SHARP

Worksheet 5 – Number Patterns and Sequences

Grade 10 – Mathematics

1. For each of the following patterns:
   - i) Identify the pattern, and state the rule
   - ii) Continue the pattern for the next three terms
   - iii) Give a general formula for the pattern
   - iv) Find the 10^{th} term for the pattern.

a) 3, 6, 9…

b) 6, 8, 10…

c) 15, 17, 19…

d) 11, 14, 17…

e) 3, 1, -1…

f) 1, 4, 9…

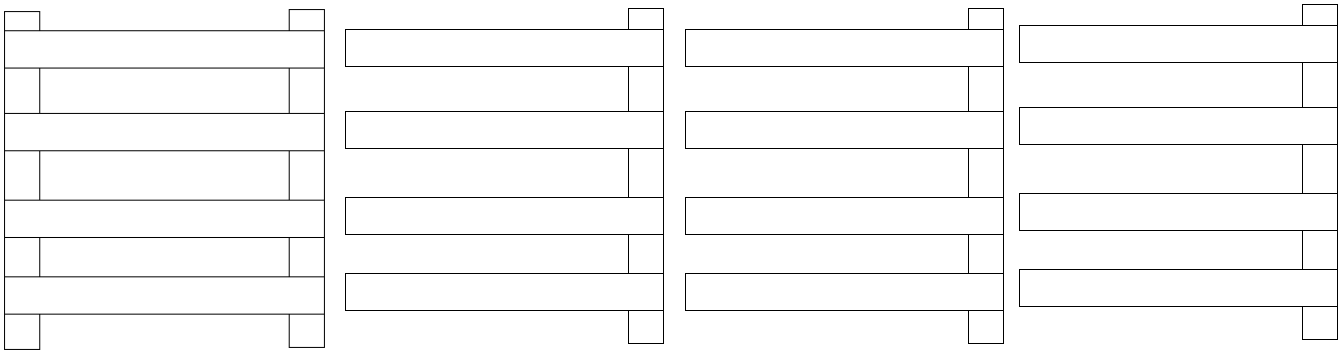
g) 2, 5, 10, 17…

h) 2, 8, 18, 32…

i) $2\frac{1}{2}, 3, 3\frac{1}{2}, 4\ldots$

j) $-2\frac{3}{4}, -2\frac{1}{2}, -2\frac{1}{4}, -2\ldots$

2. A farmer puts up a fence. The fence is made up of segments that are attached to each other. The first segment has 6 boards, as shown below, and each of the segments that attach to the next part of the fence have 5 boards each.



First Segment Second Segment Third Segment Fourth Segment

a) Complete the table below:

Segment	1	2	3	4	5	6	7
Boards	6	5	5	5	5	5	5
Total Boards	6	11	16				

b) What pattern do you see? Give a formula for this rule.

c) Determine the number of boards used after 20 segments.

d) If the farmer uses 136 boards, how many segments of fence has he put up?

e) Instead of using 5 boards on each new segment, the farmer decides to use 4 boards to save money.

i) Determine the total number of boards used for the second segment, third segment and fourth segment.

ii) Determine a formula for this pattern.

iii) How many boards would the farmer have saved after 20 segments?

3. Given the pattern: $-1\frac{3}{4};\ -\frac{1}{2};\frac{3}{4};2\ldots$

a) Determine the rule for the pattern and state it in words.

b) Write down a formula for the n^{th} term of the pattern, T_n.

c) Determine the 5^{th} , 9^{th} and 13^{th} terms.

d) Determine in which position $14\frac{1}{2}$ lies.

e) If there is a term that is exactly 1 more than its position, determine the term and its position.

4. Given a formula for each of the following patterns,

i) determine the first three terms

ii) find the 11^{th} term (except for questions b and i)

iii) state whether the sequence is arithmetic or not.

iv) if the sequence is arithmetic, state the constant difference between the terms

a) $T_n = 2^n + 1$

b) $T_{n+1} = 2T_n - n;\quad T_1 = 9$

c) $T_n = 3n + 4$

d) $T_n = n^2 - 2n + 3$

e) $T_n = \frac{1}{2}n - 4$

f) $T_{n+1} = n + 3;\quad T_1 = 5$

g) $T_n = 3^n - 1$

h) $T_n = n(n + 1)$

i) $T_{n+1} = T_n - T_{n-1}$ where $T_1 = 3 \quad and\ T_2 = 8$

j) $T_n = 4n - 3$

5.* Determine the 30^{th} and 31^{st} terms in the sequence: 6; -4; 6; 1; 6; 6; 6; 11; 6…