



education

Department:
Education
North West Provincial Government
REPUBLIC OF SOUTH AFRICA

NATIONAL SENIOR CERTIFICATE

GRADE 12

MATHEMATICS P2

SEPTEMBER 2025

MARKS: 150

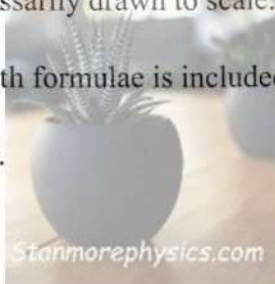
TIME: 3 hours

This question paper consists 12 pages, 1 information sheet
and an answer book of 22 pages.

INSTRUCTIONS AND INFORMATION

Read the following instructions carefully before answering the questions.

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



QUESTION 1

A survey was done under 100 members of a gymnasium about the cost of their annual membership contract.

Results showed an average annual payment of R3 240.

AMOUNT (R)	FREQUENCY
$0 \leq x < 1000$	8
$1000 \leq x < 2000$	12
$2000 \leq x < 3000$	P
$3000 \leq x < 4000$	30
$4000 \leq x < 5000$	Q
$5000 \leq x < 6000$	12

- 1.1 How many members payed less than R2 000 for their annual contract? (1)
 - 1.2 Proof by calculation that $P = 20$ and $Q = 18$. (5)
 - 1.3 Hence, complete the cumulative frequency table in the ANSWER BOOK. (2)
 - 1.4 Use the cumulative frequency table to draw an ogive to illustrate the information above. (3)
 - 1.5 Use the ogive to determine how many members spent more than R4 200 annually on their contracts. (1)
- [12]

QUESTION 2

Eight couples entered a dance competition. Two judges gave marks for their performances. The marks (out of 20) are shown in the table below.

COUPLE	1	2	3	4	5	6	7	8
JUDGE 1	18	4	6	8	5	12	10	14
JUDGE 2	15	6	3	5	5	14	8	15

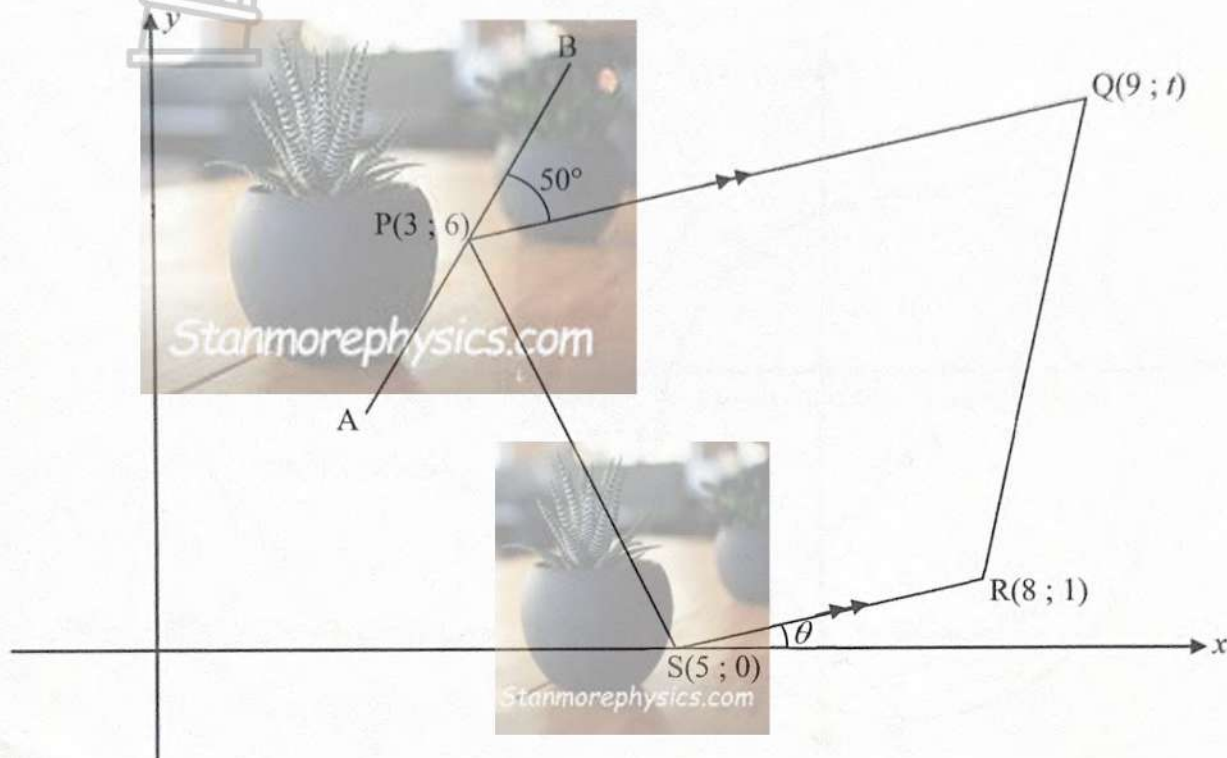
- 2.1 Determine the equation of the least squares regression line of the marks given by the two judges. (3)
- 2.2 A ninth couple had a late entry in the competition and received a mark of 15 by JUDGE 1. Calculate to the nearest integer, the mark they possibly would have received from JUDGE 2. (2)
- 2.3 Are the judges consistent when allocating marks? Motivate your answer with appropriate calculations. (3)

[8]

QUESTION 3

In the diagram below PQRS is a quadrilateral with vertices $P(3; 6)$, $Q(9; t)$, $R(8; 1)$ and $S(5; 0)$. $PQ \parallel SR$.

AB is a straight line that touches the quadrilateral at P. $\angle QPB = 50^\circ$



- 3.1 Calculate the gradient of SR. (2)
 - 3.2 Determine the equation of PQ in the form $y = mx + c$. (3)
 - 3.3 Calculate the value of t . (2)
 - 3.4 Calculate the length of PQ if $t = 8$. (2)
 - 3.5 Proof that PS is perpendicular to SR. (3)
 - 3.6 If $PQ = PS$, calculate the area of PQRS. (6)
 - 3.7 Calculate the value of θ , the angle of inclination of SR. (2)
 - 3.8 Calculate the equation of AB. Show ALL working. (6)
- [26]

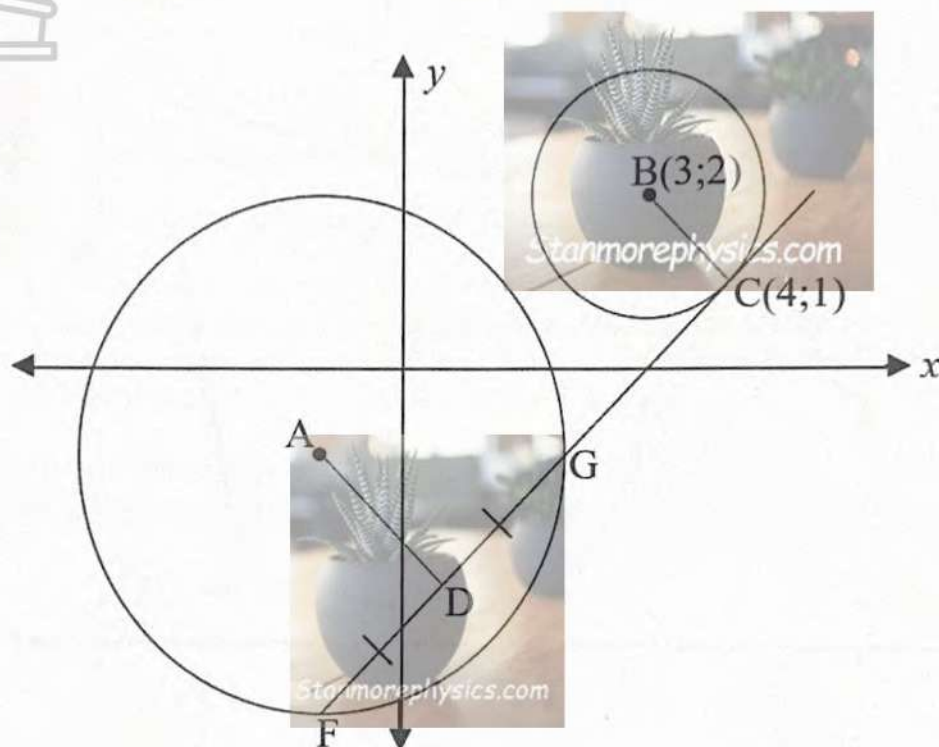


QUESTION 4

In the diagram below the circle with centre A has the equation $(x+1)^2 + (y+1)^2 = 9$.

FG is a chord of circle A. AD bisects chord FG.

FGC is a tangent to the circle with centre B(3; 2) at point C(4; 1).



4.1 Write down the coordinates of A. (1)

4.2 Determine the equation of tangent FC, in the form $y = mx + c$. (4)

4.3 Given: $AD = \frac{\sqrt{10}}{2}$ units. Calculate the length of FG. (4)

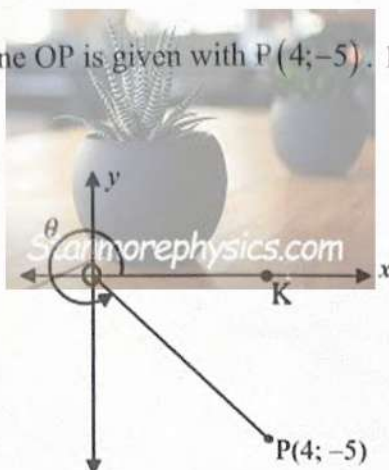
4.4 Determine the length of AB. (2)

4.5 Another circle with centre B, touches the circle with centre A at K. Determine the equation of the new circle. (3)

[14]

QUESTION 5

- 5.1 In the diagram below, line OP is given with $P(4; -5)$. $\widehat{KOP} = \theta$



Calculate, **without using a calculator**, the numerical value of the following:

5.1.1 $\sin^2(180^\circ + \theta)$ (4)

5.1.2 $\tan(-\theta)$ (2)

- 5.2 Calculate, **without using a calculator**, the value of the following:

5.2.1 $\cos 15^\circ$ (6)

5.2.2
$$\frac{\cos(90^\circ + x) \cdot \cos(180^\circ - x)}{\cos^2(180^\circ + x) \cdot \tan(180^\circ - x)}$$
 (5)

