education

Department of Education
FREE STATE PROVINCE

MARCH TEST

GRADE12

MATHEMATICS MARKING GUIDLINE

2024

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MARKS: 100

This marking guideline consists of 09 pages.

QUESTION 1

1.1	$2x^2 - 7x + 3 = 0$ $x = \frac{1}{2}$ *or* $x = 3$	*SF* ✓ $x -$ *values* ✓✓ (3)
1.2	$\left(\sqrt{x+5}\right)^2 = (3-x)^2$ $x + 5 = 9 - 6x + x^2$ $x + 5 - 9 + 6x - x^2 = 0$ $-x^2 + 7x - 4 = 0$ $x^2 - 7x + 4 = 0$ $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$ $x = \frac{-(-7) \pm \sqrt{(-7)^2 - 4(1)(4)}}{2(1)}$ $x \neq 6.37$ *or* $x = 0.63$	*Squaring* ✓ *Standard form* ✓ *Substitution into correct formula* ✓ *Solution. Panelise 1 Mark for wrong rounding and solution not rejected* ✓✓ (5)
1.3	$-x^2 + 16 > 0$ $x^2 - 16 < 0$ $(x+4)(x-4) < 0$ $cv: -4$ *and* 4 $-4 < x < 4$	*Factors* ✓ *Solution* ✓✓ (3)
1.4	$x - 3y = 1 \ldots\ldots\ldots$ (1) $(2x + y - 1)(x - y + 1) = 0 \ldots\ldots\ldots$ (2) $x = 1 + 3y \ldots\ldots\ldots\ldots 3$ *eqt 3 ... into ... eqt 2* $(2x + y - 1)(x - y + 1) = 0$ $(2(1 + 3y) + y - 1)(1 + 3y - y + 1) = 0$ $(7y + 1)(2y + 2) = 0$ $7y^2 + 8y + 1 = 0$ $(7y + 1)(y + 1) = 0$ $y = -\frac{1}{7}$ *or* $y = -1$ $x = \frac{4}{7}$ *or* $x = -2$	*Eqt 3* ✓ *Substitution* ✓ *Standard form* ✓ $y -$ *values* ✓ $x -$ *values* ✓ (5)

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1.5	$\left(\sqrt[3]{ab}\right)^{\frac{1}{2}}.\left(b\sqrt[3]{a}\right)^{\frac{1}{b}}$ $\left[(ab)^{\frac{1}{3}}\right]^{\frac{1}{2}}.\left[b\left(a^{\frac{1}{3}}\right)\right]^{\frac{1}{b}}$ $a^{\frac{1}{6}}.b^{\frac{1}{6}}.b^{\frac{1}{b}}.a^{\frac{1}{3b}}$ $a^{\frac{3b+6}{6.3b}}.b^{\frac{1}{6}+\frac{1}{b}}$ $a^{\frac{b+2}{6b}}.b^{\frac{b+6}{6b}}$	$\left(\sqrt[3]{ab}\right)^{\frac{1}{2}}.\left(b\sqrt[3]{a}\right)^{\frac{1}{b}}$ ✓ $a^{\frac{1}{6}}.b^{\frac{1}{6}}$ ✓ $b^{\frac{1}{b}}.a^{\frac{1}{3b}}$ ✓ $a^{\frac{3b+6}{6.3b}}.b^{\frac{1}{6}+\frac{1}{b}}$ ✓ (4)
		[20]

QUESTION 2

2.1.1	$\frac{25}{16}$; $\frac{81}{16}$; $\frac{169}{16}$; $\frac{289}{16}$ $\frac{7}{2}$ $\frac{11}{2}$ $\frac{15}{2}$ 2 2	*Second constant difference* $= 2$ ✓ (1)
2.1.2	$2a = 2$ $a = 1$ $3a + b = \frac{7}{2}$ $3(1) + b = \frac{7}{2}$ $b = \frac{1}{2}$ $a + b + c = \frac{25}{16}$ $1 + \frac{1}{2} + c = \frac{25}{16}$ $c = \frac{1}{16}$ $\therefore T_n = n^2 + \frac{1}{2}n + \frac{1}{16}$	$a = 1$ ✓ $b = \frac{1}{2}$ ✓ $c = \frac{1}{16}$ ✓ (3)
2.1.3	$\therefore T_n = n^2 + \frac{1}{2}n + \frac{1}{16}$ $T_n = \left(n + \frac{1}{4}\right)\left(n + \frac{1}{4}\right)$ $T_n = \left(n + \frac{1}{4}\right)^2$ $\left(n + \frac{1}{4}\right)^2 > 0$ *and is a perferct square for* $n \in N$	*Factorisation* ✓ $T_n = \left(n + \frac{1}{4}\right)^2$ ✓ *Conclusion* ✓ (3)

