



Province of the
EASTERN CAPE
EDUCATION

Iphondo leMpuma Kapa: Isebe leMfundo
Provinsie van die Oos Kaap: Departement van Onderwys
Porafensie Ya Kapa Botjhabela: Lefapha la Thuto

NATIONAL SENIOR CERTIFICATE

GRADE 12

SEPTEMBER 2026

MATHEMATICS P2

MARKS: 150

TIME: 3 hours

This question paper consists of 13 pages, including 1 information sheet and an answer book of 22 pages.

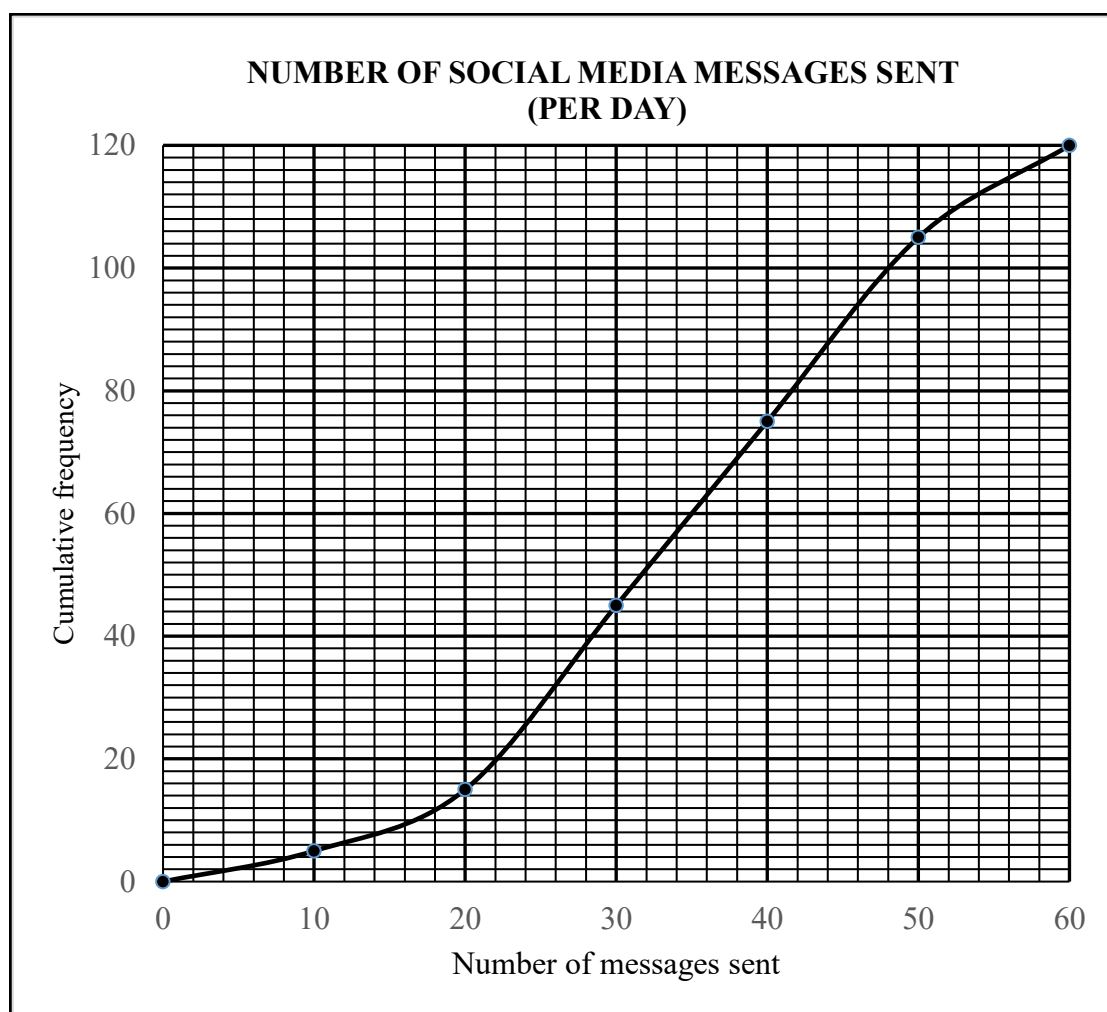
INSTRUCTIONS AND INFORMATION

Read the following instructions carefully before answering the questions.

1. This question paper consists of 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 the 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 ogive (cumulative frequency curve) below shows the number of social media messages sent by 120 learners in one day.



Use the ogive to answer the following questions.

- 1.1 How many learners sent less than 50 messages? (2)
- 1.2 Estimate the median number of messages sent per day. (2)
- 1.3 Determine the interquartile range (IQR) for the data. (3)
- 1.4 Draw a box and whisker diagram for the data on the numberline provided in the ANSWERBOOK, if minimum is 0 and maximum is 60. (2)
- 1.5 The mean number of messages is approximately equal to 37. Comment on the distribution of data. (2)

[11]

QUESTION 2

From a school sports team, eight young athletes were chosen. The table below shows their weekly weightlifting hours and the distance (in meters) they could throw a javelin.

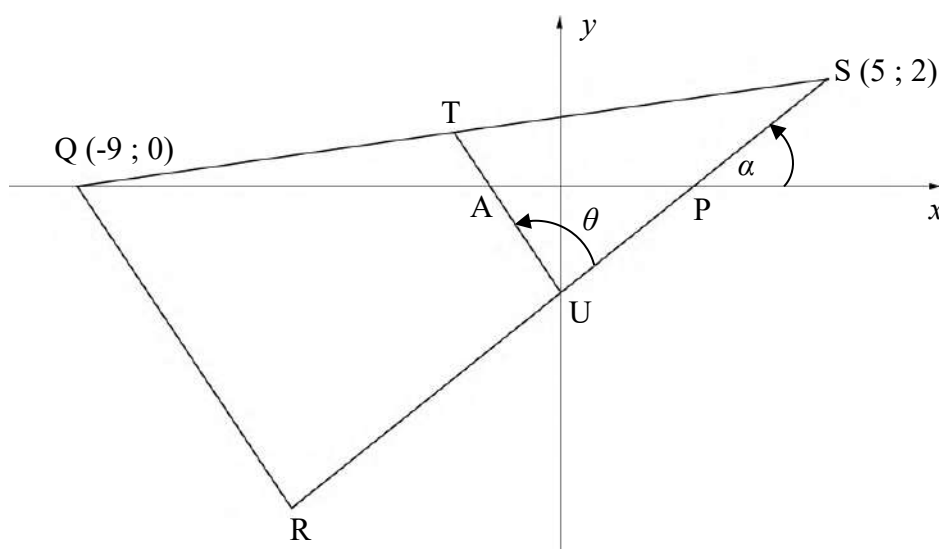
Learner	1	2	3	4	5	6	7	8
Number of hours (x)	5	12	15	20	25	30	42	45
Javelin distance (y)	130	118	115	95	88	72	48	30

- 2.1 Calculate the standard deviation of the javelin distances. (2)
- 2.2 Calculate the correlation coefficient (r) of the data. (1)
- 2.3 Determine the equation of the least squares regression line. (3)
- 2.4 A learner that was not chosen spent 35 hours per week in weightlifting.
- 2.4.1 Use your regression equation to predict the javelin distance he can cover. (2)
- 2.4.2 Is increasing gym hours likely to improve javelin distance? Justify your answer. (2)

[10]

QUESTION 3

In the diagram below, $S(5; 2)$, $Q(-9; 0)$ and R are vertices of ΔSQR . Point T is the midpoint of QS . Equation of SR is given by $5y = 4x - 10$. U is the y -intercept of TAU and $SPUR$. A and P lie on the x -axis. $\hat{TUS} = \theta$. Inclination of $SPUR$ is α .

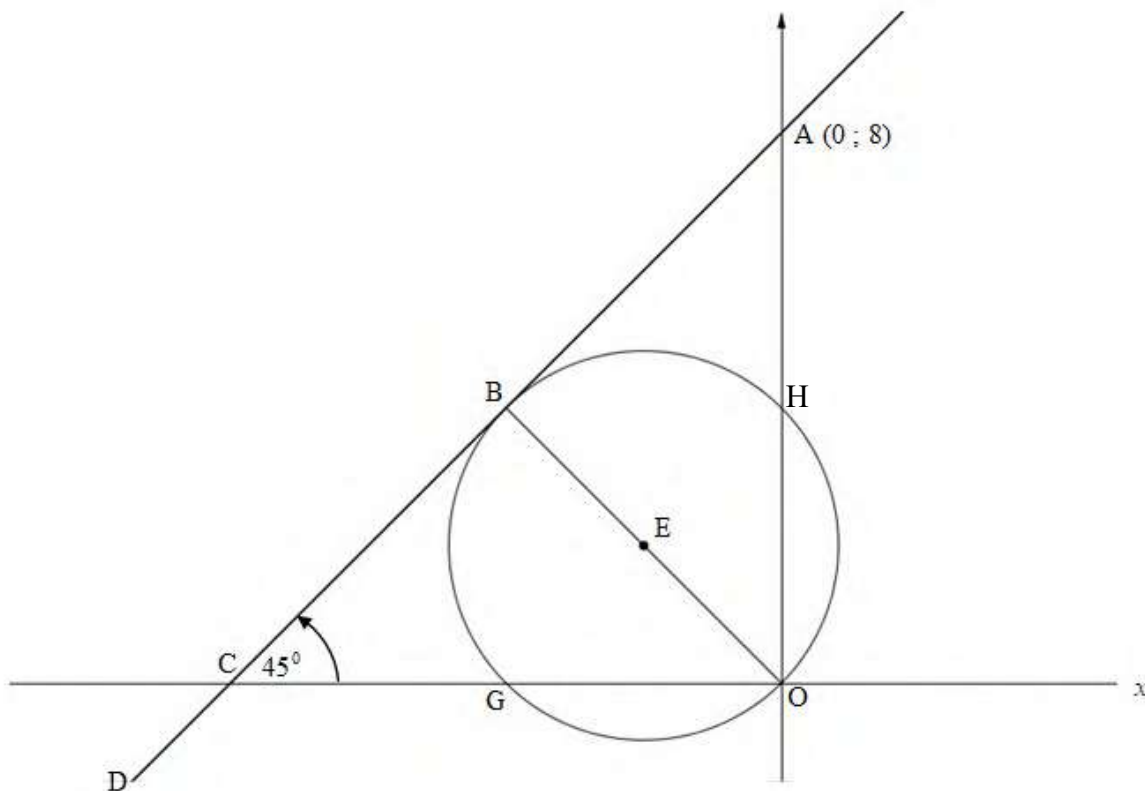


- 3.1 Calculate the coordinates of T , the midpoint of QS . (2)
- 3.2 Calculate the coordinates of U . (2)
- 3.3 Calculate length of SU . (2)
- 3.4 If it is further given that $3x + 2y + 27 = 0$ is the equation of QR , show that $QR \parallel TU$. (3)
- 3.5 Hence or otherwise, write down the length of QR . (2)
- 3.6 Determine the size of θ . (4)
- 3.7 Determine the area of ΔSQR . (4)

[19]

QUESTION 4

A circle with centre E passes through the origin. The circle intersects the x -axis at G and the y -axis at H. The tangent to the circle at B cuts the y -axis at A (0 ; 8) and form an angle of 45° with the x -axis.



