



GRADE 10
MATHEMATICS
NUMBER PATTERNS QUESTIONS

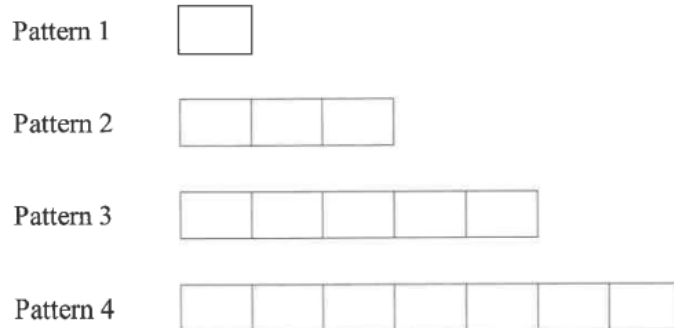
COMPILED BY ZOTHANI NDAWONDE

EMAIL ADDRESS: alexzothani@gmail.com

NOV 2023 HUD

QUESTION 2 (Start at the top of a new side of a page)

- 2.1.1. Given the following linear number pattern : $6; 2; -2; \dots; -294$
- (a) Determine the general term of the number pattern. Simplify your answer. (2)
- (b) How many terms are in this number pattern ? (2)
- 2.1.2. Now, consider the sequence : $30; 6; 30; 2; 30; -2; \dots$
- For this sequence, determine the following terms :
- (a) T_{99} (1)
- (b) T_{100} (2)
- 2.2. Given the linear number pattern : $3x + 1; 2x; 3x - 7; \dots$
- Calculate the value of x . (2)
- 2.3. Consider the following arrangement of blocks :



- 2.3.1. How many blocks will there be in Pattern 30 ? (2)
- 2.3.2. How many blocks are there in total for :
- (a) Patterns 1 to 4 ? (1)
- (b) Patterns 1 to 30 ? (2)

[14]

NOV 2023

QUESTION 3

3.1 Consider the following linear number pattern:

37 ; 33 ; 29 ; p ; 21 ;

3.1.1 Write down the value of p . (1)

3.1.2 Determine the n^{th} term of the number pattern. (2)

3.1.3 Determine the 15th term of the sequence. (2)

3.1.4 Which term is the first to have a negative value? (3)

3.2 Consider the number pattern below:

$\frac{-3}{5}$; $\frac{-6}{9}$; $\frac{-9}{13}$; ;

3.2.1 Determine the next two terms of the number pattern. (2)

3.2.2 Determine the n^{th} term of the number pattern. (2)

[12]

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QUESTION 3 (Start at the top of a new side of a page)

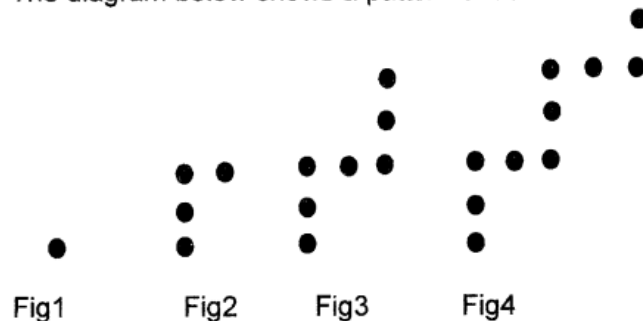
- 3.1 If the following number pattern is linear, calculate the value of x :
 $x - 3$; 7 ; $3x - 1$ (2)
- 3.2 Given : -97 ; $-94,5$; -92 ;; 208 .
- 3.2.1 Determine an expression for the general term of the sequence, T_n . Simplify your answer. (2)
- 3.2.2 How many terms are there in the sequence? (2)
- 3.2.3 a) In which position will you find the first term that has a positive value? (3)
- b) Hence, write down the value of that first positive term, in the sequence. (1)

[10]

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QUESTION 3:

