basic education

Department:
Basic Education
REPUBLIC OF SOUTH AFRICA

NATIONAL SENIOR CERTIFICATE

GRADE 12

MATHEMATICS P2

NOVEMBER 2025

MARKS: 150

TIME: 3 hours

This question paper consists of 14 pages, 1 information sheet and an answer book of 27 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

There were 11 cars of the same model for sale at a car dealership. The age (in years) of each car and its corresponding selling price (in rands) is provided in the table below.

AGE OF CAR (IN YEARS)	SELLING PRICE OF CAR (IN RAND)
2	293 000
3	265 000
3	256 000
4	219 000
4	241 000
4	246 000
6	226 000
6	176 000
7	154 000
7	180 000
8	148 000

1.1 Determine the equation of the least squares regression line. (3)

1.2 Predict the selling price of a similar car at this car dealership that is 5 years old. (2)

1.3 Use the correlation coefficient to show whether the prediction made in QUESTION 1.2 is valid or not. (2)

1.4 Use the answer to QUESTION 1.1 to write down the estimated average yearly decrease in the selling price of these 11 cars. **(1)**
[8]

QUESTION 2

2.1 The cumulative frequency table below shows the amount of time that people spent on a particular website on a certain day.

TIME, t (IN MINUTES)	CUMULATIVE FREQUENCY
$0 < t \leq 20$	16
$0 < t \leq 40$	40
$0 < t \leq 60$	59
$0 < t \leq 80$	67
$0 < t \leq 100$	70

2.1.1 How many people visited this website on that day? (1)

2.1.2 How many people spent more than 40 and up to 80 minutes on the website? (2)

2.1.3 Draw a histogram to represent the information provided in the cumulative frequency table. (3)

2.1.4 Comment on the skewness of the data. (1)

2.2 There are 9 players in a basketball team. The coach calculated that on average, each player scored 12 points during a game. The points scored by 8 of the 9 players from the team is given below:

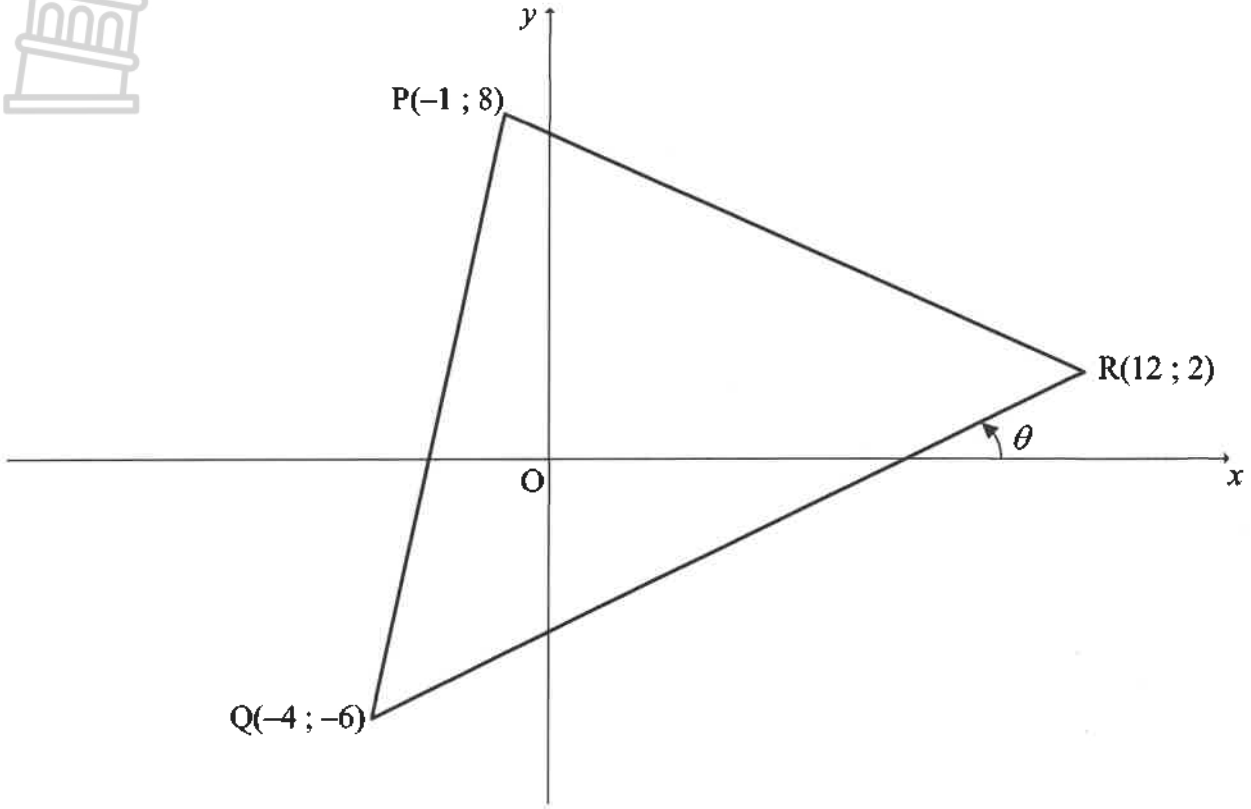
11	14	19	20	8	10	2	14

How many players' points score was outside ONE standard deviation of the mean points score? (5)

[12]

QUESTION 3

In the diagram, P(–1 ; 8), Q(–4 ; –6) and R(12 ; 2) are the vertices of ΔPQR. The angle of inclination of QR is θ.



3.1 Calculate the length of QR. Leave your answer in simplified surd form. (2)

3.2 Calculate the gradient of QR. (2)

3.3 Calculate the size of θ. (2)

3.4 Determine the equation of QR. (2)

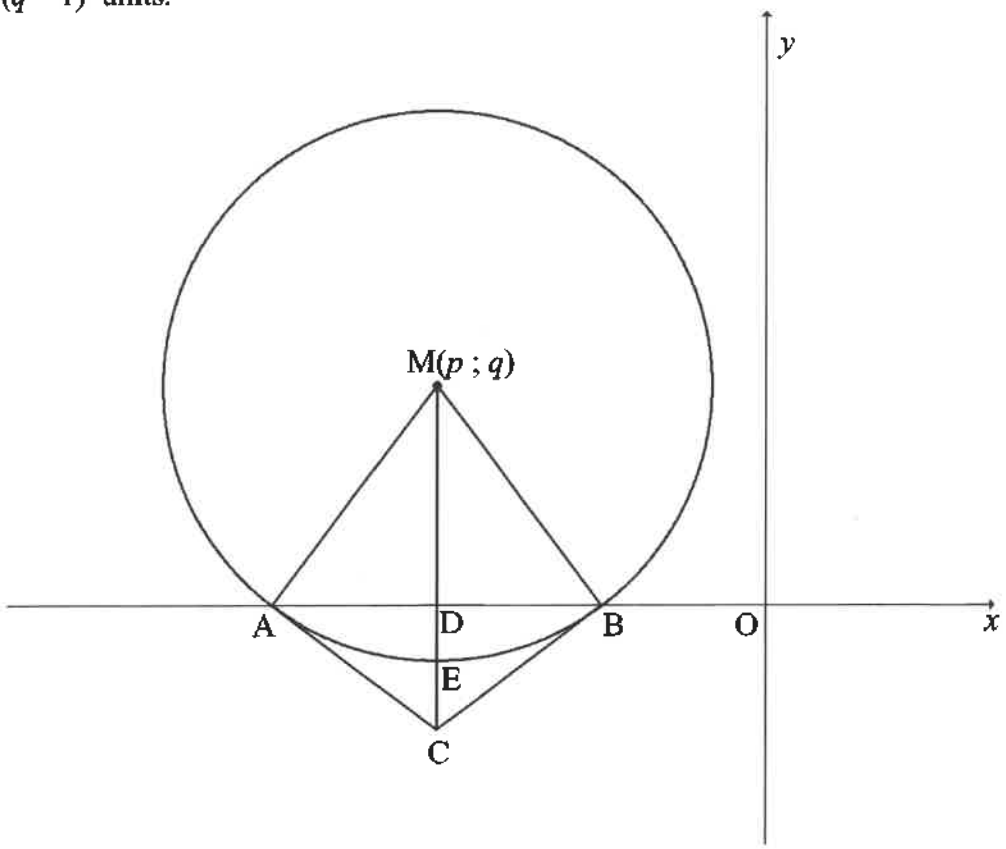
3.5 PQRS, in that order, is a parallelogram. Write down the coordinates of S. (2)

3.6 T is a point on QR such that PT ⊥ QR. Calculate the coordinates of T. (5)

3.7 Calculate the area of parallelogram PQRS. (3)
[18]

QUESTION 4

In the diagram, M(p ; q) is the centre of the circle that intersects the x-axis at A and B. C is a point such that the line drawn from M to C is parallel to the y-axis and intersects the x-axis at D. MC intersects the circle at E(–6 ; –1). Tangents drawn from C touch the circle at A and B. AD = (q – 1) units.



4.1 Write down the value of p. (1)

4.2 Show that $q = 4$. (4)

4.3 Determine the equation of the circle in the form $(x-a)^2+(y-b)^2=r^2$. (2)

4.4 If the circle is translated 2 units to the left, determine the minimum distance between the circle and the y-axis. (1)

4.5 Calculate the coordinates of A and B. (3)

4.6 Determine the equation of tangent BC. (4)

4.7 Write down the coordinates of C. (2)

4.8 Calculate the size of $A\hat{C}B$. (4)
[21]

QUESTION 5

5.1 It is given that $\tan 50° = k$. Express EACH of the following in terms of k:

5.1.1 $\cos 40°$ (2)

5.1.2 $\dfrac{2\sin 25°.\cos 25°}{-2+4\sin^2 25°}$ (5)

5.1.3 $\sin 10°$ (4)

5.2 Given: $\dfrac{\sin(540°+x).\cos(90°+x)}{\sin(-x)}$

5.2.1 Simplify the expression above fully to a single trigonometric ratio. (4)

5.2.2 Hence, determine the values of x in the interval $x \in [0°;360°]$ for which $\sqrt{\dfrac{\sin(540°+x).\cos(90°+x)}{\sin(-x)}}$ will be real. (2)

[17]

QUESTION 6

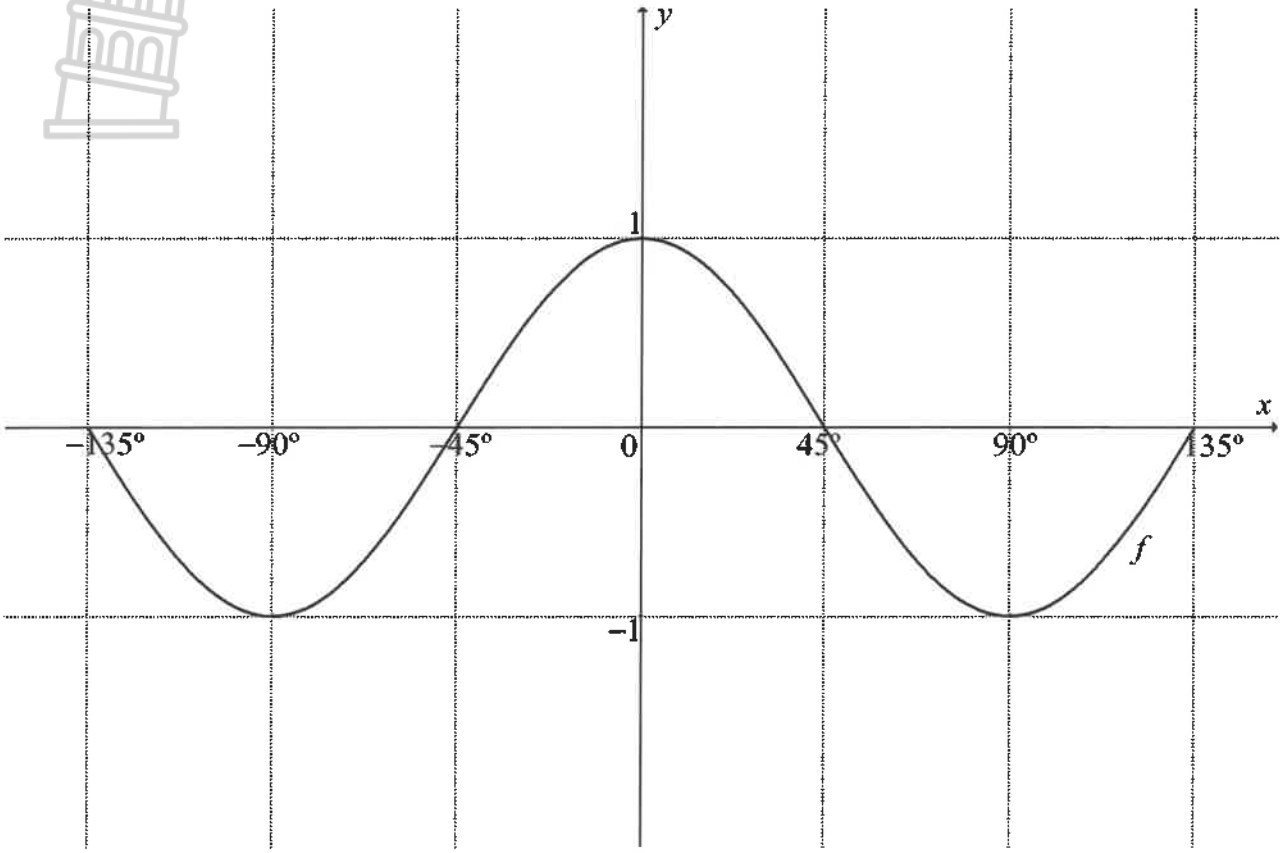
6.1 Prove that: $[\tan(180°-x)](1-\cos^2 x)+\cos^2 x = \dfrac{(\sin x-\cos x)(1+\sin x.\cos x)}{-\cos x}$ (6)

6.2 It is given that $\sin^2 x$; $\cos^2 x$ and $\frac{1}{2}\sin 2x$ are the first three terms of an arithmetic sequence. The constant difference of the arithmetic sequence is NOT zero.
Determine the general solution for x. (7)

[13]

QUESTION 7

In the diagram, the graph of $f(x)=\cos 2x$ is drawn for $x\in[-135°\,;135°]$.



