



education

Department of
Education
FREE STATE PROVINCE

**PREPARATORY EXAMINATION/
*VOORBEREIDENDE EKSAMEN***

GRADE/*GRAAD* 12

**MATHEMATICS P2/
*WISKUNDE V2***

SEPTEMBER 2025

MARKS/*PUNTE*: 150

**MARKING GUIDELINES/
*NASIENRIGLYNE***

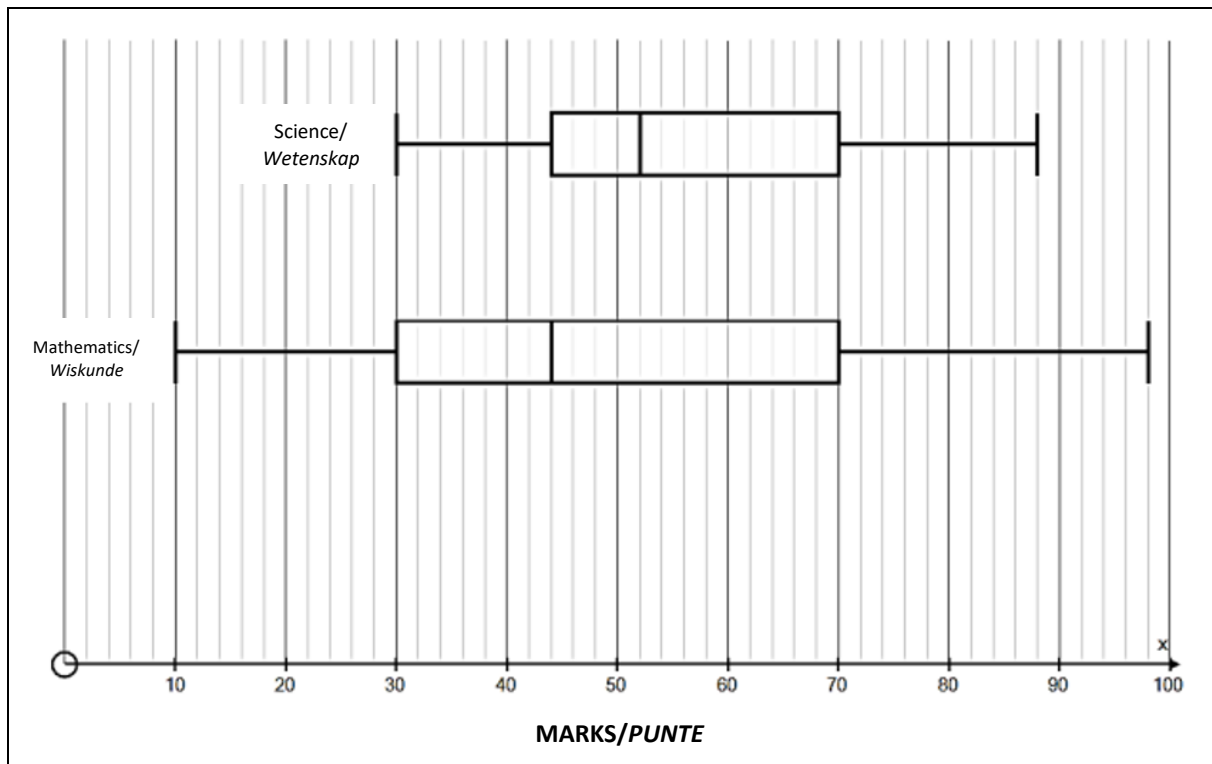
**These marking guidelines consist of 21 pages.
*Hierdie nasienriglyne bestaan uit 21 bladsye.***

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 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.*

