basic education

Department:
Basic Education
REPUBLIC OF SOUTH AFRICA

SENIOR CERTIFICATE EXAMINATIONS/
NATIONAL SENIOR CERTIFICATE EXAMINATIONS

MATHEMATICS P2

MAY/JUNE 2026

MARKS: 150

TIME: 3 hours

This question paper consists of 13 pages, 1 information sheet and an answer book of 23 pages.

INSTRUCTIONS AND INFORMATION

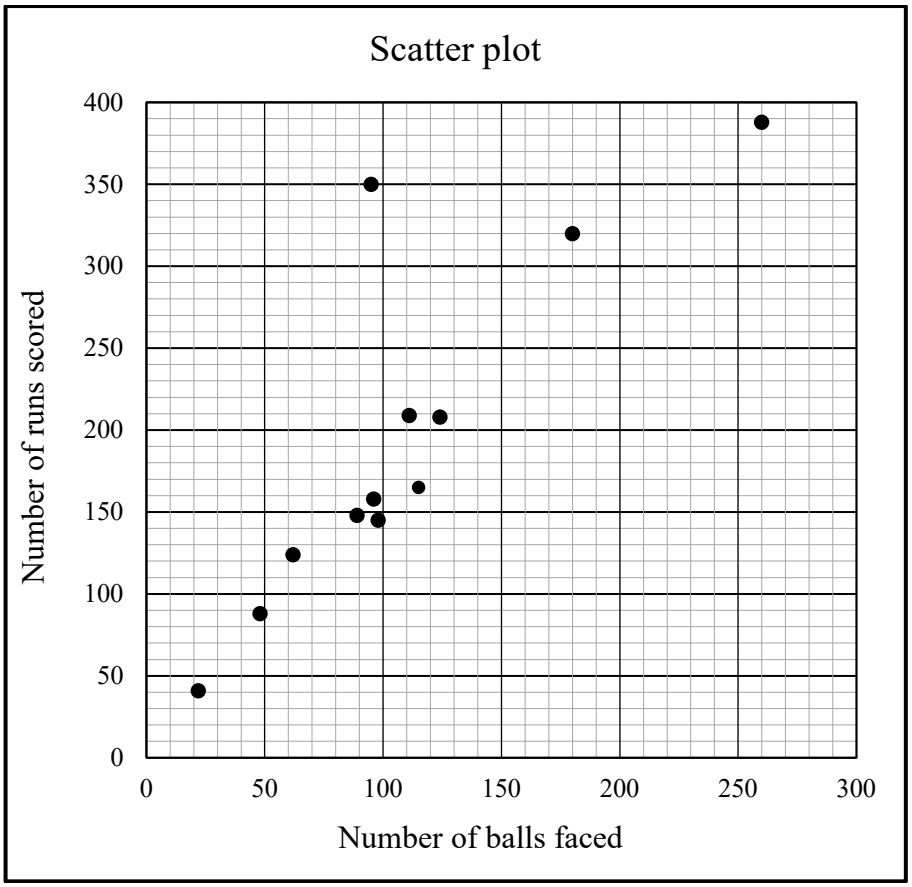
Read the following instructions and information carefully before answering the questions.

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 correct 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 are 12 players in a cricket team. In a tournament, the number of balls each player faced and the corresponding number of runs each player scored are given in the table and the scatter plot below.

NUMBER OF BALLS FACED (x)	62	111	22	48	124	180	89	96	95	260	98	115
NUMBER OF RUNS SCORED (y)	124	209	41	88	208	320	148	158	350	388	145	165



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

1.2 Estimate the number of runs a cricket player, who faced a total of 150 balls, made. (2)

1.3 Calculate how many players scored runs that were more than one standard deviation above the mean. (4)

1.4 Explain why (95 ; 350), the outlier, does NOT fit the trend of this set of data. (1)
[10]

QUESTION 2

2.1 The marks, as a percentage, that Grade 12 learners at a certain school obtained in the Mathematics examination in June 2025 was summarised in the frequency table below.

CLASS INTERVALS (AS A %)	FREQUENCY
$20 < x \leq 30$	8
$30 < x \leq 40$	14
$40 < x \leq 50$	16
$50 < x \leq 60$	21
$60 < x \leq 70$	16
$70 < x \leq 80$	9
$80 < x \leq 90$	6
$90 < x \leq 100$	2

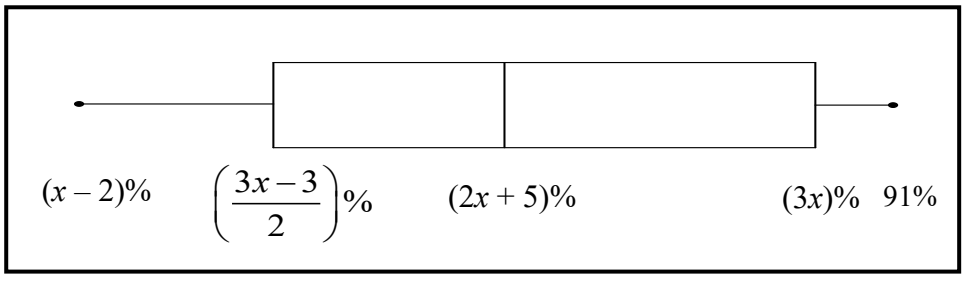
2.1.1 Write down the modal class interval for the data. (1)

2.1.2 Complete the cumulative frequency column in the table provided in the ANSWER BOOK. (2)

2.1.3 Draw a cumulative frequency curve (ogive) to represent the data above. (3)

2.1.4 Use the cumulative frequency curve (ogive) to estimate the median of the data. (1)

2.2 The marks, as a percentage, that Grade 12 learners at another school obtained in the same examination, are represented in the box and whisker diagram below.

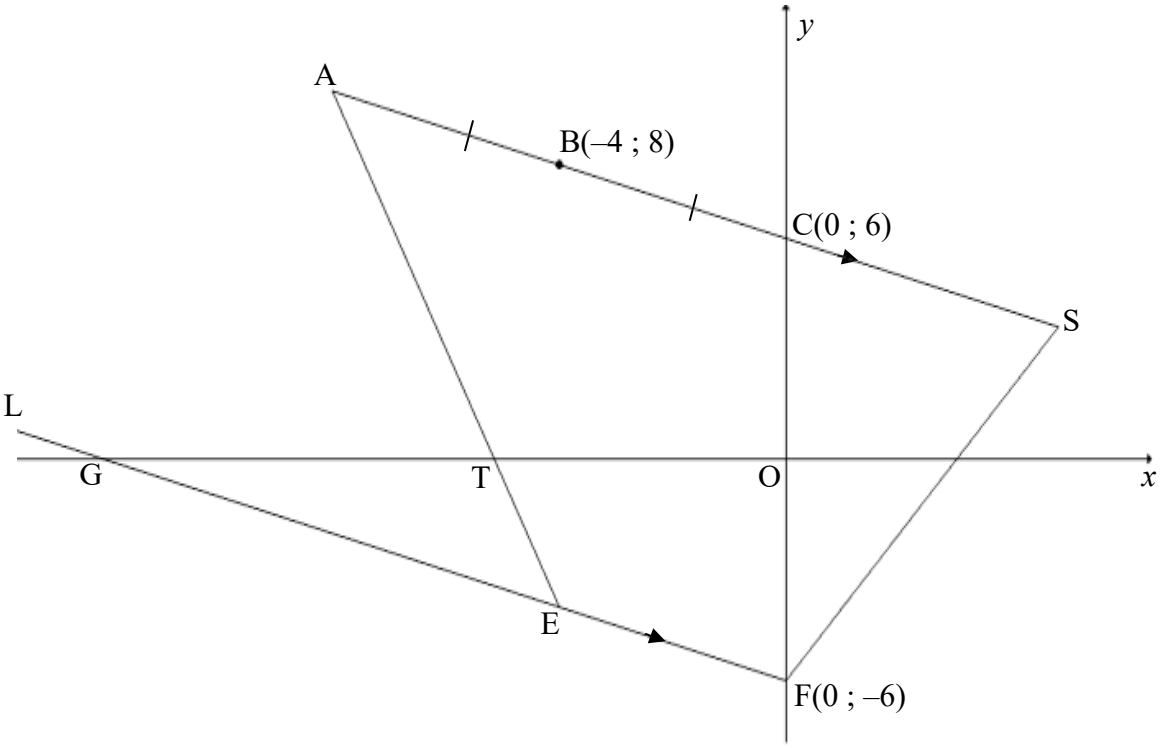


If it is given that the interquartile range (IQR) of the data is 45%, calculate the minimum percentage of learners who passed in this centre. (3)
[10]

QUESTION 3

In the diagram, AS intersects the y-axis at C(0 ; 6). B(–4 ; 8) is the midpoint of AC. The coordinates of F are (0 ; –6). LF is drawn parallel to AS and intersects the x-axis at G. E is a point on LF such that the equation of AE is $y = -\frac{7}{2}x - 18$.

AE intersects the x-axis at T. SF is drawn.



3.1 Calculate the coordinates of A. (3)

3.2 Determine the equation of line LF. (3)

3.3 Calculate the coordinates of E. (3)

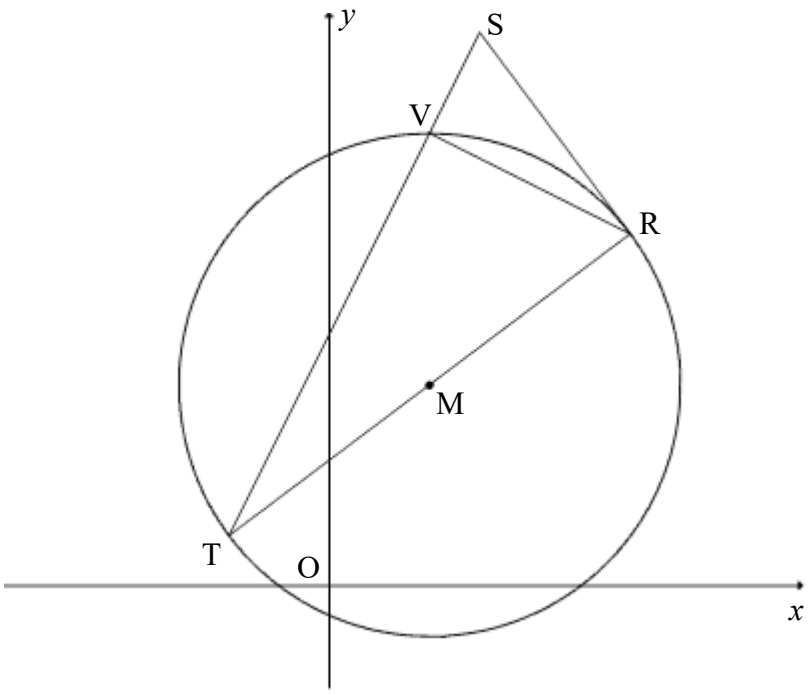
3.4 Determine the equation of the circle passing through C, S and F if it is further given that the coordinates of S are $\left(\frac{24}{5} ; \frac{18}{5}\right)$. (5)

3.5 Calculate the size of $A\hat{E}G$. (4)

[18]

QUESTION 4

In the diagram, the equation of the circle having a centre at M is $(x-2)^2+(y-4)^2=25$. Diameter TMR and tangent SR are drawn. The equation of line ST is $y=2x+5$. ST intersects the circle at V. VR is drawn.



