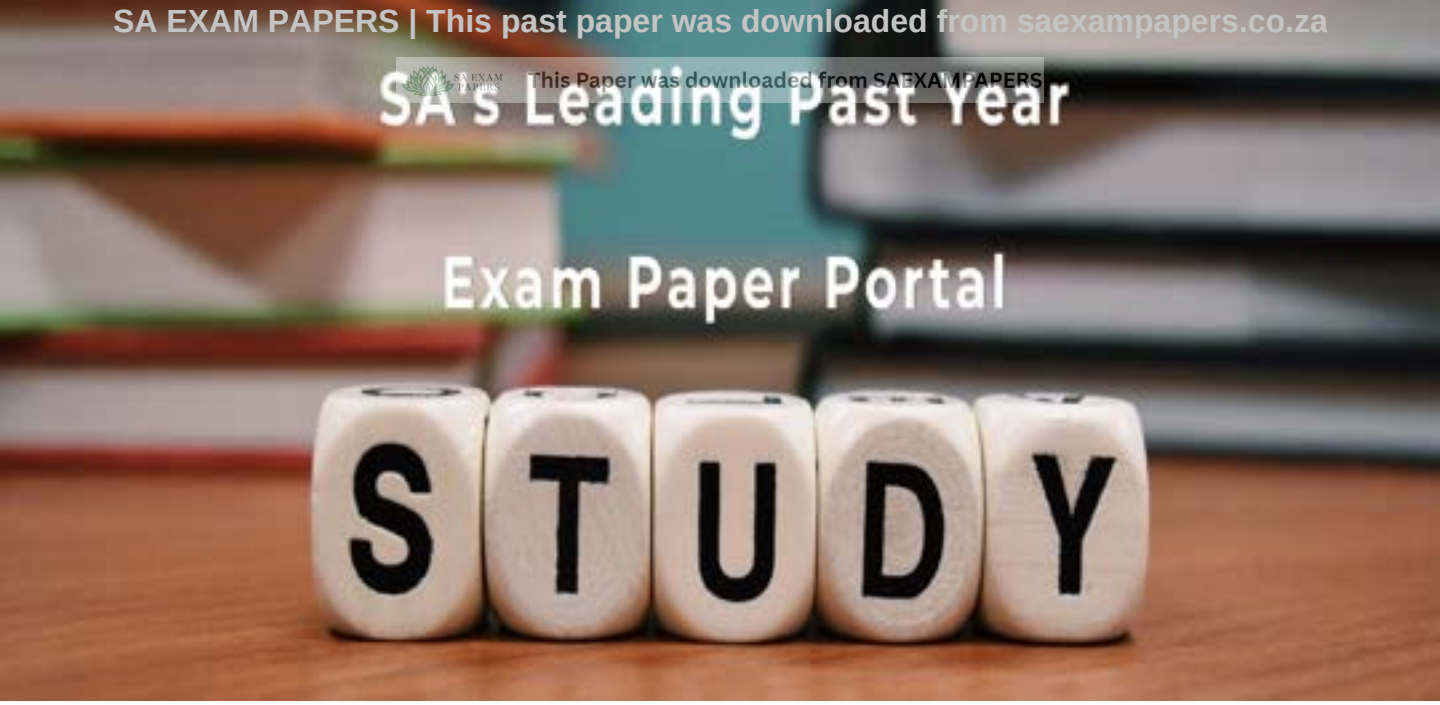


DEPARTMENT OF EDUCATION

DEPARTEMENT VAN ONDERWYS

LEFAPHA LA THUTO

ISEBE LEZEMFUNDO

PROVINCIAL PREPARATORY EXAMINATION/
PROVINSIALE VOORBEREIDENDE EKSAMEN

GRADE/*GRAAD* 12

MATHEMATICS/*WISKUNDE*

PAPER/*VRAESTEL* 2

SEPTEMBER 2025

MARKING GUIDELINES/*NASIENRIGLYNE*

MARKS/*PUNTE*: 150

These marking guidelines consist of 18 pages./
Hierdie nasienriglyne bestaan uit 18 bladsye.

NOTE:

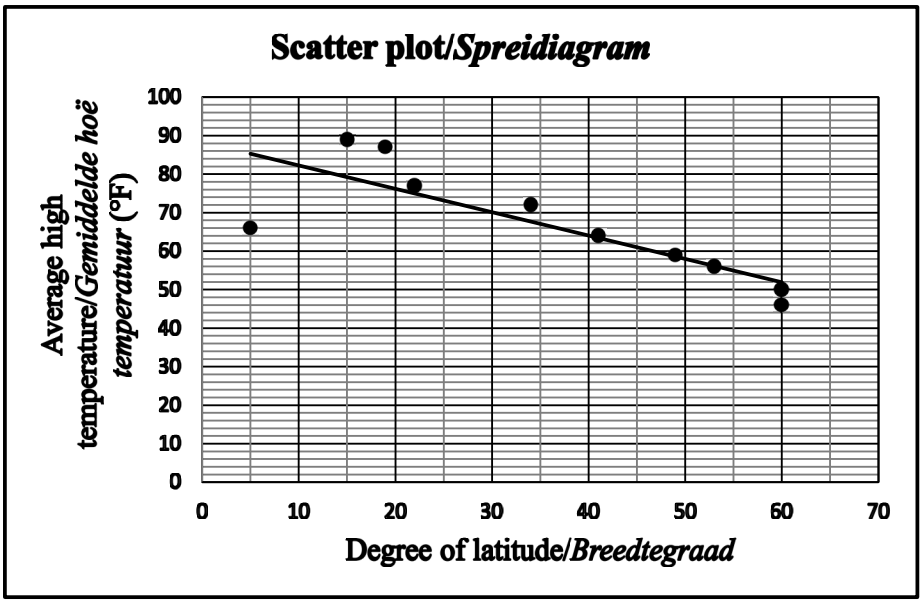
- If a candidate answers a question TWICE, only mark the FIRST attempt.
- If a candidate has crossed out an attempt of a question and not redone the question, mark the crossed-out version.
- Consistent accuracy applies in ALL aspects of the marking memorandum. Stop marking at the second calculation error.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

