



education

Department:
Education
North West Provincial Government
REPUBLIC OF SOUTH AFRICA

NATIONAL SENIOR CERTIFICATE

GRADE 12

MATHEMATICS P1

SEPTEMBER 2025

MARKING GUIDELINES

MARKS: 150

These marking guidelines consist of 18 pages.

NOTE:

- If a candidate answers a question TWICE, only mark the FIRST attempt.
- Consistent Accuracy applies in ALL aspects of the marking guidelines.

QUESTION 1

1.1.1	$(x - 3)(3x + 15) = 0$ $x = 3$ or $3x = -15$ $x = -5$	$\checkmark x = 3$ $\checkmark x = -5$ (2)
1.1.2	$7x^2 - 4x - 5 = 0$ $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$ $= \frac{-(-4) \pm \sqrt{(-4)^2 - 4(7)(-5)}}{2(7)}$ $= \frac{2 \pm \sqrt{39}}{7}$ $x = 1,18$ or $x = -0,61$	$\checkmark$ substitution into correct formula $\checkmark x = 1,18$ $\checkmark x = -0,61$ (3)
1.1.3	$x^2(x + 4) < 0$ $x^2 > 0$ for all $x \in \mathbb{R}$ $\therefore x + 4 < 0$ $\therefore x < -4$	$\checkmark x^2 > 0$ $\checkmark x < -4$ (2)
1.1.4	$\sqrt{5 - 2^{2x}} = 2^x - 3$ $(\sqrt{5 - 2^{2x}})^2 = (2^x - 3)^2$ $5 - 2^{2x} = 2^{2x} - 6 \cdot 2^x + 9$ $0 = 2 \cdot 2^{2x} - 6 \cdot 2^x + 4$ OR Let $k = 2^x$ $0 = 2^{2x} - 3 \cdot 2^x + 2$ $0 = k^2 - 3k + 2$ $0 = (2^x - 2)(2^x - 1)$ $0 = (k - 2)(k - 1)$ $2^x = 2$ or $2^x = 1$ $k = 2$ or $k = 1$ $2^x = 2^1$ $2^x = 2^0$ $x = 1$ $x = 0$ $n.a$ $n.a$ $\therefore$ no solution	$\checkmark$ square both sides $\checkmark$ simplify $\checkmark$ standard form $\checkmark$ factors $\checkmark$ both answers $\checkmark$ no solution (6)

1.2	$2y - x = 3$ $2y - 3 = x$ $y^2 - 2x^2 - x - 1 = 0$ $y^2 - 2(2y - 3)^2 - (2y - 3) - 1 = 0$ $y^2 - 2(4y^2 - 12y + 9) - 2y + 3 - 1 = 0$ $y^2 - 8y^2 + 24y - 18 - 2y + 3 - 1 = 0$ $0 = 7y^2 - 22y + 16$ $0 = (7y - 8)(y - 2)$ $7y = 8 \quad \text{or} \quad y = 2$ $y = \frac{8}{7}$ $x = 2\left(\frac{8}{7}\right) - 3 \quad x = 2(2) - 3$ $= -\frac{5}{7} \quad = 1$ OR $2y - x = 3$ $2y = x + 3$ $y = \frac{x + 3}{2}$ $y^2 - 2x^2 - x - 1 = 0$ $\left(\frac{x + 3}{2}\right)^2 - 2x^2 - x - 1 = 0$ $\left(\frac{x^2 + 6x + 9}{4}\right) - 2x^2 - x - 1 = 0$ $x^2 + 6x + 9 - 8x^2 - 4x - 4 = 0$ $0 = 7x^2 - 2x - 5$ $0 = (7x + 5)(x - 1)$ $7x = -5 \quad \text{of} \quad x = 1$ $x = -\frac{5}{7}$ $y = \frac{-\frac{5}{7} + 3}{2} \quad y = \frac{1 + 3}{2}$ $= \frac{8}{7} \quad = 2$	✓ x subject ✓ substitution ✓ standard form ✓ factors ✓ both y-values ✓ both x-values (6) ✓ y subject ✓ substitution ✓ standard form ✓ factors ✓ both x-values ✓ both y-values (6)
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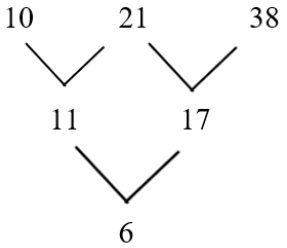
1.3	$p = \frac{19 - 3x^2}{x}$ $3x^2 + px - 19 = 0$ $\Delta = b^2 - 4ac$ $= p^2 - 4(3)(-19)$ $= p^2 + 228$ $\therefore p^2 \geq 0 \text{ for all } p \in \mathbb{R}$ $\therefore p^2 + 228 > 0 \text{ for all } p \in \mathbb{R}$ $\therefore \Delta > 0 \text{ for all } p \in \mathbb{R}$ Thus, the roots are real for all $p \in \mathbb{R}$.	✓ standard form ✓ $\Delta = p^2 + 228$ ✓ $p^2 \geq 0$ ✓ $\Delta > 0$ (4) [23]
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QUESTION 2