4.1 Write down the coordinates of M, the centre of the circle. (2)

4.2 Show that the coordinates of T are T(–2 ; 1). (4)

4.3 Write down the coordinates of V. (2)

4.4 Calculate the gradient of TR. (2)

4.5 Determine the equation of SR, the tangent to the circle at R. (5)

4.6 Another circle passes through points A(–3 ; –1), B(x ; y) and C(2 ; 3) such that AC is a diameter of the circle. The circle passing through A, B and C intersects the given circle with equation $x^2-4x+y^2-8y-5=0$. Determine the equation of the line that passes through the points of intersections of both circles. (6)

4.7 If a constant k is added to the equation of the circle such that $(x-2)^2+(y-4)^2+k=25$, what effect will k have on the circle if $0<k<25$? (1)

[22]

QUESTION 5

5.1 Given: $\sin(A-B)=\sin A.\cos B-\cos A.\sin B$

5.1.1 Use the formula given above to derive a formula for $\sin(A+B)$ (2)

5.1.2 Hence, **without using a calculator**, solve for x in the interval $x\in[0°;360°]$ if

$$\sqrt{3}\cos x=\sin(50°+x).\cos(10°-x)+\cos(50°+x).\sin(10°-x)$$ (4)

5.2 Prove the identity: $\dfrac{\sin 2x}{2\cos^2 x}+\dfrac{\sin x}{\tan x\left[1+\cos(90°-x)\right]}=\dfrac{1}{\cos x}$ (5)

5.3 Show, **without using a calculator**, that $\sin 260°=-\sqrt{\dfrac{\cos 20°+1}{2}}$ (4)

[15]

QUESTION 6

6.1 Given: $\cos 330°.\cos 365°+\sin 175°.\sin 210°$

6.1.1 **Without using a calculator**, simplify the above expression to a single trigonometric ratio. (5)

6.1.2 Hence, determine $\sin 70°$ in terms of p if

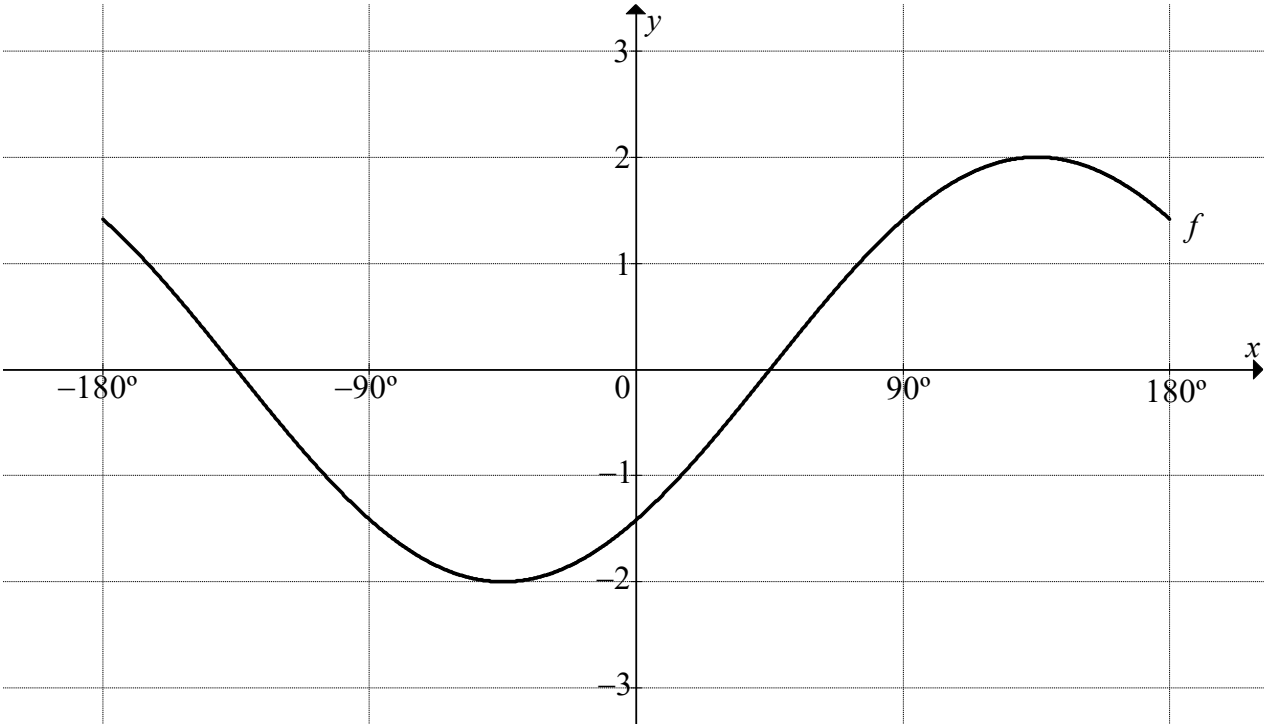
$\cos 330°.\cos 365°+\sin 175°.\sin 210°=p$ (3)

6.2 It is given that $\dfrac{2^{3\sin^2 x}}{4.2^{\sin x}}=1$. Determine the general solution for x if $\sin x<0$. (6)

[14]

QUESTION 7

In the diagram, $f(x)=2\sin(x-45°)$ is drawn for the interval $x\in[-180°\,;180°]$.



7.1 Write down the amplitude of f. (1)

7.2 Determine the values of x, in the interval $x\in[-180°\,;180°]$, for which $f'(x)\geq 0$. (2)

7.3 On the same set of axes provided in the ANSWER BOOK, draw the graph of $g(x)=-\tan x$ for the interval $x\in[-180°\,;180°]$. (3)

7.4 Write down the value of $g(-45°)-f(-45°)$. (1)

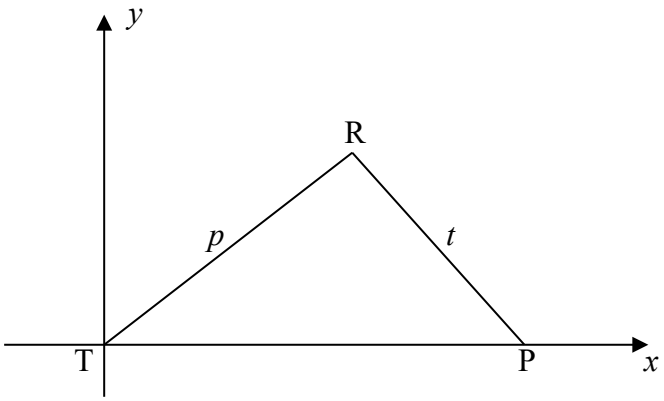
7.5 How many solutions does the equation $g(x)-f(x)=0$ have in the interval $x\in[-180°\,;180°]$? (1)

7.6 Graph h is obtained when g is translated $45°$ to the right. Write down the equations of the asymptotes of h in the interval $x\in[-180°\,;180°]$. (2)

[10]

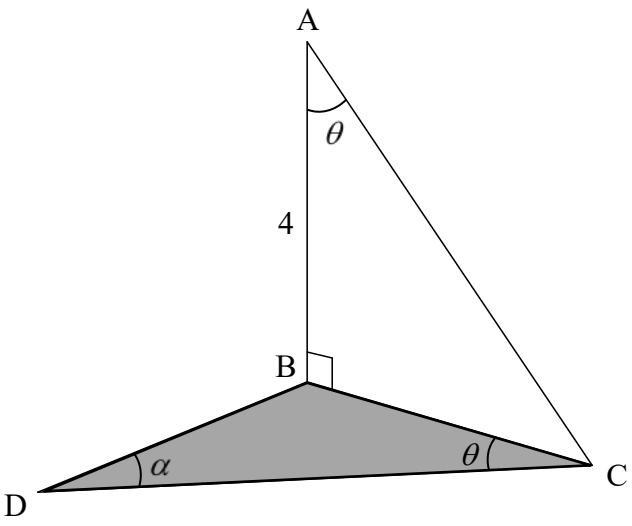
QUESTION 8

8.1 In the diagram, ΔRTP is given with $RT = p$ and $RP = t$.



Prove that $\frac{\sin \hat{T}}{t} = \frac{\sin \hat{P}}{p}$ (4)

8.2 In the diagram, D, B and C are points in the same horizontal plane. AB is a vertical flagpole. A rope is tied from A, the top of the flagpole, to point C.
$B\hat{A}C = B\hat{C}D = \theta$, $B\hat{D}C = \alpha$ and $AB = 4$ units.



8.2.1 Show that the distance between B and C is $4\tan\theta$ (1)

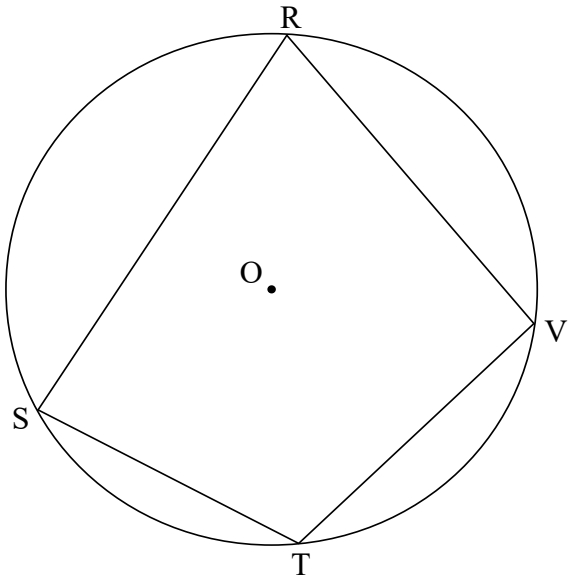
8.2.2 Hence, show that $DC = 4\sin\theta\left(1+\frac{\tan\theta}{\tan\alpha}\right)$ (5)

[10]

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

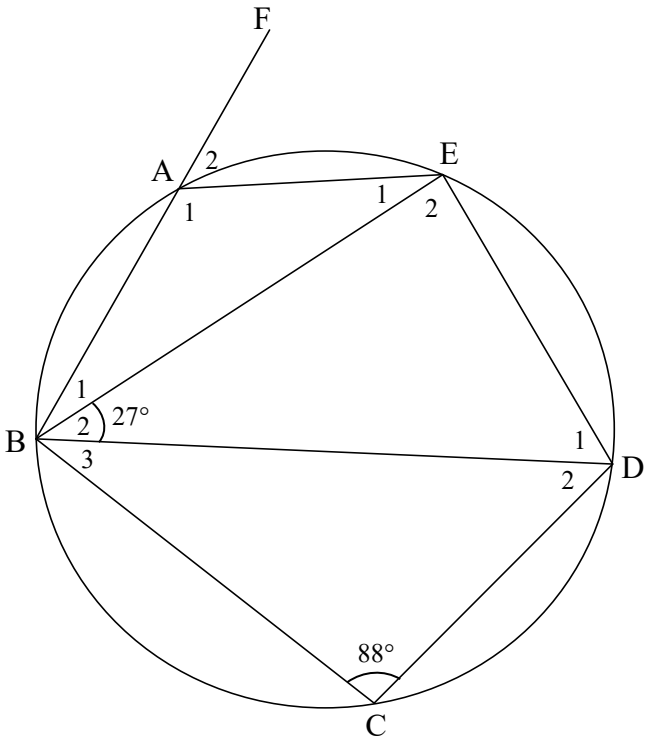
QUESTION 9

9.1 In the diagram, O is the centre of the circle. RSTV is a cyclic quadrilateral.



Use the diagram to prove the theorem which states that the opposite angles of a cyclic quadrilateral are supplementary, i.e. $\hat{R} + \hat{T} = 180°$ (5)

9.2 In the diagram, A, B, C, D and E lie on the circle. BA is produced to F. $\hat{B}_2 = 27°$ and $\hat{C} = 88°$. AE, ED, DC, BC, BE and BD are drawn.



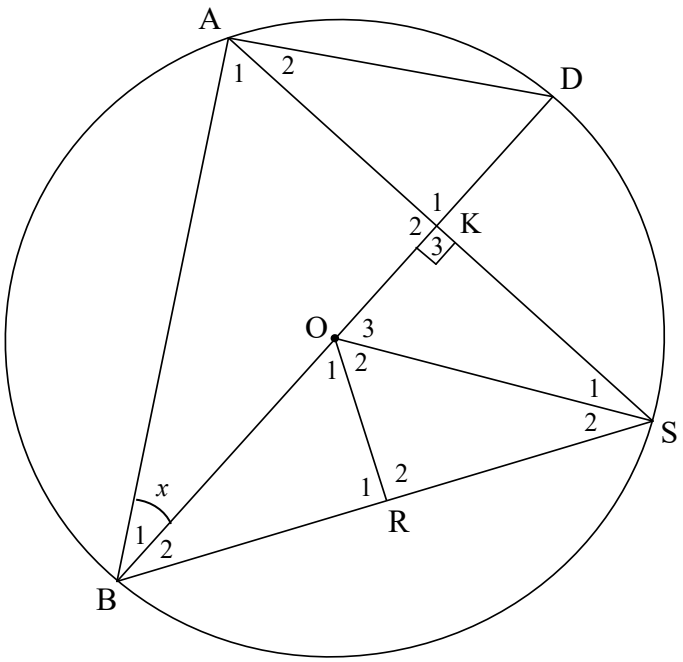
9.2.1 Calculate, with a reason, the size of $\hat{E}_2$. (2)

9.2.2 If it is given that ED = DC, write down, with a reason, the size of $\hat{B}_3$. (2)

9.2.3 Calculate, with reasons, the size of $\hat{A}_2$. (3)
[12]

QUESTION 10

In the diagram, O is the centre of the circle. Chord AS is perpendicular to diameter BOD at K. OR is drawn with R on BS. AB, AD and OS are drawn. $\hat{B}_1 = x$.



