

**GRADE 7
MATHEMATICS
TERM 2
INVESTIGATION(EXEMPLAR)
TOPIC: Numeric and Geometric Patterns**

Name: _____

Class: _____ Date: _____

School: _____

Total: 50 Marks

Time: 2 hours

Instructions:

- 1) Write your name and surname in the spaces above.
- 2) All questions must be answered on the question paper.
- 3) Show all calculations.
- 4) You may use an approved calculator.
- 5) In this Investigation you will use a pencil.
- 6) You must do your own work.
- 7) Check your answers.

Question 1

(i) Study the sequences given below.

- A. 4; 8; 12; 16; 20;
- B. 4; 8; 16; 32; 64;
- C. 4; 8; 14; 22; 32;
- D. 5; 7; 4; 8; 3; 9; 2;

(a) Write down the next three terms in each of the given sequences. (4)

A: _____
B: _____
C: _____
D: _____

(b) In A, B and C above the sequences start with 4; 8; ...

- Is that information enough for one to generalise on the following terms in each sequence? Why? (2)

- What is your observation about all four given sequences? (2)

(ii) Sequence A: 4; 7; 10; 13; 16;

Sequence B: 5; 10; 20; 40; 80;

Sequence C: 2; 5; 10; 17; 26;

(a) Write down the next three numbers in each of given sequences. (3)

Sequence A: _____
Sequence B: _____
Sequence C: _____

(b) Write down how you decided what the next number would be in each of the three sequences. (3)

Sequence A: _____
Sequence B: _____
Sequence C: _____

[14]

Question 2

A pattern with matches is shown below.



Figure 1

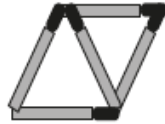


Figure 2

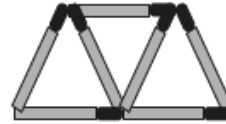


Figure 3

- (i) Explain how the pattern is formed. (2)

- (ii) Complete the table.

Figure number	1	2	3	4	5	6	7	8
Number of matches	3	5	7					

(5)

- (iii) What rule did you use to complete the table? (1)

- (iv) How many matches are needed to form figure number 9 and 17? Explain. (2)

- (v) If you used the recursive rule to complete the table, it would have taken long time to answer question (iv) because you had to add the same number many times. Copy and complete the pattern below. **HINT:** It may help to think of figure number 1 or term like this: there is one match at the beginning and two more are added every time. Study and complete. (4)

Term 1: $1 + 1 \times 2 = 3$

Term 2: $1 + 2 \times 2 = 5$

Term 3: $1 + 3 \times 2 = 7$

Term 4:

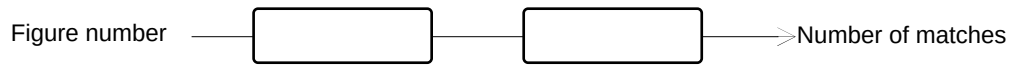
Term 5:

Term 10:

Term 17:

- (vi) What stays the same in the pattern in (v) and what varies? (2)

- (vii) Complete the flow diagram below and use it to write down the rule that you can use to calculate the number of matches needed for any figure in the pattern. (2)



- (viii) Use the flow diagram in (vii) to write the number of matches if the figure number is n and $(n-1)$. (3)

[21]

Question 4

- (i) Draw two more arrangements with dots to form the sequence: 1; 3; 6; 10; 15; ...



- (ii) How many dots will there be in the 6th and 7th arrangements? Explain how you got your answer. (3)

- (iii) What do you observe if you take any two consecutive arrangements and add the number of dots? (2)

[5]

Question 5

5.1. Extend the pattern below by writing down the next three terms.

0; -3 ; -8 ; -15 ; ____; ____; ____
(3)

5.2. Write down how you got the next terms in the above pattern, in own words. (1)

5.3. The first term of a sequence is -12 , the first term of the first level difference is 5 and the constant difference is 6, write down the next 6 terms. (6)

[10]