

MATHEMATICS – P2

LAST PUSH



Province of the
EASTERN CAPE
EDUCATION



education
Department of
Education
FREE STATE PROVINCE



KWAZULU-NATAL PROVINCE
EDUCATION
REPUBLIC OF SOUTH AFRICA



LIMPOPO
PROVINCIAL GOVERNMENT
REPUBLIC OF SOUTH AFRICA

TRIALS MEMOS

ALL PROVINCES – 2026



education
MPUMALANGA PROVINCE
REPUBLIC OF SOUTH AFRICA



Northern Cape
Department of Education



education
Department:
Education
North West Provincial Government
REPUBLIC OF SOUTH AFRICA



Western Cape
Government
FOR YOU
Education

Compiled by



GAUTENG PROVINCE
EDUCATION
REPUBLIC OF SOUTH AFRICA

Table of contents

QUESTIONS PER TOPIC

Province	Pages
EC	1 – 17
FS	18 – 37
GP	38 – 60
KZN	61 – 75
LP	76 – 93
MP	94 – 113
NC	114 – 127
NW	128– 148
SACAI	149 – 168
WC	169 – 191





Province of the
EASTERN CAPE
EDUCATION

Iphondo leMpuma Kapa: Isebe leMfundo
Provinsie van die Oos Kaap: Departement van Onderwys
Porafensie Ya Kapa Botjahabela: Lefapha la Thuto

NATIONAL/*NASIONALE* SENIOR CERTIFICATE/*SERTIFIKAAT*

GRADE/*GRAAD* 12

SEPTEMBER 2026

**MATHEMATICS P2/*WISKUNDE V2*
MARKING GUIDELINE/*NASIENRIGLYN***

MARKS/*PUNTE*: 150

This marking guideline consists of 17 pages.
Hierdie nasienriglyn bestaan uit 17 bladsye.

NOTE

- If a candidate answers a question TWICE, only mark the FIRST attempt.
- If a candidate has crossed out an attempt of a question and not redone a question, mark the crossed-out version.
- Consistency accuracy applies in ALL aspects of the marking guideline. Stop marking at the second calculation error.
- Assuming answers/values in order to solve a problem is NOT acceptable.

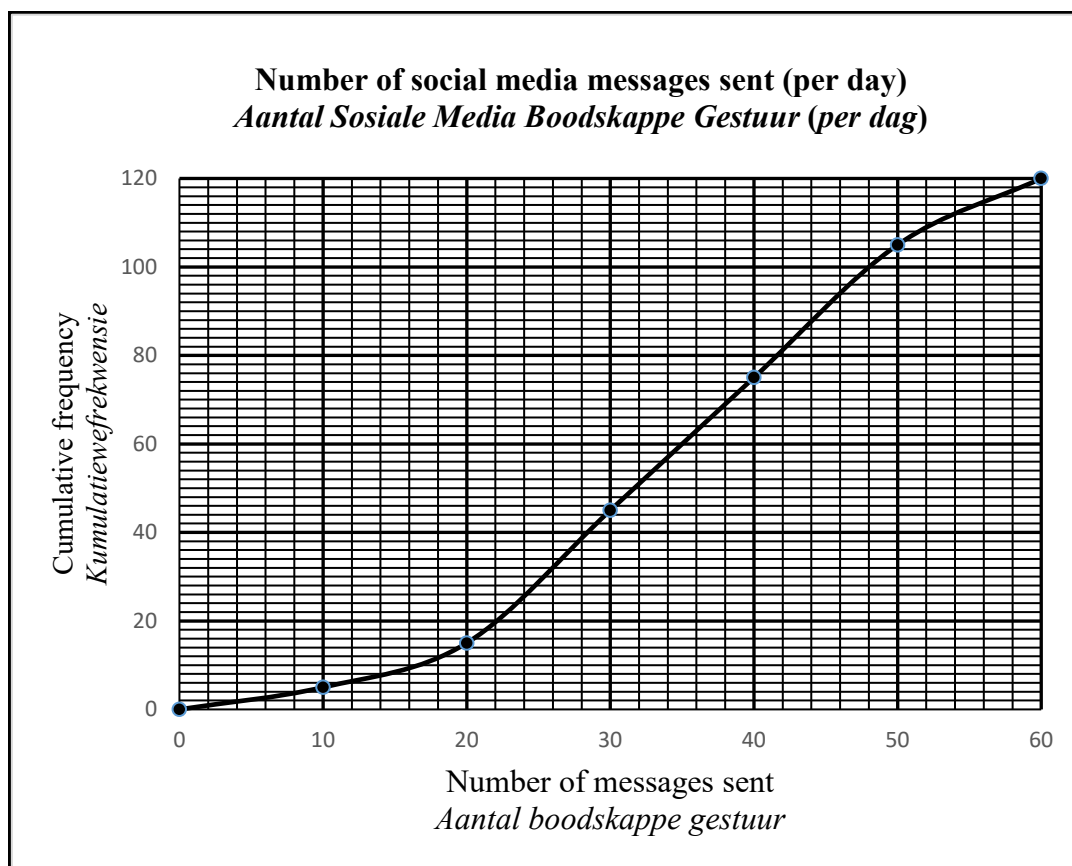
GEOMETRY	
S	A mark for a correct statement. (A statement mark is independent of a reason).
R	A mark for the correct reason. (A reason mark may only be awarded only if the statement is correct.
S/R	Award a mark if a statement and a reason are both correct.

NOTA:

- *As 'n kandidaat 'n vraag TWEEKEER beantwoord, merk slegs die EERSTE poging.*
- *As 'n kandidaat 'n poging van 'n vraag doodtrek en dit nie oordoen nie, merk die doodgetrekte poging.*
- *Volgehoue akkuraatheid word in ALLE aspekte van die nasienriglyn toegepas. Hou op nasien by die tweede berekeningsfout.*
- *Om antwoorde/waardes te aanvaar om 'n probleem op te los, word NIE toegelaat nie.*

MEETKUNDE	
S	'n Punt vir korrekte bewering. ('n Punt vir 'n bewering is onafhanklik van die rede.)
R	'n Punt vir 'n korrekte rede. ('n Punt word slegs vir die rede toegeken as die bewering korrek is.)
S/R	Ken 'n punt toe as die bewering en rede beide korrek is.

QUESTION/VRAAG 1

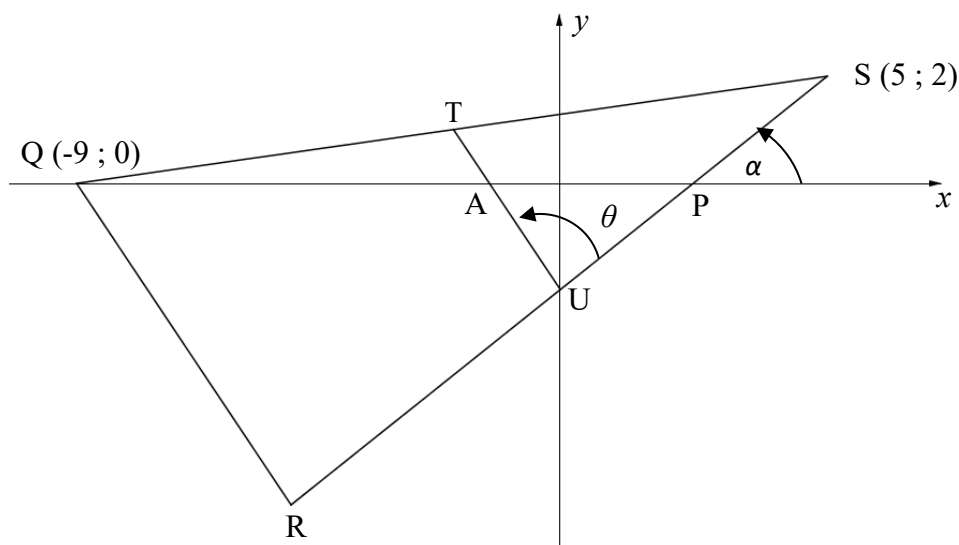


1.1	104 learners/ <i>leerders</i>	✓✓ answer/ <i>antwoord</i>	(2)
1.2	$Q_2 = 35$	✓✓ answer/ <i>antwoord</i>	(2)
1.3	$Q_1 = 25$ $Q_3 = 45$ $IQR / IKV = 45 - 25 = 20$	✓ Q_1 ✓ Q_3 ✓ answer/ <i>antwoord</i>	(3)
1.4	Number of messages sent / <i>Aantal boodskappe gestuur</i>	✓ correct min & max ✓ correct box and whisker diagram	(2)
1.5	mean > median which indicates that the data is positively skewed, meaning fewer learners sent significantly more messages than the rest. <i>gemiddelde > mediaan wat aandui dat die data positief skeef is, wat beteken dat minder leerders baie meer boodskappe as die res gestuur het.</i>	✓ mean > median <i>gemiddelde > mediaan</i> ✓ explanation <i>verduideliking</i>	(2)
			[11]

QUESTION/VRAAG 2

<table><tr><th>Learner / Leerder</th><th>1</th><th>2</th><th>3</th><th>4</th><th>5</th><th>6</th><th>7</th><th>8</th></tr><tr><th>Number of hours (x) <i>Aantal ure (x)</i></th><td>5</td><td>12</td><td>15</td><td>20</td><td>25</td><td>30</td><td>42</td><td>45</td></tr><tr><th>Javelin distance (y) <i>Spiesgooi afstand (y)</i></th><td>130</td><td>118</td><td>115</td><td>95</td><td>88</td><td>72</td><td>48</td><td>30</td></tr></table>									Learner / Leerder	1	2	3	4	5	6	7	8	Number of hours (x) <i>Aantal ure (x)</i>	5	12	15	20	25	30	42	45	Javelin distance (y) <i>Spiesgooi afstand (y)</i>	130	118	115	95	88	72	48	30	
Learner / Leerder	1	2	3	4	5	6	7	8																												
Number of hours (x) <i>Aantal ure (x)</i>	5	12	15	20	25	30	42	45																												
Javelin distance (y) <i>Spiesgooi afstand (y)</i>	130	118	115	95	88	72	48	30																												
2.1	$\delta = 32,89$					✓✓ answer/antwoord			(2)																											
2.2	$r = -0,99$					✓ answer/antwoord			(1)																											
2.3	$a = 146,80$ $b = -2,47$ $y = 146,80 - 2,47x$					✓ a ✓ b ✓ answer/antwoord			(3)																											
2.4.1	$y = 146,80 - 2,47(35)$ $= 60,35$					✓ correct substitution <i>korrekte vervanging</i> ✓ answer/antwoord			(2)																											
2.4.2	No, as the strong negative correlation suggests that more gym training is associated with decreasing throwing distances. <i>Nee, soos die sterk negatiewe korrelasie voorstel dat meer gimnasium oefening word assosieer met afname in spiesgooi afstande.</i>					✓ for No / <i>vir Nee</i> ✓ explanation/ <i>verduideliking</i>			(2)																											
									[10]																											

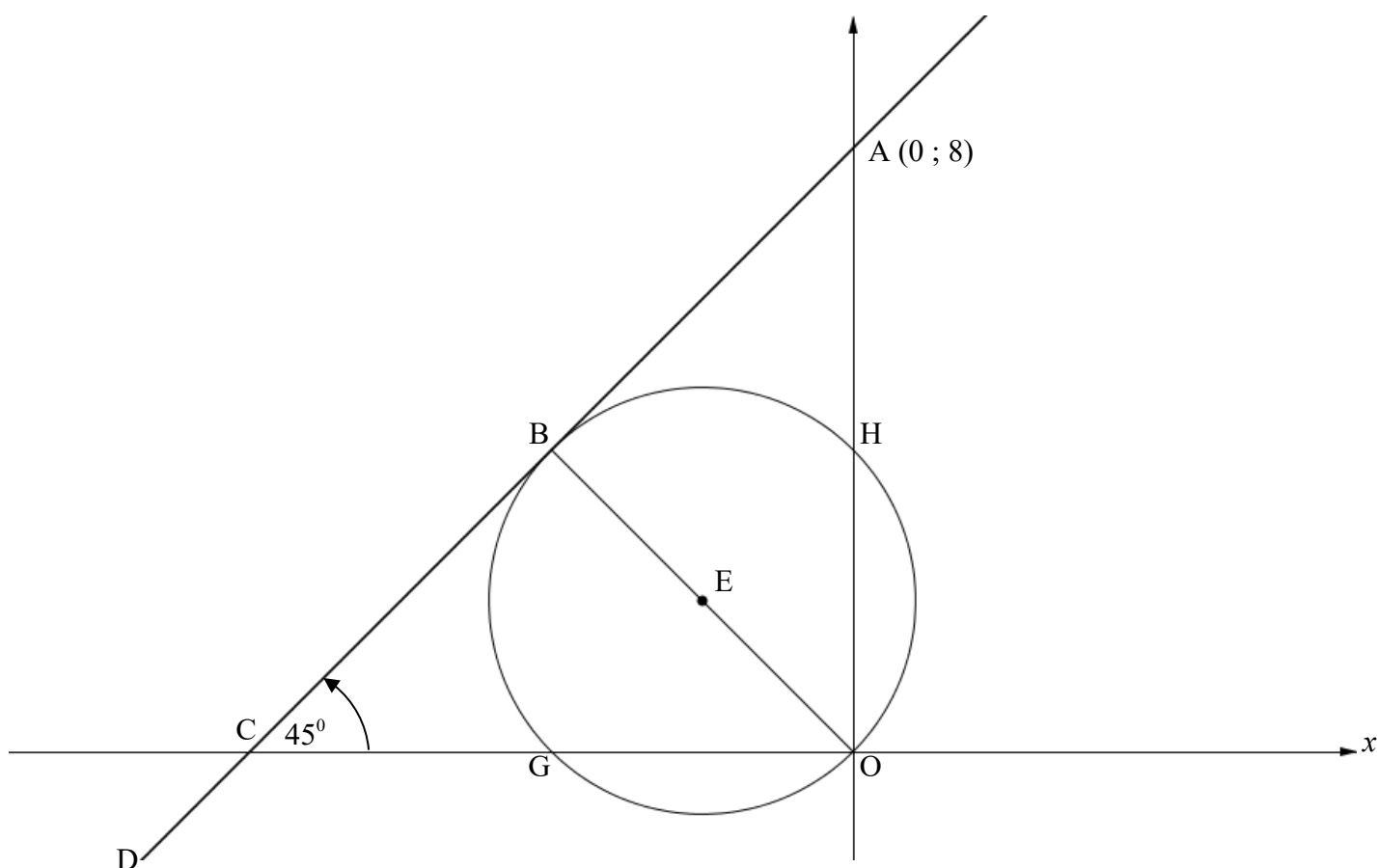
QUESTION/VRAAG 3



3.1	$x_T = \frac{-9+5}{2}; y_T = \frac{0+2}{2}$ $x_T = -2; y_T = 1$ $T(-2; 1)$	$\checkmark x_T = -2 \quad \checkmark y_T = 1$	(2)
3.2	$5y = 4(0) - 10$ $y = -2$ $U(0; -2)$	$\checkmark x = 0$ $\checkmark y = -2$	(2)
3.3	$SU = \sqrt{(5-0)^2 + (2+2)^2}$ $= \sqrt{41}$	$\checkmark$ correct substitution <i>korrekte vervanging</i> $\checkmark$ answer/antwoord	(2)
3.4	$y = -\frac{3}{2}x - \frac{27}{2}$ $m_{QR} = -\frac{3}{2}$ $m_{TU} = \frac{1+2}{-2-0}$ $= -\frac{3}{2}$ $\therefore QR \parallel TU \quad [m_{QR} = m_{TU}]$	$\checkmark m_{QR}$ $\checkmark$ correct substitution <i>korrekte vervanging</i> $\checkmark m_{TU}$	(3)
3.5	$TU = \sqrt{(-2-0)^2 + (1+2)^2}$ $= \sqrt{13}$ $QR = 2TU = 2\sqrt{13} \text{ [line through midpt to 2nd side]}$ $\text{[lyn deur middelpunt aan 2de sy]}$	$\checkmark TU = \sqrt{13}$ $\checkmark QR = 2\sqrt{13}$	(2)

3.6	$\tan \hat{TAP} = m_{TU} = -\frac{3}{2}$ $\hat{TAP} = 123.69^0$ $\tan \alpha = m_{SR} = \frac{4}{5}$ $\alpha = 38,66^0$ $\therefore \theta = 85.03^0$	$\checkmark \tan \hat{TAP} = m_{TU}$ $\checkmark$ inclination of TU <i>inklinasie van TU</i> $\checkmark$ inclination of SR <i>inklinasie van SR</i> $\checkmark$ answer/antwoord	(4)
3.7	$\hat{R} = \theta = 85.03^0$ [corresp. $\angle$ s: QR TU] / [ooreenk. $\angle$ e: QR TU] SR = 2SU [Midpoint Theorem.] / [Middelpunt Stelling] A. of $\Delta SQR = \frac{1}{2} \times SR \times QR \sin R$ $= \frac{1}{2} \times 2\sqrt{41} \times 2\sqrt{13} \times \sin 85,03^0$ $= 46$	$\checkmark \hat{R} = \theta$ $\checkmark$ SR=2SU $\checkmark$ correct substitution <i>korrekte vervanging</i> $\checkmark$ answer/antwoord	(4)
			[19]

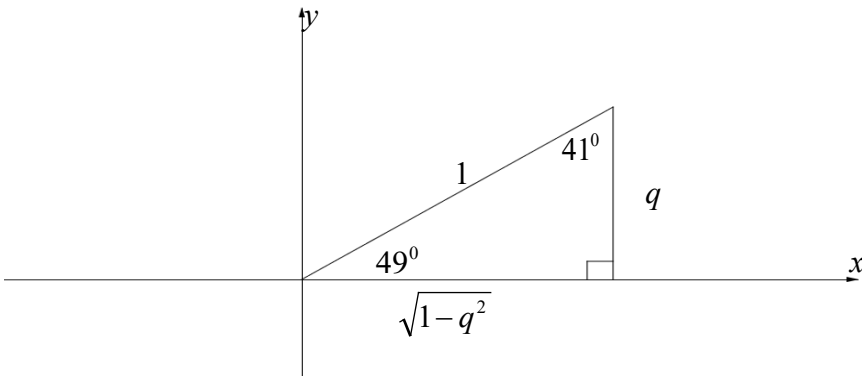
QUESTION/VRAAG 4



4.1	$m_{AD} = \tan 45^\circ = 1$	✓ answer/antwoord	(1)
4.2	$m_{OB} = -1$ $0 = -1(0) + c$ $c = 0$ $\therefore y = -x$	✓ gradient of OB <i>gradiënt van OB</i> ✓ correct substitution <i>korrekte vervanging</i> $O(0; 0)$ ✓ equation/vergeliking	(3)
4.3	$-x = x + 8$ $-2x = 8$ $x = -4$ $y = -(-4) = 4$ $B(-4; 4)$	✓ equating equations <i>gelyk stel van vergelykings</i> ✓ x-coordinate / x-koördinaat ✓ y-coordinate/y-koördinaat	(3)
4.4	$OB = \sqrt{(0 - (-4))^2 + (0 - 4)^2}$ $= 4\sqrt{2}$ $\therefore r = 2\sqrt{2}$	✓ correct substitution <i>korrekte vervanging</i> ✓ length of OB/lengthe van OB ✓ radius/radius	(3)

4.5	$x_E = \frac{0-4}{2} ; y_E = \frac{0+4}{2}$ $= -2 ; = 2$ $\therefore (x+2)^2 + (y-2)^2 = 8$	$\checkmark x_E$ $\checkmark y_E$ $\checkmark \text{ LHS/LK}$ $\checkmark \text{ RHS/RK}$	(4)
4.6	$m_{\text{tan}} = 1$ $y - 0 = 1(x - 0)$ [tangent passing through origin] <i>[raaklyn gaan deur die oorsprong]</i> $y = x$ $t = 0$ or $t = 8$	$\checkmark \checkmark$ answer/antwoord	(2)
4.7	$D_{\text{between 2 centres}} = \sqrt{(4+2)^2 + (8-2)^2}$ $= 6\sqrt{2} = 8,49$ $r_1 + r_2 = 2\sqrt{2} + 3 = 5,83$ $\therefore$ The 2 circles do not touch each other. [$D > r_1 + r_2$] <i>Die 2 sirkels raak nie mekaar nie.</i>	$\checkmark$ D between 2 centres <i>afstand tussen 2 middelpunte</i> $\checkmark r_1 + r_2$ $\checkmark$ conclusion/ $\checkmark$ R <i>gevolgtrekking</i>	(4)
			[20]

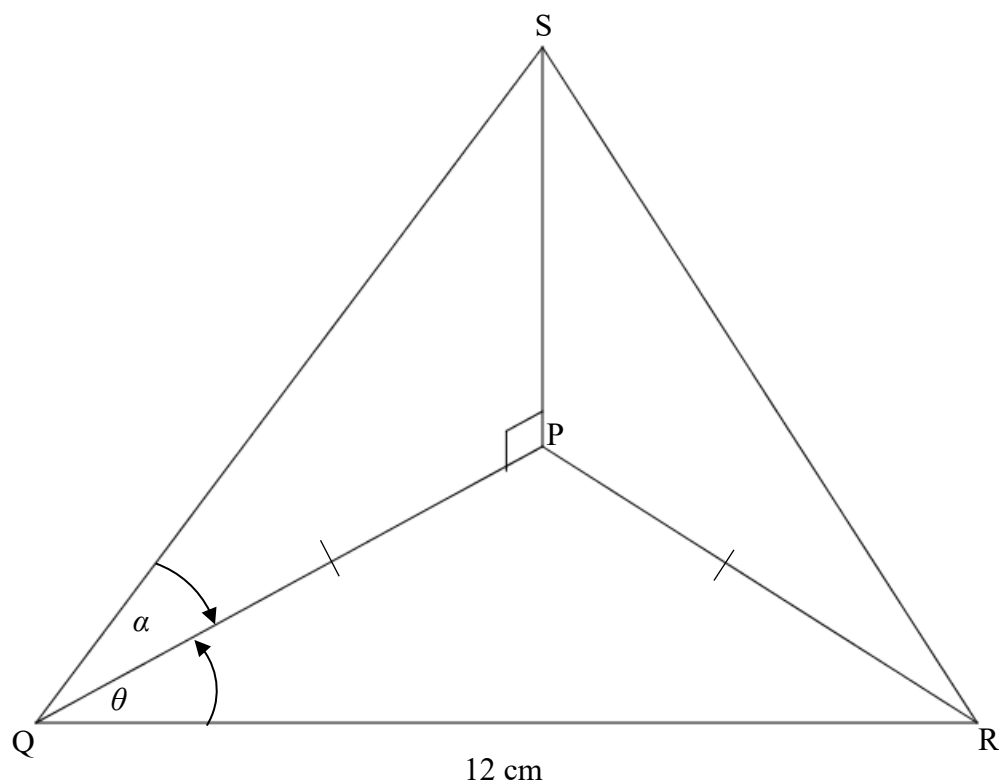
QUESTION/VRAAG 5

5.1.1			
	$1^2 = x^2 + q^2$ $x = \sqrt{1 - q^2}$ $\tan 41^\circ = \frac{\sqrt{1 - q^2}}{q}$	✓ x from Pythagoras or diagram above <i>x vanaf Pythagoras of diagram hierbo</i> ✓ answer/antwoord	(2)
5.1.2	$\cos 229^\circ = -\cos 49^\circ$ $= -\sqrt{1 - q^2}$	✓ reduction/reduksie ✓ answer/antwoord	(2)
5.1.3	$\sin 4^\circ = \sin(49^\circ - 45^\circ)$ $= \sin 49^\circ \cos 45^\circ - \sin 45^\circ \cos 49^\circ$ $= q \cdot \frac{\sqrt{2}}{2} - \frac{\sqrt{2}}{2} \cdot \sqrt{1 - q^2}$ $= \frac{\sqrt{2}(q - \sqrt{1 - q^2})}{2}$	✓ use of compound angles <i>gebruik van saamgestelde hoeke</i> ✓ expansion/uitbreiding ✓ correct substitution for each term <i>korrekte vervanging vir elke term</i>	(4)
5.2	$f(x) = \frac{\sin(x - 180^\circ) \cdot \sin(90^\circ + x)}{\sin^2 x - \cos^2(360^\circ - x)}$ $= \frac{(-\sin x)(\cos x)}{\sin^2 x - (-\cos x)^2}$ $= \frac{-\sin x \cos x}{\sin^2 x - \cos^2 x}$ $= \frac{-\frac{1}{2} \sin 2x}{-(\cos^2 x - \sin^2 x)}$ $= \frac{-\frac{1}{2} \sin 2x}{-\cos 2x}$ $= \frac{1}{2} \tan 2x$	✓ $(-\sin x)$ ✓ $\cos x$ ✓ $(-\cos x)^2$ ✓ $\frac{1}{2} \sin 2x$ ✓ $-(\cos^2 x - \sin^2 x)$ ✓ $\cos 2x$ ✓ answer/antwoord	(7)
5.2.2	$x = -135^\circ$ or / of $x = -45^\circ$	✓ ✓ each x -value / elke x -waarde	(2)
			[17]

QUESTION/VRAAG 6			
6.1	$\cos(A+B) = \cos(A-(-B))$ $= \cos A \cdot \cos(-B) + \sin A \sin(-B)$ $= \cos A \cos B - \sin A \sin B$	$\checkmark \cos(A-(-B))$ $\checkmark$ expansion $\checkmark$ answer	(3)
6.2	$LHS = \frac{\sin 22^\circ \cdot \cos 320^\circ + \sin 40^\circ \sin 68^\circ}{\sin 391^\circ \cdot \cos 31^\circ}$ $= \frac{\cos 68^\circ (\cos 40^\circ) + \sin 40^\circ \sin 68^\circ}{(\sin 31^\circ) \cos 31^\circ}$ $= \frac{\cos(68^\circ - 40^\circ)}{\frac{1}{2} \sin 62^\circ}$ $= \frac{\cos 28^\circ}{\frac{1}{2} \sin 62^\circ}$ $= 2 \cdot \frac{\sin 62^\circ}{\sin 62^\circ}$ $= 2$	$\checkmark \cos 40^\circ \checkmark \cos 68^\circ$ $\checkmark (\sin 31^\circ)$ $\checkmark \cos(68^\circ - 40^\circ)$ $\checkmark \frac{1}{2} \sin 62^\circ$ $\checkmark \sin 62^\circ$	(6)
6.3	$\cos 2x + 5 \sin x = 3$ $1 - 2 \sin^2 x + 5 \sin x - 3 = 0$ $2 \sin^2 - 5 \sin x + 2 = 0$ $(2 \sin x - 1)(\sin x - 2) = 0$ $\sin x = \frac{1}{2} \text{ or / of } \sin x \neq 2$ $ref. / verw. \angle = 30^\circ$ $x = -330^\circ \text{ or / of } x = -210^\circ$	$\checkmark 1 - 2 \sin^2 x$ $\checkmark$ standard form/ <i>standaardvorm</i> $\checkmark$ equations/ <i>vergelykings</i> $\checkmark \checkmark$ each x-value/ <i>elke x-waarde</i>	(5)
			[14]

QUESTION/VRAAG 7			
7.1	$a = 1$ $p = 30^\circ$	✓ value of a/ <i>waarde van a</i> ✓ value of p/ <i>waarde van p</i>	(2)
7.2	Period / <i>Periode</i> = 360°	✓ answer/ <i>antwoord</i>	(1)
7.3		✓ correct TP's <i>Korrekte DPe</i> ✓ correct intercepts/ <i>korrekte afsnitte</i> ✓ shape/vorm	(3)
7.4	$x = -60^\circ$ or / of $x = 120^\circ$	✓ $x = -60^\circ$ ✓ $x = 120^\circ$	(2)
7.5	$-3 \leq y \leq -1$ OR/OF $y \in [-3; -1]$	✓✓ correct answer <i>/korrekte antwoord</i>	(2)
			[10]

QUESTION/VRAAG 8

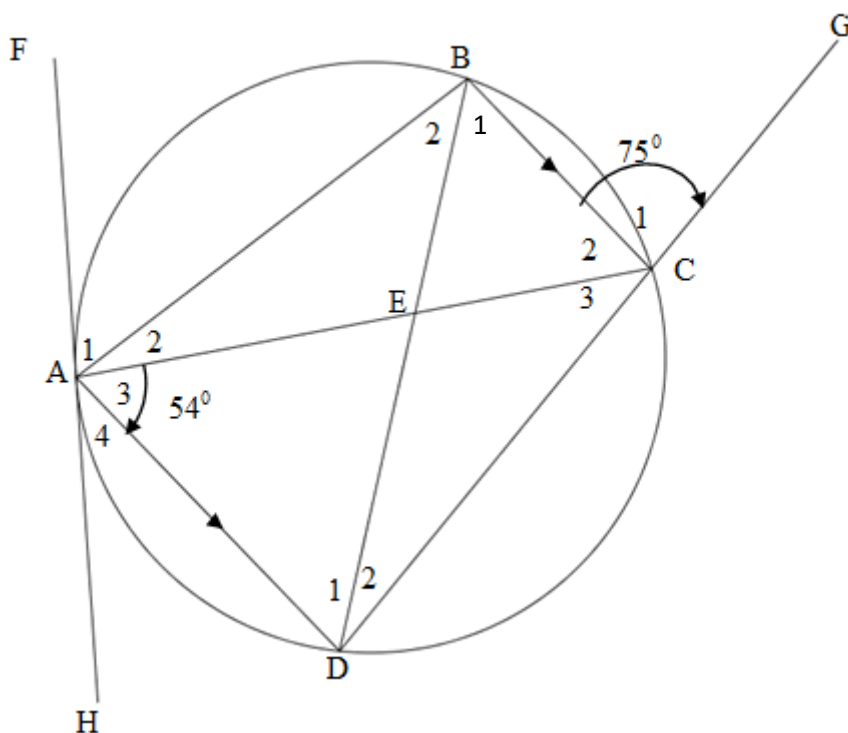


8.1	$\begin{aligned} \angle QPR &= 180^\circ - 2\theta \\ \frac{PQ}{\sin \theta} &= \frac{12}{\sin(180^\circ - 2\theta)} \\ PQ &= \frac{12 \sin \theta}{\sin 2\theta} \\ &= \frac{12 \sin \theta}{2 \sin \theta \cdot \cos \theta} \\ &= \frac{6}{\cos \theta} \\ \frac{PQ}{SQ} &= \cos \alpha \\ SQ &= \frac{1}{\cos \alpha} \times \frac{6}{\cos \theta} \\ SQ &= \frac{6}{\cos \theta \cos \alpha} \end{aligned}$	$\checkmark \angle QPR$ $\checkmark$ sine rule / <i>sinusreël</i> $\checkmark$ correct substitution <i>korrekte vervanging</i> $\checkmark$ reduction/ <i>reduksie</i> $\checkmark$ identity/ <i>identiteit</i> $\checkmark$ simplification/ <i>vereenvoudiging</i> $\frac{PQ}{SQ}$	(6)
8.2	$\begin{aligned} SQ &= \frac{6}{\cos 50^\circ \cos 35^\circ} \\ &= 11,40 \end{aligned}$	$\checkmark$ correct substitution/ <i>korrekte vervanging</i> $\checkmark$ answer/ <i>antwoord</i>	(2)
			[8]

QUESTION/VRAAG 9

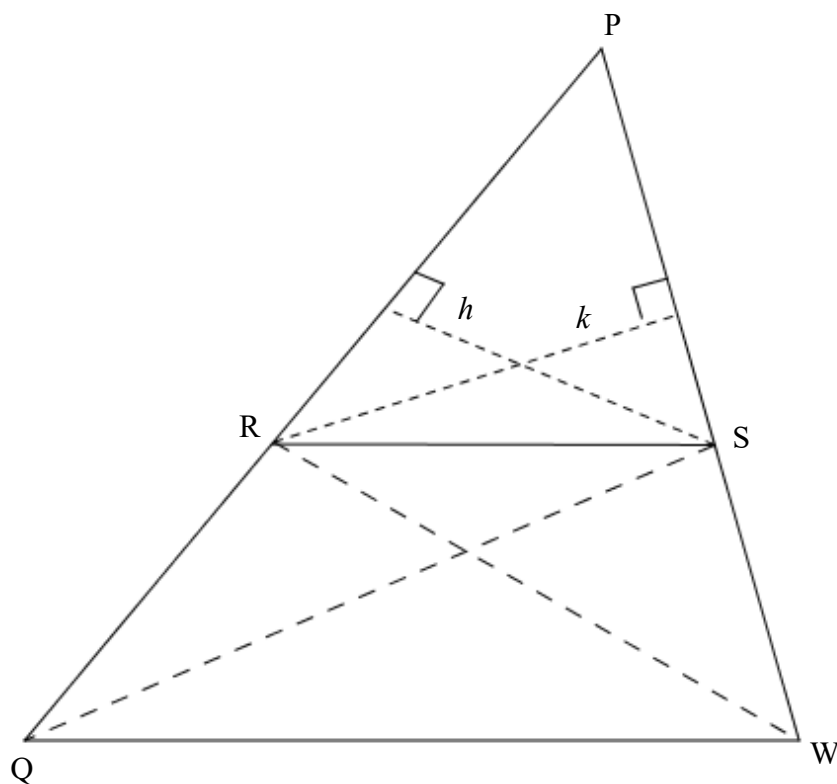
9.1 Opposite interior angle ✓

(1)

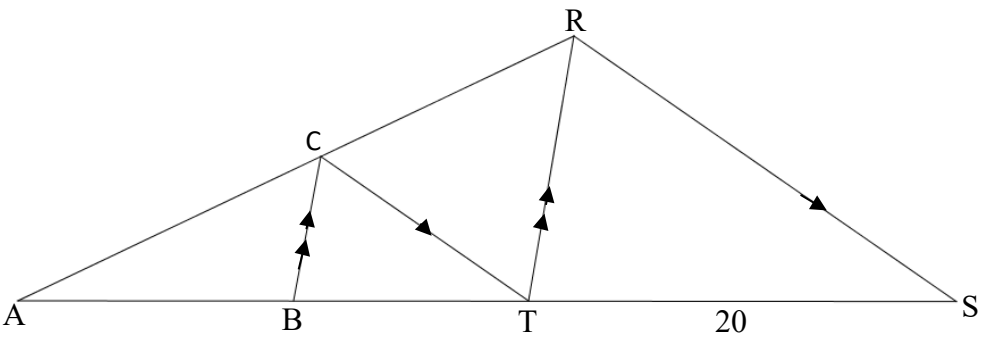


9.2.1	$\hat{A}_2 = 21^\circ$ [ext. $\angle$ of a cyclic quad] / [buite $\angle$ van koordevh]	✓ S ✓ R	(2)
9.2.2	$D_2 = 21^\circ$ [$\angle$ s same seg] / [$\angle$ e in dieselfde segment]	✓ S ✓ R	(2)
9.2.3	$\hat{D} = 75^\circ$ [corresp. $\angle$ s; $AD \parallel BC$] / [ooreenk. $\angle$ e: $AD \parallel BC$]	✓ S/R	(3)
	$\hat{A}_1 = 54^\circ$ [Tan chord Thm.] / [Raaklyn – koord – Stelling]	✓ S ✓ R	
9.2.4	$\hat{A}_3 = \hat{C}_2 = 54^\circ$ [alt. $\angle$ s, $AD \parallel BC$]	✓ S/R	(3)
	$\hat{C}_2 = \hat{D}_1$ [$\angle$ s same seg]	✓ S	
	$\therefore AE = ED$ [sides opp = $\angle$ s]	✓ R	
			[11]

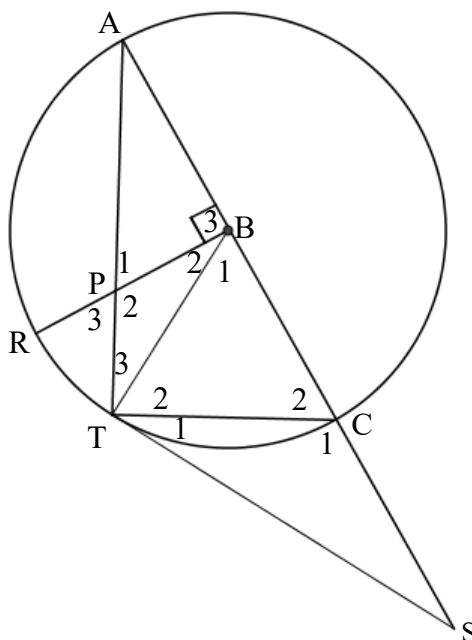
QUESTION/VRAAG 10



10.1	Constructions: Draw $\perp$ height to PS and $\perp$ height to PW. Join RW and SQ Konstruksies: Teken $\perp$ hoogte na PS en $\perp$ hoogte na PW. Verbind RW en SQ $\frac{\text{Area of/van } \triangle PRS}{\text{Area of/van } \triangle WRS} = \frac{\frac{1}{2} \times PS \times h}{\frac{1}{2} \times SW \times h} = \frac{PS}{SW} \quad [\text{same height}] / [\text{dieselfde hoogte}]$ $\frac{\text{Area of/van } \triangle PRS}{\text{Area of/van } \triangle QRS} = \frac{\frac{1}{2} \times PR \times k}{\frac{1}{2} \times RQ \times k} = \frac{PR}{RQ} \quad [\text{same height}] / [\text{dieselfde hoogte}]$ Area of/van $\triangle RSW$ = Area of/van $\triangle QRS$ [same base, between same parallel] [dies. basis, tussen dies. lyne] $\frac{\text{Area of/van } \triangle PRS}{\text{Area of/van } \triangle WRS} = \frac{\text{Area of/van } \triangle PRS}{\text{Area of/van } \triangle QRS}$ $\therefore \frac{PS}{SW} = \frac{PR}{RQ}$	✓ construction konstruksie ✓ S/R ✓ S ✓ S ✓ R	(5)
------	---	---	-----

10.2			
10.2.1	$\frac{AT}{TS} = \frac{AC}{CR}$ $AT = \frac{20 \times 3}{5}$ $= 12$	$[line \parallel to one side of a \Delta] / [lyn \parallel aan een sy van 'n \Delta]$ ✓ S ✓ R ✓ correct substitution <i>korrekte vervanging</i> ✓ AT	(4)
10.2.2	$\frac{AB}{AT} = \frac{AC}{AR}$ $\frac{AB}{20} = \frac{5}{8}$ $AB = \frac{9}{2}$	$[line \parallel to one side of a \Delta]$ ✓ S ✓ correct substitution <i>korrekte vervanging</i> ✓ AB	(3)
			[12]

QUESTION/VRAAG 11



11.1	$\hat{T}_1 = \hat{A}$ [tan chord theo.]/[raaklyn – koord – stelling] $\hat{A} = \hat{T}_3$ [$\angle$ s opp.=sides]/[$\angle$ teenoor=sye]	$\checkmark$ S $\checkmark$ R $\checkmark$ S/R	(3)
11.2	$\hat{A}\hat{T}C = 90^\circ$ [$\angle$ in semi-circle / $\angle$ subt. diameter] [<i>in halwe sirkel / $\angle$ onderspan deur middellyn</i>] $\hat{B}_3 = 90^\circ$ [given]/[gegee] $\therefore$ PBTC is a cyclic quad [ext $\angle$ of a quad = int opp. $\angle$ OR converse ext $\angle$ of a cyclic quad] $\therefore$ PBTC is 'n koordevh. [<i>buite $\angle$ van 'n koordevh = teenoorst. binne $\angle$</i> <i>OF omgek ker de buite $\angle$ van koordevh</i>]	$\checkmark$ S $\checkmark$ R $\checkmark$ R	(3)
11.3	$\hat{T}_1 = \hat{T}_3$ [proven in 11.1]/[bewys in 11.1] $\hat{C}_1 = \hat{P}_2$ [ext. $\angle$ of a cyclic quad]/[<i>buitehoek van kv</i>] $\hat{S} = \hat{B}_2$ [3rd $\angle$ s / $\angle$ e] OR/OF $\therefore \Delta SCT \parallel \Delta BPT$ [$\angle \angle \angle$]	$\checkmark$ S $\checkmark$ S $\checkmark$ R $\checkmark$ S OR/OF $\checkmark$ R	(4)

11.4	$\frac{SC}{BP} = \frac{ST}{BT}$ $[\Delta s]$ $BT = AB$ $[radii] / [radiusse]$ $\therefore SC = \frac{ST \cdot BP}{AB}$	$\checkmark$ S/R $\checkmark$ S	(2)
11.5	$\hat{BTS} = 90^\circ$ $[rad \perp \tan] / [radius \perp raaklyn]$	$\checkmark$ R	(1)
11.6	$TB = CS$ $[both = BR] / [albei = BR]$ $BS^2 = BT^2 + TS^2$ $[Pyth \text{ theo}] / [Pyth \text{ Stelling}]$ $(2CS)^2 = CS^2 + TS^2$ $4CS^2 = CS^2 + TS^2$ $3CS^2 = TS^2$ (1) but / <i>maar</i> $CS = \frac{TS \cdot BP}{AB}$ from 11.4 $CS = AB = BR$ $CS^2 = TS \cdot BP$ (2) $TS^2 = 3(TS \cdot BP)$ $\therefore TS = 3BP$	$\checkmark$ Application of Pyth. Toepassing van Pyth. $\checkmark$ Expressing BS in terms of CS <i>BS in terme van CS uitgedruk</i> $\checkmark$ simplification / <i>vereenvoudiging</i> $\checkmark$ $CS^2 = TS \cdot BP$ $\checkmark$ substitute/ <i>vervang</i> (2) in (1)	(5)
			[18]

TOTAL/TOTAAL: 150



education

Department of
Education
FREE STATE PROVINCE

PREPARATORY EXAMINATION/ *VOORBEREIDENDE EKSAMEN*

GRADE/*GRAAD* 12

**MATHEMATICS P2/
*WISKUNDE V2***

SEPTEMBER 2026

MARKS/*PUNTE*: 150

**MARKING GUIDELINES/
*NASIENRIGLYNE***

**These marking guidelines consist of 20 pages./
*Hierdie nasienriglyne bestaan uit 20 bladsye.***

NOTE:

- If a candidate answers a question TWICE, only mark the FIRST attempt.
- If a candidate has crossed out an attempt at a question and not redone the question, mark the crossed-out version.
- Consistent accuracy applies in ALL aspects of the marking memorandum. Stop marking the second calculation error.
- Assuming answers/values in order to solve a problem is NOT acceptable.

