

MARKING GUIDELINES

EXAMINATION		NATIONAL SENIOR CERTIFICATE	
GRADE		12	
DATE		NOVEMBER 2024	
SUBJECT		MATHEMATICS	
PAPER		1	
MARK TOTAL		150	
DURATION (HOURS)		3	
NUMBER OF PAGES		12	




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**NOTE:**

If a candidate answers the question twice, only the FIRST attempt will be marked.

Consistent Accuracy applies in all aspects of the marking guide unless otherwise stated.

QUESTION 1

1.1.1	$x(x - 8) = 0$ $x = 0$ or $x = 8$	✓ Factorise = 0 ✓ Answers ANSWER ONLY FULL MARKS (2)
1.1.2	$3x^2 - 9x + 2 = 0$ $x = \frac{-(-9) \pm \sqrt{(-9)^2 - 4(3)(2)}}{2(3)}$ $x = \frac{9 \pm \sqrt{57}}{6}$ $x = 2,76$ or $x = 0,24$ PENALISE ROUNDING	✓ Standard form ✓ Substitute in formula ✓✓ Answers (4)
1.1.3	$2x^2 - 3x - 5 \leq 0$ $(2x - 5)(x + 1) \leq 0$ $-1 \leq x \leq \frac{5}{2}$ OR $x \in [-1; \frac{5}{2}]$	✓ Factorise/QF ✓ Critical values ✓ Correct notation (3)
1.2	$x = 2y + 3$ $4(2y + 3)^2 + 6y = 5y(2y + 3) + 3$ $16y^2 + 48y + 36 + 6y = 10y^2 + 15y + 3$ $2y^2 + 13y + 11 = 0$ or $6y^2 + 29y + 33 = 0$ $(2y + 11)(y + 1) = 0$ or $(2y + 11)(3y + 3) = 0$ $y = -\frac{11}{2}$ OR $y = -1$ $x = -8$ OR $x = 1$ OR 	✓ $x = 3 + 2y$ ✓ Substitution ✓ Simplification ✓ Standard form ✓ Factorise/QF ✓ Answers for y ✓ Answers for x (7) OR



	$y = \frac{x}{2} - \frac{3}{2}$ $4x^2 + 6\left(\frac{x}{2} - \frac{3}{2}\right) = 5x\left(\frac{x}{2} - \frac{3}{2}\right) + 3$ $4x^2 + 3x - 9 = \frac{5x^2}{2} - \frac{15x}{2} + 3$ $8x^2 + 6x - 18 = 5x^2 - 15x + 6$ $3x^2 + 21x - 24 = 0$ $x^2 + 7x - 8 = 0$ $(x + 8)(x - 1) = 0$ $x = -8 \text{ or } x = 1$ $y = -\frac{11}{2} \text{ or } y = -1$	<ul style="list-style-type: none"> ✓ $y = \frac{x}{2} - \frac{3}{2}$ ✓ Substitution ✓ Simplification ✓ Standard form ✓ Factorise ✓ Answers for x ✓ Answers for y
1.3	<p>WITH "K" METHOD:</p> $\sqrt{3x+1} - \frac{4}{\sqrt{3x+1}} - 3 = 0$ <p>Let: $\sqrt{3x+1} = k$</p> $k - \frac{4}{k} - 3 = 0$ $k^2 - 4 - 3k = 0$ $k^2 - 3k - 4 = 0$ $(k - 4)(k + 1) = 0$ $k = 4 \quad \text{or} \quad k = -1$ $\sqrt{3x+1} = 4 \qquad \qquad \qquad \sqrt{3x+1} = -1$ $3x + 1 = 16 \qquad \qquad \qquad \text{not valid}$ $\therefore x = 5$ <p style="text-align: center;">OR</p> $\sqrt{3x+1} - \frac{4}{\sqrt{3x+1}} - 3 = 0$ $3x + 1 - 4 - 3\sqrt{3x+1} = 0$ $3x - 3 = 3\sqrt{3x+1}$ $x - 1 = \sqrt{3x+1}$ $x^2 - 2x + 1 = 3x + 1$ $x^2 - 5x = 0$ $x(x - 5) = 0$ $x = 0 \quad \text{or} \quad x = 5$ <p>But $x \neq 0$, $\therefore x = 5$</p>	<ul style="list-style-type: none"> ✓ Subst k ✓ Std. form ✓ Factors/QF ✓ Both answers for k ✓ $x = 5$ If both answers, 4/5 <ul style="list-style-type: none"> ✓ Simplify ✓ Square both sides ✓ Standard form ✓ Factorisation/QF ✓ Answer If both answers, 4/5 <p style="text-align: right;">(5)</p> <p style="text-align: right;"><i>MS</i></p>



