QUESTION/*VRAAG* 1

<table>
<tr><th></th><th>SUGGESTED ANSWER/
VOORGESTELDE ANTWOORD</th><th>DESCRIPTORS/
BESKRYWERS</th></tr>
<tr><td>1.1</td><td>$60 \le x < 80$</td><td>✓ answer/*antwoord*
(1)</td></tr>
<tr><td>1.2</td><td>

INTERVAL OF TEST MARKS/ *INTERVAL VAN TOETSPUNTE*	NUMBER OF LEARNERS/ *AANTAL LEERDERS*	$X.f$
$0 \le x < 20$	4	40
$20 \le x < 40$	5	150
$40 \le x < 60$	9	450
$60 \le x < 80$	13	910
$80 \le x < 100$	10	900
Totals/*Totale*	**41**	$\sum 2450$

$\bar{x} = \frac{\sum Xf}{n} = \frac{2450}{41} = 59{,}76$

ANSWER ONLY: FULL MARKS/
SLEGS ANTWOORD: VOLPUNTE

</td><td>✓ All correct values/*Alle korrekte waardes*

✓ 2450

✓ $\bar{x} = 59{,}76$
(3)</td></tr>
<tr><td>1.3</td><td>

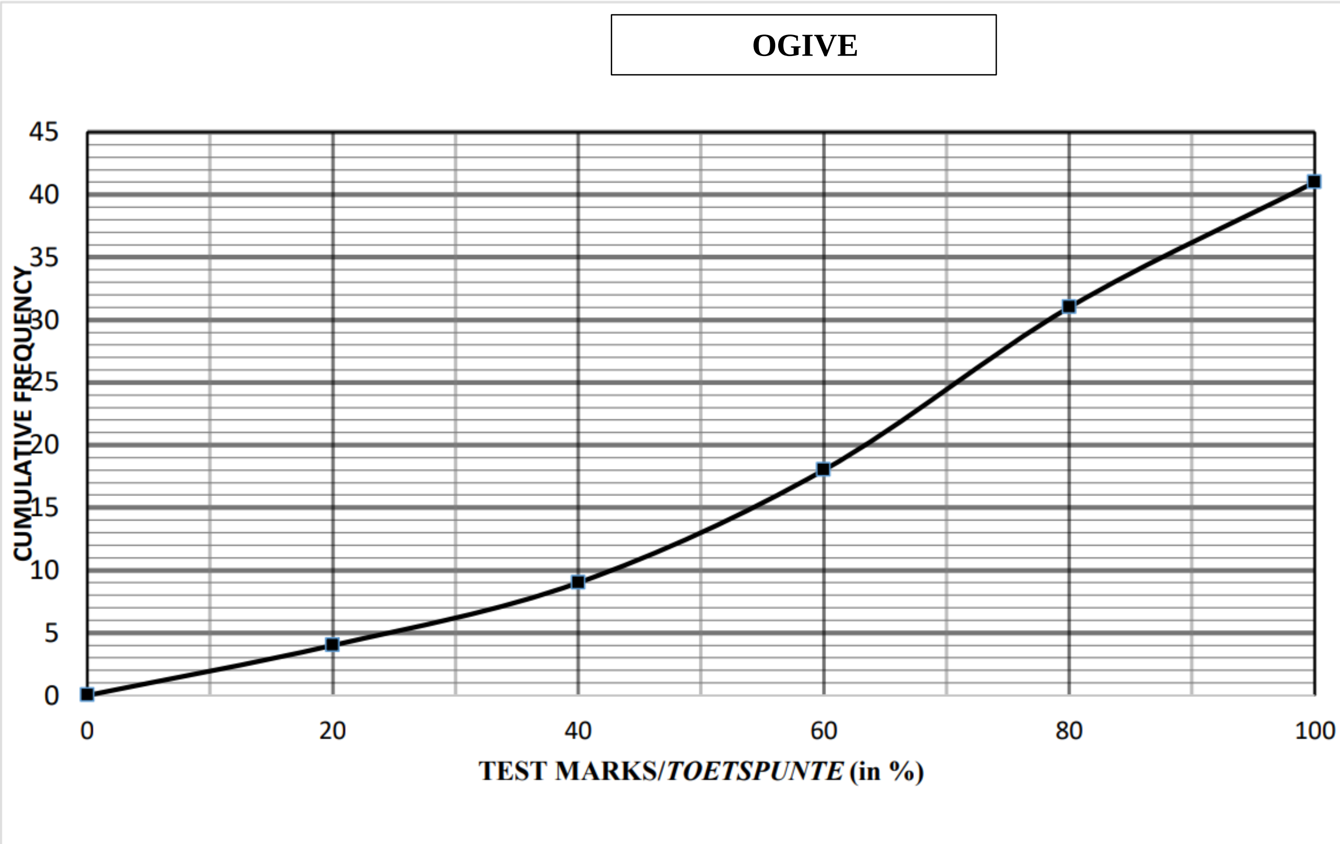
INTERVAL OF TEST MARKS/ *INTERVAL VAN TOETSPUNTE*	NUMBER OF LEARNERS/ *AANTAL LEERDERS*	CUMULATIVE FREQUENCY/ *KUMULATIEWE-FREKWENSIE*
$0 \le x < 20$	4	4
$20 \le x < 40$	5	9
$40 \le x < 60$	9	18
$60 \le x < 80$	13	31
$80 \le x < 100$	10	41

