education

Department of
Education
FREE STATE PROVINCE

PREPARATORY EXAMINATION

GRADE 12

MATHEMATICS P2

TIME: 3 HOURS

SEPTEMBER 2025

MATHEMATICS P2

N2612B

MARKS: 150

X05

N4

This question paper consists of 13 pages, 1 information sheet and an answer book of 24 pages.

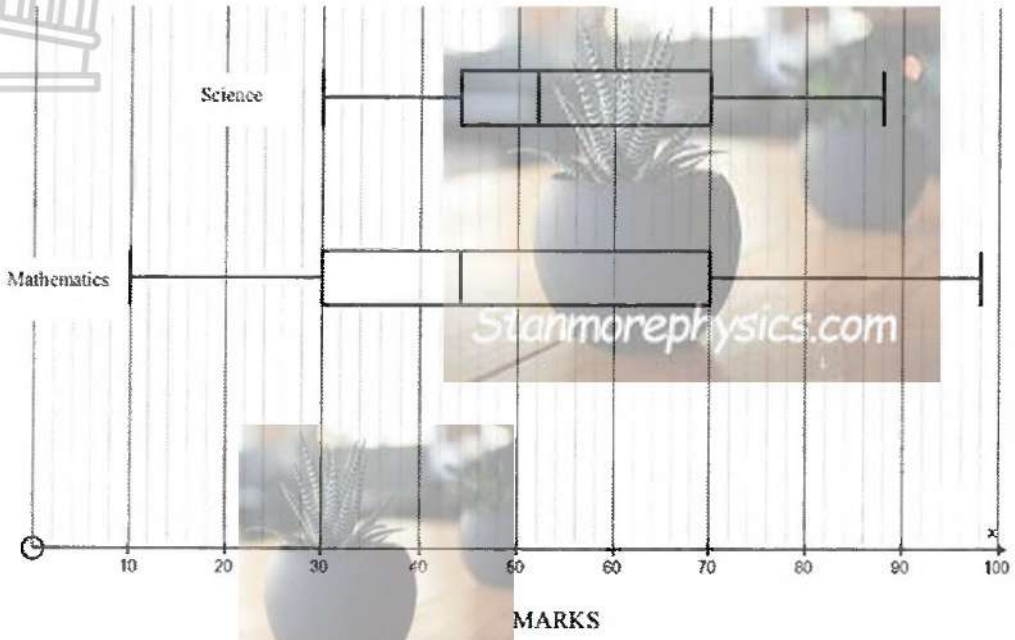
INSTRUCTIONS AND INFORMATION

Read the following instructions carefully before answering the questions.

1. This question paper consists of 10 questions.
2. Answer ALL the questions in the SPECIAL ANSWER BOOK provided.
3. Clearly show ALL calculations, diagrams, graphs, etc., which you have used in determining your answers.
4. Answers only will NOT necessarily be awarded full marks.
5. You may use an approved scientific calculator (non-programmable and non-graphical), unless stated otherwise.
6. If necessary, round off answers to TWO decimal places unless stated otherwise.
7. Diagrams are NOT necessarily drawn to scale.
8. Number the answers correctly according to the numbering system used in this question paper.
9. An information sheet with formulae is included at the end of the question paper.
10. Write neatly and legibly.

QUESTION 1

The box and whisker diagrams below show the distribution of test scores obtained by a sample of students in Mathematics and Science.



Use the diagram to determine the following:

1.1 The range for Mathematics. (2)

1.2 The median for Science. (1)

1.3 The interquartile range for Science. (2)

1.4 Which examination was easier for the students? Motivate your answer. (2)

1.5 Which examination has a weaker spread of scores? Justify by giving TWO reasons. (2)

1.6 If a learner from the Science sample is selected randomly, find the probability that the learner achieved a mark greater than 70%. (1)
[10]

QUESTION 2

Refer to the statements below and answer the questions that follow:

- A least squares regression line (a line of best fit) has an equation of $y = 49 - 3x$
- There is one outlier that has been identified as (9 ; 4)
- The correlation coefficient is very strong

2.1 If the outlier was removed, would the correlation coefficient be stronger? (Explain your answer.) (1)

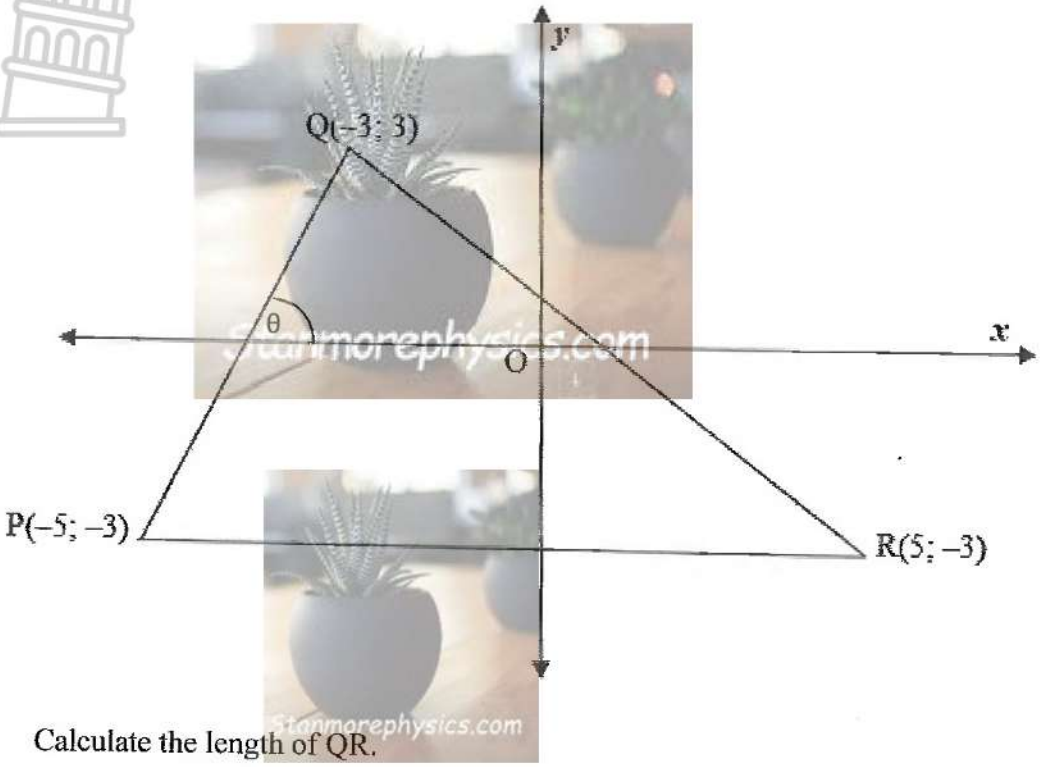
2.2 Is the correlation coefficient closer to one or negative one? (Explain your answer.) (2)

2.3 If a line of best fit is used, would it be perfectly accurate? (Explain your answer.) (2)

2.4 An individual predicts that if x has a value of 30, y will have a value of –41. However, his friend explains that he is extrapolating and that his result is inaccurate. Explain what his friend is referring to. (2)
[7]

QUESTION 3

In the diagram below, PQR is a triangle with vertices P(–5; –3), Q(–3; 3) and R(5; –3)



3.1 Calculate the length of QR. (2)

3.2 Determine M, the midpoint of QR. (2)

3.3 Determine the equation of the line passing through P and M. (4)

3.4 Determine the equation of a circle that has QR as a diameter. (3)

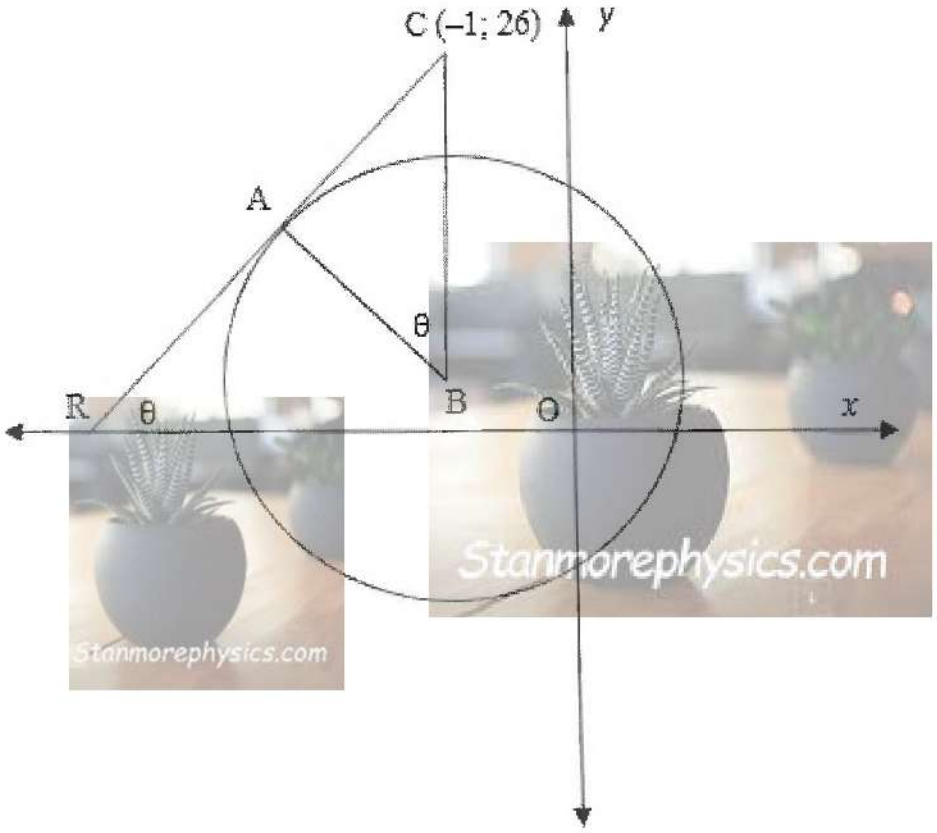
3.5 Does point P lie inside or outside the circle in QUESTION 3.4?
Motivate your answer with relevant calculations. (3)

3.6 Determine the coordinates of S, if PQRS is a parallelogram, with S in the first quadrant. (2)

3.7 Calculate the size of $Q\widehat{P}R$. (4)
[20]

QUESTION 4

In the diagram B(–1; 1) is the centre of the circle. CA is a tangent at A.
C is the point (–1; 26), $C\hat{B}A = A\hat{R}O = \theta$ and CA = 20 units.



