



education

MPUMALANGA PROVINCE
REPUBLIC OF SOUTH AFRICA

**NATIONAL
SENIOR CERTIFICATE**

GRADE 12

MATHEMATICS P2

JUNE 2026

MARKS: 150

TIME: 3 hours

**This question paper consists of 15 pages, 1 information sheet
and the answer book is provided.**

INSTRUCTIONS AND INFORMATION

Read the following instructions carefully before answering the questions.

1. The question paper consists of 11 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 the 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. An information sheet with formulae is included at the end of the question paper.
9. Write neatly and legibly.

**QUESTION 1**

The maximum daily temperatures in $^{\circ}\text{C}$ for Witbank for the first 10 days in July were recorded in the following table.

23	25	22	28	27
20	18	17	24	25

- 1.1 Calculate the mean for this data. (2)
- 1.2 Calculate the standard deviation. (1)
- 1.3 Use the scale line on the ANSWER BOOK to draw a box and whisker diagram to represent the data. (3)
- 1.4 Calculate the number of temperatures that lie outside one standard deviation of the mean. (3)

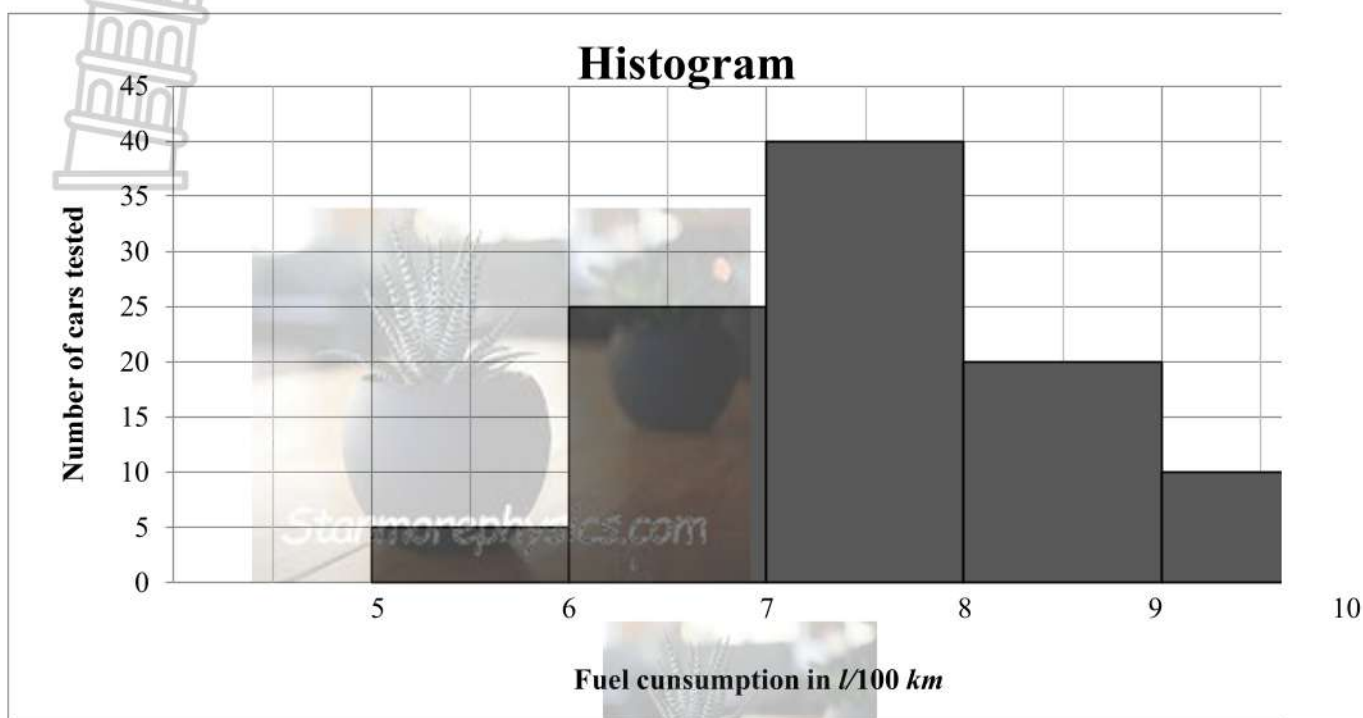
[9]



QUESTION 2

The fuel consumption of a car is expressed as the number of litres per 100 kilometres ($l/100\text{ km}$) which the car use. The histogram below indicates the results of tests done on different models of a specific car.

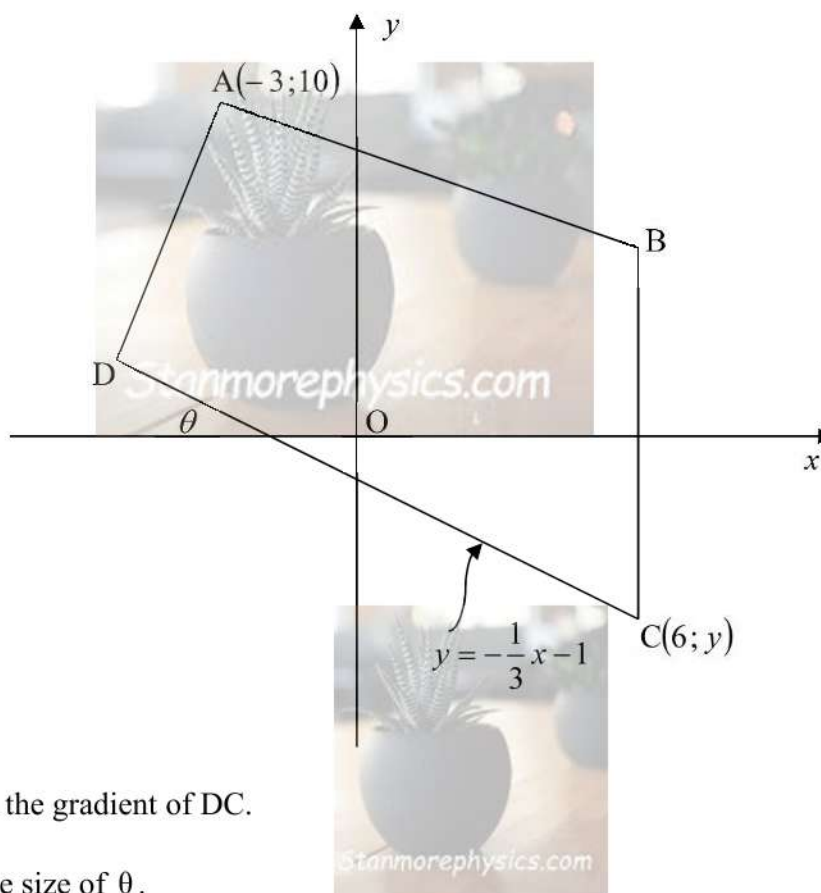
A learner conducted a research.



- 2.1 How many cars were tested? (1)
 - 2.2 Write down the modal class. (1)
 - 2.3 Use the histogram to complete the frequency table in the answer book. (3)
 - 2.4 Draw an Ogive to represent the data. (3)
 - 2.5 Use the ogive to calculate the interquartile range. (3)
- [11]**

QUESTION 3

In the diagram below, point $A(-3;10)$ and B in the first quadrant, are points on quadrilateral $ABCD$. Equation of line DC is given as $y = -\frac{1}{3}x - 1$ and DC form an angle θ with the x -axis as indicated.

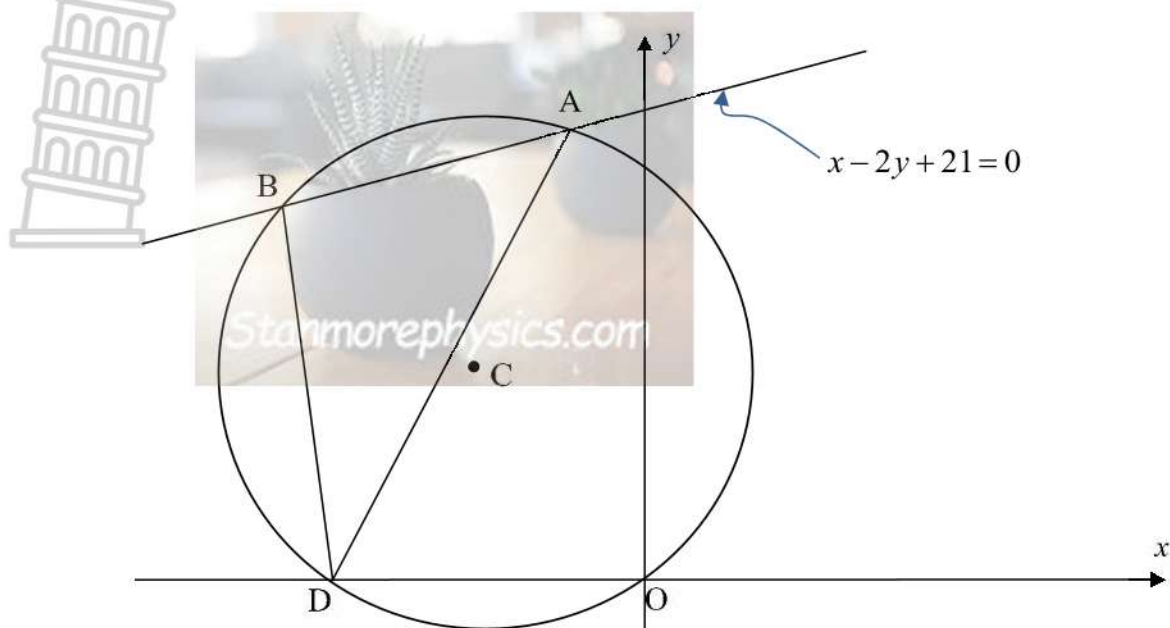


- 3.1 Write down the gradient of DC. (1)
- 3.2 Calculate the size of θ . (2)
- 3.3 Determine the equation of the line AD if $AD \perp DC$. (3)
- 3.4 Determine the y -coordinate of C. (2)
- 3.5 Determine:
 - 3.5.1 The coordinates of D and hence calculate the length of AD. (5)
 - 3.5.2 The area of $\triangle ACD$. (3)
- 3.6 Prove whether quadrilateral ABCD is a parallelogram if it is given that coordinates of $B(6;6)$. Show all necessary calculations. (3)

[19]

QUESTION 4

In the diagram below, A, B, D and the origin O lie on the circle with centre C. The equation of the circle is $x^2 + y^2 + 6x - 8y = 0$. The equation of AB is $x - 2y + 21 = 0$.