- 4.1 Write down the gradient of AD. (1)
- 4.2 Determine the equation of OB. (3)
- 4.3 Determine the coordinates of B, if the equation of the tangent is given by: $y = x + 8$. (3)
- 4.4 Calculate the length of the radius of the circle. (3)
- 4.5 Determine the equation of the circle in the form $(x-a)^2 + (y-b)^2 = r^2$. (4)
- 4.6 For which values of t will the equation $y = x + t$ be a tangent to the circle? (2)
- 4.7 Another circle with equation $(x-4)^2 + (y-8)^2 = 9$ is given. Determine whether the TWO circles touch each other or not. Justify your answer. (4)

[20]

QUESTION 5

5.1 Given: $\sin 49^\circ = q$, determine the following in terms of q :

5.1.1 $\tan 41^\circ$ (2)

5.1.2 $\cos 229^\circ$ (2)

5.1.3 $\sin 4^\circ$ (4)

5.2 Given: $f(x) = \frac{\sin(x - 180^\circ) \cdot \sin(90^\circ + x)}{\sin^2 x - \cos^2(360^\circ - x)}$

5.2.1 Simplify $f(x)$ to a one trigonometric ratio of x . (7)

5.2.2 For which values of $x \in [-180^\circ + 0^\circ]$, is $f(x)$ undefined? (2)

[17]

QUESTION 6

6.1 Given: $\cos(A - B) = \cos A \cos B + \sin A \sin B$

Use the formula given above to derive a formula for $\cos(A + B)$ (3)

6.2 **Without using a calculator**, prove that

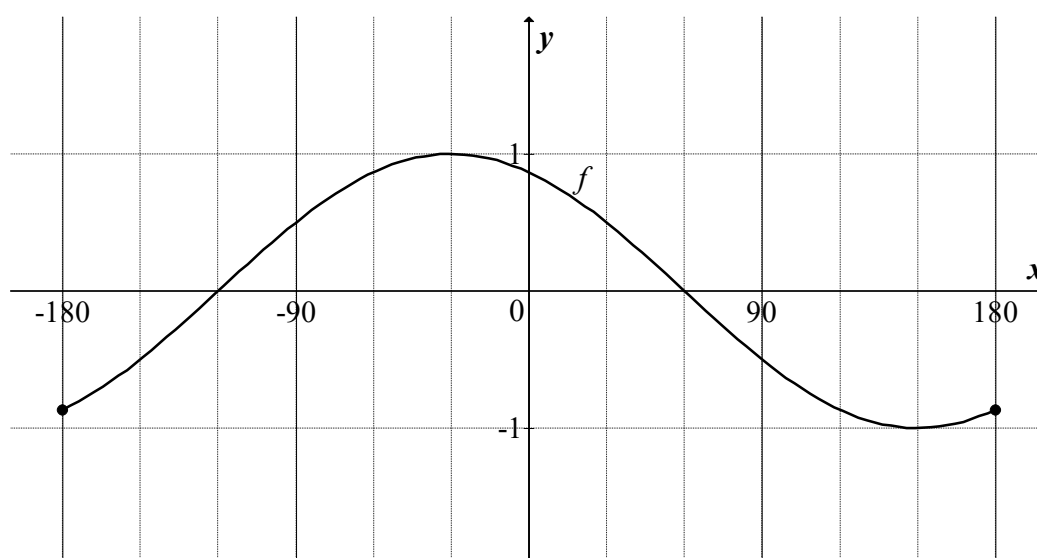
$$\frac{\sin 22^\circ \cdot \cos 320^\circ + \sin 40^\circ \sin 68^\circ}{\sin 391^\circ \cdot \cos 31^\circ} = 2 \quad (6)$$

6.3 It is given that $\cos 2x + 5 \sin x = 3$. Determine the values of x in the interval where $-360^\circ \leq x \leq 0^\circ$ (5)

[14]

QUESTION 7

Given: $f(x) = a \cos(x + p)$ where $x \in [-180^\circ; 180^\circ]$



7.1 Determine the values of a and p . (2)

7.2 Write down the period of f (1)

7.3 Sketch the graph of $g(x) = -\sin x$, where $x \in [-180^\circ; 180^\circ]$ on the grid provided in the ANSWER BOOK. Clearly indicate intercepts with the axes. (3)

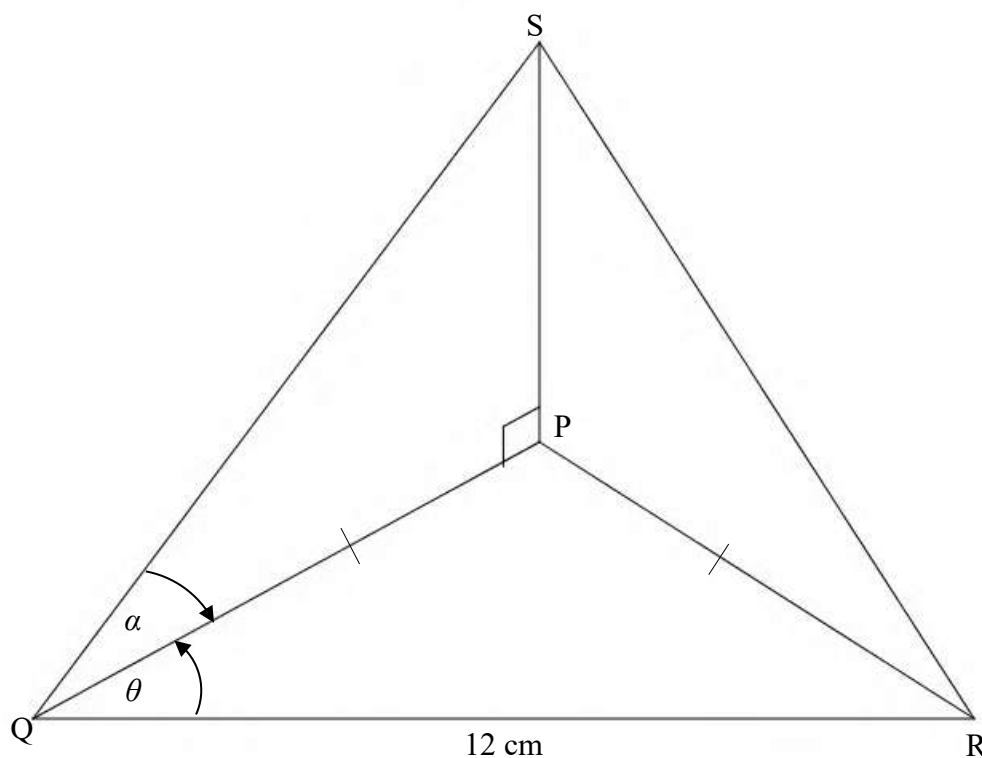
7.4 Write down the values of x where $g(x) = f(x)$ in the interval $x \in [-180^\circ; 180^\circ]$. (2)

7.5 Determine the range of h , if $h(x) = -g(x) - 2$. (2)

[10]

QUESTION 8

In the diagram, Q, P and R are points on the same horizontal plane. S is the top of a vertical tower. $QR = 12\text{ cm}$, $\hat{SQP} = \alpha$ and $\hat{PQR} = \theta$. $PQ = PR$



8.1 Show that $SQ = \frac{6}{\cos \theta \cos \alpha}$ (6)

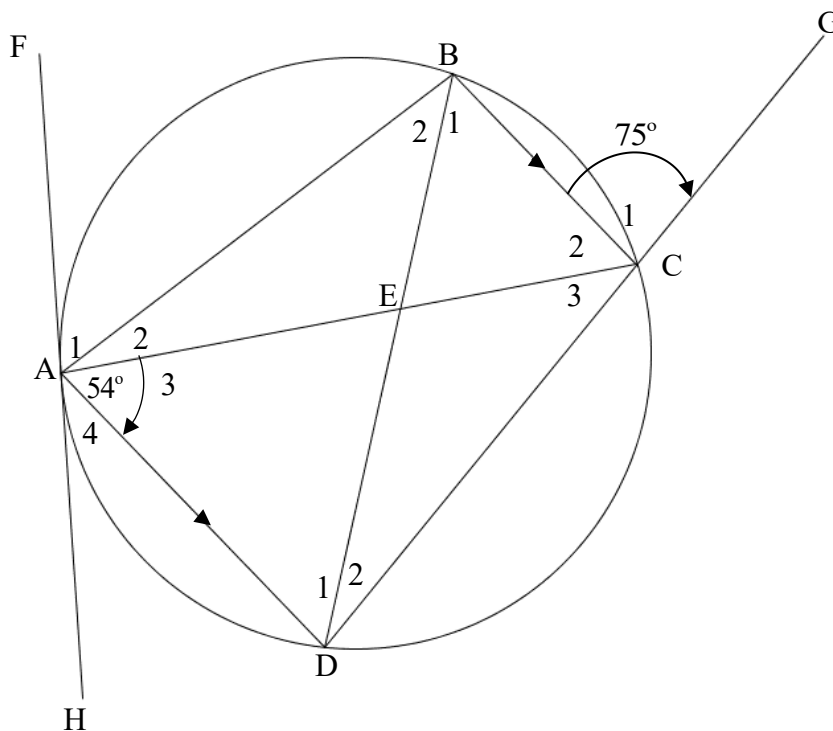
8.2 If it is further given that $\theta = 50^\circ$ and $\alpha = 35^\circ$, calculate the length of SQ. [Round off your answer to 2 decimal places.] (2)
[8]

QUESTION 9

9.1 Complete the theorem below:

Exterior angle of a cyclic quadrilateral ... (1)

9.2 In the diagram below, ABCD is a cyclic quadrilateral. DC is extended to G. FAH is a tangent to the circle at point A. $BC \parallel AD$, $\hat{C}_1 = 75^\circ$ and $\hat{A}_3 = 54^\circ$.



Determine the size of the following angles with reasons:

9.2.1 $\hat{A}_2$ (2)

9.2.2 $\hat{D}_2$ (2)

9.2.3 $\hat{A}_1$ (3)

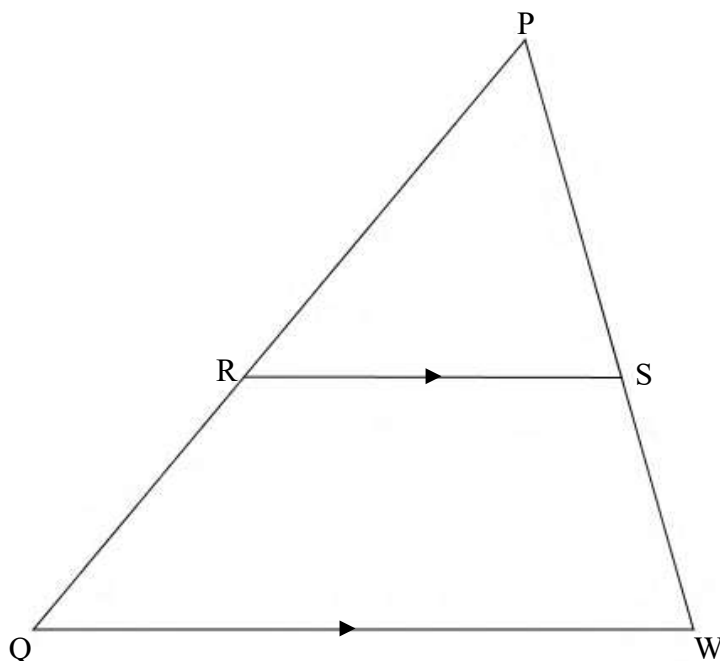
9.2.4 Give a reason why $AE = ED$. (3)

[11]

QUESTION 10

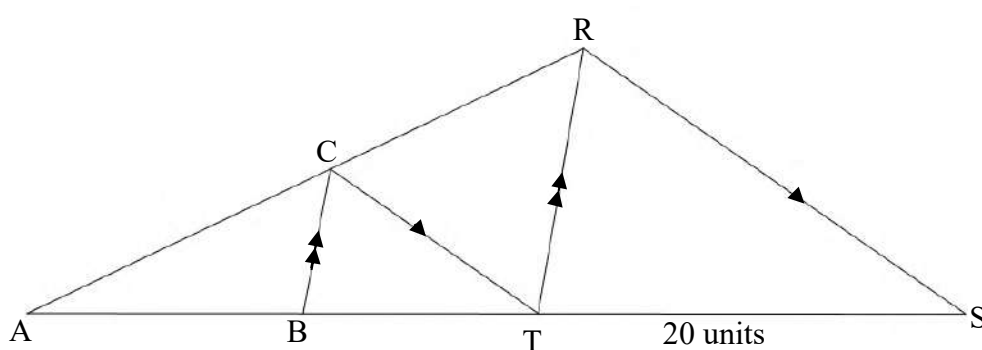
- 10.1 In the diagram below, $\triangle PQW$ is drawn with R on side PQ and S on side PW. RS is joined such that $RS \parallel QW$. Prove the theorem which states that a line drawn parallel to one side of a triangle divides the other two sides proportionally,

i.e. prove that: $\frac{PR}{RQ} = \frac{PS}{SW}$



(5)

- 10.2 In the diagram below, $\triangle ARS$ is drawn with C on line AR and B and T on line AS. $BC \parallel TR$ and $CT \parallel RS$. $TS = 20$ units and $AC : AR = 3 : 8$.



