education

Department of Education
FREE STATE PROVINCE

PREPARATORY EXAMINATION/
VOORBEREIDENDE EKSAMEN

GRADE/*GRAAD* 12

MATHEMATICS P2/
WISKUNDE V2

SEPTEMBER 2025

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MARKS/*PUNTE*: 150

MARKING GUIDELINES/
NASIENRIGLYNE

These marking guidelines consist of 21 pages.
Hierdie nasienriglyne bestaan uit 21 bladsye.

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NOTE:

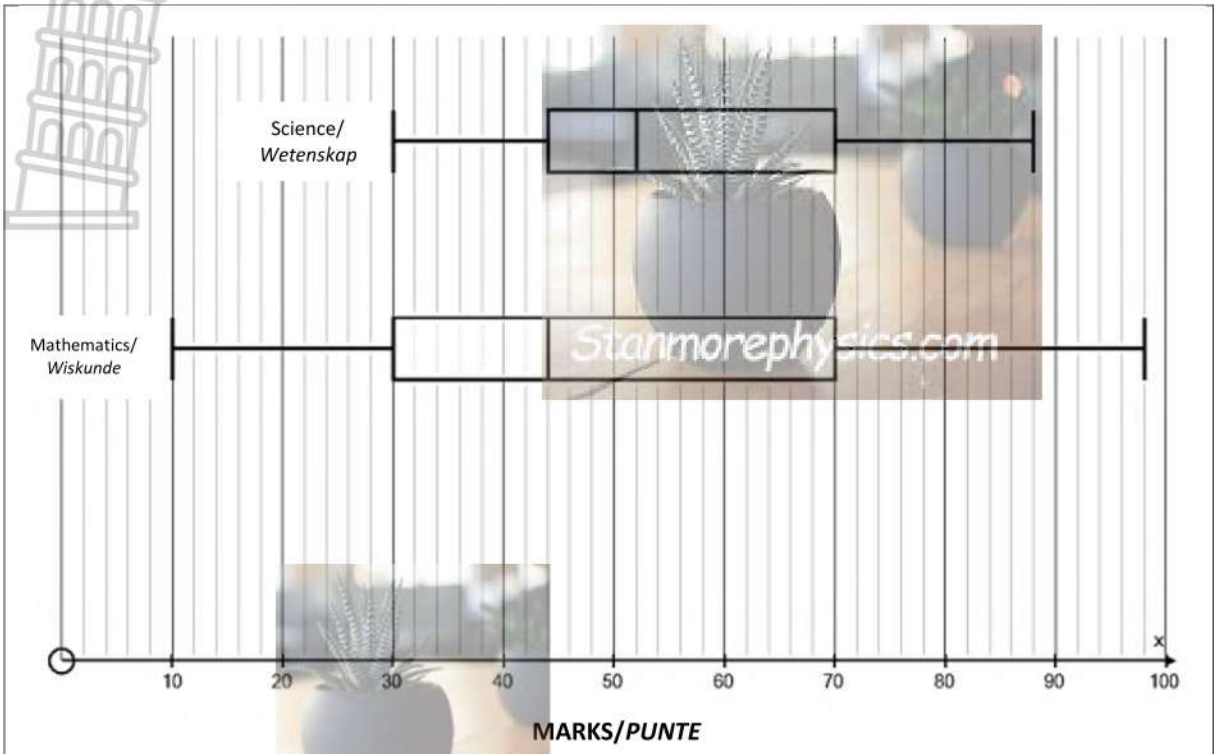
- If a candidate answers a question TWICE, only mark the FIRST attempt.
- If a candidate has crossed out an attempt of a question and not redone the question, mark the crossed-out version.
- Consistent accuracy applies in ALL aspects of the marking memorandum. Stop marking the second calculation error.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



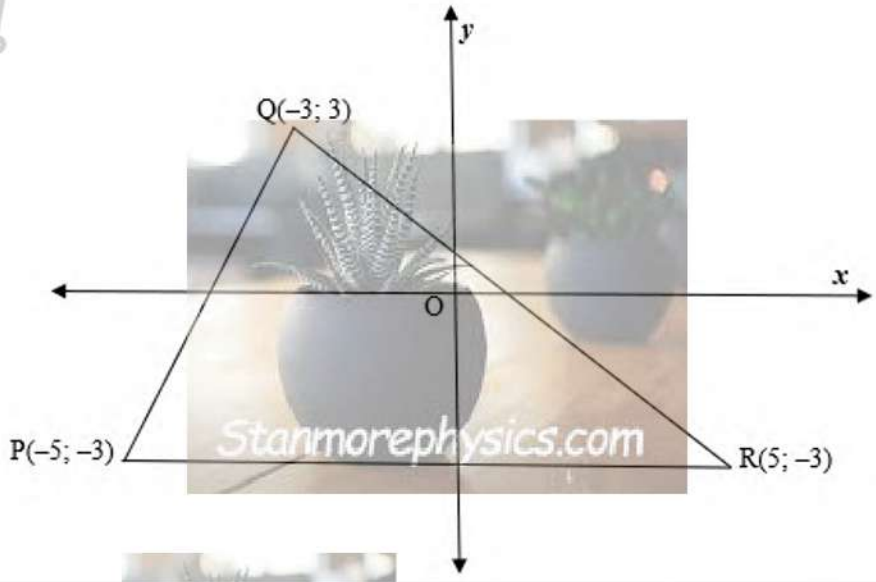
1.1	Range/Omvang : Highest – Lowest/*Hoogste – Laagste* = 98 – 10 = 88	✓substitution/*vervanging* ✓answer/*antwoord* (2)
1.2	Median/*Mediaan* = 52	✓answer/*antwoord* (1) (Accept 51-53)
1.3	IQR/*IKV* = $Q_3 - Q_1$ = 70 – 44 = 26	✓substitution/*vervanging* ✓answer/*antwoord* (2) (Q_3 – accept 69-71) (Q_1 – accept 43-45) **CA the answer**
1.4	Science /*Wetenskap*. The median and minimum in Science is higher than Mathematics/*Die mediaan en minimum vir Wetenskap is hoër as Wiskunde.*	✓Science/*Wetenskap* ✓Reason/*Rede* (2)
1.5	Mathematics/*Wiskunde.* Range is 88% and the IQR is 40 compared to Science with Range of 58% and IQR of 26/*Omvang is* 88% *en die IKO is 40 in vergelyking met Wetenskap wat 'n omvang van 58% 'n en IKO van 26 het.*	✓Mathematics/*Wiskunde* ✓Reason/*Rede* (2) (The reason can only be in terms of Range and IQR)
1.6	25% **or/*of*** 0,25	✓answer/*antwoord* (1)
		[10]

