education

Department:
Education
North West Provincial Government
REPUBLIC OF SOUTH AFRICA

NATIONAL SENIOR CERTIFICATE

GRADE 12

MATHEMATICS P2

SEPTEMBER 2025

MARKS: 150

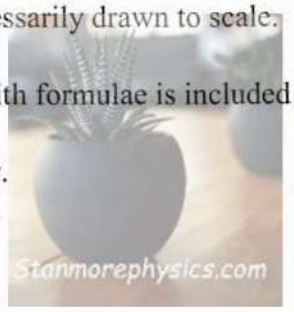
TIME: 3 hours

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
$1\,000 \leq x < 2\,000$	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

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

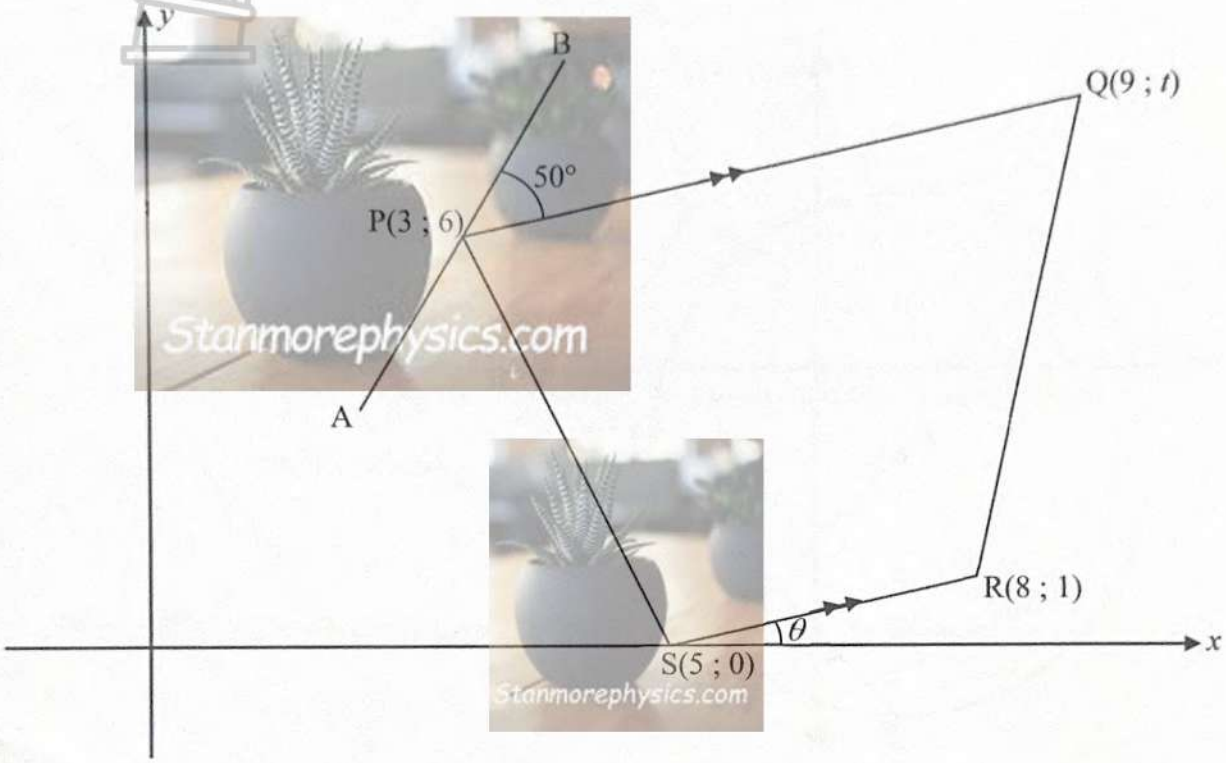
2.1 Determine the equation of the least squares regression line of the marks given by the two judges. (3)

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 || SR.
AB is a straight line that touches the quadrilateral at P. $\hat{QPB} = 50°$



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)

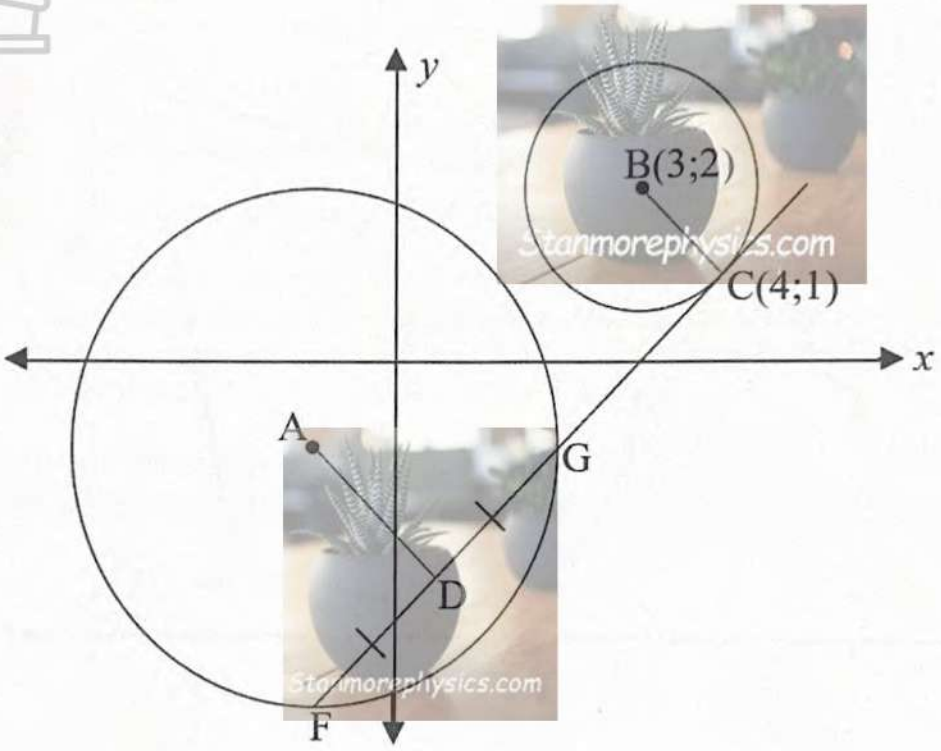
3.6 If PQ = PS, calculate the area of PQRS. (6)

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)

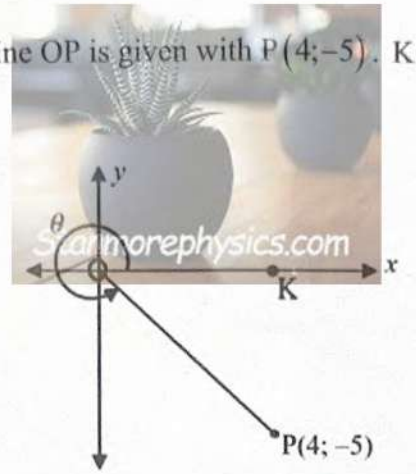
4.3 Given: AD = $\frac{\sqrt{10}}{2}$ units. Calculate the length of FG. (4)

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 $P(4;-5)$. $K\hat{O}P = \theta$



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

5.1.1 $\sin^2(180° + \theta)$ (4)

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

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

5.2.1 $\cos 15°$ (6)

5.2.2 $$\frac{\cos(90° + x).\cos(180° - x)}{\cos^2(180° + x).\tan(180° - x)}$$ (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)

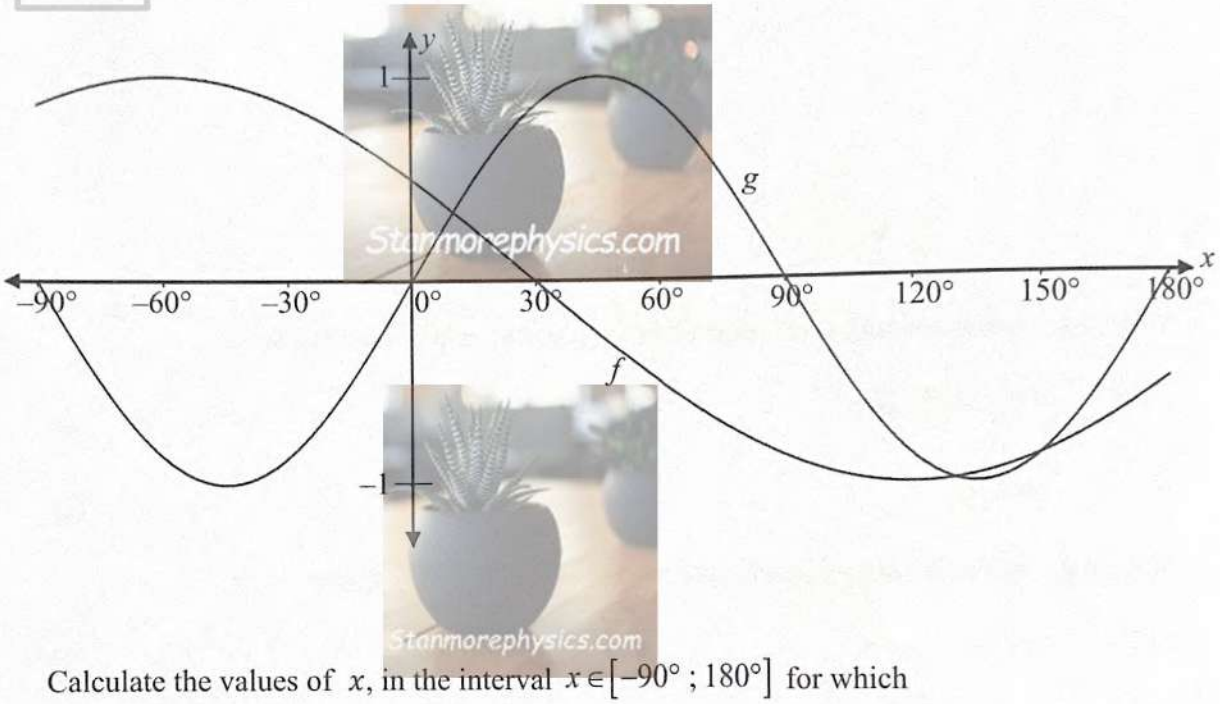
5.3.2 For which values of θ in the interval $[-360°;360°]$ is the identity in QUESTION 5.3.1 undefined? (2)