5.3 Given:
$$\frac{\sin 2\theta + 2 \cos \theta - 2 \cos^3 \theta}{1 + \sin \theta} = \sin 2\theta$$

5.3.1 Proof the identity. (5)

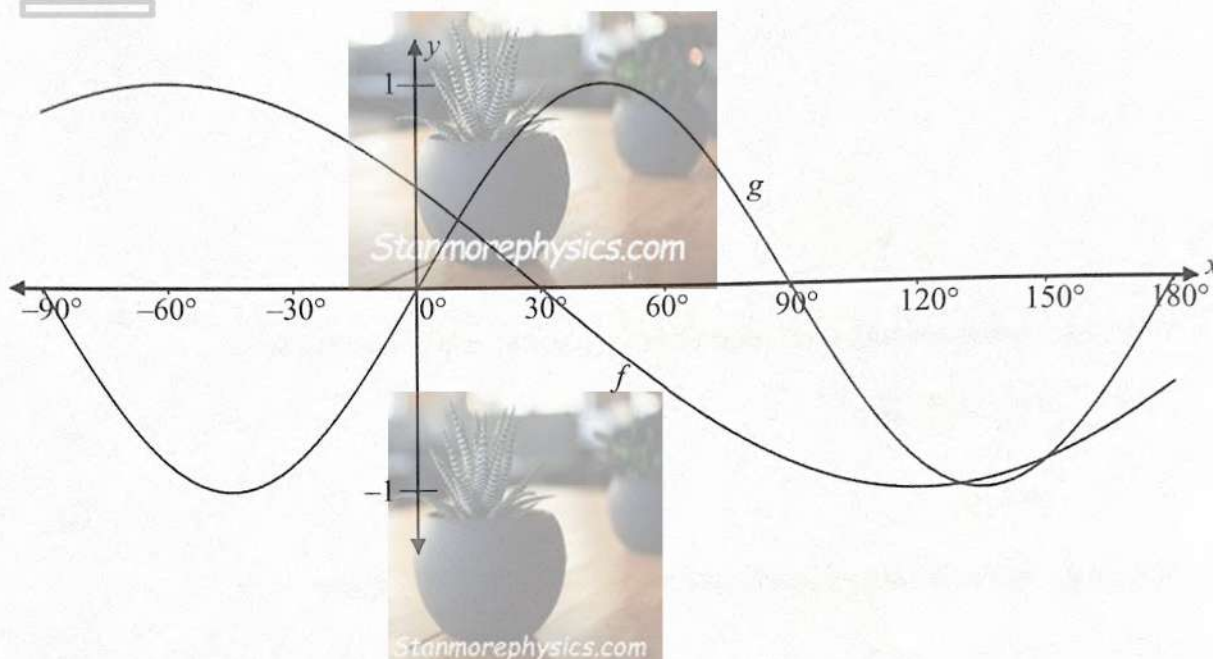
5.3.2 For which values of θ in the interval $[-360^\circ; 360^\circ]$ is the identity in QUESTION 5.3.1 undefined? (2)

5.4 Calculate the maximum value of $\frac{4}{2 + \cos x}$ (2)

[26]

QUESTION 6

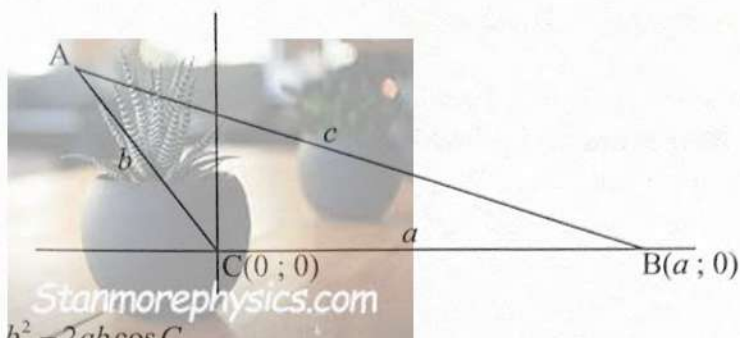
In the diagram below, the graphs of $f(x) = \cos(x + 60^\circ)$ and $g(x) = \sin 2x$ are drawn for the interval $x \in [-90^\circ; 180^\circ]$.



- 6.1 Calculate the values of x , in the interval $x \in [-90^\circ; 180^\circ]$ for which $f(x) = g(x)$. (7)
 - 6.2 Write down the period of $g(x)$. (1)
 - 6.3 Use your answer in question 6.1 to determine the value(s) of x where $g(x) \geq f(x)$. (2)
 - 6.4 Describe the transformation from h to p if $h(x) = \sin x$ and $p(x) = \sin(x - 30^\circ)$. (3)
- [13]

QUESTION 7

7.1 In the diagram below, $\triangle ABC$ is $90^\circ \leq C \leq 180^\circ$.

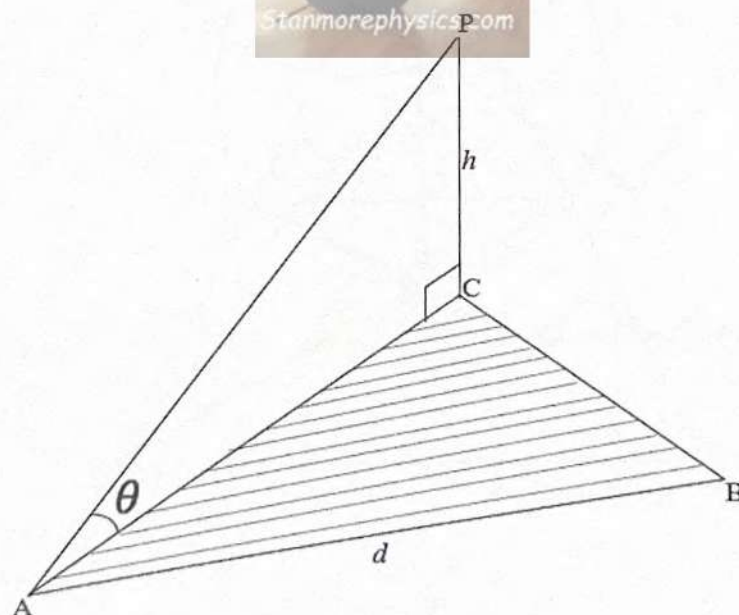


Proof: $c^2 = a^2 + b^2 - 2ab \cos C$.

(4)

7.2 In the diagram below, A, B and C are three points in the same horizontal plane.

- P is the image of a balloon vertically above C
- The angle of elevation to P from A is θ
- $\angle ABC = 90^\circ - \alpha$
- $BC = \frac{1}{2} AB$
- $AB = d$ units



7.2.1 Prove that $h = \frac{d \cdot \tan \theta \cdot \sqrt{5 - 4 \sin \alpha}}{2}$, where h is the height of the balloon above the ground.

(4)

7.2.2 Determine the value of h if $d = 300 \text{ m}$, $\alpha = 32^\circ$ and $\theta = 63^\circ$.

(3)

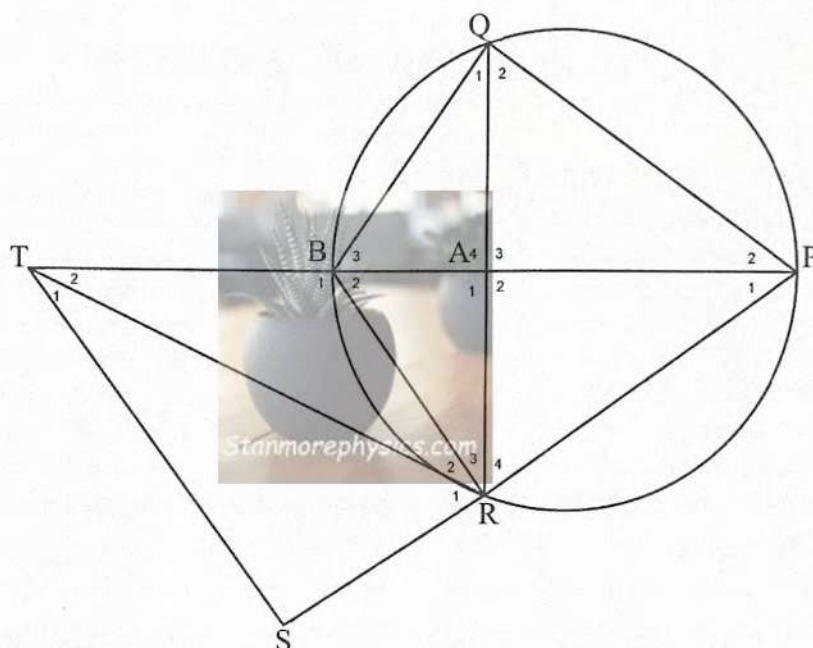
[11]

Provide reasons for your statements in QUESTION 8, 9 and 10.

QUESTION 8

In the diagram below PQBR is a cyclic quadrilateral.

- BP is a diameter of the circle. PR is produced to S, and PB to T
- PBT intersects QR at A and the circle at B
- RT bisects $\angle QRS$, $TS \perp SP$
- $PQ = PR$



8.1 If $\hat{Q}_2 = 55^\circ$, calculate with reasons the size of:

8.1.1 $\hat{R}_4$

(2)

8.1.2 $\hat{B}_3$

(2)

8.1.3 $\angle BRP$

(2)

8.1.4 $\hat{A}_1$

(3)

8.2 Give a reason why $AQ = AR$.

(1)

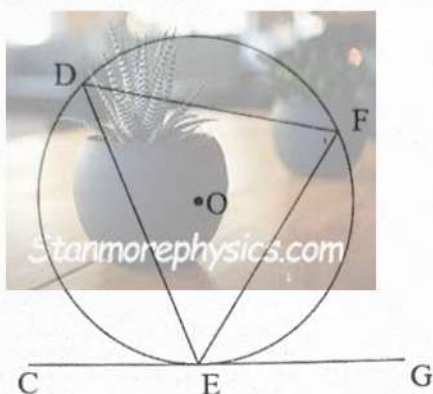
8.3 Prove that $AT = TS$.

(4)

[14]

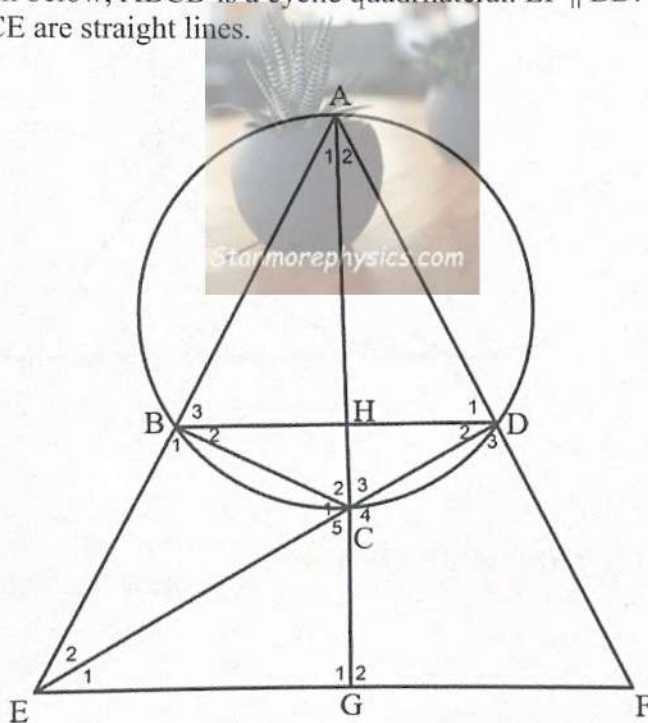
QUESTION 9

In the diagram O is the centre of the circle, with CEG a tangent to the circle.