Calculate the following:

4.1 The length of the radius of the circle. (4)

4.2 The equation of the circle. (2)

4.3 The equation of the tangent CR. (3)

4.4 The equation of the radius AB. (4)

4.5 The coordinates of A. (4)
[17]

QUESTION 5

5.1 Solve:

5.1.1 If $\tan\theta = \frac{8}{6}$ and $0° < \theta < 90°$ show that

$10\sin(\theta + x) = 6\sin x + 8\cos x$ (4)

5.1.2 Hence, solve the following equation:

$6\sin x + 8\cos x = 9$ for $x \in [0°; 360°]$ (6)

5.2 Simplify:

$$\frac{\cos(90° + x).\cos(x - 180°).\tan(360° + x)}{\cos 240°.\tan 225°}$$ (7)

5.3 Prove the identity:

$$\frac{1 + \cos 2A}{\cos 2A} = \frac{\tan 2A}{\tan A}$$ (7)

5.4 If $\sin 32° = t$ determine $\sin 16°$ in terms of t. (3)

5.5 Given: $\cos(x + y) - \cos(x - y) = -2\sin x \sin y$

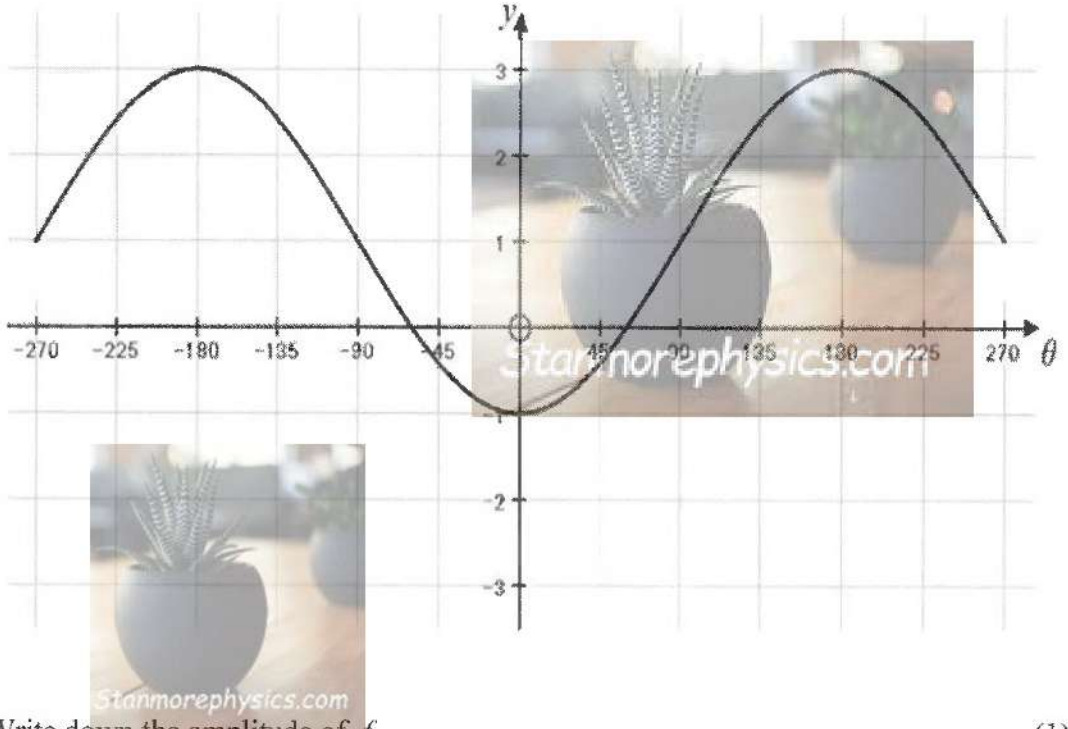
5.5.1 Prove the above identity (3)

5.5.2 Hence deduce that $\cos A - \cos B = -2\sin\frac{A+B}{2}\sin\frac{A-B}{2}$ (2)

[32]

QUESTION 6

In the diagram below, the graph of $f(\theta) = p\cos\theta + q$ is sketched for $-270° \leq \theta \leq 270°$



6.1 Write down the amplitude of f. (1)

6.2 Write down the range of f. (1)

6.3 Write down the values of p and q. (2)

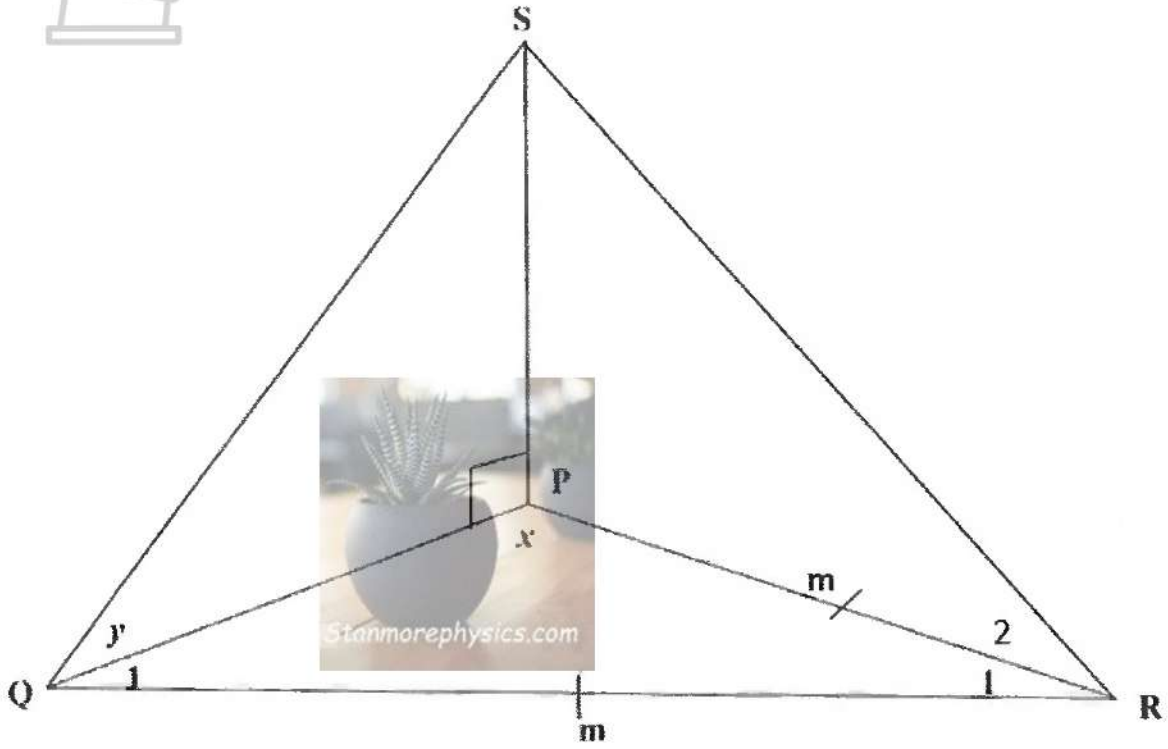
6.4 On the same set of axes, sketch the graph of $g(\theta) = -2\tan\theta$ for $\theta \in [-270°; 270°]$. (3)

6.5 Indicate on the graph using thickened lines the intervals on the horizontal θ axis, where $p\cos\theta + q \geq -2\tan\theta$ for $\theta \in [-270°; 270°]$. (3)

[10]

QUESTION 7

In the diagram, P, Q and R are three points on the same horizontal plane.
PR = QR = m, $\hat{QPR} = x$. SP is perpendicular to PQ. The angle of elevation of S from Q is y.



7.1 Express the area ΔPQR in terms of x and m. Leave your answer in simplified form. (5)

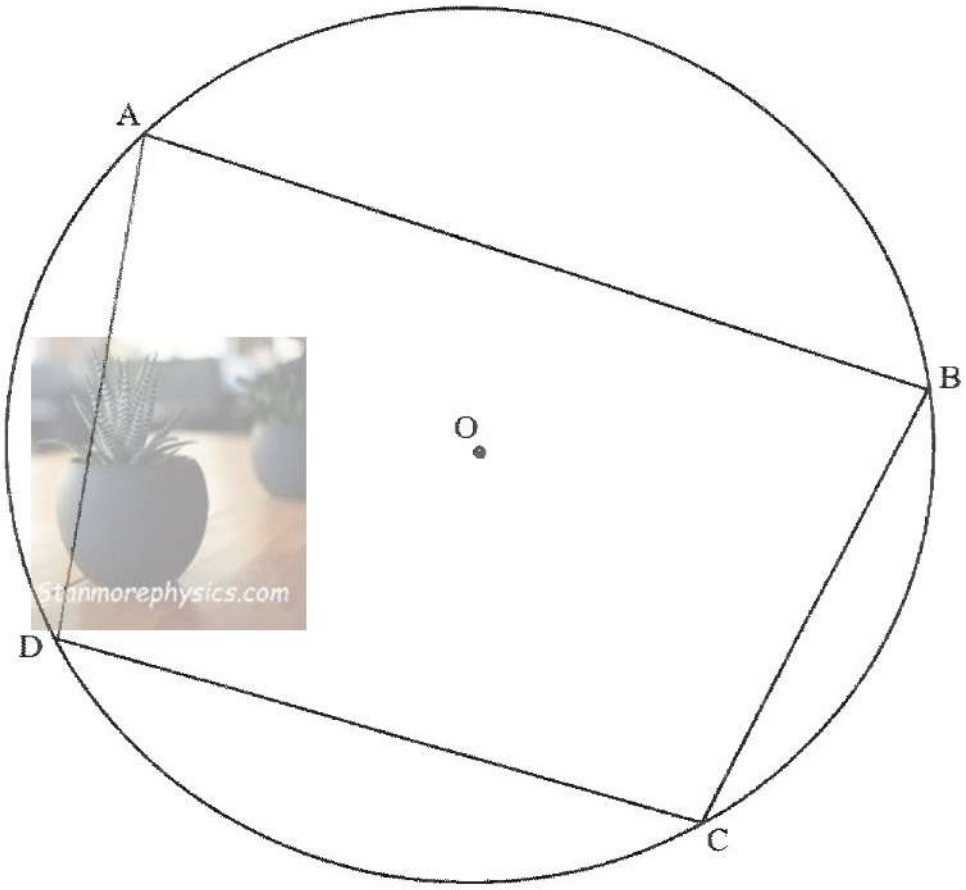
7.2 Show that PQ = $2m\cos x$ (4)

7.3 Hence, prove that SP = $2m\cos x \tan y$ (2)
[11]

Give reasons for your statements in QUESTIONS 8, 9 and 10.