1.4	$5^{x+1} - 5^{x-1} = 120\sqrt{5}$ $5^x \left(5 - \frac{1}{5}\right) = 120\sqrt{5}$ $5^x = 5^2 \cdot 5^{\frac{1}{2}}$ $5^x = 5^{\frac{5}{2}}$ $x = \frac{5}{2}$ <p>OR</p> $5^{x(5-5^{-1})} = 120\sqrt{5}$ $5^x = 55,90169944$ $x = \log_5 55,90169944$ $x = \frac{5}{2}$	<p>✓ HCF 5^x</p> <p>✓ Simplify</p> <p>✓ Answer</p> <p>(3)</p>
1.5	$3x^2 - 5x + k = 0$ always have real roots? $(-5)^2 - 4(3)(k) \geq 0$ $\therefore 25 - 12k \geq -0$ $12k \leq 25$ $k \leq \frac{25}{12}$	<p>✓ $(-5)^2 - 4(3)(k) \geq 0$</p> <p>✓ ✓ Simplify</p> <p>✓ Answer</p> <p>(4)</p>
[28]		

MS



QUESTION 2

2.1.1	$a = 8$ and $d = 7$ $T_n = 1 + 7n$ $T_{34} = 1 + 7 \times 34 = 239$ INCORRECT FORMULA (0)	✓ a and d ✓ Subst into correct formula ✓ Answer (3)
2.1.2	$S_n = \frac{n}{2}[2a + (n - 1)d]$ CA from 2.1.1 $S_{14} = \frac{40}{2}[2(8) + 39(7)]$ $= 5780$	✓ Formula ✓ Substitution ✓ Answer (3)
2.2	$\sum_{k=1}^8 \frac{(2)^{k+1}}{3^k}$ $= \frac{4}{3} + \frac{8}{9} + \frac{16}{27} - \dots$ $a = \frac{4}{3} \text{ and } r = \frac{2}{3}$ $S_8 = \frac{\frac{4}{3}(1 - (\frac{2}{3})^8)}{1 - \frac{2}{3}}$ $= 3,84$	✓ a ✓ expand ✓ r ✓ Substitution in correct formula ✓ Answer (5)
2.3	$a = 5$ and $r = 0,6$ $S_\infty = \frac{5}{1 - 0,6}$ $= 12,5 \text{ m}$ No, it won't	✓ a and r ✓ Substitution in correct formula ✓ Answer ✓ conclusion (4)
		[15]

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QUESTION 3

3.1	$1; k; 3k + 1; 8k$ $\begin{array}{ccc} \nearrow & \nearrow & \nearrow \\ k - 1; & 2k + 1; & 5k - 1 \\ \nearrow & \nearrow & \\ k + 2; & & 3k - 2 \end{array}$ $\therefore k + 2 = 3k - 2$ $k = 2$	<p>✓ 1st diff.</p> <p>✓ 2nd diff</p> <p>✓ Equation</p> <p>✓ Answer</p> <p style="text-align: right;">(4)</p>
3.2	$2a = 4; a = 2$ $3(2) + b = 1; b = -5$ $2 - 5 + c = 1; c = 4$ $T_n = 2n^2 - 5n + 4$	<p>✓✓✓ a, b and c</p> <p>✓ T_n</p> <p style="text-align: right;">(4)</p>
		[8]

