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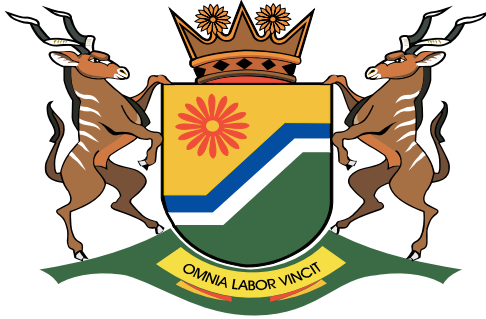
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**MPUMALANGA PROVINCE
REPUBLIC OF SOUTH AFRICA**

EHLANZENI DISTRICT

GRADE 12

**MATHEMATICS P1
PRE-TRIAL EXAMINATION
MEMORANDUM**

MARKS: 150

This memorandum consists of 15 pages.

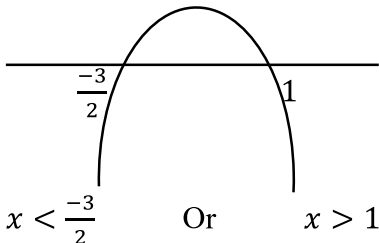


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- Continued Accuracy will apply as a general rule.
- If candidate does a question twice and does not delete either, only mark the FIRST attempt.
- If candidate does a question, crosses it out and does not re-do it, mark the deleted attempt.

QUESTION 1

1.1.1	$x^2 = x + 6$ $x^2 - x - 6 = 0$ $(x - 3)(x + 2) = 0$ $x = 3$ Or $x = -2$	FULL MARKS: SOLVING BY QUADRATIC FORMULA	✓ standard form ✓ factors ✓ both answers (3)
1.1.2	$2x^2 + 7x - 1 = 0$ $x = \frac{-(7) \pm \sqrt{(7)^2 - 4(2)(-1)}}{2(2)}$ $x = 0,14$ Or $x = -7,14$		✓ substitute into correct formula ✓ answer ✓ answer (3)
1.1.3	$6 - 2x < 4x^2$ $2x^2 + x - 3 > 0$ $(2x + 3)(x - 1) > 0$ CV's: $x = 1$; $x = \frac{-3}{2}$  $x < \frac{-3}{2}$ Or $x > 1$		✓ standard form ✓ critical values ✓✓ answers (4)
1.1.4	$x - 7\sqrt{x} = -12$ $x + 12 = 7\sqrt{x}$ $(x + 12)^2 = (7\sqrt{x})^2$ $x^2 - 25x + 144 = 0$ $(x - 16)(x - 9) = 0$ $x = 16$ Or $x \neq 9$		✓ isolating and Squaring both side. ✓ standard form ✓ factors ✓ answer & section (4)



1.2	$r + p = 2 \dots\dots\dots (1)$ $6r + 5rp - 5p = 8 \dots\dots\dots (2)$ From (1) $r + p = 2$ $r = 2 - p \dots\dots\dots (3)$ Substitute $r = 2 - p$ in (2) $6(2 - p) + 5p(2 - p) - 5p = 8$ $5p^2 + p - 4 = 0$ $(5p - 4)(p + 1) = 0$ $p = \frac{4}{5} \quad \text{Or} \quad p = -1$ $r = 2 - \left(\frac{4}{5}\right) \quad \text{Or} \quad r = 2 - (-1)$ $r = \frac{6}{5} \quad \text{Or} \quad r = 3$ OR From (1) $r + p = 2$ $p = 2 - r \dots\dots\dots (3)$ Substitute $p = 2 - r$ in (2) $6r + 5r(2 - r) - 5(2 - r) = 8$ $5r^2 - 21r + 18 = 0$ $(5r - 6)(r - 3) = 0$ $r = \frac{6}{5} \quad \text{Or} \quad r = 3$ $p = 2 - \left(\frac{6}{5}\right) \quad \text{Or} \quad p = 2 - (3)$ $p = \frac{4}{5} \quad \text{Or} \quad p = -1$	$\checkmark r = 2 - p$ $\checkmark$ Substitute $r = 2 - p$ $\checkmark$ standard form $\checkmark$ factors $\checkmark p$ values $\checkmark r$ values OR $\checkmark p = 2 - r$ $\checkmark$ Substitute $p = 2 - r$ $\checkmark$ standard form $\checkmark$ factors $\checkmark r$ values $\checkmark p$ values (6)
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1.3	Let the shortest side be x Dimension of the box: $l = x; b = 2x; h = 3x$ $V = lbh$ $3\,072 = (x)2x(3x)$ $6x^3 = 3\,072$ $x^3 = 512$ $x = 8$	✓ shortest side be x ✓ $x; 2x; 3x$ ✓ substitute in volume formula ✓ answer (4)
		[24]

