



Northern Cape Department of Education

**PROVINSIALE VOORBEREIDENDE EKSAMEN/
PROVINCIAL PREPARATORY EXAMINATION**

GRAAD/GRADE 12

WISKUNDE/MATHEMATICS

VRAESTEL/PAPER 2

SEPTEMBER 2026

PUNTE/MARKS: 150

TYD/TIME: 3 uur/hours

**Hierdie vraestel bestaan uit 14 bladsye, 1 inligtingsblad en
'n antwoordeboek van 25 bladsye./
This question paper consists of 14 pages, 1 information sheet and
an answer book of 25 pages.**

INSTRUCTIONS AND INFORMATION

Read the following instructions and information carefully before answering the questions.

1. This question paper consists of 11 questions.
2. Answer ALL the questions in the SPECIAL ANSWER BOOK provided.
3. Clearly show ALL calculations, diagrams, graphs, etc. which you have used in determining 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

The table below shows the marks (out of 150) of eleven Grade 10 learners. This was for Paper 1 and Paper 2 for the final examination in 2025.

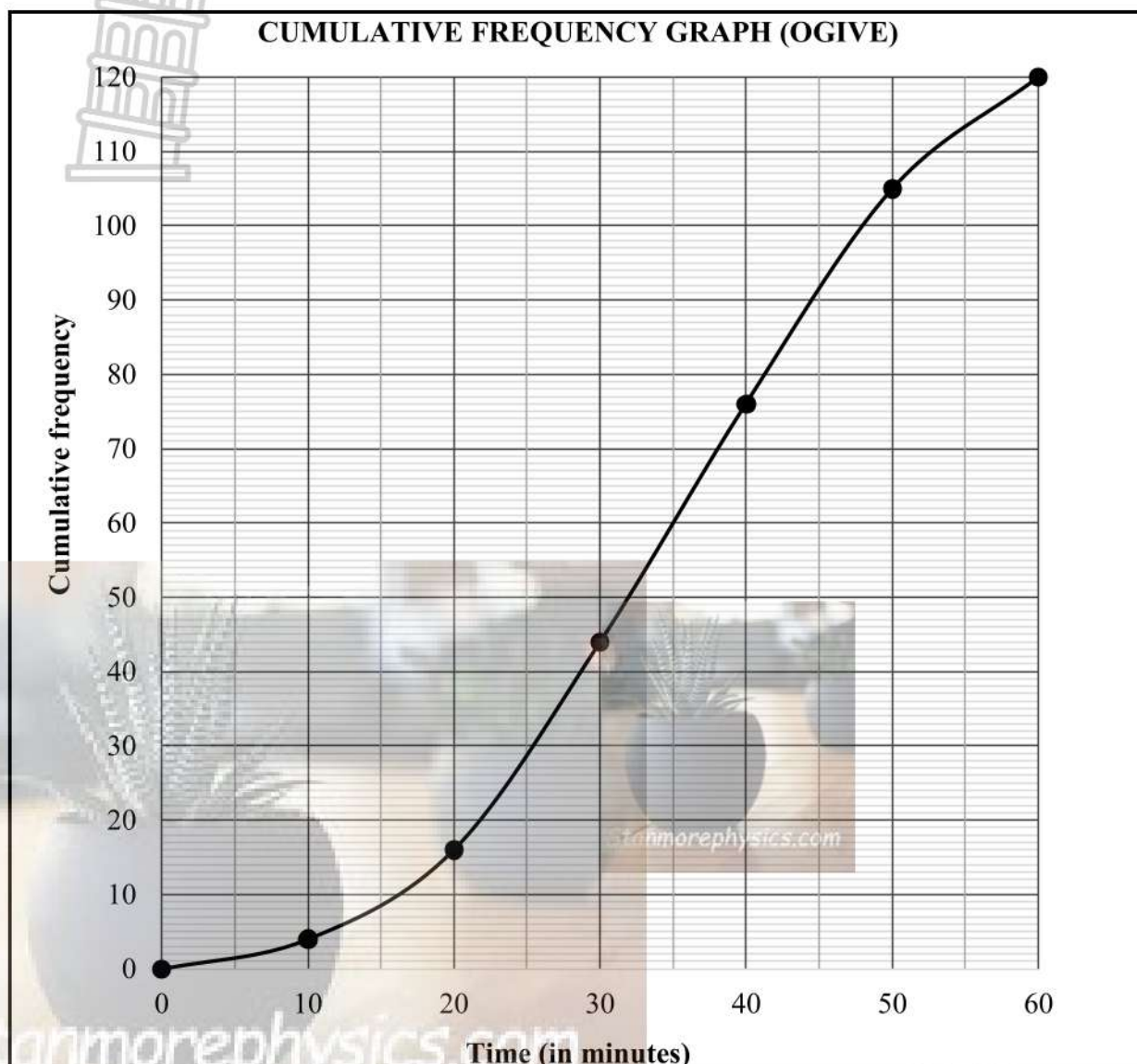
Paper 1	56	39	62	80	114	109	82	135	130	103	81
Paper 2	29	36	59	35	79	91	76	110	108	96	62

- 1.1 Determine the equation of the least squares regression line for the data. (3)
 - 1.2 A certain learner wrote Paper 1 and scored a mark of 113. She was unable to write Paper 2 due to illness. Predict the mark she could have scored for Paper 2. (2)
 - 1.3 Use the correlation coefficient to determine whether the prediction in QUESTION 1.2 is valid. (2)
 - 1.4 Determine the number of learners who lie above one standard deviation of the mean for Paper 1. (3)
- [10]**



