



education

Department of
Education
FREE STATE PROVINCE

PREPARATORY EXAMINATION

GRADE 12

MATHEMATICS P2



TIME: 3 HOURS



MATHEMATICS P2



12612B

SEPTEMBER 2026

MARKS: 150

X05



N1

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

INSTRUCTIONS AND INFORMATION

Read the following instructions carefully before answering the questions.

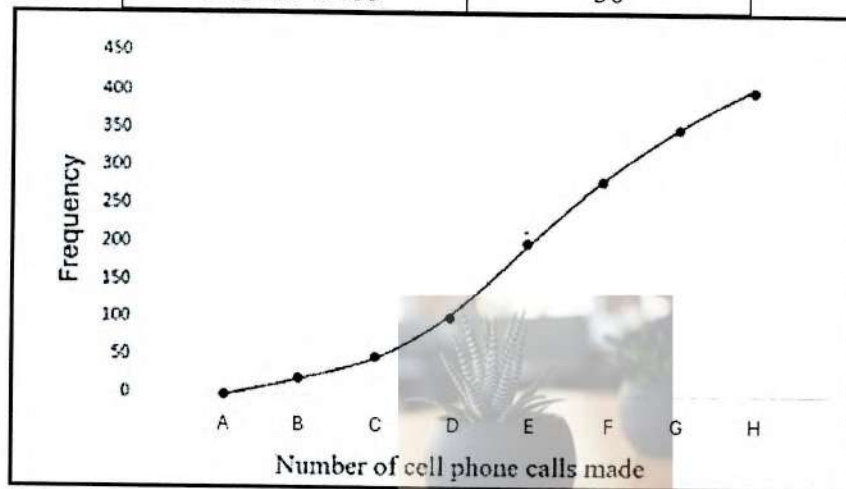
1. This question paper consists of 9 questions.
2. Answer ALL the questions in the SPECIAL ANSWER BOOK provided.
3. Clearly show ALL calculations, diagrams, graphs, etc. that you have used in determining your answers.
4. Answers only will NOT necessarily be awarded full marks.
5. Unless stated otherwise,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



QUESTION 1

Several learners were asked how many cell phone calls they made during the day. The results are summarised in the table and the cumulative frequency curve given below.

Cell phone call made	Frequency
$50 \leq x < 100$	20
$100 \leq x < 150$	30
$150 \leq x < 200$	Q
$200 \leq x < 250$	R
$250 \leq x < 300$	80
$300 \leq x < 350$	70
$350 \leq x < 400$	50



- 1.1 What is the value of A on the horizontal axis of the cumulative frequency curve? (1)
- 1.2 How many learners were asked for the information? (1)
- 1.3 Determine the values of Q and R in the table. (2)
- 1.4 Calculate the inter-quartile range. (3)
- 1.5 Calculate the estimate for the mean number of cell phone calls made per day. (2)
- 1.6 If the cell phone company introduced a contract where you were not allowed to make more than 300 calls per day:
 - 1.6.1 How would this affect the median? Explain. (2)
 - 1.6.2 How would this affect the standard deviation? Explain. (2)
 - 1.6.3 In which direction would the data be skewed? Explain. (2)

[15]

QUESTION 2

A study was conducted with twelve soccer players on a team to determine the relationship between the number of rest days allocated in a year and the players' performance.

The results are shown in the table below.

Rest days given	5	2	9	1	3	12	10	4	4	5	8	6
Performance of the player	0,87	0,65	0,9	0,58	0,7	0,91	0,88	0,78	0,72	0,91	0,82	0,62

2.1 Calculate the correlation coefficient. (2)

2.2 Refer to the correlation coefficient and write down the letter that best describes the relationship.

A Fairly strong, negative correlation

B Very weak positive correlation

C Fairly strong positive correlation

D Perfect positive correlation

(1)

2.3 If the equation of the least squares regression line is $y = A + Bx$, calculate the values of A and B. Give answers correct to TWO decimal places. (2)

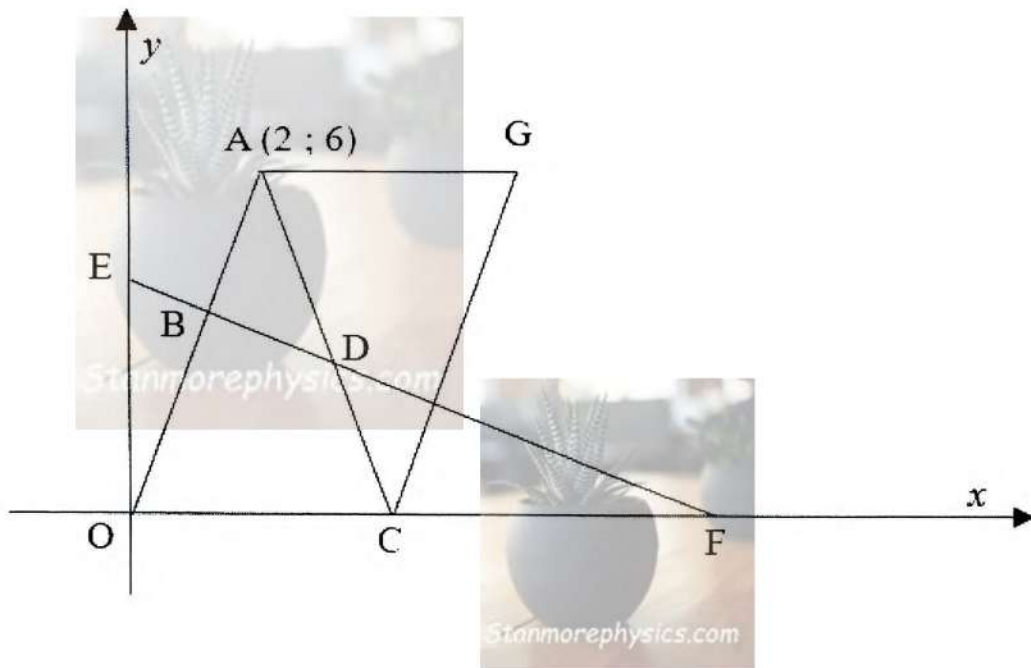
2.4 Should the regression line in QUESTION 2.3 be used to predict the performance of the players if 30 rest days are given to the players in a year? (Explain your answer.) (2)

[7]

QUESTION 3

In the diagram below, $\triangle AOC$ with $A(2; 6)$ and $O(0; 0)$ is drawn.