Max of 1/2 for 3 correct values in the table/
Maksimum van 1/2 vir 3 korrekte waardes in die tabel

</td><td>✓✓ ALL correct values in the table/ *ALLE korrekte waardes in die tabel*

(2)</td></tr>
</table>

1.4			



✓ using the cumulative frequency/*gebruik die kumulatiewefrekwensie*
✓ smooth curve/*gladde kurwe*
✓ using upper limits/*gebruik boonste limiete*

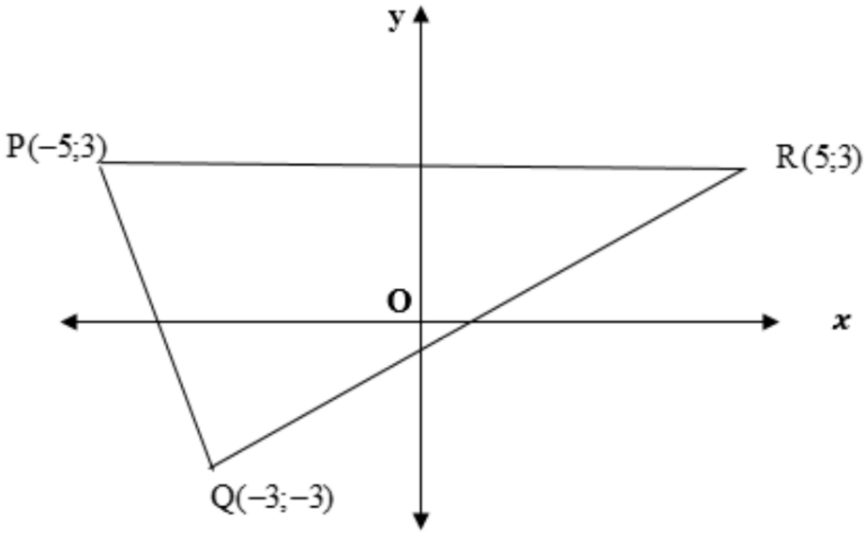
(3)

1.5	$IQR = Q_3 - Q1$ $= 68 - 33$ $= 35$ ACCEPT/***AANVAAR***: • 32 **OR/OF** 34 lower quartile/*laer kwartiel* • 67 **OR/OF** 69 upper quartile/*boonste kwartiel*	✓L Q ✓U Q ✓ *IQR* (3)
		[12]