NOTA:

- *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 ná die tweede berekeningsfout.*
- *Om antwoorde/waardes aan te neem om 'n probleem op te los, word NIE toegelaat NIE.*

GEOMETRY/*MEETKUNDE*	
S	A mark for a correct statement (A statement 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/*VRAAG* 1

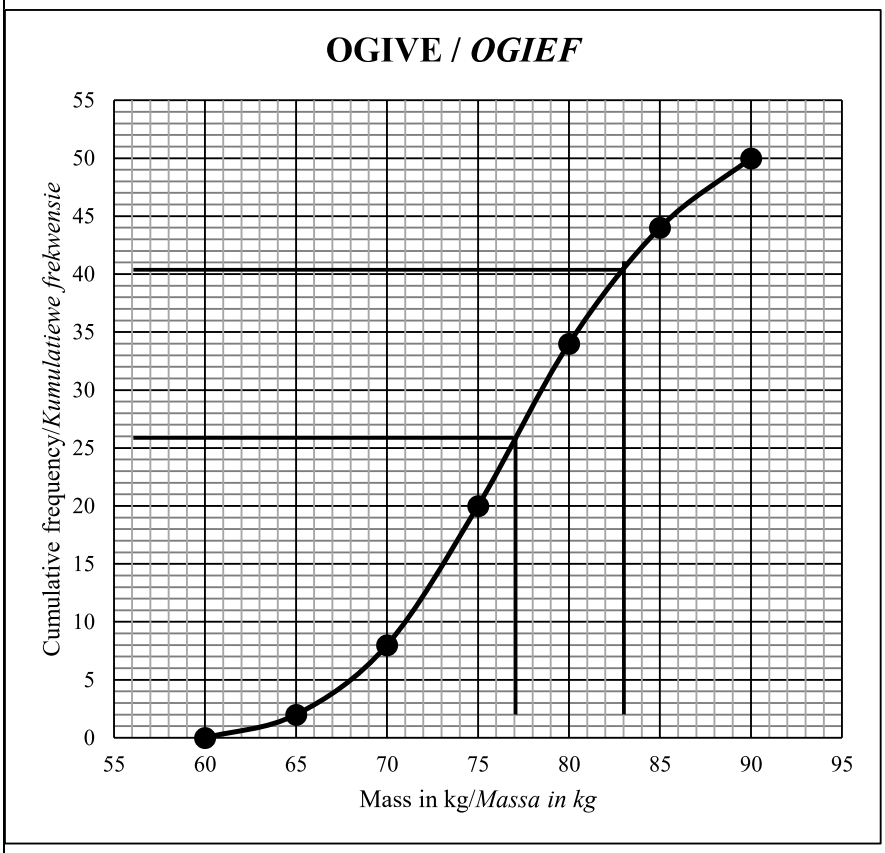


1.1	Strong negative correlation/*Sterk negatiewe korrelasie* Data points are close to the regression line/*Data punte lê naby regressielyn.*	✓ strong/*sterk* ✓ reason/rede (2)

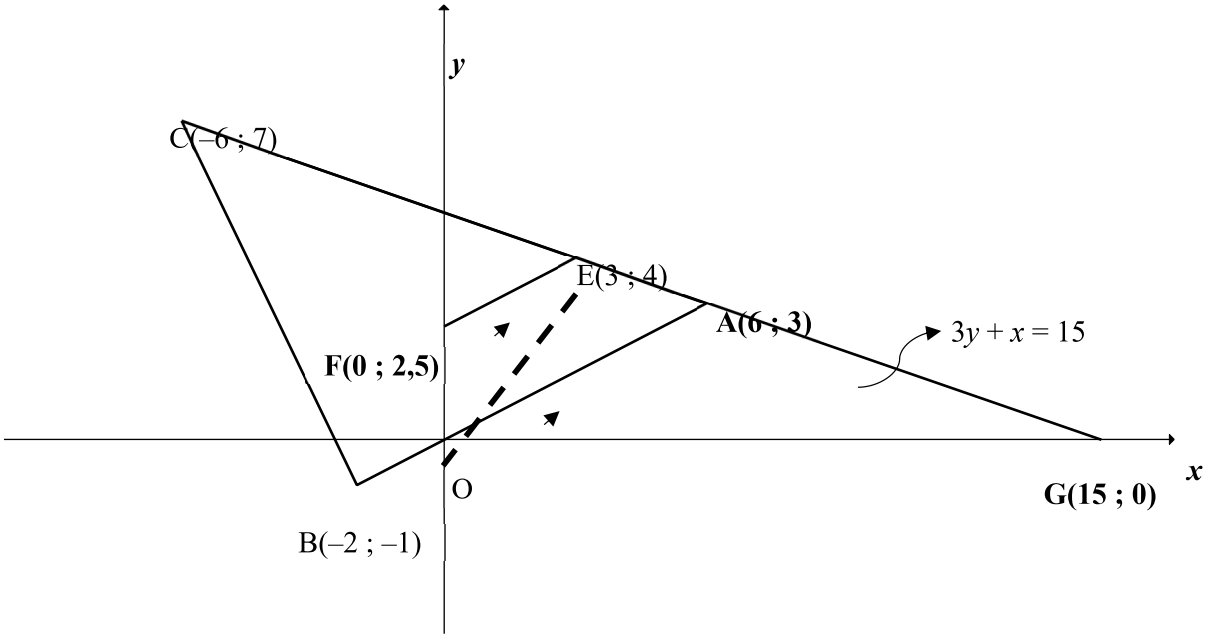
Latitude in degrees/ *Beedtegraad*	5	19	34	53	22	41	60	15	60	49
Average high temperature/*Gemiddelde hoë temperatuur* (in °F)	66	87	72	56	77	64	46	89	50	59