QUESTION 2

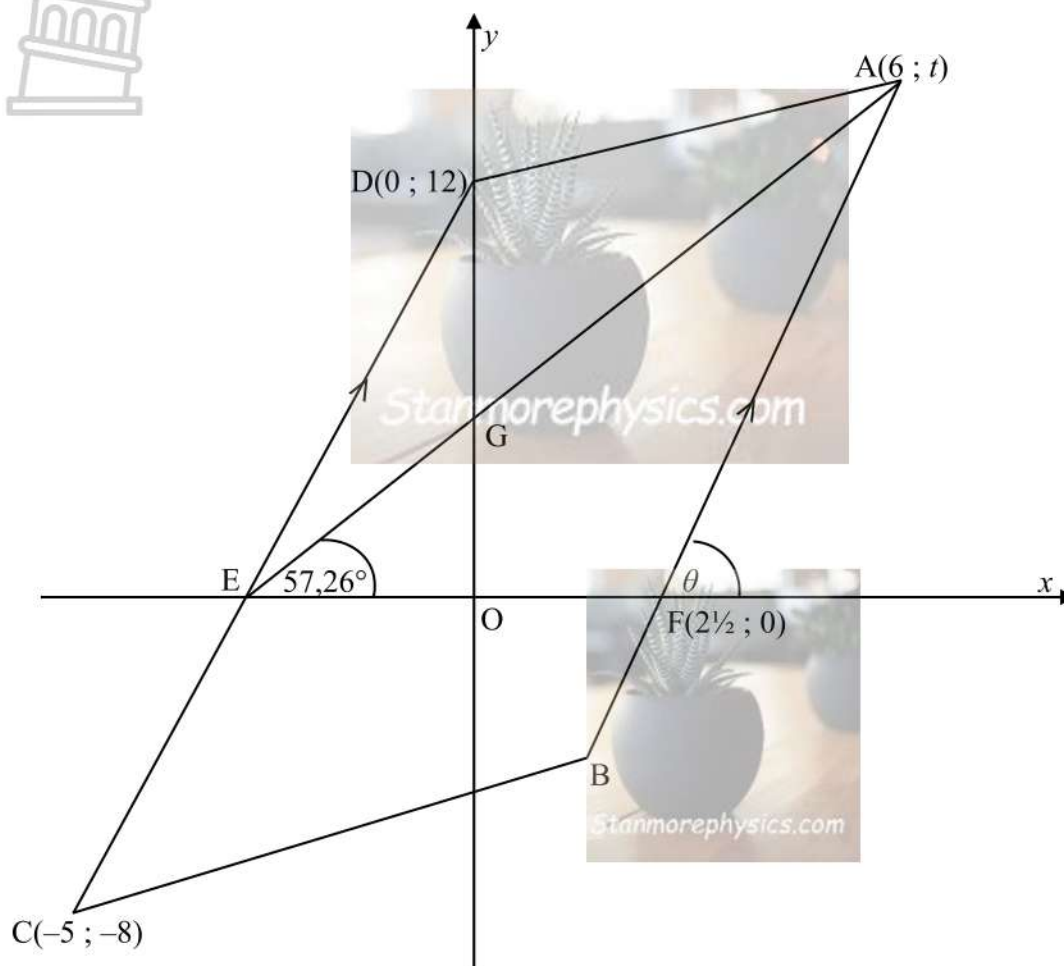
The cumulative frequency graph (ogive) below shows the time it takes learners to get to school.



- 2.1 How many learners were recorded? (1)
 - 2.2 Use the ogive to estimate the interquartile range for the data. (3)
 - 2.3 Estimate the median time taken to travel to school. (2)
 - 2.4 Calculate the number of learners whose travel to school took 40 minutes and more. (2)
- [8]**

QUESTION 3

In the diagram, $A(6; t)$, B , $C(-5; -8)$ and $D(0; 12)$ are the vertices of quadrilateral $ABCD$. E and $F(2\frac{1}{2}; 0)$ are the x -intercepts of CD and AB respectively. The angles of inclination of AE and AB are $57,26^\circ$ and θ respectively. $AB \parallel CD$.

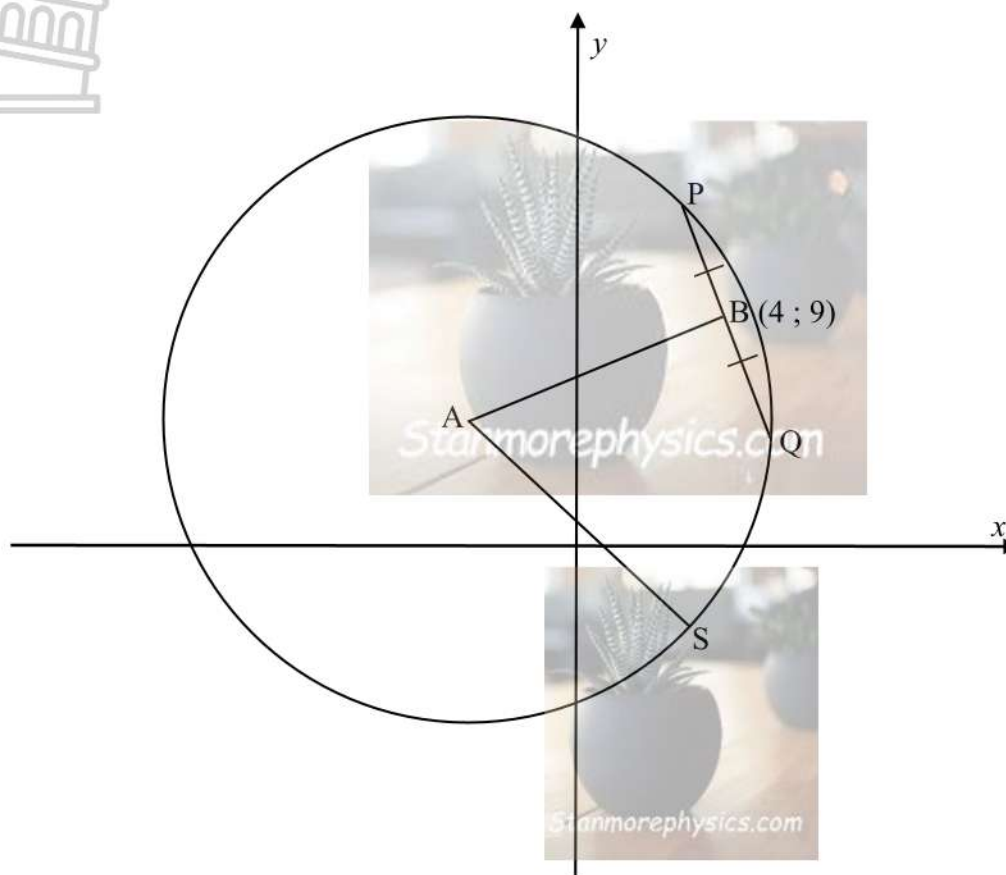


- 3.1 Calculate the gradient of CD . (2)
- 3.2 Hence, determine the equation of AB . (3)
- 3.3 Calculate the value of t . (2)
- 3.4 Calculate the size θ . (2)
- 3.5 Calculate the coordinates of E . (3)
- 3.6 If the equation of CB is $3y - x = -19$, determine the coordinates of B . (4)
- 3.7 Calculate the area of quadrilateral $AGOF$ (correct to ONE decimal place). (7)

[23]

QUESTION 4

In the diagram, the equation of the circle with centre A is $x^2 + y^2 + 4x - 12y - 10 = 0$. PQ is a chord of the circle. S, P and Q are points on the circumference. B(4 ; 9) is the midpoint of PQ.