QUESTION/*VRAAG* 2

2.1	Yes. It would strengthen the correlation coefficient/ *Ja. Dit sal die korrelasie koeffisient versterk*	✓answer/*antwoord* (1)
2.2	Closer to negative one as the gradient is negative or the relationshp is indirect./*Nader na negatief een, want die gradiënt is negatief of die verwantskap is omgekeerd*	✓answer/*antwoord* ✓reason/*rede* (2)
2.3	No/*Nee.* The correlation is not equal to –1./*Die korrelasie is nie gelyk aan –1 nie.*	✓answer/*antwoord* ✓reason/*rede* (2)
2.4	He is saying that the value for x is outside of the lowest and the highest values used to find the line of best fit so he cannot be sure if it is accurate./*Hy sê die waarde van x is buite die laagste en hoogste waardes wat gebruik word om die aanpassing lyn te verkry, hy kan nie seker wees of dit akkuraat is nie.*	✓✓reason/*rede* (2)
		[7]

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QUESTION/*VRAAG* 3



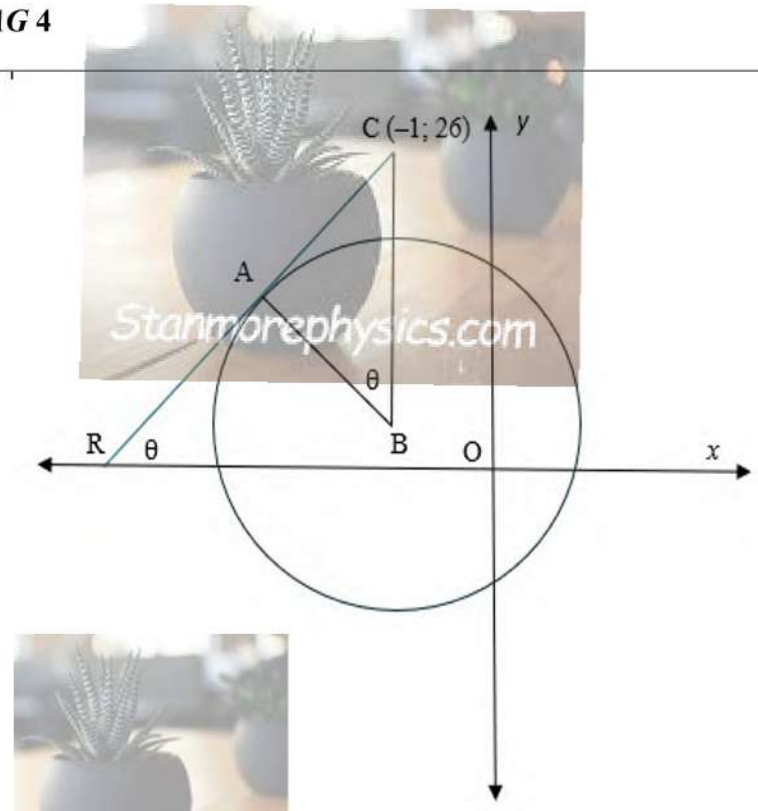
3.1	$QR = \sqrt{((5-(-3))^2 + (-3-3)^2}$ $= \sqrt{64+36}$ $= \sqrt{100}$ $= 10$ *units*	✓substitution/*vervanging* ✓answer/*antwoord* (2) (accept surd or simplified form)
3.2	$M = \left(\frac{-3+5}{2}; \frac{3+(-3)}{2}\right)$ $= (1;0)$	✓ x value/-*waarde* ✓ y value/-*waarde* (2)
3.3	$m_{pm} = \frac{-3-0}{-5-1}$ $= \frac{-3}{-6}$ $= \frac{1}{2}$ $y-0 = \frac{1}{2}(x-1)$ *or* $y+3 = \frac{1}{2}(x+5)$ $y = \frac{1}{2}x - \frac{1}{2}$ $y = \frac{1}{2}x - \frac{1}{2}$	✓substitution/*vervanging* ✓ $m = \frac{1}{2}$ ✓substitution/*vervanging* (1 ; 0) **or/*of*** (–5 ; –3) ✓equation/vergelyking (4) (if $c = \frac{-1}{2}$ is determined then give full marks)