10.1 Complete the following theorem statement:

The angles subtended by a chord at the circumference of the circle, on the same side of the chord, are … (1)

10.2 Determine, with reasons, the sizes of the following angles in terms of x:

10.2.1 $\hat{D}$ (3)

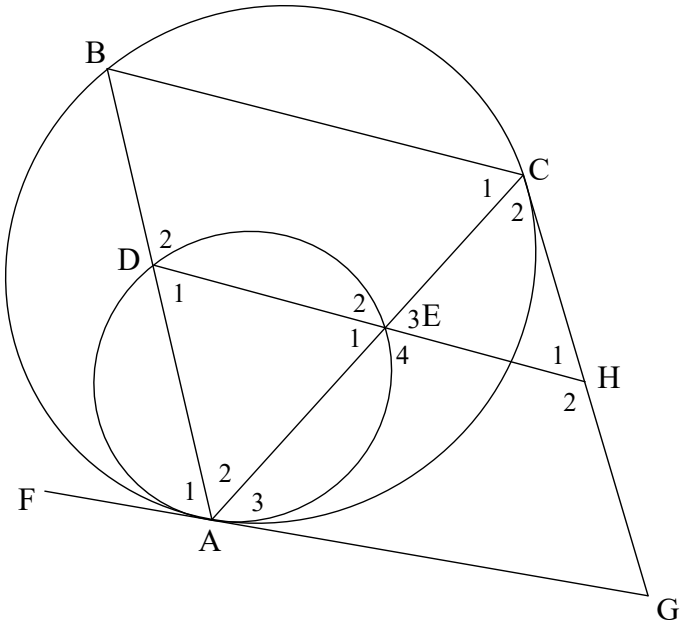
10.2.2 $\hat{B}_2$ (3)

10.2.3 $\hat{S}_1$ (2)

10.3 It is further given that BR = RS. Prove that OKSR is a cyclic quadrilateral. (3)
[12]

QUESTION 11

In the diagram, FA is a common tangent to circle ABC and circle ADE at A. Chords AB and AC of the larger circle cut the smaller circle at D and E respectively. BC is drawn. Another tangent is drawn from C to intersect FA produced at G. DE produced intersects tangent GC at H.



11.1 Prove that $\Delta ADE \;|||\; \Delta ABC$ (4)

11.2 It is further given that AD : AB = 1 : 3 and AE = 4 cm. Calculate the length of EC. (4)

11.3 Prove that $\frac{EH}{EC} = \frac{CA}{CB}$ (4)

11.4 Prove that $EC = \sqrt{\frac{EH.CB.DB}{3AD}}$ (5)

[17]

TOTAL: 150

INFORMATION SHEET

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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Candidate Barcode label/*Stafieskodeplakker*

SC/NSC Answer Book
SS/NSS-antwoordeboek

Senior Certificate/National Senior Certificate/*Senior Sertifikaat/Nasionale Senior Sertifikaat* (Grade 12/*Graad 12*) – May/June/*Mei/Junie 2026* Confidential/Vertroulik

CENTRE NUMBER *SENTRUMNOMMER*	
EXAMINATION NUMBER *EKSAMENNOMMER*	

Sequence No. on mark sheet
Volgnommer op puntestaat

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**
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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 23 pages./*Hierdie antwoordeboek bestaan uit 23 bladsye.*

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. Write answers 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

NUMBER OF BALLS FACED (*x*)/ *GETAL BALLE GETROTSEER (x)*	62	111	22	48	124	180	89	96	95	260	98	115
NUMBER OF RUNS SCORED (*y*)/ *GETAL LOPIES GEMAAK (y)*	124	209	41	88	208	320	148	158	350	388	145	165

	Solution/*Oplossing*	**Marks *Punte***
1.1		(3)
1.2		(2)
1.3		(4)
1.4		(1)
		[10]

QUESTION/*VRAAG* 2

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

CLASS INTERVALS (AS A %)/ ***KLASINTERVALLE (AS 'N %)***	**FREQUENCY/** ***FREKWENSIE***	**CUMULATIVE FREQUENCY/** ***KUMULATIEWE FREKWENSIE***
$20 < x \leq 30$	8	
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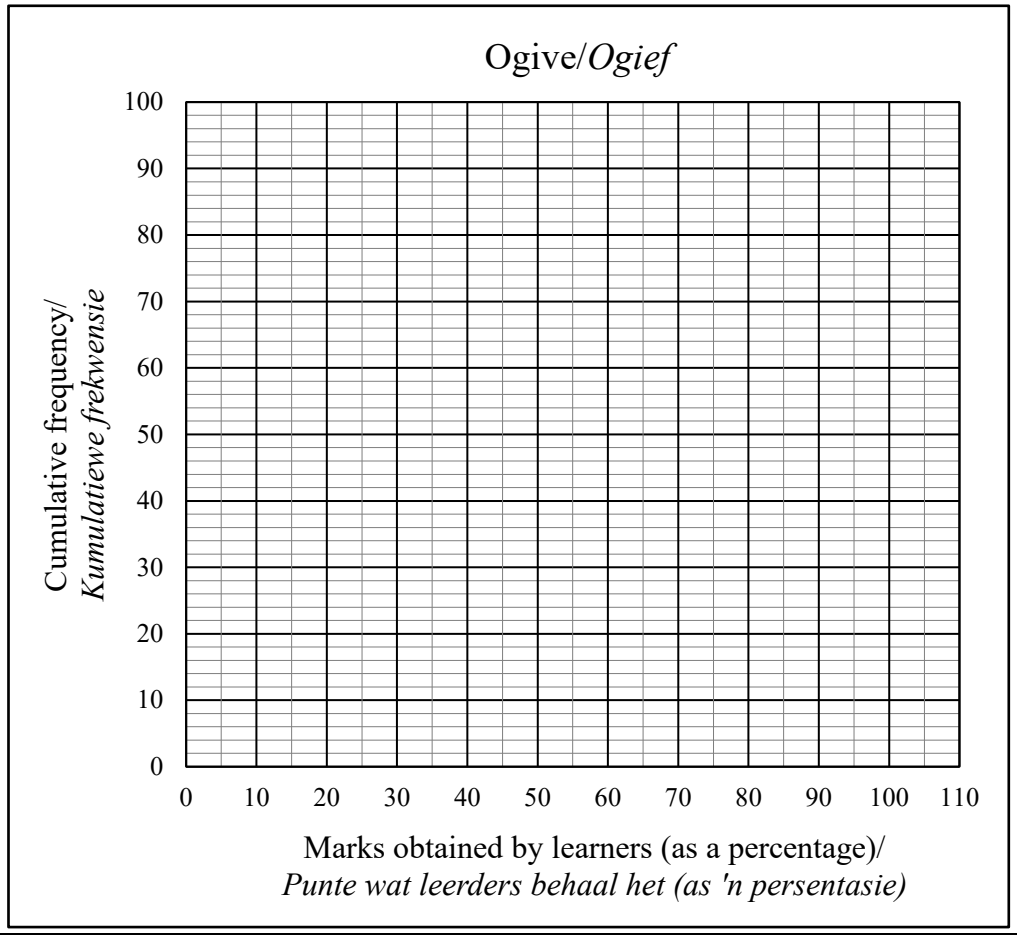
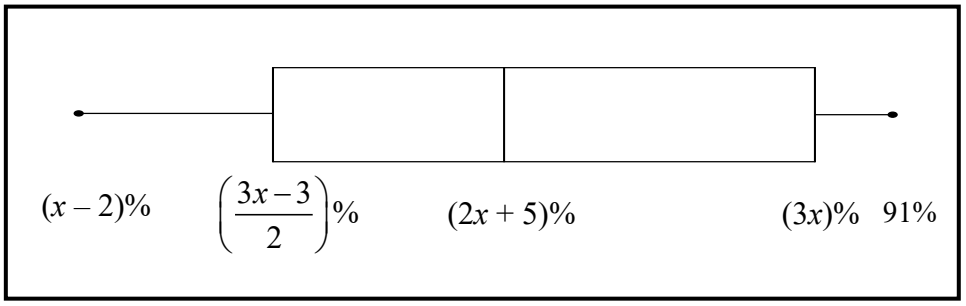


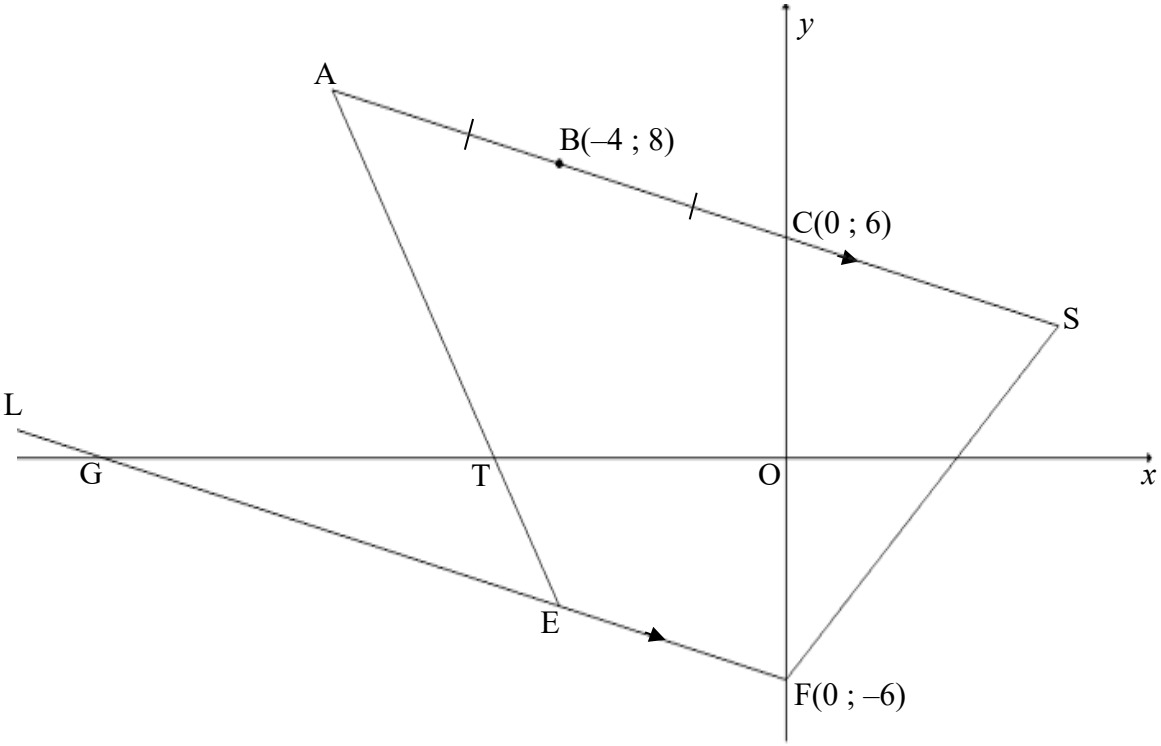
	Solution/*Oplossing*	**Marks** ***Punte***
2.1.4		(1)

2.2



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

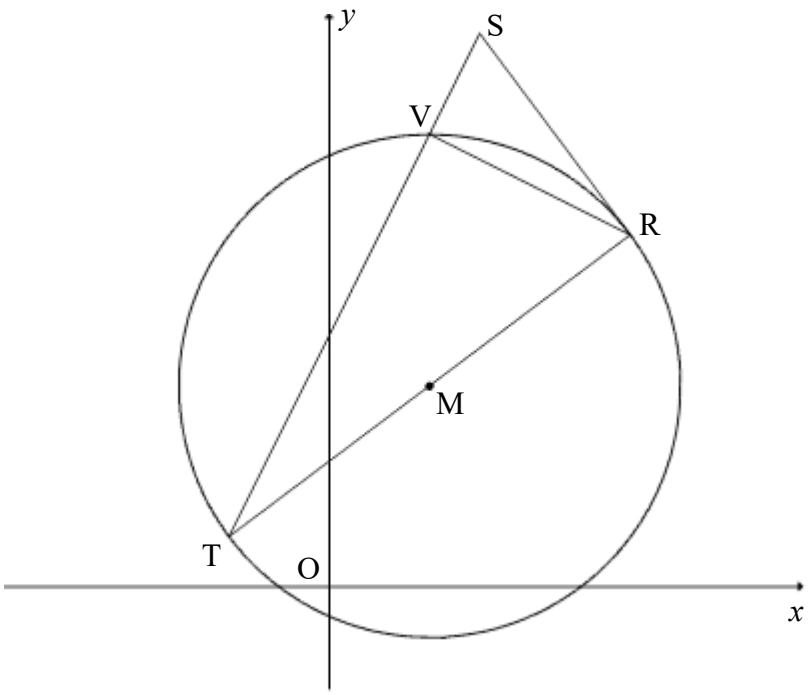
QUESTION/*VRAAG* 3



	Solution/*Oplossing*	**Marks** ***Punte***
3.1		(3)
3.2		(3)

	Solution/*Oplossing*	**Marks** ***Punte***
3.3		(3)
3.4		(5)
3.5		(4)
		[18]

QUESTION/*VRAAG* 4



	Solution/*Oplossing*	**Marks** ***Punte***
4.1		(2)
4.2		(4)
4.3		(2)
4.4		(2)

	Solution/*Oplossing*	**Marks** ***Punte***
4.5		(5)
4.6		(6)
4.7		(1)
		[22]

