Education and Sport Development

Department of Education and Sport Development
Departement van Onderwys en Sport Ontwikkeling
Lefapha la Thuto le Tlhabololo ya Metshameko
NORTH WEST PROVINCE

GRADE 11

MATHEMATICS: MEMO

MID-YEAR EXAMINATION

JUNE 2019

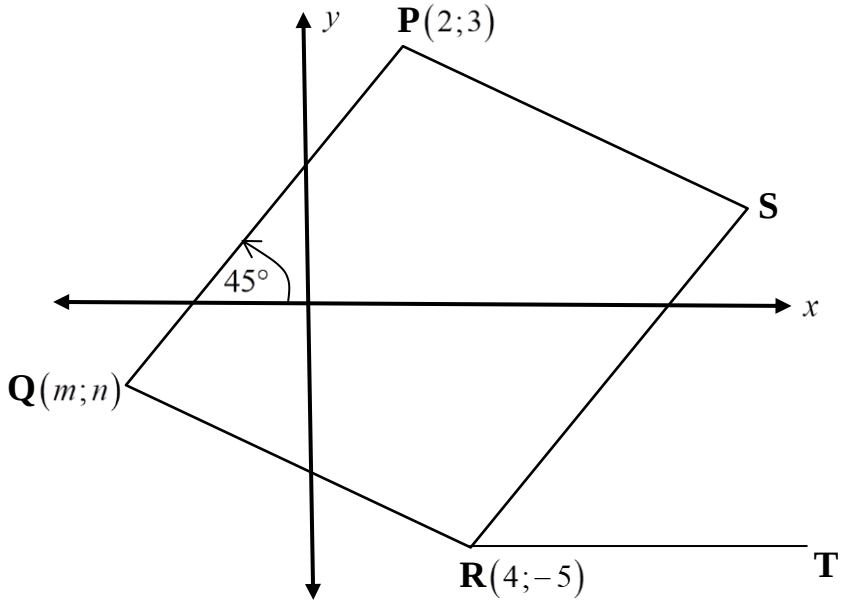
MARKS: 100

This marking guideline consists of 12 pages.

QUESTION 1

1.1	$m = \frac{y_2 - y_1}{x_2 - x_1}$ $m_{AB} = \frac{1-4}{-1-3}$ $= \frac{3}{4}$	✓ substitution ✓ answer	(2)
1.2	$\left(\frac{3+a}{2}; \frac{4-2}{2}\right) = (0;1)$ $\therefore \frac{3+a}{2} = 0$ $a = -3$	✓ $\frac{3+a}{2} = 0$ ✓ answer	(2)
			[4]

QUESTION 2



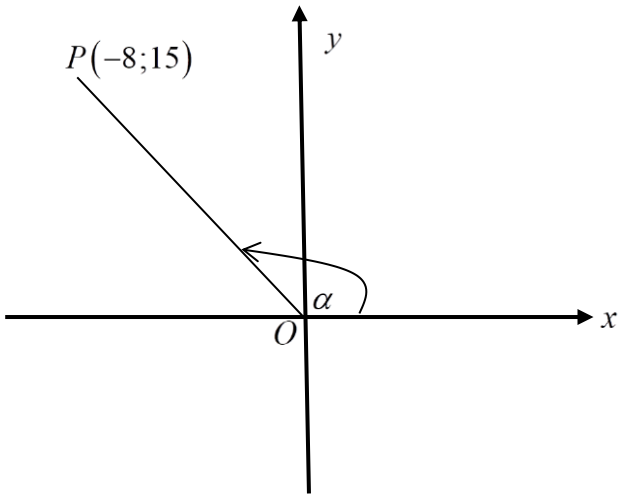
2.1	$m_{PR} = \frac{-5-3}{4-2}$ $= -4$ $y - y_1 = m(x - x_1)$ $y - 3 = -4(x - 2)$ $y = -4x + 11$	✓ $m = -4$ ✓ substitution ✓ answer	(3)