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

[26]

QUESTION 6

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



6.1 Calculate the values of x, in the interval $x\in[-90°\,;180°]$ for which $f(x)=g(x)$. (7)

6.2 Write down the period of $g(x)$. (1)

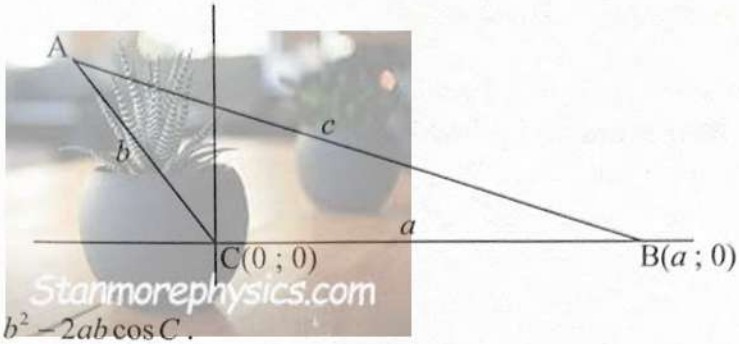
6.3 Use your answer in question 6.1 to determine the value(s) of x where $g(x)\geq f(x)$. (2)

6.4 Describe the transformation from h to p if $h(x)=\sin x$ and $p(x)=\sin(x-30°)$. (3)

[13]

QUESTION 7

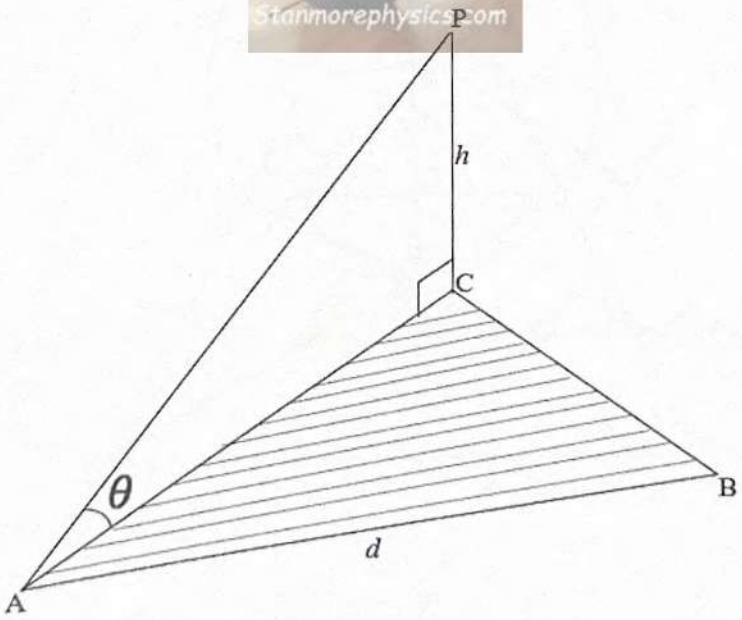
7.1 In the diagram below, ΔABC is $90° \leq C \leq 180°$.



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
- $A\hat{B}C = 90° - \alpha$
- $BC = \frac{1}{2}AB$
- $AB = d$ units



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

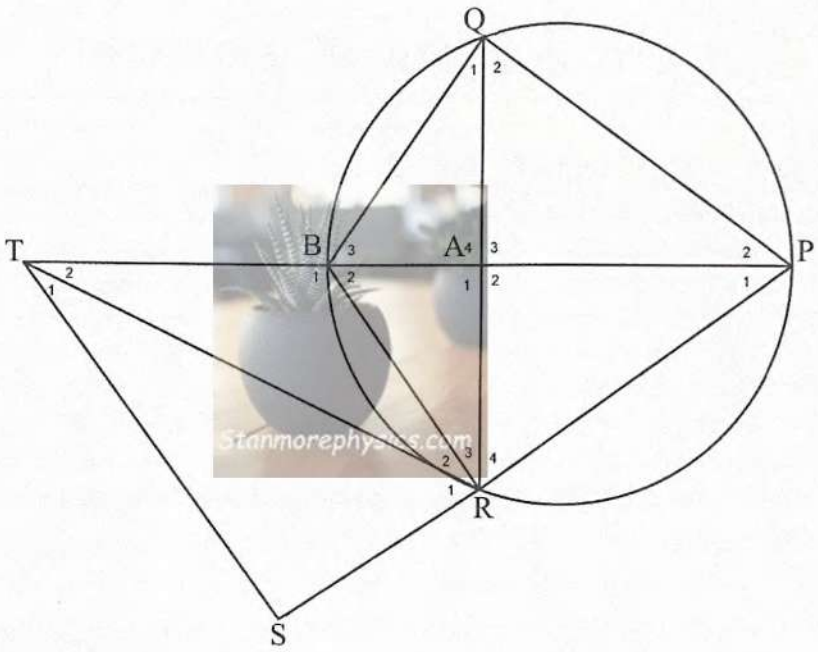
7.2.2 Determine the value of h if $d = 300\,m$, $\alpha = 32°$ and $\theta = 63°$. (3)
[11]

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 $Q\hat{R}S$, $TS \perp SP$
- $PQ = PR$



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

8.1.1 $\hat{R}_4$ (2)

8.1.2 $\hat{B}_3$ (2)

8.1.3 $B\hat{R}P$ (2)

8.1.4 $\hat{A}_1$ (3)

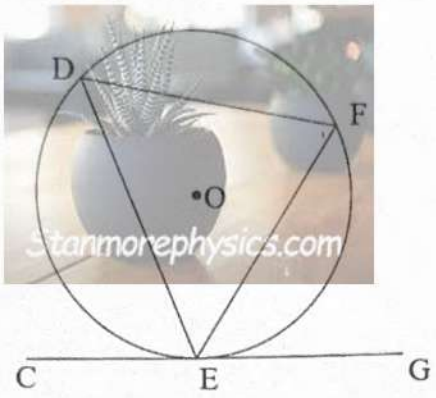
8.2 Give a reason why $AQ = AR$. (1)

8.3 Prove that $AT = TS$. (4)

[14]

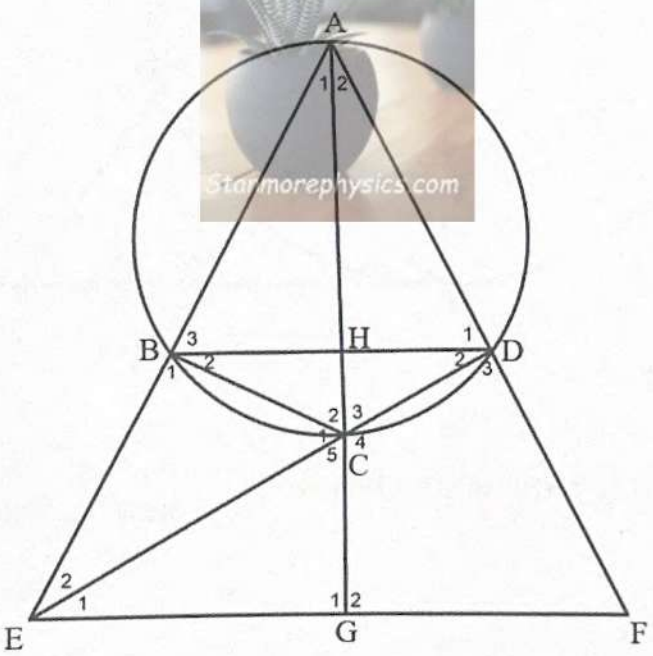
QUESTION 9

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 $C\hat{E}D = \hat{F}$. (5)

9.2 In the diagram below, ABCD is a cyclic quadrilateral. EF || 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 $\Delta ABC \,|||\, \Delta EDF$ (4)