Calculate the length of:

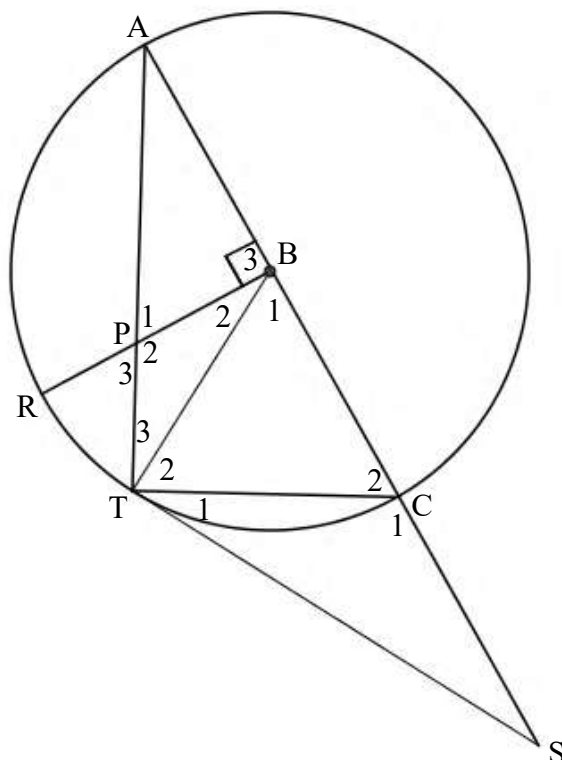
10.2.1 AT (4)

10.2.2 AB (3)

[12]

QUESTION 11

In the diagram below, A, R, T and C are points on the circumference of the circle. B is centre of the circle. ABC the diameter of the circle is produced to S. TS is the tangent of the circle at T. BPR is perpendicular to ABC. Angles are marked as follows: $\angle ABP = 1$, $\angle PBT = 2$, $\angle BPT = 3$, $\angle BTP = 2$, $\angle TPC = 1$, $\angle PCT = 2$, $\angle TCS = 1$, $\angle SCT = 2$.



- 11.1 Name TWO other angles each equal to $\hat{T}_1$, giving reasons. (3)
- 11.2 Prove that PBCT is a cyclic quadrilateral. (3)
- 11.3 Prove that $\triangle SCT \parallel \triangle BPT$ (4)
- 11.4 Prove that $SC = \frac{ST \cdot BP}{AB}$ (2)
- 11.5 Give a reason why $\hat{BTS} = 90^\circ$ (1)
- 11.6 If it is further given that $BR = CS$, prove that $TS = 3BP$. (5)

[18]

TOTAL: 150

INFORMATION SHEET: MATHEMATICS

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

$$y = mx + c \quad y - y_1 = m(x - x_1)$$

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

$$m = \tan \theta$$

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

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

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

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

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

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

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

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

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

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

$$\bar{x} = \frac{\sum x}{n} \quad \sigma^2 = \frac{\sum (x_i - \bar{x})^2}{n}$$

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

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

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

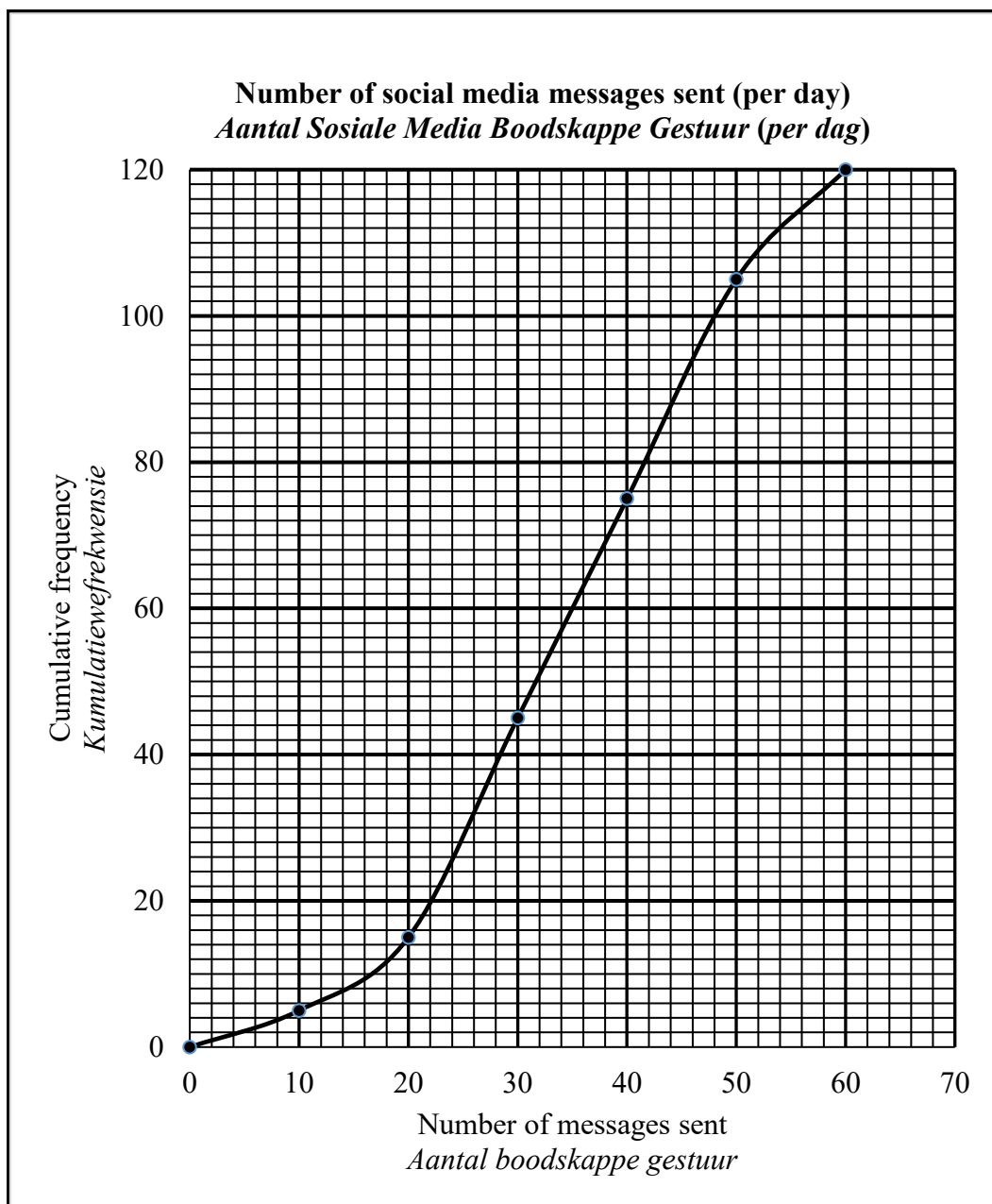
$$b = \frac{\sum (x - \bar{x})(y - \bar{y})}{\sum (x - \bar{x})^2}$$


 LEARNER'S NAME AND SURNAME:
LEERDER NAAM EN VAN
GRADE/GRAAD 12
**NATIONAL/NASIONALE
 SENIOR
 CERTIFICATE/SERTIFIKAAT**
GRADE 12/GRAAD 12
SEPTEMBER 2026
**MATHEMATICS P2/WISKUNDE V2
 SPECIAL ANSWER BOOK/SPEZIALE ANTWOORDEBOEK**

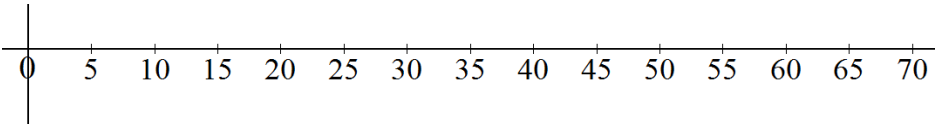
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Question Vraag	Mark Punt	Initial Parafeer	Marks Punte	S M	Marks Punte	D M	Marks Punte	P M	Marks Punte	N M			
1													
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11													
TOTAL TOTAAL													

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

QUESTION/VRAAG 1



	Solution/Oplissing	Marks Punte
1.1		(2)
1.2		(2)

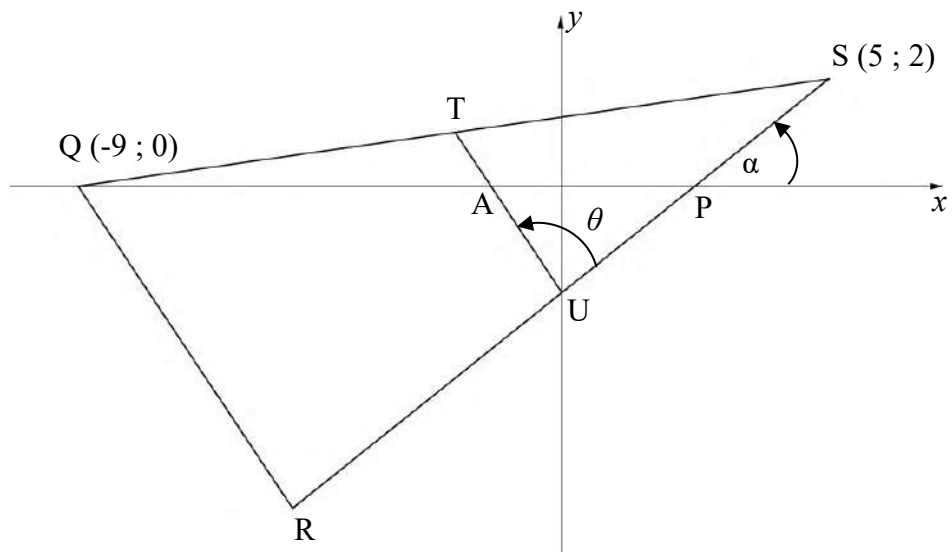
1.3		(3)
1.4		(2)
1.5		(2)
		[11]

QUESTION/VRAAG 2

Learner / Leerder	1	2	3	4	5	6	7	8
Gym training (x) <i>Gim oefening (x)</i>	5	12	15	20	25	30	42	45
Javelin distance (y) <i>Spiesgooi afstand (y)</i>	130	118	115	95	88	72	48	30

	Solution/Oplissing	Marks Punte
2.1		(2)
2.2		(1)
2.3		(3)
2.4.1		(2)
2.4.2		(2)
		[10]