- 4.1 Determine the coordinates of the centre C, and the radius of the circle. (4)
- 4.2 Determine the coordinates of A and B. (6)
- 4.3 Determine:
 - 4.3.1 The midpoint of AD. (5)
 - 4.3.2 Whether CB passes through the midpoint of line AD. (4)
- 4.4 A second circle with equation $(x - 3)^2 + (y + 4)^2 = 25$ is drawn on the same set of axes. A student claims that the circles touch each other in one point. Is the student correct? Show all calculations. (4)

[23]

QUESTION 5

- 5.1 If $\tan p = \frac{5}{12}$ and $90^\circ < p < 270^\circ$ using a diagram and without the use of a calculator, determine the value of :

5.1.1 $\cos 2p$ (4)

5.1.2 $\sin(p - 45^\circ)$ (3)

- 5.2 Given: $\sin(85^\circ + \theta)\cos(25^\circ + \theta) - \cos(85^\circ + \theta)\sin(25^\circ + \theta)$

5.2.1 Simplify without using a calculator. (2)

5.2.2 Hence, determine the general solution of :

$$\sin(85^\circ + \theta)\cos(25^\circ + \theta) - \cos(85^\circ + \theta)\sin(25^\circ + \theta) = -\tan x \quad (4)$$

- 5.3 Simplify without using a calculator:

$$\tan(-\theta) \cdot \sin(90^\circ + \theta) + \frac{\sin 2\theta}{2\cos(360^\circ + \theta)} \quad (6)$$

[19
]



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QUESTION 6

6.1 Given: $\frac{\cos^4 x + \sin^2 x \cdot \cos^2 x}{1 + \sin x} = 1 - \sin x$

6.1.1 Prove the identity.

(4)

6.1.2 For which values of x in the interval $x \in [0^\circ; 360^\circ]$ is the identity undefined?

(2)

6.1.3 Write down the minimum value of the function defined by

(2)

$$y = \frac{\cos^4 x + \sin^2 x \cdot \cos^2 x}{1 + \sin x}$$

6.2 Given that $\sin \theta = \frac{1}{3}$, calculate the numerical value of $\sin 3\theta$, WITHOUT using a calculator.

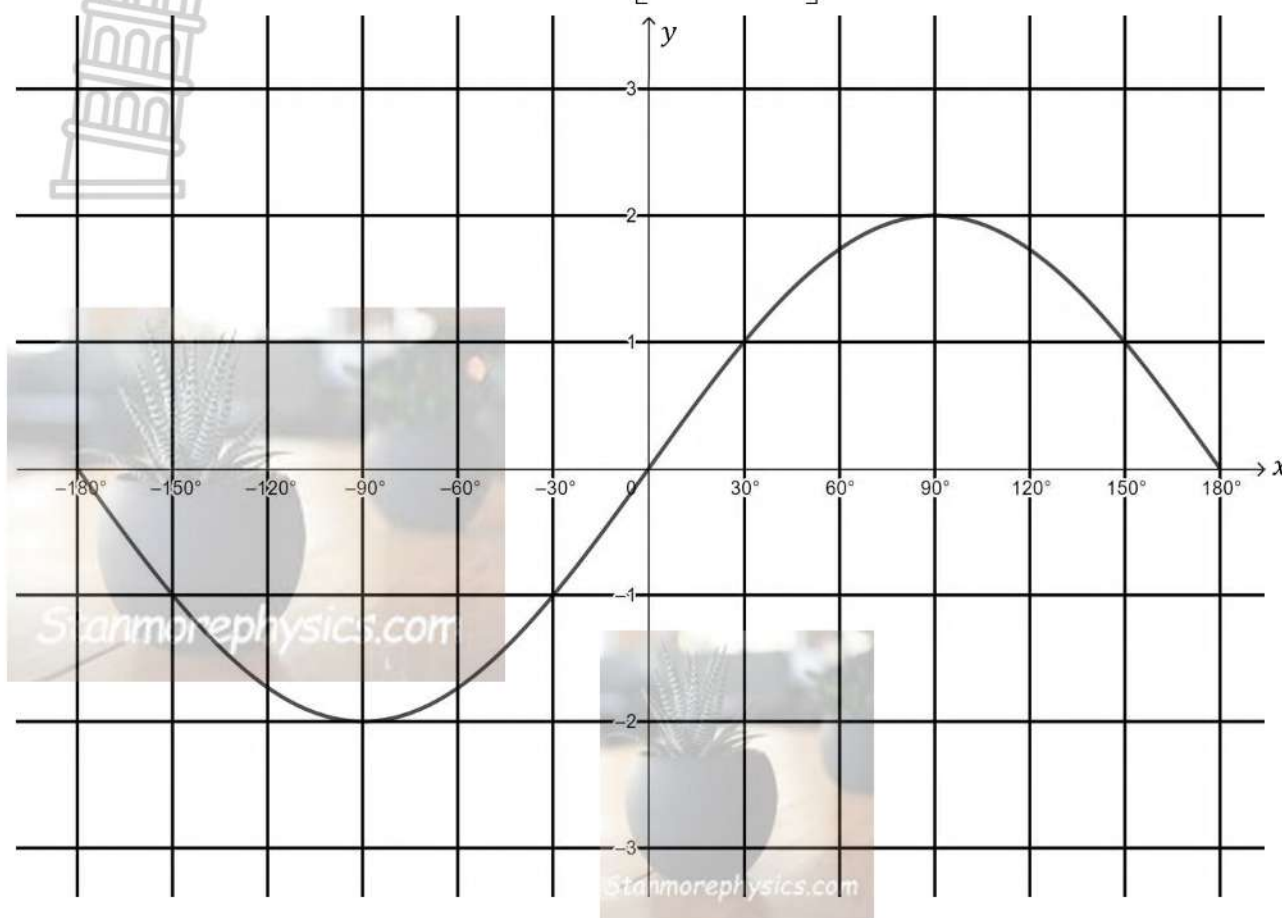
(5)

[13]



QUESTION 7

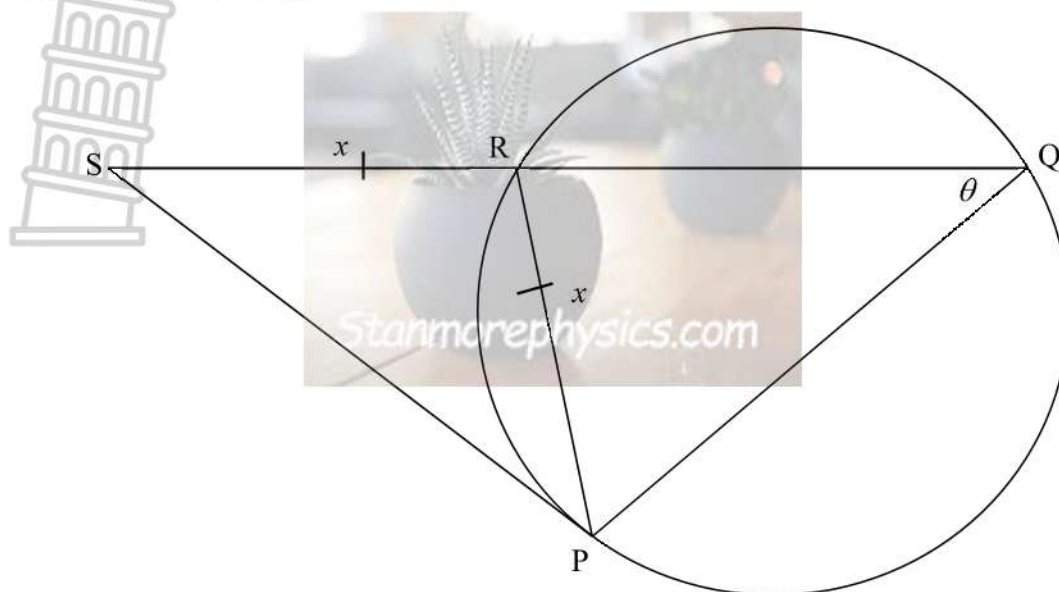
The sketch below is the graph $f(x) = 2 \sin x$ for $x \in [-180^\circ; 180^\circ]$.



- 7.1 Write down the period of f . (1)
- 7.2 Sketch the graph of $g(x) = \cos(x + 30^\circ)$ for $x \in [-180^\circ; 180^\circ]$ on the same set of axes with the graph of f IN THE ANSWER BOOK. (3)
- 7.3 If $h(x) = \sin x$, state the translation from g to h . (2)
- 7.4 Use the sketched graphs to answer the question. For which values of x is
- 7.4.1 $f(x) \geq g(x)$, if $f(x)$ and $g(x)$ intersect at $x = 19,11^\circ$ and $x = -160,89^\circ$ (2)
- 7.4.2 $f(x) \cdot g'(x) > 0$? if $x \in [-180^\circ; 0^\circ]$ (2)
- [10]**

QUESTION 8

In the diagram below, PS is a tangent to the circle through P, Q and R. QRS is a straight line.
 $PR = RS = x$ and $\hat{PQR} = \theta$.



Prove that $PS = 2x \cos \theta$

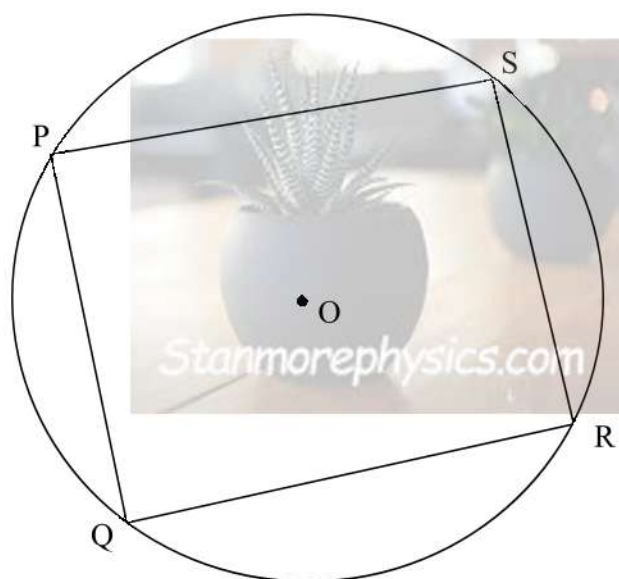


[6]

Give reasons for your statements and calculations in QUESTIONS 9, 10 and 11.

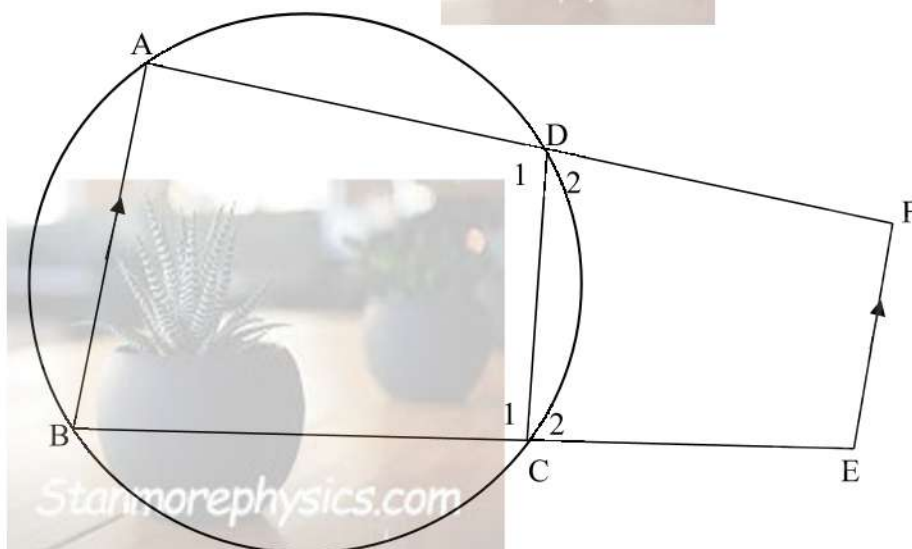
QUESTION 9

- 9.1 In the diagram, PQRS is a cyclic quadrilateral and the circle has centre O.



Prove the theorem which states that $\hat{P} + \hat{R} = 180^\circ$ (5)

- 9.2 In the diagram below, ABCD is a cyclic quadrilateral. Chords AD and BC are produced to F and E respectively. F and E are joined such that $EF \parallel AB$.