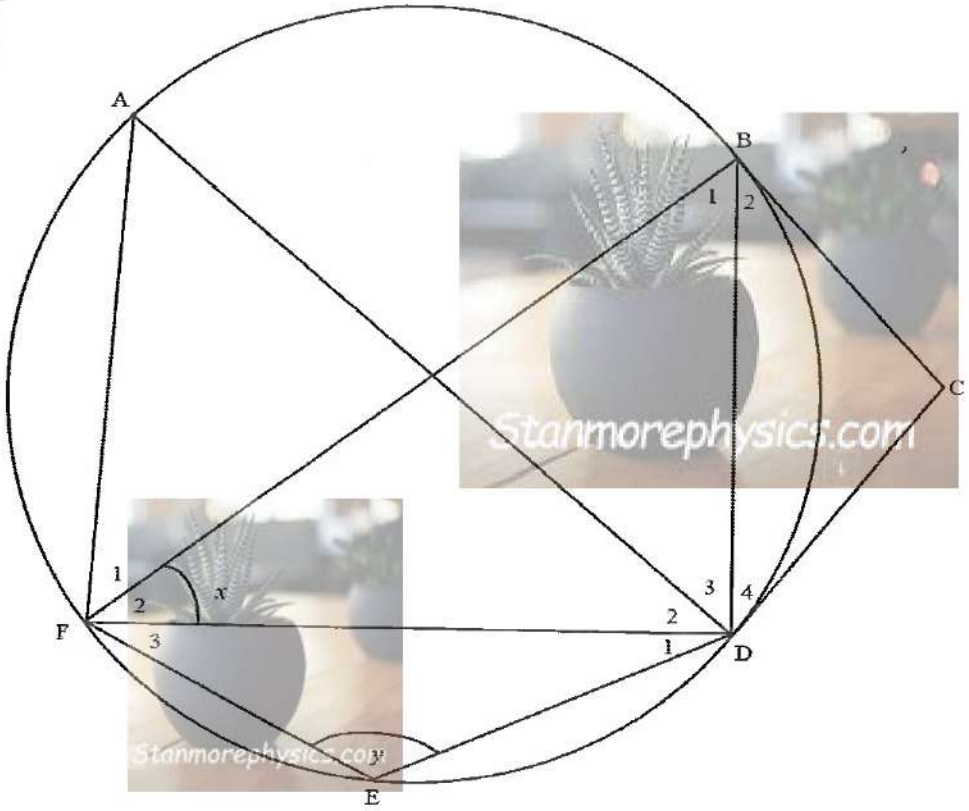
QUESTION 8

8.1 Given a circle with centre O. A, B, C, and D are points on the circle. Prove the theorem that states $\hat{A} + \hat{C} = 180°$



(6)

8.2 In the diagram below, a circle is drawn passing through A, B, D, E and F. The tangents at B and D meet at C. $B\hat{F}D = x$ and $\hat{E} = y$.



Express the following in terms of x and y, giving reasons:

8.2.1 $\hat{B}_2$ (2)

8.2.2 $\hat{D}_4$ (2)

8.2.3 $\hat{C}$ (2)

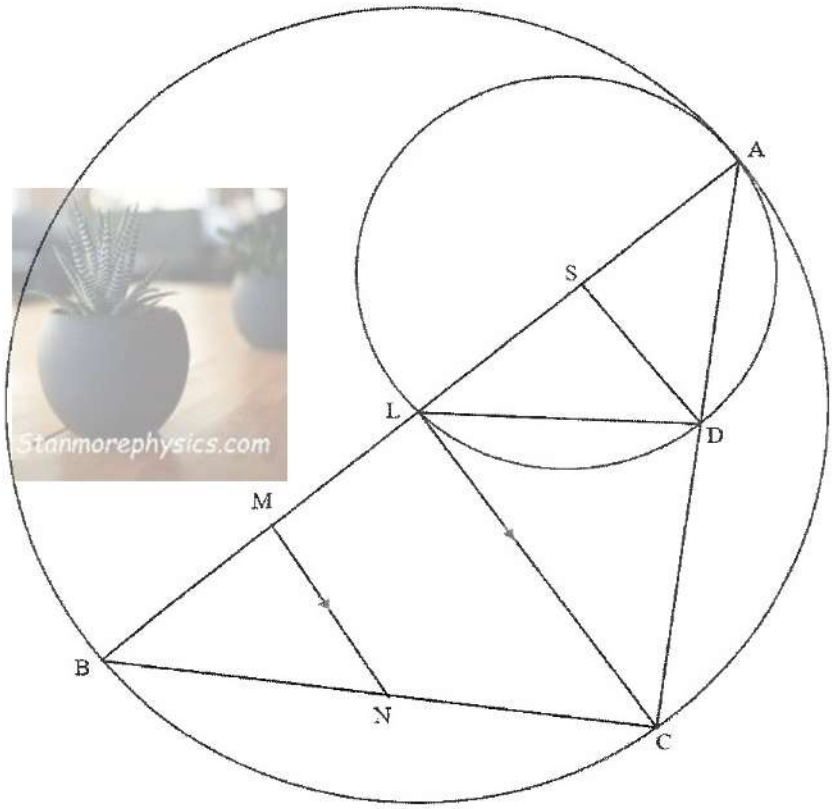
8.2.4 $\hat{A}$ (2)

8.2.5 $\hat{B}_1$ (2)
[16]

QUESTION 9

In the diagram below, two circles touch internally at A.

- AB is the diameter of the larger circle, and AL is the diameter of the smaller circle.
- S and L are the centres of the circles.
- D is the point on the smaller circle, and C is a point on the larger circle. ADC is a straight line.
- M is a point on LB such that MN ||LC.



9.1 Prove DL||CB. (4)

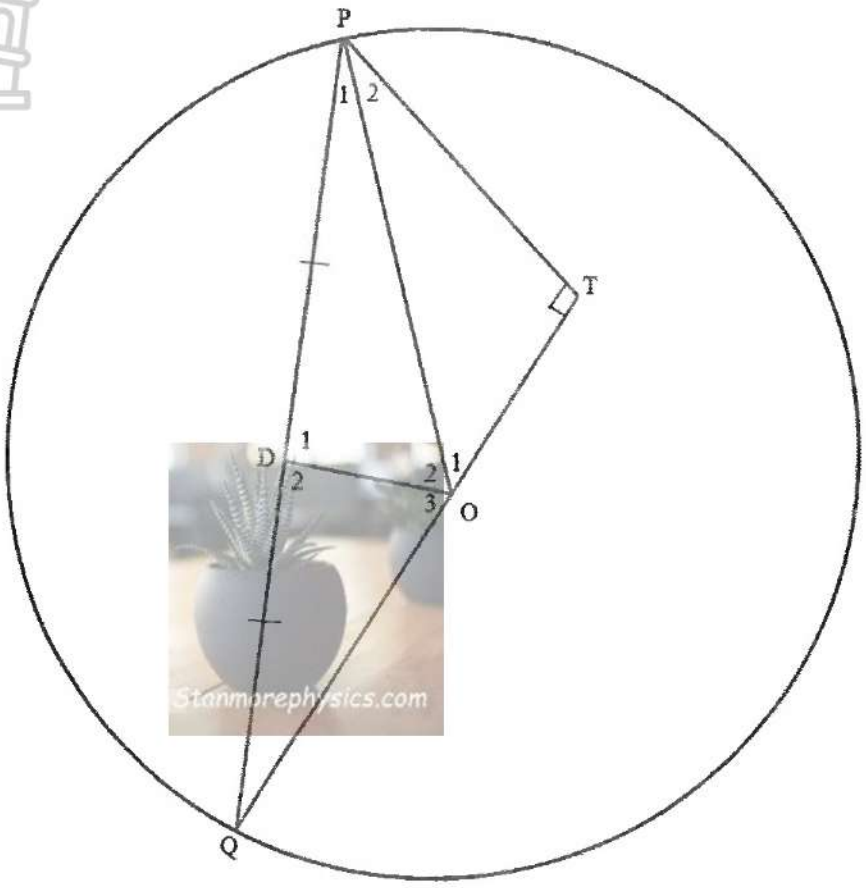
9.2 Prove that 2SD = LC (3)

9.3 Determine the value of $\frac{SL}{AB}$ (2)

9.4 Determine the length of LM, if AB is 30 units and $\frac{BN}{NC}=\frac{7}{9}$ (3)
[12]

QUESTION 10

In the diagram below Δ PQT is drawn. O is the centre of the circle, and OD bisects PQ. PT ⊥ QT.



