



**GAUTENG DEPARTMENT OF EDUCATION
PROVINCIAL EXAMINATION**

JUNE 2018

GRADE 11

MATHEMATICS

PAPER 2

MEMORANDUM

9 Pages

MEMORANDUM	MATHEMATICS Paper 2 Grade 11
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**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 accuracy applies to **ALL** aspects of the memorandum.
- Assuming values / answers in order to solve a problem is **UNACCEPTABLE**.

MEMORANDUM	MATHEMATICS Paper 2 Grade 11
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	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	$F\left(\frac{x_1 + x_2}{2}; \frac{y_1 + y_2}{2}\right)$ $F\left(\frac{-1+7}{2}; \frac{1+(-5)}{2}\right)$ $F(3; -2)$	✓ 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	$\tan \theta = m_{BF}$ $\tan \theta = \frac{5}{2}$ $\theta = 68,2^\circ$ $\tan \alpha = -4$ $\text{Ref. } \angle = 75,9^\circ$ $\alpha = 180^\circ - 75,9^\circ$ $\alpha = 104,1^\circ$ $\angle F\hat{B}C = \alpha - \theta \text{ext. } \angle \text{ of } \Delta$ $= 104,1^\circ - 68,2^\circ$ $= 35,9^\circ$	✓ $\tan \theta = \frac{5}{2}$ ✓ $\theta = 68,2^\circ$ ✓ Ref. $\angle = 75,9^\circ$ ✓ $\alpha = 104,1^\circ$ ✓ answer (5)

MEMORANDUM	MATHEMATICS Paper 2 Grade 11
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1.5	$m_{AF} \times m_{FK} = -1$ $\frac{1 - (-2)}{-1 - 3} \times \frac{p - (-2)}{6 - 3} = -1$ $\frac{3}{-4} \times \frac{p + 2}{6 - 3} = -1$ $\frac{p + 2}{3} = \frac{4}{3}$ $p = 2$	$\checkmark m_{AF} \times m_{FK} = -1$ $\checkmark \frac{3}{-4}$ $\checkmark \frac{p+2}{6-3}$ $\checkmark \text{answer}$ (4)
1.6	T(1 ; - 7)	$\checkmark x = 1$ $\checkmark y = - 7$ (2)
1.7	Midpt. of BT $(\frac{5+1}{2} ; \frac{3+(-7)}{2})$ (3 ; -2) Also the midpt. of AC	$\checkmark \text{corr. sub. into formula}$ $\checkmark \text{conclusion}$ (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 = $2 \times 29,14$ = 58,28	$\checkmark \text{corr. sub. in dist. formula}$ $\checkmark AB = 2\sqrt{10}$ $\checkmark BC = 2\sqrt{17}$ $\checkmark \text{Perimeter of ABCT} = 29,14$ $\checkmark \text{answer}$ (5)

MEMORANDUM	MATHEMATICS Paper 2 Grade 11
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	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	$\cos(90^\circ + \alpha)$ $= -\sin \alpha$ $= -\frac{3}{5}$	✓ $-\sin \alpha$ ✓ answer (2)
2.1.4	$\tan \alpha = \frac{3}{-4}$ Ref. $\angle = 36,87^\circ$ $\alpha = 143,13^\circ$	✓ Ref. $\angle = 36,87^\circ$ ✓ $143,13^\circ$ (2)
2.2	$\cos A = \frac{3}{7}$ $y_A = 2\sqrt{10}$...Th of Pyth. $B(2\sqrt{10}; 3)$ $7 \cos B - 3 \tan A$ $= 7 \cos(90^\circ - A) - 3 \tan A$ $= 7 \sin A - 3 \tan A$ $= 7 \left(\frac{2\sqrt{10}}{7}\right) - 3 \left(\frac{2\sqrt{10}}{3}\right)$ $= 0$	✓ $y_A = 2\sqrt{10}$ ✓ $B(2\sqrt{10}; 3)$ ✓ corr. sub. ✓ answer (4)

