



**Western Cape
Government**

METRO NORTH EDUCATION DISTRICT

SCHOOL-BASED ASSESSMENT

SEPTEMBER TRIAL COMMON EXAMINATION

MATHEMATICS P2

TASK NO.: 6

SEPTEMBER 2026

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TOTAL: 150

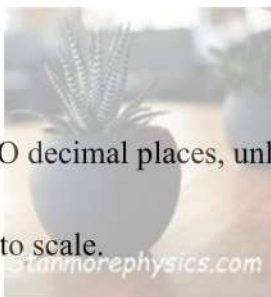
DURATION: 3 hours

This question paper consists of 13 pages and an information sheet.

INSTRUCTIONS AND INFORMATION

Read the following instructions carefully before answering the questions.

1. This question paper consists of 10 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. 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 annual absenteeism of 155 Grade 12 students at a particular school.

NUMBER OF DAYS ABSENT	FREQUENCY	CUMULATIVE FREQUENCY
$0 < d \leq 5$	20	
$5 < d \leq 10$	35	
$10 < d \leq 15$	75	
$15 < d \leq 20$	20	
$20 < d \leq 25$	5	

- 1.1 Complete the cumulative frequency column in your ANSWER BOOK. (2)
- 1.2 Draw an ogive (cumulative frequency curve) to represent the above information in your ANSWER BOOK. (3)
- 1.3 Use your graph to estimate the median days absent from school. (1)
- 1.4 What percentage of learners was absent for more than 15 days. (2)

[8]

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QUESTION 2

An athlete's ability to take in and use oxygen effectively is called his VO_2 –max.

Twelve athletes with pre-recorded VO_2 –max readings ran for one hour.

The VO_2 –max readings and the distances (in kilometres) that they each covered are represented in the table below.

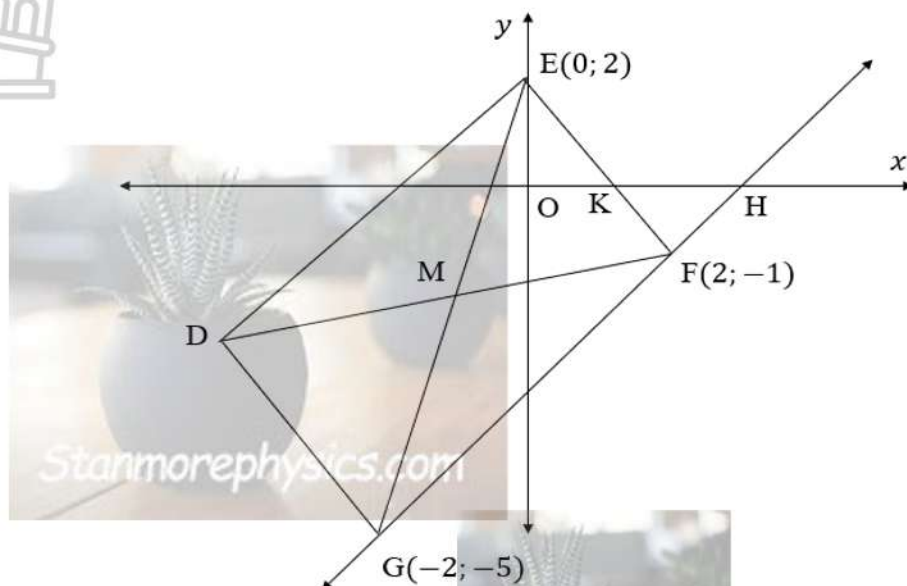
VO_2 –max reading	20	55	30	25	40	30	50	40	35	30	50	40
Distance run (km)	8	18	13	10	11	12	16	14	13	9	15	12

- 2.1 Using the axes provided in the answer book, draw a scatter plot from the information in the table above. (3)
- 2.2 Determine the correlation coefficient and then describe the relationship between the two sets of data. (2)
- 2.3 Determine the equation of the least squares regression line of the athletes. (3)
- 2.4 Use your answer to question 2.3 to predict the distance an athlete runs if they have a VO_2 –maximum value of 26. (2)
- 2.5 It was discovered that the recorded VO_2 - max readings for each athlete were incorrect. To correct the error, x units must be added to every VO_2 - max reading. What effect does the change in the VO_2 – max readings have on the new standard deviation compared to the previous standard deviation? (1)

[11]

QUESTION 3

In the diagram below, D, E(0; 2), F(2; -1) and G(-2; -5) are the vertices of a parallelogram. EF cuts the x -axis in K. GF produced cuts the x -axis in H. Diagonals DF and GE intersect each other at M.

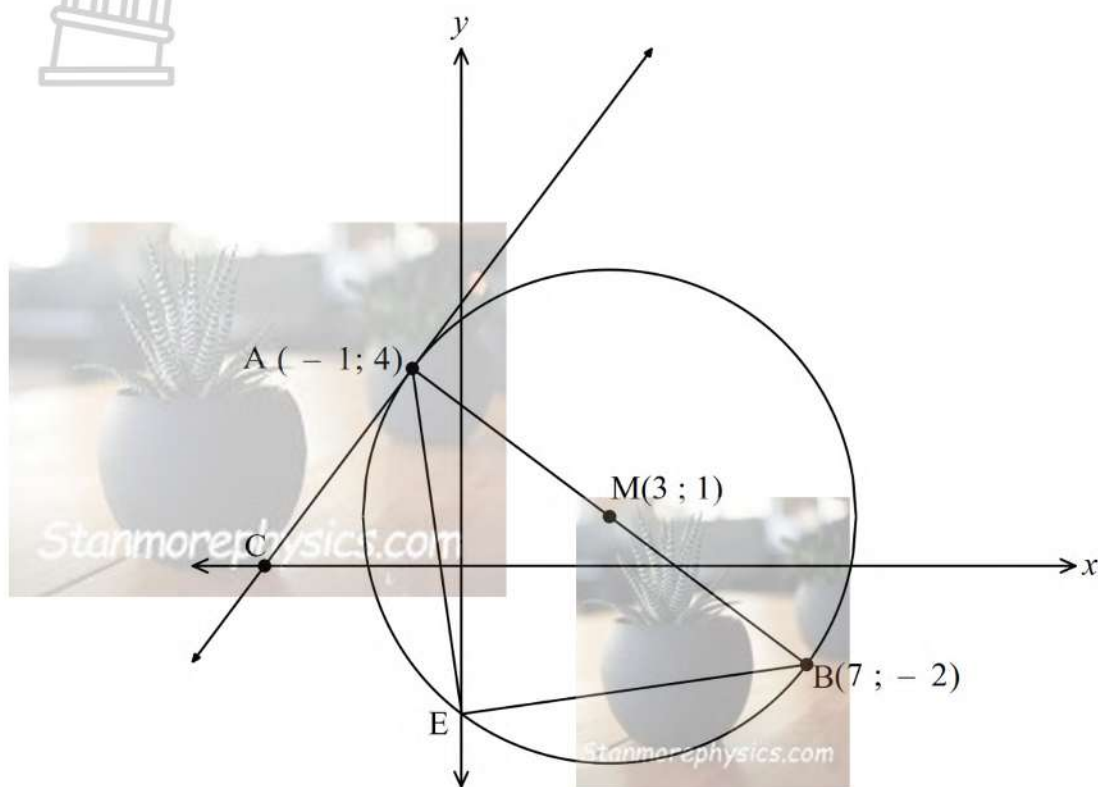


- 3.1 Calculate the coordinates of M. (2)
- 3.2 Calculate the length of GE (leave your answer in surd form). (2)
- 3.3 Determine the gradient of DE. (3)
- 3.4 Determine the equation of line GH in the form $y = mx + c$. (2)
- 3.5 Write down the coordinates of D, the fourth vertex of parallelogram DEFG. (2)
- 3.6 Calculate the size of $\widehat{DGF}$. (5)
- 3.7 Calculate the area of $\triangle GEF$. (5)

[21]

QUESTION 4

In the Cartesian plane below, a circle centred at $M(3; 1)$ passes through the point $A(-1; 4)$. $B(7; -2)$ is another point on the circle such that the line segment AB is a diameter of the circle. The tangent to the circle at point A intersects the x -axis at point C . E is a point where the circle intersects the y -axis.



- 4.1 Determine the equation of the circle in the form:
 $(x - a)^2 + (y - b)^2 = r^2$. (3)
- 4.2 Determine the coordinates of E . (3)
- 4.3 Determine the length of the tangent AC . (6)
- 4.4 Determine the value(s) of k if $k^2 + x^2 + y^2 - 35 = 2(xk + y)$ is a tangent to circle M . (7)

[19]

QUESTION 5

- 5.1 Given: $\cos 17^\circ = t$. Express each of the following in terms of t **without the use of a calculator**.

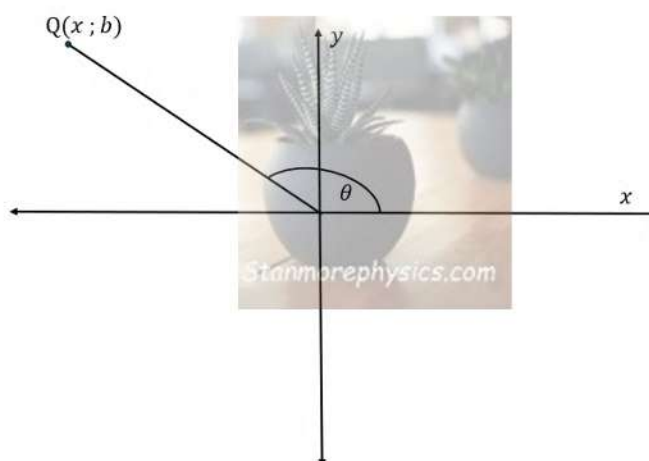
5.1.1 $\cos 163^\circ$ (2)

5.1.2 $\sin 13^\circ$ (3)

- 5.2 Simplify the following expression to ONE trigonometry term:

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

- 5.3 In the diagram below, $Q(x; b)$ is a point in the second quadrant and it is given that $\sin \theta = \frac{b}{\sqrt{b^2 + 4}}$



- 5.3.1 Determine the value of x . (3)

- 5.3.2 Write $\tan(360^\circ - \theta)$ in terms of b in its simplest form. (2)

- 5.3.3 Show that: $\cos 2\theta = \frac{4 - b^2}{b^2 + 4}$ (3)

5.4 Determine the general solution of $3\cos 2x = 1 + 5\sin x$. (7)

5.5 Determine, without the use of a calculator, the value of:

$$\cos(\theta + 105^\circ) \cdot \sin(\theta + 165^\circ) + \cos(\theta + 15^\circ) \cdot \sin(\theta + 75^\circ) \quad (4)$$

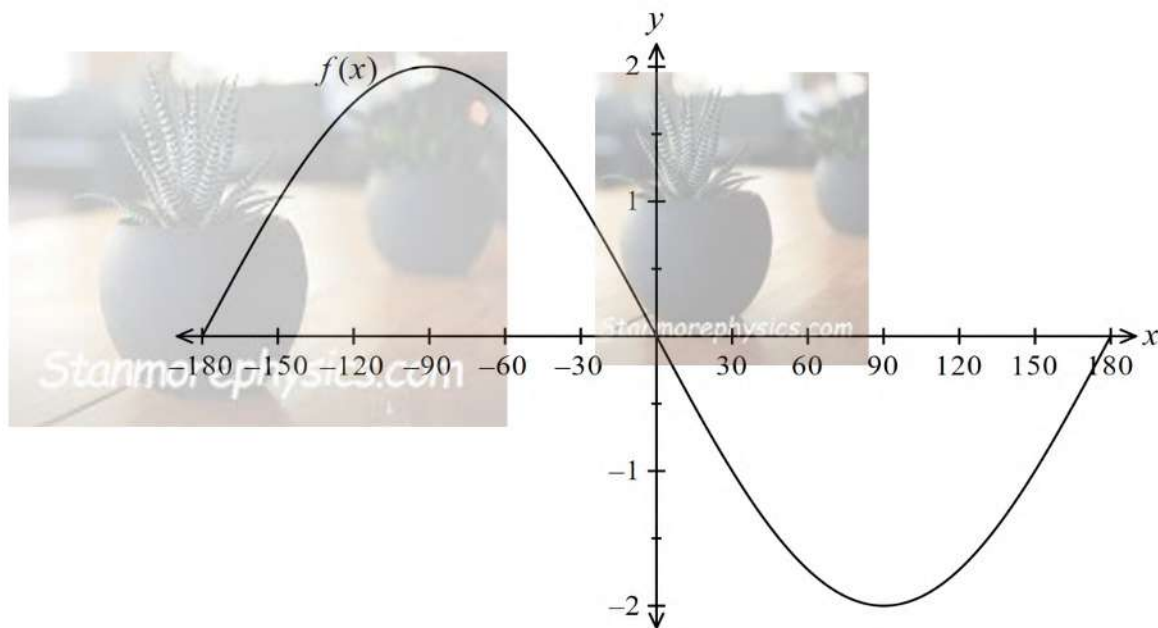
5.6 Given: $a + 1 = \frac{3}{2}\cos \theta$ and $a + 2 = \frac{1}{a}$