- 4.1 Write down the coordinates of A. (3)
 - 4.2 Give a reason why $AB \perp PQ$. (1)
 - 4.3 Determine the equation of PQ in the form $y = mx + c$. (4)
 - 4.4 Determine the coordinates of P and Q respectively. (5)
 - 4.5 Determine the value(s) of k such that the line $y = 2x + k$ does NOT intersect the circle centred at A. (7)
- [20]**

QUESTION 5

5.1 It is given that $17 \sin \theta + 8 = 0$ where $\theta \in (0^\circ ; 270^\circ)$. Determine the value of the following without using a calculator:

5.1.1 $\tan \theta$ (2)

5.1.2 $\cos(180^\circ - \theta)$ (2)

5.1.3 $\sin\left(\frac{\theta}{2} - 15^\circ\right) \cdot \cos\left(\frac{\theta}{2} - 15^\circ\right)$ (6)

5.2 Given: $\frac{\tan(180^\circ - x) \cdot \cos(-x) \cdot \cos(180^\circ + x)}{4 \cos(90^\circ + x)}$

5.2.1 Simplify the expression above fully to a single trigonometric ratio. (6)

5.2.2 Hence, determine the values of x in the interval $x \in [0^\circ ; 360^\circ]$ for which

$\sqrt{\frac{\tan(180^\circ - x) \cdot \cos(-x) \cdot \cos(180^\circ + x)}{4 \cos(90^\circ + x)}}$ will be real. (2)

[18]

QUESTION 6

6.1 Given: $f(x) = \frac{\sin 2x \cdot \cos 2x}{2 \sin^2 2x - 2 \cos^2 2x}$

6.1.1 Simplify $f(x)$ to a single trigonometric ratio. (4)

6.1.2 Hence, write down the equations of the asymptotes of f for $x \in [0^\circ ; 90^\circ]$. (2)

6.2 Determine the general solution for the following if it is a converging geometric series and $\cos x \neq 0$:

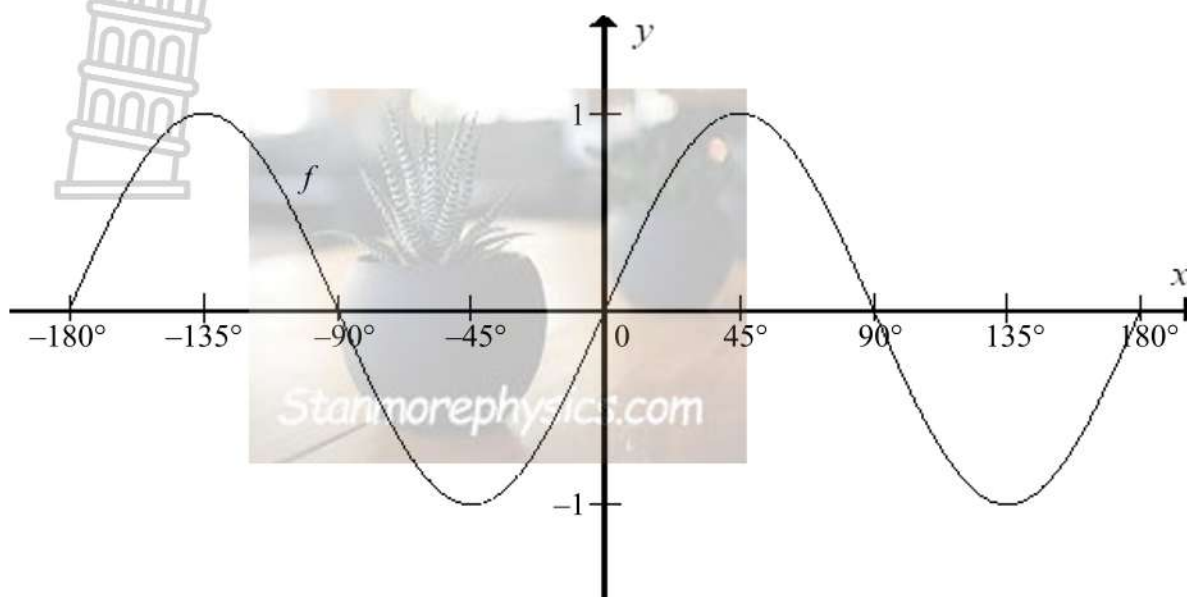
$$\sum_{r=0}^{\infty} (\sin x)^{2r} = 2 \tan x$$

(7)
[13]



QUESTION 7

In the diagram, the graph of $f(x) = \sin 2x$ is drawn for $x \in [-180^\circ; 180^\circ]$.



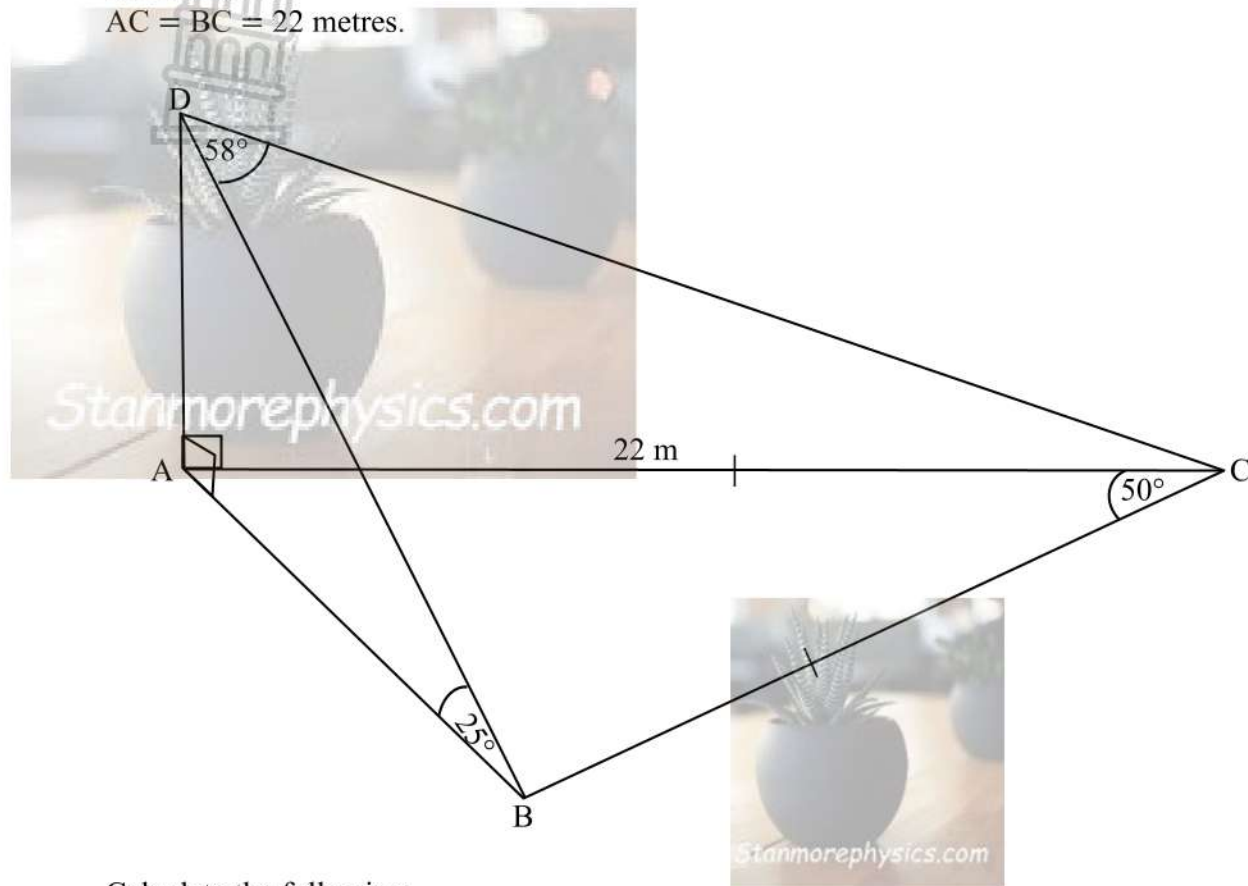
- 7.1 Write down the period of f . (1)
- 7.2 Write down the range of $\frac{1}{2}f(x) + 1$. (2)
- 7.3 On the set of axes provided in the ANSWER BOOK, draw the graph of $g(x) = -\cos(x - 45^\circ)$ for $x \in [-180^\circ; 180^\circ]$. Clearly show ALL the intercepts with the axes and the coordinates of the turning point. (4)
- 7.4 Determine the maximum difference of $f(x) - g(x)$ for $x \in [-180^\circ; 180^\circ]$. (2)
- 7.5 Determine the number of solutions to the equation $f(x) - g(x) = 0$ for $x \in [-180^\circ; 180^\circ]$. (2)
- 7.6 Determine the values of x for which $\cos(90^\circ + 2x) \cdot \cos(x - 45^\circ) \geq 0$ in the interval $x \in [-180^\circ; 180^\circ]$. (4)