QUESTION/*VRAAG* 5

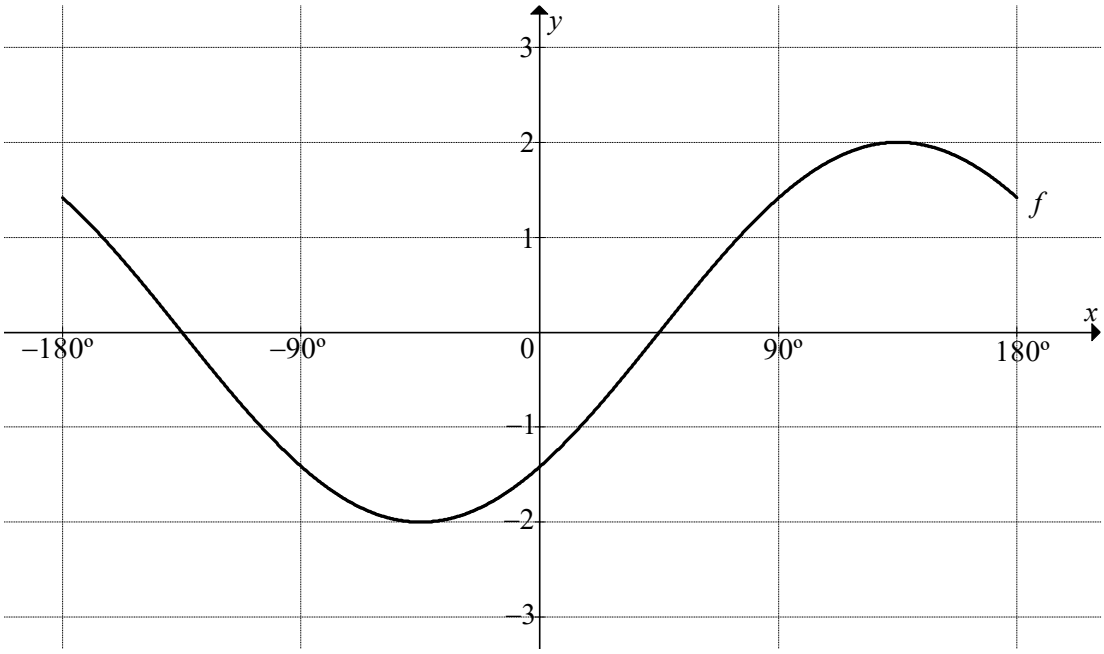
	Solution/*Oplossing*	**Marks** ***Punte***
5.1.1		(2)
5.1.2		(4)
5.2		(5)

	Solution/*Oplossing*	Marks *Punte*
5.3		(4)
		[15]

QUESTION/*VRAAG* 6

	Solution/*Oplossing*	**Marks** ***Punte***
6.1.1		(5)
6.1.2		(3)
6.2		(6)
		[14]

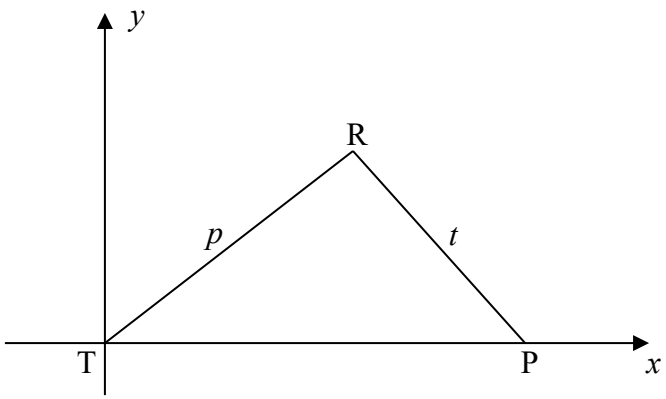
QUESTION/*VRAAG* 7

	Solution/*Oplossing*	**Marks** ***Punte***
7.1		(1)
7.2		(2)
7.3		(3)
7.4		(1)
7.5		(1)
7.6		(2)
		[10]

 Please turn over/Blaai om asseblief

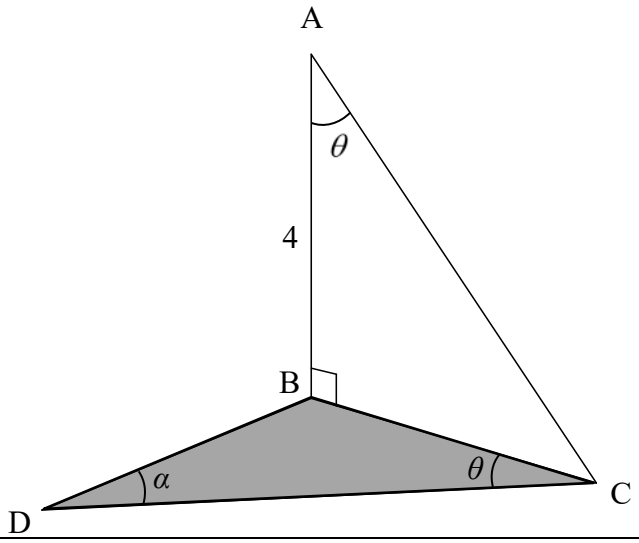
QUESTION/*VRAAG* 8

8.1



	Solution/*Oplossing*	**Marks** ***Punte***
		(4)

8.2

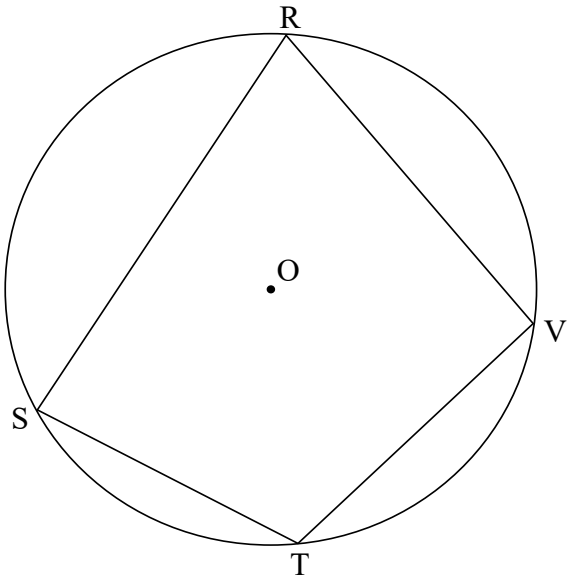


	Solution/*Oplossing*	Marks *Punte*
8.2.1		(1)
8.2.2		(5)
		[10]

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

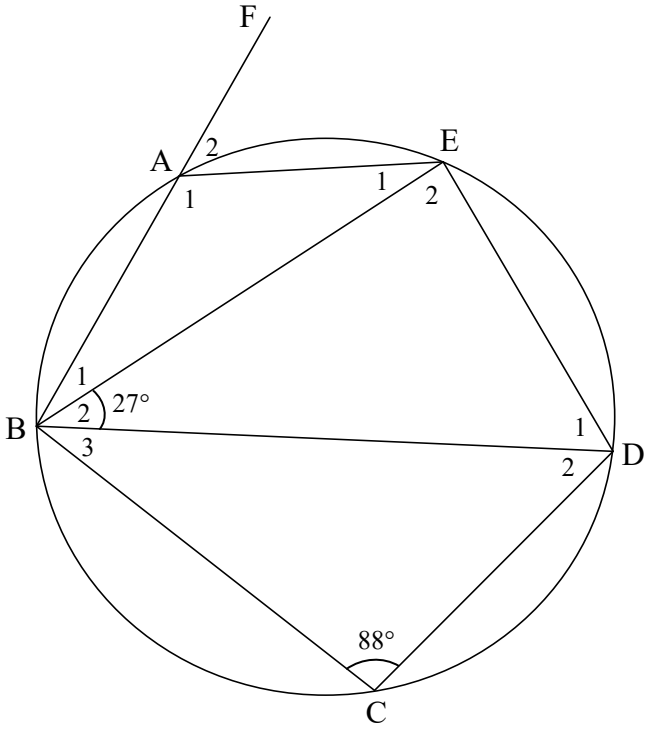
QUESTION/*VRAAG* 9

9.1



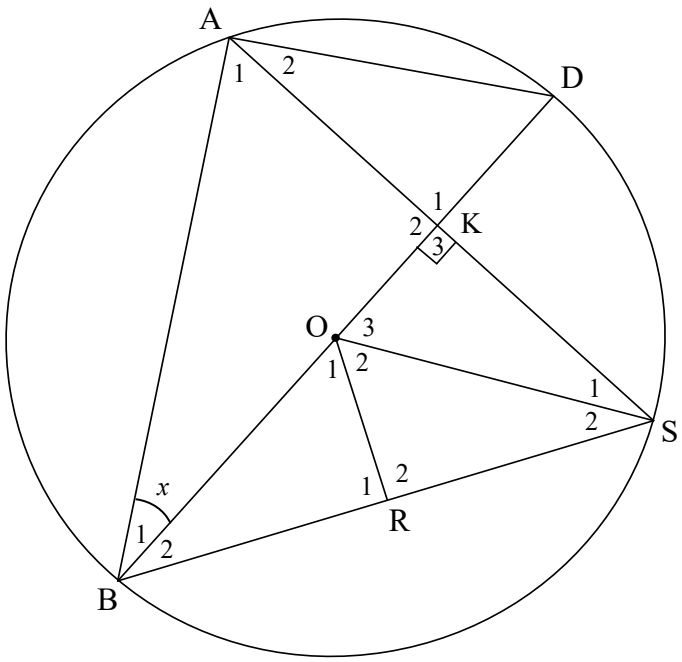
	Solution/*Oplossing*	**Marks** ***Punte***
9.1		(5)

9.2



	Solution/*Oplossing*	**Marks** ***Punte***
9.2.1		(2)
9.2.2		(2)
9.2.3		(3)
		[12]

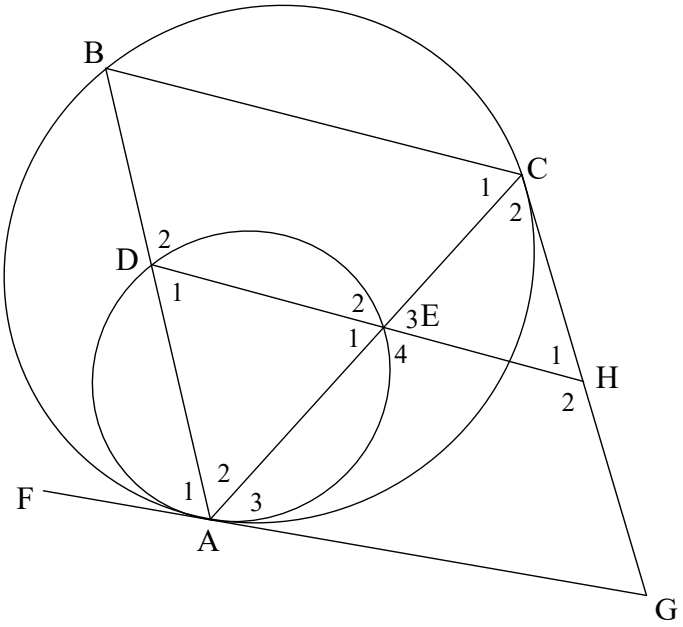
QUESTION/*VRAAG* 10



	Solution/*Oplossing*	**Marks** ***Punte***
10.1		(1)
10.2.1		(3)
10.2.2		(3)

	Solution/*Oplossing*	**Marks** ***Punte***
10.2.3		(2)
10.3		(3)
		[12]

QUESTION/*VRAAG* 11



	Solution/*Oplossing*	**Marks** ***Punte***
11.1		(4)
11.2		(4)

	Solution/*Oplossing*	**Marks** ***Punte***
11.3		(4)
11.4		(5)
		[17]

	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

SENIOR CERTIFICATE EXAMINATIONS/
NATIONAL SENIOR CERTIFICATE EXAMINATIONS/
SENIORSERTIFIKAAT-EKSAMEN/
NASIONALE SENIORSERTIFIKAAT-EKSAMEN

MATHEMATICS P2/*WISKUNDE V2*

MAY/JUNE 2026/*MEI/JUNIE 2026*

MARKING GUIDELINES/*NASIENRIGLYNE*

MARKS/*PUNTE*: 150

These marking guidelines consist of 24 pages./
Hierdie nasienriglyne bestaan uit 24 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.