Determine the value of $\cos 2\theta$, without the use of a calculator. (5)

[34]

QUESTION 6

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



6.1 Write down the period of $f\left(\frac{1}{2}x\right)$ (2)

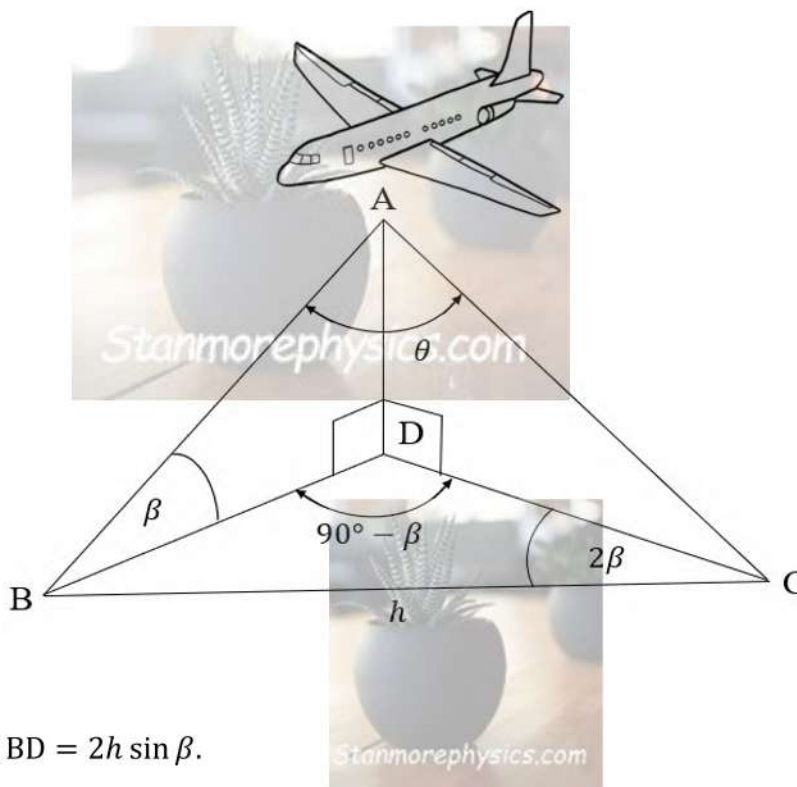
6.2 Draw the graph of $g(x) = \cos(x - 30^\circ)$ for $x \in [-180^\circ; 180^\circ]$ on the same grid provided in your ANSWERBOOK. (3)

6.3 For which value(s) of x is $f'(x) < 0$ and $g'(x) > 0$? (3)

[8]

QUESTION 7

A FlySafair airplane at point A flies directly above point D. Two observers are standing at point B and point C. The two observers standing at point B and C are in the same horizontal plane as point D. The angle of elevation from B to A is β . $\widehat{BCD} = 2\beta$ and $\widehat{BDC} = 90^\circ - \beta$. The distance between the two observers is h metres.



7.1 Show that $BD = 2h \sin \beta$. (3)

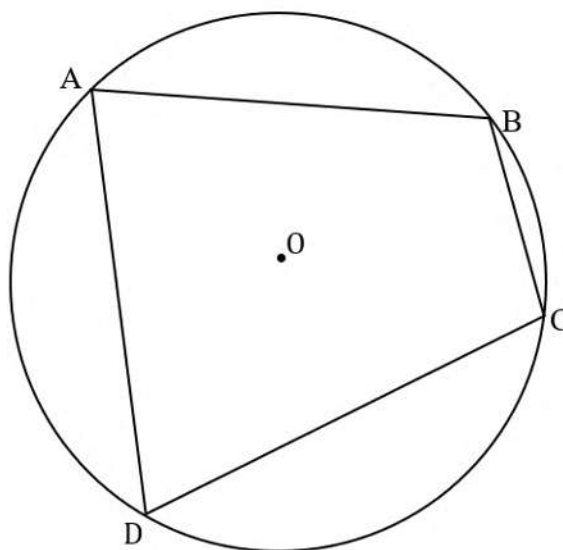
7.2 Hence, show that the length of $AB = 2h \tan \beta$. (2)

7.3 If $h = 55\text{m}$, $\beta = 28^\circ$ and $AC = 28\text{m}$, calculate θ , the angle between AB and AC. (4)

[9]

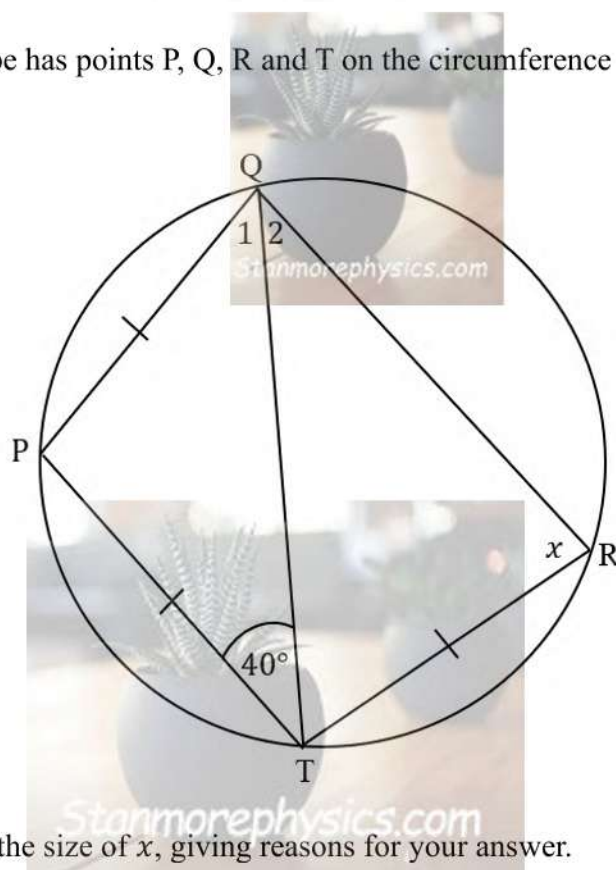
QUESTION 8

- 8.1 In the figure below, A, B, C and D are points on the circumference of the circle with centre O. Use the given sketch to prove the theorem which states that $\hat{A} + \hat{C} = 180^\circ$.



(4)

- 8.2 The following shape has points P, Q, R and T on the circumference of the circle.
 $PQ = PT = TR$.



- 8.2.1 Calculate the size of x , giving reasons for your answer.

(3)

- 8.2.2 Calculate the size of $\hat{Q}_2$.

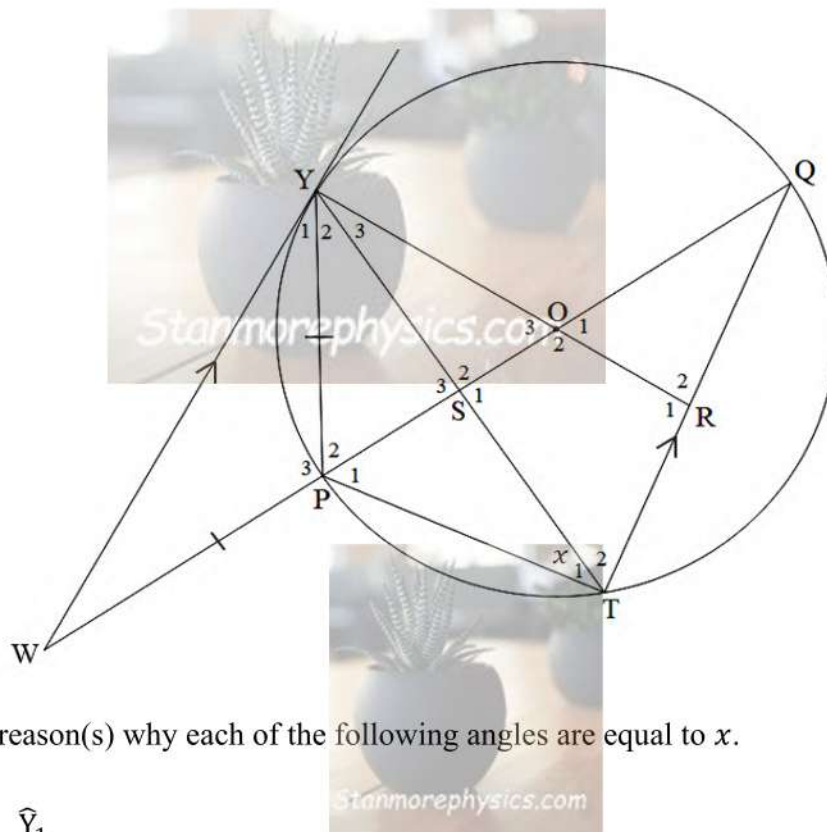
(2)

[9]

QUESTION 9

In the figure below, WY is a tangent to the circle with centre O.

WPQ, YOR, YST are straight lines. $PW = PY$, $WY \parallel TQ$ and $\hat{T}_1 = x$.



9.1 Provide reason(s) why each of the following angles are equal to x .

9.1.1 $\hat{Y}_1$ (1)

9.1.2 $\hat{W}$ (1)

9.1.3 $\hat{Q}$ (1)

9.1.4 $\hat{Y}_2$ (1)

9.2 Prove that $\hat{T}_2 = 2\hat{T}_1$. (2)

9.3 Prove that SORT is a cyclic quadrilateral. (2)

9.4 Determine the value of x . (2)

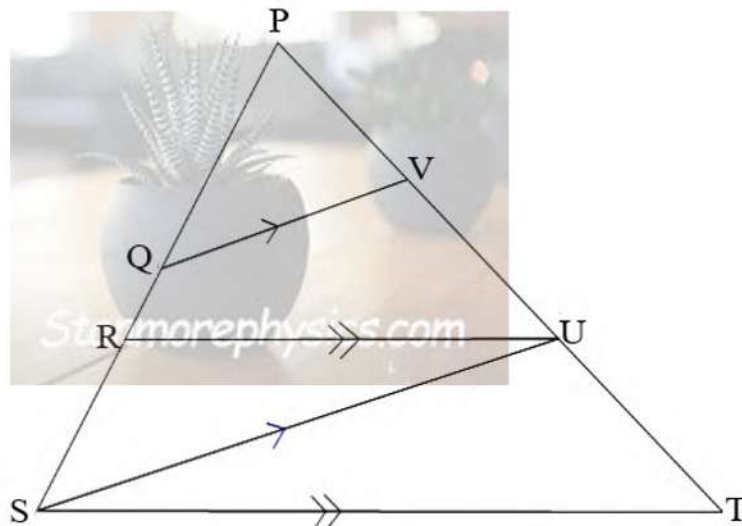
9.5 Show that $TR = RQ$. (3)

[13]

QUESTION 10

10.1 In $\triangle PST$, $QV \parallel SU$ and $RU \parallel ST$.

$PU = 30\text{cm}$ and $PU : UT = 3 : 2$.



