Province of the
EASTERN CAPE
EDUCATION

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

NATIONAL SENIOR CERTIFICATE

GRADE 12

JUNE 2025

MATHEMATICS P2

MARKS: **150**

TIME: **3 hours**

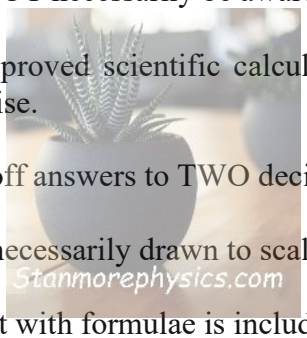
JMATHE2

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

INSTRUCTIONS AND INFORMATION

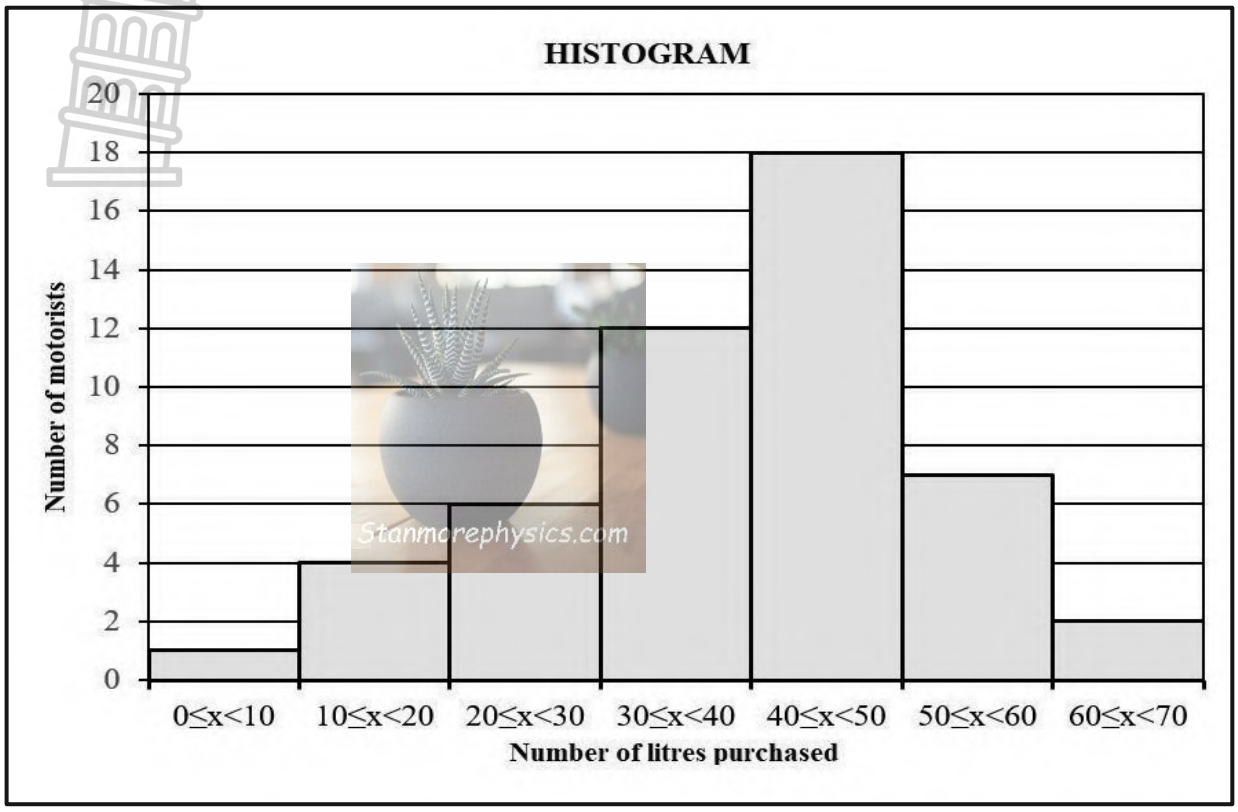
Read the following instructions carefully before answering the questions.

1. This question paper consists of 9 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

A researcher observed the number of litres of fuel purchased by motorists on a certain Saturday. The data collected on that Saturday is represented on the histogram below.