[15]

QUESTION 8

In the diagram, A, B and C are points in the same horizontal plane. AD is a vertical tower anchored at B and C. The angle of elevation of D from B is 25° , $\widehat{ACB} = 50^\circ$ and $\widehat{BDC} = 58^\circ$.

$AC = BC = 22$ metres.



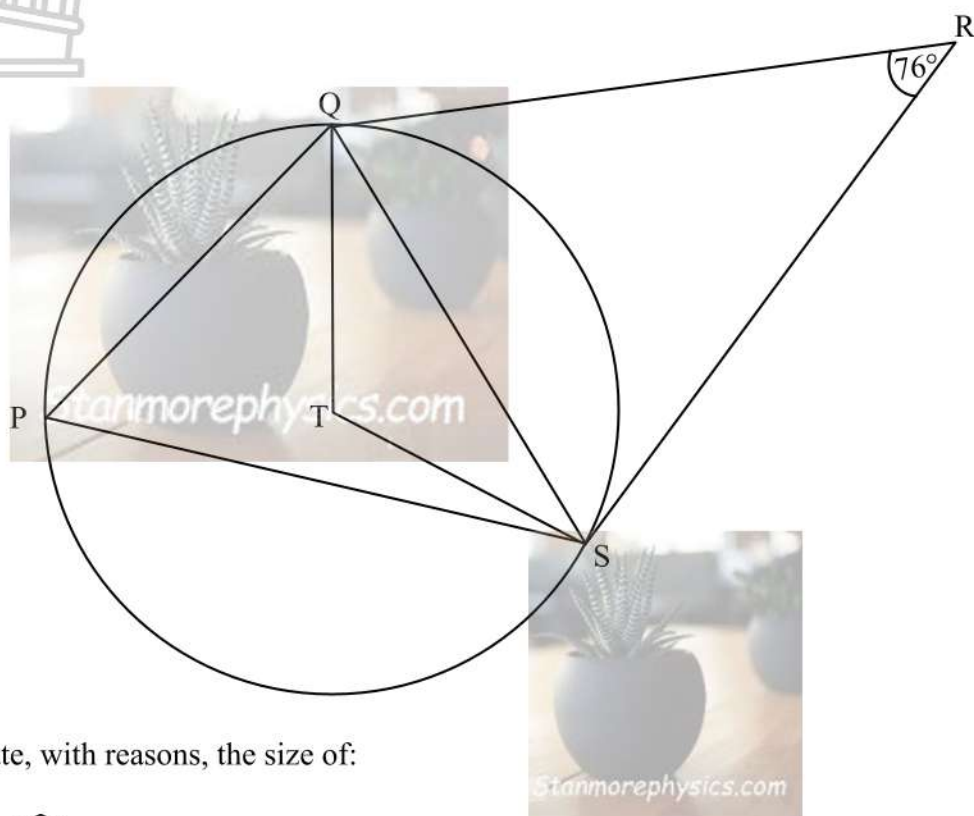
Calculate the following:

- 8.1 The area of $\triangle ABC$ (3)
 - 8.2 The length of AB (2)
 - 8.3 The length of DB (2)
 - 8.4 The magnitude of $\widehat{DBC}$ (3)
- [10]**

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

QUESTION 9

In the diagram, T is the centre of the circle. QR and RS are tangents to Q and S respectively. $\widehat{QRS} = 76^\circ$

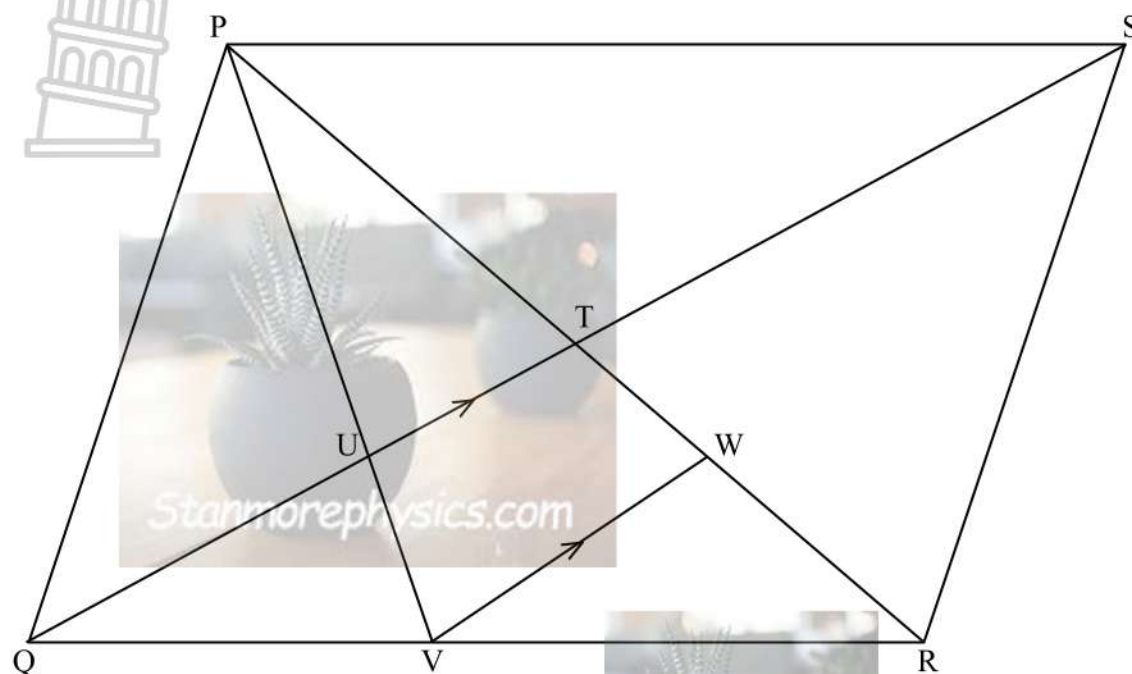


Calculate, with reasons, the size of:

- 9.1 $\widehat{RQS}$ (4)
 - 9.2 $\widehat{QPS}$ (2)
 - 9.3 $\widehat{QTS}$ (2)
- [8]**

QUESTION 10

In the diagram, PQRS is a parallelogram with $UT \parallel VW$ and $\frac{QV}{VR} = \frac{2}{3}$.