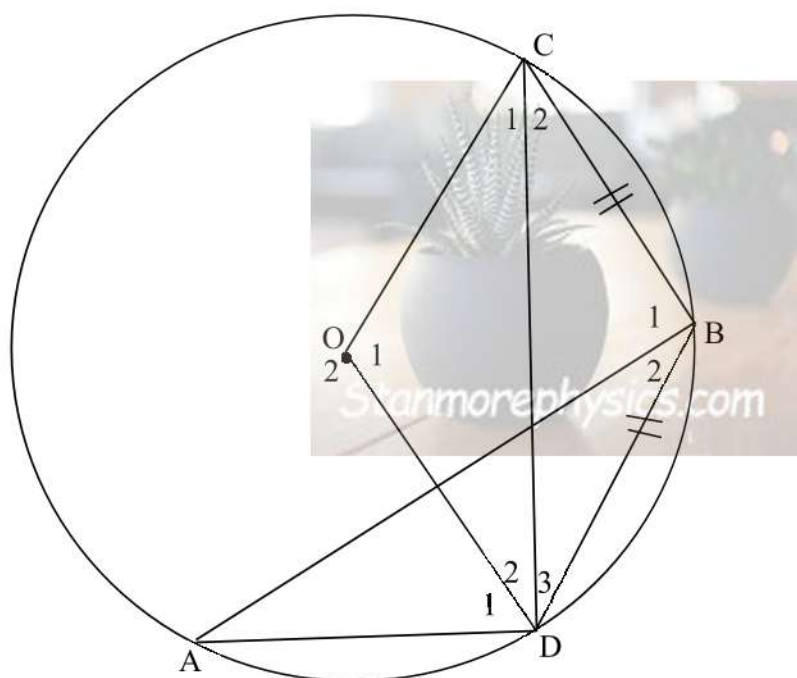


Prove that CEFD is a cyclic quadrilateral. (5)

[10]

QUESTION 10

10.1 In the diagram below, A, D, B and C lie on the circle with centre O. $DB = BC$.



10.1.1 If $\hat{A} = x$, state with reasons, two other angles equal to x . (4)

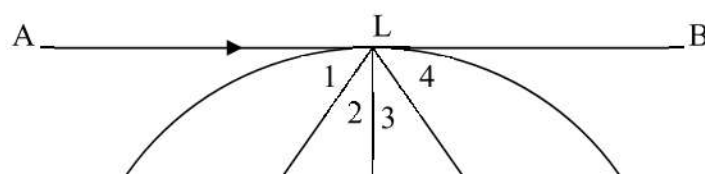
10.1.2 Given $\hat{O}_1 = 94^\circ$

a) Determine $\hat{D}_2$. (3)

b) Determine $\hat{B}_1 + \hat{B}_2$. (4)

c) Hence or otherwise determine the value of x . (2)

10.2 AB is a tangent to circle LMNP, $AB \parallel MP$.





Prove that:

10.2.1 $LM = LP$

(4)

10.2.2 LN bisects $\hat{MNP}$.

(4)

10.2.3 LM is a tangent to circle passing through MNQ .

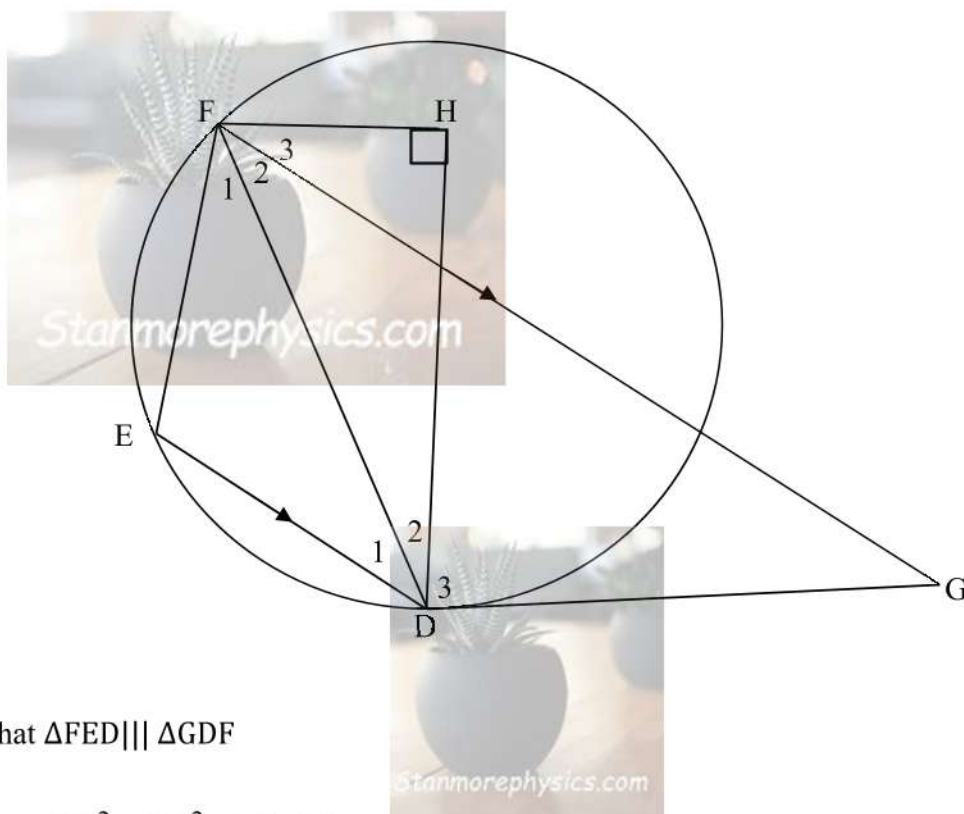
(2)

[23]



QUESTION 11

In the diagram below, a circle passing through F, E and D is drawn. G is a point outside the circle so that $FG \parallel ED$ and DG is a tangent to the circle at D. H is a point inside the circle with $\widehat{FHD} = 90^\circ$.



11.1 Prove that $\triangle FED \parallel \triangle GDF$ (4)

11.2 Show that $FH^2 + HD^2 = ED \cdot GF$ (3)

[7]

TOTAL: 150

INFORMATION SHEET

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

$$A = P(1 + ni) \quad A = P(1 - ni)$$

$$T_n = a + (n - 1)d$$

$$T_n = ar^{n-1}$$

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

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

$$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$

$$y = mx + c \quad y - y_1 = m(x - x_1)$$

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

$$\text{In } \triangle ABC: \frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

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

$$\text{area } \triangle ABC = \frac{1}{2} ab \cdot \sin C$$

$$\sin(\alpha + \beta) = \sin \alpha \cdot \cos \beta + \cos \alpha \cdot \sin \beta$$

$$\cos(\alpha + \beta) = \cos \alpha \cdot \cos \beta - \sin \alpha \sin \beta$$

$$\cos 2\alpha = \cos^2 \alpha - \sin^2 \alpha$$

$$= 1 - 2\sin^2 \alpha$$

$$= 2\cos^2 \alpha - 1$$

$$\bar{x} = \frac{\sum fx}{n}$$

$$P(A) = \frac{n(A)}{n(S)}$$

$$\hat{y} = a + bx$$

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

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

$$S_n = \frac{a(r^n - 1)}{r - 1}; r \neq 1$$

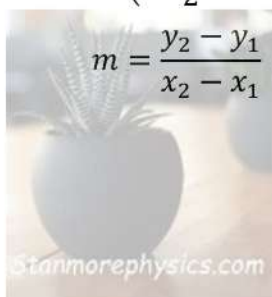
$$S_\infty = \frac{a}{1 - r}; -1 < r < 1$$

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

$$M\left(\frac{x_1 + x_2}{2}; \frac{y_1 + y_2}{2}\right)$$

$$m = \frac{y_2 - y_1}{x_2 - x_1}$$

$$m = \tan \theta$$



$$\sin(\alpha - \beta) = \sin \alpha \cdot \cos \beta - \cos \alpha \cdot \sin \beta$$

$$\cos(\alpha - \beta) = \cos \alpha \cdot \cos \beta + \sin \alpha \sin \beta$$

$$\sin 2\alpha = 2 \sin \alpha \cos \alpha$$

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

$$P(A \text{ of } B) = P(A) + P(B) - P(A \text{ en } B)$$

$$b = \frac{\sum (x - \bar{x})(y - \bar{y})}{\sum (x - \bar{x})^2}$$

NAME OF LEARNER: NAAM VAN LEERDER	
CLASS/KLAS:	

**NATIONAL SENIOR CERTIFICATE
NASIONALE SENIOR SERTIFIKAAT
MATHEMATICS P2/WISKUNDE VRAESTEL 2**

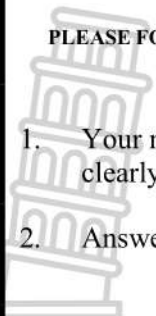
GRADE/GRAAD 12

JUNE/JUNIE 2026

**SPECIAL ANSWER BOOK
SPESIALE ANTWOORDEBOEK**

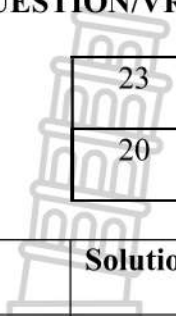
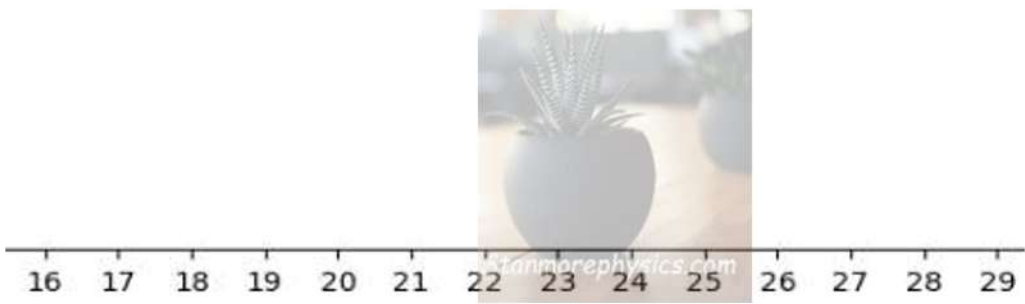
QUESTION VRAAG	MARK PUNTE			INITIAL VOORLETTERS	MODERATION MODERERING			INITIAL VOORLETTERS
1								
2								
3								
4								
5								
6								
7								
8								
9								
10								
11								
TOTAL TOTAAL (150)								

This answer book consists of 20 pages/Hierdie antwoordeboek bestaan uit 21 bladsye

PLEASE FOLLOW THESE INSTRUCTIONS CAREFULLY	VOLG ASSEBLIEF HIERDIE INSTRUKSIES NOUKEURIG
 1. Your name, surname, school and class must be clearly written in the space provided. 2. Answer ALL questions in the spaces provided. 3. No pages may be torn from this answer book. 4. Read the instructions printed on your timetable carefully as well as any other instructions which may be given in each examination paper. 5. Candidates may not retain an answer book or remove it from the examination room. Answer books must be returned to the Invigilator at the end of the examination session. 6. Answers must be written in black/blue ink as distinctly as possible. Do NOT write in the margins. 7. Indicate the questions you have answered by drawing a circle around the relevant numbers on the front cover of the answer book where marks are to be recorded. 8. Draw a neat line through any work/rough work that must not be marked. 9. In the event that you use the additional space provided at the end of this ANSWER BOOK: 9.1 Write down the question number. 9.2 Leave a line and rule off after your answer.	1. Skryf jou naam, van, skool en klaas duidelik in die ruimtes verskaf. 2. Beantwoord ALLE vrae in die ruimtes wat verskaf is. 3. Geen bladsye mag uit hierdie antwoordeboek geskeur word nie. 4. Lees die instruksies wat op jou eksamenrooster gedruk is sorgvuldig deur, asook enige ander instruksies wat in elke eksamenvraestel gegee word. 5. Geen antwoordeboek mag deur die kandidaat behou of uit die eksamenlokaal verwyder word nie. Antwoordeboeke moet aan die einde van die eksamensessie aan die toesighouer terugbesorg word. 6. Skryf die antwoorde so duidelik moontlik met swart/blou ink. MOENIE in die kantlyne skryf NIE. 7. Dui die vrae wat jy beantwoord het op die voorblad van die antwoordeboek aan, waar die punte aangebring word, deur 'n kringetjie om die nommers van die vrae wat jy beantwoord het, te trek. 8. Trek 'n netjiese lyn deur enige werk/rofwerk wat nie nagesien moet word nie. 9. In geval jy die bykomende ruimte wat aan die einde van hierdie ANTWOORDEBOEK verskaf is, gebruik: 9.1 Skryf die vraagnommer neer 9.2 Laat 'n lyn oop en trek 'n lyn na jou antwoord.