9.1 Prove the theorem that states that $\hat{CED} = \hat{F}$. (5)

9.2 In the diagram below, ABCD is a cyclic quadrilateral. $EF \parallel BD$. ACG and DCE are straight lines.



Prove that:

9.2.1 $\hat{E}_1 = \hat{A}_1$ (3)

9.2.2 EF is a tangent to the circle EAC (1)

9.2.3 $\triangle ABC \parallel \triangle EDF$ (4)

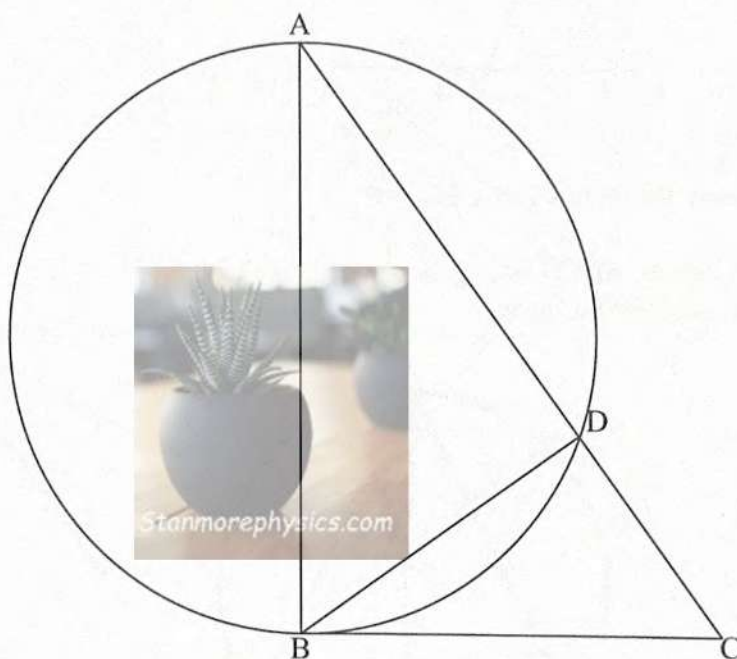
9.2.4 $\frac{BE \cdot AH}{GH} = \frac{ED \cdot BC}{DF}$ (6)

[19]

QUESTION 10

In the diagram below, AB is a diameter of the circle. CB is a tangent to the circle at B. AC intersect the circle at D.

- $DC = x$
- $DC = \frac{1}{2} AD$



10.1 Prove that $\frac{BD}{DC} = \sqrt{2}$

(4)

10.2 Calculate the perimeter of $\triangle ABC$ if $AD = 10$ mm.

(3)

[7]

TOTAL: 150

INFORMATION SHEET

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

$$A = P(1 + ni)$$

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

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

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

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

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

$$y = mx + c$$

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

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

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

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

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

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

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

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

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

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

$$A = P(1 - ni)$$

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

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

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

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

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

$$y - y_1 = m(x - x_1)$$



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

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

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

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

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

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

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

$$P(A \text{ or } B) = P(A) + P(B) - P(A \text{ and } B)$$

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

LEARNER'S NAME/NAAM VAN LEERDER



**NATIONAL SENIOR CERTIFICATE/
NASIONALE SENIOR SERTIFIKAAT**

MATHEMATICS P2/WISKUNDE V2

GRADE 12/GRAAD 12

SEPTEMBER 2025



**SPECIAL ANSWER BOOK/
SPESIALE ANTWOORDEBOEK**

QUESTION/ VRAAG	MARK/ PUNT	INITIAL/ PARAAF	MODERATOR
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
TOTAL/ TOTAAL			



**This answer book consists of 22 pages./
Hierdie antwoordeboek bestaan uit 22 bladsye.**

FOLLOW THESE INSTRUCTIONS CAREFULLY	VOLG HIERDIE INSTRUKSIES NOUKEURIG
1. Clearly write your name in the space provided. 2. No pages may be torn OR ADDED from this answer book. 3. Read the instructions given in the examination paper carefully. 4. Learners may not retain any answer book or remove it from the examination room. 5. Answers must be written in black/blue ink as distinctly as possible. 6. Draw a neat line through any work/rough work that must not be marked.	1. Skryf jou naam in die ruimte soos verskaf. 2. Geen bladsy mag uit hierdie antwoordeboek geskeur word OF BYGEVOEG WORD nie. 3. Lees die instruksies wat in die eksamen vraestel gegee word, sorgvuldig deur. 4. Geen antwoordeboek mag deur leerders behou of uit die eksamenlokaal verwyder word nie. 5. Skryf die antwoorde so duidelik moontlik met swart/blou ink. 6. Trek 'n netjiese lyn deur enige werk/rofwerk wat nie nagesien moet word nie.

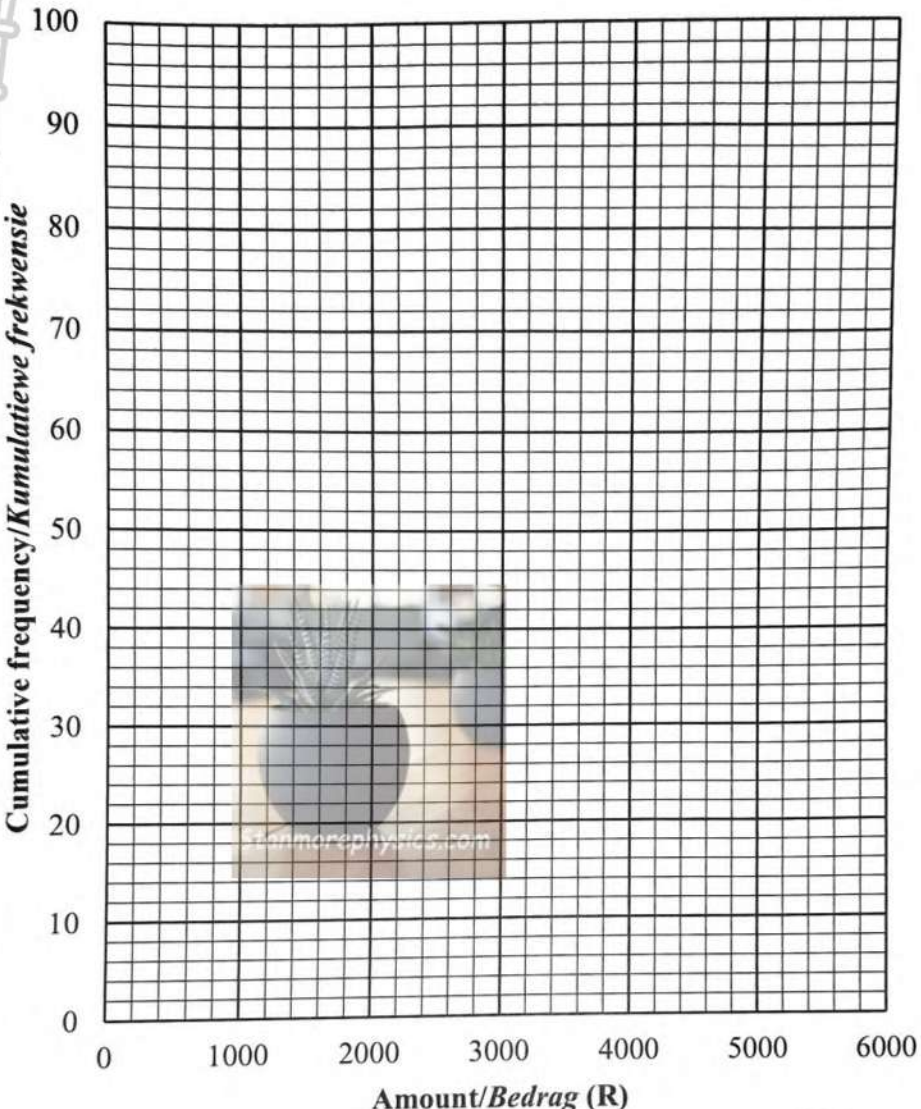


QUESTION/VRAAG 1



AMOUNT/ BEDRAG (R)	FREQUENCY/ FREKWENSIE
$0 \leq x < 1\,000$	8
$1\,000 \leq x < 2\,000$	12
$2\,000 \leq x < 3\,000$	P
$3\,000 \leq x < 4\,000$	30
$4\,000 \leq x < 5\,000$	Q
$5\,000 \leq x < 6\,000$	12

	Solution/Oplissing	Marks/ Punte																					
1.1		(1)																					
1.2		(5)																					
1.3	<table> <tr> <th>AMOUNT/ BEDRAG (R)</th><th>FREQUENCY/ FREKWENSIE</th><th>CUMULATIVE FREQUENCY/ KUMULATIEWE FREKWENSIE</th></tr> <tr> <td>$0 \leq x < 1\,000$</td><td>8</td><td></td></tr> <tr> <td>$1\,000 \leq x < 2\,000$</td><td>12</td><td></td></tr> <tr> <td>$2\,000 \leq x < 3\,000$</td><td>20</td><td></td></tr> <tr> <td>$3\,000 \leq x < 4\,000$</td><td>30</td><td></td></tr> <tr> <td>$4\,000 \leq x < 5\,000$</td><td>18</td><td></td></tr> <tr> <td>$5\,000 \leq x < 6\,000$</td><td>12</td><td></td></tr> </table>	AMOUNT/ BEDRAG (R)	FREQUENCY/ FREKWENSIE	CUMULATIVE FREQUENCY/ KUMULATIEWE FREKWENSIE	$0 \leq x < 1\,000$	8		$1\,000 \leq x < 2\,000$	12		$2\,000 \leq x < 3\,000$	20		$3\,000 \leq x < 4\,000$	30		$4\,000 \leq x < 5\,000$	18		$5\,000 \leq x < 6\,000$	12		(2)
AMOUNT/ BEDRAG (R)	FREQUENCY/ FREKWENSIE	CUMULATIVE FREQUENCY/ KUMULATIEWE FREKWENSIE																					
$0 \leq x < 1\,000$	8																						
$1\,000 \leq x < 2\,000$	12																						
$2\,000 \leq x < 3\,000$	20																						
$3\,000 \leq x < 4\,000$	30																						
$4\,000 \leq x < 5\,000$	18																						
$5\,000 \leq x < 6\,000$	12																						