1.1 Write down the total number of motorists who purchased fuel on this day. (1)

1.2 Write down the modal class. (1)

1.3 Complete the cumulative frequency table provided in the SPECIAL ANSWER BOOK. (3)

1.4 Draw an ogive on the grid provided in the SPECIAL ANSWER BOOK. (3)

1.5 Estimate the lower quartile. (1)

1.6 Estimate the mean. (3)

1.7 Determine the 75^{th} percentile. (2)

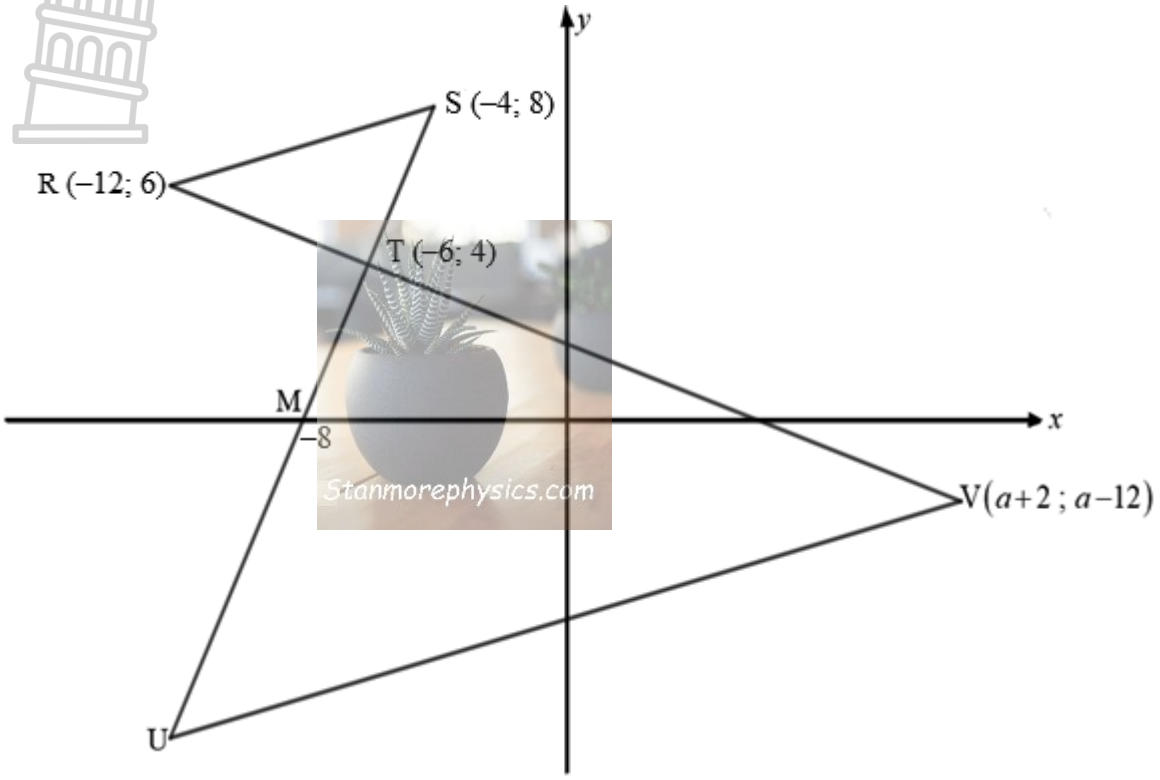
1.8 Determine interquartile range for the data. (2)

1.9 Determine the number of motorists at 75^{th} percentile or above and calculate the total reward spent by the petrol station if each of these motorists that are at 75^{th} percentile or above bought 60 litres each, with a reward of R0,40 per litre. (2)

[18]

QUESTION 2

In the diagram below, S (–4 ; 8), T (–6 ; 4), M and U lie on the same straight line. R (–12 ; 6), T (–6 ; 4) and V also lie on another straight line. RV and SU intersect each other at T.
M is the x-intercept of line SMU at $x=-8$. SM = MU.



2.1 Calculate the gradient of RV. (2)

2.2 Calculate the length of RT. (2)

2.3 Determine the value of a. (3)

2.4 If SM = MU, determine the coordinates of U. (2)

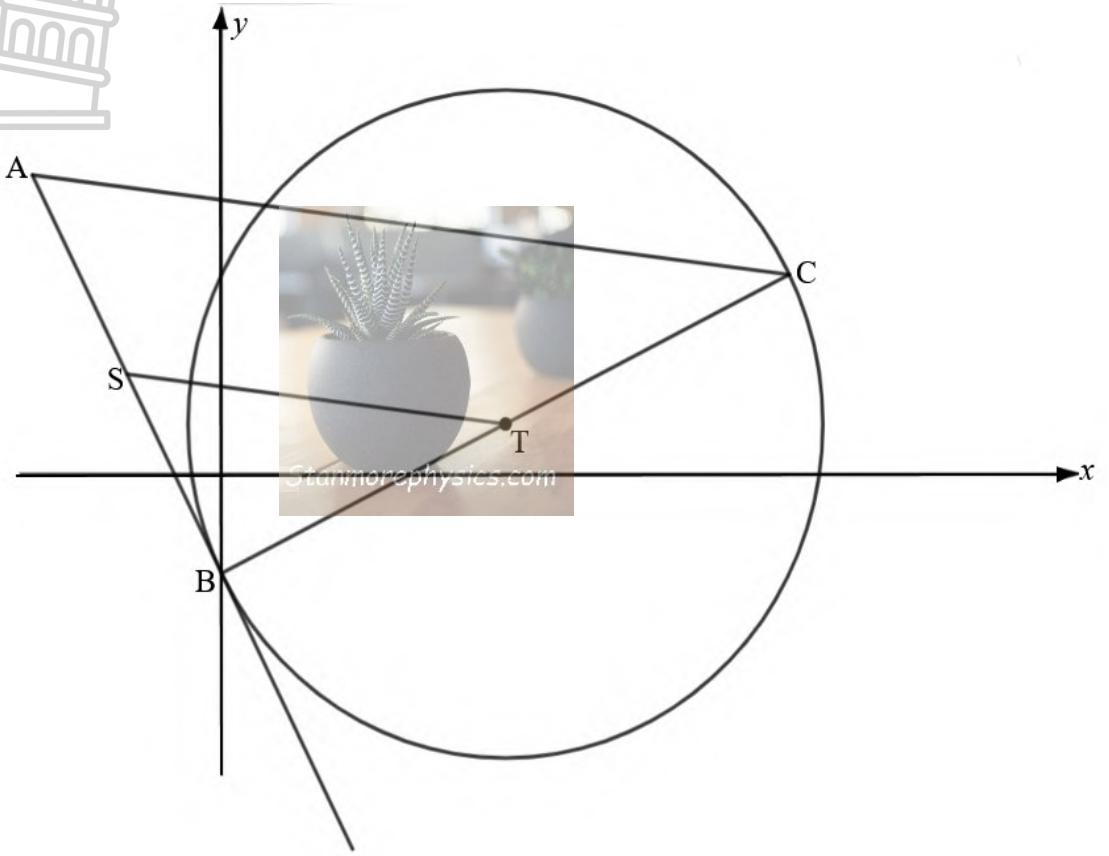
2.5 Determine the equation of line SU. (3)