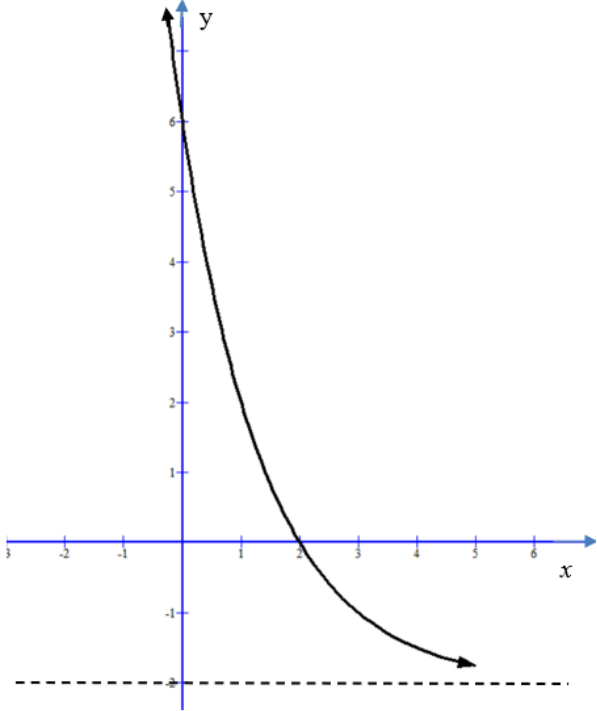
2.1.1	$r = \frac{63}{21} = 3$ $p = \frac{21}{3} = 7$ OR $\frac{21}{p} = \frac{63}{21}$ $p = \frac{(21)(21)}{63} = 7$	✓ $r = 3$ ✓ answer (2)
2.1.2	$T_n = ar^{n-1}$ $137\,781 = 7(3)^{n-1}$ $19\,683 = 3^{n-1}$ $n - 1 = \log_3 19\,683 \quad \text{or} \quad 3^{n-1} = 3^9$ $n - 1 = 9$ $n = 10$ ∴ 10 terms in the series	✓ substitution ✓ log/basis same ✓ answer (3)
2.1.3.	$s_n = \frac{a(r^n - 1)}{r - 1}$ $s_{10} = \frac{7(3^{10} - 1)}{3 - 1}$ $= 206\,668$	✓ substitution ✓ sum of 10 terms (2)
2.2.1	10; 14; 18; ... $T_n = a + (n - 1)d$ $T_8 = 10 + (8 - 1)(4)$ $= 38$ 38 learners will enter the hall during the 8th minute.	✓ $d = 4$ ✓ substitution ✓ answer (3)

2.2.2	$S_n = \frac{n}{2}[2a + (n-1)d]$ $S_8 = \frac{8}{2}[2(10) + (8-1)(4)]$ $= 192$ Number of learners in full hall = $5(192) = 960$ $960 = \frac{n}{2}[2(10) + (n-1)(4)]$ $1\,920 = n(20 + 4n - 4)$ $1\,920 = 16n + 4n^2$ $0 = 4n^2 + 16n - 1\,920$ $0 = n^2 + 4n - 480$ $0 = (n-20)(n+24)$ $n = 20 \quad \text{or} \quad n = -24$ n.a $\therefore$ The hall will be full after 20 min.	✓ substitution ✓ answer for S_8 ✓ total full hall ✓ substitution ✓ standard form ✓ answer (6) [16]
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QUESTION 3