7.1 Write down the period of f. (1)

7.2 On the set of axes provided in the ANSWER BOOK, draw the graph of $g(x)=\tan 2x-1$ for $x\in[-135°\,;135°]$. (3)

7.3 Graph f is translated $45°$ to the left to form graph h. Determine the equation of h in its simplest form. (1)

7.4 Write down the range of h. (1)

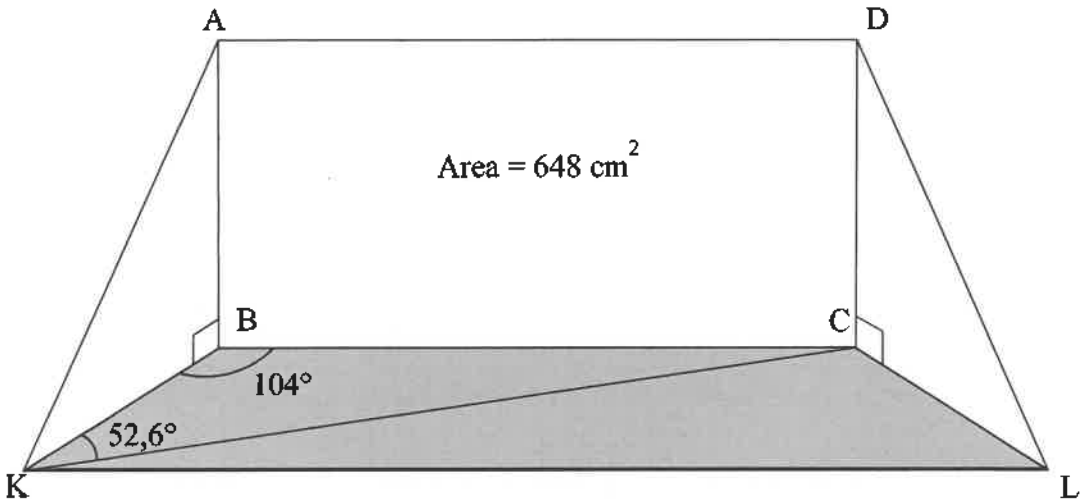
7.5 Determine the values of x for which $(1-\tan 2x)(\cos 2x)\geq 0$ in the interval $x\in[0°\,;135°]$. (4)

[10]

QUESTION 8

As part of a school project, learners are required to design a portable stage for a puppet show, as shown in the diagram below. The design must fulfil the following requirements:

- BKLC is a horizontal base having $K\hat{B}C = 104°$ and $B\hat{K}C = 52,6°$.
- The rectangular backdrop, ABCD, is vertical to the horizontal base and must have an area of 648 cm^2.
- The sides of ABCD must be in the ratio AB : BC = 1 : 2.
- The stage must be partly enclosed with triangular sides ABK and DCL.



8.1 Show that AB = 18 cm. (2)

8.2 Calculate the length of AC. (2)

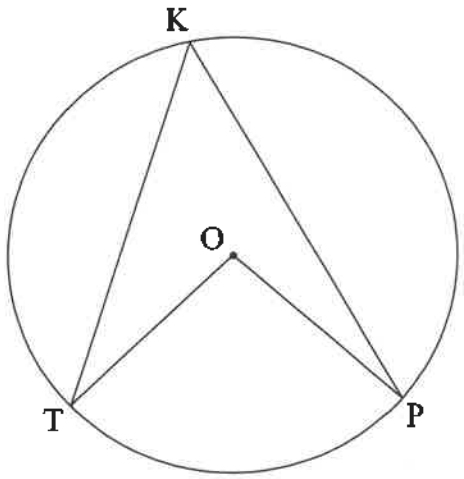
8.3 Calculate the length of diagonal KC. (2)

8.4 If AB = BK, calculate the size of $K\hat{A}C$. (4)
[10]

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

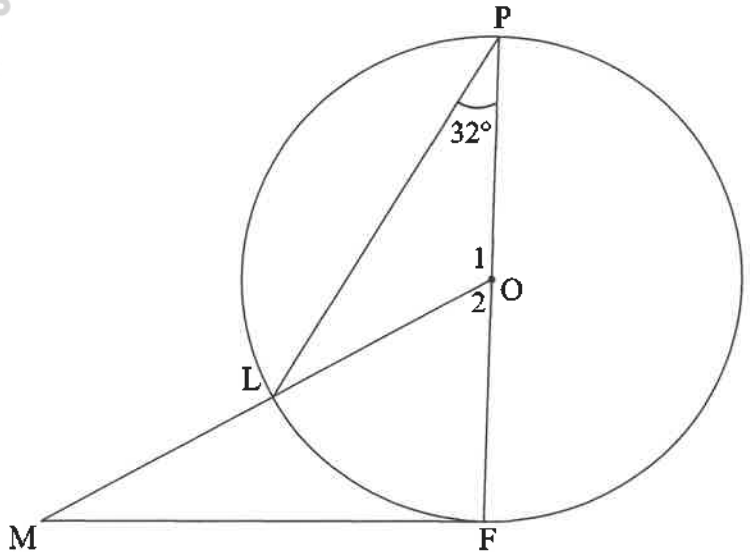
QUESTION 9

9.1 In the diagram, O is the centre of the circle. K, T and P lie on the circle.



Use the diagram above to prove the theorem which states that the angle subtended by a chord (or arc) at the centre of the circle is equal to twice the angle subtended by the same chord (or arc) at the circumference, that is prove that $T\hat{O}P = 2\,T\hat{K}P$. (5)

9.2 In the diagram, O is the centre of the circle. POF is the diameter of the circle and MF is a tangent to the circle at F. OM cuts the circle at L. $\hat{P} = 32°$.



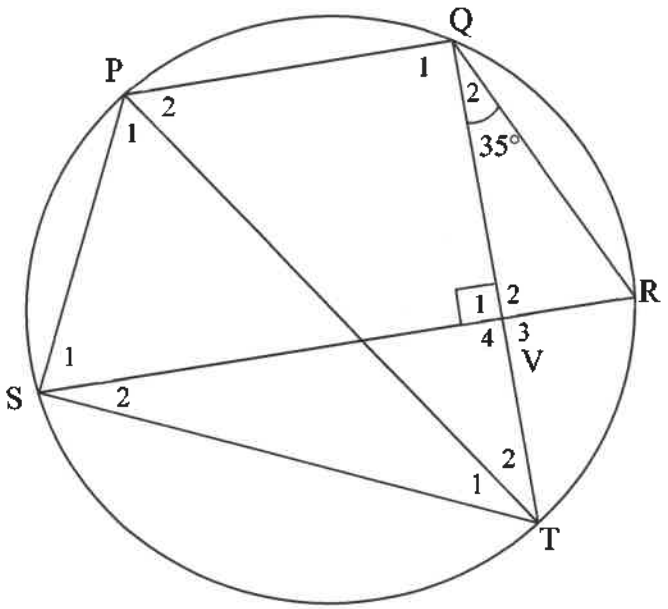
Calculate, with reasons, the size of:

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

9.2.2 $\hat{M}$ (3)
[10]

QUESTION 10

In the diagram, PQRS is a cyclic quadrilateral. T is a point on the circle such that QT is perpendicular to SR at V. PT and ST are drawn. $\hat{Q}_2 = 35°$ and $\hat{R} = \hat{S}_1$.



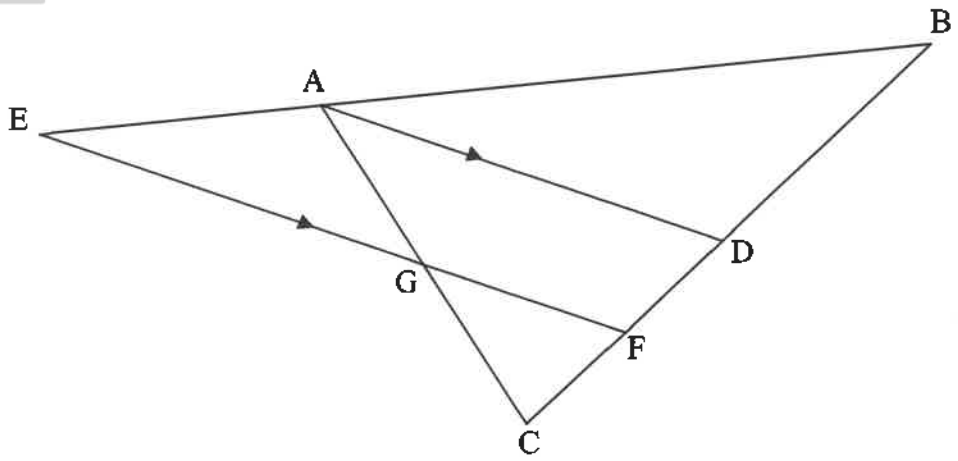
10.1 Calculate, with reasons, the size of $Q\hat{T}S$. (3)

10.2 Prove that PQ || SR. (3)

10.3 Prove that PT is a diameter of the circle. (2)
[8]

QUESTION 11

11.1 In the diagram, ΔABC is drawn. BA is produced to E. F and D are points on BC such that $AD \parallel EF$. AC and EF intersect at G. $\frac{CF}{FB}=\frac{2}{5}$ and $\frac{CG}{GA}=\frac{3}{2}$.



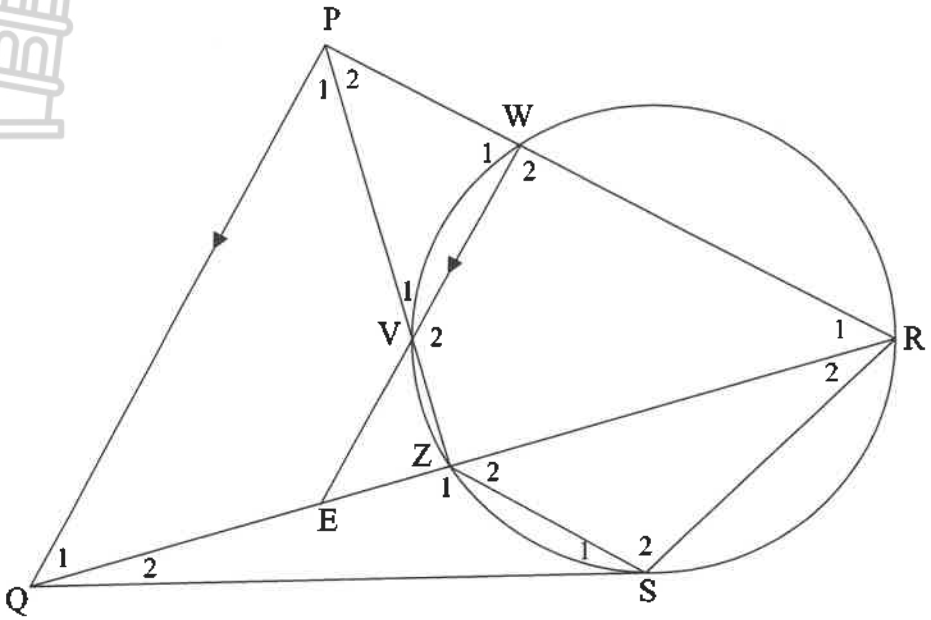
Calculate, with reasons, the value of:

11.1.1 $\frac{FD}{CF}$ (2)

11.1.2 $\frac{BA}{EA}$ (4)

11.1.3 $\frac{\text{Area of } \Delta GCF}{\text{Area of GFDA}}$ (4)

11.2 In the diagram, WVZR is a cyclic quadrilateral. RZ is produced to Q. A tangent is drawn from Q to touch the circle at S. WV is produced to E, a point on ZQ. RW produced meets ZV produced in P. PQ || WE. RS and ZS are drawn.