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2.2.1	$T_6 = -5$	$T_6 = -5$ ✓ (1)
2.2.2	$T_n = a + (n-1)d$ $T_n = 5 + (n-1)(-2)$ $T_n = -2n + 7$	*Subtstitution of* $a = 5$ & $c = -2$ ✓ $T_n = -2n + 7$ ✓ (2)
2.2.3	$-375 = -2n + 7$ $-382 = -2n$ $n = 191$	*Substitution of* -375 *for* T_n ✓ $n = 191$ ✓ (2)
2.2.4	$S_{64} = \frac{n}{2}(2a + (n-1)d)$ $= \frac{64}{2}\big(2(3) + (64-1)(-6)\big)$ $= -11904$ **OR** $5; 3; 1; -1; +3; -5; -7; -9; -11; -13; -15; \ldots\ldots; -375$ *New Seq*: $3; -3; -9; \ldots\ldots; -375$ $S_{64} = \frac{64}{2}\big(3 + (-375)\big)$ $= -11904$	$a = 3$ ✓ *correct substitution* ✓ *answer* ✓ **OR** $a = 3$ ✓ *correct substitution* ✓ *answer* ✓ (3)
2.2.5	$\sum_{y=43°}^{47°} \sin^2 y$ $= \sin^2 43° + \sin^2 44° + \sin^2 45° + \sin^2 46° + \sin^2 47°$ $= \cos^2 47° + \cos^2 46° + \sin^2 45° + \sin^2 46° + \sin^2 47°$ $= \cos^2 47° + \sin^2 47° + \cos^2 46° + \sin^2 46° + \sin^2 45°$ $= 1 + 1 + \left(\frac{1}{\sqrt{2}}\right)^2$ $= \frac{5}{2}$	Expansion ✓ Co – ratio $sin^2 43° = cos^2 47°$ ✓ Or $sin^2 44° = cos^2 46°$ ✓ *Square Identity* Or $sin^2 46° + cos^2 46°$ ✓ Answer ✓ (4)
		[19]

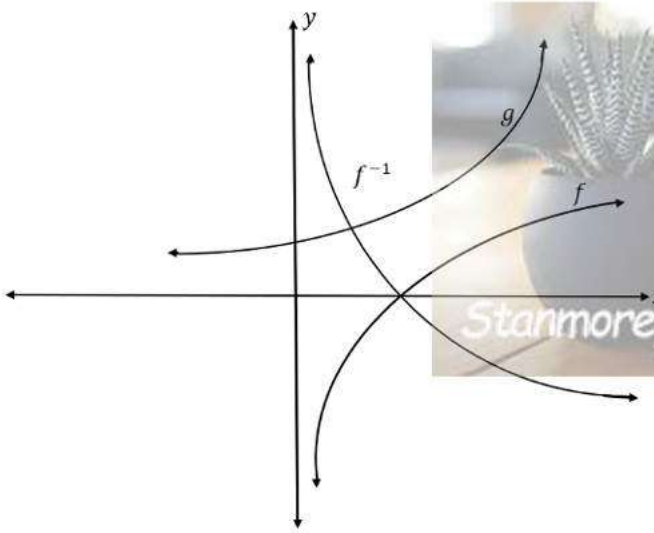
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QUESTION 3