Determine, with reasons:

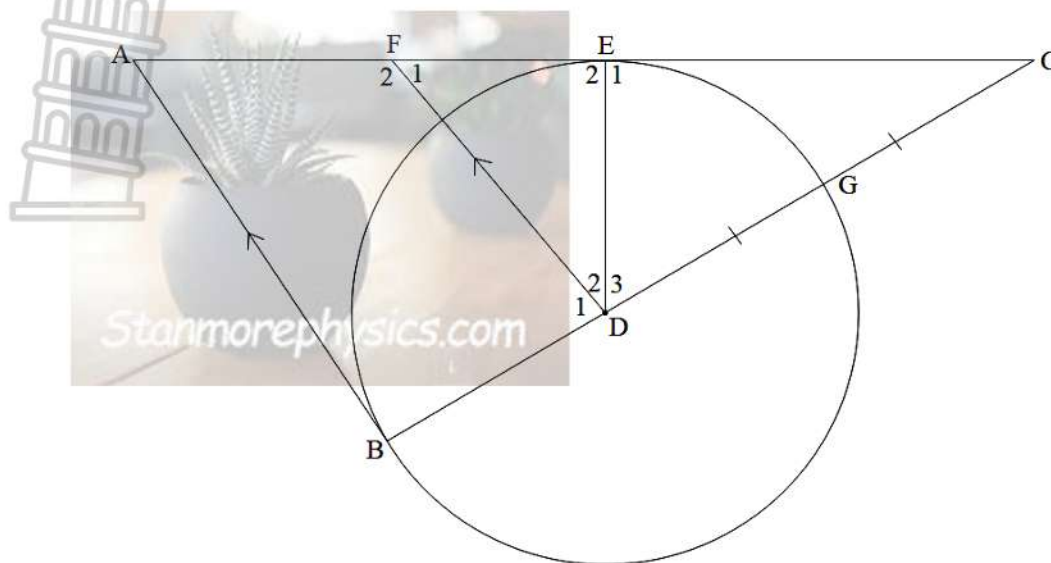
10.1.1 The length of UT .

(2)

10.1.2 If it is further given that $PV : VU = 7 : 8$, determine value of $\frac{QR}{RS}$

(4)

- 10.2 In the diagram below, D is the centre of a circle. AB and AC are tangents to the circle at B and E respectively. The diameter BG is produced and meets tangent AC at C. $DG = CG$. F is a point on AC such that $FD \parallel AB$.



10.2.1 Find, with reasons, the ratio of $\frac{AC}{FC}$. (2)

10.2.2 Prove, giving reasons, that $\triangle ABC \parallel \triangle DEC$. (3)

10.2.3 Prove that $DE^2 = \frac{AE \cdot EC}{3}$. (4)

10.2.4 Find the ratio of $\frac{\text{Area of } \triangle FDC}{\text{Area of } \triangle ABC}$. (3)

[18]

TOTAL: 150

INFORMATION SHEET

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

$$y = mx + c$$

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

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

$$m = \tan \theta$$

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

MATHEMATICS P2 / WISKUNDE V2
GR 12
SEPTEMBER 2026
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DATE DATUM	31 AUGUST 2026
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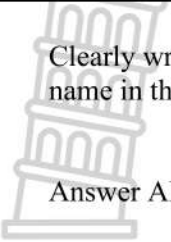
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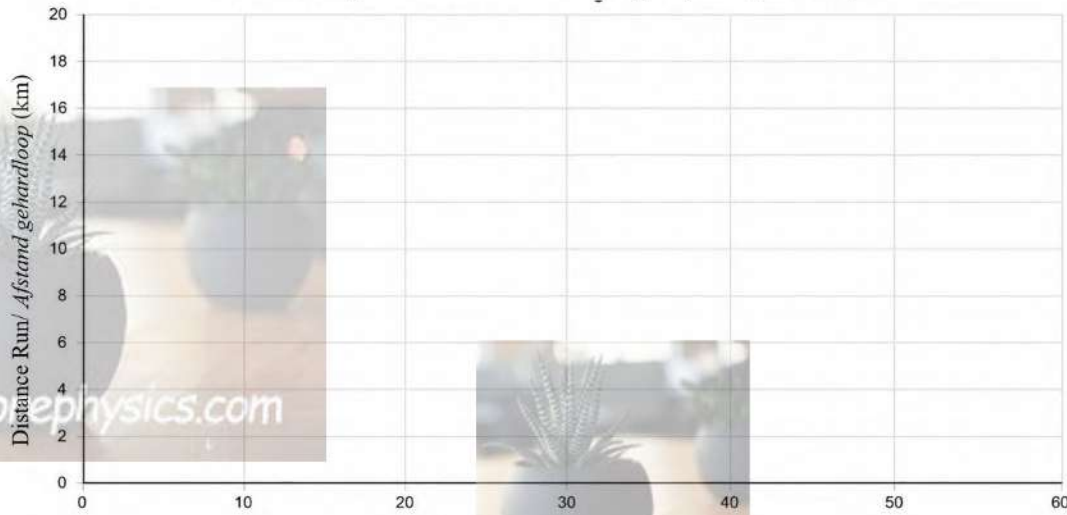
MARKER/NASIENER				MODERATOR				EXTERNAL MODERATOR			
Question Vraag	Marks Punte	Markers's Initials Merker se Voorletters		Marks Punte	Moderator's Initials Moderator se Voorletters			Marks Punte	Moderator's Initials Moderator se Voorletters		
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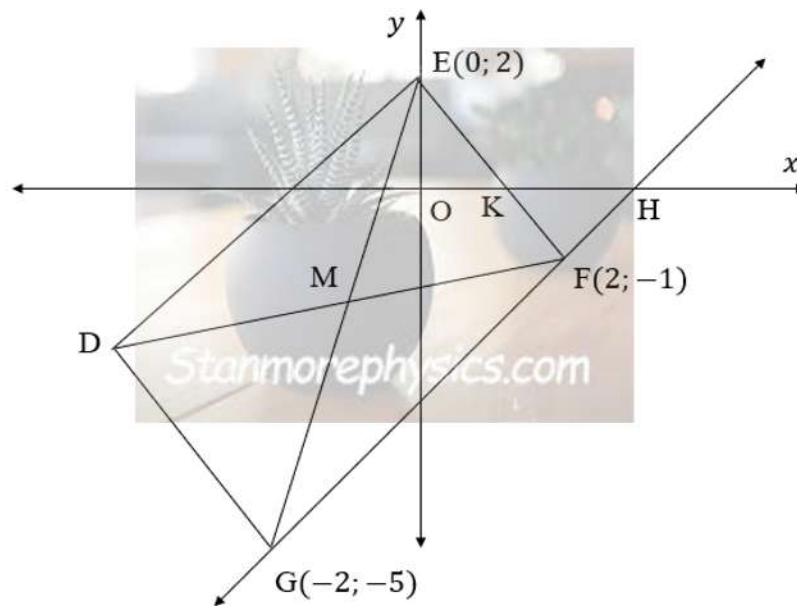
This answer book consists of 25 pages./Hierdie antwoordeboek bestaan uit 25 bladsye.

PLEASE FOLLOW THESE INSTRUCTIONS CAREFULLY	VOLG ASSEBLIEF HIERDIE INSTRUKSIES NOUKEURIG
 1. Clearly write your name and your teacher's name in the space provided. 2. Answer ALL questions in the spaces provided. 3. NO pages may be torn from this answer book. 4. Candidates may NOT retain an answer book or remove it from the examination room. 5. Answers must be written in black/blue ink as distinctly as possible. Do NOT write in the margins. 6. If you require additional space for your answers: 6.1 Use the additional space provided at the end of the answer book. 6.2 When answering a question in the additional space, clearly indicate the question number in the column on the LHS. 6.3 Rule off after each answer. 7. Draw a neat line through any work/rough work that must not be marked.	1. Skryf jou naam en jou onderwyser se naam in die ruimtes verskaf. 2. Beantwoord ALLE vrae in die ruimtes wat verskaf is. 3. GEEN bladsye mag uit hierdie antwoordeboek geskeur word NIE. 4. GEEN antwoordeboek mag deur die kandidaat behou of uit die eksamenlokaal verwyder word NIE. 5. Skryf die antwoorde so duidelik moontlik met swart/blou ink. Laat die kantlyne oop. 6. In geval jy bykomende ruimte benodig vir jou antwoorde: 6.1 Gebruik die bykomende ruimte wat aan die einde van die antwoordeboek verskaf word. 6.2 As 'n vraag in die bykomende ruimte beantwoord word, dui duidelik die vraagnommer in die kolom aan die LK aan. 6.3 Trek 'n lyn na elke antwoord. 7. Trek 'n netjiese lyn deur enige werk/rofwerk wat nie nagesien moet word nie.

QUESTION/VRAAG 1

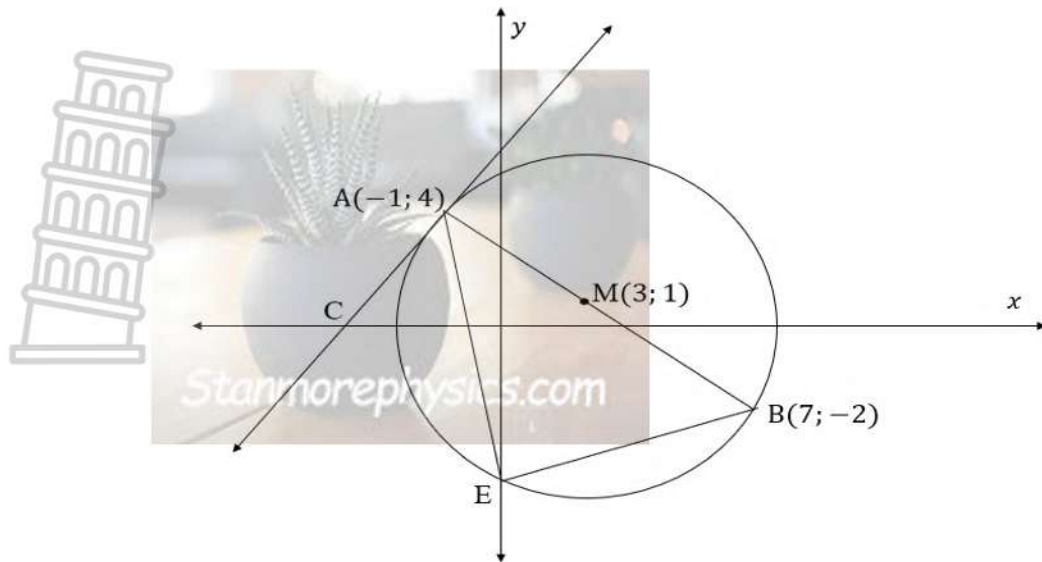
	Solution/Oplissing	Marks Punte																		
1.1	<table border="1"> <thead> <tr> <th>NUMBER OF DAYS ABSENT/ AANTAL DAE AFWESIG</th><th>FREQUENCY/ FREKENSIE</th><th>CUMULATIVE FREQUENCY/ KUMULATIEWE FREKWENSIE</th></tr> </thead> <tbody> <tr> <td>$0 < d \leq 5$</td><td>20</td><td></td></tr> <tr> <td>$5 < d \leq 10$</td><td>35</td><td></td></tr> <tr> <td>$10 < d \leq 15$</td><td>75</td><td></td></tr> <tr> <td>$15 < d \leq 20$</td><td>20</td><td></td></tr> <tr> <td>$20 < d \leq 25$</td><td>5</td><td></td></tr> </tbody> </table>	NUMBER OF DAYS ABSENT/ AANTAL DAE AFWESIG	FREQUENCY/ FREKENSIE	CUMULATIVE FREQUENCY/ KUMULATIEWE FREKWENSIE	$0 < d \leq 5$	20		$5 < d \leq 10$	35		$10 < d \leq 15$	75		$15 < d \leq 20$	20		$20 < d \leq 25$	5		(2)
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$0 < d \leq 5$	20																			
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$20 < d \leq 25$	5																			
1.2		(3)																		
1.3		(1)																		
1.4		(2)																		
		[8]																		

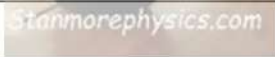
Solution/Oplossing													Marks Punte
	max reading/ maks lesing	20	55	30	25	40	30	50	40	35	30	50	40
	Distance run / Afstand hardloop (km)	8	18	13	10	11	12	16	14	13	9	15	12
2.1	Max Reading vs Distance Run/ Maks Lesing vs Afstand gehardloop 												(3)
2.2													(2)
2.3													
2.4													(2)
2.5													
													(1)
													[11]



	Solution/Oplossing	Marks Punte
3.1		(2)
3.2		(2)
3.3		(3)
3.4		(2)
3.5		(2)

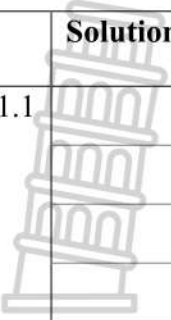
Solution/ <i>Oplossing</i>		Marks <i>Punte</i>
3.6		(5)
3.7		
		(5)
		[21]

