GAUTENG PROVINCE
EDUCATION
REPUBLIC OF SOUTH AFRICA

GAUTENG DEPARTMENT OF EDUCATION

PROVINCIAL EXAMINATION

2016

GRADE 11

MATHEMATICS
Second Paper

MEMORANDUM

11 pages

GAUTENG DEPARTMENT OF EDUCATION

PROVINCIAL EXAMINATION

MATHEMATICS
(Second Paper)

INFORMATION:

A – Accuracy

C.A. – Continued Accuracy

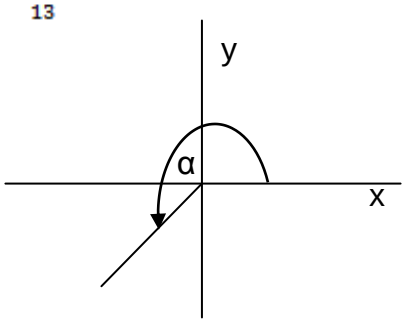
S – Statement

R – Reason

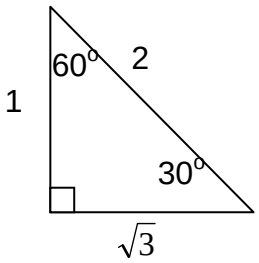
S and R – Statement and Reason

	QUESTION 1	MARKS : 16
1.1	KT = $\sqrt{(x_2-x_1)^2+(y_2-y_1)^2}$ = $\sqrt{(-5-1)^2+(1-6)^2}$ = $\sqrt{61}$	✓ Distance formula ✓ subst. in corr. formula ✓ answer [2/3 if answer not in surd form] **(3)**
1.2	$m_{KP} = \frac{y_2-y_1}{x_2-x_1}$ $= -\frac{1}{4}$ $(y-y_1) = m(x-x_1)$ $(y-1) = -\frac{1}{4}(x-(-5))$ $y = -\frac{1}{4}x - \frac{1}{4}$ **OR** $m_{KP} = \frac{y_2-y_1}{x_2-x_1}$ $= -\frac{1}{4}$ $(y-(-2)) = -\frac{1}{4}(x-7)$ $y = -\frac{1}{4}x - \frac{1}{4}$	✓ answer m_{KP} ✓ subst. (-5 ; 1) into str. line eq. ✓ answer (C.A) **OR** ✓ answer m_{KP} ✓ subst. (7 ;-2) into str. line eq. ✓ answer (C.A) **(3)**
1.3	$m_{KT} = \frac{6-1}{1-(-5)}$ $= \frac{5}{6}$ $(y-6) = \frac{5}{6}(x-1)$ $y = \frac{5}{6}x + 5\frac{1}{6}$ A (0 ; $5\frac{1}{6}$) B (0 ; $-\frac{1}{4}$) AB = $5\frac{1}{6}+\frac{1}{4}$ = $5\frac{5}{12}$ **OR** 5,42 **OR** $\frac{65}{12}$	✓ answer m_{KT} (A) ✓ eq. of Line KT. (A) **OR** y-int of line KT. ✓ add of *y* co-ord. of A and B ✓ answer (A) **(4)**

1.4	$\tan\beta = m_{KT}$ $\tan\beta = \frac{5}{6}$ $\beta = 39{,}81°$ $m_{PT} = -\frac{4}{3}$ $\tan\alpha = -\frac{4}{3}$ $\alpha = 180° - 53{,}13°$ $= 126{,}87°$ $\theta = \alpha - \beta$ .....ext. $\angle$ of Δ $= 126{,}87° - 39{,}81°$ $= 87{,}06°$ ANY other valid solution	✓ $\tan\beta = \frac{5}{6}$ ✓ $\beta = 39{,}81°$ ✓ $\tan\alpha = -\frac{4}{3}$ ✓ $\alpha = 126{,}87°$ ✓ $126{,}87° - 39{,}81°$ ✓ answer (PENALISE once for rounding off , either α or *β)* **(6)**
	QUESTION 2	**MARKS : 14**
2.1	Let M (x ; y) $OM^2 = MB^2$ ..... radii) $(0-x)^2 + (0-y)^2 = (8-x)^2 + (0-y)^2$ $x^2 + y^2 = 64 - 16x + x^2 + y^2$ $x = 4$	✓ $OM^2 = MB^2$ ✓ corr. Subst. in dist. formula ✓ simplification (C.A) ✓ answer **(4)** Answer only 0
2.2	A(x ; y) $x = 0$ $\frac{0+y}{2} = 2$ $y = 4$ A(0 ; 4)	✓subst. in midpt. formula ✓ y = 0 ✓ co-ord. of A [2/3 if not in co-ordinate form] **(3)**
2.3	$m_{AB} = -\frac{1}{2}$ Eq. of line OK: $y - y_1 = m(x - x_1)$ $y - 0 = -\frac{1}{2}(x - 0)$ $y = -\frac{1}{2}x$	✓ m_{AB} ✓ corr. subst. in str. line formula ✓answer (C.A) **(3)**