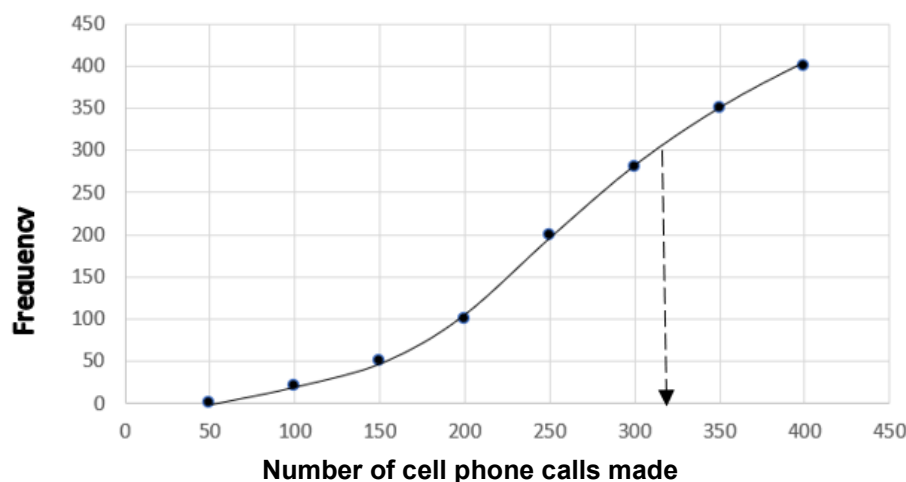
NOTA:

- *As 'n kandidaat 'n vraag TWEE KEER beantwoord, merk slegs die EERSTE poging.*
- *As 'n kandidaat 'n antwoord van 'n vraag doodtrek en nie oordoen nie, merk die doodgetrekte poging.*
- *Volgehoue akkuraatheid word in ALLE aspekte van die nasienriglyne toegepas. Hou op nasien by die tweede berekeningsfout.*
- *Aanvaar van antwoorde/waardes om 'n probleem op te los, word NIE toegelaat nie.*

QUESTION/VRAAG 1

Cell phone call made	Frequency
$50 \leq x < 100$	20
$100 \leq x < 150$	30
$150 \leq x < 200$	Q
$200 \leq x < 250$	R
$250 \leq x < 300$	80
$300 \leq x < 350$	70
$350 \leq x < 400$	50

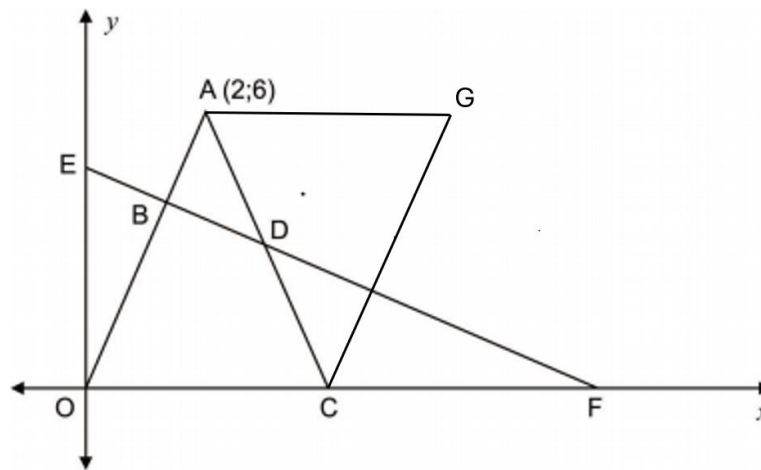
Ogive



1.1	$A = 50$	✓ answer (1)
1.2	400	✓ answer (1)
1.3	$Q = 50$ and $R = 100$	✓ $Q = 50$ ✓ $R = 100$ (2)
1.4	Q_3 = greater than 300 and less than 325 $Q_1 = 200$ $IQR = 110$ (CA based on values)	✓ Q_3 value ✓ Q_1 value ✓ answer (3)
1.5	Mean = 250	✓ answer (2)
1.6.1	It would decrease. People will leave the contract. Therefore, fewer people.	✓ answer ✓ explanation (2)
1.6.2	Standard deviation would decrease. The difference between the new mean and the data would decrease.	✓ answer ✓ explanation (2)
1.6.3	It would skew the data to the left. The values above the median are less spread out. OR	✓ answer ✓ explanation (2) OR

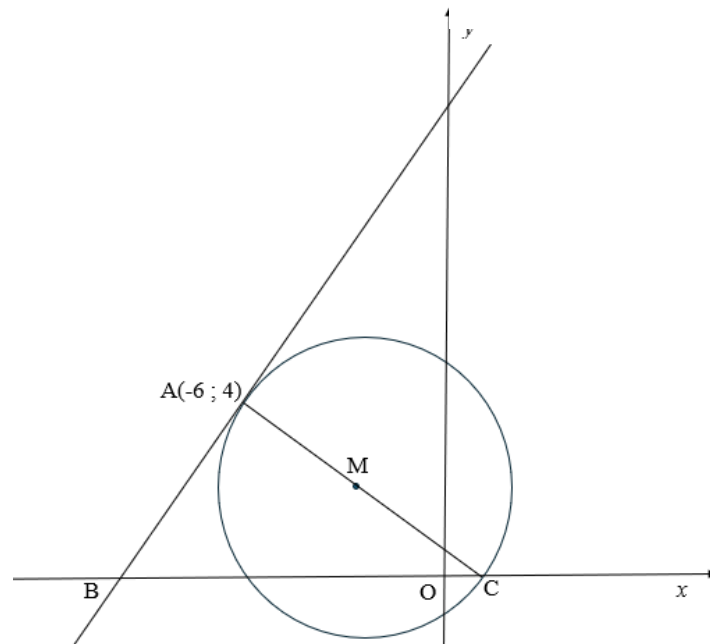
	It would skew the data to the left. Mean < median	✓ answer ✓ explanation (2)
		[15]

QUESTION/VRAAG 2												
Rest days given	5	2	9	1	3	12	10	4	4	5	8	6
Performance of the player	0,87	0,65	0,9	0,58	0,7	0,91	0,88	0,78	0,72	0,91	0,82	0,62
2.1	0,7337 $\approx$ 0,73								✓✓ answer (2)			
2.2	C								✓ answer (1)			
2.3	A = 0,6268 $\approx$ 0,63 B = 0,0264 $\approx$ 0,03								✓ value of A ✓ value of B (2)			
2.4	No. 30 falls outside the given data; therefore it will not be accurate. Extrapolation will be taking place.								✓ answer ✓ reason (2)			
									[7]			

QUESTION/VRAAG 3

3.1	$OA = \sqrt{(0-2)^2 + (0-6)^2}$ $= \sqrt{40}$ $= 2\sqrt{10}$ $= 6,32$ $OA = AC = 6,32$	✓ substitution ✓ answer ✓ $OA = AC$ (3)
3.2	Midpoint M $\left(\frac{0+2}{2}; \frac{0+6}{2}\right)$ $= (1; 3)$ Answer only full marks	✓ x - value ✓ y - value (2)
3.3	Using translation $G(6; 6)$ Answer only full marks	✓ x -value ✓ y - value (2)
3.4	$m_{OA} = 3$ Equation of line OA is $y = 3x$ Equation of line EF is $2y + x = 10$ $2(3x) + x = 10$ $7x = 10$ $x = \frac{10}{7}$ (this represents the height of the triangle) $B\left(\frac{10}{7}; \frac{30}{7}\right)$	✓ gradient of OA ✓ equation of OA ✓ equating ✓ value of x ✓ value of y (5)

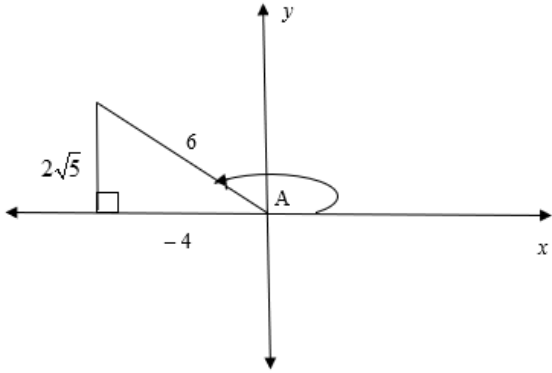
3.5	Coordinates of E $2y + 0 = 10$ $y = 5$ $E(0; 5)$ Area of $\triangle EBO = \frac{1}{2} \times 5 \times \frac{10}{7}$ $= \frac{25}{7}$ $= 3,57 \text{ units}^2$ OR Inclination of OA : $\tan \theta = 3$ $\theta = 71,57^\circ$ $\widehat{EOB} = 18,43^\circ$ OB = 4.52 units Area of $\triangle EBO = \frac{1}{2} OE \cdot OB \sin \widehat{EOB}$ $= \frac{1}{2} (4,52)(5) \sin 18,43^\circ$ $= 3,57 \text{ units}^2$	✓ value of y ✓ substitution ✓ answer (3) ✓ angle EOB ✓ substitution ✓ answer (3)
3.6	C(4 ; 0) $2(0) + x = 10$ $x = 10$ CF = 6 Area $\triangle DFC = \frac{1}{2} \times 6 \times \frac{18}{5}$ $= \frac{54}{5}$ $= 10,80 \text{ units}^2$ OR C(4 ; 0) $2(0) + x = 10$ $x = 10$ CF = 6 $2y + x = 10 \text{ sub } y = \frac{18}{5}$ $2\left(\frac{18}{5}\right) + x = 10$ $x = \frac{14}{5}$ $D\left(\frac{14}{5}; \frac{18}{5}\right) \quad C(4; 0)$	✓ coordinates of C ✓ length CF ✓ substitution ✓ answer (4) ✓ length CF

QUESTION/VRAAG 4

4.1.1	$x^2 + y^2 + 4x - 4y - 12 = 0$ $(x + 2)^2 + (y - 2)^2 = 12 + 4 + 4 = 20$ $M(-2; 2)$ OR $M\left(\frac{4}{-2}; \frac{-4}{-2}\right)$ $M(-2; 2)$	✓ x value ✓ y value (2) OR ✓ x value ✓ y value (2)
4.1.2	$x^2 + 0^2 + 4x - 4(0) - 12 = 0$ $x^2 + 4x - 12 = 0$ $(x + 6)(x - 2) = 0$ $x = -6$ or $x = 2$ $C(2; 0)$ OR $\frac{x - 6}{2} = -2$ $x = 2$ $C(2; 0)$	✓ substitute $y = 0$ ✓ factors ✓ correct x value (3) OR ✓ correct use of formula ✓ x- value ✓ $y = 0$ (3)

4.2	$M(-2;2) \quad C(2;0)$ $m_{MC} = \frac{0-2}{2-(-2)}$ $m_{MC} = \frac{-1}{2}$ $m_{\text{tan}} = 2 \quad \text{tangent} \perp \text{radius}$ $y-4=2(x-(-6))$ $y = 2x+16$	✓ substitution ✓ gradient of tangent ✓ substituting A(-6 ; 4) ✓ equation (4)
4.3	$x^2 + y^2 + 4x - 4y - 12 = 0$ $(x+2)^2 + (y-2)^2 = 20$ <i>Centre</i> $O_1(-2;2)$ $radius_1 = \sqrt{20}$ $= 2\sqrt{5}$ $(x+4)^2 + (y+2)^2 = 5$ <i>Centre</i> $O_2(-4;-2)$ $radius_2 = \sqrt{5}$ Distance between centres: $= \sqrt{(-4+2)^2 + (-2-2)^2}$ $= \sqrt{4+16}$ $= \sqrt{20}$ $= 2\sqrt{5}$ $r_1 + r_2 = 3\sqrt{5}$ $3\sqrt{5} > 2\sqrt{5}$ therefore circles intersect	✓ $2\sqrt{5}$ ✓ <i>centre</i> $O_2(-4;-2)$ ✓ distance between centres = $2\sqrt{5}$ ✓ $r_1 + r_2 = 3\sqrt{5}$ ✓ $3\sqrt{5} > 2\sqrt{5}$ (5)

QUESTION/VRAAG 5

5.1.1	 $x^2 = (6)^2 - (\sqrt{20})^2$ $= 36 - 20$ $= 16$ $x = \pm 4$ only $x = -4$ $\sin 2A$ $= 2 \sin A \cos A$ $= 2 \cdot \frac{2\sqrt{5}}{6} \cdot \frac{-4}{6}$ $= \frac{-4\sqrt{5}}{9}$	✓ correct quadrant ✓ correct x-value ✓ double angle formulae ✓ substitution ✓ answer (5)
5.1.2	$\cos 2\left(\frac{A}{2}\right) = 1 - 2\sin^2\left(\frac{A}{2}\right)$ $2\sin^2\left(\frac{A}{2}\right) = 1 - \cos A$ $\sin\left(\frac{A}{2}\right) = \sqrt{\frac{1 - \frac{-4}{6}}{2}}$ $= \sqrt{\frac{5}{6}}$	✓ reduction formulae ✓ substitution ✓ answer (3)

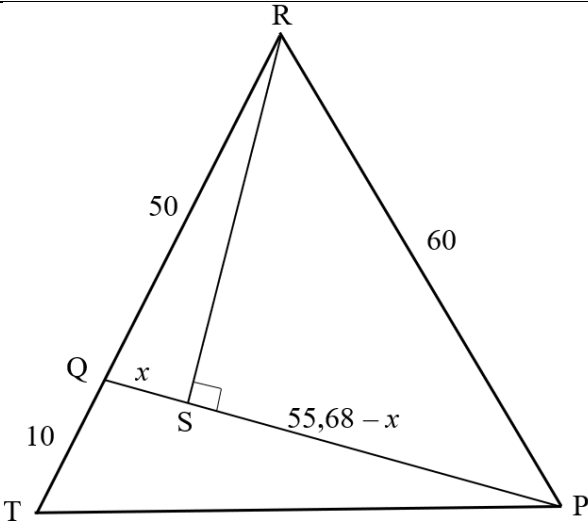
5.2	$\frac{\sin x \cdot \sin(90^\circ + y) - \cos x \cdot \sin(180^\circ + y)}{\cos x \cdot \cos(y - 360^\circ) + \sin(-x) \cdot \sin y}$ $= \frac{\sin x \cdot (\cos y) - \cos x \cdot (-\sin y)}{\cos x \cdot (\cos y) + (-\sin x) \sin y}$ $= \frac{\sin x \cdot \cos y + \cos x \cdot \sin y}{\cos x \cdot \cos y - \sin x \cdot \sin y}$ $= \frac{\sin(x + y)}{\cos(x + y)}$ $= \tan(x + y)$	$\checkmark \cos y$ $\checkmark -\sin y$ $\checkmark \cos y$ $\checkmark -\sin x$ $\checkmark \frac{\sin(x + y)}{\cos(x + y)}$ $\checkmark \tan(x + y)$ (6)
5.3	LHS: $\frac{\sin \theta}{\cos \theta} + \frac{\cos \theta}{\sin \theta}$ $= \frac{\sin^2 \theta + \cos^2 \theta}{\cos \theta \cdot \sin \theta}$ $= \frac{1}{\cos \theta \cdot \sin \theta}$ RHS: $\frac{2}{\sin 2\theta}$ $= \frac{2}{2 \sin \theta \cdot \cos \theta}$ $= \frac{1}{\sin \theta \cdot \cos \theta}$ LHS = RHS	$\checkmark \frac{\sin \theta}{\cos \theta}$ $\checkmark$ simplification $\checkmark \sin^2 \theta + \cos^2 \theta$ $\checkmark$ double angle $\checkmark$ simplification (5)
5.4.1	$-1 \leq m \leq 1$ OR $m \in [-1; 1]$	$\checkmark \checkmark$ answer (2) OR $\checkmark \checkmark$ answer (2)

5.4.2	$3 \sin \theta - \frac{4}{\sin \theta} + 4 = 0$ $3 \sin^2 \theta - 4 + 4 \sin \theta = 0$ $3 \sin^2 \theta + 4 \sin \theta - 4 = 0$ $(3 \sin \theta - 2)(\sin \theta + 2) = 0$ $\sin \theta = \frac{2}{3} \quad \text{or} \quad \sin \theta = -2$ $\text{ref angle} = 41,81^\circ$ $\theta = 41,81 + k360^\circ, k \in \mathbb{Z}$ OR $\theta = 180^\circ - 41,81^\circ + k360^\circ; k \in \mathbb{Z}$ $\theta = 138,19^\circ + k360^\circ, k \in \mathbb{Z}$ $\theta = 41,81^\circ \quad \text{or} \quad 138,19^\circ \quad \theta \in [-180^\circ; 180^\circ]$	✓ standard form ✓ factors ✓ $x = 41,81 + k360^\circ$ ✓ $x = 138,19^\circ + k360^\circ, k \in \mathbb{Z}$ ✓ $x = 41,81^\circ$ or ✓ $x = 138,19^\circ$ (6)
5.5	$AB^2 = (\cos \theta - 6)^2 + (\sin \theta - 7)^2$ $86 = \cos^2 \theta - 12 \cos \theta + 36 + \sin^2 \theta - 14 \sin \theta + 49$ $86 = 1 + 36 + 49 - 12 \cos \theta - 14 \sin \theta$ $0 = -12 \cos \theta - 14 \sin \theta$ $14 \sin \theta = -12 \cos \theta$ $\frac{\sin \theta}{\cos \theta} = \frac{-12}{14}$ $\tan \theta = \frac{-6}{7}$ $= -0,86$	✓ substitution ✓ simplification ✓ $14 \sin \theta = -12 \cos \theta$ ✓ answer (4)
		[31]

QUESTION/VRAAG 6

6.1	f: ✓ x- intercepts/afsnitte ✓ y-intercepts/afsnitte ✓ turning points/ draaipunte g: ✓ asymptotes/asimptote ✓✓ passing through/gaan deur $(0 ; 0)$, $(-90^\circ; -1)$, $(90^\circ; 1)$		(6)
6.2.1	$x = -45^\circ$ or / of $x = 135^\circ$	✓ $x = -45^\circ$ ✓ $x = 135^\circ$	(2)
6.2.2	$x = 180^\circ$ or / of $x = -180^\circ$	✓ $x = 180^\circ$ ✓ $x = -180^\circ$	(2)
6.2.3	1	✓ answer/antwoord	(1)
6.2.4	$x \in (-180^\circ; -45^\circ)$ or / of $x \in (0^\circ; 135^\circ)$ OR $-180^\circ < x < -45^\circ$ or / of $0 < x < 135^\circ$	✓ $-180^\circ ; -45^\circ$ ✓ $0^\circ ; 135^\circ$ ✓ notation/notasie	(3)
			[14]

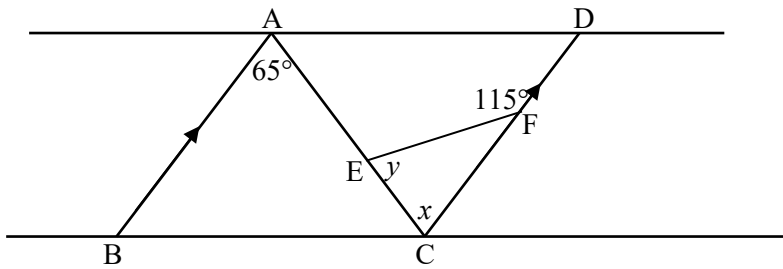
QUESTION/VRAAG 7

7.1	$\hat{R} = \hat{T} = \hat{P} = 60^\circ$ $QT = 10$ and/ <i>en</i> $QR = 50$ $PQ^2 = 60^2 + 50^2 - 2(50)(60) \cos 60^\circ$ $= 3100$ $PQ = 55,68$ units OR $PQ^2 = 60^2 + 10^2 - 2(10)(60) \cos 60^\circ$ $= 3100$ $PQ = 55,68$ units	✓ 60° ✓ 10 or/of 50 ✓ correct substitution into the cosine rule/ <i>korrekte vervanging in cosreël</i> ✓ answer/antwoord (4) OR ✓ 60° ✓ 10 or/of 60 ✓ correct substitution into the cosine rule/ <i>korrekte vervanging in cosreël</i> ✓ answer/antwoord (4)
7.2	 S is the nearest to R where RS is the perpendicular height/ <i>S is die naaste aan R waar RS die loodregte hoogte is</i> Let/ Laat $QS = x$ $\therefore PS = 55,68 - x$ $(50^2 - x^2) = (60^2 - [55,68 - x]^2 = RS^2$ $2500 - x^2 = 3600 - 3100,26 + 11136x - x^2$ $2000,26 = 11136x$ $\therefore x = 17,96$ units / <i>eenhede</i>	✓ diagram/ <i>diagram</i> ✓ Pythagoras/ <i>Pythagoras</i> ✓ simplify/ <i>vereenvoudig</i> ✓ answer/antwoord (4)
		[8]

GEOMETRY/MEETKUNDE

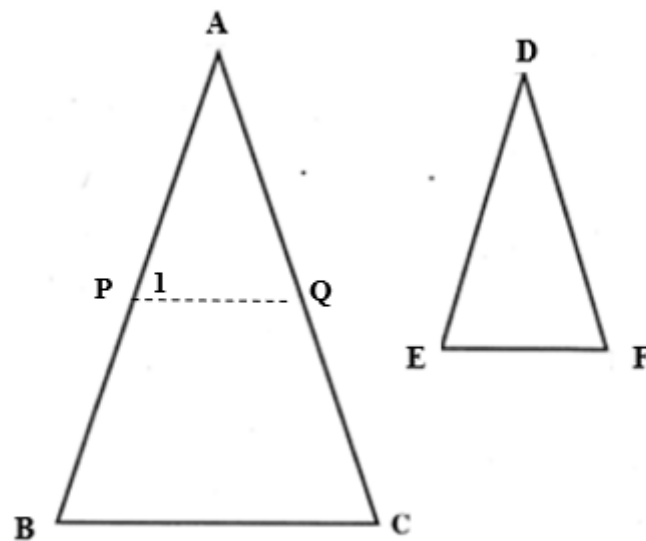
Please read carefully through the following table before marking **QUESTION 8–9/**

*Lees asseblief sorgvuldig deur die volgende tabel alvorens **VRAAG 8–9** nagesien word.*

	The order in which the candidate answers a geometry question must follow logically/<i>Die volgorde waarin 'n kandidaat 'n meetkundevraag beantwoord moet logies volg.</i> Example/Voorbeeld Given/Gegee $AB \parallel CD$ and/en $\angle EFD = 115^\circ$  The candidate first needs to calculate x BEFORE he/she can calculate y/<i>Die kandidaat moet eerste vir x bereken VOORDAT hy/sy vir y kan bereken.</i>
S	A mark for a correct statement (A statement mark is independent of a reason)
	<i>'n Punt vir 'n korrekte bewering (‘n Punt vir 'n bewering is onafhanklik van die rede)</i>
R	A mark for the correct reason (A reason mark may only be awarded if the statement is correct)
	<i>'n Punt vir 'n korrekte rede (‘n Punt word slegs vir die rede toegeken as die bewering korrek is)</i>
S/R	Award a mark if the statement AND reason are both correct (Both MUST be correct to get one mark)
	<i>Ken 'n punt toe as die bewering EN rede beide korrek is (Beide MOET korrek wees om een punt te kry)</i>

QUESTION/VRAAG 8

8.1.1	90°		✓ answer/ antwoord (1)
8.1.2	parallel ...equal to half the length of the third side <i>parallel....gelyk aan die helfte van die lengte van die derde sy.</i>		✓ answer/ antwoord (2)
8.2			
8.2.1	$\widehat{QPR} = 80^\circ$	sum of interior angles of triangle/ <i>som van binne hoeke van 'n driehoek</i>	✓ S ✓ R (2)
8.2.2	$OT \parallel QR$ $\widehat{PTO} = \widehat{R} = 25^\circ$	midpoint theorem/ <i>middelpunt stelling</i> corres angles $OT \parallel QR$ / <i>ooreenk hoeke</i> $OT \parallel QR$	✓ S/R ✓ S/R (2)
8.2.3	$\widehat{QNP} = 90^\circ$	angles in a semi-circle/ <i>hoeke in 'n halfsirkel</i>	✓ S ✓ R (2)
8.2.4	$\widehat{S}_2 + \widehat{S}_3 = 90^\circ$	opposite angles of a cyclic quad/ <i>teenoorstaande hoeke van koordevierhoek</i>	✓ S/R
	$\widehat{S}_1 = 90^\circ$	angles on a str. line/ <i>hoeke op 'n reguitlyn</i>	✓ S/R (2)
8.3	$OS \parallel QR$ $PS = SM$	$OT \parallel QR$ proved in 8.2.2/ <i>OT // QR bewys in 8.2.2</i> converse of midpoint theorem/ <i>omgekeerde van middelpunt stelling</i>	✓ S/R ✓ S/R (2)
8.4	In $\triangle POS$ and $\triangle MQS$ $\widehat{S}_2 + \widehat{S}_3 = \widehat{S}_1 = 90^\circ$ $QS = QS$ $PS = SM$ $\triangle PQS = \triangle MQS$	proved/ <i>bewys</i> common/ <i>gemeenskaplik</i> proved/ <i>bewys</i> [SAS]/[SHS]	✓ S ✓ S/R ✓ S ✓ R (4)
8.5	$PQ = QM$ $2PO = PQ$ $QM = 2PO$	$\triangle PQS \equiv \triangle MQS$ radii/ <i>radii</i>	✓ S/R ✓ S/R (2)
			[19]

QUESTION/VRAAG 9

9.1	Construction/<i>Konstruksie</i> On AB mark off $AP=DE$ and on AC mark off $AQ=DF$/Op AB merk af $AP = DE$ en op AC merk af $AQ = DF$ Proof/<i>Bewys</i>: In $\triangle APQ$ and $\triangle DEF$ $AP = DE$ const/<i>konst</i> $AQ = DF$ const/<i>konst</i> $\hat{A} = \hat{D}$ given/<i>gegee</i> $\triangle APQ \equiv \triangle DEF$ SAS/<i>SHS</i> $\hat{P}_1 = \hat{E}$ But $\hat{E} = \hat{B}$ $\hat{P}_1 = \hat{B}$ $PQ \parallel BC$ corres $\angle$'s/<i>ooreenkom \angle</i>'e $\frac{AB}{AP} = \frac{AC}{AQ}$ line//tooneside of $\triangle$/<i>lyn//aaneen</i> <i>sy van $\triangle$</i> $\frac{AB}{DE} = \frac{AC}{DF}$ $AP = DE$ and $AQ = DP$	✓ Construction/<i>Konstruksie</i> ✓ $\triangle APQ \equiv \triangle DEF$ SAS/<i>SHS</i> ✓ $\hat{P}_1 = \hat{E}$ ✓ $\hat{E} = \hat{B}$ ✓ $\hat{P}_1 = \hat{B}$ ✓ $PQ \parallel BC$ ✓ S/R (7)
-----	--	---

9.2			
9.2.1	In $\triangle PAT$ and $\triangle PCA$ $\hat{P} = \hat{P}$ common/<i>gemeenskaplik</i> $\widehat{A_1} = \widehat{C_1}$ tan chord theorem/<i>tan koordstelling</i> $\widehat{PTA} = \widehat{PCA}$ sum of int $\angle$'s /som van binne hoeke van Δ $\triangle PAT \sim \triangle PCA$ $\angle\angle\angle$ $\therefore \frac{PA}{PC} = \frac{PT}{PA}$ $\sim \Delta$'s $PA^2 = PC \cdot PT$	✓ S identifying Δ's /identifiseer Δ'e ✓ S ✓ S/R ✓ S/R ✓ S (5)	
9.2.2	$PA^2 = PC \cdot PT$ $36 = (x+5)x$ $x^2 + 5x - 36 = 0$	✓ substitution/<i>substitusie</i> ✓ simplify/<i>vereenvoudig</i> (2)	
9.2.3	$(x+9)(x-4) = 0$ $x = -9$ or $x = 4$ $PT = 4$	✓ factorise/<i>faktoriseer</i> ✓ answer/<i>antwoord</i> (2)	
9.2.4	$\frac{PD}{PA} = \frac{PT}{PC}$ prop theorem $AC \parallel DB$ <i>eweredigheidstelling</i> $AC \parallel DB$ $DP = \frac{4}{9} \cdot 6$ $= \frac{8}{3}$	✓ S/R ✓ answer/<i>antwoord</i> (2)	
			[18]

TOTAL/TOTAAL: 150



PREPARATORY EXAMINATION

2026

MARKING GUIDELINES

MATHEMATICS PAPER 2 (10612)

23 pages

INSTRUCTIONS AND INFORMATION

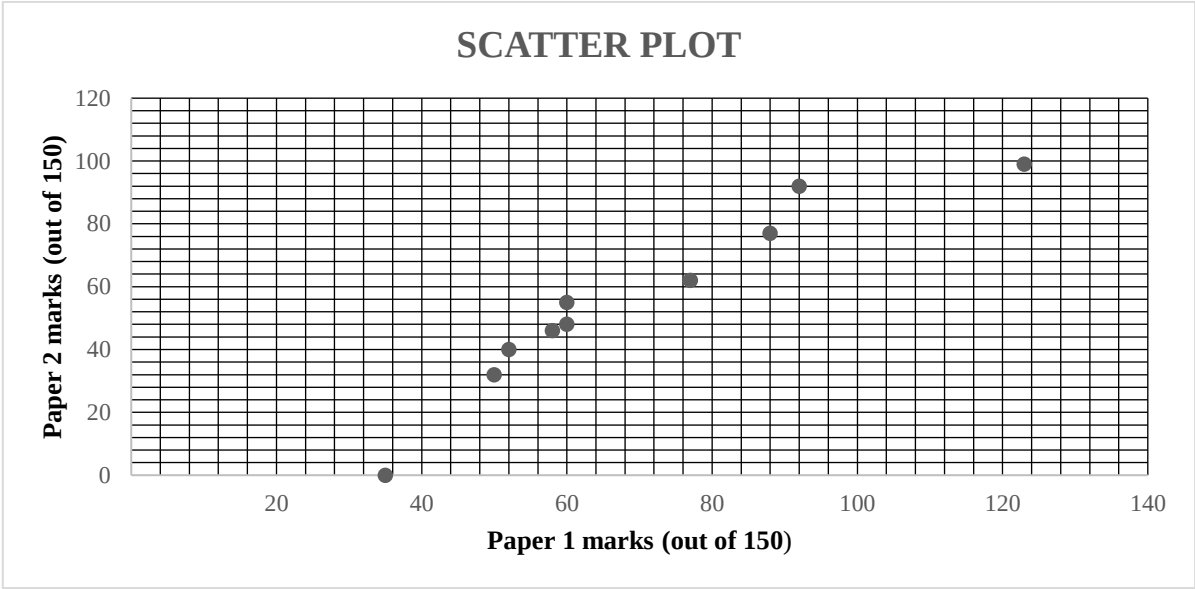
NOTE:

- If a candidate answers a question TWICE, only mark the FIRST attempt.
- If a candidate has crossed out an attempt to a question and not redone the question, mark the crossed out version.
- Consistent accuracy applies in ALL aspects of the marking guidelines. Stop marking at the second calculation error.
- Assuming answers/values to solve a problem is NOT acceptable.

GEOMETRY	
S	A mark for a correct statement (A statement mark is independent of a reason.)
R	A mark for a correct reason (A reason mark may only be awarded if the statement is correct.)
S/R	Award a mark if the statement AND reason are both correct.

QUESTION 1

Paper 1 (out of 150 marks)	35	50	52	58	60	60	77	88	92	123
Paper 2 (out of 150 marks)	0	32	40	46	48	55	62	77	92	99

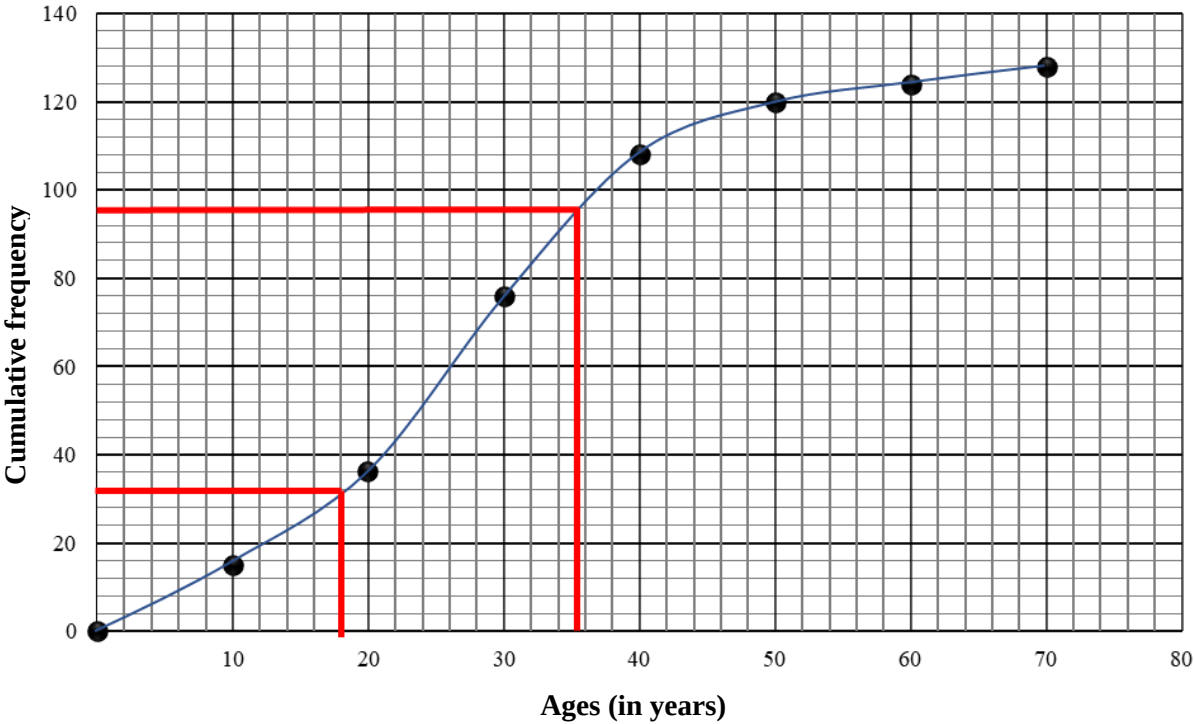


	SOLUTIONS	MARK DESCRIPTIONS	MARKS
1.1	$a = -19,86$ $b = 1,08$ $\therefore y = -19,86 + 1,08x$ Answer Only Full marks	$\checkmark a = -19,86$ $\checkmark b = 1,08$ $\checkmark$ equation	(3)
1.2	$r = 0,95$	$\checkmark r = 0,95$	(1)
1.3	Strong positive correlation	$\checkmark$ answer	(1)
1.4	$y = -19,86 + 1,08 (75)$ $y = 61,14$ OR $y = 61,03$ (calculator) Answer Only Full marks	$\checkmark$ substitution $\checkmark$ answer OR $\checkmark\checkmark$ answer	(2) (2)
1.5	$\sigma = 27,83$	$\checkmark$ answer	(1)
1.6.1	$\bar{x} = 69,5 + 4$ $\therefore \bar{x} = 73,5$	$\checkmark$ answer	(1)
1.6.2	The standard deviation will remain the same as all data changed with the same value.	$\checkmark$ answer	(1)
1.7	He ranked higher in paper 2. 52 is the first quartile for paper 1 and 51 is the median for paper 2, He ranked higher in paper 2. OR Using the given table, he ranked 8 th in paper 1 and 6 th in paper 2.	$\checkmark$ answer $\checkmark$ explanation	(2)

[12]

QUESTION 2

CUMULATIVE FREQUENCY GRAPH (OGIVE)

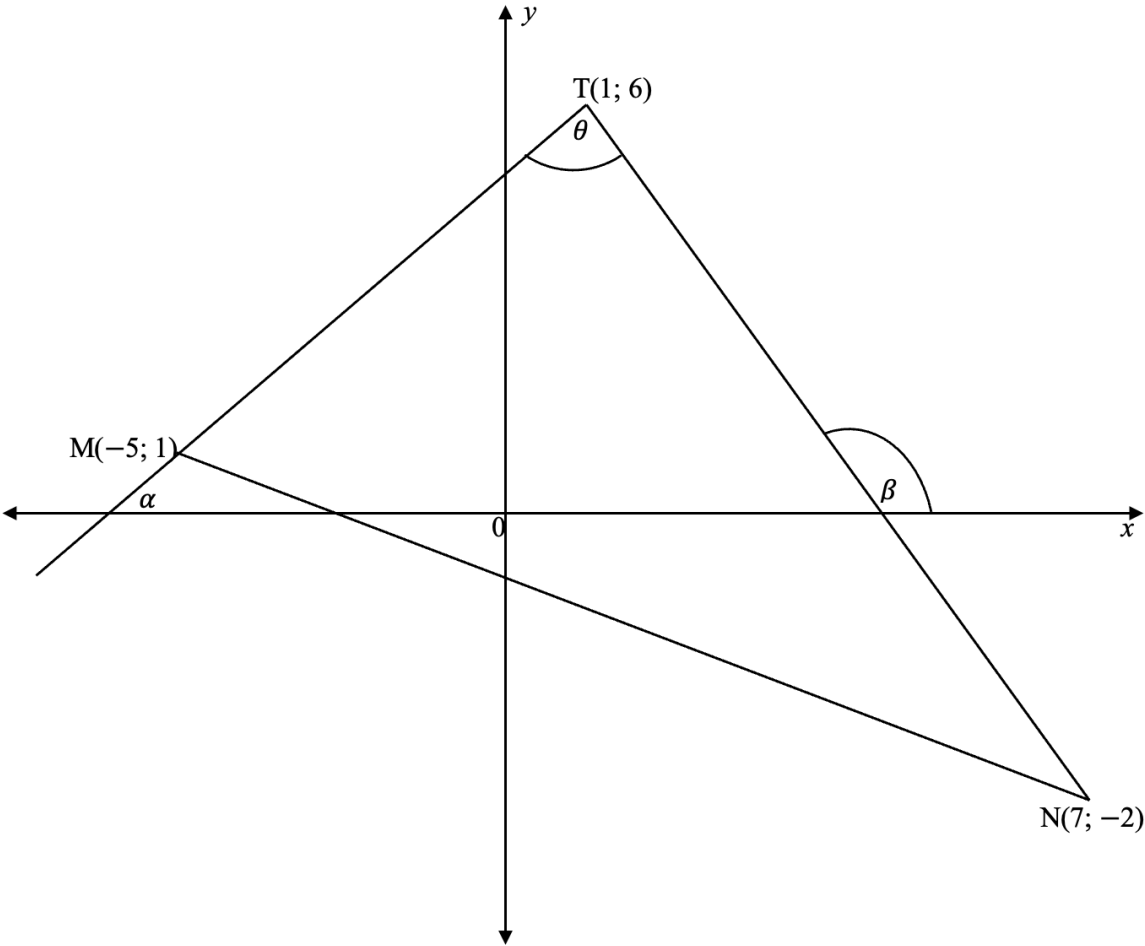


	SOLUTIONS		MARK DESCRIPTIONS	MARKS
2.1	Age groups:	Number of T-shirts Sold:	✓ 21; 40; 32 ✓ 12; 4; 4	(2)
	$0 < x \leq 10$	15		
	$10 < x \leq 20$	21		
	$20 < x \leq 30$	40		
	$30 < x \leq 40$	32		
	$40 < x \leq 50$	12		
	$50 < x \leq 60$	4		
	$60 < x \leq 70$	4		

2.2	$20 < x \leq 30$	✓ answer	(1)
2.3	$Q_1 = 18 \quad Q_3 = 35$ (Accept 36) $\therefore \text{IQR} = 35 - 18$ $= 17$ (Accept 18)	✓ 18 ✓ 35 ✓ answer	(3)
2.4	Cumulative graph will become steeper. OR The last two points will be higher.	✓ ✓ correct reason	(2)

[8]

QUESTION 3



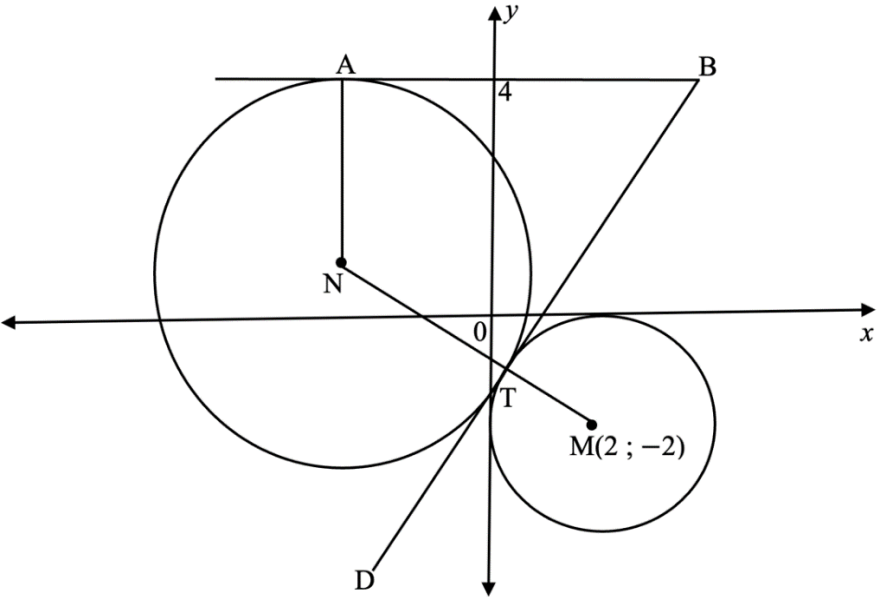
	SOLUTIONS	MARK DESCRIPTIONS	MARKS
3.1	$MT = \sqrt{(1 + 5)^2 + (6 - 1)^2}$ $\therefore MT = \sqrt{61} = 7,81 \text{ units}$	✓ substitution ✓ answer	(2)
3.2	$m_{TN} = \frac{6+2}{1-7}$ $\therefore m_{TN} = -\frac{4}{3}$	✓ substitution ✓ answer	(2)

3.5	$m_{TN} \times m_{TP} = -1$ $\therefore m_{TP} = \frac{3}{4}$ $\frac{3}{4} = \frac{9-6}{r-1}$ $3r - 3 = 12$ $3r = 15$ $r = 5$ OR $m_{TP} = \frac{9-6}{r-1}$ $\therefore m_{TP} = \frac{3}{r-1}$ $m_{TN} \times m_{TP} = -1$ $\therefore \left(-\frac{4}{3}\right) \times \left(\frac{3}{r-1}\right) = -1$ $\frac{-12}{3r-3} = -1$ $-3r + 3 = -12$ $-3r = -15$ $\therefore r = 5$ OR $m_{TN} = -\frac{4}{3}$ $m_{TN} \times m_{TP} = -1$ $\therefore m_{TP} = \frac{3}{4}$ $y - 6 = \frac{3}{4}(x - 1)$ $y = \frac{3}{4}x + \frac{21}{4}$ $(r ; 9)$ $9 = \frac{3}{4}r + \frac{21}{4}$ $\frac{3}{4}r = \frac{15}{4}$ $r = 5$	$\checkmark m_{TP} = \frac{3}{4}$ $\checkmark$ correct substitution into gradient formula $\checkmark$ answer OR $\checkmark m_{TP} = \frac{9-6}{r-1}$ $\checkmark \left(-\frac{4}{3}\right) \times \left(\frac{3}{r-1}\right) = -1$ $\checkmark$ answer OR $\checkmark$ substituting m and point T $\checkmark$ substitution of point P $\checkmark$ answer	(3) (3) (3)
-----	--	---	----------------------------------

3.6	$\widehat{NTP} = 90^\circ$ [given] $\therefore$ PN is a diameter [conv $\angle$ in semi circle/ chord subtends 90°] P(5; 9) N(7; -2) $x = \frac{5 + 7}{2} \quad y = \frac{9 - 2}{2}$ $x = 6 \quad y = \frac{7}{2}$ $\therefore$ Centre of the circle is $\left(6; \frac{7}{2}\right)$ $PN = \sqrt{(7 - 5)^2 + (-2 - 9)^2}$ $\therefore$ PN = $5\sqrt{5}$ units $\therefore r = \frac{5\sqrt{5}}{2} \text{ units}$ $\therefore r^2 = \frac{125}{4}$ $\therefore (x - 6)^2 + \left(y - \frac{7}{2}\right)^2 = \frac{125}{4}$	✓ identifying PN as diameter ✓ coordinates of centre ✓ r^2 ✓ equation of the circle	(4)
-----	---	--	-----