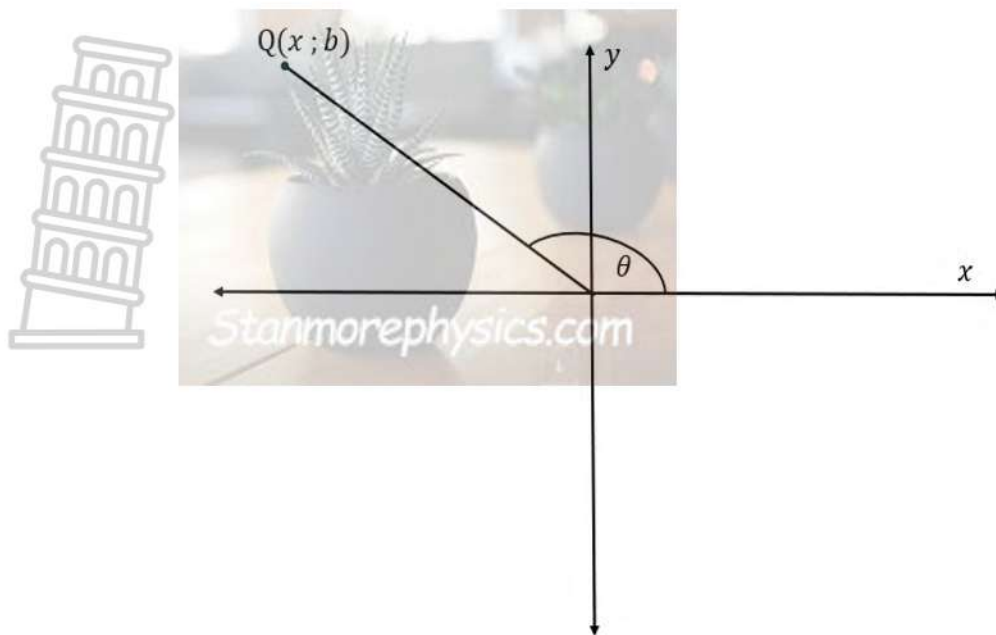


	Solution/Oplossing	Marks Punte
4.1		(3)
4.2		(3)

	Solution/Oplissing	Marks Punte
4.3		(6)
4.4		
		(7)
		[19]

QUESTION/VRAAG 5

	Solution/Oplossing	Marks Punte
5.1.1		(2)
5.1.2		(3)
5.2		(5)

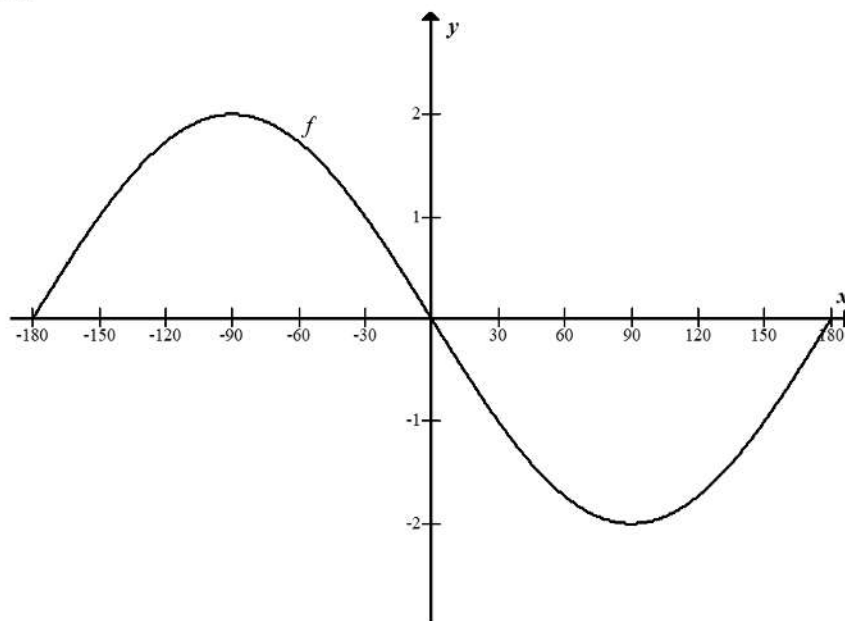


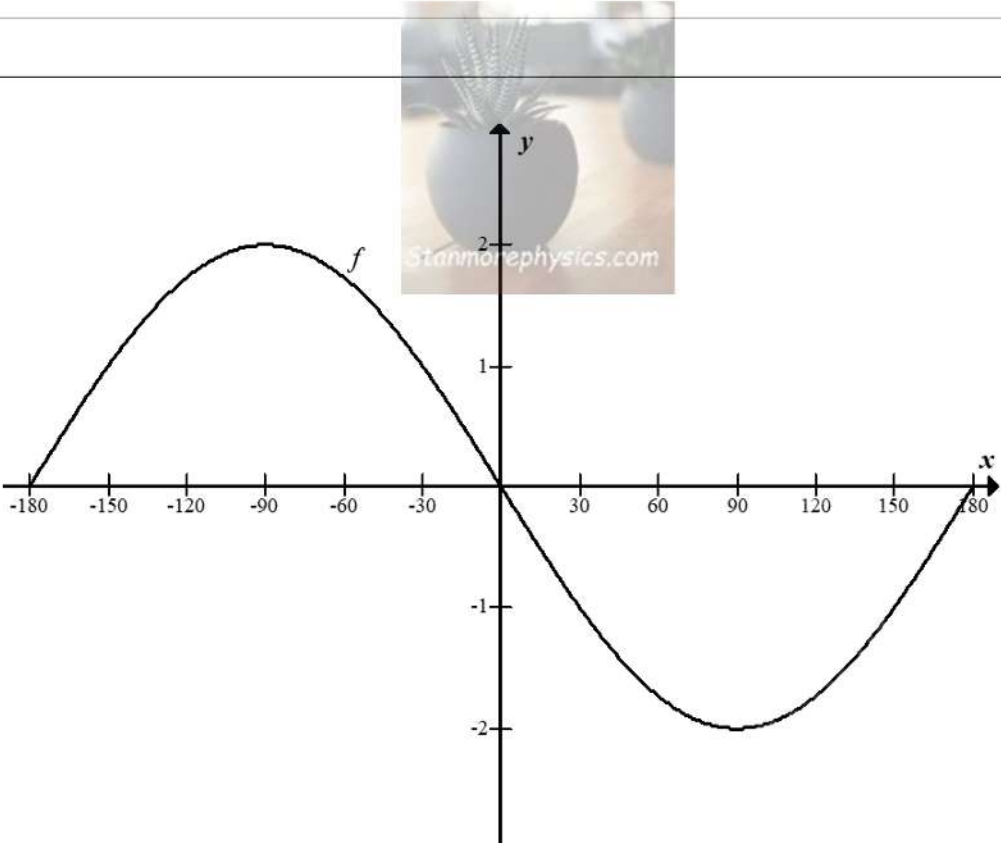
	Solution/ <i>Oplossing</i>	Marks <i>Punte</i>
5.3.1		(3)
5.3.2		(2)
5.3.3		(3)

Solution/ Oplossing		Marks Punte
5.4		(7)
5.5		
		(4)

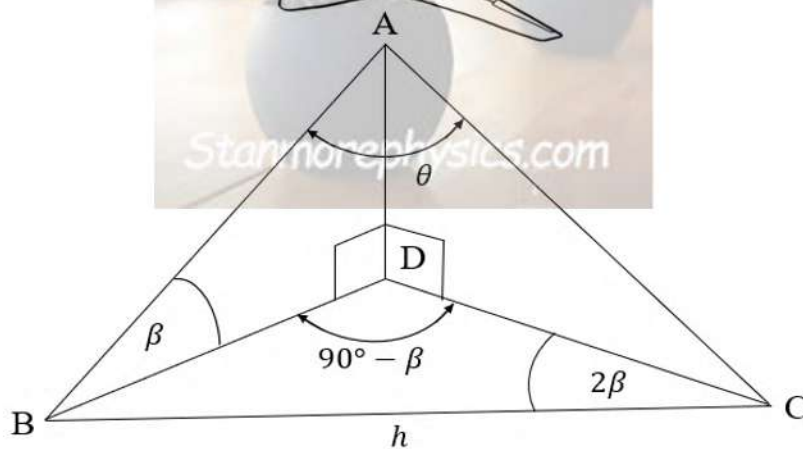
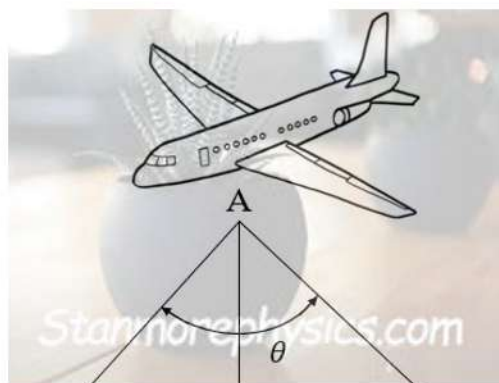
	Solution/Oplissing	Marks Punte
5.6		
		(5)
		[34]





	Solution/Oplissing	Marks Punte
6.1		(2)
6.2		
		(3)
6.3		(3)
		[8]

QUESTION/VRAAG 7

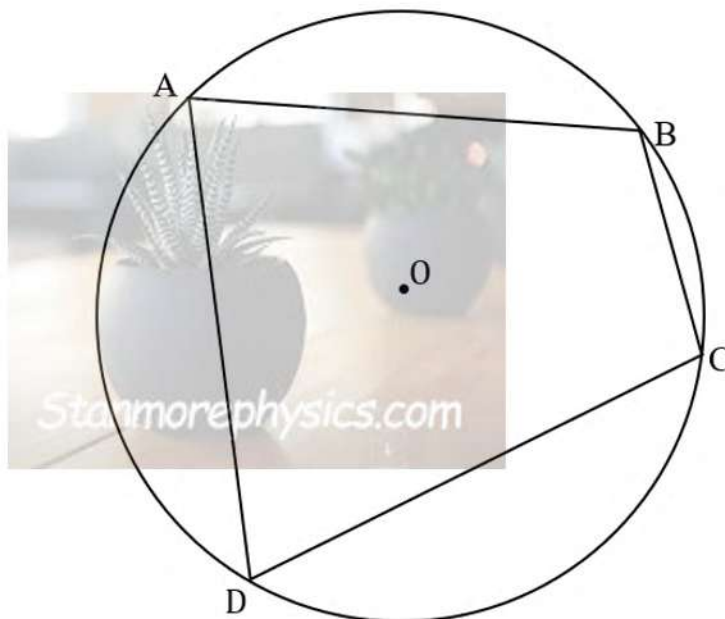


	Solution/Oplissing	Marks Punte
7.1		(3)
7.2		(2)
7.3		(4)
		[9]

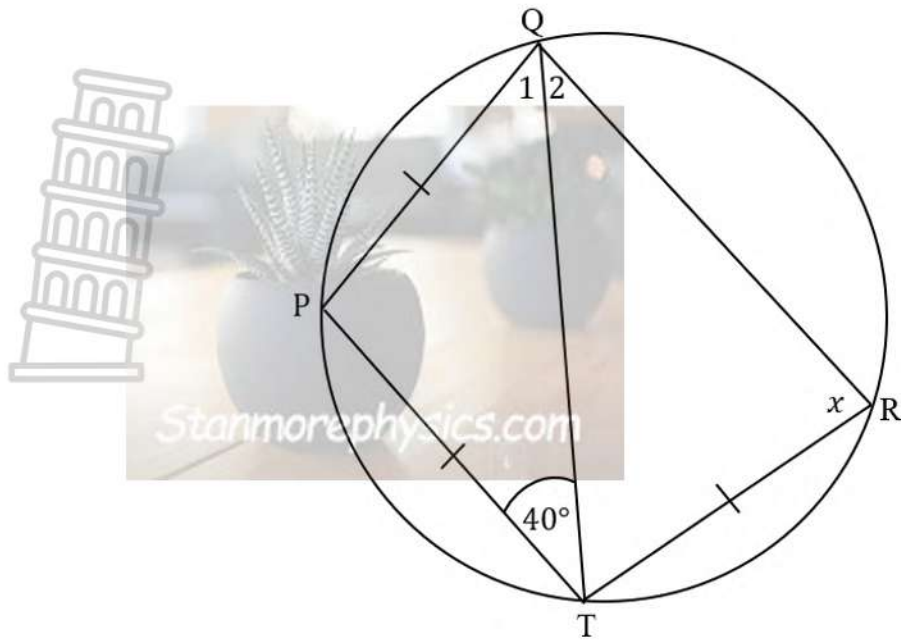
Give reasons for your statements in QUESTIONS 8, 9 and 10.