3.1	$ar^{n-1} = \frac{3}{128}$ $3\left(\frac{1}{2}\right)^{n-1} = \frac{3}{128}$ $\left(\frac{1}{2}\right)^{n-1} = \left(\frac{1}{2}\right)^{7}$ $n = 8$	method ✓ *substitution* ✓ *simplification* ✓ *answer*✓ (4)
3.2	$x, y, -2y - x$ $r = \frac{y}{x} = \frac{-2y-x}{y}$ $y^2 = -2xy - x^2$ $x^2 + 2xy + y^2 = 0$ $(x + y)(x + y) = 0$ $x = -y \text{ or } x = -y$ $\frac{x}{y} = -1 \text{ or } \frac{x}{y} = -1$	$r = \frac{y}{x} = \frac{-2y-x}{y}$ ✓ S.F ✓ Factorisation ✓ $\frac{x}{y} = -1$ ✓ (4)
3.3.1	$T_1 = 2P^{1-1}$ $T_1 = 2$	*expansion*✓ *answer*✓ (2)
3.3.2	$T_2 = 2P^{1-2}$ $2P^{-1}$ $r = \frac{T_2}{T_1} = \frac{2P^{-1}}{2} = \frac{1}{P}$ $S_\infty = \frac{a}{1-r}$ $12 = \frac{2}{1-\frac{1}{p}}$ $12 - \frac{12}{p} = 2$ $-\frac{12}{p} = -10$ $p = \frac{6}{5}$ $r = \frac{5}{6}$	*Value of r* ✓ $s\infty = 12$ ✓ *Substitution* ✓ $p = \frac{6}{5}$ ✓ $r = \frac{5}{6}$ ✓ (5)
		[15]

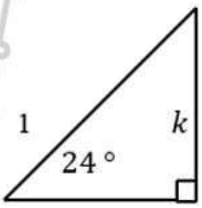
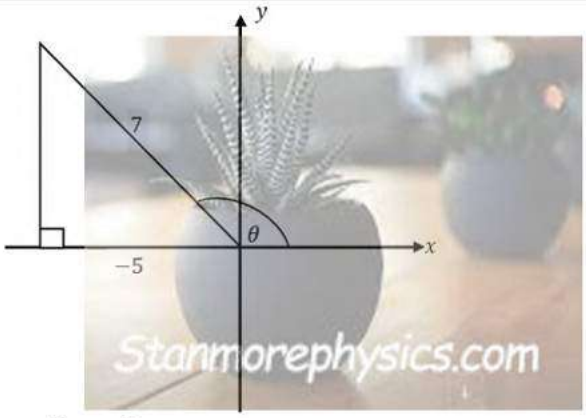
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QUESTION 4

4.1.1	$x \leq 0$	*answer* ✓	(1)
4.1.2	$(-8; 2)$	*answer* ✓	(1)
4.1.3	$-8 < x \leq 0$	*Boundries* ✓ *Notation* ✓	(2)
4.2.1	$\frac{3}{2} = log_a 8$ $a^{\frac{3}{2}} = 8$ $a^{\frac{3}{2}} = 2^3$ $\left(a^{\frac{3}{2}}\right)^{\frac{2}{3}} = (2^3)^{\frac{2}{3}}$ $a = 4$	$\left(a^{\frac{3}{2}}\right)^{\frac{2}{3}} = (2^3)^{\frac{2}{3}}$ ✓ $a = 4$ ✓	(2)
4.2.2	$y = 4^x$	*x and y swop* ✓ *answer* ✓	(2)
4.2.3	$g(x) = -log_4 x$ *or* $g(x) = log_{\frac{1}{4}} x$	Answer ✓	(1)
4.2.4		*graph of f* ✓ *graph of g* ✓ *graph of* f^{-1} ✓ *Increasing shape of g and f* ✓ *Decreasing shape of* f^{-1} ✓	(5)
			[14]

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QUESTION 5

5.1.1	 $r^2 = x^2 + y^2$ $1^2 = x^2 + k^2$ $x = \sqrt{1 - k^2}$ $sin336° = \sin(360° - 24°)$ $= sin24°$ $= -k$	$sin24°$ ✓ $-k$ ✓ (2)
5.1.2	$tan(-24°) = -tan24$ ° $= -\frac{k}{\sqrt{1-k^2}}$	$\sqrt{1-k^2}$✓ $-\frac{k}{\sqrt{1-k^2}}$ ✓ (2)
5.2	 $7^2 = (-5)^2 + y^2$ $49 - 25 = y^2$ $24 = y^2$ $\therefore y = \sqrt{24}$ $sin(\theta + 60°) = sin\theta cos60° + cos\theta sin60°$ $\left(\frac{\sqrt{24}}{7}\right)\left(\frac{1}{2}\right) + \left(\frac{-5}{7}\right)\left(\frac{\sqrt{3}}{2}\right)$ $\frac{2\sqrt{6} - 5\sqrt{3}}{14}$	$y = \sqrt{24}$ ✓ *Expansion compound identity of sine* ✓ *substitution* ✓ *Answer* ✓ (4)