QUESTION/VRAAG 1

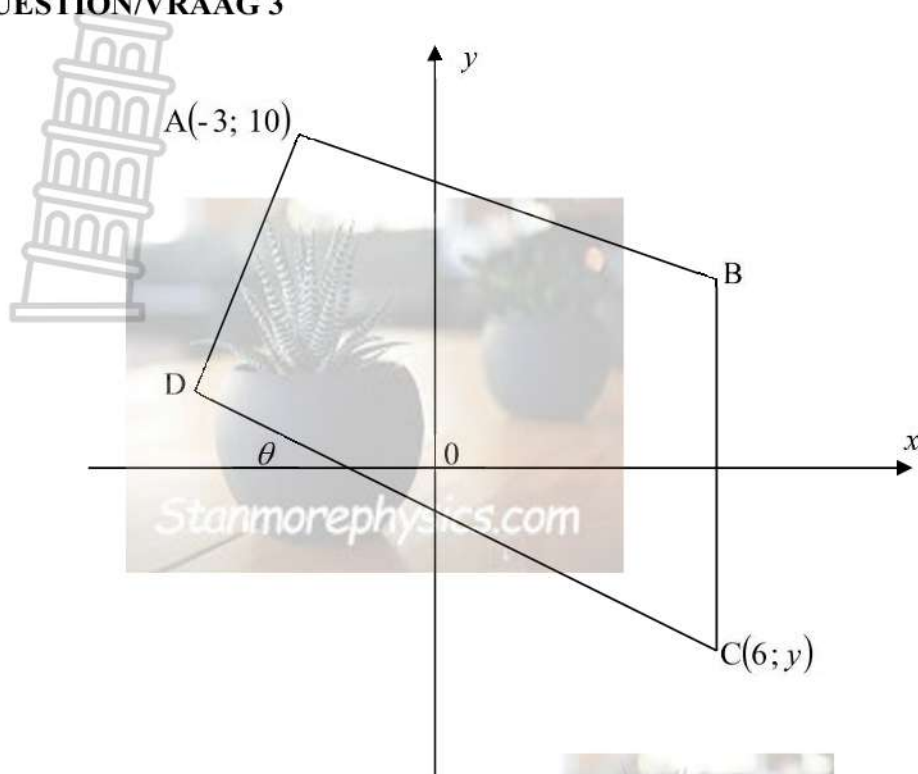
23	25	22	28	27
20	18	17	24	25

	Solution/Oplossing	Marks Punte
1.1		(2)
1.2		(1)
1.3		(3)
1.4		(3)
		[9]

QUESTION/VRAAG 2

2.1		(1)																		
2.2		(1)																		
2.3	<table> <tr> <th>INTERVAL</th><th>FREQUENCY(NUMBER OF VEHICLES) FREKWENSIE (AANTAL VOERTUIE)</th><th>CUMULATIVE FREQUENCY KUMULATIEWE FREKWENSIE</th></tr> <tr> <td>$5 \leq x < 6$</td><td></td><td></td></tr> <tr> <td>$6 \leq x < 7$</td><td></td><td></td></tr> <tr> <td>$7 \leq x < 8$</td><td></td><td></td></tr> <tr> <td>$8 \leq x < 9$</td><td></td><td></td></tr> <tr> <td>$9 \leq x < 10$</td><td></td><td></td></tr> </table>	INTERVAL	FREQUENCY(NUMBER OF VEHICLES) FREKWENSIE (AANTAL VOERTUIE)	CUMULATIVE FREQUENCY KUMULATIEWE FREKWENSIE	$5 \leq x < 6$			$6 \leq x < 7$			$7 \leq x < 8$			$8 \leq x < 9$			$9 \leq x < 10$			(3)
INTERVAL	FREQUENCY(NUMBER OF VEHICLES) FREKWENSIE (AANTAL VOERTUIE)	CUMULATIVE FREQUENCY KUMULATIEWE FREKWENSIE																		
$5 \leq x < 6$																				
$6 \leq x < 7$																				
$7 \leq x < 8$																				
$8 \leq x < 9$																				
$9 \leq x < 10$																				
2.4	OGIVE/OGIEF	(3)																		
2.5																				
		(3)																		
		[11]																		

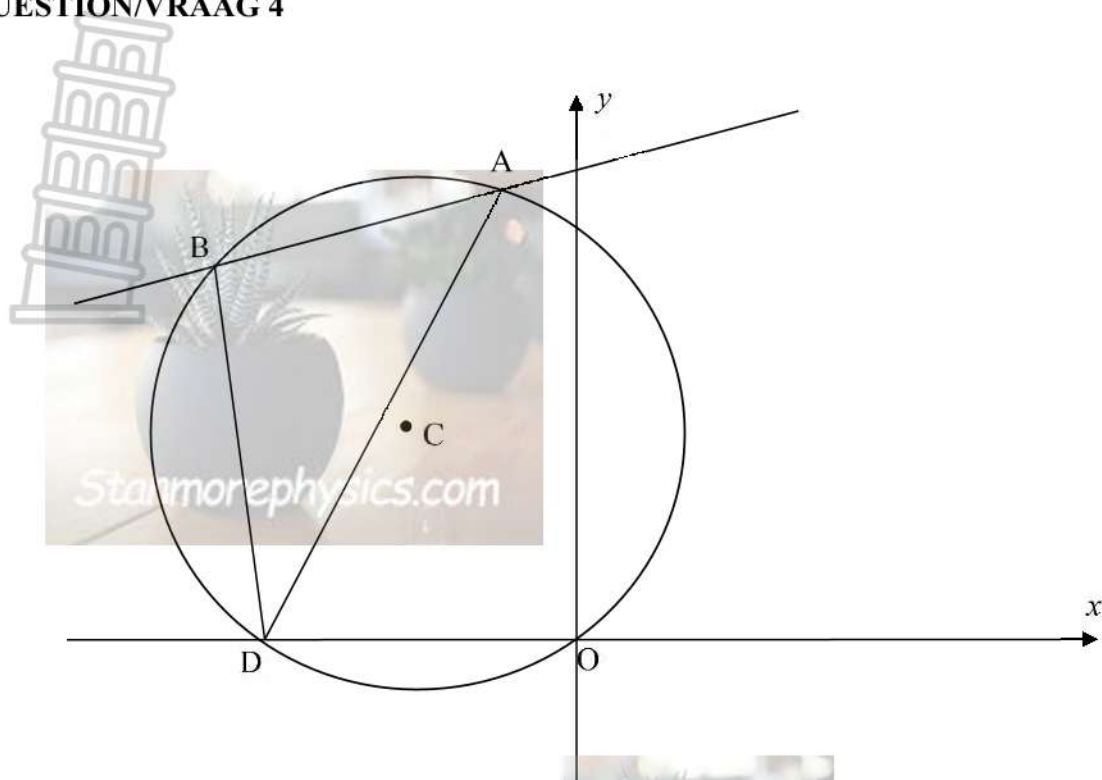
QUESTION/VRAAG 3



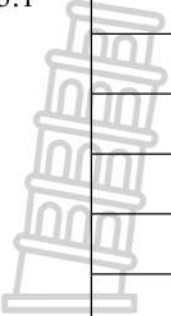
3.1		(1)
3.2		(2)
3.3		(3)

3.4		
		(2)
3.5.1		
		(5)
3.5.2		
		(3)
3.6		
		(3)
		[19]

QUESTION/VRAAG 4



4.1			
4.2			(4)
			(6)

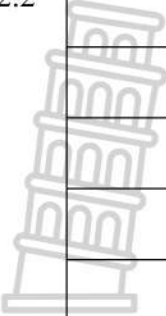
4.3.1		(5)
4.3.2		

4.4		
		(4)
		[23]

ADDITIONAL SPACE/ADDISIONELE SPASIE

QUESTION/VRAAG 5

5.1.1		
5.1.2		(4)
5.2.1		(3)
		(2)

5.2.2			
5.3			(4)
			(6)
			[19]

QUESTION/VRAAG 6

6.1.1		(4)
6.1.2		(2)
6.1.3		(2)
6.2		(5)
		[13]

QUESTION/VRAAG 7

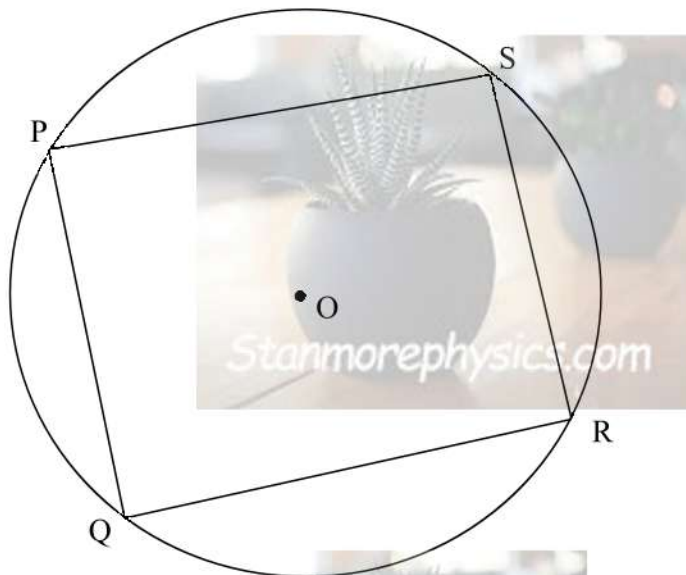
7.1		(1)
7.2		(3)
7.3	Stanmorephysics.com	(2)
7.4.1	Stanmorephysics.com	(2)
7.4.2	Stanmorephysics.com	(2)
		[10]

QUESTION/VRAAG 8

8.		
		(6)
		[6]

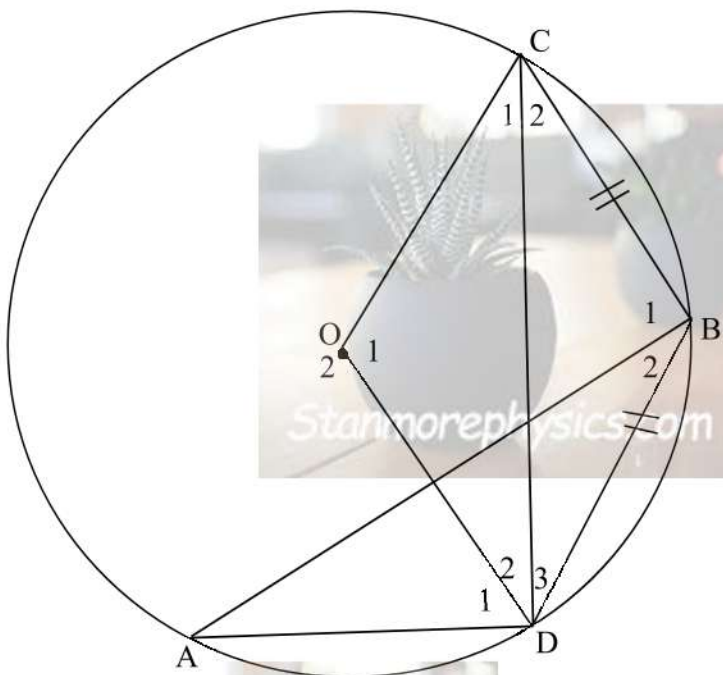
QUESTION/VRAAG 9

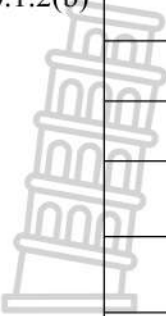
9.1

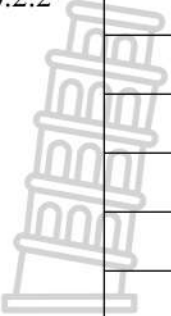


[illegible]