Gee redes vir jou bewerings in VRAAG 8, 9 en 10.

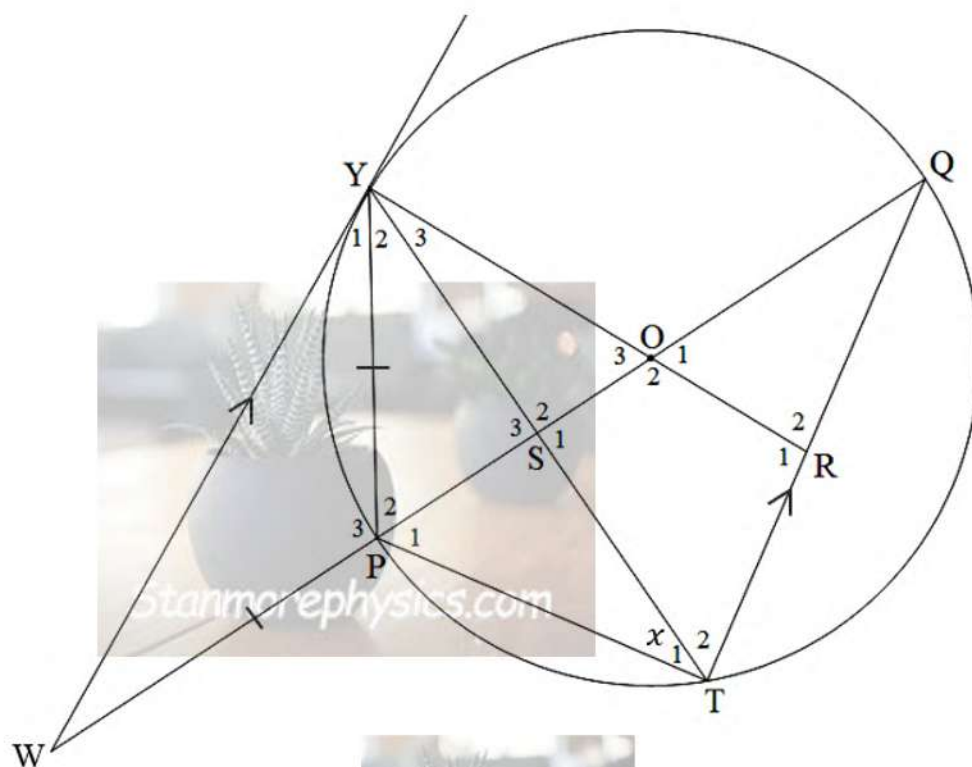
QUESTION/VRAAG 8



	Solution/ <i>Oplossing</i>	Marks <i>Punte</i>
8.1	 Stanmorephysics.com	(4)



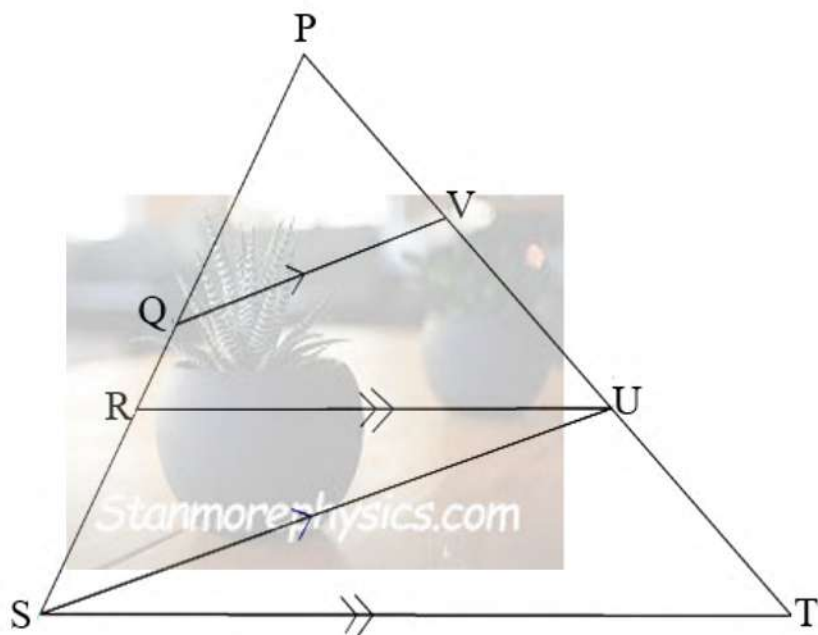
8.2.1		(3)
8.2.2		(2)
		[9]



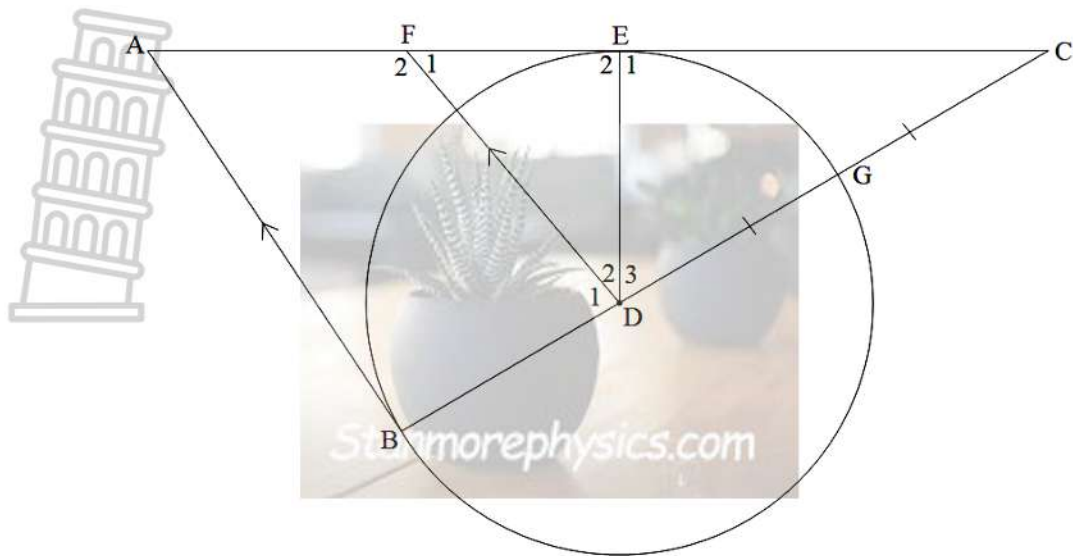
	Solution/Oplossing	Marks Punte
9.1.1		
		(1)
9.1.2		
		(1)
9.1.3		
		(1)
9.1.4		
		(1)
9.2		
		(2)
9.3		
		(2)

	Solution/ <i>Oplossing</i>	Marks <i>Punte</i>
9.4		(2)
9.5		
		(3)
		[13]

QUESTION/VRAAG 10



	Solution/Oplissing	Marks Punte
10.1.1		(2)
10.1.2		(4)

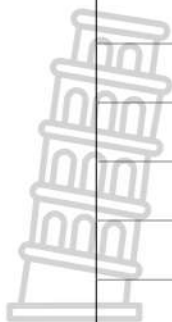


	Solution/Oplissing	Marks Punte
10.2.1		(2)
10.2.2		(3)

	Solution/ <i>Oplossing</i>	Marks <i>Punte</i>
10.2.3		(4)
10.2.4		
		(3)
		[18]

TOTAL/TOTAAL: 150

Additional space/Bykomende ruimte

Marks
Punte

Additional space/Bykomende ruimte

Marks
Punte

Add





**Western Cape
Government**

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**MATHEMATICS PAPER 2
GRADE 12 MARKING GUIDELINE**

TRIAL EXAMINATION

SEPTEMBER 2026

MARKS: 150

TIME: 3 hours

NOTE:



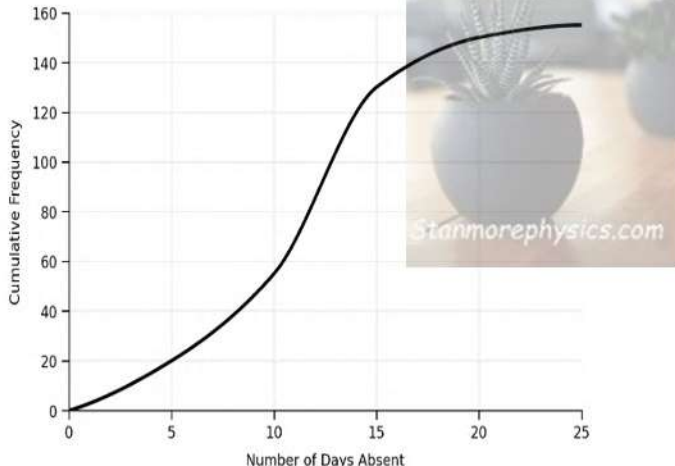
- If a candidate answers a question **TWICE**, only mark the **FIRST** attempt.
- If a candidate has crossed out an attempt of a question and not redone the question, mark the crossed-out version.
- Consistent accuracy applies in **ALL** aspects of the Marking Guidelines. Stop marking at the second calculation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

LET WEL:

- 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, sien die doodgetrekte poging na.
- 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.

GEOMETRY • MEETKUNDE

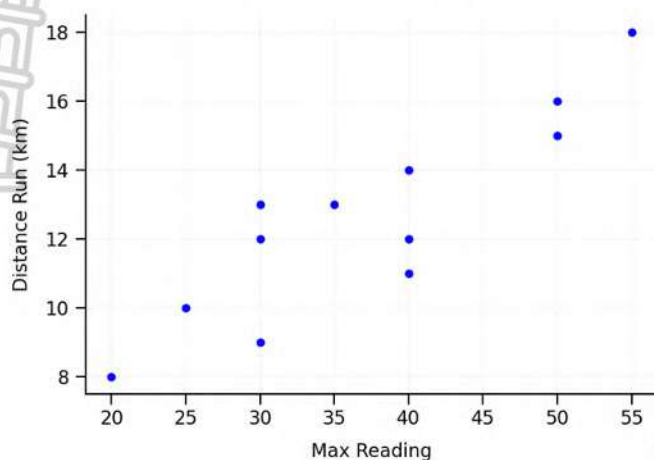
GEOMETRY • MEETKUNDE	
S	A mark for a correct statement (A statement mark is independent of a reason)
	'n Punt vir 'n korrekte bewering ('n Punt vir 'n bewering is onafhanklik van die rede)
R	A mark for the correct reason (A reason mark may only be awarded if the statement is correct)
	'n Punt vir 'n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

QUESTION 1								
1.1	<table><tr><th>Cumulative Frequency</th></tr><tr><td>20</td></tr><tr><td>55</td></tr><tr><td>130</td></tr><tr><td>150</td></tr><tr><td>155</td></tr></table>	Cumulative Frequency	20	55	130	150	155	✓ first 3 values ✓ last 2 values (2)
Cumulative Frequency								
20								
55								
130								
150								
155								
1.2	Ogive  Cumulative Frequency Number of Days Absent	✓ grounding ✓ correct plotting of points ✓ smooth curve (3)						
1.3	Median = 12	✓ answer (1)						
1.4	More than 15 days absent: $= \frac{20 + 5}{155} \times 100$ $= 16,13\%$	✓ 20 + 5 ✓ answer (2)						
		[8]						

QUESTION 2

2.1

Max Reading vs Distance Run



- ✓ correct plotting of first 4 points
- ✓ correct plotting of second 4 points
- ✓ correct plotting of third 4 points

(3)

2.2

$$r = 0,89$$

∴ strong positive correlation



$$✓ r = 0,89$$

✓ strong positive

(2)

2.3

$$A = 3,69$$

$$B = 0,24$$

$$y = 0,24x + 3,69$$

- ✓ correct A value
- ✓ correct B value

✓ equation

(3)

2.4.

$$y = 0,24(26) + 3,69$$

$$y = 9,93 \text{ km}$$

- ✓ sub
- ✓ answer

(2)