- C is a point on the x -axis
- $AO = AC$
- E lies on the y -axis and F on the x -axis
- Line EF goes through the points B and D on OA and CA, respectively
- The equation of EF is given by $2y + x = 10$
- OAGC forms a parallelogram



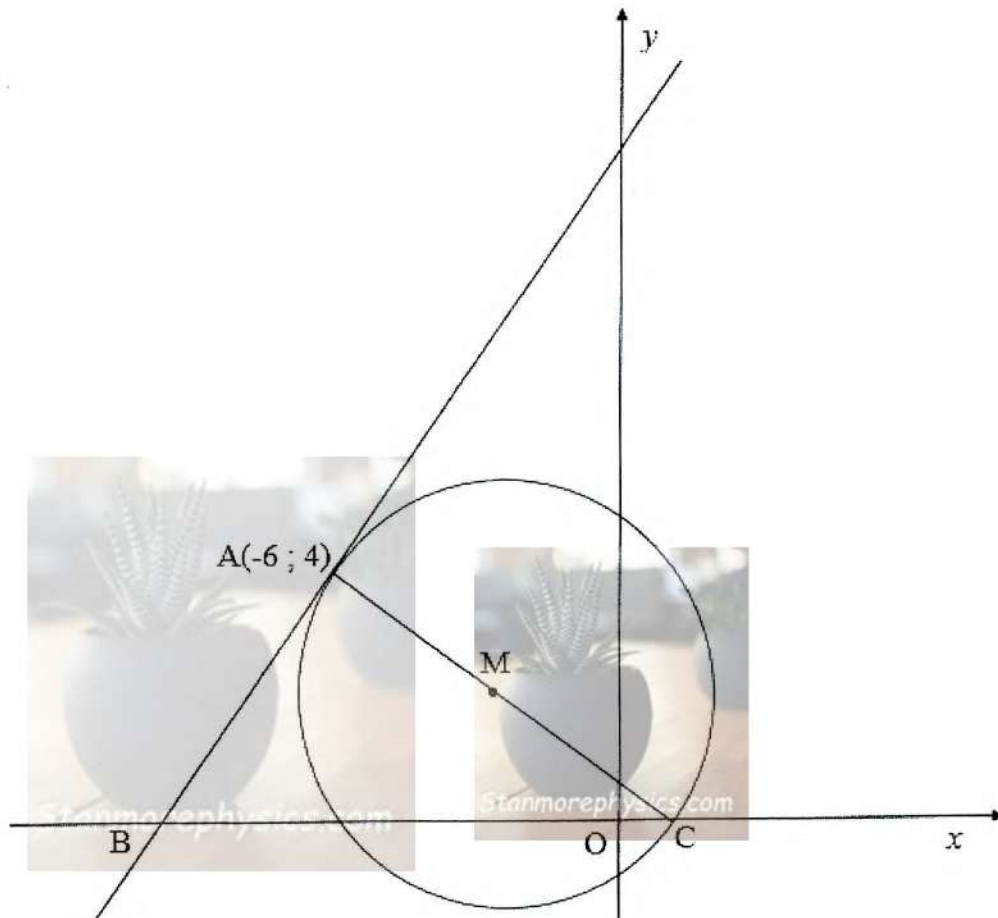
- 3.1 Calculate the length of AC. (3)
- 3.2 Calculate the midpoint of OA. (2)
- 3.3 Determine the coordinates of G. (2)
- 3.4 Determine the coordinates of B. (5)
- 3.5 Hence, or otherwise, determine the area of $\triangle EBO$. (3)
- 3.6 If $D\left(x; \frac{18}{5}\right)$, determine the area of $\triangle DFC$. (4)

[19]

QUESTION 4

In the diagram, the circle with centre M and equation $x^2 + y^2 + 4x - 4y - 12 = 0$ is drawn.

C is the x-intercept of the circle. AB is a tangent to the circle at A(-6 ; 4) and cuts the x-axis at B.



- 4.1 Calculate the:
 - 4.1.1 Coordinates of M (2)
 - 4.1.2 Coordinates of C (3)
- 4.2 Determine the equation of the tangent AB in the form $y = mx + c$ (4)
- 4.3 Show algebraically that the given circle $x^2 + y^2 + 4x - 4y - 12 = 0$ and the circle $(x + 4)^2 + (y + 2)^2 = 5$ intersect each other. (5)
- 4.4 Determine for which values of k the line $y = 2x + k$ will intersect the circle $x^2 + y^2 + 4x - 4y - 12 = 0$ at two points. (5)

[19]

QUESTION 5

- 5.1 If $\sin A = \frac{\sqrt{20}}{6}$ and $\hat{A} > 90^\circ$, determine, **without using a calculator**, the value of:

5.1.1 $\sin 2A$ (5)

5.1.2 $\sin \frac{A}{2}$ (3)

- 5.2 Simplify the following expression to a single trigonometric function:

$$\frac{\sin x \cdot \sin(90^\circ + y) - \cos x \cdot \sin(180^\circ + y)}{\cos x \cdot \cos(y - 360^\circ) + \sin(-x) \cdot \sin y} \quad (6)$$

- 5.3 Prove that $\tan \theta + \frac{\cos \theta}{\sin \theta} = \frac{2}{\sin 2\theta}$ (5)

- 5.4 Given: $\sin \theta = m$

- 5.4.1 Write down the values of m for which $\sin \theta$ is defined. (2)

- 5.4.2 Determine the general solution for θ if:

$$3 \sin \theta - \frac{4}{\sin \theta} + 4 = 0 \quad \text{and} \quad \theta \in [-180^\circ; 180^\circ] \quad (6)$$

- 5.5 Find the value of $\tan \theta$, if the distance between $A(\cos \theta ; \sin \theta)$ and $B(6 ; 7)$ is $\sqrt{86}$. (4)

[31]

QUESTION 6

Consider: $f(x) = \cos(x - 45^\circ)$ and $g(x) = \tan \frac{1}{2}x$ for $x \in [-180^\circ; 180^\circ]$

6.1 On the grid provided in the ANSWER BOOK, draw sketch graphs of f and g on the same set of axes for $x \in [-180^\circ; 180^\circ]$. Show clearly all the intercepts on the axes, the coordinates of the turning points and the asymptotes. (6)

6.2 Use the graphs to answer the following questions for $x \in [-180^\circ; 180^\circ]$.

6.2.1 Write down the solutions of $\cos(x - 45^\circ) = 0$ (2)

6.2.2 Write down the equations of the asymptote(s) of g (2)

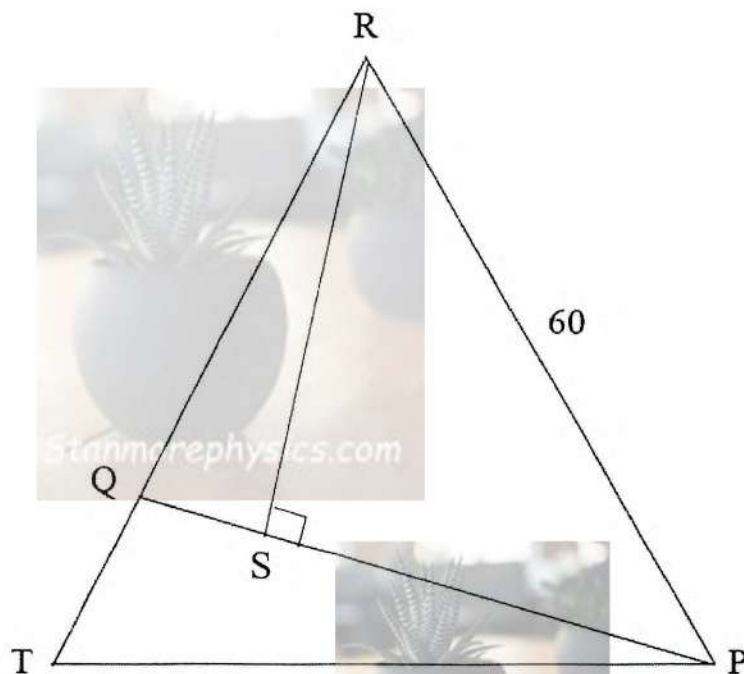
6.2.3 How many solutions exist for the equation $\cos(x - 45^\circ) = \tan \frac{1}{2}x$? (1)

6.2.4 For what value(s) of x is $f(x) \cdot g(x) > 0$? (3)
[14]



QUESTION 7

In the diagram below, $\triangle TPR$ is equilateral with $PR = 60$ units. Q is a point on RT such that $RQ : QT = 5:1$. It is given that S is any point on the straight line PQ . RS is perpendicular to QP .