QUESTION 2

2.1	$y = 12{,}01 + 0{,}88x$	✓ value of a/*waarde van a* ✓value of b/*waarde van b* ✓ equation / *vergelyking* (3)
2.2	$y = 12{,}01 + 0{,}88(46)$ $= 52\%$	✓sub. 46 into the equation / *vervang 46 in die vergelyking* ✓answer / *antwoord* (2)
2.3	No, the preparatory exam mark is the independent variable. Hence we cannot determine the prep. exam marks using the final exam./*Nee,die voorbereidende eksamenpunt is die onafhanklike veranderlike. Dus kan ons nie die voorbereidende eksamenpunt met behulp van die finale eksmenpunt bepaal nie.*	✓answer / *antwoord* ✓reason /*rede* (2)
2.4	$\bar{x} = 60{,}58$ $\bar{y} = 65{,}33$ LHS/ *ILK* $= y = 65{,}33$ RHS/*RK* $= 12{,}01 + 0{,}88(60{,}58) = 65{,}32$ LHS/*ILK* = RHS / *RK* $(\bar{x}\ ;\ \bar{y})$ lies on the regression line	✓ $\bar{x} = 60{,}58$ ✓ $\bar{y} = 65{,}33$ ✓sub. into RHS / *vervang in RK* ✓ LHS = RHS and conclusion / *LK = RK en gevolgtrekking* (4)
2.5	$r = 0{,}98$	✓ value of r / *waarde van r* (1)
2.6	There is a very strong positive correlation between prep. marks and final marks./ *Daar is'n sterk positiewe korrelasie tussen die voorbereidende punte en die finale punte.*	✓very strong / *baie sterk* ✓positive / *positief* (2) **[14]**

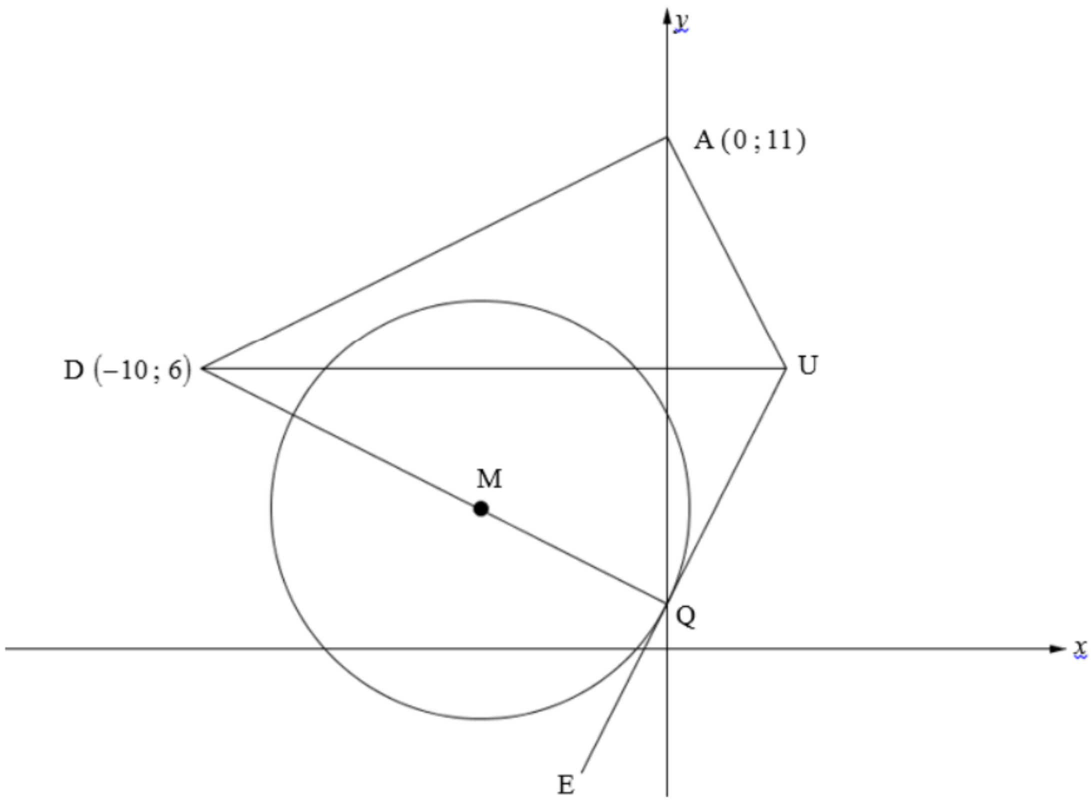
QUESTION 3



3.1	$QR = \sqrt{(5+3)^2 + (3+3)^2}$ $= \sqrt{64+36}$ $= \sqrt{100}$ $=10$	✓ substitution/ *vervang* ✓10 (2)