Prove, with reasons, that:

11.2.1 $PR = \dfrac{PW.QR}{QE}$ (2)

11.2.2 If $\Delta PQZ \,|||\, \Delta RQP$, then $PQ^2 = RQ.QZ$ (1)

11.2.3 $\Delta QSZ \,|||\, \Delta QRS$ (3)

11.2.4 $PQ = QS$ (3)

11.2.5 $PW = \dfrac{QE.PZ}{\sqrt{QR.QZ}}$ (4)

[23]

TOTAL: 150

INFORMATION SHEET

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

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

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

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

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

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

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

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

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

In ΔABC: $\dfrac{a}{\sin A} = \dfrac{b}{\sin B} = \dfrac{c}{\sin C}$

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

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

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

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

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

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

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

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

basic education

Department:
Basic Education
REPUBLIC OF SOUTH AFRICA

Candidate Barcode Label/Stafleskodeplakker

NSC Answer Book
NSS-antwoordeboek

National Senior Certificate/*Nasionale Senior Sertifikaat* (Grade 12/*Graad 12*) – November 2025 ***Confidential/Vertroulik***

CENTRE NUMBER *SENTRUMNOMMER*	
EXAMINATION NUMBER *EKSAMENNOMMER*	

Sequence No. on mark sheet
Volgnommer op punteblad

DATE *DATUM*		**BOOK NUMBER** *BOEKNOMMER*	**OF** *VAN*	**BOOKS** *BOEKE*
SUBJECT CODE *VAKKODE*		**PAPER NUMBER** *VRAESTELNOMMER*	**2**	
SUBJECT NAME *VAKNAAM*	**MATHEMATICS/*WISKUNDE***			

MARKER/*NASIENER*				**MODERATOR'S INITIALS IN RELEVANT BLOCK** *MODERATOR SE VOORLETTERS IN RELEVANTE BLOKKIE*											
Question *Vraag*	**Marks** *Punte*	**Marker's Code & Initials** *Nasiener se kode & Voorletters*	**Marks** *Punte*	**SM**	**Marks** *Punte*	**DCM** *AHN*	**Marks** *Punte*	**CM** *HN*	**Marks** *Punte*	**IM**	**Marks** *Punte*	**EM**
1												
2												
3												
4												
5												
6												
7												
8												
9												
10												
11												
		TOTAL *TOTAAL*										

CONTROLLED AND CERTIFIED CORRECT (SURNAME AND INITIALS OF EA) ***GEKONTROLEER EN AS KORREK GESERTIFISEER (VAN EN VOORLETTERS VAN EA)***		READ INSTRUCTIONS ON THE NEXT PAGE. *LEES INSTRUKSIES OP DIE VOLGENDE BLADSY.*

This answer book consists of 27 pages./*Hierdie antwoordeboek bestaan uit 27 bladsye.*

Please turn over/*Blaai om asseblief*

PLEASE FOLLOW THESE INSTRUCTIONS CAREFULLY	*VOLG ASSEBLIEF HIERDIE INSTRUKSIES NOUKEURIG*
1. Clearly write your examination number and centre number in the space provided and attach your barcode label in the space provided.	*1. Skryf jou eksamennommer en sentrumnommer duidelik in die ruimtes soos verskaf en plak jou stafieskodeplakker in die ruimte soos verskaf.*
2. Remember that your own name (or the name of your school) may not appear anywhere on or in this answer book.	*2. Onthou dat jou eie naam (of die naam van jou skool) nie op of in hierdie antwoordeboek mag voorkom nie.*
3. Answer ALL questions in the spaces provided.	*3. Beantwoord ALLE vrae in die ruimtes wat voorsien is.*
4. No pages may be torn from this answer book.	*4. Geen bladsye mag uit hierdie antwoordeboek geskeur word nie.*
5. Read the instructions printed on your timetable carefully as well as any other instructions which may be given in each examination paper.	*5. Lees die instruksies wat op jou eksamenrooster gedruk is, sorgvuldig deur, asook enige ander instruksies wat op elke eksamenvraestel gegee word.*
6. Candidates may not retain an answer book or remove it from the examination room.	*6. Geen antwoordeboek mag deur die kandidaat behou of uit die eksamenlokaal verwyder word nie.*
7. Answers must be written in black/blue ink as distinctly as possible. Do not write in the margins.	*7. Skryf die antwoorde so duidelik moontlik met swart/blou ink. Laat die kantlyne oop.*
8. Write the numbers of the questions you have answered on the front cover of the answer book where marks are to be recorded.	*8. Skryf die nommers van die vrae wat jy beantwoord het op die voorblad van die antwoordeboek waar die punte aangebring word.*
9. If you require additional space for your answers: 9.1 Use the additional space provided at the end of the answer book. 9.2 When answering a question in the additional space, indicate clearly the question number in the column on the LHS. 9.3 Rule off after each answer.	*9. In geval jy bykomende ruimte benodig vir jou antwoorde:* *9.1 Gebruik die bykomende ruimte wat aan die einde van die antwoordeboek voorsien word.* *9.2 As 'n vraag in die bykomende ruimte beantwoord word, dui duidelik die vraagnommer in die kolom aan die LK aan.* *9.3 Trek 'n lyn na elke antwoord.*
10. Draw a neat line through any work/rough work that must not be marked.	*10. Trek 'n netjiese lyn deur enige werk/rofwerk wat nie nagesien moet word nie.*

QUESTION/*VRAAG* 1.

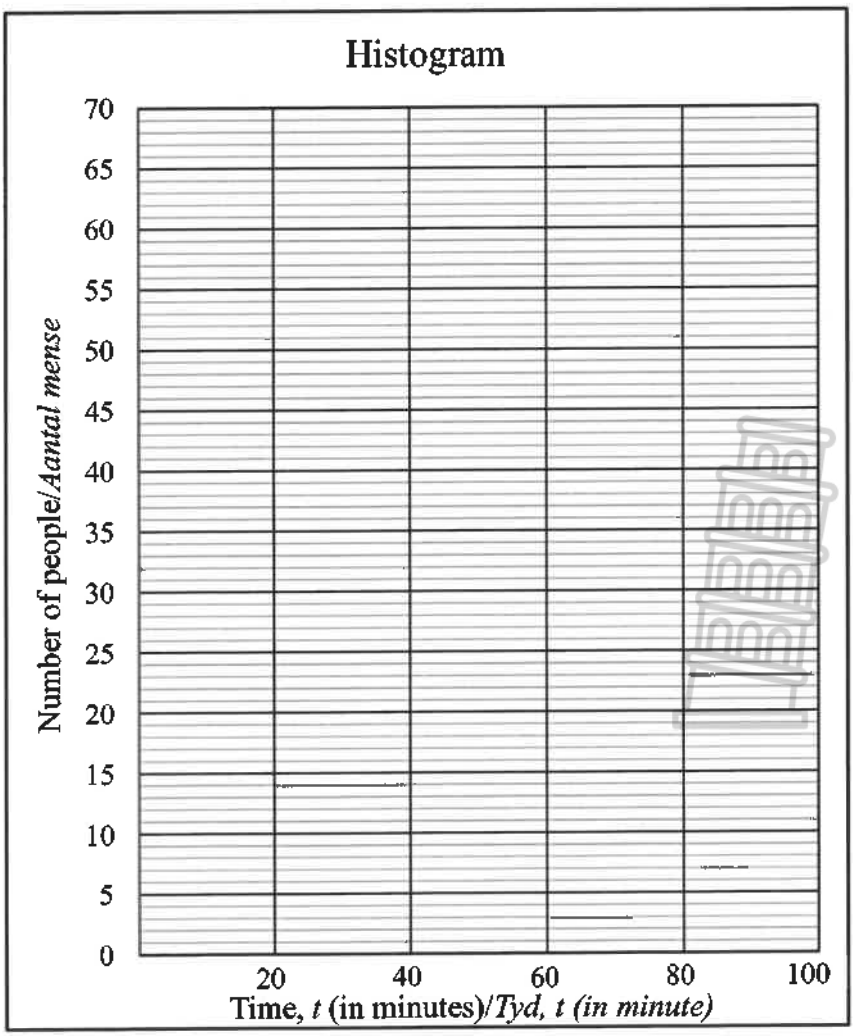
AGE OF CAR (IN YEARS)/ *OUDERDOM VAN MOTOR (IN JAAR)*	**SELLING PRICE OF CAR (IN RAND)/ *VERKOOPPRYS VAN MOTOR (IN RAND)***
2	293 000
3	265 000
3	256 000
4	219 000
4	241 000
4	246 000
6	226 000
6	176 000
7	154 000
7	180 000
8	148 000

	Solution/*Oplossing*	**Marks *Punte***
1.1		(3)
1.2		(2)
1.3		(2)
1.4		(1)
		[8]

QUESTION/*VRAAG 2*

2.1

TIME, *t* (IN MINUTES)/ *TYD, t (IN MINUTE)*	**CUMULATIVE FREQUENCY/ *KUMULATIEWE FREKWENSIE***
$0 < t \leq 20$	16
$0 < t \leq 40$	40
$0 < t \leq 60$	59
$0 < t \leq 80$	67
$0 < t \leq 100$	70

	Solution/*Oplossing*	**Marks *Punte***
2.1.1		(1)
2.1.2		(2)
2.1.3		(3)

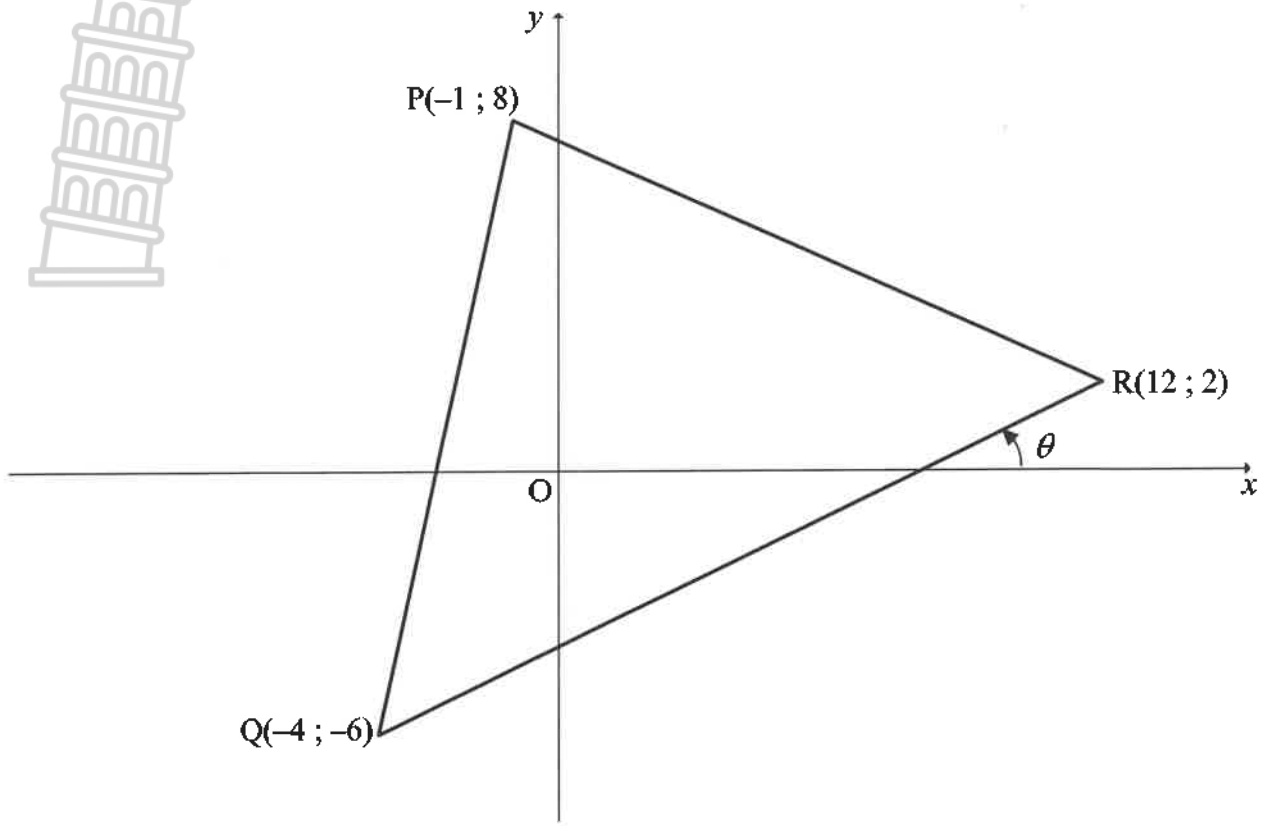
	Solution/*Oplossing*	Marks *Punte*
2.1.4		(1)

2.2

11	14	19	20	8	10	2	14

	Solution/*Oplossing*	Marks *Punte*
		(5)
		[12]

QUESTION/*VRAAG* 3

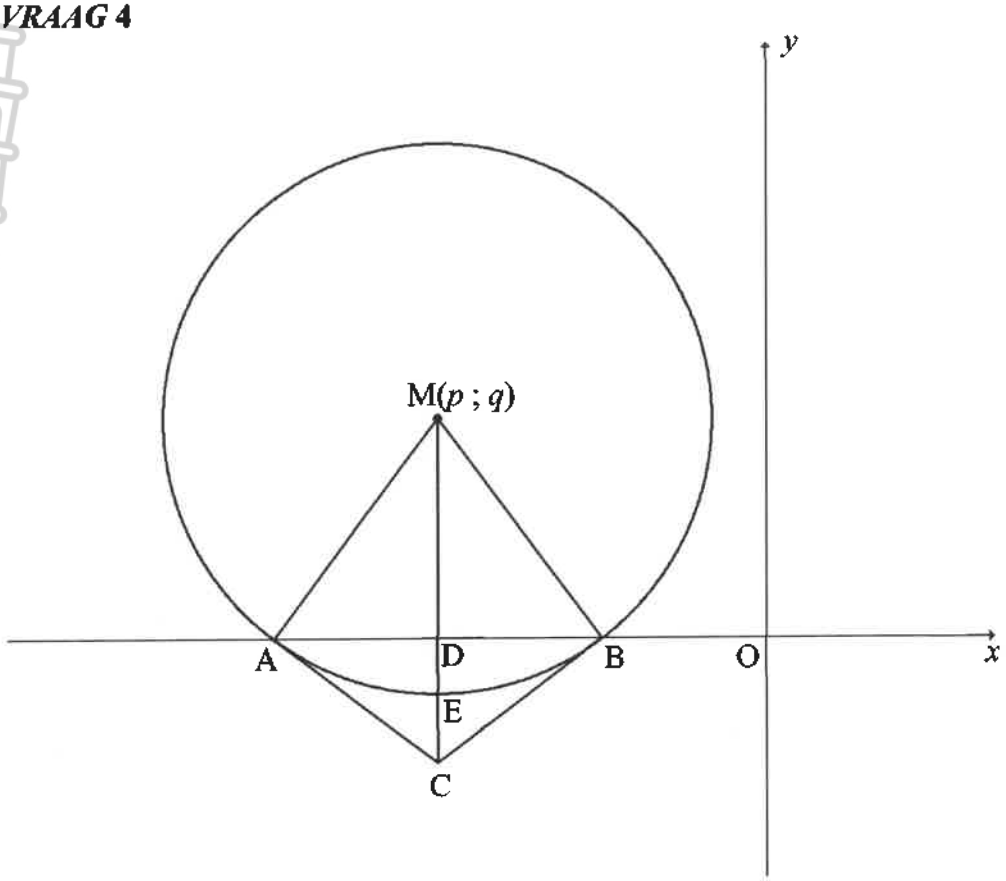


	Solution/*Oplossing*	**Marks** ***Punte***
3.1		(2)
3.2		(2)
3.3		(2)