- 7.1 Show by calculation that $PQ = 55,68$ units. (4)
- 7.2 Calculate the distance QS . (4)
- [8]

Provide reasons for your statements in QUESTIONS 8 and 9.

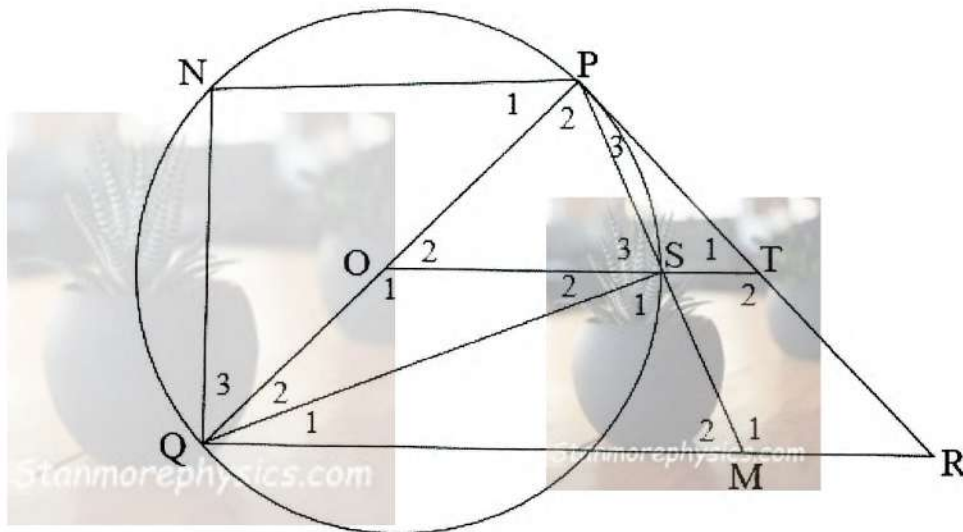
QUESTION 8

8.1 Complete the following statements:

8.1.1 The angle subtended by the diameter at the circumference of a circle is ... (1)

8.1.2 The line segment joining the midpoints of two sides of a triangle is ... to the third side and ... (2)

8.2 In the diagram below, $\triangle PQR$ is drawn with $\hat{R} = 25^\circ$ and $\hat{PQM} = 75^\circ$. O and T are midpoints of PQ and PR, respectively. POQ is a diameter of the circle with centre O. The points S, Q, N, and P lie on the circumference of the circle.



Determine, with reasons, the size of the following angles:

8.2.1 $\hat{QPR}$ (2)

8.2.2 $\hat{PTO}$ (2)

8.2.3 $\hat{QNP}$ (2)

8.2.4 $\hat{QSM}$ (2)

8.3 Show that $PS = SM$ (2)

8.4 Prove that $\triangle PQS \equiv \triangle MQS$ (4)

8.5 Hence, show that $QM = 2PO$ (2)

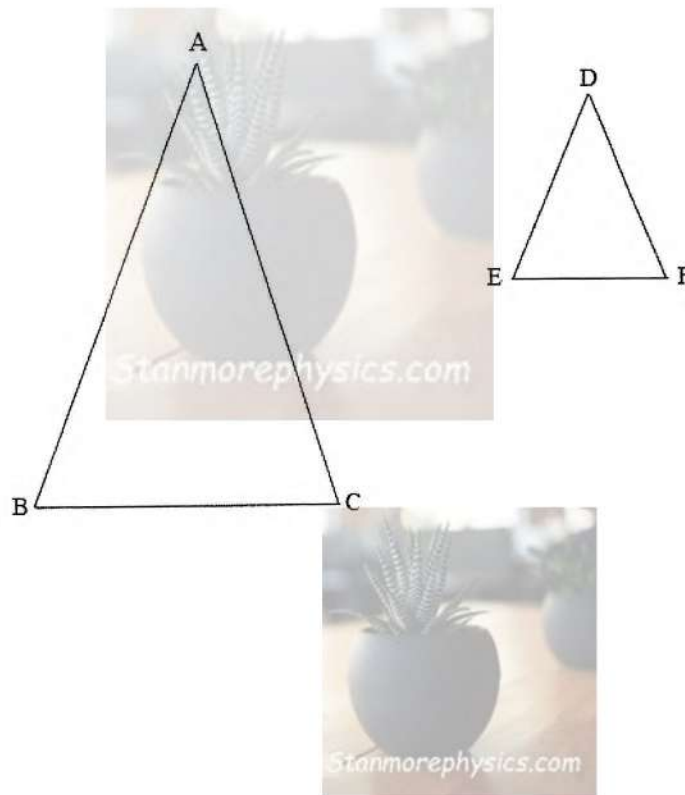
[19]

QUESTION 9

9.1

In the diagram, $\triangle ABC$ and $\triangle DEF$ are given.

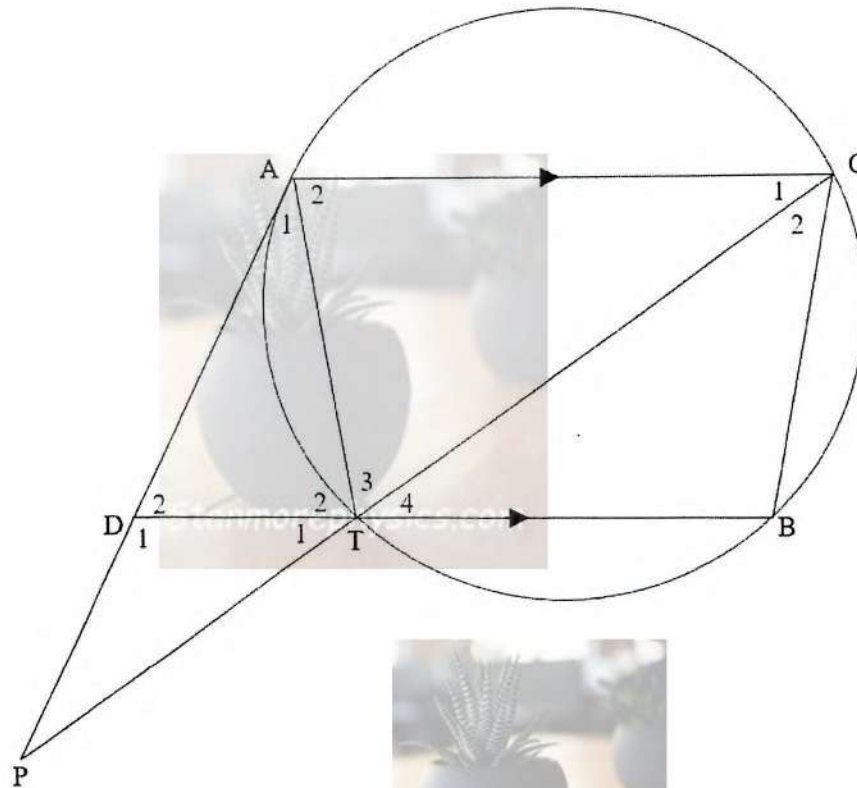
Prove the theorem that states that:

If $\hat{A} = \hat{D}$, $\hat{B} = \hat{E}$ and $\hat{C} = \hat{F}$ then $\frac{AB}{DE} = \frac{AC}{DF}$ 

(7)



9.2 In the diagram below, ACBT is a cyclic quadrilateral. BT is produced to meet tangent AP at D. CT is produced to P. AC // DB. BT is produced to meet tangent AP at D. CT is produced to P. AC // DB.