1.2	$a = 88,33$ $b = -0,61$ $\hat{y} = 88,33 - 0,61x$ Answer only: Full Marks/ *Slegs antwoord: Volpunte*	✓ *a* ✓ *b* ✓ eq/*vgl* (3)
1.3	$y = 88,33 - 0,61(28)$ $= 71,25°F$ **OR/*OF*** $y = 71,33$ °F (calc/sakr) **OR/*OF*** From Diagram: 71-72	✓ subst ✓ answ/*antw* (2) ✓✓ answ/*antw* (2)
1.4	$\sigma y = 13,9$ °F	✓ answ/*antw* (1)
1.5	$\bar{y} = 66,6$ $66,6 + 13,9 = 80,5$ $\therefore$ 2 Cities / *Stede* CA: From 1.4 if learner used $\sigma x = 18,77$ 35,8 + 18.77 = 54,58 2 cities (3/3)	✓ mean ✓ mean + σy ✓ answ/*antw* (3)
		[11]

QUESTION/*VRAAG* 2

2.1	$k = 44$ $f = 6$	✓ k ✓ f (2)
2.2		✓ (60 ; 0) ✓ (90 ; 50) ✓ S-curve/-*kurwe* (3)
2.3	M = 77 kg (accept: 76 – 78 kg) CA from OGIVE/*van OGIEF*	✓ CF = 25 ✓ answ/*antw* (2)
2.4	(83 ; ± 40) (accept: 39 – 41) $\therefore \frac{10}{50} \times 100 = 20\%$	✓ CF ✓ % (2)
		[9]

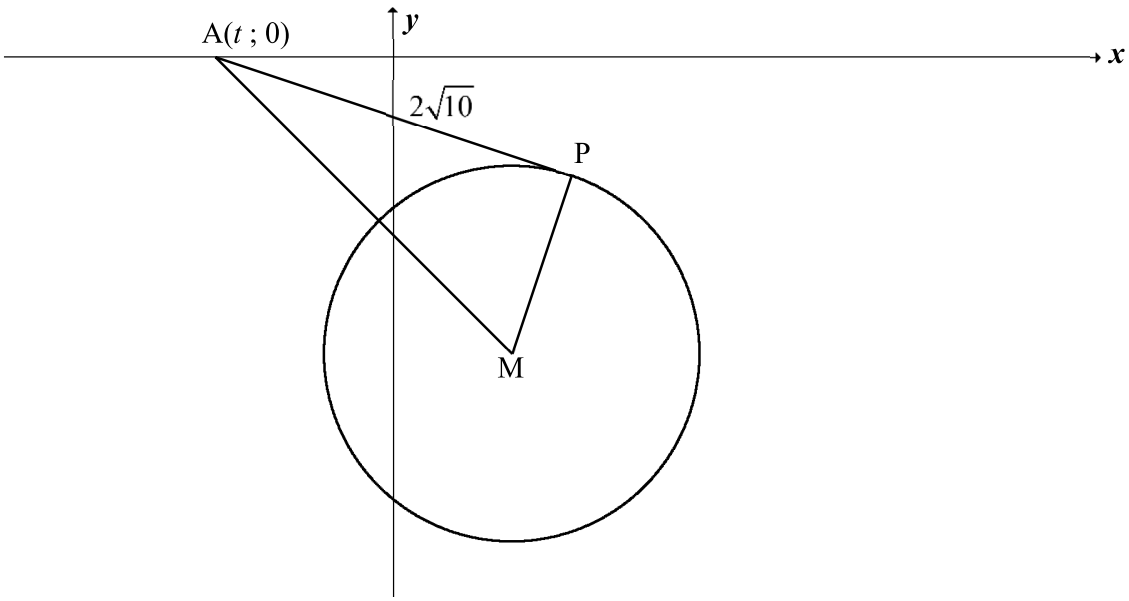
QUESTION/*VRAAG* 3



3.1	$m_{AB} = \frac{-1-0}{-2-0} = \frac{1}{2}$	✓ subst B and O ✓ answ/*antw* (2)
3.2	$m_{CB} = \frac{7+1}{-6+2} = -2$ $m_{AB} \times m_{CB} = \frac{1}{2} \times -2 = -1$ $\therefore$ CB $\perp$ BA	✓ subst B and C ✓ m_{CB} ✓ $m_1 \times m_2 = -1$ (3)
3.3	$y = mx + c$ *OR / OF* $y - y_1 = m(x - x_1)$ $4 = \frac{1}{2}(3) + c$ $y - 4 = \frac{1}{2}(x - 3)$ $c = \frac{5}{2}$ $y = \frac{1}{2}x + \frac{5}{2}$ $y = \frac{1}{2}x + \frac{5}{2}$	✓ $m_{EF} = m_{AB}$ ✓ subst E into equation ✓ eq/vgl (3)
3.4.1	$\tan A\hat{O}G = \frac{1}{2}$ $A\hat{O}G = 26,57°$ $O\hat{F}E = 26,57° + 90°$ (Corr $\angle$'s; FE||BA) $= 116,57°$	✓ $\tan A\hat{O}G = \frac{1}{2}$ ✓ size of $A\hat{O}G$ ✓ $O\hat{F}E$ (3)

