
1	-2 = -2	= -2+**3**(0)
2	-2+ 3 = 1	= -2+**3**(1)
3	-2+3+3 = 4	= -2+**3**(2)
4	-2+3+3+3 = 7	= -2+**3**(3)
n	-2+3+3+3+ … +3	= -2+**3**$(n-1)$ $= -2 + 3n - 3$ $= \mathbf{3n - 5}$

$\therefore T_n = 3n - 5$

$T_n = 3n - 5$

$\therefore T_{50} = 3(50) - 5$

$T_{50} = 145$

The **position** of the term is 50. Therefore, $n = 50$

$T_n = 55$

$\therefore T_n = 3n - 5 = 55$

$3n = 55 + 5$

$3n = 60$

$n = 20$

The **value** of the term is 55.

$\therefore$ 20th term of the pattern is equal to 55

CAN YOU?

Given the following sequence: 3; 8; 13; 18; …

Determine:

a) The general term
b) The 20th term
c) Which term of the sequence is equal to 223

Answers:

a) $T_n = 5n - 2$
b) 98
c) $n = 45$

Example 8:

Write down the first three terms and the constant difference for a linear pattern with general term: $T_n = 6n + 5$

Solution:

First 3 terms

$T_1 = 6(1) + 5 = 11$

$T_2 = 6(2) + 5 = 17$

$T_3 = 6(3) + 5 = 23$

Constant difference:

$d = T_2 - T_1$ or $d = T_3 - T_2$

$d = 17 - 11$

$d = 6$

ACTIVITIES/ASSESSMENT

Mind Action Series		Siyavula		Classroom Mathematics	
Exerise	Page	Exerise	Page	Exerise	Page
1	57	3.1	64	3.1, 3.2, 3.3	59, 61, 64

CONSOLIDATION

- Linear patterns have a constant/common difference (***d***)
- Find the general term/ *n*th term:
- Find a term in the given position of a linear pattern