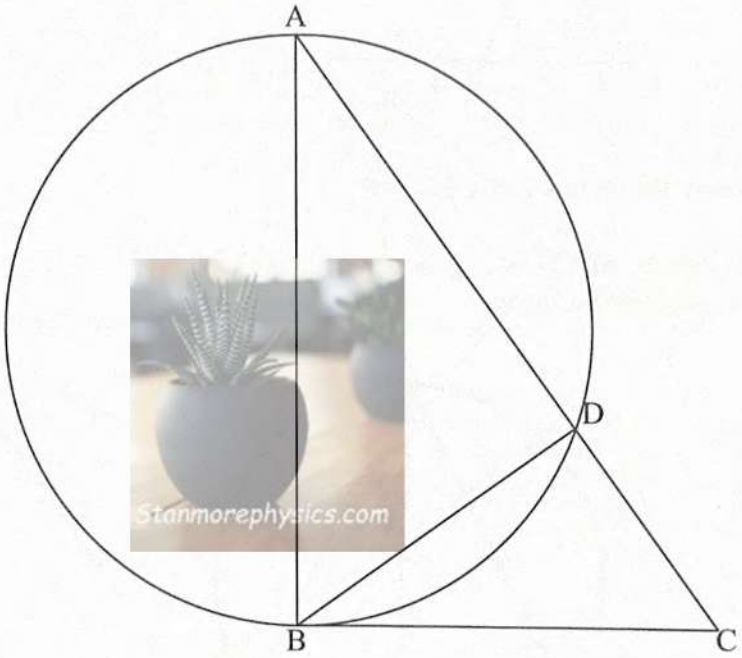
9.2.4 $\dfrac{BE.AH}{GH} = \dfrac{ED.BC}{DF}$ (6)

[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 ΔABC if AD = 10 mm. (3)
[7]

TOTAL: 150

NSC

INFORMATION SHEET

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

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

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

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

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

$$f'(x) = \lim_{h \to 0} \frac{f(x+h) - f(x)}{h} \qquad x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

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

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

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

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

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

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

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

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

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

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

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

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

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

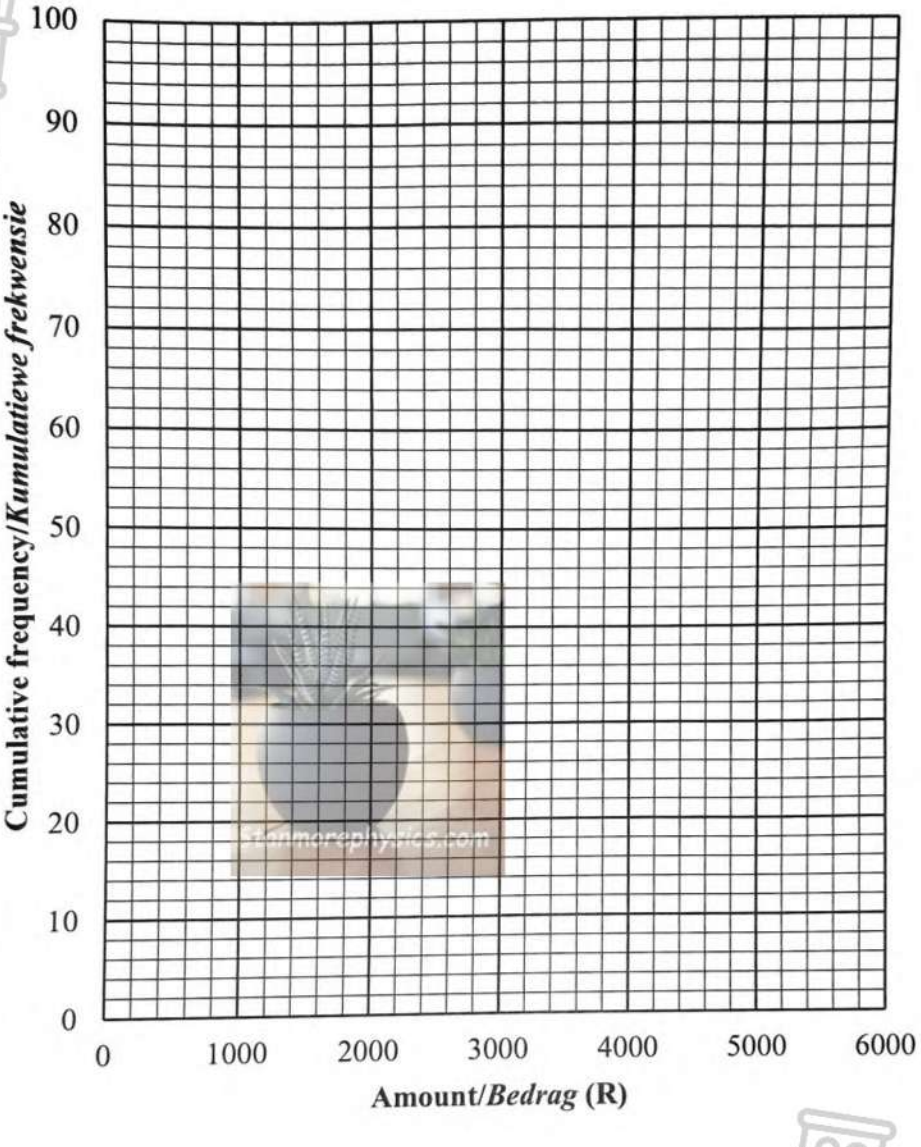
QUESTION/*VRAAG 1*

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/*Oplossing*	Marks/ *Punte*
1.1		(1)
1.2		(5)
1.3		(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



(3)

1.5

(1)

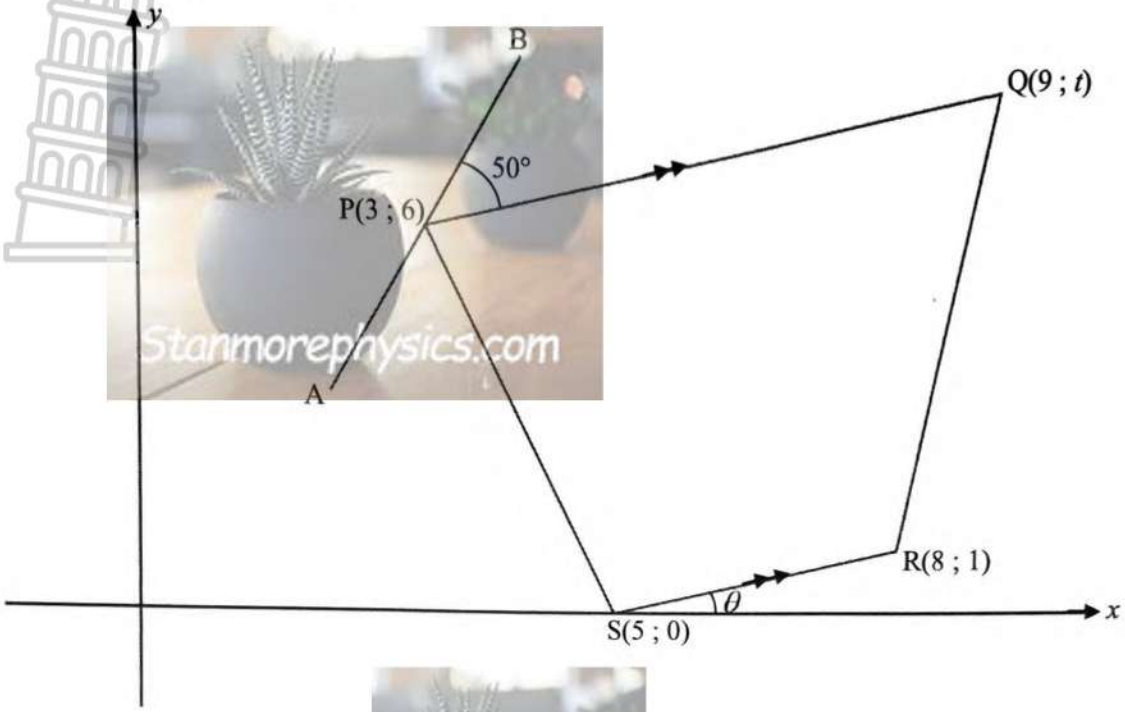
[12]