3.2	$M(\frac{5-3}{2};\frac{3-3}{2})$ $=M(1;0)$	✓ x-value/*waarde* ✓ y-value /*waarde* (2)
3.3	$P(-5;3)$ and $M(1;0)$: $m=\frac{0-3}{1+5}$ $=\frac{-1}{2}$ $y-0=-\frac{1}{2}(x-1)$ $y=-\frac{1}{2}x+\frac{1}{2}$	✓ m ✓ subst of m and point/ *vervang m en punt* ✓ equation/*vergelyking* (3)
3.4	$r=5$; centre $(1;0)$: $(x-1)^2+y^2=25$	✓ r = 5 and/*en* (1;0) ✓ LHS/*LK* ✓ RHS/*RK* (3)
3.5	$PM=\sqrt{(1+5)^2+(-3)^2}$ $=\sqrt{45}$ $>\sqrt{25}$ $\therefore$ P lies OUTSIDE the circle.	✓ $PM=\sqrt{45}$ ✓ $>\sqrt{25}$ ✓ conclusion/*gevolgtrekking* (3)
3.6	S(3;9)	✓ x-value/*waarde* ✓ y –value/*waarde* (2)
3.7	$m_{PQ}=\frac{3+3}{-5+3}=-3$ $\tan\theta=-3$ $\theta=180°-71{,}57°$ $=108{,}43°$ $\beta=71{,}57°$ co-interior angles, PR $\parallel$ x-axis.	✓ $m_{PQ}=-3$ ✓ $\tan\theta=-3$ ✓ $\theta=108{,}43°$ ✓ $\beta=71{,}57°$ (4)
		[19]

QUESTION 4 / *VRAAG 4*

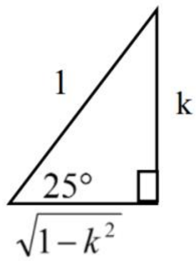


4.1	$x^2+8x+16+y^2-6y+9=20$ $(x+4)^2+(y-3)^2=20$ $\therefore M(-4\,;\,3)$	✓ completing square *kwadraatsvoltooiing* ✓ $(x+4)^2+(y-3)^2=20$ ✓ x-coordinate / *x-koördinaat* ✓ y-coordinate / *y-koördinaat*	(4)
4.2	$(0+4)^2+(y-3)^2=20$ $(y-3)^2=4$ $y=3\pm 2$ $\therefore y=1$ Q (0; 1)	✓ subst. $x=0$ into circle equation *verv. $x=0$ in sirkel vergelyking* ✓ $(y-3)^2=4$ ✓ $y=1$	(3)
4.3	$m_{radius}=\dfrac{3-1}{-4-0}=-\dfrac{1}{2}$ $m_{\tan/rkl}=2$ $y-1=2(x-0)$ [tangent ⊥ radius] *[raaklyn ⊥* $\therefore y=2x+1$	✓ $m_{rad}=-\dfrac{1}{2}$ ✓ $m_{\tan}=2$ / $m_{raaklyn}=2$ ✓ subst. $m_{\tan/rkl}=2$ and Q into correct form. / *verv.* $m_{\tan/rkl}=2$ *en Q in korrekte formule.* ✓ equation / *vergelyking*	(4)
4.4	$y=6$	✓ answer / *antwoord*	(1)

[20]

4.5	$6 = 2x + 1$ $x = \frac{5}{2}$ $\text{U}\left(\frac{5}{2}\,;\,6\right)$	✓ $6 = 2x + 1$ ✓ $x = \frac{5}{2}$	(2)
4.6	$m_{\text{AU}} = \frac{11-6}{0-\frac{5}{2}}$ $= -2$ $m_{\text{AD}} = \frac{6-11}{-10-0}$ $= \frac{1}{2}$ $m_{\text{AU}} \times m_{\text{DA}} = -2 \times \frac{1}{2}$ $= -1$ $\therefore$ AU $\perp$ DA $\therefore$ $\hat{\text{A}} = 90^\circ$ $\text{D}\hat{\text{Q}}\text{U} = 90^\circ$ [tangent $\perp$ radius] / [*raaklyn $\perp$ radius*] $\therefore$ QUAD is a cyclic quad.[opp. $\angle^s$ add up to 180º] *QUAD is 'n koordevierhoek [teenoorst. $\angle^e$ se som is 180º]*	✓ $m_{\text{AU}} = -2$ ✓ $m_{\text{AD}} = \frac{1}{2}$ ✓ $m_{\text{AU}} \times m_{\text{DA}} = -1$ ✓ $\hat{A} = 90°$ ✓ $D\hat{Q}U = 90°$ ✓ R	(6)
			[20]