2.6 Determine the size of $U\hat{T}V$. (4)

2.7 If TV = 4RT, determine the area of ΔTUV. (4)
[20]

QUESTION 3

In the diagram, T is the centre of the circle. $x^2 + y^2 - 12x - 2y - 8 = 0$ is the equation of the circle. BC is the diameter of the circle. AB is the tangent of the circle at point B. S is the point on AB. The equation of line ST is $x + 8y = 7$. Inclination of line AC is $172{,}875°$.



3.1 Determine the coordinates of T. (3)

3.2 Determine the coordinates of B, a y-intercept of the circle. (3)

3.3 Show that ST$\|$AC. **(Round off your answer to 3 decimal places)** (3)

3.4 It is further given that $ST^2 = 65$ and the coordinates of A are (–4 ; k), determine the:

3.4.1 Length of AC (2)

3.4.2 Coordinates of C (2)

3.4.3 Value of k if $k > 4$ (3)

3.4.4 Equation of the circle passing through point A, B and C in the form $(x-a)^2 + (y-b)^2 = r^2$ (4)

[20]

QUESTION 4

4.1 If $\sin 14° = t$, determine the values of the following in terms of t:

4.1.1 $\cos 14°$ (2)

4.1.2 $\sin 38°$ (3)

4.1.3 $\sin 59°$ (4)

4.2 Simplify to a single trigonometric ratio of A.

$$\sin A.\tan\left(\frac{1}{2}A - 360°\right) + 1$$ (6)

4.3 Given: $f(x) = \dfrac{2\cos x\cos(90° - x)}{\cos^2 x + \sin(180° + x).\cos(-x).\tan x}$

4.3.1 Prove that $f(x) = \tan 2x$ (6)

4.3.2 Write down the values of x in the interval of $x \in [-90°; 90°]$ where f is undefined. (2)

4.4 Given: $\cos(\theta + 30°) = \dfrac{1}{2}\sin\theta$

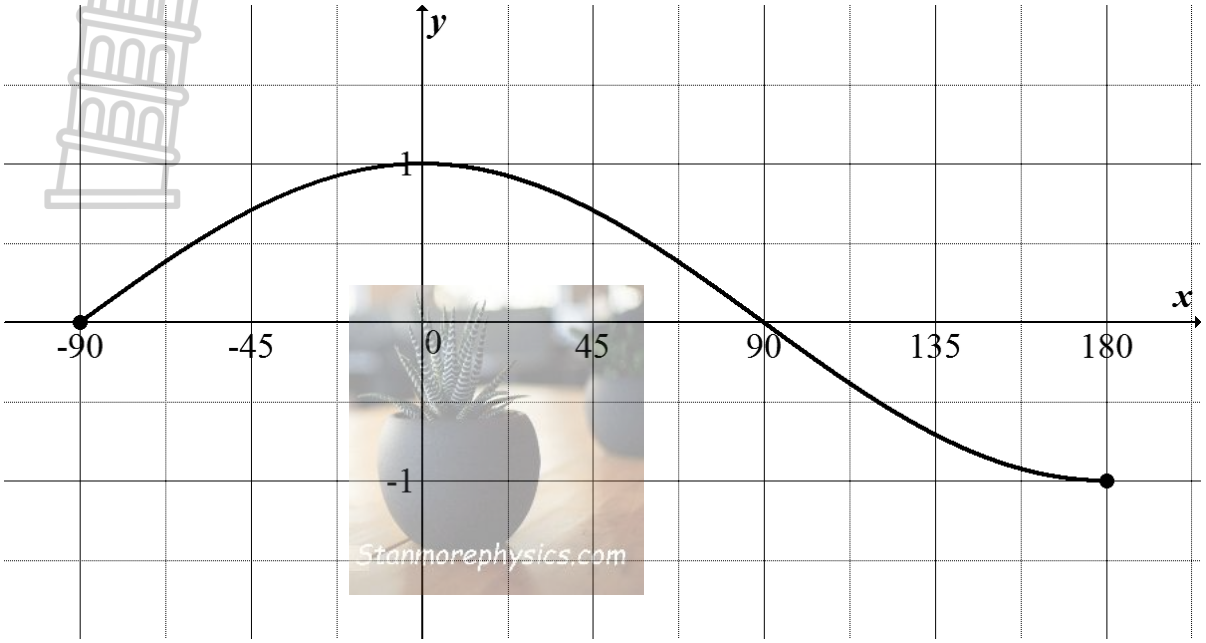
4.4.1 Determine the general solution of the above equation. (4)

4.4.2 Hence or otherwise, determine the values of θ if $\theta \in [-270°; 180°]$ (2)

[29]

QUESTION 5

The graph of $f(x)=\cos x$ is drawn on the diagram below where $x\in[-90°;180°]$.