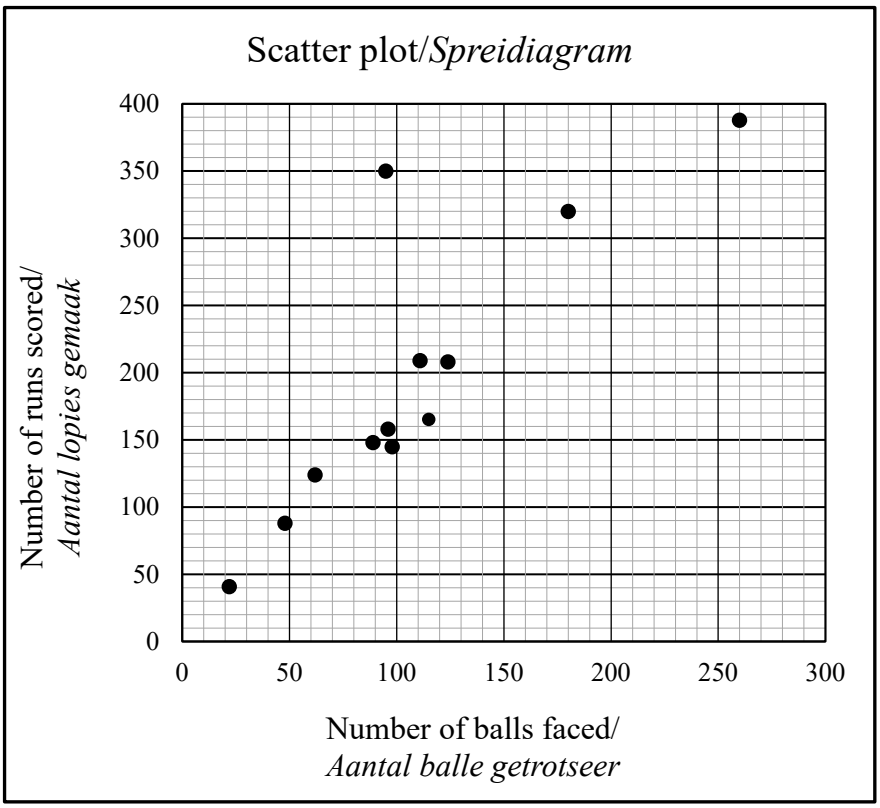
LET WEL:

- *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

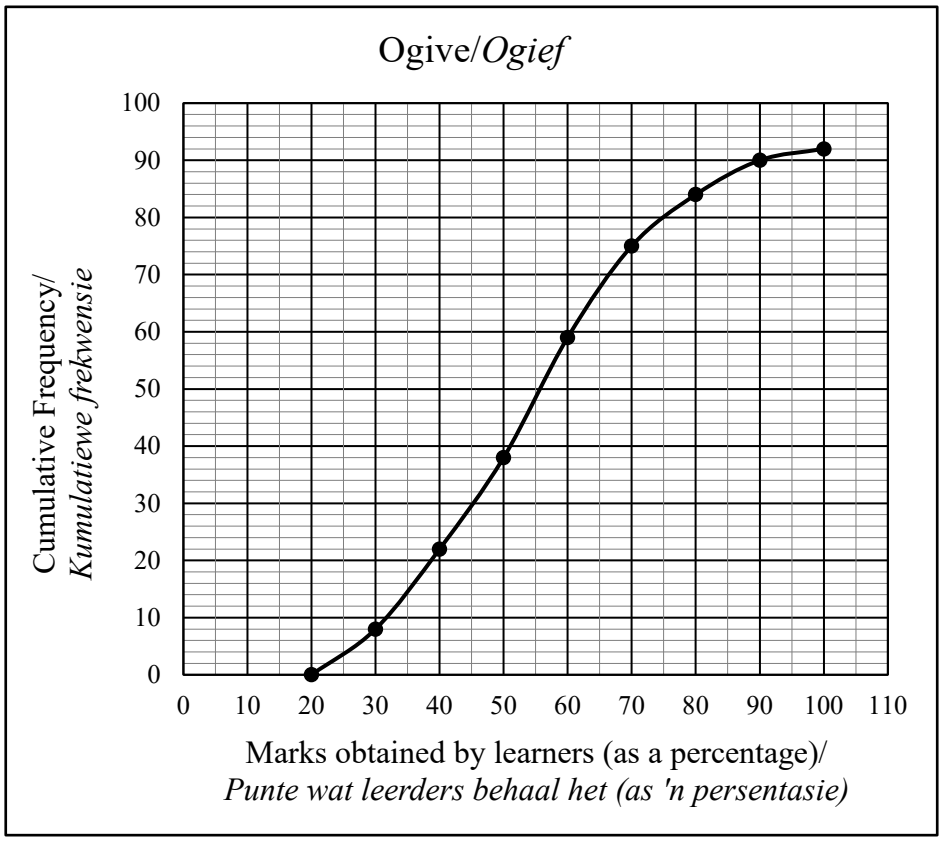
QUESTION/*VRAAG* 1

NUMBER OF BALLS FACED (*x*)/ ***GETAL BALLE GETROTSEER (x)***	62	111	22	48	124	180	89	96	95	260	98	115
NUMBER OF RUNS SCORED (*y*)/ ***GETAL LOPIES GEMAAK (y)***	124	209	41	88	208	320	148	158	350	388	145	165



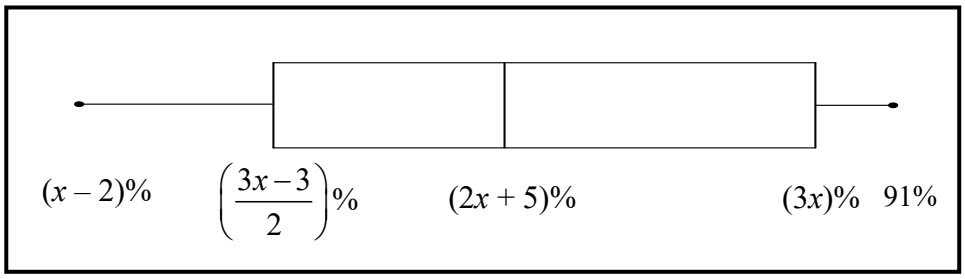
1.1	$a = 39,47$ $b = 1,44$ $\hat{y} = 39,47 + 1,44x$	✓ $a = 39,47$ ✓ $b = 1,44$ ✓ equation (3)
1.2	$y = 39,47 + 1,44(150)$ $y = 255,47$ **OR** $y = 255,28$ (calculator)	✓ substitution ✓ answer (2) ✓✓ answer (2)
1.3	$\overline{y} = 195,33$ $\sigma_y = 101,84$ One σ above the $\overline{y}$: 195,33 + 101,84 = 297,17 No. of players = 3	✓ $\overline{y} = 195,33$ ✓ $\sigma_y = 101,84$ ✓ $\overline{y} + \sigma$ ✓ answer (4)
1.4	This player scored many more runs than the other players who faced a similar number of balls. / *Hierdie speler het meer lopies as enige ander speler, wat dieselfde hoeveelheid balle getrotseer het, gemaak.*	✓ answer (1)
		[10]

QUESTION/*VRAAG* 2

2.1.1	$50 < x \leq 60$	✓ $50 < x \leq 60$ (1)
2.1.2		✓ first four correct values ✓ last four values (2)
2.1.3		✓ Grounding at (20 ; 0) ✓ plotting cumulative frequency at upper boundaries ✓ smooth curve (3)
2.1.4	Median = 54	✓ answer (1)

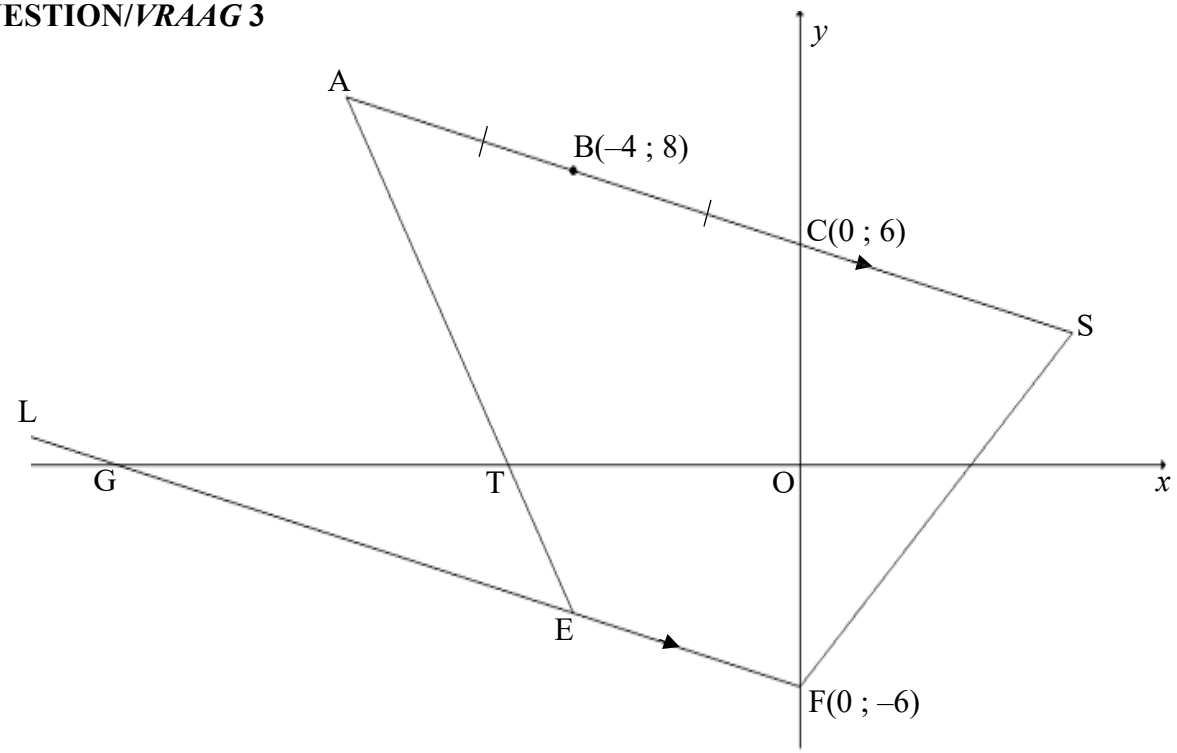
CLASS INTERVALS (AS A %)/ *KLASINTERVALLE (AS 'N %)*	FREQUENCY/ *FREKWENSIE*	CUMULATIVE FREQUENCY/ *KUMULATIEWE FREKWENSIE*
$20 < x \leq 30$	8	8
$30 < x \leq 40$	14	22
$40 < x \leq 50$	16	38
$50 < x \leq 60$	21	59
$60 < x \leq 70$	16	75
$70 < x \leq 80$	9	84
$80 < x \leq 90$	6	90
$90 < x \leq 100$	2	92

2.2



2.2	IQR as a %: $3x-\frac{3x-3}{2}=45$ $6x-3x+3=90$ $x=29$ Min % = $(29-2)\%$ $=27\%$	✓ $3x-\frac{3x-3}{2}=45$ ✓ value of x ✓ answer (3)
		[10]

QUESTION/*VRAAG* 3

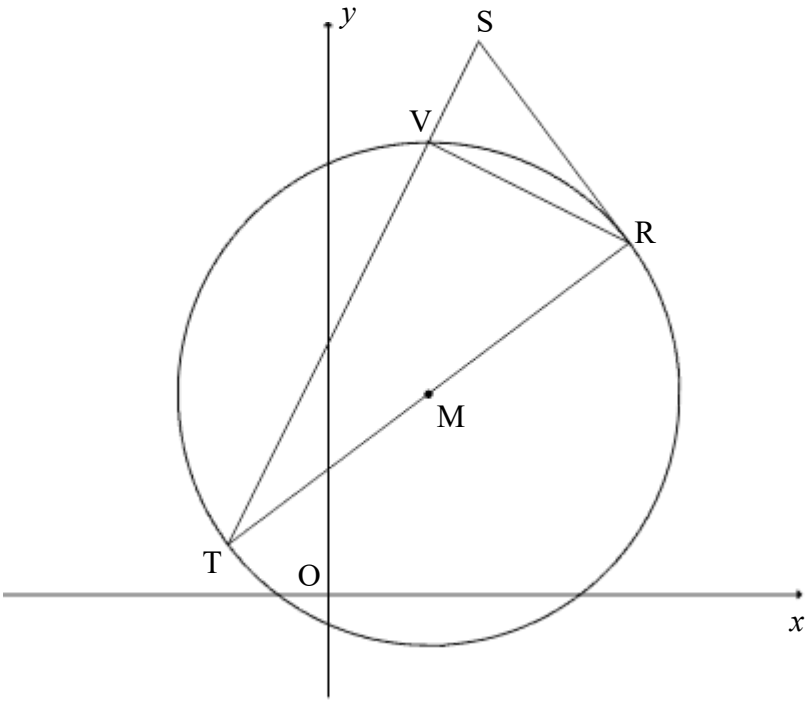


3.1	$\frac{x_A+0}{2}=-4$ $\quad$ $\frac{y_A+6}{2}=8$ $x_A=-8$ $\quad$ $y_A=10$ $A(-8\,;10)$ **OR** $C\to B:(x\,;y)\to(x-4\,;y+2)$ $B\to A:(-4\,;8)\to(-4-4\,;8+2)$ $\therefore A(-8\,;10)$ **OR** $m_{AS}=\frac{8-6}{-4-0}$ $m_{AS}=-\frac{1}{2}$ $y=-\frac{1}{2}x+6$ $-\frac{1}{2}x+6=-\frac{7}{2}x-18$ $-x+12=-7x-36$ $6x=-48$ $x=-8$ $y=-\frac{1}{2}(-8)+6$ $y=10$ $A(-8;10)$	✓ substitution into midpoint formula ✓ x_A ✓ y_A (3) ✓ translation: 4 left and 2 up from B ✓ x_A ✓ y_A (3) ✓ $-\frac{1}{2}x+6=-\frac{7}{2}x-18$ ✓ x_A ✓ y_A (3)