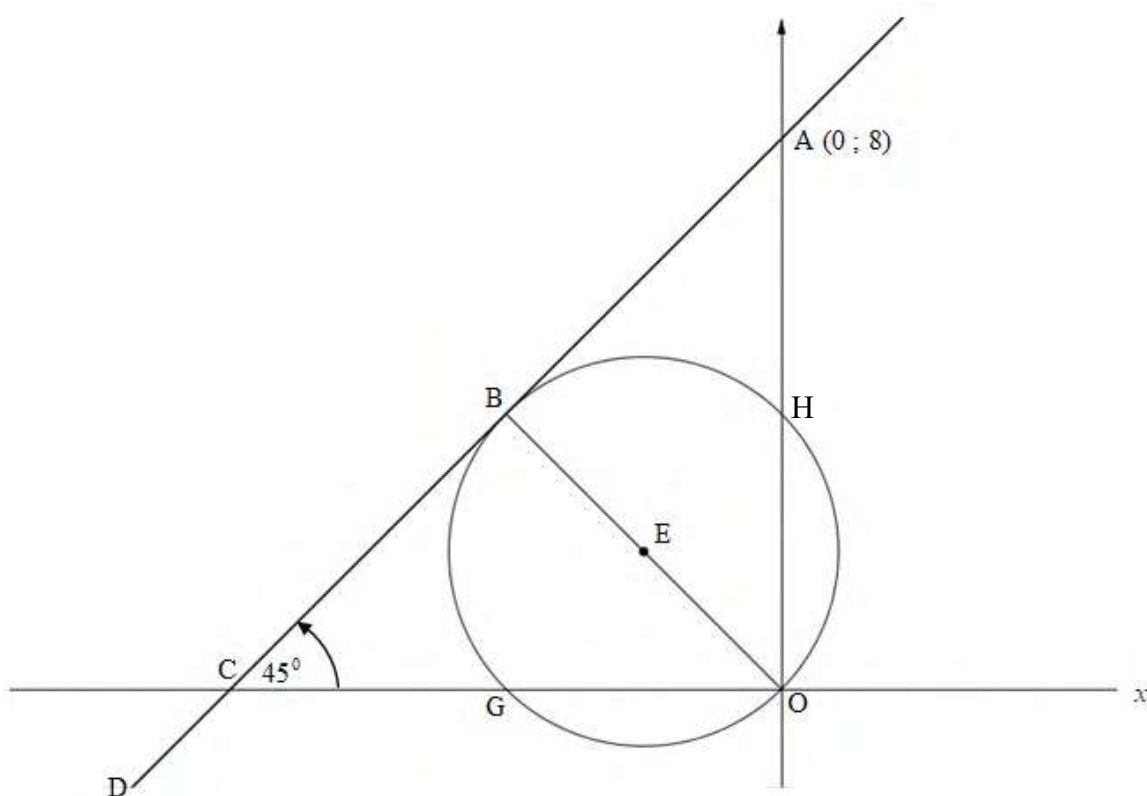
QUESTION/VRAAG 3



	Solution/Oplissing	Marks/ Punte
3.1		(2)
3.2		(2)
3.3		(2)

3.4		(3)
3.5		(2)
3.6		(4)
3.7		(4)
		[19]

QUESTION/VRAAG 4



	Solution/Oplossing	Marks/ Punte
4.1		(1)
4.2		(3)
4.3		(3)

4.4		(3)
4.5		(4)
4.6		(2)
4.7		(4)
		[20]

QUESTION/VRAAG 5

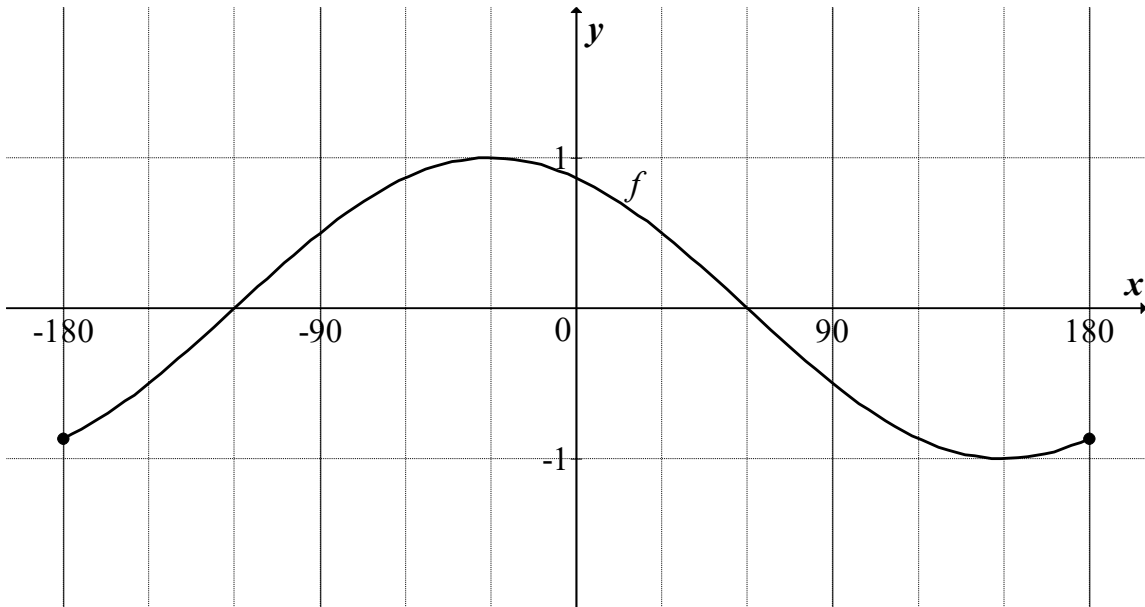
	Solution/Oplissing	Marks/ Punte
5.1.1		(2)
5.1.2		(2)
5.1.3		(4)

5.2.1		(7)
5.2.2		(2)
		[17]

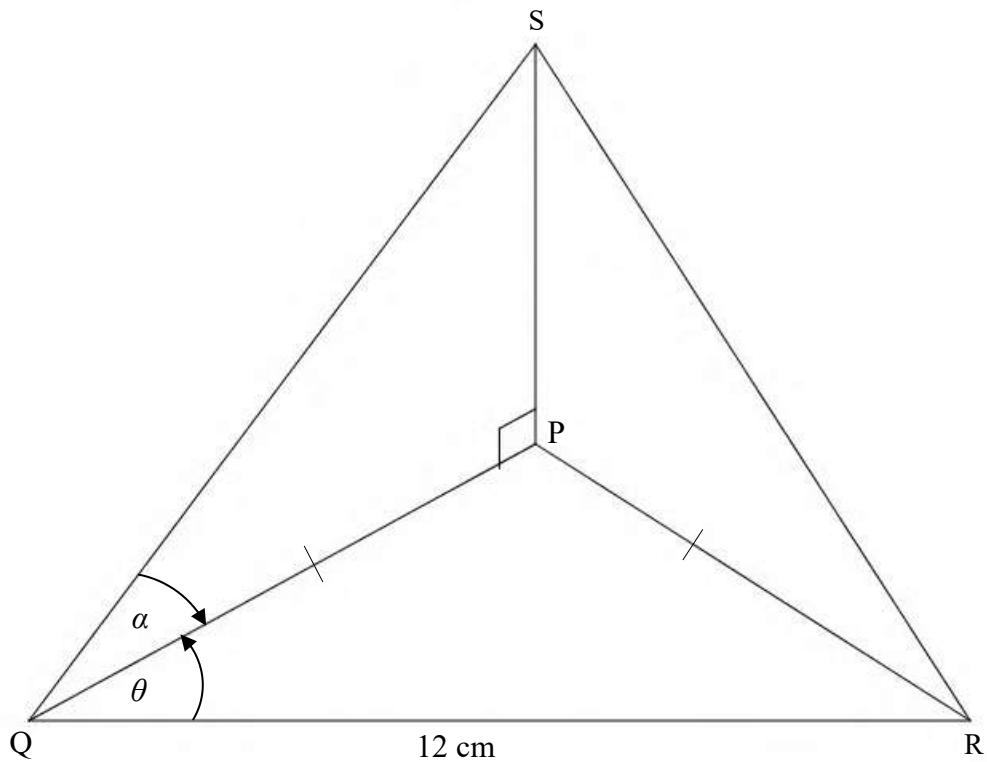
QUESTION/VRAAG 6

	Solution/Oplissing	Marks/ Punte
6.1		(3)
6.2		(6)
6.3		(5)
		[14]

QUESTION/VRAAG 7

	Solution/Oplissing	Marks/ Punte
7.1		(2)
7.2		(1)
7.3		(3)
7.4		(2)
7.5		(2)
		[10]

QUESTION/VRAAG 8

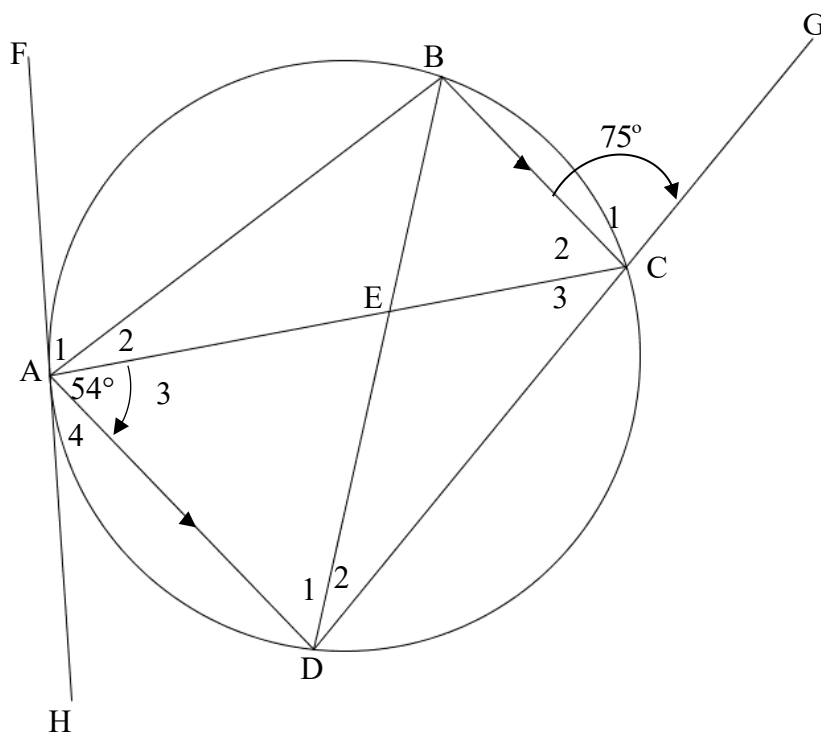


	Solution/Oplissing	Marks/ Punte
8.1		(6)

8.2		(2)
		[8]

QUESTION/VRAAG 9

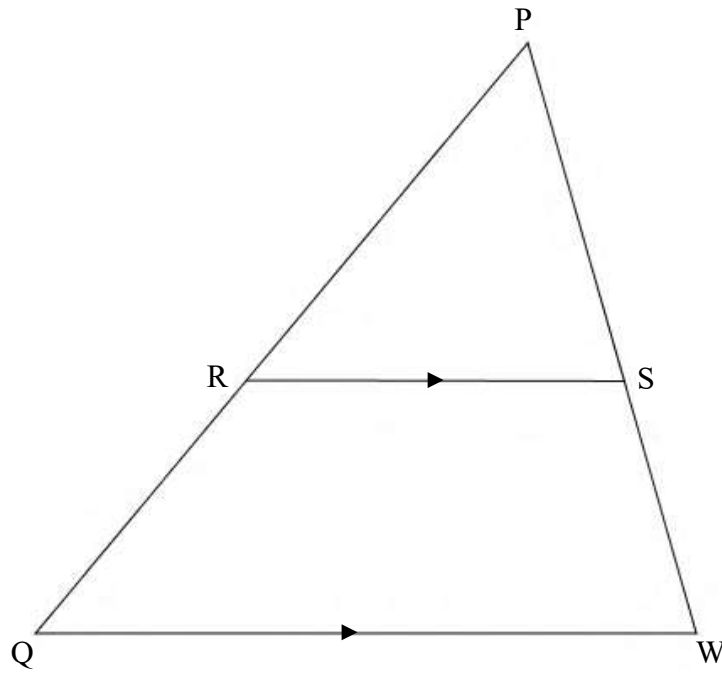
	Solution/Oplossing	Marks/ Punte
9.1		(1)