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

5.2 Write down the range of $f\left(\frac{x}{2}\right)-1$. (2)

5.3 Draw the graph of $g(x)=\frac{1}{2}\sin 2x$ on the same set of axes. (3)

5.4 Write down the minimum value of $g(x-25°)$ (1)

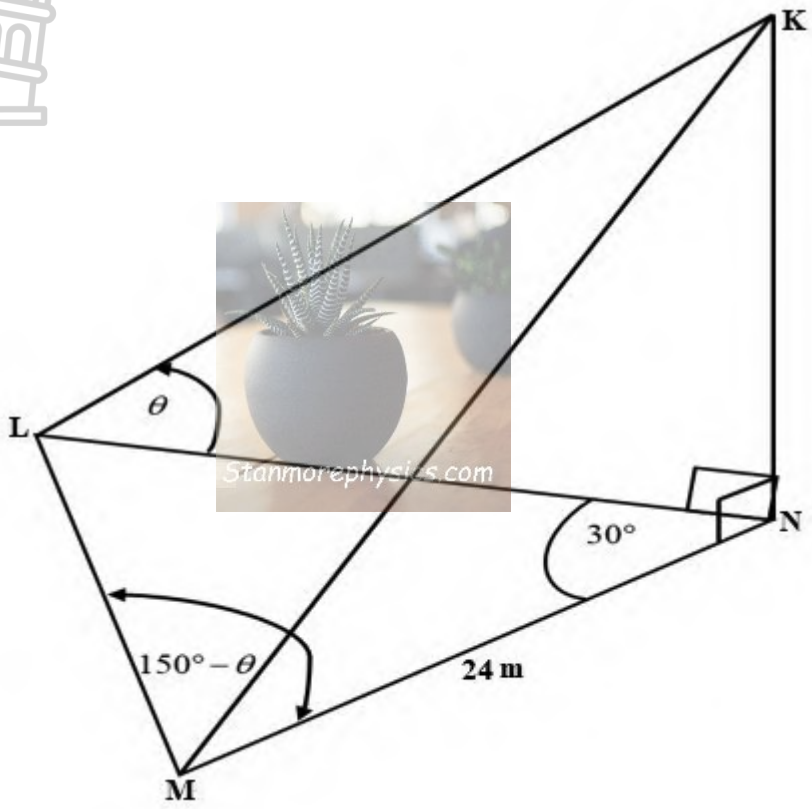
5.5 Use the graph to determine the values of x when:

$\sin x\cos x-\cos x=0$ (3)

[10]

QUESTION 6

In the diagram below, KN is a vertical tower. L, N and M are points in the same horizontal plane. The angle of elevation to the top of the tower, K from L is θ. $L\hat{N}M = 30°$, $L\hat{M}N = 150° - \theta$ and MN = 24 m.



6.1 Write down the size of $M\hat{L}N$. (1)

6.2 Determine LN in terms of $\sin\theta$ and $\cos\theta$. (4)

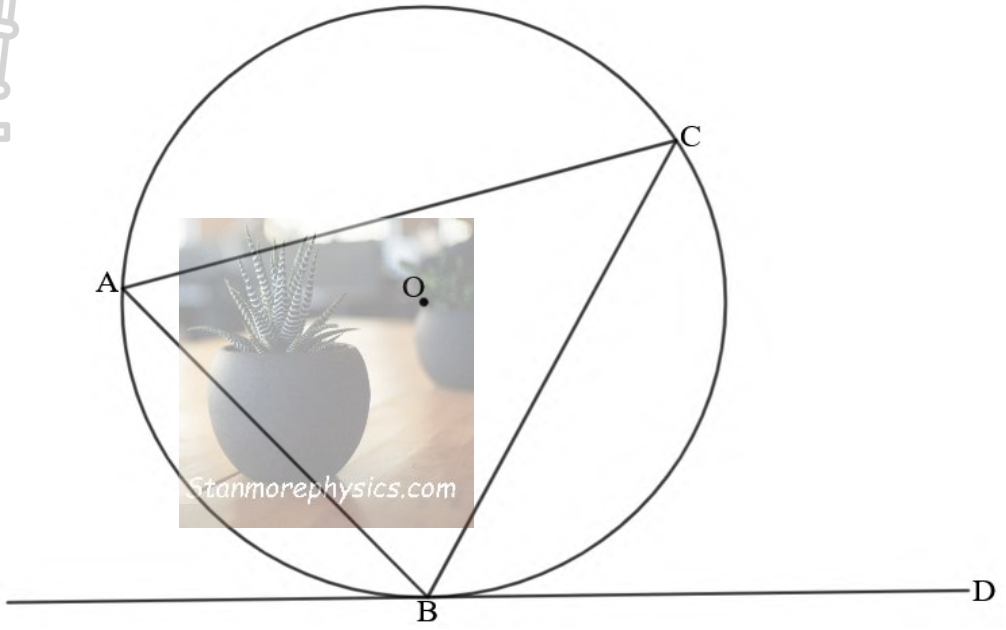
6.3 Hence or otherwise, show that the height of a vertical tower can be written as $KN = 12 + 12\sqrt{3}\tan\theta$. (3)