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

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

QUESTION/*VRAAG 3*



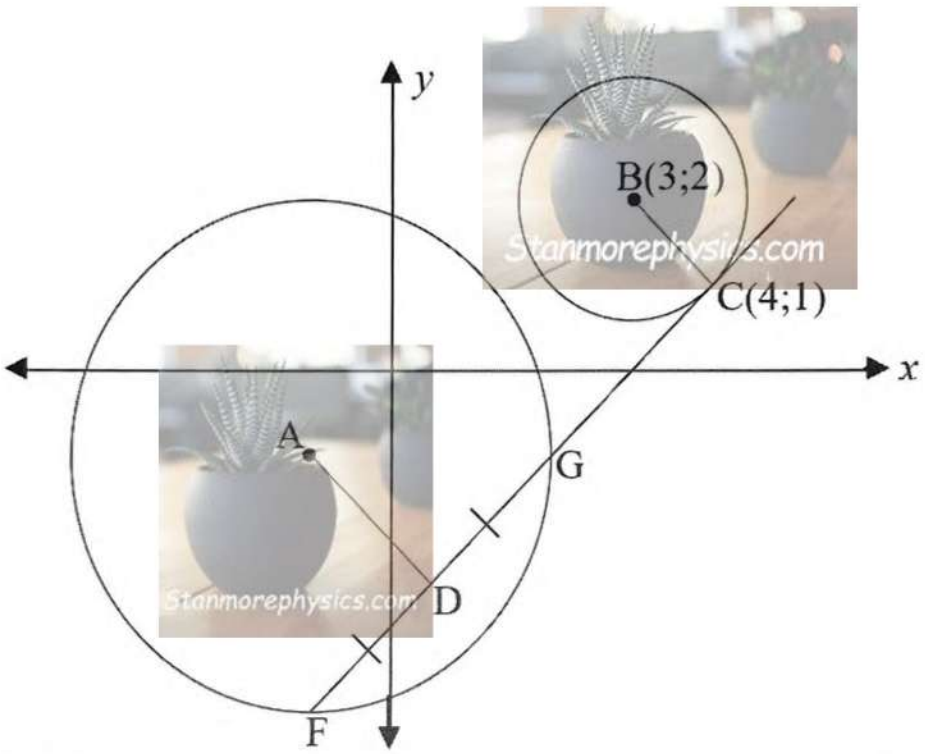
	Solution/*Oplossing*	Marks/ *Punte*
3.1		(2)
3.2		(3)
3.3		(2)
3.4		(2)

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$(4;1)$.

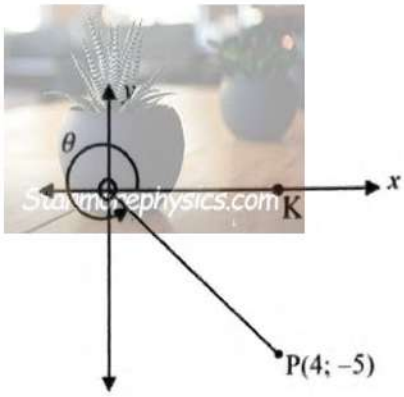
Sirkel met middelpunt A se vergelyking gegee deur $(x+1)^2+(y+1)^2=9$. *FG is 'n koord van sirkel A. AD halveer koord FG. FGC is 'n raaklyn aan die sirkel met middelpunt* $B(3;2)$ *by punt* $C(4;1)$.



	Solution/*Oplossing*	**Marks/ *Punte***
4.1		(1)
4.2		(4)

4.3		
4.4		(4)
4.5		(2)
		(3)
		[14]

QUESTION/*VRAAG 5*



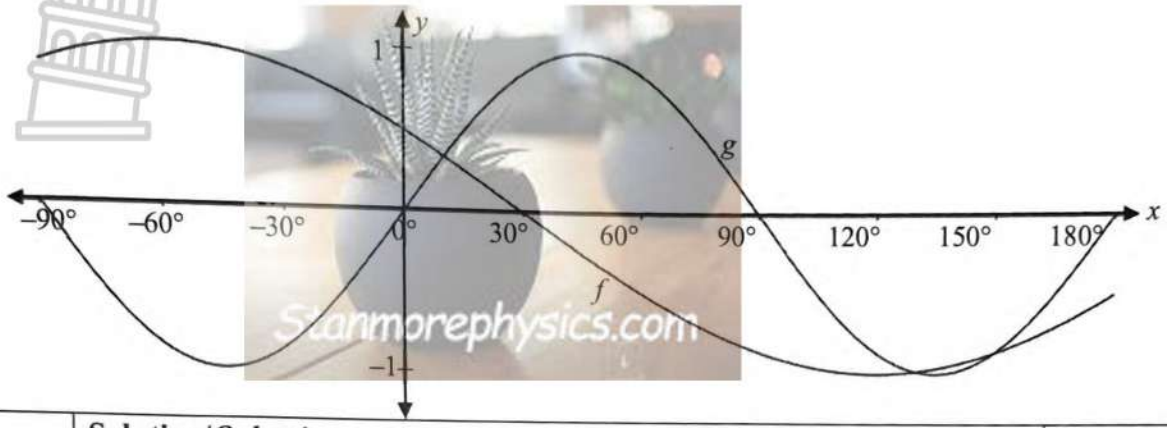
	Solution/*Oplossing*	**Marks/ *Punte***
5.1.1	$\sin^2(180°+\theta)$	(4)
5.1.2	$\tan(-\theta)$	(2)
5.2.1	$\cos 15°$	(6)

5.2.2	$\dfrac{\cos(90°+x).\cos(180°-x)}{\cos^2(180°+x).\tan(180°-x)}$	(5)
5.3.1	$\dfrac{\sin 2\theta + 2\cos\theta - 2\cos^3\theta}{1+\sin\theta} = \sin 2\theta$	(5)

5.3.2		(2)
5.4		(2)
		[26]

QUESTION 6/*VRAAG 6*

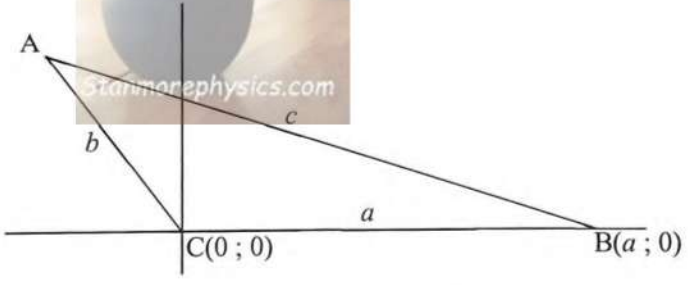
$f(x) = \cos(x + 60°)$ $\quad g(x) = \sin 2x$



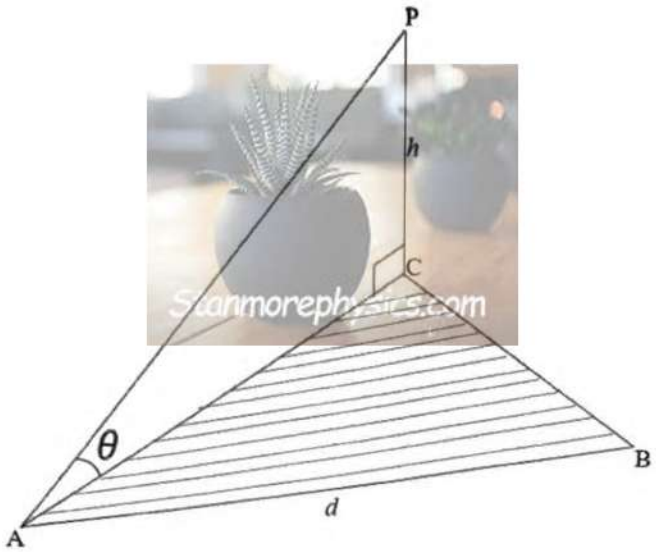
	Solution/*Oplossing*	Marks/ *Punte*
6.1		(7)

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

QUESTION/*VRAAG 7*

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

7.2.1



(4)

7.2.2

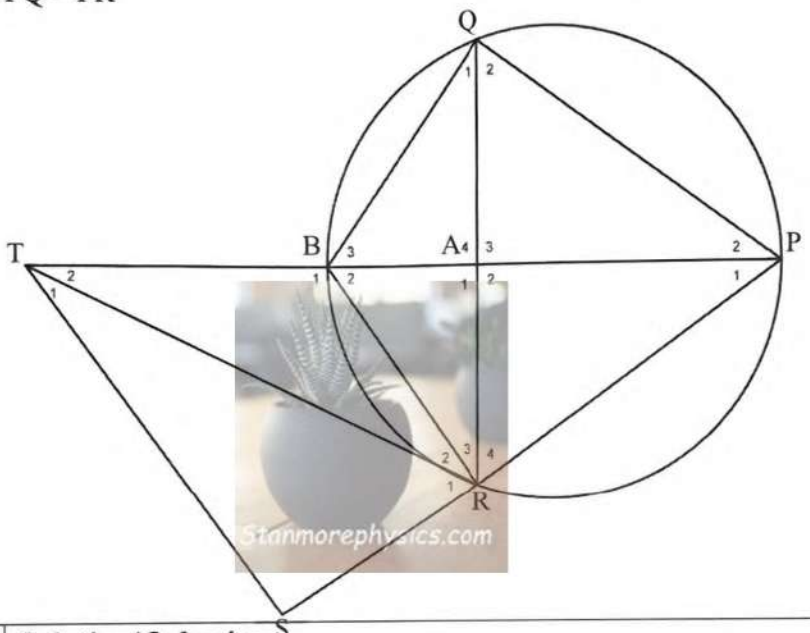
(3)

[11]