QUESTION 5

5.1.1	$y^2 = 1^2 - (\sqrt{1-k^2}\ )^2$ $= 1 - 1 + k^2$ $= k^2$ $y = k$  $\sin 25° = k$	✓ diagram and/*en* Pythagoras ✓ $\sin 25° = k$ (2)
5.1.2	$\sin 50° = 2\sin 25° \cos 25°$ $= 2k\sqrt{1-k^2}$	✓ double angle expansion/ *Brei dubbelhoek uit* ✓ substitution/*vervang* (2)

5.2.1	$\dfrac{\sin(180°-70°).\tan 60°}{\cos 180°.\tan(180°+70°).\sin 20°}$ $\dfrac{\sin 70°.\tan 60°}{(-1)\tan 70°.\sin 20°}$ $\dfrac{\sin 70°.\sqrt{3}}{(-1).\dfrac{\sin 70°}{\cos 70°}.\cos 70°}$ $= -\sqrt{3}$	✓ $\sin 70°$ ✓ $\cos 180°$ ✓ $\tan 70°$ ✓ $\sin 20°$ ✓ $\dfrac{\sin 70°}{\cos 70°}$ ✓ $\sin 20° = \cos 70°$ ✓ $-\sqrt{3}$ (7)
5.2.2	$1 - 2\sin^2 22,5°$ $\cos 2(22,5°)$ $\cos 45°$ $= \dfrac{1}{\sqrt{2}}$ $= \dfrac{\sqrt{2}}{2}$	✓ $1 - 2\sin^2 22,5°$ ✓ $\cos 2(22,5°)$ ✓ $\cos 45°$ ✓ $\dfrac{1}{\sqrt{2}}$ (4)

5.3	LHS $= \dfrac{\cos x+\sin x}{\cos x-\sin x} - \dfrac{\cos x-\sin x}{\cos x+\sin x}$ RHS $= 2\tan 2x$ $= \dfrac{(\cos x+\sin x)^2 - (\cos x-\sin x)^2}{(\cos x-\sin x)(\cos x+\sin x)}$ $= \dfrac{\cos^2 x+2\sin x\cos x+\sin^2 x-\cos^2 x+2\sin x\cos x-\sin^2 x}{\cos^2 x-\sin^2 x}$ $= \dfrac{2(2\sin x\cos x)}{\cos^2 x-\sin^2 x}$ $= \dfrac{2\sin 2x}{\cos 2x}$ $= 2\tan 2x$ $=$ RHS	✓ single fraction ✓ expansion ✓ simplification (both) ✓ double ∠ identity ✓ double ∠ identity (5)
	OR/*OF* LHS $= \dfrac{\cos x+\sin x}{\cos x-\sin x} - \dfrac{\cos x-\sin x}{\cos x+\sin x}$ RHS $= 2\tan 2x$ $= \dfrac{(\cos x+\sin x)^2 - (\cos x-\sin x)^2}{(\cos x-\sin x)(\cos x+\sin x)}$ $= \dfrac{(\cos x+\sin x+\cos x-\sin x)(\cos x+\sin x-\cos x+\sin x)}{\cos^2 x-\sin^2 x}$ $= \dfrac{(2\cos x)(2\sin x)}{\cos^2 x-\sin^2 x}$ $= \dfrac{2(2\sin x\cos x)}{\cos^2 x-\sin^2 x}$ $= \dfrac{2\sin 2x}{\cos 2x}$ $= 2\tan 2x$ $=$ RHS	✓ single fraction ✓ difference of two squares ✓ simplification (both) ✓ double ∠ identity ✓ double ∠ identity (5)
	OR/*OF* RHS $= 2\tan 2x$ $= \dfrac{2\sin 2x}{\cos 2x}$ $= \dfrac{2(2\sin x.\cos x)}{\cos^2 x-\sin^2 x}$ $= \dfrac{4\sin x.\cos x}{\cos^2 x-\sin^2 x}$ $= \dfrac{1+2\sin x.\cos x-(1-2\sin x.\cos x)}{\cos^2 x-\sin^2 x}$ $= \dfrac{(\cos x+\sin x)^2-(\cos x-\sin x)^2}{(\cos x+\sin x)(\cos x-\sin x)}$ $= \dfrac{(\cos x+\sin x)^2}{(\cos x+\sin x)(\cos x-\sin x)} - \dfrac{(\cos x-\sin x)^2}{(\cos x+\sin x)(\cos x-\sin x)}$ $= \dfrac{\cos x+\sin x}{\cos x-\sin x} - \dfrac{\cos x-\sin x}{\cos x+\sin x} =$ LHS	✓ double ∠ identity ✓ double ∠ identity ✓ identity & method ✓ factorising numerator and denominator ✓ writing as 2 terms (5)