Prove the following:

10.1 $\hat{O}_3 = Q\hat{P}T$ (5)

10.2 ΔOPD /// ΔPQT (4)

10.3 $OQ.QT = 2\ PD^2$ (6)
[15]

TOTAL: 150

INFORMATION SHEET:

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$A = P(1 + ni) \qquad A = P(1 - ni) \qquad A = P(1 - i)^n \qquad A = P(1 + i)^n$$

$$T_n = a + (n-1)d \qquad S_n = \frac{n}{2}[2a + (n-1)d]$$

$$T_n = ar^{n-1} \qquad S_n = \frac{a(r^n - 1)}{r - 1}; r \neq 1 \qquad S_\infty = \frac{a}{1 - r}; -1 < r < 1$$

$$F = \frac{x[(1+i)^n - 1]}{n} \qquad P = \frac{x[1 - (1+i)^{-n}]}{i}$$

$$f'(x) = \lim_{h \to 0} \frac{f(x+h) - f(x)}{h}$$

$$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2} \qquad M\left(\frac{x_1 + x_2}{2}; \frac{y_1 + y_2}{2}\right)$$

$$y = mx + c \qquad y - y_1 = m(x - x_1) \qquad m = \frac{y_2 - y_1}{x_2 - x_1} \qquad m = \tan\theta$$

$$(x - a)^2 + (y - b)^2 = r^2$$

In ΔABC: $\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$

$$a^2 = b^2 + c^2 - 2bc\cos A$$

$$\text{area } \Delta ABC = \frac{1}{2}ab.\sin C$$

$$\sin(\alpha + \beta) = \sin\alpha.\cos\beta + \cos\alpha.\sin\beta \qquad \sin(\alpha - \beta) = \sin\alpha.\cos\beta - \cos\alpha.\sin\beta$$

$$\cos(\alpha + \beta) = \cos\alpha.\cos\beta - \sin\alpha.\sin\beta \qquad \cos(\alpha - \beta) = \cos\alpha.\cos\beta + \sin\alpha.\sin\beta$$

$$\cos 2\alpha = \begin{cases} \cos^2\alpha - \sin^2\alpha \\ 1 - 2\sin^2\alpha \\ 2\cos^2\alpha - 1 \end{cases} \qquad \sin 2\alpha = 2\sin\alpha.\cos\alpha$$

$$\bar{x} = \frac{\sum x}{n} \qquad \sigma^2 = \frac{\sum_{i=1}^{n}(x_i - \bar{x})^2}{n}$$

$$P(A) = \frac{n(A)}{n(S)} \qquad P(A \text{ or } B) = P(A) + P(B) - P(A \text{ and } B)$$

$$\hat{y} = a + bx \qquad b = \frac{\sum(x - \bar{x})(y - \bar{y})}{\sum(x - \bar{x})^2}$$

education

Department of Education
FREE STATE PROVINCE

LEARNER NAME
LEERDER SE NAAM

MATHEMATICS P2/ *WISKUNDE V2*

GRADE/*GRAAD* 12

SEPTEMBER 2025

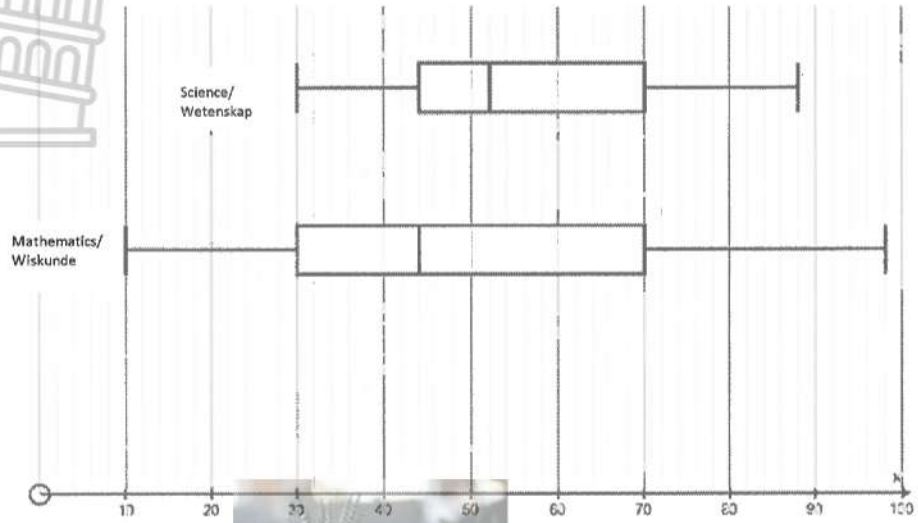
SPECIAL ANSWER BOOK/ *SPESIALE ANTWOORDBOEK*

Question/*Vraag*	Mark/*Punt*	Initial/*Paraaf*	Mod.
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
Total/*Totaal*			

This answer book consists of 24 pages.
Hierdie antwoordboek bestaan uit 24 bladsye.

Please turn over/*Blaai om asseblief*

QUESTION/*VRAAG* 1

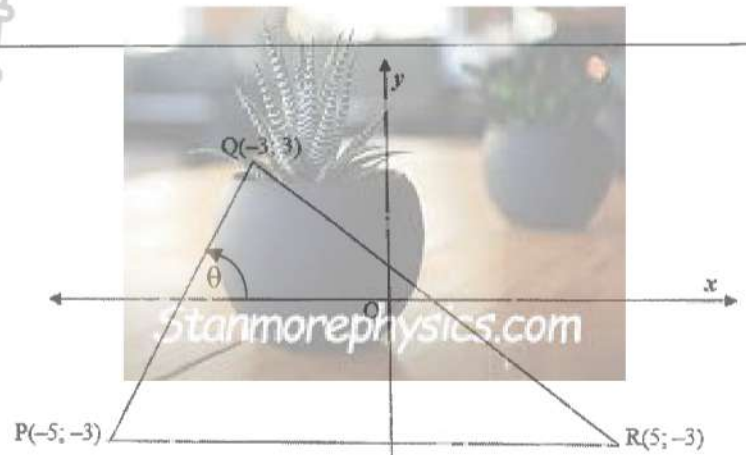
	Solution/*Oplossing*	Marks/ *Punte*
1.1		(2)
1.2		(1)
1.3		(2)
1.4		(2)
1.5		(2)

1.6		(1)
		[10]

QUESTION/*VRAAG* 2

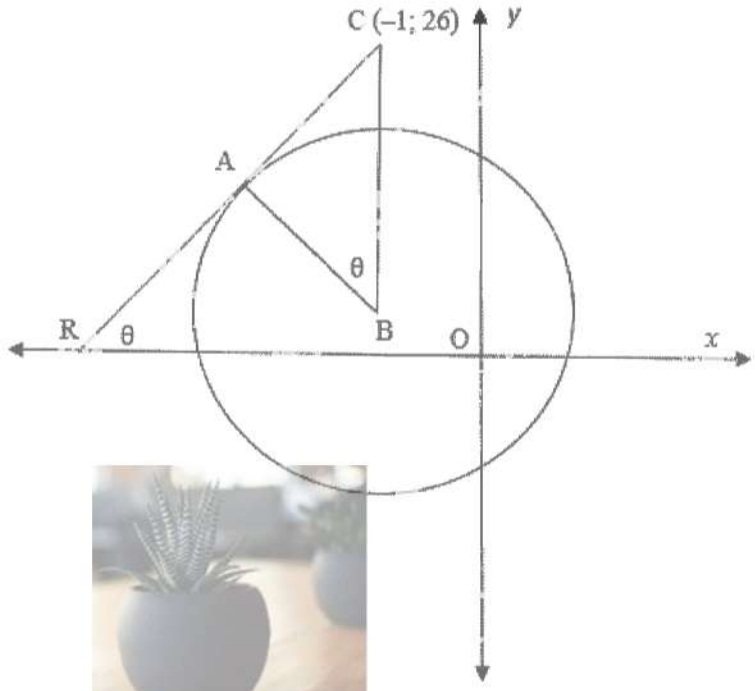
	Solution/*Oplossing*	**Marks/ *Punte***
2.1		(1)
2.2		(2)
2.3		(2)
2.4		(2)
		[7]

QUESTION/*VRAAG* 3

	Solution/*Oplossing*	**Marks/ *Punte***
3.1		(2)
3.2		(2)
3.3		(4)
3.4		(3)

3.5		(3)
3.6		(2)
3.7		(4)
		[20]

QUESTION/*VRAAG* 4

	Solution/*Oplossing*	**Marks/ *Punte***
	 	
4.1		(4)
4.2		(2)

	Solution/*Oplossing*	**Marks/ *Punte***
4.3		(3)
4.4		(4)
4.5		(4)
		[17]

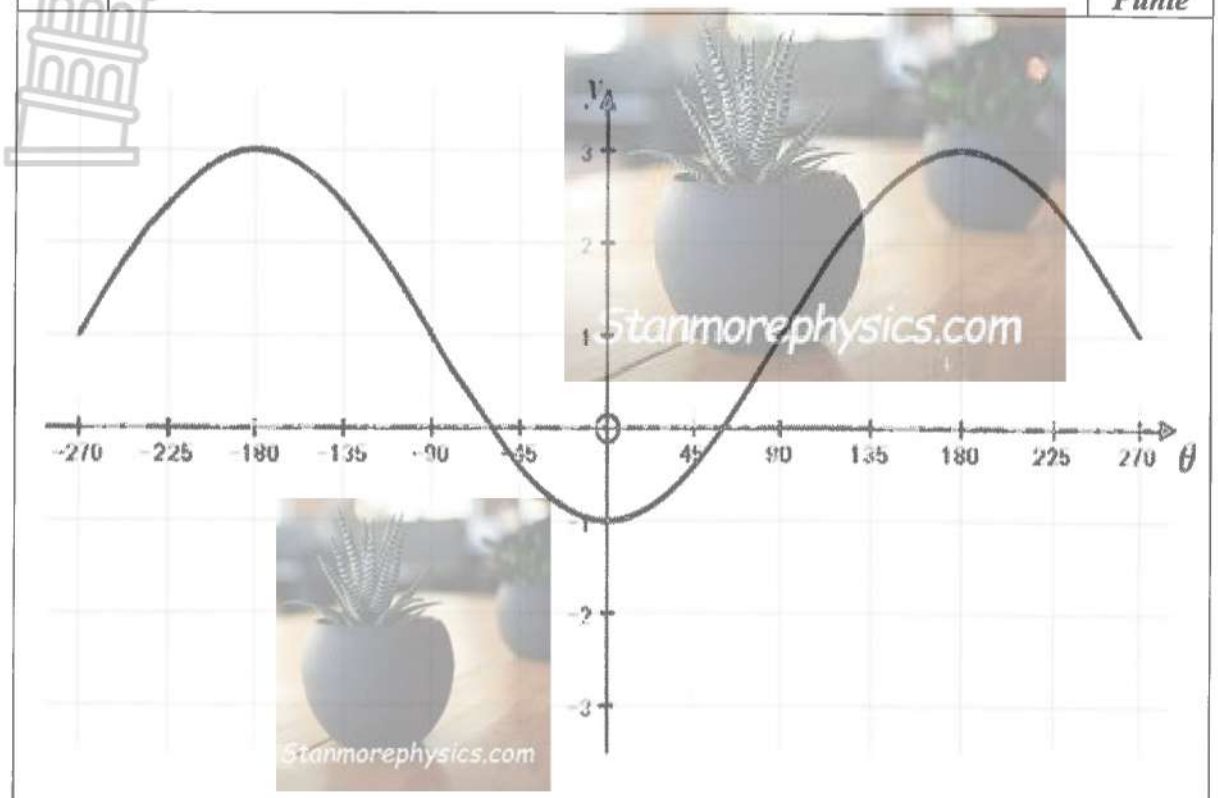
QUESTION/*VRAAG* 5

	Solution/*Oplossing*	**Marks/ *Punte***
5.1.1		(4)
5.1.2		(6)