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3.4	Centre (1 ; 0) $(x-1)^2+(y-0)^2=r^2$ *sub* $(5;-3)$ *or/of* $(-3;3)$ $(5-1)^2+(-3-0)^2=r^2$ *or/of* $(-3-1)^2+(3-0)^2=r^2$ $16+9=r^2$ $16+9=r^2$ $r^2=25$ $r^2=25$ $(x-1)^2+(y-0)^2=25$ $(x-1)^2+(y-0)^2=25$	✓$(x-1)^2+(y-0)^2=r^2$ ✓ *sub* $(5;-3)$ *or/of* $(-3;3)$ ✓equation/*vergelyking* (3)
3.5	$MP=\sqrt{(-5-1)^2+(-3-0)^2}$ $=\sqrt{36+9}$ $=\sqrt{45}$ $=6,7$ *radius* $<6,7$ $\therefore$ *P lies outside circle*	✓substition/*vervanging* ✓answer/*antwoord* ✓conclusion/*gevolgtrekking* (3)
3.6	$\frac{x+(-5)}{2}=1$ $\frac{y+(-3)}{2}=0$ $x-5=2$ $y-3=0$ $x=7$ $y=3$ $S(7:3)$ ANSWER ONLY FULL MARKS/ *SLEGS ANTWOORD VOLPUNTE*	✓*x* value/-*waarde* ✓*y* value/-*waarde* (2)
3.7	$m_{QP}=\frac{-3-3}{-5-(-3)}$ $=3$ $\tan\theta=3$ $\theta=71,57°$ $QPR=\theta=71,57°$ corres ∠'s/*ooreenkom∠'e* $PR//x-$axis/*as*	✓m=3 ✓ $\tan\theta=3$ ✓value of θ/*waarde van* θ ✓value of $Q\hat{P}R$/*waarde van* $Q\hat{P}R$ (4)
		[20]

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QUESTION/*VRAAG* 4

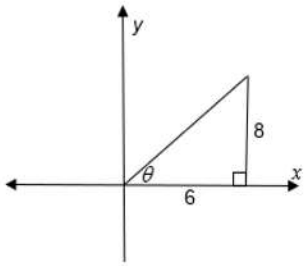


4.1	$CB = 25 \quad CA = 20$ $AB = \sqrt{(25)^2 - (20)^2}$ $= \sqrt{225}$ $= 15$ $\therefore radius = 15 \text{ units / } eenhede$	✓value of CB/*waarde van CB* ✓substitution/*vervanging* ✓simplification/*vereenvoudiging* ✓value of AB/*waarde van AB* (4)
4.2	$(x+1)^2 + (y-1)^2 = 225$	✓ $(x+1)^2 + (y-1)^2$ ✓value/*waarde* of r^2 (2)
4.3	$m = \tan\theta = \frac{20}{15} = \frac{4}{3} \quad sub \ (-1;26)$ $y - 26 = \frac{4}{3}(x+1)$ $y = \frac{4}{3}x + 27\frac{1}{3}$	✓value of tanθ/*waarde van tan*θ ✓sub *m* and point/*vervang m* en punt ✓equation/*vergelyking* (3) **(if $c = 27\frac{1}{3}$ is determined give full marks)**
4.4	$m_{\tan} = \frac{4}{3} \qquad m_{radius} = \frac{-3}{4}$ $y - 1 = \frac{-3}{4}(x+1)$ $y = \frac{-3}{4}x + \frac{1}{4}$	✓ value/*waarde* $m_{\tan}$ ✓ value/*waarde* m_{radius} ✓ substitution/*vervanging* of/*van* (-1 ;1) ✓ equation/*vergelyking* (4)

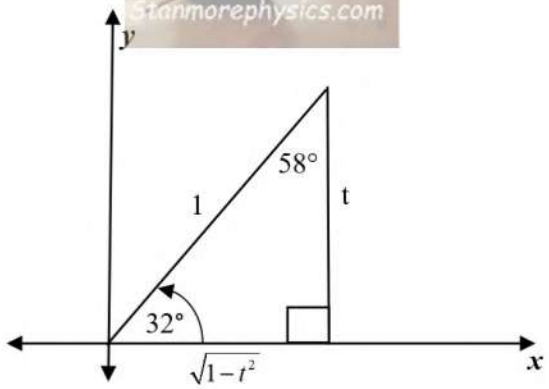
4.5	$\frac{4}{3}x+27\frac{1}{3}=\frac{-3}{4}x+\frac{1}{4}$ $\frac{4}{3}x+\frac{3}{4}x=\frac{1}{4}-27\frac{1}{3}$ $\frac{25}{12}x=-27,08333$ $x=-13$ $y=10$ $A(-13;10)$	✓ equating/*gelykstel* ✓ simplification/*vereenvoudiging* ✓ value of *x/waarde van x* ✓ value of *y/waarde van y* (4) **[17]**



QUESTION/*VRAAG* 5

5.1.1	$\tan\theta = \frac{8}{6}$ $r^2 = (8)^2 + (6)^2$ $= 64 + 36$ $= 100$ $r = 10$  $10\sin(\theta + x)$ $= 10(\sin\theta\cos x + \cos\theta\sin x)$ $= 10\left(\frac{8}{10.}\cos x + \frac{6}{10}\sin x\right)$ $= 8\cos x + 6\sin x$	✓ $r = 10$ ✓expand/*uitbrei* ✓ $\sin\theta = \frac{8}{10}$ ✓ $\cos\theta = \frac{6}{10}$ (4)
5.1.2	$\sin\theta = \frac{8}{10}$ $\theta = 53{,}13°$ $10\sin(53{,}13° + x) = 9$ $\sin(53{,}13° + x) = 0{,}9$ $53{,}13° + x = 64{,}16°$ $x = 11{,}03°$ or/*of* $53{,}13° + x = 180° - 64{,}16°$ $x = 62{,}71°$	✓value of/*waarde van* θ ✓$10\ sin(53{,}13° + x) = 9$ ✓simplification/*vereenvoudiging* ✓ref angle/*verwysings hoe* ✓value of /*waarde van x* ✓value of /*waarde van x* (6)
5.2	$\frac{\cos(90° + x).\cos(x - 180°).\tan(360° + x)}{\cos 240°.\tan 225°}$ $= \frac{(-\sin x)(-\cos x)(\tan x)}{-\cos 60°\tan 45°}$ $= \frac{(-\sin x)(-\cos x)\left(\frac{\sin x}{\cos x}\right)}{-\left(\frac{1}{2}\right)(1)}$ $= -2\sin^2 x.$	✓–sin*x* (neg must be shown) ✓–cos*x* (neg must be shown) ✓tan*x* ✓ $\frac{\sin x}{\cos x}$ ✓ $\frac{1}{2}$ ✓1 ✓answer/*antwoord* (7)