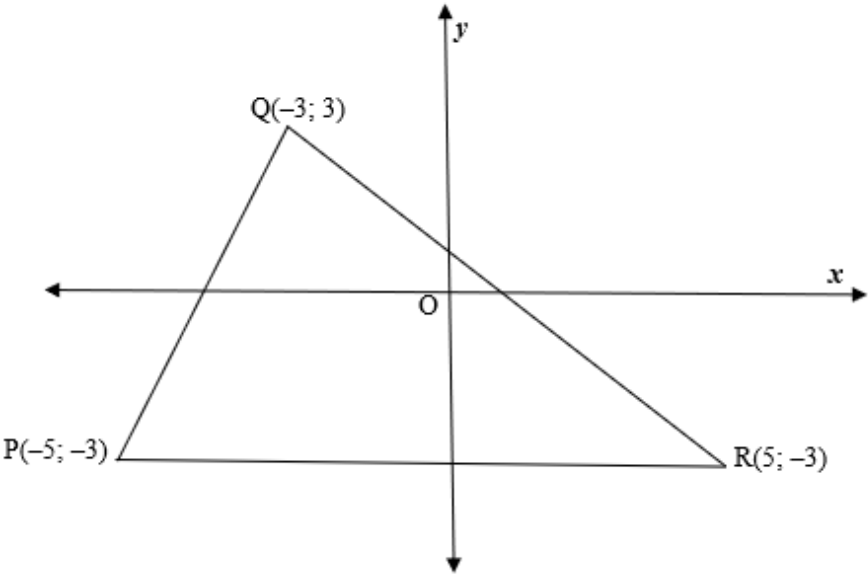
QUESTION/VRAAG 1

1.1	Range/Omvang : Highest – Lowest/Hoogste – Laagste = 98 – 10 = 88	✓ substitution/vervanging ✓ answer/antwoord (2)
1.2	Median/Mediaan = 52	✓ answer/antwoord (1)
1.3	IQR/IKV = $Q_3 - Q_1$ = 70 – 44 = 26	✓ substitution/vervanging ✓ answer/antwoord (2)
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)
1.6	25% or/of 0,25	✓ answer/antwoord (1)
		[10]

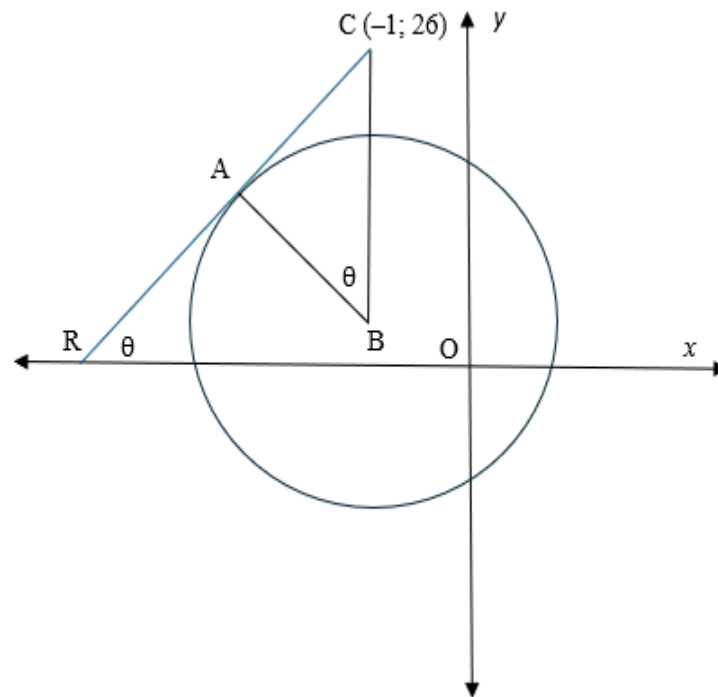
QUESTION/VRAAG 2

2.1	Yes. It would strengthen the correlation coefficient/ <i>Ja. Dit sal die korrelasie koëffisient versterk</i>	✓ answer/antwoord (1)
2.2	Closer to negative one as the gradient is negative or the relationship is indirect./ <i>Nader na negatief een, want die gradiënt is negatief of die verwantskap is omgekeerd</i>	✓ answer/antwoord ✓ reason/rede (2)
2.3	No/Nee. The correlation is not equal to -1 ./ <i>Die korrelasie is nie gelyk aan -1 nie.</i>	✓ 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./ <i>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.</i>	✓✓ reason/rede (2)
		[7]

QUESTION/VRAAG 3

		
3.1	$QR = \sqrt{((5 - (-3)))^2 + (-3 - 3)^2}$ $= \sqrt{64 + 36}$ $= \sqrt{100}$ $= 10 \text{ units}$	✓ substitution/vervanging ✓ answer/antwoord (2)
3.2	$M = \left(\frac{-3 + 5}{2}; \frac{3 + (-3)}{2} \right)$ $= (1; 0)$	✓ x value/-waarde ✓ y value/-waarde (2)
3.3	$m_{pm} = \frac{-3 - 0}{-5 - 1}$ $= \frac{-3}{-6}$ $= \frac{1}{2}$ $y - 0 = \frac{1}{2}(x - 1) \quad \text{or} \quad y + 3 = \frac{1}{2}(x + 5)$ $y = \frac{1}{2}x - \frac{1}{2} \quad \quad \quad y = \frac{1}{2}x - \frac{1}{2}$	✓ substitution/vervanging ✓ $m = \frac{1}{2}$ ✓ substitution/vervanging (1 ; 0) or/of (-5 ; -3) ✓ equation/vergelyking (4)