5.2		(7)
5.3		(7)

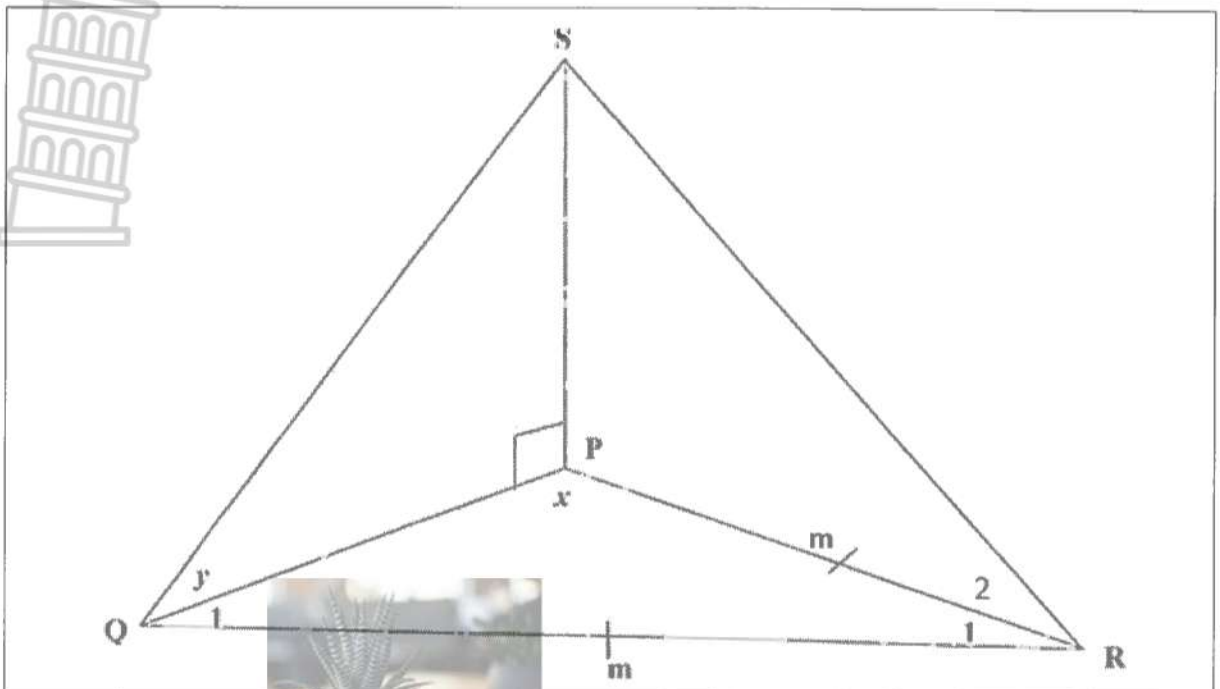
5.4		(3)
5.5.1		(3)
5.5.2		(2)
		[32]

QUESTION/*VRAAG* 6

	Solution/*Oplossing*	**Marks/ *Punte***
		
6.1		(1)
6.2		(1)

6.3		(2)
6.4		(3)
6.5		(3)
		[10]

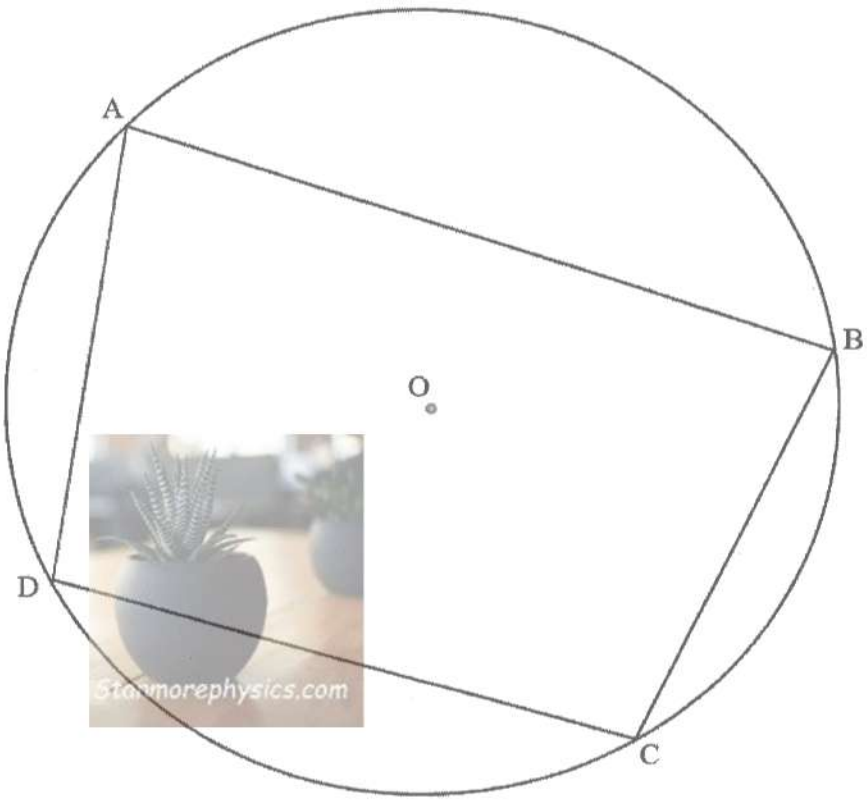
QUESTION/*VRAAG* 7

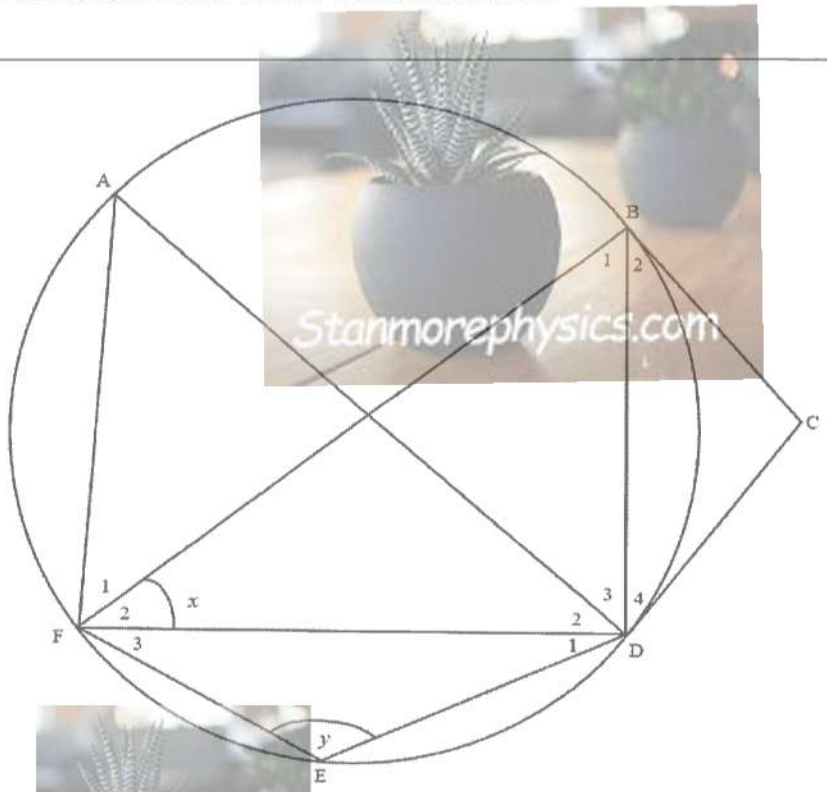


	Solution/*Oplossing*	Marks/ *Punte*
7.1		(5)
7.2		(4)

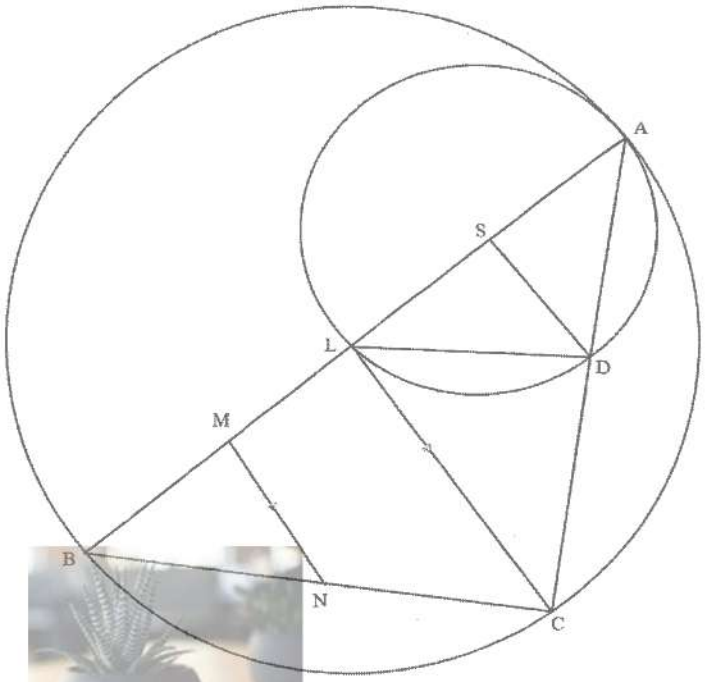
7.3		(2)
		[11]

QUESTION/*VRAAG* 8

	Solution/*Oplossing*	**Marks/ *Punte***
		
8.1		(6)

8.2		
8.2.1		(2)
8.2.2		(2)
8.2.3		(2)
8.2.4		(2)
8.2.5		(2)
		[16]