6.4 Calculate the size of θ, angle of elevation of K from L, if KN = 46 m. (3)

[11]

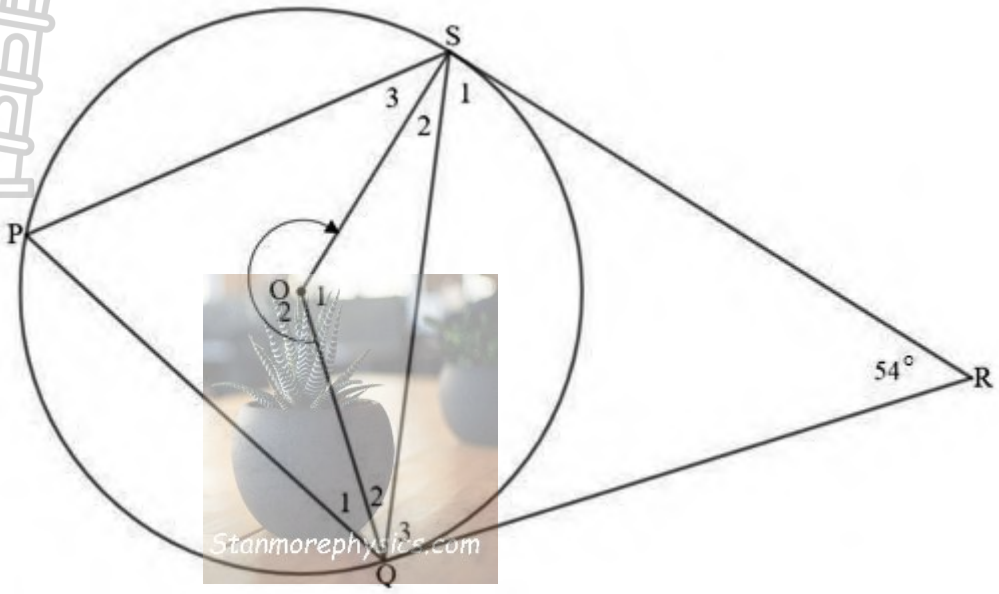
QUESTION 7

7.1 In the diagram, O is the centre of the circle which passes through A, B and C. BD is a tangent to the circle at B.



Prove the theorem which states that the angle between the tangent BD and the chord BC is equal to the angle in the alternate segment, that is prove that $C\hat{B}D = \hat{A}$. (5)

7.2 In the diagram below, O is the centre of the circle. P, S and Q are points on the circumference of the circle. $S\hat{R}Q = 54°$. SR and QR are tangents of the circle at S and Q respectively.



Determine the size of:

7.2.1 $\hat{Q}_3$ (4)

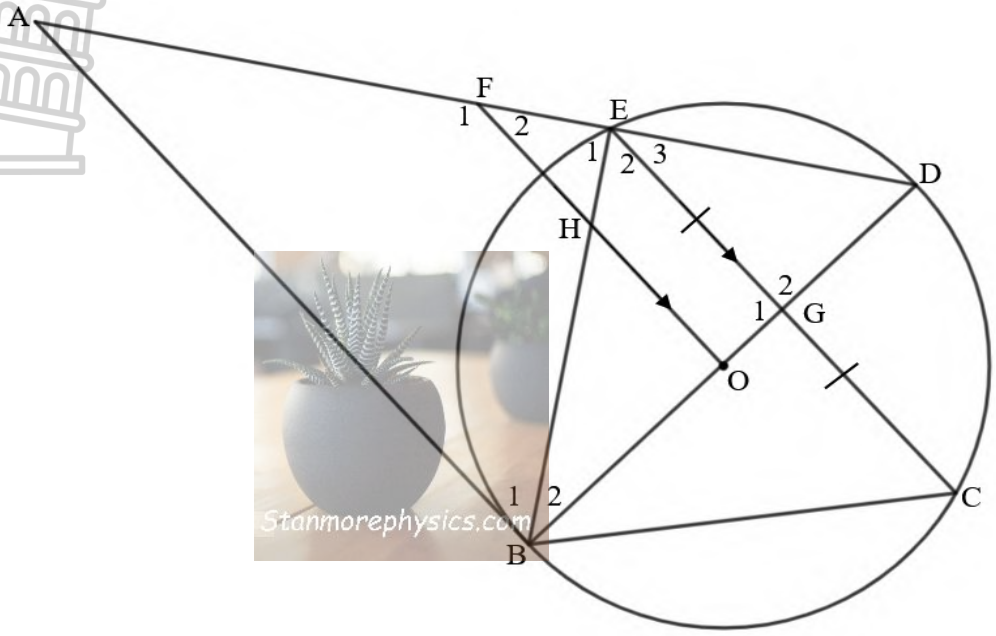
7.2.2 $\hat{P}$ (2)

7.2.3 $\hat{O}_1$ (2)

[13]

QUESTION 8

In the diagram O is the centre of the circle. BCDE is a cyclic quadrilateral. G is the midpoint of chord EC. AB is a tangent to the circle at B. GD : OG = 3 : 2, ED = 2 units.