1.4	Ogive/Ogief 	(3)
1.5		(1)
		[12]

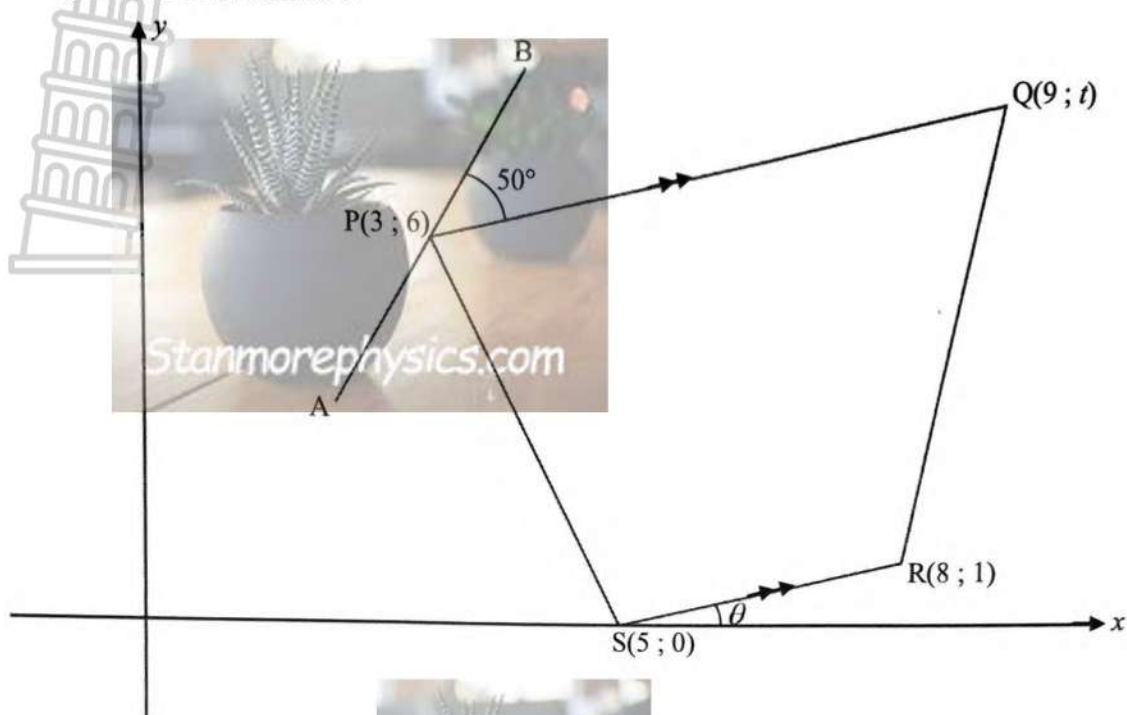
QUESTION/VRAAG 2

COUPLE/PAAR	1	2	3	4	5	6	7	8
JUDGE/BEOORDEELLAAR 1	18	4	6	8	5	12	10	14
JUDGE/BEOORDEELLAAR 2	15	6	3	5	5	14	8	15

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	Solution/Oplissing	Marks/ Punte
2.1		(3)
2.2		(2)
2.3		(3)
		[8]

QUESTION/VRAAG 3



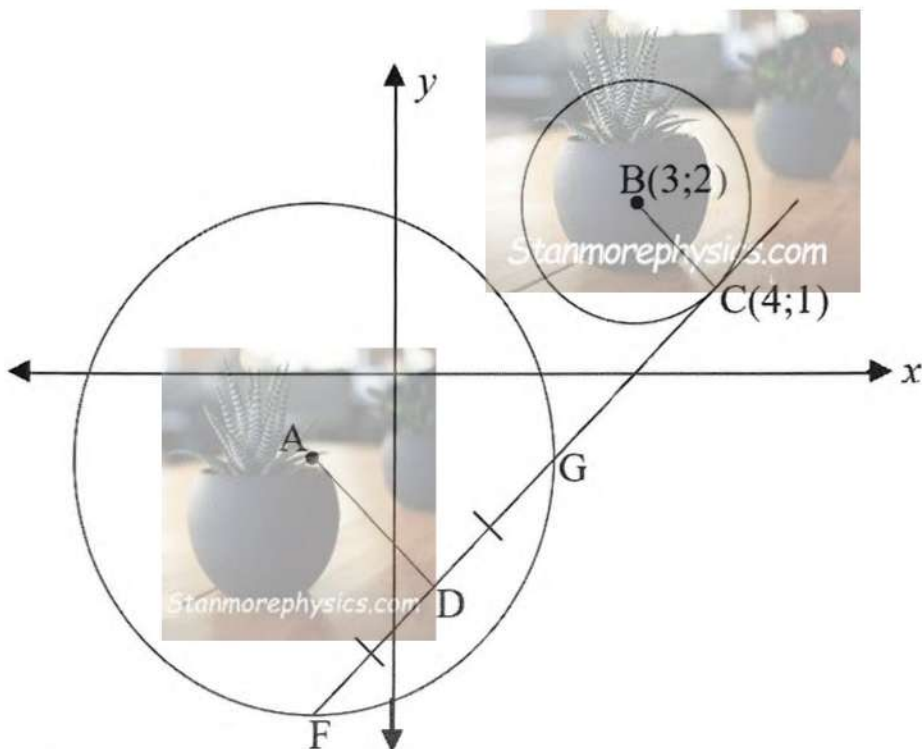
	Solution/Oplossing	Marks/ Punte
3.1		(2)
3.2		(3)
3.3		(2)
3.4		(2)

3.5		
		(3)
3.6		
		(6)
3.7		
		(2)
3.8		
		(6)
		[26]

QUESTION/VRAAG 4

Equation of circle with centre A is $(x+1)^2 + (y+1)^2 = 9$. FG is a chord of circle A. AD bisects chord FG. FGC is a tangent to the circle with centre B(3;2) at point C(4;1).

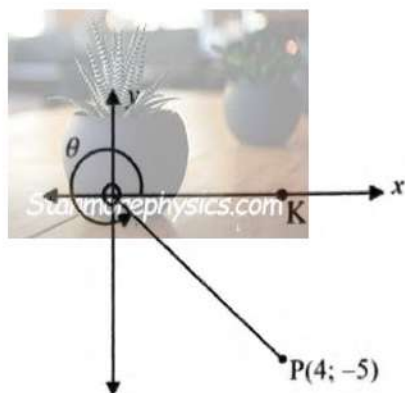
Sirkel met middelpunt A se vergelyking gegee deur $(x+1)^2 + (y+1)^2 = 9$. FG is 'n koord van sirkel A. AD halveer koord FG. FGC is 'n raaklyn aan die sirkel met middelpunt B(3;2) by punt C(4;1).



	Solution/Oplissing	Marks/ Punte
4.1		(1)
4.2		(4)

4.3		
4.4		(4)
4.5		(2)
[14]		

QUESTION/VRAAG 5



	Solution/Oplissing	Marks/ Punte
5.1.1	$\sin^2(180^\circ + \theta)$	(4)
5.1.2	$\tan(-\theta)$	(2)
5.2.1	$\cos 15^\circ$	(6)

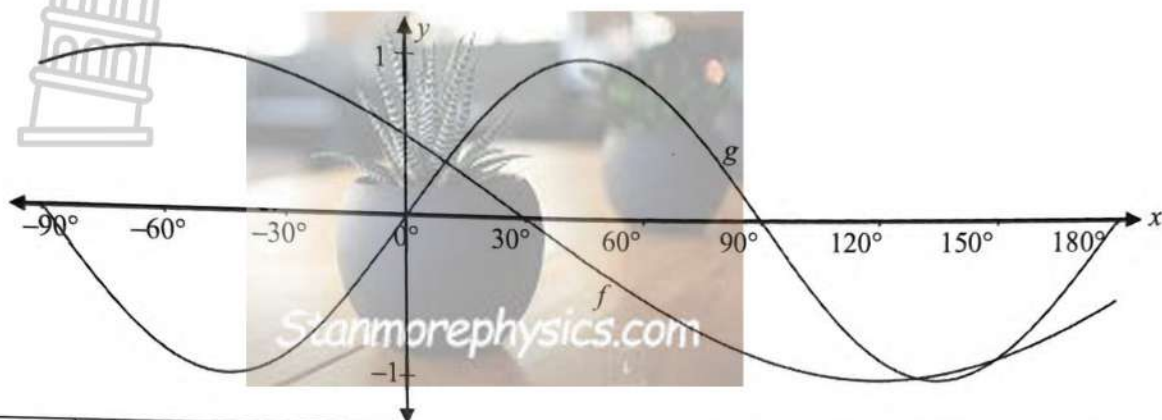
5.2.2	$\frac{\cos(90^\circ + x) \cdot \cos(180^\circ - x)}{\cos^2(180^\circ + x) \cdot \tan(180^\circ - x)}$	
5.3.1	$\frac{\sin 2\theta + 2 \cos \theta - 2 \cos^3 \theta}{1 + \sin \theta} = \sin 2\theta$ 	(5)

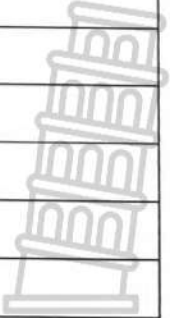
5.3.2		(2)
5.4		(2)
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$$f(x) = \cos(x + 60^\circ)$$

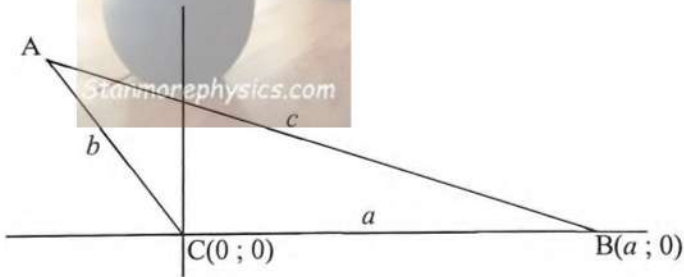
$$g(x) = \sin 2x$$



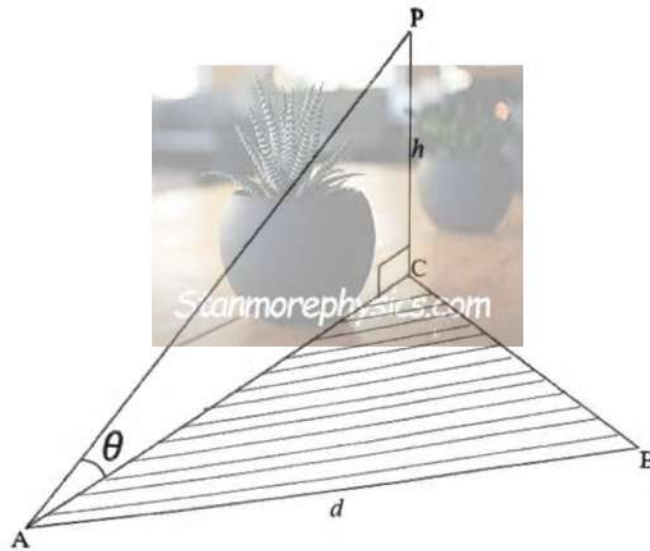
	Solution/ <i>Oplossing</i>	Marks/ <i>Punte</i>
6.1	 	(7)

6.2		(1)
6.3		(2)
6.4		(3)
		[13]

QUESTION/VRAAG 7

	Solution/Oplissing	Marks/ Punte
7.1		(4)

7.2.1



(4)

7.2.2

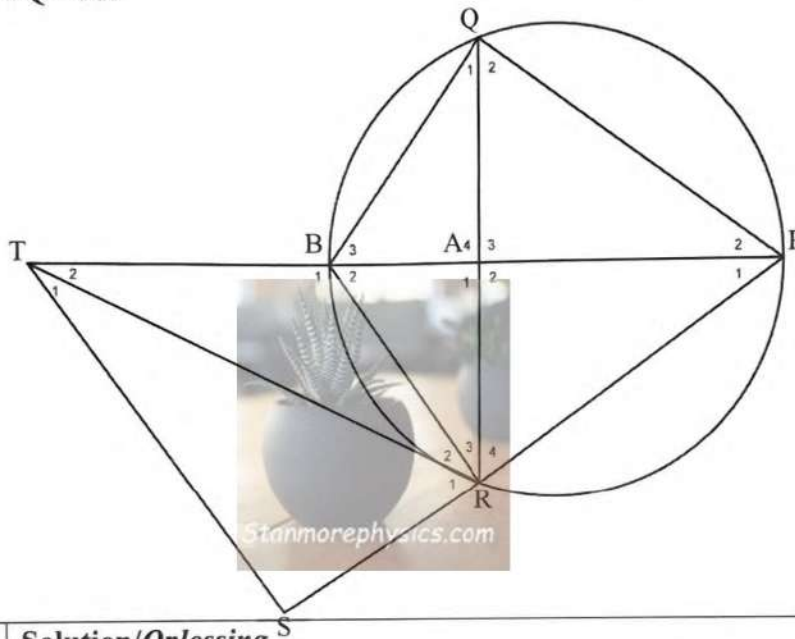
(3)

[11]

Provide reasons for your statements in QUESTION 8, 9 and 10.