- 3.1. The diagram below shows a pattern of dots:



- 3.1.1. Draw the fifth figure. (1)
- 3.1.2. Determine the general term for this pattern. (2)
- 3.1.3. How many dots will there be in figure 30? (2)
- 3.1.4. Which figure will have 136 dots (3)

[8]

QUESTION 1



1.1 Consider the following number sequences: $-14; -17; -20; -23; \dots$

1.1.1 Write down the next TWO terms in the sequence. (2)

1.1.2 Complete the table below, by determining the values of a , b and c .

n	1	2	3	a	14	50
T_n	-14	-17	-20	-32	b	c

(3)

1.1.3 Write down the general term, T_n , of the sequence. (2)

1.2 A sequence of patterns is made from square tiles and triangular tiles. Below are the first three patterns in the sequence.

Pattern 1



Pattern 2



Pattern 3



1.2.1 Determine how many square tiles are required for pattern 10. (2)

1.2.2 Calculate how many triangular tiles are required for pattern 24. (3)

[12]

QUESTION 4

4.1 Given: $8; 2; -4; \dots$

4.1.1 Determine an expression for the general term of the sequence T_n ,
in terms of n . Simplify your answer. (3)

4.1.2 Hence, determine the 13th term in the sequence. (1)

4.1.3 Will $-5\,242$ be a term in the pattern? Justify your answer. (2)

4.2 If the following pattern is linear (arithmetic):

$$x - 3; 7; 3x - 1$$

Calculate the value of x . (2)

4.3 Given: $\sqrt{2}; \pi; -8; -1; 6; 13; \dots; 643$

How many terms are there in the given sequence? (4)

[12]

QUESTION 4

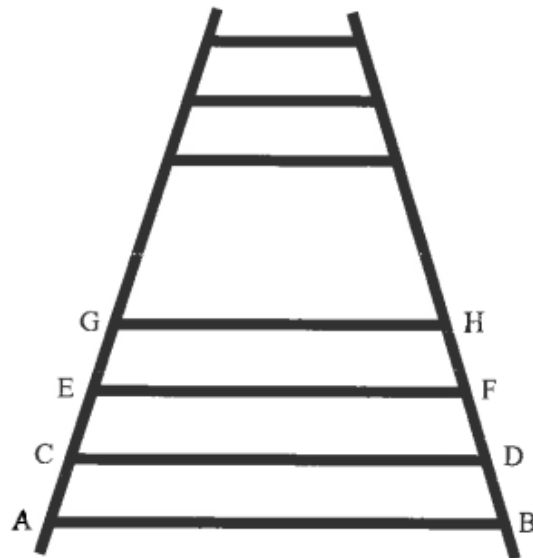
- 4.1. The bottom four rungs and the top three rungs of a ladder are shown.

The lengths of the rungs of the ladder form a linear number pattern :

$$AB = 2,00 \text{ metres}$$

$$CD = 1,97 \text{ metres}$$

$$EF = 1,94 \text{ metres}$$



- 4.1.1. How long will rung GH be ? (1)
- 4.1.2. Determine a formula for the length of rung n , R_n , in terms of n . (2)
- 4.1.3. If the length of the top-most rung is 0,38 m, how many rungs will the ladder have ? (2)
- 4.2. If: $2x - 7$; $10x + 1$; $-7x - 5$ are three consecutive terms in an arithmetic sequence, calculate the value of x . (2)

[7]

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QUESTION 3

Given the linear pattern: $2x + 2$; $3x + 4$; $5x + 6$; ...

3.1 If $x = 0$, calculate the numerical value of the fourth term.

Hence determine the n^{th} term of the sequence. (4)

3.2 Calculate the value of the 18th term. (2)

3.3 Which term in the sequence will be equal to 108? (2)

3.4 Determine the largest value of n for which $T_n < 166$. (3)

3.5 The following values are the multiples of five from the number pattern:

5; 10; 15; 20; ...