2.2	$m_{PQ} = \tan 45°$ $= 1$	✓ $\tan 45°$ ✓ answer	(2)
2.3	$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$ $PQ = \sqrt{(m-2)^2 + (n-3)^2}$ $= \sqrt{m^2 - 4m + 4 + n^2 - 6n + 9}$ $= \sqrt{m^2 - 4m + n^2 - 6n + 13}$ $QR = \sqrt{(m-4)^2 + (n+5)^2}$ $= \sqrt{m^2 - 8m + 16 + n^2 + 10n + 25}$ $= \sqrt{m^2 - 8m + n^2 + 10n + 41}$	✓ substitution ✓ simplification ✓ substitution	(3)
2.4	$PQ = QR$ $\sqrt{m^2 - 4m + n^2 - 6n + 13} = \sqrt{m^2 - 8m + n^2 + 10n + 41}$ $m^2 - 4m + n^2 - 6n + 13 = m^2 - 8m + n^2 + 10n + 41$ $-4m - 6n + 13 = -8m + 10n + 41$ $4m - 16n = 28$ $m - 4n = 7$ ..... (1) $m_{PQ} = 1$ $\frac{n-3}{m-2} = 1$ $n - 3 = m - 2$ $m = n - 1$ ..... (2) Substitute (2) in (1): $n - 1 - 4n = 7$ $-3n = 8$ $n = -\frac{8}{3}$ $m = -\frac{8}{3} - 1$ $= -\frac{11}{3}$ $\therefore Q(m;n) = Q\left(-\frac{11}{3}; -\frac{8}{3}\right)$	✓ PQ = QR ✓ $m - 4n = 7$ ✓ $\frac{n-3}{m-2} = 1$ ✓ $m = n - 1$ ✓ substitution ✓ $-3n = 8$	(6)

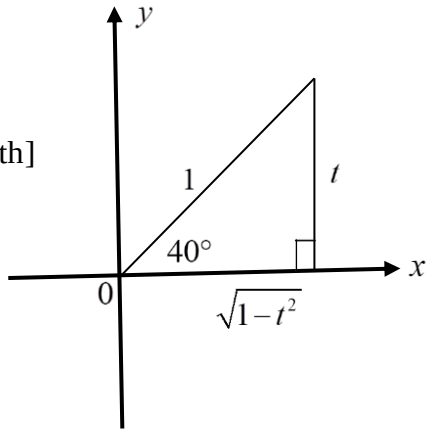
2.5	$m_{QS} \times m_{PR} = -1$ $m_{QS} \times (-4) = -1$ $m_{QS} = \frac{1}{4}$ $y = mx + c$ $-\frac{8}{3} = \frac{1}{4}\left(-\frac{11}{3}\right) + c$ $c = -\frac{7}{4}$ $y = \frac{1}{4}x - \frac{7}{4}$	✓ $m_{QS} = \frac{1}{4}$ ✓ substitution ✓ $c = -\frac{7}{4}$ ✓ answer	(4)
2.6	$\tan Q\hat{R}T = m$ $= \frac{-5-\left(-\frac{8}{3}\right)}{4-\left(-\frac{11}{3}\right)}$ $= \frac{-\frac{7}{3}}{\frac{23}{3}}$ $= -\frac{7}{23}$ $\therefore Q\hat{R}T = 180° + \tan^{-1}\left(-\frac{7}{23}\right)$ $= 180° - 16,93°$ $= 163,07°$ $QRS = 163,07° - 45°$ $= 118,07°$ $\therefore QPS = 118,07°$	✓ $m = -\frac{7}{23}$ ✓ $163,07°$ ✓for $-45°$ ✓ $QRS = 118,07°$ ✓ answer	(5)
			[23]

QUESTION 3

3.1



3.1.1	$r^2 = x^2 + y^2$ [Pyth] $OP^2 = (-8)^2 + 15^2$ $= 289$ $OP = 17$	✓ substitution ✓ answer	(2)
3.1.2 (a)	$\tan\alpha = \frac{y}{x}$ $= \frac{15}{-8}$	✓ answer	(1)
(b)	$17\sin(180° - \alpha) - \frac{\cos(-\alpha)}{8}$ $= 17\sin\alpha - \frac{\cos\alpha}{8}$ $= 17\left(\frac{15}{17}\right) - \frac{1}{8}\left(\frac{-8}{17}\right)$ $= \frac{256}{17}$	✓ $\sin\alpha$ ✓ $\cos\alpha$ ✓ substitution ✓ answer	(4)
3.1.3	$\tan\alpha = -\frac{15}{8}$ Ref$\angle = 61,93°$ $\alpha = 180° - 61,93°$ $= 118,1°$	✓ $-78,07°$ ✓ answer	(2)

