GAUTENG PROVINCE
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GAUTENG DEPARTMENT OF EDUCATION

PROVINCIAL EXAMINATION

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GRADE 11

MATHEMATICS

PAPER 2

MEMORANDUM

9 Pages

GAUTENG DEPARTMENT OF EDUCATION

PROVINCIAL EXAMINATION

MATHEMATICS Paper 2

MEMORANDUM

INSTRUCTIONS AND INFORMATION:

A – Accuracy
C.A. – Consistent Accuracy
S – Statement
R – Reason
SR – Statement and Reason

NOTE:

- If a candidate answered a question **TWICE**, mark only the first attempt.
- If a candidate **CROSSED OUT** an answer and did not redo it, mark the crossed-out answer.
- Consistent accurancy applies to **ALL** aspects of the memorandum.
- Assuming values / answers in order to solve a problem is UNACCEPTABLE.

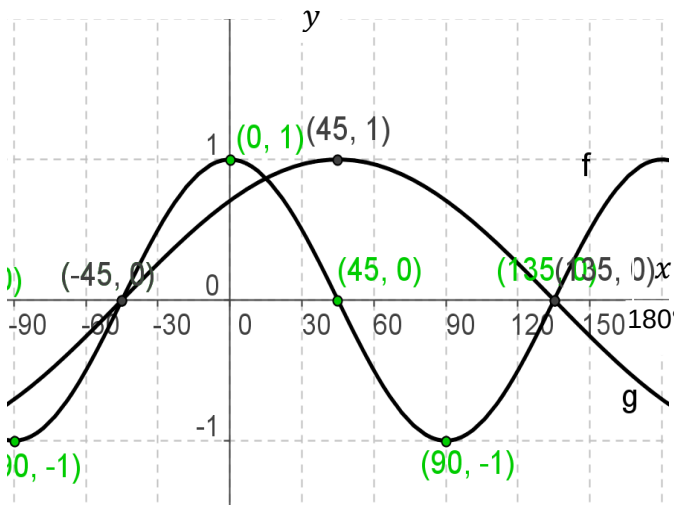
MEMORANDUM	MATHEMATICS Paper 2 Grade 11

	QUESTION 1	[25]
1.1	$m_{BC} = \frac{y_2 - y_1}{x_2 - x_1}$ $= \frac{-5-3}{7-5}$ $= -4$	✓ subst. in corr. formula ✓ answer (2)
1.2	$F(\frac{x_1 + x_2}{2} ; \frac{y_1 + y_2}{2})$ $F(\frac{-1+7}{2} ; \frac{1+(-5)}{2})$ F(3; -2)	✓ subst. into correct formula ✓ answer (2)
1.3	$m_{BF} = \frac{3-(-2)}{5-3}$ $= \frac{5}{2}$ $(y - 3) = \frac{5}{2}(x - 5)$ $y = \frac{5}{2}x - \frac{19}{2}$	✓ $m_{BF} = \frac{5}{2}$ ✓ corr. sub. in str. line eq. ✓ answer (3)
1.4	$\tan\theta = m_{BF}$ $\tan\theta = \frac{5}{2}$ $\theta = 68{,}2°$ $\tan \propto = -4$ Ref. ⌊ = 75,9° $\propto = 180° - 75{,}9°$ $\propto = 104{,}1°$ $F\hat{B}C = \alpha - \theta$ .....ext. ⌊ of Δ $= 104{,}1° - 68{,}2°$ $= 35{,}9°$	✓ $\tan\theta = \frac{5}{2}$ ✓ $\theta = 68{,}2°$ ✓ Ref. ⌊ = 75,9° ✓ $\propto = 104{,}1°$ ✓ answer (5)