9.2.1 Prove that $PA^2 = PT \cdot PC$

(5)

9.2.2 If $PA = 6$ units, $TC = 5$ units and $PT = x$, show that $x^2 + 5x - 36 = 0$

(2)

9.2.3 Calculate the length of PT.

(2)

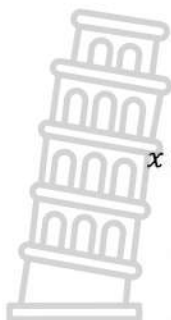
9.2.4 Calculate the length of PD.

(2)

[18]

TOTAL: 150

INFORMATION SHEET



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

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

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

$$A = P(1 - i)^n$$

$$A = P(1 + i)^n$$

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

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

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

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

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

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

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

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

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

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

$$y = mx + c$$

$$y - y_1 = m(x - x_1) \quad m = \frac{y_2 - y_1}{x_2 - x_1}$$

$$m = \tan \theta$$

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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



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FREE STATE PROVINCE

PREPARATORY EXAMINATION/ *VOORBEREIDENDE EKSAMEN*

GRADE/GRAAD 12

**MATHEMATICS P2/
*WISKUNDE V2***

Stanmorephysics.com

SEPTEMBER 2026

MARKS/PUNTE: 150

Stanmorephysics.com

**MARKING GUIDELINES/
*NASIENRIGLYNE***

**These marking guidelines consist of 20 pages./
*Hierdie nasienriglyne bestaan uit 20 bladsye.***

NOTE:

- If a c
- If a c
- Cons
- Assu

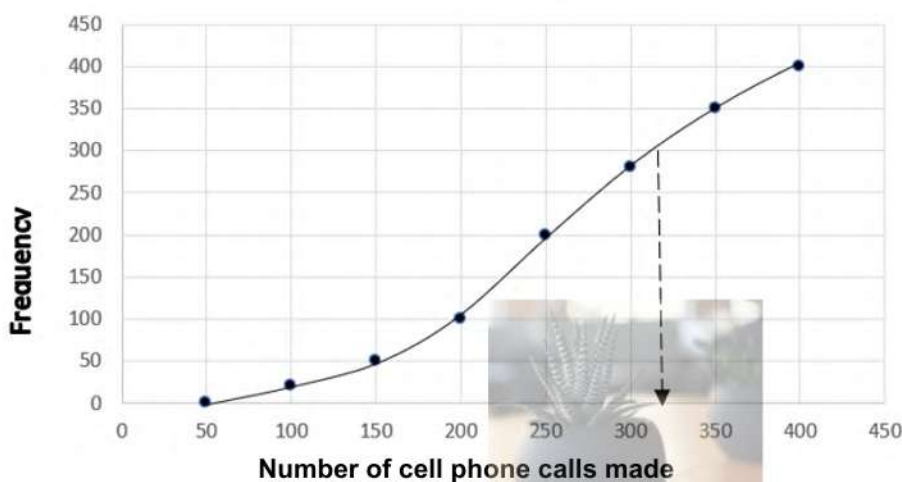
- NOTA:**

- As 'n kandidaat 'n vraag TWEE KEER beantwoord, merk slegs die EERSTE poging.
- As 'n kandidaat 'n antwoord van 'n vraag doodtrek en nie oordoen nie, merk die doodgetrekte poging.
- Volgehoue akkuraatheid word in ALLE aspekte van die nasienriglyne toegepas. Hou op nasien by die tweede berekeningsfout.
- Aanvaar van antwoorde/waardes om 'n probleem op te los, word NIE toegelaat nie.

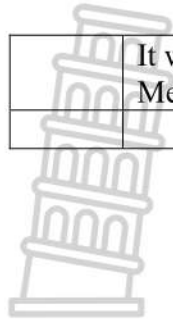
QUESTION/VRAAG 1

Cell phone call made	Frequency
$50 \leq x < 100$	20
$100 \leq x < 150$	30
$150 \leq x < 200$	Q
$200 \leq x < 250$	R
$250 \leq x < 300$	80
$300 \leq x < 350$	70
$350 \leq x < 400$	50

Ogive



1.1	A = 50	✓ answer (1)
1.2	400	✓ answer (1)
1.3	Q = 50 and R = 100	✓ Q = 50 ✓ R = 100 (2)
1.4	Q_3 = greater than 300 and less than 325 Q_1 = 200 $IQR = 110$ (CA based on values)	✓ Q_3 value ✓ Q_1 value ✓ answer (3)
1.5	Mean = 250	✓ answer (2)
1.6.1	It would decrease. People will leave the contract. Therefore, fewer people.	✓ answer ✓ explanation (2)
1.6.2	Standard deviation would decrease. The difference between the new mean and the data would decrease.	✓ answer ✓ explanation (2)
1.6.3	It would skew the data to the left. The values above the median are less spread out. OR	✓ answer ✓ explanation (2) OR



It would skew the data to the left. Mean < median	✓ answer ✓ explanation (2)
	[15]



QUESTION/VRAAG 2

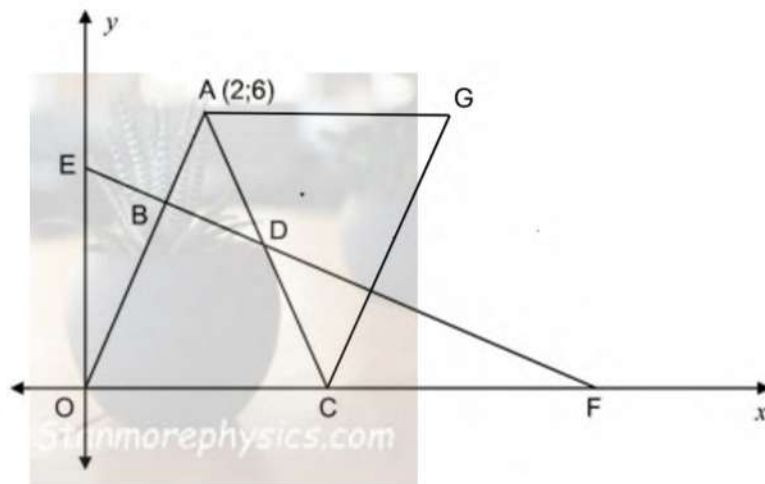
QUESTION/VRAAG 2

Rest days given	5	2	9	1	3	12	10	4	4	5	8	6
Performance of the player	0,87	0,65	0,9	0,58	0,7	0,91	0,88	0,78	0,72	0,91	0,82	0,62

2.1	0,7337 $\approx$ 0,73	✓✓ answer (2)
2.2	C	✓ answer (1)
2.3	A = 0,6268 $\approx$ 0,63 B = 0,0264 $\approx$ 0,03	✓ value of A ✓ value of B (2)
2.4	No. 30 falls outside the given data; therefore it will not be accurate. Extrapolation will be taking place.	✓ answer ✓ reason (2)
		[7]