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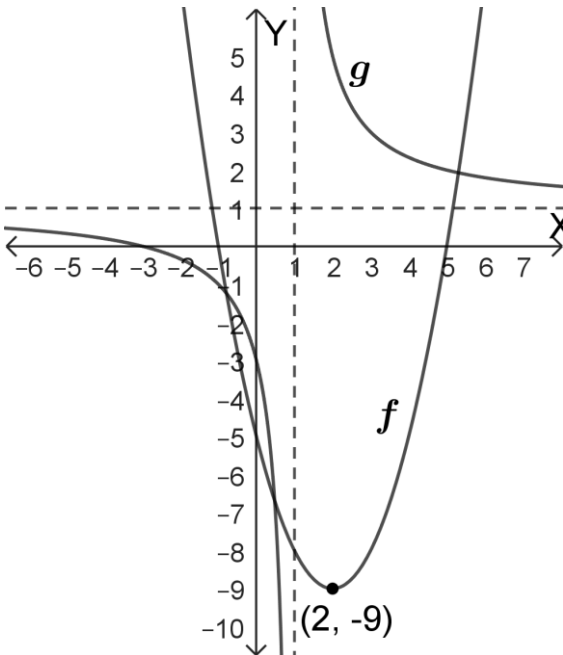



QUESTION 4

4.1.1	$105400 = 200000 \left(1 - \frac{15}{100}\right)^n \text{ old}$ $\frac{527}{1000} = \left(\frac{17}{20}\right)^n \text{ (OR } 0,527=0,85^n)$ $n = \log_{0,85} \frac{527}{1000}$ $n = 3,94 \text{ years (accept 4 years)}$	<ul style="list-style-type: none"> ✓ Correct subst in correct formula ✓ Simplify ✓ log ✓ Answer <p style="text-align: right;">(4)</p>
4.2.1	$2000000 = x \cdot \frac{1 - \left(1 + \frac{11}{1200}\right)^{-240}}{\frac{11}{1200}}$ $x = R20643,77$	<ul style="list-style-type: none"> ✓ Correct formula with correct substitution ✓ n and i (independent of formula) ✓ answer <p style="text-align: right;">(3)</p>
4.2.2	$OB \text{ at } T_{91} = 2000000 \left(1 + \frac{11}{1200}\right)^{89} - 20\,643,77 \left(\frac{1 + \frac{11}{1200}}{\frac{11}{1200}}\right)^{89} - 1$ $= R4505342,76$ $= R4505342,76 - R2821075,62$ $= R1684267,14$ $OB = 1684267,14 \left(1 + \frac{11}{1200}\right)^2$ $= R1715286,90$ <p>OR</p> $OB = 20643,77 \left(\frac{1 - \left(1 + \frac{11}{1200}\right)^{-11}}{\frac{11}{1200}}\right) \left(1 + \frac{11}{1200}\right)^2$ $OB = 1715287,37$	<ul style="list-style-type: none"> ✓ $2000000 \left(1,1 + \frac{11}{1200}\right)^{91}$ ✓ ✓ $20\,643,77 \left(\frac{1 + \frac{11}{1200}}{\frac{11}{1200}}\right)^{89} - 1$ ✓ R 1684267,14 ✓ $1684267,14 \left(1 + \frac{11}{1200}\right)^2$ ✓ R1715286,90 (5)
4.2.3	$OB = \frac{21000 \left(1 - \left(1 + \frac{11}{1200}\right)^{-n}\right)}{\frac{11}{1200}}$ $0,251 \dots = \left(1 + \frac{11}{1200}\right)^{-n}$ $-n = \log_{1 + \frac{11}{1200}} 0,251$ $n = 151,37$	<ul style="list-style-type: none"> ✓ Subst in correct formula ✓ log ✓ Answer <p style="text-align: right;">(3)</p>
<p style="text-align: right;">[15]</p>		