	Solution/Oplossing	Marks/ Punte
9.2.1		(2)
9.2.2		(2)
9.2.3		(3)

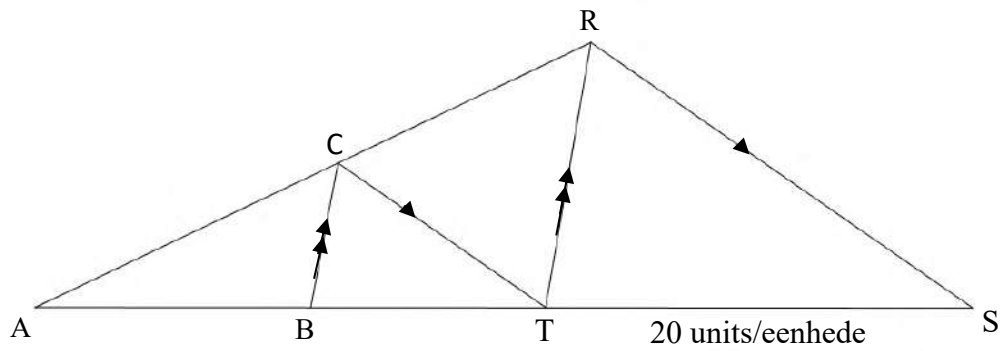
9.2.4		(3)
		[11]

QUESTION/VRAAG 10



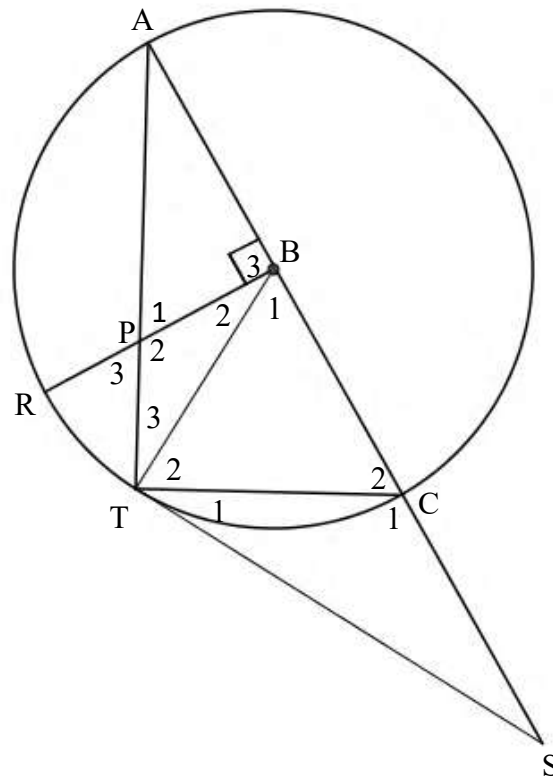
	Solution/ <i>Oplossing</i>	Marks/ <i>Punte</i>
10.1		(5)

10.2



	Solution/Oplissing	Marks/ Punte
10.2.1		(4)
10.2.2		(3)
		[12]

QUESTION/VRAAG 11



	Solution/ <i>Oplossing</i>	Marks/ <i>Punte</i>
11.1		(3)
11.2		(3)

11.3		(4)
11.4		(2)
11.5		(1)
11.6		(5)
		[18]

TOTAL/TOTAAL: 150

Additional Space/Advisionele Ruimte

Additional Space/*Addizionele Ruimte*

**ADDITIONAL MARKING NOTES MATHEMATICS P2 SEPTEMBER 2026**

1.1	Accept 104 -106	
1.2	Accept 34-36	
1.3	Accept 24-26 & 44-46	
1.4	CA from 1.2 & 1.3	
1.5	Negatively or positively skewed any response between the 2 should be accepted. Diagram in 1.4 and the statement in 1.5 are contradictory	
2.3	- Answer only full marks - Award 1 mark for swopping the value of a & b in equation	
2.4	Answer from calculator should be accepted	
3.1	Answer only full marks	
3.3	CA from 3.2	
3.4	Applying proportionality in calculating sides of the diagram should be accepted	
3.5	Calculating distance of QR from coordinates of R should be accepted	
3.6	Cosine rule should be accepted	
3.7	$R(-5;-6) \& P(2,5;0)$ $\text{Area } \triangle SQP + \text{Area } \triangle RQP = \frac{1}{2} \times \frac{3}{2} \times 2 + \frac{1}{2} \times 11,5 \times 6$ $= 45$	✓PQ ✓ $\perp$ heights ✓ correct substitution ✓ answer
4.2	Answer only full marks	
4.3	Assuming B is the midpoint of AC, award only 1 mark	
5.1.2	CA from 5.1.1	



5.1.3	$\begin{aligned}\sin 4^{\circ} &= \sin(45^{\circ} - 41^{\circ}) \\ &= \sin 45^{\circ} \cos 41^{\circ} - \sin 41^{\circ} \cos 45^{\circ} \\ &= \frac{\sqrt{2}}{2} \cdot \frac{q}{2} - \sqrt{1-q^2} \cdot \frac{\sqrt{2}}{2} \\ &= \frac{\sqrt{2}}{2} \left(\frac{q - \sqrt{1-q^2}}{2} \right)\end{aligned}$	✓ compound angle $\sin(45^{\circ} - 41^{\circ})$ ✓ expansion ✓✓ substitution for each term
5.2.1	Correct $(-\cos x)^2$ to be $(\cos x)^2$	
6.2	$\begin{aligned}LHS &= \frac{\sin 22^{\circ} \cos 320^{\circ} + \sin 40^{\circ} \sin 68^{\circ}}{\sin 391^{\circ} \cos 31^{\circ}} \\ &= \frac{\sin 22^{\circ} \cos 40^{\circ} + \sin 40^{\circ} \cos 22^{\circ}}{\sin 31^{\circ} \cdot \cos 31^{\circ}} \\ &= \frac{\sin(22^{\circ} + 40^{\circ})}{\frac{\sin 62^{\circ}}{2}} \\ &= 2 \times \frac{\sin 62^{\circ}}{\sin 62^{\circ}} \\ &= 2\end{aligned}$ OR $\begin{aligned}LHS &= \frac{\sin 22^{\circ} \cos 320^{\circ} + \sin 40^{\circ} \sin 68^{\circ}}{\sin 391^{\circ} \cos 31^{\circ}} \\ &= \frac{\sin 22^{\circ} \cos 40^{\circ} + \sin 40^{\circ} \cos 22^{\circ}}{\sin 31^{\circ} \cdot \cos 31^{\circ}} \\ &= \frac{\sin(22^{\circ} + 40^{\circ})}{\sin 31^{\circ} \cos 31^{\circ}} \\ &= \frac{\sin 62^{\circ}}{\sin 31^{\circ} \cos 31^{\circ}} \\ &= \frac{2 \sin 31^{\circ} \cos 31^{\circ}}{\sin 31^{\circ} \cos 31^{\circ}} \\ &= 2 \\ &= 2\end{aligned}$	✓ $\cos 40^{\circ}$ ✓ $\cos 22^{\circ}$ ✓ $\sin 31^{\circ}$ ✓ compound angle of $\sin(22^{\circ} + 40^{\circ})$ ✓ $\frac{\sin 62^{\circ}}{2}$ ✓ $\sin 62^{\circ}$ numerator OR ✓ $\cos 40^{\circ}$ ✓ $\cos 22^{\circ}$ ✓ $\sin 31^{\circ}$ ✓ compound angle of $\sin(22^{\circ} + 40^{\circ})$ ✓ $\sin 62^{\circ}$ ✓ $2 \sin 31^{\circ} \cos 31^{\circ}$ numerator
7.4	CA from 7.3	
8.1	Cosine rule is also applicable	
9.1	Equal opposite interior angle	
9.2.4	CA from 9.2.1 -9.2.3	



10.2.2	$\frac{AB}{AT} = \frac{AC}{AR}$ $\frac{AB}{12} = \frac{3}{8}$ $AB = \frac{9}{2}$	$[line \parallel to\ one\ side\ of\ a\ \Delta]$	✓ S ✓ correct substitution ✓ answer
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NB – These notes were compiled following a detailed and intensive MG discussion representing the EC. The notes will be circulated to all schools to ensure consistent marking throughout the Province of the EC.

Thank you to all who participated in the MG discussion to ensure that our learners are awarded the marks that they deserve.



**NATIONAL/NASIONALE
SENIOR
CERTIFICATE/SERTIFIKAAT**

GRADE/GRAAD 12

SEPTEMBER 2026

**MATHEMATICS P2/WISKUNDE V2
MARKING GUIDELINE/NASIENRIGLYN**

MARKS/PUNTE: 150

This marking guideline consists of 17 pages.
Hierdie nasienriglyn bestaan uit 17 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 a question, mark the crossed-out version.
- Consistency accuracy applies in ALL aspects of the marking guideline. Stop marking at the second calculation error.
- Assuming answers/values in order to solve a problem is NOT acceptable.

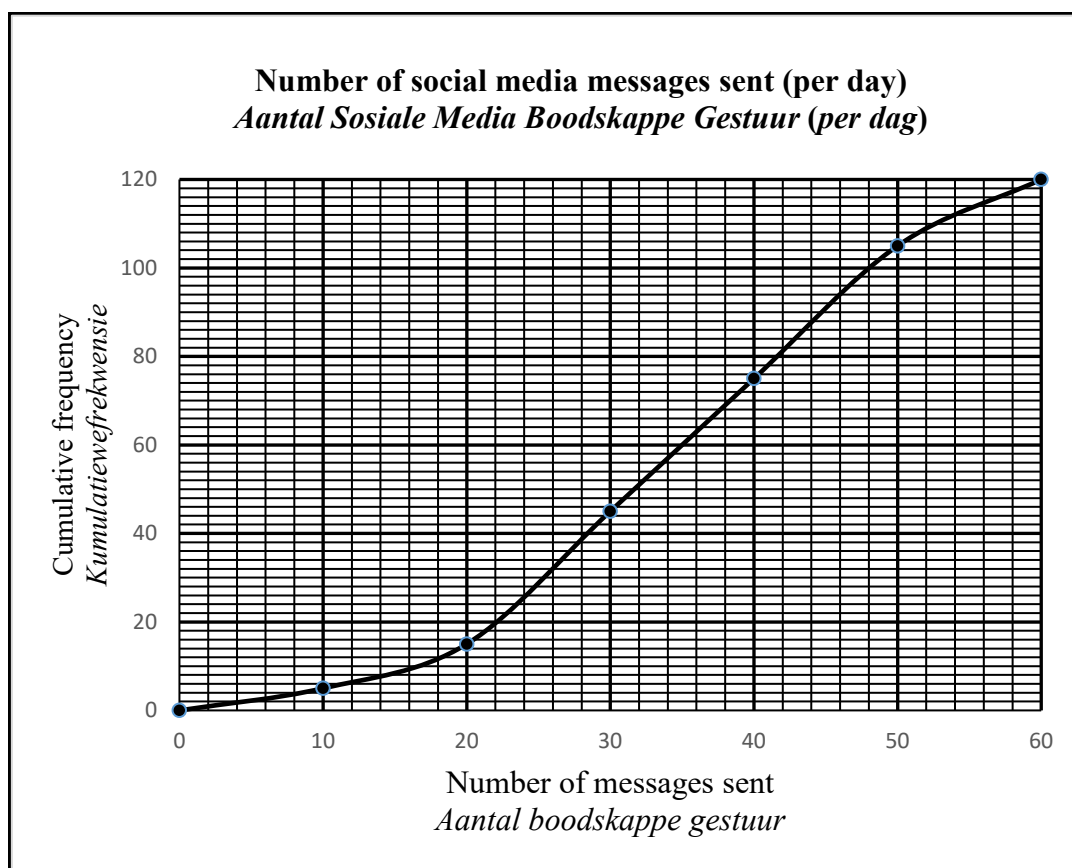
GEOMETRY	
S	A mark for a correct statement. (A statement mark is independent of a reason).
R	A mark for the correct reason. (A reason mark may only be awarded only if the statement is correct.
S/R	Award a mark if a statement and a reason are both correct.