[17]

QUESTION 4



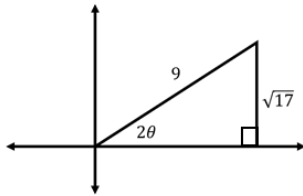
	SOLUTIONS	MARK DESCRIPTIONS	MARKS
4.1	$x^2 + 4x + y^2 - 2y = -k$ $x^2 + 4x + 4 + y^2 - 2y + 1 = 4 + 1 - k$ $(x + 2)^2 + (y - 1)^2 = 5 - k$ Radius: $r = \sqrt{5 - k}$	✓ $-k$ ✓ r^2 ✓ answer	(3)
4.2	N(-2; 1)	✓ x – value ✓ y – value	(2)
4.3	$NM = \sqrt{(2 + 2)^2 + (-2 - 1)^2}$ NM = 5 units Answer Only Full marks	✓ substitution ✓ answer	(2)
4.4	NT = 5 – 2 = 3 $\sqrt{5 - k} = 3$ $5 - k = 9$ $\therefore k = -4$ OR MN = TN + TM $5 = \sqrt{5 - k} + 2$ $(\sqrt{5 - k})^2 = (3)^2$ $5 - k = 9$ $\therefore k = -4$	✓ NT = 3 ✓ equating ✓ answer ✓ applying rule for circle ✓ squaring both sides ✓ answer	(3)

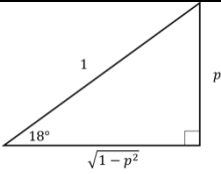
4.5	$m_{TM} = \frac{-2 + \frac{4}{5}}{2 - \frac{2}{5}}$ OR $m_{NT} = \frac{1 + \frac{4}{5}}{-2 - \frac{2}{5}}$ $\therefore m_{TM} = -\frac{3}{4}$ $\therefore m_{NT} = -\frac{3}{4}$ $m_{TM} \times m_{BT} = -1$ $m_{NT} \times m_{BT} = -1$ $\therefore m_{BT} = \frac{4}{3}$ $\frac{4}{3} = \frac{4 + \frac{4}{5}}{x - \frac{2}{5}}$ $4x - \frac{8}{5} = \frac{72}{5}$ $4x = 16$ $x = 4$ $y = 4$ OR $m_{TM} = \frac{-2 + \frac{4}{5}}{2 - \frac{2}{5}}$ OR $m_{NT} = \frac{1 + \frac{4}{5}}{-2 - \frac{2}{5}}$ $\therefore m_{TM} = -\frac{3}{4}$ $\therefore m_{NT} = -\frac{3}{4}$ $m_{TM} \times m_{BT} = -1$ $m_{NT} \times m_{BT} = -1$ $\therefore m_{BT} = \frac{4}{3}$ $y = \frac{4}{3}x + c$ subs point T $\left(\frac{2}{5}; -\frac{4}{5}\right)$ $-\frac{4}{5} = \frac{4}{3}\left(\frac{2}{5}\right) + c$ OR $y + \frac{4}{5} = \frac{4}{3}\left(x - \frac{2}{5}\right)$ $\therefore c = -\frac{4}{3}$ $y = \frac{4}{3}x - \frac{4}{3}$ $y = \frac{4}{3}x - \frac{4}{3}$ (1) $y = 4$ (2) $\frac{4}{3}x - \frac{4}{3} = 4$ $4x - 4 = 12$ $4x = 16$ $\therefore x = 4$ $\therefore B(4; 4)$ OR	$\checkmark m_{TM} = -\frac{3}{4}$ or $m_{NT} = -\frac{3}{4}$ $\checkmark m_{BT} = \frac{4}{3}$ $\checkmark$ value of y $\checkmark$ substitution into gradient formula $\checkmark$ simplify $\checkmark$ value of x OR $\checkmark m_{TM} = -\frac{3}{4}$ or $m_{NT} = -\frac{3}{4}$ $\checkmark m_{BT} = \frac{4}{3}$ $\checkmark y = 4$ $\checkmark$ substitute gradient and point T $\checkmark y = \frac{4}{3}x - \frac{4}{3}$ $\checkmark$ simplification OR	(6) (6)
-----	---	---	---

	AB = BR tangent from same point $y = 4$ $\sqrt{(-2 - x)^2 + (4 - 4)^2} = \sqrt{\left(x - \frac{2}{5}\right)^2 + \left(4 + \frac{4}{5}\right)^2}$ $4 + 4x + x^2 = x^2 - \frac{4}{5}x + \frac{4}{25} + \frac{576}{25}$ $\frac{24}{5}x = \frac{96}{5}$ $x = 4$	✓ AB = BR ✓ $y = 4$ ✓ substitution for AB ✓ substitution for BR ✓ simplification ✓ simplification	(6)
4.6	M' (2; 1) AB = 6 units NM' = 4 units AN = 3 units Area of trapezium = $\frac{1}{2} (AB + NM')AN$ $= \frac{1}{2} (6 + 4)3$ = 15 square units	✓ M' (2; 1) ✓ length of AB ✓ length of NM' and AN ✓ substitution into the formula ✓ answer	(5)

[21]

QUESTION 5

	SOLUTIONS	MARK DESCRIPTIONS	MARKS
5.1.1	 $x^2 = 9^2 - (\sqrt{17})^2$ $x^2 = 64$ $x = 8$ $\cos 2\theta = \frac{8}{9}$	$\checkmark x = 8$ $\checkmark$ answer	(2)
5.1.2	$\sin(2\theta - 45^\circ) = \sin 2\theta \cos 45^\circ - \cos 2\theta \sin 45^\circ$ $= \left(\frac{\sqrt{17}}{9}\right)\left(\frac{\sqrt{2}}{2}\right) - \left(\frac{8}{9}\right)\left(\frac{\sqrt{2}}{2}\right)$ $= \frac{\sqrt{34}}{18} - \frac{8\sqrt{2}}{18}$ $= \frac{\sqrt{34} - 8\sqrt{2}}{18}$	$\checkmark$ correct compound expansion $\checkmark$ substitution $\checkmark$ answer	(3)
5.1.3	$\cos 2\theta = 2 \cos^2 \theta - 1$ $2 \cos^2 \theta = \cos 2\theta + 1$ $\cos \theta = \sqrt{\frac{\cos 2\theta + 1}{2}}$ $= \sqrt{\frac{\left(\frac{8}{9}\right) + 1}{2}}$ $= \frac{\sqrt{34}}{6} \text{ or } \sqrt{\frac{17}{18}}$ OR $\cos 2\theta = 2 \cos^2 \theta - 1$ $\frac{8}{9} = 2 \cos^2 \theta - 1$ $\frac{17}{9} = 2 \cos^2 \theta$ $\frac{17}{18} = \cos^2 \theta$ $\therefore \cos \theta = \sqrt{\frac{17}{18}}$	$\checkmark$ double angle $\checkmark$ substitution of $\cos 2\theta$ $\checkmark$ answer OR $\checkmark$ double angle $\checkmark$ substitution of $\cos 2\theta$ $\checkmark$ answer	(3)

5.2.1	$\sin 198^\circ = \sin(180^\circ + 18^\circ)$ $= -\sin 18^\circ$ $= -p$	✓ reduction ✓ answer	(2)
5.2.2	$x^2 = 1^2 - p^2$ Pyth $x = \sqrt{1 - p^2}$  $\tan 522^\circ = \tan 162^\circ$ $= -\tan 18^\circ$ $= -\frac{p}{\sqrt{1-p^2}}$	✓ $x = \sqrt{1 - p^2}$ ✓ $-\tan 18^\circ$ ✓ answer	(3)
5.2.3	$\sin 9^\circ \cos 9^\circ = \frac{1}{2} (2 \sin 9^\circ \cos 9^\circ)$ $= \frac{1}{2} \sin 2(9^\circ)$ $= \frac{1}{2} \sin 18^\circ$ $= \frac{p}{2}$	✓ $\frac{1}{2} (2 \sin 9^\circ \cos 9^\circ)$ ✓ $\frac{1}{2} \sin 18^\circ$ ✓ answer	(3)

[16]

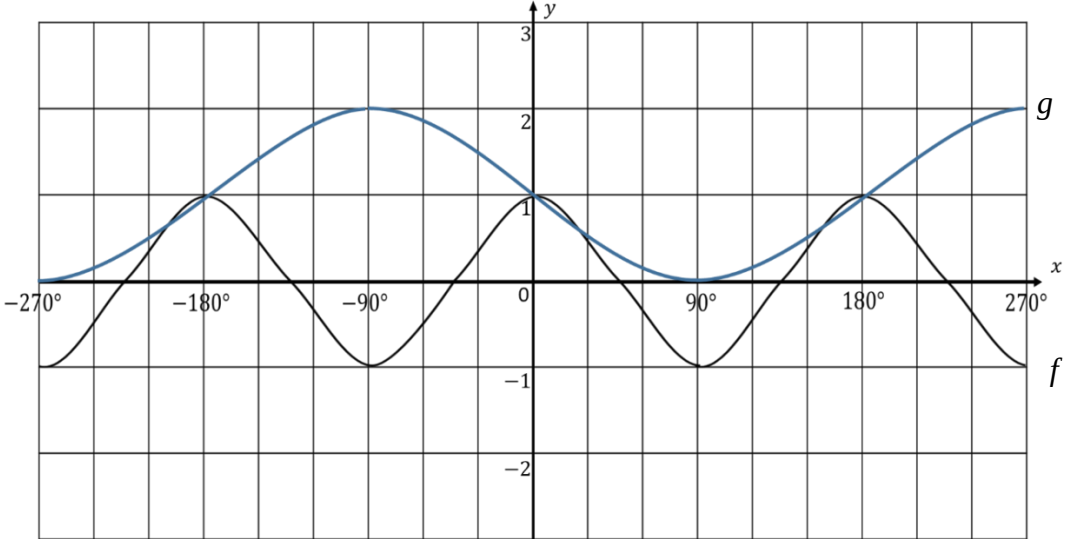
QUESTION 6

	SOLUTIONS	Mark descriptions	Marks
6.1	$\frac{\sin 100^\circ \tan^2 225^\circ}{\cos 10^\circ \sin 30^\circ}$ $= \frac{\cos 10^\circ \tan^2 45^\circ}{\cos 10^\circ \sin 30^\circ} \quad \text{OR} \quad = \frac{\sin 80^\circ \tan^2 45^\circ}{\sin 80^\circ \sin 30^\circ}$ $= \frac{1}{\frac{1}{2}}$ $= 2$	✓ $\cos 10^\circ / \sin 80^\circ$ ✓ $\tan 45^\circ$ ✓ substitution ✓ answer	(4)
6.2	$\text{LHS} = \frac{\cos^2 \theta - \cos \theta - \sin^2 \theta}{2 \sin \theta \cos \theta + \sin \theta}$ $= \frac{\cos^2 \theta - \cos \theta - (1 - \cos^2 \theta)}{\sin \theta (2 \cos \theta + 1)}$ $= \frac{2 \cos^2 \theta - \cos \theta - 1}{\sin \theta (2 \cos \theta + 1)}$ $= \frac{(2 \cos \theta + 1)(\cos \theta - 1)}{\sin \theta (2 \cos \theta + 1)}$ $= \frac{\cos \theta - 1}{\sin \theta}$ $= \frac{\cos \theta}{\sin \theta} - \frac{1}{\sin \theta}$ $= \frac{1}{\tan \theta} - \frac{1}{\sin \theta}$ OR $\text{RHS: } \frac{1}{\tan \theta} - \frac{1}{\sin \theta}$ $= \frac{\cos \theta}{\sin \theta} - \frac{1}{\sin \theta}$ $= \frac{\cos \theta - 1}{\sin \theta}$ $\text{LHS: } = \frac{\cos^2 \theta - \cos \theta - \sin^2 \theta}{2 \sin \theta \cos \theta + \sin \theta}$ $= \frac{\cos^2 \theta - \cos \theta - (1 - \cos^2 \theta)}{\sin \theta (2 \cos \theta + 1)}$ $= \frac{2 \cos^2 \theta - \cos \theta - 1}{\sin \theta (2 \cos \theta + 1)}$ $= \frac{(2 \cos \theta + 1)(\cos \theta - 1)}{\sin \theta (2 \cos \theta + 1)}$ $= \frac{\cos \theta - 1}{\sin \theta}$	✓ $1 - \cos^2 \theta$ ✓ $\sin \theta (2 \cos \theta + 1)$ ✓ $(2 \cos \theta + 1)(\cos \theta - 1)$ ✓ $\frac{\cos \theta - 1}{\sin \theta}$ OR ✓ $\frac{\cos \theta - 1}{\sin \theta}$ ✓ $1 - \cos^2 \theta$ ✓ $\sin \theta (2 \cos \theta + 1)$ ✓ $(2 \cos \theta + 1)(\cos \theta - 1)$	(4)

6.3	$ \begin{aligned} x^2 - y^2 &= \sin^2 76^\circ - \cos^2 76^\circ \\ &= -(\cos^2 76^\circ - \sin^2 76^\circ) \\ &= -\cos 2(76^\circ) \\ &= -\cos 152^\circ \\ &= -(-\sin 62^\circ) \\ &= \sin 62^\circ \end{aligned} $ OR $ \begin{aligned} \sin 62^\circ &= \sin(90^\circ - 28^\circ) \\ &= \cos 28^\circ \\ &= \cos 2(14^\circ) \\ &= \cos^2 14^\circ - \sin^2 14^\circ \\ &= \sin^2 76^\circ - \cos^2 76^\circ \\ &= x^2 - y^2 \end{aligned} $ OR $ \begin{aligned} \sin^2 76^\circ - \cos^2 76^\circ &= \sin^2(45^\circ + 31^\circ) - \cos^2(45^\circ + 31^\circ) \\ &= (\sin 45^\circ \cos 31^\circ + \cos 45^\circ \sin 31^\circ)^2 - (\cos 45^\circ \cos 31^\circ - \sin 45^\circ \sin 31^\circ)^2 \\ &= \left(\frac{1}{\sqrt{2}} \cos 31^\circ + \frac{1}{\sqrt{2}} \sin 31^\circ\right)^2 - \left(\frac{1}{\sqrt{2}} \cos 31^\circ - \frac{1}{\sqrt{2}} \sin 31^\circ\right)^2 \\ &= \frac{1}{2} \cos^2 31^\circ + \cos 31^\circ \sin 31^\circ + \frac{1}{2} \sin^2 31^\circ - \left(\frac{1}{2} \cos^2 31^\circ - \cos 31^\circ \sin 31^\circ + \frac{1}{2} \sin^2 31^\circ\right) \\ &= 2 \sin 31^\circ \cos 31^\circ \\ &= \sin 62^\circ \end{aligned} $	$ \begin{aligned} &\checkmark \text{ substitution} \\ &\checkmark -(\cos^2 76^\circ - \sin^2 76^\circ) \\ &\checkmark -\cos 2(76^\circ) \\ &\checkmark = -(-\sin 62^\circ) \end{aligned} $ OR $ \begin{aligned} &\checkmark \cos 28^\circ \\ &\checkmark \cos^2 14^\circ - \sin^2 14^\circ \\ &\checkmark \sin^2 76^\circ \\ &\checkmark \cos^2 76^\circ \end{aligned} $ OR $ \begin{aligned} &\checkmark \text{ compound expansion} \\ &\checkmark \text{ compound expansion} \\ &\checkmark \text{ simplification} \\ &\checkmark 2 \sin 31^\circ \cos 31^\circ \end{aligned} $	(4) (4) (4)
------------	--	--	----------------------------------

[12]

QUESTION 7

	SOLUTIONS	MARK DESCRIPTIONS	MARKS
7.1	180°	✓ 180°	(1)
7.2	$y \in [-3; 3]$ OR $-3 \leq y \leq 3$	✓✓ answer OR ✓✓ answer	(2) (2)
7.3	✓ turning points ✓ intercepts ✓ shape 		(3)
7.4	$\cos 2x = 1 - \sin x$ $1 - 2 \sin^2 x = 1 - \sin x$ $2 \sin^2 x - \sin x = 0$ $\sin x (2 \sin x - 1) = 0$ $\sin x = 0 \quad \text{or} \quad 2 \sin x - 1 = 0$ $\sin x = \frac{1}{2}$ For $\sin x = 0$: $x = k \cdot 180^\circ; k \in \mathbb{Z}$ or $x = k \cdot 360^\circ; k \in \mathbb{Z} \quad \text{or} \quad x = 180^\circ + k \cdot 360^\circ; k \in \mathbb{Z}$ For $\sin x = \frac{1}{2}$: $x = 30^\circ + k \cdot 360^\circ; k \in \mathbb{Z}$ or $x = 150^\circ + k \cdot 360^\circ; k \in \mathbb{Z}$	✓ $\cos 2x = 1 - 2 \sin^2 x$ ✓ standard form ✓ both equations for $\sin x$ ✓ $x = k \cdot 180^\circ; k \in \mathbb{Z}$ $x = k \cdot 360^\circ; k \in \mathbb{Z} \quad \text{or}$ $x = 180^\circ + k \cdot 360^\circ; k \in \mathbb{Z}$ ✓ $x = 30^\circ \text{ \& } 150^\circ$ ✓ $k \cdot 360^\circ \quad k \in \mathbb{Z}$	(6)

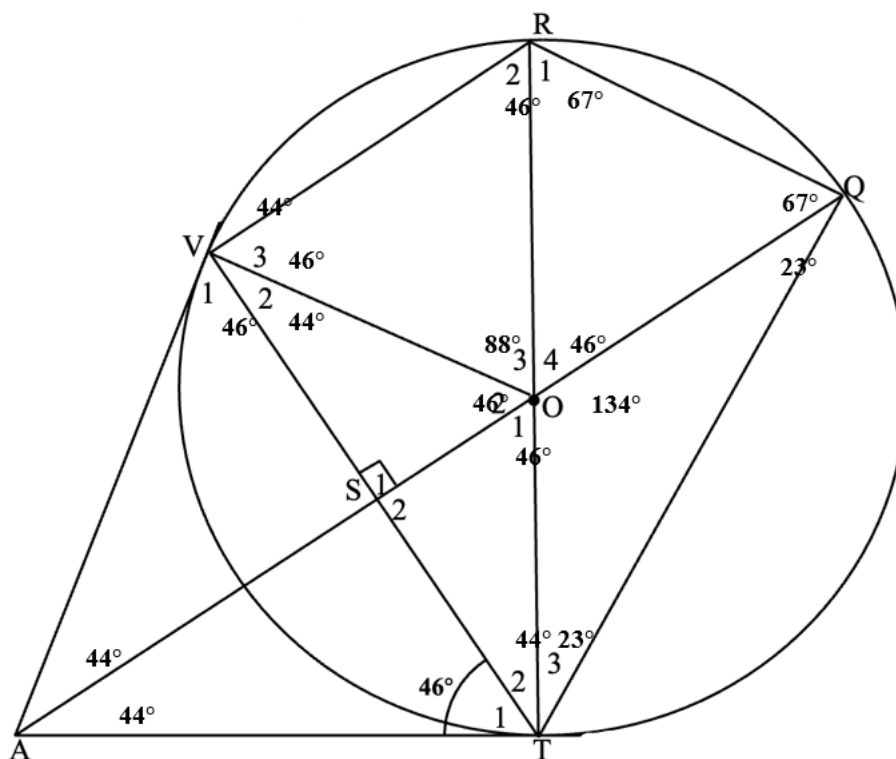
7.5.1	$x \in \{90^\circ; 180^\circ; 270^\circ\}$	✓ $90^\circ; 180^\circ$ ✓ 270°	(2)
7.5.2	$x = 150^\circ$	✓ answer	(1)

[15]

QUESTION 8

	SOLUTIONS	MARK DESCRIPTIONS	MARKS
8.1	$\tan \theta = \frac{PQ}{QR}$ $PQ = QR \tan \theta$	✓ correct trig ratio ✓ answer	(2)
8.2	$\frac{QR}{\sin \beta} = \frac{8}{\sin(180^\circ - (\alpha + \beta))}$ $QR = \frac{8 \sin \beta}{\sin(\alpha + \beta)}$	✓ correct use of sine rule ✓ $\hat{Q} = 180^\circ - (\alpha + \beta)$	(2)
8.3	$PQ = QR \tan \theta$ $PQ = \frac{8 \sin \beta}{\sin(\alpha + \beta)} \times \tan \theta$ $PQ = \frac{8 \sin \beta}{\sin 2\beta} \times \frac{\sin \theta}{\cos \theta}$ $PQ = \frac{8 \sin \beta \sin \theta}{2 \sin \beta \cos \beta \cos \theta}$ $PQ = \frac{4 \sin \theta}{\cos \beta \cos \theta}$	✓ substitution of QR ✓ $\frac{\sin \theta}{\cos \theta}$ ✓ $\sin 2\beta$ ✓ $\sin 2\beta = 2 \sin \beta \cos \beta$	(4)
8.4	$PQ = \frac{4 \sin \theta}{\cos \beta \cos \theta}$ $PQ = \frac{4 \sin 25^\circ}{\cos 67^\circ \cos 25^\circ}$ $PQ = 4,77\text{m}$	✓ correct substitution of θ and β ✓ answer	(2)

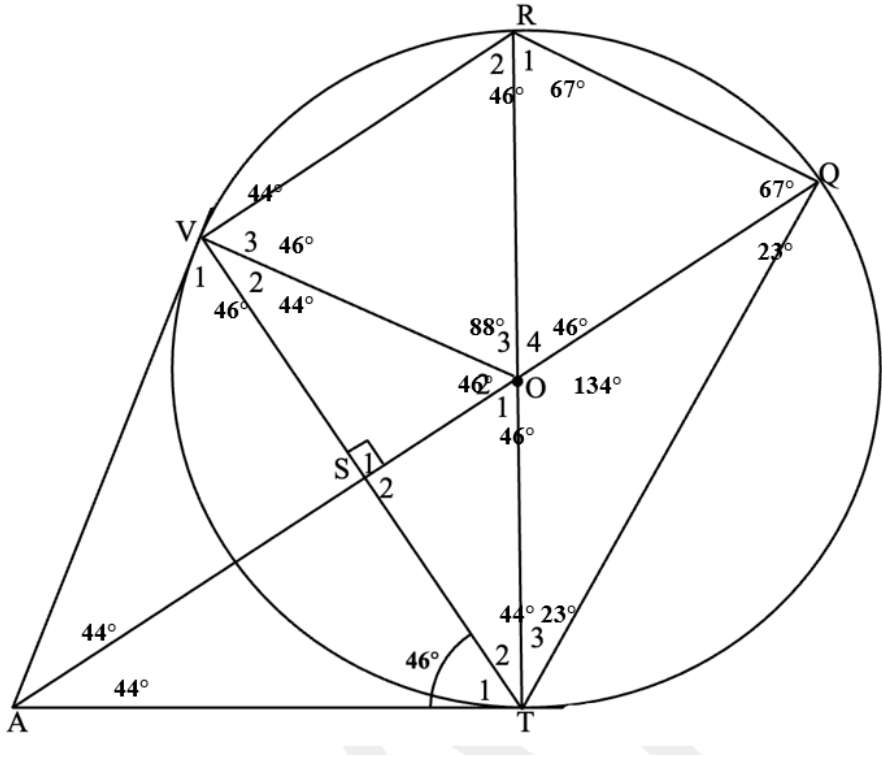
[10]

[illegible]

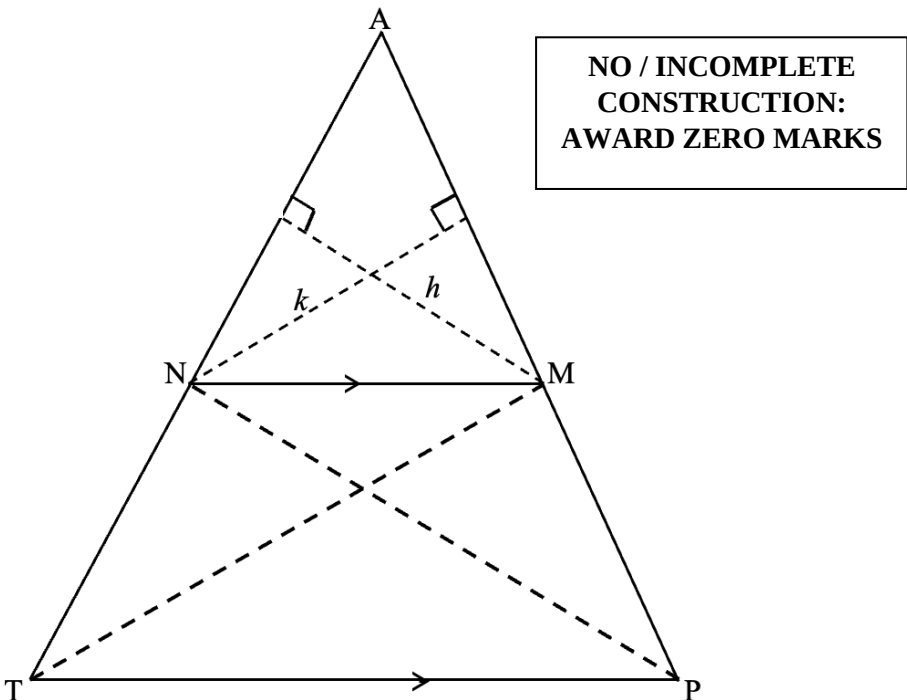
10.2	$\widehat{V}_2 = 44^\circ$ [∠s opp radii] $\widehat{S}_1 = 90^\circ$ [given] $\widehat{O}_2 = 46^\circ$ [sum of ∠s in Δ] $\therefore \widehat{O}_2 = \widehat{T}_1 = 46^\circ$ $\therefore$ TAVO is a cyclic quad [converse ∠s in same seg or line subtends equal ∠s]	✓ S/R ✓ S ✓ S ✓ R	(4)
------	--	------------------------------------	-----

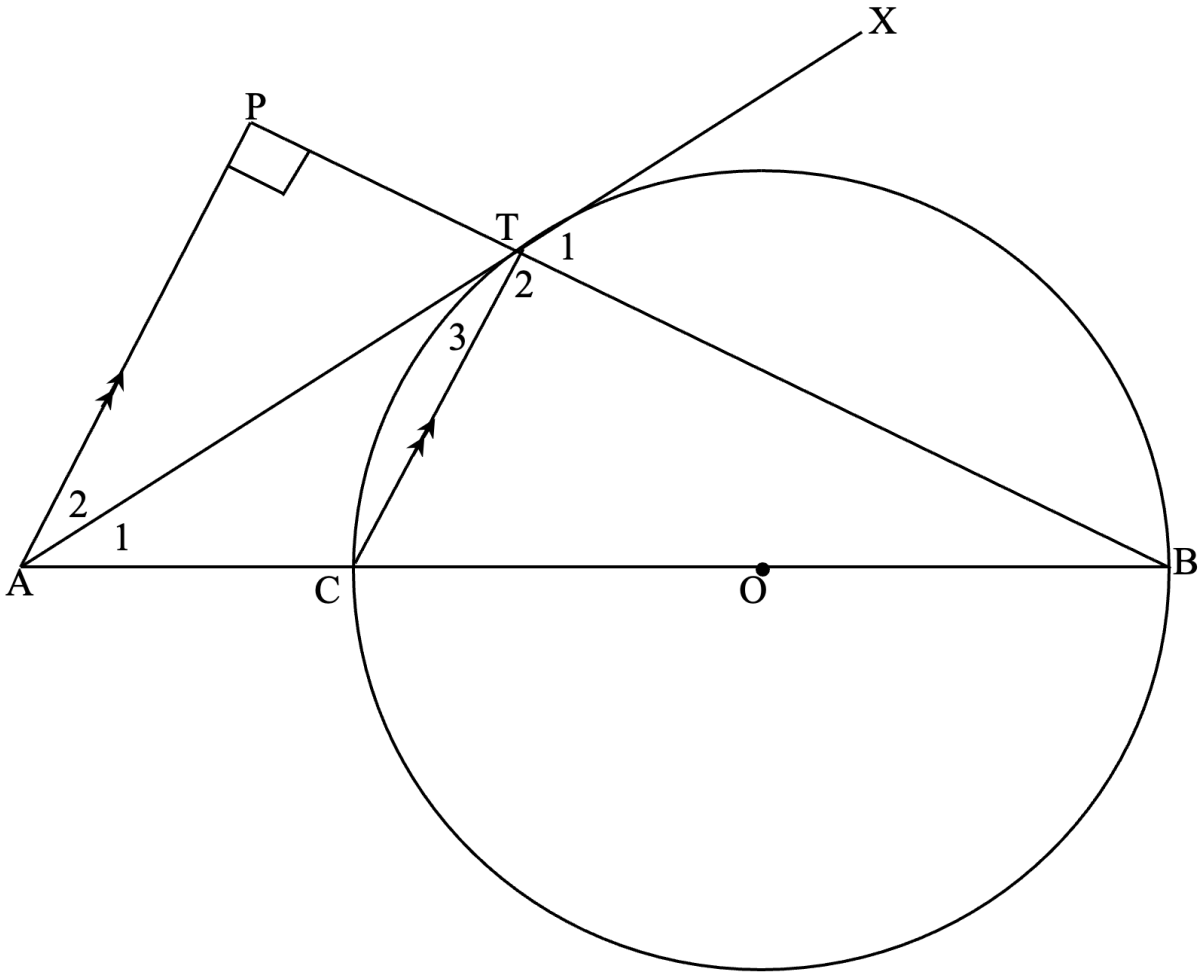
10.3	$\widehat{O}_1 = \widehat{V}_1 = 46^\circ$ [∠s in same seg] $\therefore \widehat{V}_1 = \widehat{O}_2 = 46^\circ$ $\therefore$ VA is a tangent to the circle. [converse tan chord theorem or ∠ between line and chord]	✓ S/R ✓ R	(2)
------	---	------------------	-----

[13]



QUESTION 11

	SOLUTIONS	MARK DESCRIPTIONS	MARKS
11.1	Construction: In ΔATP, draw perpendicular height k with base AM and perpendicular height h with base AN. Join TM and NP.		
			
	Proof: $\frac{\text{Area } \Delta ANM}{\text{Area } \Delta TNM} = \frac{\frac{1}{2} \cdot AN \cdot h}{\frac{1}{2} \cdot NT \cdot h}$ $= \frac{AN}{NT}$ $\frac{\text{Area } \Delta ANM}{\text{Area } \Delta PNM} = \frac{\frac{1}{2} \cdot AM \cdot k}{\frac{1}{2} \cdot MP \cdot k}$ $= \frac{AM}{MP}$ Area ΔANM = Area ΔANM But Area ΔTNM = Area ΔPMN (same base and height) $\therefore \frac{\text{Area } \Delta ANM}{\text{Area } \Delta TNM} = \frac{\text{Area } \Delta ANM}{\text{Area } \Delta PNM}$ $\therefore \frac{AN}{NT} = \frac{AM}{MP}$	✓ construction $\checkmark \frac{\text{Area } \Delta ANM}{\text{Area } \Delta TNM} = \frac{\frac{1}{2} \cdot AN \cdot h}{\frac{1}{2} \cdot NT \cdot h}$ $\checkmark \frac{AN}{NT}$ $\checkmark \frac{\text{Area } \Delta ANM}{\text{Area } \Delta PNM} = \frac{AM}{MP}$ ✓ S/R	(5)



	SOLUTIONS	MARK DESCRIPTIONS	MARKS
11.2.3	$\frac{BP}{TB} = \frac{AP}{TC}$ $\Delta TBC \parallel \Delta PBA$ $\therefore AP = \frac{BP \cdot TC}{TB}$ $\frac{AP}{BP} = \frac{PT}{AP}$ $\Delta APT \parallel \Delta BPA$ $\therefore AP^2 = BP \cdot PT$ $\left(\frac{BP \cdot TC}{TB}\right)^2 = BP \cdot PT$ $\frac{BP^2 \cdot TC^2}{TB^2} = BP \cdot PT$ $PT = \frac{BP^2 \cdot TC^2}{BP \cdot TB^2}$ $\therefore PT = \frac{BP \cdot TC^2}{TB^2}$	✓ S/R ✓ S ✓ S ✓ S ✓ $\left(\frac{BP \cdot TC}{TB}\right)^2 = BP \cdot PT$ ✓ $PT = \frac{BP^2 \cdot TC^2}{BP \cdot TB^2}$	(6)

[18]

TOTAL: 150

FINAL



KWAZULU-NATAL PROVINCE

EDUCATION
REPUBLIC OF SOUTH AFRICA

**PROVINCIAL STANDARDISED
ASSESSEMENT**

GRADE 12

MATHEMATICS P2

SEPTEMBER 2026

PREPARATORY EXAMINATION

MARKING GUIDELINES

MARKS: 150

These marking guidelines consist of 15 pages.

Copyright Reserved

Please turn over

QUESTION 1

1.1	$\bar{x} = \frac{107}{10}$ $= 10,7$ Answer only: Full marks	✓A $\bar{x} = \frac{107}{10}$ ✓CA answer (2)
1.2	$a = 49,51$ $b = 2,62$ $\hat{y} = 49,51 + 2,62x$	✓A value of a ✓A value of b ✓CA equation (3)
1.3	$r = 0,96$ Penalty for incorrect rounding: Only in this question.	✓A answer (1)
1.4	There is a very strong correlation between gym hours and maximum performance minutes.	✓CA very strong (1)
1.5	$\hat{y} = 49,51 + 2,62(4)$ $= 59,99$ minutes OR 59,97 minutes (from calculator)	✓CA substitution ✓CA answer (2) OR ✓✓A A answer (2)
1.6	Increase	✓A answer (1)
[10]		

QUESTION 2

2.1	200	✓A answer (1)
2.2.1	R3920	✓A answer (accept: R3850 – R4000) (1)
2.2.2	No. of Bolt vehicles for which fares are R5000 or less = 153 No of Bolt vehicles for which fares are more than R5000 $= 200 - 153$ $= 47$	✓A 153 (accept: 150 – 155) ✓CA subtraction ✓CA answer (accept: 45 – 50) (3)
2.3	20% of 200 = 40 Reading from the graph this equates to R2425 in fares. $\text{distance travelled} = \frac{2425}{25}$ $= 97 \text{ km}$ $\therefore x = 97$	✓A 40 ✓CA amount in fares (accept: R2400 – R2450) ✓CA dividing amount by 25 ✓CA answer (accept: 96 to 98 km) (4)
[9]		

QUESTION 3

3.1.1	Midpoint of EH $= \left(\frac{-2+2}{2}; \frac{-3+0}{2} \right)$ $= \left(0; \frac{-3}{2} \right)$ Answer only: Full marks	✓A x-value ✓A y-value (2)
3.1.2	$m_{EF} = \frac{-5-(-3)}{2-(-2)}$ $= \frac{-1}{2}$ Answer only: Full marks	✓A substitution ✓CA answer (2)
3.1.3	$m_{DG} = m_{EF} = \frac{-1}{2}$ [DG ∥ EF] $y = mx + c$ Substitute (2 ; 0): $0 = \left(\frac{-1}{2} \right)(2) + c$ $c = 1$ $\therefore y = \frac{-1}{2}x + 1$	✓CA $m_{DG} = \frac{-1}{2}$ ✓CA substitution ✓CA answer (3)
3.1.4	$m_{DG} = \tan \hat{DHC} = -\frac{1}{2}$ $\hat{DHC} = 153,43^\circ$ $\alpha = 180^\circ - 153,43^\circ = 26,57^\circ$ [∠s on a straight line] $\theta = 90^\circ + 26,57^\circ = 116,57^\circ$ [ext ∠ of ΔDOH]	✓CA $\tan \hat{DHC} = -\frac{1}{2}$ ✓CA size of $\hat{DHC}$ ✓CA size of θ (3)
3.2	D(0;1) $m_{DE} = \frac{-3-1}{-2-0} = 2$ $m_{DE} \times m_{DG} = 2 \times -\frac{1}{2} = -1$ $\therefore DE \perp DG$	✓CA coordinates of D ✓CA $m_{DE} = 2$ ✓A showing that product of gradients = -1 (3)
3.3.1	$\left(0; \frac{-3}{2} \right)$	✓CA answer (1)

3.3.2	$(x-0)^2 + \left[y - \left(-\frac{3}{2} \right) \right]^2 = r^2$ $x^2 + \left(y + \frac{3}{2} \right)^2 = r^2$ $r^2 = (2-0)^2 + \left[0 - \left(-\frac{3}{2} \right) \right]^2$ $= 4 + \frac{9}{4} = \frac{25}{4}$ $\therefore x^2 + \left(y + \frac{3}{2} \right)^2 = \frac{25}{4}$ Answer only: 3/4	✓CA substitution of coordinates of centre ✓CA substitution of $H(2; 0)$ ✓CA value of r^2 ✓CA equation of circle (4)
[18]		

QUESTION 4

4.1	$(x-4)^2 + (y-6)^2 = 10^2$ $(-4-4)^2 + (p-6)^2 = 10^2$ $(p-6)^2 = 36$ $p-6 = \pm\sqrt{36} \quad \text{OR} \quad p^2 - 12p + 36 = 36$ $p-6=6 \text{ or } p-6=-6 \quad p(p-12)=0$ $p=12 \text{ or } p \neq 0 \quad p=12 \text{ or } p \neq 0$ $\therefore p=12 \quad \therefore p=12$	✓A equation of the circle/distance formula ✓CA substitution of point J ✓CA simplification ✓A $p-6 = \pm\sqrt{36}$ OR $p(p-12) = 0$ (4)
4.2.1	$C(4; 6-10)$ $\therefore C(4; -4)$ Answer only: Full marks	✓A x-coordinate ✓A y-coordinate (2)
4.2.2	$m_{MJ} = \frac{12-6}{-4-4} = -\frac{3}{4}$ $\therefore m_{AJB} = \frac{4}{3} \quad [\text{radius} \perp \text{tangent}]$ $y = \frac{4}{3}x + c$ Subst. point J: $12 = \frac{4}{3}(-4) + c$ $c = \frac{52}{3}$ $y = \frac{4}{3}x + \frac{52}{3}$	✓A gradient of radius ✓CA gradient of tangent ✓CA substitution of gradient and point J ✓CA equation of tangent (4)

4.2.3	$y_A = \frac{4}{3}(4) + \frac{52}{3} = \frac{68}{3}$ $AC = y_A - y_C = \frac{68}{3} - (-4) = \frac{80}{3}$ Calculate x-coordinate of B: $\frac{x_B + 4}{2} = -9$ $\therefore x_B = -22$ height of $\triangle ABC \perp AC = 4 - (-22) = 26$ units $\therefore \text{Area of } \triangle ABC = \frac{1}{2} \times \text{base} \times \text{height}$ $= \frac{1}{2} \times \frac{80}{3} \times 26$ $= \frac{1040}{3} = 346,67 \text{ units}^2$ OR Coordinates of A: $y_A = \frac{4}{3}(4) + \frac{52}{3} = \frac{68}{3}$ $AC = y_A - y_C = \frac{68}{3} - (-4) = \frac{80}{3}$ Coordinates of B: $\frac{x_B + 4}{2} = -9$ $\therefore x_B = -22$ $\frac{-4 + y_B}{2} = -8$ $\therefore y_B = -12$ $\therefore B(-22; -12)$ Length of AB = $\sqrt{(-22 - 4)^2 + \left(-12 - \frac{68}{3}\right)^2} = \frac{130}{3}$ $\tan^{-1}\left(\frac{4}{3}\right) = 53,13^\circ$ $\therefore \hat{A} = 180^\circ - 90^\circ - 53,13^\circ = 36,87^\circ$ $\therefore \text{Area of } \triangle ABC = \frac{1}{2} AB \cdot AC \sin A$ $= \frac{1}{2} \left(\frac{130}{3}\right) \left(\frac{80}{3}\right) \sin 36,87^\circ$ $= 346,67 \text{ units}^2$	✓CA calculation of y_A ✓CA length of AC ✓CA calculation of x_B ✓CA value of x-coordinate of B ✓CA height of $\triangle ABC$ ✓CA substitution into area formula ✓CA answer (7) OR ✓CA calculation of y_A ✓CA length of AC ✓CA values of coordinates of B ✓CA length of AB ✓CA size of $\hat{A}$ ✓CA substitution into area formula ✓CA answer (7)
-------	--	--

Grade 12 - Marking Guidelines

4.3	For circles touching externally, the distance between centres: $d = r_1 + r_2$ $(4-4)^2 + (6-n)^2 = (10+10)^2$ $36 - 12n + n^2 = 400$ $n^2 - 12n - 364 = 0$ $(n+14)(n-26) = 0$ $\therefore n = -14 \quad \text{or} \quad n = 26$ OR $n = 6 - 2(r) \quad \text{or} \quad n = 6 + 2(r)$ $= 6 - 2(10) \quad \quad \quad = 6 + 2(10)$ $= -14 \quad \quad \quad = 26$	✓A $d = r_1 + r_2$ ✓A substitution ✓A $n = -14$ ✓A $n = 26$ (4) OR ✓A $n = 6 - 2(r)$ ✓A $n = 6 + 2(r)$ ✓A $n = -14$ ✓A $n = 26$ (4)
[21]		

QUESTION 5

5.1.1	$x = -3 ; y = -\sqrt{7}$ $(-3)^2 + (-\sqrt{7})^2 = r^2 \quad [\text{Pythagoras}]$ $r^2 = 16$ $r = 4$ $\therefore \cos \alpha = \frac{-3}{4}$	✓A substitution ✓CA value of r ✓CA answer (3)
5.1.2	$\sin 3\alpha \cos 2\alpha - \cos 3\alpha \sin 2\alpha$ $= \sin(3\alpha - 2\alpha)$ $= \sin \alpha$ $= \frac{-\sqrt{7}}{4}$	✓A $\sin \alpha$ ✓CA answer (2)
5.2	$\frac{\sin 290^\circ \cdot \sin(90^\circ + x) \cdot \sin 160^\circ}{\cos(-x - 360^\circ) \cdot \sin 220^\circ}$ $= \frac{(-\sin 70^\circ) \cdot (\cos x) \cdot \sin 20^\circ}{\cos x \cdot (-\sin 40^\circ)}$ $= \frac{-\cos 20^\circ \cdot \sin 20^\circ}{-\sin 40^\circ}$ $= \frac{\sin 20^\circ \cos 20^\circ}{2 \sin 20^\circ \cos 20^\circ}$ $= \frac{1}{2}$	✓A $-\sin 70^\circ$ and $\sin 20^\circ$ ✓A $\cos x$ (in numerator) ✓A $\cos x$ (in denominator) ✓A $-\sin 40^\circ$ ✓CA $\sin 70^\circ = \cos 20^\circ$ ✓CA double angle expansion ✓CA answer (7)