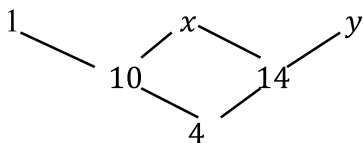
QUESTION 2

2.1	$S_n = a + [a + d] + [a + 2d] + \dots + [a + (n - 2)d] + [a + (n - 1)d]$ $S_n = [a + (n - 1)d] + [a + (n - 2)d] + \dots + [a + d] + a$ $2S_n = [2a + (n - 1)d] + [2a + (n - 1)d]$ $2S_n = n[2a + (n - 1)d]$ $S_n = \frac{n}{2}[2a + (n - 1)d]$	✓ S_n ✓ Reversing S_n ✓ Expressing $2S_n$ ✓ Grouping to get $2S_n = n[2a + (n - 1)d]$ (4)
2.2.1	$\frac{1}{16}; 13$	✓✓ answers (2)
2.2.2	$\left(\frac{1}{2} + \frac{1}{4} + \frac{1}{8} + \dots \text{to } 25 \text{ terms}\right) \quad (4 + 7 + 10 + \dots \text{to } 25 \text{ terms})$ $S_n = \frac{a(r^n - 1)}{r - 1}$ $S_n = \frac{n}{2}[2a + (n - 1)d]$ $S_{25} = \frac{\frac{1}{2}\left(\left(\frac{1}{2}\right)^{25} - 1\right)}{\frac{1}{2} - 1}$ $S_{25} = \frac{25}{2}[2(4) + (25 - 1)3]$ $S_{25} = 0,999999$ $S_{25} = 1\,000$ $S_{50} = 0,999999 + 1000$ $S_{50} = 1001,00$ OR	✓ a & r Geometric ✓ a & d Arithmetic ✓ subst. a & r in formula ✓ subst. a & d in formula ✓ $S_{25} = 0,999999$ ✓ $S_{25} = 1\,000$ ✓ $S_{50} = 1001,0$



	$S_{50} = 25 \text{ terms of } 1^{st} \text{ sequence} + 25 \text{ terms of } 2^{nd} \text{ sequence.}$ $S_{50} = \left(\frac{1}{2} + \frac{1}{4} + \frac{1}{8} + \dots \text{to 25 terms} \right)$ $\quad + (4 + 7 + 10 \dots \text{to 25 terms})$ $S_{50} = \frac{\frac{1}{2} \left(\left(\frac{1}{2} \right)^{25} - 1 \right)}{\frac{1}{2} - 1} + \frac{25}{2} [2(4) + (25 - 1)3]$ $S_{50} = 0,999999 \dots + 1\,000$ $S_{50} = 1\,001,00$	(7)
2.3	$r = x + 1$ $-1 < r < 1$ $-1 < x + 1 < 1$ $-2 < r < 0$	$\checkmark r$ $\checkmark -1 < x + 1 < 1$ $\checkmark -2 < r < 0$ (3)
		[16]

