Quadratic Number Patterns (Grade 11 & 12)

MEMORANDUM

Name: ..... Class: .....

Date: .....

MARK ____ / 17

Answer all questions. Show all your working — marks are awarded for method as well as the final answer. **Teacher copy: accept any correct equivalent method.**

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1 Show that 3 ; 8 ; 17 ; 30 ; 47 is a quadratic pattern. **(2)**

First differences 5 ; 9 ; 13 ; 17. Second differences 4 ; 4 ; 4 — constant, so it is **quadratic**. ✓✓ (2)

2 Determine T_n for 3 ; 8 ; 17 ; 30 ; 47 **(4)**

$2a = 4 \rightarrow a = 2$; $3a + b = 5 \rightarrow b = -1$; $a + b + c = 3 \rightarrow c = 2$. $\mathbf{T_n = 2n^2 - n + 2}$ ✓✓✓✓ (4)

3 Which term of 3 ; 8 ; 17 ; 30 ; 47 equals 122? **(3)**

$2n^2 - n - 120 = 0 \rightarrow (2n + 15)(n - 8) = 0 \rightarrow \mathbf{n = 8}$ (reject $n = -7{,}5$) ✓✓✓ (3)

4 Determine the general term of the pattern shown in the difference table below. **(3)**

T_n	1		5		11		19		29
1st		4		6		8		10	
2nd			2		2		2		

$2a = 2 \rightarrow a = 1$; $3a + b = 4 \rightarrow b = 1$; $a + b + c = 1 \rightarrow c = -1$. $\mathbf{T_n = n^2 + n - 1}$ ✓✓✓ (3)

5 1 ; p ; 11 ; ... is a quadratic pattern whose first differences are 3 ; 7 ; ... Determine p. **(2)**

$p - 1 = 3$, so $\boldsymbol{p = 4}$ ✓✓ (2)

6 The second difference of a quadratic pattern is 6. Determine a. **(1)**

$2a = 6$, so $\boldsymbol{a = 3}$ ✓ (1)

7 Calculate T_{10} if $T_n = 2n^2 - n + 2$. **(2)**

$2(100) - 10 + 2 = \mathbf{192}$ ✓✓ (2)

TOTAL: 17 marks

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