5.3.1	$\frac{\frac{1}{4} - \cos(\theta - 60^\circ) \cdot \cos(\theta + 60^\circ)}{\sin 2\theta}$ $= \frac{\frac{1}{4} - [(\cos \theta \cos 60^\circ + \sin \theta \sin 60^\circ)(\cos \theta \cos 60^\circ - \sin \theta \sin 60^\circ)]}{2 \sin \theta \cos \theta}$ $= \frac{\frac{1}{4} - [\cos^2 \theta \cos^2 60^\circ - \sin^2 \theta \sin^2 60^\circ]}{2 \sin \theta \cos \theta}$ $= \frac{\frac{1}{4} - \cos^2 \theta \left(\frac{1}{2}\right)^2 + \sin^2 \theta \left(\frac{\sqrt{3}}{2}\right)^2}{2 \sin \theta \cos \theta}$ $= \frac{\frac{1}{4} - \frac{1}{4} \cos^2 \theta + \frac{3}{4} \sin^2 \theta}{2 \sin \theta \cos \theta}$ $= \frac{\frac{1}{4}(1 - \cos^2 \theta) + \frac{3}{4} \sin^2 \theta}{2 \sin \theta \cos \theta}$ $= \frac{\frac{1}{4} \sin^2 \theta + \frac{3}{4} \sin^2 \theta}{2 \sin \theta \cos \theta}$ $= \frac{\sin^2 \theta}{2 \sin \theta \cos \theta}$ $= \frac{1}{2} \tan \theta$ $= \text{RHS}$	✓A compound $\angle$ expansions ✓A double $\angle$ expansion ✓A simplifying numerator ✓A special angle values ✓A common factor ✓A using square identity ✓A $\frac{\sin^2 \theta}{2 \sin \theta \cos \theta}$ (7)
5.3.2	Undefined at $\theta = 90^\circ$, because $\tan 90^\circ$ is undefined. Also undefined when $\sin 2\theta = 0$ $2\theta = 0^\circ + k \cdot 180^\circ$ $\therefore \theta = 0^\circ + k \cdot 90^\circ$ Therefore, in the interval $\theta \in [0^\circ; 180^\circ]$, the identity is undefined at: $\theta = 0^\circ; 90^\circ; 180^\circ$.	✓A 0° ✓A 90° ✓A 180° (3)
[22]		

QUESTION 6

6.1.1	$A(210^\circ; -1)$	✓A 210° ; ✓A -1 (2)
6.1.2	$\sin(2x - 60^\circ) = 1$ $2x - 60^\circ = 90$ $2x = 150^\circ$ $x = 75^\circ$ $\therefore B(75^\circ; 1)$ OR $y = \sin(2x - 60^\circ) = \sin 2(x - 30^\circ)$ The graph of $y = \sin 2(x - 30^\circ)$ is obtained by translating the graph of $y = \sin 2x$ to the right by 30° . $y = \sin 2x$ has a maximum turning point at $x = 45^\circ$. Therefore, the graph of $y = \sin(2x - 60^\circ)$ will have a maximum turning point at $x = 45^\circ + 30^\circ = 75^\circ$. Therefore, the coordinates of B will be $(75^\circ; 1)$.	✓A setting up equation ✓A x-coordinate ✓A y-coordinate (3) OR ✓A translation of 30° to the right ✓A x-coordinate ✓A y-coordinate (3)
6.2	360°	✓A answer (1)
6.3	Range of $y = \cos(x - 30^\circ)$ is $-1 \leq y \leq 1$ $\therefore$ Range of $y = 2^{\cos(x-30^\circ)}$ is $\frac{1}{2} \leq y \leq 2$ Answer only: Full marks	✓A range of $\cos(x - 30^\circ)$ ✓✓CA CA answer (3)
6.4.1	$\frac{1}{2} \sin 2x - \frac{\sqrt{3}}{2} \cos 2x = \cos(x - 30^\circ)$ $\sin 2x \cos 60^\circ - \cos 2x \sin 60^\circ = \cos(x - 30^\circ)$ $\sin(2x - 60^\circ) = \cos(x - 30^\circ)$ $\sin(2x - 60^\circ) = \sin(90 - (x - 30^\circ))$ $\sin(2x - 60^\circ) = \sin(120^\circ - x)$ $2x - 60^\circ = 120^\circ - x + k.360^\circ$ or $2x - 60^\circ = 180^\circ - (120^\circ - x) + k.360^\circ$ $3x = 180^\circ + k.360^\circ$ $x = 120^\circ + k.360^\circ, k \in \mathbb{Z}$ $x = 60^\circ + k.120^\circ, k \in \mathbb{Z}$ OR $k \in \mathbb{Z} :$ at least once.	✓A special angles ✓A compound angle identity used ✓CA co-ratio ✓CA both equations ✓CA $x = 120^\circ + k.360^\circ$ ✓CA $x = 60^\circ + k.120^\circ$ (6) OR

	$\frac{1}{2}\sin 2x - \frac{\sqrt{3}}{2}\cos 2x = \cos(x - 30^\circ)$ $\sin 30^\circ \sin 2x - \cos 30^\circ \cos 2x = \cos(x - 30^\circ)$ $-(\cos 30^\circ \cos 2x - \sin 30^\circ \sin 2x) = \cos(x - 30^\circ)$ $-\cos(2x + 30^\circ) = \cos(x - 30^\circ)$ $2x + 30^\circ = 180^\circ - (x - 30^\circ) + k.360^\circ \quad \text{or} \quad 2x + 30^\circ = 180^\circ + (x - 30^\circ) + k.360^\circ$ $3x = 180^\circ + k.360^\circ \quad \text{or} \quad x = 120^\circ + k.360^\circ, k \in Z$ $x = 60^\circ + k.120^\circ, k \in Z$ OR $\frac{1}{2}\sin 2x - \frac{\sqrt{3}}{2}\cos 2x = \cos(x - 30^\circ)$ $\cos 60^\circ \sin 2x - \sin 60^\circ \cos 2x = \cos(x - 30^\circ)$ $\sin 2x \cos 60^\circ - \cos 2x \sin 60^\circ = \cos(x - 30^\circ)$ $\sin(2x - 60^\circ) = \cos(x - 30^\circ)$ $\sin 2(x - 30^\circ) = \cos(x - 30^\circ)$ $2\sin(x - 30^\circ)\cos(x - 30^\circ) = \cos(x - 30^\circ)$ $\cos(x - 30^\circ)[2\sin(x - 30^\circ) - 1] = 0$ $\cos(x - 30^\circ) = 0 \quad \text{or} \quad \sin(x - 30^\circ) = \frac{1}{2}$ $x - 30^\circ = 90^\circ + k.180^\circ \quad \text{or} \quad x - 30^\circ = 30^\circ + k.360^\circ \quad \text{or}$ $x - 30^\circ = 150^\circ + k.360^\circ$ $x = 120^\circ + k.180^\circ \quad k \in Z \quad x = 60^\circ + k.360^\circ, k \in Z \quad x = 180^\circ + k.360^\circ, k \in Z$	✓A special angles ✓A compound angle identity used ✓CA co-ratio ✓CA both equations ✓CA $x = 120^\circ + k.360^\circ$ ✓CA $x = 60^\circ + k.120^\circ$ (6) OR ✓A special angles ✓A compound angle identity used ✓CA factorisation ✓CA all 3 equations ✓CA $x = 120^\circ + k.180^\circ$ ✓CA $x = 60^\circ + k.360^\circ$ and $x = 180^\circ + k.360^\circ$ (6)
6.4.2	60°	✓CA answer (1)
[16]		

QUESTION 7

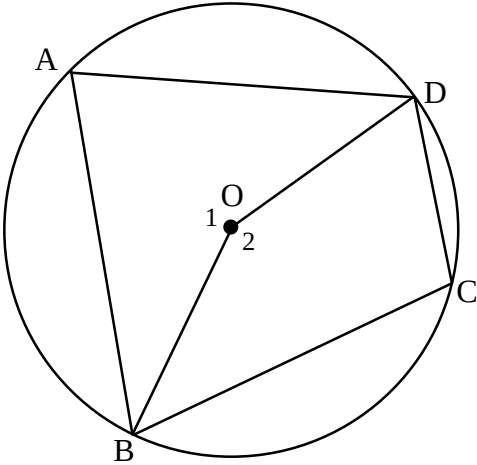
7.1	In $\triangle ABC$: $\frac{AB}{r} = \tan 2\theta$ $\therefore AB = r \tan 2\theta$ In $\triangle ABD$: $\frac{AB}{R} = \tan \theta$ $\therefore AB = R \tan \theta$ $\therefore r \tan 2\theta = R \tan \theta$ $R = \frac{r \tan 2\theta}{\tan \theta}$ $= \frac{(r) \frac{\sin 2\theta}{\cos 2\theta}}{\frac{\sin \theta}{\cos \theta}}$ $= \left(\frac{r \cdot 2 \sin \theta \cos \theta}{2 \cos^2 \theta - 1} \right) \times \frac{\cos \theta}{\sin \theta}$ $= \frac{2r \cos^2 \theta}{2 \cos^2 \theta - 1}$	✓A $\frac{AB}{r} = \tan 2\theta$ ✓A $\frac{AB}{R} = \tan \theta$ ✓A equating ✓A quotient identity ✓A double angle expansion ✓A double angle expansion (6)
7.2	$BD = \frac{2r \cos^2 \theta}{2 \cos^2 \theta - 1} = \frac{2(2) \cos^2 30^\circ}{2 \cos^2 30^\circ - 1} = 6 \text{ m}$ In $\triangle BCD$: $CD^2 = BD^2 + BC^2 - 2BD \cdot BC \cdot \cos \hat{C}BD$ $7^2 = 6^2 + 2^2 - 2(6)(2) \cos \hat{C}BD$ $\cos \hat{C}BD = -\frac{9}{24}$ $\hat{C}BD = 112,02^\circ$ Area of $\triangle BCD = \frac{1}{2} \cdot BC \cdot BD \cdot \sin \hat{C}BD$ $= \frac{1}{2} (2)(6) \sin 112,02^\circ$ $= 5,6 \text{ m}^2$ OR	✓A length of BD ✓CA substitution into cosine rule ✓CA value of $\cos \hat{C}BD$ ✓CA size of $\hat{C}BD$ ✓CA substitution into area rule ✓CA answer (6) OR

	$BD = \frac{2r \cos^2 \theta}{2 \cos^2 \theta - 1} = \frac{2(2) \cos^2 30^\circ}{2 \cos^2 30^\circ - 1} = 6 \text{ m}$ In $\triangle BCD$: $BD^2 = BC^2 + CD^2 - 2BC \cdot CD \cdot \cos \hat{BCD}$ $6^2 = 2^2 + 7^2 - 2(2)(7) \cos \hat{BCD}$ $\cos \hat{BCD} = \frac{17}{28}$ $\hat{BCD} = 52,62^\circ$ $\text{Area of } \triangle BCD = \frac{1}{2} \cdot BC \cdot CD \cdot \sin \hat{BCD}$ $= \frac{1}{2}(2)(7) \sin 52,62^\circ$ $= 5,6 \text{ m}^2$ OR $BD = \frac{2r \cos^2 \theta}{2 \cos^2 \theta - 1} = \frac{2(2) \cos^2 30^\circ}{2 \cos^2 30^\circ - 1} = 6 \text{ m}$ In $\triangle BCD$: $BC^2 = BD^2 + CD^2 - 2BD \cdot CD \cdot \cos \hat{BDC}$ $2^2 = 6^2 + 7^2 - 2(6)(7) \cos \hat{BDC}$ $\cos \hat{BDC} = \frac{81}{84}$ $\hat{BDC} = 15,36^\circ$ $\text{Area of } \triangle BCD = \frac{1}{2} \cdot BD \cdot CD \cdot \sin \hat{BDC}$ $= \frac{1}{2}(6)(7) \sin 15,36^\circ$ $= 5,6 \text{ m}^2$	✓ A length of BD ✓ CA substitution into cosine rule ✓ CA value of $\cos \hat{BCD}$ ✓ CA size of $\hat{BCD}$ ✓ CA substitution into area rule ✓ CA answer (6) OR ✓ A length of BD ✓ CA substitution into cosine rule ✓ CA value of $\cos \hat{BDC}$ ✓ CA size of $\hat{BDC}$ ✓ CA substitution into area rule ✓ CA answer (6)
[12]		

QUESTION 8

8.1.1	$\hat{A}DC = 67^\circ$ [ext $\angle$ of cyclic quad]	✓S ✓R (2)
8.1.2	$\hat{A} = 67^\circ$ [alt $\angle$ s; $BC \parallel AD$]	✓S ✓R (2)
8.1.3	$\hat{C} = 180^\circ - 67^\circ$ $= 113^\circ$ [opp $\angle$ s of cyclic quad]	✓ R ✓ S (2)
8.1.4	$\hat{B}_2 = \hat{A} = 67^\circ$ [$\angle$ s opp = sides] $\hat{D}_1 = \hat{B}_2 = 67^\circ$ [tan-chord th]	✓S/R ✓S ✓R (3)
8.2	$\hat{D}_2 = \hat{B}_3$ [alt. $\angle$ s; $BC \parallel AD$] $\therefore AB = CD$ [converse: equal chords subtend equal angles] OR $\hat{D}_2 = 180^\circ - (67^\circ + 67^\circ)$ [sum of $\angle$ s in Δ] $= 46^\circ$ $\hat{B}_3 = 180^\circ - (67^\circ + 67^\circ)$ [$\angle$ s on a str line] $= 46^\circ$ $\hat{D}_2 = \hat{B}_3$ $\therefore AB = CD$ [converse: equal chords subtend equal angles]	✓S ✓R ✓R OR ✓S/R ✓S $\hat{B}_3 = 46^\circ$ ✓R (3)
[12]		

QUESTION 9

9.1		
	Construct radii OD and OB. $\hat{O}_1 = 2\hat{C}$ [$\angle$ at centre = $2 \times \angle$ at circumf] $\hat{O}_2 = 2\hat{A}$ [$\angle$ at centre = $2 \times \angle$ at circumf] $\hat{O}_1 + \hat{O}_2 = 360^\circ$ [$\angle$ s around a point] $\therefore 2\hat{C} + 2\hat{A} = 360^\circ$ $\hat{C} + \hat{A} = 180^\circ$ or: $\hat{A} + \hat{C} = 180^\circ$	✓ construction ✓S ✓R ✓S/R ✓S (5)
9.2.1	$\hat{G}_2 = 90^\circ$ [radius $\perp$ tangent] $\hat{H}_4 = 90^\circ$ [line from centre to midpoint of chord] $\hat{G}_2 + \hat{H}_4 = 180^\circ$ $\therefore$ OGEH is a cyclic quadrilateral [converse opp $\angle$ s of cyclic quad] OR $\hat{G}_2 = 90^\circ$ [radius $\perp$ tangent] $\hat{H}_1 = 90^\circ$ [line from centre to midpoint of chord] $\hat{G}_2 + \hat{H}_1 = 180^\circ$ $\therefore$ OGEH is a cyclic quadrilateral [converse: exterior $\angle$ of cyclic quad]	✓S/R ✓S ✓R ✓R OR S/R ✓S ✓R ✓R (4)
9.2.2	In $\triangle AHC$ and $\triangle DHC$ 1. $AH = DH$ [given] 2. $HC = HC$ [common] 3. $\hat{H}_2 = \hat{H}_3$ [both = 90°] $\therefore \triangle AHC \equiv \triangle DHC$ [SAS] $\therefore \hat{C}_1 = \hat{C}_2$ [congruent Δ s]	✓S ✓R ✓R (3)

QUESTION 10

10.1.1	$\frac{CE}{EA} = \frac{FC}{BF} \quad [\text{prop th, EF} \parallel \text{AB}]$ $\therefore \frac{CE}{EA} = \frac{3}{2}$	✓R ✓ answer (2)
10.1.2	In $\triangle EFC$ and $\triangle ABC$ 1) $\hat{C}_2 = \hat{C}_2$ [common] 2) $\hat{E}_1 = \hat{A}_1$ [corr $\angle$s, $AB \parallel EF$] 3) $\hat{EFC} = \hat{B}$ [sum of $\angle$s in $\triangle$] $\therefore \triangle EFC \parallel \triangle ABC$ [$\angle\angle\angle$] $\frac{EF}{AB} = \frac{FC}{BC}$ [$\parallel \Delta$s] $\therefore \frac{EF}{AB} = \frac{3}{5}$	✓S ✓S/R ✓R ✓S/R ✓S (5)
10.2	In $\triangle EGF$ and $\triangle CGD$ 1) $\hat{E}_1 = \hat{C}_1$ [alt $\angle$s, $EF \parallel CD$] 2) $\hat{F}_2 = \hat{D}_2$ [alt $\angle$s, $EF \parallel CD$] 3) $\hat{G}_3 = \hat{G}_1$ [vert opp $\angle$s] $\therefore \triangle EGF \parallel \triangle CGD$ [$\angle\angle\angle$] $\frac{EG}{CG} = \frac{EF}{CD}$ [$\parallel \Delta$s] But, $CD = AB$ [opp sides of parm ABCD] $\therefore \frac{EG}{CG} = \frac{EF}{AB}$ $\therefore EG = \frac{CG \cdot EF}{AB}$	✓S/R ✓S/R ✓S/R ✓S (5)
[12]		

TOTAL: 150 MARKS



LIMPOPO

PROVINCIAL GOVERNMENT
REPUBLIC OF SOUTH AFRICA

DEPARTMENT OF
EDUCATION

NATIONAL SENIOR CERTIFICATE/
NASIONALE SENIOR SERTIFIKAAT

GRADE 12/GRAAD 12

MATHEMATICS P2/WISKUNDE V2
SEPTEMBER 2026/SEPTEMBER 2026
MARKING GUIDELINES/NASIENRIGLYNE

MARKS/PUNTE: 150

This marking guidelines consists of 18 pages/*Hierdie nasienriglyne bestaan uit 18 bladsye*

NOTE:

If a candidate answers a question TWICE, only mark the FIRST attempt.

If a candidate has crossed out an attempt of a question and not redone the question, mark the crossed-out version.

Consistent accuracy applies in ALL aspects of the Marking Guidelines. Stop marking at the second calculation error.

Assuming answers/values to solve a problem is NOT acceptable.

LET WEL:

As 'n kandidaat 'n vraag TWEE KEER beantwoord, sien slegs die EERSTE poging na.

As 'n kandidaat 'n antwoord van 'n vraag doodtrek en nie oordoen nie, sien die doodgetrekte poging na.

Volgehoue akkuraatheid word in ALLE aspekte van die Nasienriglyne toegepas. Hou op nasien by die tweede berekeningsfout.

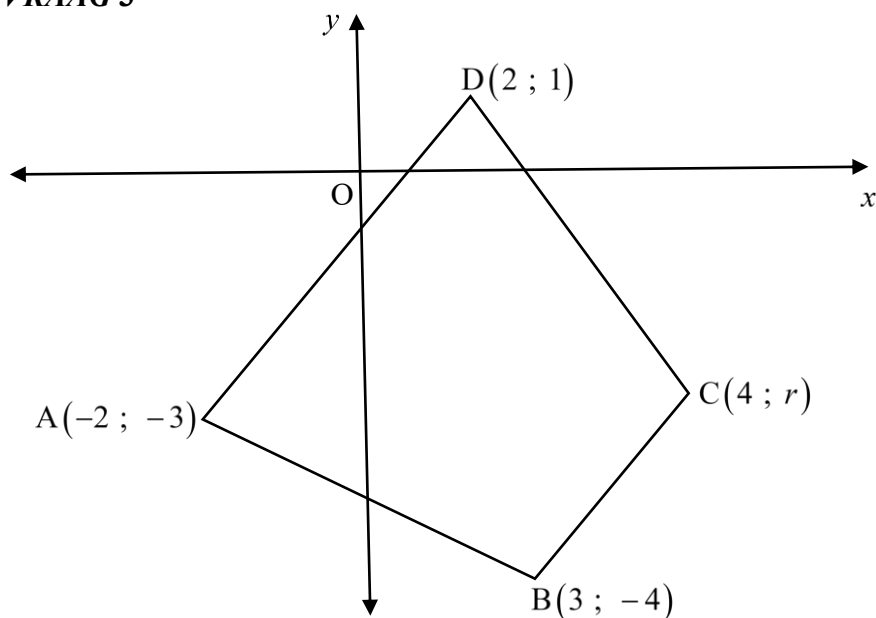
Aanvaar van antwoorde/waardes om 'n probleem op te los, word NIE toegelaat nie.

GEOMETRY·MEETKUNDE	
S	A mark for a correct statement (A statement mark is independent of a reason)
	<i>'n Punt vir 'n korrekte bewering ('n Punt vir 'n bewering is onafhanklik van die rede)</i>
R	A mark for the correct reason (A reason mark may only be awarded if the statement is correct)
	<i>'n Punt vir 'n korrekte rede ('n Punt word slegs vir die rede toegeken as die bewering korrek is)</i>
S/R	Award a mark if statement AND reason are both correct
	<i>Ken 'n punt toe as die bewering EN rede beide korrek is</i>

QUESTION/VRAAG 1

1.1	<table border="1"> <thead> <tr> <th>Screen time (hours)</th><th>Frequency</th><th>Cumulative Frequency</th></tr> </thead> <tbody> <tr> <td>$0 < x \leq 1$</td><td>0</td><td>0</td></tr> <tr> <td>$1 < x \leq 2$</td><td>2</td><td>2</td></tr> <tr> <td>$2 < x \leq 3$</td><td>5</td><td>7</td></tr> <tr> <td>$3 < x \leq 4$</td><td>9</td><td>16</td></tr> <tr> <td>$4 < x \leq 5$</td><td>12</td><td>28</td></tr> <tr> <td>$5 < x \leq 6$</td><td>7</td><td>35</td></tr> <tr> <td>$6 < x \leq 7$</td><td>5</td><td>40</td></tr> <tr> <td>$7 < x \leq 8$</td><td>0</td><td>40</td></tr> </tbody> </table>	Screen time (hours)	Frequency	Cumulative Frequency	$0 < x \leq 1$	0	0	$1 < x \leq 2$	2	2	$2 < x \leq 3$	5	7	$3 < x \leq 4$	9	16	$4 < x \leq 5$	12	28	$5 < x \leq 6$	7	35	$6 < x \leq 7$	5	40	$7 < x \leq 8$	0	40	✓16 ✓40 (2)
Screen time (hours)	Frequency	Cumulative Frequency																											
$0 < x \leq 1$	0	0																											
$1 < x \leq 2$	2	2																											
$2 < x \leq 3$	5	7																											
$3 < x \leq 4$	9	16																											
$4 < x \leq 5$	12	28																											
$5 < x \leq 6$	7	35																											
$6 < x \leq 7$	5	40																											
$7 < x \leq 8$	0	40																											
1.2	Screen time(in hours)/Skermtyd (in ure)	✓grounding/anker ✓using cumulative values/gebruik van kumulatiewe waardes (2)																											
1.3	$Q_2 = 4,3$ Accept/aanvaar 4,2 to 4,4	✓ answer/antwoord (1)																											
1.4	$\bar{x} < Q_2$ Data skew to left/Data is skeef na links	✓ $\bar{x} < Q_2$ ✓conclusion/gevolgtrekking (2)																											
1.5	new/nuwe $\bar{x} = \frac{(1,5 \times 2) + (2,5 \times 5) + (3,5 \times 33)}{40}$ $= \frac{131}{40}$ $= 3,275$	✓131 ✓answer/antwoord (2)																											
		[9]																											

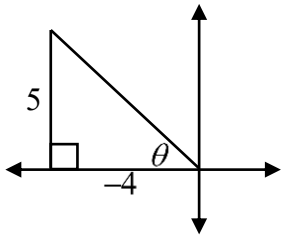
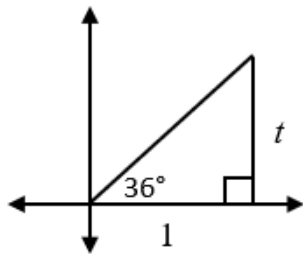
QUESTION/VRAAG 2		
2.1	G20 SUMMIT/BERAAD 2025 CO₂ EMISSIONS PER CAPITA (TONNES PER PERSON) GDP PER CAPITA (USD)/BBP PER CAPITA (USD)	✓4 points correct/4 punte korrek ✓all points correct/alle punte korrek (2)
2.2	$a = 6,1289$ $b = 0,0001$ $y = 6,1289 + 0,0001x$	✓value/waarde a ✓value/waarde b ✓equation/vergeliking (3)
2.3	$r = 0,47$	✓answer/antwoord (1)
2.4	Moderate correlation/Matige korrelasie	✓answer/antwoord (1)
2.5	$y = 6,1289 + 0,0001(40000)$ $y = 10,1289$	✓subst/vervang ✓answer/antwoord (2)
2.6	No, some countries are more developed than others and that can influence the Gross Domestic Product (GDP) per capita Or some countries are more densely populated than others. <i>Nee, sommige lande is meer ontwikkel as ander en dit kan die Bruto Binnelandse Produk (BBP) per capita beïnvloed</i> <i>Of sommige lande is digter bevolk as ander.</i>	✓answer/antwoord (1)
		[10]

QUESTION/VRAAG 3

3.1	$x_M = \frac{-2+2}{2} \quad y_M = \frac{-3+1}{2}$ $x_M = 0 \quad y_M = -1$	✓ value x / waarde x ✓ value y / waarde y (2)
3.2	$y - y_1 = m(x - x_1) \quad m(BP) = \frac{-4 - (-1)}{3 - 0} = -1$ $y - (-4) = -1(x - 3) \quad \text{or/of} \quad y - (-1) = -1(x - 0)$ $y + 4 = -x + 3 \quad y + 1 = -x$ $y = -x - 1 \quad y = -x - 1$	✓ $m(AP)$ ✓ subst in formula / vervang in formule ✓ answer / antwoord (3)
3.3	$m(AD) = \frac{-3 - 1}{-2 - 2} = 1$ $m(AD) \times m(BP)$ $= 1 \times -1$ $= -1$ $\therefore BP \perp AD$	✓ $m(AD)$ ✓ subst in formula / vervang in formule (2)
3.4	$m(AD) = m(BC)$ $1 = \frac{-4 - r}{3 - 4}$ $-1 = -4 - r$ $r = -3$	✓ $m(BC)$ ✓ equate gradients / gelykstel ✓ answer / antwoord (3)

3.5	$\tan \theta = m(\text{BD})$ $\tan \theta = \frac{-4-1}{3-2}$ $\tan \theta = -5$ $\theta = 180^\circ - 78,69^\circ$ $\theta = 101,31^\circ$	$\checkmark$ subst in formula/ vervang in formule $\checkmark -5$ $\checkmark 180^\circ - 78,69^\circ$ $\checkmark$ answer/antwoord (4)
3.6	AC: $y = -3 \dots\dots \textcircled{1}$ BD: $y - y_1 = m(x - x_1)$ $m(\text{BD}) = -5$ $y - (-4) = -5(x - 3)$ or/of $y - 1 = -5(x - 2)$ $y + 4 = -5x + 15$ $y - 1 = -5x + 10$ $y = -5x + 11$ $y = -5x + 11 \dots\dots \textcircled{2}$ Subst $\textcircled{1}$ into $\textcircled{2}$: $-3 = -5x + 11$ $5x = 14$ $x = \frac{14}{5}$ $S\left(\frac{14}{5}; -3\right)$	$\checkmark$ equation AC/vergeliking AC $\checkmark m(\text{BD})$ $\checkmark$ equation BD/vergeliking BD $\checkmark$ equating/gelykstel $\checkmark$ value x /waarde x (5)
3.7	$AB = \sqrt{(-2-3)^2 + (-3-(-4))^2}$ $= \sqrt{26}$ $BD = \sqrt{(3-2)^2 + (-4-1)^2} = \sqrt{26}$ $AB = BD$ $\therefore \Delta ABD$ is isosceles/gelykbenig	$\checkmark$ subst in distance formula/ vervang in afstand formule $\checkmark$ length AB/lengte AB $\checkmark$ length BD/lengte BD $\checkmark$ conclusion/gevolgtrekking (4)
3.8	Trapezium one pair of sides parallel Trapezium een paar sye ewewydig	$\checkmark$ answer/antwoord $\checkmark$ reason/rede (2)
		[25]

QUESTION/VRAAG 4		
4.1	$\tan P = \frac{1}{3}$ $\hat{P} = 18,43^\circ$ $Q\hat{P}V = 18,43^\circ - 4,4^\circ$ $Q\hat{P}V = 14,03^\circ$	✓ subst in tan def/vervang in tan def ✓ size $\hat{P}$ /grootte $\hat{P}$ ✓ $18,43^\circ - 4,4^\circ$ ✓ $14,03^\circ$ (4)
4.2	$\hat{Q} = 90^\circ$ rad $\perp$ tan In ΔPQV : $\tan 14,03^\circ = \frac{QV}{8\sqrt{10}}$ $QV = 6,32$ $\therefore$ rad = 6,32	✓ state 90° /stel 90° ✓ tan def/vervang in tan def ✓ radius (3)
4.3	$(x-a)^2 + (y-b)^2 = r^2$ through/deur $(0 ; 0)$ $(0-6)^2 + (0-b)^2 = (6,32)^2$ $36 + b^2 = 39,9424$ $b^2 = 3,9424$ $b = 2$ Centre/midpunt $(6 ; 2)$	✓ a – value/a – waarde ✓ substitution $(0, 0)$ /vervang ✓ subst radius/vervang rad ✓ b – value/b – waarde (4)
4.4	$S(-16 ; -2)$	✓ value x /waarde x ✓ value y /waarde y (2)
		[13]

QUESTION/VRAAG 5		
5.1.1	$\tan \theta = -\frac{5}{4}$ $r = \sqrt{41}$ $\sin(180^\circ + \theta)$ $= -\sin \theta$ $= \frac{5}{\sqrt{41}}$	 $\checkmark$ value r/waarde r $\checkmark$ reduction/reduksie $\checkmark$ answer/antwoord (3)
5.1.2	$\sqrt{41} \cos \theta - 4 \sin(-150^\circ) \cdot \cos 180^\circ$ $= \sqrt{41} \cos \theta + 4 \sin 150^\circ (-1)$ $= \sqrt{41} \cos \theta + 4(\sin 30^\circ)(-1)$ $= \sqrt{41} \left(-\frac{4}{\sqrt{41}}\right) + 4\left(\frac{1}{2}\right)(-1)$ $= -4 - 2$ $= -6$	$\checkmark \sin 30^\circ$ $\checkmark \frac{1}{2}$ and/en -1 $\checkmark -\frac{4}{\sqrt{41}}$ $\checkmark$ answer/antwoord (4)
5.2	$a \in [-1 ; 1]$	$\checkmark$ answer/antwoord (1)
5.3.1	$r = \sqrt{t^2 + 1}$ $\frac{1}{\sin 306^\circ}$ $= \frac{1}{-\sin 54^\circ}$ $= 1 \div -\left(\frac{1}{\sqrt{t^2 + 1}}\right)$ $= -\sqrt{t^2 + 1}$ OR/OF $= \frac{1}{-\sin 54^\circ}$ $= \frac{1}{-\cos 36^\circ}$ $= 1 \div -\left(\frac{1}{\sqrt{t^2 + 1}}\right)$ $= -\sqrt{t^2 + 1}$	 $\checkmark -\sin 54^\circ$ $\checkmark$ substitution/vervangings $\checkmark$ answer/antwoord (3)
	$= \frac{1}{-\sin 54^\circ}$ $= \frac{1}{-\cos 36^\circ}$ $= 1 \div -\left(\frac{1}{\sqrt{t^2 + 1}}\right)$ $= -\sqrt{t^2 + 1}$	$\checkmark -\sin 54^\circ$ $\checkmark$ substitution/vervangings $\checkmark$ answer/antwoord (3)

5.3.2	$\begin{aligned} &\tan 81^\circ \\ &= \frac{\sin 81^\circ}{\cos 81^\circ} \\ &= \frac{\sin(45^\circ + 36^\circ)}{\cos(45^\circ + 36^\circ)} \\ &= \frac{\sin 45^\circ \cos 36^\circ + \cos 45^\circ \sin 36^\circ}{\cos 45^\circ \cos 36^\circ - \sin 45^\circ \sin 36^\circ} \\ &= \frac{\left(\frac{\sqrt{2}}{2}\right)\left(\frac{1}{\sqrt{t^2+1}}\right) + \left(\frac{\sqrt{2}}{2}\right)\left(\frac{t}{\sqrt{t^2+1}}\right)}{\left(\frac{\sqrt{2}}{2}\right)\left(\frac{1}{\sqrt{t^2+1}}\right) - \left(\frac{\sqrt{2}}{2}\right)\left(\frac{t}{\sqrt{t^2+1}}\right)} \\ &= \frac{\left(\frac{\sqrt{2}}{2}\right)\left(\frac{1}{\sqrt{t^2+1}}\right)(1+t)}{\left(\frac{\sqrt{2}}{2}\right)\left(\frac{1}{\sqrt{t^2+1}}\right)(1-t)} \end{aligned}$	✓ quotient identity/kwosiënt identiteit ✓ $45^\circ + 36^\circ$ ✓ expansion/uitbreiding ✓ substitution numerator/ vervangings teller ✓ substitution denominator/ vervangings noemer (5)
		[15]

QUESTION/VRAAG 6		
6.1.1	$\text{LHS} = 2 \cos \theta \cdot \cos 2\theta + \frac{\sin^2 2\theta}{\cos \theta}$ $\text{LHS} = 2 \cos \theta (2 \cos^2 \theta - 1) + \frac{(2 \sin \theta \cos \theta)^2}{\cos \theta}$ $\text{LHS} = 4 \cos^3 \theta - 2 \cos \theta + \frac{4 \sin^2 \theta \cos^2 \theta}{\cos \theta}$ $\text{LHS} = 4 \cos^3 \theta - 2 \cos \theta + 4 \sin^2 \theta \cos \theta$ $\text{LHS} = 2 \cos \theta (2 \cos^2 \theta - 1 + 2 \sin^2 \theta)$ $\text{LHS} = 2 \cos \theta (2 - 1)$ $\text{LHS} = 2 \cos \theta$	✓ cos double angle/cos dubbelhoek ✓ sin double angle/sin dubbelhoek ✓ simplification/vereenv ✓ simplification/vereenv ✓ common factor/gemeensk faktor ✓ 2 (6)
6.1.2	$x = \{90^\circ\}$	✓ 90° (1)
6.2	$\cos \theta = \frac{1}{\cos \theta} + \frac{5}{6}$ $6 \cos^2 \theta = 6 + 5 \cos \theta$ $6 \cos^2 \theta - 5 \cos \theta - 6 = 0$ $(3 \cos \theta + 2)(2 \cos \theta - 3) = 0$ $3 \cos \theta + 2 = 0 \quad \text{or/of} \quad 2 \cos \theta - 3 = 0$ $\cos \theta = -\frac{2}{3} \quad \text{or/of} \quad \cos \theta = \frac{3}{2}$ NA $\theta = 180^\circ - 48,19^\circ + k \cdot 360^\circ \text{ or/of } \theta = 180^\circ + 48,19^\circ + k \cdot 360^\circ$ $\theta = 131,81^\circ + k \cdot 360^\circ, k \in \mathbb{Z} \text{ or/of } \theta = 228,19^\circ + k \cdot 360^\circ, k \in \mathbb{Z}$	✓ LCM/KGV ✓ standard form/std vorm ✓ factors/faktore ✓ both equations/albei vgl's ✓ $131,81^\circ$ and/en $228,19^\circ$ ✓ $k \cdot 360^\circ, k \in \mathbb{Z}$ (6)
6.3	$\text{area/opv } \Delta PQR = \frac{1}{2} pq \sin R \dots\dots ①$ $\frac{p}{\sin P} = \frac{q}{\sin Q}$ $p = \frac{q \sin P}{\sin Q} \dots\dots ②$ $\text{Subs } ② \text{ into } ①: \text{ area/opv } \Delta PQR = \frac{1}{2} \left(\frac{q \sin P}{\sin Q} \right) q \sin R$ $\text{area/opv } \Delta PQR = \frac{q^2 \sin P \sin R}{2 \sin Q}$	✓ $p = \frac{q \sin P}{\sin Q}$ ✓ substitution/vervang (2)
		[15]

QUESTION/VRAAG 7		
7.1.1	$\cos(\alpha - \beta) = \cos \alpha \cos \beta + \sin \alpha \sin \beta$	✓ answer/antwoord (1)
7.1.2	$\sin 2\alpha$ $= \cos(90^\circ - (\alpha + \alpha))$ $= \cos(90^\circ - \alpha - \alpha)$ $= \cos((90^\circ - \alpha) - \alpha)$ $= \cos(90^\circ - \alpha) \cos \alpha + \sin(90^\circ - \alpha) \sin \alpha$ $= \sin \alpha \cos \alpha + \cos \alpha \sin \alpha$ $= 2 \sin \alpha \cos \alpha$	✓ $90^\circ - (\alpha + \alpha)$ ✓ expansion/uitbreiding ✓ co-functions/ ko-funksies (3)
7.2.1	In $\triangle PNR$: $\sin \theta = \frac{r}{b}$ $r = b \sin \theta \dots\dots \textcircled{1}$	✓ sin def ✓ r subject/r onderwerp (2)
7.2.2	$r = b \sin \theta \dots\dots \textcircled{1}$ $r = a \sin 2\theta \dots\dots \textcircled{2}$ From $\textcircled{1}$ and $\textcircled{2}$: $b \sin \theta = a \sin 2\theta$ $b = \frac{a \sin 2\theta}{\sin \theta}$ $b = \frac{a(2 \sin \theta \cos \theta)}{\sin \theta}$ $b = 2a \cos \theta$	✓ equating/gelykstel ✓ b subject/b onderwerp ✓ sin double angle/sin dubbelhoek (3)
7.2.3	$\cos \theta = \frac{PR}{b}$ $PR = b \cos \theta$ $\cos 2\theta = \frac{PQ}{a}$ $PQ = a \cos 2\theta$ $\therefore QR = PR - PQ$ $QR = b \cos \theta - a \cos 2\theta$ $QR = (2a \cos \theta) \cos \theta - a(2 \cos^2 \theta - 1)$ $QR = 2a \cos^2 \theta - 2a \cos^2 \theta + a$ $QR = a$	✓ $PR = b \cos \theta$ ✓ $PQ = a \cos 2\theta$ ✓ $QR = b \cos \theta - a \cos 2\theta$ ✓ substitution/vervanging (4)
		[13]

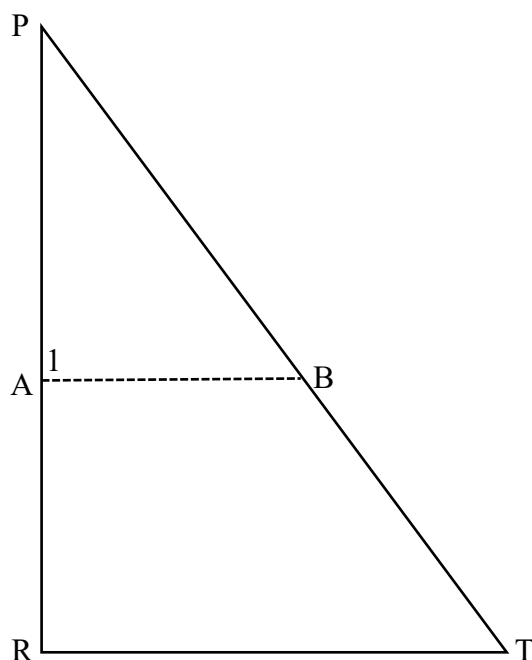
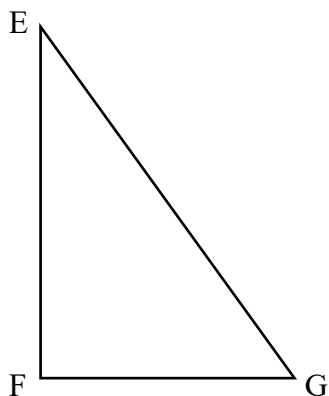
QUESTION/VRAAG 8		
8.1	$a = 2$	$\checkmark a = 2$ (1)
8.2	$f(x) = \sin 2x$ $f\left(\frac{3x}{2}\right) = \sin 2\left(\frac{3x}{2}\right) = \sin 3x$ Period/Periode: 120°	$\checkmark \sin 3x$ $\checkmark$ answer/antwoord (2)
8.3	$\sqrt{\sin 2x - 1}$ Max/maks = 0	$\checkmark$ answer/antwoord (1)
8.4	$f(x) = \sin 2x$ shifted down/afgeskuif $\frac{1}{2}$ units/eenhede $h(x) = \sin 2x - \frac{1}{2}$	$\checkmark$ answer/antwoord (1)
8.5	$x = 15^\circ$ and/en $x = 75^\circ$	$\checkmark x = 15^\circ$ $\checkmark x = 75^\circ$ (2)
		[7]

QUESTION/VRAAG 9

9.1	$\hat{B}_1 = 81^\circ$ $\angle$ at centre is $2 \times \angle$ at circumf/midpt $\angle = 2 \times \angle$ by omtrek	✓S ✓R (2)
9.2	$\hat{G}_1 = 81^\circ$ $\angle$'s in same segment/ $\angle$ 'e in dies segment	✓S ✓R (2)
9.3	$\hat{G}_1 = \hat{FED} = 81^\circ$ ext $\angle$ cyclic quad ext /buite $\angle$ kvh $\hat{FED} = \hat{D}_1 = 81^\circ$ given/gegee	✓S ✓R ✓S (3)
		[7]

QUESTION/VRAAG 10

10.1



Draw AB with A on PR and B on PT so that $EF = PA$ and $EG = PB$
 /Trek AB met A op PR en B op PT sodat $EF = PA$ en $EG = PB$

In $\triangle EFG$ and/en $\triangle PAB$:

(i) $EF = PA$ constr/konstr

(ii) $EG = PB$ constr/konstr

(iii) $\hat{E} = \hat{P}$ given/gegee

$\triangle EFG \equiv \triangle PAB$ SAS/SHS

$\therefore \hat{F} = \hat{A}_1 \equiv \Delta$

But/maar: $\hat{F} = \hat{R}$ given/gegee

$\therefore \hat{A}_1 = \hat{R}$

$\therefore AB \parallel RT$ corresp $\angle$'s equal/ooreenk $\angle$ 'e gelyk

$\therefore \frac{PA}{PR} = \frac{PB}{PT}$ prop theorem $AB \parallel RT$ /eweredigh st $AB \parallel RT$

and/en $EF = PA$ constr/konstr

$EG = PB$ constr/konstr

$\therefore \frac{EF}{PR} = \frac{EG}{PT}$

✓ constr/konstr

✓ $\equiv$ proof/bewys

✓ R

✓ S ✓ R

✓ S

(6)

10.2			
10.2.1	$\Delta SXL \equiv \Delta MXL$	$\angle \angle S$	$\checkmark S$ (1)
10.2.2	$KL^2 = KM^2 + ML^2$ $20^2 = KM^2 + 12^2$ $KM^2 = 256$ $KM = 16$	Pythagoras	$\checkmark S$ $\checkmark$ subst/ <i>verv</i> $\checkmark$ answer/ <i>antwoord</i> (3)
(a)			
(b)	$\frac{KX}{SX} = \frac{KL}{ML}$ $\frac{KX}{SX} = \frac{20}{12} = \frac{5}{3}$ OR/OF $\frac{KX}{KL} = \frac{SX}{ML}$ $\frac{KX}{20} = \frac{SX}{12}$ $\frac{KX}{SX} = \frac{20}{12} = \frac{5}{3}$	$\parallel \Delta$'s $\parallel \Delta$'s	$\checkmark S$ $\checkmark R$ $\checkmark \frac{5}{3}$ $\checkmark S$ $\checkmark R$ $\checkmark \frac{5}{3}$ (3)
			(3)