Determine, with reasons, the value of:

10.1 $\frac{TR}{WR}$ (2)

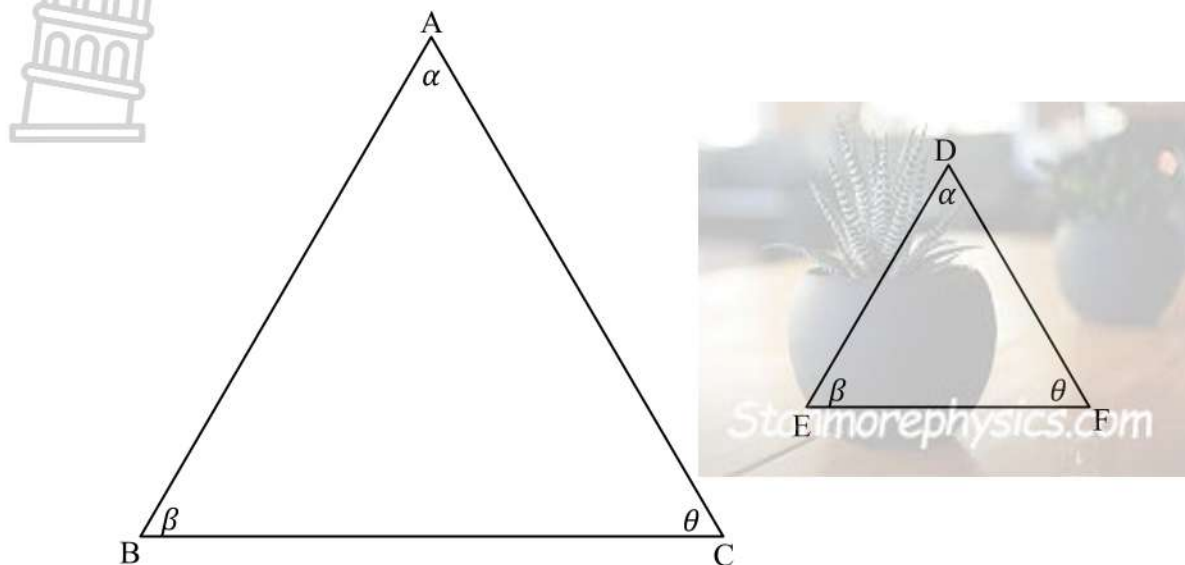
10.2 $\frac{PU}{UV}$ (3)

10.3 $\frac{\text{Area of } \triangle PUT}{\text{Area of } \triangle PVW}$ (3)

[8]

QUESTION 11

- 11.1 In the diagram below, $\triangle ABC$ and $\triangle DEF$ are drawn with $\hat{A} = \hat{D}$, $\hat{B} = \hat{E}$ and $\hat{C} = \hat{F}$.



Use the diagram to prove the theorem which states that, if two triangles are equiangular, then the corresponding sides are proportional, i.e. $\frac{DE}{AB} = \frac{DF}{AC}$.

(6)



[17]

TOTAL: 150

INFORMATION SHEET

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

$$y = mx + c$$

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

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

$$m = \tan \theta$$

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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



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**PROVINCIAL PREPARATORY EXAMINATION/
PROVINSIALE VOORBEREIDENDE EKSAMEN**

GRADE 12/GRAAD 12

MATHEMATICS/WISKUNDE

PAPER 2/VRAESTEL 2

SEPTEMBER 2026

MARKING GUIDELINES/NASIENRIGLYNE

MARKS/PUNTE: 150

**These marking guidelines consist of 14 pages./
Hierdie nasienriglyne bestaan uit 14 bladsye.**

NOTE:

- If a learner answers a question TWICE, only mark the FIRST attempt.
- If a learner has crossed out (cancelled) an attempt of a question and not redone the question, mark the crossed-out (cancelled) version.
- Consistent accuracy applies in ALL aspects of the marking memorandum.
- Assuming answers/values in order to solve a problem is NOT acceptable.

LET WEL:

- *As 'n leerder 'n vraag TWEE KEER beantwoord, sien slegs die EERSTE poging na.*
- *As 'n leerder 'n poging om die vraag te beantwoord, doodgetrek (gekanselleer) het en nie dit oorgedoen het nie, sien die doodgetrekte (gekanselleerde) poging na.*
- *Volgehoue akkuraatheid word in ALLE aspekte van die nasienmemorandum toegepas.*
- *Aanvaarding van antwoorde/waardes om 'n probleem op te los, word NIE toegelaat nie.*

GEOMETRY/MEETKUNDE	
S	A mark for the correct statement (A statement mark is independent of a reason) <i>'n Punt vir 'n korrekte bewering</i> <i>('n Punt vir 'n bewering is onafhanklik van die rede)</i>
R	A mark for a correct reason (A reason mark may only be awarded if the statement is correct) <i>'n Punt vir 'n korrekte rede</i> <i>('n Punt word slegs vir die rede toegeken as die bewering korrek is)</i>
S/R	Award a mark if the statement AND reason are both correct. <i>Ken 'n punt toe as beide die bewering EN rede korrek is.</i>

QUESTION 1

1.1	$a = -5,51$ $b = 0,85$ $y = -5,51 + 0.85x$ - A/O FULL MARKS - CORRECT A/B SWOPPED IN EQUATION 2/3	$\checkmark a = -5,51$ $\checkmark b = 0,85$ $\checkmark \text{answer}$ (3)
1.2	$y = -5,51 + 0,85(113)$ $= 90,54$ $= 91$ CA FROM 1.1	$\checkmark \text{substitution}$ $\checkmark \text{answer}$ (2)
1.3	$r = 0.897$ $r = 0.90$ The prediction is VALID	$\checkmark \text{ value of } r.$ $\checkmark \text{valid}$ (2)
1.4	$\tilde{x} + \sigma$ $90.09 + 29.41$ 119.5 <i>2 learners</i>	$\checkmark 90.09$ $\checkmark 29.41$ $\checkmark 2 \text{ learners}$ (3)
[10]		

QUESTION 2

2.1	120 learners	accurate mark	✓ answer	(1)
2.2	$Q_1 = \frac{1}{4}(120) = 30$ $Q_3 = \frac{3}{4}(120) = 90$ $IQR = 44 - 26 = 18$	(17-19)	✓ 44 ✓ 26 ✓ answer	(3)
2.3	$Q_2 = \frac{1}{2}(120) = 60$ $Q_2 = 35$		✓ 60 ✓ 35	(2)
2.4	$120 - 76 = 44$ learners accept 43 – 45		✓ method ✓ answer	(2)
				[8]