8.1 Prove that $AB \parallel EC$. (4)

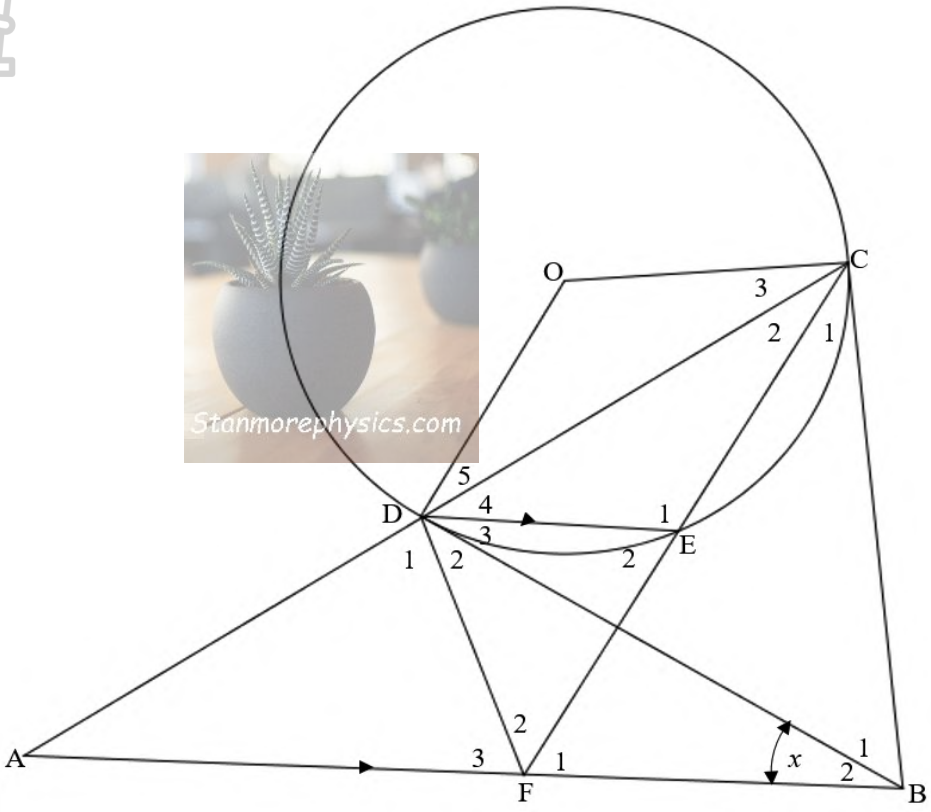
8.2 Prove that BE = BC. (4)

8.3 If it is further given that $FO \parallel EC$, determine the ratio of EF : FA. (3)

8.4 Determine the length of BC if the length of the diameter BD is 20 units. (3)
[14]

QUESTION 9

In the diagram below, O is the centre of the circle. D, E and C are points on the circumference. BC is a tangent at point C and DB is also a tangent at point D. Chord CD is extended to point A and CE is also extended to point F. DF is drawn. $\hat{B}_2 = x$ and $DE \parallel AB$. DE bisects $C\hat{D}B$.



Prove that:

9.1 CDFB is a cyclic quadrilateral (4)

9.2 $\Delta ADF \,|||\, \Delta CBF$ (4)

9.3 $AD = \dfrac{DF.CB}{BF}$ (4)

9.4 $\dfrac{AC.FE}{CF} = \dfrac{DF.CB}{BF}$ (3)

[15]

TOTAL: 150

INFORMATION SHEET

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

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

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

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

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

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

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

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

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

$$In\ \Delta ABC: \ \frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C} \qquad a^2 = b^2 + c^2 - 2bc.\cos A \qquad area\ \Delta ABC = \frac{1}{2}ab.\sin C$$

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

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

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

$$\bar{x} = \frac{\sum x}{n} \qquad \sigma^2 = \frac{\sum_{i=1}^{n}\left(x_i - \bar{x}\right)^2}{n} \qquad P(A) = \frac{n(A)}{n(S)} \qquad P\ (A\ or\ B) = P(A) + P(B) - P\ (A\ and\ B)$$