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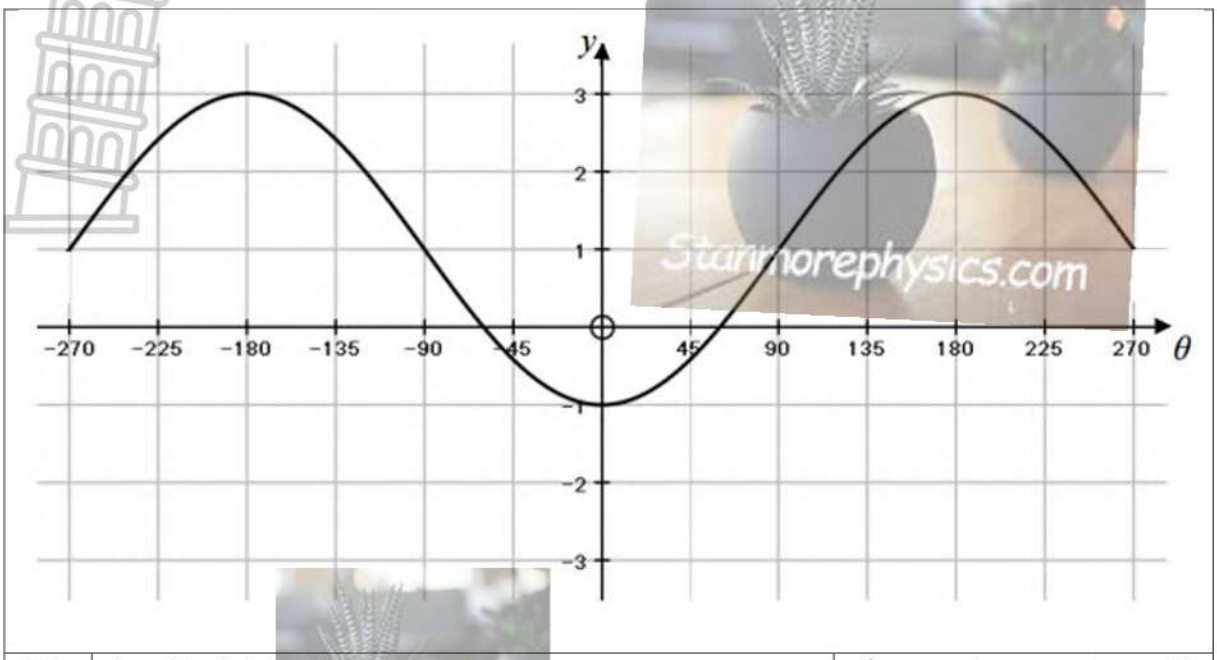
5.3	$\frac{1+\cos 2A}{\cos 2A}=\frac{\tan 2A}{\tan A}$ LHS / *LK* $=\frac{1+(2\cos^2 A-1)}{2\cos^2 A-1}$ $=\frac{2\cos^2 A}{2\cos^2 A-1}$ RHS / *RK* $=\frac{\sin 2A}{\cos 2A}\times\frac{\cos A}{\sin A}$ $=\frac{2\sin A\cos A.\cos A}{\sin A.2\cos^2 A-1}$ $=\frac{2\cos^2 A}{2\cos^2 A-1}$ LHS=RHS / *LK = RK*	✓double angle in both numerator / *dubblehoek in teller* ✓ double angle in denominator/ *dubblehoek in noemer* ✓simplificaion/*vereenvoudiging* ✓ $\frac{\sin 2A}{\cos 2A}\times\frac{\cos A}{\sin A}$ ✓double angle in numerator / *dubblehoek in teller* ✓ double angle in denominator/ *dubblehoek in noemer* ✓ simplification/*vereenvoudiging* (7)
5.4	 $\cos 2(16°)=1-2\sin^2 16°$ $2\sin^2 16°=1-\cos 2(16°)$ $\sin 16°=\sqrt{\frac{1-\cos 2(16°)}{2}}$ $\sin 16°=\sqrt{\frac{1-\sqrt{1-t^2}}{2}}$	✓ $\cos 2(16°)=1-2\sin^2 16°$ ✓ $\sin 16°=\sqrt{\frac{1-\cos 2(16°)}{2}}$ ✓ $\sin 16°=\sqrt{\frac{1-\sqrt{1-t^2}}{2}}$ (3)