2.4	Let T (x ; y) $m_{AT} = \frac{4-y}{-x}$ $\frac{4-y}{-x} \times -\frac{1}{2} = -1$ .....⊥ lines $y = 2x + 4$ .....(1) Eq. of line OK $y = -\frac{1}{2}x$ .....(2) $2x + 4 = -\frac{1}{2}x$ $x = -\frac{8}{5}$ Any other valid method	✓$\frac{4-y}{-x} \times -\frac{1}{2} = -1$ ✓ $y = 2x + 4$ ✓ equating (1) and (2) ✓ answer (C.A) **(4)**
	QUESTION 3	**MARKS 28**
3.1	13sinα = -5 sinα = - $\frac{5}{13}$  $x = -\sqrt{13^2 - (-5)^2}$ = –12 3cosα = 3($-\frac{12}{13}$) = $-\frac{36}{13}$	✓ sinα = - $\frac{5}{13}$ ✓ cartesian plane with terminal arm in 3rd quad. ✓ x = –12 ✓ subst. cosα = $-\frac{12}{13}$ ✓ answer **(5)**

3.2.1	$\frac{\sin(\theta-180°).\tan(360°-\theta).\sin(90°-\theta)}{cos^2\ (\theta+180°)}$ $= \frac{-\sin\theta \times -\tan\theta \times \cos\theta}{cos^2\ \theta}$ $= \frac{-\sin\theta \times -\frac{\sin\theta}{\cos\theta} \times \cos\theta}{cos^2\ \theta}$ $= \frac{sin^2\ \theta}{cos^2\ \theta}$ $= tan^2\ \theta$	✓ -sin θ ; ✓ -tan θ ; ✓ cos θ ; ✓ $cos^2\ \theta$ ✓ $-\tan\ \theta = -\frac{\sin\theta}{\cos\theta}$ ✓ $\frac{sin^2\ \theta}{cos^2\ \theta}$ or $tan^2\ \theta$ **(6)**
3.2.2	$\frac{\sin 210°.\cos 400°}{\sin(-50°)\times \cos 120°}$ $= \frac{\sin(180°+30°)\times\cos(360°+40°)}{-\sin 50° \times\cos(180°-60°)}$ $= \frac{-\sin 30° \times\cos 40°}{-\cos 40° \times -\cos 60°}$ = -1	✓ -sin 50° ✓ – sin 30° ; ✓ cos 40° ; ✓ – cos 40° or cos 40° = sin 50° ✓ – cos 60° ✓ answer **(6)**
3.3	$(4\theta-8)\sin 30° = \theta^3 - 8$ $(4\theta-8)\sin 30° = (\theta-2)(\theta^2+2\theta+4)$ (4 θ – 8) sin 30° = (θ – 2) (2) sin 30° $= \frac{(\theta-2)(2)}{(4\theta-8)}$ $= \frac{(\theta-2)(2)}{4(\theta-2)}$ $= \frac{1}{2}$	✓ factorization ✓ factorization of denominator ✓ answer

	 $\tan 240° = \tan(180° + 60°)$ $= \tan 60°$ $= \sqrt{3}$	✓ $\tan 60°$ ✓ answer Full marks if $\tan 60° = \sqrt{3}$ or Show sketch to determine sol. Answer only max 1 mark(surd form) (5)
3.4.1	L.H.S: $\frac{1}{\tan x}(\sin\alpha\tan\alpha+\cos\alpha)$ $= \sin\alpha + \frac{\cos\alpha}{\tan\alpha}$ $= \sin\alpha + \frac{\cos\alpha}{\frac{\sin\alpha}{\cos\alpha}}$ $= \sin\alpha + \frac{\cos^2\alpha}{\sin\alpha}$ $= \frac{\sin^2\alpha+\cos^2\alpha}{\sin\alpha}$ $= \frac{1}{\sin\alpha}$ =R.H.S Any other valid method	✓ $\sin\alpha + \frac{\cos\alpha}{\tan\alpha}$ ✓ subst. $\tan\alpha = \frac{\sin\alpha}{\cos\alpha}$ ✓ $\frac{\cos^2\alpha}{\sin\alpha}$ ✓ $\frac{\sin^2\alpha+\cos^2\alpha}{\sin\alpha}$ **(4)**
3.4.2	$\alpha =$ {0°; 90°; 180; 270° ; 360°}	✓ 0° ; 180°; 360° ✓ 90°; 270° **(2)**