(c)	$ML = SL = 12 \quad \Delta SXL \equiv \Delta MXL$ $\therefore KS = 8$ $\frac{KS}{KM} = \frac{SX}{ML} \quad \Delta \text{'s}$ $\frac{8}{KX + XM} = \frac{XM}{12} \quad KX + XM \text{ and/en } SX = XM$ $XM(KX + XM) = 96$ $XM\left(\frac{5}{3}XS + XM\right) = 96 \quad \text{from/uit 10.2.2 (b)}$ $XM\left(\frac{5}{3}XM + XM\right) = 96$ $XM\left(\frac{8}{3}XM\right) = 96$ $XM^2 = 36$ $XM = 6$ OR/OF In ΔKML: $\cos L = \frac{20^2 + 12^2 - 16^2}{2(20)(12)}$ $\cos L = \frac{3}{5}$ $\hat{L} = 53,13^\circ$ $\therefore \hat{L}_1 = \hat{L}_2 = 26,57^\circ$ In ΔXML: $M = 90^\circ \quad \angle \text{ in semi circle}$ $\tan 26,57^\circ = \frac{XM}{12}$ $XM = 6$	$\checkmark S$ $\checkmark S$ $\checkmark S$ $\checkmark \text{subst/verv}$ $\checkmark \text{answer/}$ antwoord (5)
		[18]



education
MPUMALANGA PROVINCE
REPUBLIC OF SOUTH AFRICA

**NATIONAL
SENIOR CERTIFICATE
NASIONALE
SENIOR SERTIFIKAAT**

GRADE 12/GRAAD 12

MATHEMATICS P2 / WISKUNDE V2
SEPTEMBER 2026
MARKING GUIDELINE/NASIENRIGLYNE

MARKS/PUNTE: 150

**These marking guidelines consist of 20 pages.
Hierdie nasienriglyne bestaan uit 20 bladsye.**

NOTE:

- If candidate answers a question TWICE, only answer the FIRST attempt
- If a candidate has crossed out an attempt of a question and not redone the question, mark the crossed-out version
- Consistent accuracy applies in ALL aspects of the Marking Guideline. Stop marking at the second calculation error.
- Assuming answers/values in order to solve a problem is NOT acceptable

GEOMETRY/MEETKUNDE	
S	A mark for a correct statement (A statement mark is independent of a reason)
R	A mark for the correct reason (A reason mark may only be awarded if the statement is correct)
S/R	Award a mark if statement AND reason are both correct

QUESTION 1 / VRAAG 1

Area/Oppervlakte (x) in m ²	360	120	845	602	1190	530	245	486	350	1005	320	250
Time/Tyd (y) in minutes/minute	50	28	130	75	120	95	55	70	48	110	55	60

1.1	$\hat{y} = 0,09x + 28,14$	✓ 0,09 ✓ 28,14 ✓ Answer/Antwoord (3)
1.2	$r = 0,91$	✓ Answer/Antwoord (1)
1.3	Very strong positive / Baie sterk positief	✓ Answer/Antwoord (1)
1.4	$\hat{y} = 0,09(560) + 28,14$ $= 78,54$ Cost/Koste = $150 + 3(50)$ $= R300$	✓ Substitution/Substitusie ✓ 78,54 ✓ 3 ✓ R300 (4)

[9]

QUESTION 2 / VRAAG 2

Marks Punte	Frequency Frekwensie	Cumulative frequency Kumulatiewe frekwensie
$5 < x \leq 15$	4	
$15 < x \leq 25$	7	
$25 < x \leq 35$	m	21
$35 < x \leq 45$	11	
$45 < x \leq 55$	11	
$55 < x \leq 65$	8	
$65 < x \leq 75$	n	
Total	54	

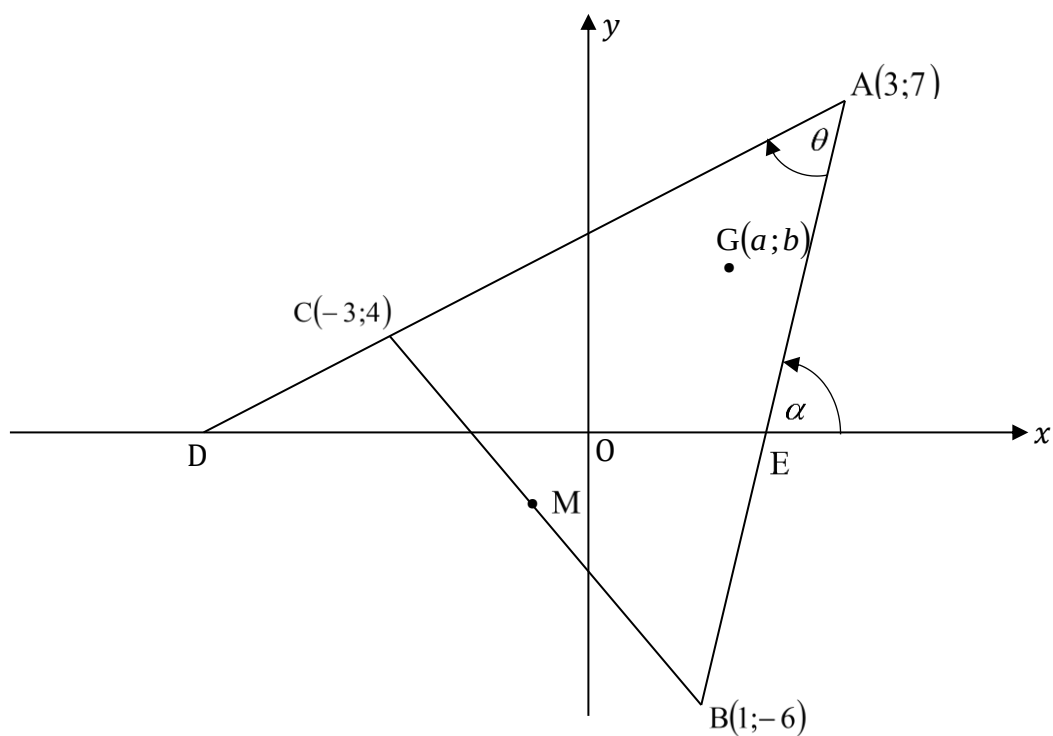
2.1	$m = 10$ $n = 3$	✓ $m = 10$ ✓ $n = 3$ (2)
-----	---------------------	--------------------------------

2.2	<table> <tr> <th>Marks Punte</th><th>Frequency Frekwensie</th><th>Cumulative frequency Kumulatiewe frekwensie</th></tr> <tr> <td>$5 < x \leq 15$</td><td>4</td><td>4</td></tr> <tr> <td>$15 < x \leq 25$</td><td>7</td><td>11</td></tr> <tr> <td>$25 < x \leq 35$</td><td>10</td><td>21</td></tr> <tr> <td>$35 < x \leq 45$</td><td>11</td><td>32</td></tr> <tr> <td>$45 < x \leq 55$</td><td>11</td><td>43</td></tr> <tr> <td>$55 < x \leq 65$</td><td>8</td><td>51</td></tr> <tr> <td>$65 < x \leq 75$</td><td>3</td><td>54</td></tr> <tr> <td>Total/Totaal</td><td>54</td><td></td></tr> </table>	Marks Punte	Frequency Frekwensie	Cumulative frequency Kumulatiewe frekwensie	$5 < x \leq 15$	4	4	$15 < x \leq 25$	7	11	$25 < x \leq 35$	10	21	$35 < x \leq 45$	11	32	$45 < x \leq 55$	11	43	$55 < x \leq 65$	8	51	$65 < x \leq 75$	3	54	Total/Totaal	54		✓ 1 st / _e 4 CF/KF ✓ Last/laaste 3 CF/KF (2)
Marks Punte	Frequency Frekwensie	Cumulative frequency Kumulatiewe frekwensie																											
$5 < x \leq 15$	4	4																											
$15 < x \leq 25$	7	11																											
$25 < x \leq 35$	10	21																											
$35 < x \leq 45$	11	32																											
$45 < x \leq 55$	11	43																											
$55 < x \leq 65$	8	51																											
$65 < x \leq 75$	3	54																											
Total/Totaal	54																												

2.3		✓ Grounded/Gegron ✓ Plot upper boundaries / Plot boonste grense ✓ Smooth Curve/ Gladde kurwe (3)
-----	--	---

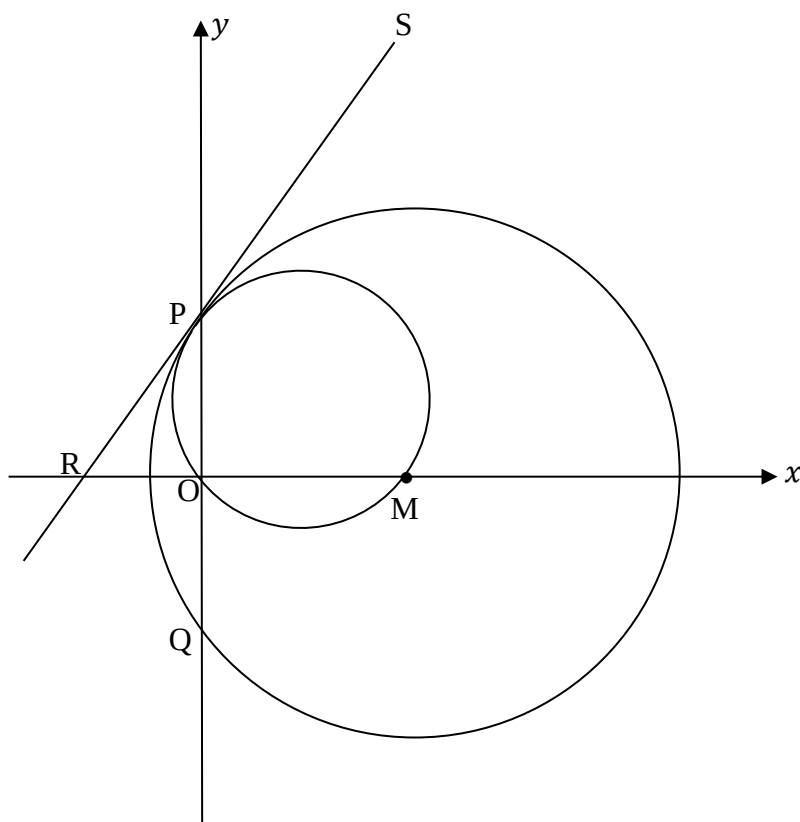
2.4	$P_{25} = 27,5$ marks / punte	✓ Answer/Antwoord
-----	-------------------------------	----------------------

			(1)
2.5	$\bar{x} = \frac{(10)(4) + (20)(7) + (30)(10) + (40)(11) + (50)(11) + (60)(8) + (70)(3)}{54}$ $= 40 \text{marks/ punte}$ $\sigma = 16,33 \text{marks/ punte}$	✓ Method/ Metode ✓ 40 marks/ punte ✓ 16,33 marks/ punte	(3)
			[11]

QUESTION 3 / VRAAG 3

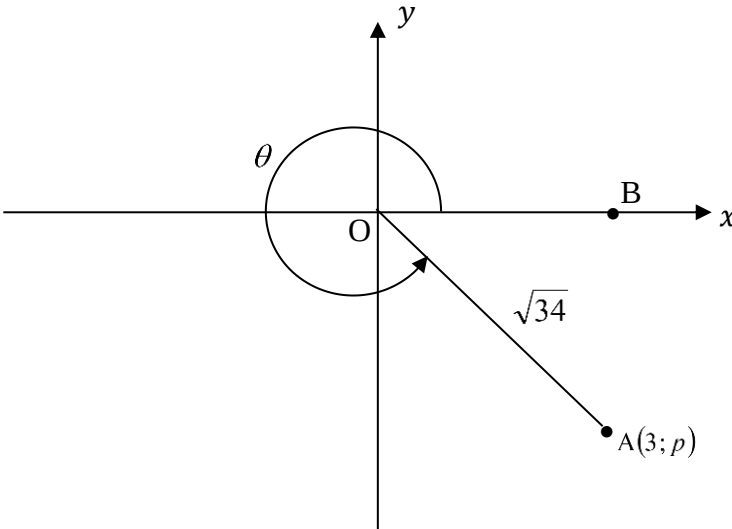
3.1		$m_{AD} = \frac{7-4}{3-(-3)}$ $= \frac{1}{2}$	✓ Substitution/Substitusie ✓ Answer/Antwoord (2)
3.2		$y-7 = \frac{1}{2}(x-3)$ $\therefore y = \frac{1}{2}x + \frac{11}{2}$	✓ Substitution/Substitusie ✓ Answer /Antwoord (2)
3.3		$y = \frac{1}{2}x + \frac{11}{2}$ $0 = \frac{1}{2}x + \frac{11}{2}$ $x = -11$ $D(-11;0)$ $AD = \sqrt{(3-(-11))^2 + (7-0)^2}$ $= 7\sqrt{5} = 15,65$	✓ Substitution/Substitusie ✓ $x = -11$ ✓ Substitution/Substitusie ✓ Answer /Antwoord (4)
3.4		$M\left(\frac{-3+1}{2}; \frac{4-6}{2}\right)$ $M(-1;-1)$	✓ Substitution/Substitusie ✓ Answer/Antwoord (2)

3.5		$\tan \hat{A}DE = m_{AD} = \frac{1}{2}$ $\hat{A}DE = 26,56^\circ$ $m_{AB} = \frac{7 - (-6)}{3 - 1}$ $= \frac{13}{2}$ $\tan \alpha = \frac{13}{2}$ $\alpha = 81,25^\circ$ $\theta + 26,56^\circ = 81,25^\circ$ $\theta = 54,69^\circ \approx 55^\circ$	✓ $\hat{A}DE = 26,56^\circ$ ✓ Substitution/Substitusie ✓ $m_{AB} = \frac{13}{2}$ ✓ $\alpha = 81,25^\circ$ ✓ $\theta = 55^\circ$
3.6		$m_{AM} = m_{AG}$ $\frac{7 - (-1)}{3 - (-1)} = \frac{7 - b}{3 - a}$ $2 = \frac{7 - b}{3 - a}$ $b = 2a + 1$ $GC^2 = (a - (-3))^2 + (b - 4)^2$ $(\sqrt{17})^2 = (a + 3)^2 + (2a + 1 - 4)^2$ $17 = a^2 + 6a + 9 + 4a^2 - 12a + 9$ $5a^2 - 6a + 1 = 0$ $(5a - 1)(a - 1) = 0$ $a = \frac{1}{5}$ or/of $a = 1$ $b = \frac{7}{5}$ or/of $b = 3$	✓ $b = 2a + 1$ ✓ Substitution/Substitusie ✓ Standard form/Standaardvorm ✓ Factors/Faktore ✓ Values/Waardes of/van a ✓ Values/Waardes van b
			[21]

QUESTION 4/ VRAAG 4

4.1	$x^2 - 8x + y^2 = 9$ $x^2 - 8x + 16 + y^2 = 25$ $(x - 4)^2 + (y - 0)^2 = 25$ $M(4; 0)$	$\checkmark (x - 4)^2 + y^2 = 25$ $\checkmark M(4; 0)$ (2)
4.2	$x^2 - 8x + y^2 = 9$ $(0)^2 - 8(0) + y^2 = 9$ $y = \pm 3$ $PQ = 6 \text{ units / eenhede}$ OR/OF $0 = \frac{0+x_Q}{2}; 0 = \frac{3+y_Q}{2}$ $Q(0; -3)$ $PQ = 6 \text{ units / eenhede}$	$\checkmark$ Substitution/Substitusie $\checkmark$ Answer/Antwoord (2) OR/OF $\checkmark$ Substitution/Substitusie $\checkmark$ Answer/Antwoord (2)
4.3	$(0 - 4)^2 + y^2 = 25$ $y^2 = 9$ $y = 3$ $P(0; 3)$ $m_{PM} = \frac{0-3}{4-0} = -\frac{3}{4}$	$\checkmark y = 3$ $\checkmark$ Substitution/Substitusie $\checkmark m_{PM} = -\frac{3}{4}$

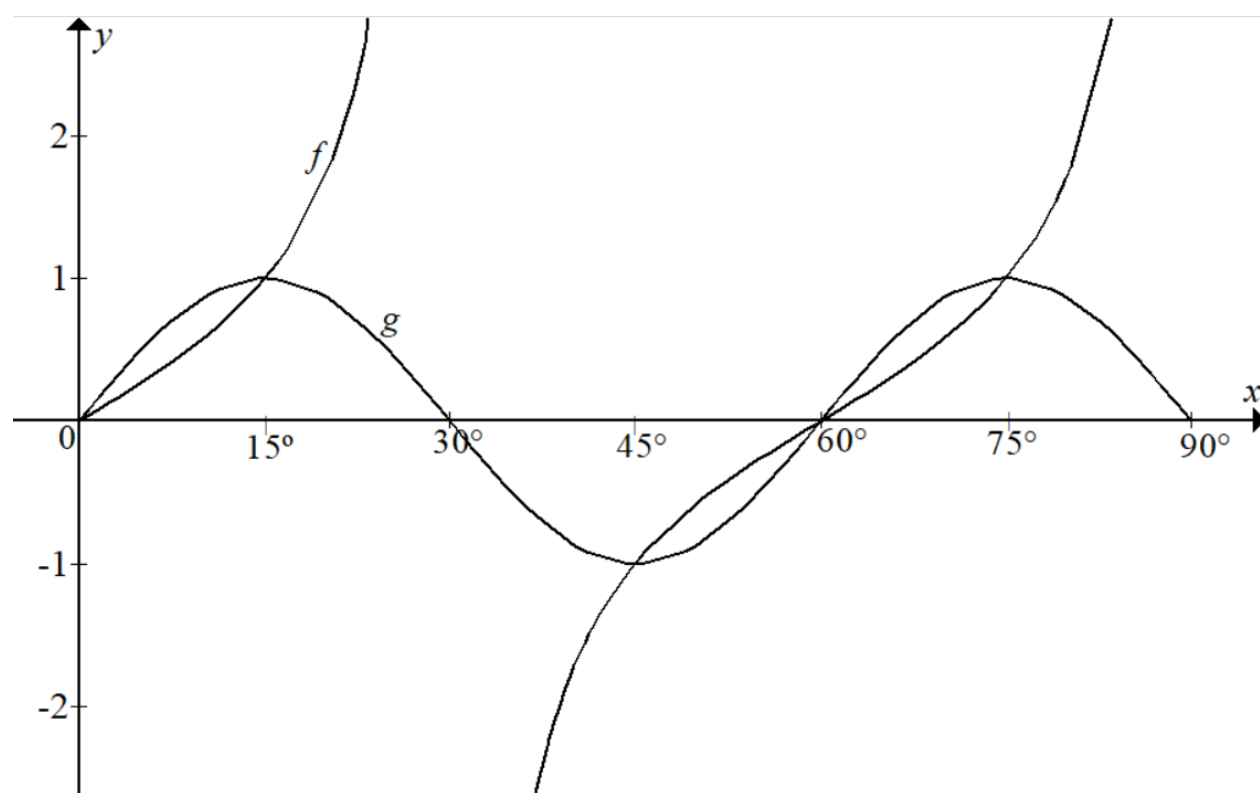
		$m_{\text{tangent/raaklyn}} = \frac{4}{3}$ $y = \frac{4}{3}x + 3$	✓ $m_{\text{tangent/raaklyn}} = \frac{4}{3}$ ✓ Answer/Antwoord (5)
4.4		$y = \frac{4}{3}x + 3$ $0 = \frac{4}{3}x + 3$ $x = -\frac{9}{4}$ $R\left(-\frac{9}{4}; 0\right)$ $RP^2 = \left(0 - \left(-\frac{9}{4}\right)\right)^2 + (3 - 0)^2$ $RP^2 = \frac{81}{16} + 9$ $RP^2 = \frac{225}{16}$ $RP = \frac{15}{4}$ Area/Opp of/van $\triangle PRM = \frac{1}{2}(RP)(PM)$ $= \frac{1}{2}\left(\frac{15}{4}\right)(5)$ $= \frac{75}{8} = 9,34$	✓ $x = -\frac{9}{4}$ ✓ Substitution/Substitusie ✓ $RP = \frac{15}{4}$ ✓ Answer/Antwoord (4)
4.5		$M_{PM}\left(\frac{4+0}{2}; \frac{3+0}{2}\right)$ $M_{PM}\left(2; \frac{3}{2}\right)$ $(0 - 2)^2 + \left(3 - \frac{3}{2}\right)^2 = r^2$ $r^2 = \frac{25}{4}$ $(x - 2)^2 + \left(y - \frac{3}{2}\right)^2 = \frac{25}{4}$	✓ $M_{PM}\left(2; \frac{3}{2}\right)$ ✓ $(x - 2)^2 + \left(y - \frac{3}{2}\right)^2$ ✓ $r^2 = \frac{25}{4}$ (3)
4.6		P, M and P' are collinear/is koliniêr $P'(4; 0)$ $r = 5$ Maximum distance/Maksimum afstand = 5units /eenhede	✓ P, M and P' are collinear/ /is koliniêr ✓ $P'(4; 0)$ ✓ Answer/Antwoord (3)
			[19]

QUESTION 5 / VRAAG 5			
5.1	$\begin{aligned}\cos(P + Q) &= \sin[90^\circ - (P + Q)] \\ &= \sin[(90^\circ - P) - Q] \\ &= \sin(90^\circ - P)\cos Q - \cos(90^\circ - P)\sin Q \\ &= \cos P \cos Q - \sin P \sin Q\end{aligned}$	$\checkmark \sin(90^\circ - (P + Q))$ $\checkmark \sin((90^\circ - P) - Q)$ $\checkmark$ Expansion	(3)
			
5.2.1	$\begin{aligned}(3)^2 + (p)^2 &= (\sqrt{34})^2 \\ p &= -5\end{aligned}$	$\checkmark$ Subst. Pyth. $\checkmark$ Answer/Antwoord	(2)
5.2.2	$\begin{aligned}\cos(60^\circ + \theta) &= \cos 60^\circ \cos \theta - \sin 60^\circ \sin \theta \\ &= \left(\frac{1}{2}\right)\left(\frac{3}{\sqrt{34}}\right) - \left(\frac{\sqrt{3}}{2}\right)\left(\frac{-5}{\sqrt{34}}\right) \\ &= \frac{3+5\sqrt{3}}{2\sqrt{34}}\end{aligned}$	$\checkmark$ Expansion/Brei uit $\checkmark$ Special Angles/Spesiale hoeke $\checkmark$ Substitution/Substitusie $\checkmark$ Answer/Antwoord	(4)
5.3	$\begin{aligned}\sin 50^\circ &= \sin 145^\circ \cos(360^\circ - k) - \sin(-375^\circ) \cos(-35^\circ) \\ \sin 50^\circ &= \sin 35^\circ \cos k - [-\sin 375^\circ \cos 35^\circ] \\ \sin 50^\circ &= \sin 35^\circ \cos k + \sin 15^\circ \cos 35^\circ \\ \therefore k &= 15^\circ\end{aligned}$	$\checkmark \sin 35^\circ$ $\checkmark \cos k$ $\checkmark \sin 15^\circ$ $\checkmark \cos 35^\circ$ $\checkmark$ Answer/Antwoord	(5)
5.4	$\begin{aligned}\text{LHS} &= 4\cos\theta - \frac{1+\cos 2\theta}{\cos\theta} \\ &= \frac{4\cos^2\theta - (1+\cos 2\theta)}{\cos\theta} \\ &= \frac{4\cos^2\theta - 1 - (2\cos^2\theta - 1)}{\cos\theta}\end{aligned}$	$\checkmark$ Single Fraction/Enkel breuk $\checkmark 2\cos^2\theta - 1$	

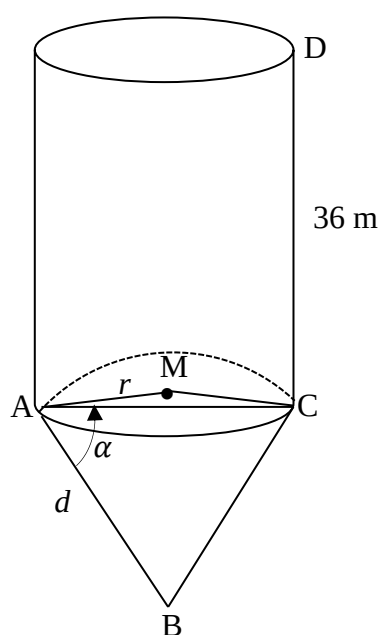
	$= \frac{2\cos^2\theta}{\cos\theta}$ $= 2\cos\theta$ $\text{RHS} = \frac{\sin 2\theta}{\sin\theta}$ $= \frac{2\sin\theta\cos\theta}{\sin\theta}$ $= 2\cos\theta$	✓ Simplification/Vereenvoudig ✓ $2\sin\theta\sin$ (4)
5.5	$2\cos x = 3\tan x$ $2\cos x = \frac{3\sin x}{\cos x}$ $2\cos^2 x = 3\sin x$ $2(1 - \sin^2 x) = 3\sin x$ $2 - 2\sin^2 x = 3\sin x$ $2\sin^2 x + 3\sin x - 2 = 0$ $(2\sin x - 1)(\sin x + 2) = 0$ $\sin x = \frac{1}{2} \text{ or /of } \sin x = -2 \text{ Invalid/Ongeldig}$ $x = 30^\circ + k \cdot 360^\circ; k \in \mathbb{Z} \text{ or/of}$ $x = 150^\circ + k \cdot 360^\circ; k \in \mathbb{Z}$	✓ $\frac{3\sin x}{\cos x}$ ✓ $1 - \sin^2 x$ ✓ Standard form/Standaard vorm ✓ Equation/Vergelyking ✓ $x = 30^\circ$ or/of $x = 150^\circ$ ✓ $k \cdot 360^\circ; k \in \mathbb{Z}$ (6)
5.6	$\cos 45^\circ = 1 - 2\sin^2 22,5^\circ$ $\frac{\sqrt{2}}{2} = 1 - 2\sin^2 22,5^\circ$ $\sin^2 22,5^\circ = \frac{1 - \frac{\sqrt{2}}{2}}{2}$ $= \frac{2 - \sqrt{2}}{4}$ $3 - 4\sin^2 22,5^\circ = 3 - 4\left(\frac{2 - \sqrt{2}}{4}\right)$ $= 3 - 2 + \sqrt{2}$ $= 1 + \sqrt{2}$ OR/OF $\sin^2 22,5^\circ = \frac{1 - \cos 45^\circ}{2}$ $\sin^2 22,5^\circ = \frac{1 - \frac{\sqrt{2}}{2}}{2}$ $= \frac{2 - \sqrt{2}}{4}$ $3 - 4\sin^2 22,5^\circ = 3 - 4\left(\frac{2 - \sqrt{2}}{4}\right)$ $= 1 + \sqrt{2}$	✓ $\cos 45^\circ = 1 - 2\sin^2 22,5^\circ$ ✓ Special Angle/Spesiale hoek ✓ Substitution/Substitusie ✓ Answer/Antwoord (4) OR ✓ $\sin^2 22,5^\circ = \frac{1 - \cos 45^\circ}{2}$ ✓ Special Angle ✓ Substitution/Substitusie ✓ Answer/Antwoord (4)
		[28]

QUESTION 6 / VRAAG 6

6.1

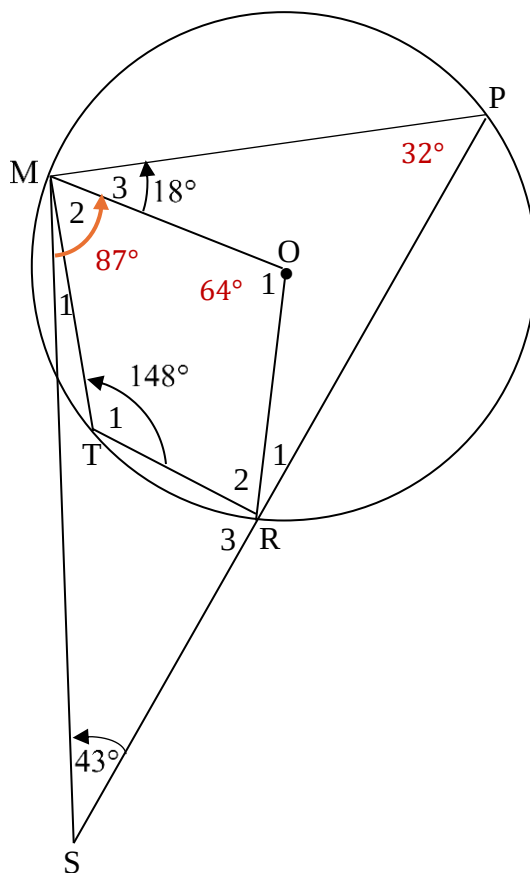


6.1.1	60°	✓ Answer /Antwoord (1)
6.1.2	$x = 30^\circ$ $x = 90^\circ$	✓ $x = 30^\circ$ ✓ $x = 90^\circ$ (2)
6.1.3	$0^\circ \leq x \leq 15^\circ$ or/of $30^\circ < x \leq 45^\circ$	✓ $0^\circ \leq x \leq 15^\circ$ ✓ $30^\circ < x \leq 45^\circ$ (2)
6.2.1	The graph of $y = \sin 6x$ has been translated 10° to the right. Die grafiek van $y = \sin 6x$ het 10° regs geskuif.	✓ 10° ✓ to the right / regs (2)
6.2.2	$p(x) = -2 \sin(6x - 60^\circ) + 1$ $y \in [-2, 2]$ OR/OF $-2 \leq y \leq 2$ Range/Waardeversameling: $y \in [-2 + 1; 2 + 1]$ $y \in [-1; 3]$ OR/OF Range/Waardeversameling: $-1 \leq y \leq 3$	✓ $y \in [-2; 2]$ ✓✓ $y \in [-1; 3]$ (3)
		[10]

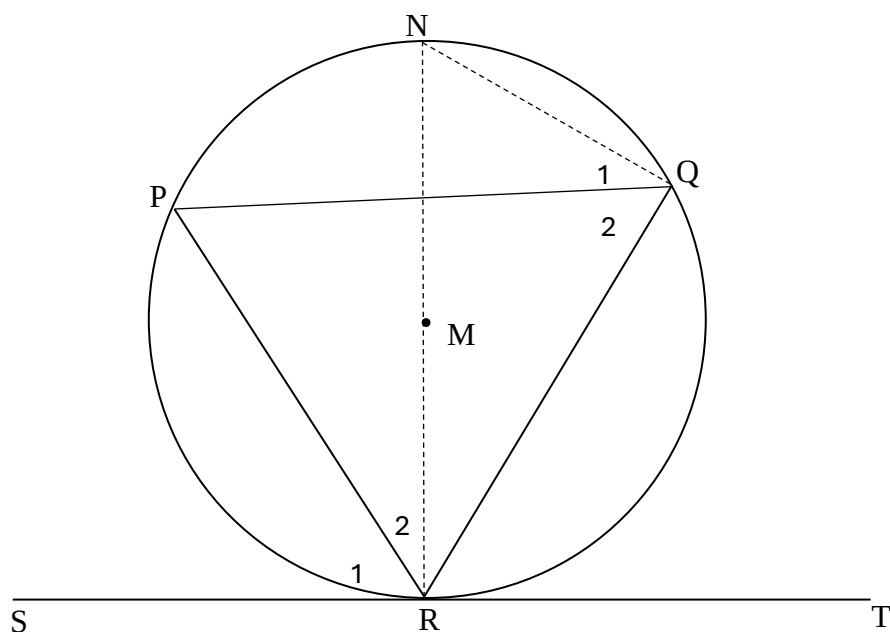
QUESTION 7 / VRAAG 7

7.1	$AB = BC = d$ tans from common pt/raaklyne uit dieselfde punt $\hat{A}CB = \alpha$ $\angle$ s opp = sides / $\angle$ e teenoor = e sye $\hat{B} = 180^\circ - 2\alpha$ sum of $\angle$ s in Δ / binne $\angle$ e van Δ	$\checkmark \hat{A}CB = \alpha$ $\checkmark \hat{B} = 180^\circ - 2\alpha$ (2)
7.2	$AC^2 = AB^2 + BC^2 - 2AB \cdot BC \cos B$ $AC^2 = d^2 + d^2 - 2d \cdot d \cos(180^\circ - 2\alpha)$ $AC^2 = 2d^2 - 2d^2(-\cos 2\alpha)$ $AC^2 = 2d^2 + 2d^2 \cos 2\alpha$ $AC^2 = 2d^2 + 2d^2(2\cos^2 \alpha - 1)$ $AC^2 = 4d^2 \cos^2 \alpha$ $\therefore AC = 2d \cos \alpha$	$\checkmark$ Cosine rule/cosreël $\checkmark -\cos 2\alpha$ $\checkmark 2\cos^2 \alpha - 1$ $\checkmark AC^2 = 4d^2 \cos^2 \alpha$ (4)
7.3	In $\triangle ACM$: $\hat{AMC} = 108^\circ$ opp $\angle$ s of cyclic quad/teenoorst $\angle$ e van koordevierhoek $AM = MC = r$ radii/radiusse $\hat{MAC} = 36^\circ$ sum of $\angle$ s in Δ / binne $\angle$ e van Δ $AC = 2r \cos(\hat{MAC})$ $12,22 = 2r \cos 36^\circ$ $r = \frac{12,22}{2 \cos 36^\circ} = 7,55 m$ OR/OF	$\checkmark \hat{AMC} = 108^\circ$ $\checkmark \hat{MAC} = 36^\circ$ $\checkmark 12,22 = 2r \cos 36^\circ$ (3) OR/OF

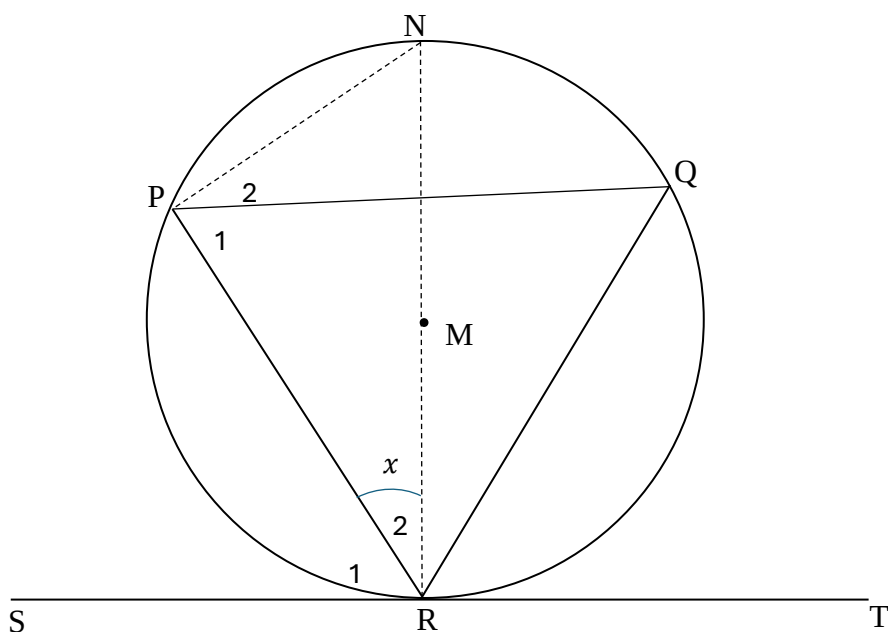
	$\hat{AMC} = 108^\circ$ opp $\angle$ s of cyclic quad/ teenoorst $\angle$ e van koordevierhoek $AM = MC = r$ radii/radiusse $\hat{MAC} = 36^\circ$ sum of $\angle$ s in Δ / binne $\angle$ e van Δ $\frac{r}{\sin 36^\circ} = \frac{12,22}{\sin 108^\circ}$ $r = \frac{12,22 \sin 36^\circ}{\sin 108^\circ} = 7,5523753425 \dots$ $\therefore r = 5,55m$ as required/soos gevra. OR/OF $\hat{AMC} = 108^\circ$ opp $\angle$ s of cyclic quad/ teenoorst $\angle$ e van koordevierhoek $AM = MC = r$ radii/radiusse $AC^2 = r^2 + r^2 - 2r \cdot r \cos 108^\circ$ $(12,22)^2 = r^2 + r^2 - 2r^2 \cos 108^\circ$ $149,3284 = 2r^2 - 2r^2 \cos 108^\circ$ $r^2(2 - 2 \cos 108^\circ) = 149,3284$ $r = \sqrt{\frac{149,3284}{2 - 2 \cos 108^\circ}}$ $\therefore r = 7,55m$ as required/soos gevra.	$\checkmark \hat{AMC} = 108^\circ$ $\checkmark \hat{MAC} = 36^\circ$ $\checkmark \frac{r}{\sin 36^\circ} = \frac{12,22}{\sin 108^\circ}$ (3) OR/OF $\checkmark \hat{AMC} = 108^\circ$ $\checkmark$ Substitution into Cosine Rule /Substitusie in Cos-reël $\checkmark$ simplification/vernoudig (3)
7.4	$V = \pi r^2 h$ $= \pi (7,55)^2 (36)$ $= 6446,83m^3$ $= 6\,447\,m^3$	$\checkmark$ Substitution into correct formula /Substitusie in korrekte formule $\checkmark$ Answer/Antwoord (2)
		[11]

QUESTION 8 / VRAAG 8

8.1	$\hat{P} = 32^\circ$ opp $\angle$ s of cyclic quad / teenoorst $\angle$ e van koordevierhoek	✓S ✓R	(2)
8.2	$\hat{O}_1 = 2\hat{P}$ $= 64^\circ$ $\angle$ at centre = 2 $\angle$ at circumference /middelpunts $\angle$ = 2x omtreks $\angle$	✓S ✓R	(2)
8.3	$\hat{PMS} + 43^\circ + 32^\circ = 180^\circ$ sum $\angle$ s of $\triangle MPS$ /binne $\angle$ e van $\triangle MPS$ $\hat{PMS} = 105^\circ$ $\therefore \hat{OMS} = 87^\circ$	✓ $\hat{PMS} = 105^\circ$ ✓ $\hat{OMS} = 87^\circ$	(2)
8.4	$\hat{PMT} = 105^\circ - 6^\circ = 99^\circ$ $\hat{R}_3 = \hat{PMT} = 99^\circ$ ext $\angle$ of cyclic quad / buite $\angle$ van koordevierhoek	✓ $\hat{PMT} = 99^\circ$ ✓S/R	(2)
			[8]

QUESTION 9 / VRAAG 9

9.1	Construction: Draw diameter RMN and join NQ. Konstruksie: Teken middellyn RMN en verbind NQ. $\hat{R}_1 + \hat{R}_2 = 90^\circ \mid \tan \perp \text{radius/ raaklyn} \perp \text{radius}$ $\hat{Q}_1 + \hat{Q}_2 = 90^\circ \mid \angle s \text{ in the semi-circle / } \angle e \text{ in halfsirkel}$ $\hat{R}_2 = \hat{Q}_1 \mid \angle s \text{ in the same seg/ } \angle e \text{ in dieselfde sirkelsegment}$ $\hat{R}_1 + \hat{R}_2 = \hat{Q}_1 + \hat{Q}_2 \mid = 90^\circ$ $\therefore \hat{R}_2 = \hat{Q}_2$ Hence/Vervolgens $\hat{P}RS = \hat{P}QR$ as required. /soos gevra	✓ Construction/Konstruksie ✓ S ✓ R ✓ S/R ✓ S/R (5)

QUESTION 9 / VRAAG 9

9.1	Construction: Draw diameter RMN and join NP. Konstruksie: Teken middellyn RMN en verbind NP. Let/Laat $\hat{R}_2 = x$ $\hat{R}_1 = 90^\circ - x$ $\tan \perp$ radius / raaklyn $\perp$ radius $\hat{N} + \hat{NPR} + \hat{R}_2 = 180^\circ$ sum of $\angle$s in Δ / binne $\angle$e van Δ $\hat{N} = 90^\circ - x$ $\hat{Q} = \hat{N}$ $\angle$s in the same seg / $\angle$e in dieselfde sirkelsegment $\hat{R}_2 = \hat{N}$ $= 90^\circ - x$ Hence/Vervolgens $\hat{PRS} = \hat{PQR}$ as required. /soos gevra	✓Construction/Konstruksie ✓S ✓R ✓S/R ✓S/R (5)

9.2		
9.2.1	$\hat{A}_1 = \hat{B}_1 = x$ tan-chord theorem/raaklyn koord stelling $\hat{A}_2 = \hat{B}_1 = x$ $\angle$ s opp = sides / $\angle$ e teenoor = e sye $\hat{B}_2 = \hat{A}_2 = x$ tan-chord theorem/ raaklyn koord stelling $\hat{B}_1 = \hat{C} = x$ corresp $\angle$ s / ooreenkomstige $\angle$ e, $DC \parallel FB$ $\hat{B}_2 = \hat{D}_1 = x$ alt $\angle$ s / verwisselende $\angle$ e, $DC \parallel FB$	$\checkmark$ S/R $\checkmark$ S/R $\checkmark$ S $\checkmark$ S $\checkmark$ R $\checkmark$ S/R
9.2.2	$\hat{D}_1 = \hat{A}_2$ proven/ bewys ABED is a cyclic quadrilateral converse $\angle$ s in the same seg ABED is 'n koordevierhoek omgekeerde $\angle$ e in dieselfde sirkelsegment.	$\checkmark \hat{D}_1 = \hat{A}_2$ $\checkmark$ R
9.2.3	$\hat{A}_1 = \hat{B}_3 = x$ $\angle$ s in the same seg / $\angle$ e in dieselfde sirkelsegment $\hat{A}\hat{B}\hat{E} = \hat{B}_1 + \hat{B}_2 + \hat{B}_3$ maar/but $\hat{B}_1 = \hat{B}_2 = \hat{B}_3 = \hat{A}_1 = x$ $\therefore \hat{A}\hat{B}\hat{E} = 3\hat{A}_1$	$\checkmark$ S/R $\checkmark$ S
9.2.4	$\hat{D}_1 = \hat{C} = x$ $BC = BD$ sides opp = $\angle$ /sye teenoor = e $\angle$ e $AD = BD$ tans from common pt / raaklyne uit dieselfde punt	$\checkmark \hat{D}_1 = \hat{C}$ $\checkmark$ S/R $\checkmark$ S/R

	$\therefore AD = BC \quad \quad = BD$	
9.3	$\frac{AF}{FE} = \frac{AB}{BC} = \frac{2}{3} \quad \quad \text{prop theorem/eweredigheidstelling, FB} \parallel \text{EC}$ $\frac{\text{Area of/van } \triangle FAB}{\text{Area of/van } \triangle EAC} = \frac{\frac{1}{2}AF \cdot AB \sin A_2}{\frac{1}{2}AE \cdot AC \sin A_2}$ $= \frac{\frac{1}{2}(2)(2)\sin A_2}{\frac{1}{2}(5)(5)\sin A_2}$ $= \frac{4}{25}$	✓S ✓R ✓ $\frac{\frac{1}{2}AF \cdot AB \sin A_2}{\frac{1}{2}AE \cdot AC \sin A_2}$ ✓ Answer/Antwoord (4)
		[22]



Northern Cape Department of Education

**PROVINCIAL PREPARATORY EXAMINATION/
*PROVINSIALE VOORBEREIDENDE EKSAMEN***

GRADE 12/*GRAAD 12*

MATHEMATICS/WISKUNDE

PAPER 2/VRAESTEL 2

SEPTEMBER 2026

MARKING GUIDELINES/*NASIENRIGLYNE*

MARKS/PUNTE: 150

**These marking guidelines consist of 14 pages./
*Hierdie nasienriglyne bestaan uit 14 bladsye.***

NOTE:

- If a learner answers a question TWICE, only mark the FIRST attempt.
- If a learner has crossed out (cancelled) an attempt of a question and not redone the question, mark the crossed-out (cancelled) version.
- Consistent accuracy applies in ALL aspects of the marking memorandum.
- Assuming answers/values in order to solve a problem is NOT acceptable.