	Solution/*Oplossing*	Marks *Punte*
3.4		(2)
3.5		(2)
3.6		(5)

	Solution/*Oplossing*	Marks *Punte*
3.7		(3)
		[18]

QUESTION/*VRAAG* 4



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

	Solution/*Oplossing*	Marks *Punte*
4.3		(2)
4.4		(1)
4.5		(3)

	Solution/*Oplossing*	Marks *Punte*
4.6		(4)
4.7		(2)
4.8		(4)
		[21]

QUESTION/*VRAAG* 5

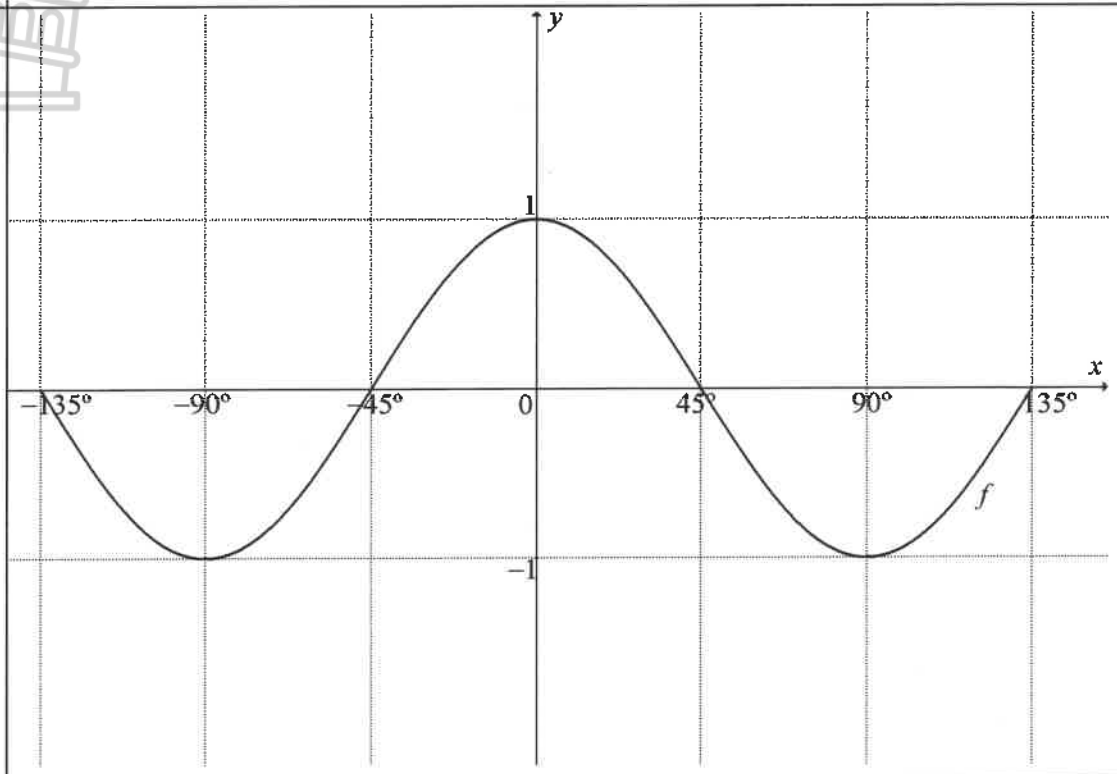
	Solution/*Oplossing*	**Marks** ***Punte***
5.1.1		(2)
5.1.2		(5)
5.1.3		(4)

	Solution/*Oplossing*	**Marks** ***Punte***
5.2.1		(4)
5.2.2		(2)
		[17]

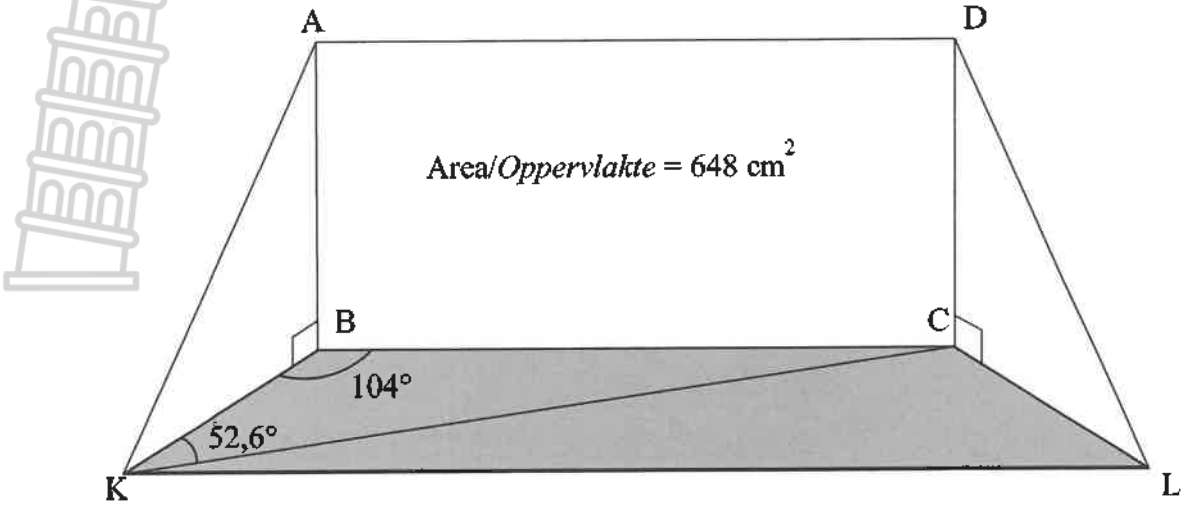
QUESTION/*VRAAG* 6

	Solution/*Oplossing*	**Marks** ***Punte***
6.1		(6)
6.2		(7)
		[13]

QUESTION/*VRAAG* 7

	Solution/*Oplossing*	**Marks** ***Punte***
7.1		(1)
7.2		(3)
7.3		(1)
7.4		(1)
7.5		(4)
		[10]

QUESTION/*VRAAG* 8



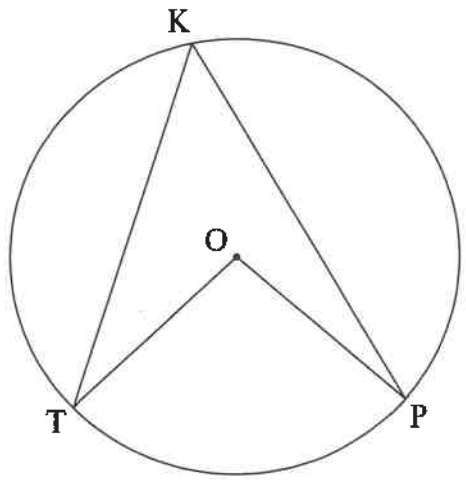
	Solution/*Oplossing*	**Marks** ***Punte***
8.1		(2)
8.2		(2)
8.3		(2)

	Solution/*Oplossing*	Marks *Punte*
8.4		(4)
		[10]

Provide reasons for your statements in QUESTIONS 9, 10 and 11.
Verskaf redes vir jou bewerings in VRAAG 9, 10 en 11.

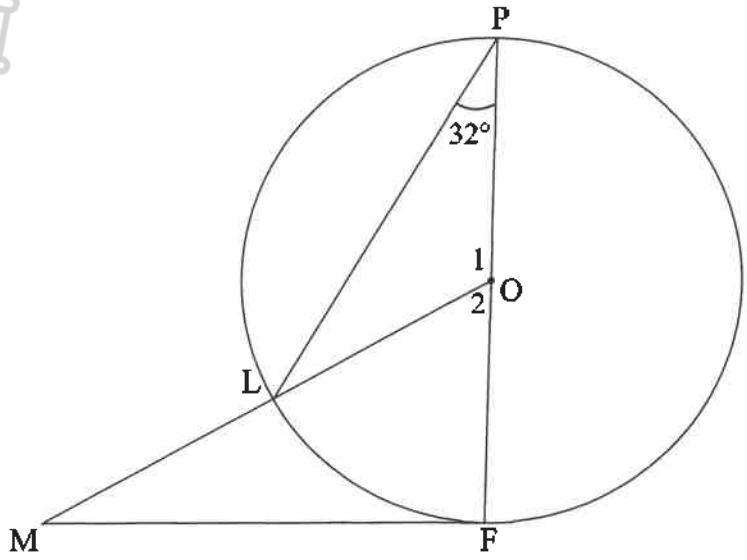
QUESTION/*VRAAG* 9

9.1



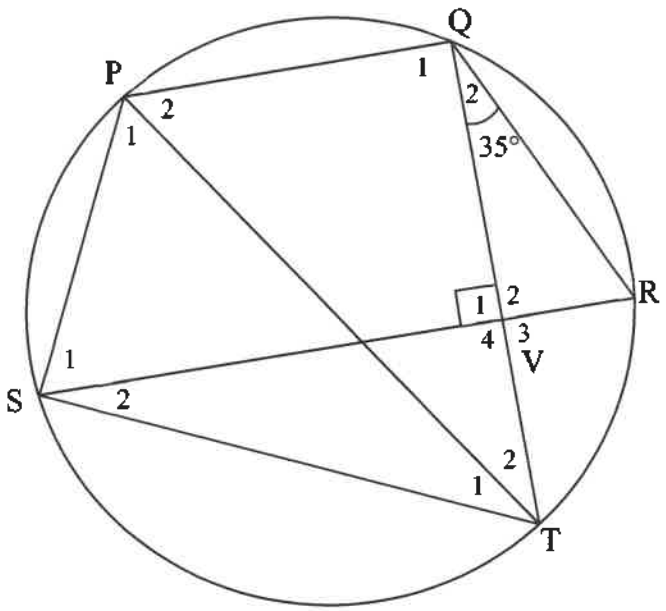
	Solution/*Oplossing*	**Marks** ***Punte***
9.1		(5)

9.2



	Solution/*Oplossing*	Marks *Punte*
9.2.1		(2)
9.2.2		(3)
		[10]

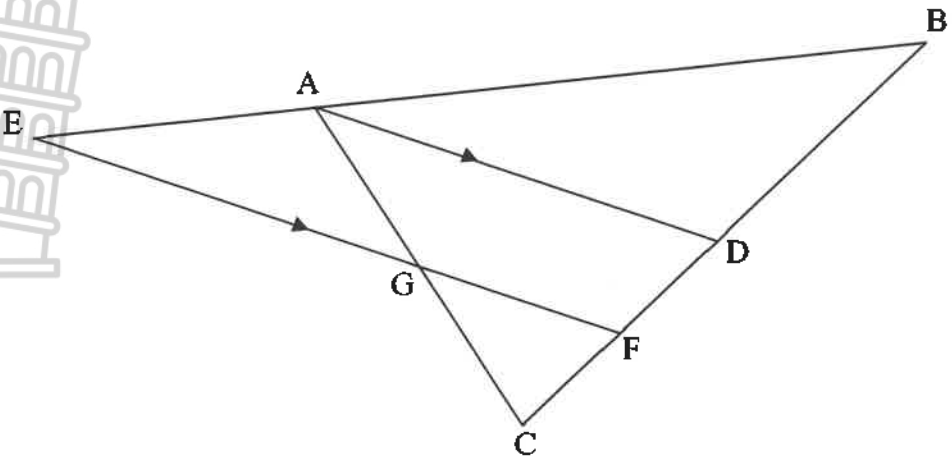
QUESTION/*VRAAG* 10



	Solution/*Oplossing*	**Marks** ***Punte***
10.1		(3)
10.2		(3)
10.3		(2)
		[8]