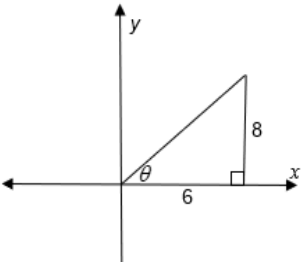
3.4	Centre (1 ; 0) $(x-1)^2 + (y-0)^2 = r^2 \quad \text{sub } (5;-3) \quad \text{or/of } (-3;3)$ $(5-1)^2 + (-3-0)^2 = r^2 \quad \text{or/of } (-3-1)^2 + (3-0)^2 = r^2$ $16+9 = r^2 \quad 16+9 = r^2$ $r^2 = 25 \quad r^2 = 25$ $(x-1)^2 + (y-0)^2 = 25 \quad (x-1)^2 + (y-0)^2 = 25$	✓ $(x-1)^2 + (y-0)^2 = r^2$ ✓ sub (5;-3) or/of (-3;3) ✓equation/vergeliking (3)
3.5	$MP = \sqrt{(-5-1)^2 + (-3-0)^2}$ $= \sqrt{36+9}$ $= \sqrt{45}$ $= 6,7$ radius < 6,7 ∴ P lies outside circle	✓substitution/vervanging ✓answer/antwoord ✓conclusion/gevolgtrekking (3)
3.6	$\frac{x+(-5)}{2} = 1 \quad \frac{y+(-3)}{2} = 0$ $x-5 = 2 \quad y-3 = 0$ $x = 7 \quad y = 3$ S(7 : 3) ANSWER ONLY FULL MARKS/ SLEGS ANTWOORD VOLPUNTE	✓x value/-waarde ✓y value/-waarde (2)
3.7	$m_{QP} = \frac{-3-3}{-5-(-3)}$ $= 3$ $\tan \theta = 3$ $\theta = 71,57^\circ$ $QPR = \theta = 71,57^\circ$ corres $\angle$'s/ooreenkom$\angle$'e $PR \parallel x$-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]

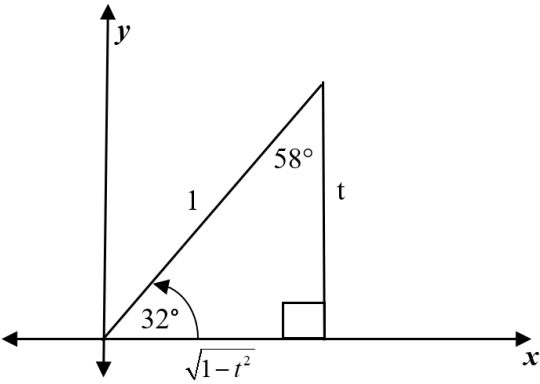
QUESTION/VRAAG 4

4.1	$CB = 25 \quad CA = 20$ $AB = \sqrt{(25)^2 - (20)^2}$ $= \sqrt{225}$ $= 15$ $\therefore \text{radius} = 15 \text{ units / eenhede}$	✓ 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	$m = \tan \theta = \frac{20}{15} = \frac{4}{3} \text{ sub } (-1; 26)$ $y - 26 = \frac{4}{3}(x + 1)$ $y = \frac{4}{3}x + 27\frac{1}{3}$	✓ value of $\tan \theta$ /waarde van $\tan \theta$ ✓ sub m and point/vervang m en punt ✓ equation/vergelyking (3)
4.4	$m_{\tan} = \frac{4}{3} \quad m_{\text{radius}} = \frac{-3}{4}$ $y - 1 = \frac{-3}{4}(x + 1)$ $y = \frac{-3}{4}x + \frac{1}{4}$	✓ value/waarde $m_{\tan}$ ✓ value/waarde m_{radius} ✓ substitution/vervanging of/van $(-1 ; 26)$ ✓ equation/vergelyking (4)