QUESTION 8/VRAAG 8

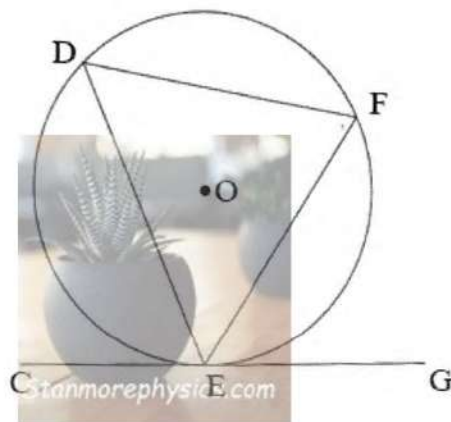
- BP is a diameter of the circle. PR is produced to S, and PB to T / BP is 'n middellyn van die sirkel. PR is verleng na S en PB is verleng na T
- PBT intersects QR at A and the circle at B / PBT sny QR by A en die sirkel by B
- RT bisects $\hat{QRS}$, $TS \perp SP$ / RT halveer $\hat{QRS}$, $TS \perp SP$
- $PQ = PR$



	Solution/Oplossing	Marks/ Punte
8.1.1		(2)
8.1.2		(2)
8.1.3		(2)
8.1.4		(3)
8.2		(1)
8.3		(4)

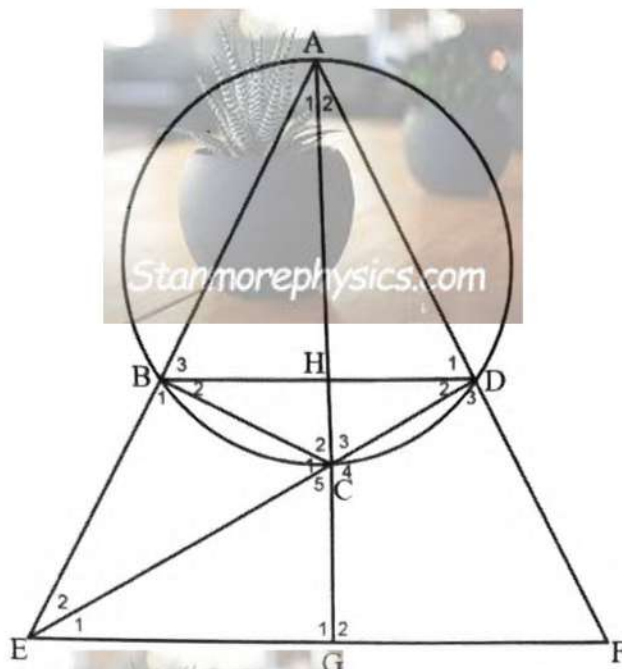
	
[14]	

QUESTION 9/VRAAG 9



	Solution/Oplossing	Marks/ Punte
9.1		(5)

9.2.1



9.2.1

(3)

9.2.2

(1)

9.2.3

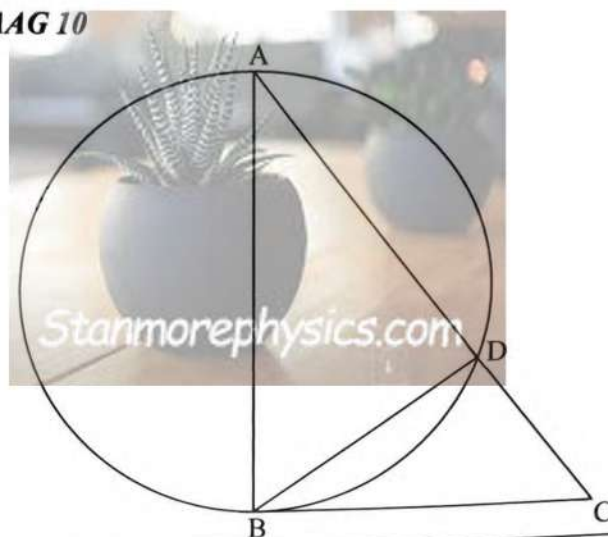
(4)

9.2.4		
		(6)
		[19]





QUESTION/VRAAG 10



	Solution/Oplossing	Marks/ Punte
10.1		(4)
10.2		(3)
		[7]

TOTAL/TOTAAL: 150

Mathematics Paper 2 (08 SEPTEMBER 2025)

Marking Guideline discussion Notes

Question 1 [Statistics]

- 1.5 Possibility of an interval {73 - 75}

Question 2 [Statistics]

- 2.2 C.A from Q2.1
- To the NEAREST INTEGER was emphasized. As stated on the question paper.

Question 3 [Analytical Geometry]

- 3.2 & 3.3 C.A Only if the gradient is positive
- 3.6 Teachers wanted to know whether the "Shoelace Method" can also be accepted to which the answer was YES given that everything is correct (Accuracy mark)
- 3.6 **DO NOT PENALIZE** for SI units
- 3.7 C.A from 3.1
- 3.8 Check alternative methods

Question 4 [Analytical Geometry]

- 4.2 Gradient of BC must be negative(-) in order to C.A (Max $\frac{2}{4}$ marks)
- 4.4 & 4.5 Answer Only is accepted
- 4.5 C.A from 4.4 (AB)

Question 5 [Trigonometry]

- 5.1.1 If reduction formula is Wrong, C.A (Max $\frac{2}{4}$)
- 5.2.1 Learners can also use $\cos 30^\circ = 2\cos^2 15^\circ - 1$ or $\cos (45^\circ - 30^\circ)$
$$\cos 15^\circ = \sqrt{\frac{\cos 30^\circ + 1}{2}}$$
- 5.3.2 Answer Only is accepted
- 5.4 Learner can also use calculator (TABLE $f(x) = \dots$) to find the maximum

Question 6 [Trigonometry]

- 6.4 **30° Right** – Accepted (Full Marks)

Question 7 [Trigonometry]

- 7.2.2 Mark allocation must be check
- **Teachers are advised to revise the proofs of Area, Sine & Cosine Rules**

Question 8 [Euclidean Geometry]

- **Always** start marking from candidate's diagram. Marks can be allocated on the diagram.
- 8.2 Perpendicular bisector is acceptable as reason

Question 9 [Euclidean Geometry]

- 9.1 No Construction/wrong construction constitute a break down BD
- 9.2.4 Specify the specific triangles Δ

Question 10 [Euclidean Geometry]

- 10.1 Trigonometric ratios can also be used and 90° MUST be stated or MUST be Shown on the candidate's diagram.
- 10.2 If BC and AB are incorrect $\rightarrow$ C.A can be applied.

THE END





education

Department:
Education
North West Provincial Government
REPUBLIC OF SOUTH AFRICA

NATIONAL SENIOR CERTIFICATE/ NASIONALE SENIOR SERTIFIKAAT

GRADE/GRAAD 12

MATHEMATICS P2/WISKUNDE V2

SEPTEMBER 2025

Stanmorephysics.com

MARKING GUIDELINES/NASIENRIGLYNE

Stanmorephysics.com

MARKS/PUNTE: 150



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

NOTE:

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

NOTA:

- As 'n kandidaat 'n vraag TWEE KEER beantwoord, sien slegs die EERSTE poging na.
- As 'n kandidaat 'n antwoord van 'n vraag doodtrek en nie oordoen nie, 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



AMOUNT/ BEDRAG (R)	FREQUENCY/ FREKWENSIE
$0 \leq x < 1000$	8
$1000 \leq x < 2000$	12
$2000 \leq x < 3000$	P
$3000 \leq x < 4000$	30
$4000 \leq x < 5000$	Q
$5000 \leq x < 6000$	12

1.1	20	✓ answer/antwoord (1)																					
1.2	$8 + 12 + P + 30 + Q + 12 = 100$ $P + Q = 38 \dots\dots\dots \textcircled{1}$ $\bar{x} = 3240 = \frac{8(500) + 12(1500) + P(2500) + 30(3500) + Q(4500) + 12(5500)}{100}$ $\therefore 1310 = 25P + 45Q$ $\therefore 262 = 5P + 9Q$ $5(38 - Q) + 9P = 262$ $190 - 5Q + 9Q = 262$ $4Q = 72$ $Q = 18$ $P = 20$	✓ $P + Q = 38$ ✓ eq of $\bar{x} = 3240$ ✓ $262 = 5P + 9Q$ ✓ subst/vervang $\textcircled{1}$ ✓ subst/vervang $Q = 18$ (5)																					
1.3	<table border="1"> <thead> <tr> <th>AMOUNT/ BEDRAG (R)</th><th>FREQUENCY/ FREKWENSIE</th><th>CUMULATIVE FREQUENCY/ KUMULATIEWE FREKWENSIE</th></tr> </thead> <tbody> <tr> <td>$0 \leq x \leq 1000$</td><td>8</td><td>8</td></tr> <tr> <td>$1000 \leq x \leq 2000$</td><td>12</td><td>20</td></tr> <tr> <td>$2000 \leq x \leq 3000$</td><td>20</td><td>40</td></tr> <tr> <td>$3000 \leq x \leq 4000$</td><td>30</td><td>70</td></tr> <tr> <td>$4000 \leq x \leq 5000$</td><td>18</td><td>88</td></tr> <tr> <td>$5000 \leq x \leq 6000$</td><td>12</td><td>100</td></tr> </tbody> </table>	AMOUNT/ BEDRAG (R)	FREQUENCY/ FREKWENSIE	CUMULATIVE FREQUENCY/ KUMULATIEWE FREKWENSIE	$0 \leq x \leq 1000$	8	8	$1000 \leq x \leq 2000$	12	20	$2000 \leq x \leq 3000$	20	40	$3000 \leq x \leq 4000$	30	70	$4000 \leq x \leq 5000$	18	88	$5000 \leq x \leq 6000$	12	100	✓ 8, 20, 40 ✓ 70, 88, 100 (2)
AMOUNT/ BEDRAG (R)	FREQUENCY/ FREKWENSIE	CUMULATIVE FREQUENCY/ KUMULATIEWE FREKWENSIE																					
$0 \leq x \leq 1000$	8	8																					
$1000 \leq x \leq 2000$	12	20																					
$2000 \leq x \leq 3000$	20	40																					
$3000 \leq x \leq 4000$	30	70																					
$4000 \leq x \leq 5000$	18	88																					
$5000 \leq x \leq 6000$	12	100																					