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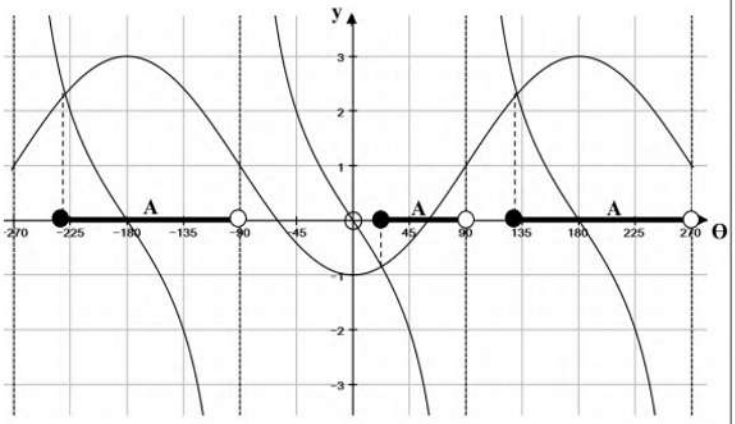
5.5.1	$\cos(x+y)-\cos(x-y)$ $=(\cos x\cos y-\sin x\sin y)-(\cos x\cos y+\sin x\sin y)$ $=\cos x\cos y-\sin x\sin y-\cos x\cos y-\sin x\sin y$ $=-2\sin x\sin y$	✓expansion of both compound angles/*uitbreiding van beide saamgestelde hoeke* ✓ $\cos x\cos y-\sin x\sin y$ ✓ $-\cos x\cos y-\sin x\sin y$ (3)
5.5.2	$\cos A-\cos B$ $=\cos\left(\frac{A+B}{2}+\frac{A-B}{2}\right)-\cos\left(\frac{A+B}{2}-\frac{A-B}{2}\right)$ $=-2\sin\left(\frac{A+B}{2}\right)\sin\left(\frac{A-B}{2}\right)$	✓ $\cos\left(\frac{A+B}{2}+\frac{A-B}{2}\right)$ ✓ $\cos\left(\frac{A+B}{2}-\frac{A-B}{2}\right)$ (2)
		[32]



QUESTION/*VRAAG* 6

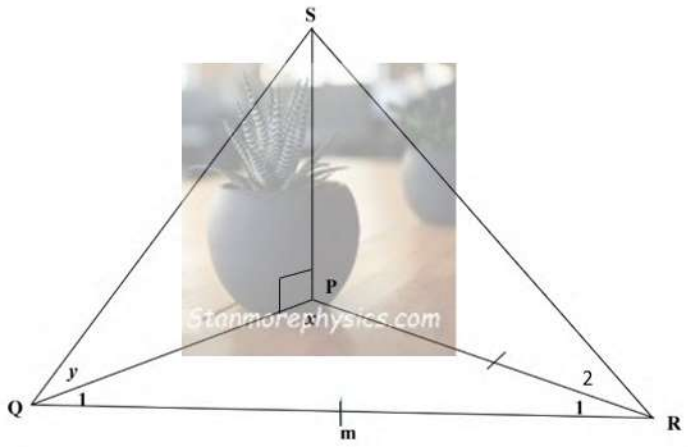


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6.1	Amplitude/*Amplitude* = 2	✓ answer/*antwoord* (1)
6.2	Range of *f*/*Waardeversameling van f*: $y \in [-1; 3]$ or/*of* $y \in -1 \leq y \leq 3$	✓ answer/*antwoord* (1)
6.3	$p = -2$ and/*en* $q = 1$	✓ value of *p*/*waarde van p* ✓ value of *q*/*waarde van q* (2)
6.4		✓ asymptotes/*asimptote* ✓shape/*vorm* ✓all three *x* -intercepts/*afsnitte* (3)

6.5	See graph	✓✓✓ one mark for each interval/*een punt vir elke interval* (subtracted one mark if inclusion/exclusion at end points are not indicated)/(*minus een punt as ingesluit/uitgesluit van eindpunte nie aangewys is nie).* (3) **[10]**

QUESTION/*VRAAG* 7

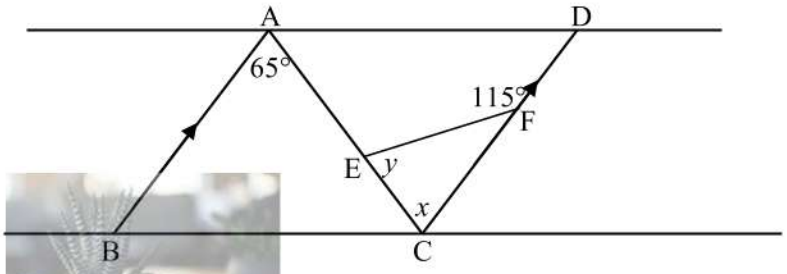
7.1	 $R = 180° - 2x$ interior angles of Δ Area $\Delta PQR = \frac{1}{2}QR.PR.\sin R$ $= \frac{1}{2}m.m.\sin(180° - 2x)$ $= \frac{1}{2}m^2 \sin 2x$ $= \frac{1}{2}m^2 2\sin x\cos x$ $= m^2 \sin x\cos x$	✓ $R = 180° - 2x$ ✓substitution/*vervanging* ✓simplify/vereenvoudig ✓double angle/*dubbelhoek* ✓simplify/vereenvoudig (5)

7.2	$PQ = \sqrt{PR^2 + RQ^2 - 2PR.RQ\cos(180° - 2x)}$ $= \sqrt{m^2 + m^2 + 2m.m\cos 2x}$ $= \sqrt{2m^2(1+\cos 2x)}$ $= \sqrt{2m^2(1+2\cos^2 x - 1)}$ $= \sqrt{4m^2\cos^2 x}$ $= 2m\cos x$	✓substitution/*vervanging* ✓factorise/*faktoriseer* ✓double angle/*dubbelhoek* ✓simplify/*vereenvoudig* (4)
7.3	$\tan y = \frac{SP}{PQ}$ $SP = PQ.\tan y$ $= 2m\cos x\tan y$	✓trig ratio/*trig verhouding* ✓ $SP = PQ.\tan y$ (2)
		[11]