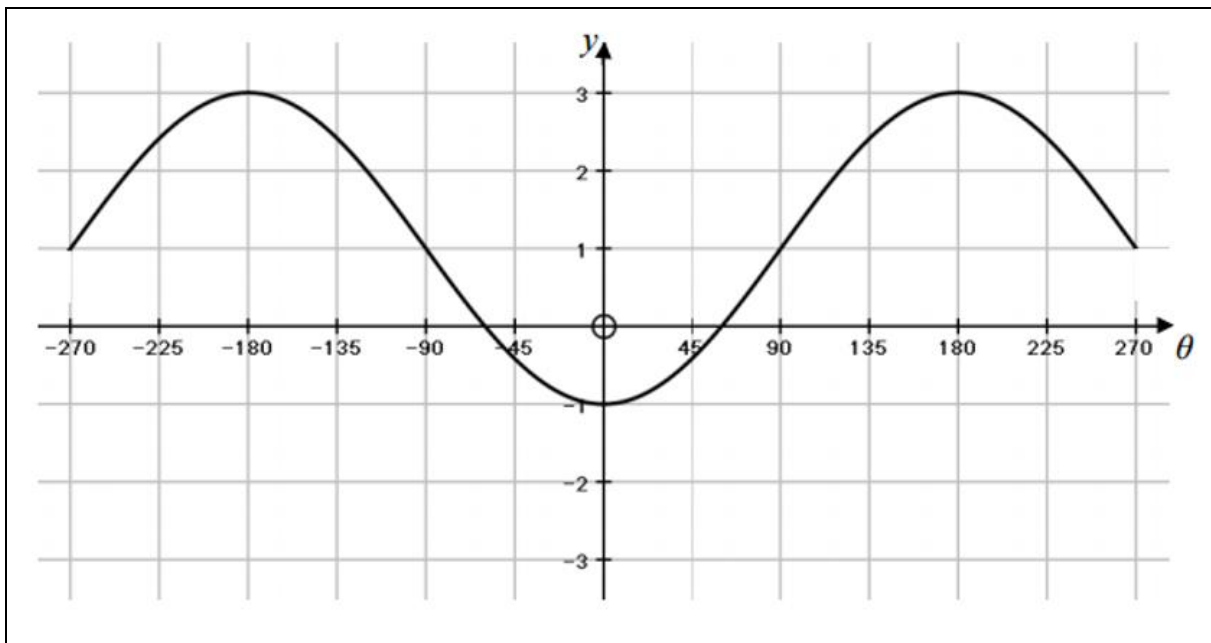
4.5	$\frac{4}{3}x + 27\frac{1}{3} = \frac{-3}{4}x + \frac{1}{4}$ $\frac{4}{3}x + \frac{3}{4}x = \frac{1}{4} - 27\frac{1}{3}$ $\frac{25}{12}x = -27,08333$ $x = -13$ $y = 10$ $A(-13;10)$	✓ equating/gelykstel ✓ simplification/vereenvoudiging ✓ value of x/waarde van x ✓ value of y/waarde van y (4) [17]
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QUESTION/VRAAG 5

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

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 $= \frac{\sin 2A}{\cos 2A} \times \frac{\cos A}{\sin A}$ $= \frac{2 \sin A \cos A \cdot \cos A}{\sin A \cdot 2 \cos^2 A - 1}$ $= \frac{2 \cos^2 A}{2 \cos^2 A - 1}$ LHS=RHS/ LK = RK	✓✓ double angle in both numerator and denominator/dubbelehoek in beide noemer en teller ✓ simplification/vereenvoudiging ✓ $\frac{\sin 2A}{\cos 2A} \times \frac{\cos A}{\sin A}$ ✓✓ double angle in both numerator and denominator/dubbelehoek in beide noemer en teller ✓ simplification/vereenvoudiging (7)
5.4	 $\cos 2(16^\circ) = 1 - 2 \sin^2 16^\circ$ $2 \sin^2 16^\circ = 1 - \cos 2(16^\circ)$ $\sin 16^\circ = \sqrt{\frac{1 - \cos 2(16^\circ)}{2}}$ $\sin 16^\circ = \sqrt{\frac{1 - \sqrt{1 - t^2}}{2}}$	✓ $\cos 2(16^\circ) = 1 - 2 \sin^2 16^\circ$ ✓ $\sin 16^\circ = \sqrt{\frac{1 - \cos 2(16^\circ)}{2}}$ ✓ $\sin 16^\circ = \sqrt{\frac{1 - \sqrt{1 - t^2}}{2}}$ (3)