3.1	 $2a = 6$ $a = 3$ $T_2 - T_1 = 3a + b$ $11 = 3(3) + b$ $b = 2$ $T_1 = a + b + c$ $10 = 3 + 2 + c$ $c = 5$ $\therefore T_n = 3n^2 + 2n + 5$	✓ $a = 3$ ✓ $b = 2$ ✓ $c = 5$ ✓ answer (4)
3.2	$T_n = 3n^2 + 2n + 5$ $T_{10} = 3(10)^2 + 2(10) + 5$ $= 325$	✓ substitution ✓ answer (2)
3.3	$T_n = a + (n - 1)d$ $95 = 11 + (n - 1)(6)$ $84 = (n - 1)(6)$ $14 = n - 1$ $n = 15$ Term 15 and 16 differ with 95. OR $T_{n+1} - T_n = 95$ $3(n + 1)^2 + 2(n + 1) + 5 - (3n^2 + 2n + 5) = 95$ $3(n^2 + 2n + 1) + 2n + 2 + 5 - 3n^2 - 2n - 5 = 95$ $3n^2 + 6n + 3 + 2n + 2 + 5 - 3n^2 - 2n - 5 = 95$ $6n = 90$ $n = 15$ Term 15 and 16 differ with 95.	✓ substitution ✓ value of n ✓ answer (3) ✓ substitution ✓ value of n ✓ answer (3) [9]

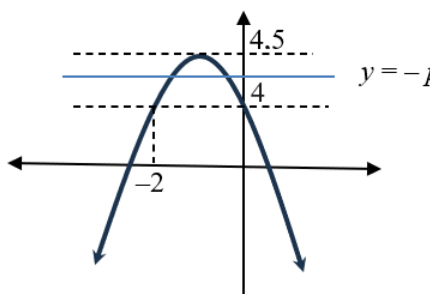
QUESTION 4

4.1	$x = 0$	✓ $x = 0$ (1)
4.2	$f: y = \log_{\frac{1}{2}} x$ $f^{-1}: x = \log_{\frac{1}{2}} y$ $y = \left(\frac{1}{2}\right)^x$	✓ swop x and y ✓ standard form (2)
4.3	$g(x) = \left(\frac{1}{2}\right)^{x-3} - 2$ $0 = \left(\frac{1}{2}\right)^{x-3} - 2$ $2 = \left(\frac{1}{2}\right)^{x-3}$ $\left(\frac{1}{2}\right)^{-1} = \left(\frac{1}{2}\right)^{x-3}$ or $x - 3 = \log_{\frac{1}{2}} 2$ $x - 3 = -1$ $x = 2$	✓ $0 = \left(\frac{1}{2}\right)^{x-3} - 2$ ✓ same basis/logs ✓ answer (3)
4.4	$y = -2$	✓ answer (1)
4.5		✓ y-intercept ✓ shape ✓ x-intercept ✓ asymptote (4) [11]