Determine the 16th even number of this pattern. (3)

[14]

QUESTION 3

3.1 Given the linear pattern: $2x+1$; $3x+3$; $4x+5$; ...

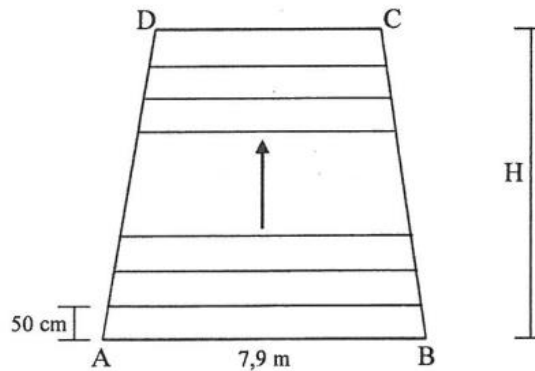
3.1.1 Write down the next term in the pattern. (1)

3.1.2 Write, in terms of x , the formula for T_n , the general term of the pattern. (3)

3.1.3 If the value of the 13th term of the pattern is 95, calculate the value of x . (2)

3.1.4 If $x = 5$, determine the largest value of n for which $T_n < 158$. (3)

3.2 An air-traffic control tower is constructed at an airport. The front view of the tower is shown in the diagram below. AB, the first horizontal support from the bottom, is 7,9 m long and is secured to the ground. Additional horizontal supports are secured parallel to AB and are 50 cm apart. Each additional support above is 10 cm shorter than the one below it. CD is the 45th horizontal support. AD and BC are lateral supports on which the horizontal supports are secured.



3.2.1 Calculate the height (H), in cm, of the tower. (1)

3.2.2 Calculate the length, in metres, of the 45th horizontal support. (3)

3.2.3 Calculate the area, in square metres, enclosed by supports AB, BC, CD and AD. (3)

[16]

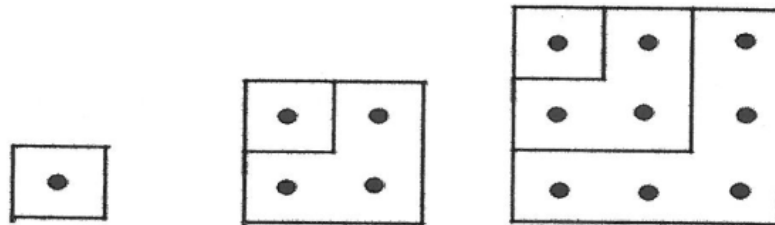
QUESTION 3

Consider the finite linear pattern: 20 ; 17 ; 14 ; ... ; -103

- 3.1 Write down the 4th term of the pattern. (1)
- 3.2 Determine the expression for the n^{th} term. (2)
- 3.3 Calculate the number of terms in the sequence. (2)
- 3.4 Which term is the first to have a negative value? (3)
- 3.5 What is the value of the 19th even-valued term in the sequence? (2)
- [10]**

QUESTION 4

Samantha is investigating a pattern of dots represented in the diagram below.



Pattern number:	1	2	3
Number of dots:	$1^2 = 1$	$1 + 3 = 2^2 = 4$	$1 + 3 + 5 = 3^2 = 9$

- 4.1 Write down:
- 4.1.1 The number of dots in the 4th pattern (1)
- 4.1.2 The number of dots in the 13th pattern (1)
- 4.1.3 A formula for the number of dots in the n^{th} pattern (1)
- 4.2 Hence, or otherwise, calculate the value of:

$$1 + 3 + 5 + \dots + 43$$

(3)

[6]

QUESTION 3

3.1 Consider the linear sequence: $5 ; 8 ; 11 ; b ; 17 ; \dots$

3.1.1 Write down the value of b . (2)

3.1.2 Determine the n^{th} term of the sequence. (2)

3.1.3 Calculate the value of the 15th term of the sequence. (2)

3.1.4 Which term in the sequence is equal to 83? (2)

3.2 Consider the number pattern below created by using the numbers of the sequence $2 ; 6 ; 10 ; 14 ; 18 ; \dots$

		2			
		6		10	
	14		18	22	
26		30		34	38
42	...		...	...	...