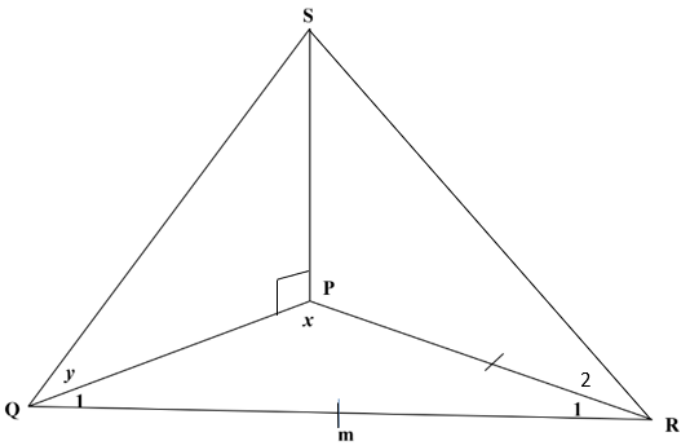
5.5.1	$\cos(x+y) - \cos(x-y)$ $= (\cos x \cos y - \sin x \sin y) - (\cos x \cos y + \sin x \sin y)$ $= \cos x \cos y - \sin x \sin y - \cos x \cos y - \sin x \sin y$ $= -2 \sin x \sin y$	✓ expansion of both compound angles/ <i>uitbreiding van beide saamgestelde hoeke</i> ✓ $\cos x \cos y - \sin x \sin y$ ✓ $-\cos x \cos y - \sin x \sin y$ (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

6.1	Amplitude/ <i>Amplitude</i> = 2	✓ answer/ <i>antwoord</i> (1)
6.2	Range of f / <i>Waardeversameling van f</i> : $y \in [-1; 3]$	✓ answer/ <i>antwoord</i> (1)
6.3	$p = -2$ and/en $q = 1$	✓ value of p / <i>waarde van p</i> ✓ value of q / <i>waarde van q</i> (2)
6.4		✓ asymptotes/ <i>asimptote</i> ✓ shape/ <i>vorm</i> ✓ intercepts/ <i>afsnitte</i> (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]
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QUESTION/VRAAG 7

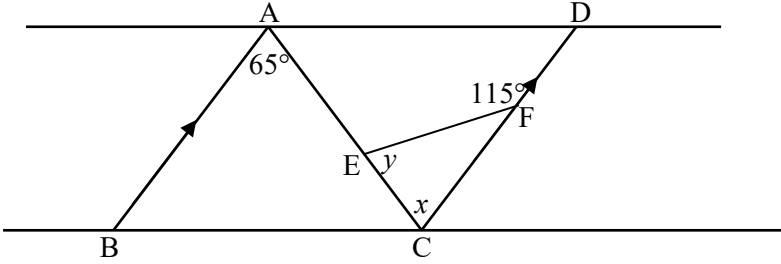
7.1	 $R = 180^\circ - 2x$ interior angles of Δ $\text{Area } \Delta PQR = \frac{1}{2} QR \cdot PR \cdot \sin R$ $= \frac{1}{2} m \cdot m \cdot \sin(180^\circ - 2x)$ $= \frac{1}{2} m^2 \sin 2x$ $= \frac{1}{2} m^2 2 \sin x \cos x$ $= m^2 \sin x \cos x$	✓ $R = 180^\circ - 2x$ ✓ substitution/vervanging ✓ simplify/vereenvoudig ✓ double angle/dubbelhoek ✓ simplify/vereenvoudig (5)
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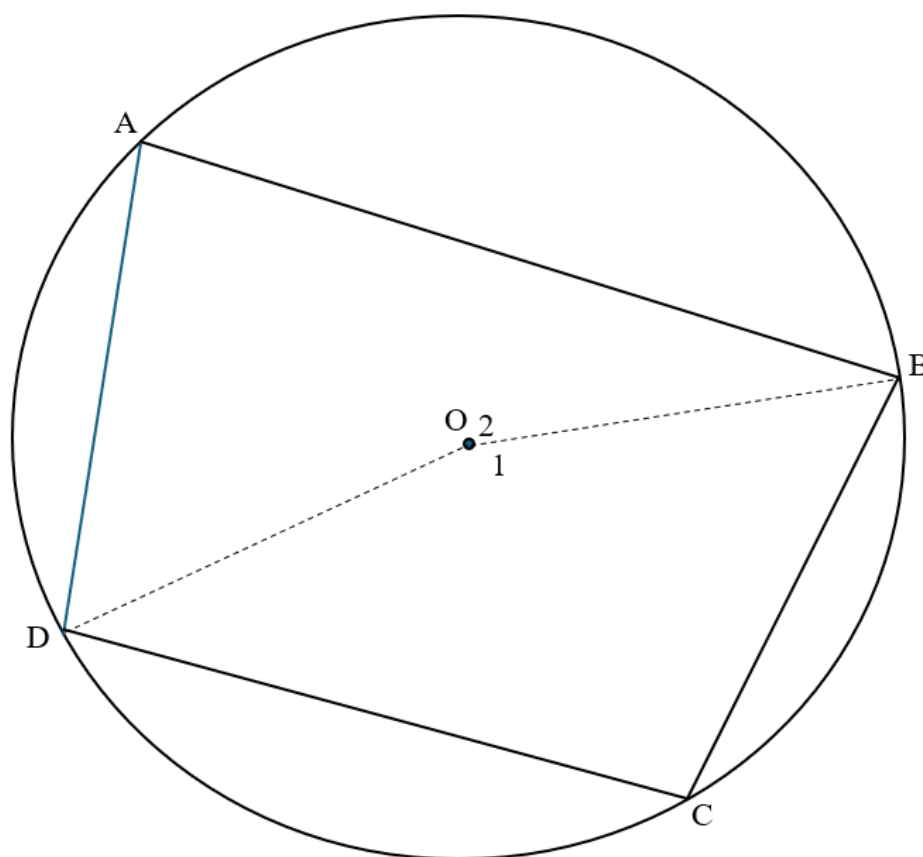
7.2	$PQ = \sqrt{PR^2 + RQ^2 - 2PR.RQ \cos(180^\circ - 2x)}$ $= \sqrt{m^2 + m^2 + 2m.m \cos 2x}$ $= \sqrt{2m^2 (1 + \cos 2x)}$ $= \sqrt{2m^2 (1 + 2 \cos^2 x - 1)}$ $= \sqrt{4m^2 \cos^2 x}$ $= 2m \cos x$	✓ substitution/vervanging ✓ factorise/faktoriseer ✓ double angle/dubbelhoek ✓ simplify/vereenvoudig (4)
7.3	$\tan y = \frac{SP}{PQ}$ $SP = PQ \cdot \tan y$ $= 2m \cos x \tan y$	✓ trig ratio/trig verhouding ✓ $SP = PQ \cdot \tan y$ (2)
		[11]