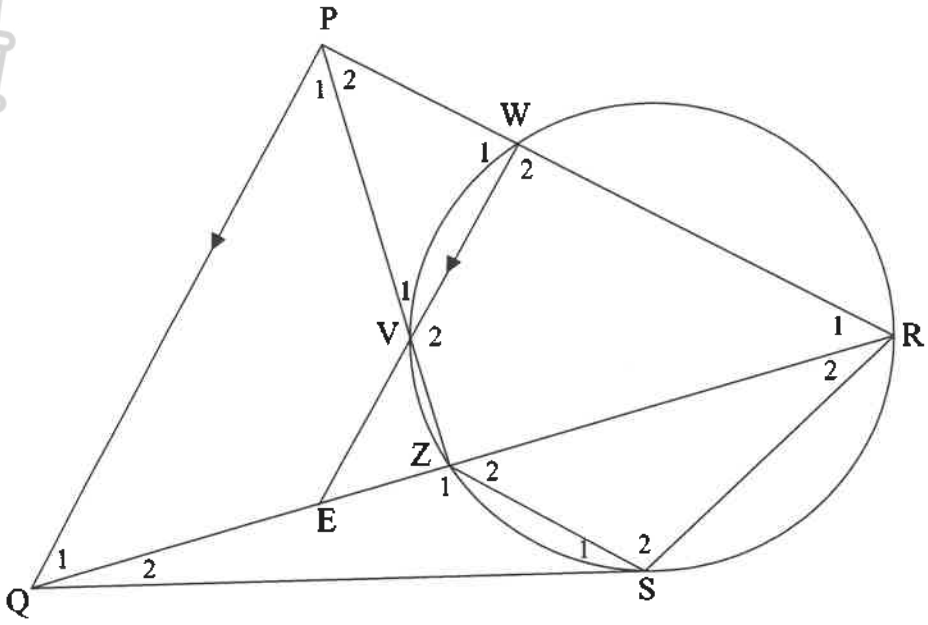
QUESTION/*VRAAG* 11

11.1



	Solution/*Oplossing*	**Marks** ***Punte***
11.1.1		(2)
11.1.2		(4)
11.1.3		(4)

11.2



	Solution/*Oplossing*	**Marks** ***Punte***
11.2.1		(2)
11.2.2		(1)
11.2.3		(3)

	Solution/*Oplossing*	Marks *Punte*
11.2.4		(3)
11.2.5		(4)
		[23]

	Additional space/*Bykomende ruimte*	**Marks** ***Punte***

	Additional space/*Bykomende ruimte*	**Marks** ***Punte***

	Additional space/*Bykomende ruimte*	**Marks** ***Punte***

	Additional space/*Bykomende ruimte*	**Marks** ***Punte***

TOTAL/*TOTAAL*: 150

RE-MARK/RE-CHECK *HERMERK/HERSIEN*				
Question *Vraag*	Marks *Punte*			Initials *Voorletters*
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
TOTAL *TOTAAL*				
HASH TOTAL *KAF-TOTAAL*				

basic education

Department:
Basic Education
REPUBLIC OF SOUTH AFRICA

NATIONAL SENIOR CERTIFICATE/ *NASIONALE SENIOR SERTIFIKAAT*

GRADE 12/*GRAAD 12*

MATHEMATICS P2/*WISKUNDE V2*

NOVEMBER 2025

MARKING GUIDELINES/*NASIENRIGLYNE*

MARKS/*PUNTE*: 150

These marking guidelines consist of 26 pages./
Hierdie nasienriglyne bestaan uit 26 bladsye.

NOTE:

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

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	
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

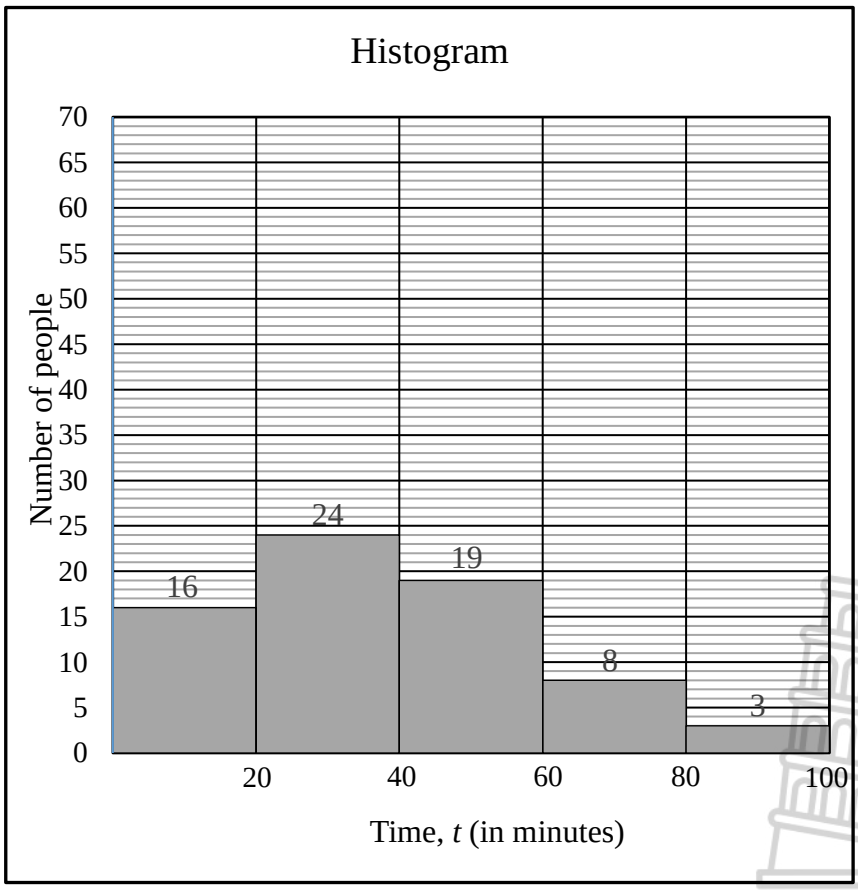
QUESTION/*VRAAG* 1

AGE OF CAR (IN YEARS)	SELLING PRICE OF CAR (IN RANDS)
2	293 000
3	265 000
3	256 000
4	219 000
4	241 000
4	246 000
6	226 000
6	176 000
7	154 000
7	180 000
8	148 000

1.1	$a = 331\,397{,}20$ $b = -22\,988{,}32$ $\hat{y} = 331\,397{,}20 - 22\,988{,}32x$	✓ $a = 331\,397{,}20$ ✓ $b = -22\,988{,}32$ ✓ equation (3)
1.2	$\hat{y} = 331\,397{,}20 - 22\,988{,}32(5)$ $= 216\,455{,}60$ **OR/*OF*** $\hat{y} = 216\,455{,}61$ (calculator)	✓ substitution ✓ answer (2) ✓✓ answer (2)
1.3	The strong correlation ($r = -0{,}95$) suggests that the data points lie close to the regression line. Therefore, the prediction will be valid./ *'n Sterk korrelasie* ($r = -0{,}95$) *dui aan dat die punte naby aan die regressielyn lê.* *Dus, die voorspelling is geldig.*	✓ strong correlation **OR** $r = -0{,}95$ ✓ answer (2)
1.4	The average decrease per year is R22 988,32. *Die gemiddelde afname per jaar is* R 22 988,32.	✓ answer (1)
		[8]

QUESTION/*VRAAG* 2

TIME, *t* (IN MINUTES)	**CUMULATIVE FREQUENCY**
$0 < t \leq 20$	16
$0 < t \leq 40$	40
$0 < t \leq 60$	59
$0 < t \leq 80$	67
$0 < t \leq 100$	70

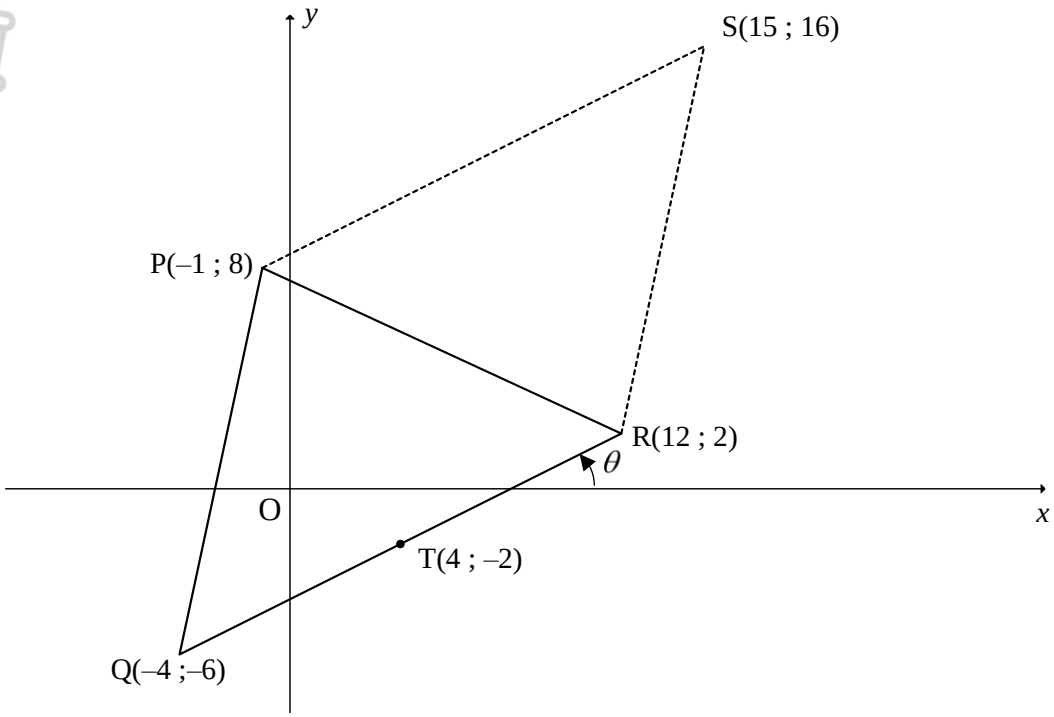
2.1.1	70	✓ 70 (1)
2.1.2	No. of people = 67 – 40 = 27	✓ 67 – 40 ✓ 27 (2)
2.1.3		✓ two frequencies correct ✓ all frequencies correct ✓ no gaps between bars (3)
2.1.4	Skewed to the right **OR** positively skewed *Skeef na regs* **OF** *positief skeef*	✓ answer (1)

2.2

11	14	19	20	8	10	2	14

	$\frac{11+14+19+20+8+10+2+14+x}{9}=12$ $x+98=108$ $x=10$ The 9th player scored 10 points $\sigma=5,23 \quad (5,22812)$ $(\bar{x}-\sigma\ ;\ \bar{x}+\sigma)=(12-5,23;\ 12+5,23)$ $=(6,77;17,23)$ 3 players' points were outside one standard deviation of the mean. 3 *spelers se punte aangeteken lê buite een standaardafwyking van die gemiddeld.*	✓ equating using mean ✓ answer ✓ standard deviation ✓ interval ✓ answer (5)
		[12]

QUESTION/*VRAAG* 3

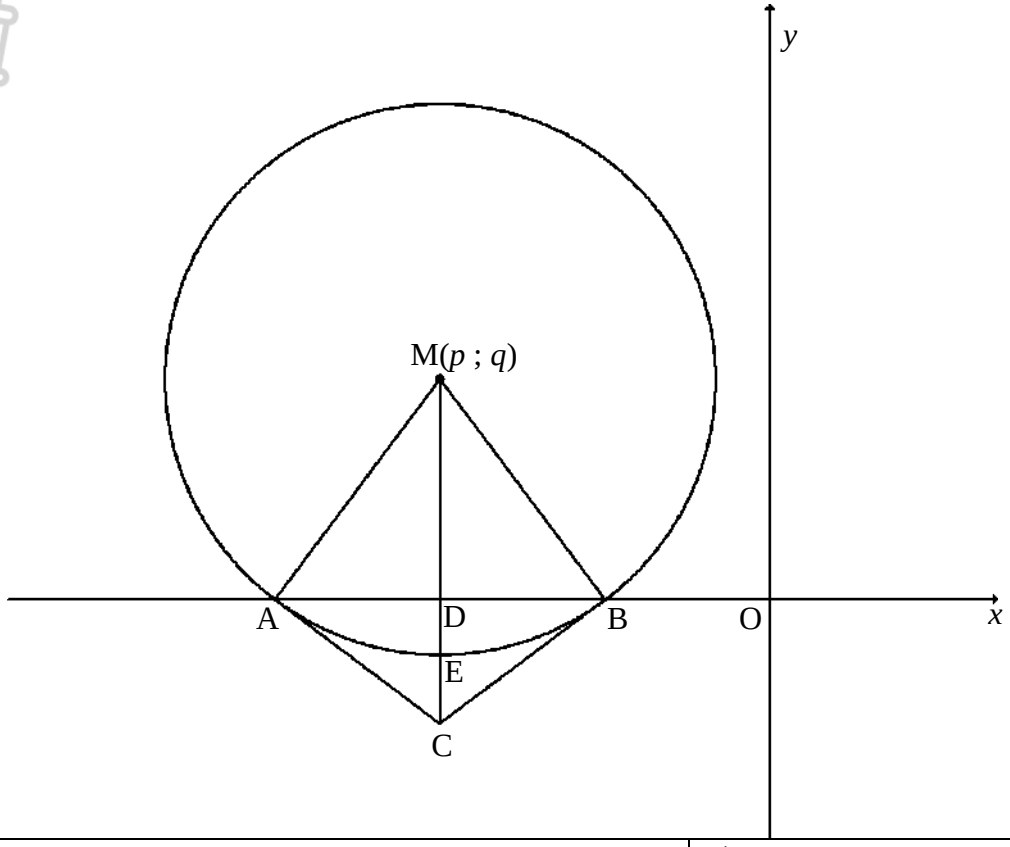


3.1	$QR=\sqrt{(-4-12)^2+(-6-2)^2}$ $=\sqrt{320}=8\sqrt{5}$ units	✓ $QR=\sqrt{(-4-12)^2+(-6-2)^2}$ ✓ answer (2)
3.2	$m_{QR}=\frac{-6-2}{-4-12}$ OR $m_{QR}=\frac{2-(-6)}{12-(-4)}$ $m_{QR}=\frac{1}{2}$ $m_{QR}=\frac{1}{2}$	✓ correct substitution of Q(–4 ; –6) & R(12 ; 2) into gradient formula ✓ answer (2)
3.3	$m_{QR}=\frac{1}{2}$ $\tan\theta=\frac{1}{2}$ $\theta=26,57°$	✓ $\tan\theta=m_{QR}$ ✓ answer (2)
3.4	$m_{QR}=\frac{1}{2}$ $-6=\frac{1}{2}(-4)+c$ **OR** $y-2=\frac{1}{2}(x-12)$ $c=-4$ $y-2=\frac{1}{2}x-6$ $y=\frac{1}{2}x-4$ $y=\frac{1}{2}x-4$	✓ correct substitution of gradient and point Q(–4 ; –6) or R(12 ; 2) ✓ answer (2)
3.5	$Q\rightarrow R:(x\,;y)\rightarrow(x+16\,;y+8)$ $\therefore$ S(15 ; 16)	✓ $x_S=15$ ✓ $y_S=16$ (2)