3.2	$m_{AS}=\frac{8-6}{-4-0}$ $m_{AS}=-\frac{1}{2}$ $m_{LF}=m_{AS}=-\frac{1}{2}\ \ (AS\|\|LF)$ $y=-\frac{1}{2}x-6$	✓ substitution into gradient formula ✓ m_{AS} ✓ $c=-6$ (3)
3.3	$-\frac{1}{2}x-6=-\frac{7}{2}x-18$ $-x-12=-7x-36$ $6x=-24$ $x=-4$ $y=-\frac{1}{2}(-4)-6$ $y=-4$ $E(-4;-4)$	✓ equating ✓ x_E ✓ y_E (3)
3.4	$m_{AS}=-\frac{1}{2}$ $m_{FS}=\frac{\frac{18}{5}-(-6)}{\frac{24}{5}-0}$ **OR** $m_{FS}=\frac{-6-\frac{18}{5}}{0-\frac{24}{5}}$ $=2$ $m_{AS}\times m_{FS}=-\frac{1}{2}\times 2$ $=-1$ $\therefore C\hat{S}F=90°$ CF is a diameter [CF subtends a right ∠] / CF *is 'n middellyn* [*omgekeerde ∠ in halwe sirkel*] ∴centre O(0 ; 0) and $r=6$ $x^2+y^2=36$	✓ m_{FS} ✓ $m_{AS}\times m_{FS}=-1$ ✓ $C\hat{S}F=90°$ or CF is a diameter ✓ r ✓ $x^2+y^2=r^2$ (5)
3.5	$\tan A\hat{T}O=m_{AE}=-\frac{7}{2}$ $A\hat{T}O=105,95...°$ $\tan L\hat{G}T=m_{LF}=-\frac{1}{2}$ $L\hat{G}T=153,43...°$ $A\hat{E}G=153,43...°-105,95...°$ $=47,49°$ **OR**	✓ $\tan A\hat{T}O=m_{AE}$ **or** $\tan L\hat{G}T=m_{LF}$ ✓ $A\hat{T}O$ ✓ $L\hat{G}T$ ✓ answer (4)

	$\tan A\hat{T}O = m_{AE} = -\frac{7}{2}$ $A\hat{T}O = 105,95...°$ Inclination of AS produced = $153,43...°$ $T\hat{A}S = 47,49°$ [ext. $\angle$s of Δ/*buite* $\angle$ *van* Δ] $A\hat{E}G = 47,49°$ [alt $\angle$s; LF $\parallel$ AS/*verw* $\angle$*s; LF* $\parallel$ *AS*] **OR** $G(-12\ ;\ 0)$ and $T\left(-\frac{36}{7}\ ;\ 0\right)$ $TG = \frac{48}{7}$ units $GE = \sqrt{80}$ units $TE = \frac{4\sqrt{53}}{7}$ units $\left(\frac{48}{7}\right)^2 = \left(\sqrt{80}\right)^2 + \left(\frac{4\sqrt{53}}{7}\right)^2 - 2\left(\sqrt{80}\right)\left(\frac{4\sqrt{53}}{7}\right)\cos A\hat{E}G$ $A\hat{E}G = 47,49°$	✓ $\tan A\hat{T}O = m_{AE}$ ✓ $A\hat{T}O$ ✓ $T\hat{A}S$ ✓ answer (4) ✓ length of TG ✓ length of GE and TE ✓ substitution in cosine-rule ✓ answer (4)
		[18]

QUESTION/*VRAAG* 4



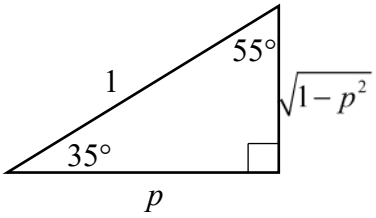
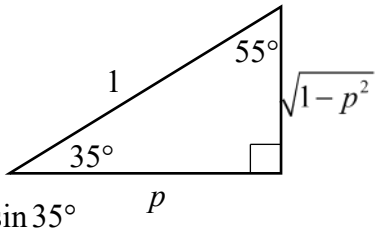
4.1	M(2 ; 4)	✓ $x=2$ ✓ $y=4$ (2)
4.2	$(x-2)^2+(2x+5-4)^2=25$ $x^2-4x+4+4x^2+4x+1-25=0$ $5x^2-20=0$ $x^2-4=0$ $(x-2)(x+2)=0$ $x=2$ or $x=-2$ $y=2(-2)+5$ $y=1$ $\therefore$T(–2 ; 1)	✓ substituting $y=2x+5$ into equation of circle ✓ standard form ✓ factors ✓ substituting $x=-2$ (4)
4.3	V(2 ; 9)	✓ $x_V=2$ ✓ $y_V=9$ (2)
4.4	$m_{TR}=m_{TM}=\frac{4-1}{2+2}$ $=\frac{3}{4}$	✓ substitution into the gradient formula ✓ answer (2)

4.5	R(6;7) [Translation **OR** midpoint] $m_{TR}=\frac{3}{4}$ $m_{SR}=-\frac{4}{3}$ $y=-\frac{4}{3}x+c$ $7=-\frac{4}{3}(6)+c$ **OR** $y-7=-\frac{4}{3}(x-6)$ $y=-\frac{4}{3}x+15$ $y=-\frac{4}{3}x+15$	✓ $x_R=6$ ✓ $y_R=7$ ✓ m_{SR} ✓ substitution of point R ✓ equation (5)
4.6	Let N be the centre of the circle. $N\left(\frac{-3+2}{2};\frac{3-1}{2}\right)$ $N\left(-\frac{1}{2};1\right)$ $AC=\sqrt{(2-(-3))^2+(3-(-1))^2}$ $AC=\sqrt{41}$ $\left(x+\frac{1}{2}\right)^2+(y-1)^2=\frac{41}{4}$ $x^2+x+\frac{1}{4}+y^2-2y+1=\frac{41}{4}$ $x^2+x+y^2-2y-9=0$ $x^2+x+y^2-2y-9=x^2-4x+y^2-8y-5$ $6y+5x-4=0$ **OR** $\hat{B}=90°$ [∠ in semi-circle/∠ *in halwe sirkel*] $\frac{y+1}{x+3}\times\frac{y-3}{x-2}=-1$ $y^2-2y-3=-1(x^2+x-6)$ $x^2+x+y^2-2y-9=0$ $x^2+x+y^2-2y-9=x^2-4x+y^2-8y-5$ $6y+5x-4=0$	✓ midpoint of AC: $N\left(-\frac{1}{2};1\right)$ ✓ substitution into distance formula ✓ length of AC ✓ equation of new circle ✓ equating ✓ answer (6) ✓ $\frac{y+1}{x+3}\times\frac{y-3}{x-2}$ ✓ -1 ✓ simplification ✓ equation of new circle ✓ equating ✓ answer (6)
4.7	The radius of the circle gets smaller. / *Die radius van die sirkel word kleiner.* **OR** The circle will decrease in size. / *Die sirkel word kleiner.*	✓ correct statement (1) ✓ correct statement (1)
		[22]

QUESTION/*VRAAG* 5

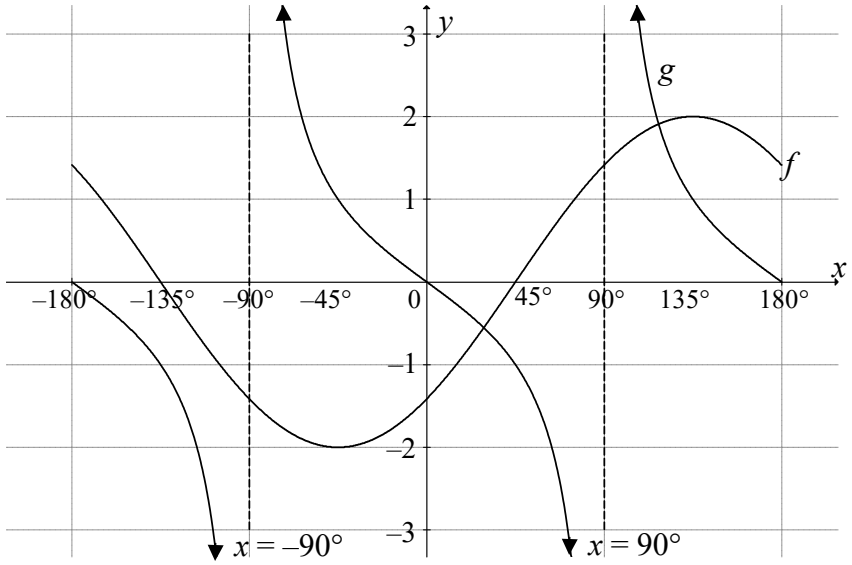
5.1.1	Given: $\sin(A-B)=\sin A.\cos B-\cos A.\sin B$ $\sin(A+B) = \sin(A-(-B))$ $= \sin A.\cos(-B)-\cos A.\sin(-B)$ $= \sin A(\cos B)-\cos A(-\sin B)$ $= \sin A.\cos B+\cos A.\sin B$	✓ $\sin(A-(-B))$ ✓ $\sin A.\cos(-B)-\cos A.\sin(-B)$ (2)
5.1.2	$\sqrt{3}\cos x=\sin(50°+x).\cos(10°-x)+\cos(50°+x).\sin(10°-x)$ $\sqrt{3}\cos x=\sin[(50°+x)+(10°-x)]$ $\sqrt{3}\cos x=\sin 60°$ $\sqrt{3}\cos x=\frac{\sqrt{3}}{2}$ $\cos x=\frac{1}{2}$ ref $\angle = 60°$ $x = 60°$ or $x = 300°$	✓ $\sin 60°$ ✓ special angle value ✓ answer ✓ answers (4)
5.2	$\text{LHS}=\frac{\sin 2x}{2\cos^2 x}+\frac{\sin x}{\tan x\left[1+\cos(90°-x)\right]}$ $=\frac{2\sin x\cos x}{2\cos^2 x}+\frac{\sin x}{\frac{\sin x}{\cos x}(1+\sin x)}$ $=\frac{\sin x}{\cos x}+\frac{\cos x}{1+\sin x}$ $=\frac{\sin x+\sin^2 x+\cos^2 x}{\cos x(1+\sin x)}$ $=\frac{\sin x+1}{\cos x(1+\sin x)}$ $=\frac{1}{\cos x}$ $\therefore$ LHS = RHS	✓ $\sin 2x=2\sin x\cos x$ ✓ $\tan x=\frac{\sin x}{\cos x}$ ✓ $\cos(90°-x)=\sin x$ ✓ writing as a single fraction ✓ $\sin^2 x+\cos^2 x=1$ (5)
5.3	LHS = $\sin 260°$ $=-\sin 80°$ $=-\cos 10°$ $\text{RHS}=-\sqrt{\frac{\cos 20°+1}{2}}$ $=-\sqrt{\frac{(2\cos^2 10°-1)+1}{2}}$ $=-\sqrt{\cos^2 10°}$ $=-\cos 10°$ $\therefore$ LHS = RHS	✓ $\sin 260°=-\sin 80°$ ✓ $\sin 80°=\cos 10°$ ✓ $\cos 20°=2\cos^2 10°-1$ ✓ $-\sqrt{\cos^2 10°}$ (4)
		[15]