2.5

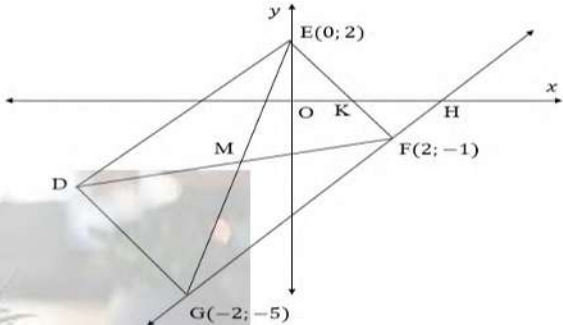
∴ Standard deviation remains the same/Unchanged

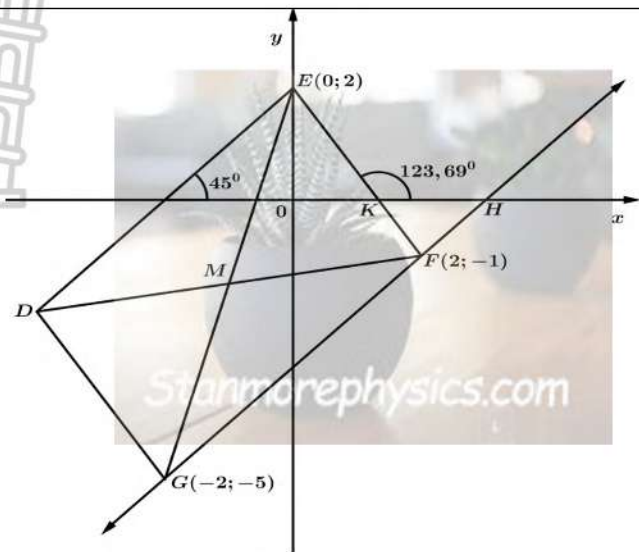
✓ Unchanged/Remain the same

(1)

[11]

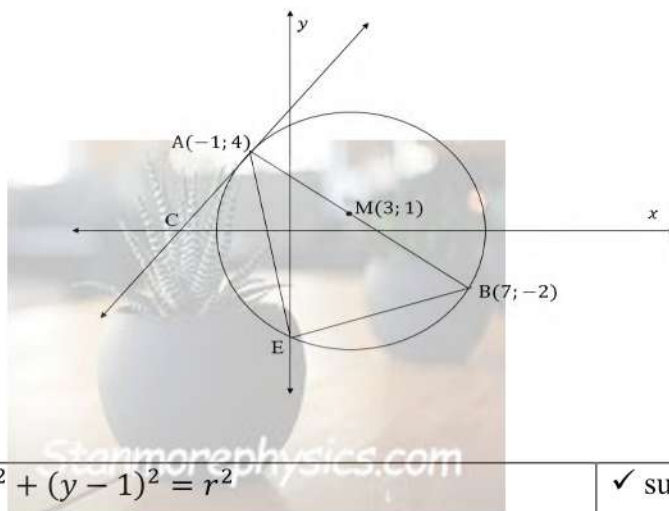
QUESTION 3

		
3.1	$M\left(\frac{-2+0}{2}; \frac{-5+2}{2}\right)$ $M\left(-1; -\frac{3}{2}\right)$	✓ sub ✓ answer (2)
3.2	$GE = \sqrt{(-2-0)^2 + (-5-2)^2}$ $GE = \sqrt{53}$	✓ sub ✓ answer (2)
3.3	$m_{GF} = \frac{-5+1}{-2-2}$ $= 1$ $m_{DE} = m_{GF} = 1$ OR $D(-4; -2)$ $m_{DE} = \frac{2-(-2)}{0-(-4)}$ $= 1$	✓ sub ✓ gradient of GF ✓ gradient of DE (3) ✓ D ✓ substitution ✓ answer (3)
3.4	$m_{GH} = 1$ $y = x + c$ $(-2; -5): -5 = (-2) + c$ $c = -3$ $y = x - 3$	✓ sub of coordinate ✓ answer (2)

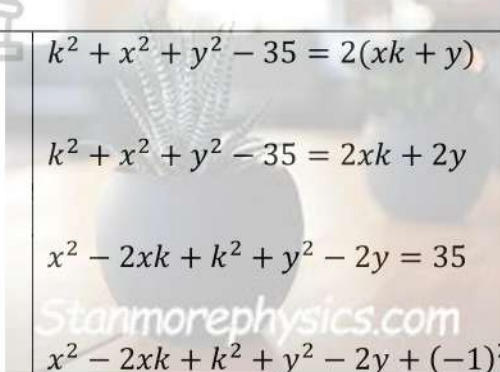
3.5	$D(-4; -2)$	✓ x value and ✓ y value (2)
3.6	 $m_{EF} = \frac{-1-2}{2-0}$ or $m_{DG} = m_{EF}$ $= -\frac{3}{2}$ $\tan \theta = -\frac{3}{2}$ $\theta = 123,69^\circ$ $m_{GF} = m_{DE} = 1$ $\tan \alpha = 1$ $\alpha = 45^\circ$ $\widehat{DEF} = 123,69^\circ - 45^\circ$ [ext $\angle$ of Δ] $= 78,69^\circ$ $\therefore \widehat{DGF} = 78,69^\circ$ [opp $\angle$s of $\parallel$ m] OR $DG = \sqrt{(-4+2)^2 + (-2+5)^2} = \sqrt{13}$ $GF = \sqrt{(-2-2)^2 + (-5+1)^2} = 4\sqrt{2}$ $DF = \sqrt{(-4-2)^2 + (-2+1)^2} = \sqrt{37}$ $DF^2 = GF^2 + DG^2 - 2GF \cdot DG \cdot \cos \widehat{DGF}$	✓ sub into correct formula ✓ gradient of EF ✓ $\theta = 123,69^\circ$ ✓ $\alpha = 45^\circ$ ✓ $\widehat{DGF} = 78,69^\circ$ (5) ✓ DG ✓ GF ✓ DF

	$(\sqrt{37})^2 = (4\sqrt{2})^2 + (\sqrt{13})^2 - 2(\sqrt{13})(4\sqrt{2}) \cos \widehat{DGF}$ $\cos \widehat{DGF} = \frac{(4\sqrt{2})^2 + (\sqrt{13})^2 - (\sqrt{37})^2}{2(\sqrt{13})(4\sqrt{2})}$ $\cos \widehat{DGF} = 78,69^\circ$	✓ sub into correct formula ✓ answers (5)
3.7	$GF = \sqrt{(-2 - 2)^2 + (-5 + 1)^2}$ $GF = 4\sqrt{2}$ $EF = \sqrt{(2 - 0)^2 + (-1 - 2)^2}$ $EF = \sqrt{13}$ $\widehat{GFE} = 101,31^\circ \quad [\text{co-interior } \angle\text{s, } EF \parallel DG]$ $\text{Area } \triangle GEF = \frac{1}{2} \times 4\sqrt{2} \times \sqrt{13} \sin 101,31^\circ$ $= 10,00 \text{ units}^2$ OR $m_{GE} = \frac{-5 - 2}{-2 - 0}$ $= \frac{7}{2}$ $\tan \alpha = \frac{7}{2}$ $\alpha = 74,05^\circ$ $\widehat{EGF} = 74,05^\circ - 45^\circ$ $= 29,05^\circ$ $GF = \sqrt{(-2 - 2)^2 + (-5 + 1)^2}$ $GF = 4\sqrt{2}$ $\text{Area } \triangle GEF = \frac{1}{2} \times 4\sqrt{2} \times \sqrt{13} \sin 29,05^\circ$ $= 10,00 \text{ units}^2$	✓ sub into formula ✓ $GF = 4\sqrt{2}$ ✓ S ✓ Sub into correct formula ✓ answer (5) ✓ sub into formula ✓ $\alpha = 74,05^\circ$ ✓ $\widehat{EGF} = 29,05^\circ$ ✓ $GF = 4\sqrt{2}$ ✓ answer (5)
		[21]

QUESTION 4



4.1	$(x - 3)^2 + (y - 1)^2 = r^2$ Sub: (-1;4) $(-1 - 3)^2 + (4 - 1)^2 = r^2$ $r^2 = 25$ $(x - 3)^2 + (y - 1)^2 = 25$	✓ sub midpoint ✓ sub (-1; 4) ✓ answer (3)
4.2	$(0 - 3)^2 + (y - 1)^2 = 25$ $y^2 - 2y - 15 = 0$ $(y - 5)(y + 3) = 0$ $y \neq 5 \quad \text{or} \quad y = -3$	✓ sub $x = 0$ ✓ std form ✓ answer with selection (3)
4.3	$m_{AM} = \frac{1-4}{3-(-1)}$ $= -\frac{3}{4}$ $m_{Tan} = \frac{4}{3} \quad [\text{radius} \perp \text{tan}]$ $y - 4 = \frac{4}{3}(x + 1)$ $y = \frac{4}{3}x + \frac{16}{3} \therefore 0 = \frac{4}{3}x + \frac{16}{3} \therefore x = -4$ C(-4; 0)	✓ gradient of radius ✓ gradient of tangent ✓ sub (-1; 4) ✓ equation ✓ coordinate of C

	$AC = \sqrt{(-4 + 1)^2 + (0 - 4)^2}$ $AC = 5 \text{ units}$	✓ answer (6)
4.4	 $k^2 + x^2 + y^2 - 35 = 2(xk + y)$ $k^2 + x^2 + y^2 - 35 = 2xk + 2y$ $x^2 - 2xk + k^2 + y^2 - 2y = 35$ $x^2 - 2xk + k^2 + y^2 - 2y + (-1)^2 = 35 + (-1)^2$ $(x - k)^2 + (y - 1)^2 = 36$ Circle centre $(k ; 1)$ with $r = 6$ Externally: $\therefore k = 14 \quad \text{or} \quad k = -8$ Or Internally: $k = 4 \quad \text{or} \quad k = 2$ 	✓ simplify ✓ completing square ✓ standard form ✓ ✓ centre and radius ✓ ✓ values for k (7)
		[19]

QUESTION 5

5.1.1

$$\cos 163^\circ$$

$$= -\cos 17^\circ$$

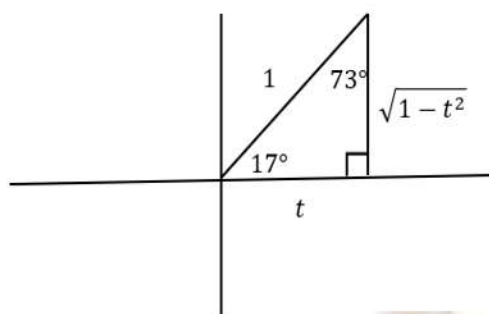
$$= -t$$

$$\checkmark -\cos 17^\circ$$

$$\checkmark \text{ answer}$$

(2)

5.1.2



$$\sin 13^\circ = \sin(73^\circ - 60^\circ)$$

$$= \sin 73^\circ \cdot \cos 60^\circ - \cos 73^\circ \cdot \sin 60^\circ$$

$$= t \cdot \frac{1}{2} - \sqrt{1-t^2} \cdot \frac{\sqrt{3}}{2}$$

$$= \frac{t - \sqrt{3-3t^2}}{2}$$

OR

$$\sin 13^\circ = \sin(30^\circ - 17^\circ)$$

$$= \sin 30^\circ \cdot \cos 17^\circ - \cos 30^\circ \cdot \sin 17^\circ$$

$$= \frac{1}{2}t - \frac{\sqrt{3}}{2}(\sqrt{1-t^2})$$

$$= \frac{t - \sqrt{3}\sqrt{1-t^2}}{2}$$

$$= \frac{t - \sqrt{3-3t^2}}{2}$$

$$\checkmark \text{ compound angle}$$

$$\checkmark \text{ expansion}$$

$$\checkmark \text{ substitution}$$

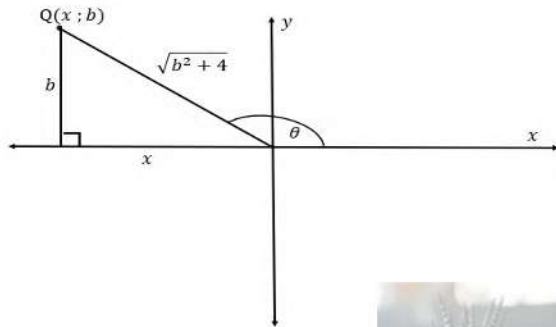
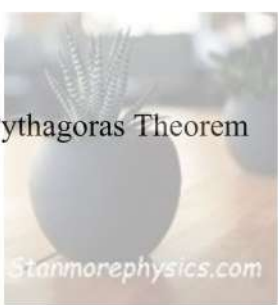
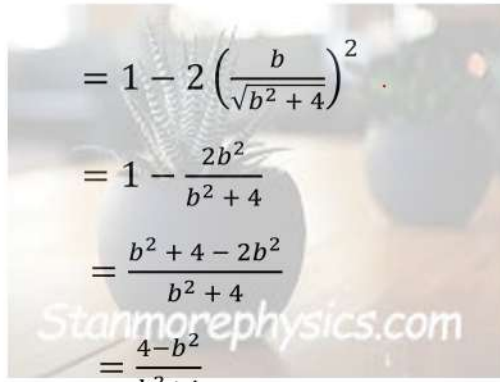
(3)

$$\checkmark \text{ compound angle}$$

$$\checkmark \text{ expansion}$$

$$\checkmark \text{ substitution}$$

(3)