5.3	$\frac{\sin(180°-2x)\,cosx}{2\cos(90°-x)} - \tan(180°-x)\cos(180°+x)\sin(x-720°)$ $\frac{\sin(2x)\,cosx}{2sinx} - (-tanx)(-cosx)sinx$ $\frac{2sinxcosxcosx}{2sinx} + tanx(-cosx)sinx$ $cosx.cosx + \frac{sinx}{cosx}(-cosx)sinx$ $\cos^2 x - \sin^2 x$ $cos2x$	$(-tanx)$✓ $(-cosx)$ ✓ $2sinx$ ✓ $sinx$ ✓ *Expansion double identity of sine* : $sin2\,x = 2\sin x\cos x\frac{sinx}{cosx}$ ✓ $cos^2x - sin^2x$ ✓ $cos2x$ ✓ (7)
5.4.1	$LHS = \frac{\frac{2sin\beta}{cos\beta}}{\frac{cos^2\beta}{cos^2\beta} + \frac{sin^2\beta}{cos^2\beta}}$ $= \frac{\frac{2sin\beta}{cos\beta}}{\frac{cos^2\beta + sin^2\beta}{cos^2\beta}}$ $= \frac{\frac{2sin\beta}{cos\beta}}{\frac{1}{cos^2\beta}}$ $= \frac{2sin\beta}{cos\beta} \times \frac{cos^2\beta}{1}$ $= \frac{2sin\beta cos\beta}{1}$ $= sin2\beta$	$sin^2\beta$ $cos^2\beta$ ✓ $cos^2\beta + sin^2\beta$ ✓ $\frac{1}{cos^2\beta}$ ✓ $2sin\beta cos\beta$✓ (4)
5.4.2	$= \frac{1 + 2tan\beta + tan^2\beta}{1 + tan^2\beta}$ $= \frac{1 + tan^2\beta + 2tan\beta}{1 + tan^2\beta}$ $= 1 + \frac{2tan\beta}{1 + tan^2\beta}$ $= 1 + sin2\beta$ $\therefore Max\ Value = 2$	Quadratic trinomial $1 + 2tan\beta + tan^2$ ✓ $1 + sin2\beta$ ✓ Max value = 2 ✓ (3)

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5.5	$(2cosx + 1)(cosx - 1) = 0$ $cosx = -\frac{1}{2}\ or \cos x = 1$ $x = 120° + 360°.k\ or\ x = 240° + 360°.k \quad k \epsilon Z$ $x = 360°.k \quad k \epsilon Z$	Factorization ✓ $cosx = -\frac{1}{2}\ or \cos x = 1$ ✓ $x = 120° + 360°.k\ ;\ k \epsilon Z$ ✓ $x = 240° + 360°.k\ ; k \epsilon Z$ ✓ $x = 360°.k \quad k \epsilon Z$ ✓ (5)
		[27]

QUESTION 6

7.4.1	$r^2 = x^2 + y^2$ $(AE)^2 = (11{,}5)^2 + (2{,}4)^2$ $= 11.7$	*Substitution* ✓ *Answer* ✓ (2)
7.4.2	$\triangle ADE \equiv \triangle BCE \quad RHS\ or\ SAS$ $AE = BE \quad \equiv \triangle' s$ $a^2 = b^2 + c^2 - 2bc.cosA$ $(7.3)^2 = (11.7)^2 + (11.7)^2 - 2(11.7)(11.7).cos\theta$ $-220.49 = -273.78.cos\theta$ $0.8053546643 = cos\theta$ $\theta = 36.4°$	*Substitution into cosine rule* ✓ *simplification* ✓ *Answer* ✓ (3)
		[5]
	TOTAL	**[100]**