QUESTION/*VRAAG* 6

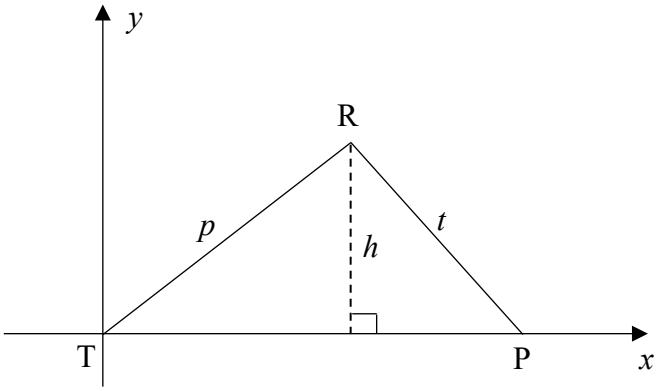
6.1.1	$\cos 330°.\cos 365° + \sin 175°.\sin 210°$ $= \cos 30°.\cos 5° + \sin 5°(-\sin 30°)$ $= \cos 30°.\cos 5° - \sin 30°.\sin 5°$ $= \cos(30° + 5°)$ $= \cos 35°$ **OR** $\cos 330°.\cos 365° + \sin 175°.\sin 210°$ $= \sin 60°.\cos 5° + \sin 5°.(-\cos 60°)$ $= \sin 60°.\cos 5° - \sin 5°.\cos 60°$ $= \sin(60° - 5°)$ $= \sin 55°$	✓ $\cos 330° = \cos 30°$ ✓ $\cos 365° = \cos 5°$ ✓ $\sin 175° = \sin 5°$ ✓ $\sin 210° = -\sin 30°$ ✓ answer (5) ✓ $\cos 330° = \sin 60°$ ✓ $\cos 365° = \cos 5°$ ✓ $\sin 175° = \sin 5°$ ✓ $\sin 210° = -\cos 60°$ ✓ answer (5)
6.1.2	$\cos 35° = p$ $\sin 70°$ $= 2\sin 35°\cos 35°$ $= 2p\sqrt{1-p^2}$  **OR** $\sin 70°$ $= \cos 20°$ $= \cos(55° - 35°)$ $= \cos 55°.\cos 35° + \sin 55°.\sin 35°$ $= \sqrt{1-p^2}.p + p\sqrt{1-p^2}$ $= 2p\sqrt{1-p^2}$  	✓ 3rd side = $\sqrt{1-p^2}$ ✓ expansion of double ∠ ✓ substitution (3) ✓ 3rd side = $\sqrt{1-p^2}$ ✓ expansion of compound ∠ ✓ substitution (3)

6.2	$\frac{2^{3\sin^2 x}}{4.2^{\sin x}} = 1$ $\frac{2^{3\sin^2 x}}{2^{\sin x+2}} = 1$ $2^{3\sin^2 x} = 2^{\sin x+2}$ $3\sin^2 x = \sin x + 2$ $3\sin^2 x - \sin x - 2 = 0$ $(3\sin x + 2)(\sin x - 1) = 0$ $\sin x = -\frac{2}{3}$ or $\sin x = 1$ (N/A) ref $\angle = 41,810...°$ $x = 221,81° + k.360°$ or $x = 318,19° + k.360°$, $k \in \mathbb{Z}$ **OR** $\frac{2^{3\sin^2 x}}{4.2^{\sin x}} = 1$ $\frac{2^{3\sin^2 x}}{2^2.2^{\sin x}} = 2^0$ $2^{3\sin^2 x - 2 - \sin x} = 2^0$ $3\sin^2 x - \sin x - 2 = 0$ $(3\sin x + 2)(\sin x - 1) = 0$ $\sin x = -\frac{2}{3}$ or $\sin x = 1$ (N/A) ref $\angle = 41,810...°$ $x = 221,81° + k.360°$ or $x = 318,19° + k.360°$, $k \in \mathbb{Z}$	✓ exponential law ✓ cross multiplication ✓ equation from exponents ✓ equation ✓ both x - values ✓ $+k.360°; k \in \mathbb{Z}$ (6) ✓ 2^0 ✓ exponential law ✓ equation from exponents ✓ equation ✓ both x - values ✓ $+k.360°; k \in \mathbb{Z}$ (6)
		[14]

QUESTION/*VRAAG* 7

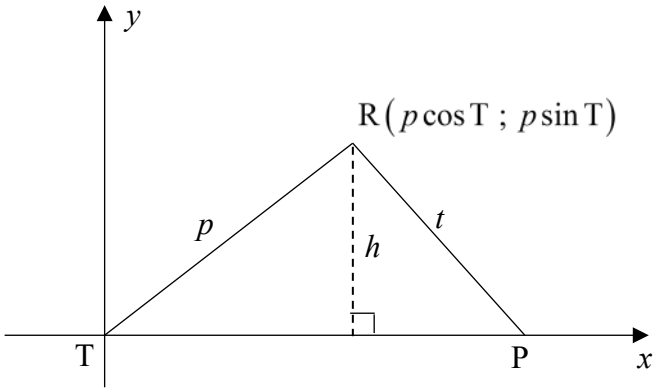
7.1	Amplitude = 2	✓ answer (1)
7.2	$x \in [-45°;135°]$ **OR** $-45° \le x \le 135°$	✓✓ answer (2) ✓✓ answer (2)
7.3		✓ asymptotes ✓ *x*–intercepts ✓ shape (3)
7.4	$g(-45°) - f(-45°) = 3$	✓ answer (1)
7.5	2	✓ answer (1)
7.6	$x = -45°$ $x = 135°$	✓ answer ✓ answer (2)
		[10]

QUESTION/*VRAAG* 8



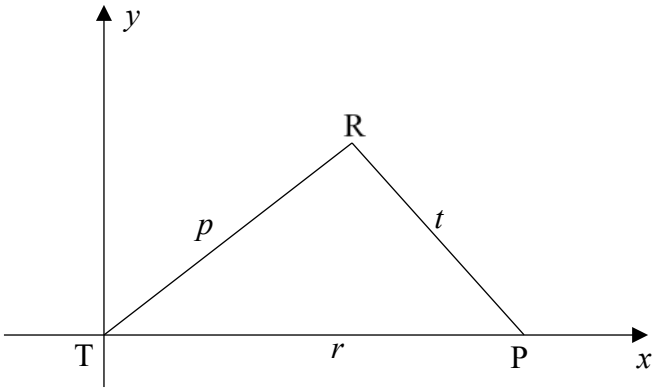
8.1	Construction of perpendicular height, h $\sin T = \frac{h}{p}$ and $\sin P = \frac{h}{t}$ $h = p\sin T$ and $h = t\sin P$ $p\sin T = t\sin P$ $\frac{p\sin T}{pt} = \frac{t\sin P}{pt}$ $\frac{\sin T}{t} = \frac{\sin P}{p}$	✓ correct construction ✓ $\sin T = \frac{h}{p}$ and $\sin P = \frac{h}{t}$ ✓ $h = p\sin T$ and $h = t\sin P$ ✓ $p\sin T = t\sin P$ (4)

OR



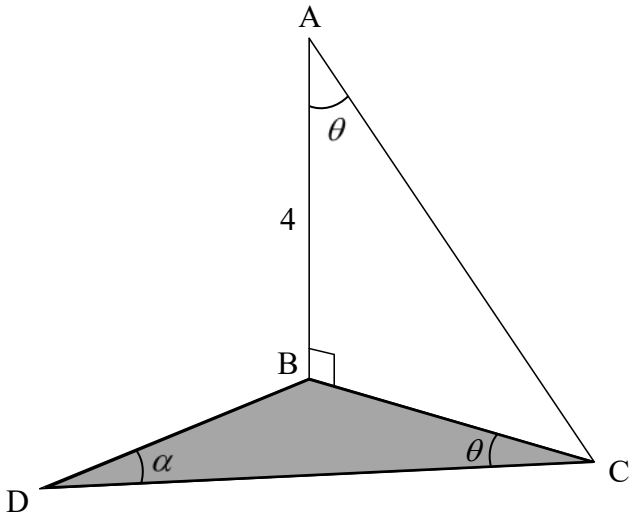
8.1	$R(p\cos T\ ;\ p\sin T)$ $h = p\sin T$ $\sin P = \frac{h}{t}$ $\sin P = \frac{p\sin T}{t}$ $\frac{\sin T}{t} = \frac{\sin P}{p}$ **OR**	✓ $x_R = p\cos T$ ✓ $y_R = p\sin T$ ✓ $\sin P = \frac{h}{t}$ ✓ $\sin P = \frac{p\sin T}{t}$ (4)

8.1



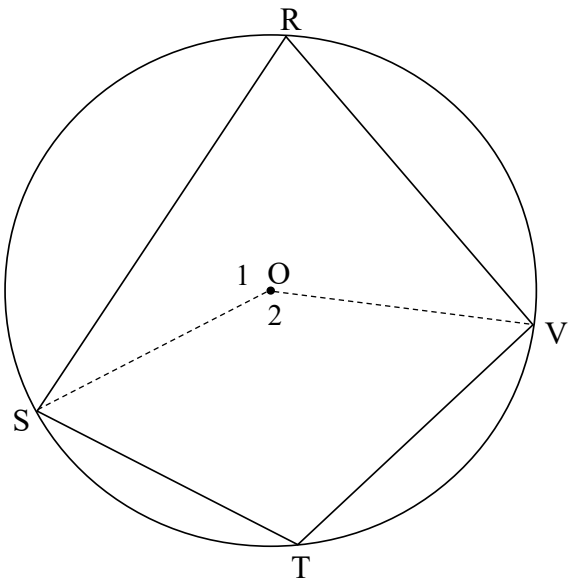
	Area of $\Delta PRT = \frac{1}{2}pr\sin T$ Area of $\Delta PRT = \frac{1}{2}tr\sin P$ $\therefore \frac{1}{2}pr\sin T = \frac{1}{2}tr\sin P$ $\frac{\frac{1}{2}pr\sin T}{\frac{1}{2}ptr} = \frac{\frac{1}{2}tr\sin P}{\frac{1}{2}ptr}$ $\frac{\sin T}{t} = \frac{\sin P}{p}$	✓ Area of $\Delta PRT = \frac{1}{2}pr\sin T$ ✓ Area of $\Delta PRT = \frac{1}{2}tr\sin P$ ✓ equating of areas ✓ dividing by $\frac{1}{2}ptr$ (4)

8.2



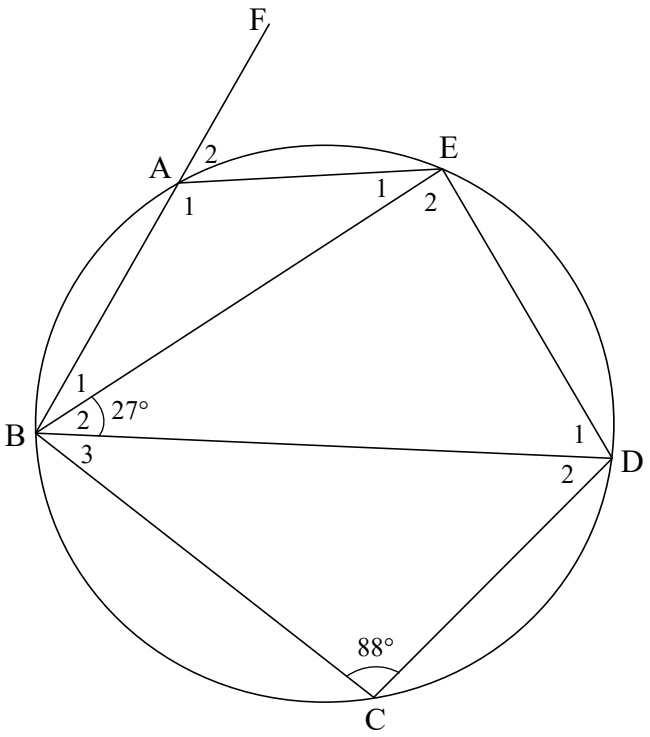
8.2.1	$\tan\theta = \frac{BC}{4}$ $BC = 4\tan\theta$	✓ $\tan\theta = \frac{BC}{4}$ (1)
8.2.2	$D\hat{B}C = 180° - (\alpha + \theta)$ $\frac{DC}{\sin[180° - (\alpha+\theta)]} = \frac{4\tan\theta}{\sin\alpha}$ $DC = \frac{4\tan\theta\sin(\alpha+\theta)}{\sin\alpha}$ $= \frac{4\tan\theta(\sin\alpha.\cos\theta + \cos\alpha.\sin\theta)}{\sin\alpha}$ $= \frac{4\sin\theta(\sin\alpha.\cos\theta + \cos\alpha.\sin\theta)}{\cos\theta.\sin\alpha}$ $= 4\sin\theta\left(\frac{\sin\alpha.\cos\theta}{\cos\theta.\sin\alpha} + \frac{\cos\alpha.\sin\theta}{\cos\theta.\sin\alpha}\right)$ $= 4\sin\theta\left(1 + \tan\theta\frac{1}{\tan\alpha}\right)$ $= 4\sin\theta\left(1 + \frac{\tan\theta}{\tan\alpha}\right)$	✓ correct use of sine rule ✓ $\sin[180° - (\alpha+\theta)] = \sin(\alpha+\theta)$ ✓ compound angle expansion ✓ separating into two fractions ✓ using quotient identity (5)
		[10]

