SHARP

Worksheet 5 Memorandum – Number Patterns and Sequences

Grade 10 – Mathematics

1. a) 3, 6, 9…
   - i) add 3 to the previous term
   - ii) 12, 15, 18
   - iii) $T_n = 3n$
   - iv) $T_{10} = 30$

b) 6, 8, 10…
   - i) add 2 to the previous term
   - ii) 12, 14, 16
   - iii) $T_n = 2n + 4$
   - iv) $T_{10} = 24$

c) 15, 17, 19…
   - i) add 2 to the previous term
   - ii) 21, 23, 25
   - iii) $T_n = 2n + 13$
   - iv) $T_{10} = 33$

d) 11, 14, 17…
   - i) add 3 to the previous term
   - ii) 20, 23, 26
   - iii) $T_n = 3n + 8$
   - iv) $T_{10} = 38$

e) 3, 1, -1…
   - i) subtract 2 from the previous term
   - ii) -3, -5, -7
   - iii) $T_n = -2n + 5$
   - iv) $T_{10} = -15$

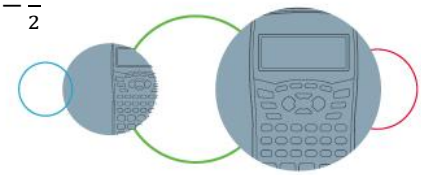
f) 1, 4, 9…
   - i) each term is the square of its position
   - ii) 16, 25, 36
   - iii) $T_n = n^2$
   - iv) $T_{10} = 100$

g) 2, 5, 10, 17…
   - i) square each term and add 1.
   - ii) 26, 37, 50
   - iii) $T_n = n^2 + 1$
   - iv) $T_{10} = 101$

h) 2, 8, 18, 32…
   - i) Square each term and multiply by 2.
   - ii) 50, 72, 98
   - iii) $T_n = 2n^2$
   - iv) $T_{10} = 200$

i) $2\frac{1}{2}, 3, 3\frac{1}{2}, 4\ldots$
   - i) add $\frac{1}{2}$ to the previous term
   - ii) $4\frac{1}{2}, 5, 5\frac{1}{2}$
   - iii) $T_n = \frac{1}{2}n + 2$
   - iv) $T_{10} = 7$

j) $-2\frac{3}{4}, -2\frac{1}{2}, -2\frac{1}{4}, -2\ldots$
   - i) add $\frac{1}{4}$ to the previous term
   - ii) $-1\frac{3}{4}, -1\frac{1}{2}, -1\frac{1}{4}$
   - iii) $T_n = \frac{1}{4}n - 3$
   - iv) $T_{10} = -\frac{1}{2}$



2. a)

Segment	1	2	3	4	5	6	7
Boards	6	5	5	5	5	5	5
Total Boards	6	11	16	21	26	31	36

b) As the fence increases by 1 segment the number of boards in total increases by 5.
$T_n = 5n + 1$

c) $T_{20} = 5(20) + 1$
$T_{20} = 101$

d) $136 = 5n + 1$
$135 = 5n$
$\therefore n = 27$

e) i) 6 (first segment); 10 (second segment); 14 (third segment); 18 (fourth segment)

ii) $T_n = 4n + 2$

iii) $T_{20} = 4(20) + 2$
$T_{20} = 82$
$\therefore$ He will save $101 - 82$
$= 19$ boards.

3. a) Add $1\frac{1}{4}$ to the previous term.

b) $T_n = 1\frac{1}{4}n - 3$

c) $T_5 = 1\frac{1}{4}(5) - 3$
$T_5 = 3\frac{1}{4}$

$T_9 = 1\frac{1}{4}(9) - 3$
$T_9 = 8\frac{1}{4}$

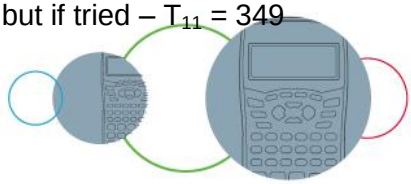
$T_{13} = 1\frac{1}{4}(13) - 3$
$T_{13} = 13\frac{1}{4}$

d) $14\frac{1}{2} = 1\frac{1}{4}n - 3$
$17\frac{1}{2} = 1\frac{1}{4}n$
$\therefore n = 14$

e) Let position $= x - 1$ and term $= x$
$\therefore x = 1\frac{1}{4}(x - 1) - 3$
$\therefore x = 1\frac{1}{4}x - 1\frac{1}{4} - 3$
$\therefore x - 1\frac{1}{4}x = -4\frac{1}{4}$
$\therefore -\frac{1}{4}x = -4\frac{1}{4}$
$\therefore x = 17$
$\therefore$ Term = 17 and position is 16.

4. a) $T_n = 2^n + 1$
i) 3, 5, 9
ii) $T_{11} = 2\,049$

b) $T_{n+1} = 2T_n - n; \quad T_1 = 9$
i) 9, 16, 29
ii) not necessary but if tried – $T_{11} = 349$



iii) not arithmetic

iv) N/A

iii) not arithmetic

iv) N/A

c) $T_n = 3n + 4$

i) 7, 10, 13

ii) $T_{11} = 37$

iii) Arithmetic

iv) 3

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

i) 2, 3, 6

ii) $T_{11} = 102$

iii) Not arithmetic

iv) N/A

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

i) $-3\frac{1}{2}, -3, -2\frac{1}{2}$

ii) $T_{11} = 1\frac{1}{2}$

iii) Arithmetic

iv) $\frac{1}{2}$

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

i) 5, 8, 11

ii) $T_{11} = 35$

iii) Arithmetic

iv) 3

g) $T_n = 3^n - 1$

i) 2, 8, 26

ii) $T_{11} = 177\ 146$

iii) not arithmetic

iv) N/A

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

i) 2, 6, 12

ii) $T_{11} = 132$

iii) not arithmetic

iv) N/A

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

i) 3, 8, 5

ii) not necessary but if tried: $T_{11} = -307$

iii) Not arithmetic

iv) N/A

j) $T_n = 4n - 3$

i) 1, 5, 9

ii) $T_{11} = 41$

iii) Arithmetic

iv) 4

5. The uneven term is very easy as the uneven term pattern is a repeating 6: 6, even, 6, even, 6…

∴ $T_{31} = 6$

For the even terms the pattern is odd, -4, odd, 1, odd, 6…

Therefore the formula for the pattern is $T_n = 5n - 9$

And ∴ $T_{30} = 5(30) - 9$

$T_{30} = 141$.