3.6	$m_{QR} = \frac{1}{2}$ $m_{PT} = -2$ Equation of PT: $y = -2x + c$ **OR** $y - y_1 = -2(x - x_1)$ $8 = -2(-1) + c$ **OR** $y - 8 = -2(x - (-1))$ $c = 6$ $y - 8 = -2x - 2$ $y = -2x + 6$ $y = -2x + 6$ $-2x + 6 = \frac{1}{2}x - 4$ $-4x + 12 = x - 8$ $5x = 20$ $x = 4$ $y = \frac{1}{2}(4) - 4$ $y = -2$ $T(4;-2)$ **OR** $PQ = \sqrt{(-4-(-1))^2 + (-6-8)^2} = \sqrt{205}$ $PR = \sqrt{(12-(-1))^2 + (2-8)^2} = \sqrt{205}$ $\therefore$ ΔPQR is isosceles / ΔPQR *is 'n gelykbenige* Δ $\therefore$ $\perp$ height bisects the base QR / $\perp$ *hoogte halveer die basis* QR $\therefore$ T is midpoint of QR / T *is middelpunt van* QR $\therefore T(4;-2)$	✓ m_{PT} ✓ equation of PT ✓ equation QR = equation PT ✓ simplification ✓ $T(x_T ; y_T)$ (5) ✓ $PQ = \sqrt{205}$ ✓ $PR = \sqrt{205}$ ✓ ΔPQR is isosceles ✓ $\perp$ height bisects the base QR ✓ $T(4;-2)$ (5)
3.7	$PT = \sqrt{(4-(-1))^2 + (-2-8)^2}$ $PT = \sqrt{125} = 5\sqrt{5}$ units = 11,18 units Area of PQRS = QR.PT $= (8\sqrt{5})(5\sqrt{5})$ $= 200$ units^2 **OR**	✓ length of PT ✓ substitution of QR and PT ✓ answer (3)

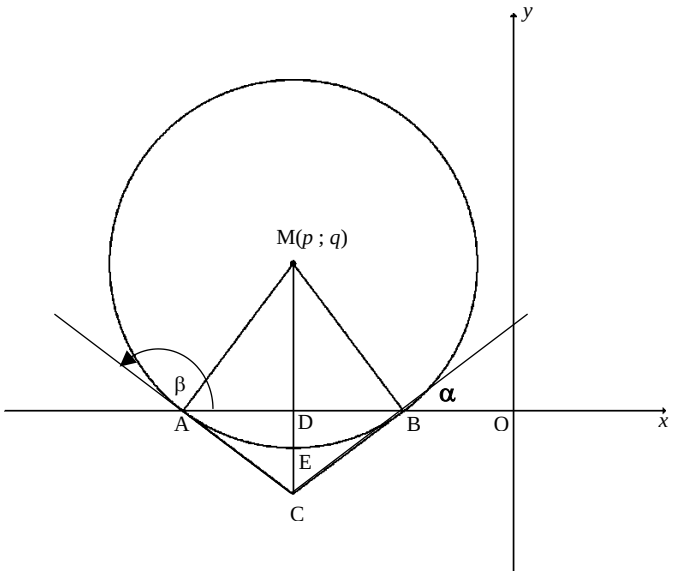
	$PT = \sqrt{\left(4-(-1)\right)^2+(-2-8)^2}$ $PT = \sqrt{125} = 5\sqrt{5}$ units $= 11{,}18$ units Area of $\Delta PQR = \frac{1}{2}\left(8\sqrt{5}\right)\left(5\sqrt{5}\right)$ $= 100$ units^2 Area of PQRS $= 2\times$ Area of ΔPQR $= 200$ units^2	✓ length of PT ✓ substitution of QR and PT ✓answer (3)
		[18]

QUESTION/*VRAAG* 4



4.1	$p = -6$	✓ $p = -6$ (1)
4.2	$M\hat{D}B = 90°$ [MC ⊥ *y*-axis] $AM = ME = q + 1$ [radii] $MD = q$ $AM^2 = AD^2 + MD^2$ [Pythagoras] $(q+1)^2 = (q-1)^2 + q^2$ $q^2 + 2q + 1 = q^2 - 2q + 1 + q^2$ $q^2 - 4q = 0$ $q(q-4) = 0$ $q \neq 0$ or $q = 4$	✓ $AM = q + 1$ ✓ $MD = q$ ✓ substitution into Pythagoras ✓ standard form (4)
4.3	AM = 5 units $(x+6)^2 + (y-4)^2 = 25$	✓ LHS ✓ RHS (2)
4.4	3 units	✓ answer (1)

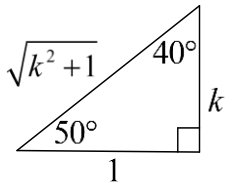
4.5	$(x+6)^2+(0-4)^2=25$ $(x+6)^2=9$ $x+6=3$ or $x+6=-3$ $x=-3$ $x=-9$ A$(-9\ ;\ 0)$ B$(-3\ ;\ 0)$ **OR** $(x+6)^2+(0-4)^2=25$ $x^2+12x+36+16-25=0$ $x^2+12x+27=0$ $(x+3)(x+9)=0$ $x=-3$ or $x=-9$ A$(-9\ ;\ 0)$ B$(-3\ ;\ 0)$ **OR** $q-1=3$ DB = AD = 3 [line from centre ⊥ to chord/ *lyn vanuit midpt ⊥ op koord*] A$(-9\ ;\ 0)$ B$(-3\ ;\ 0)$	✓ substituting $y = 0$ into equation of circle ✓ coordinates of A ✓ coordinates of B (3) ✓ substituting $y = 0$ into equation of circle ✓ coordinates of A ✓ coordinates of B (3) ✓ DB = 3 ✓ coordinates of A ✓ coordinates of B (3)
4.6	$m_{MB}=\frac{4-0}{-6-(-3)}$ $=-\frac{4}{3}$ $m_{BC}=\frac{3}{4}$ $y=\frac{3}{4}x+c$ $0=\frac{3}{4}(-3)+c$ $c=\frac{9}{4}$ $y=\frac{3}{4}x+\frac{9}{4}$ **OR** $y-y_1=\frac{3}{4}(x+x_1)$ $y-0=\frac{3}{4}[x-(-3)]$ $y=\frac{3}{4}(x+3)$ $y=\frac{3}{4}x+\frac{9}{4}$	✓ m_{MB} ✓ m_{BC} ✓ substitution of gradient BC and coordinates of B ✓ answer (4)
4.7	C$\left(-6\ ;\ -\frac{9}{4}\right)$	✓ x_C ✓ y_C (2)



4.8	$\tan\alpha = \frac{3}{4}$ $\alpha = 36,87°$	✓ $\alpha = 36,87°$
	$m_{AC} = -\frac{3}{4}$ $\tan\beta = -\frac{3}{4}$	✓ $\tan\beta = m_{AC}$
	$\beta = 180° - 36,87°$ $\beta = 143,13°$	✓ value of β
	$\therefore A\hat{C}B = 106,26°$	✓ answer (4)
	OR	
	$\tan M\hat{A}B = m_{MA} = \frac{4}{3}$ $M\hat{A}B = 53,13°$	✓ $M\hat{A}B$
	$A\hat{M}D = 90° - 53,13°$ $A\hat{M}D = 36,87°$	✓ $A\hat{M}D$
	$M\hat{A}C = 90°$ [tangent ⊥ radius / *raaklyn⊥radius*] $A\hat{C}M = 53,13°$	✓ $A\hat{C}M$
	$\therefore A\hat{C}B = 106,26°$ [property of kite /*eienskappe van vlieër*]	✓ answer (4)
	OR	
	$\tan A\hat{C}D = \frac{AD}{DC}$	✓ trig ratio in ΔACD or ΔBCD
	$\tan A\hat{C}D = \frac{3}{\frac{9}{4}} = \frac{4}{3}$	✓ $\tan A\hat{C}D$
	$A\hat{C}D = 53,13°$	✓ $A\hat{C}D$
	$\therefore A\hat{C}B = 106,26°$ [property of kite/*eienskappe van vlieër*]	✓ answer (4)

	OR AB = 6 units $AC = BC = \frac{15}{4}$ units [tangent from same point/ *raaklyne vanuit dieselfde punt*] $(AB)^2 = (AC)^2 + (BC)^2 - 2(AC)(BC)\cos\hat{C}$ $(6)^2 = \left(\frac{15}{4}\right)^2 + \left(\frac{15}{4}\right)^2 - 2\left(\frac{15}{4}\right)\left(\frac{15}{4}\right)\cos\hat{C}$ $\cos A\hat{C}B = -0,28$ $A\hat{C}B = 106,26°$ **OR** $\tan M\hat{A}B = m_{MA} = \frac{4}{3}$ $M\hat{A}B = 53,13°$ AMBC is a cyclic quad/ AMBC *is 'n kvh* $\therefore M\hat{C}B = 53,13°$ [∠s in the same seg/*∠e in dies segm*] $\therefore A\hat{C}B = 106,26°$ [property of kite/*eienskappe v vlieër*]	✓ AC = BC ✓ substitution into cosine-rule ✓ simplification ✓ answer (4) ✓ MÂB ✓ AMBC is a cyclic quad/*kvh* ✓ MĈB ✓ answer (4)
		[21]

QUESTION/*VRAAG* 5

5.1.1	$r^2 = k^2 + 1^2$ [Pythagoras] $r = \sqrt{k^2+1}$ $\cos 40°$ $= \dfrac{k}{\sqrt{k^2+1}}$  	✓ third side = $\sqrt{k^2+1}$ ✓ answer (2)
5.1.2	$\dfrac{2\sin 25°\cos 25°}{-2+4\sin^2 25°}$ $= \dfrac{\sin 50°}{-2\left(1-2\sin^2 25°\right)}$ $= \dfrac{\sin 50°}{-2\cos 50°}$ $= \left(\dfrac{k}{\sqrt{k^2+1}}\right) \div \left(\dfrac{-2}{\sqrt{k^2+1}}\right)$ **OR** $= -\dfrac{1}{2}\tan 50°$ $= -\dfrac{1}{2}k$	✓ $\sin 50°$ ✓ $-2\left(1-2\sin^2 25°\right)$ ✓ double angle ✓ subst **OR** quotient identity ✓ answer (5)
5.1.3	$\sin 10° = \sin(50° - 40°)$ $= \sin 50°\cos 40° - \cos 50°\sin 40°$ $= \left(\dfrac{k}{\sqrt{k^2+1}}\right)\left(\dfrac{k}{\sqrt{k^2+1}}\right) - \left(\dfrac{1}{\sqrt{k^2+1}}\right)\left(\dfrac{1}{\sqrt{k^2+1}}\right)$ $= \dfrac{k^2-1}{k^2+1}$ **OR** $\sin 10°$ $= \cos 80°$ $= \cos 2(40°)$ $= 2\cos^2 40° - 1$ $= 2\left(\dfrac{k}{\sqrt{k^2+1}}\right)^2 - 1$ $= \dfrac{2k^2}{k^2+1} - 1$ $= \dfrac{k^2-1}{k^2+1}$ **OR**	✓ $\sin 10° = \sin(50° - 40°)$ ✓ correct expansion ✓ first term ✓ second term (4) ✓ $\sin 10° = \cos 80°$ ✓ correct expansion ✓✓ substitution (4)

	$\sin 10° = \sin(60° - 50°)$ $= \sin 60° \cos 50° - \cos 60° \sin 50°$ $= \left(\frac{\sqrt{3}}{2}\right)\left(\frac{1}{\sqrt{k^2+1}}\right) - \left(\frac{1}{2}\right)\left(\frac{k}{\sqrt{k^2+1}}\right)$ $= \frac{\sqrt{3}-k}{2\sqrt{k^2+1}}$	✓ $\sin 10° = \sin(60° - 50°)$ ✓ correct expansion ✓ first term ✓ second term (4)
5.2.1	$\frac{\sin(540° + x).\cos(90° + x)}{\sin(-x)}$ $= \frac{(-\sin x)(-\sin x)}{(-\sin x)}$ $= -\sin x$	✓ $\sin(540° + x) = -\sin x$ ✓ $\cos(90° + x) = -\sin x$ ✓ $\sin(-x) = -\sin x$ ✓ answer (4)
5.2.2	$x \in (180°; 360°)$ **OR** $180° < x < 360°$	✓✓ $x \in (180°; 360°)$ (2) ✓✓ $180° < x < 360°$ (2)
		[17]