QUESTION/*VRAAG* 9



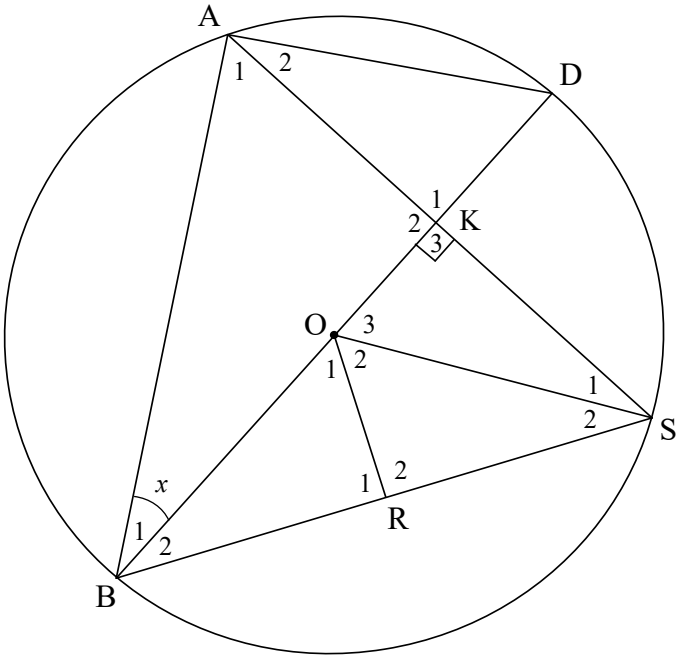
9.1	Draw radii OS and OV	✓ construction
	$\hat{O}_2 = 2\hat{R}$ [∠ at centre = 2 ×∠ at circumference/ *midpts ∠ = 2 × omtreks ∠*]	✓ S ✓ R
	$\hat{O}_1 = 2\hat{T}$ [∠ at centre = 2 ×∠ at circumference *midpts ∠ = 2 × omtreks ∠*]	✓ S
	$\hat{O}_1 + \hat{O}_2 = 360°$ [∠s round a pt/*∠e om 'n punt*]	✓ S/R
	$2\hat{R} + 2\hat{T} = 360°$	
	$2\left(\hat{R} + \hat{T}\right) = 360°$	
	$\hat{R} + \hat{T} = 180°$	(5)

9.2



9.2.1	$\hat{E}_2 = 92°$	[opp ∠s of cyclic quad/*teenoorst ∠e v kvh*]	✓ S ✓ R (2)
9.2.2	$\hat{B}_3 = \hat{B}_2 = 27°$	[equal chords ; equal ∠s/ *gelyke koorde; gelyke ∠e*]	✓ S ✓ R (2)
9.2.3	$\hat{D}_1 = 61°$ $\therefore \hat{A}_2 = 61°$	[sum of ∠s in a Δ/binne ∠e v Δ] [ext ∠ of cyclic quad/*buite ∠ v kvh*]	✓ S ✓ S ✓ R (3)
			[12]

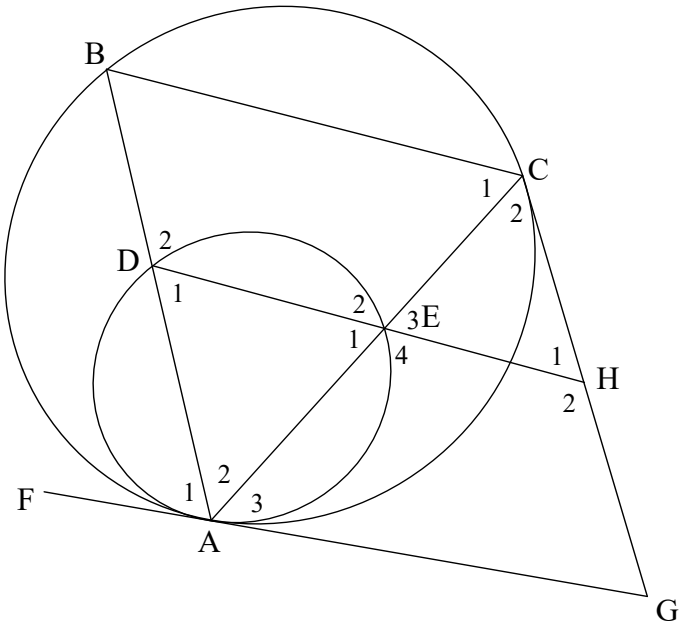
QUESTION/*VRAAG* 10



10.1	The angles subtended by a chord at the circumference of the circle, on the same side of the chord, are **equal**. *Die hoeke wat deur 'n koord op die sirkel aan dieselfde kant van die koord onderspan word, is **gelyk.***	✓ S (1)
10.2.1	$D\hat{A}B = 90°$ [∠ in semi-circle/*∠ in halwe sirkel*] $\hat{D} = 90° - x$ [sum of ∠s in a Δ/*binne ∠e v* Δ]	✓ S ✓ R ✓ S/R (3)
10.2.2	$\hat{S}_1 + \hat{S}_2 = 90° - x$ [∠ s in the same segment/*∠e in dies. segment*] $\hat{B}_2 = x$ [sum of ∠ s in a Δ/*binne ∠e v* Δ] **OR** $\hat{A}_2 = x$ [ext ∠ of Δ/ *buite ∠ v* Δ] $\therefore \hat{B}_2 = x$ [∠ s in the same segment/*∠e in dies. segment*]	✓ S ✓ R ✓ S (3) ✓ S ✓ S ✓ R (3)
10.2.3	$\hat{S}_2 = x$ [∠ s opp equal sides/*∠e teenoor gelyke sye*] $\hat{S}_1 = 90° - 2x$ **OR** $\hat{O}_3 = 2x$ [∠ at centre = 2 ×∠ at circumference *midpts ∠ = 2 × omtreks ∠*] $\hat{S}_1 = 90° - 2x$ [sum of ∠ s in a Δ/ *binne ∠e v* Δ] **OR**	✓ S/R ✓ S (2) ✓ S/R ✓ S (2)

	$\hat{D} = \hat{S}_1 + \hat{S}_2$ [$\angle$s in the same segment/$\angle e$ *in dies. segment*] $90° - x = \hat{S}_1 + x$ $\therefore \hat{S}_1 = 90° - 2x$ [sum of $\angle$s in a Δ/ *binne* $\angle e$ *v* Δ]	✓ S/R ✓ S (2)
10.3	$\hat{R}_1 = \hat{R}_2 = 90°$ [line from centre to midpt of chord/ *lyn vanuit midpt na midpt van koord*] $\therefore \hat{R}_2 + \hat{K}_3 = 180°$ $\therefore$ OKSR is a cyclic quadrilateral [converse opp $\angle$s of cyclic quad/ *omgekeerde teenoorst.* $\angle e$ *v kvh*] **OR** $\hat{K}_2 = 90°$ [$\angle$s on a str line/$\angle e$ *op 'n reguitlyn*] $\hat{R}_1 = \hat{R}_2 = 90°$ [line from centre to midpt of chord/ *lyn vanuit midpt na midpt van koord*] $\therefore \hat{R}_2 = \hat{K}_2 = 90°$ $\therefore$ OKSR is a cyclic quadrilateral [converse ext $\angle$ of cyclic quad/ *omgekeerde buite* $\angle$ *v kvh*] **OR** $A\hat{D}K = K\hat{S}R = 90° - x$ [$\angle$s in the same segment/ $\angle e$ *in dies. segment*] $\hat{R}_1 = \hat{R}_2 = 90°$ [line from centre to midpt of chord/ *lyn vanuit midpt na midpt van koord*] $B\hat{O}R = 90° - x$ [sum of $\angle$s in a Δ/ *binne* $\angle e$ *v* Δ] $\therefore B\hat{O}R = K\hat{S}R = 90° - x$ $\therefore$ OKSR is a cyclic quadrilateral [converse ext $\angle$ of cyclic quad/ *omgekeerde buite* $\angle$ *v kvh*]	✓ S ✓ R ✓ R (3) ✓ S ✓ R ✓ R (3) ✓ S ✓ R ✓ R (3)
		[12]

QUESTION/*VRAAG* 11



11.1	In ΔADE and ΔABC 1. $\hat{A}_2 = \hat{A}_2$ [common/*gemeenskaplik*] 2. $\hat{A}_1 = \hat{E}_1$ [tan chord theorem/*raaklyn koord st*] $\hat{A}_1 = \hat{C}_1$ [tan chord theorem/ *raaklyn koord st*] $\therefore \hat{E}_1 = \hat{C}_1$ 3. $\hat{A}_3 = \hat{D}_1$ [tan chord theorem/ *raaklyn koord st*] $\hat{A}_3 = \hat{B}$ [tan chord theorem/ *raaklyn koord st*] $\therefore \hat{D}_1 = \hat{B}$ $\therefore \Delta ADE \,|||\, \Delta ABC$ $[\angle\angle\angle]$	✓ S ✓ S ✓ R ✓ S **OR** R (4)
11.2	$\hat{D}_1 = \hat{B}$ DE || BC [corresp ∠s =/*ooreenk. ∠e* =] $\frac{AD}{DB} = \frac{AE}{EC}$ [prop theorem; DE || BC/*eweredige st.;* DE||BC] **OR** [line || one side of Δ/*lyn* || *een sy v* Δ] $\frac{1k}{2k} = \frac{4}{EC}$ $\therefore EC = 8$ **OR** $\frac{AD}{AB} = \frac{AE}{AC}$ $[\Delta ADE \,|||\, \Delta ABC]$ $\frac{1k}{3k} = \frac{4}{AC}$ [AB = 3AD] $AC = 12$ $\therefore EC = 12 - 4$ $\therefore EC = 8$	✓ S/R ✓ S ✓ R ✓ answer (4) ✓ S ✓ R ✓ AC ✓ answer (4)

11.3	In ΔECH and ΔCBA $\hat{E}_3 = \hat{C}_1$ [alt $\angle$s; BC $\parallel$ DE/*verw.* $\angle e$; BC $\parallel$ DE] $\hat{C}_2 = \hat{B}$ [tan chord theorem/*raaklyn koord st.*] $\hat{H}_1 = \hat{A}_2$ [sum of $\angle$s in a Δ / *binne* $\angle e$ *v* Δ] $\therefore \Delta ECH \,|||\, \Delta CBA$ [$\angle\angle\angle$] $\therefore \frac{EH}{EC} = \frac{CA}{CB}$	✓ S/R ✓ S ✓ R ✓ S **OR** R (4)
11.4	$\frac{EH}{EC} = \frac{CA}{CB}$ [proved in 11.3] $EC = \frac{EH.BC}{AC}$ $\frac{EC}{AC} = \frac{BD}{AB}$ [prop theorem; DE $\parallel$ BC/*eweredige st.;* DE$\parallel$BC] **OR** [line $\parallel$ one side of Δ/*lyn* $\parallel$ *een sy v* Δ] $EC = \frac{AC.BD}{AB}$ $EC \times EC = \frac{EH.BC}{AC} \times \frac{AC.BD}{AB}$ $EC^2 = \frac{EH.BC.DB}{AB}$ $EC^2 = \frac{EH.BC.DB}{3AD}$ [AD: AB = 1:3] $EC = \sqrt{\frac{EH.BC.DB}{3AD}}$ **OR** $\frac{EH}{EC} = \frac{CA}{CB}$ [proved in 11.3] $EC = \frac{EH.BC}{AC}$ $\frac{EC}{AC} = \frac{BD}{AB}$ [prop theorem; DE $\parallel$ BC/*eweredige st.;* DE$\parallel$BC] **OR** [line $\parallel$ one side of Δ/*lyn* $\parallel$ *een sy v* Δ] $AC = \frac{AB.EC}{BD}$	✓ S ✓ S / R ✓ S ✓ S ✓ S (5) ✓ S ✓ S / R ✓ S

	$EC = \frac{\frac{EH.BC}{AB.EC}}{BD}$ $EC = \frac{EH.BC.DB}{AB.EC}$ $EC^2 = \frac{EH.BC.DB}{3AD}$ $EC = \sqrt{\frac{EH.BC.DB}{3AD}}$	[AD: AB = 1:3]	✓ S ✓ S (5)
	OR		
	$\frac{AD}{AB} = \frac{AE}{AC}$ $AB = \frac{AD.AC}{AE}$ $3AD = \frac{AD.AC}{AE}$ $3 = \frac{AC}{AE}$ $\frac{EH}{EC} = \frac{CA}{CB}$ $AC = \frac{EH.BC}{EC}$	[ΔADE ||| ΔABC] [AD: AB = 1:3] [proved in 11.3]	✓ S ✓ S ✓ S
	$\frac{AD}{DB} = \frac{AE}{EC}$ $AE = \frac{AD.EC}{DB}$	[prop theorem; DE ‖ BC/*eweredige st.;* DE‖BC] **OR** [line ‖ one side of Δ/*lyn* ‖ *een sy v* Δ]	✓ S / R
	$\therefore 3 = \frac{EH.BC.DB}{EC.AD.EC}$ $3\,EC^2 = \frac{EH.BC.DB}{AD}$ $EC = \sqrt{\frac{EH.BC.DB}{3AD}}$		✓ S (5)
			[17]

TOTAL/*TOTAAL*: 150