NOTA:

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

MEETKUNDE	
S	'n Punt vir korrekte bewering. ('n Punt vir 'n bewering is onafhanklik van die rede.)
R	'n Punt vir 'n korrekte rede. ('n Punt word slegs vir die rede toegeken as die bewering korrek is.)
S/R	Ken 'n punt toe as die bewering en rede beide korrek is.

QUESTION/VRAAG 1

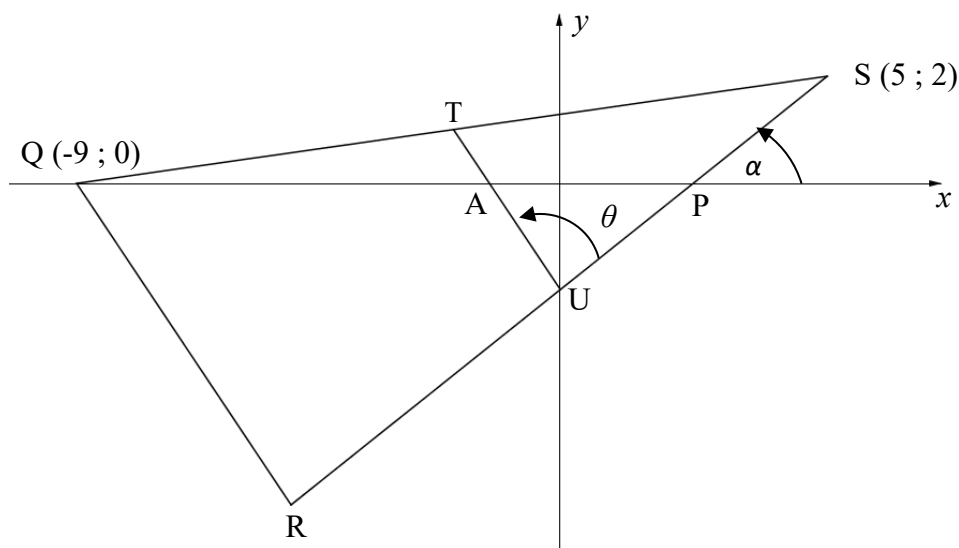


1.1	104 learners/ <i>leerders</i>	✓✓ answer/ <i>antwoord</i>	(2)
1.2	$Q_2 = 35$	✓✓ answer/ <i>antwoord</i>	(2)
1.3	$Q_1 = 25$ $Q_3 = 45$ $IQR / IKV = 45 - 25 = 20$	✓ Q_1 ✓ Q_3 ✓ answer/ <i>antwoord</i>	(3)
1.4	Number of messages sent / <i>Aantal boodskappe gestuur</i>	✓ correct min & max ✓ correct box and whisker diagram	(2)
1.5	mean > median which indicates that the data is positively skewed, meaning fewer learners sent significantly more messages than the rest. <i>gemiddelde > mediaan wat aandui dat die data positief skeef is, wat beteken dat minder leerders baie meer boodskappe as die res gestuur het.</i>	✓ mean > median <i>gemiddelde > mediaan</i> ✓ explanation <i>verduideliking</i>	(2)
			[11]

QUESTION/VRAAG 2

<table><tr><th>Learner / Leerder</th><th>1</th><th>2</th><th>3</th><th>4</th><th>5</th><th>6</th><th>7</th><th>8</th></tr><tr><th>Number of hours (x) <i>Aantal ure (x)</i></th><td>5</td><td>12</td><td>15</td><td>20</td><td>25</td><td>30</td><td>42</td><td>45</td></tr><tr><th>Javelin distance (y) <i>Spiesgooi afstand (y)</i></th><td>130</td><td>118</td><td>115</td><td>95</td><td>88</td><td>72</td><td>48</td><td>30</td></tr></table>									Learner / Leerder	1	2	3	4	5	6	7	8	Number of hours (x) <i>Aantal ure (x)</i>	5	12	15	20	25	30	42	45	Javelin distance (y) <i>Spiesgooi afstand (y)</i>	130	118	115	95	88	72	48	30	
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2.1	$\delta = 32,89$					✓✓ answer/antwoord			(2)																											
2.2	$r = -0,99$					✓ answer/antwoord			(1)																											
2.3	$a = 146,80 \quad b = -2,47$ $y = 146,80 - 2,47x$					✓ a ✓ b ✓ answer/antwoord			(3)																											
2.4.1	$y = 146,80 - 2,47(35)$ $= 60,35$					✓ correct substitution <i>korrekte vervanging</i> ✓ answer/antwoord			(2)																											
2.4.2	No, as the strong negative correlation suggests that more gym training is associated with decreasing throwing distances. <i>Nee, soos die sterk negatiewe korrelasie voorstel dat meer gimnasium oefening word assosieer met afname in spiesgooi afstande.</i>					✓ for No / <i>vir Nee</i> ✓ explanation/ <i>verduideliking</i>			(2)																											
									[10]																											

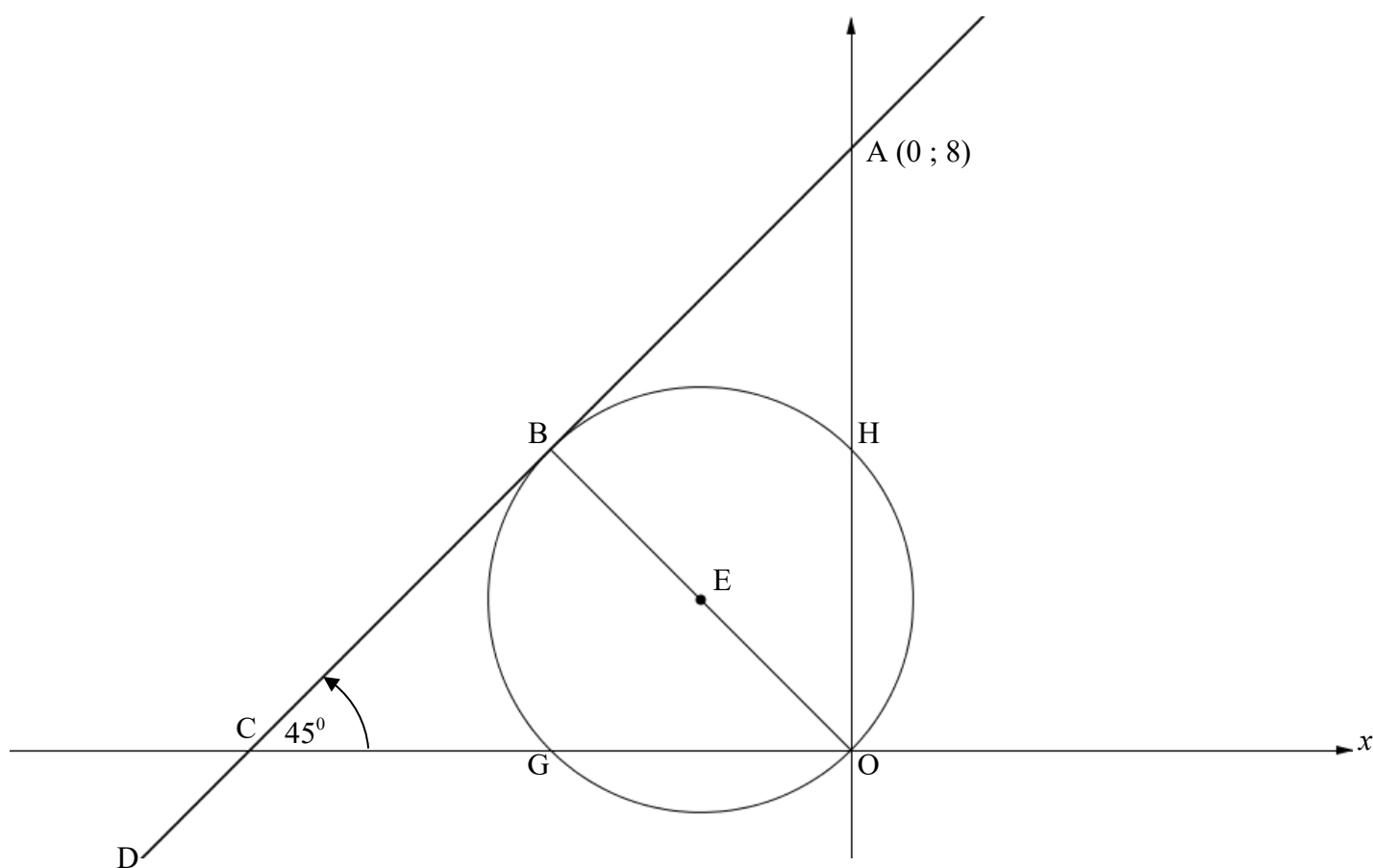
QUESTION/VRAG 3



3.1	$x_T = \frac{-9+5}{2}; y_T = \frac{0+2}{2}$ $x_T = -2; y_T = 1$ $T(-2; 1)$	$\checkmark x_T = -2 \quad \checkmark y_T = 1$	(2)
3.2	$5y = 4(0) - 10$ $y = -2$ $U(0; -2)$	$\checkmark x = 0$ $\checkmark y = -2$	(2)
3.3	$SU = \sqrt{(5-0)^2 + (2+2)^2}$ $= \sqrt{41}$	$\checkmark$ correct substitution <i>korrekte vervanging</i> $\checkmark$ answer/antwoord	(2)
3.4	$y = -\frac{3}{2}x - \frac{27}{2}$ $m_{QR} = -\frac{3}{2}$ $m_{TU} = \frac{1+2}{-2-0}$ $= -\frac{3}{2}$ $\therefore QR \parallel TU \quad [m_{QR} = m_{TU}]$	$\checkmark m_{QR}$ $\checkmark$ correct substitution <i>korrekte vervanging</i> $\checkmark m_{TU}$	(3)
3.5	$TU = \sqrt{(-2-0)^2 + (1+2)^2}$ $= \sqrt{13}$ $QR = 2TU = 2\sqrt{13} \text{ [line through midpt } \parallel \text{ to 2nd side]}$ $[\text{lyn deur middelpunt } \parallel \text{ aan 2de sy}]$	$\checkmark TU = \sqrt{13}$ $\checkmark QR = 2\sqrt{13}$	(2)

3.6	$\tan \hat{TAP} = m_{TU} = -\frac{3}{2}$ $\hat{TAP} = 123.69^{\circ}$ $\tan \alpha = m_{SR} = \frac{4}{5}$ $\alpha = 38,66^{\circ}$ $\therefore \theta = 85.03^{\circ}$	✓ $\tan \hat{TAP} = m_{TU}$ ✓ inclination of TU <i>inklinasie van TU</i> ✓ inclination of SR <i>inklinasie van SR</i> ✓ answer/antwoord	(4)
3.7	$\hat{R} = \theta = 85.03^{\circ}$ [corresp. $\angle$ s: $QR \parallel TU$] / [ooreenk. $\angle$ e: $QR \parallel TU$] $SR = 2SU$ [Midpoint Theorem.] / [Middelpunt Stelling] $A. \text{ of } \triangle SQR = \frac{1}{2} \times SR \times QR \sin R$ $= \frac{1}{2} \times 2\sqrt{41} \times 2\sqrt{13} \times \sin 85,03^{\circ}$ $= 46$	✓ $\hat{R} = \theta$ ✓ $SR = 2SU$ ✓ correct substitution <i>korrekte vervanging</i> ✓ answer/antwoord	(4)
			[19]