1.5	$m_{AF} \times m_{FK} = -1$ $\frac{1-(-2)}{-1-3} \times \frac{p-(-2)}{6-3} = -1$ $\frac{3}{-4} \times \frac{p+2}{6-3} = -1$ $\frac{p+2}{3} = \frac{4}{3}$ $p = 2$	✓$m_{AF} \times m_{FK} = -1$ ✓$\frac{3}{-4}$ ✓$\frac{p+2}{6-3}$ ✓answer (4)
1.6	T(1 ; – 7)	✓ x = 1 ✓y = – 7 (2)
1.7	Midpt. of BT ($\frac{5+1}{2}$; $\frac{3+(-7)}{2}$) (3 ; -2) Also the midpt. of AC	✓ corr. sub. into formula ✓conclusion (2)
1.8	AB = $\sqrt{(5-(-1))^2+(3-1)^2}$ =$2\sqrt{10}$ BC = $\sqrt{(-5-3)^2+(7-5)^2}$ =$2\sqrt{17}$ Perimeter of ABCT = $2(2\sqrt{10} \times 2\sqrt{17})$ = 29,14 Per of LMNO = 2× 29,14 = 58,28	✓ corr. sub. in dist. formula ✓ AB = $2\sqrt{10}$ ✓ BC =$2\sqrt{17}$ ✓ Perimeter of ABCT = 29,14 ✓answer (5)

	QUESTION 2	[26]
2.1.1	$k = -\sqrt{5^2 - 3^2}$ ..... Th. of Pyth. $k = -4$	✓any relevant version of Pyth. ✓answer (2)
2.1.2	$\tan\alpha = \frac{3}{-4}$	✓ answer (1)
2.1.3	$\cos(90° + \alpha)$ $= -\sin\alpha$ $= -\frac{3}{5}$	✓$-\sin\alpha$ ✓ answer (2)
2.1.4	$\tan\alpha = \frac{3}{-4}$ Ref. ∟ = 36,87° $\alpha = 143{,}13°$	✓ Ref. ∟ = 36,87° ✓143,13° (2)
2.2	$\cos A = \frac{3}{7}$ $y_A = 2\sqrt{10}$ ...Th of Pyth. B($2\sqrt{10}$; 3) $7\cos B - 3\tan A$ $= 7\cos(90° - A) - 3\tan A$ $= 7\sin A - 3\tan A$ $= 7\left(\frac{2\sqrt{10}}{7}\right) - 3\left(\frac{2\sqrt{10}}{3}\right)$ = 0	✓ $y_A = 2\sqrt{10}$ ✓ B($2\sqrt{10}$; 3) ✓ corr. sub. ✓ answer (4)

2.3	$\frac{\sin 210° \,.\cos 790° \,.\tan(-330°)}{\sin 160°}$ $\frac{\sin(180° + 30°) \times \cos(720° + 70°) \times -\tan(330°)}{\sin(90° + 70°)}$ $\frac{-\sin 30° \times \cos 70° \times -\tan(360° - 330°)}{\cos 70°}$ $\frac{-\frac{1}{2} \times \cos 70° \times \tan 30°}{\cos 70°}$ $-\frac{1}{2} \times \frac{\sqrt{3}}{3}$ $-\frac{\sqrt{3}}{6}$	✓$-\sin 30°$ ✓$\cos 70°$ ✓ $\cos 70°$ ✓ $\tan 30°$ ✓ answer (5)
2.4	LHS = $\frac{\sin x - \sin x.\cos x}{\cos x - 1 + \sin^2 x}$ $= \frac{\sin x(1-\cos x)}{\cos x - (1 - \sin^2 x)}$ $= \frac{\sin x(1-\cos x)}{\cos x - \cos^2 x}$ $= \frac{\sin x(1-\cos x)}{\cos x(1-\cos x)}$ $= \frac{\sin x}{\cos x}$ = tan *x* = RHS	✓ $\sin x(1 - \cos x)$ ✓ $(1 - \sin^2 x) = \cos^2 x$ ✓ $\cos x(1 - \cos x)$ ✓ $\frac{\sin x}{\cos x}$ (4)
2.5	$\sin 2\theta = \cos(\theta + 30°)$ $\sin 2\theta = \sin(90° - (\theta + 30°)$ $\sin 2\theta = \sin(60° - \theta)$ $2\theta = 60° - \theta + 360°k \,, k \in \mathrm{Z}$ $\theta = 20° + 120°k$ $2\theta = 180° - (60° - \theta) + 360°k$ $\theta = 120° + 360°k$ $\theta = \{-340°; -240°; -220°; -100°; 20°\}$	✓ $\sin(60° - \theta)$ ✓ $k \in \mathrm{Z}$ ✓$\theta = 20° + 120°k$ ✓ $\theta = 120° + 360°k$ ✓✓ all values correct **OR** ✓ 3 or 4 values correct (6)