QUESTION/VRAAG 3



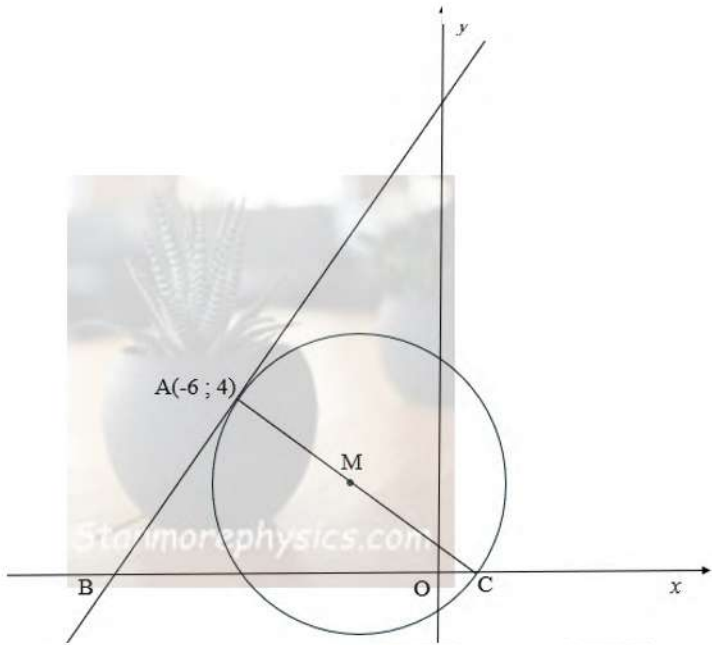
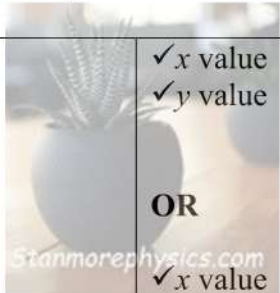
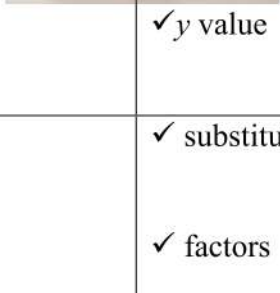
3.1	$OA = \sqrt{(0-2)^2 + (0-6)^2}$ $= \sqrt{40}$ $= 2\sqrt{10}$ $= 6,32$ $OA = AC = 6,32$	✓ substitution ✓ answer ✓ $OA = AC$ (3)
3.2	$\text{Midpoint } M \left(\frac{0+2}{2}; \frac{0+6}{2} \right)$ $= (1;3)$ Answer only full marks	✓ x - value ✓ y - value (2)
3.3	Using translation $G(6; 6)$ Answer only full marks	✓ x -value ✓ y - value (2)
3.4	$m_{OA} = 3$ Equation of line OA is $y = 3x$ Equation of line EF is $2y + x = 10$ $2(3x) + x = 10$ $7x = 10$ $x = \frac{10}{7}$ (this represents the height of the triangle) $B \left(\frac{10}{7}; \frac{30}{7} \right)$	✓ gradient of OA ✓ equation of OA ✓ equating ✓ value of x ✓ value of y (5)

3.5	Coordinates of E $2y + 0 = 10$ $y = 5$ $E(0; 5)$ Area of $\triangle EBO = \frac{1}{2} \times 5 \times \frac{10}{7}$ $= \frac{25}{7}$ $= 3,57 \text{ units}^2$ OR Inclination of OA : $\tan \theta = 3$ $\theta = 71,57^\circ$ $E\hat{O}B = 18,43^\circ$ OB = 4.52 units Area of $\triangle EBO = \frac{1}{2} OE \cdot OB \sin E\hat{O}B$ $= \frac{1}{2} (4,52)(5) \sin 18,43^\circ$ $= 3,57 \text{ units}^2$	✓ value of y ✓ substitution ✓ answer (3) ✓ angle $E\hat{O}B$ ✓ substitution ✓ answer (3)
3.6	C(4 ; 0) $2(0) + x = 10$ $x = 10$ CF = 6 Area $\triangle DFC = \frac{1}{2} \times 6 \times \frac{18}{5}$ $= \frac{54}{5}$ $= 10,80 \text{ units}^2$ OR C(4 ; 0) $2(0) + x = 10$ $x = 10$ CF = 6 $2y + x = 10 \text{ sub } y = \frac{18}{5}$ $2\left(\frac{18}{5}\right) + x = 10$ $\frac{14}{5}$ $x = \frac{14}{5}$ $D\left(\frac{14}{5}; \frac{18}{5}\right)$ C(4; 0) $DC = \sqrt{\left(4 - \frac{14}{5}\right)^2 + \left(0 - \frac{18}{5}\right)^2}$	✓ coordinates of C ✓ length CF ✓ substitution ✓ answer (4) ✓ length CF

[19]



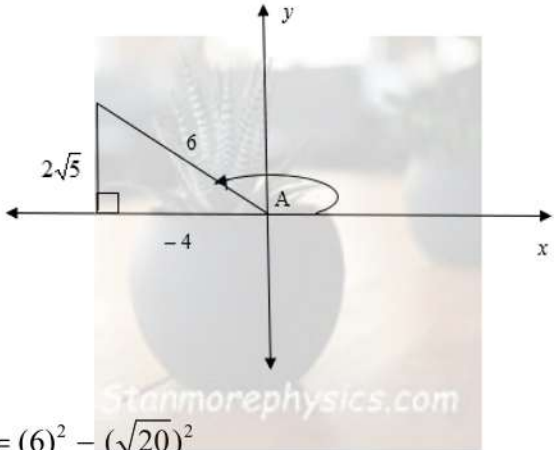
QUESTION/VRAAG 4

			
4.1.1	$x^2 + y^2 + 4x - 4y - 12 = 0$ $(x + 2)^2 + (y - 2)^2 = 12 + 4 + 4 = 20$ $M(-2; 2)$ OR $M\left(\frac{4}{-2}; \frac{-4}{-2}\right)$ $M(-2; 2)$	 OR 	✓ x value ✓ y value (2)
4.1.2	$x^2 + 0^2 + 4x - 4(0) - 12 = 0$ $x^2 + 4x - 12 = 0$ $(x + 6)(x - 2) = 0$ $x = -6 \text{ or } x = 2$ $C(2; 0)$ OR $\frac{x - 6}{2} = -2$ $x = 2$ $C(2; 0)$	✓ substitute $y = 0$ ✓ factors ✓ correct x value (3)	OR ✓ correct use of formula ✓ x- value ✓ y = 0 (3)

4.2	$M(-2;2) \quad C(2;0)$ $m_{MC} = \frac{0-2}{2-(-2)}$ $m_{MC} = \frac{-1}{2}$ $m_{\text{tan}} = 2 \quad \text{tangent} \perp \text{radius}$ $y-4=2(x-(-6))$ $y = 2x+16$	✓ substitution ✓ gradient of tangent ✓ substituting $A(-6;4)$ ✓ equation (4)
4.3	$x^2 + y^2 + 4x - 4y - 12 = 0$ $(x+2)^2 + (y-2)^2 = 20$ Centre $O_1(-2;2)$ $radius_1 = \sqrt{20}$ $= 2\sqrt{5}$ $(x+4)^2 + (y+2)^2 = 5$ Centre $O_2(-4;-2)$ $radius_2 = \sqrt{5}$ Distance between centres: $= \sqrt{(-4+2)^2 + (-2-2)^2}$ $= \sqrt{4+16}$ $= \sqrt{20}$ $= 2\sqrt{5}$ $r_1 + r_2 = 3\sqrt{5}$ $3\sqrt{5} > 2\sqrt{5}$ therefore circles intersect	✓ $2\sqrt{5}$ ✓ centre $O_2(-4;-2)$  ✓ distance between centres = $2\sqrt{5}$ ✓ $r_1 + r_2 = 3\sqrt{5}$ ✓ $3\sqrt{5} > 2\sqrt{5}$ (5)