3.2.1	$\sin 40° = t$ $x^2 + y^2 = r^2$ [Pyth] $x = \sqrt{1-t^2}$ $\cos 320° = \cos(360° - 40°)$ $= \cos 40°$ $= \sqrt{1-t^2}$	 ✓ sketch ✓ $x = \sqrt{1-t^2}$ ✓ $\cos 40°$ ✓ answer	(4)
3.2.2	$\sin 140° = \sin(180° - 40°)$ $= \sin 40°$ $= t$	✓ $\sin 40°$ ✓ answer	(2)
3.2.3	$\tan(-220°) = -\tan 220°$ $= -\tan(180° + 40°)$ $= -\tan 40°$ $= -\frac{t}{\sqrt{1-t^2}}$	✓ $-\sin 220°$ ✓ $\tan 40°$ ✓ answer	(3)
			[18]

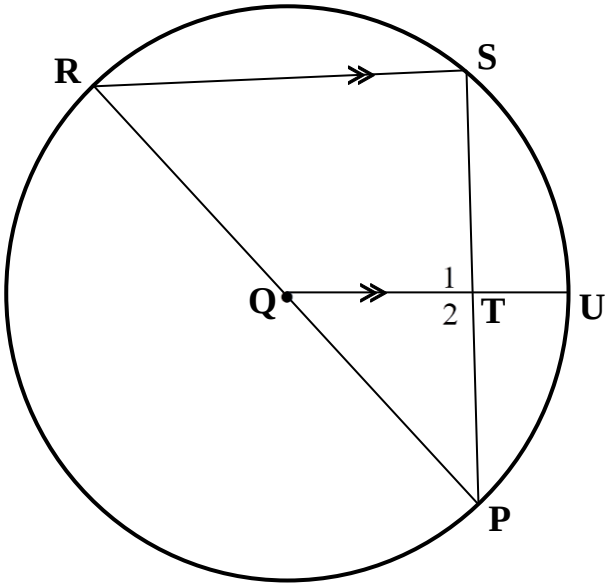
QUESTION 4

4.1	$\frac{\sin(90°+A)}{\cos(540°+A)}+\frac{\tan(A-540°)}{\cos A.\sin A}$ $=\frac{\cos A}{-\cos A}+\frac{\tan A}{\cos A.\sin A}$ $=-1+\frac{\frac{\sin A}{\cos A}}{\cos A.\sin A}$ $=-1+\frac{1}{\cos^2 A}$ $=\frac{-\cos^2 A+1}{\cos^2 A}$ $=\frac{\sin^2 A}{\cos^2 A}$ $=\tan^2 A$	✓ $\cos A$ ✓ $-\cos A$ ✓ $\tan A$ ✓ $\frac{\sin A}{\cos A}$ ✓ $\sin^2 A$ ✓ answer	(6)
4.2	$\tan^2 x=\frac{\sin(120°).\tan 330°}{\cos 240°}$ $=\frac{\sin(180°-60°).\tan(360°-30°)}{\cos(180°+60°)}$ $=\frac{\sin 60°(-\tan 30°)}{-\cos 60°}$ $=\frac{\frac{\sqrt{3}}{2}\times\frac{1}{\sqrt{3}}}{\frac{1}{2}}$ $\tan^2 x=1$ $\tan^2 x-1=0$ $(\tan x+1)(\tan x-1)=0$ $\tan x=-1$ or $\tan x=1$ $x=-45°;\ 45°$	✓ $\sin 60°$ ✓ $-\tan 30°$ ✓ $-\cos 60°$ ✓ substitution ✓ factors or $\tan x=\pm 1$ ✓ $-45°$ ✓ $45°$	(7)
4.3	$4\cos^2 x=3$ $\cos^2 x=\frac{3}{4}$ $\cos x=\pm\frac{\sqrt{3}}{2}$ $x=\pm 150°+360°.k$ or $\pm 30°+360°.k$ $k\in\mathbb{Z}$	✓ $\cos x=\pm\frac{\sqrt{3}}{2}$ ✓ $\pm 150°+360°.k$ ✓ $\pm 30°+360°.k$ ✓ $k\in\mathbb{Z}$	(4)
			[17]