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

QUESTION 8/*VRAAG 8*

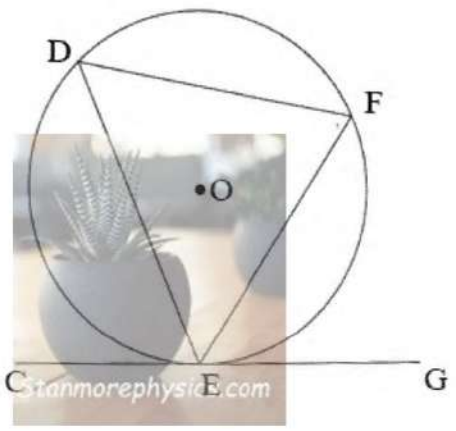
- BP is a diameter of the circle. PR is produced to S, and PB to T/*BP is 'n middellyn van die sirkel. PR is verleng na S en PB is verleng na T*
- PBT intersects QR at A and the circle at B/*PBT sny QR by A en die sirkel by B*
- RT bisects $\hat{QRS}$, TS ⊥ SP / RT *halveer* $\hat{QRS}$, TS ⊥ SP
- PQ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

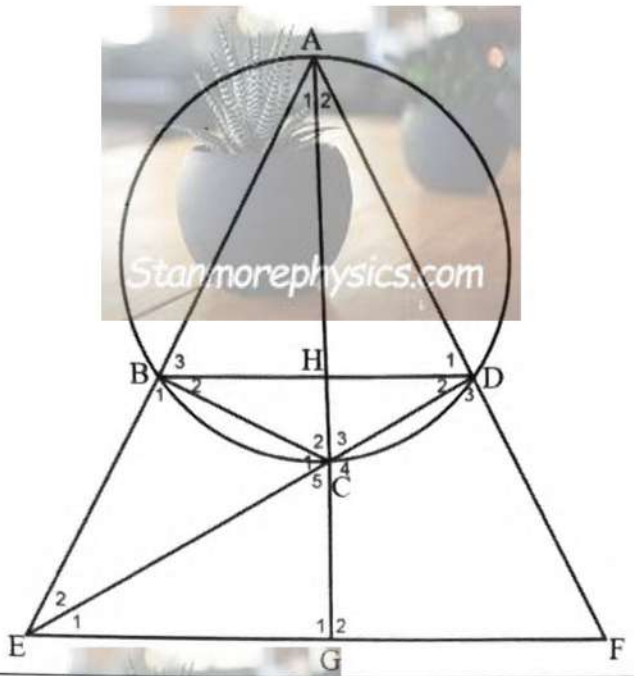
		[14]

QUESTION 9/*VRAAG 9*



	Solution/*Oplossing*	Marks/ *Punte*
9.1		(5)

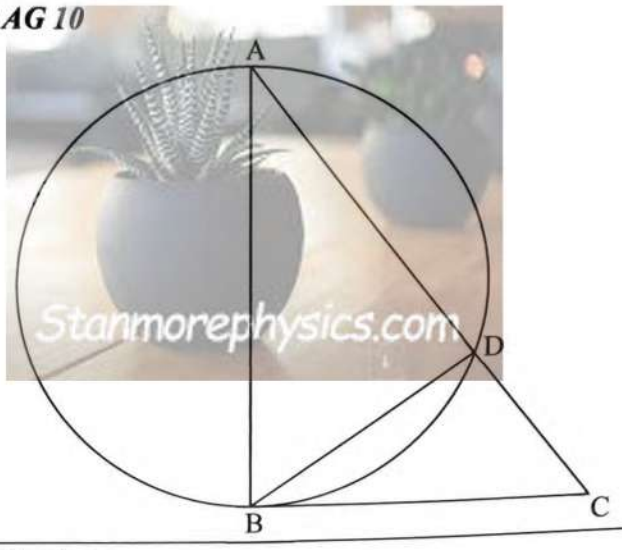
9.2.1



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

	Additional space/ *Addisionele ruimte*	**Marks/ *Punte***

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 $^2/_4\ marks$)
- 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 $^2/_4$)
- 5.2.1 Learners can also use $\cos 30° = 2cos^2 15° - 1\ or$ **cos (45⁰ – 30⁰)**

$$cos15° = \sqrt{\frac{\cos 30°+1}{2}}$$

- 5.3.2 Answer Only is accepted
- 5.4 Learner can also use calculator (TABLE $f(x)$ =….) 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

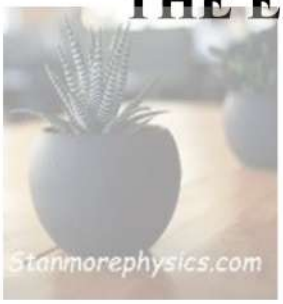
Question 9 [Euclidean Geometry]

- 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^{0} MUST be stated or MUST be Shown on the candidate's diagram.
- 10.2 If BC and AB are incorrect → 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

MARKING GUIDELINES/*NASIENRIGLYNE*

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.*

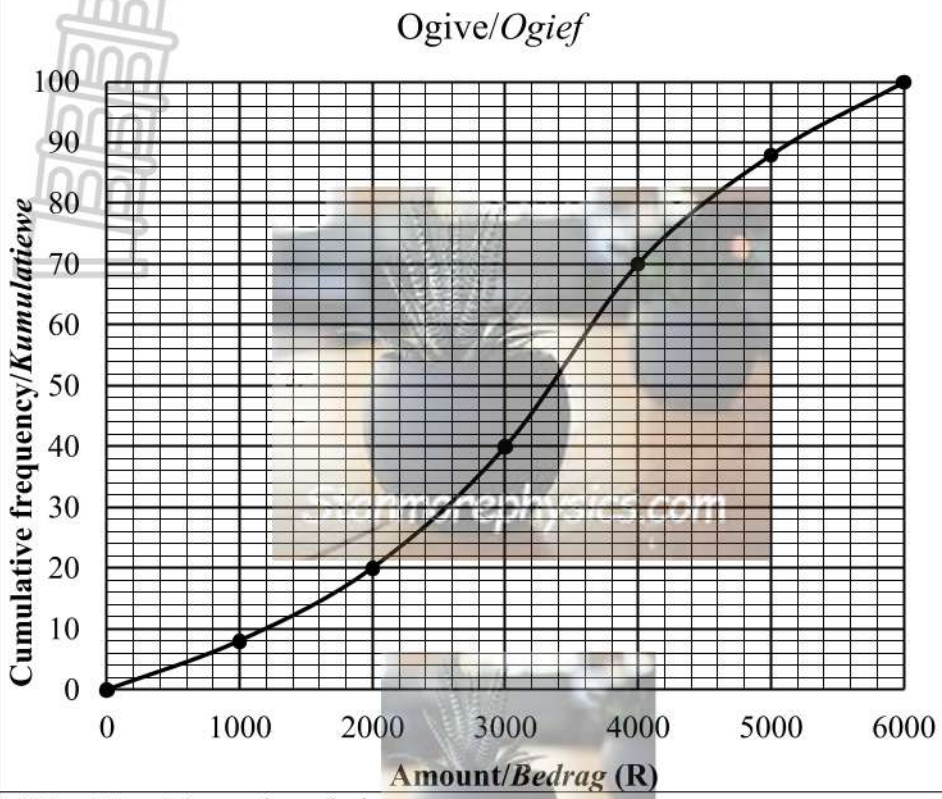
QUESTION/*VRAAG* 1

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

1.1	20	✓answer/*antwoord* (1)
1.2	$8+12+P+30+Q+12=100$ $P+Q=38 \ldots\ldots\ldots ①$ $\bar{x}=3240=\frac{8(500)+12(1500)+P(2500)+30(3500)+Q(4500)+12(5500)}{100}$ $\therefore 1310=25P+45Q$ $\therefore 262=5P+9Q$ $5(38-Q)+9P=262$ $190-5Q+9Q=262$ $4Q=72$ $Q=18$ $P=20$	✓ $P+Q=38$ ✓eq of $\bar{x}=3240$ ✓ $262=5P+9Q$ ✓subst/*vervang* ① ✓ subst/*vervang* $Q=18$ (5)
1.3		

AMOUNT/ *BEDRAG* (R)	FREQUENCY/ *FREKWENSIE*	CUMULATIVE FREQUENCY/ *KUMULATIEWE FREKWENSIE*
$0 \le x \le 1000$	8	8
$1000 \le x \le 2000$	12	20
$2000 \le x \le 3000$	20	40
$3000 \le x \le 4000$	30	70
$4000 \le x \le 5000$	18	88
$5000 \le x \le 6000$	12	100

✓ 8, 20, 40
✓ 70, 88, 100 (2)

1.4		✓ min/max values ✓ all coordinates *(*penalise without grouning*/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]