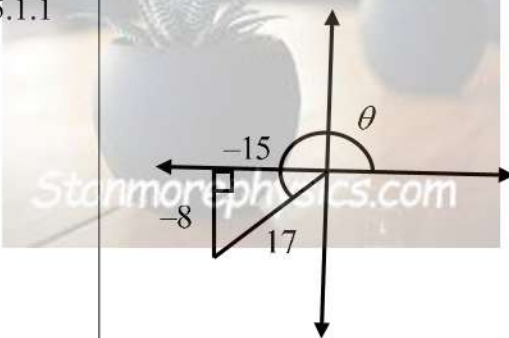
QUESTION 3		
3.1	$m_{CD} = \frac{12 - (-8)}{0 - (-5)}$ $m_{CD} = 4$ • x/y BD • x swopped in the denominator CA 1/2	✓ substitution ✓ answer (2)
3.2	$y = 4x + c$ $0 = 4(2.5) + c$ $0 = 10 + c$ $c = -10$ $y = 4x - 10$	✓ gradient ✓ substitution ✓ answer (3)
3.3	$t = 4(6) - 10$ $t = 14$	✓ substitution ✓ answer (2)
3.4	$\tan \theta = 4$ $\theta = 75,96^\circ$	✓ substitution ✓ answer (2)
3.5	$y = 4x + 12$ $0 = 4x + 12$ $x = -3$ $E(-3; 0)$	✓ $y = 4x + 12$ ✓ 0 ✓ -3 (3)
3.6	$3y - x = -19$ $3(4x - 10) - x = -19$ $12x - 30 - x = -19$ $11x = 11$ $x = 1$ $y = 4(1) - 10$ $y = -6$ $B(1; -6)$	✓ substitution ✓ simplification ✓ $x = 1$ ✓ $y = -6$ (4)

3.7	$m_{EA} = \tan 57,26^\circ = 1,56$ $y = 1,56x + c$ $0 = 1,56(-3) + c \quad (-3; 0)$ $c = 4,67$ $EA = \sqrt{(-3-6)^2 + (0-14)^2}$ $= \sqrt{277}$ $\text{Area of } \triangle EAF = \frac{1}{2}(\sqrt{277})(5,5)\sin 57,26^\circ$ $= 38,5 \text{ units}^2$ $\text{Area of } \triangle EOG = \frac{1}{2}(3)(4,67)$ $= 7,0 \text{ units}^2$ $\text{Area of AGOF} = 38,5 - 7,0$ $= 31,5 \text{ units}^2$ OR $AE = \sqrt{(-3-6)^2 + (0-14)^2}$ $= \sqrt{277}$ $\text{Area of } \triangle AEF = \frac{1}{2}\left(\frac{11}{2}\right)(\sqrt{277})\sin 57,26^\circ$ $= 38,50(u)^2$ $\tan 57,26^\circ = \frac{OG}{3}$ $OG = 3 \tan 57,26^\circ$ $= 4,67$ $\text{Area of } \triangle EOG = \frac{1}{2}(3)(4,67)$ $= 7,005$ $\text{Area of AGOF} = 38,50 - 7,005$ $= 31,50(u)^2$	$\checkmark m_{EA} = 1,56$ $\checkmark c = 4,67$ $\checkmark \sqrt{277}$ $\checkmark$ substitution $\checkmark 38,5 \text{ units}$ $\checkmark 7,0 \text{ units}^2$ $\checkmark$ answer (7) $\checkmark$ Length of AE $\checkmark$ Subs $\checkmark$ Area of $\triangle AEF$ $\checkmark$ Equation $\checkmark$ Length of OG $\checkmark$ area of $\triangle EOG$ $\checkmark$ Answer (7)
[23]		

QUESTION 4		
4.1	$(x+2)^2 + (y-6)^2 = 10 + (2)^2 + (6)^2$ $(x+2)^2 + (y-6)^2 = 50$ $A(-2;6)$	✓ standard form ✓ -2 ✓ 6 (3)
4.2	Line from centre to midpt of chord.	✓ answer (1)
4.3	$m = \frac{6-9}{-2-4} = \frac{1}{2}$ $m_{PQ} = -2$ $y = -2x + c$ $9 = -2(4) + c$ $9 + 8 = c$ $y = -2x + 17$	✓ gradient of AB. ✓ gradient of PQ. ✓ substitiuon ✓ answer (4)
4.4	$x^2 + y^2 + 4x - 12y - 10 = 0$ $x^2 + (-2x+17)^2 + 4x - 12(-2x+17) - 10 = 0$ $x^2 + 4x^2 - 68x + 289 + 4x + 24x - 204 - 10 = 0$ $5x^2 - 40x + 75 = 0$ $x^2 - 8x + 15 = 0$ $(x-3)(x-5) = 0$ $x = 3 \text{ or } x = 5$ $y = -2(3) + 17 \text{ or } y = -2(5) + 17$ $y = 11 \text{ or } y = 7$ $P(3;11) \quad Q(5;7)$	✓ substitiuon ✓ standard form ✓ factors ✓ x-values ✓ y-values (5)

4.5	$x^2 + y^2 + 4x - 12y - 10 = 0$ $x^2 + (2x + k)^2 - 12(2x + k) - 10 = 0$ $x^2 + 4x^2 + 4kx + k^2 + 4x - 24x - 12k - 10 = 0$ $5x^2 + 4kx - 20x + k^2 - 12k - 10 = 0$ $\Delta < 0$ $(4k - 20)^2 - 4(5)(k^2 - 12k - 10) < 0$ $16k^2 - 160k + 400 - 20k^2 + 240k + 200 < 0$ $-4k^2 + 80k + 600 < 0$ $k^2 - 20k - 150 > 0$ $k = \frac{-(-20) \pm \sqrt{(-20)^2 - 4(1)(-150)}}{2(1)}$ $k = 10 - 5\sqrt{10} \text{ or } k = 10 + 5\sqrt{10}$ $\therefore k < 10 - 5\sqrt{10} \text{ or } k > 10 + 5\sqrt{10}$	✓ substitution ✓ standard form ✓ $\Delta < 0$ ✓ substitution ✓ substitution ✓ ✓ answer (7)
[20]		

QUESTION 5

5.1.1	 $\tan \theta = \frac{-8}{-15} = \frac{8}{15}$	✓ $x = -15$ ✓ answer (2)
5.1.2	$\cos(180^\circ - \theta)$ $= -\cos \theta$ $= -\left(\frac{-15}{17}\right)$ $= \frac{15}{17}$	✓ $-\cos \theta$ ✓ answer (2)