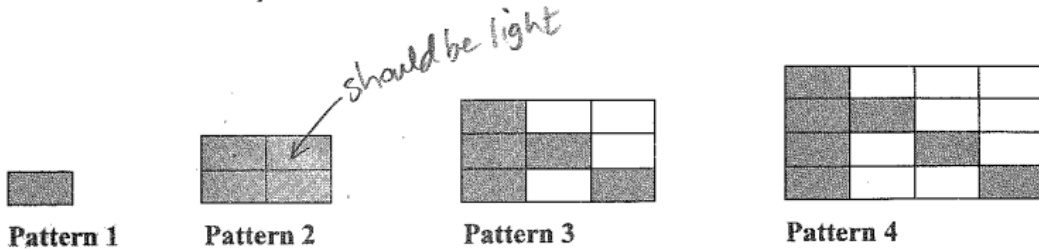
3.2.1 Calculate the sum of the numbers in the 8th row. (3)

3.2.2 Determine the mean of the numbers in the 20th row. (2)

[13]

QUESTION 3

Dark tiles (D) and light tiles (L) are used to create patterns on a floor. The first four patterns are shown below. For the patterns that follow the tiles are arranged in a similar manner.



- 3.1 How many dark tiles were used in pattern 5? (1)
 - 3.2 How many light tiles were used in pattern 6? (1)
 - 3.3 Write down the general term (D_n) for the number of dark floor tiles used in each pattern. (2)
 - 3.4 Write down the general term (L_n) for the number of light floor tiles used in each pattern. (2)
 - 3.5 Which pattern will have exactly 64 light floor tiles? (3)
 - 3.6 Each dark tile is 0,3 m wide and 0,6 m long. Calculate the total area covered by all the dark tiles in the first 100 patterns. (3)
- [12]

NOV 2015

QUESTION 3

- 3.1 Given the linear number pattern: $8; 3; -2; \dots$
- 3.1.1 Write down the NEXT TWO terms of the pattern. (2)
- 3.1.2 Determine the n^{th} term of the pattern. (2)
- 3.1.3 Calculate T_{30} , the thirtieth term of the pattern. (2)
- 3.1.4 Which term of the pattern is equal to -492 ? (2)
- 3.2 The first four terms of PATTERN A and PATTERN B are shown in the table below:

Position of term (n)	1	2	3	4
PATTERN A	1	3	5	7
PATTERN B	1	9	25	49

- 3.2.1 Determine a general formula for the n^{th} term of PATTERN A. (2)
- 3.2.2 Hence, or otherwise, determine a general formula for the n^{th} term of PATTERN B. (1)
- 3.2.3 Hence, determine a general formula for the pattern $0; -6; -20; -42 \dots$
Simplify your answer as far as possible. (4)
- [15]

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Question 8 (10 marks)

8.1) If $13; 10; 7 \dots$

8.1.1) Write down an expression for the n -th term of the sequence T_n and simplify the expression

(3)

8.1.2) In which position will you find the first term lower than -44 ?

(3)

8.2) If $3x - 1; 2x + 3; 2x - 1$ are the first 3 terms of an arithmetic sequence. Calculate x .

(4)

QUESTION 5 [5 marks]

- 5.1. Given : $17 ; 15 ; 13 ; \dots$
- 5.1.1. Write down an expression for the n -th term of the sequence, T_n . 1
- 5.1.2. Hence, determine the position of the term whose value is -981 . 2 (3)
- 5.2. If : $3x - 1 ; 4x + 7 ; 2x - 5$ are 3 consecutive terms of an arithmetic sequence, calculate the value of x . (2)