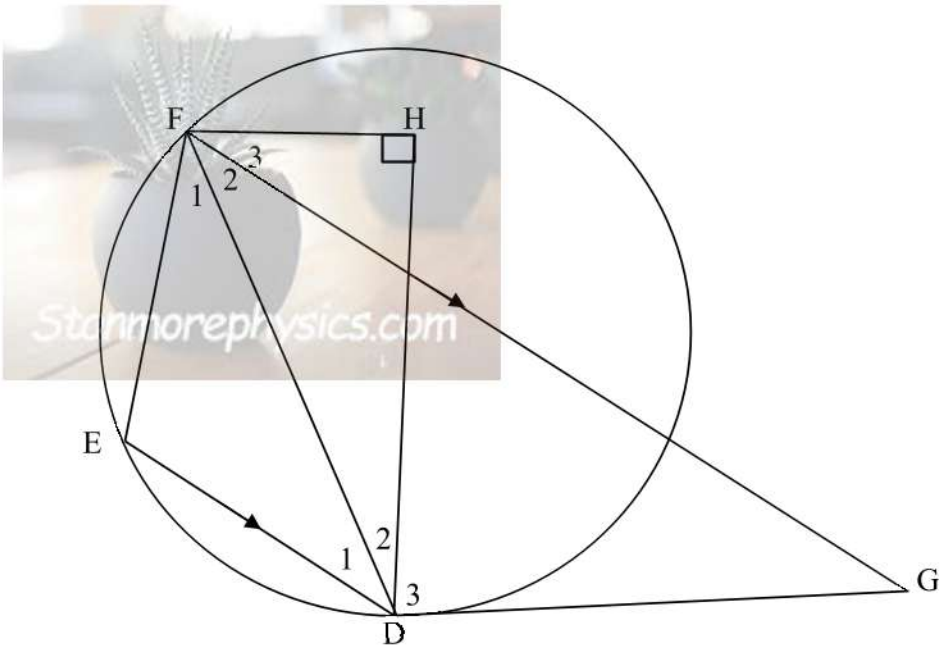
QUESTION/VRAAG 10

10.1 		
10.1.1		(4)
10.1.2(a)		(3)

10.1.2(b) 	(4)
10.1.2(c)	 (2)
10.2.1	(4)

10.2.2			(4)
10.2.3			(2)
		Stanmorephysics.com	[23]

QUESTION/VRAAG 11

11.		
11.1		(4)
11.2		(3)
		[7]

ADDITIONAL SPACE/ADDISIONELE SPASIE

	
	 stanmorephysics.com
TOTAL/TOTAAL	
150	



education

MPUMALANGA PROVINCE
REPUBLIC OF SOUTH AFRICA

**NATIONAL
SENIOR CERTIFICATE
NASIONALE
SENIOR SERTIFIKAAT**

GRADE 12/GRAAD 12

MATHEMATICS P2 / WISKUNDE V2

JUNE/JUNIE 2026

MARKING GUIDELINES/NASIENRIGLYNE

MARKS/PUNTE: 150

**This marking guideline consist of 18 pages.
Hierdie nasienriglyne bestaan uit 18 bladsye.**

NOTE:

- If a candidate answered a question TWICE, mark only the FIRST attempt.
- If a candidate crossed out an answer and did not redo it, mark the crossed-out answer.
- Consistent accuracy applies to ALL aspects of the marking guidelines.
- Assuming values/answers in order to solve a problem is unacceptable.

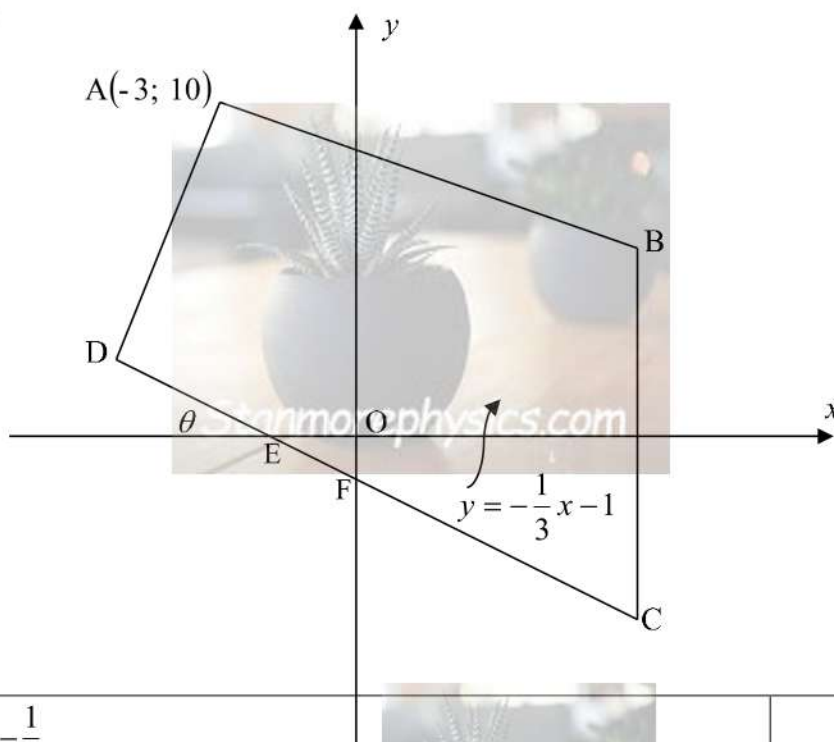
LET WEL:

- As 'n kandidaat 'n vraag TWEE keer beantwoord het, sien slegs die EERSTE poging na.
- As 'n kandidaat 'n antwoord deurgehaal en nie oorgedoen het nie, sien die deurgehaalde antwoord na.
- Volgehoue akkuraatheid is op ALLE aspekte van die nasienriglyn van toepassing.
- Dit is onaanvaarbaar om waardes/antwoorde te veronderstel om 'n probleem op te los.

QUESTION/VRAAG 1		
1.1	$\text{Mean/Gemiddeld} = \frac{229}{10}$ $= 22,9$	✓ sum/som ✓ answer/antwoord (2)
1.2	$\sigma = 3,48$	✓ answer/antwoord (1)
1.3		✓ 17 and/en 28 ✓ 20 and/en 25 ✓ 23,5 (3)
1.4	$(\bar{x} - \sigma; \bar{x} + \sigma) = (22,90 - 3,48; 22,90 + 3,48)$ $= (19,42; 26,38)$ 4 temperatures lies outside one standard deviation. 4 temperature lê buite een standaardafwyking van die gemiddeld.	✓ Lower limit onderste grens ✓ Upper limit boonste grens ✓ answer/antwoord (3)
		[9]

QUESTION/VRAAG 2																				
2.1	100 cars/motors	✓ answer/antwoord (1)																		
2.2	$7 \leq x < 8$ or/of $7 < x \leq 8$	✓ answer/antwoord (1)																		
2.3	<table border="1"> <thead> <tr> <th>INTERVAL</th><th>FREQUENCY(NUMBER OF VEHICLES) FREKWENSIE (AANTAL MOTORS)</th><th>CUMULATIVE FREQUENCY KUMULATIEWE FREKWENSIE</th></tr> </thead> <tbody> <tr> <td>$5 \leq x < 6$</td><td>5</td><td>5</td></tr> <tr> <td>$6 \leq x < 7$</td><td>25</td><td>30</td></tr> <tr> <td>$7 \leq x < 8$</td><td>40</td><td>70</td></tr> <tr> <td>$8 \leq x < 9$</td><td>20</td><td>90</td></tr> <tr> <td>$9 \leq x < 10$</td><td>10</td><td>100</td></tr> </tbody> </table>	INTERVAL	FREQUENCY(NUMBER OF VEHICLES) FREKWENSIE (AANTAL MOTORS)	CUMULATIVE FREQUENCY KUMULATIEWE FREKWENSIE	$5 \leq x < 6$	5	5	$6 \leq x < 7$	25	30	$7 \leq x < 8$	40	70	$8 \leq x < 9$	20	90	$9 \leq x < 10$	10	100	✓ Frequency/ frekwensie ✓ 5, 30, 70 ✓ 90 & 100 (3)
INTERVAL	FREQUENCY(NUMBER OF VEHICLES) FREKWENSIE (AANTAL MOTORS)	CUMULATIVE FREQUENCY KUMULATIEWE FREKWENSIE																		
$5 \leq x < 6$	5	5																		
$6 \leq x < 7$	25	30																		
$7 \leq x < 8$	40	70																		
$8 \leq x < 9$	20	90																		
$9 \leq x < 10$	10	100																		
2.4	OGIVE/OGIEF	✓ grounding gegrond ✓ three correct points drie korrekte punte ✓ shape/vorm (3)																		
2.5	$\begin{aligned} \text{IQR} &= Q_3 - Q_1 \\ &= 8,5 - 6,5 \\ &= 2 \end{aligned}$	✓ $Q_3 = 8,5$ Accept/aanvaar 8 - 9 ✓ $Q_1 = 6,5$ Accept/aanvaar 6-7 ✓ answer/antwoord (3)																		
		[11]																		

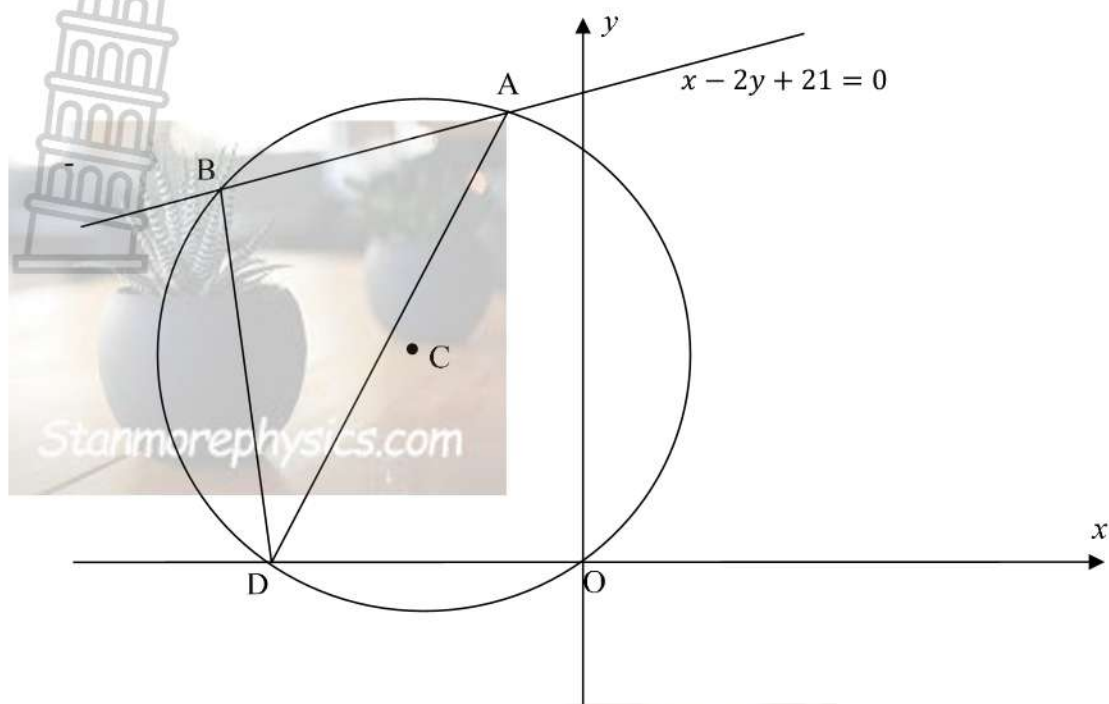
QUESTION/VRAAG 3



3.1	$m_{DC} = -\frac{1}{3}$	$\checkmark m_{DC} = -\frac{1}{3} \quad (1)$
3.2	$\tan \hat{XED} = -\frac{1}{3}$ $\hat{XED} = 180^\circ - 18,4349 \dots^\circ = 161,57^\circ$ $\therefore \theta = 18,4^\circ$ OR / OF $0 = -\frac{1}{3}x - 1$ $x = -3$ $\therefore E(-3; 0)$ $\tan \theta = \frac{OF}{OE}$ $= \frac{1}{3}$ $= 18,4^\circ$	$\checkmark \tan \hat{XED} = -\frac{1}{3}$ $\checkmark \text{answer /antwoord}$ (2) OR / OF $y = -\frac{1}{3}(0) - 1$ $y = -1$ $\therefore F(-1; 0)$ $\checkmark E(-3; 0); F(-1; 0)$ $\checkmark \text{answer /antwoord}$