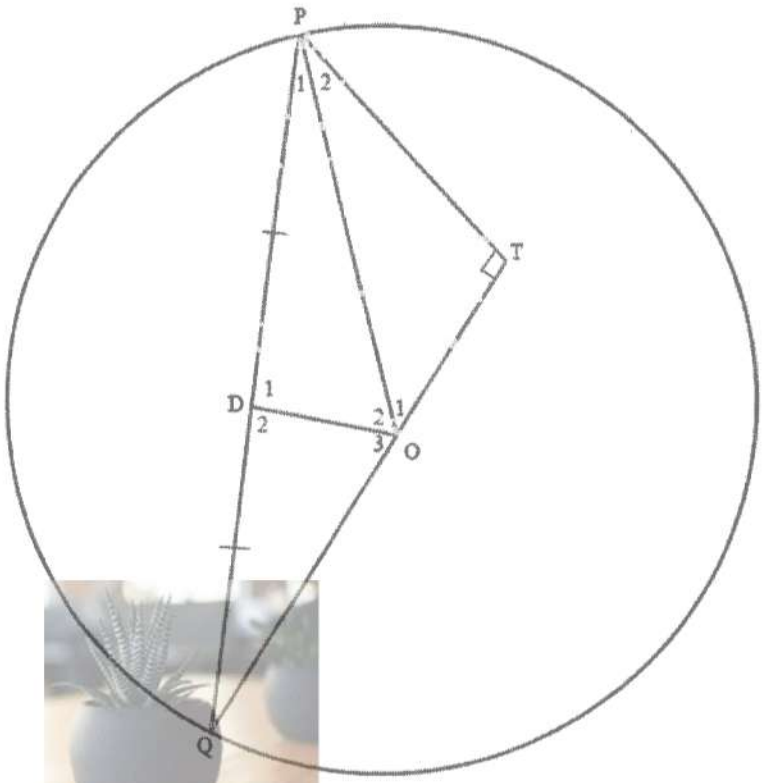
QUESTION/*VRAAG* 9



	Solution/*Oplossing*	**Marks/ *Punte***
9.1		(4)
9.2		(3)

	Solution/*Oplossing*	**Marks/ *Punte***
9.3		(2)
9.4		(3)
		[12]

QUESTION 10



	Solution/*Oplossing*	Marks/ *Punte*
10.1		(5)
10.2		

		(4)
10.3		(6)
		[15]

	Additional space/*Bykomende spasie*	
	Solution/*Oplossing*	**Marks/ *Punte***

	Additional space/*Bykomende spasie*	Marks/ *Punte*

Additional space/*Bykomende spasie*

Additional space/*Bykomende spasie*

TOTAL/*TOTAAL:* 150

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.

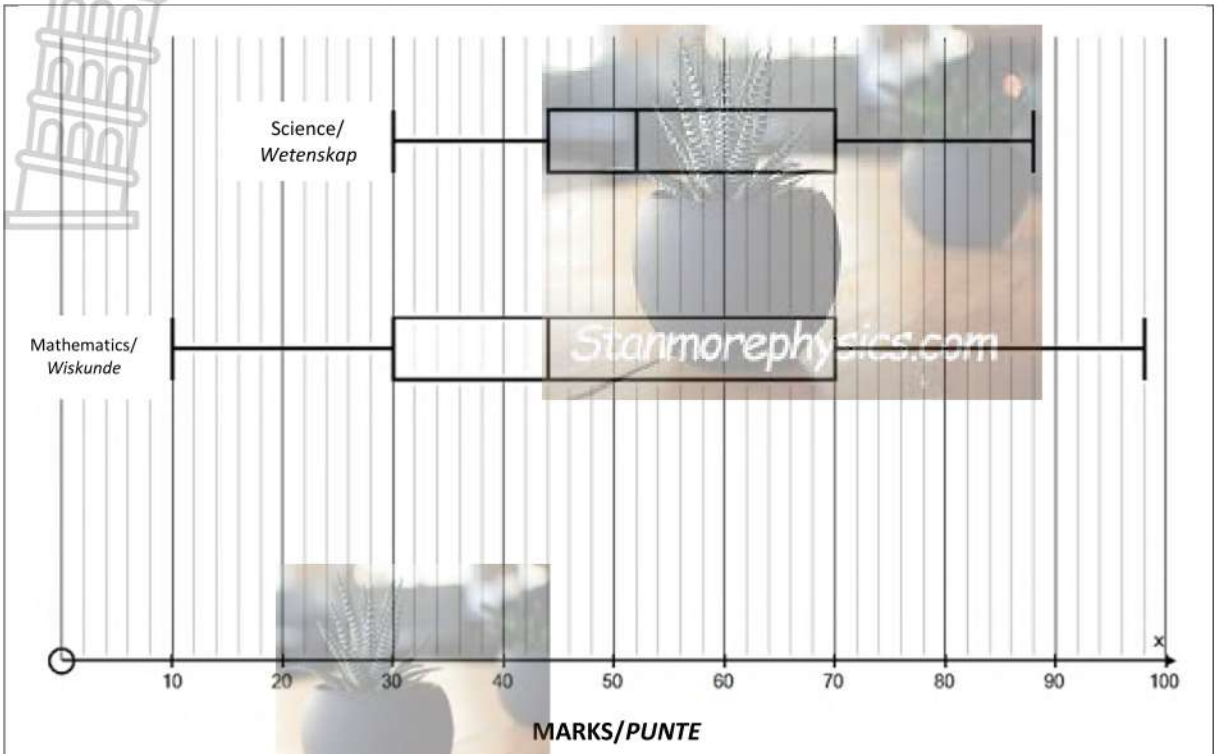
NOTE:

- 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

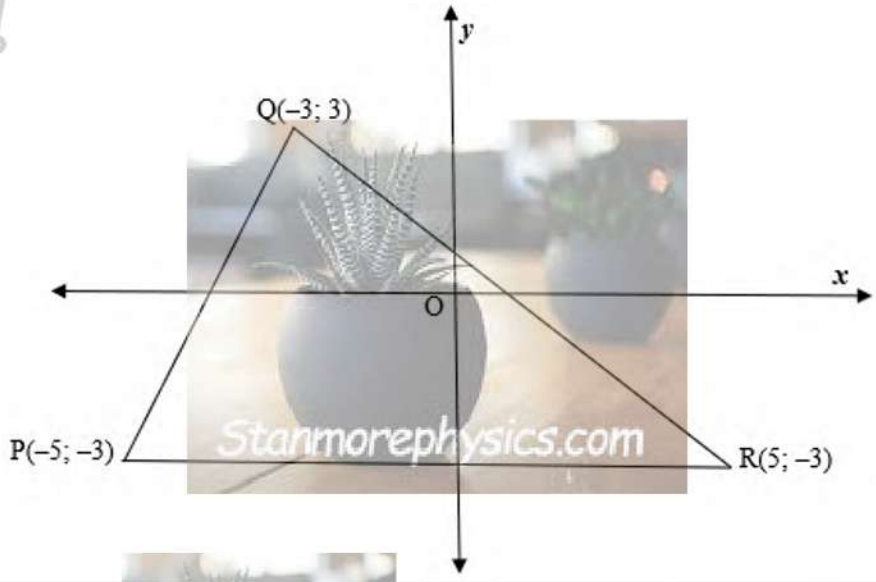


1.1	Range/Omvang : Highest – Lowest/*Hoogste – Laagste* = 98 – 10 = 88	✓substitution/*vervanging* ✓answer/*antwoord* (2)
1.2	Median/*Mediaan* = 52	✓answer/*antwoord* (1) (Accept 51-53)
1.3	IQR/*IKV* = $Q_3 - Q_1$ = 70 – 44 = 26	✓substitution/*vervanging* ✓answer/*antwoord* (2) (Q_3 – accept 69-71) (Q_1 – 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]

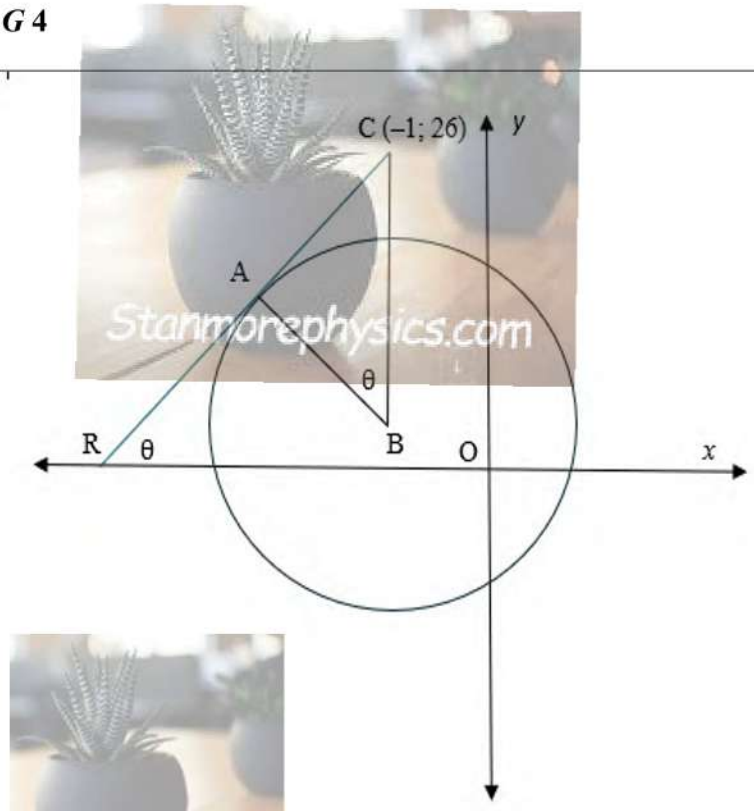
QUESTION/*VRAAG* 3



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)

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]

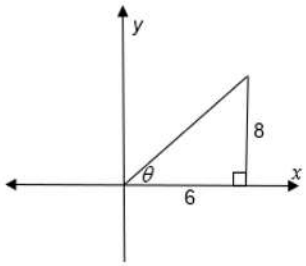
QUESTION/*VRAAG* 4

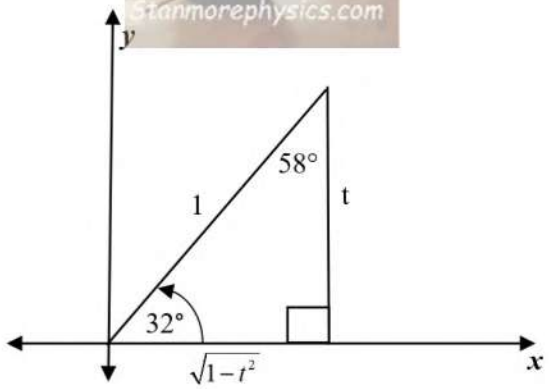


4.1	CB = 25 CA = 20 $AB = \sqrt{(25)^2 - (20)^2}$ $= \sqrt{225}$ $= 15$ $\therefore$ *radius* = 15 units / *eenhede*	✓value of CB/*waarde van CB* ✓substitution/*vervanging* ✓simplification/*vereenvoudiging* ✓value of AB/*waarde van AB* (4)
4.2	$(x+1)^2 + (y-1)^2 = 225$	✓ $(x+1)^2 + (y-1)^2$ ✓value/*waarde* of r^2 (2)
4.3	$m = \tan\theta = \frac{20}{15} = \frac{4}{3}$ *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	$m_{\tan} = \frac{4}{3}$ $m_{radius} = \frac{-3}{4}$ $y - 1 = \frac{-3}{4}(x+1)$ $y = \frac{-3}{4}x + \frac{1}{4}$	✓ 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]**

