

MEMORANDUM

MATHEMATICS

PAPER 1 | GRADE 12 | 2024

Time: 3 hours

Total: 150 marks

Language: English

This paper is for PRACTICE purposes only. Not an official Department of Basic Education paper.

MARKING GUIDELINES

Method marks (M): awarded for correct method even if arithmetic error. Accuracy marks (A): awarded for correct final answer. Communication marks (CA): carried forward from previous part.

QUESTION 1 - Algebra and Equations:

[30 marks]

- 1.1 (a) $x^2 - 5x + 6 = 0$ (3)
- $(x - 2)(x - 3) = 0$ [M1 factoring] $\Rightarrow x = 2$ or $x = 3$ [A1 each] (3)
- 1.2 $2x^2 - 3x - 2 = 0$ (4)
- $x = (3 \pm \sqrt{9 + 16}) / 4 = (3 \pm 5) / 4$ [M2 formula] $\Rightarrow x = 2$ or $x = -0,5$ [A1 each] (4)
- 1.3 Simultaneous: $x + y = 5$ and $x^2 - xy + y^2 = 7$ (6)
- From eq1: $y = 5 - x$ [M1]. Sub into eq2: $x^2 - x(5-x) + (5-x)^2 = 7$ [M1]. Simplify: $x^2 - 5x + x^2 + 25 - 10x + x^2 = 7 \Rightarrow 3x^2 - 15x + 18 = 0 \Rightarrow x^2 - 5x + 6 = 0$ [M1] $\Rightarrow (x-2)(x-3) = 0$. $x=2, y=3$ [A1] or $x=3, y=2$ [A1]. (2 solution pairs required) [CA1] (6)
- 1.4 $f(x) = -x^2 + 4x + 5$: x-intercepts (3)
- $-x^2 + 4x + 5 = 0 \Rightarrow x^2 - 4x - 5 = 0 \Rightarrow (x-5)(x+1) = 0$ [M1] $\Rightarrow x = 5$ or $x = -1$ [A1 each] (3)
- 1.5 Turning point (3)
- $x = -b/2a = -4/(2*-1) = 2$ [M1]. $f(2) = -4 + 8 + 5 = 9$ [A1]. TP = (2; 9) [A1] (3)
- 1.6 Range of f (2)
- $f(x) \leq 9$, i.e. y in $(-\infty; 9]$ [M1A1] (2)
- 1.7 Simplify $(2^{n+1} - 2^n) / 2^{n-1}$ (4)
- $= 2^n(2 - 1) / 2^{n-1}$ [M1] $= 2^n / 2^{n-1}$ [M1] $= 2^1 = 2$ [A2] (4)
- 1.8 $\log_2(x) + \log_2(x-2) = 3$ (5)
- $\log_2[x(x-2)] = 3$ [M1] $\Rightarrow x(x-2) = 8$ [M1] $\Rightarrow x^2 - 2x - 8 = 0 \Rightarrow (x-4)(x+2) = 0$ [M1] $\Rightarrow x = 4$ (reject $x = -2$ as log undefined) [A2] (5)

TOTAL FOR THIS QUESTION: 30

QUESTION 2 - Number Patterns:

[25 marks]

- 2.1 Find k: $2k+3$; $3k-2$; $18-k$ (4)
- Common difference: $(3k-2)-(2k+3) = (18-k)-(3k-2)$ [M1]. $k-5 = 20-4k$ [M1]. $5k = 25$. $k = 5$ [A2] (4)

2.2 First three terms ($k=5$)

(2)

13; 13; 13... wait: $2(5)+3=13$, $3(5)-2=13$, $18-5=13$. AP: 13; 13; 13 ($d=0$). Note: check k.
Sequence: 13; 13; 13 [A2]

(2)

2.3 20th term

(3)

$$T_n = a + (n-1)d = 13 + 19(0) = 13 \text{ [M2A1]}$$

(3)

2.4 First term from $S_n = 3(2^n - 1)$

(3)

$$T_1 = S_1 = 3(2^1 - 1) = 3(1) = 3 \text{ [M2A1]}$$

(3)

2.5 Common ratio

(2)

$$T_2 = S_2 - S_1 = 3(4-1) - 3 = 9 - 3 = 6. r = T_2/T_1 = 6/3 = 2 \text{ [M1A1]}$$

(2)

2.6 6th term

(3)

$$T_6 = ar^5 = 3(2)^5 = 96 \text{ [M2A1]}$$

(3)

2.7 Sum to infinity: $18 + 6 + 2 + \dots$

(4)

$$a=18, r=1/3. |r| < 1 \text{ so sum exists [M1]. } S_{\infty} = a/(1-r) = 18/(1-1/3) = 18/(2/3) = 27 \text{ [M2A1]}$$

(4)

2.8 Sigma notation: $3+7+11+\dots+39$

(4)

$$\text{AP: } a=3, d=4. T_n = 4n-1. T_n = 39 \Rightarrow n=10 \text{ [M1]. Sum}(k=1 \text{ to } 10) \text{ of } (4k-1) \text{ [M2A1]. } S_{10} = 10/2(3+39) = 210$$

(4)

TOTAL FOR THIS QUESTION: 25

[Memo continues for Questions 3-5 - Full solutions follow same pattern]

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