QUESTION/VRAAG 4



4.1	$m_{AD} = \tan 45^\circ = 1$	✓ answer/antwoord	(1)
4.2	$m_{OB} = -1$ $0 = -1(0) + c$ $c = 0$ $\therefore y = -x$	✓ gradient of OB <i>gradiënt van OB</i> ✓ correct substitution <i>korrekte vervanging</i> $O(0; 0)$	(3)
4.3	$-x = x + 8$ $-2x = 8$ $x = -4$ $y = -(-4) = 4$ $B(-4; 4)$	✓ equating equations <i>gelyk stel van vergelykings</i> ✓ x-coordinate / x-koördinaat ✓ y-coordinate/y-koördinaat	(3)
4.4	$OB = \sqrt{(0 - (-4))^2 + (0 - 4)^2}$ $= 4\sqrt{2}$ $\therefore r = 2\sqrt{2}$	✓ correct substitution <i>korrekte vervanging</i> ✓ length of OB/lengte van OB ✓ radius/radius	(3)

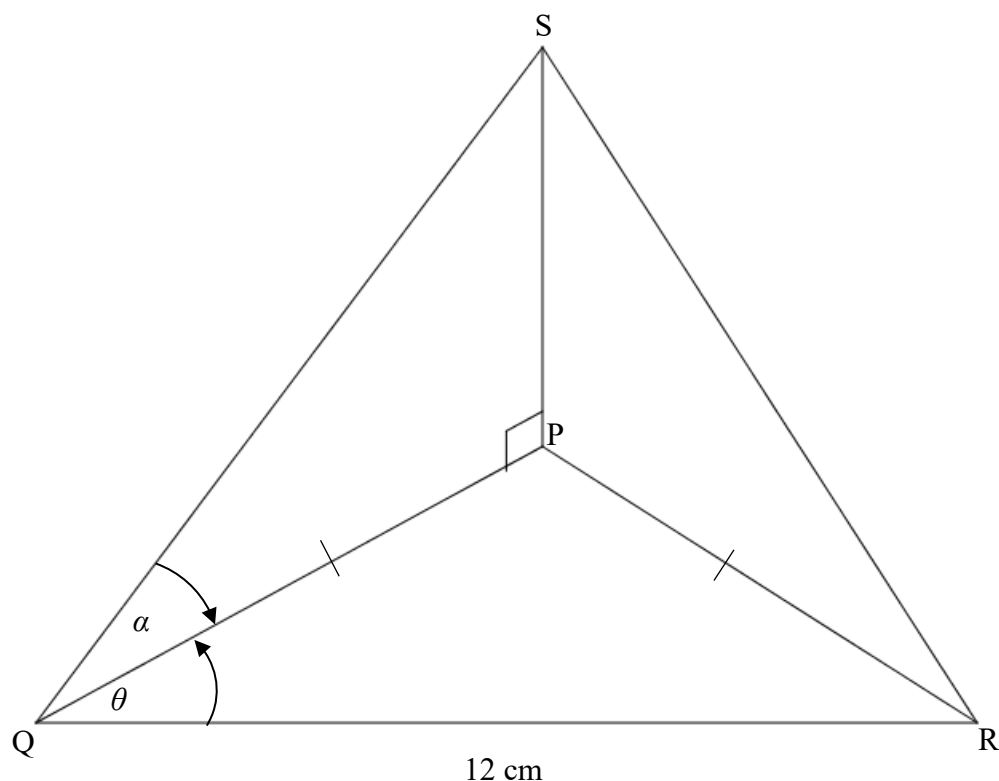
4.5	$x_E = \frac{0-4}{2} ; y_E = \frac{0+4}{2}$ $= -2 ; = 2$ $\therefore (x+2)^2 + (y-2)^2 = 8$	$\checkmark x_E$ $\checkmark y_E$ $\checkmark$ LHS/LK $\checkmark$ RHS/RK	(4)
4.6	$m_{\tan} = 1$ $y - 0 = 1(x - 0)$ [tangent passing through origin] [raaklyn gaan deur die oorsprong] $y = x$ $t = 0$ or $t = 8$	$\checkmark\checkmark$ answer/antwoord	(2)
4.7	$D_{\text{between 2 centres}} = \sqrt{(4+2)^2 + (8-2)^2}$ $= 6\sqrt{2} = 8,49$ $r_1 + r_2 = 2\sqrt{2} + 3 = 5,83$ $\therefore$ The 2 circles do not touch each other. [$D > r_1 + r_2$] Die 2 sirkels raak nie mekaar nie.	$\checkmark$ D between 2 centres afstand tussen 2 middelpunte $\checkmark r_1 + r_2$ $\checkmark$ conclusion/ $\checkmark$ R gevolgtrekking	(4)
			[20]

5.1.1			
	$1^2 = x^2 + q^2$ $x = \sqrt{1 - q^2}$ $\tan 41^\circ = \frac{\sqrt{1 - q^2}}{q}$	✓ x from Pythagoras or diagram above <i>x vanaf Pythagoras of diagram hierbo</i> ✓ answer/antwoord	(2)
5.1.2	$\cos 229^\circ = -\cos 49^\circ$ $= -\sqrt{1 - q^2}$	✓ reduction/reduksie ✓ answer/antwoord	(2)
5.1.3	$\sin 4^\circ = \sin(49^\circ - 45^\circ)$ $= \sin 49^\circ \cos 45^\circ - \sin 45^\circ \cos 49^\circ$ $= q \cdot \frac{\sqrt{2}}{2} - \frac{\sqrt{2}}{2} \cdot \sqrt{1 - q^2}$ $= \frac{\sqrt{2}(q - \sqrt{1 - q^2})}{2}$	✓ use of compound angles <i>gebruik van saamgestelde hoeke</i> ✓ expansion/uitbreiding ✓ ✓ correct substitution for each term <i>korrekte vervanging vir elke term</i>	(4)
5.2	$f(x) = \frac{\sin(x - 180^\circ) \cdot \sin(90^\circ + x)}{\sin^2 x - \cos^2(360^\circ - x)}$ $= \frac{(-\sin x)(\cos x)}{\sin^2 x - (-\cos x)^2}$ $= \frac{-\sin x \cos x}{\sin^2 x - \cos^2 x}$ $= \frac{-\frac{1}{2} \sin 2x}{-(\cos^2 x - \sin^2 x)}$ $= \frac{-\frac{1}{2} \sin 2x}{-\cos 2x}$ $= \frac{1}{2} \tan 2x$	✓ $(-\sin x)$ ✓ $\cos x$ ✓ $(-\cos x)^2$ ✓ $\frac{1}{2} \sin 2x$ ✓ $-(\cos^2 x - \sin^2 x)$ ✓ $\cos 2x$ ✓ answer/antwoord	(7)
5.2.2	$x = -135^\circ$ or / of $x = -45^\circ$	✓ ✓ each x -value / elke x -waarde	(2)
			[17]

QUESTION/VRAAG 6			
6.1	$\cos(A+B) = \cos(A-(-B))$ $= \cos A \cdot \cos(-B) + \sin A \sin(-B)$ $= \cos A \cos B - \sin A \sin B$	$\checkmark \cos(A-(-B))$ $\checkmark$ expansion $\checkmark$ answer	(3)
6.2	$LHS = \frac{\sin 22^\circ \cdot \cos 320^\circ + \sin 40^\circ \sin 68^\circ}{\sin 391^\circ \cdot \cos 31^\circ}$ $= \frac{\cos 68^\circ (\cos 40^\circ) + \sin 40^\circ \sin 68^\circ}{(\sin 31^\circ) \cos 31^\circ}$ $= \frac{\cos(68^\circ - 40^\circ)}{\frac{1}{2} \sin 62^\circ}$ $= \frac{\cos 28^\circ}{\frac{1}{2} \sin 62^\circ}$ $= 2 \cdot \frac{\sin 62^\circ}{\sin 62^\circ}$ $= 2$	$\checkmark \cos 40^\circ \checkmark \cos 68^\circ$ $\checkmark (\sin 31^\circ)$ $\checkmark \cos(68^\circ - 40^\circ)$ $\checkmark \frac{1}{2} \sin 62^\circ$ $\checkmark \sin 62^\circ$	(6)
6.3	$\cos 2x + 5 \sin x = 3$ $1 - 2 \sin^2 x + 5 \sin x - 3 = 0$ $2 \sin^2 - 5 \sin x + 2 = 0$ $(2 \sin x - 1)(\sin x - 2) = 0$ $\sin x = \frac{1}{2} \text{ or / of } \sin x \neq 2$ <i>ref. / verw. $\angle = 30^\circ$</i> $x = -330^\circ \text{ or / of } x = -210^\circ$	$\checkmark 1 - 2 \sin^2 x$ $\checkmark$ standard form/ <i>standaardvorm</i> $\checkmark$ equations/ <i>vergelykings</i> $\checkmark \checkmark$ each x-value/ <i>elke x-waarde</i>	(5)
			[14]

QUESTION/VRAAG 7			
7.1	$a = 1$ $p = 30^\circ$	✓ value of a/ <i>waarde van a</i> ✓ value of p/ <i>waarde van p</i>	(2)
7.2	Period / Periode = 360°	✓ answer/ <i>antwoord</i>	(1)
7.3		✓ correct TP's <i>Korrekte DPe</i> ✓ correct intercepts/ <i>korrekte afsnitte</i> ✓ shape/vorm	(3)
7.4	$x = -60^\circ$ or / of $x = 120^\circ$	✓ $x = -60^\circ$ ✓ $x = 120^\circ$	(2)
7.5	$-3 \leq y \leq -1$ OR/OF $y \in [-3 ; -1]$	✓✓ correct answer /korrekte <i>antwoord</i>	(2)
			[10]

QUESTION/VRAAG 8

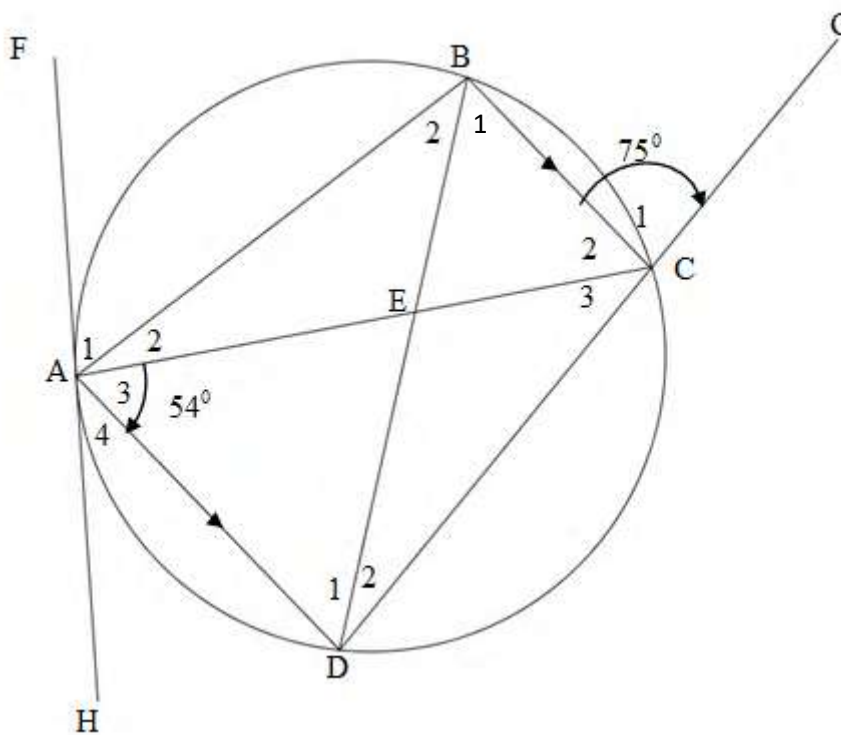


8.1	$\hat{QPR} = 180^\circ - 2\theta$ $\frac{PQ}{\sin \theta} = \frac{12}{\sin(180^\circ - 2\theta)}$ $PQ = \frac{12 \sin \theta}{\sin 2\theta}$ $= \frac{12 \sin \theta}{2 \sin \theta \cdot \cos \theta}$ $= \frac{6}{\cos \theta}$ $\frac{PQ}{SQ} = \cos \alpha$ $SQ = \frac{1}{\cos \alpha} \times \frac{6}{\cos \theta}$ $SQ = \frac{6}{\cos \theta \cos \alpha}$	✓ $\hat{QPR}$ ✓ sine rule / <i>sinusreël</i> ✓ correct substitution / <i>korrekte vervanging</i> ✓ reduction / <i>reduksie</i> ✓ identity / <i>identiteit</i> ✓ simplification / <i>vereenvoudiging</i> $\frac{PQ}{SQ}$	(6)
8.2	$SQ = \frac{6}{\cos 50^\circ \cos 35^\circ}$ $= 11,40$	✓ correct substitution / <i>korrekte vervanging</i> ✓ answer / <i>antwoord</i>	(2)
			[8]