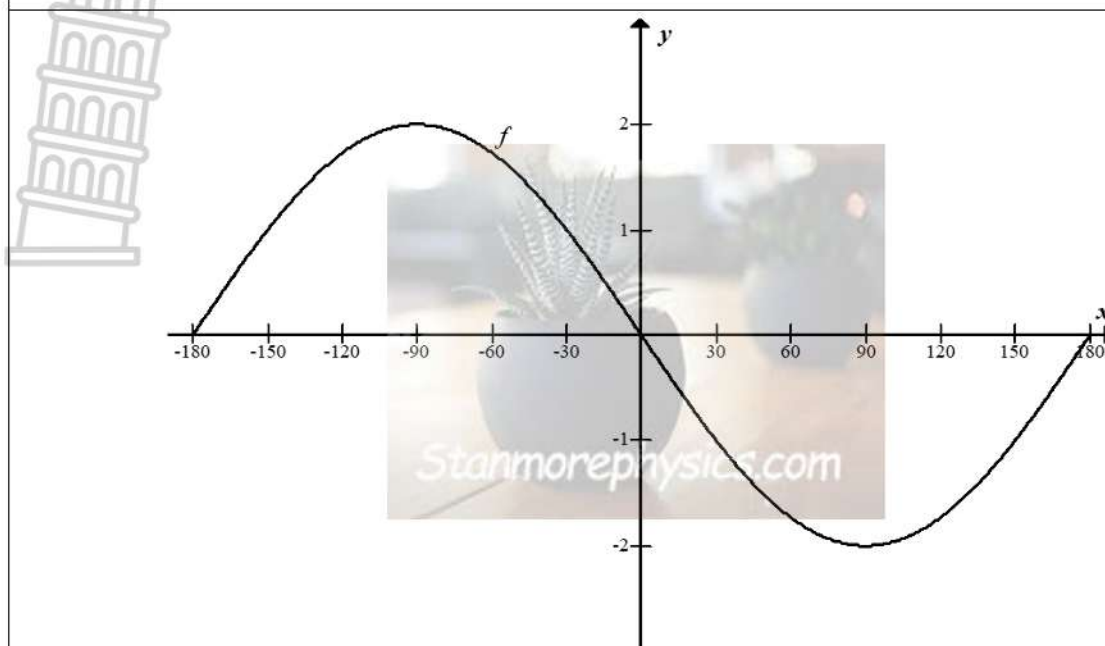
5.2 	$= \frac{\sin x}{\cos x \cdot \frac{\sin x}{\cos x}} + 2 \sin x \cdot (-\sin x)$ $= 1 - 2\sin^2 x$ $= \cos 2x$	✓ $\frac{\sin x}{\cos x}$ ✓ $\sin x$ ✓ $-\sin x$ ✓ simplify ✓ answer (5)
5.3.1	 Pythagoras Theorem $x^2 + b^2 = b^2 + 4$ $x^2 = 4$ $\therefore x = -2$ 	✓ pythagoras ✓ simplify ✓ selection (3)
5.3.2	$= -\tan \theta$ $= -\left(\frac{b}{-2}\right) = \frac{b}{2}$	✓ $-\tan \theta$ ✓ answer (2)
5.3.3	$\cos 2\theta = 1 - 2\sin^2 \theta$  $= 1 - 2\left(\frac{b}{\sqrt{b^2 + 4}}\right)^2$ $= 1 - \frac{2b^2}{b^2 + 4}$ $= \frac{b^2 + 4 - 2b^2}{b^2 + 4}$ $= \frac{4 - b^2}{b^2 + 4}$	✓ identity ✓ squaring ✓ simplify single term (3)

	OR $\cos 2\theta = \cos^2\theta - \sin^2\theta$ $= \left(\frac{-2}{\sqrt{b^2+4}}\right)^2 - \left(\frac{b}{\sqrt{b^2+4}}\right)^2$ $= \frac{4}{b^2+4} - \frac{b^2}{b^2+4}$ $= \frac{4-b^2}{b^2+4}$ OR $\cos 2\theta = 2\cos^2\theta - 1$ $= 2\left(\frac{-2}{\sqrt{b^2+4}}\right)^2 - 1$ $= \frac{8}{b^2+4} - \frac{b^2+4}{b^2+4}$ $= \frac{8-b^2-4}{b^2+4}$ $= \frac{4-b^2}{b^2+4}$ 	✓ identity ✓✓ squaring each term (3) ✓ identity ✓ squaring ✓ simplify single term (3)
---	---	--

5.4	$3(1 - 2\sin^2 x) = 1 + 5 \sin x$ $3 - 6\sin^2 x - 5 \sin x - 1 = 0$ $-6\sin^2 x - 5 \sin x + 2 = 0$ $6 \sin^2 x + 5 \sin x - 2 = 0$ $\sin x = 0,30 \quad \text{or} \quad \sin x \neq -1,13 \text{ (N/A)}$ $x = 17,46^\circ + k \cdot 360$ Or $x = 162,54^\circ + k \cdot 360; k \in \mathbb{Z}$	$\checkmark 1 - 2\sin^2 x$ $\checkmark$ standard form $\checkmark$ factors $\checkmark \sin x \neq -1,13$ $\checkmark x = 17,46^\circ$ $\checkmark x = 162,54^\circ$ $\checkmark +k \cdot 360; k \in \mathbb{Z}$ (7)
5.5	$= -\sin(\theta + 15^\circ) \cos(\theta + 75^\circ) + \cos(\theta + 15^\circ) \sin(\theta + 75^\circ)$ $= \sin(\theta + 75^\circ) \cos(\theta + 15^\circ) - \cos(\theta + 75^\circ) \sin(\theta + 15^\circ)$ $= \sin[(\theta + 75^\circ) - (\theta + 15^\circ)]$ $= \sin 60^\circ$ $= \frac{\sqrt{3}}{2}$	$\checkmark -\sin(\theta + 15^\circ)$ $\checkmark \cos(\theta + 75^\circ)$ $\checkmark$ compound formula identity $\checkmark$ answer (4)
5.6	$(a + 1)^2 = \left(\frac{3}{2} \cos \theta\right)^2$ $a^2 + 2a + 1 = \frac{9}{4} \cos^2 \theta \dots\dots\dots(1)$ $a^2 + 2a = 1 \dots\dots\dots(2)$ $\therefore 1 + 1 = \frac{9}{4} \cos^2 \theta$ $\therefore \frac{8}{9} = \cos^2 \theta$ $\cos 2\theta = 2\cos^2 \theta - 1$ $= 2\left(\frac{8}{9}\right) - 1 = \frac{7}{9}$	$\checkmark$ squaring both sides $\checkmark a^2 + 2a + 1 = \frac{9}{4} \cos^2 \theta$ $\checkmark a^2 + 2a = 1$ $\checkmark \cos^2 \theta = \frac{8}{9}$ $\checkmark$ answer (5)

	OR $a + 1 = \frac{3}{2} \cos \theta$ $2a + 2 = 3 \cos \theta$ $\cos \theta = \frac{2a+2}{3} \dots\dots\dots 1$ $a + 2 = \frac{1}{a}$ $a^2 + 2a = 1$ $a^2 = 1 - 2a \dots\dots\dots 2$ $\cos 2\theta = 2\cos^2 \theta - 1$ $= 2 \left[\frac{2a+2}{3} \right]^2 - 1$ $= 2 \left[\frac{4a^2+8a+4}{9} \right] - 1$ $= \frac{8a^2+16a+8}{9} - \frac{9}{9}$ $= \frac{8(1-2a)+16a-1}{9}$ $= \frac{8-16a+16a-1}{9}$ $= \frac{7}{9}$	$\checkmark \cos \theta = \frac{2a+2}{3}$ $\checkmark a^2 = 1 - 2a$ $\checkmark \text{sub into identity}$ $\checkmark \text{sub } 1 - 2a$ $\checkmark \text{answer}$ (5)
		[34]

QUESTION 6



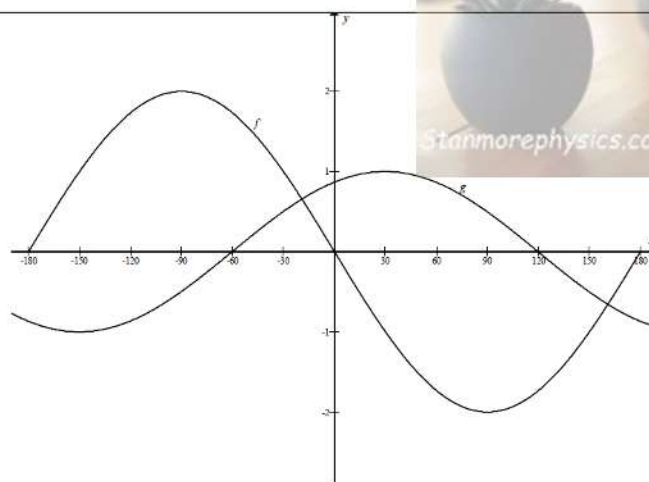
6.1

720°

✓✓ answer

(2)

6.2



✓ shape
✓ x -intercepts
✓ amplitude

(3)

6.3

$-90^\circ < x < 30^\circ$ or $x \in (-90^\circ; 30^\circ)$

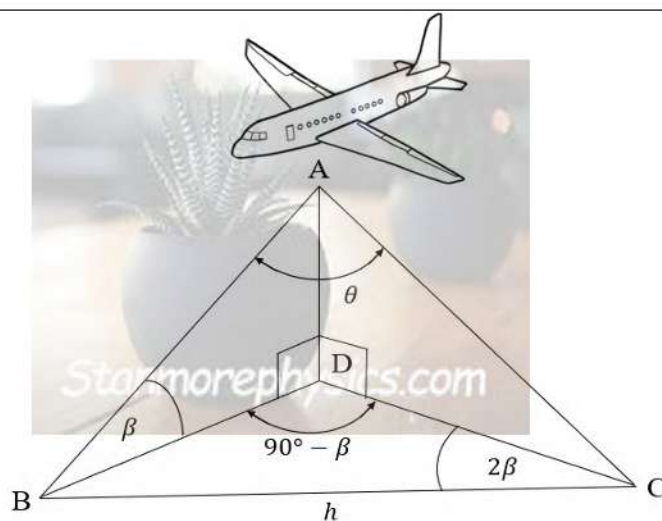
✓✓ $-90^\circ, 30^\circ$

✓ notation

(3)

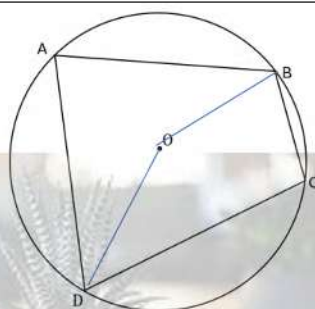
[8]

QUESTION 7



7.1	$\frac{BD}{\sin 2\beta} = \frac{h}{\sin(90^\circ - \beta)}$ $\frac{BD}{2 \sin \beta \cdot \cos \beta} = \frac{h}{\cos \beta}$ $BD = 2h \sin \beta$	✓ sub into sine formula ✓ expansion ✓ reduction (3)
7.2	$\cos \beta = \frac{BD}{AB}$ $AB = \frac{2h \sin \beta}{\cos \beta}$ $AB = 2h \tan \beta$	✓ sub ✓ AB (2)
7.3	$AB = 2 \times 55 \times \tan 28^\circ$ $= 58,49 \text{ m}$ $BC^2 = AB^2 + AC^2 - 2AB \cdot AC \cdot \cos \theta$ $\cos \theta = \frac{(58,49)^2 + (28)^2 - (55)^2}{2(58,49)(28)}$ $\cos \theta = 0,36 \dots$ $\theta = 68,88^\circ$	✓ AB = 58,49 m ✓ sub into correct formula ✓ simplify ✓ answer (4)
		[9]

QUESTION 8



8.1

Construct line DO and OB

Let $\widehat{DOB} = 2x$

Reflex $\widehat{DOB} = 360^\circ - 2x$ ($\angle$ s around a point/ $\angle$ s in rev)

$\hat{A} = x$ ($\angle$ at centre = $2 \times \angle$ at circumference)

$\hat{C} = 180^\circ - x$ ($\angle$ at centre = $2 \times \angle$ at circumference)

$\hat{A} + \hat{C} = 180^\circ$ (opp. $\angle$ of a cyclic quad.)