3.4.2	F(0 ; 2,5) G(15 ; 0) Draw EO area OFEG = area ΔOFE + area ΔEOG $= \frac{1}{2}\left(\frac{5}{2}\right)(3) + \frac{1}{2}(15)(4)$ $= 3\frac{3}{4} + 30$ $= 33\frac{3}{4}$ units^2	✓ coordinates of F ✓ coordinates of G ✓ method ✓ area of ΔOFE ✓ area of ΔEOG ✓ area of OFEG (6)
3.5.1	Use midpoint of AC: D(2 ; 11)	✓ x ✓ y (2)
3.5.2 (a)	AC = diameter (converse∠ in semi circle) Centre$\left(\frac{-6+6}{2} ; \frac{7+3}{2}\right) = (0 ; 5)$	✓ x ✓ y (2)
3.5.2 (b)	$r = \sqrt{(0-6)^2 + (5-3)^2}$ $= \sqrt{40}$ $x^2 + (y-5)^2 = 40$	✓ subst into distance formula ✓ LHS ✓ RHS (3)
		[24]

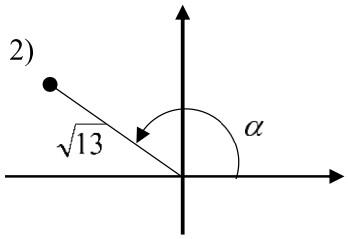
QUESTION/*VRAAG* 4



4.1	Radius ⊥ Tangent	✓ reason (1)
4.2.1	$x^2-4x+4+y^2+10y+25=-19+4+25$ $(x-2)^2+(y+5)^2=10$ $\therefore$ M(2 ; –5) **OR/*OF*** $M\left(-\frac{1}{2}(-4)\ ;-\frac{1}{2}(10)\right)$ $\therefore$ M(2 ; –5) Need to show some calculation	✓ LHS & RHS ✓ x ✓y (3) ✓ using formula ✓ x ✓y (3)
4.2.2	$r=\sqrt{2^2+(-5)^2-19}$ $=\sqrt{10}$ Answer only: Full Marks/ *Slegs antwoord: Volpunte*	✓ answer/*antwoord* (1)
4.3	$AM^2=AP^2+MP^2$ (Pyth th) $(t-2)^2+(0+5)^2=(2\sqrt{10})^2+(\sqrt{10})^2$ $t^2-4t+4+25=40+10$ $t^2-4t-21=0$ $(t-7)(t+3)=0$ $\therefore\ t=-3$ (given)	✓ subst into distance formula ✓ correct use of Pyth th ✓ standard form ✓ factors (4)

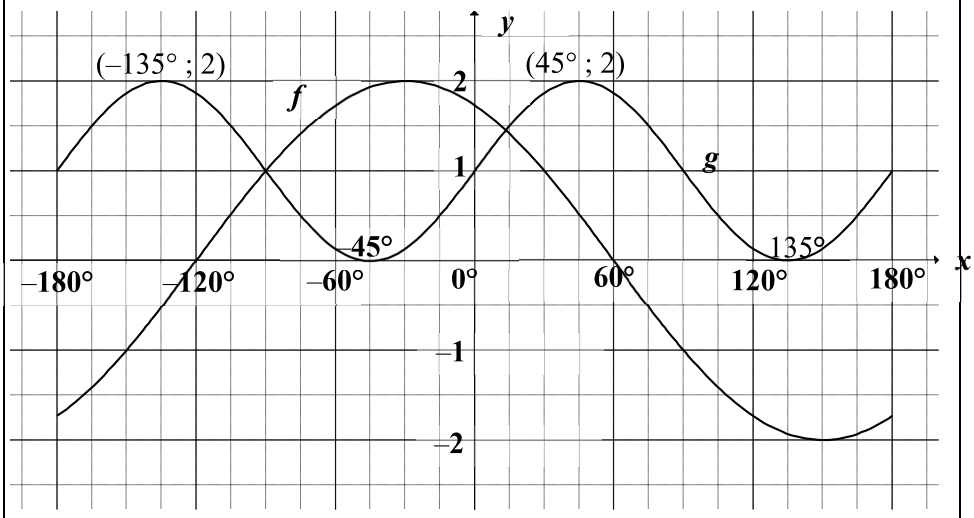
4.4.1	$y = -5 - 3$ $= -8$ $\therefore$ N(5 ; –8)	✓ substitution ✓ *y*-value of N (2)
4.4.2	$MN = \sqrt{(-5-(-8))^2 + (2-5)^2}$ $= 3\sqrt{2} = 4,24$ units Radius of circle N = $\sqrt{40} = 2\sqrt{10} = 6,32$ units Sum of two radii = $\sqrt{10} + \sqrt{40} = 3\sqrt{10} = 9,49$ units $\therefore$ MN < sum of 2 radii $\therefore$ 2 circles intersect	✓ subst into distance formula ✓ MN ✓ radius of N ✓ sum of radii ✓ answer (5)
		[16]