4.4	Equation of tangent parallel to AB through C: $y - 0 = 2(x - 2)$ $y = 2x - 4$ $\therefore -4 < k < 16$ OR $x^2 + (2x + k)^2 + 4x - 4(2x + k) - 12 = 0$ $5x^2 + 4xk - 4x + k^2 - 4k - 12 = 0$ $5x^2 + (4k - 4)x + (k^2 - 4k - 12) = 0$ $\Delta > 0$ $(4k - 4)^2 - 4(5)(k^2 - 4k - 12) > 0$ $16k^2 - 32k + 16 - 20k^2 + 80k + 240 > 0$ $-4k^2 + 48k + 256 > 0$ $k^2 - 12k - 64 < 0$ $(k + 4)(k - 16) < 0$ $-4 < k < 16$	✓ $m = 2$ ✓ substitution ✓ simplification ✓✓ answer (5) OR ✓ substitution ✓ standard form ✓ $(4k - 4)^2 - 4(5)(k^2 - 4k - 12) > 0$ ✓✓ answer (5)
	[19]	

QUESTION/VRAAG 5

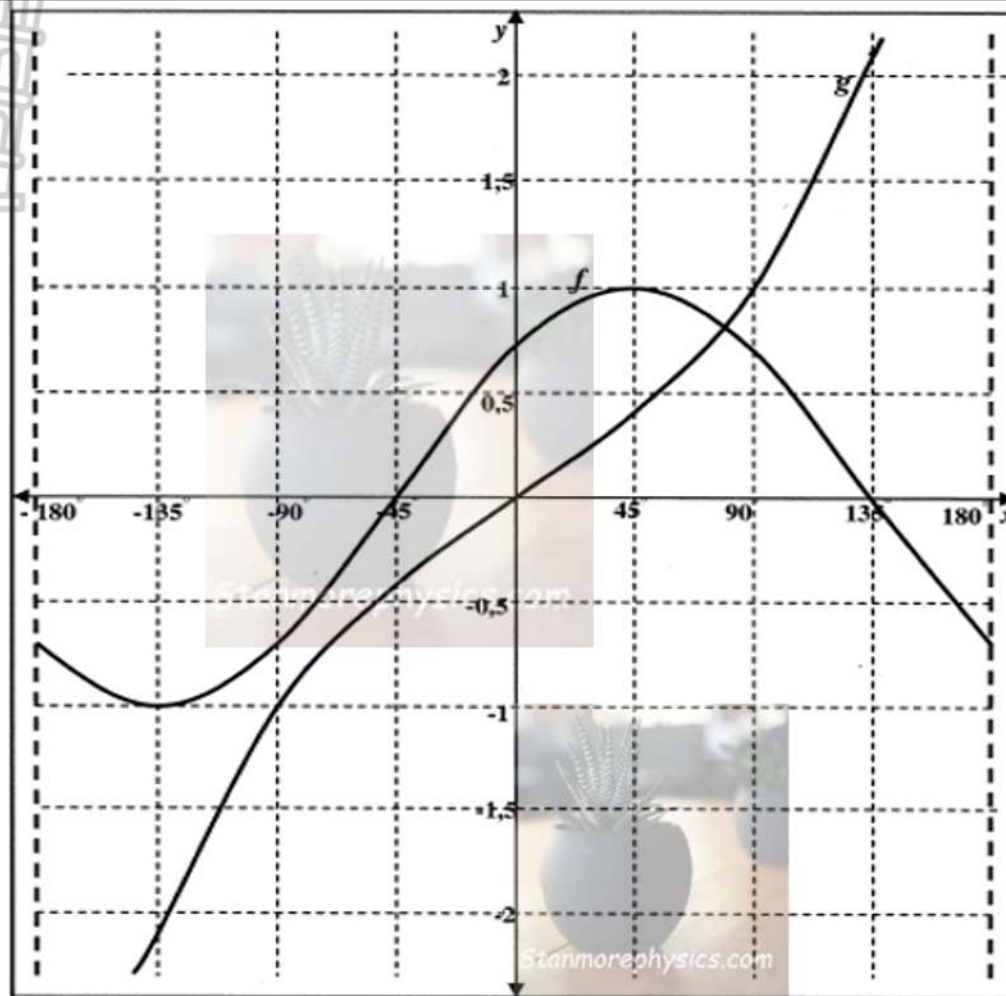
5.1.1	 $x^2 = (6)^2 - (\sqrt{20})^2$ $= 36 - 20$ $= 16$ $x = \pm 4$ only $x = -4$ $\sin 2A$ $= 2 \sin A \cos A$ $= 2 \cdot \frac{2\sqrt{5}}{6} \cdot \frac{-4}{6}$ $= \frac{-4\sqrt{5}}{9}$	✓ correct quadrant ✓ correct x-value ✓ double angle formulae ✓ substitution ✓ answer (5)
5.1.2	$\cos 2\left(\frac{A}{2}\right) = 1 - 2 \sin^2\left(\frac{A}{2}\right)$ $2 \sin^2\left(\frac{A}{2}\right) = 1 - \cos A$ $\sin\left(\frac{A}{2}\right) = \sqrt{\frac{1 - \frac{-4}{6}}{2}}$ $= \sqrt{\frac{5}{6}}$	✓ reduction formulae ✓ substitution ✓ answer (3)

5.2	$\frac{\sin x \cdot \sin(90^\circ + y) - \cos x \cdot \sin(180^\circ + y)}{\cos x \cdot \cos(y - 360^\circ) + \sin(-x) \cdot \sin y}$ $= \frac{\sin x \cdot (\cos y) - \cos x \cdot (-\sin y)}{\cos x \cdot (\cos y) + (-\sin x) \sin y}$ $= \frac{\sin x \cdot \cos y + \cos x \cdot \sin y}{\cos x \cdot \cos y - \sin x \cdot \sin y}$ $= \frac{\sin(x + y)}{\cos(x + y)}$ $= \tan(x + y)$	✓ $\cos y$ ✓ $-\sin y$ ✓ $\cos y$ ✓ $-\sin x$ ✓ $\frac{\sin(x + y)}{\cos(x + y)}$ ✓ $\tan(x + y)$	(6)
5.3	LHS: $\frac{\sin \theta}{\cos \theta} + \frac{\cos \theta}{\sin \theta}$ $= \frac{\sin^2 \theta + \cos^2 \theta}{\cos \theta \cdot \sin \theta}$ $= \frac{1}{\cos \theta \cdot \sin \theta}$ RHS: $\frac{2}{\sin 2\theta}$ $= \frac{2}{2 \sin \theta \cdot \cos \theta}$ $= \frac{1}{\sin \theta \cdot \cos \theta}$ LHS = RHS	✓ $\frac{\sin \theta}{\cos \theta}$ ✓ simplification ✓ $\sin^2 \theta + \cos^2 \theta$ ✓ double angle ✓ simplification	(5)
5.4.1	$-1 \leq m \leq 1$ OR $m \in [-1; 1]$	✓✓ answer OR ✓✓ answer	(2) (2)