3.3	$AD \perp DC$ $m_{AD} \times m_{DC} = -1$ $\therefore m_{AD} \times \left(-\frac{1}{3}\right) = -1$ $\therefore m_{AD} = 3$ $\therefore y = 3x + c$ $A(-3; 10): 10 = 3(-3) + c$ $10 = -9 + c$ $\therefore c = 19$ $\therefore y = 3x + 19$	$\checkmark m_{AD} = 3$ $\checkmark$ Substitution / substitusie $\checkmark$ Answer/antwoord (3)
3.4	$y = -\frac{1}{3}(6) - 1$ $= -3$ $\therefore C(6; -3)$	$\checkmark$ Substitution / substitusie $\checkmark$ Answer/Antwoord (2)
3.5.1	$y = -\frac{1}{3}x - 1$ and /en $y = 3x + 19$ $3x + 19 = -\frac{1}{3}x - 1$ $\therefore x = -6$ $\therefore y = 3(-6) + 19 = 1$ $\therefore D(-6; 1)$ $AD = \sqrt{(x_D - x_A)^2 + (y_D - y_A)^2}$ $= \sqrt{(-6 - (-3))^2 + (1 - 10)^2}$ $= \sqrt{90} = 9,49 \text{ units / eenhede}$	$\checkmark$ Equating / stel gelyk $\checkmark x = -6$ $\checkmark y = 1$ $\checkmark$ Substitution / substitusie $\checkmark$ Answer/antwoord (5)
3.5.2	$CD = \sqrt{(-6 - 6)^2 + (1 - (-3))^2}$ $= 4\sqrt{10}$ $\text{Area of /Opp van } \triangle ACD = \frac{1}{2} \times 4\sqrt{10} \times \sqrt{90}$ $= 60 \text{ units}^2 / \text{eenhede}^2$	$\checkmark 4\sqrt{10}$ $\checkmark$ substitution / substitusie $\checkmark$ answer /antwoord (3)
3.6	$A(-3; 10) \quad B(6; 6)$ $m_{AB} = \frac{6 - 10}{6 - (-3)}$ $= -\frac{4}{9}$ $m_{DC} = -\frac{1}{3}$ $m_{AB} \neq m_{DC}$ $ABCD$ is not a parallelogram, since opposite sides are not parallel. $ABCD$ is nie 'n parallelogram nie, want teenoorstaande sye is nie ewewydig nie.	$\checkmark$ Substitution / substitusie $\checkmark m_{AB}$ $\checkmark$ Conclusion + Reason $\checkmark$ Gevolgtrekking + rede
		[18]

QUESTION/VRAAG 4

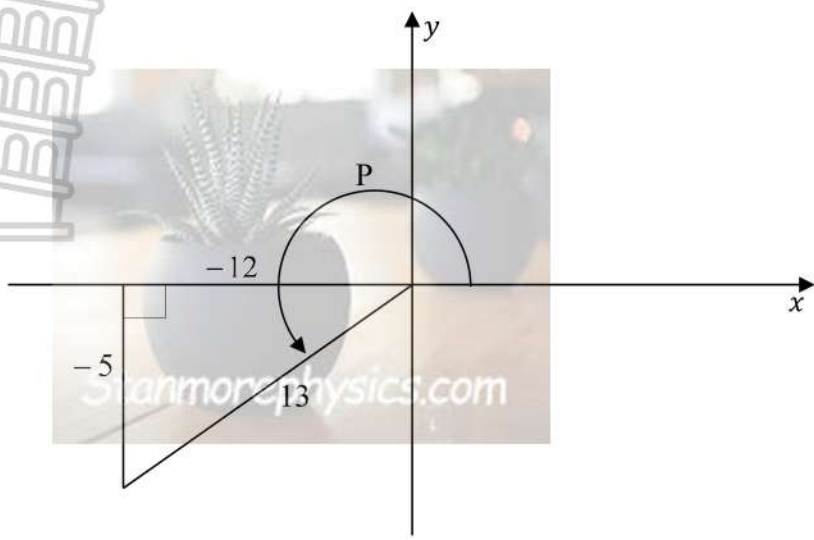


4.1	$x^2 + y^2 + 6x - 8y = 0$ $x^2 + 6x + 9 + y^2 - 8y + 16 = 9 + 16$ $(x + 3)^2 + (y - 4)^2 = 25$ $\therefore C(-3; 4) \text{ radius} = \sqrt{25} = 5$	 ✓ Completing the square / Voltooi die vierkant ✓ Factorisation / Faktoriseer ✓ $C(-3; 4)$ ✓ radius (4)
4.2	$x - 2y + 21 = 0 \dots\dots\dots (1)$ $(x + 3)^2 + (y - 4)^2 = 25 \dots\dots\dots (2)$ $\therefore x = 2y - 21 \dots\dots\dots (3)$ sub eq(3) into eq(2) / subst vgl (3) in (2) $(2y - 21 + 3)^2 + (y - 4)^2 = 25$ $(2y - 18)^2 + (y - 4)^2 = 25$ $4y^2 - 72y + 324 + y^2 - 8y + 16 = 25$ $5y^2 - 80y + 315 = 25$ $5y^2 - 80y + 290 = 0$ $(y - 7)(y - 9) = 0$ $\therefore y = 7 \text{ or } y = 9$ $\therefore x = -7 \text{ or } x = -3$ $\therefore A(-3; 9) \text{ and/en } B(-7; 7)$ OR / OF	✓ $x = 2y - 21$ ✓ substitution / substitusie ✓ standard form / standaard vorm ✓ factors/faktore ✓ $A(-3; 9)$ ✓ $B(-7; 7)$ (6) OR / OF

	$2y = x + 21$ $y = \frac{x+21}{2} \dots (1)$ $(x+3)^2 + (y-4)^2 = 25 \dots (2)$ $(x+3)^2 + \left(\frac{x+21}{2} - 4\right)^2 = 25$ $(x+3)^2 + \left(\frac{x+13}{2}\right)^2 = 25$ $x^2 + 6x + 9 + \frac{x^2 + 26x + 169}{4} - 25 = 0$ $4x^2 + 24x + 36 + x^2 + 26x + 169 - 100 = 0$ $5x^2 + 50x + 105 = 0$ $x^2 + 10x + 21 = 0$ $(x+3)(x+7) = 0$ $x = -3 \text{ or } x = -7$ y = 9 or /of y = 7 A(-3;9) and/en B(-7;7)	$\checkmark y = \frac{x+21}{2}$ ✓ substitution / substitusie ✓ standard form / standard vorm ✓ factors / faktore ✓ A(-3;9) ✓ B(-7;7) (6)
4.3.1	$(x+3)^2 + (y-4)^2 = 25$ x – intercept/afsnit: y = 0 $(x+3)^2 + (0-4)^2 = 25$ $(x+3)^2 + 16 = 25$ $x^2 + 6x = 0$ $x(x+6) = 0$ x = 0 or / of x = -6 ∴ D(-6; 0) A(-3; 9) $\therefore x_M = \frac{x_D + x_A}{2}; y_M = \frac{y_D + y_A}{2}$ $= \frac{-6+3}{2}; \quad = \frac{0+9}{2}$ $= -\frac{3}{2}; \quad = \frac{9}{2}$ ∴ M(-1.5; 4.5)	✓ subst of / subst van y = 0 ✓ standard form Standard vorm ✓ factors / faktore ✓ substitution / substitusie ✓ answer / antwoord (5)

4.3.2	$B(-7; 7); C(-3; 4)$ $m_{CB} = \frac{y_B - y_C}{x_B - x_C}$ $= \frac{7 - 4}{-7 - (-3)}$ $= -\frac{3}{4}$ $y = -\frac{3}{4}x + c$ $7 = -\frac{3}{4}(-7) + c$ $c = \frac{7}{4}$ $\therefore y = -\frac{3}{4}x + \frac{7}{4}$ $M\left(-\frac{9}{2}; \frac{9}{2}\right)$ $LHS = \frac{9}{2}$ $RHS = -\frac{3}{4}\left(-\frac{9}{2}\right) + \frac{7}{4} = \frac{41}{8}$ $LHS \neq RHS$ $\therefore CB$ does not pass through M. $\therefore CB$ gaan nie deur M nie.	✓ m_{CB} ✓ equation of CB vergelyking van CB ✓ LHS and RHS LK en RK ✓ conclusion / gevolgtrekking (4)
4.4	$(x - 3)^2 + (y + 4)^2 = 25$ $\therefore$ centre / middelpunt: $K(3; -4)$; $r = 5$ $KC = \sqrt{(x_C - x_K)^2 + (y_C - y_K)^2}$ $= \sqrt{(-3 - 3)^2 + (4 - (-4))^2}$ $= \sqrt{100}$ $= 10 \text{ units / eenhede}$ sum of radii of circles / som van radiusse = $5 + 5 = 10$ The student is correct / die student is korrek.	✓ coordinates of centre and radius koördinate van middelpunt en radius ✓ KC ✓ sum of radii / som van radiusse ✓ conclusion / gevolgtrekking (4)
		[23]

QUESTION/VRAAG 5

5.1		
5.1.1	$\cos 2p = 2\cos^2 p - 1 \quad \text{or/of} \quad = 1 - 2\sin^2 p - 1 \quad \text{or/of} \quad = \cos^2 p - \sin^2 p$ $= 2\left(\frac{-12}{13}\right)^2 - 1 \quad \text{or/of} \quad = 1 - 2\left(\frac{-5}{13}\right)^2 \quad \text{or/of} \quad = \left(\frac{-12}{13}\right)^2 - \left(\frac{-5}{13}\right)^2$ $= \frac{119}{169} \quad \text{or/of} \quad = \frac{119}{169} \quad \text{or/of} \quad = \frac{119}{169}$	✓ value of r / waarde van r ✓ identity / identiteit ✓ substitution / substitusie ✓ answer/ antwoord (4)
5.1.2	$\sin(p - 45^\circ) = \sin p \cdot \cos 45^\circ - \cos p \cdot \sin 45^\circ$ $= \sin p \cdot \left(\frac{1}{\sqrt{2}}\right) - \cos p \cdot \left(\frac{1}{\sqrt{2}}\right) \quad \text{or} \quad = \sin p \cdot \left(\frac{\sqrt{2}}{2}\right) - \cos p \cdot \left(\frac{\sqrt{2}}{2}\right)$ $= \frac{\sin p - \cos p}{\sqrt{2}} \quad \text{or/of} \quad = \frac{\sqrt{2}\sin p - \sqrt{2}\cos p}{2}$ $= \frac{-\frac{5}{13} + \frac{12}{13}}{\sqrt{2}} \quad \text{or/of} \quad = \frac{\sqrt{2}}{2} \left(-\frac{5}{13} + \frac{12}{13}\right)$ $= \frac{7\sqrt{2}}{26} \quad \text{or/of} \quad = \frac{7\sqrt{2}}{26}$	✓ expansion / uitbreiding ✓ substitution / substitusie ✓ answer/antwoord (3)