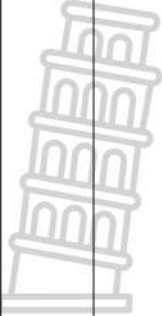
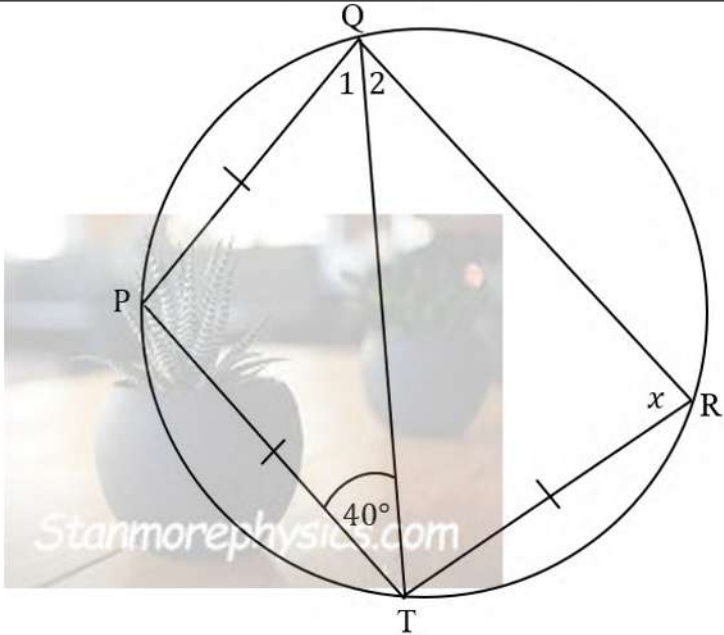
✓ Construction

✓ S

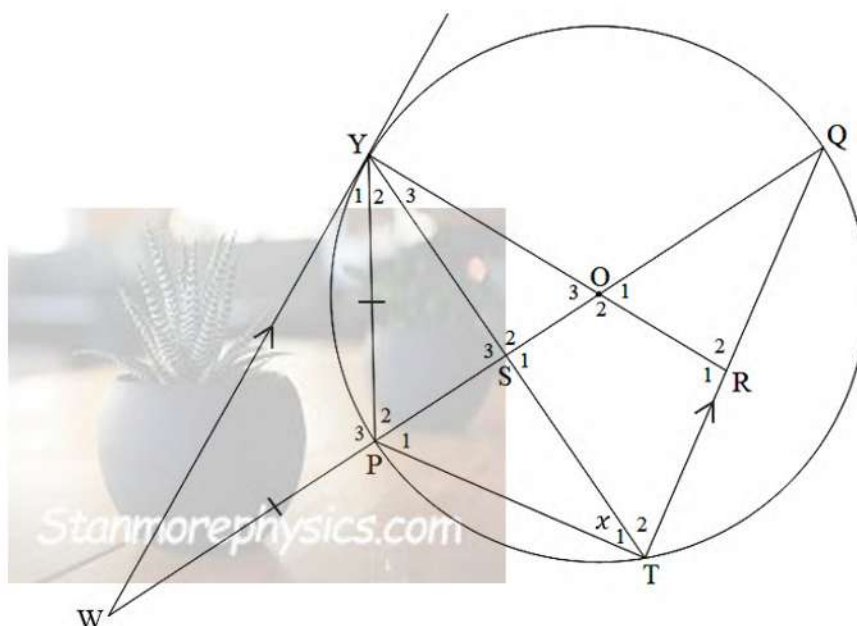
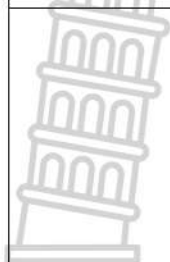
✓ S/R

✓ S

(4)

	
8.2.1	$\hat{Q}_1 = 40^\circ$ (equal chords ;equal angles) $\hat{P} = 100^\circ$ (sum of $\angle s$ in Δ) or (int $\angle s$ Δ) $x = 80^\circ$ (opp. $\angle$ of a cyclic quad.) (3)
8.2.2	$\hat{Q}_2 = 40^\circ$ (equal chord; equal angles) (2)
	[9]

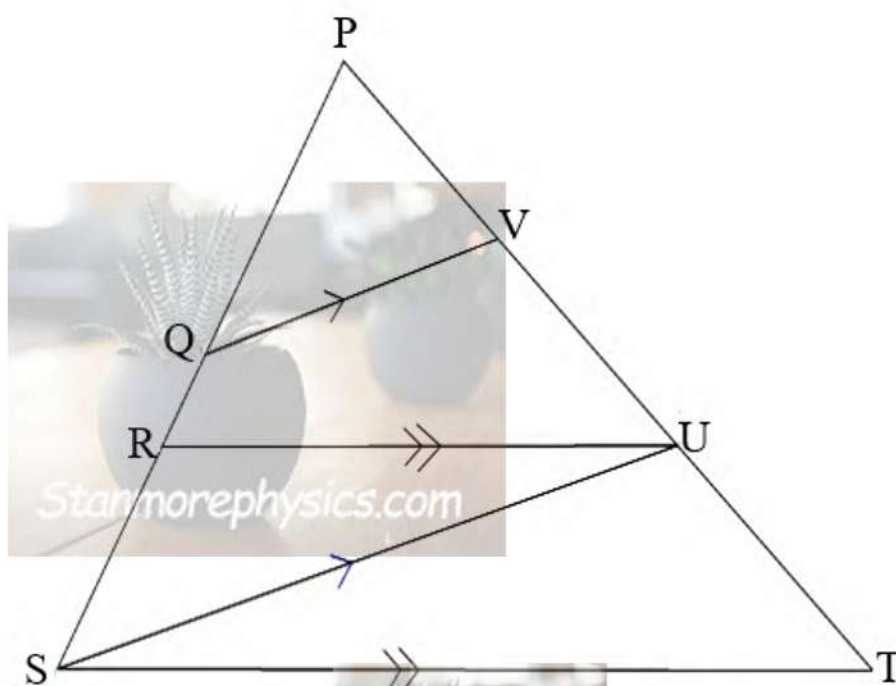
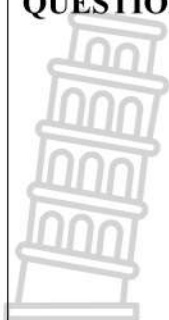
QUESTION 9



9.1.1	$\hat{Y}_1 = \hat{T}_1 = x$ (tan chord theorem)	✓ reason	(1)
9.1.2	$\hat{W} = \hat{Y}_1 = x$ (equal $\angle$ s opp = sides)	✓ reason	(1)
9.1.3	$\hat{Q} = \hat{W} = x$ (alt. $\angle$, $WY \parallel TQ$)	✓ reason	(1)
9.1.4	$\hat{Y}_2 = \hat{Q} = x$ (angles in same segment)	✓ reason	(1)
9.2	$\hat{T}_2 = \hat{Y}_1 + \hat{Y}_2$ $\hat{T}_2 = 2x$ (alt. $\angle$, $WY \parallel TQ$) $\therefore \hat{T}_2 = 2\hat{T}_1$ OR $\hat{P}_2 = 2x$ (ext $\angle$ of Δ) $\therefore \hat{T}_2 = 2x$ ($\angle$ s in same segment)	✓ S ✓ R ✓ S ✓ R	 (2) (2)

9.3	$\hat{O}_3 = 2\hat{T}_1 = 2x$ ($\angle$ at centre = $2 \times \angle$ at circumference) $T_2 = 2x$ (Proven) $\therefore SORT$ is a cyclic quad (converse ext $\angle$ of a cyclic quad)	✓ S/R ✓ R (2)
9.4	$\hat{T} = 90^\circ$ ($\angle$ in semi – circle) $\hat{T} = 3x$ $\therefore x = 30^\circ$	✓ S/R ✓ value of x (2)
9.5	$O\hat{Y}W = 90^\circ$ (rad $\perp$ tan) $\hat{R}_1 = 90^\circ$ (co – int $\angle$ s , $WY \parallel TQ$) $\therefore TR = RQ$ (line from centre $\perp$ chord)	✓ S/R ✓ S ✓ R (3)
		[13]

QUESTION 10



10.1.1 $\frac{PU}{UT} = \frac{3a}{2a}$ (prop thm, $RU \parallel ST$)

$3a = 30 \text{ cm}$

$UT = 2a = 20 \text{ cm}$

✓ $3a = 30 \text{ cm}$

✓ value of UT

(2)

10.1.2	$\frac{PV}{VU} = \frac{PQ}{QS} = \frac{7b}{8b} \quad \text{prop thm; } QV \parallel SU$ $\frac{PU}{UT} = \frac{PR}{RS} = \frac{3c}{2c} \quad \text{prop thm; } RU \parallel ST$ $5c = 15b$ $c = 3b$ $QR = 2b$ $\frac{QR}{RS} = \frac{2b}{6b} = \frac{1}{3}$ OR $\frac{PV}{VU} = \frac{PQ}{QR} = \frac{7b}{8b} \quad (\text{prop thm, } QV \parallel SU)$ $\frac{PS}{PQ} = \frac{PU}{PV} = \frac{15c}{7c} \quad (\text{prop thm, } QV \parallel ST)$ $\frac{PS}{PR} = \frac{PT}{PU} = \frac{5d}{3d} \quad (\text{prop theorem, } RU \parallel ST)$ $PS = \frac{15}{7}PQ \text{ and } PS = \frac{5}{3}PR$ $\frac{15}{7}PQ = \frac{5}{3}PR$ $\frac{PQ}{PR} = \frac{5}{3} \times \frac{7}{15}$ $\frac{PQ}{PR} = \frac{7p}{9p}$ $\therefore QR = 2p \text{ and } RS = 6p$ $\frac{QR}{RS} = \frac{1}{3}$	✓S ✓S ✓R ✓answer ✓S ✓S ✓R ✓answer (4)
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10.2.1	Let $DG = x$, then $GC = x$ $DB = DG = x$ (DB = DG, radii) $\frac{AC}{FC} = \frac{BC}{CD} = \frac{3x}{2x}$ (prop thm, $FD \parallel AB$) $\frac{AC}{FC} = \frac{3}{2}$	✓ R ✓ answer (2)
10.2.2	$E_1 = 90^\circ$ (radius $\perp$ tangent) $\hat{B} = 90^\circ$ (radius $\perp$ tangent) In $\triangle ABC$ and $\triangle DEC$ 1. C is common 2. $E_1 = B = 90^\circ$ (proven) 3. $A = D_3$ (sum of inter$\angle$s of Δ) $\therefore \triangle ABC \parallel \triangle DEC$ A, A, A	✓ C common ✓ S ✓ R (3)
10.2.3	$\frac{AB}{DE} = \frac{BC}{EC}$ (proven, $\parallel \Delta$) $AB = AE$ (tangents drawn to external points) $DE = DG = x$, radii $BC = 3x = 3DE$ $\therefore \frac{AE}{DE} = \frac{3DE}{EC}$ $DE^2 = \frac{AE \cdot EC}{3}$	✓ S/R ✓ S ✓ R ✓ $BC = 3x = 3DE$ (4)
10.2.4	$\frac{AC}{FC} = \frac{3}{2}$ (proven) $AC = 3k$ and $FC = 2k$ $\frac{\text{Area } \triangle FDC}{\text{Area } \triangle ABC} = \frac{\frac{1}{2} \times FC \times CD \sin C}{\frac{1}{2} \times AC \times BC \sin C}$ $\frac{\text{Area } \triangle FDC}{\text{Area } \triangle ABC} = \frac{2k \times 2x}{3k \times 3x} = \frac{4}{9}$	✓ correct use of area rule ✓ subst ✓ answer (3)
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