5.1.3	$\sin\left(\frac{\theta}{2} - 15^\circ\right) \cdot \cos\left(\frac{\theta}{2} - 15^\circ\right)$ $= \frac{1}{2} \sin\left(2 \cdot \left(\frac{\theta}{2} - 15^\circ\right)\right)$ $= \frac{1}{2} \sin(\theta - 30^\circ)$ $= \frac{1}{2} (\sin \theta \cdot \cos 30^\circ - \cos \theta \cdot \sin 30^\circ)$ $= \frac{1}{2} \left[\frac{-8}{17} \cdot \frac{\sqrt{3}}{2} - \frac{-15}{17} \cdot \frac{1}{2} \right]$ $= \frac{1}{2} \left[\frac{-8\sqrt{3} + 15}{34} \right]$ $= \frac{-8\sqrt{3} + 15}{68}$	$\checkmark \frac{1}{2} \left[2 \sin\left(\frac{\theta}{2} - 15^\circ\right) \cos\left(\frac{\theta}{2} - 15^\circ\right) \right]$ $\checkmark \frac{1}{2} \sin\left(2 \cdot \left(\frac{\theta}{2} - 15^\circ\right)\right)$ $\checkmark \frac{1}{2} \sin(\theta - 30^\circ)$ $\checkmark \text{expansion}$ $\checkmark \text{substitution}$ $\checkmark \text{answer}$
5.2.1	$\frac{\tan(180^\circ - x) \cdot \cos(-x) \cdot \cos(180^\circ + x)}{4 \cos(90^\circ + x)}$ $= \frac{-\tan x \cdot \cos x \cdot (-\cos x)}{-4 \sin x}$ $= \frac{-\frac{\sin x}{\cos x} \cdot \cos x \cdot (-\cos x)}{-4 \sin x}$ $= -\frac{1}{4} \cos x$	$\checkmark -\tan x$ $\checkmark \cos x$ $\checkmark -\cos x$ $\checkmark -4 \sin x$ $\checkmark -\frac{\sin x}{\cos x}$ $\checkmark \text{answer}$
5.2.2	$x \in (90^\circ; 270^\circ)$	$\checkmark \text{CV}$ $\checkmark \text{Correct Notation}$
[18]		

QUESTION 6

6.1.1	$f(x) = \frac{\sin 2x \cdot \cos 2x}{2 \sin^2 2x - 2 \cos^2 2x}$ $= \frac{\frac{1}{2} \sin(2 \cdot 2x)}{-2(\cos^2 2x - \sin^2 2x)}$ $= \frac{\frac{1}{2} \sin 4x}{-2 \cos 4x}$ $= -\frac{1}{4} \tan 4x$	✓ $\frac{1}{2} \sin(2 \cdot 2x)$ ✓ -2 Common factor ✓ $-2 \cos 4x$ ✓ answer (4)
6.1.2	$x = 22.5^\circ \quad x = 67.5^\circ$	✓ $x = 22.5^\circ$ ✓ $x = 67.5^\circ$ (2)
6.2	$\sum_{r=0}^{\infty} (\sin x)^{2r} = 2 \tan x$ $(\sin x)^{2(0)} + (\sin x)^{2(1)} + (\sin x)^{2(2)} + \dots = 2 \tan x$ $1 + \sin^2 x + \sin^4 x + \dots = 2 \tan x$ $a = 1 \quad r = \sin^2 x$ $2 \tan x = \frac{1}{1 - \sin^2 x}$ $2 \tan x = \frac{1}{\cos^2 x}$ $2 \frac{\sin x}{\cos x} = \frac{1}{\cos^2 x}$ $2 \sin x \cos^2 x = \cos x$ $2 \sin x \cdot \cos^2 x - \cos x = 0$ $\cos x (2 \sin x \cos x - 1) = 0$ $\cos x = 0 \quad \sin 2x = 1$ $2x = 90^\circ + k \cdot 360^\circ$ $x = 45^\circ + k \cdot 180^\circ, k \in \mathbb{Z}$ OR	✓ expansion ✓ a and r ✓ substitution in S_∞ ✓ $1 - \sin^2 x = \cos^2 x$ ✓ standard form ✓ both equations ✓ $x = 45^\circ + k \cdot 180^\circ, k \in \mathbb{Z}$ (7)

	$\sum_{r=0}^{\infty} (\sin x)^{2r} = 2 \tan x$ $(\sin x)^{2(0)} + (\sin x)^{2(1)} + (\sin x)^{2(2)} + \dots = 2 \tan x$ $1 + \sin^2 x + \sin^4 x + \dots = 2 \tan x$ $a = 1 \quad r = \sin^2 x$ $2 \tan x = \frac{1}{1 - \sin^2 x}$ $2 \tan x = \frac{1}{\cos^2 x}$ $2 \frac{\sin x}{\cos x} = \frac{1}{\cos^2 x}$ $LCD = \cos^2 x$ $\cos^2 x \left(\frac{2 \sin x}{\cos x} \right) = \left(\frac{1}{\cos^2 x} \right) \cos^2 x$ $2 \sin x \cdot \cos x = 1$ $\sin 2x = 1$ $2x = 90^\circ + k \cdot 360^\circ$ $x = 45^\circ + k \cdot 180^\circ, k \in \mathbb{Z}$	✓ expansion ✓ a and r ✓ substitution ✓ $1 - \sin^2 x = \cos^2 x$ ✓ $2 \sin x \cdot \cos x = 1$ ✓ $\sin 2x = 1$ ✓ $x = 45^\circ + k \cdot 180^\circ, k \in \mathbb{Z}$ (7)
		[13]

QUESTION 7		
7.1	180°	✓ answer (1)
7.2	$y \in \left[\frac{1}{2}; \frac{3}{2} \right]$	✓✓ answer (2)
7.3	1 –180° –135° –90° –45° 0 45° 90° 135° 180° –1	✓ shape ✓ turning points ✓ x-intercepts ✓ y-intercept (4)
7.4	2	✓✓ answer (2)
7.5	3	✓✓ answer (2)

7.6	$\cos(90^\circ + 2x) \cdot \cos(x - 45^\circ) \geq 0$ $= -\sin 2x \cdot \cos(x - 45^\circ) \geq 0$ $= [\sin 2x][-\cos(x - 45^\circ)] \geq 0$ $[-180^\circ; -90^\circ] \text{ or } [-45^\circ; 0^\circ] \text{ or } [90^\circ; 135^\circ]$	✓ co-function ✓ $[-180^\circ; -90^\circ]$ ✓ $[-45^\circ; 0^\circ]$ ✓ $[90^\circ; 135^\circ]$
		(4)
		[15]