QUESTION/*VRAAG* 5

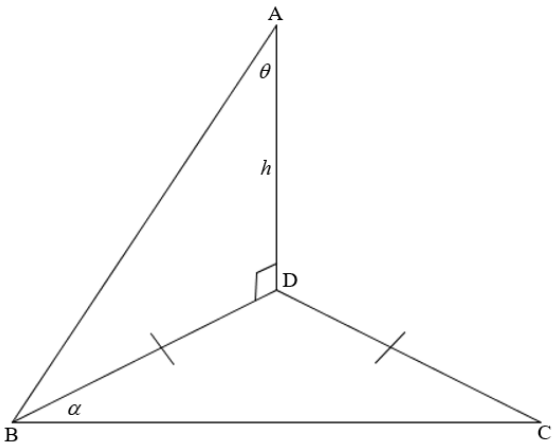
5.1.1	$\sin\alpha = \frac{2}{\sqrt{13}}$ $x^2 + y^2 = r^2$ $x^2 + 4 = 13$ $x^2 = 9$ $x = -3$ $\tan\alpha = -\frac{2}{3}$  	✓ 2nd quadrant ✓ subst into Pyth ✓ value of x ✓ answer/*antw* (4)
5.1.2	$\sin(90° - \alpha) = \cos\alpha$ $= \frac{-3}{\sqrt{13}}$	✓ co-function ✓ answer/*antwoord* (2)
5.2	$\frac{\sin(180° + \theta).\cos(90° + \theta)}{\tan\theta.\cos(-\theta)}$ $\frac{-\sin\theta.-\sin\theta}{\frac{\sin\theta}{\cos\theta}.\cos\theta}$ $= \sin\theta$ OR $= \frac{-\sin\theta.-\sin\theta}{\tan\theta.\cos\theta}$ $= \frac{\tan\theta\sin\theta}{\tan\theta}$ $= \sin\theta$	✓ $-\sin\theta$ ✓ $-\sin\theta$ ✓ $\cos\theta$ ✓ $\frac{\sin\theta}{\cos\theta}$ ✓ $\sin\theta$ (5) ✓ $-\sin\theta$ ✓ $-\sin\theta$ ✓ $\cos\theta$ ✓ $\tan\theta$ ✓ $\sin\theta$ (5)
5.3	$\sin x = 1 - \cos 2x$ $\sin x = 1 - (1 - 2\sin^2 x)$ $\sin x = 1 - 1 + 2\sin^2 x$ $\sin x - 2\sin^2 x = 0$ $\sin x(1 - 2\sin x) = 0$ $\sin x = 0 \quad or / of \quad \sin x = \frac{1}{2}$ $\sin x = 0$: $x = 0° + k.\,360°$ or $180° + k.\,360°$; $k \in Z$ $\sin x = \frac{1}{2}$: $x = 30° + k.\,360°$ or/of $x = 150° + k.\,360°$; $k \in Z$	✓correct double identity ✓ standard form ✓ both equations ✓ 0 & 180° ✓ 30° & 150° ✓ $+ k.\,360°$; $k \in Z$ (6)

5.4.1	$\text{LHS} = \sin A\cos B + \cos A\sin B + \sin A\cos B - \cos A\sin B$ $= 2\sin A\cos B$ $= \text{RHS}$	✓ expansion of sin(A+B) ✓ expansion of sin(A–B) (2)
5.4.2	$\text{LHS} = \dfrac{\sin(5x+2x)+\sin(5x-2x)}{\cos(5x+2x)+\cos(5x-2x)}$ $= \dfrac{2\sin 5x\cos 2x}{\cos 5x\cos 2x - \sin 5x\sin 2x + \cos 5x\cos 2x + \sin 5x\sin 2x}$ $= \dfrac{2\sin 5x\cos 2x}{2\cos 5x\cos 2x}$ $= \dfrac{\sin 5x}{\cos 5x}$ $= \tan 5x = \text{RHS}$ **OR/OF** $\text{LHS} = \dfrac{\sin(5x+2x)+\sin(5x-2x)}{\cos(5x+2x)+\cos(5x-2x)}$ $= \dfrac{2\sin 5x\cos 2x}{\sin[90° - (5x+2x)] + \sin[(90° - (5x-2x)]}$ $= \dfrac{2\sin 5x\cos 2x}{\sin[(90° - 5x) - 2x] + \sin[(90° - 5x) + 2x]}$ $= \dfrac{2\sin 5x\cos 2x}{2\sin(90° - 5x)\cos(2x)}$ $= \dfrac{2\sin 5x\cos 2x}{2\cos 5x\cos 2x}$ $= \tan 5x$	✓ $5x + 2x$ & $5x - 2x$ ✓ simplify numerator ✓ expand denominator ✓ simplify denominator ✓ simplify fraction (5) ✓ $5x + 2x$ & $5x - 2x$ ✓ simplify numerator ✓ expand denominator ✓ simplify denominator ✓ simplify fraction (5)
		[24]