5.4	$\sin\theta\sin\frac{3\theta}{2}+\cos\frac{3\theta}{2}\cos\theta=-\frac{\sqrt{3}}{2}$ $\cos\frac{3\theta}{2}\cos\theta+\sin\frac{3\theta}{2}\sin\theta=-\frac{\sqrt{3}}{2}$ $\cos\left(\frac{3\theta}{2}-\theta\right)=-\frac{\sqrt{3}}{2}$ $\cos\left(\frac{\theta}{2}\right)=-\frac{\sqrt{3}}{2}$ $\frac{\theta}{2}=150^\circ+k.360^\circ\ \ k\in Z$ or/ *of* $\frac{\theta}{2}=-150^\circ+k.360^\circ\ \ k\in Z$ $\theta=300^\circ+k.720^\circ\ \ k\in Z$ $\theta=-300^\circ+k.720^\circ\ \ k\in Z$ **OR / *OF*** *ref* $\angle=30^\circ$ $\frac{\theta}{2}=180^\circ-30^\circ+k.360^\circ$ or / *of* $\frac{\theta}{2}=180^\circ+30^\circ+k.360^\circ;k\in Z$ $\theta=300^\circ+k.720^\circ$ or / *of* $\theta=420^\circ+k.720^\circ$	✓ $\cos\left(\frac{3\theta}{2}-\theta\right)$ ✓ $\frac{\theta}{2}=\pm150^\circ+k.360^\circ$ ✓ $\theta=300^\circ+k.720^\circ$ ✓ $\theta=-300^\circ+k.720^\circ$ (4) **OR / *OF*** ✓ $\frac{\theta}{2}=180^\circ\pm30^\circ+k.360^\circ$ ✓ 300º+k.720º ✓ 420º+k.720º (4)
5.5.	Maximum value is 1 and minimum value is –1 / *Maksimum waarde is 1 en mimimum waarde –1*	✓answer /*antw.* (1)

[26]

QUESTION 6

6.1	$a=1$ $b=2$ $c=2$ $d=1$	✓ $a=1$ ✓ $b=2$ ✓ $c=2$ ✓ $d=1$ (4)
6.2	$P(21{,}44°;0{,}73)$	✓ correct substitution (2)
6.3.1	$x=90°$	✓ 90° (1)
6.3.2	$x\in[45°;135°]$ OR $45°\le x\le135°$	✓ 45° *and* 135° ✓ Notation (2)
		[9]

QUESTION 7

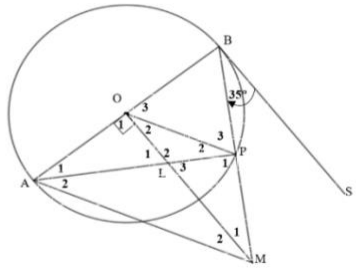
7.1	n ΔPQR: $\hat{Q}_1 = x \quad (PR = QR)$ $\hat{R} = 180° - 2x \quad (sum\ of\ \angle\ \Delta PQR)$ $Area\ of\ \Delta PQR = \frac{1}{2}pq\sin\hat{R}$ $= \frac{1}{2}m.m\sin(180° - 2x)$ $= \frac{1}{2}m^2\sin 2x$	A✓$\hat{Q}_1 = x$ A✓$\hat{R} = 180° - 2x$ A✓Subst. into Area rule A✓sin2x A✓answer (5)