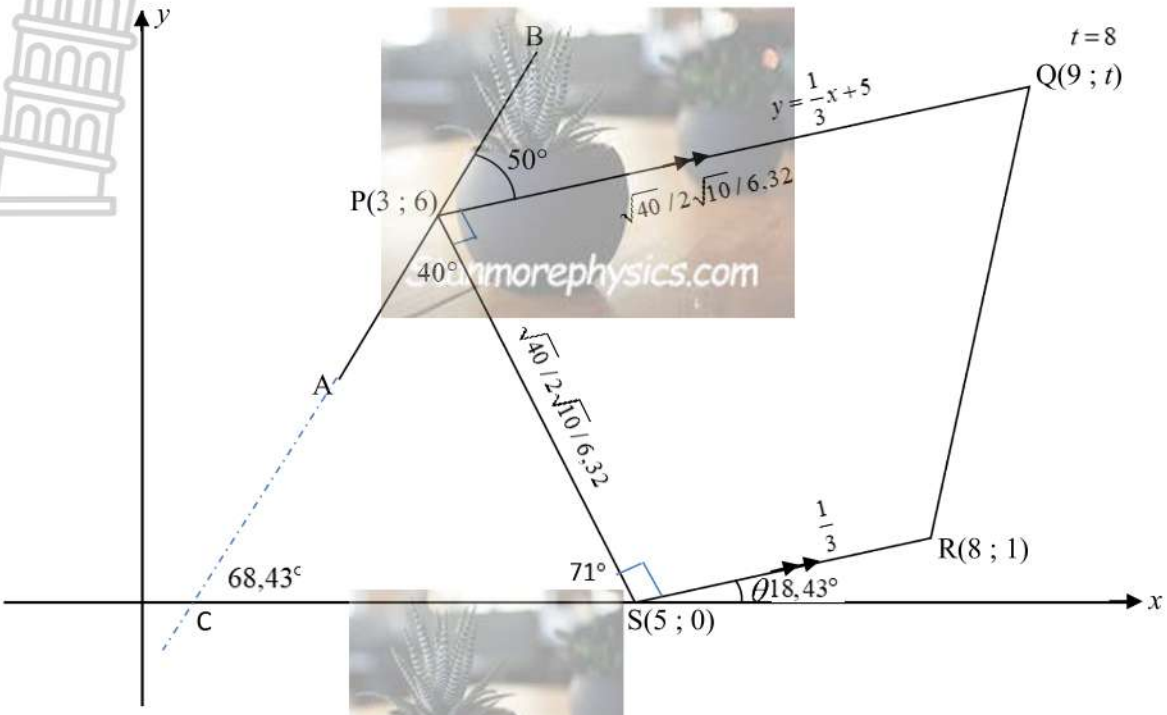
QUESTION/*VRAAG* 2

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

[8]

QUESTION/*VRAAG 3*

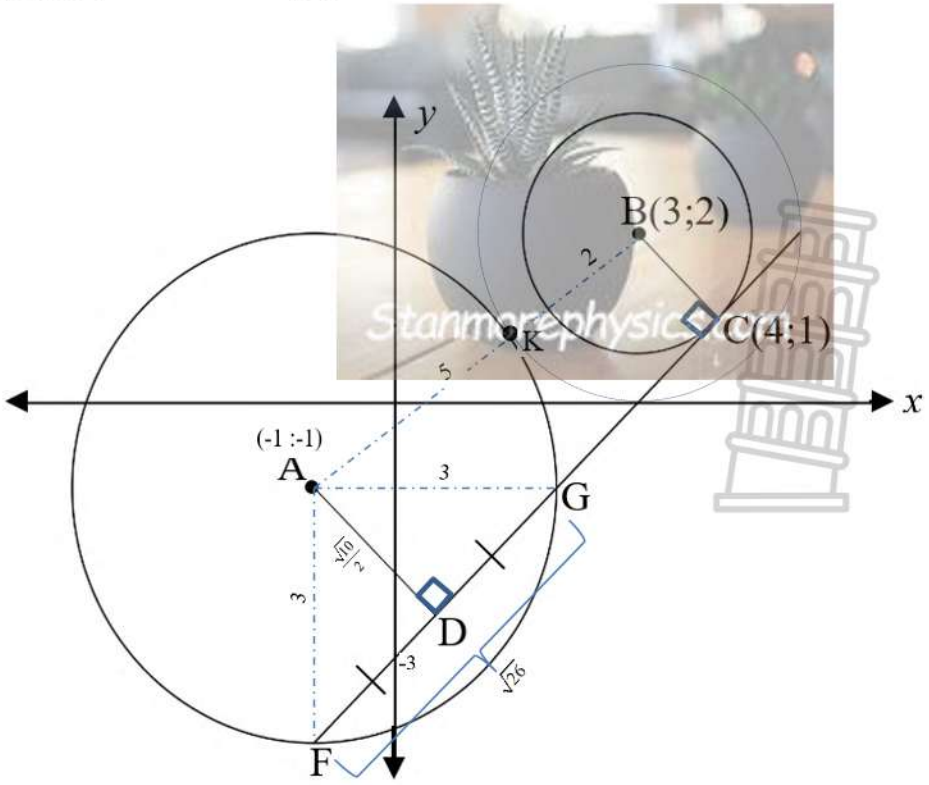


3.1	$m_{SR} = \frac{1-0}{8-5}$ $= \frac{1}{3}$	✓subst./*vervang* ✓answer/*antwoord* (2)
3.2	Eqution/Vergelyking: PQ $m_{PQ} = m_{SR} = \frac{1}{3}$ $P(3:6)$: $6 = \left(\frac{1}{3}\right)(3) + c$ $\therefore \quad c = 5$ $\therefore\ y = \frac{1}{3}x + 5$ CA from 3.1 only if gradient is +	✓ $m_{PQ} = m_{SR} = \frac{1}{3}$ ✓subst. coordinates of/ *vervang koördinate van P* ✓equation of PQ/ *vergelyking van PQ* (3)
3.3	$Q\ (9:t)\ in\ y = \frac{1}{3}x + 5$ $t = \frac{1}{3}(9) + 5$ $t = 8$ CA from 3.2 only if gradient is +	✓subst. coordinates of/ *vervang koördinate van P* ✓value of/ *waarde van* y (2)
3.4	$PQ = \sqrt{(3-9)^2 + (6-8)^2}$ $PQ = \sqrt{36+4}$ $PQ = \sqrt{40}\ /\ 2\sqrt{10}\ /\ 6{,}32$	✓subst. coordinates in correct formula/ *vervang koördinate in korrekte formule* ✓answer/*antwoord*

		(2)
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	✓ $m_{PS}=-3$ $m_{PS}\times m_{RS}$ ✓ $=-3\times\frac{1}{3}$ $=-1$ ✓ conclusion/*gevolgtrekking* (3)
3.6	$SR=\sqrt{(8-5)^2+(1-0)^2}$ $PS=\sqrt{(5-3)^2+(0-6)^2}$ $SR=\sqrt{9+1}$ $PS=\sqrt{4+36}$ $SR=\sqrt{10}\,/\,3{,}16$ $PS=\sqrt{40}\,/\,2\sqrt{10}\,/\,6{,}32$ area of trapezium/ *oppv van trapesium* $=\frac{1}{2}(PQ+RS)\,.\,PS$ $=\frac{1}{2}(\sqrt{40}+\sqrt{10})\times\sqrt{40}$ $=30$ 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 trapezium* ✓ $\sqrt{40}$ ✓ $\sqrt{10}$ ✓ answer/*antwoord* (6)
3.7	$\tan\theta=\frac{1}{3}$ CA from 3.1 only if gradient is + $\therefore\theta=18{,}43°$ Answer only: full marks	✓ $\tan\alpha=m_{SR}$ ✓ answer/*antwoord* (2)

3.8	$\hat{QPS}=90°\left[\text{co-int } \angle's / ko-binne \angle^e\ PQ \parallel SR\right]$ $\hat{P}_1=40°\left[\text{straight line / } reguitlyn\right]$ $\hat{C}=68{,}43°\left[\text{ext } \angle \text{ of } \Delta / buite \angle v\ \Delta\right]$ $\tan 68{,}43°=2{,}53$ OR/*OF* $\hat{PSC}=71{,}57°$ $\hat{CPS}=40°$ $\therefore \hat{PCS}=68{,}43°$ $P(3:6):$ $6=(2{,}53)(3)+c$ $\therefore \quad c=-1{,}59$ $\therefore\ y=2{,}53x-1{,}59$	✓ $\hat{QPS}=90°$ ✓ $\hat{P}_1=40°$ ✓ $\hat{PCS}=68{,}43°$ ✓ $m=2{,}53$ ✓ $\hat{PSC}=71{,}57°$ ✓ $\hat{CPS}=40°$ ✓ $\hat{PCS}=68{,}43°$ ✓subst. coordinates of/ *vervang koördinate van P* ✓ equasion/ vergelyking (6)
		[26]