5.2.1	$\sin(85^\circ + \theta)\cos(25^\circ + \theta) - \cos(85^\circ + \theta)\sin(25^\circ + \theta) = \sin[(85^\circ + \theta) - (25^\circ + \theta)]$ $= \sin 60^\circ$ $= \frac{\sqrt{3}}{2}$	✓ compound $\angle$ s/ saamgestelde $\angle$ e ✓ answer/antwoord (2)
5.2.2	$\sin 60^\circ = -\tan x$ $\tan x = -\frac{\sqrt{3}}{2}$ $x = 40,89334$ $x = 180^\circ - 40,89334 \dots\dots^\circ + k180^\circ \quad k \in \mathbb{Z}$ $x = 139,11^\circ + k180^\circ \quad k \in \mathbb{Z}$	✓ equating / stel gelyk ✓ ref/verw $\angle$ ✓ $x = 139,11^\circ$ ✓ $k \in \mathbb{Z}$ (4)
5.3	$\tan(-\theta)\sin(90^\circ + \theta) + \frac{\sin 2\theta}{2\cos(360^\circ + \theta)}$ $= -\tan\theta \cdot \cos\theta + \frac{\sin 2\theta}{2\cos\theta}$ $= -\frac{\sin\theta}{\cos\theta} \cdot \cos\theta + \frac{2\sin\theta \cdot \cos\theta}{2\cos\theta}$ $= -\sin\theta + \sin\theta$ $= 0$	✓ $-\tan\theta$ ✓ $\cos\theta$ ✓ $\cos\theta$ ✓ $2\sin\theta \cdot \cos\theta$ ✓ $-\frac{\sin\theta}{\cos\theta}$ ✓ answer/antwoord (6)
		[19]

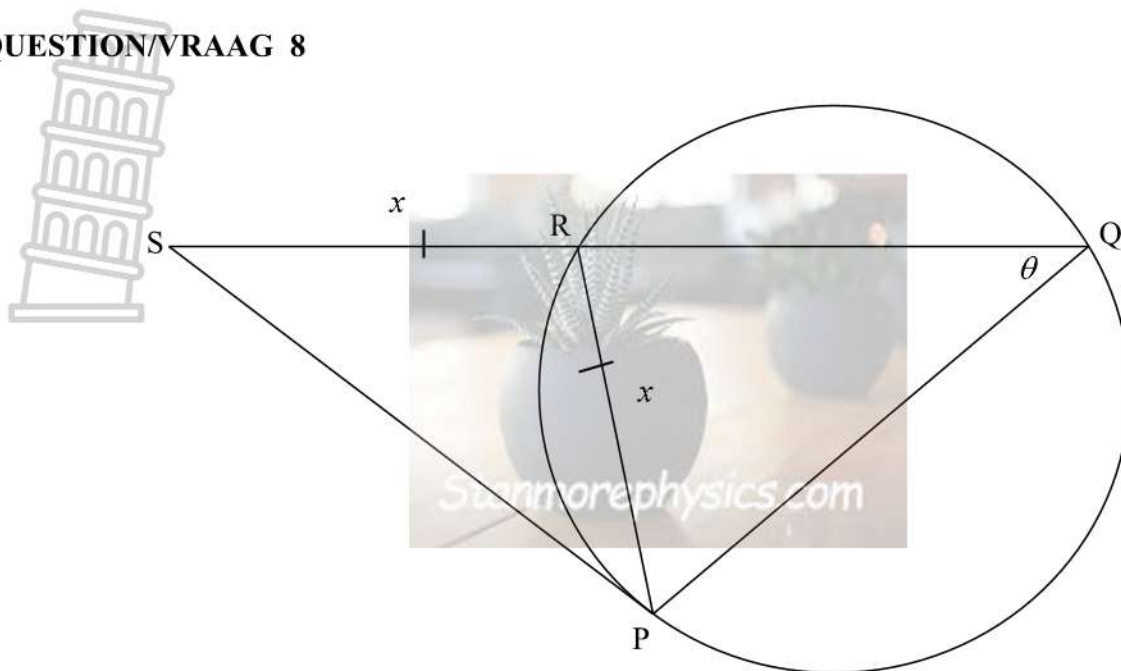
QUESTION/VRAAG 6

6.1.1	$\begin{aligned} \text{LHS} &= \frac{\cos^4 x + \sin^2 x \cdot \cos^2 x}{1 + \sin x} = 1 - \sin x \\ &= \frac{\cos^2 x (\cos^2 x + \sin^2 x)}{1 + \sin x} \\ &= \frac{\cos^2 x (1)}{1 + \sin x} \\ &= \frac{1 - \sin^2 x}{1 + \sin x} \\ &= \frac{(1 - \sin x)(1 + \sin x)}{1 + \sin x} \\ &= 1 - \sin x \\ \therefore \text{LHS} &= \text{RHS} \end{aligned}$	✓ common factor / gemeenskaplike faktor ✓ $\cos^2 x + \sin^2 x = 1$ ✓ $\cos^2 x = 1 - \sin^2 x$ ✓ factors / faktore (4)
6.1.2	$\begin{aligned} 1 + \sin x &= 0 \\ \therefore \sin x &= -1 \\ \therefore x &= 180^\circ + 90^\circ + k \cdot 360^\circ \quad k \in \mathbb{Z} \\ \therefore x &= 270^\circ + k \cdot 360^\circ \quad k \in \mathbb{Z} \end{aligned}$	✓ $\sin x = -1$ ✓ answer/antwoord (2)
6.1.3	$\begin{aligned} \therefore \text{minimum of /van } -\sin x &= -1 \\ \therefore \text{minimum of /van } -\sin x + 1 &= -1 + 1 = 0 \end{aligned}$	✓ substitution / substitusie ✓ answer/antwoord (2)
6.2	$\begin{aligned} \sin 3\theta &= \sin(2\theta + \theta) \\ &= \sin 2\theta \cos \theta + \cos 2\theta \sin \theta \\ &= 2 \sin \theta \cos \theta \cos \theta + (1 - 2 \sin^2 \theta) \sin \theta \\ &= 2 \sin \theta (1 - \sin^2 \theta) + \sin \theta - 2 \sin^3 \theta \\ &= 3 \sin \theta - 4 \sin^3 \theta \\ &= 3 \left(\frac{1}{3} \right) - 4 \left(\frac{1}{3} \right)^3 \\ &= \frac{23}{27} \end{aligned}$	✓ $\sin(2\theta + \theta)$ ✓ $2 \sin \theta \cos \theta$ & $1 - 2 \sin^2 \theta$ ✓ $1 - \sin^2 \theta$ ✓ Substitution / substitusie ✓ Answer/antwoord (5)
		[13]

QUESTION/VRAAG 7

7.1	360°	✓ Answer/antwoord (1)
7.2		✓ x – intercept / afsnit ✓ Intersection/ snyding ✓ shape / vorm (3)
7.3	Reflection along the y – axis then shifted 60° to the right. Refleksie in die y -as en dan skuif 60° na regs. OR / OF Reflection along the x -axis then shifted 60° to the left. Refleksie in die y -as en dan skuif 60° na links. OR / OF Translation of 120 to the right / translasie 120 regs.	✓ Reflection y – axis ✓ shifted 60° to the right (2)
7.4	$x \leq -160,89^\circ$ or/of $x \geq 19,11^\circ$	✓ $x \leq -160,89^\circ$ ✓ $x \geq 19,11^\circ$ (2)
7.5	$-30^\circ < x < 0^\circ$	✓ End points / eindpunte ✓ Correct Interval / korrekte interval (2)
		[10]

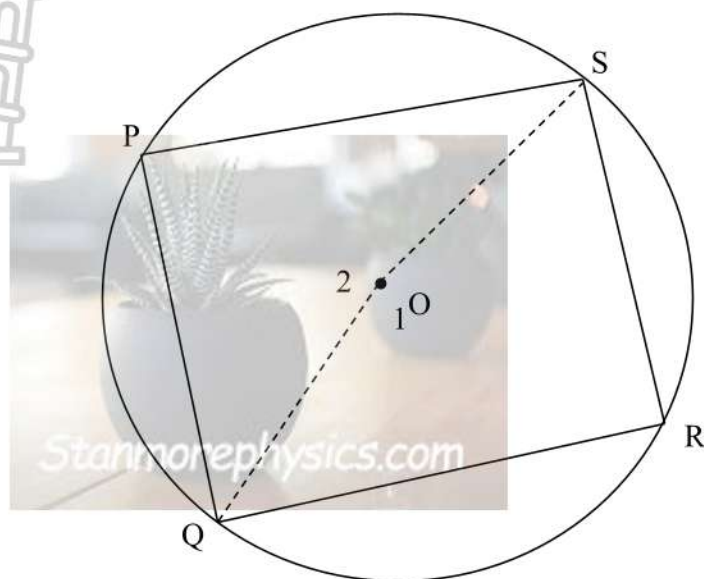
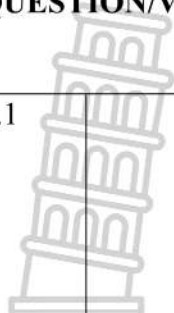
QUESTION/VRAAG 8



8	$\widehat{SPR} = \theta$ [tan-chord theorem/raaklyn koord stelling] $\widehat{SRP} = 180^\circ - 2\theta$ [sum of $\angle$'s of Δ /som van $\angle$ e van Δ] $PS^2 = SR^2 + PR^2 - 2SR.PR \cos \widehat{SRP}$ $= x^2 + x^2 - 2x^2 \cos (180^\circ - 2\theta)$ $= 2x^2 + 2x^2 \cos 2\theta$ $= 2x^2(1 + \cos 2\theta)$ $= 2x^2(1 + 2 \cos^2 \theta - 1)$ $= 2x^2(2 \cos^2 \theta)$ $= 4x^2 \cos \theta$ $\therefore PS = 2x \cos \theta$	✓ S ✓ S ✓ cosine rule / kosinus reël ✓ substitution / substitusie ✓ common factor / gemeenskaplike faktor ✓ identity / identiteit (6)
		[6]

QUESTION/VRAAG 9

9.1



Construction / Konstruksie: Join / verbind OQ and/en OS.