	QUESTION 3	[14]
3.1		✓shape of f ✓corr. turning points of f ✓ corr. x and y intercepts of f ✓shape of g ✓corr.turning points of g ✓corr. x and y intercepts of g (6)
3.2.1	$y \in [-1; 1]$	✓ – 1 ✓ 1 (2)
3.2.2	360°	✓answer (1)
3.2.3	3	✓answer (1)
3.3	$45° \leq x \leq 180°$	✓$45°; 180°$ ✓ corr. brackets / inequalities (2)
3.4	$\sin(x + 15°) + 1$	✓$\sin(x + 15°)$ ✓+1 (2)

QUESTION 4		**[12]**
4.1.1	Perpendicular	✓ answer (1)
4.1.2	Twice	✓ answer (1)
4.2.1	$B\hat{C}A = 90°$ ($\angle$ in the semi-circle)	✓ S ✓ R (2)
(a)	AC = $\sqrt{10^2 - 8^2}$ (Pythagoras Th.) AC = $\sqrt{36}$ AC = 6 ∴ AM = 3 (line from centre of circle ⊥ to chord bisects chord **OR** midpoint theorem)	✓ diameter =10 ✓ AC = 6 ✓ AM = 3 ✓ Statement (line from centre of circle ⊥ to chord bisects chord **OR** midpoint theorem) (4)
(b)	OM = $\sqrt{5^2 - 3^2}$ (Phyth.Th. **OR** Midpt.Th.) OM = 4 Area Δ AOM : Area Δ ABC $\frac{1}{2}$. 4. 3 : $\frac{1}{2}$. 8. 6 6 : 24 1 : 4	✓ OM = 4 ✓ subst. for areas of Δ AOM and Δ ABC ✓ area Δ AOM = 6 and area Δ ABC = 24 ✓ both correct simplified answers (4)

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QUESTION 5		**[4]**
5.1	$\hat{A}_1 + \hat{A}_2 = \hat{F}_1$ (angles in the same segment) But $\hat{F}_1 = \hat{C}_1$ $\therefore \hat{A}_1 + \hat{A}_2 = \hat{C}_1$ (angles opp. = sides) $\therefore FC \parallel AB$.	✓ R ✓ R (2)
5.2	$\hat{B}_1 + \hat{B}_2 = \hat{C}_1$ (angles in the same segment) $\therefore \hat{B}_1 + \hat{B}_2 = \hat{A}_1 + \hat{A}_2$ $\therefore \Delta ABE$ isosceles	✓ R ✓ $\therefore \hat{B}_1 + \hat{B}_2 = \hat{A}_1 + \hat{A}_2$ (2)

QUESTION 6		**[19]**
6.1	A$\hat{B}$C = 104° (Co-int ∠'s OC || AB) ∴Reflex AÔC = 2B = 208° (∠ at centre twice ∠ at circumf.) ∴Obtuse AÔC = 152° ∴ x = 28° (co-int ∠'s OC || AB)	✓ A$\hat{B}$C = 104° ✓ Reflex AÔC = 208° ✓ obtuse AÔC = 152° ✓ x = 28° ✓ R (5)
6.2.1.	$\hat{R}_1 = x$ (∠' s opp = sides/ radii) $\hat{O}_1$ = 180° - 2x (sum of ∠s in ΔQRO) $\hat{P}_1$ = 90° - x (∠ at centre = twice ∠ at circumf.)	✓ S ✓ R(∠' s opp = sides/radii) ✓ $\hat{O}_1$ = 180° - 2x ✓ R(sum of∠s in ΔQRO) ✓ $\hat{P}_1$ = 90° - x ✓ S ✓ R(∠at centre = twice ∠ at circumf.) (7)
6.2.2.	PQ = QR (given) Q$\hat{R}$P = 90° - x (∠ opp = sides in Δ) P$\hat{Q}$R = 2x (∠ sum in ΔPQR) $x + \hat{Q}_2 = 2x$ $\therefore \hat{Q}_2 = x$ TQ bisects PQR	✓ S (PQ = QR) ✓ S (Q$\hat{R}$P = 90° - x) ✓ R (∠ opp = sides in Δ) ✓ S (P$\hat{Q}$R = 2x) ✓ (∠ sum in ΔPQR) ✓ $x + \hat{Q}_2 = 2x$ ✓ $\hat{Q}_2 = x$ (7)

TOTAL : 100