QUESTION 5

5.1	The other x-intercept: $(-4; 0)$ $f(x) = -\frac{1}{2}(x-2)(x+4)$ $= -\frac{1}{2}(x^2 + 2x - 8)$ $= -\frac{1}{2}x^2 - x + 4$ OR $f(x) = -\frac{1}{2}x^2 + bx + c$ Turning point: $x = \frac{-b}{2a} \quad \text{or} \quad f'(x) = -x + b$ $-1 = \frac{-b}{2\left(-\frac{1}{2}\right)} \quad 0 = -(-1) + b$ $b = -1$ $0 = -\frac{1}{2}(2)^2 - (2) + c$ $c = 4$ $\therefore f(x) = -\frac{1}{2}x^2 - x + 4$ OR $f(x) = -\frac{1}{2}(x+1)^2 + q$ $0 = -\frac{1}{2}(2+1)^2 + q$ $q = \frac{9}{2}$ $f(x) = -\frac{1}{2}(x+1)^2 + \frac{9}{2}$ $= -\frac{1}{2}(x^2 + 2x + 1) + \frac{9}{2}$ $= -\frac{1}{2}x^2 - x - \frac{1}{2} + \frac{9}{2}$ $\therefore f(x) = -\frac{1}{2}x^2 - x + 4$	✓ x-intercept ✓ substitution (2) ✓ substitution into turning point formula ✓ substitution: B(2; 0) ✓ substitution of p ✓ substitution: B(2; 0) (2)
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5.2	$(0 ; 4)$	✓ $x = 0$ ✓ $y = 4$ (2)
5.3	$f(x) = -\frac{1}{2}(-1)^2 - (-1) + 4$ $= 4,5$ $\therefore (-1 ; 4,5)$	✓ substitution ✓ answer (2)
5.4	$h(x) = -x + c$ $0 = -(2) + c$ $c = 2$ $h(x) = -x + 2$	✓ $m = -1$ ✓ substitution ✓ answer (3)
5.5	$h(x) = -x + 2$ $q = -(-1) + 2$ $q = 3$ $g(x) = \frac{a}{x+1} + 3$ $4 = \frac{a}{0+1} + 3$ $a = 1$ $g(x) = \frac{1}{x+1} + 3$	✓ $q = 3$ ✓ substitution p and q ✓ substitution $(0 ; 4)$ ✓ answer (4)
5.6	$0 = \frac{1}{x+1} + 3$ $-3 = \frac{1}{x+1}$ $-3x - 3 = 1$ $-3x = 4$ $x = -\frac{4}{3}$	✓ $y = 0$ ✓ simplify ✓ answer (3)
5.7	$x \in \left[-\frac{4}{3} ; -1\right) \cup (-1 ; \infty)$ OR $x \in \left[-\frac{4}{3} ; \infty\right) ; x \neq -1$	✓✓ $\left[-\frac{4}{3} ; -1\right)$ ✓ $(-1 ; \infty)$ ✓✓ $\left[-\frac{4}{3} ; \infty\right)$ ✓ $x \neq -1$ (3)

5.8	$k(x) = \frac{-1}{x-9} + 3$	✓ -1 ✓ $x-9$ ✓ answer (3)
5.9	$y = a(x - x_1)(x - x_2)$ $= -\frac{1}{2}(x + 2)(x - 0)$ $= -\frac{1}{2}(x^2 + 2x)$ $= -\frac{1}{2}x^2 - x$ Move downwards with more than the distance from the y-intercept of 4 to 0. Move downwards with less than the distance from the turning point of 4,5 to the x-axis. $\therefore -4,5 \leq p < -4$ OR $y = -\frac{1}{2}x^2 - x + 4 + p$ $0 = -\frac{1}{2}(-2)^2 - (-2) + 4 + p$ $p = -4$ The x-intercept must be greater than -2 $\therefore p < -4$ Move downwards with less than the distance from the turning point of 4,5 to the x-axis. $\therefore -4,5 \leq p < -4$ OR $f(-2) = -\frac{1}{2}(-2)^2 - (-2) + 4$ $= 4$  $4,5 \geq -p > 4$ $-4,5 \leq p < -4$	✓ substitution ✓ standard form ✓ ✓ answer (4) ✓ substitution (-2; 0) ✓ $p < -4$ ✓ ✓ answer (4) ✓ $f(-2) = 4$ ✓ $4,5 \geq -p > 4$ ✓ ✓ answer (4) [26]

QUESTION 6

6.1	Deposit = 0,15(cost) R202 500 = 0,15(cost) cost = R1 350 000	✓ substitution ✓ answer (2)
6.2	Loan = R1 350 000 – R202 500 = R1 147 500 $P = \frac{x[1 - (1 + i)^{-n}]}{i}$ $1\,147\,500 = \frac{20\,000 \left[1 - \left(1 + \frac{0,098}{12} \right)^{-n} \right]}{\frac{0,098}{12}}$ $\frac{7\,497}{16\,000} = 1 - \left(1 + \frac{0,098}{12} \right)^{-n}$ $\left(1 + \frac{0,098}{12} \right)^{-n} = \frac{8\,503}{16\,000}$ $-n = \log_{\left(1 + \frac{0,098}{12} \right)} \frac{8\,503}{16\,000}$ $-n = -77,72418859$ ∴ 78 monthly instalments	✓ loan ✓ i ✓ substitution ✓ simplification ✓ use of logs ✓ answer (6)
6.3	$A = 1\,147\,500 \left(1 + \frac{0,098}{12} \right)^{24}$ = R1 394 853,88 $F = \frac{x[(1 + i)^n - 1]}{i}$ $= \frac{20\,000 \left[\left(1 + \frac{0,098}{12} \right)^{24} - 1 \right]}{\frac{0,098}{12}}$ x = R527 899,43 Outstanding balance = R1 394 853,88 – R527 899,43 = R866 954,45 OR	✓ substitution into A formula ✓ substitution into F formula ✓ answer (3)