$$\hat{O}_1 = 2\hat{P} \quad [\angle \text{ at centre} = 2 \times \angle \text{ at circumference}]$$

middelpunts $\angle = 2 \times$ omtreks $\angle$

$$\hat{O}_2 = 2\hat{R} \quad [\angle \text{ at centre} = 2 \times \angle \text{ at circumference}]$$

middelpunts $\angle = 2 \times$ omtreks $\angle$

but /maar $\hat{O}_1 + \hat{O}_2 = 360^\circ$ [$\angle$'s at a point / $\angle$ e om 'n punt]

$$\therefore 2\hat{P} + 2\hat{R} = 360^\circ$$

$$2(\hat{P} + \hat{R}) = 360^\circ$$

$$\therefore \hat{P} + \hat{R} = 180^\circ$$

✓ construction /
konstruksie

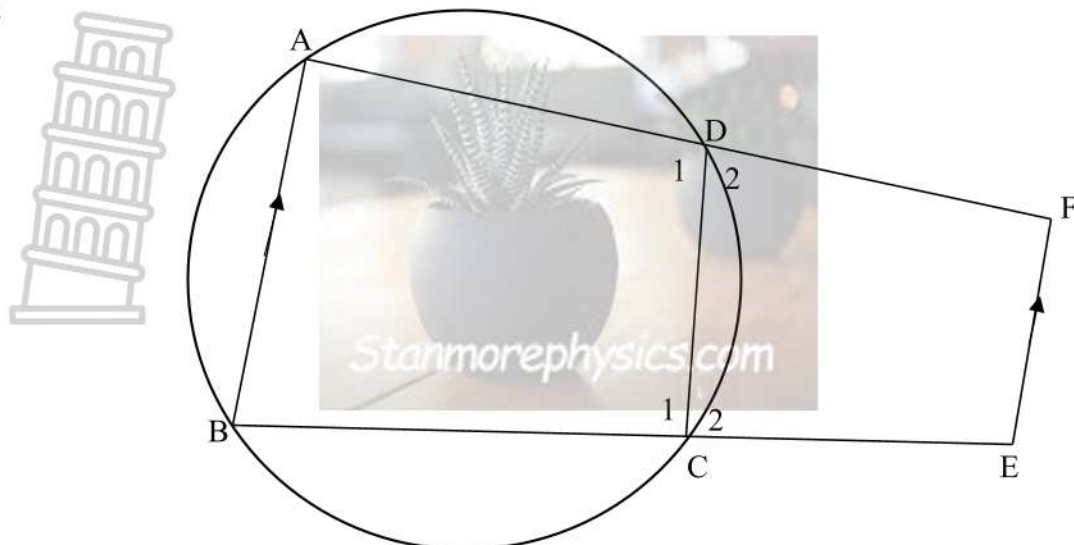
✓ S/B ✓ R

✓ S/B+R

✓ S/B ✓ R

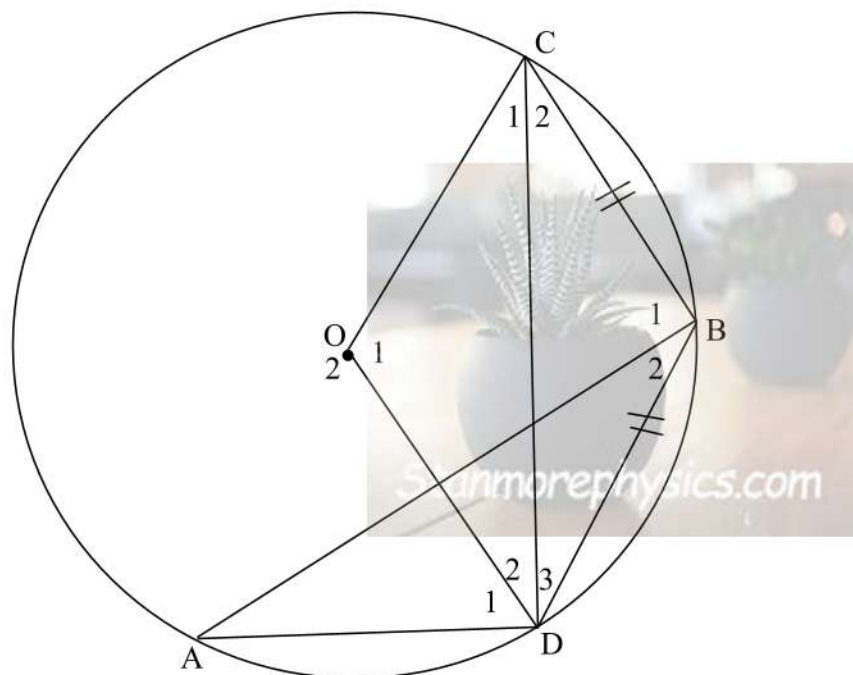
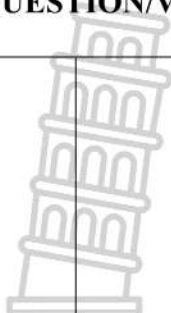
(5)

9.2



9.2	$\widehat{D}_2 = \widehat{B}$ but/maar $\widehat{B} + \widehat{E} = 180^\circ$ $\therefore \widehat{D}_2 + \widehat{E} = 180^\circ$ $\therefore$ CEFD is a cyclic quadrilateral CEFD is 'n koordevierhoek	[ext $\angle$ of cyclic quad]/ buite $\angle$ van koorde4 $\angle$ [co-int $\angle$'s /ko-binne $\angle$ e; AB FE] $\therefore \widehat{D}_2 + \widehat{E} = 180^\circ$ [converse opp $\angle$'s of a quad] buite $\angle$ van koordevierhoek omgekeerde	$\checkmark$ S/B $\checkmark$ R $\checkmark$ S/B $\checkmark$ R $\checkmark$ R (5)
			[10]

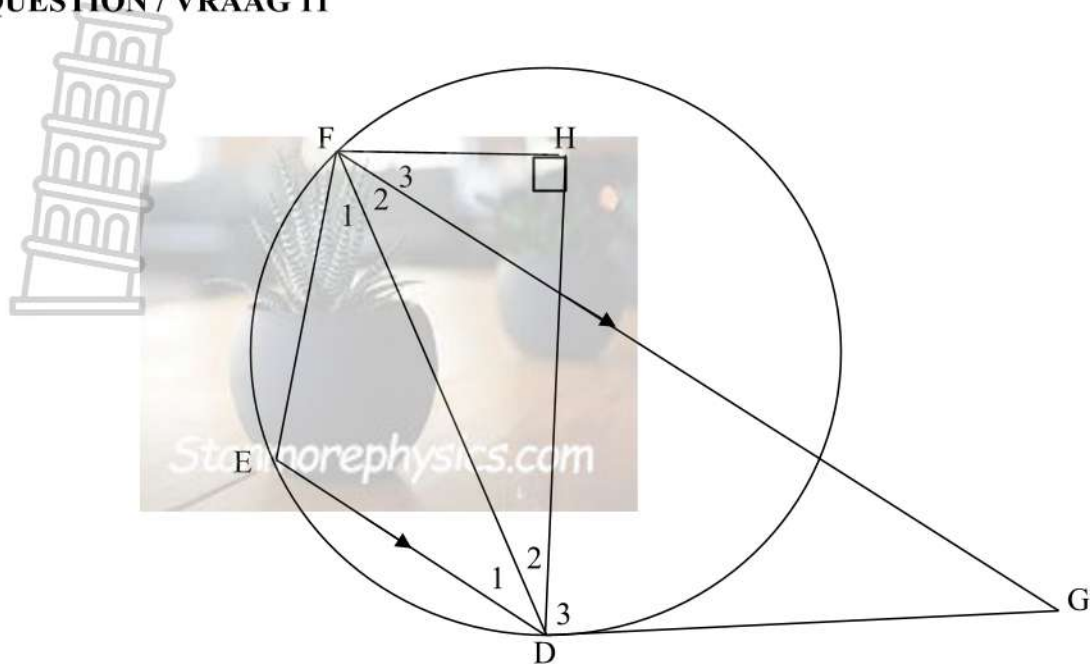
QUESTION/VRAAG 10



10.1.1		$\hat{A} = \hat{C}_2 = x$ [∠'s in the same seg / ∠e in selfde segment] $\hat{C}_2 = \hat{D}_3 = x$ [∠'s opp = sides / ∠e teenoor = sye]	✓ S/B ✓R ✓ S/B ✓R (4)
10.1.2	a)	$OC = OD$ [radii / radiusse] $\therefore \hat{C}_1 = \hat{D}_2$ [∠'s opp = sides / ∠e teenoor = sye] $\hat{C}_1 + \hat{D}_2 + \hat{O}_1 = 180^\circ$ [sum of ∠'s of Δ / som ∠e van Δ] $\hat{D}_2 + \hat{D}_2 + \hat{O}_1 = 180^\circ$ $\therefore 2\hat{D}_2 = 86^\circ$ $\therefore \hat{D}_2 = 43^\circ 7$	✓ S/B ✓R ✓ answer / antwoord (3)
	b)	$\hat{O}_1 + \hat{O}_2 = 360^\circ$ [∠'s round a point / ∠'e om 'n punt] $94^\circ + \hat{O}_2 = 360^\circ$ $\therefore \hat{O}_2 = 266^\circ$ $\hat{O}_2 = 2(\hat{B}_1 + \hat{B}_2)$ [∠ at centre = $2 \times \angle$ at circumference] middelpunts ∠ = $2 \times$ omtreks∠ $\therefore 266^\circ = 2(\hat{B}_1 + \hat{B}_2)$ $\therefore \hat{B}_1 + \hat{B}_2 = 133^\circ$	✓ S/B+R ✓ S/B ✓R ✓ answer/ antwoord (4)
	c)	$\hat{C}_2 = \hat{D}_3 = x$ [∠'s opp = sides / ∠e teenoor = sye] $\hat{B}_1 + \hat{B}_2 + \hat{C}_2 + \hat{D}_3 = 180^\circ$ [sum of ∠'s of Δ / som ∠e van Δ] $\therefore 133^\circ + x + x = 180^\circ$ $\therefore x = 23,5^\circ$	✓ S/B+R ✓ answer / antwoord (2)

10.2		
10.2.1	$\hat{L}_1 = \hat{M}_1$ [Alt $\angle$'s, verw $\angle$ e AB $\parallel$ MP] but $\hat{L}_1 = \hat{P}_1$ [tan – chord theorem / raaklyn koord stelling] $\therefore \hat{M}_1 = \hat{P}_1$ [both / beide = $\hat{L}_1$] $\therefore LM = LP$ [sides opp = $\angle$'s / sye teenoor = $\angle$ e]	$\checkmark$ S/B $\checkmark$ R $\checkmark$ S/B $\checkmark$ R (4)
10.2.2	$\hat{N}_2 = \hat{M}_1$ [$\angle$'s in the same seg / $\angle$ e in dieselfde segment] $\hat{N}_1 = \hat{P}_1$ [$\angle$'s in the same seg / $\angle$ e in dieselfde segment] but $\hat{M}_1 = \hat{P}_1$ [proven / bewys] $\therefore \hat{N}_1 = \hat{M}_1$ [both / beide = $\hat{P}_1$] $\therefore \hat{N}_1 = \hat{N}_1$ [both / beide = $\hat{M}_1$] $\therefore LN$ bisects / halveer $M\hat{N}P$	$\checkmark$ S/B $\checkmark$ R $\checkmark$ S/B+R $\checkmark$ S/B (4)
10.2.3	$\hat{N}_1 = \hat{M}_1$ [proven / bewys] $\therefore LM$ is a tangent to circle passing through MNQ, [converse tan – chord theorem] $\therefore LM$ is 'n raaklyn aan die sirkel duer MNQ [raaklyn koord stelling omgekeerde]	$\checkmark$ S/B $\checkmark$ R (2)
		[23]

QUESTION / VRAAG 11



11.1	In $\triangle EDF$ and $\triangle DFG$: $\hat{E} = \hat{D}_2 + \hat{D}_3$ [tan-chord theorem] raaklyn koord stelling $\hat{D}_1 = \hat{F}_2$ [alt $\angle$'s / verw $\angle$e, $ED \parallel FG$] $\therefore \hat{F}_1 = \hat{G}$ [sum of $\angle$'s of $\triangle$ / som $\angle$e van $\triangle$] $\therefore \triangle FED \parallel \triangle GDF$ [$\angle\angle\angle$]	✓ S /B ✓ R ✓ SB ✓ R (4)
11.2	$\frac{FD}{GF} = \frac{DE}{FD}$ [From / uit $\parallel \triangle$'s] $\therefore FD^2 = DE \cdot GF$ In $\triangle FHD$ $FD^2 = FH^2 + HD^2$ [Pythagoras] $\therefore FH^2 + HD^2 = DE \cdot GF$	✓ S/B ✓ R ✓ S (3)
		[7]
		TOTAL/TOTAAL:150