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

Province of the
EASTERN CAPE
EDUCATION

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

LEARNER'S NAME: ***LEERDER SE NAAM:***	

GRADE/*GRAAD* 12	

NATIONAL/*NASIONALE* SENIOR CERTIFICATE/*SERTIFIKAAT*

GRADE 12/*GRAAD 12*

JUNE/*JUNIE* 2025

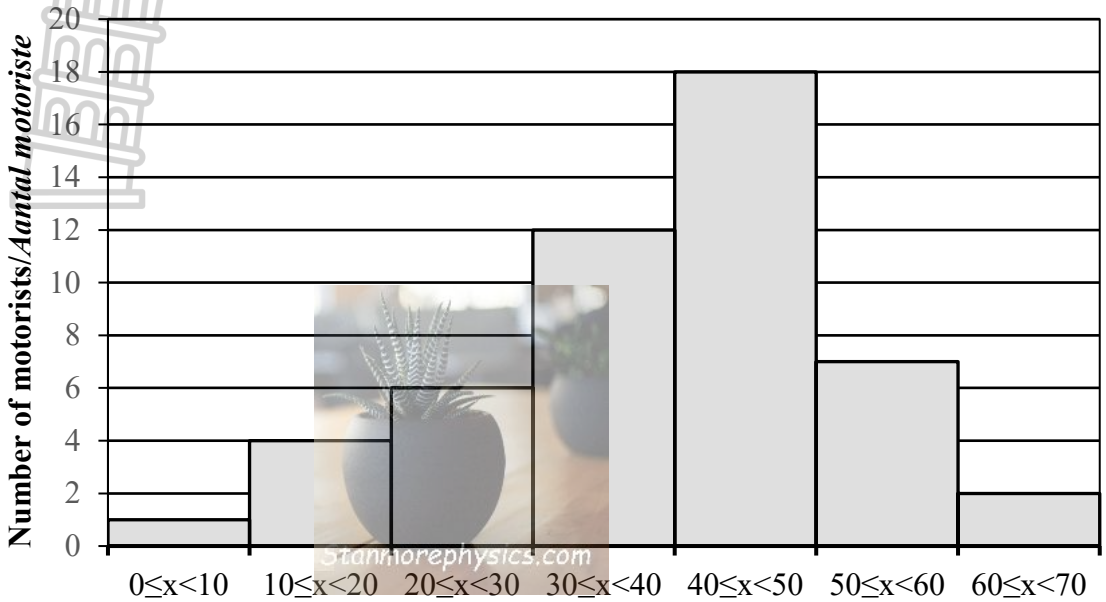
MATHEMATICS P2/*WISKUNDE V2*
SPECIAL ANSWER BOOK/*SPESIALE ANTWOORDEBOEK*

Marker/*Merker*				Moderator's Initials / *Moderator se paraaf*															
Question *Vraag*	**Marks** *Punte*			**Initial** *Parafeer*	**Marks** *Punte*			**S M**	**Marks** *Punte*			**D M**	**Marks** *Punte*			**P M**	**Marks** *Punte*			**N M**
1																			
2																			
3																			
4																			
5																			
6																			
7																			
8																			
9																			
10																			
TOTAL *TOTAAL*																			

***SM = School Moderator** ***DM = District Moderator** ***PM = Provincial Moderator** ***NM = National Moderator**
SM =** ***Skool Moderator ***DM =** ***Distrik Moderator*** ***PM =** ***Provinsiale Moderator*** ***NM =** ***Nasionale Moderator***

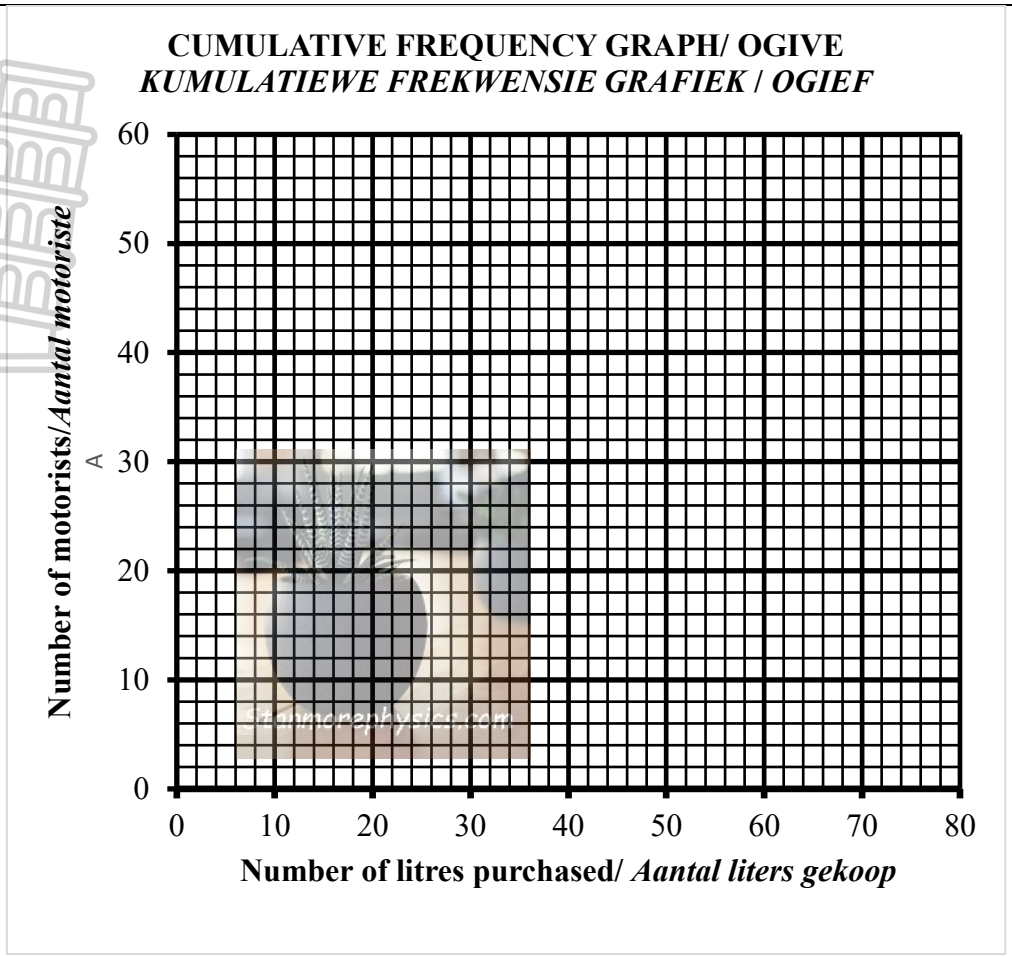
This special answer book consists of 23 pages. /
Hierdie spesiale antwoordeboek bestaan uit 23 *bladsye.*