QUESTION/*VRAAG* 6

6.1	$a = 2$ $b = 30°$	✓ a ✓ b (2)
6.2		✓ y-intercept ✓ max tps ✓ min tps (3)
6.3	180°	✓ answer/*antw* (1)
6.4	$2g(x) = 2\sin 2x + 2$ $\therefore 0 \le y \le 4 \quad OR \quad y \in [0;4]$	✓ $2g(x)$ ✓ critical values ✓ inequalities (3)
6.5.1	$x \in [-180°;-90°)$ *OR* $-180° \le x < -90°$	✓ critical values ✓ inequalities (2)
6.5.2	where $\cos(x + b) = 0$ $x = -120°$ or $60°$	✓ $-120°$ ✓ $60°$ (2)
6.6	$p(x) = \sin[2(x+45°)]+1$ $= \sin(2x+90°)+1$ $p(x) = \cos 2x + 1$ Answer only: Full Marks/ *Slegs antwoord: Volpunte*	✓ correct subst of $x + 45°$ ✓ answer/ *antwoord* (2)
		[15]

QUESTION/*VRAAG* 7

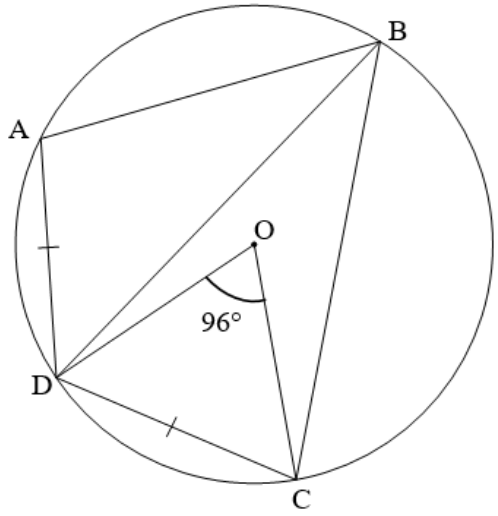


7.1	$\tan\theta = \frac{BD}{h}$ $BD = h\tan\theta$	✓ tan ratio ✓ answer/ *antwoord* (2)
7.2	$D\hat{C}B = \alpha \quad (\angle s \text{ opp } = \text{ sides}) / (\angle e \text{ to } = \text{ sye})$ $B\hat{D}C = 180° - 2\alpha \quad (\angle^{s/e} \text{ of/van } \Delta)$ $\frac{BC}{\sin(180° - 2\alpha)} = \frac{BD}{\sin\alpha}$ $\frac{BC}{\sin 2\alpha} = \frac{h\tan\theta}{\sin\alpha}$ $BC = \frac{h\tan\theta\sin 2\alpha}{\sin\alpha}$ $= \frac{h\tan\theta.2\sin\alpha\cos\alpha}{\sin\alpha}$ $= 2h\tan\theta\cos\alpha$ **OR/*OF*** $BC^2 = (h\tan\theta)^2 + (h\tan\theta)^2 - 2(h\tan\theta)\cos(180° - 2\alpha)$ $= h^2\tan^2\theta + h^2\tan^2\theta - 2h^2\tan^2\theta(-\cos 2\alpha)$ $= 2h^2\tan^2\theta(1 + 2\cos^2\alpha - 1)$ $= 2h^2\tan^2\theta(2\cos^2\alpha)$ $BC = \sqrt{4h^2\tan^2\theta\cos^2\alpha}$ $BC = 2h\tan\theta\cos\alpha$	✓ $180° - 2\alpha$ ✓ subst into sin rule ✓ reduction ✓ sin double angle identity (4) ✓ $180° - 2\alpha$ ✓ subst into cos rule ✓ reduction ✓ cos double angle identity (4)

7.3	$\text{Area of } \Delta BDC = \frac{1}{2}BD.DC.\sin B\hat{D}C$ $= \frac{1}{2}(h\tan\theta)(h\tan\theta)\sin(180° - 2\alpha)$ $= \frac{1}{2}(5\tan 40°)(5\tan 40°)\sin 130°$ $= 6,74 \text{ units}^2$	✓subst into area rule ✓ subst values ✓answer/ *antwoord* (3)
		[9]

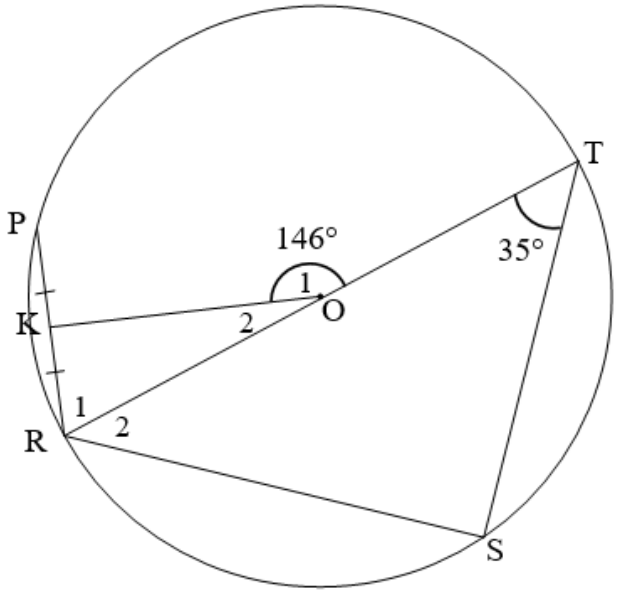
QUESTION/*VRAAG* 8

8.1



8.1.1	$D\hat{B}C = 48°$ ($\angle$ at centre $= 2\angle$ at circle/*midpts∠ = 2omtreks∠*)	✓ S ✓ R (2)
8.1.2	$A\hat{B}D = 48°$ (= chords; = ∠s/= *koorde; = ∠e*)	✓ S ✓ R (2)
8.1.3	$O\hat{D}C = 42°$ ($\angle^s$ opp = sides/$\angle^e$ *to = sye*) $A\hat{D}C = 180° - 96°$ (opp $\angle^s$ cyc quad/*to* $\angle^e$*koordevh*) $= 84°$ $A\hat{D}O = 84° - 42°$ $= 42°$	✓ S ✓ R ✓ S ✓ R ✓ answer/ *antwoord* (5)