QUESTION/VRAAG 6

6.1

$$\text{LHS} = \left[\tan(180° - x)\right](1 - \cos^2 x) + \cos^2 x$$
$$= (-\tan x)(\sin^2 x) + \cos^2 x \quad ✓ \tan(180° - x) = -\tan x$$
$$= \left(-\frac{\sin x}{\cos x}\right)(\sin^2 x) + \cos^2 x \quad ✓ 1 - \cos^2 x = \sin^2 x \quad ✓ \text{quotient identity}$$
$$= -\frac{\sin^3 x}{\cos x} + \cos^2 x$$
$$= \frac{\sin^3 x - \cos^3 x}{-\cos x} \quad ✓ \text{simplification to a single fraction}$$
$$= \frac{(\sin x - \cos x)(\sin^2 x + \sin x.\cos x + \cos^2 x)}{-\cos x} \quad ✓ \text{factors for a difference of cubes}$$
$$= \frac{(\sin x - \cos x)(1 + \sin x.\cos x)}{-\cos x} \quad ✓ \sin^2 x + \cos^2 x = 1$$
$$= \text{RHS}$$

(6)

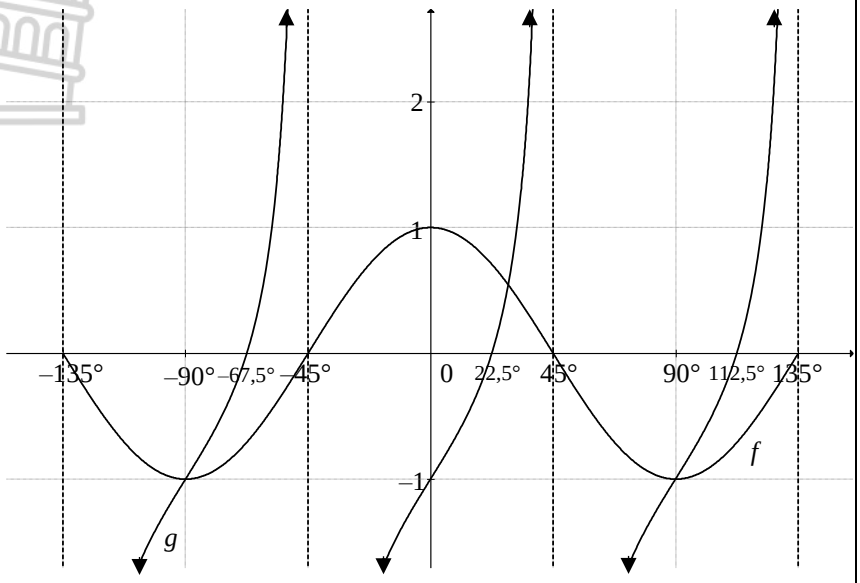
OR

$$\text{RHS} = \frac{(\sin x - \cos x)(1 + \sin x.\cos x)}{-\cos x}$$
$$= \frac{(\sin x - \cos x)(\cos^2 x + \sin^2 x + \sin x.\cos x)}{-\cos x} \quad ✓ 1 = \sin^2 x + \cos^2 x$$
$$= \frac{\sin x\cos^2 x + \sin^3 x + \sin^2 x\cos x - \cos^3 x - \sin^2 x\cos x - \sin x.\cos^2 x}{-\cos x} \quad ✓ \text{expansion}$$
$$= \frac{\sin^3 x - \cos^3 x}{-\cos x} \quad ✓ \text{simplification}$$
$$= \frac{\sin^3 x}{-\cos x} + \cos^2 x \quad ✓ \text{split fraction}$$
$$= \frac{-\sin x}{\cos x}(\sin^2 x) + \cos^2 x$$
$$= -\tan x(1 - \cos^2 x) + \cos^2 x \quad ✓ \text{quotient identity} \quad ✓ \sin^2 x = 1 - \cos^2 x$$
$$= \text{LHS}$$

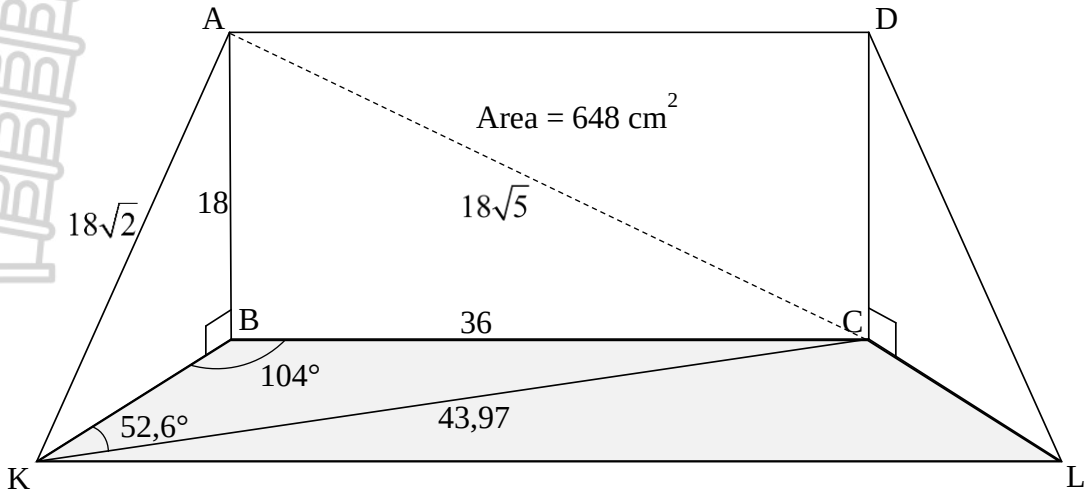
(6)

6.2	$\sin^2 x\ ;\ \cos^2 x\ ;\ \frac{1}{2}\sin 2x$	
	$\cos^2 x-\sin^2 x=\frac{1}{2}\sin 2x-\cos^2 x$	✓ $\cos^2 x-\sin^2 x=\frac{1}{2}\sin 2x-\cos^2 x$
	$\cos^2 x-\sin^2 x=\frac{1}{2}(2\sin x\cos x)-\cos^2 x$	✓ $\sin 2x=2\sin x\cos x$
	$\cos^2 x-\sin^2 x=\sin x\cos x-\cos^2 x$	
	$2\cos^2 x-\sin x\cos x-\sin^2 x=0$	✓ standard form
	$(2\cos x+\sin x)(\cos x-\sin x)=0$	✓ factors
	$2\cos x=-\sin x$ or $\cos x=\sin x$ $\tan x=-2$ or $\tan x=1$	✓ both equations
	ref $\angle$ = $63,43°$ or ref $\angle$ = $45°$	
	$x=116,57°+k.180°$ or $x\neq 45°+k.180°;k\in Z$	✓ x = $116,57°$ ✓ $116,57°+k.180°;k\in Z$
	OR	(7)
	$\sin^2 x\ ;\ \cos^2 x\ ;\ \frac{1}{2}\sin 2x$	
	$\cos^2 x-\sin^2 x=\frac{1}{2}\sin 2x-\cos^2 x$	✓ $\cos^2 x-\sin^2 x=\frac{1}{2}\sin 2x-\cos^2 x$
	$\cos^2 x-\sin^2 x=\frac{1}{2}(2\sin x\cos x)-\cos^2 x$	✓ $\sin 2x=2\sin x\cos x$
	$\cos^2 x-\sin^2 x=\sin x\cos x-\cos^2 x$	
	$\cos^2 x-\sin^2 x-\sin x\cos x+\cos^2 x=0$	
	$(\cos x-\sin x)(\cos x+\sin x)+\cos x(\cos x-\sin x)=0$	✓ factors
	$(\cos x-\sin x)(\cos x+\sin x+\cos x)=0$	✓ factors
	$\cos x=\sin x$ or $2\cos x=-\sin x$ $\tan x=1$ $\tan x=-2$ ref $\angle$ = $45°$ ref $\angle$ = $63,43°$	✓ both equations
	$x\neq 45°+k.180°;k\in Z$ $x=116,57°+k.180°$	✓ x = $116,57°$ ✓ $116,57°+k.180°;k\in Z$
		(7)
		[13]

QUESTION/*VRAAG* 7

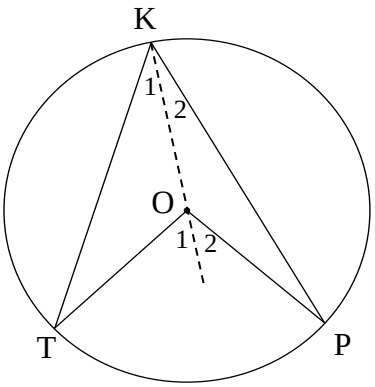
7.1	$180°$	✓ answer (1)
7.2		✓ asymptotes ✓ shape ✓ intercepts with axes (3)
7.3	$f(x)=\cos 2x$ $h(x)=\cos 2(x+45°)$ $=\cos(2x+90°)$ $=-\sin 2x$	✓ answer (1)
7.4	$y\in[-1;1]$ **OR** $-1\le y\le 1$	✓ $y\in[-1;1]$ (1) ✓ $-1\le y\le 1$ (1)
7.5	$\tan 2x-1=0$ $\tan 2x=1$ $2x=45°$ $x=22,5°$ $(1-\tan 2x)(\cos 2x)\ge 0$ $-(\tan 2x-1)(\cos 2x)\ge 0$ $(\tan 2x-1)(\cos 2x)\le 0$ $x\in[0°;22,5°]\cup[112,5°;135°)$ **OR** $0°\le x\le 22,5°$ or $112,5°\le x<135°$	✓ $x=22,5°$ ✓ $(\tan 2x-1)(\cos 2x)\le 0$ ✓ first interval ✓ second interval (4)
		[10]

QUESTION/*VRAAG* 8



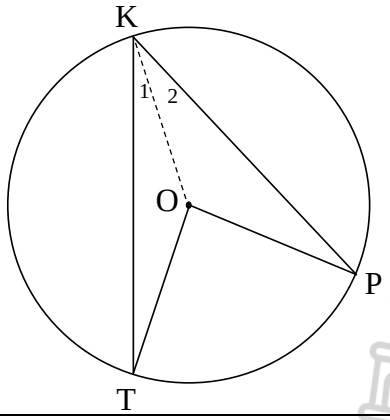
8.1	Area of ABCD = $BC \times AB$ $648 = 2AB \times AB$ $AB^2 = 324$ $AB = 18$ cm	✓ $BC = 2AB$ ✓ substitution into area of rectangle (2)
8.2	$AC^2 = AB^2 + BC^2$ [Pythagoras] $= 18^2 + 36^2$ $AC = \sqrt{1620} = 18\sqrt{5} = 40,25$ cm	✓ $AC^2 = 18^2 + 36^2$ ✓ answer (2)
8.3	$\frac{KC}{\sin K\hat{B}C} = \frac{BC}{\sin B\hat{K}C}$ $\frac{KC}{\sin 104°} = \frac{36}{\sin 52,6°}$ $KC = \frac{36 \sin 104°}{\sin 52,6°}$ $KC = 43,97$ cm	✓ substitution into sine rule ✓ answer (2)
8.4	$AK^2 = AB^2 + BK^2$ [Pythagoras] $= 18^2 + 18^2$ $AK = \sqrt{648} = 18\sqrt{2}$ cm = 25,46 cm $KC^2 = AK^2 + AC^2 - 2AK.AC \cos K\hat{A}C$ $(43,97)^2 = (18\sqrt{2})^2 + (18\sqrt{5})^2 - 2(18\sqrt{2})(18\sqrt{5})(\cos K\hat{A}C)$ $\cos K\hat{A}C = 0,16...$ $K\hat{A}C = 80,60°$	✓ length of AK ✓ substitution into cosine rule ✓ simplification ✓ answer (4)
		[10]

QUESTION/VRAAG 9



9.1	Construction: Draw KO produced $\hat{O}_1 = \hat{K}_1 + \hat{T}$ [ext ∠ of Δ/*buite ∠van* Δ] But $\hat{K}_1 = \hat{T}$ [∠s opp equal sides/*∠e teenoor gelyke sye*] $\therefore \hat{O}_1 = 2\hat{K}_1$ $\hat{O}_2 = \hat{K}_2 + P$ [ext ∠ of Δ/*buite ∠van* Δ] But $\hat{K}_2 = P$ [∠s opp equal sides/*∠e teenoor gelyke sye*] $\therefore \hat{O}_2 = 2\hat{K}_2$ $\therefore \hat{O}_1 + \hat{O}_2 = 2\hat{K}_1 + 2\hat{K}_2$ $= 2\left(\hat{K}_1 + \hat{K}_2\right)$ $\therefore T\hat{O}P = 2\,T\hat{K}P$	✓ construction ✓ S / R ✓ S ✓ S ✓ S (5)