QUESTION 3

3.1.1	$1; x; y; z \dots$ $T_n = 4n + 6$ $10; 14; 18 \dots$  $2a = 4$ $a = 2$ OR $T_n = 4n + 6$ $d = 4$ $2a = 4$ $a = 2$ ANSWER ONLY: FULL MARKS	$\checkmark 2a = 4$ $\checkmark a = 2$ OR $\checkmark d = 4$ $\checkmark a = 2$ (2)
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3.1.2	$a = 2$ $3a + b = 10$ $3(2) + b = 10$ $b = 4$ $a + b + c = 1$ $2 + 4 + c = 1$ $c = -5$ $T_n = 2n^2 + 4n - 5$	$\checkmark a = 2$ $\checkmark b = 4$ $\checkmark c = -5$ $\checkmark T_n$ (4)
3.2	Consider the sequence made up by the first factor of each term: $1 ; 5 ; 9 ; 13 ; \dots 81$ $T_n = a + (n - 1)d$ $= 1 + (n - 1)4$ $= 4n - 3$ Above sigma: $81 = 4n - 3$ $n = 21$ Below sigma: $1 = 4n - 3$ $n = 1$ The second factor is 1 more than the first factor $T_n = 4n - 3 + 1$ $= 4n - 2$ OR Consider the sequence made by the second factor of each term: $2 ; 46 ; 10 ; 14 ; \dots 82$ $T_n = a + (n - 1)d$ $= 2 + (n - 1)4$ $= 4n - 2$ In sigma notation: $\sum_{n=1}^{21} (4n - 3)(4n - 2)$	$\checkmark 4n - 3$ $\checkmark \checkmark 4n - 2$ $\checkmark$ sigma (4)
		[10]

QUESTION 4

4.1	$x + 1 = -x - 7$ $2x = -8$	$\checkmark x + 1 = -x - 7$ $\checkmark 2x = -8$
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	$x = -4$ $\therefore y = -3$ $\therefore f(x) = \frac{-2}{x+4} - 3$ $\therefore p = 4 \quad \text{and} \quad q = -3$ OR $p + q = 1 \dots \dots (1)$ $-p + q = -7$ $q = p - 7 \dots \dots (2)$ Subst. (2) into (1) $p + q - 7 = 1$ $2p = 8$ $p = 4 \quad \text{and} \quad q = -3$	$\checkmark x = -4$ $\checkmark y = -3$ $\checkmark p + q = 1$ $\checkmark q = p - 7$ $\checkmark$ Substitution $\checkmark$ simplification (4)
4.2	$f(x) = \frac{-2}{x+4} - 3$ $0 = \frac{-2}{x+4} - 3$ $\therefore x = -\frac{14}{3}$	$\checkmark f(x) = 0$ $\checkmark x = -\frac{14}{3}$ (2)
4.3		$\checkmark$ Asymptotes $\checkmark$ y-intercept $\checkmark$ shape (3)
		[9]



QUESTION 5

5.1	B: x –intercept $h(x) = 0$ $-x^2 + 2x + 3 = 0$ $x^2 - 2x - 3 = 0$ $(x - 3)(x + 1) = 0$ $x = 3$ and $x = -1$ $\therefore B(3; 0)$ C: y –intercept: $x = 0$ $y = -(0)^2 + 2(0) + 3$ $y = 3$ $C(0; 3)$ ANSWER ONLY: FULL MARKS	✓✓ $B(3; 0)$ ✓✓ $C(0; 3)$ (4)
5.2	$CD = y_C - y_D$ $6 = 3 - y_D$ $y_D = -3$ $\therefore D(0; -3)$ OR $CD = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$ $6 = \sqrt{(0 - (0))^2 + (y - (3))^2}$ $y = 9$ Or $y = -3$ $\therefore D(0; -3)$ ANSWER ONLY: FULL MARKS	✓ $x = 0$ ✓ $y = -3$ (2)
5.3	$a = \frac{0 - (-3)}{3 - 0}$ $a = 1$ $q = -3$ $\therefore g(x) = x - 3$ ANSWER ONLY: FULL MARKS	✓ $a = 1$ ✓ $q = -3$ (2)
5.4	$y = x - 3$ $x = y - 3$ $y = x + 3$ ANSWER ONLY: FULL MARKS	✓ interchange ✓ $y = x + 3$ (2)
5.5	$-x^2 + 2x + 3 = x - 3$ $x^2 - x - 6 = 0$ $(x - 3)(x + 2) = 0$ $x \neq 3$ Or $x = -2$ $y = -5$ $\therefore E(-2; -5)$	✓ equating ✓ standard form ✓ factors ✓ $x = -2$ ✓ $y = -5$ (5)



5.6	$x < -3$ or $x > 3$	$\checkmark\checkmark x < -3$ $\checkmark\checkmark x > 3$ (4)
		[19]