GEOMETRY/MEETKUNDE

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

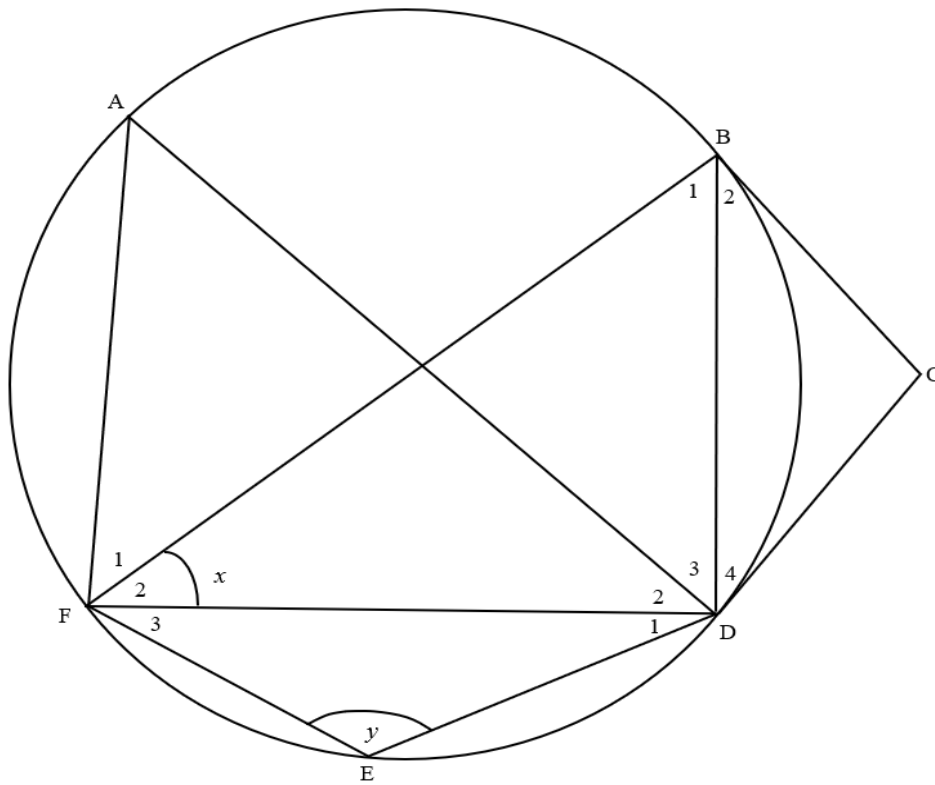
*Lees asseblief sorgvuldig deur die volgende tabel alvorens **VRAAG 8–10** nagesien word.*