7.2	$\therefore \frac{PQ}{\sin(180° - 2x)} = \frac{m}{\sin x}$ $\therefore PQ = \frac{m.\sin(180° - 2x)}{\sin x}$ $\therefore PQ = \frac{m.\sin 2x}{\sin x}$ $\therefore PQ = \frac{m.2\sin x.\cos x}{\sin x}$ $\therefore PQ = 2m\cos x$	A✓Use of sine rule A✓subst into sine Rule A✓sin $2x$ A✓2 sin x cos x (4)
7.3	In ΔSPQ: $\tan y = \frac{SP}{PQ}$ $\therefore SP = PQ\tan y$ $\therefore SP = 2m\cos x\tan y$	A✓$\tan y = \frac{SP}{PQ}$ A✓SP = PQ tan y (2)

[11]

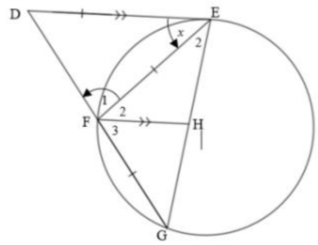
QUESTION 8

8.1.1	90^0	(1)
8.1.2	Supplementary	(1)

8.2					
8.2.1	(a)	$\hat{A}_1 = 35°$ [tan- chord thm/ *raakl-koordstelling*]	✓S ✓R	(2)	K
	(b)	$\hat{O}_3 = 70°$ [$\angle$ at centre = 2 $\angle$ at circumf/ *middelpts*$\angle$ = 2 *omtr.*$\angle$	✓S ✓R	(2)	K
	(c)	$\hat{P}_3 = 55°$ [$\sum$ interior/ *binne* $\angle$ of/ *van* (isosceles/*gelykbenige*) Δ]	✓S ✓R	(2)	K
	(d)	$B\hat{O}M = 90°$ [adjacent/ *aanligg* – suppl.] And/ *en* $O\hat{B}M = 55°$ ° **[$\sum \angle$ *s* of/ *van* (isosceles/*gelykbenige*) Δ]** **OR/ *OF* [$\angle$s opposite = radii/ sides/ $\angle$*e teenoor* = *radiusse*/ *sye*]** **OR/*OF* $O\hat{B}S = 90°$ [tan/ *raakl.*$\perp$ radius]** $\therefore \hat{M}_1 = 35°$ [$\sum \angle$ *s* of/ *van* Δ] **OR/OF** $A\hat{P}B = 90°$ [$\angle$ in semi circle/ $\angle$ *in halwe sirkel*] $\therefore \hat{P}_1 = 90°$ [adj./ *aanligg.*/ suppl] $= \hat{O}_1$ AMPO is cycl quad/ *is 'n kvh* [conv. $\angle$s Subt by same chord/ *omg.* $\angle$e *ondersp. deur selfde koord]* $\therefore \hat{M}_1 = \hat{A}_1 = 35°$ [$\angle$s Subt by same chord/ $\angle$e *ondersp. deur selfde koord*	✓S/ R ✓S/ R ✓S	(3)	K
8.2.2	(a)	$A\hat{P}B = 90°$ [$\angle$in semi-circle/ $\angle$ *in halwe sirkel*] $= \hat{O}_1$ [Given/ *Gegee*] $\therefore$OLPB is a cycl. quad/ *is 'n kvh* [ext$\angle$=opp. int $\angle$/ *buite*$\angle$=*teenoorst. binne*$\angle$]	✓S ✓R ✓R	(3)	R
	(b)	$O\hat{B}S = 90°$ [tan/ *raakl.*$\perp$ radius] $= \hat{O}_1$ [Given/ *Gegee*] $\therefore$ BS // OM [corresp.$\angle$s =/ *ooreenk.*$\angle$*e* =] OR/ *OF* $O\hat{B}S = 90°$ [tan/ *raakl.*-radius] $= B\hat{O}M$ [Proved/ *Bewys*] $\therefore$ BS // OM [co-int.$\angle$s suppl./ *ko-binne* $\angle$*e suppl.*] OR/ *OF* $\hat{M}_1 = 35°$ [Proved/ *Bewys*] $= M\hat{B}S$ [Given/ *Gegee*] $\therefore$ BS // OM [alt.$\angle$s =/ *verw.*$\angle$*e* =]	✓S/ R ✓R ✓S/ R ✓R ✓S ✓R	(2) (2) (2)	R
	(c)	$\hat{P}_2 = \hat{A}_1 = 35°$ [$\angle$s opposite = sides/radii/ $\angle$*e teenoor* = *sye*/ *radiusse*] $= \hat{M}_1$ $\therefore$ OP is a tangent to the circle through P, L and M [converse tan-chord thm/ *omgekeerde raakl-koordstelling*]	✓S ✓R ✓R	(3)	R