QUESTION 5

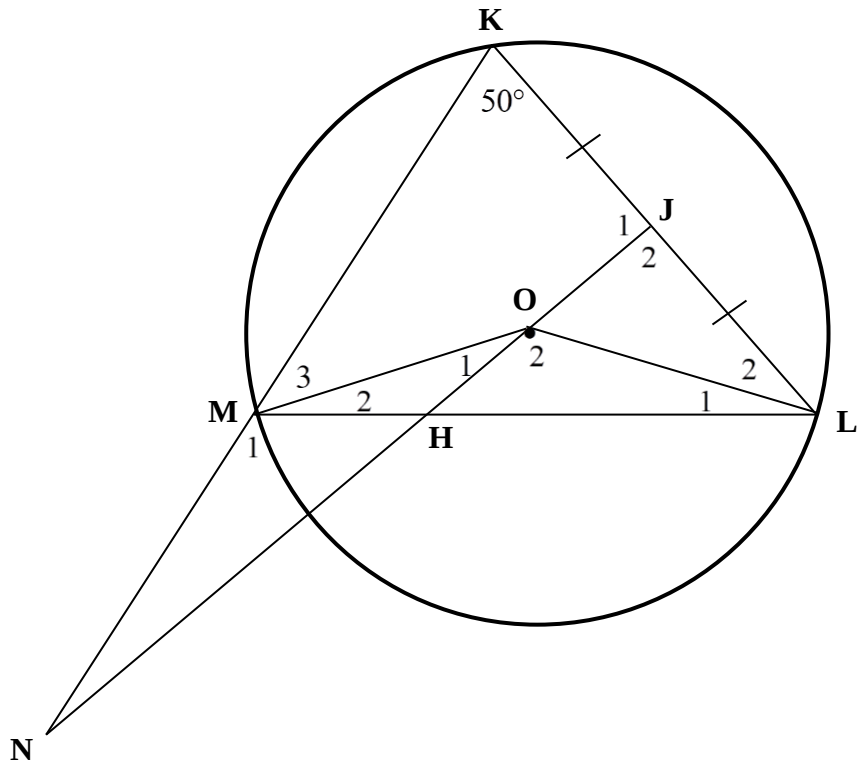
5.1	supplementary	✓answer	(1)

5.2



5.2.1	$\hat{S} = 90°$	diameter subtends right $\angle$	✓ S ✓ R	(2)
5.2.2	$\hat{T}_2 = 90°$ TP = 8 cm $QT^2 + 8^2 = 10^2$ $QT = \sqrt{10^2 - 8^2} = 6$ $TU = 10 - 6 = 4\,cm$	[corr $\angle$s ; QU ∥ RS] [line from centre ⊥ to chord] [Pythagoras]	✓ S/ R ✓ S/ R ✓ QT = 6 ✓ answer	(6)
				[9]

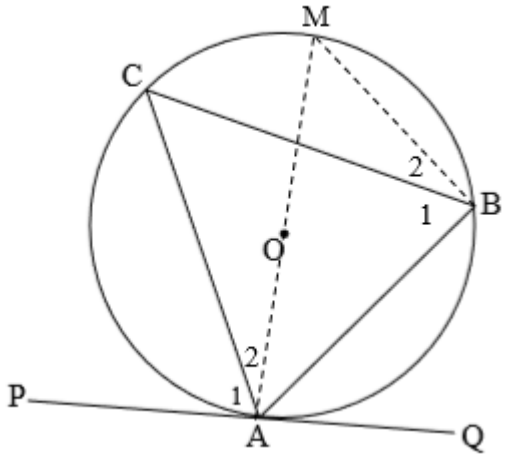
QUESTION 6



6.1.1	$M\hat{O}L = 2\times 50° = 100°$ [$\angle$ at centre $= 2\times\angle$ at circumf]	✓ S ✓ R	(2)
6.1.2	$KJ = JL$ [given] $\hat{J}_1 = 90°$ [line from centre to midpt of chord] In ΔNKL $\hat{N} = 40°$ [acute $\angle$s of right triangle complementary/ sum of $\angle$s in Δ]	✓ S ✓ S/ R ✓ S	(3)
6.1.3	$MO = LO$ [radii] $\hat{M}_2 = \hat{L}_1$ [$\angle$s opp equal sides] $\hat{L}_1 = \frac{180° - 100°}{2} = 40°$ [ΔOML is isosc]	✓ S/ R ✓ S/ R ✓ S	(3)
6.2	$\hat{L}_1 = \hat{N} = 40°$ [calculated in 6.1.2 and 6.1.3] MOLN is a cyclic quad [line subt. equal $\angle$s / converse $\angle$s in the same seg]	✓ S ✓ R	(2)
			[10]