LET WEL:

- *As 'n leerder 'n vraag TWEE KEER beantwoord, sien slegs die EERSTE poging na.*
- *As 'n leerder 'n poging om die vraag te beantwoord, doodgetrek (gekanselleer) het en nie dit oorgedoen het nie, sien die doodgetrekte (gekanselleerde) poging na.*
- *Volgehoue akkuraatheid word in ALLE aspekte van die nasienmemorandum toegepas.*
- *Aanvaarding van antwoorde/waardes om 'n probleem op te los, word NIE toegelaat nie.*

GEOMETRY/MEETKUNDE	
S	A mark for the correct statement (A statement mark is independent of a reason) <i>'n Punt vir 'n korrekte bewering</i> <i>('n Punt vir 'n bewering is onafhanklik van die rede)</i>
R	A mark for a correct reason (A reason mark may only be awarded if the statement is correct) <i>'n Punt vir 'n korrekte rede</i> <i>('n Punt word slegs vir die rede toegeken as die bewering korrek is)</i>
S/R	Award a mark if the statement AND reason are both correct. <i>Ken 'n punt toe as beide die bewering EN rede korrek is.</i>

QUESTION 1		
1.1	$a = -5,51$ $b = 0,85$ $y = -5,51 + 0.85x$ - A/O FULL MARKS - CORRECT A/B SWOPPED IN EQUATION 2/3	$\checkmark a = -5,51$ $\checkmark b = 0,85$ $\checkmark$ answer (3)
1.2	$y = -5,51 + 0,85(113)$ $= 90,54$ $= 91$ CA FROM 1.1	$\checkmark$ substitution $\checkmark$ answer (2)
1.3	$r = 0.897$ $r = 0.90$ The prediction is VALID	$\checkmark$ value of r . $\checkmark$ valid (2)
1.4	$\tilde{x} + \sigma$ $90.09 + 29.41$ 119.5 2 learners	$\checkmark 90.09$ $\checkmark 29.41$ $\checkmark$ 2 learners (3)
[10]		

QUESTION 2		
2.1	120 learners accurate mark	$\checkmark$ answer (1)
2.2	$Q_1 = \frac{1}{4}(120) = 30$ $Q_3 = \frac{3}{4}(120) = 90$ IQR = $44 - 26 = 18$ (17-19)	$\checkmark 44$ $\checkmark 26$ $\checkmark$ answer (3)
2.3	$Q_2 = \frac{1}{2}(120) = 60$ $Q_2 = 35$	$\checkmark 60$ $\checkmark 35$ (2)
2.4	$120 - 76 = 44$ learners accept 43 – 45	$\checkmark$ method $\checkmark$ answer (2)
[8]		

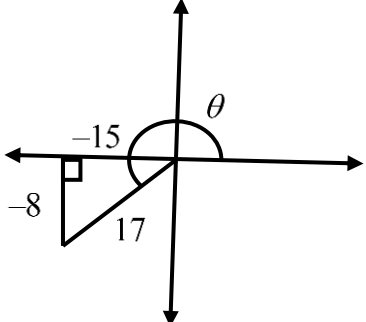
QUESTION 3		
3.1	$m_{CD} = \frac{12 - (-8)}{0 - (-5)}$ $m_{CD} = 4$ • x/y BD • x swopped in the denominator CA 1/2	✓ substitution ✓ answer (2)
3.2	$y = 4x + c$ $0 = 4(2.5) + c$ $0 = 10 + c$ $c = -10$ $y = 4x - 10$	✓ gradient ✓ substitution ✓ answer (3)
3.3	$t = 4(6) - 10$ $t = 14$	✓ substitution ✓ answer (2)
3.4	$\tan \theta = 4$ $\theta = 75,96^\circ$	✓ substitution ✓ answer (2)
3.5	$y = 4x + 12$ $0 = 4x + 12$ $x = -3$ $E(-3; 0)$	✓ $y = 4x + 12$ ✓ 0 ✓ -3 (3)
3.6	$3y - x = -19$ $3(4x - 10) - x = -19$ $12x - 30 - x = -19$ $11x = 11$ $x = 1$ $y = 4(1) - 10$ $y = -6$ $B(1; -6)$	✓ substitution ✓ simplification ✓ $x = 1$ ✓ $y = -6$ (4)

3.7	$m_{EA} = \tan 57,26^\circ = 1,56$ $y = 1,56x + c$ $0 = 1,56(-3) + c \quad (-3; 0)$ $c = 4,67$ $EA = \sqrt{(-3-6)^2 + (0-14)^2}$ $= \sqrt{277}$ $\text{Area of } \triangle EAF = \frac{1}{2}(\sqrt{277})(5,5)\sin 57,26^\circ$ $= 38,5 \text{ units}^2$ $\text{Area of } \triangle EOG = \frac{1}{2}(3)(4,67)$ $= 7,0 \text{ units}^2$ $\text{Area of AGOF} = 38,5 - 7,0$ $= 31,5 \text{ units}^2$ OR $AE = \sqrt{(-3)-6)^2 + (0-14)^2}$ $= \sqrt{277}$ $\text{Area of } \triangle AEF = \frac{1}{2}\left(\frac{11}{2}\right)(\sqrt{277})\sin 57,26^\circ$ $= 38,50(u)^2$ $\tan 57,26^\circ = \frac{OG}{3}$ $OG = 3 \tan 57,26^\circ$ $= 4,67$ $\text{Area of } \triangle EOG = \frac{1}{2}(3)(4,67)$ $= 7,005$ $\text{Area of AGOF} = 38,50 - 7,005$ $= 31,50(u)^2$	$\checkmark m_{EA} = 1,56$ $\checkmark c = 4,67$ $\checkmark \sqrt{277}$ $\checkmark$ substitution $\checkmark 38,5 \text{ units}$ $\checkmark 7,0 \text{ units}^2$ $\checkmark$ answer (7) $\checkmark$ Length of AE $\checkmark$ Subs $\checkmark$ Area of $\triangle AEF$ $\checkmark$ Equation $\checkmark$ Length of OG $\checkmark$ area of $\triangle EOG$ $\checkmark$ Answer (7)
[23]		

QUESTION 4		
4.1	$(x+2)^2 + (y-6)^2 = 10 + (2)^2 + (6)^2$ $(x+2)^2 + (y-6)^2 = 50$ $A(-2;6)$	✓ standard form ✓ -2 ✓ 6 (3)
4.2	Line from centre to midpt of chord.	✓ answer (1)
4.3	$m = \frac{6-9}{-2-4} = \frac{1}{2}$ $m_{PQ} = -2$ $y = -2x + c$ $9 = -2(4) + c$ $9 + 8 = c$ $y = -2x + 17$	✓ gradient of AB. ✓ gradient of PQ. ✓ substitiuon ✓ answer (4)
4.4	$x^2 + y^2 + 4x - 12y - 10 = 0$ $x^2 + (-2x + 17)^2 + 4x - 12(-2x + 17) - 10 = 0$ $x^2 + 4x^2 - 68x + 289 + 4x + 24x - 204 - 10 = 0$ $5x^2 - 40x + 75 = 0$ $x^2 - 8x + 15 = 0$ $(x-3)(x-5) = 0$ $x = 3 \text{ or } x = 5$ $y = -2(3) + 17 \text{ or } y = -2(5) + 17$ $y = 11 \text{ or } y = 7$ $P(3;11) \quad Q(5;7)$	✓ substitiuon ✓ standard form ✓ factors ✓ x-values ✓ y-values (5)

4.5	$x^2 + y^2 + 4x - 12y - 10 = 0$ $x^2 + (2x + k)^2 - 12(2x + k) - 10 = 0$ $x^2 + 4x^2 + 4kx + k^2 + 4x - 24x - 12k - 10 = 0$ $5x^2 + 4kx - 20x + k^2 - 12k - 10 = 0$ $\Delta < 0$ $(4k - 20)^2 - 4(5)(k^2 - 12k - 10) < 0$ $16k^2 - 160k + 400 - 20k^2 + 240k + 200 < 0$ $-4k^2 + 80k + 600 < 0$ $k^2 - 20k - 150 > 0$ $k = \frac{-(-20) \pm \sqrt{(-20)^2 - 4(1)(-150)}}{2(1)}$ $k = 10 - 5\sqrt{10} \text{ or } k = 10 + 5\sqrt{10}$ $\therefore k < 10 - 5\sqrt{10} \text{ or } k > 10 + 5\sqrt{10}$	✓ substitution ✓ standard form ✓ $\Delta < 0$ ✓ substitution ✓ substitution ✓ ✓ answer (7)
[20]		

QUESTION 5

5.1.1	 $\tan \theta = \frac{-8}{-15} = \frac{8}{15}$	✓ $x = -15$ ✓ answer (2)
5.1.2	$\cos(180^\circ - \theta)$ $= -\cos \theta$ $= -\left(\frac{-15}{17}\right)$ $= \frac{15}{17}$	✓ $-\cos \theta$ ✓ answer (2)

5.1.3	$\sin\left(\frac{\theta}{2}-15^\circ\right).\cos\left(\frac{\theta}{2}-15^\circ\right)$ $= \frac{1}{2}\sin\left(2.\left(\frac{\theta}{2}-15^\circ\right)\right)$ $= \frac{1}{2}\sin(\theta-30^\circ)$ $= \frac{1}{2}(\sin\theta.\cos 30^\circ - \cos\theta.\sin 30^\circ)$ $= \frac{1}{2}\left[\frac{-8}{17}.\frac{\sqrt{3}}{2} - \frac{-15}{17}.\frac{1}{2}\right]$ $= \frac{1}{2}\left[\frac{-8\sqrt{3}+15}{34}\right]$ $= \frac{-8\sqrt{3}+15}{68}$	$\checkmark \frac{1}{2}\left[2 \sin\left(\frac{\theta}{2}-15^\circ\right)\cos\frac{\theta}{2}-15^\circ\right]$ $\checkmark \frac{1}{2}\sin\left(2.\left(\frac{\theta}{2}-15^\circ\right)\right)$ $\checkmark \frac{1}{2}\sin(\theta-30^\circ)$ $\checkmark$ expansion $\checkmark$ substitution $\checkmark$ answer (6)
5.2.1	$\frac{\tan(180^\circ-x).\cos(-x).\cos(180^\circ+x)}{4\cos(90^\circ+x)}$ $= \frac{-\tan x.\cos x.(-\cos x)}{-4\sin x}$ $= \frac{-\frac{\sin x}{\cos x}.\cos x.(-\cos x)}{-4\sin x}$ $= -\frac{1}{4}\cos x$	$\checkmark -\tan x$ $\checkmark \cos x$ $\checkmark -\cos x$ $\checkmark -4\sin x$ $\checkmark -\frac{\sin x}{\cos x}$ $\checkmark$ answer (6)
5.2.2	$x \in (90^\circ; 270^\circ)$	$\checkmark$ CV $\checkmark$ Correct Notation (2)
[18]		

QUESTION 6		
6.1.1	$f(x) = \frac{\sin 2x \cdot \cos 2x}{2 \sin^2 2x - 2 \cos^2 2x}$ $= \frac{\frac{1}{2} \sin(2 \cdot 2x)}{-2(\cos^2 2x - \sin^2 2x)}$ $= \frac{\frac{1}{2} \sin 4x}{-2 \cos 4x}$ $= -\frac{1}{4} \tan 4x$	$\checkmark \frac{1}{2} \sin(2 \cdot 2x)$ $\checkmark -2$ Common factor $\checkmark -2 \cos 4x$ $\checkmark$ answer (4)
6.1.2	$x = 22.5^\circ \quad x = 67.5^\circ$	$\checkmark x = 22.5^\circ$ $\checkmark x = 67.5^\circ$ (2)
6.2	$\sum_{r=0}^{\infty} (\sin x)^{2r} = 2 \tan x$ $(\sin x)^{2(0)} + (\sin x)^{2(1)} + (\sin x)^{2(2)} + \dots = 2 \tan x$ $1 + \sin^2 x + \sin^4 x + \dots = 2 \tan x$ $a = 1 \quad r = \sin^2 x$ $2 \tan x = \frac{1}{1 - \sin^2 x}$ $2 \tan x = \frac{1}{\cos^2 x}$ $2 \frac{\sin x}{\cos x} = \frac{1}{\cos^2 x}$ $2 \sin x \cos^2 x = \cos x$ $2 \sin x \cdot \cos^2 x - \cos x = 0$ $\cos x (2 \sin x \cos x - 1) = 0$ $\cos x = 0 \quad \sin 2x = 1$ $2x = 90^\circ + k \cdot 360^\circ$ $x = 45^\circ + k \cdot 180^\circ, k \in \mathbb{Z}$ OR	$\checkmark$ expansion $\checkmark a$ and r $\checkmark$ substitution in S_∞ $\checkmark 1 - \sin^2 x = \cos^2 x$ $\checkmark$ standard form $\checkmark$ both equations $\checkmark x = 45^\circ + k \cdot 180^\circ, k \in \mathbb{Z}$ (7)

	$\sum_{r=0}^{\infty} (\sin x)^{2r} = 2 \tan x$ $(\sin x)^{2(0)} + (\sin x)^{2(1)} + (\sin x)^{2(2)} + \dots = 2 \tan x$ $1 + \sin^2 x + \sin^4 x + \dots = 2 \tan x$ $a = 1 \quad r = \sin^2 x$ $2 \tan x = \frac{1}{1 - \sin^2 x}$ $2 \tan x = \frac{1}{\cos^2 x}$ $2 \frac{\sin x}{\cos x} = \frac{1}{\cos^2 x}$ $LCD = \cos^2 x$ $\cos^2 x \left(\frac{2 \sin x}{\cos x} \right) = \left(\frac{1}{\cos^2 x} \right) \cos^2 x$ $2 \sin x \cdot \cos x = 1$ $\sin 2x = 1$ $2x = 90^\circ + k \cdot 360^\circ$ $x = 45^\circ + k \cdot 180^\circ, k \in Z$	✓ expansion ✓ a and r ✓ substitution ✓ $1 - \sin^2 x = \cos^2 x$ ✓ $2 \sin x \cdot \cos x = 1$ ✓ $\sin 2x = 1$ ✓ $x = 45^\circ + k \cdot 180^\circ, k \in Z$ (7)
[13]		

QUESTION 7		
7.1	180°	✓ answer (1)
7.2	$y \in \left[\frac{1}{2}; \frac{3}{2} \right]$	✓✓ answer (2)
7.3	$ \begin{array}{ccccccccccc} & & & & 1 & & & & & & \\ -180^\circ & -135^\circ & -90^\circ & -45^\circ & 0 & 45^\circ & 90^\circ & 135^\circ & 180^\circ & & \\ & & & & -1 & & & & & & \end{array} $	✓ shape ✓ turning points ✓ x-intercepts ✓ y-intercept (4)
7.4	2	✓✓ answer (2)
7.5	3	✓✓ answer (2)

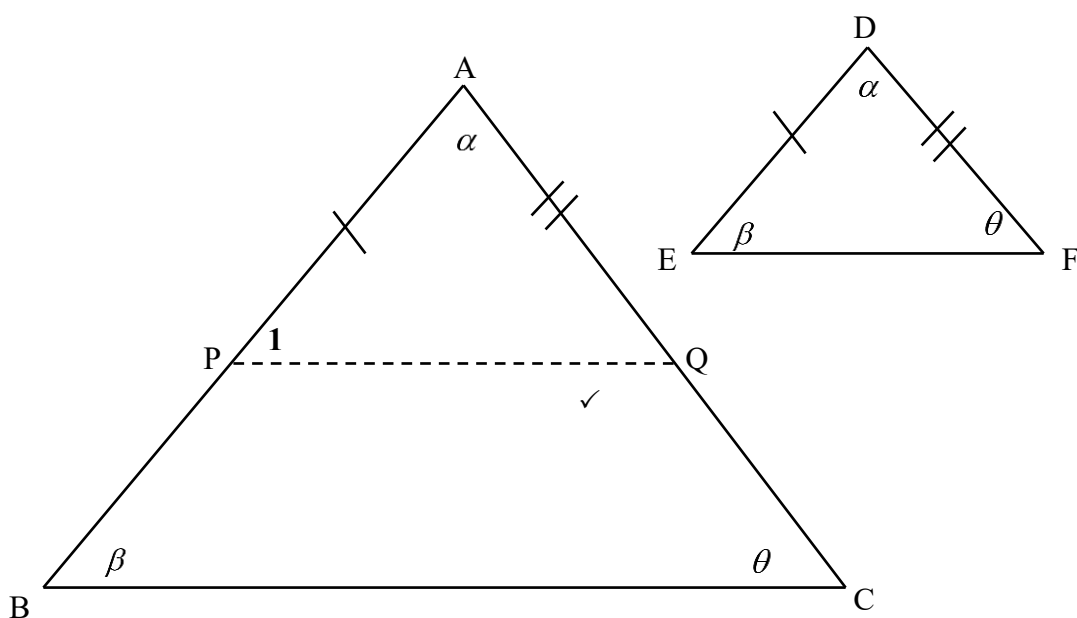
7.6	$\cos(90^\circ + 2x) \cdot \cos(x - 45^\circ) \geq 0$ $= -\sin 2x \cdot \cos(x - 45^\circ) \geq 0$ $= [\sin 2x][-\cos(x - 45^\circ)] \geq 0$ $[-180^\circ; -90^\circ] \text{ or } [-45^\circ; 0^\circ] \text{ or } [90^\circ; 135^\circ]$	✓ co-function ✓ $[-180^\circ; -90^\circ]$ ✓ $[-45^\circ; 0^\circ]$ ✓ $[90^\circ; 135^\circ]$ (4)
[15]		

QUESTION 8		
8.1	$Area = \frac{1}{2}(22)(22)\sin 50^\circ$ $= 185,38m^2$	✓ correct formula ✓ substitution ✓ answer (3)
8.2	$AB^2 = (22)^2 + (22)^2 - 2(22)(22)\cos 50^\circ$ $AB = \sqrt{345,78...}$ $= 18,60m$ OR $B\hat{A}C = 65^\circ$ $\frac{AB}{\sin 50^\circ} = \frac{BC}{\sin B\hat{A}C}$ $AB = \frac{22 \cdot \sin 50^\circ}{\sin 65^\circ}$ $AB = 18,60 m$ ($\angle s \text{ opp} = \text{sides}$)	✓ substitution ✓ answer ✓ substitution ✓ answer (2)
8.3	$\cos 25^\circ = \frac{18,60}{DB}$ $DB = \frac{18,60}{\cos 25^\circ}$ $DB = 20,52m$	✓ substitution ✓ answer (2)
8.4	In $\triangle BDC$ $\frac{\sin 58^\circ}{22} = \frac{\sin \hat{C}}{20,52}$ $\sin \hat{C} = \frac{20,52 \sin 58^\circ}{22}$ $\hat{C} = 52,28^\circ$ $D\hat{B}C = 180^\circ - 58^\circ - 52,28^\circ = 69,72^\circ$	✓ substitution into sine rule. ✓ value of $\hat{C}$ ✓ answer (3)
[10]		

QUESTION 9		
9.1	$QR=RS$ (Tan from same ext pt) $R\hat{Q}S = \frac{180^\circ - 76^\circ}{2}$ ($\angle s$ opp = sides) or (sum $\angle$'s of Δ) $= 52^\circ$	✓ S ✓ R ✓ S/R ✓ answer (4)
9.2	$\hat{P} = 52^\circ$ (tan chord – theorem)	✓ S ✓ R (2)
9.3	$Q\hat{T}S = 2(52^\circ) = 104^\circ$ ($\angle$ at center = 2 $\angle$ at circumference)	✓ S ✓ R (2)
		[8]

QUESTION 10		
10.1	$\frac{TR}{WR} = \frac{QR}{VR}$ (Prop theorem $QT \parallel VW$) $\frac{TR}{WR} = \frac{5}{3}$	✓ S/R ✓ answer (2)
10.2	$PT=TR$ $\frac{PU}{UV} = \frac{PT}{TW}$ (Prop theorem $QT \parallel VW$) $\frac{PU}{UV} = \frac{5}{2}$	✓ S ✓ S ✓ answer (3)
10.3	$\frac{\text{Area of } \Delta PUT}{\text{Area of } \Delta PVW} = \frac{\frac{1}{2} PU \cdot PT \sin \hat{P}}{\frac{1}{2} PV \cdot PW \sin \hat{P}}$ $= \frac{(5x)(5y)}{(7x)(7y)}$ $= \frac{25}{49}$ NOTE: If perpendicular height is used, construction must be shown on diagram	✓ formula ✓ substitution ✓ answer (3)
		[8]

QUESTION 11



11.1	In $\triangle APQ$ and $\triangle DEF$ $AQ = DF$ [construction/<i>konstruksie</i>] $\hat{A} = \hat{D}$ [given/<i>gegee</i>] $AP = DE$ [construction/<i>konstruksie</i>] $\therefore \triangle APQ \equiv \triangle DEF$ [S$\angle$S] $\hat{P}_1 = \hat{E}$ $\hat{P}_1 = \hat{B}$ [$\hat{E} = \hat{B}$] $PQ \parallel BC$ [corresp $\angle$'s/<i>ooreenkomstige \angle e</i>] $\frac{AP}{AB} = \frac{AQ}{AC}$ [Prop theorem $PQ \parallel BC$] But/<i>maar</i> $AP = DE$ and/en $AQ = DF$ $\therefore \frac{DE}{AB} = \frac{DF}{AC}$	no construction = 0 ✓ construction ✓ $\therefore \triangle APQ \equiv \triangle DEF$ [S$\angle$S] ✓ $\hat{P}_1 = \hat{E}$ ✓ $PQ \parallel BC$ ✓ S/R ✓ S (6)
11.2.1	$\hat{M}_1 = \theta$ (tan chord theorem) $\hat{P}_2 = \theta$ ($\angle$s opp = sides) $\hat{MSP} = 180^\circ - 2\theta$	✓ S/R ✓ S ✓ answer (3)
11.2.2	$\triangle KZS$ and $\triangle SRP$ $\hat{R}_2 = \hat{S}_2$ (alt $\angle$s $SL \parallel KZ$) $\hat{S}_1 = \hat{P}_1 = \theta$ (proved) $\hat{Z} = \hat{R}$ (sum of $\angle$s in $\triangle$) $\triangle KZS \parallel \triangle SRP$ (AAA)	✓ S/R ✓ S ✓ R (3)

11.2.3	$\hat{P}_2 = \theta$ (Vert opp $\angle s =$) $PT \parallel SZ$ (Corresp $\angle s =$) $\frac{KT}{TZ} = \frac{KP}{SP}$ (Prop theorem $PT \parallel SZ$) $KT = \frac{TZ \cdot KP}{SP}$ $\therefore KT = \frac{TZ \cdot KP}{MS}$ ($SP = MS$)	$\checkmark$ S/R $\checkmark$ S/R $\checkmark$ S/R $\checkmark$ S $\checkmark$ R (5)
[17]		

TOTAL: 150



education

Department:
Education
North West Provincial Government
REPUBLIC OF SOUTH AFRICA

NATIONAL SENIOR CERTIFICATE/ NASIONALE SENIOR SERTIFIKAAT

GRADE/GRAAD 12

MATHEMATICS P2/WISKUNDE V2

SEPTEMBER 2026

MARKING GUIDELINES/NASIENRIGLYNE

MARKS/PUNTE: 150

**These marking guidelines consist of 20 pages.
Hierdie nasienriglyne bestaan uit 20 bladsye.**

NOTE:

- If a candidate answers a question TWICE, only mark the FIRST attempt.
- If a candidate has crossed out an attempt of a question and not redone the question, mark the crossed out version.
- Consistent accuracy applies in ALL aspects of the Marking Guidelines. Stop marking at the second calculation error.
- Assuming answers/values in order to solve a problem is NOT acceptable.

LET WEL:

- *As 'n kandidaat 'n vraag TWEE KEER beantwoord, merk slegs die EERSTE poging.*
- *As 'n kandidaat 'n antwoord van 'n vraag doodtrek en nie oordoen nie, merk die doodgetrekte poging.*
- *Volgehoue akkuraatheid word in ALLE aspekte van die Nasienriglyne toegepas. Hou op nasien by die tweede berekeningsfout.*
- *Aanvaar van antwoorde/waardes om 'n probleem op te los, word NIE toegelaat nie.*

QUESTION/VRAAG 1

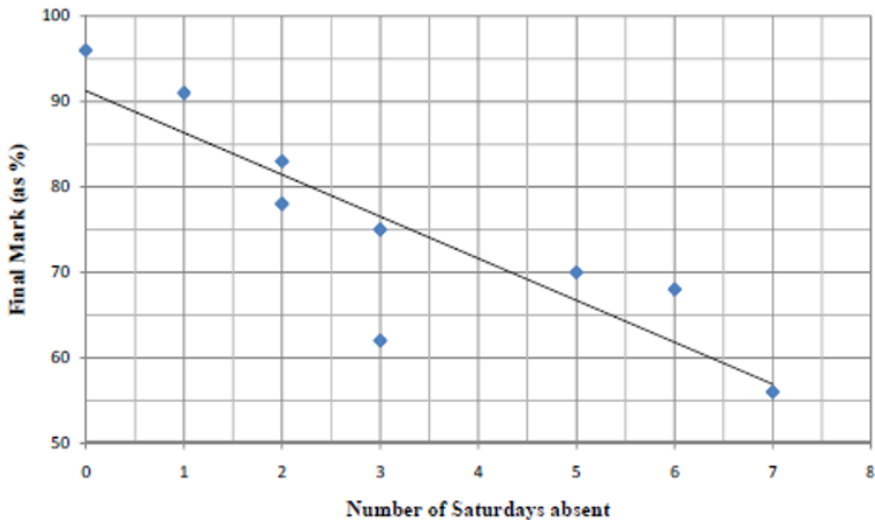
60	62	63	63	67	68	70
71	73	76	76	77	78	79
79	80	80	80	82	82	84

1.1	$\bar{x} = \frac{1550}{21}$ $= 73,81$	- Accept/aanvaar: 73,74 and 73,8 - Answer only: full marks/ <i>Slegs antwoord: vol punte</i>	✓ 1550 ✓ answer/antwoord (2)
1.2	$Q_2 = 76$		✓ 76 (1)
1.3	$73,81 - 76 = -2.52$ Negative skew OR skew to the left / <i>Negatief skeef of skeef na links</i>	CA from 1.1 and 1.2	✓ Negative skew OR skew to the left / <i>Negatief skeef of skeef na links</i> (1)
1.4	$(73,81 - 7,27; 73,81 + 7,27)$ $= (66,54; 81,08)$ $\approx 14 \text{ days}$		✓ $\sigma = 7,27$ ✓ $(66,54; 81,08)$ ✓ answer/antwoord (3)
			[7]

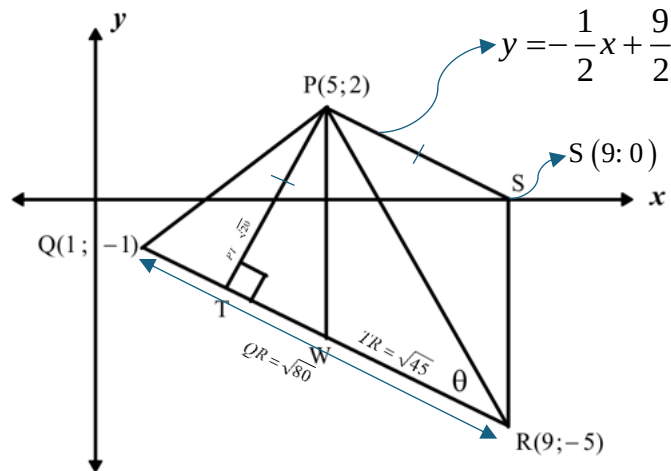
- If $\bar{x}$ and σ is swopped/As $\bar{x}$ en σ omgeruil is – 2/3
- Wrong $\bar{x}$, wrong σ , /Verkeerde $\bar{x}$, verkeerde σ , correct answer – 1/3
- Answer only (ACCURACY) /Slegs antwoord (AKKURAAT) - 3/3

QUESTION/VRAAG 2

Number of Saturdays absent/ <i>Aantal Saterdag afwesig</i>	0	1	2	2	3	3	5	6	7
Final mark/ <i>Finale punt</i> (as %)	96	91	78	83	75	62	70	68	56

2.1	$a = 91,27$ $b = -4,91$ $\hat{y} = 91,27 - 4,91x$	• If a and b is swopped/As a en b omgeruil is – 1/3 • If a and b is correct but switched in equation/ As a en b korrek is maar in die vergelyking omgeruil is – 2/3 • Wrong a, wrong b, correct equation /Verkeerde a, verkeerde b, korrekte vergelyking – 1/3 • Answer only(ACCURACY) /Slegs antwoord (AKKURAAT) - 3/3	✓ $a = 91,27$ ✓ $b = -4,91$ ✓ equation/vergelyking (3)
2.2	SCATTER PLOT SHOWING THE NUMBER OF SATURDAYS ABSENT AND THE FINAL MARK ACHIEVED 	✓ y-intercept/afsnit ✓ (3.22 ; 75,44)/ Or any correct 2 points (2)	
2.3	$r = -0,87$	✓ – ✓ 0,87 (2)	
2.4	The greater the number of days absent, the lower the mark. / Hoe meer dae afwesig, hoe laer is die punt. (Answer should be in context with scenario)	✓ greater nr of days/meer dae afwesig ✓ lower mark/laer punt. (2)	
2.5	$\hat{y} = 91,27 - 4,91(4)$ $= 71,63$ Answer only: full marks Slegs antwoord: Vol punte	✓ 4 ✓ 71,63% (2)	
[11]			

QUESTION/VRAAG 3

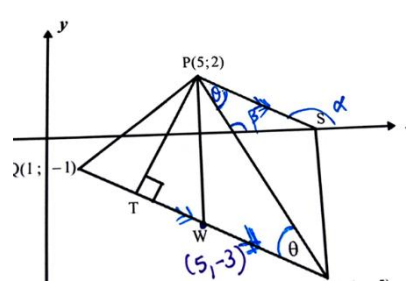


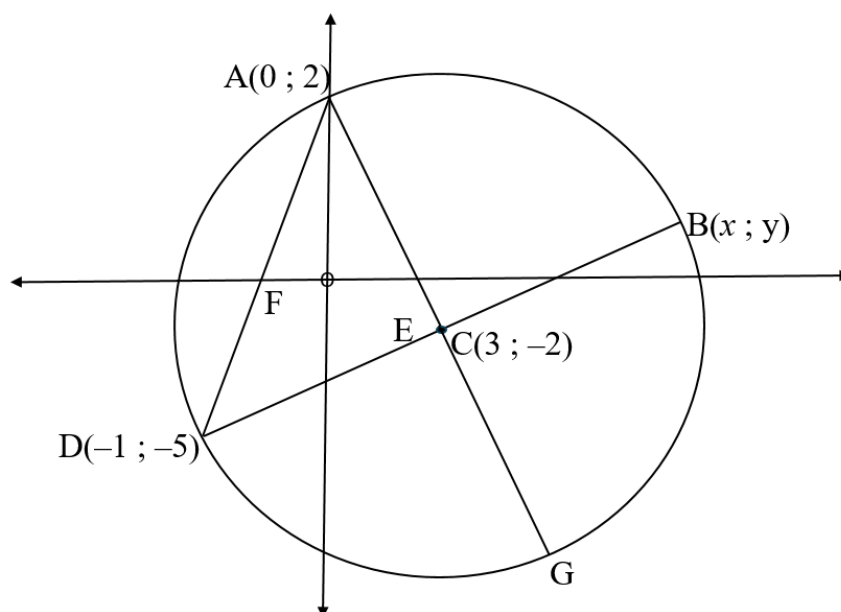
3.1	$m_{QR} = \frac{-1+5}{1-9}$ $= -\frac{1}{2}$	✓ subst./vervang ✓ answer/antwoord (2)
3.2	$m_{PS} = -\frac{1}{2}$ $(5:2): 2 = -\frac{1}{2}(5) + c$ $c = \frac{9}{2}$ $\therefore y = -\frac{1}{2}x + \frac{9}{2}$ or / of $y - 2 = -\frac{1}{2}(x - 5)$ $y - 2 = -\frac{1}{2}x + \frac{5}{2}$ $y = -\frac{1}{2}x + \frac{9}{2}$	✓ $m_{PS} = -\frac{1}{2}$ ✓ subst./vervang coordinates of/ <i>koördinate P</i> ✓ equation/vergelyking of PS or/of ✓ $m_{PS} = -\frac{1}{2}$ ✓ subst./vervang coordinates of/ <i>koördinate P</i> ✓ equation/vergelyking of PS (3)

3.3	$y = -\frac{1}{2}x + \frac{9}{2}$ $0 = -\frac{1}{2}x + \frac{9}{2}$ $x = 9$ $S(9; 0)$ CA from 3.2	✓ $y = 0$ ✓ $x = 9$ (2)
3.4	area / oppv trapezium PQRS = $\frac{1}{2}(PS + QR).PT$ $QR = \sqrt{(1-9)^2 + (-1-(-5))^2}$ $QR = \sqrt{80} / 4\sqrt{5}$ $30 = \frac{1}{2}(\sqrt{20} + \sqrt{80}).PT$ $PT = \sqrt{20} / 2\sqrt{5}$	✓ subst. coordinates in correct formula/vervang koördinate in korrekte formule ✓ answer/antwoord ✓ subst. distances in correct formula/vervang afstande in korrekte formule ✓ answer/antwoord (4)

Allow other alternative responses

- Finding the gradient of MR
- Equation of QR
- Equation of PT
- Equate the 2 equations to get the co-ordinates (point of intersection)

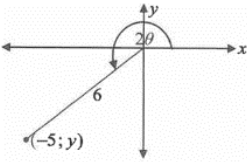
3.5 $20 = (x_T - 5)^2 + (y_T - 2)^2 \dots\dots (1)$ $m_{PT} \times m_{QR} = -1$ $\frac{y_T - 2}{x_T - 5} \times -\frac{1}{2} = -1$ $\frac{y_T - 2}{x_T - 5} = 2$ $\therefore y_T - 2 = 2x - 10 \dots\dots (2)$ Subst eq 2 into eq 1/verv verg 2 in verg 1 $20 = x^2 - 10x + 25 + (2x - 10)^2$ $20 = x^2 - 10x + 25 + 4x^2 - 40x + 100$ $0 = 5x^2 - 50x + 105$ $0 = x^2 - 10x + 21$ $0 = (x - 7)(x - 3)$ $\therefore x = 7 \text{ of } x = 3$ nvt $T(3; -2)$ Candidates may not ASSUME T is the midpoint... Reward marks only if: • 2 TRIANGLES ARE PROVED TO BE CONGRUENT • If its shown that PQ =PW AND that ΔPQW is an isosceles	✓ subst. distance in correct formula/ vervang afstande in korrekte formule ✓ $m_{PT} = \frac{y_T - 2}{x_T - 5}$ ✓ equation/vergelyking PT ✓ subst./vervang PT ✓ std form ✓ answer/antwoord (6)
3.6 $PT = \sqrt{20}$ $TR = \sqrt{36 + 9} = \sqrt{45}$ $\tan \theta = \frac{\sqrt{20}}{\sqrt{45}}$ $\theta = 33,69^\circ$ $M_{PR} = -\frac{7}{4}$ $\beta = 119,74^\circ$ $M_{PS} = -\frac{1}{2}$ $\alpha = 153,43^\circ$ $\theta = 153,43^\circ - 119,74^\circ \text{ (ext } < \text{ of } \Delta)$ $= 33,69^\circ \text{ (alt } <, PS // QR)$ 	✓ $TR = \sqrt{36 + 9} = \sqrt{45}$ ✓ $\tan \theta = \frac{\sqrt{20}}{\sqrt{45}}$ ✓ $\theta = 33,69^\circ$ ✓ $\beta = 119,74^\circ$ ✓ $153,43^\circ$ ✓ $\theta = 33,69^\circ$ (3)

QUESTION/VRAAG 4

4.1	$3 = \frac{-1+x}{2}$ $6 = -1+x$ $x = 7$ $-2 = \frac{-5+y}{2}$ $-4 = -5+y$ $y = 1$ $\therefore B(7;1)$	✓ subst. coordinates in correct formula/vervang koördinate in korrekte formule ✓ $x = 7$ ✓ subst. coordinates in correct formula/vervang koördinate in korrekte formule ✓ $y = 1$ (4)
4.2	$AC^2 = (0-3)^2 + (2-(-2))^2$ $AC^2 = 25$ $\therefore (x-3)^2 + (y+2)^2 = 25$ Or/of $DC^2 = (-1-3)^2 + (-5+2)^2$ $= 25$ $\therefore (x-3)^2 + (y+2)^2 = 25$	✓ subst. coordinates of/ vervang koördinate van A and C ✓ $r^2 = 25$ ✓ equation/vergelyking ✓ subst. coordinates of/ vervang koördinate van D and C ✓ $r^2 = 25$ ✓ equation/vergelyking (3)

4.3	$m_{BD} = \frac{1 - (-5)}{7 - (-1)} = \frac{3}{4}$ $(3; -2) : -2 = \frac{3}{4}(3) + c \quad \text{OR/OF}$ $c = -\frac{17}{4}$ $\therefore y = \frac{3}{4}x - \frac{17}{4} / 4\frac{1}{4}$	$m_{CD} = \frac{-2 - (-5)}{3 - 1} = \frac{3}{4}$ $y + 2 = \frac{3}{4}(x - 3)$ $y + 2 = \frac{3}{4}x - \frac{9}{4}$ $y = \frac{3}{4}x - \frac{17}{4}$	✓ m_{BD} ✓ equation/vergelyking (2)
4.4	$m_{AC} = \frac{-2 - 2}{3 - 0}$ $= -\frac{4}{3}$ $m_{BC} = \frac{3}{4}$ $m_{AE} \times m_{BC}$ $= -\frac{4}{3} \times \frac{3}{4}$ $= -1$ $\therefore AG \perp BD$ $\hat{A} = 90^\circ [\angle \text{ in semi-circle} / \angle \text{ in halwe sirkel}]$ $\therefore ABGD$ is a square.....diagonals bisect each other $\perp$ AND $\hat{A} = 90^\circ / ABGD$ is 'n vierkant... diagonale halveer mekaar $\perp$ EN $\hat{A} = 90^\circ$ Or/Of $ABGD$ is a square. (diagonals bisect/diagonale halveer) $\hat{A} = 90^\circ [\angle \text{ in semi-circle} / \angle \text{ in halwe sirkel}]$ $\therefore ABGD$ is a square / vierkant $AD = 5\sqrt{2}$ $AB = 5\sqrt{2}$ $\therefore AD = AB$ $\therefore ABGD$ is a square / vierkant	✓ $m_{AC} = -\frac{4}{3}$ ✓ $m_{AE} \times m_{BC} = -1$ ✓ $\therefore m_{ACG} \perp m_{BCD}$ ✓ $\hat{DAB} = 90^\circ$ ✓ $ABGD$ is a square. (diagonals bisect at 90° / diagonale halveer 90°) ✓ $\hat{A} = 90^\circ$ ✓ $AD = 5\sqrt{2}$ ✓ $AB = 5\sqrt{2}$ (4)	

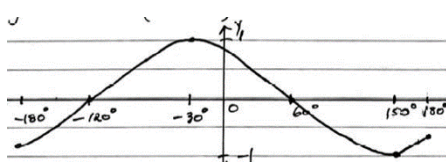
QUESTION/VRAAG 5

5.1.1	$\sin 2\theta$ $= -\frac{\sqrt{11}}{6}$ Answer only: full marks Slegs antwoord: Vol punte  $y^2 = 6^2 - (-5)^2$ $\therefore y = -\sqrt{11}$ CA from diagram	$\checkmark$ Diagram in the 3 rd quadrant/3 ^{de} kwadrant $\checkmark$ $y = -\sqrt{11}$ $\checkmark$ $-\frac{\sqrt{11}}{6}$ answer/antwoord (3)
5.1.2	$\sin^2 \theta$ $\cos 2\theta = 1 - 2\sin^2 \theta$ $-\frac{5}{6} = 1 - 2\sin^2 \theta$ $-\frac{11}{6} = 1 - 2\sin^2 \theta$ $\sin^2 \theta = \frac{11}{12}$ CA the value of y	$\checkmark$ $1 - 2\sin^2 \theta$ $\checkmark$ subst/vervang $-\frac{5}{6}$ $\checkmark$ $\frac{11}{12}$ (3)
5.2	$\sin(A+B) = \cos[90^\circ - (A+B)]$ $= \cos[(90^\circ - A) - B]$ $= \cos(90^\circ - A)\cos B + \sin(90^\circ - A)\sin B$ $= \sin A \cos B + \cos A \sin B$	$\checkmark$ $\cos[90^\circ - (A+B)]$ $\checkmark$ $\cos[(90^\circ - A) - B]$ $\checkmark$ $\cos(90^\circ - A)\cos B + \sin(90^\circ - A)\sin B$ $\checkmark$ $\sin A \cos B + \cos A \sin B$ (4)
5.3	$\frac{\cos(90^\circ + x) \cdot \sin(x - 180^\circ) - \cos^2(180^\circ - x)}{\cos(-2x)}$ $= \frac{(-\sin x)(-\sin x) - (-\cos x)^2}{\cos 2x}$ $= \frac{\sin^2 x - \cos^2 x}{(\cos^2 x - \sin^2 x)}$ $= \frac{-(\cos^2 x - \sin^2 x)}{\cos^2 x - \sin^2 x}$ $= -1$	$\checkmark$ $(-\sin x)$ $\checkmark$ $(-\sin x)$ $\checkmark$ $(-\cos x)^2$ $\checkmark$ $\cos 2x = (\cos^2 x - \sin^2 x)$ $\checkmark$ nominator: $-(\cos^2 x - \sin^2 x)$ $\checkmark$ -1 (6)

- Reductions of trig identities are independent marks
- $(\cos x)^2$ is also accepted but encourage candidates to show the full reduction before arriving at $(\cos x)^2$.
- Alternative expansion of $\cos 2x$ must lead to the answer to get the mark for expansion