5.4.2	$3\sin\theta - \frac{4}{\sin\theta} + 4 = 0$ $3\sin^2\theta - 4 + 4\sin\theta = 0$ $3\sin^2\theta + 4\sin\theta - 4 = 0$ $(3\sin\theta - 2)(\sin\theta + 2) = 0$ $\sin\theta = \frac{2}{3} \quad \text{or} \quad \sin\theta = -2$ $\text{ref angle} = 41,81^\circ$ $\theta = 41,81 + k360^\circ, k \in \mathbb{Z}$ OR $\theta = 180^\circ - 41,81^\circ + k360^\circ; k \in \mathbb{Z}$ $\theta = 138,19^\circ + k360^\circ, k \in \mathbb{Z}$ $\theta = 41,81^\circ \quad \text{or} \quad 138,19^\circ \quad \theta \in [-180^\circ; 180^\circ]$	✓ standard form ✓ factors ✓ $x = 41,81 + k360^\circ$ ✓ $x = 138,19^\circ + k360^\circ, k \in \mathbb{Z}$ ✓ $x = 41,81^\circ$ or ✓ $x = 138,19^\circ$ (6)
5.5	$AB^2 = (\cos\theta - 6)^2 + (\sin\theta - 7)^2$ $86 = \cos^2\theta - 12\cos\theta + 36 + \sin^2\theta - 14\sin\theta + 49$ $86 = 1 + 36 + 49 - 12\cos\theta - 14\sin\theta$ $0 = -12\cos\theta - 14\sin\theta$ $14\sin\theta = -12\cos\theta$ $\frac{\sin\theta}{\cos\theta} = \frac{-12}{14}$ $\tan\theta = \frac{-6}{7}$ $= -0,86$	✓ substitution ✓ simplification ✓ $14\sin\theta = -12\cos\theta$ ✓ answer (4)
		[31]

QUESTION/VRAAG 6

6.1



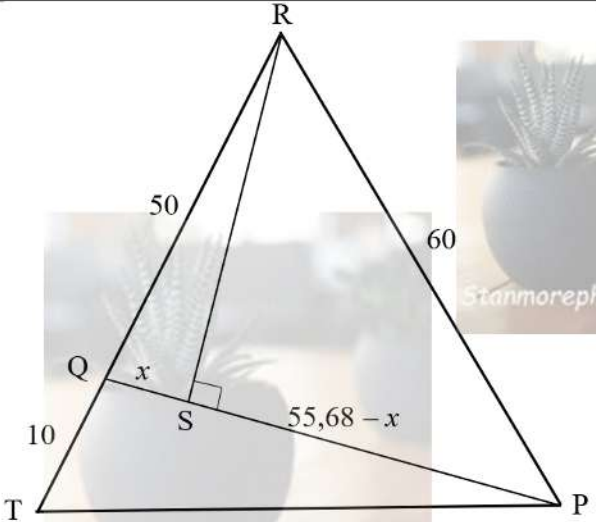
f : ✓ x - intercepts/afsnitte
 ✓ y -intercepts/afsnitte
 ✓ turning points/ draaipunte

g : ✓ asymptotes/asimptote
 ✓✓ passing through/gaan deur $(0 ; 0)$, $(-90^\circ; -1)$, $(90^\circ; 1)$

(6)

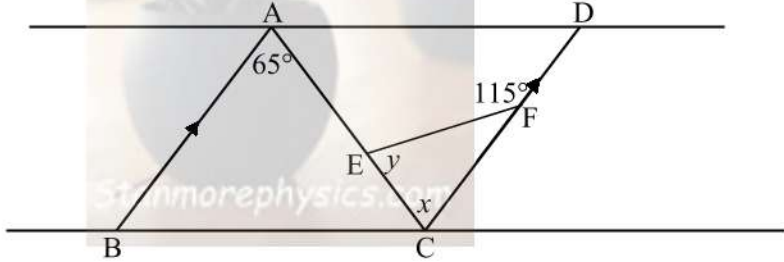
6.2.1	$x = -45^\circ$ or / of $x = 135^\circ$	✓ $x = -45^\circ$ ✓ $x = 135^\circ$ (2)
6.2.2	$x = 180^\circ$ or / of $x = -180^\circ$	✓ $x = 180^\circ$ ✓ $x = -180^\circ$ (2)
6.2.3	1	✓ answer/antwoord (1)
6.2.4	$x \in (-180^\circ; -45^\circ)$ or / of $x \in (0^\circ; 135^\circ)$ OR $-180^\circ < x < -45^\circ$ or / of $0 < x < 135^\circ$	✓ $-180^\circ ; -45^\circ$ ✓ $0^\circ ; 135^\circ$ ✓ notation/notasie (3)
		[14]

QUESTION/VRAAG 7

7.1	$\hat{R} = \hat{T} = \hat{P} = 60^\circ$ $QT = 10$ and/ <i>en</i> $QR = 50$ $PQ^2 = 60^2 + 50^2 - 2(50)(60) \cos 60^\circ$ $= 3100$ $PQ = 55,68 \text{ units}$ OR $PQ^2 = 60^2 + 10^2 - 2(10)(60) \cos 60^\circ$ $= 3100$ $PQ = 55,68 \text{ units}$	$\checkmark 60^\circ$ $\checkmark 10$ or/of 50 $\checkmark$ correct substitution into the cosine rule/ <i>korrekte vervanging in cosreël</i> $\checkmark$ answer/antwoord (4) OR $\checkmark 60^\circ$ $\checkmark 10$ or/of 60 $\checkmark$ correct substitution into the cosine rule/ <i>korrekte vervanging in cosreël</i> $\checkmark$ answer/antwoord (4)
7.2	 S is the nearest to R where RS is the perpendicular height/ <i>S is die naaste aan R waar RS die loodregte hoogte is</i> Let/ Laat $QS = x$ $\therefore PS = 55,68 - x$ $(50^2 - x^2) = (60^2 - [55,68 - x]^2 = RS^2$ $2500 - x^2 = 3600 - 3100,26 + 11136x - x^2$ $2000,26 = 11136x$ $\therefore x = 17,96 \text{ units / eenhede}$	$\checkmark$ diagram/<i>diagram</i> $\checkmark$ Pythagoras/<i>Pythagoras</i> $\checkmark$ simplify/<i>vereenvoudig</i> $\checkmark$ answer/antwoord (4) [8]

GEOMETRY/MEETKUNDE

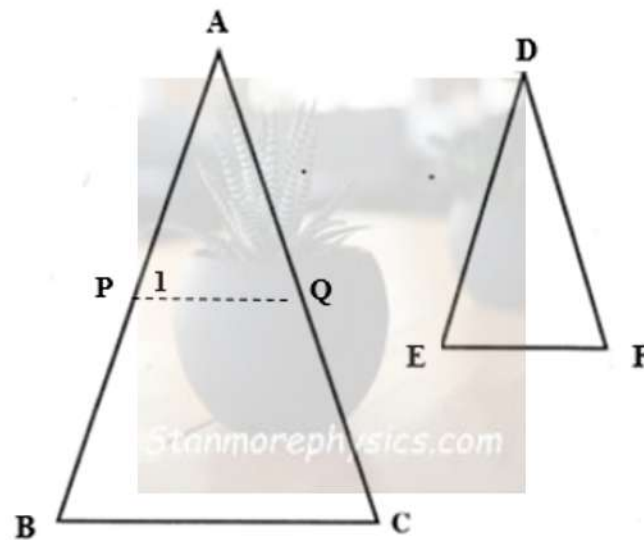
Please read carefully through the following table before marking **QUESTION 8–9**/
 Lees asseblief sorgvuldig deur die volgende tabel alvorens **VRAAG 8–9** nagesien word.