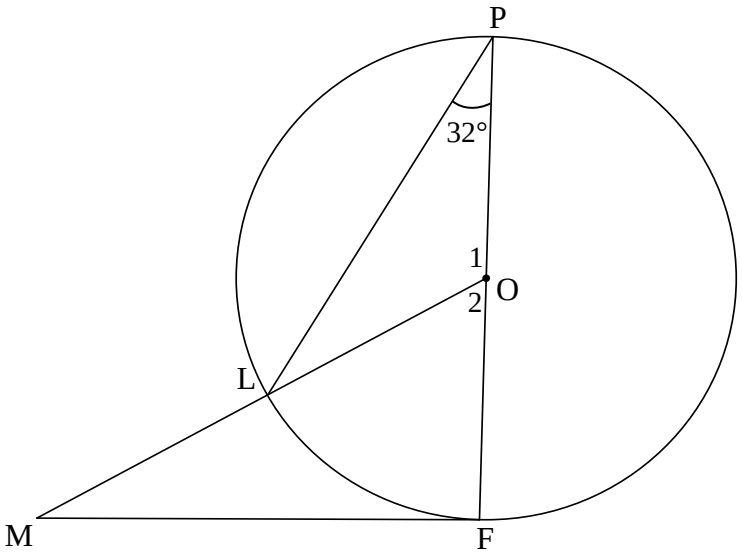
OR



9.1	Construction: Draw KO $\hat{T} = \hat{K}_1$ [∠ s opp. equal sides/*∠e teenoor gelyke sye*] $\therefore K\hat{O}T = 180° - 2\hat{K}_1$ [sum of ∠ s of Δ /*binne ∠e van* Δ] $\hat{P} = \hat{K}_2$ [∠ s opp. equal sides/*∠e teenoor gelyke sye*] $\therefore K\hat{O}P = 180° - 2\hat{K}_2$ [sum of ∠ s of Δ / *binne ∠e van* Δ] $T\hat{O}P = 360° - \left(K\hat{O}T + K\hat{O}P\right)$ [∠ s around a point/*∠e om 'n punt*] $= 360° - \left(180° - 2\hat{K}_1 + 180° - 2\hat{K}_2\right)$ $= 2\hat{K}_1 + 2\hat{K}_2$ $= 2\left(\hat{K}_1 + \hat{K}_2\right)$	✓ construction ✓ S / R ✓ S ✓ S ✓ S (5)

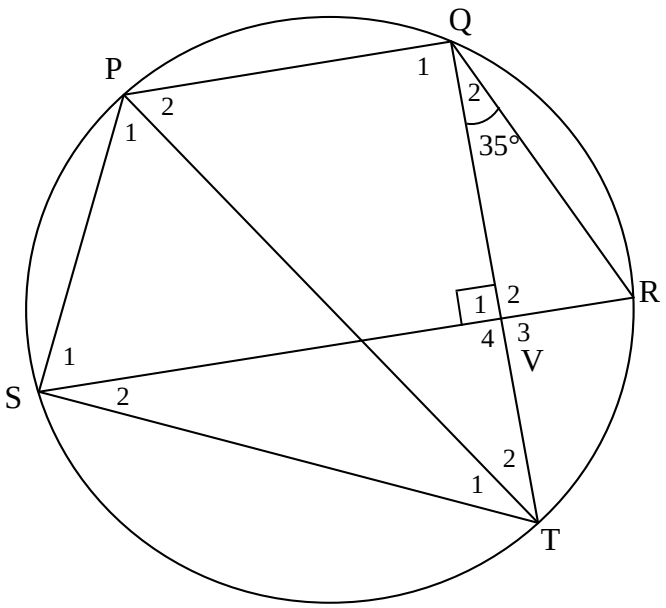
	$\therefore T\hat{O}P = 2\,T\hat{K}P$	

9.2



9.2.1	$\hat{O}_2 = 64°$	[∠ at centre = 2 ×∠ at circumference/ *Midpts∠ = 2 × Omtreks∠*]	✓ S ✓ R (2)
	OR		
	PLO = $\hat{P}$ = 32°	[∠s opp equal radii/ *∠e teenoor gelyke radiusse*]	✓ S / R
	$\hat{O}_2 = 64°$	[ext ∠of Δ / *buite ∠ van Δ*]	✓ S (2)
9.2.2	$P\hat{F}M = 90°$	[tan ⊥ diameter/*raaklyn ⊥ middellyn*]	✓ S ✓ R
	$\hat{M} = 26°$	[sum of ∠ s of Δ/*binne ∠e van Δ*]	✓ S (3)
			[10]

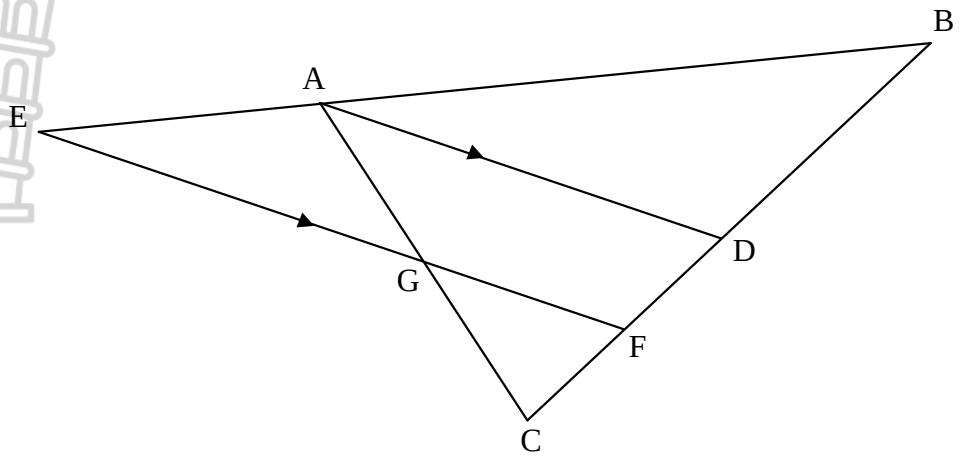
QUESTION/VRAAG 10



10.1	$\hat{R} = 55°$ [sum of ∠s in Δ/*binne ∠e van* Δ] $\therefore Q\hat{T}S = 55°$ [∠s in the same seg/*∠e in dieselfde segment*] **OR** $\hat{S}_2 = 35°$ [∠s in the same seg/*∠e in dieselfde segment*] $\therefore Q\hat{T}S = 55°$ [sum of ∠s in Δ/*binne ∠e van* Δ]	✓ S ✓ S ✓ R (3) ✓ S ✓ R ✓ S (3)
10.2	$S\hat{P}Q = 125°$ [opp ∠s of cyclic quad/teenoorst. *∠e van kvh*] $\hat{S}_1 = \hat{R} = 55°$ [given/*gegee*] $S\hat{P}Q + \hat{S}_1 = 180°$ $\therefore$ PQ || SR [co-int ∠s supp/*ko-binne ∠e suppl*] **OR** $\hat{S}_1 = \hat{R} = 55°$ [given/*gegee*] $P\hat{Q}R = 125°$ [opp ∠s of cyclic quad/teenoorst. *∠e van kvh*] $\therefore \hat{Q}_1 = 125° - 35° = 90°$ $\therefore \hat{Q}_1 + \hat{V}_1 = 180°$ $\therefore$ PQ || SR [co-int ∠s supp/*ko-binne ∠e suppl*]	✓ S ✓ R ✓ R (3) ✓ S ✓ R ✓ R (3)

10.3	$\hat{Q}_1 = 90°$ $\therefore$ PT is a diameter **OR** $\hat{S}_2 = 35°$ $P\hat{S}T = 90°$ $\therefore$ PT is a diameter	[co-int ∠s; PQ|| SR/ *ko-binne ∠e; PQ ||SR*] [converse ∠ in semi-circle/ chord subtends 90°∠ *omgekeerde ∠ in halwe sirkel / koord onderspan* 90° ∠] [ext ∠ of ΔSVT or sum of ∠s in Δ *buite ∠v* Δ of *binne ∠e van* Δ] [converse ∠ in semi-circle/ chord subtends 90°∠ *omgekeerde ∠ in halwe sirkel / koord onderspan* 90° ∠]	✓ S ✓ R (2) ✓ S ✓ R (2)
			[8]

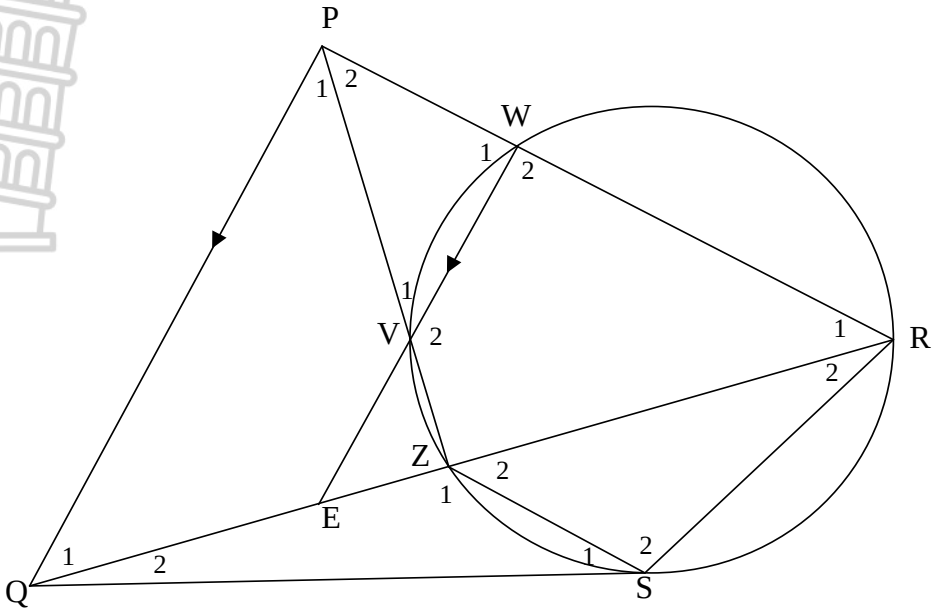
QUESTION/*VRAAG* 11



11.1.1	$\frac{FD}{CF}=\frac{GA}{CG}$ [prop theorem; AD || EF/line || one side of Δ/ *eweredigheidst.; AD || EF / lyn || een sy v* Δ] $\frac{FD}{CF}=\frac{2}{3}$	✓ S ✓ answer (2)
11.1.2	$FD=\frac{2}{3}CF$ $FD=\frac{2}{3}(2x)=\frac{4}{3}x$ $\frac{BA}{EA}=\frac{BD}{FD}$ [prop theorem; AD || EF/line || one side of Δ/ *eweredigheidst.; AD || EF / lyn || een sy v* Δ] $\frac{BA}{EA}=\frac{5x-\frac{4}{3}x}{\frac{4}{3}x}$ $=\frac{11}{3}\times\frac{3}{4}$ $=\frac{11}{4}$	✓ $\frac{4}{3}x$ ✓ S ✓ substitution ✓ answer (4)

11.1.3	$\frac{\text{Area of } \Delta GCF}{\text{Area of GFDA}} = \frac{\text{Area } \Delta GCF}{\text{Area } \Delta CDA - \text{Area } \Delta GCF}$ $= \frac{\frac{1}{2}GC.CF\sin\hat{C}}{\frac{1}{2}AC.CD\sin\hat{C} - \frac{1}{2}GC.CF\sin\hat{C}}$ $= \frac{\frac{1}{2}(3k)(3p)(\sin\hat{C})}{\frac{1}{2}(5k)(5p)(\sin\hat{C}) - \frac{1}{2}(3k)(3p)(\sin\hat{C})}$ $= \frac{\frac{1}{2}(9kp)(\sin\hat{C})}{\frac{1}{2}\sin\hat{C}(25kp - 9kp)}$ $= \frac{9}{16}$	✓ GFDA = ΔCDA – ΔCGF ✓ $\frac{1}{2}(GC)(FC)\sin\hat{C}$ ✓ $\frac{1}{2}AC.CD\sin\hat{C} - \frac{1}{2}GC.CF\sin\hat{C}$ ✓ answer (4)

11.2



11.2.1	$\frac{QE}{QR}=\frac{PW}{PR}$ [prop theorem; PQ ‖ WE/line ‖ one side of Δ / *eweredigheidst.; PQ ‖ WE / lyn ‖ een sy v Δ*] $PR=\frac{PW.QR}{QE}$	✓ S ✓ R (2)
11.2.2	$\frac{PQ}{RQ}=\frac{QZ}{QP}$ $[\Delta PQZ \text{ ||| } \Delta RQP]$ $\therefore PQ^2 = RQ.QZ$	✓ $\frac{PQ}{RQ}=\frac{QZ}{QP}$ (1)
11.2.3	In ΔQSZ and ΔQRS $\hat{Q}_2=\hat{Q}_2$ [common ∠ / *gemeenskaplike∠*] $\hat{S}_1=\hat{R}_2$ [tan chord theorem/*raaklyn koord stelling*] $\hat{Z}_1=Q\hat{S}R$ [3rd ∠ of Δ] $\therefore \Delta QSZ \text{ ||| } \Delta QRS$ [∠∠∠]	✓ S ✓ S/R ✓ S **OR** R (3)
11.2.4	$\frac{QS}{QR}=\frac{QZ}{QS}$ [ΔQSZ‖‖ΔQRS] $\therefore QS^2 = QZ.QR$ But $PQ^2 = RQ.QZ$ [proved in 11.2.2] $\therefore PQ = QS$	✓ S / R ✓ S ✓ S (3)

11.2.5	$\frac{PQ}{RQ} = \frac{PZ}{PR}$ $[\Delta PQZ \| \| \| \Delta RQP]$	
	$PR = \frac{QR.PZ}{PQ}$	✓ $PR = \frac{QR.PZ}{PQ}$
	$PR = \frac{PW.QR}{QE}$ [proved in 11.2.1]	
	$\therefore \frac{PW.QR}{QE} = \frac{QR.PZ}{PQ}$	✓ S
	$PW = \frac{QE.PZ}{PQ}$	✓ $PW = \frac{QE.PZ}{PQ}$
	But $PQ^2 = RQ.QZ$ [proved in 11.2.2]	
	$\therefore PQ = \sqrt{RQ.QZ}$	✓ $PQ = \sqrt{RQ.QZ}$
	$\therefore PW = \frac{QE.PZ}{\sqrt{QR.QZ}}$	(4)
		[23]

TOTAL/*TOTAAL*: 150