5.4.1	$LHS = \frac{\sin^2 \theta - 2\sin \theta \cos \theta + \cos^2 \theta}{\cos^2 \theta}$ $= \frac{1 - 2\sin \theta \cos \theta}{\cos^2 \theta}$ $RHS = \frac{1}{\cos^2 \theta} - \frac{2\sin \theta}{\cos \theta}$ $= \frac{1 - 2\sin \theta \cos \theta}{\cos^2 \theta}$ $LHS = RHS$ OR/OF $\frac{(\sin \theta - \cos \theta)^2}{1 - \sin^2 \theta} = \frac{1}{\cos^2 \theta} - 2\tan \theta$ $LHS = \frac{(\sin \theta - \cos \theta)^2}{1 - \sin^2 \theta}$ $= \frac{\sin^2 \theta - 2\sin \theta \cos \theta + \cos^2 \theta}{\cos^2 \theta}$ $= \frac{1 - 2\sin \theta \cos \theta}{\cos^2 \theta}$ $= \frac{1}{\cos^2 \theta} - \frac{2\sin \theta \cos \theta}{\cos^2 \theta}$ $= \frac{1}{\cos^2 \theta} - \frac{2\sin \theta}{\cos \theta}$ $RHS = \frac{1}{\cos^2 \theta} - 2\tan \theta$	$\checkmark \sin^2 \theta - 2\sin \theta \cos \theta + \cos^2 \theta$ $\checkmark \sin^2 \theta + \cos^2 \theta = 1$ $\checkmark \cos^2 \theta$ $\checkmark \tan \theta = \frac{\sin \theta}{\cos \theta}$ $\checkmark \frac{1 - 2\sin \theta \cos \theta}{\cos^2 \theta}$ $\checkmark \sin^2 \theta - 2\sin \theta \cos \theta + \cos^2 \theta$ $\checkmark \sin^2 \theta + \cos^2 \theta = 1$ $\checkmark \cos^2 \theta$ $\checkmark \frac{1}{\cos^2 \theta} - \frac{2\sin \theta \cos \theta}{\cos^2 \theta}$ $\checkmark \frac{2\sin \theta}{\cos \theta}$
-------	--	---

(5)

5.4.2	$1 - \sin^2 \theta = 0$ OR / OF $\cos^2 \theta = 0$ $\theta = 90^\circ; 270^\circ$ $\therefore \theta = 90^\circ; 270^\circ$ Answer only: full marks Slegs antwoord: Vol punte	$\checkmark$ $1 - \sin^2 \theta = 0$ or / of $\cos^2 \theta = 0$ $\checkmark$ $\theta = 90^\circ; 270^\circ$ (2)
5.5	$k(x) = \sin 60^\circ \cos x + \cos 60^\circ \sin x$ $= \sin(60^\circ + x)$ OR/OF $k(x) = \cos 30^\circ \cos x + \sin 30^\circ \sin x$ $= \cos(30^\circ - x)$ $y \in [-1; 1]$ OR $-1 \leq y \leq 1$ 	(Reverse special angle id) $\checkmark$ $\sin(60^\circ + x)$ or / of $\cos(30^\circ - x)$ $\checkmark$ $y \in [-1; 1]$ (2)

[25]

QUESTION/VRAAG 6

6.1	720°	$\checkmark$ answer/antwoord (1)
6.2	$AB = \cos \frac{\alpha}{2} - \cos(\alpha - 30^\circ)$ at $\alpha = 150^\circ$ $AB = \cos 75^\circ - \cos 120^\circ$ $= 0,76$ Answer only: full marks Slegs antwoord: Vol punte	$\checkmark$ $\cos 75^\circ - \cos 120^\circ$ (or substitution of angles/verv grade) $\checkmark$ answer/antwoord (2)
6.3	$f(\alpha) - g(\alpha) = 0$ $\therefore f(\alpha) = g(\alpha)$ $\cos \frac{\alpha}{2} = \cos(\alpha - 30^\circ)$ $\frac{\alpha}{2} = \alpha - 30^\circ$ $\frac{\alpha}{2} = \alpha - 30^\circ + k.360^\circ$ $\alpha = 2\alpha - 60^\circ + k.720^\circ$ $-\alpha = -60^\circ + k.720^\circ$ $\alpha = 60^\circ + k.720^\circ$ $k \in \mathbb{Z}$ $\therefore \alpha = 20^\circ; 60^\circ; 260^\circ$ Answer only: 1/6	Answer only [Calculator usage] will not be ACCEPTED to find “specific solutions” in this case, candidates must apply the skill of general solution to determine specific solution with respect to the given interval. $\checkmark$ $\cos \frac{\alpha}{2} = \cos(\theta - 30^\circ)$ $\checkmark$ $\frac{\alpha}{2} = \alpha - 30^\circ + k.360^\circ$ $\checkmark$ $\frac{\alpha}{2} = 360^\circ - (\alpha - 30^\circ) + k.360^\circ$ $\checkmark$ $\alpha = 60^\circ + k.720^\circ$ & $\checkmark$ $\alpha = 260^\circ + k.240^\circ$ $\checkmark$ $\alpha = 20^\circ; 60^\circ; 260^\circ$ together with $k \in \mathbb{Z}$ (6)

6.4	$[-180^\circ; 20^\circ)$	CA from diagram	✓ values/waardes ✓ notation/notasie	(2)
6.5	$h(\alpha) = -\cos(\alpha - 30^\circ + 30^\circ)$ $h(\alpha) = -\cos(\alpha)$	Answer only: full marks Slegs antwoord: Vol punte	✓ $+30^\circ$ ✓ $h(\alpha) = -\cos(\alpha)$	(2)
6.6	$\alpha = 0^\circ \therefore \cos \frac{\alpha}{2} = 1$ $\alpha = 180^\circ \therefore \cos \frac{\alpha}{2} = 0$ $\alpha = 360^\circ \therefore \cos \frac{\alpha}{2} = -1$ $\sum_{\alpha=0^\circ}^k = 0$ if/as $k = 360^\circ$	Answer only: full marks Slegs antwoord: Vol punte	✓ $\alpha = 0^\circ$ ✓ answer/antwoord	(2)

[15]

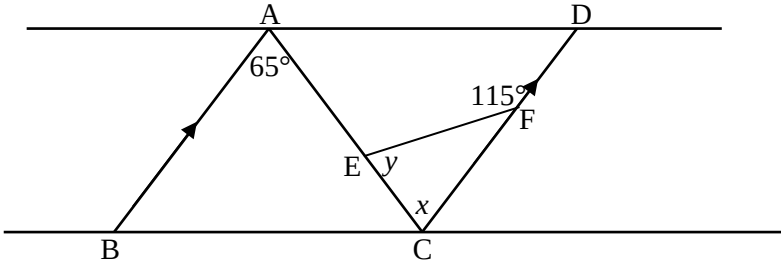
QUESTION/VRAAG 7

7.1.1	$\hat{P}SQ = 90^\circ \dots \angle^s$ in a semi – circle / sirkel $RQS = 90^\circ + \theta \dots \text{ext } \angle$ of Δ / buite $\angle$ Δ	✓ $\hat{P}SQ = 90^\circ$ ✓ R	(2)
7.1.2	$RS^2 = QR^2 + QS^2 - 2(QR)(QS)\cos \hat{Q}_2$ $RS^2 = (2x)^2 + x^2 - 2(2x)(x)\cos(90^\circ + \theta)$ $RS^2 = 4x^2 + x^2 + 4x^2\sin\theta$ $RS^2 = 5x^2 + 4x^2\sin\theta$ $RS^2 = x^2(5 + 4\sin\theta)$ If QR is $\frac{x}{2}$ and QS = x $RS^2 = \left(\frac{x}{2}\right)^2 + x^2 - 2\left(\frac{x}{2}\right)(x)\cos(90^\circ + \theta)$ $RS^2 = \left(\frac{x}{2}\right)^2 + x^2 - 2\left(\frac{x}{2}\right)(x)[- \sin\theta]$ $RS^2 = \frac{x^2}{4} + x^2 + x^2\sin\theta$ $RS^2 = \frac{5x^2}{4} + x^2\sin\theta$ $RS^2 = x^2\left(\frac{5}{4} + \sin\theta\right)$	✓ correct subst of cosine rule korrekte subst in die cosinus-reël ✓ $-\sin\theta$ (can be implied) ✓ x^2 (comm factor / gem faktor) ✓ correct subst of cosine rule korrekte subst in die cosinus-reël ✓ $-\sin\theta$ (can be implied) ✓ x^2 (comm factor / gem faktor)	(3)

GEOMETRY/MEETKUNDE

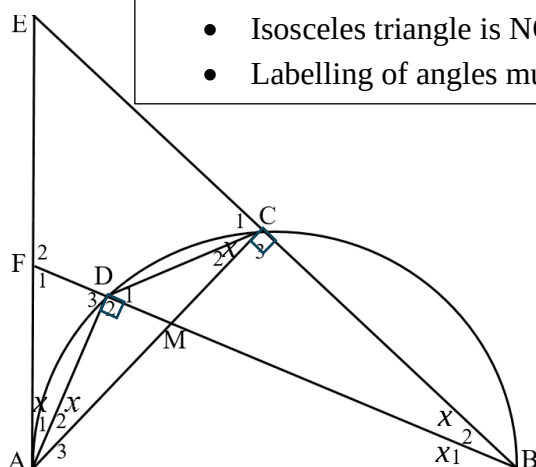
Please read carefully through the following table before marking **QUESTION 8–10/**

*Lees asseblief sorgvuldig deur die volgende tabel alvorens **VRAE 8–10** nagesien word.*

	The order in which the candidate answers a geometry question must follow logically/ <i>Die volgorde waarin 'n kandidaat 'n meetkundevraag beantwoord moet logies volg.</i> Example/Voorbeeld Given/Gegee $AB \parallel CD$ and/en $\hat{EFD} = 115^\circ$  The candidate first needs to calculate x BEFORE he/she can calculate y/Die kandidaat moet eerste vir x bereken VOORDAT hy/sy vir y kan bereken.
S	A mark for a correct statement (A statement mark is independent of a reason)
	<i>'n Punt vir 'n korrekte bewering</i> <i>('n Punt vir 'n bewering is onafhanklik van die rede)</i>
R	A mark for the correct reason (A reason mark may only be awarded if the statement is correct)
	<i>'n Punt vir 'n korrekte rede</i> <i>('n Punt word slegs vir die rede toegeken as die bewering korrek is)</i>
S/R	Award a mark if the statement AND reason are both correct (Both MUST be correct to get one mark)
	<i>Ken 'n punt toe as die bewering EN rede beide korrek is</i> <i>(Beide MOET korrek wees om een punt te kry)</i>

QUESTION/VRAAG 8

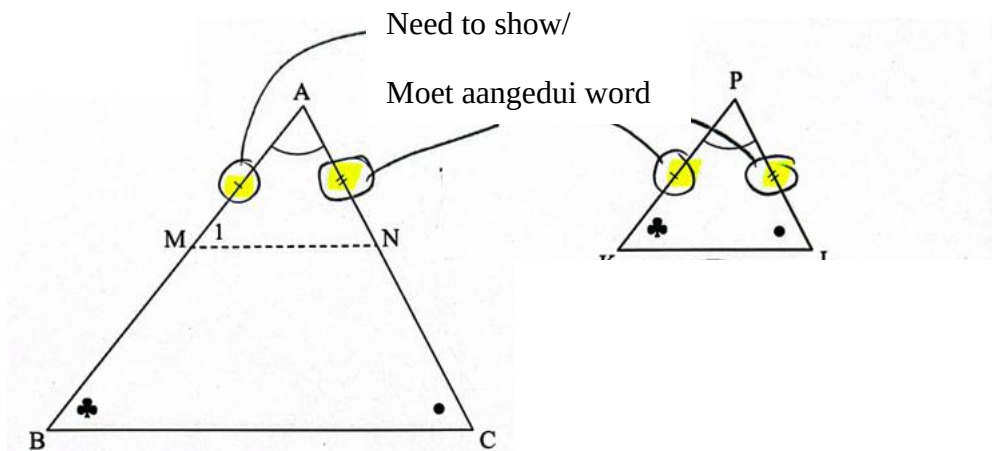
- B₂ Also have other reasons (= chords subtends = angles)
- Isosceles triangle is NOT a reason (angles opposite = sides)
- Labelling of angles must be specific



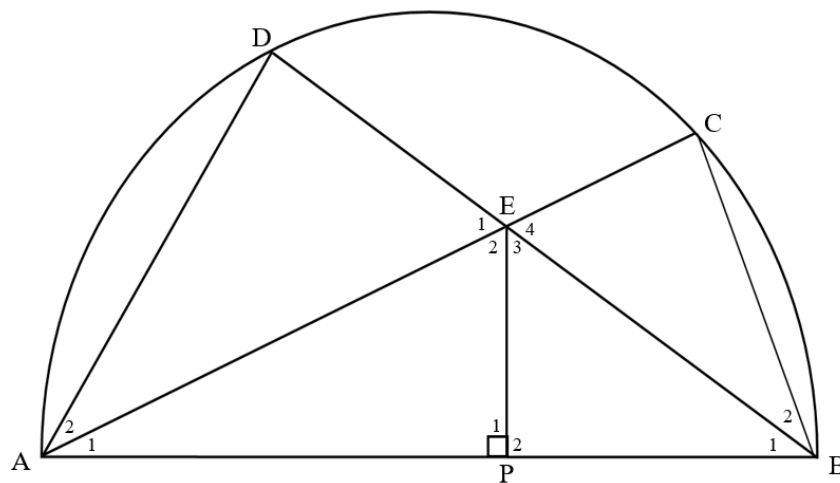
8.1	$\hat{A}_1 = x$ [tan chord / rklyn koordstelling] $\hat{C}_2 = x$ [$\angle$ s in the same segment/ $\angle$ e in dieselfde sirkel segment] $\hat{A}_2 = x$ [$\angle$ s opp. = sides/ $\angle$ e teenoor = sye] $\hat{B}_2 = x$ [$\angle$ s in the same segment/ $\angle$ e in dieselfde sirkel segment]	✓ S ✓ R ✓ S ✓ R ✓ S ✓ R ✓ S ✓ R (8)
8.2.1	$\hat{C}_1 = 90^\circ - x$ [$\angle^s$ on a straight line/ $\angle^e$ op 'n reguitlyn] $\hat{D}_2 = 90^\circ$ [$\angle$ in semi circle./ $\angle$ in halvesirkel] $\hat{D}_3 = 90^\circ$ [$\angle^s$ on a straight line/ $\angle^e$ op 'n reguitlyn] $\hat{F}_1 = 90^\circ - x$ [sum of Δ /som $\angle^e$ v Δ] of [ext $\angle$ / buite $\angle$] $\hat{C}_1 = \hat{F}_1$	✓ S ✓ S ✓ R ✓ S/R ✓ S/R (5)
8.2.2	In $\triangle FDA$ and/en $\triangle ADM$ is: $\hat{D}_3 = \hat{D}_2 = 90^\circ$ proven / bewys in 8.2.1 $\hat{A}_1 = \hat{A}_2 = x$ proven / bewys in 8.1 $AD = AD$ common / gemeenskaplik $\therefore \triangle FDA \equiv \triangle MDA$ AAS $\therefore FD = DM$	✓ S both/beide $\angle$ ✓ S ✓ S/R (3)

[16]

QUESTION/VRAAG 9

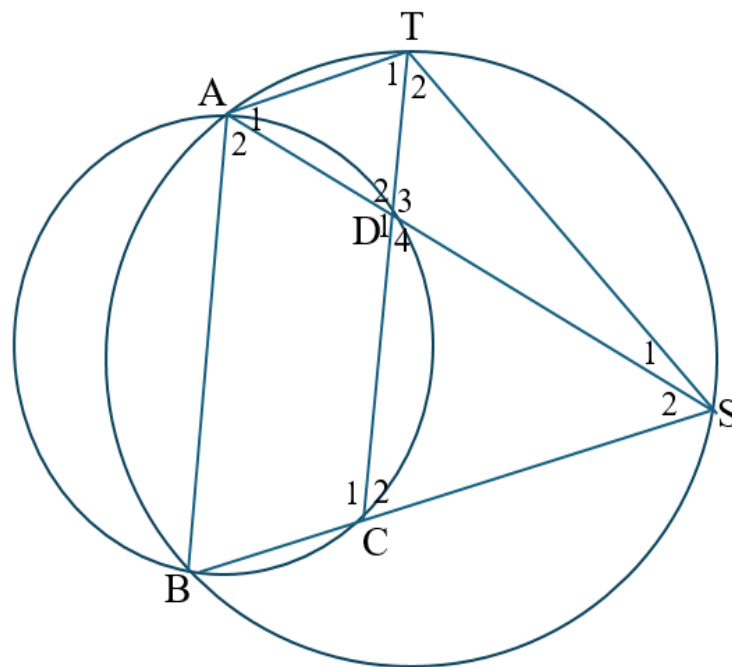


9.1	Konstruksie: Teken lyn MN, waar M en N punte op AB en AC onderskeidelik is. $AM = PK$ and $AN = PL$ Construction: Draw line MN, where M and N are points on AB and AC respectively. $AM = PK$ and $AN = PL$ In $\triangle AMN$ and/en $\triangle PKL$ is: $\hat{A} = \hat{P}$ [given / gegee] $AM = PK$ [construction / konstruksie] $AN = PL$ [construction / konstruksie] $\therefore \triangle AMN \equiv \triangle PKL$ [S $\angle$ S] $\therefore \hat{M}_1 = \hat{K}$ But $\hat{B} = \hat{K}$ [given / gegee] $\therefore \hat{M}_1 = \hat{B}$ $\therefore MN \parallel BC$ [corr $\angle^s$ are = /ooreenkomst $\angle^e$ is =] $\frac{AB}{AM} = \frac{AC}{AN}$ [prop th/ ewered st , line $\parallel$ one side of a $\triangle$ / lyn $\parallel$ een sy v $\triangle$] or/of $MN \parallel BC$ But $AM = PK$ and/en $AN = PL$ $\therefore \frac{AB}{PK} = \frac{AC}{PL}$	✓ construction/konstruksie Need to show or write/ moet wys of uitskryf BD if no construction ✓ S/R ✓ S ✓ R ✓ S ✓ R (6)
-----	---	---



9.2.1	In $\triangle BPE$ and/en $\triangle BDA$: $\hat{B}_1$ is common / <i>gemeenskaplik</i> $\hat{P}_2 = \hat{D} = 90^\circ$ [given/gegee and / en $\angle^s$ in a semi-circle / $\angle$ in $\frac{1}{2} \odot$] $\hat{B}\hat{A}\hat{D} = \hat{E}_3$ [3^{rd} $\angle$ or / of sum/ som van $\angle^s$] $\triangle BPE \parallel \triangle BDA$ [$\angle\angle\angle$] $\therefore \frac{BP}{BD} = \frac{PE}{AD} = \frac{BE}{AB}$ [$\triangle BPE \parallel \triangle BDA$] $\therefore \frac{BP}{BD} = \frac{PE}{AD}$	✓ S ✓ S ✓ S/R ✓ S/R (4)
9.2.2	$\hat{C} = \hat{D} = 90^\circ$ [$\angle^s$ in a semi-circle / $\angle$ in $\frac{1}{2} \odot$] $AB^2 = AC^2 + BC^2$ [<i>pyth</i>] $AB^2 = AD^2 + BD^2$ [<i>pyth</i>] $AC^2 + BC^2 = AD^2 + BD^2$	✓ S ✓ S ✓ S (3)

[13]

QUESTION/VRAAG 10

10.1	$\hat{B} + \hat{D} = 180^\circ$	[opp $\angle^s$ cyclic quad / teenoorst $\angle^e$ v kvh]	✓ S/R
	$\hat{D}_1 = \hat{D}_3$	[vert opp / regoorst $\angle^e$]	✓ S/R
	$\hat{B} + \hat{D}_3 = 180^\circ$		✓ S
	$\hat{B} + \hat{T}_1 + \hat{T}_2 = 180^\circ$	[opp $\angle^s$ cyclic quad / teenoorst $\angle^e$ v kvh]	✓ S/R
	$\hat{D}_3 = \hat{T}_1 + \hat{T}_2$		
	Or/of		
	$\hat{D}_1 = \hat{D}_3$	[vert opp $\angle$ / regoorst $\angle$]	✓ S/R
	$\hat{D}_1 = 180^\circ - B$	[opp $\angle^s$ cyclic quad / teenoorst $\angle^e$ v kvh]	✓ S/R
	$\therefore \hat{D}_3 = 180^\circ - B$		✓ S
	$180^\circ - B = \hat{T}_1 + \hat{T}_2$	[opp $\angle^s$ cyclic quad / teenoorst $\angle^e$ v kvh]	✓ S/R
	$\hat{D}_3 = \hat{T}_1 + \hat{T}_2$		(4)

MARKING GUIDELINES / NASIENRIGLYNE

EXAMINATION <i>EKSAMEN</i>	NATIONAL SENIOR CERTIFICATE <i>NASIONALE SENIOR SERTIFIKAAT</i>
GRADE / <i>GRAAD</i>	12
DATE / <i>DATUM</i>	SEPTEMBER 2026
SUBJECT / <i>VAK</i>	MATHEMATICS / <i>WISKUNDE</i>
PAPER / <i>VRAESTEL</i>	2
MARK TOTAL / <i>PUNTETOTAAL</i>	150
DURATION (HOURS) / <i>TYDSDUUR (UUR)</i>	3
NUMBER OF PAGES / <i>AANTAL BLADSYE</i>	20



SOUTH AFRICAN COMPREHENSIVE ASSESSMENT INSTITUTE
SUID-AFRIKAANSE KOMPREHENSIEWE ASSESSERINGSINSTITUUT



NOTE:

- If a candidate answered a question **TWICE**, only mark the first attempt.
- If a candidate cancelled the first attempt and did not answer the question again, mark the cancelled attempt.
- The principle of consistent accuracy (**CA**) will be applied throughout the memorandum.
- If a candidate has given the answer only, without showing any necessary working out, only **ONE** mark will be given.

LET WEL:

- As 'n kandidaat 'n vraag **TWEE KEER** beantwoord het, merk slegs die eerste poging.
- As 'n kandidaat die eerste poging gekanselleer het en nie die vraag weer beantwoord het nie, merk die gekanselleerde poging.
- Die beginsel van konsekwente akkuraatheid (**CA**) sal regdeur die memorandum toegepas word.
- Indien 'n kandidaat slegs die antwoord gegee het, sonder om die nodige bewerkings te toon, sal slegs **EEN** punt toegeken word.



QUESTION 1 / VRAAG 1		[9 MARKS / PUNTE]	
1.1	$r = -0,79$ ✓✓ Do NOT penalise rounding / <i>Moet NIE afronding</i> <i>penaliseer nie</i>	✓✓ Answer/ Antwoord	(2)
1.2	Yes / Ja ✓ Relatively / Moderately strong negative correlation / <i>Relatiewe / matige sterk negatiewe korrelasie</i> ✓ CA the answer from 1.1 / CA antwoord vanaf 1.1	✓ Yes/Ja ✓ Explanation/ <i>verduideliking</i>	(2)
1.3	✓ $y = 1,7390 - 0,0084x$ ✓ Penalise rounding / <i>Penaliseer afronding</i>	✓ 1,7390 ✓ Equation/ <i>Vergelyking</i>	(2)
1.4	$y = 1,7390 - 0,0084(55)$ ✓ $= 1,28$ minutes ✓ Yes, interpolation ✓ (and the correlation is relatively strong). <i>Ja, intrapolasie (en relatiewe sterk korrelasie)</i>	✓ Sub/ Vervang ✓ Answer/ <i>Antwoord</i> ✓ Interpolation/ <i>Intrapolasie</i> (CA 1.3)	(3)
[9]			



QUESTION / VRAAG 2		[12 MARKS / PUNTE]	
2.1	Max: $89,18 - 64,31 = 24,87 \text{ sec/sek}$ ✓ Lando: $92,33 - 69,67 = 22,66 \text{ sec/ sek}$ ✓	✓ Answer/ Antwoord ✓ Answer/ Antwoord	(2)
2.2	Max: $80,40 - 75,38 = 5,02 \text{ sec/ sek}$ ✓ Lando: $80,14 - 73,40 = 6,74 \text{ sec/ sek}$ ✓	✓ Answer/ Antwoord ✓ Answer/ Antwoord	(2)
2.3	IQR, ✓ because it excludes extreme values which could be included in the range. ✓ <i>Interkwartielevariasiewydte, want dit sluit ekstreme waardes, wat by die variasiewydte bygevoeg word, uit.</i>	✓ IQR/ IKW ✓ Explanation/ Verduideliking	(2)
2.4	Max value/ Maks waarde – Q_2 $= 92,33 - 76,41 = 15,92$ Q_2 – min value/ min waarde $= 76,41 - 69,67 = 6,74$ ∴ Data is spread to the right ✓ / Positively skewed <i>Data versrei na regs / Positief skeef</i> ∴ $\bar{x} > 76$ ✓ OR / OF ∴ Data is spread to the right/ <i>Data versprei na regs.</i> Skewed to the right / <i>skeef na regs.</i> ∴ $\bar{x} > 76$	✓ Calculating spread of data/ Bereken verspreiding van data (6,74 and 15,92) ✓ Spread to the right / <i>versprei na regs</i> ✓ Conclusion/ Samevatting Or/of ✓ diagram ✓ diagram on scale/ diagram op skaal ✓ Conclusion/ Samevatting	(3)
2.5	$\frac{85}{100} \times 240$ ✓ $= 204 \text{ drivers/ bestuurders}$ ✓ $85 \leq t < 90$ ✓ Answer only full marks/ <i>Slegs antw vol punte</i>	✓ $\frac{85}{100} \times 240$ ✓ 204 ✓ $85 \leq t < 90$	(3)
[12]			



QUESTION / VRAAG 3		[20 MARKS / PUNTE]	
3.1	G is midpt of/van AB. (Properties of a kite/ eienskappe van 'n vlieër) $x = \frac{-1+5}{2} \quad \checkmark \quad 2 = \frac{0+y}{2}$ $x = 2 \quad \checkmark \quad y = 4 \quad \checkmark$	✓ Sub/ Vervang ✓ x ✓ y	(3)
3.2	$m_{CD} = \frac{-3}{2} \quad \checkmark$ $\therefore m_{EF} = \frac{-3}{2} \quad \checkmark \quad (CD \parallel EF)$	✓ m_{CD} ✓ Answer/ Antwoord	(2)
3.3	$m_{EF} = \frac{-3}{2}$ $\tan \theta = -\frac{3}{2} \quad \checkmark$ $\theta = 180^\circ + (-56,31^\circ) = 123,69^\circ$	✓ $\tan \theta = \frac{-3}{2}$	(1)
3.4	$m_{CA} = \frac{0-5}{-1-0} \quad \checkmark$ $= 5 \quad \checkmark$	✓ Sub/ Vervang ✓ Answer/ Antwoord	(2)
3.5	$\tan \hat{CAH} = 5 \quad \checkmark$ $\hat{CAH} = 78,69^\circ \quad \checkmark$ $\alpha = \theta - \hat{CAH}$ $= 123,69^\circ - 78,69^\circ$ $= 45^\circ \quad \checkmark$	✓ $\tan \hat{CAH} = 5$ ✓ $\hat{CAH} = 78,69^\circ$ ✓ α	(3)



3.6	$m_{\text{tangent} / \text{raaklyn}} = m_{EF} = \frac{-3}{2} \checkmark$ (EF// CD and/ en CD//tangent / raaklyn) $y - 4 = \frac{-3}{2}(x - 5) \checkmark$ $y = \frac{-3}{2}x + 11,5 \checkmark$	$\checkmark m_{\text{tangent} / \text{raaklyn}}$ $\checkmark$ Sub/ Vervang B(5; 4) $\checkmark$ Equation/ Vergelyking	(3)
3.7	$m_{AC} = \frac{5-0}{0-(-1)} = 5 \checkmark$ $m_{BC} = \frac{5-4}{0-5} = \frac{-1}{5} \checkmark$ $m_{AC} \times m_{BC} = 5 \times \frac{-1}{5} = -1$ $\therefore AC \perp BC$ or $\hat{C} = 90^\circ \checkmark$ $\therefore AB$ is the diameter of the circle (line subtends $90^\circ \angle$) <i>AB is die middellyn van die sirkel (lyn onderspan $90^\circ \angle$)</i> $\therefore G$ is the midpoint of the circle/ $\checkmark$ <i>G is die middelpunt van die sirkel</i> $2 = \frac{0+x_k}{2} \quad 2 = \frac{5+y_k}{2}$ $x_k = 4 \checkmark \quad y_k = -1 \checkmark$ $K(4; -1)$	$\checkmark m_{AC}$ CA 3.4 $\checkmark m_{BC}$ $\checkmark$ Conclusion/ <i>Samevatting $\hat{C} = 90^\circ$</i> $\checkmark$ G midpt $\checkmark$ x-value/ waarde $\checkmark$ y-value/ waarde	(6)
[20]			

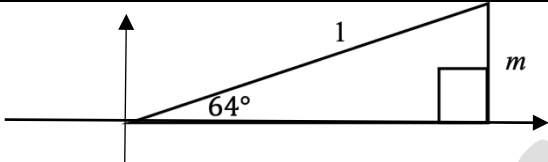


QUESTION / VRAAG 4		[18 MARKS / PUNTE]	
4.1	$x^2 + 6x + y^2 - 4y - 12 = 0$ $x^2 + 6x + 9 + y^2 - 4y + 4 = 12 + 9 + 4$ $(x + 3)^2 + (y - 2)^2 = 25$ $A(-3; 2)$ $r = 5$	✓ completing the square/ voltooi die vierkant ✓ 25 ✓ $A(-3; 2)$ ✓ $r = 5$	(4)
4.2	$(0 + 3)^2 + (y - 2)^2 = 25$ $y^2 - 4y - 12 = 0$ $(y - 6)(y + 2) = 0$ $y = 6$ or $y = -2$ $\therefore B(0; 6)$ $m_{AB} = \frac{2-6}{-3-0}$ $= \frac{4}{3}$	✓ $x = 0$ ✓ Std form/ Std vorm ✓ Factors/ Faktore ✓ Coordinates/ koördinate B ✓ Gradient/ gradiënt AB	(5)
4.3	$\therefore k = -3$	✓✓ Answer/ Antwoord	(2)
4.4	FE = 15 units/ eenhede BE = 15 units/ eenhede (Accept / Aanvaar: FE = BE = 15 units / eenhede) (tangents from the same point/ raaklyne van dieselfde punt)	✓ Answer/ Antwoord ✓ Answer/ Antwoord ✓ Reason/ Rede	(3)



4.5	$EA = \sqrt{(-3 - 12)^2 + (2 - (-3))^2}$ $EA = 5\sqrt{10}$ units/ <i>eenhede</i> ✓ $r = 5$ (original circle/ <i>oorspronklike sirkel</i>) Circles touch externally: $r + R = EA$ $\therefore 5 + R = 5\sqrt{10}$ ✓ $R = 10,81$ ✓ $\therefore (x - 12)^2 + (y + 3)^2 = 116,89$ ✓	✓ EA ✓ $5 + R = 5\sqrt{10}$ ✓ R value/ <i>waarde</i> ✓ Equation/ <i>Vergelyking</i>	(4)
[18]			



QUESTION 5 / VRAAG 5		[30 MARKS / PUNTE]	
5.1.1	$2\sin 32^\circ \cdot \cos 32^\circ$ $= \sin 2(32^\circ) \quad \checkmark$ $= \sin 64^\circ$ $= m \quad \checkmark$	$\checkmark$ double angle/ <i>dubbel hoek</i> $\checkmark$ Answer/ <i>Antwoord</i>	(2)
5.1.2	 $x = \sqrt{1 - m^2} \quad \checkmark$ Pythagoras $\tan 116^\circ = -\tan 64^\circ \quad \checkmark$ $= -\frac{m}{\sqrt{1 - m^2}} \quad \checkmark$	$\checkmark$ x (on diagram or calculated / <i>op diagram of bereken</i>) $\checkmark$ Reduction/ <i>Herleiding</i> $\checkmark$ Answer/ <i>Antwoord</i>	(3)
5.1.3	$\cos 34^\circ = \cos(64^\circ - 30^\circ) \quad \checkmark$ $= \cos 64^\circ \cos 30^\circ + \sin 64^\circ \sin 30^\circ \quad \checkmark$ $= (\sqrt{1 - m^2}) \cdot \frac{\sqrt{3}}{2} + m \cdot \frac{1}{2} \quad \checkmark$ $= \frac{\sqrt{3} \cdot \sqrt{1 - m^2}}{2} + \frac{m}{2}$ $= \frac{\sqrt{3 - 3m^2} + m}{2} \quad \checkmark$	$\checkmark$ Expansion/ <i>Uitbreiding</i> $\checkmark$ Compound angle/ <i>Saamgestelde hoek</i> $\checkmark$ Sub/ <i>Vervang</i> $\checkmark$ Answer/ <i>Antwoord</i> One fraction/ <i>een breuk</i>	(4)



5.2	$= \frac{\cos^2 15^\circ - \frac{1}{2}(\sin^2 55^\circ + \cos^2 55^\circ) \checkmark}{\sin 73^\circ \cos 43^\circ \checkmark + \cos 73^\circ (-\sin 43^\circ) \checkmark}$ $= \frac{\cos^2 15^\circ - \frac{1}{2}(\sin^2 55^\circ + \cos^2 55^\circ)}{\sin 73^\circ \cos 43^\circ - \cos 73^\circ \sin 43^\circ}$ $= \frac{\cos^2 15^\circ - \frac{1}{2}(1) \checkmark}{\sin(73^\circ - 43^\circ) \checkmark}$ $= \frac{\cos^2 15^\circ - \frac{1}{2}}{\sin 30^\circ \checkmark}$ $= \frac{\cos^2 15^\circ - \frac{1}{2}}{\frac{1}{2}}$ $= 2 \cos^2 15^\circ - 1 \checkmark$ $= \cos 30^\circ$ $= \frac{\sqrt{3}}{2} \checkmark$	✓ LCF/KGV $\frac{1}{2}$ ✓ $\cos 43^\circ$ ✓ $-\sin 43^\circ$ ✓ 1 ✓ $\sin(73^\circ - 43^\circ)$ ✓ $\sin 30^\circ$ ✓ Cos double angle/dubbel hoek ✓ Answer/ Antwoord	(8)
5.3	$\frac{2 \cos^3 x - 2 \sin^3 x}{2 + \sin 2x} = \cos x - \sin x$ LHS: $= \frac{2(\cos^3 x - \sin^3 x) \checkmark}{2 + 2 \sin x \cos x \checkmark}$ $= \frac{2(\cos x - \sin x)(\cos^2 x + \cos x \sin x + \sin^2 x) \checkmark}{2(1 + \sin x \cos x) \checkmark}$ $= \frac{(\cos x - \sin x)(\cos^2 x + \sin^2 x + \cos x \sin x)}{1 + \sin x \cos x}$ $= \frac{(\cos x - \sin x)(1 + \cos x \sin x) \checkmark}{1 + \sin x \cos x}$ $= \cos x - \sin x$ $= \text{RHS}$ OR / OF	✓ Sin double angle/dubbel hoek ✓ common 2 num/gemeesk 2 in teller ✓ common 2 denom/gemeesk 2 in noemer ✓ Difference of cubes/verskil van 3de magte ✓ $\cos^2 x + \sin^2 x = 1$ OR / OF	(5)



	LHS: $= \frac{2(\cos^3 x - \sin^3 x) \checkmark}{2 + \sin 2x}$ $= \frac{2[(\cos x - \sin x)(\cos^2 + \cos x \sin x + \sin^2 x)] \checkmark}{2 + \sin 2x}$ $= \frac{2[(\cos x - \sin x)(1 + \cos x \sin x)] \checkmark}{2 + \sin 2x}$ $= \frac{(\cos x - \sin x)(2 + 2 \cos x \sin x) \checkmark}{2 + \sin 2x}$ $= \frac{(\cos x - \sin x)(2 + 2 \sin 2x) \checkmark}{2 + \sin 2x}$ $= \cos x - \sin x$ = RHS	✓ common 2 num/ <i>gemeesk 2 in teller</i> ✓ Difference of cubes/ <i>verskil van 3de magte</i> ✓ $\cos^2 x + \sin^2 x = 1$ ✓ $\times 2$ ✓ Sin double angle/ <i>dubbel hoek</i>	
--	--	---	--

5.4.1	$\frac{5}{2} \cos x + \frac{5\sqrt{3}}{2} \sin x = -1$ $5 \left(\frac{1}{2} \cos x + \frac{\sqrt{3}}{2} \sin x \right) = -1 \checkmark$ $\frac{1}{2} \cos x + \frac{\sqrt{3}}{2} \sin x = -\frac{1}{5} \checkmark$ $\sin 30^\circ \cdot \cos x \checkmark + \cos 30^\circ \cdot \sin x \checkmark = -\frac{1}{5}$ $\sin(x + 30^\circ) = -\frac{1}{5}$	✓ HCF/ GGV 5 ✓ $-\frac{1}{5}$ ✓ $\sin 30^\circ \cdot \cos x$ ✓ $+\cos 30^\circ \cdot \sin x$	(4)
5.4.2	$\sin(x + 30^\circ) = -\frac{1}{5}$ Ref $\angle = 11,54^\circ$ (11,53696) : $x + 30^\circ \checkmark = 180^\circ + 11,54^\circ + k \cdot 360^\circ$ $x = 161,54^\circ + k \cdot 360^\circ; k \in \mathbb{Z} \checkmark$ IV: $x + 30^\circ = 360^\circ - 11,54^\circ + k \cdot 360^\circ$ $x = 318,46^\circ + k \cdot 360^\circ; k \in \mathbb{Z} \checkmark$	✓ Method / <i>Metode</i> ✓ Using compound angle / <i>Gebruik saamgestelde hoek</i> ✓ $161,54^\circ$ ✓ $318,46^\circ$ $+k \cdot 360^\circ; k \in \mathbb{Z}$	(4)
[30]			



QUESTION / VRAAG 6			[9 MARKS / PUNTE]
6.1	$a = 2$ ✓ $p = 30^\circ$ ✓ $b = -30^\circ$ ✓	✓ a ✓ p ✓ b	(3)
6.2	$y \in [-7; 5]$ ✓✓ OR $-7 \leq y \leq 5$	✓ Values/ Waardes ✓ Notation/ Notasie	(2)
6.3	$x \in (-120^\circ; -30^\circ]$ ✓ $-120^\circ < x \leq -30^\circ$ OR $x \in [30^\circ; 60^\circ)$ ✓ $30^\circ \leq x < 60^\circ$ OR $x \in [150^\circ; 210^\circ]$ ✓ $150^\circ \leq x \leq 210^\circ$ All notation / Alle notasie ✓	✓ Values/ Waardes ✓ Values/ Waardes ✓ Values/ Waardes ✓ Notation/ Notasie	(4)
			[9]



QUESTION / VRAAG 7		[10 MARKS / PUNTE]	
7.1	$\cos \beta = \frac{CB}{x} \checkmark$ $CB = x \cdot \cos \beta$	✓ Sub/ Vervang	(1)
7.2	$\frac{FB}{\sin 2\beta} = \frac{2x}{\sin \beta} \checkmark$ $FB = \frac{2x \cdot \sin 2\beta}{\sin \beta} \checkmark$ $FB = \frac{2x(2 \sin \beta \cdot \cos \beta)}{\sin \beta} \checkmark$ $FB = 4x \cos \beta \checkmark$ But $CD = FB - (FD + CB)$ and $CB = FD$ $CD = 4x \cos \beta - 2(x \cdot \cos \beta) \checkmark$ $\therefore CD = 2x \cos \beta$	✓ sin rule/ reël ✓ Simplify / Vereenvoudig ✓ sin double angle/ dubbelhoek ✓ FB ✓ Sub/ vervang	(5)
7.3	$AB = \sqrt{x^2 - x^2 \cos^2 \beta} \checkmark$ (Pythagoras) $h = \sqrt{x(1 - \cos^2 \beta)}$ $h = \sqrt{x(\sin^2 \beta)}$ $h = x \cdot \sin \beta \checkmark$ $Area EACD = \frac{1}{2}(2x \cdot \cos \beta + 4x \cos \beta)(x \cdot \sin \beta) \checkmark$ $= \frac{1}{2}(6x \cdot \cos \beta)(x \sin \beta)$ $= 3x^2 \cos \beta \cdot \sin \beta$ $= \frac{3}{2}x^2(2 \sin \beta \cdot \cos \beta) \checkmark$ $= \frac{3}{2}x^2 \sin 2\beta \checkmark$ OR	✓ Sub/ vervang ✓ h ✓ Sub/ vervang ✓ Simplify/ vereenvoudig ✓ Answer/ Antwoord	



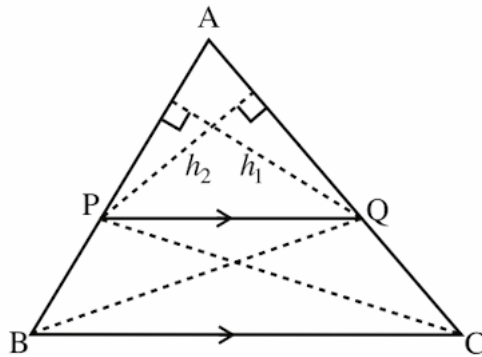
$AB = \sqrt{x^2 - x^2 \cos^2 \beta} \quad \checkmark \quad (\text{Pythagoras})$ $h = \sqrt{x(1 - \cos^2 \beta)}$ $h = \sqrt{x(\sin^2 \beta)}$ $h = x \cdot \sin \beta \quad \checkmark$ $\text{Area } EABF = 4x \cos \beta \times x \cdot \sin \beta$ $= 4x^2 \sin \beta \cdot \cos \beta \quad \checkmark$ $\text{Area } \triangle ABC = \frac{1}{2} \times x \cdot \cos \beta \times x \cdot \sin \beta$ $= \frac{1}{2} x^2 \sin \beta \cdot \cos \beta \quad \checkmark$ $\text{Area } EACD = 4x^2 \sin \beta \cdot \cos \beta - 2\left(\frac{1}{2} x^2 \sin \beta \cdot \cos \beta\right)$ $= 4x^2 \sin \beta \cdot \cos \beta - x^2 \sin \beta \cdot \cos \beta$ $= 3x^2 \sin \beta \cdot \cos \beta$ $= \frac{3}{2} (2 \sin \beta \cdot \cos \beta)$ $= \frac{3}{2} x^2 \sin 2\beta \quad \checkmark$	$\checkmark$ Sub/ vervang $\checkmark$ h $\checkmark$ Area EABF $\checkmark$ Area $\triangle ABC$ $\checkmark$ Answer/ Antwoord	(5)
[11]		