1.4	Ogive/Ogief Cumulative frequency/Kumulatiewe Amount/Bedrag (R)	✓ min/max values ✓ all coordinates (penalise without grouping/penaliseer sonder beginpunt) ✓ Shape/Vorm (3)
1.5	$100 - 74 = 26$ members/lede Possibility of an interval {73 - 75} CA from graph	✓ answer/antwoord (1)
[12]		

QUESTION/VRAAG 2

COUPLE/PAAR	1	2	3	4	5	6	7	8
JUDGE/BEOORDELAAR 1	18	4	6	8	5	12	10	14
JUDGE/BEOORDELAAR 2	15	6	3	5	5	14	8	15

2.1	$a = -0.03$ $b = 0,93$ $\hat{y} = -0.03 + 0,93x$ Answer only: full marks, but if a and b are swapped only 1/3 marks/ <i>Slegs antwoord: vol punte maar as a en b omgeruil is, slegs 1/3 punte.</i>	✓ a ✓ b ✓ equation/vergelyking (3)
2.2	$\hat{y} = -0.03 + 0,93(15)$ $= 13,92$ OR / OF $13,85$ ≈ 14 CA from 2.1 Answer only: full marks <i>Slegs antwoord: vol punte</i>	✓ substitute 15 into eq. / vervang 15 in vgl. ✓ answer/antwoord (2)
2.3	Yes, they are consistent. $r = 0.9$ – positive strong correlation / <i>Ja, hulle is konsekwent. $r = 0.9$ – positief sterk korrelasie</i>	✓ yes/ja ✓ $r = 0,9$ ✓ positive strong/positief sterk (3)

QUESTION/VRAAG 3

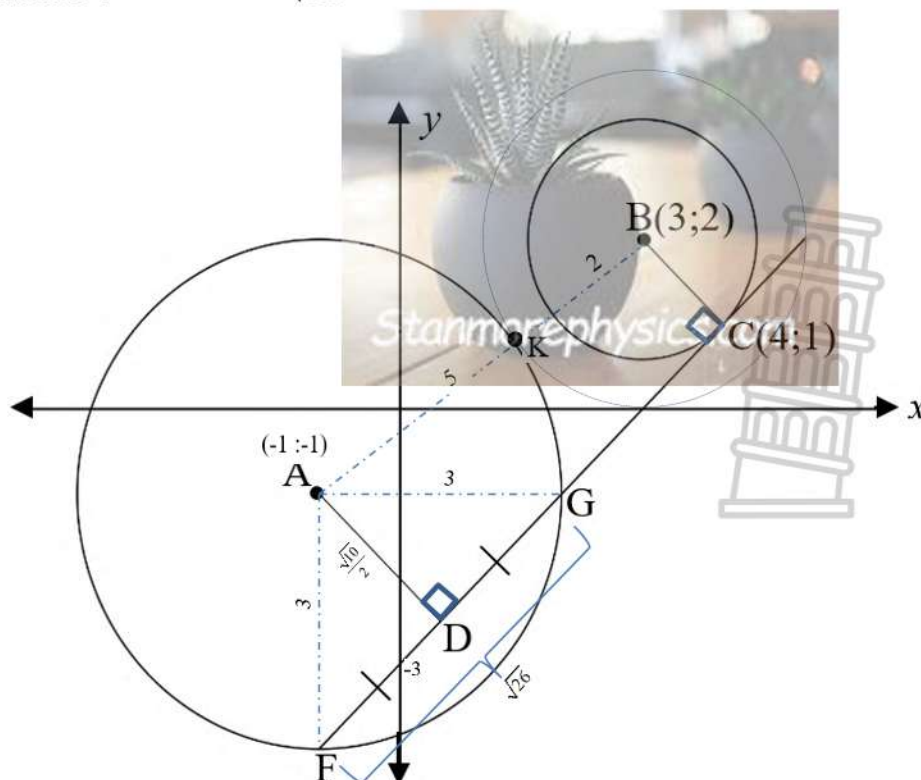


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3.5	$m_{PS} = \frac{6-0}{3-5} = \frac{6}{-2} = -3$ $m_{SR} = \frac{1}{3}$ $m_{PS} \times m_{RS}$ $= -3 \times \frac{1}{3}$ $= -1$ $\therefore PS \perp SR$	(2) ✓ $m_{PS} = -3$ $m_{PS} \times m_{RS}$ ✓ $= -3 \times \frac{1}{3}$ $= -1$ ✓ conclusion/gevolgtrekking (3)
3.6	$SR = \sqrt{(8-5)^2 + (1-0)^2}$ $SR = \sqrt{9+1}$ $SR = \sqrt{10} / 3,16$ $PS = \sqrt{(5-3)^2 + (0-6)^2}$ $PS = \sqrt{4+36}$ $PS = \sqrt{40} / 2\sqrt{10} / 6,32$ $\text{area of trapezium/ oppv van trapesium} = \frac{1}{2}(PQ + RS) \cdot PS$ $= \frac{1}{2}(\sqrt{40} + \sqrt{10}) \times \sqrt{40}$ $= 30 \text{ square units / vierkante eenhede}$ Please note: Shoe-lace method is not in CAPS. Answer (ACC) only is 6/6	✓ SR ✓ PS ✓ area of trapezium/ oppv van trapesium ✓ $\sqrt{40}$ ✓ $\sqrt{10}$ ✓ answer/antwoord (6)
3.7	$\tan \theta = \frac{1}{3}$ CA from 3.1 only if gradient is + $\therefore \theta = 18,43^\circ$ Answer only: full marks	✓ $\tan \alpha = m_{SR}$ ✓ answer/antwoord (2)

3.8 $\hat{Q}\hat{P}S = 90^\circ$ [co-int $\angle$'s / <i>ko-binne $\angle$'s</i> $PQ \parallel SR$] $\hat{P}_1 = 40^\circ$ [straight line / <i>reguitlyn</i>] $\hat{C} = 68,43^\circ$ [ext $\angle$ of Δ / <i>buite $\angle$ v Δ</i>] $\tan 68,43^\circ = 2,53$ OR/OF $\hat{P}\hat{S}C = 71,57^\circ$ $\hat{C}\hat{P}S = 40^\circ$ $\therefore \hat{P}\hat{C}S = 68,43^\circ$ $P(3:6):$ $6 = (2,53)(3) + c$ $\therefore c = -1,59$ $\therefore y = 2,53x - 1,59$	✓ $\hat{Q}\hat{P}S = 90^\circ$ ✓ $\hat{P}_1 = 40^\circ$ ✓ $\hat{P}\hat{C}S = 68,43^\circ$ ✓ $m = 2,53$ ✓ $\hat{P}\hat{S}C = 71,57^\circ$ ✓ $\hat{C}\hat{P}S = 40^\circ$ ✓ $\hat{P}\hat{C}S = 68,43^\circ$ ✓ subst. coordinates of/ <i>vervang koördinate van P</i> ✓ equation/ <i>vergelyking</i>	(6) [26]
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QUESTION/VRAAG 4

$$\sqrt{26}$$


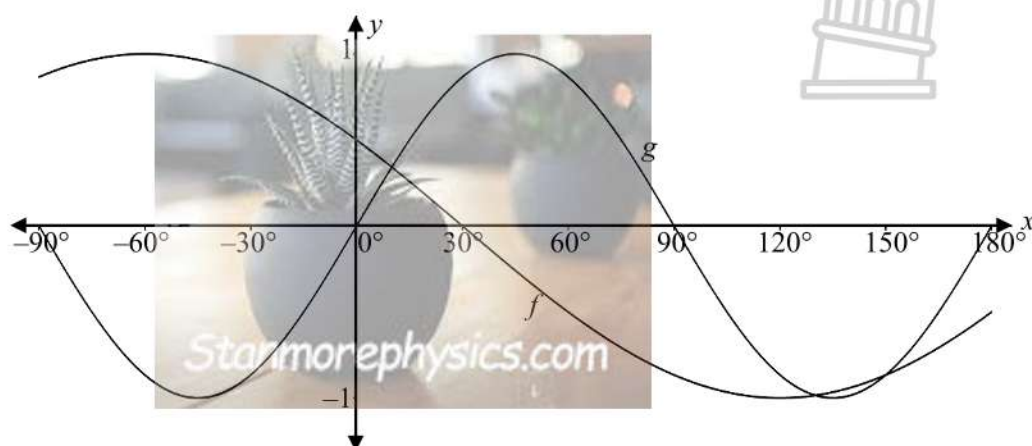
4.1	A(-1;-1)	✓ answer/antwoord (1)
4.2	$\hat{ADC} = 90^\circ$ (line from centre bisect cord / <i>mdpt</i> $\square$; <i>mdpt koord</i>) FGC is a tangent to circle B / 'n raaklyn aan sirkel B $\therefore \hat{BCG} = 90^\circ$ (tan $\perp$ chord / <i>rklyn</i> $\perp$ rad) $m_{BC} = \frac{2-1}{3-4}$ $= -1$ $\therefore m_{AD} = -1$ CA only if BC gradient is - $\perp m_{FC} = 1$ $1 = 1(4) + c$ C (4;1): $c = -3$ $\therefore y = x - 3$	✓ $m_{BC} = -1$ ✓ $m_{FC} = 1$ ✓ equation of FC/ <i>vergelyking van FC</i> (4)
4.3	$\hat{ADF} = 90^\circ$ $FD^2 = 3^2 - \left(\frac{\sqrt{10}}{2}\right)^2$ (<i>pyth</i>) $FD^2 = 9 - \frac{10}{4}$ $FD = \sqrt{6\frac{1}{2}} = \frac{\sqrt{26}}{2} / 2,55$ Stanmorephysics.com FD = DG $\therefore FG = 2 \times \frac{\sqrt{26}}{2}$ $\therefore FG = \sqrt{26} / 5,10$	✓ radii ✓ subst. in pyth formula/ <i>vervang in pyth formule</i> ✓ $FD = \frac{\sqrt{26}}{2} / 2,55$ ✓ $FG = \sqrt{26} / 5,10$ (4)
4.4	$AB = \sqrt{(-1-3)^2 + (-1-2)^2}$ $AB = \sqrt{16+9}$ AB = 5 Answer only – full marks	✓ subst. coordinates in correct formula/ <i>vervang koördinate in korrekte formule</i> ✓ answer/antwoord (2)
4.5	BK = AB – AK BK = 5 – 3 BK = 2 $(x-3)^2 + (y-2)^2 = 4$ Answer only – full marks	✓ BK = 2 ✓ subst. coordinates in correct formula/ <i>vervang koördinate in korrekte formule</i> ✓ $r^2 = 4$ (3)
		[14]