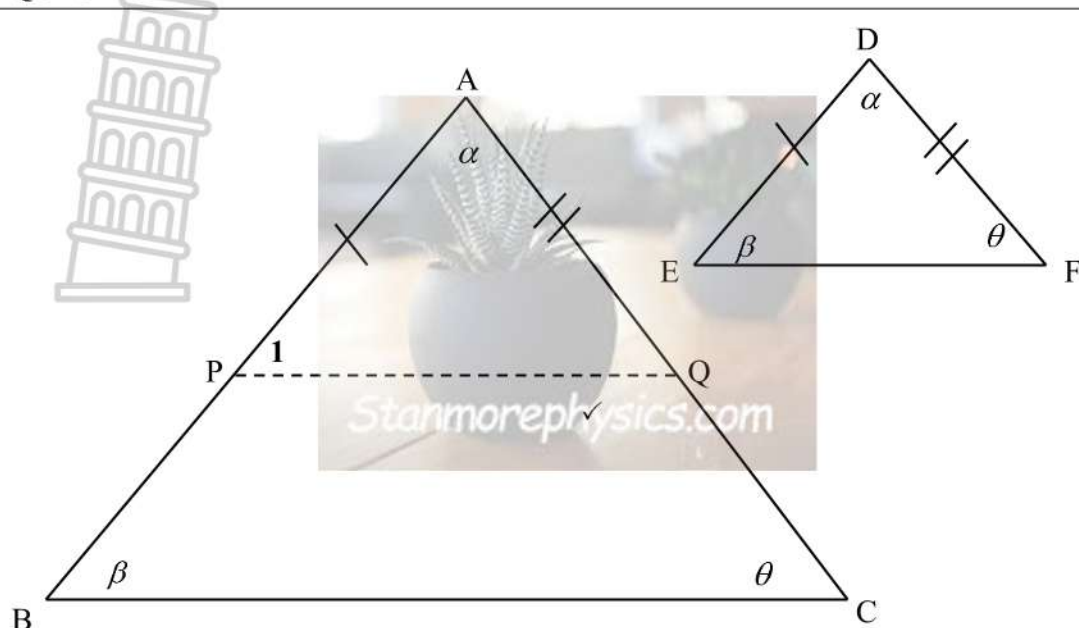
QUESTION 8

8.1	$\text{Area} = \frac{1}{2}(22)(22)\sin 50^\circ$ $= 185,38\text{m}^2$	✓ correct formula ✓ substitution ✓ answer
8.2	$AB^2 = (22)^2 + (22)^2 - 2(22)(22)\cos 50^\circ$ $AB = \sqrt{345,78\dots}$ $= 18,60\text{m}$ OR ($\angle s \text{ opp} = \text{sides}$) $\frac{B\hat{A}C}{AB} = \frac{BC}{\sin 50^\circ}$ $AB = \frac{22 \cdot \sin 50^\circ}{\sin 65^\circ}$ $AB = 18,60\text{m}$	✓ substitution ✓ answer ✓ substitution ✓ answer
8.3	$\cos 25^\circ = \frac{18,60}{DB}$ $DB = \frac{18,60}{\cos 25^\circ}$ $DB = 20,52\text{m}$	✓ substitution ✓ answer
8.4	In $\triangle BDC$ $\frac{\sin 58^\circ}{22} = \frac{\sin \hat{C}}{20,52}$ $\sin \hat{C} = \frac{20,52 \sin 58^\circ}{22}$ $\hat{C} = 52,28^\circ$ $D\hat{B}C = 180^\circ - 58^\circ - 52,28^\circ = 69,72^\circ$	✓ substitution into sine rule. ✓ value of $\hat{C}$ ✓ answer
		(3)
		[10]

QUESTION 9		
9.1	$QR=RS$ (Tan from same ext pt) $\hat{RQS} = \frac{180^\circ - 76^\circ}{2}$ ($\angle s$ opp = sides) or (sum $\angle$'s of Δ) $= 52^\circ$	✓ S ✓ R ✓ S/R ✓ answer (4)
9.2	$\hat{P} = 52^\circ$ (tan chord – theorem)	✓ S ✓ R (2)
9.3	$\hat{QTS} = 2(52^\circ) = 104^\circ$ ($\angle$ at center = $2\angle$ at circumference)	✓ S ✓ R (2)
		[8]

QUESTION 10		
10.1	$\frac{TR}{WR} = \frac{QR}{VR}$ (Prop theorem $QT \parallel VW$) $\frac{TR}{WR} = \frac{5}{3}$	✓ S/R ✓ answer (2)
10.2	$PT=TR$ $\frac{PU}{UV} = \frac{PT}{TW}$ (Prop theorem $QT \parallel VW$) $\frac{PU}{UV} = \frac{5}{2}$	✓ S ✓ S ✓ answer (3)
10.3	$\frac{\text{Area of } \Delta PUT}{\text{Area of } \Delta PVW} = \frac{\frac{1}{2} PU \cdot PT \sin \hat{P}}{\frac{1}{2} PV \cdot PW \sin \hat{P}}$ $= \frac{(5x)(5y)}{(7x)(7y)}$ $= \frac{25}{49}$ NOTE: If perpendicular height is used, construction must be shown on diagram	✓ formula ✓ substitution ✓ answer (3)
		[8]

QUESTION 11



11.1	In $\triangle APQ$ and $\triangle DEF$ $AQ = DF$ [construction/<i>konstruksie</i>] $\hat{A} = \hat{D}$ [given/<i>gegee</i>] $AP = DE$ [construction/<i>konstruksie</i>] $\therefore \triangle APQ \equiv \triangle DEF$ [S$\angle$S] $\hat{P}_1 = \hat{E}$ $\hat{P}_1 = \hat{B}$ [$\hat{E} = \hat{B}$] $PQ \parallel BC$ [corresp $\angle$'s/<i>ooreenkomstige \angle e</i>] $\frac{AP}{AB} = \frac{AQ}{AC}$ [Prop theorem $PQ \parallel BC$] But/<i>maar</i> $AP = DE$ and/en $AQ = DF$ $\therefore \frac{DE}{AB} = \frac{DF}{AC}$	no construction = 0 ✓ construction ✓ $\therefore \triangle APQ \equiv \triangle DEF$ [S$\angle$S] ✓ $\hat{P}_1 = \hat{E}$ ✓ $PQ \parallel BC$ ✓ S/R ✓ S (6)
11.2.1	$\hat{M}_1 = \theta$ (tan chord theorem) $\hat{P}_2 = \theta$ ($\angle$s opp = sides) $M\hat{S}P = 180^\circ - 2\theta$	✓ S/R ✓ S ✓ answer (3)
11.2.2	$\triangle KZS$ and $\triangle SRP$ $\hat{R}_2 = \hat{S}_2$ (alt $\angle$s SL $\parallel$ KZ) $\hat{S}_1 = \hat{P}_1 = \theta$ (proved) $\hat{Z} = \hat{R}$ (sum of $\angle$s in $\triangle$) $\triangle KZS \parallel \triangle SRP$ (AAA)	✓ S/R ✓ S ✓ R (3)

11.2.3	$\hat{P}_2 = \theta$ (Vert opp $\angle s =$) $PT \parallel SZ$ (Corresp $\angle s =$) $\frac{KT}{TZ} = \frac{KP}{SP}$ (Prop theorem $PT \parallel SZ$) $KT = \frac{TZ \cdot KP}{SP}$ $\therefore KT = \frac{TZ \cdot KP}{MS}$ ($SP = MS$)	✓S/R ✓S/R ✓S/R ✓S ✓R
		(5)
		[17]

TOTAL: 150