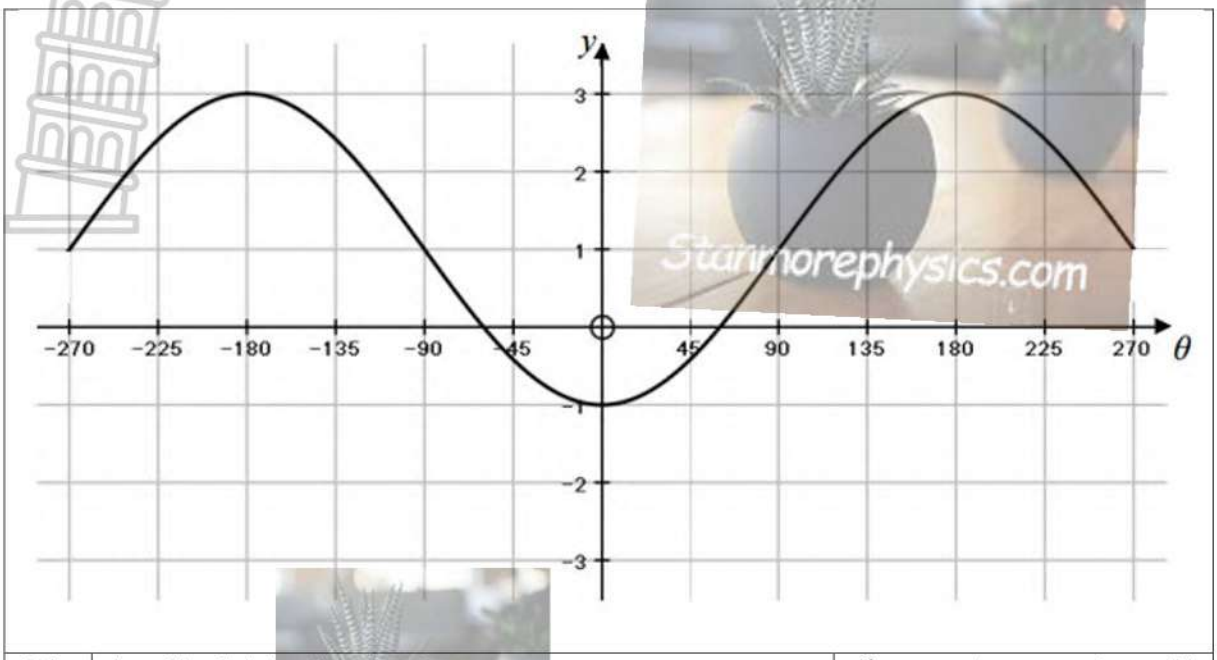
QUESTION/*VRAAG* 5

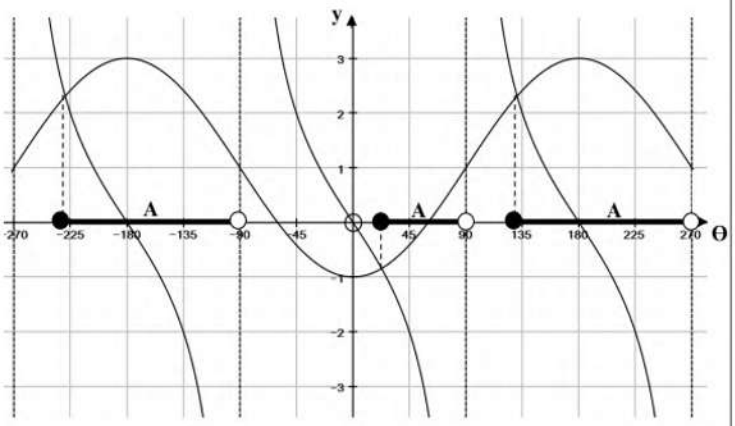
5.1.1	$\tan\theta = \frac{8}{6}$ $r^2 = (8)^2 + (6)^2$ $= 64 + 36$ $= 100$ $r = 10$  $10\sin(\theta + x)$ $= 10(\sin\theta\cos x + \cos\theta\sin x)$ $= 10\left(\frac{8}{10.}\cos x + \frac{6}{10}\sin x\right)$ $= 8\cos x + 6\sin x$	✓ $r = 10$ ✓expand/*uitbrei* ✓ $\sin\theta = \frac{8}{10}$ ✓ $\cos\theta = \frac{6}{10}$ (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)

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)

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]

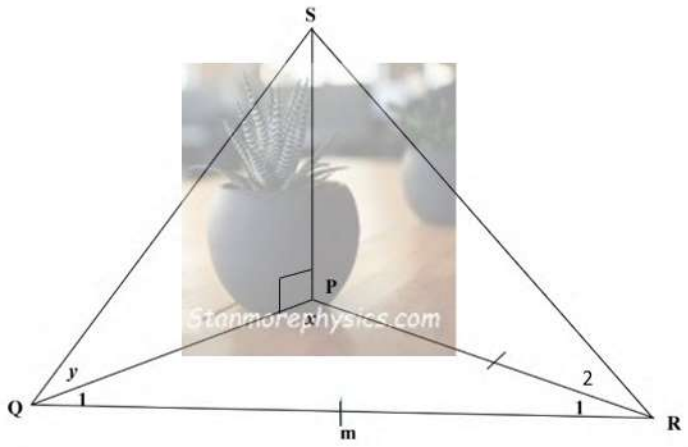
QUESTION/*VRAAG* 6



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]**

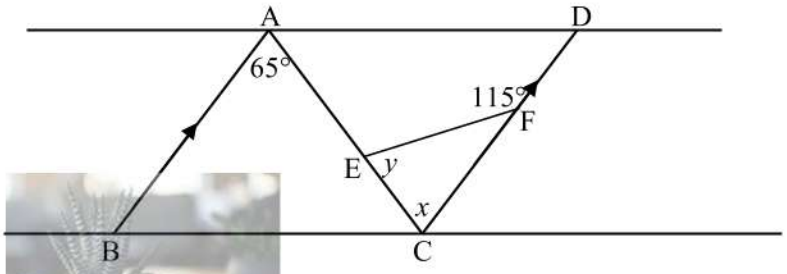
QUESTION/*VRAAG* 7

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)

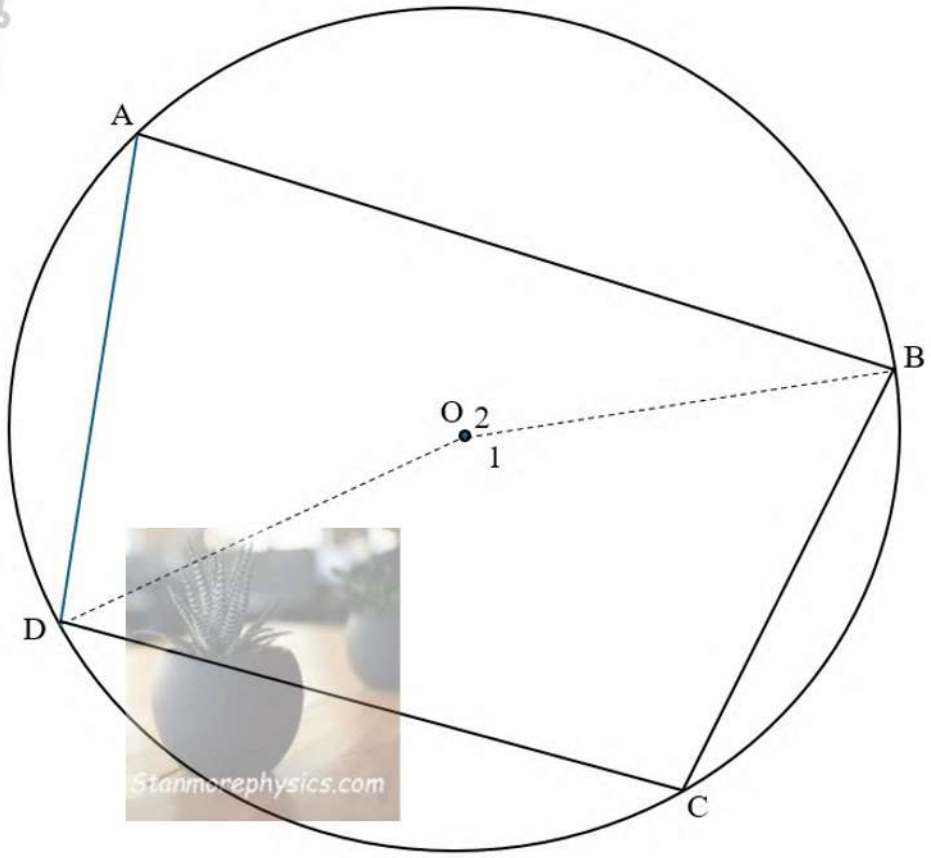
7.2	$PQ = \sqrt{PR^2 + RQ^2 - 2PR.RQ\cos(180° - 2x)}$ $= \sqrt{m^2 + m^2 + 2m.m\cos 2x}$ $= \sqrt{2m^2(1+\cos 2x)}$ $= \sqrt{2m^2(1+2\cos^2 x - 1)}$ $= \sqrt{4m^2\cos^2 x}$ $= 2m\cos x$	✓substitution/*vervanging* ✓factorise/*faktoriseer* ✓double angle/*dubbelhoek* ✓simplify/*vereenvoudig* (4)
7.3	$\tan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