QUESTION/VRAAG 5

5.1.1	$\sin^2(180^\circ + \theta)$ $= \sin^2 \theta$ $= \left(\frac{-5}{\sqrt{41}} \right)^2$ $= \frac{25}{41}$	$OP^2 = OK^2 + KP^2$ $OP^2 = 4^2 + (-5)^2$ $OP = \sqrt{41}$	✓ $r = \sqrt{41}$ ✓ $\sin^2 \theta$ ✓ subst./vervang ✓ answer/antwoord (4)
5.1.2	$\tan(-\theta)$ $= -\tan \theta$ $= -\left(\frac{-5}{4} \right)$ $= \frac{5}{4}$		✓ $-\tan \theta$ ✓ answer/antwoord (2)
5.2.1	$\cos 15^\circ$ $= \cos(60^\circ - 45^\circ)$ $= \cos 60^\circ \cdot \cos 45^\circ + \sin 60^\circ \cdot \sin 45^\circ$ $= \frac{1}{2} \cdot \frac{1}{\sqrt{2}} + \frac{\sqrt{3}}{2} \cdot \frac{1}{\sqrt{2}}$ $= \frac{1 + \sqrt{3}}{2\sqrt{2}} / \frac{\sqrt{6} + \sqrt{2}}{4}$	Accept $\frac{\sqrt{2}}{2}$ ANSWER ONLY – NO MARKS DECIMAL ANSWERS – NO MARKS	✓ expansion ✓ $\frac{1}{2}$ ✓ $\frac{1}{\sqrt{2}}$ ✓ $\frac{\sqrt{3}}{2}$ ✓ $\frac{1}{\sqrt{2}}$ ✓ answer/antwoord (6)
5.2.2	$\frac{\cos(90^\circ + x) \cdot \cos(180^\circ - x)}{\cos^2(180^\circ + x) \cdot \tan(180^\circ - x)}$ $= \frac{(-\sin x)(-\cos x)}{(\cos^2 x)(-\tan x)}$ $= -\frac{\tan x}{\tan x}$ $= -1$		✓ $-\sin x$ ✓ $-\cos x$ ✓ $\cos^2 x$ ✓ $-\tan x$ ✓ -1 (5)

5.3.1	$\frac{\sin 2\theta + 2 \cos \theta - 2 \cos^3 \theta}{1 + \sin \theta} = \sin 2\theta$ $LHS = \frac{2 \sin \theta \cos \theta + 2 \cos \theta - 2 \cos^3 \theta}{1 + \sin \theta}$ $= \frac{2 \sin \theta \cos \theta + 2 \cos \theta (1 - \cos^2 \theta)}{1 + \sin \theta}$ $= \frac{2 \sin \theta \cos \theta + 2 \cos \theta (\sin^2 \theta)}{1 + \sin \theta}$ $= \frac{2 \sin \theta \cos \theta (1 + \sin \theta)}{1 + \sin \theta}$ $= 2 \sin \theta \cos \theta$ $= \sin 2\theta$ $= RHS$	✓ $2 \sin \theta \cos \theta$ ✓ $2 \cos \theta$ (common factor/gem faktor) ✓ $\sin^2 \theta$ ✓ $2 \sin \theta \cos \theta$ (common factor/gem faktor) ✓ $2 \sin \theta \cos \theta$ (5)
5.3.2	$1 + \sin \theta = 0$ $\therefore \sin \theta = -1$ $\theta = -90^\circ \text{ or } \theta = 270^\circ$	✓ $1 + \sin \theta = 0$ ✓ $-90^\circ, 270^\circ$ (both/beide) (2)
5.4	$\frac{4}{2 + \cos x}$ $= \frac{4}{2 + (-1)}$ $= \frac{4}{1}$ $= 4$	For max value, $\cos x$ should be a min/ <i>Vir maks waarde, moet $\cos x$ 'n min wees</i> Answer only – full marks ✓ -1 ✓ answer/antwoord (2)
		[26]

QUESTION/VRAAG 6



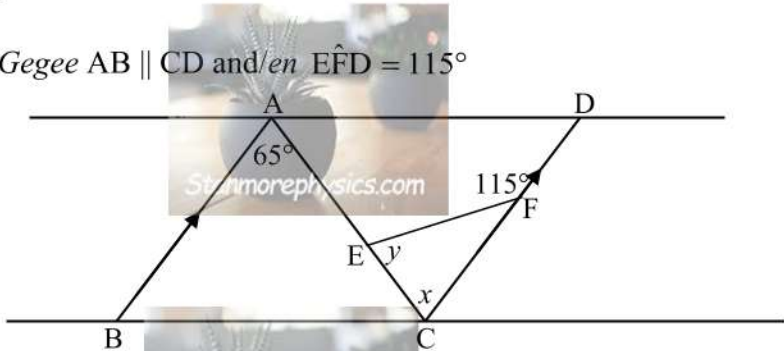
6.1	$\cos(x + 60^\circ) = \sin 2x$ $\therefore \cos(x + 60^\circ) = \cos[90^\circ - 2x]$ reference/verwysings $\angle$: $x + 60^\circ = 90^\circ - 2x$ 1: $x + 60^\circ = 90^\circ - 2x + k.360^\circ \quad k \in \mathbb{Z}$ $3x = 30^\circ + k.360^\circ$ $\therefore x = 10^\circ + k.120^\circ$ $x + 60^\circ = 360^\circ - (90^\circ - 2x) + k.360^\circ \quad k \in \mathbb{Z}$ $\therefore x + 60^\circ = 360^\circ - 90^\circ + 2x + k.360^\circ$ 4: $-x = 210^\circ + k.360^\circ$ $\therefore x = -210^\circ + k.360^\circ$ But/maar $x \in [-90^\circ; 180^\circ]$ $\therefore x = 10^\circ; 130^\circ; 150^\circ$ OR/OF $\sin[90^\circ \pm (x + 60^\circ)] = \sin 2x$ 1: $90^\circ - x - 60^\circ = 2x + k.360^\circ \quad k \in \mathbb{Z}$ $-3x = -30^\circ + k.360^\circ$ $x = 10^\circ + k.120^\circ$ or / of 2: $90^\circ + x + 60^\circ = 2x + k.360^\circ \quad k \in \mathbb{Z}$ $-x = -150^\circ + k.360^\circ$ $x = 150^\circ - k.360^\circ$ But/maar $x \in [-90^\circ; 180^\circ]$ $\therefore x = 10^\circ; 130^\circ; 150^\circ$	$\checkmark \cos(x + 60^\circ) = \cos[90^\circ - 2x]$ $\checkmark x + 60^\circ = 90^\circ - 2x + k.360^\circ$ $\checkmark x = 10^\circ + k.120^\circ$ $\checkmark$ $x + 60^\circ = 360^\circ - (90^\circ - 2x) + k.360^\circ$ $\checkmark x = -210^\circ + k.360^\circ$ $\checkmark k \in \mathbb{Z}$ (provided $k.360^\circ$ is stated/slegs as $k.360^\circ$ gegee word) $\checkmark$ all three answers/al drie antwoorde $\checkmark \sin[90^\circ \pm (x + 60^\circ)] = \sin 2x$ $\checkmark 90^\circ - x - 60^\circ = 2x + k.360^\circ$ $\checkmark -3x = -30^\circ + k.360^\circ$ $\checkmark 90^\circ + x + 60^\circ = 2x + k.360^\circ$ $\checkmark -x = -150^\circ + k.360^\circ$ $\checkmark k \in \mathbb{Z}$ $\checkmark$ all three answers/al drie antwoorde (7)
6.2	180°	$\checkmark$ answer/antwoord (1)
6.3	$10^\circ \leq x \leq 130^\circ \cup 150^\circ \leq x < 180^\circ$ of $[10^\circ; 130^\circ] \cup [150^\circ; 180)$	$\checkmark$ values/waardes $\checkmark$ notation/notasie (2)
6.4	$p(x) = \sin(x - 30^\circ)$ The graph of h is shifted/moved 30° to the right./ Die grafiek het 30° na regs geskuif.	$\checkmark$ shifted/moved/geskuif $\checkmark 30^\circ$ $\checkmark$ right/regs (3)
		[13]

QUESTION/VRAAG 7

7.1	$A(b \cos A; b \sin A)$ $c^2 = AB^2 = (x_A - x_B)^2 + (y_A - y_B)^2$ $c^2 = (b \cos C - a)^2 + (b \sin C - 0)^2$ $c^2 = b^2 \cos^2 C - 2ab \cos C + a^2 + b^2 \sin^2 C$ $c^2 = b^2 (\cos^2 C + \sin^2 C) + a^2 - 2ab \cos C$ $c^2 = b^2 (1) + a^2 - 2ab \cos C$ $c^2 = a^2 + b^2 - 2ab \cos C$	✓ coordinates of/coördinate van A ✓ correct subst into distance/korrekte invang in afstands formulae ✓ simplification/vereenvoudig ✓ $\sin^2 x + \cos^2 x = 1$ (4)
7.2.1	$AC^2 = d^2 + \left(\frac{d}{2}\right)^2 - 2 \cdot d \cdot \frac{d}{2} \cdot \cos(90^\circ - \alpha)$ $AC^2 = d^2 + \frac{d^2}{4} - d^2 \sin \alpha$ $AC^2 = \frac{5d^2}{4} - \frac{4d^2 \sin \alpha}{4}$ $AC^2 = \frac{d^2 (5 - 4 \sin \alpha)}{4}$ $AC = \frac{d \sqrt{5 - 4 \sin \alpha}}{2}$ $\tan \theta = \frac{h}{AC}$ $\therefore h = AC \cdot \tan \theta$ $\therefore h = \frac{d \sqrt{5 - 4 \sin \alpha}}{2} \cdot \tan \theta$	✓ correct subst into cosine rule/korrekte vervanging in kosinus formule ✓ $BC = \frac{d}{2}$ ✓ $\sin \alpha$ ✓ factorise/faktoriseer (4)
7.2.2	$\tan \theta = \frac{h}{AC}$ $\therefore h = AC \cdot \tan \theta$ $\therefore h = \frac{300 \cdot \sqrt{5 - 4 \sin 32^\circ}}{2} \cdot \tan 63^\circ$ $\therefore h = 499,63m$	✓ trig ratio ✓ correct subst into tan ratio/korrekte vervanging in tan verhouding ✓ answer/antwoord (3)
		[11]