	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 $AB \parallel CD$ and/en $\widehat{EFD} = 115^\circ$  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) 'n Punt vir 'n korrekte bewering ('n Punt vir 'n bewering is onafhanklik van die rede)
R	A mark for the correct reason (A reason mark may only be awarded if the statement is correct) 'n Punt vir 'n korrekte rede ('n Punt word slegs vir die rede toegeken as die bewering korrek is)
S/R	Award a mark if the statement AND reason are both correct (Both MUST be correct to get one mark) Ken 'n punt toe as die bewering EN rede beide korrek is (Beide MOET korrek wees om een punt te kry)

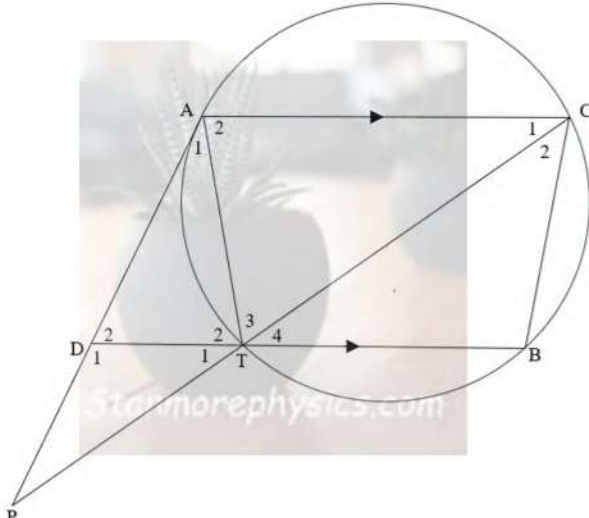
QUESTION/VRAAG 8

8.1.1	90°		✓ answer/ antwoord (1)
8.1.2	parallel ...equal to half the length of the third side <i>parallel....gelyk aan die helfte van dielengte van die derde sy.</i>		✓ answer/ antwoord (2)
8.2			
8.2.1	$\widehat{QPR} = 80^\circ$	sum of interior angles of triangle/ <i>som van binne hoeke van 'n driehoek</i>	✓S ✓R (2)
8.2.2	$OT \parallel QR$ $\widehat{PTO} = \widehat{R} = 25^\circ$	midpoint theorem/ <i>middelpunt stelling</i> corres angles $OT \parallel QR$ / <i>ooreenk hoeke OT // QR</i>	✓S/R ✓S/R (2)
8.2.3	$\widehat{QNP} = 90^\circ$	angles in a semi-circle/ <i>hoeke in 'n halfsirkel</i>	✓S ✓R (2)
8.2.4	$\widehat{S}_2 + \widehat{S}_3 = 90^\circ$	opposite angles of a cyclic quad/ <i>teenoorstaande hoeke van koordevierhoek</i>	✓S/R
	$\widehat{S}_1 = 90^\circ$	angles on a str. line/ <i>hoeke op 'n reguitlyn</i>	✓S/R (2)
8.3	$OS \parallel QR$ $PS = SM$	$OT \parallel QR$ proved in 8.2.2/ <i>OT // QR bewys in 8.2.2</i> converse of midpoint theorem/ <i>omgekeerde van middelpunt stelling</i>	✓S/R ✓S/R (2)
8.4	In $\triangle POS$ and $\triangle MQS$ $\widehat{S}_2 + \widehat{S}_3 = \widehat{S}_1 = 90^\circ$ $QS = QS$ $PS = SM$ $\triangle PQS = \triangle MQS$	proved/ <i>bewys</i> common/ <i>gemeenskaplik</i> proved/ <i>bewys</i> [SAS]/[SHS]	✓S ✓S/R ✓S ✓R (4)
8.5	$PQ = QM$ $2PO = PQ$ $QM = 2PO$	$\triangle PQS \equiv \triangle MQS$ radii/ <i>radii</i>	✓S/R ✓S/R (2)

QUESTION/VRAAG 9



9.1	Construction/Konstruksie On AB mark off AP=DE and on AC mark off AQ=DF/Op AB merk af AP = DE en op AC merk af AQ = DF Proof/Bewys: In $\triangle APQ$ and $\triangle DEF$ $AP = DE$ const/konst $AQ = DF$ const/konst $\hat{A} = \hat{D}$ given/gegee $\triangle APQ \equiv \triangle DEF$ SAS/SHS $\hat{P}_1 = \hat{E}$ But $\hat{E} = \hat{B}$ $\hat{P}_1 = \hat{B}$ $PQ \parallel BC$ corres $\angle$'s/ooreenkom $\angle$'e $\frac{AB}{AP} = \frac{AC}{AQ}$ line//tooneside of $\triangle$/lyn//aaneen sy van $\triangle$ $\frac{AB}{DE} = \frac{AC}{DF}$ AP = DE and AQ = DP	✓ Construction/Konstruksie ✓ $\triangle APQ \equiv \triangle DEF$ SAS/SHS ✓ $\hat{P}_1 = \hat{E}$ ✓ $\hat{E} = \hat{B}$ ✓ $\hat{P}_1 = \hat{B}$ ✓ $PQ \parallel BC$ ✓ S/R (7)
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9.2			
9.2.1	In $\triangle PAT$ and $\triangle PCA$ $\hat{P} = \hat{P}$ common/<i>gemeenskaplik</i> $\widehat{A_1} = \widehat{C_1}$ tan chord theorem/<i>tan koordstelling</i> $\hat{P\hat{T}A} = \hat{P\hat{A}C}$ sum of int $\angle$'s /som van binne hoeke van Δ $\triangle PAT \sim \triangle PCA$ $\angle\angle\angle$ $\therefore \frac{PA}{PC} = \frac{PT}{PA}$ $\sim \Delta$'s $PA^2 = PC \cdot PT$	✓ S identifying Δ's /identifiseer Δ'e ✓ S ✓ S/R ✓ S/R ✓ S	(5)
9.2.2	$PA^2 = PC \cdot PT$ $36 = (x+5)x$ $x^2 + 5x - 36 = 0$	✓ substitution/<i>substitusie</i> ✓ simplify/<i>vereenvoudig</i>	(2)
9.2.3	$(x+9)(x-4) = 0$ $x = -9$ or $x = 4$ $PT = 4$	✓ factorise/<i>faktoriseer</i> ✓ answer/<i>antwoord</i>	(2)
9.2.4	$\frac{PD}{PA} = \frac{PT}{PC}$ prop theorem $AC \parallel DB$ <i>eweredigheidsstelling</i> $AC \parallel DB$ $DP = \frac{4}{9} \cdot 6$ $= \frac{8}{3}$	✓ S/R ✓ answer/<i>antwoord</i>	(2)
			[18]

TOTAL/TOTAAL: 150