QUESTION 6

6.1	$x > 0$	$\checkmark$ answer (1)
6.2	$f(x) = \log_b x$ $-2 = \log_b 25$ $b^{-2} = 25$ $b = \frac{1}{5}$ $\therefore f(x) = \log_{\frac{1}{5}} x$ ANSWER ONLY: FULL MARKS	$\checkmark$ substitute $\checkmark b = \frac{1}{5}$ (2)
6.3	$f(x) = \log_{\frac{1}{5}} x$ $y = \log_{\frac{1}{5}} x$ $x = \log_{\frac{1}{5}} y$ $y = \left(\frac{1}{5}\right)^x$ Or $y = 5^{-x}$ ANSWER ONLY: FULL MARKS	$\checkmark$ interchange x and y $\checkmark$ answer (2)
6.4	$x > -5$	$\checkmark\checkmark$ answer (2)
		[7]



QUESTION 7

7.1.1	$F = 2000 \left(1 + \frac{0,08}{12}\right)^{24} + \frac{1200 \left[\left(1 + \frac{0,08}{12}\right)^{24} - 1\right]}{\frac{0,08}{12}}$ $F = 33\,465,60$ OR $F = 800 \left(1 + \frac{0,08}{12}\right)^{24} + \frac{1200 \left[\left(1 + \frac{0,08}{12}\right)^{25} - 1\right]}{\frac{0,08}{12}}$ $F = 33\,465,60$	$\checkmark i = \frac{0,08}{12}$ $\checkmark 2000 \left(1 + \frac{0,08}{12}\right)^{24}$ $\checkmark n = 24 \text{ in } F$ $\checkmark \frac{1200 \left[\left(1 + \frac{0,08}{12}\right)^{24} - 1\right]}{\frac{0,08}{12}}$ OR $\checkmark i = \frac{0,08}{12}$ $\checkmark 800 \left(1 + \frac{0,08}{12}\right)^{24}$ $\checkmark n = 25 \text{ in } F$ $\checkmark \frac{1200 \left[\left(1 + \frac{0,08}{12}\right)^{25} - 1\right]}{\frac{0,08}{12}}$ $\checkmark \text{answer.}$ (5)
7.1.2	$A = 33\,465,60 \left(1 + \frac{0,08}{12}\right)^5$ $A = \text{R}34\,596,10.$	$\checkmark 33\,465,60$ $\checkmark \text{substitute}$ $\checkmark \text{answer}$ (3)
7.2.1	$150\,000 \left(1 + \frac{0,15}{12}\right)^2 = \frac{x \left[1 - \left(1 + \frac{0,15}{12}\right)^{-94}\right]}{\frac{0,15}{12}}$ $x = \text{R } 2790,10$	$\checkmark i = \frac{0,15}{12}$ $\checkmark 150\,000 \left(1 + \frac{0,15}{12}\right)^2$ $\checkmark n = -94$ $\checkmark \frac{x \left[1 - \left(1 + \frac{0,15}{12}\right)^{-94}\right]}{\frac{0,15}{12}}$ $\checkmark \text{answer.}$ (5)



7.2.2	$1 + i = \left(1 + \frac{0,15}{12}\right)^{12}$ $i = 16,08\%$	✓ substitution ✓ answer (2)
		[15]

QUESTION 8

8.1.1	$f'(x) = \lim_{h \rightarrow \infty} \frac{f(x+h) - f(x)}{h}$ $f(x) = -3x^2 - p$ $f(x+h) = -3(x+h)^2 - p$ $= -3x^2 - 6xh - 3h^2 - p$ $f(x+h) - f(x) = -3x^2 - 6xh - 3h^2 - p - (-3x^2 - p)$ $= -6xh - 3h^2$ $f'(x) = \lim_{h \rightarrow 0} \frac{f(x+h) - f(x)}{h}$ $f'(x) = \lim_{h \rightarrow 0} \frac{-6xh - 3h^2}{h}$ $f'(x) = \lim_{h \rightarrow 0} \frac{h(-6x - 3h)}{h}$ $f'(x) = \lim_{h \rightarrow 0} -6x - 3h$ $f'(x) = -6x - 3(0)$ $\therefore f'(x) = -6x$	✓ $f(x+h)$ ✓ Simplification ✓ Substitution ✓ Factorization ✓ answer (5)
8.1.2	$m = f'(2)$ $m = -6(2)$ $m = -12$	✓ Substitution ✓ $m = -12$ (2)