QUESTION/*VRAAG 4* $\sqrt{26}$



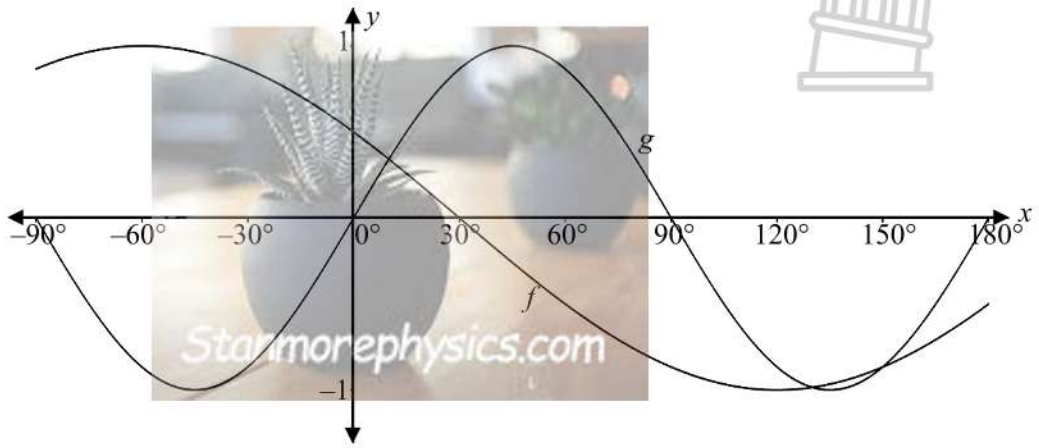
4.1	A $(-1;-1)$	✓ answer/*antwoord* (1)
4.2	$A\hat{D}C = 90°$ (line from centre bisect cord / *mdpt ; mdpt koord*) FGC is a tangent to circle B / *'n raaklyn aan sirkel B* $\therefore B\hat{C}G = 90°$ (tan ⊥ chord / *rklyn ⊥ rad*) $m_{BC} = \frac{2-1}{3-4}$ $= -1$ $\therefore m_{AD} = -1$ CA only if 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/ *vergelyking van FC* (4)
4.3	$A\hat{D}F = 90°$ $FD^2 = 3^2 - \left(\frac{\sqrt{10}}{2}\right)^2$ (*pyth*) $FD^2 = 9 - \frac{10}{4}$ $FD = \sqrt{6\frac{1}{2}} = \frac{\sqrt{26}}{2} / 2,55$ $FD = DG$ $\therefore FG = 2 \times \frac{\sqrt{26}}{2}$ $\therefore FG = \sqrt{26} / 5,10$	✓radii ✓subst. in pyth formula/ *vervang in pyth formule* ✓ $FD = \frac{\sqrt{26}}{2} / 2,55$ ✓ $FG = \sqrt{26} / 5,10$ (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/ *vervang koördinate in korrekte formule* ✓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/ *vervang koördinate in korrekte formule* ✓ $r^2 = 4$ (3)
		[14]

QUESTION/*VRAAG 5*

5.1.1	$\sin^2(180°+\theta)$ $=\sin^2\theta$ $=\left(\frac{-5}{\sqrt{41}}\right)^2$ $=\frac{25}{41}$ $OP^2 = OK^2 + KP^2$ $OP^2 = 4^2 + (-5)^2$ $OP = \sqrt{41}$	✓ $r = \sqrt{41}$ ✓ $\sin^2\theta$ ✓subst./*vervang* ✓answer/*antwoord* (4)
5.1.2	$\tan(-\theta)$ $=-\tan\theta$ $=-\left(\frac{-5}{4}\right)$ $=\frac{5}{4}$	✓ -tanθ ✓answer/*antwoord* (2)
5.2.1	$\cos 15°$ $=\cos(60°-45°)$ $=\cos 60°.\cos 45° + \sin 60°.\sin 45°$ $=\frac{1}{2}.\frac{1}{\sqrt{2}} + \frac{\sqrt{3}}{2}.\frac{1}{\sqrt{2}}$ $=\frac{1+\sqrt{3}}{2\sqrt{2}} / \frac{\sqrt{6}+\sqrt{2}}{4}$ 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	$\frac{\cos(90°+x).\cos(180°-x)}{\cos^2(180°+x).\tan(180°-x)}$ $=\frac{(-\sin x)(-\cos x)}{(\cos^2 x)(-\tan x)}$ $=-\frac{\tan x}{\tan x}$ -1	✓ $-\sin x$ ✓ $-\cos x$ ✓ $\cos^2 x$ ✓ - tan$x$ ✓ -1 (5)

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

QUESTION/*VRAAG 6*



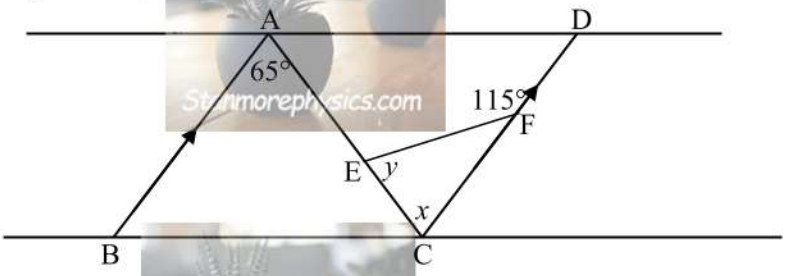
6.1	$\cos(x+60°)=\sin 2x$ $\therefore \cos(x+60°)=\cos[90°-2x]$ reference/*verwysings* $\angle$: $x+60°=90°-2x$ 1: $x+60°=90°-2x+k.360°$ $k\in\mathbb{Z}$ $3x=30°+k.360°$ $\therefore\ x=10°+k.120°$ $x+60°=360°-(90°-2x)+k.360°$ $k\in\mathbb{Z}$ $\therefore x+60°=360°-90°+2x+k.360°$ 4: $-x=210°+k.360°$ $\therefore\ x=-210°+k.360°$ But/*maar* $x\in[-90°;180°]$ $\therefore x=10°;130°;150°$ OR/*OF* $\sin[90°\pm(x+60°)]=\sin 2x$ 1: $90°-x-60°=2x+k.360°$ $k\in\mathbb{Z}$ $-3x=-30°+k.360°$ $x=10°+k.120°$ *or / of* 2: $90°+x+60°=2x+k.360°$ $k\in\mathbb{Z}$ $-x=-150°+k.360°$ $x=150°-k.360°$ But/*maar* $x\in[-90°;180°]$ $\therefore x=10°;130°;150°$	✓ $\cos(x+60°)=\cos[90°-2x]$ ✓ $x+60°=90°-2x+k.360°$ ✓ $x=10°+k.120°$ ✓ $x+60°=360°-(90°-2x)+k.360°$ ✓ $x=-210°+k.360°$ ✓ $k\in\mathbb{Z}$ (provided k.360° is stated/*slegs as k.360°gegee word*) ✓ all three answers/al drie *antwoorde* ✓ $\sin[90°\pm(x+60°)]=\sin 2x$ ✓ $90°-x-60°=2x+k.360°$ ✓ $-3x=-30°+k.360°$ ✓ $90°+x+60°=2x+k.360°$ ✓ $-x=-150°+k.360°$ ✓ $k\in\mathbb{Z}$ ✓ all three answers/al drie *antwoorde* (7)
6.2	$180°$	✓ answer/*antwoord* (1)
6.3	$10°\le x\le 130°\cup 150°\le x\prec 180°$ *of* $[10°;130°]\cup[150°;180)$	✓ values/*waardes* ✓ notation/*notasie* (2)
6.4	$p(x)=\sin(x-30°)$ The graph of h is shifted/moved 30° to the right./ Die grafiek het 30° na regs geskuif.	✓ shifted/moved/*geskuif* ✓ *30°* ✓ 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/*coordinate van* A ✓ correct subst into distance/korrekte invervanging in afstands formulae ✓ simplification/vereenvoudig ✓ $\sin^2 x + \cos^2 x = 1$ (4)
7.2.1	$AC^2 = d^2 + \left(\frac{d}{2}\right)^2 - 2.d.\frac{d}{2}.\cos(90° - \alpha)$ $AC^2 = d^2 + \frac{d^2}{4} - d^2\sin\alpha$ $AC^2 = \frac{5d^2}{4} - \frac{4d^2\sin\alpha}{4}$ $AC^2 = \frac{d^2(5 - 4\sin\alpha)}{4}$ $AC = \frac{d\sqrt{5 - 4\sin\alpha}}{2}$ $\tan\theta = \frac{h}{AC}$ $\therefore h = AC.\tan\theta$ $\therefore h = \frac{d\sqrt{5 - 4\sin\alpha}}{2}.\tan\theta$	✓ correct subst into cosine rule/*korrekte vervanging in kosinus formule* ✓ $BC = \frac{d}{2}$ ✓ $\sin\alpha$ ✓ factorise/faktoriseer (4)
7.2.2	$\tan\theta = \frac{h}{AC}$ $\therefore h = AC.\tan\theta$ $\therefore h = \frac{300.\sqrt{5 - 4\sin 32°}}{2}.\tan 63°$ $\therefore h = 499,63m$	✓ trig ratio ✓ correct subst into tan ratio/*korrekte vervanging in tan verhouding* ✓ answer/*antwoord* (3)
		[11]