[19]

QUESTION/ *VRAAG* 9

#	Suggested answer(s)/ *Voorgestelde antwoord(e)*	Descriptors/ *Beskrywers*	Mark/ *Punt*	
	 			
9.1	$\hat{EFH} = x$ [alt.∠s; DE//FH/ *verw.∠e; DE//FH*]	✓ S ✓ R	3	K
	$\hat{G} = x$ [tan- chord thm/ *raakl-koordstelling*]	✓ S ✓ R		
	$\hat{FEG} = \hat{G} = x$ [∠s opposite = sides/ *∠e teenoor* = sye]	✓ S ✓ R		
9.2.1	$\frac{EH}{HG} = \frac{DF}{FG}$ [FH//DE or line // 1 side of Δ/ *lyn // 1 sy van Δ*] $= \frac{DF}{DE}$ [FG = DE; given/ *Gegee*] $= y$	✓ S ✓ R ✓ S	(3)	R
9.2.2	In ΔDEF: $\hat{D} = \frac{180° - x}{2}$ [$\sum\angle s$ of/ *van* (isosceles/*gelykbenige*) Δ] In ΔDEG: $\hat{D} = 180° - 3x$ [$\sum\angle s$ of/ *van* Δ] $\therefore \frac{180° - x}{2} = 180° - 3x$ $\therefore 180° - x = 360° - 6x$ $\therefore 5x = 180°$ $\therefore x = 36°$ $\therefore \hat{D} = \frac{180° - 36°}{2} = 72°$	✓ S ✓ R ✓ S ✓ (equating/ *gelyk stel*) ✓ Simplify/ *Vereenvoudig* ✓ value of/ *waarde van x*	(5)	C

9.2.3	In ΔDGE and/ *en* ΔDEF: 1. $\hat{D}$ is common/ *gemeen* 2. $\hat{G} = \hat{DEF} = x$ [proved/ *bewys*] 3. $\therefore \hat{DEG} = \hat{DFE}$ [3rd/ *3de* ∠] ∴ ΔDGE ||| ΔDEF [∠, ∠, ∠]	✓ S ✓ S ✓ S OR/ *OF* ✓ R (∠, ∠, ∠) (Can also work with 72° etc)	(3)	R
9.2.4	$\therefore \frac{DG}{DE} = \frac{GE}{EF} = \frac{DE}{DF}$ from/ *vanaf* 9.2.3 OR/ *OF* ΔDGE ||| ΔDEF $\Rightarrow DE^2 = DF.DG$	✓ S ✓ R ***Can only give needed 2 ratios***	(2)	K
9.2.5	$\frac{DE}{DF} = \frac{DG}{DE}$ $\frac{1}{y} = \frac{DF+FG}{DE}$ $= \frac{DF}{DE} + \frac{FG}{DE}$ $= y + 1$ $\therefore y^2 + y = 1$	✓ S Correct Proportion/ *Korrekte Eweredigheid* ✓ $\frac{DE}{DF} = \frac{1}{y}$ ✓ $\frac{DG}{DE} = \frac{DF+FG}{DE}$ ✓ $\frac{1}{y} = \frac{DF}{DE} + \frac{FG}{DE}$ ✓ $\frac{FG}{DE} = 1$	(5)	P