QUESTION/VRAAG 9

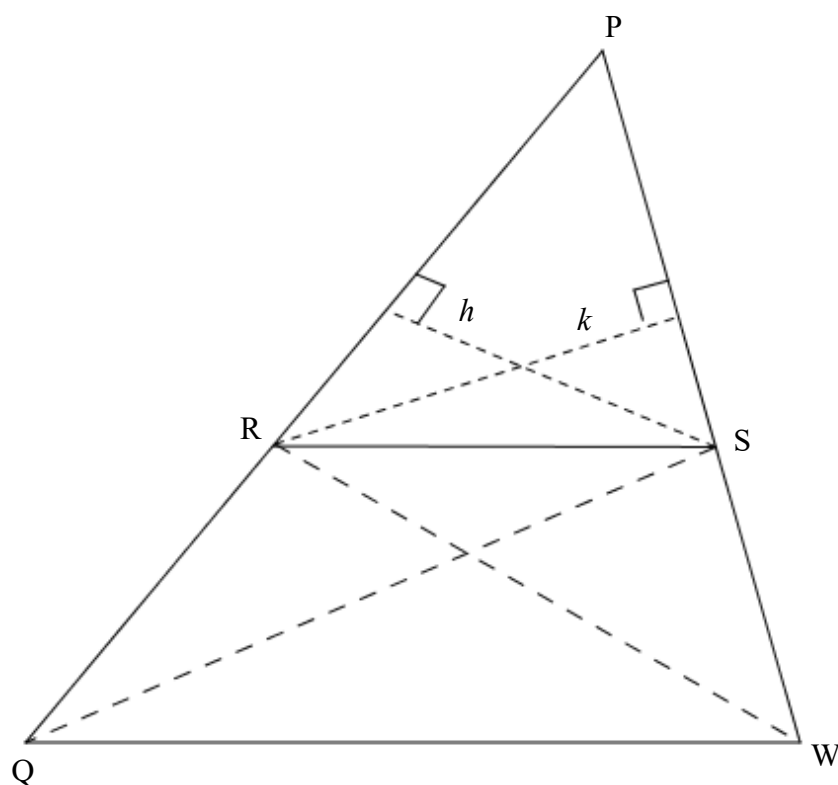
9.1 Opposite interior angle ✓

(1)

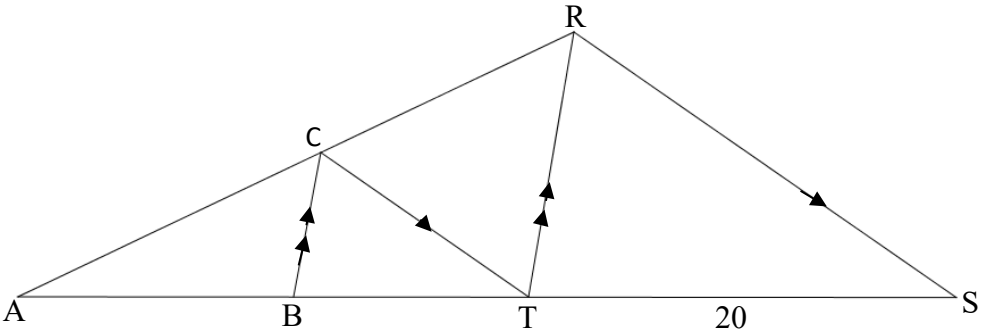


9.2.1	$\hat{A}_2 = 21^\circ$ [ext. $\angle$ of a cyclic quad] / [buite $\angle$ van koordevh]	✓ S ✓ R	(2)
9.2.2	$D_2 = 21^\circ$ [$\angle$ s same seg] / [$\angle$ e in dieselfde segment]	✓ S ✓ R	(2)
9.2.3	$\hat{D} = 75^\circ$ [corresp. $\angle$ s; $AD \parallel BC$] / [ooreenk. $\angle$ e: $AD \parallel BC$]	✓ S/R	(3)
	$\hat{A}_1 = 54^\circ$ [Tan chord Thm.] / [Raaklyn – koord – Stelling]	✓ S ✓ R	
9.2.4	$\hat{A}_3 = \hat{C}_2 = 54^\circ$ [alt. $\angle$ s, $AD \parallel BC$]	✓ S/R	(3)
	$\hat{C}_2 = \hat{D}_1$ [$\angle$ s same seg]	✓ S	
	$\therefore AE = ED$ [sides opp = $\angle$ s]	✓ R	
			[11]

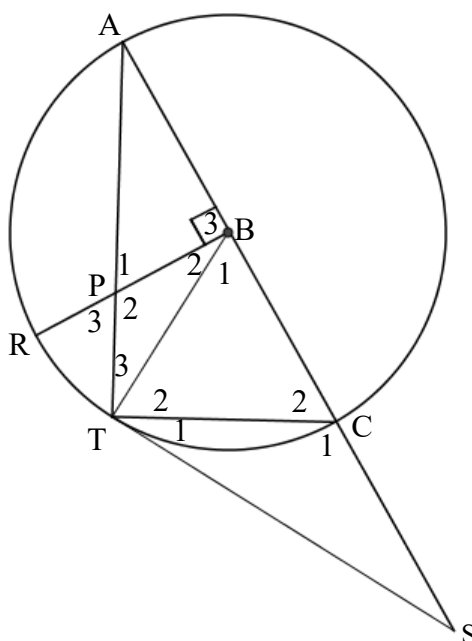
QUESTION/VRAAG 10



10.1	Constructions: Draw $\perp$ height to PS and $\perp$ height to PW. Join RW and SQ Konstruksies: Teken $\perp$ hoogte na PS en $\perp$ hoogte na PW. Verbind RW en SQ $\frac{\text{Area of/van } \triangle PRS}{\text{Area of/van } \triangle WRS} = \frac{\frac{1}{2} \times PS \times h}{\frac{1}{2} \times SW \times h} = \frac{PS}{SW} \quad [\text{same height}] / [\text{dieselfde hoogte}]$ $\frac{\text{Area of/van } \triangle PRS}{\text{Area of/van } \triangle QRS} = \frac{\frac{1}{2} \times PR \times k}{\frac{1}{2} \times RQ \times k} = \frac{PR}{RQ} \quad [\text{same height}] / [\text{dieselfde hoogte}]$ Area of/van $\triangle RSW$ = Area of/van $\triangle QRS$ [same base, between same parallel] [dies. basis, tussen dies. lyne] $\frac{\text{Area of/van } \triangle PRS}{\text{Area of/van } \triangle WRS} = \frac{\text{Area of/van } \triangle PRS}{\text{Area of/van } \triangle QRS}$ $\therefore \frac{PS}{SW} = \frac{PR}{RQ}$	✓ construction konstruksie ✓ S/R ✓ S ✓ S ✓ R	(5)
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10.2			
10.2.1	$\frac{AT}{TS} = \frac{AC}{CR}$ $AT = \frac{20 \times 3}{5}$ $= 12$ [line to one side of a Δ] / [lyn aan een sy van 'n Δ]	✓ S ✓ R ✓ correct substitution korrekte vervanging ✓ AT	(4)
10.2.2	$\frac{AB}{AT} = \frac{AC}{AR}$ $\frac{AB}{20} = \frac{5}{8}$ $AB = \frac{9}{2}$ [line to one side of a Δ]	✓ S ✓ correct substitution korrekte vervanging ✓ AB	(3)
			[12]

QUESTION/VRAAG 11



11.1	$\hat{T}_1 = \hat{A}$ [tan chord theo.]/[<i>raaklyn – koord – stelling</i>] $\hat{A} = \hat{T}_3$ [$\angle$ s opp.=sides]/[<i>∠teenoor = sye</i>]	$\checkmark S$ $\checkmark R$ $\checkmark S/R$	(3)
11.2	$A\hat{T}C = 90^0$ [$\angle$ in semi-circle / $\angle$ subt.diameter] [<i>∠ in halwe sirkel / ∠ onderspan deur middellyn</i>] $\hat{B}_3 = 90^0$ [given]/[<i>gegee</i>] $\therefore$ PBTC is a cyclic quad $\left[\begin{array}{l} \text{ext } \angle \text{ of a quad} = \text{int opp. } \angle \\ \text{OR converse ext } \angle \text{ of a cyclic quad} \end{array} \right]$ $\therefore$ PBTC is 'n koordevh. $\left[\frac{\text{buite } \angle \text{ van 'n koordevh} = \text{teenoorst. binne } \angle}{\text{OF omgek ker de buite } \angle \text{ van koordevh}} \right]$	$\checkmark S$ $\checkmark R$ $\checkmark R$	(3)
11.3	$\hat{T}_1 = \hat{T}_3$ [proven in 11.1]/[<i>bewys in 11.1</i>] $\hat{C}_1 = \hat{P}_2$ [ext. $\angle$ of a cyclic quad]/[<i>buitehoek van kv</i>] $\hat{S} = \hat{B}_2$ [3^{rd} $\angle$ s / $\angle$ e] OR/OF $\therefore \Delta SCT \equiv \Delta BPT$ [$\angle \angle \angle$]	$\checkmark S$ $\checkmark S$ $\checkmark R$ $\checkmark S$ OR/OF $\checkmark R$	(4)

11.4	$\frac{SC}{BP} = \frac{ST}{BT}$ $[\Delta s]$ $BT = AB$ $[radii] / [radiusse]$ $\therefore SC = \frac{ST \cdot BP}{AB}$	$\checkmark$ S/R $\checkmark$ S	(2)
11.5	$\hat{BTS} = 90^\circ$ $[rad \perp \tan] / [radius \perp raaklyn]$	$\checkmark$ R	(1)
11.6	$TB = CS$ $[both = BR] / [albei = BR]$ $BS^2 = BT^2 + TS^2$ $[Pyth \text{ theo}] / [Pyth \text{ Stelling}]$ $(2CS)^2 = CS^2 + TS^2$ $4CS^2 = CS^2 + TS^2$ $3CS^2 = TS^2$ (1) but / maar $CS = \frac{TS \cdot BP}{AB}$ from 11.4 $CS = AB = BR$ $CS^2 = TS \cdot BP$ (2) $TS^2 = 3(TS \cdot BP)$ $\therefore TS = 3BP$	$\checkmark$ Application of Pyth. Toepassing van Pyth. $\checkmark$ Expressing BS in terms of CS <i>BS in terme van CS uitgedruk</i> $\checkmark$ simplification / vereenvoudiging $\checkmark$ $CS^2 = TS \cdot BP$ $\checkmark$ substitute/vervang (2) in (1)	(5)
			[18]

TOTAL/TOTAAL: 150