MEMORANDUM	MATHEMATICS Paper 2 Grade 11
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2.3	$\frac{\sin 210^\circ \cdot \cos 790^\circ \cdot \tan(-330^\circ)}{\sin 160^\circ}$ $\frac{\sin(180^\circ + 30^\circ) \times \cos(720^\circ + 70^\circ) \times -\tan(330^\circ)}{\sin(90^\circ + 70^\circ)}$ $\frac{-\sin 30^\circ \times \cos 70^\circ \times -\tan(360^\circ - 330^\circ)}{\cos 70^\circ}$ $\frac{-\frac{1}{2} \times \cos 70^\circ \times \tan 30^\circ}{\cos 70^\circ}$ $-\frac{1}{2} \times \frac{\sqrt{3}}{3}$ $-\frac{\sqrt{3}}{6}$	$\checkmark -\sin 30^\circ$ $\checkmark \cos 70^\circ$ $\checkmark \cos 70^\circ$ $\checkmark \tan 30^\circ$ $\checkmark$ answer
		(5)
2.4	$\text{LHS} = \frac{\sin x - \sin x \cos x}{\cos x - 1 + \sin^2 x}$ $= \frac{\sin x(1 - \cos x)}{\cos x - (1 - \sin^2 x)}$ $= \frac{\sin x(1 - \cos x)}{\cos x - \cos^2 x}$ $= \frac{\sin x(1 - \cos x)}{\cos x(1 - \cos x)}$ $= \frac{\sin x}{\cos x}$ $= \tan x = \text{RHS}$	$\checkmark \sin x(1 - \cos x)$ $\checkmark (1 - \sin^2 x) = \cos^2 x$ $\checkmark \cos x(1 - \cos x)$ $\checkmark \frac{\sin x}{\cos x}$
		(4)
2.5	$\sin 2\theta = \cos(\theta + 30^\circ)$ $\sin 2\theta = \sin(90^\circ - (\theta + 30^\circ))$ $\sin 2\theta = \sin(60^\circ - \theta)$ $2\theta = 60^\circ - \theta + 360^\circ k, k \in \mathbb{Z}$ $\theta = 20^\circ + 120^\circ k$ $2\theta = 180^\circ - (60^\circ - \theta) + 360^\circ k$ $\theta = 120^\circ + 360^\circ k$ $\theta = \{-340^\circ; -240^\circ; -220^\circ; -100^\circ; 20^\circ\}$	$\checkmark \sin(60^\circ - \theta)$ $\checkmark k \in \mathbb{Z}$ $\checkmark \theta = 20^\circ + 120^\circ k$ $\checkmark \theta = 120^\circ + 360^\circ k$ $\checkmark \checkmark$ all values correct OR $\checkmark$ 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	$45^\circ \leq x \leq 180^\circ$	✓ $45^\circ; 180^\circ$ ✓ corr. brackets / inequalities (2)
3.4	$\sin(x + 15^\circ) + 1$	✓ $\sin(x + 15^\circ)$ ✓ $+1$ (2)

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

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) $\therefore \hat{B}_1 + \hat{B}_2 = \hat{A}_1 + \hat{A}_2$ $\therefore \triangle ABE$ isosceles	✓ R ✓ $\therefore \hat{B}_1 + \hat{B}_2 = \hat{A}_1 + \hat{A}_2$ (2)

QUESTION 6		[19]
6.1	$\angle ABC = 104^\circ$ (Co-int $\angle$'s $OC \parallel AB$) $\therefore$ Reflex $\angle AOC = 2B$ $= 208^\circ$ ($\angle$ at centre twice $\angle$ at circumf.) $\therefore$ Obtuse $\angle AOC = 152^\circ$ $\therefore x = 28^\circ$ (co-int $\angle$'s $OC \parallel AB$)	✓ $\angle ABC = 104^\circ$ ✓ Reflex $\angle AOC = 208^\circ$ ✓ obtuse $\angle AOC = 152^\circ$ ✓ $x = 28^\circ$ ✓ R (5)
6.2.1.	$\hat{R}_1 = x$ ($\angle$'s opp = sides/ radii) $\hat{O}_1 = 180^\circ - 2x$ (sum of $\angle$ s in $\triangle QRO$) $\hat{P}_1 = 90^\circ - x$ ($\angle$ at centre = twice $\angle$ at circumf.)	✓ S ✓ R($\angle$'s opp = sides/radii) ✓ $\hat{O}_1 = 180^\circ - 2x$ ✓ R(sum of $\angle$ s in $\triangle QRO$) ✓ $\hat{P}_1 = 90^\circ - x$ ✓ S ✓ R($\angle$ at centre = twice $\angle$ at circumf.) (7)
6.2.2.	$PQ = QR$ (given) $\angle QRP = 90^\circ - x$ ($\angle$ opp = sides in $\triangle$) $\angle PQR = 2x$ ($\angle$ sum in $\triangle PQR$) $x + \hat{Q}_2 = 2x$ $\therefore \hat{Q}_2 = x$ TQ bisects PQR	✓ S ($PQ = QR$) ✓ S ($\angle QRP = 90^\circ - x$) ✓ R ($\angle$ opp = sides in $\triangle$) ✓ S ($\angle PQR = 2x$) ✓ ($\angle$ sum in $\triangle PQR$) ✓ $x + \hat{Q}_2 = 2x$ ✓ $\hat{Q}_2 = x$ (7)

TOTAL : 100