QUESTION 5

5.1	$g(x) = \frac{4 + x - 1}{x - 1}$ $= \frac{4}{x - 1} + \frac{x - 1}{x - 1}$ $= \frac{4}{x - 1} + 1$	✓ Correct denominator ✓ Different fractions ✓ Answer (3) ANSWER ONLY (0)
5.2	$x^2 - 4x - 5 = (x - 5)(x + 1) = 0$ $x = 5 \text{ or } x = -1$ $y = -5$ $y = \frac{4}{0-1} + 1 = -3$ $\frac{4}{x-1} = -1$ $4 = -x + 1, \therefore x = -3$	✓ $x = 5$ or $x = -1$ ✓ $y = -5$ ✓ $x = -3$ ✓ $y = -3$ (4)
5.3		✓ f turning point ✓ f form ✓ g asymptotes ✓ g form (4)
5.4	$y = 1^2 - 4(1) - 5$ $y = -8$ $B(1; -8)$	✓ $x = 1$ ✓ Answer (2)
5.5	$m = f'(x) = 2x - 4$ $2x - 4 = -2$ $x = 1 \text{ and } y = -8$ This is point B	✓ $m = f'(x)$ ✓ $m = -2$ ✓ value of x ✓ conclusion (4)
		[17]



QUESTION 6

6.1.1	$8 = a^3$ $a = 2$	✓ ✓ Substitute (3; 8) ✓ $a = 2$ (3)
6.1.2	$h(x) = 2^{x-1} - 3$	✓ $x - 1$ ✓ -3 (2)
6.1.3	$x = 2^y$ $y = \log_2 x$	✓ Swop x and y ✓ conversion ✓ answer (3)
6.2.1	$2x^2 + 4x - 2 = -x + 1$ $2x^2 + 5x - 3 = 0$ $(2x - 1)(x + 3) = 0$ $x = -3$	✓ Equate equations ✓ Standard form ✓ Factorise/QF ✓ Answer (4)
6.2.2	$AB = -x + 1 - 2x^2 - 4x + 2$ $AB = -2x^2 - 5x + 3 = 5$ $2x^2 + 5x + 2 = 0$ $(2x + 1)(x + 2) = 0$ $x = -\frac{1}{2}$ or $x = -2$ $OC = 2$	✓ AB ✓ $AB = 5$ ✓ Standard form ✓ Factorise/QF ✓ values of x ✓ OC (6)
		[18]

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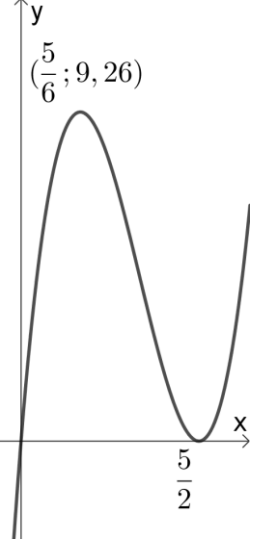



QUESTION 7

Only penalize ONCE for notation in this question.		
7.1	$f(x) = -5x^2$ $f(x+h) = -5(x+h)^2$ $= -5x^2 - 10xh - 5h^2$ $f'(x) = \lim_{h \rightarrow 0} \frac{f(x+h) - f(x)}{h}$ $f'(x) = \lim_{h \rightarrow 0} \frac{-5x^2 - 10xh - 5h^2 + 5x^2}{h}$ $f'(x) = \lim_{h \rightarrow 0} \frac{-10xh - 5h^2}{h}$ $f'(x) = \lim_{h \rightarrow 0} \frac{h(-10x - 5h)}{h}$ $f'(x) = \lim_{h \rightarrow 0} (-10x - 5h)$ $f'(x) = -10x$	<p>✓ $f(x+h)$</p> <p>✓ correct substitution</p> <p>✓ Simplify</p> <p>Answer ✓</p> <p>(4)</p>
7.2	$\frac{d}{dx} \left(8 - \frac{4}{x^2} + \sqrt[5]{x^4} \right)$ $= \frac{d}{dx} (8 - 4x^{-2} + x^{\frac{4}{5}})$ $= 8x^{-3} + \frac{4}{5}x^{-\frac{1}{5}}$	<p>✓ $-4x^{-2}$</p> <p>✓ $x^{\frac{4}{5}}$</p> <p>✓ $8x^{-3}$</p> <p>✓ $\frac{4}{5}x^{-\frac{1}{5}}$</p> <p>(4)</p>
7.3.1	$x(4x^2 - 20x + 25) = 0$ $x(2x - 5)(2x - 5) = 0$ $x = 0 \text{ or } x = \frac{5}{2}$	<p>✓ $x(4x^2 - 20x + 25)$</p> <p>✓ Factors $x(2x - 5)(2x - 5)$</p> <p>✓ Answers</p> <p>(3)</p>