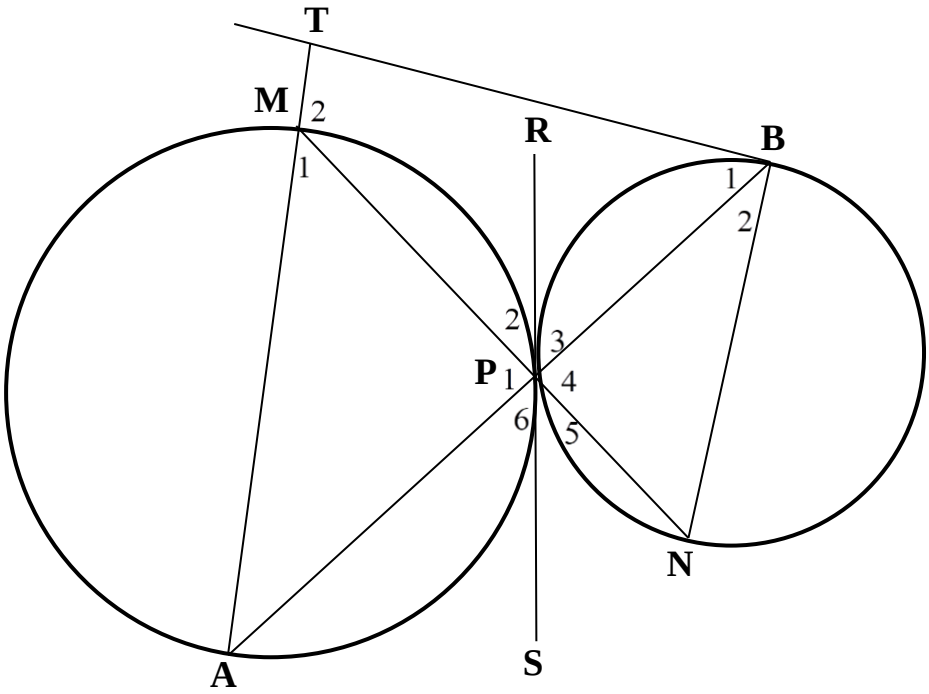
QUESTION 7

7.1



	Construction: Draw diameter AM and join M to B	✓ construction	
	$\hat{A}_1 + \hat{A}_2 = 90°$ [radius ⊥ tangent]	✓ S/ R	
	$\hat{B}_1 + \hat{B}_2 = 90°$ [∠s in a semi-circle]	✓ S/ R	
	$\hat{B}_2 = \hat{A}_2$ [∠s in same segment]	✓ S/ R	
	$\hat{B}_1 = \hat{A}_1$	✓ S	(5)

7.2



7.2.1	$\hat{P}_1 = 90°$ $\hat{P}_1 = \hat{P}_4$ BN is a diameter	[diameter subtends right $\angle$] [vert. opp.]$\angle$s [chord subtends $90°$/ converse $\angle$s in a semi-circle]	✓ S/ R ✓ S/ R ✓ conclusion	(3)
7.2.2	$\hat{N} = \hat{P}_3$ $\hat{P}_6 = \hat{P}_3$ $\hat{M}_1 = \hat{P}_6$ AM ∥ NB **OR** $\hat{A} = \hat{P}_2$ $\hat{P}_5 = \hat{P}_2$ $\hat{B}_2 = \hat{P}_5$ AM ∥ NB	[tan chord theorem] [vert. opp. $\angle$s] [tan chord theorem] [alt $\angle$s equal] [tan chord theorem] [vert. opp. $\angle$s] [tan chord theorem] [alt $\angle$s equal]	✓ S ✓ R ✓ S/ R ✓ S/ R ✓ R ✓ S ✓ R ✓ S/ R ✓ S/ R ✓ R	(5)

7.2.3	$\hat{M}_1 = 90° - \hat{A}$ $\hat{B}_1 = 90° - \hat{B}_2$ $\hat{A} = \hat{B}_2$ MPBT is a cyclic quad **OR** $\hat{M}_1 = \hat{N}$ $\hat{N} = \hat{B}_1$ $\hat{M}_1 = \hat{B}_1$ MPBT is a cyclic quad	[$\angle$s in ΔAMP [radius $\perp$tangent] [alt $\angle$s ; AM ∥ NB] [ext $\angle$ = int opp $\angle$ / converse ext $\angle$ of cyclic quad] [alt $\angle$s ; AM ∥ NB] [tan chord theorem] [ext $\angle$ = int opp $\angle$ / converse ext $\angle$ of cyclic quad]	✓ S/ R ✓ S/ R ✓ S/ R ✓ R ✓ S/ R ✓ S ✓ R ✓ R	(4)
7.2.4	$\hat{T} = \hat{P}_1 = 90°$	[ext $\angle$ of cyclic quad]	✓ S ✓ R	(2)
				[19]
	TOTAL:			**[100]**