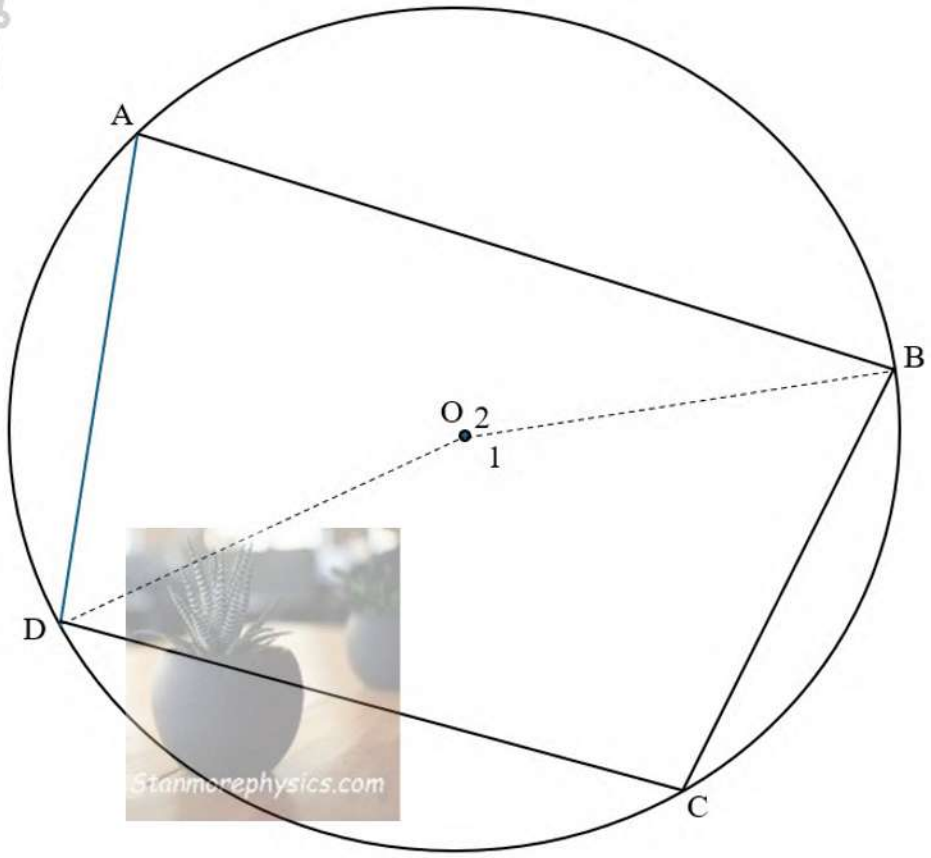
GEOMETRY/*MEETKUNDE*

Please read carefully through the following table before marking **QUESTION 8–10**/
*Lees asseblief sorgvuldig deur die volgende tabel alvorens **VRAAG 8–10** nagesien word.*

	The order in which the candidate answers a geometry question must follow logically/*Die volgorde waarin 'n kandidaat 'n meetkundevraag beantwoord moet logies volg.* **Example/*Voorbeeld*** Given/*Gegee* AB || CD and/*en* $E\hat{F}D = 115°$  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)
	'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 the statement AND reason are both correct (Both MUST be correct to get one mark)
	Ken 'n punt toe as die bewering EN rede beide korrek is *(Beide MOET korrek wees om een punt te kry)*

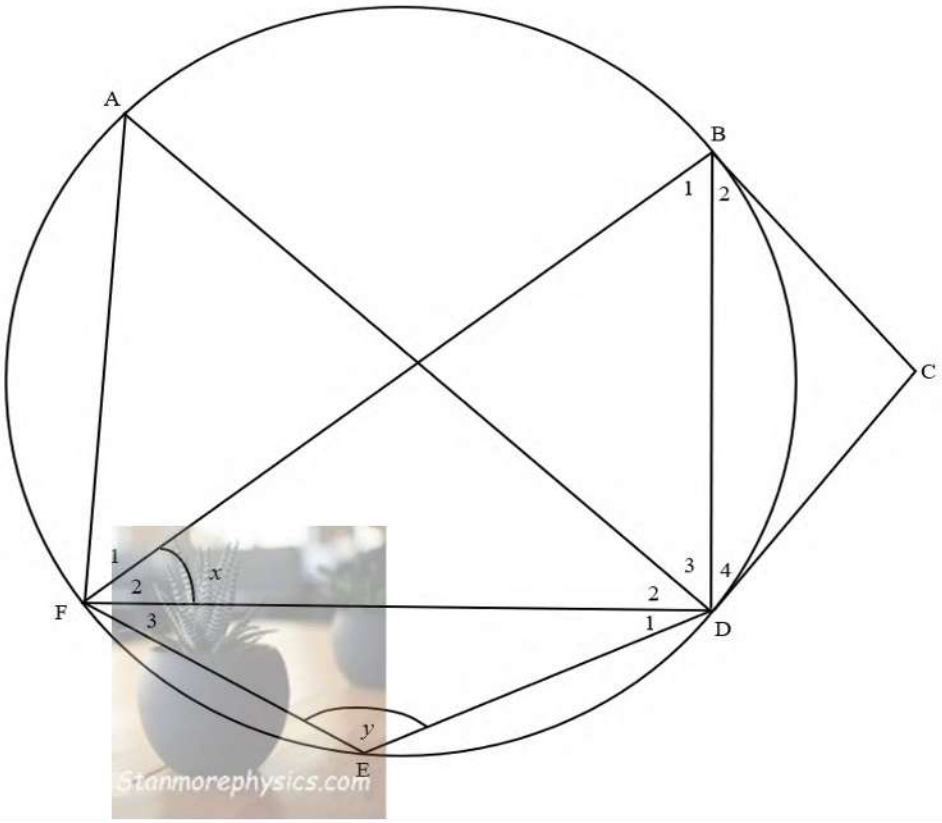
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QUESTION/*VRAAG* 8