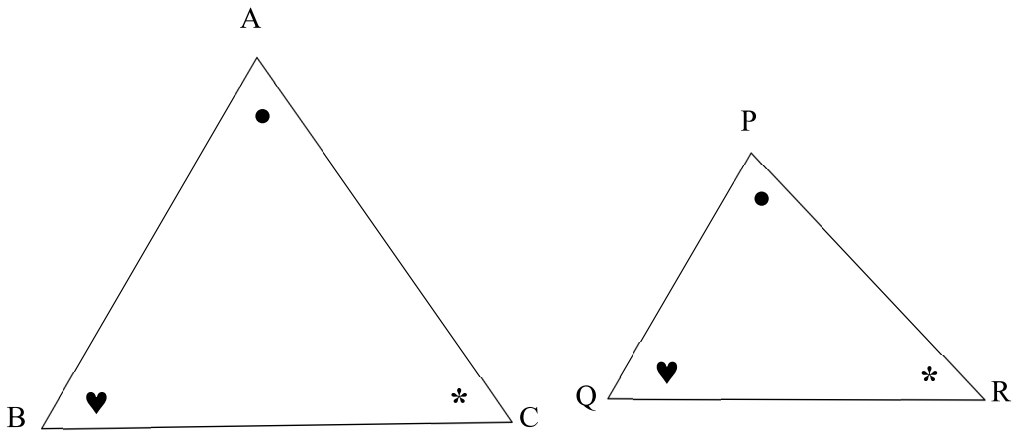
8.2



	$\hat{S} = 90°$ ($\angle$ in half circle) $\hat{R}_2 = 55°$ ($\angle^s$ *of* Δ) $O_2 = 34°$ ($\angle^s$ on a straight line) $R\hat{K}O = 90°$ (line from centre to midpt of chord) $\hat{R}_1 = 56°$ (ext $\angle$ of Δ) $P\hat{R}S = 56° + 55° = 111°$ **OR/*OF*** $\hat{S} = 90°$ ($\angle$ in half circle) $\hat{R}_2 = 55°$ ($\angle^s$ *of* Δ) $R\hat{K}O = 90°$ (line from centre to midpt of chord) $\hat{R}_1 = 56°$ (ext $\angle$ of Δ) $P\hat{R}S = 56° + 55° = 111°$	✓ S ✓ R ✓ S ✓ S ✓ R ✓ S/R ✓ answer/ *antwoord* (7) ✓ S ✓ R ✓ S ✓ S ✓ R ✓ S/R ✓ answer/ *antwoord* (7)
		[16]