	QUESTION 4	MARKS 12
4.1	$180°$	✓ answer **(1)**
4.2	$y \in [-1;1]$ **OR** $-1 \leq y \leq 1,\ y \in \mathrm{R}$	✓ -1 ;1 ✓ corr. brackets **OR** ✓ -1 ;1 ✓ corr. inequalities **(2)**
4.3	$\theta = 40°$ $a = 2$	✓ $40°$ ✓ 2 **(2)**
4.4	g(180°) = – 0,77	✓ answer (C.A) **(1)**
4.5.1	$f(x) - g(x) > 0$ $f(x) > g(x)$ $-180° \leq x < -103{,}3°$ **OR** [-180° ; - 103,3°)	✓ -180° ; -103,3° ✓ corr. inequality **OR** corr. bracket OR (16,7°; 130°) or (136,7°; 180°] **(2)**
4.5.2	$g(x).f(x) \geq 0$ [–130° ;- 90°] **OR** –130° ≤ x ≤ –90°	✓ [-130° ; -90°] ✓corr brackets **OR** corr. inequalities [0° ;50°] or [90° ;180] **(2)**
4.6	$3^{\cos(90°-2x)}$ $= 3^{\sin 2x}$ $= 3^{-1}$ **OR** $=\frac{1}{3}$	✓ $3^{\sin 2x}$ ✓ answer **(2)**

	QUESTION 5	MARKS 8
5.1	is perpendicular to the chord	✓ answer **(1)**
5.2.1	AD = $\sqrt{AB^2 + BD^2}$... th. of pyth. = $\sqrt{24^2 + 16^2}$ = 28,84 cm	✓ Subst. ✓ answer **(2)**
5.2.2	OD = x + 16	✓ answer **(1)**
5.2.3	$OC^2 = BC^2 + OB^2$ ..... th. of pyth $OD^2 = 24^2 + x^2$ $(x + 16)^2 = 24^2 + x^2$ $x^2 + 32x + 256 = 576 + x^2$ $32x = 320$ x = 10	$OC^2 = BC^2 + OB^2$ OC = OD .....radii ✓$(x + 16)^2$ ✓ $24^2 + x^2$ ✓ simplification ✓ answer **(4)**
	QUESTION 6	**MARKS 8**
6.1	PT = $\frac{1}{2}$KT ..... line from centre ⊥ to ch.	✓ S ✓ R **(2)**
6.2	$KC^2 = PC^2 + KP^2$ ..... th. of pyth. but $KP^2 = OK^2 - OP^2$ ..... th. of pyth. $KC^2 = PC^2 + OK^2 - OP^2$ but OK = OC ..... radii = $PC^2 + OC^2 - (OC - PC)^2$\ = $PC^2 + OC^2 - (OC^2 - 2OC.PC + PC^2)$ = 2(OC.PC) = 2$(x + y)(y)$ = $2xy + 2y^2$	✓ S ✓ $KP^2 = OK^2 - OP^2$ ✓ subst. OK = OC ✓ subst.OP = OC – PC ✓ simplification ✓ subst. for OC and PC **(6)**

	QUESTION 7	MARKS 14
7.1	$\hat{U} = \frac{1}{2}\,V\hat{S}R$ ..... ∟ at centre = 2 × ∟ on circum. $= \frac{1}{2}(110°)$ $= 55°$	✓ Reason ✓ answer **(2)**
7.2	$\hat{V}_2 = \frac{180° - V\hat{S}R}{2}$ ..... ∟s opp = sides, radii $= \frac{180° - 110°}{2}$ $= 35°$	✓ S ✓ R ✓ answer Answer with reason full marks **(3)**
7.3	$\hat{R}_2 = (\hat{R}_3 + \hat{R}_2) - \hat{R}_3$ ∟s opp = sides $\hat{R}_2 = 35° - 20°$ $= 15°$ $\hat{Q} = \hat{R}_2 + \hat{R}_1$ ..... ∟s in same seg $= 15° + 30°$ $= 45°$	✓ answer $\hat{R}_2 = 15°$ ✓ S and R ✓ answer **(3)**
7.4	$\hat{K}_4 = \hat{K}_2$ ..... vert opp. ∟s $= 90°$ $\hat{P} = 180° - (\hat{Q} + \hat{K}_4)$ ..... ∟s of a Δ $= 180° - (45° + 90°)$ $= 45°$ **OR** $\hat{T} = 180° - (\hat{K}_2 + T\hat{R}K)$ ..... ∟s of a Δ $= 180° - (90° + 45°)$ $= 45°$ $\hat{P} = \hat{T}$ ..... ∟s in the same seg. $= 45°$	✓ S and R ✓ answer ✓ S and R ✓ answer **OR** ✓ S and R ✓ answer ✓ S and R ✓ answer **(4)**

7.5	$\hat{T} = 45°$ $\hat{T} = \hat{Q} = 45°$ ∴ TR // PQ ..... alt. ∠s = **OR** $T\hat{R}P = 45°$ $T\hat{R}P = \hat{P} = 45°$ ∴ TR // PQ ..... alt. ∠s =	✓ $\hat{T} = 45°$ ✓ R **OR** ✓ $T\hat{R}P = \hat{P}$ ✓ R **(2)**