	The order in which the candidate answers a geometry question must follow logically/<i>Die volgorde waarin 'n kandidaat 'n meetkundevraag beantwoord moet logies volg.</i> Example/Voorbeeld Given/Gegee $AB \parallel CD$ and/en $\widehat{EFD} = 115^\circ$  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

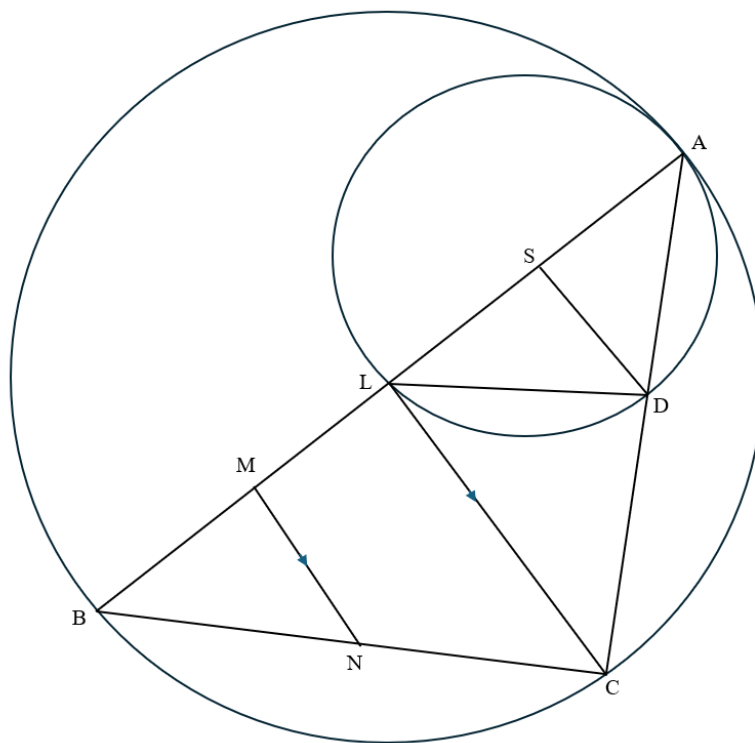
8.1	Construction/Konstruksie: Join DO and BO /Verbind DO en BO.	✓ constr./ konstr.
	$O_1 = 2A$ angle at centre 2x angle at circum/ <i>middelpunts hoek 2x omtreks</i> $\angle$	✓ S/R
	$O_2 = 2C$ angle at centre 2x angle at circum/ <i>middelpunts hoek 2x omtreks</i> $\angle$	✓ S/R
	$O_1 + O_2 = 360^\circ$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