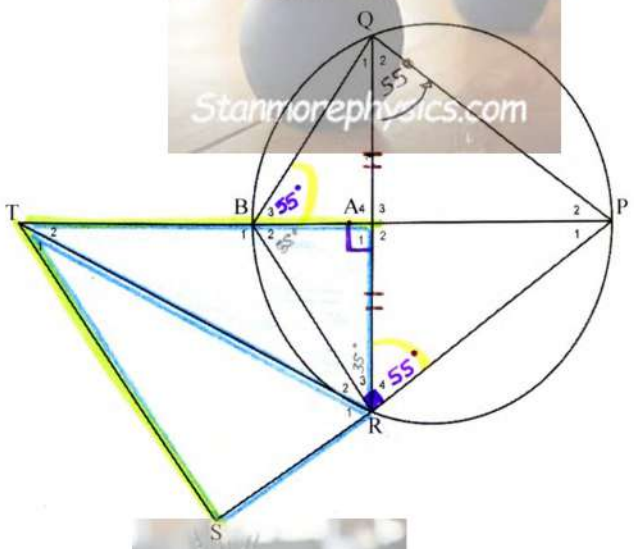
GEOMETRY/*MEETKUNDE*

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/ *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)*

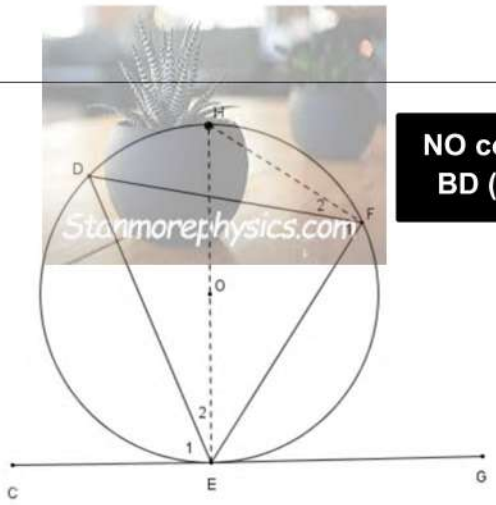
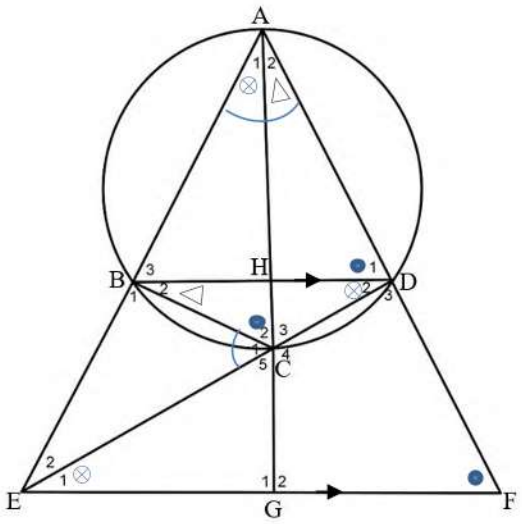
QUESTION/*VRAAG 8*

CHECK CANDIDATES DIAGRAM!!



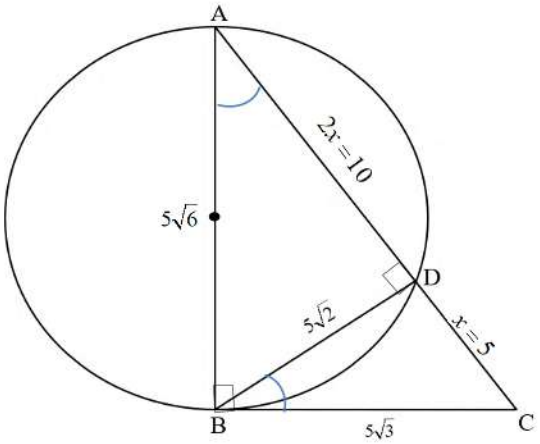
8.1.1	$\hat{R}_4 = 55°$ [∠s opp. = sides/*∠e teenoor = sye*]	✓S ✓R (2)
8.1.2	$\hat{B}_3 = 55°$ [∠s in the same segment/*∠e in dieselfde sirkel segment*]	✓S ✓R (2)
8.1.3	$B\hat{R}P = 90°$ [∠ in semi circle./*∠ in halfsirkel*]	✓S ✓R (2)
8.1.4	$\hat{R}_4 = 55°$ [proved / *bewys* in 8.1.1] $B\hat{R}P = 90°$ [proved / *bewys* in 8.1.3] $\therefore \hat{R}_3 = 35°$ $\hat{B}_2 = \hat{Q}_2 = 55°$ [∠s in the same segment/*∠e in dieselfde sirkel segment*] $\hat{A}_1 = 90°$	✓S ✓S ✓**S** (3)
8.2	[line from centre ⊥ to chord/*lyn vanuit midpt ⊥ op koord*]	✓S (1)
8.4	In ΔTAR and/*en* ΔTSR is: TR = TR [common / *gemeenskaplik*] $\hat{R}_2 + \hat{R}_3 = \hat{R}_1$ [given / *gegee*] $\hat{A}_1 = \hat{S} = 90°$ [$\hat{A}_1 = 90°$, line from centre ⊥ to cord bicects the cord / *lyn van uit midpt ⊥ op koord halveer koord*] $\therefore \Delta TAR \equiv \Delta TSR$ [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* $\hat{E}_1 + \hat{E}_2 = 90°$ [rad ⊥ tan/ *rklyn*] $\hat{F}_1 + \hat{F}_2 = 90°$ [∠ in semi circle./*∠ in halfsirkel*] $\hat{F}_1 + \hat{F}_2 = \hat{E}_1 + \hat{E}_2$ But/*maar* $\hat{E}_2 = \hat{F}_2$ [∠sin the same segment/*∠e in dieselfde sirkelsegment*] $\therefore \hat{E}_1 = \hat{F}_1$ $C\hat{E}D = F_1$	✓ constr/*konstr* ✓ S ✓ R ✓ S/R ✓ S/R (5)
	 	
9.2.1	$\hat{E}_1 = \hat{D}_2$ [alt ∠s/ *verw.∠e*; BD||EF] $\hat{D}_2 = \hat{A}_1$ [∠s in the same segment/*∠e in dieselfde sirkel segment*] $\therefore \hat{E}_1 = \hat{A}_1$	✓ S/R (with //) ✓ S ✓ R (3)
9.2.2	∴ EF is a tangent/EF is 'n *raaklyn* [converse tan chord / *omgekeerde raaklyn koord stelling*]	✓ R (1)

9.2.3	In ΔABC and/*en* ΔEDF 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 kvh*] $\hat{C}_2 = \hat{F}$ [3^{rd} $\angle$sum of Δ / 3^{de} $\angle$ *som* $\angle$ *v* Δ] $\therefore \Delta ABC \,\|\|\| \,\Delta EDF$ [$\angle,\angle,\angle$] OR/*OF* In ΔABC and ΔDEF : $\hat{A}_1 = \hat{E}_1$ [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*] $\therefore \Delta ABC \,\|\|\| \,\Delta EDF$ [$\angle,\angle,\angle$]	✓ S ✓ S ✓ R ✓S/R ✓ S ✓ S ✓ R ✓ R (4)
9.2.4	$\frac{AB}{ED} = \frac{BC}{DF}$ [out of $\|\|\|$ / uit $\|\|\|$] penalize once if // lines not shown/ penaliseer 1x as // ontbreek $\therefore AB = \frac{BC.ED}{DF}$ But/*maar* $\frac{AB}{BE} = \frac{AH}{HG}$ [$BH \,\|\, EG$] [line || to one side of a Δ / *lyn* || *ander sy v* Δ] [prop theorem BD|| EF / *BD* || EF] $\therefore AB = \frac{AH.BE}{HG}$ $\therefore \frac{AH.BE}{HG} = \frac{BC.ED}{DF}$	✓ S ✓ R ✓ S (making AB the subject/*maak AB die onderwerp)* ✓ S ✓ R ✓ S (making AB the subject/*maak AB die onderwerp)* (6)
		[19]

QUESTION/*VRAAG 10*



10.1	$A\hat{D}B = 90°$ [∠ in semi circle./∠ *in halfsirkel*] $A\hat{B}C = 90°$ [rad ⊥ tan/ *rklyn*] $AB^2 = (2x)^2 + BD^2$ .....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* $BD^2 = AD.CD$ [right angled Δwith BD ⊥ AC / *loodlyn vanuit reghoekige hoekpunt*] $BD^2 = 2x.x$ $\therefore BD = \sqrt{2}x$ $\frac{BD}{DC} = \frac{\sqrt{2}x}{x} = \sqrt{2}$	✓ both 90° S/R ✓ both eq ✓ $4x^2 = 2BD^2$ ✓ $BD = \sqrt{2}x$ ✓ S ✓ R ✓ $BD = \sqrt{2}x$ (4)

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

TOTAL/*TOTAAL*: 150