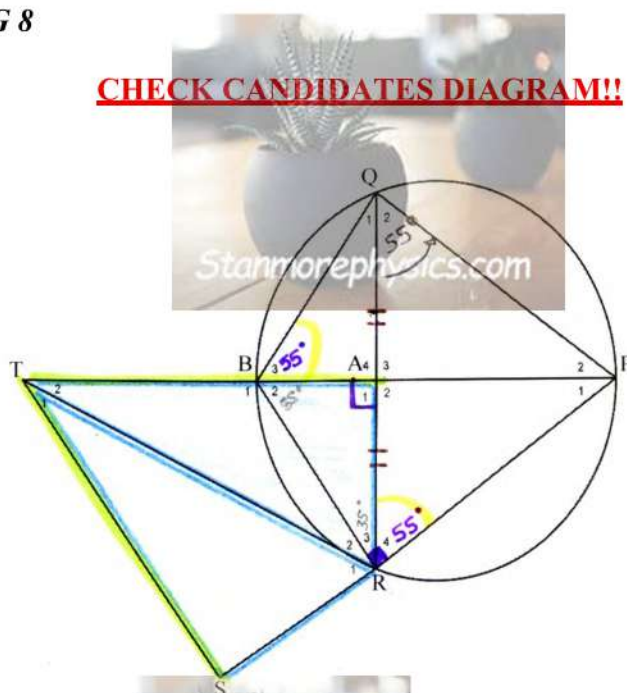
GEOMETRY/MEETKUNDE

Please read carefully through the following table before marking **QUESTION 8–10** /
 Lees asseblief sorgvuldig deur die volgende tabel alvorens **VRAE 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 $\hat{EFD} = 115^\circ$  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) <i>'n Punt vir 'n korrekte bewering</i> ('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) <i>'n Punt vir 'n korrekte rede</i> ('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) <i>Ken 'n punt toe as die bewering EN rede beide korrek is</i> (Beide MOET korrek wees om een punt te kry)

QUESTION/VRAAG 8

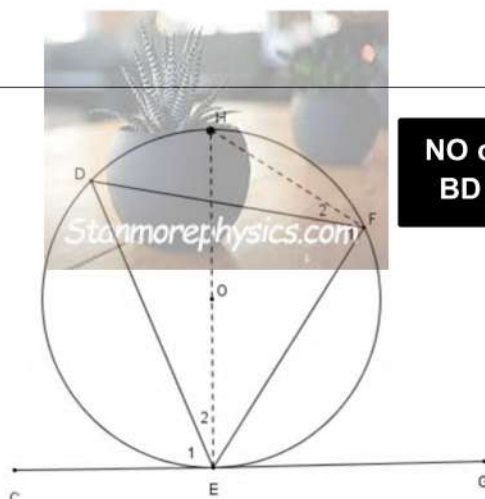
CHECK CANDIDATES DIAGRAM!!



8.1.1	$\hat{R}_4 = 55^\circ$ [$\angle$ s opp. = sides/ $\angle e$ teenoor = sye]	✓ S ✓ R (2)
8.1.2	$\hat{B}_3 = 55^\circ$ [$\angle$ s in the same segment/ $\angle e$ in dieselfde sirkel segment]	✓ S ✓ R (2)
8.1.3	$\hat{B}\hat{R}\hat{P} = 90^\circ$ [$\angle$ in semi circle/ $\angle$ in halfsirkel]	✓ S ✓ R (2)
8.1.4	$\hat{R}_4 = 55^\circ$ [proved / bewys in 8.1.1] $\hat{B}\hat{R}\hat{P} = 90^\circ$ [proved / bewys in 8.1.3] $\therefore \hat{R}_3 = 35^\circ$ $\hat{B}_2 = \hat{Q}_2 = 55^\circ$ [$\angle$ s in the same segment/ $\angle e$ in dieselfde sirkel segment] $\hat{A}_1 = 90^\circ$	✓ S ✓ S ✓ S (3)
8.2	[line from centre $\perp$ to chord/ lyn vanuit midpt $\perp$ op koord]	✓ S (1)
8.4	In $\triangle TAR$ and/en $\triangle TSR$ is: $TR = TR$ [common / gemeenskaplik] $\hat{R}_2 + \hat{R}_3 = \hat{R}_1$ [given / gegee] $\hat{A}_1 = \hat{S} = 90^\circ$ [$\hat{A}_1 = 90^\circ$, line from centre $\perp$ to cord biseects the cord / lyn van uit midpt $\perp$ op koord halveer koord] $\therefore \triangle TAR \equiv \triangle TSR$ [RHS] $\therefore AT = TS$	✓ S ✓ S ✓ S ✓ R (4)
		[14]

QUESTION/VRAAG 9

9.1



**NO construction =
BD (0/5 MARKS)**

Construction/*konstruksie*: Line EH through midpoint to circumference to F/*Middellyn EH en verbind met F*

$$\hat{E}_1 + \hat{E}_2 = 90^\circ \quad [\text{rad} \perp \text{tan/rklyn}]$$
$$\hat{F}_1 + \hat{F}_2 = 90^\circ \quad [\angle \text{ in semi circle. / } \angle \text{ in halfsirkel}]$$
$$\hat{F}_1 + \hat{F}_2 = \hat{E}_1 + \hat{E}_2$$

But/maar $\hat{E}_2 = \hat{F}_2$ [$\angle$ sin the same segment/ $\angle$ e in dieselfde sirkelsegment]

$$\therefore \hat{E}_1 = \hat{F}_1$$
$$\hat{C}^{\hat{E}}D=F_1$$

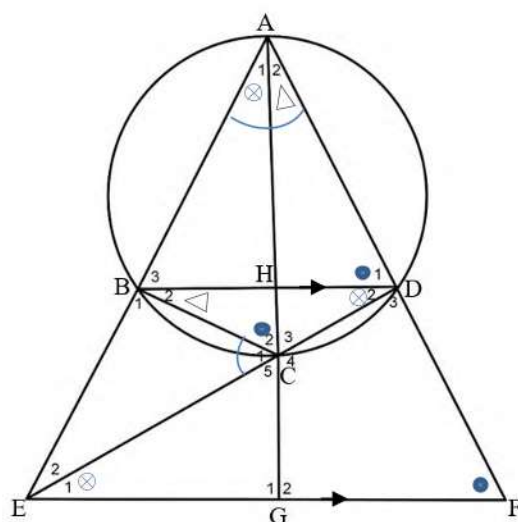
✓
constr/*konstr*

✓ S ✓ R

✓ S/R

✓ S/R

(5)



9.2.1

$$\hat{E}_1 = \hat{D}_7$$

[alt $\angle s$ / *verw.* $\angle e$; BD||EF]

$$\hat{D}_2 = \hat{A}_1$$

[$\angle$ s in the same segment/ $\angle$ e in *dieselfde* sirkel segment]

$$\therefore \hat{E}_1 = \hat{A}_1$$

✓ S/R (with //)	
--------------------	--

✓ S ✓ R

(3)

9.2.2

$\therefore$ EF is a tangent/EF is 'n *raaklyn*

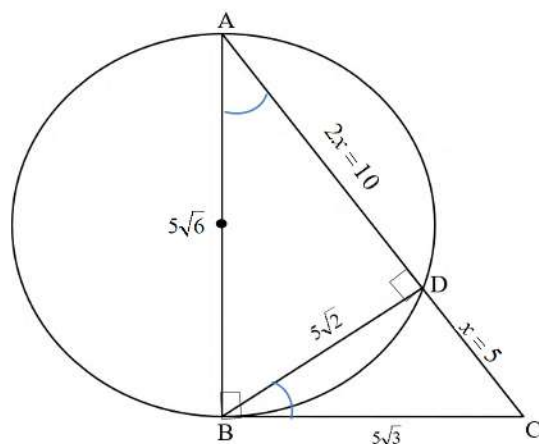
[converse tan chord / omgekeerde raaklyn koord stelling]

✓ R

(1)

9.2.3	In $\triangle ABC$ and $\triangle EDF$ is: $\hat{A}_1 = \hat{E}_1$ [proved/bewys in 9.2.1] $\hat{B}_2 + \hat{B}_3 = \hat{D}_3$ [ext $\angle$ of cyclic quad / buite $\angle$ v <i>kvh</i>] $\hat{C}_2 = \hat{F}$ [3^{rd} $\angle$ sum of $\triangle$ / 3^{de} $\angle$ som $\angle$ v $\triangle$] $\therefore \triangle ABC \parallel \triangle EDF$ [$\angle, \angle, \angle$] OR/OF In $\triangle ABC$ and $\triangle DEF$: $\hat{A}_1 = \hat{E}_1$ [proven/ bewys in 9.2.1] $\hat{B}_2 + \hat{B}_3 = \hat{D}_3$ [ext $\angle$'s of cyclic quad / buite $\angle$ v vierhoek] $\therefore \triangle ABC \parallel \triangle EDF$ [$\angle, \angle, \angle$]	✓ S ✓ S ✓ R ✓ S/R ✓ S ✓ S ✓ R ✓ R (4)
9.2.4	$\frac{AB}{ED} = \frac{BC}{DF}$ [out of $\parallel$ / uit $\parallel$] $\therefore AB = \frac{BC \cdot ED}{DF}$ But/maar $\frac{AB}{BE} = \frac{AH}{HG}$ [$BH \parallel EG$] [line $\parallel$ to one side of a $\triangle$ / lyn $\parallel$ <i>ander sy</i> v $\triangle$] [prop theorem $BD \parallel EF$ / $BD \parallel EF$] $\therefore AB = \frac{AH \cdot BE}{HG}$ $\therefore \frac{AH \cdot BE}{HG} = \frac{BC \cdot ED}{DF}$ penalize once if // lines not shown/ penaliseer 1x as // ontbreek	✓ S ✓ R ✓ S (making AB the subject/maak AB die onderwerp) ✓ S ✓ R ✓ S (making AB the subject/maak AB die onderwerp) (6)

QUESTION/VRAAG 10



10.1	$\hat{A}DB = 90^\circ$ [$\angle$ in semi circle./ $\angle$ in halfsirkel] $\hat{A}BC = 90^\circ$ [rad $\perp$ tan/ <i>rklyn</i>] $AB^2 = (2x)^2 + BD^2$ 1 $BC^2 = (x)^2 + BD^2$ 2 $AB^2 + BC^2 = 5x^2 + 2BD^2$ $9x^2 = 5x^2 + 2BD^2$ $\therefore 4x^2 = 2BD^2$ $\therefore BD = \sqrt{2}x$ $\therefore \frac{BD}{DC} = \sqrt{2}$ OR/OF $BD^2 = AD \cdot CD$ [$\text{right angled } \Delta \text{ with } BD \perp AC /$ <i>loodlyn vanuit reghoekige hoekpunt</i>] $BD^2 = 2x \cdot x$ $\therefore BD = \sqrt{2}x$ $\frac{BD}{DC} = \frac{\sqrt{2}x}{x} = \sqrt{2}$	$\checkmark$ both 90° S/R $\checkmark$ both eq $\checkmark 4x^2 = 2BD^2$ $\checkmark BD = \sqrt{2}x$ $\checkmark S \checkmark R$ $\checkmark BD = \sqrt{2}x$
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(4)

10.2	$AB^2 = 10.15$ $AB = 5\sqrt{6}$ $BC^2 = 5.15$ $BC = 5\sqrt{3}$ $AB + BC + AC$ $= 5\sqrt{6} + 5\sqrt{3} + 15$ $= 35,91$	$\checkmark AB = 5\sqrt{6}$ $\checkmark BC = 5\sqrt{3}$ $\checkmark$ answer/antwoord (3)
		[7]

TOTAL/TOTAAL: 150