8.2



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

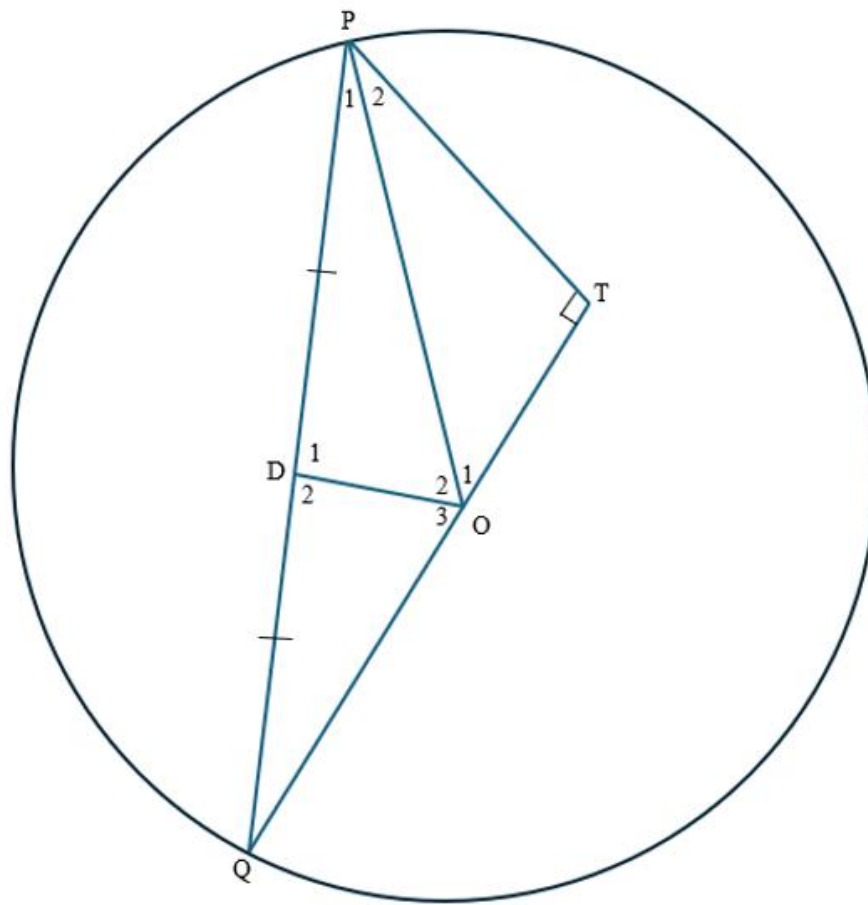
QUESTION/VRAAG 9



9.1	$\widehat{ADL} = 90^\circ$ angles in semi-circle / <i>hoek in halwe – sirkel</i> $\widehat{ACB} = 90^\circ$ angles in semi-circle / <i>hoek in halwe – sirkel</i> $DL \parallel CB$ corres $\angle$'s equal / <i>ooreenst $\angle$'e gelyk</i>	$\checkmark$ S $\checkmark$ R $\checkmark$ S/R $\checkmark$ R	(4)
9.2	$LC = LA$ radii of large circle / <i>radii van groot sirkel</i> $SD = SL = SA$ radii of small circle / <i>radii van klein sirkel</i> $LA = SA + SL$ $\therefore LC = 2SD$ OR/OF $AD = DC$ converse of midpoint $DL \parallel BC$ / <i>omgekeerde van middelpunt stelling</i> $DL \parallel BC$ In $\triangle ACL$ $DS \parallel CL$ midpoint theorem / <i>middelpunt stelling</i> $\therefore LC = 2SD$ midpoint theorem / <i>middelpunt stelling</i> OR/OF $AD = DC$ $LD \perp AC$ $AS = SL$ radii $SD \parallel LC$ midpoint theorem / <i>middelpunt stelling</i> $SD = \frac{1}{2} LC$ midpoint theorem / <i>middelpunt stelling</i> $LC = 2SD$	$\checkmark$ S/R $\checkmark$ S/R $\checkmark$ S $\checkmark$ S/R $\checkmark$ S/R $\checkmark$ R $\checkmark$ S/R $\checkmark$ S/R $\checkmark$ R	(3) (3) (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/ eweredigheidstelling LM = 8,44 units	✓S ✓S/R ✓answer/antwoord (3)
		[12]

QUESTION/VRAAG 10



10.1	$DQ = DP$ given/ gegee $OD \perp PQ$ line through centre to mid point of chord/ lyn deur middelpunt van sirkel tot middelpunt van koord $\hat{D}_1 + \hat{T} = 180^\circ$ DOTP is a cyclic quad/koordevierhoek opposite angles are supplementary/teenoorgestelde hoeke is supplementêr $\hat{O}_3 = \hat{QPT}$ exterior angle of cyclic quad/buitehoek van koordevierhoek	✓S/R ✓S ✓S ✓R ✓S ✓R (5)
10.2	In $\triangle OPD$ and $\triangle PQT$ $\hat{D}_1 = \hat{T} = 90^\circ$ 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 $O_2 = \hat{QPT}$ sum of int. $\angle$'s of Δ / som van binne hoeke van Δ $\triangle OPD \equiv \triangle PQT$ [AAS]	✓S/R ✓S/R ✓S/R ✓R (4)

10.3	$\frac{OP}{PQ} = \frac{PD}{QT} = \frac{OD}{PT}$ $\Delta OPD \sim \Delta PQT$ $OP \cdot QT = PQ \cdot PD$ $PD = DQ$ (proved) / (<i>bewys</i>) $PQ = 2PD$ $OQ \cdot QT = 2PD \cdot PD$ $\quad = 2PD^2$	✓ S/R ✓ S ✓ S ✓ S ✓ S (6)
		[15]

TOTAL/TOTAAL: 150