8.2	$xy - 2y = x^2 - x - 2$ $y(x - 2) = (x - 2)(x + 1)$ $y = x + 1$ $\frac{dy}{dx} = 1$	✓✓ factorization ✓ simplify ✓ answer (4)
8.3	$h^{-1}(x) = \sqrt{\frac{x}{a}}$ and $h'(x) = 2ax$ $h^{-1}(8) = \sqrt{\frac{8}{a}}$ and $h'(4) = 8a$ $h^{-1}(8) = h'(4)$ $\sqrt{\frac{8}{a}} = 8a$ $\frac{8}{a} = 64a^2$ $a^3 = \frac{8}{64}$ $a = \frac{1}{2}$	✓ $h^{-1}(x) = \sqrt{\frac{x}{a}}$ ✓ $h^{-1}(8) = \sqrt{\frac{8}{a}}$ ✓ $h'(x) = 2ax$ ✓ $h'(4) = 8a$ ✓ $\sqrt{\frac{8}{a}} = 8a$ ✓ answer (6)
		[17]

QUESTION 9

9.1	$3x^2 + 8x - 3 = 0$ $(3x - 1)(x + 3) = 0$ $x = \frac{1}{3}$ or $x = -3$	✓ $f'(x) = 0$ ✓ factors ✓ x values. (3)
9.2	$f''(x) = 6x + 8$ Concave up : $f''(x) > 0$ $6x + 8 > 0$ $x > -\frac{4}{3}$	✓ $f''(x) = 6x + 8$ ✓ ✓ $x > -\frac{4}{3}$ (3)



9.3	$x < -3$ or $x > \frac{1}{3}$	✓✓ answer (2)
9.4	$f(x) = ax^3 + bx^2 + cx + d$ $f'(x) = 3ax^2 + 2bx + c$ $3a = 3$ $2b = 8$ $c = -3$ $d = 18$ $a = 1$ $b = 4$ $\therefore f(x) = x^3 + 4x^2 - 3x + 18$	✓ $f'(x)$ ✓ $a = 1$ ✓ $b = 4$ ✓ $c = -3$ ✓ $d = 18$ (5)
		[13]

QUESTION 10

10.1	$V = s(0)$ $V = 2(0)^2 - 18(0) + 45$ $V = 45$	✓ $t=0$ ✓ $V = 45$ (2)
10.2	$V = S'(t)$ $V = 4t - 18$	✓ $4t - 18$ (1)
10.3	$S'(t) = 0$ $4t - 18 = 0$ $t = 4,5 \text{ seconds}$	✓ $4t - 18 = 0$ ✓ $t = 4,5 \text{ seconds}$ (2)
		[5]



QUESTION 11

11.1.1	$7^5 = 16\,807$	✓ answer (1)
11.1.2	$7 \times 6 \times 5 \times 4 \times 3$ $= \frac{7!}{2!} = 2520$	✓ $7 \times 6 \times 5 \times 4 \times 3$ Or $\frac{7!}{2!}$ (1)
11.2	$2 \times 7 \times 1 = 14$	✓✓✓ $2 \times 7 \times 1$ (3)
11.3.1	1	✓ $\frac{1}{6}$ ✓ $\frac{1}{2}$ ✓ $\frac{3}{4}$ (3)
11.3.2	$P(S \text{ or NOT } T) = P(S) + P(\text{NOT } T)$ $= \frac{1}{12} + \frac{3}{4}$ $= \frac{5}{6}$ ACCEPT DECIMALS	✓ $\frac{1}{12} + \frac{3}{4}$ ✓ $\frac{5}{6}$ (2)
		[10]



QUESTION 12

12.1	$P(\text{Win}) = P(\text{F and W}) + P(\text{not F and W})$ $= 0,595 + 0,165$ $= 0,76$ ACCEPT FRACTION & PERCENTAGE	✓ 0,3 ✓ $P(\text{F and W}) = 0,595$ ✓ $P(\text{not F and W}) = 0,165$ ✓ $0,595 + 0,165$ ✓ 0,76
		[5]

TOTAL: 150