	$P = \frac{x \left[1 - (1 + i)^{-n} \right]}{i}$ $= \frac{20\,000 \left[1 - \left(1 + \frac{0,098}{12} \right)^{-53,72418859} \right]}{\frac{0,098}{12}}$ $= R866\,954,45$	✓ substitution into P formula ✓ $n = -53,72418859$ ✓ answer (3)
6.4	Total cost $= R202\,500 + (24)(20\,000) + R866\,954,45$ $= R1\,549\,454,45$	✓ $R202\,500 + R866\,954,45$ ✓ $(24)(20\,000)$ ✓ answer (3) [14]

QUESTION 7

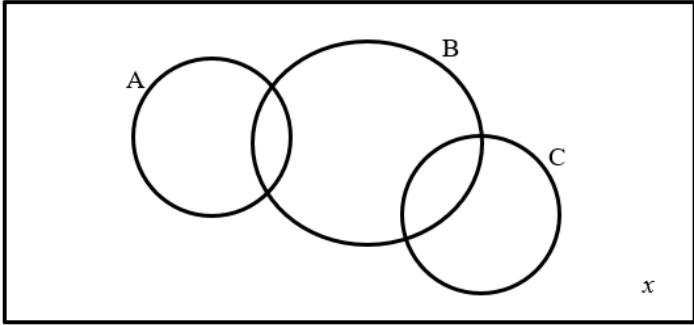
7.1	$f(x) = x^2 - x + 3$ $f(x+h) = (x+h)^2 - (x+h) + 3$ $= x^2 + 2xh + h^2 - x - h + 3$ $f(x+h) - f(x) = (x^2 + 2xh + h^2 - x - h + 3) - (x^2 - x + 3)$ $= 2xh + h^2 - h$ $f'(x) = \lim_{h \rightarrow 0} \frac{f(x+h) - f(x)}{h}$ $= \lim_{h \rightarrow 0} \frac{2xh + h^2 - h}{h}$ $= \lim_{h \rightarrow 0} \frac{h(2x + h - 1)}{h}$ $= \lim_{h \rightarrow 0} (2x + h - 1)$ $= 2x - 1$ OR $f(x) = x^2 - x + 3$ $f'(x) = \lim_{h \rightarrow 0} \frac{f(x+h) - f(x)}{h}$ $f'(x) = \lim_{h \rightarrow 0} \frac{[(x+h)^2 - (x+h) + 3] - (x^2 - x + 3)}{h}$ $= \lim_{h \rightarrow 0} \frac{x^2 + 2xh + h^2 - x - h + 3 - x^2 + x - 3}{h}$ $f'(x) = \lim_{h \rightarrow 0} \frac{2xh + h^2 - h}{h}$ $= \lim_{h \rightarrow 0} \frac{h(2x + h - 1)}{h}$ $= \lim_{h \rightarrow 0} (2x + h - 1)$ $= 2x - 1$	✓ substitution of $(x+h)$ ✓ simplify $f(x+h)$ ✓ simplification ✓ factors ✓ answer (5) ✓ substitution of $(x+h)$ ✓ simplify $f(x+h)$ ✓ simplification ✓ factors ✓ answer (5)
7.2.1	$f(x) = 5x^3 - 7x + 2$ $f'(x) = 15x^2 - 7$	✓ $15x^2$ ✓ -7 (2)
7.2.2	$f(x) = \frac{2x+1}{\sqrt[3]{x}}$ $= 2x^{\frac{2}{3}} + x^{-\frac{1}{3}}$ $f'(x) = \frac{4}{3}x^{-\frac{1}{3}} - \frac{1}{3}x^{-\frac{4}{3}}$	✓ $2x^{\frac{2}{3}}$ ✓ $x^{-\frac{1}{3}}$ ✓ $\frac{4}{3}x^{-\frac{1}{3}}$ ✓ $-\frac{1}{3}x^{-\frac{4}{3}}$ (4)