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7.3.2	$f'(x) = 12x^2 - 40x + 25 = 0$ $(2x - 5)(6x - 5) = 0$ $x = \frac{5}{2}$ or $x = \frac{5}{6}$ $y = 0$ or $y = \frac{250}{27} = 9,26$ $TP\left(\frac{5}{2}; 0\right)$ and $TP\left(\frac{5}{6}; \frac{250}{27}\right)$	<ul style="list-style-type: none"> ✓ Derivative = 0 ✓ Factors ✓ x - values ✓ co-ordinates <p style="text-align: right;">(4)</p>
7.3.3		<ul style="list-style-type: none"> ✓ Intercepts ✓ Turning points ✓ Shape <p style="text-align: right;">(3)</p>
7.3.4	$f''(x) = 24x - 40 = 0$ $x = \frac{5}{3}$ OR $x = -\frac{b}{2a}$ $x = \frac{5}{3}$	<ul style="list-style-type: none"> ✓ 2nd derivative = 0 ✓ Answer <p style="text-align: right;">(2)</p>
7.3.5	$x > \frac{5}{3}$	<ul style="list-style-type: none"> ✓ Notation ✓ Value <p style="text-align: right;">(2)</p>
7.3.6	$-9,26 < k < 0$	<ul style="list-style-type: none"> ✓ ✓ values ✓ Correct inequality <p style="text-align: right;">(3)</p>
		[25]



QUESTION 8

8.1	$DC = 2x$ $BC = 6 - y$ $BC = 6 - x^2$	✓ CD ✓ ✓ BC (3)
8.2	$\text{Area} = l \times b$ $= 2x(6 - x^2)$ $\text{Area} = 12x - 2x^3$	✓ ✓ $2x(6 - x^2)$ ✓ ✓ Answer (4)
8.3	$\text{Max if } A'(x) = 0$ $A'(x) = 12 - 6x^2 = 0$ $x = \sqrt{2}$ $\text{Max Area} = 12(\sqrt{2}) - 2(\sqrt{2})^3$ $= 8\sqrt{2} = 11,31$	✓ $A' = 0$ ✓ $x = \sqrt{2}$ ✓ Substitute ✓ Answer (4)
		[11]

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QUESTION 9

9.1.1	$a = 872 - 428 = 448$ $b = 780 - 424 = 356$ $c = 720 - 448 = 272$ OR $c = 628 - 356 = 272$	✓ ✓ ✓ a, b, c (3)
9.1.2	$\frac{448}{872}$ $= \frac{56}{109} = 0,51$	✓ $\frac{448}{872}$ ✓ 0,51 (2)
9.1.3	$P(A) \times P(B) = \frac{720}{1500} \times \frac{872}{1500} = 0,28$ $P(A \text{ and } B) = 0,30$ The answers are not the same. Not independent	✓ $\frac{720}{1500} \times \frac{872}{1500} =$ ✓ 0,28 ✓ 0,30 ✓ No (4)
9.2	8 People: $8! = 40320$ Pairs sit together: $2 \times 2 \times 2 \times 2 \times 4! = 384$ $P(\text{pairs sit together}) = \frac{384}{40320}$ $= \frac{1}{105}$	✓ $8!$ ✓ $2 \times 2 \times 2 \times 2$ ✓ $4!$ ✓ $\frac{1}{105}$ (4)
		[13]
GRAND TOTAL: [150]		

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