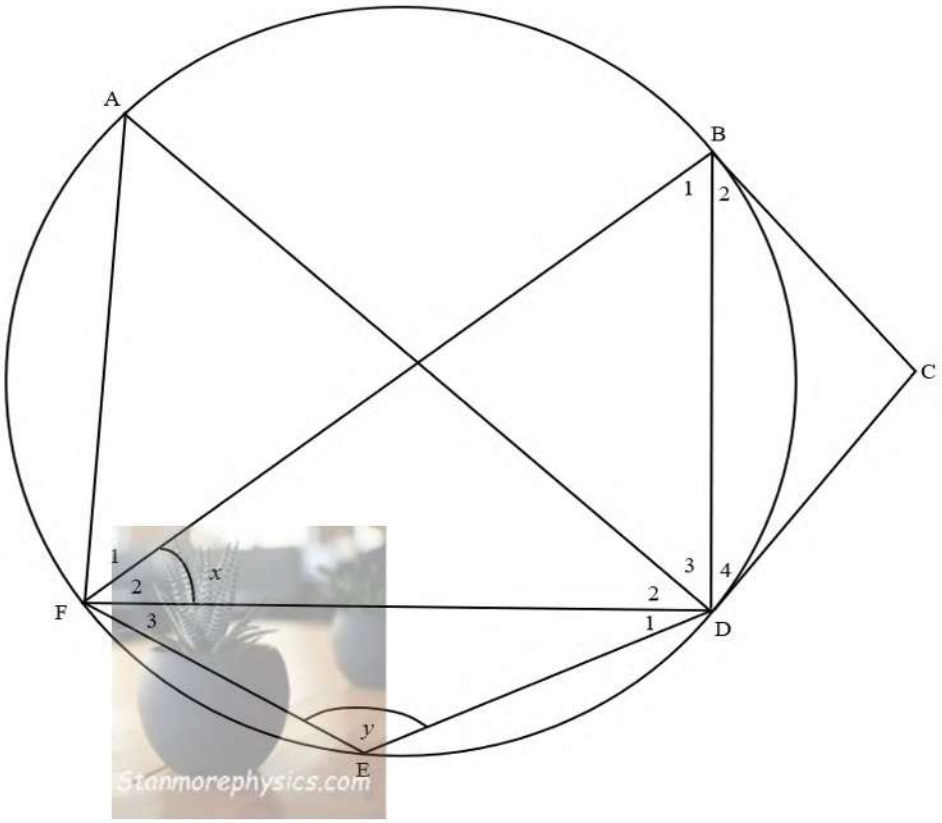
	The order in which the candidate answers a geometry question must follow logically/*Die volgorde waarin 'n kandidaat 'n meetkundevraag beantwoord moet logies volg.* **Example/*Voorbeeld*** Given/*Gegee* AB ‖ CD and/*en* $E\hat{F}D = 115°$  The candidate first needs to calculate *x* BEFORE he/she can 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)*

QUESTION/*VRAAG* 8



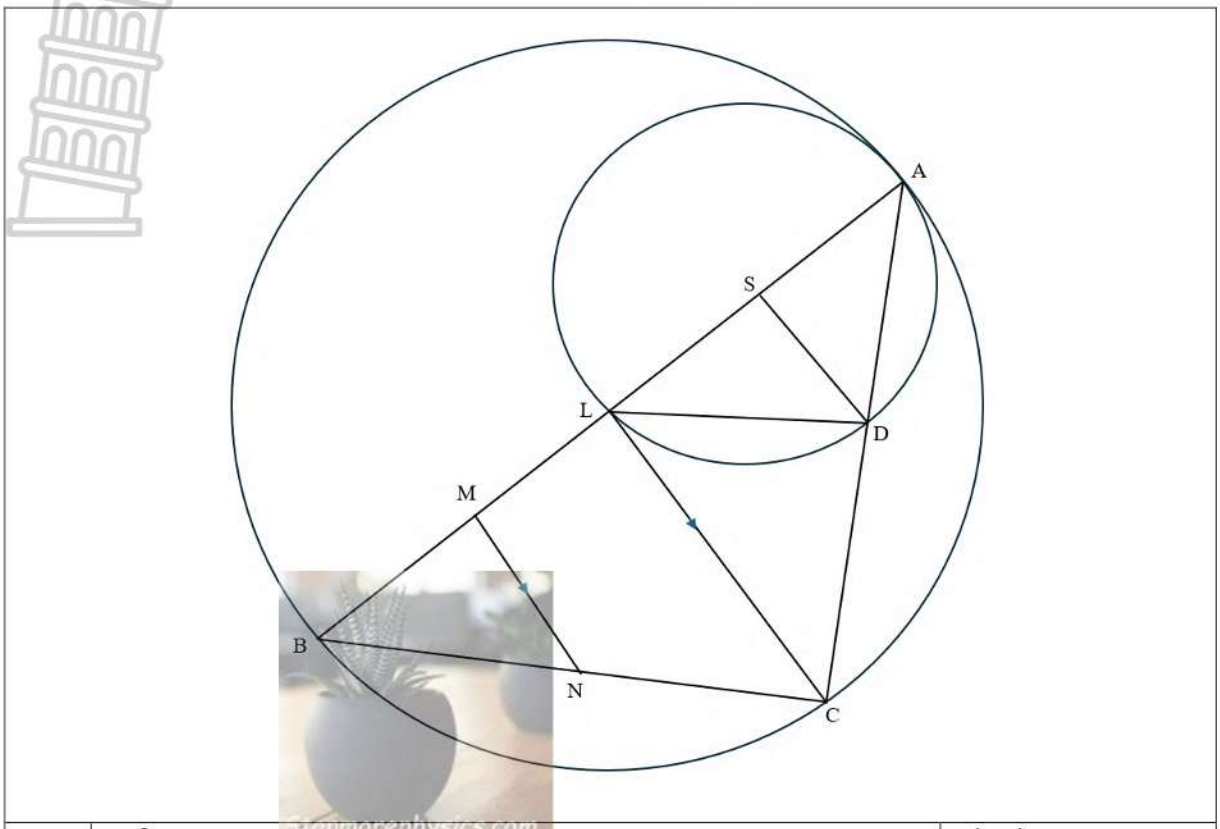
8.1	Construction/*Konstruksie*: Join DO and BO /Verbind *DO en BO.*	✓ constr./ *konstr.*
	$O_1 = 2A$ angle at centre 2x angle at circum/ *middelpunts hoek 2x omtreks ∠*	✓ S/R
	$O_2 = 2C$ angle at centre 2x angle at circum/ *middelpunts hoek 2x omtreks ∠*	✓ S/R
	$O_1 + O_2 = 360°$ angle around a point/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

8.2



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

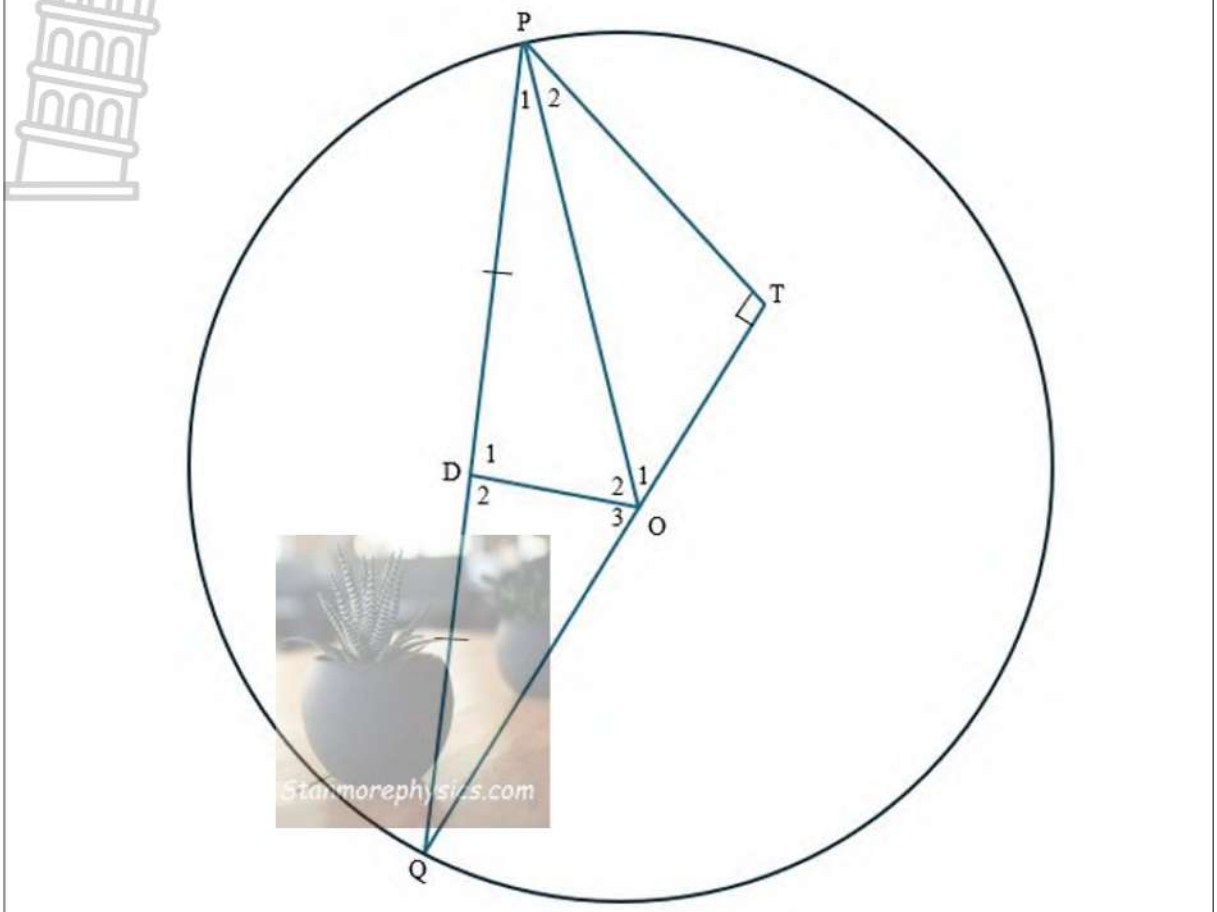


9.1	$A\hat{D}L=90°$ angles in semi-circle/*hoek in halwe – sirkel* $A\hat{C}B = 90°$ anglesinsemi-circle/*hoek in halwe – sirkel* DL ∥ CB corres $\angle's$ equal/ *ooreenst* $\angle'e$ *gelyk*	✓S✓R ✓S/R ✓R	(4)

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
		
		✓S/R
		
		✓**S**/R
		✓R
		
		✓S/R
		
		✓S/R
		✓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 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*