[11]

QUESTION 9

9.1	Chris	✓ Chris (1)
9.2	John	✓ John (1)
9.3	$k(x) = x^3 - 10,5x^2 + 37x$ $k'(x) = 3x^2 - 21x + 37$ $k''(x) = 6x - 21$ $0 = 6x - 21$ $6x = 21$ $x = \frac{21}{6} = 3,5 \text{ hours}$ $k(3,5) = (3,5)^3 - 10,5(3,5)^2 + 37(3,5)$ $= 43,75 \text{ km}$	✓ $k'(x) = 3x^2 - 21x + 37$ ✓ $k''(x) = 6x - 21$ ✓ $k''(x) = 0$ ✓ $x = 3,5$ ✓ answer (5)
9.4	$D(x) = k(x) - g(x)$ $= x^3 - 10,5x^2 + 37x - 2,6x^2$ $= x^3 - 13,1x^2 + 37x$ $D'(x) = 3x^2 - 26,2x + 37$ $0 = 3x^2 - 26,2x + 37$ $x = \frac{26,2 \pm \sqrt{(-26,2)^2 - 4(3)(37)}}{2(3)}$ $x = 6,96 \quad \text{or} \quad x = 1,77$ <i>n.a</i> $\therefore$ After 1,77 hours $\therefore$ After 1 hour and 46 min or 1 hour and 46,2 min	✓ $k(x) - g(x)$ ✓ $D'(x) = 0$ ✓ $x = 1,77$ ✓ answer (4) [11]

QUESTION 10

		
10.1	$P(A \text{ and } B) = P(A) \times P(B)$ $= 0,25 \times P(B)$ $P(A \text{ or } B) = P(A) + P(B) - P(A \text{ and } B)$ $0,55 = 0,25 + P(B) - 0,25P(B)$ $0,75P(B) = 0,3$ $P(B) = 0,4$	✓ $P(A \text{ and } B) = 0,25P(B)$ ✓ substitution ✓ $0,75P(B) = 0,3$ (3)
10.2	$P(A \text{ and } B) = P(A) \times P(B)$ $= 0,25 \times 0,4$ $= 0,1$	✓ substitution ✓ answer (2)
10.3	$P(\text{only } A) + P(B) + P(\text{only } C) + x = 1$ $0,15 + 0,4 + 0,25 + x = 1$ $x = 0,2$	✓ substitution ✓ answer (2)
10.4	$0,2 + P(\text{only } B) = 0,38$ $P(\text{only } B) = 0,18$	✓ substitution ✓ answer (2) [9]

QUESTION 11

11.1	$(1)(1)(1)(1)(10 \times 10 \times 10 \times 10)(10 \times 10 \times 10 \times 10)$ $= 10^8 = 100\,000\,000$	✓ ✓ answer (2)
11.2	$(4 \times 8 \times 7 \times 3) + (3 \times 8 \times 7 \times 1) + (3 \times 8 \times 7 \times 1)$ $= 672 + 168 + 168$ $= 1\,008$ $P = \frac{(1)(1)(1)(1)[1\,008][10 \times 10 \times 10 \times 10]}{10^8}$ $= 0,1008 \approx 0.10$ OR $(4 \times 8 \times 7 \times 3) + (3 \times 8 \times 7 \times 1) + (3 \times 8 \times 7 \times 1)$ $= 672 + 168 + 168$ $= 1\,008$ $P = \frac{1\,008}{10 \times 10 \times 10 \times 10}$ $= 0,1008 \approx 0.10$	✓ $(4 \times 8 \times 7 \times 3)$ ✓ $(3 \times 8 \times 7 \times 1)$ ✓ $(3 \times 8 \times 7 \times 1)$ ✓ 10^8 in the denominator ✓ answer (A) (5) ✓ $(4 \times 8 \times 7 \times 3)$ ✓ $(3 \times 8 \times 7 \times 1)$ ✓ $(3 \times 8 \times 7 \times 1)$ ✓ 10^4 in the denominator ✓ answer (A) (5) [7]
	TOTAL: 150	