QUESTION / VRAAG 8		[11 MARKS / PUNTE]	
8.1	$\hat{D} = 90^\circ \checkmark$ ($\angle$ in semi-circle/ $\angle$ in 'n halwe sirkel)	$\checkmark$ S/R	(1)
8.2	$\hat{P}_1 = 90^\circ \checkmark$ (midpt O; midpt chord/ <i>midpt O; midpt koord</i>) $\checkmark$ $\hat{A}_2 = 180^\circ - 90^\circ - 46^\circ$ ($\angle$ s of Δ / $\angle$ e van Δ) $\checkmark$ $\hat{A}_2 = 44^\circ$	$\checkmark$ S $\checkmark$ R $\checkmark$ S&R	(3)
8.3	$\hat{A} = 90^\circ \checkmark$ ($\angle$ in semi-circle/ $\angle$ in 'n halwe sirkel) $\hat{A}_1 = 46^\circ \checkmark$ $\hat{E}_1 = 46^\circ \checkmark$ ($\angle$ s opp = radii/ $\angle$ e teenoor = radiusse) OR / OF $\hat{B}_1 = 44^\circ \checkmark$ (radii/ radiusse; $\angle$ opp=sides/ $\angle$ teenoor = sye) $\hat{O}_2 = 88^\circ \checkmark$ $(\angle \text{ at centre} = 2 \times \angle \text{ at circ/ middelp } \angle = 2 \times \text{ omtreks } \angle)$ $\hat{E}_1 = \frac{180^\circ - 88^\circ}{2}$ (radii; $\angle$ s opp = sides; $\angle$ e van Δ) (radiusse; $\angle$ e teenoor = sye; $\angle$ e van Δ) $\hat{E}_1 = 46^\circ$	$\checkmark$ S&R $\checkmark$ S $\checkmark$ S&R $\checkmark$ S&R $\checkmark$ S&R $\checkmark$ S&R	(3)
8.4	$\hat{B}_2 = 46^\circ \checkmark$ (Alt $\angle$'s; AE BD / Verw $\angle$'s; AE BD) $E\hat{B}F = 90^\circ \checkmark$ (radius $\perp$ tangent / rdus $\perp$ raaklyn) $\checkmark$ $\hat{B}_3 = 44^\circ \checkmark$ OR / OF $\hat{D} = 90^\circ$ ($\angle$ in semi-circle/ $\angle$ in 'n halwe sirkel) $\checkmark$ $\hat{A} = 90^\circ$ ($\angle$ in semi-circle/ $\angle$ in 'n halwe sirkel) But, AEDB is a parrallogram/ <i>Maar AEBD is 'n parallelogram</i> $\therefore$ AEDB is a rectangle (parm with $90^\circ \angle$) / $\checkmark$ AEDB is 'n reghoek (parallelogram met $90^\circ \angle$) $\therefore \hat{E}_2 = 90^\circ - 46^\circ = 44^\circ \checkmark$ $\hat{B}_3 = 44^\circ \checkmark$ (tan-chord/raaklyn koord stelling)	$\checkmark$ S&R $\checkmark$ S $\checkmark$ R $\checkmark$ $\hat{B}_3 = 44^\circ$ $\checkmark$ S $\checkmark$ S&R $\checkmark$ $\hat{E}_2$ $\checkmark$ S&R	(4)
[11]			

[16 MARKS / PUNTE]

- ✓ Construction
/ *konstruksie*



OR / OF

✓ S

(6)

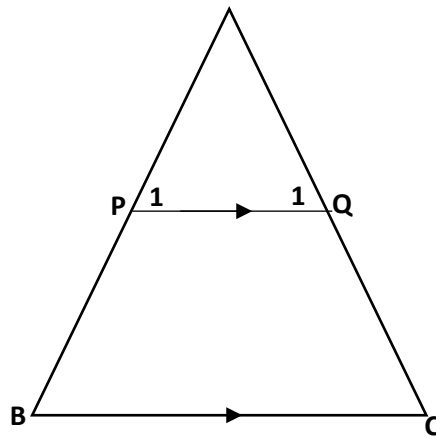


Given / Gegee: $\triangle ABC$ with / met $PQ \parallel BC$

Prove / Bewys: $\frac{AP}{PB} = \frac{AQ}{QC}$

Let / Stel $\angle P = \hat{P}_1$ and / en

$$\angle Q = \hat{Q}_1$$



In $\triangle APQ$ and / en $\triangle ABC$:

$$\hat{A} = \hat{A} \quad \text{Common / Gemeenskaplik}$$

$$\hat{P}_1 = \hat{B} \quad \checkmark \text{ Corr } \angle\text{'s}; PQ \parallel BC$$

Verw $\angle$ 'e: $PQ \parallel BC$

$$\hat{Q}_1 = \hat{C} \quad \checkmark \text{ Corr } \angle\text{'s}; PQ \parallel BC$$

Verw $\angle$ 'e: $PQ \parallel BC$

$$\triangle APQ \parallel \triangle ABC \quad \checkmark \text{ A; A A / H; H; H}$$

$$\frac{AP}{AB} = \frac{AQ}{AC} \quad \checkmark \text{ Proportionality theorem; } PQ \parallel BC$$

OR Line $\parallel$ to side of $\triangle$ /

Eweredigheidst; $PQ \parallel BC$ OF Lyn $\parallel$ sy v $\triangle$

But / Maar:

$$PB = AB - AP$$

And / en

$$QC = AC - AQ$$

$$\therefore \frac{AP}{AB - AP} = \frac{AQ}{QC - AQ} \quad \checkmark$$

$$\therefore \frac{AP}{PB} = \frac{AQ}{QC}$$



9.2.1	$\hat{A}_1 + \hat{A}_2 = \hat{B}_1 + \hat{B}_2 \quad \checkmark$ (corresp / ooreenkonstige $\angle$s, AC $\parallel$ BD) $\hat{A}_1 = \hat{B}_1 \quad \checkmark$ (= chords/koorde = $\angle$s) $\therefore \hat{A}_2 = \hat{B}_2$ $\therefore AD \parallel BE$ (correspooreenkonstige $\angle$s =) $\checkmark$ OR / OF $\hat{A}_1 = \hat{B}_1 \quad \checkmark$ (= chords/koorde = $\angle$s) $\hat{A}_1 = \widehat{ADB} \quad \checkmark$ (Alt $\angle$s; CA $\parallel$ DB ; Verw $\angle$e; CA $\parallel$ DB) $\therefore \hat{B}_1 = \widehat{ADB}$ $\therefore AD \parallel BE$ (Alt $\angle$s = ; Verw $\angle$e=) $\checkmark$	$\checkmark$ S&R $\checkmark$ S&R $\checkmark$ R OR / OF $\checkmark$ S&R $\checkmark$ S&R $\checkmark$ R	(3)
9.2.2	$\frac{CD}{EG} = \frac{\sqrt{k}}{1} \quad \checkmark$ (given/ gegee) But $CD = DE$ $\therefore \frac{DE}{EG} = \frac{AB}{BG} = \frac{\sqrt{k}}{1} \quad \checkmark$ (prop theorem; AD $\parallel$ BE / $\checkmark$ <i>ewered.stelling ; AD $\parallel$ BE)</i> OR/OF (line $\parallel$ to side $\triangle AGD$; lyn $\parallel$ sy $\triangle AGD$) $\frac{\text{Area of } \triangle ABD}{\text{Area of } \triangle AGD} = \frac{\frac{1}{2} \times AB \times h}{\frac{1}{2} \times AG \times h} \quad \checkmark$ $\frac{\text{Area of } \triangle ABD}{\text{Area of } \triangle AGD} = \frac{\sqrt{k}}{\sqrt{k}+1} \quad \checkmark$ $\frac{\sqrt{k}}{\sqrt{k}+1} = \frac{3}{4} \quad \checkmark$ $4\sqrt{k} = 3\sqrt{k} + 3 \quad \checkmark$ $\sqrt{k} = 3$ $\therefore k = 9 \quad \checkmark$	$\checkmark$ S&R $\checkmark$ S&R $\checkmark$ $\frac{\frac{1}{2} \times AB \times h}{\frac{1}{2} \times AG \times h}$ $\checkmark$ $\frac{\sqrt{k}}{\sqrt{k}+1}$ $\checkmark$ Equating/ = aan $\frac{3}{4}$ $\checkmark$ Simplification/ Vereenvoudig $\checkmark$ Answer/ antwoord	(7)
[16]			

QUESTION / VRAAG 10		[14 MARKS / PUNTE]	
10.1	$\widehat{P}_4 = 90^\circ \quad \checkmark$ (midpt circle; midpt chord/ <i>midpt sirkel; midpt koord</i>) $\widehat{C} = 90^\circ \quad \checkmark$ (Opp. $\angle$ s of cyclic quad/ <i>teenoorst $\angle$ van koordevhoek</i>) $\widehat{P}_1 = \widehat{P}_4 = 90^\circ \quad \checkmark$ (vert opp/ <i>regoorstaande. $\angle$s</i>) $\therefore D\widehat{C}K = \widehat{P}_1$ OR / OF $\widehat{P}_1 = 90^\circ \quad \checkmark$ (midpt circle; midpt chord/ <i>midpt sirkel; midpt koord</i>) $\widehat{P}_2 + \widehat{P}_3 = 90^\circ \quad \checkmark$ ($\angle$ s on str line / $\angle$ e op reguitlyn) $\widehat{C} = 90^\circ \quad \checkmark$ (Opp. $\angle$ s of cyclic quad/ <i>teenoorst $\angle$ van koordevhoek</i>) $\therefore D\widehat{C}K = \widehat{P}_1$	$\checkmark$ S&R $\checkmark$ S&R $\checkmark$ S&R OR / OF $\checkmark$ S&R $\checkmark$ S&R $\checkmark$ S&R	(3)
10.2	In ΔKCD and/en ΔEPF 1) $\widehat{K} = \widehat{P}_3 \quad \checkmark$ ($\angle$ s opposite/ <i>teenoor</i> = sides/ <i>sye</i>) $\widehat{P}_3 = \widehat{E} \quad \checkmark$ (corresp/ <i>ooreenkomst $\angle$s</i> , $KD \parallel EF$) $\therefore \widehat{K} = \widehat{E}$ 2) $D\widehat{C}K = \widehat{P}_1$ (already proven/ <i>reeds bewys</i>) 3) $\widehat{D} = \widehat{F} \quad \checkmark$ (3^{rd} $\angle$ s of Δ / 3^{de} $\angle$ van Δ) $\therefore \Delta KCD \parallel \Delta EPF \quad (\angle\angle\angle) \quad \checkmark$	$\checkmark$ S&R $\checkmark$ S&R $\checkmark$ S&R $\checkmark$ R	(4)
10.3	$\frac{KC}{EP} = \frac{CD}{PF} = \frac{KD}{EF} \quad \checkmark \quad (\parallel \Delta e) \quad \checkmark$ $\therefore KC \cdot EF = KD \cdot EP$	$\checkmark$ S $\checkmark$ R	(2)

10.4	$KD = \frac{KC.EF}{EP} \checkmark \text{ (Proven in 10.2)}$ $EP = KB \checkmark$ $= \frac{(KB+BC) \checkmark .EF}{KB}$ $= \frac{KB.EF + BC.EF \checkmark}{KB}$ $= \frac{KB.EF}{KB} + \frac{BC.EF}{KB} \checkmark$ $\therefore KD = \frac{BC.EF}{KB} + EF$	✓ S (KD =) ✓ Sub EP ✓ Sub (KB + BC) ✓ Distribute ✓ Split fraction	(5)
[14]			
GRAND TOTAL / GROOTTOTAAL: [150]			



**Western Cape
Government**

Education

FOR YOU

EDUCATION DISTRICTS

MATHEMATICS PAPER 2

GRADE 12 MARKING GUIDELINE

TRIAL EXAMINATION

SEPTEMBER 2026

MARKS: 150

TIME: 3 hours

NOTE:

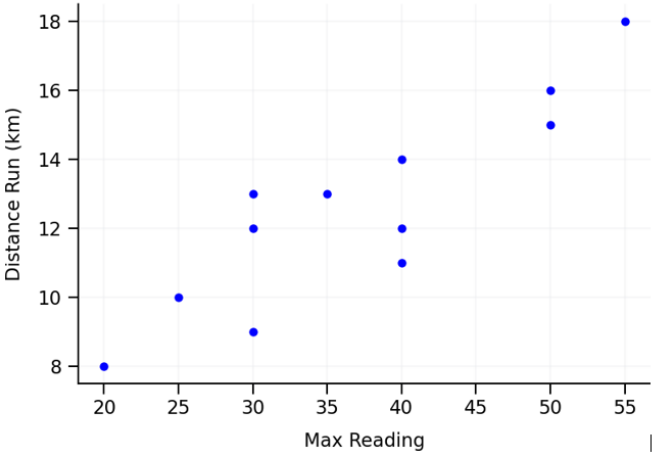
- If a candidate answers a question **TWICE**, only mark the **FIRST** attempt.
- If a candidate has crossed out an attempt of a question and not redone the question, mark the crossed-out version.
- Consistent accuracy applies in **ALL** aspects of the Marking Guidelines. Stop marking at the second calculation error.
- Assuming answers/values in order to solve a problem is **NOT** acceptable.

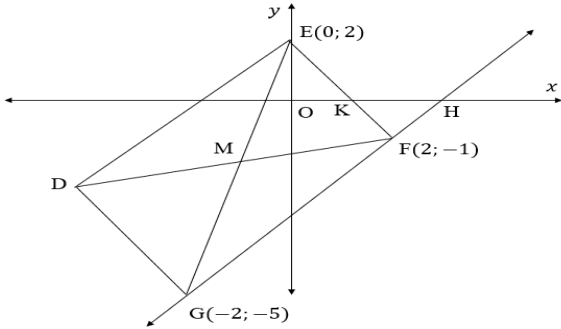
LET WEL:

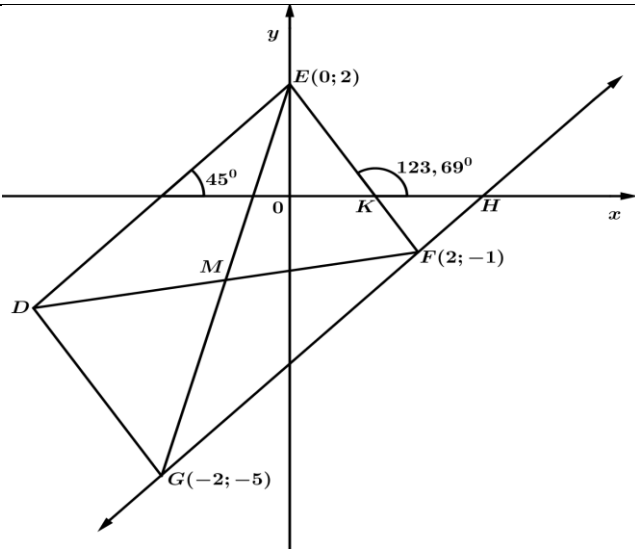
- *As 'n kandidaat 'n vraag TWEE KEER beantwoord, sien slegs die EERSTE poging na.*
- *As 'n kandidaat 'n antwoord van 'n vraag doodtrek en nie oordoen nie, sien die doodgetrekte poging na.*
- *Volgehoue akkuraatheid word in ALLE aspekte van die Nasienriglyne toegepas. Hou op nasien by die tweede berekeningsfout.*
- *Aanvaar van antwoorde/waardes om 'n probleem op te los, word NIE toegelaat nie.*

GEOMETRY • MEETKUNDE	
S	A mark for a correct statement (A statement mark is independent of a reason)
	'n Punt vir 'n korrekte bewering ('n Punt vir 'n bewering is onafhanklik van die rede)
R	A mark for the correct reason (A reason mark may only be awarded if the statement is correct)
	'n Punt vir 'n korrekte rede ('n Punt word slegs vir die rede toegeken as die bewering korrek is)
S/R	Award a mark if statement AND reason are both correct
	Ken 'n punt toe as die bewering EN rede beide korrek is

QUESTION 1																
1.1	<table><tr><th>Cumulative Frequency</th></tr><tr><td>20</td></tr><tr><td>55</td></tr><tr><td>130</td></tr><tr><td>150</td></tr><tr><td>155</td></tr></table>	Cumulative Frequency	20	55	130	150	155	✓ first 3 values ✓ last 2 values (2)								
Cumulative Frequency																
20																
55																
130																
150																
155																
1.2	Ogive <table><caption>Ogive Data Points</caption><tr><th>Number of Days Absent</th><th>Cumulative Frequency</th></tr><tr><td>0</td><td>0</td></tr><tr><td>5</td><td>20</td></tr><tr><td>10</td><td>55</td></tr><tr><td>15</td><td>130</td></tr><tr><td>20</td><td>150</td></tr><tr><td>25</td><td>155</td></tr></table>	Number of Days Absent	Cumulative Frequency	0	0	5	20	10	55	15	130	20	150	25	155	✓ grounding ✓ correct plotting of points ✓ smooth curve (3)
Number of Days Absent	Cumulative Frequency															
0	0															
5	20															
10	55															
15	130															
20	150															
25	155															
1.3	Median = 12	✓ answer (1)														
1.4	More than 15 days absent: $= \frac{20 + 5}{155} \times 100$ $= 16,13\%$	✓ 20 + 5 ✓ answer (2)														
		[8]														

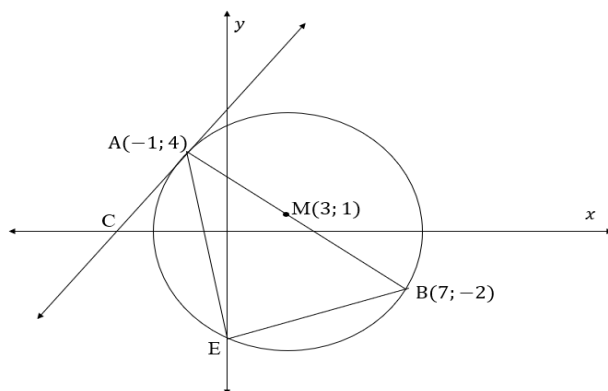
QUESTION 2		
2.1	Max Reading vs Distance Run 	✓ correct plotting of first 4 points ✓ correct plotting of second 4 points ✓ correct plotting of third 4 points (3)
2.2	$r = 0,89$ $\therefore$ strong positive correlation	✓ $r = 0,89$ ✓ strong positive (2)
2.3	$A = 3,69$ $B = 0,24$ $y = 0,24x + 3,69$	✓ correct A value ✓ correct B value ✓ equation (3)
2.4.	$y = 0,24(26) + 3,69$ $y = 9,93 \text{ km}$	✓ sub ✓ answer (2)
2.5	$\therefore$ Standard deviation remains the same/Unchanged	✓ Unchanged/Remain the same (1)
		[11]

QUESTION 3		
		
3.1	$M\left(\frac{-2+0}{2}; \frac{-5+2}{2}\right)$ $M\left(-1; -\frac{3}{2}\right)$	✓ sub ✓ answer (2)
3.2	$GE = \sqrt{(-2-0)^2 + (-5-2)^2}$ $GE = \sqrt{53}$	✓ sub ✓ answer (2)
3.3	$m_{GF} = \frac{-5+1}{-2-2}$ $= 1$ $m_{DE} = m_{GF} = 1$ OR $D(-4; -2)$ $m_{DE} = \frac{2-(-2)}{0-(-4)}$ $= 1$	✓ sub ✓ gradient of GF ✓ gradient of DE (3) ✓ D ✓ substitution ✓ answer (3)
3.4	$m_{GH} = 1$ $y = x + c$ $(-2; -5): -5 = (-2) + c$ $c = -3$ $y = x - 3$	✓ sub of coordinate ✓ answer (2)

3.5	$D(-4; -2)$	✓ x value and ✓ y value (2)
3.6	 $m_{EF} = \frac{-1-2}{2-0}$ or $m_{DG} = m_{EF}$ $= -\frac{3}{2}$ $\tan \theta = -\frac{3}{2}$ $\theta = 123,69^\circ$ $m_{GF} = m_{DE} = 1$ $\tan \alpha = 1$ $\alpha = 45^\circ$ $\widehat{DEF} = 123,69^\circ - 45^\circ$ [ext $\angle$ of Δ] $= 78,69^\circ$ $\therefore \widehat{DGF} = 78,69^\circ$ [opp $\angle$s of $\parallel$ m] OR $DG = \sqrt{(-4+2)^2 + (-2+5)^2} = \sqrt{13}$ $GF = \sqrt{(-2-2)^2 + (-5+1)^2} = 4\sqrt{2}$ $DF = \sqrt{(-4-2)^2 + (-2+1)^2} = \sqrt{37}$ $DF^2 = GF^2 + DG^2 - 2GF \cdot DG \cdot \cos \widehat{DGF}$	✓ sub into correct formula ✓ gradient of EF ✓ $\theta = 123,69^\circ$ ✓ $\alpha = 45^\circ$ ✓ $\widehat{DGF} = 78,69^\circ$ (5) ✓ DG ✓ GF ✓ DF

	$(\sqrt{37})^2 = (4\sqrt{2})^2 + (\sqrt{13})^2 - 2(\sqrt{13})(4\sqrt{2}) \cos \widehat{DGF}$ $\cos \widehat{DGF} = \frac{(4\sqrt{2})^2 + (\sqrt{13})^2 - (\sqrt{37})^2}{2(\sqrt{13})(4\sqrt{2})}$ $\cos \widehat{DGF} = 78,69^\circ$	✓ sub into correct formula ✓ answers (5)
3.7	$GF = \sqrt{(-2 - 2)^2 + (-5 + 1)^2}$ $GF = 4\sqrt{2}$ $EF = \sqrt{(2 - 0)^2 + (-1 - 2)^2}$ $EF = \sqrt{13}$ $\widehat{GFE} = 101,31^\circ \quad [\text{co-interior } \angle\text{s, } EF \parallel DG]$ $\text{Area } \triangle GEF = \frac{1}{2} \times 4\sqrt{2} \times \sqrt{13} \sin 101,31^\circ$ $= 10,00 \text{ units}^2$ OR $m_{GE} = \frac{-5 - 2}{-2 - 0}$ $= \frac{7}{2}$ $\tan \alpha = \frac{7}{2}$ $\alpha = 74,05^\circ$ $\widehat{EGF} = 74,05^\circ - 45^\circ$ $= 29,05^\circ$ $GF = \sqrt{(-2 - 2)^2 + (-5 + 1)^2}$ $GF = 4\sqrt{2}$ $\text{Area } \triangle GEF = \frac{1}{2} \times 4\sqrt{2} \times \sqrt{13} \sin 29,05^\circ$ $= 10,00 \text{ units}^2$	✓ sub into formula ✓ $GF = 4\sqrt{2}$ ✓ S ✓ Sub into correct formula ✓ answer (5) ✓ sub into formula ✓ $\alpha = 74,05^\circ$ ✓ $\widehat{EGF} = 29,05^\circ$ ✓ $GF = 4\sqrt{2}$ ✓ answer (5)
		[21]

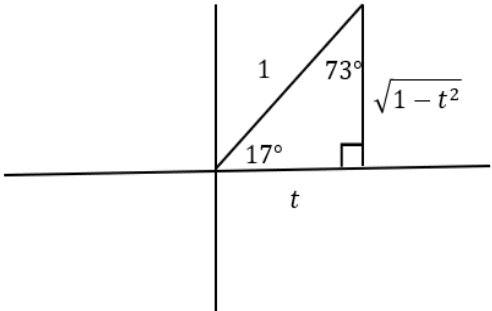
QUESTION 4

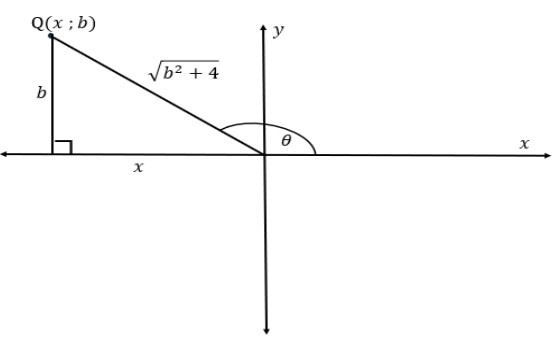


4.1	$(x - 3)^2 + (y - 1)^2 = r^2$ Sub: (-1;4) $(-1 - 3)^2 + (4 - 1)^2 = r^2$ $r^2 = 25$ $(x - 3)^2 + (y - 1)^2 = 25$	✓ sub midpoint ✓ sub (-1; 4) ✓ answer (3)
4.2	$(0 - 3)^2 + (y - 1)^2 = 25$ $y^2 - 2y - 15 = 0$ $(y - 5)(y + 3) = 0$ $y \neq 5 \quad \text{or} \quad y = -3$	✓ sub $x = 0$ ✓ std form ✓ answer with selection (3)
4.3	$m_{AM} = \frac{1-4}{3-(-1)}$ $= -\frac{3}{4}$ $m_{Tan} = \frac{4}{3} \quad [\text{radius} \perp \text{tan}]$ $y - 4 = \frac{4}{3}(x + 1)$ $y = \frac{4}{3}x + \frac{16}{3} \quad \therefore 0 = \frac{4}{3}x + \frac{16}{3} \therefore x = -4$ $C(-4; 0)$	✓ gradient of radius ✓ gradient of tangent ✓ sub (-1; 4) ✓ equation ✓ coordinate of C

	$AC = \sqrt{(-4 + 1)^2 + (0 - 4)^2}$ $AC = 5 \text{ units}$	✓ answer (6)
--	--	---------------------

4.4	$k^2 + x^2 + y^2 - 35 = 2(xk + y)$ $k^2 + x^2 + y^2 - 35 = 2xk + 2y$ $x^2 - 2xk + k^2 + y^2 - 2y = 35$ $x^2 - 2xk + k^2 + y^2 - 2y + (-1)^2 = 35 + (-1)^2$ $(x - k)^2 + (y - 1)^2 = 36$ Circle centre $(k ; 1)$ with $r = 6$ Externally: $\therefore k = 14 \quad \text{or} \quad k = -8$ Or Internally: $k = 4 \quad \text{or} \quad k = 2$	✓ simplify ✓ completing square ✓ standard form ✓ ✓ centre and radius ✓ ✓ values for k (7)
		[19]

QUESTION 5		
5.1.1	$\cos 163^\circ$ $= -\cos 17^\circ$ $= -t$	$\checkmark -\cos 17^\circ$ $\checkmark$ answer (2)
5.1.2	 $\sin 13^\circ = \sin(73^\circ - 60^\circ)$ $= \sin 73^\circ \cdot \cos 60^\circ - \cos 73^\circ \cdot \sin 60^\circ$ $= t \cdot \frac{1}{2} - \sqrt{1-t^2} \cdot \frac{\sqrt{3}}{2}$ $= \frac{t - \sqrt{3-3t^2}}{2}$ OR $\sin 13^\circ = \sin(30^\circ - 17^\circ)$ $= \sin 30^\circ \cdot \cos 17^\circ - \cos 30^\circ \cdot \sin 17^\circ$ $= \frac{1}{2}t - \frac{\sqrt{3}}{2}(\sqrt{1-t^2})$ $= \frac{t - \sqrt{3}\sqrt{1-t^2}}{2}$ $= \frac{t - \sqrt{3-3t^2}}{2}$	$\checkmark$ compound angle $\checkmark$ expansion $\checkmark$ substitution $\checkmark$ compound angle $\checkmark$ expansion $\checkmark$ substitution (3)

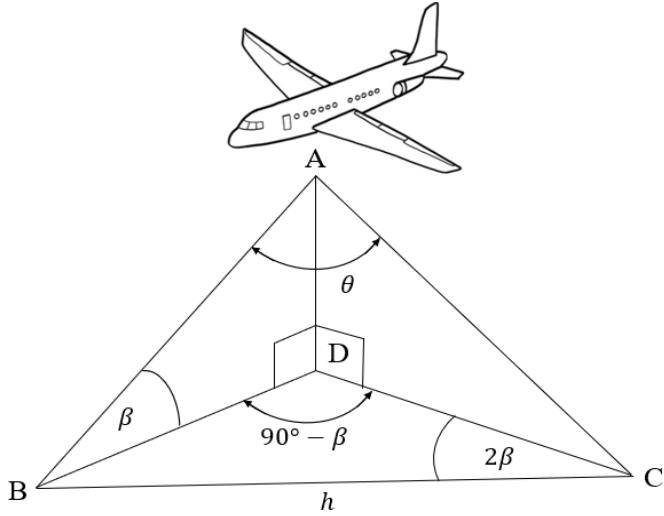
5.2	$= \frac{\sin x}{\cos x \cdot \frac{\sin x}{\cos x}} + 2 \sin x \cdot (-\sin x)$ $= 1 - 2\sin^2 x$ $= \cos 2x$	$\checkmark \frac{\sin x}{\cos x}$ $\checkmark \sin x$ $\checkmark -\sin x$ $\checkmark \text{ simplify}$ $\checkmark \text{ answer}$
5.3.1	 Pythagoras Theorem $x^2 + b^2 = b^2 + 4$ $x^2 = 4$ $\therefore x = -2$	$\checkmark \text{ pythagoras}$ $\checkmark \text{ simplify}$ $\checkmark \text{ selection}$
5.3.2	$= -\tan \theta$ $= -\left(\frac{b}{-2}\right) = \frac{b}{2}$	$\checkmark -\tan \theta$ $\checkmark \text{ answer}$
5.3.3	$\cos 2\theta = 1 - 2\sin^2 \theta$ $= 1 - 2\left(\frac{b}{\sqrt{b^2 + 4}}\right)^2$ $= 1 - \frac{2b^2}{b^2 + 4}$ $= \frac{b^2 + 4 - 2b^2}{b^2 + 4}$ $= \frac{4 - b^2}{b^2 + 4}$	$\checkmark \text{ identity}$ $\checkmark \text{ squaring}$ $\checkmark \text{ simplify single term}$

	OR $\cos 2\theta = \cos^2\theta - \sin^2\theta$ $= \left(\frac{-2}{\sqrt{b^2+4}}\right)^2 - \left(\frac{b}{\sqrt{b^2+4}}\right)^2$ $= \frac{4}{b^2+4} - \frac{b^2}{b^2+4}$ $= \frac{4-b^2}{b^2+4}$ OR $\cos 2\theta = 2\cos^2\theta - 1$ $= 2\left(\frac{-2}{\sqrt{b^2+4}}\right)^2 - 1$ $= \frac{8}{b^2+4} - \frac{b^2+4}{b^2+4}$ $= \frac{8-b^2-4}{b^2+4}$ $= \frac{4-b^2}{b^2+4}$	✓ identity ✓✓ squaring each term (3) ✓ identity ✓ squaring ✓ simplify single term (3)
--	--	--

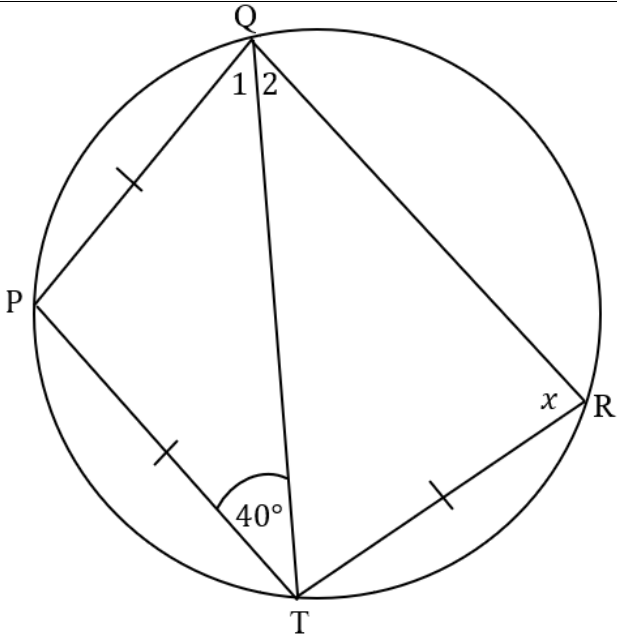
5.4	$3(1 - 2\sin^2 x) = 1 + 5 \sin x$ $3 - 6\sin^2 x - 5 \sin x - 1 = 0$ $-6\sin^2 x - 5 \sin x + 2 = 0$ $6 \sin^2 x + 5 \sin x - 2 = 0$ $\sin x = 0,30 \quad \text{or} \quad \sin x \neq -1,13 \text{ (N/A)}$ $x = 17,46^\circ + k.360$ Or $x = 162,54^\circ + k.360; k \in \mathbb{Z}$	$\checkmark 1 - 2\sin^2 x$ $\checkmark$ standard form $\checkmark$ factors $\checkmark \sin x \neq -1,13$ $\checkmark x = 17,46^\circ$ $\checkmark x = 162,54^\circ$ $\checkmark +k.360; k \in \mathbb{Z}$ (7)
5.5	$= -\sin(\theta + 15^\circ) \cos(\theta + 75^\circ) + \cos(\theta + 15^\circ) \sin(\theta + 75^\circ)$ $= \sin(\theta + 75^\circ) \cos(\theta + 15^\circ) - \cos(\theta + 75^\circ) \sin(\theta + 15^\circ)$ $= \sin[(\theta + 75^\circ) - (\theta + 15^\circ)]$ $= \sin 60^\circ$ $= \frac{\sqrt{3}}{2}$	$\checkmark -\sin(\theta + 15^\circ)$ $\checkmark \cos(\theta + 75^\circ)$ $\checkmark$ compound formula identity $\checkmark$ answer (4)
5.6	$(a + 1)^2 = \left(\frac{3}{2} \cos \theta\right)^2$ $a^2 + 2a + 1 = \frac{9}{4} \cos^2 \theta \dots\dots\dots(1)$ $a^2 + 2a = 1 \dots\dots\dots(2)$ $\therefore 1 + 1 = \frac{9}{4} \cos^2 \theta$ $\therefore \frac{8}{9} = \cos^2 \theta$ $\cos 2\theta = 2\cos^2 \theta - 1$ $= 2\left(\frac{8}{9}\right) - 1 = \frac{7}{9}$	$\checkmark$ squaring both sides $\checkmark a^2 + 2a + 1 = \frac{9}{4} \cos^2 \theta$ $\checkmark a^2 + 2a = 1$ $\checkmark \cos^2 \theta = \frac{8}{9}$ $\checkmark$ answer (5)

	OR $a + 1 = \frac{3}{2} \cos \theta$ $2a + 2 = 3 \cos \theta$ $\cos \theta = \frac{2a+2}{3} \dots\dots\dots 1$ $a + 2 = \frac{1}{a}$ $a^2 + 2a = 1$ $a^2 = 1 - 2a \dots\dots\dots 2$ $\cos 2\theta = 2\cos^2\theta - 1$ $= 2 \left[\frac{2a+2}{3} \right]^2 - 1$ $= 2 \left[\frac{4a^2+8a+4}{9} \right] - 1$ $= \frac{8a^2+16a+8}{9} - \frac{9}{9}$ $= \frac{8(1-2a)+16a-1}{9}$ $= \frac{8-16a+16a-1}{9}$ $= \frac{7}{9}$	$\checkmark \cos \theta = \frac{2a+2}{3}$ $\checkmark a^2 = 1 - 2a$ $\checkmark \text{sub into identity}$ $\checkmark \text{sub } 1 - 2a$ $\checkmark \text{answer}$ (5)
		[34]

QUESTION 6		
6.1	720°	✓✓ answer (2)
6.2		✓ shape ✓ x –intercepts ✓ amplitude (3)
6.3	$-90^\circ < x < 30^\circ$ or $x \in (-90^\circ; 30^\circ)$	✓✓ $-90^\circ, 30^\circ$ ✓ notation (3)
		[8]

QUESTION 7		
		
7.1	$\frac{BD}{\sin 2\beta} = \frac{h}{\sin(90^\circ - \beta)}$$\frac{BD}{2 \sin \beta \cdot \cos \beta} = \frac{h}{\cos \beta}$$BD = 2h \sin \beta$	✓ sub into sine formula ✓ expansion ✓ reduction (3)
7.2	$\cos \beta = \frac{BD}{AB}$$AB = \frac{2h \sin \beta}{\cos \beta}$$AB = 2h \tan \beta$	✓ sub ✓ AB (2)
7.3	$AB = 2 \times 55 \times \tan 28^\circ$$= 58,49 \text{ m}$$BC^2 = AB^2 + AC^2 - 2AB \cdot AC \cdot \cos \theta$$\cos \theta = \frac{(58,49)^2 + (28)^2 - (55)^2}{2(58,49)(28)}$$\cos \theta = 0,36 \dots$$\theta = 68,88^\circ$	✓ AB = 58,49 m ✓ sub into correct formula ✓ simplify ✓ answer (4)
		[9]

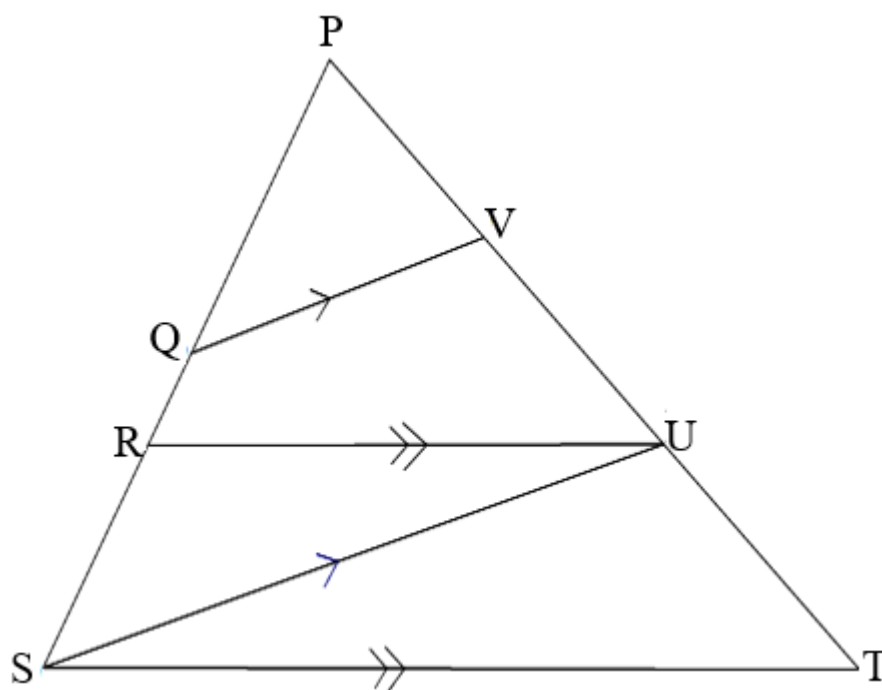
QUESTION 8		
8.1	Construct line DO and OB Let $D\hat{O}B = 2x$ $Reflex\ D\hat{O}B = 360^\circ - 2x$ ($\angle s$ around a point/ $\angle s$ in rev) $\hat{A} = x$ ($\angle$ at centre $= 2 \times \angle$ at circumference) $\hat{C} = 180^\circ - x$ ($\angle$ at centre $= 2 \times \angle$ at circumference) $\hat{A} + \hat{C} = 180^\circ$ (opp. $\angle$ of a cyclic quad.)	✓ Construction ✓ S ✓ S/R ✓ S (4)

		
8.2.1	$\widehat{Q}_1 = 40^\circ$ (equal chords ;equal angles) $\widehat{P} = 100^\circ$ (sum of $\angle$ s in Δ) or (int $\angle$ s Δ) $x = 80^\circ$ (opp. $\angle$ of a cyclic quad.)	✓ S ✓ S ✓ S/R (3)
8.2.2	$\widehat{Q}_2 = 40^\circ$ (equal chord; equal angles)	✓ S ✓ R (2)
		[9]

QUESTION 9		
9.1.1	$\hat{Y}_1 = \hat{T}_1 = x$ (tan chord theorem)	✓ reason (1)
9.1.2	$\hat{W} = \hat{Y}_1 = x$ (equal $\angle$ s opp = sides)	✓ reason (1)
9.1.3	$\hat{Q} = \hat{W} = x$ (alt. $\angle$, $WY \parallel TQ$)	✓ reason (1)
9.1.4	$\hat{Y}_2 = \hat{Q} = x$ (angles in same segment)	✓ reason (1)
9.2	$\hat{T}_2 = \hat{Y}_1 + \hat{Y}_2$ $\hat{T}_2 = 2x$ (alt. $\angle$, $WY \parallel TQ$) $\therefore \hat{T}_2 = 2\hat{T}_1$ OR $\hat{P}_2 = 2x$ (ext $\angle$ of Δ) $\therefore \hat{T}_2 = 2x$ ($\angle$ s in same segment)	✓ S ✓ R ✓ S ✓ R (2)

9.3	$\hat{O}_3 = 2\hat{T}_1 = 2x$ ($\angle$ at centre = $2 \times \angle$ at circumference) $T_2 = 2x$ (Proven) $\therefore SORT$ is a cyclic quad (converse ext $\angle$ of a cyclic quad)	✓ S/R ✓ R (2)
9.4	$\hat{T} = 90^\circ$ ($\angle$ in semi – circle) $\hat{T} = 3x$ $\therefore x = 30^\circ$	✓ S/R ✓ value of x (2)
9.5	$O\hat{Y}W = 90^\circ$ (rad $\perp$ tan) $\hat{R}_1 = 90^\circ$ (co – int $\angle$ s , $WY \parallel TQ$) $\therefore TR = RQ$ (line from centre $\perp$ chord)	✓ S/R ✓ S ✓ R (3)
		[13]

QUESTION 10



10.1.1 $\frac{PU}{UT} = \frac{3a}{2a}$ (prop thm, $RU \parallel ST$)

$3a = 30 \text{ cm}$

$UT = 2a = 20 \text{ cm}$

✓ $3a = 30 \text{ cm}$

✓ value of UT

(2)

10.1.2	$\frac{PV}{VU} = \frac{PQ}{QS} = \frac{7b}{8b}$ prop thm; QV SU $\frac{PU}{UT} = \frac{PR}{RS} = \frac{3c}{2c}$ prop thm; RU ST $5c = 15b$ $c = 3b$ $QR = 2b$ $\frac{QR}{RS} = \frac{2b}{6b} = \frac{1}{3}$ OR $\frac{PV}{VU} = \frac{PQ}{QR} = \frac{7b}{8b}$ (prop thm, QV SU) $\frac{PS}{PQ} = \frac{PU}{PV} = \frac{15c}{7c}$ (prop thm, QV ST) $\frac{PS}{PR} = \frac{PT}{PU} = \frac{5d}{3d}$ (prop theorem, RU ST) $PS = \frac{15}{7}PQ$ and $PS = \frac{5}{3}PR$ $\frac{15}{7}PQ = \frac{5}{3}PR$ $\frac{PQ}{PR} = \frac{5}{3} \times \frac{7}{15}$ $\frac{PQ}{PR} = \frac{7p}{9p}$ $\therefore QR = 2p$ and $RS = 6p$ $\frac{QR}{RS} = \frac{1}{3}$	✓ S ✓ S ✓ R ✓ answer ✓ S ✓ S ✓ R ✓ answer (4)
--------	---	--

10.2.1	Let $DG = x$, then $GC = x$ $DB = DG = x$ (DB = DG, radii) $\frac{AC}{FC} = \frac{BC}{CD} = \frac{3x}{2x}$ (prop thm, $FD \parallel AB$) $\frac{AC}{FC} = \frac{3}{2}$	✓ R ✓ answer (2)
10.2.2	$E_1 = 90^\circ$ (radius $\perp$ tangent) $\hat{B} = 90^\circ$ (radius $\perp$ tangent) In $\triangle ABC$ and $\triangle DEC$ 1. C is common 2. $E_1 = B = 90^\circ$ (proven) 3. $A = D_3$ (sum of inter $\angle$s of Δ) $\therefore \triangle ABC \parallel \triangle DEC$ A, A, A	✓ C common ✓ S ✓ R (3)
10.2.3	$\frac{AB}{DE} = \frac{BC}{EC}$ (proven, $\parallel \Delta$) $AB = AE$ (tangents drawn to external points) $DE = DG = x$, radii $BC = 3x = 3DE$ $\therefore \frac{AE}{DE} = \frac{3DE}{EC}$ $DE^2 = \frac{AE \cdot EC}{3}$	✓ S/R ✓ S ✓ R ✓ $BC = 3x = 3DE$ (4)
10.2.4	$\frac{AC}{FC} = \frac{3}{2}$ (proven) $AC = 3k$ and $FC = 2k$ $\frac{\text{Area } \triangle FDC}{\text{Area } \triangle ABC} = \frac{\frac{1}{2} \times FC \times CD \sin C}{\frac{1}{2} \times AC \times BC \sin C}$ $\frac{\text{Area } \triangle FDC}{\text{Area } \triangle ABC} = \frac{2k \times 2x}{3k \times 3x} = \frac{4}{9}$	✓ correct use of area rule ✓ subst ✓ answer (3)
		[18] 150