8.1	Construction/*Konstruksie*: Join DO and BO /Verbind *DO en BO.*	✓ constr./ *konstr.*
	$O_1 = 2A$ angle at centre 2x angle at circum/ *middelpunts hoek 2x omtreks ∠*	✓ S/R
	$O_2 = 2C$ angle at centre 2x angle at circum/ *middelpunts hoek 2x omtreks ∠*	✓ S/R
	$O_1 + O_2 = 360°$ angle around a point/ *hoeke om 'n punt*	✓ S/R
	$2A + 2C = 360°$	✓ S
	$A + C = 180°$	✓ S
		(6)

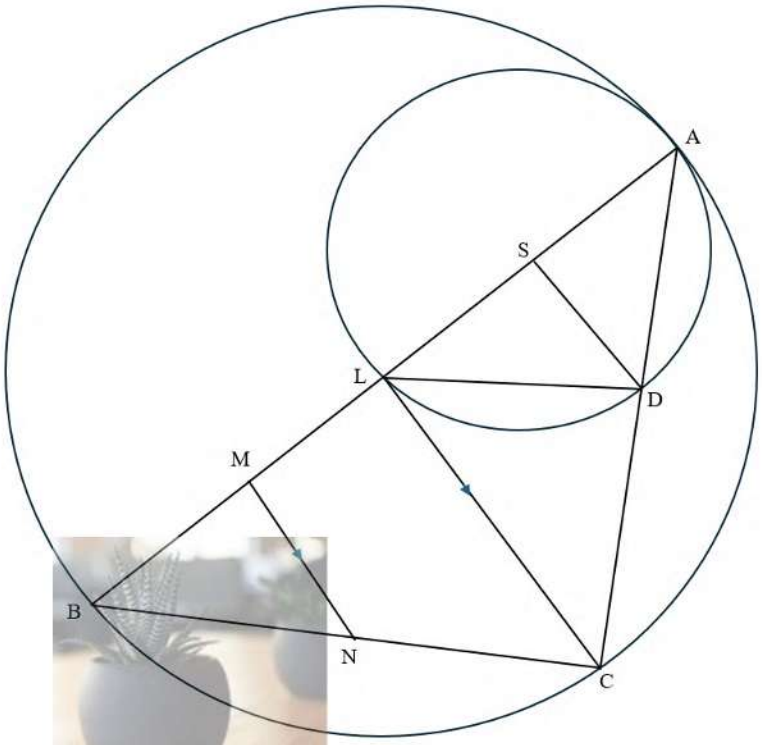
8.2



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8.2.1	$\hat{B}_2 = B\hat{F}D = x$ tan chord theorem/*raaklynkoordstelling*	✓S ✓ R (2)
8.2.2	$\hat{D}_4 = \hat{B}_2 = x$ angles opposite equal sides/*hoeke teenoor gelyke sye* **OR/*OF*** $\hat{D}_4 = B\hat{F}D = x$ tan chord theorem/*tan-koordstelling*	✓S ✓ R (2)
8.2.3	$\hat{C} = 180° - 2x$ sum of interior angles of Δ/*som van binne hoeke van* Δ	✓S ✓ R (2)
8.2.4	$A = 180° - y$ opposite angles of cyclic quadrilateral/ *teenoorst ∠'e van koordevierhoek*	✓S ✓ R (2)
8.2.5	$B_1 = 180° - y$ FD subtends equal angles / FD *onderspan gelyke hoeke*	✓S ✓ R (2)
		[16]