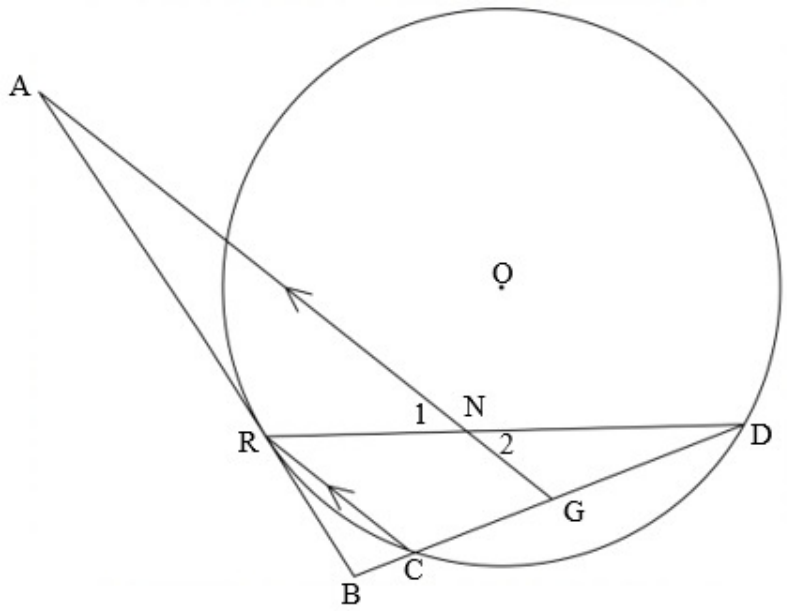
QUESTION/*VRAAG* 9

9.1



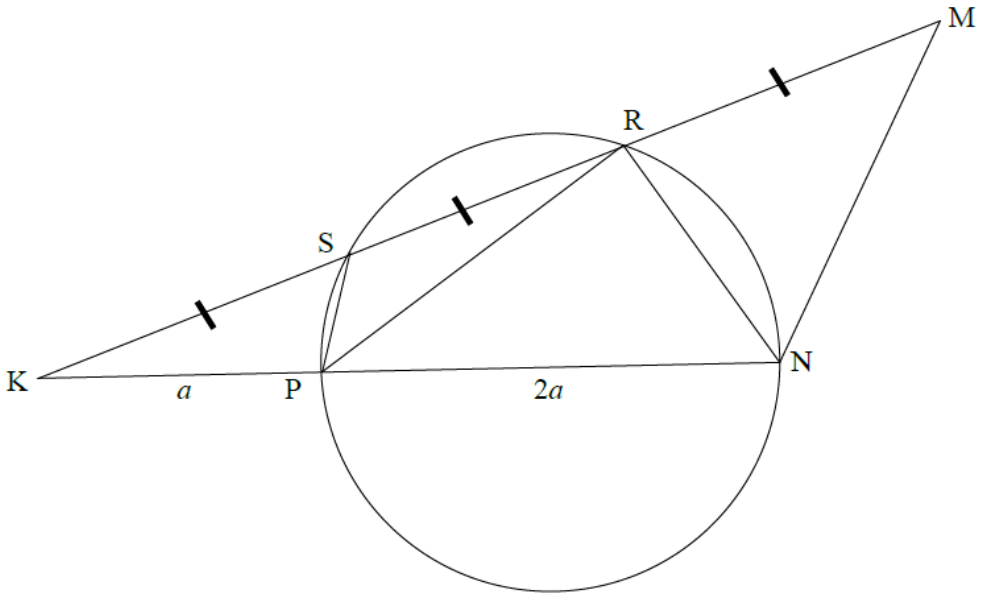
	Constr: Let G and H lie on AB and AC respectively such that AG = PQ and AH = PR. Draw GH. Proof: In Δ AGH and Δ PQR: AG = PQ [Constr] AH = PR [Constr] $\hat{A} = \hat{P}$ [Given] $\therefore \Delta AGH \equiv \Delta PQR$ (SAS) $\therefore A\hat{G}H = \hat{Q} = \hat{B}$ GH ∥ BC [corresp ∠'s are equal] $\frac{AB}{AG} = \frac{AC}{AH}$ [line ∥ one side of Δ **OR** prop theorem; MN ∥BC] $\therefore \frac{AB}{PQ} = \frac{AC}{PR}$ [AM = DE and AN = DF]	✓ constr ✓ S ✓ R ✓ S/R ✓ S ✓ R (6)

9.2



9.2.1	In ΔDNG ||| ΔANR: $\hat{N}_1 = \hat{N}_2$ (vert opp ∠s/*regootst ∠e*) $A\hat{R}N = R\hat{C}D$ (tan chord th/*rkl koord st*) $R\hat{C}D = N\hat{G}D$ (corresp ∠s/*ooreenk ∠e* ; RC || AG) ∴ΔDNG ||| ΔANR (AAA) **OR/*OF*** In ΔDNG ||| ΔANR: $\hat{N}_1 = \hat{N}_2$ (vert opp ∠s/*regootst ∠e*) $A\hat{R}N = R\hat{C}D$ (tan chord th/*rkl koord st*) $R\hat{C}D = N\hat{G}D$ (corresp ∠s/*ooreenk ∠e* ; RC || AG) $\hat{A} = \hat{D}$ (∠s of Δ/*∠e v Δ)* ∴ΔDNG ||| ΔANR	✓ S/R ✓ S ✓ R ✓ S/R ✓ R (5) ✓ S/R ✓ S ✓ R ✓ S/R ✓ R (5)
9.2.2	$B\hat{R}C = \hat{D}$ (tan chord th/*rkl koord st*) $\hat{A} = \hat{D}$ (||| Δs/e) ∴ $B\hat{R}C = \hat{A}$	✓ S/R ✓ S (2)
		[13]

QUESTION/*VRAAG* 10



10.1.1	$\frac{KP}{PN}=\frac{KS}{SM}=\frac{1}{2}$ PS|| NM (side in proportion/*sye in dieselfde verh*) **OR/*OF*** $\frac{KP}{KN}=\frac{KS}{KM}=\frac{1}{3}$ ∴ PS || NM (side in proportion/*sye in dieselfde verh*)	✓ S ✓ R (2)
10.1.2	$K\hat{S}P=\hat{M}$ (Corr ∠^{s} / *ooreenk* ∠^{e}; PS||NM) $K\hat{S}P=P\hat{N}R$ (ext ∠of cyc quad/*buite* ∠*v koordevh*) $P\hat{N}R=\hat{M}$ ∴ PN = tangent/*raaklyn* (conv tan chord th/*omg rkl koordst*)	✓ S/R ✓ S ✓ R ✓ R (4)
10.1.3	In ΔKRN and ΔKMN: $K\hat{N}R=\hat{M}$ (proven/*bewys*) $\hat{K}=\hat{K}$ (common/*gemeen*) ∴ ΔKRN ||| ΔKMN (AAA) $\frac{NM}{RN}=\frac{KN}{KR}=\frac{KM}{KN}$ $\frac{NM}{RN}=\frac{3a}{12}=\frac{a}{4}$	✓ 2 ∠s = + R OR 3∠s = ✓ correct Δs ||| ✓ proportion ✓ $\frac{3a}{12}$ (4)

10.2	$\frac{PN}{NM}=\frac{NR}{MR}$ (Similar Δ's) $\frac{2a}{NM}=\frac{NR}{6}$ but $NR=\frac{4NM}{a}$ $\frac{2a}{NM}=\frac{4NM}{6a}$ $4NM^2=12a^2$ $NM=\sqrt{3}a$	✓ ratio ito NM and NR ✓ subst NR ✓ answer/*antwoord* (3)
		[16]
		TOTAL: 150