QUESTION/*VRAAG* 9



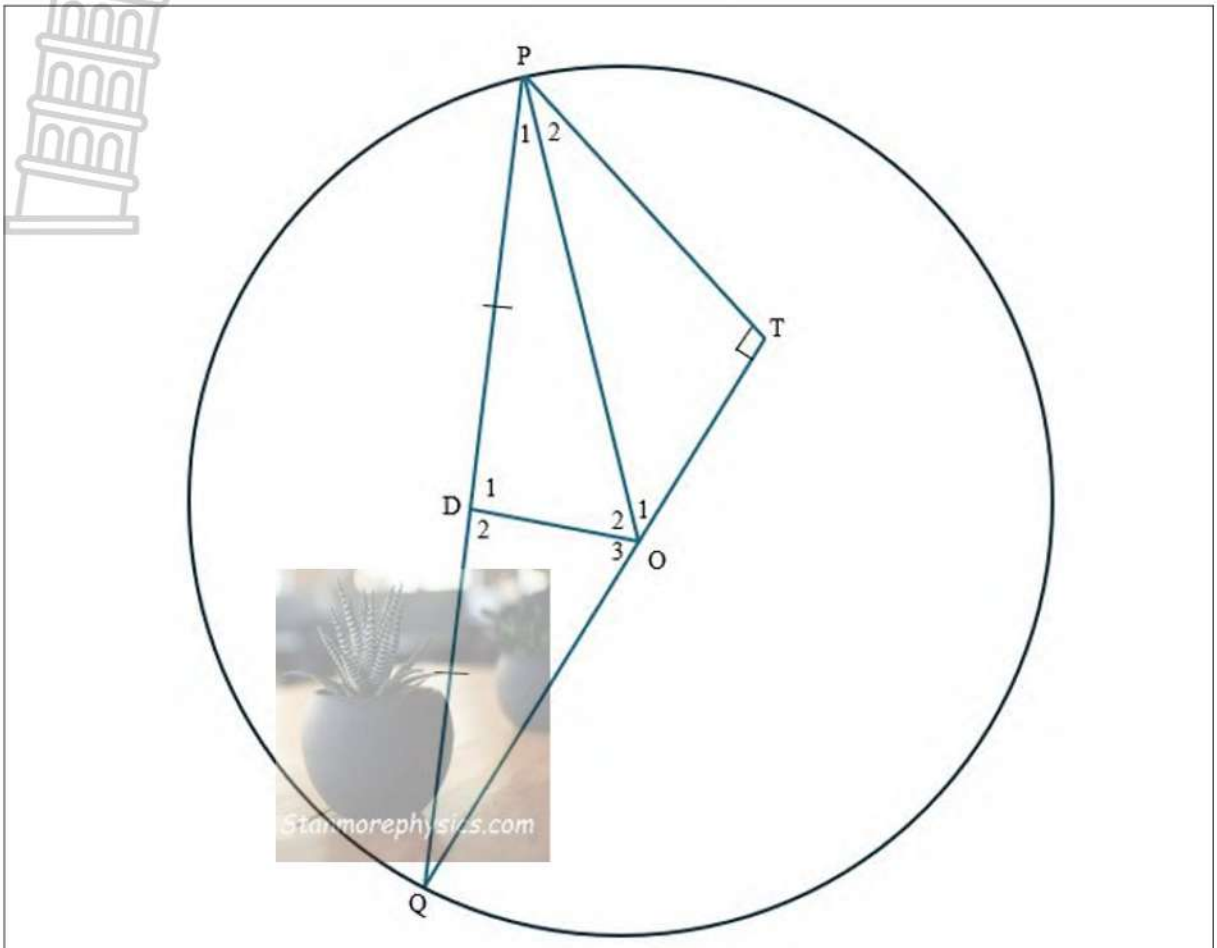
9.1	$A\hat{D}L=90°$ angles in semi-circle/*hoek in halwe − sirkel* $A\hat{C}B = 90°$ anglesinsemi-circle/*hoek in halwe − sirkel* DL ∥ CB corres $\angle's$ equal/ *ooreenst* $\angle'e$ *gelyk*	✓S✓R ✓S/R ✓R (4)

9.2	LC = LA radii of large circle / *radii van groot sirkel*
	SD = SL = SA radii of small circle / *radii van klein sirkel*
	LA = SA + SL
	∴ LC = 2SD
	
	OR/*OF*
	
	AD = DC converse of midpoint DL // BC/ *omgekeerde van middelpunt stelling DL // BC*
	In ΔACL
	DS//CL midpoint theorem/*middelpunt stelling*
	∴ LC = 2SD midpoint theorem/*middelpunt stelling*
	
	OR/*OF*
	
	AD = DC LD ⊥ AC
	AS = SL radii
	SD // LC midpoint theorem/ *middelpunt stelling*
	SD = $\frac{1}{2}$ LC midpoint theorem/ *middelpunt stelling*
	LC = 2SD
		✓S/R
		✓S/R
		✓S (3)
		
		✓S/R
		
		✓**S**/R
		✓R (3)
		
		✓S/R
		
		✓S/R
		✓R (3)

9.3	AS = SL and AL = LB radii/*radii* $\therefore \frac{SL}{LB} = \frac{1}{4}$	✓S/R ✓answer/*antwoord* (2)
9.4	LB = 15 units radius/*radius* $\frac{9}{16} = \frac{LM}{15}$ prop theorem lines // ; *eweredigheidstelling lyne //* LM= 8,44 units	✓S ✓S/R ✓answer/*antwoord* (3)
		[12]



QUESTION/*VRAAG* 10



10.1	DQ = DP given/ gegee OD ⊥ PQ line through centre to mid point of chord/ *lyn deur middelpunt van sirkel tot middelpunt van koord* $\hat{D}_1 + \hat{T} = 180°$ DOTP is a cyclc quad/*koordevierhoek* opposite angles are supplimentary/*teenoorgestelde hoeke is supplementêr* $\hat{O}_3 = Q\hat{P}T$ exterior angle of cyclic quad/*buitehoek van koordevierhoek*	✓S/R ✓S ✓S/R ✓S ✓R (5)
10.2	In ΔOPD and ΔPQT $\hat{D}_1 = \hat{T} = 90°$ Proved in (9.1)/*bewys in (9.1)* OP=OQ radii/*radii* $\hat{P}_1 = \hat{Q}$ angles opposite equal sides/ *hoeke teenoor gelyke sye* $O_2 = QPT$ sum of int. ∠'*s* of Δ/ *som van binne hoeke van* Δ ΔOPD/// ΔPQT[∠∠∠]	✓S/R ✓S/R ✓S/R ✓ R (4)

10.3	$\frac{OP}{PQ}=\frac{PD}{QT}=\frac{OD}{PT}$ $\Delta OPD /// \Delta PQT$ $OP.QT = PQ.PD$ $PD = DQ$ (proved) /(*bewys*) $PQ = 2PD$ $OQ.QT = 2PD.PD$ $= 2PD^2$	✓S ✓ S ✓ S ✓ S ✓ S ✓ S (6)
		[15]

TOTAL/*TOTAAL: 150*



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