QUESTION/*VRAAG* 1

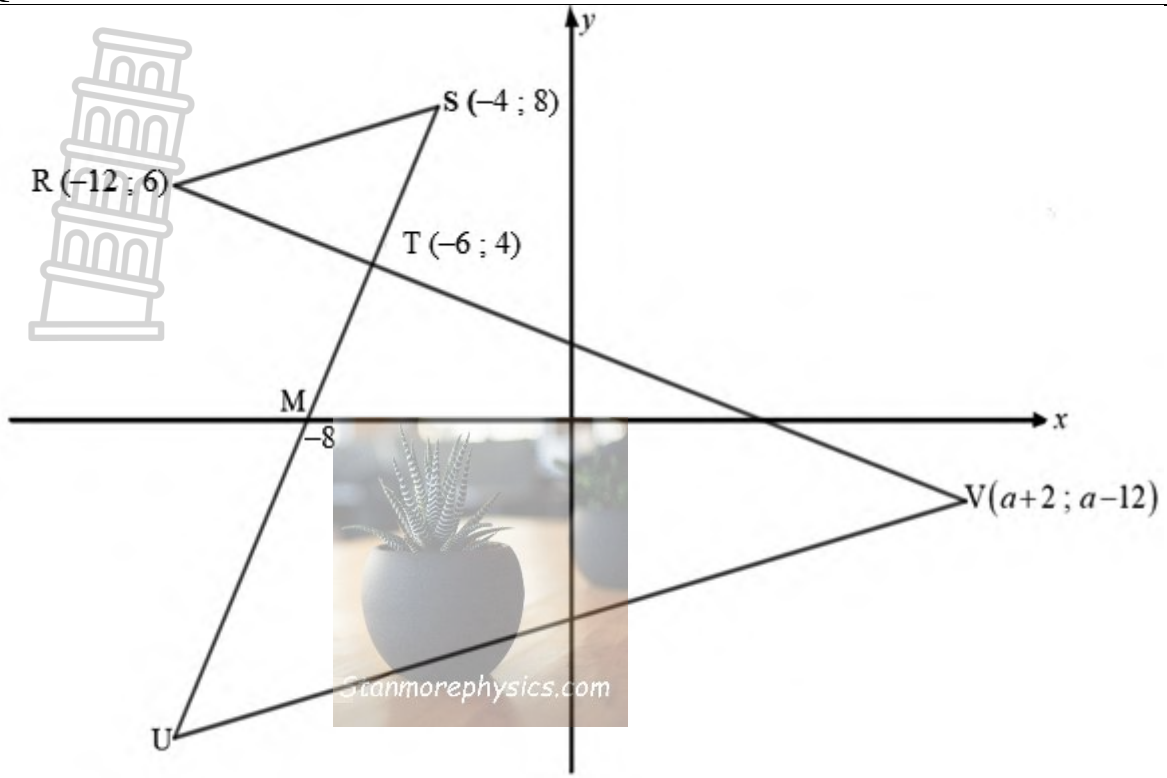


	Solution/*Oplossing*	Marks/ *Punte*
1.1		(1)
1.2		(1)
1.3		(3)

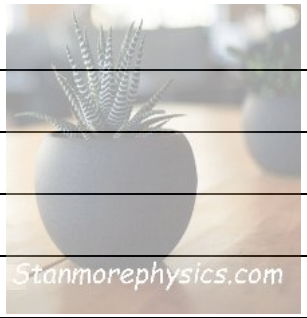
No. of litres purchased *Aantal liters gekoop*	Frequency/ *Frekwensie*	Cumulative Frequency/ *Kumulatiewe Frekwensie*
$0 \le x < 10$		
$10 \le x < 20$		
$20 \le x < 30$		
$30 \le x < 40$		
$40 \le x < 50$		
$50 \le x < 60$		
$60 \le x < 70$		

1.4		(3)
1.5		(1)
1.6		(3)
1.7		(2)
1.8		(2)
1.9		(2)
		[18]

QUESTION/*VRAAG* 2

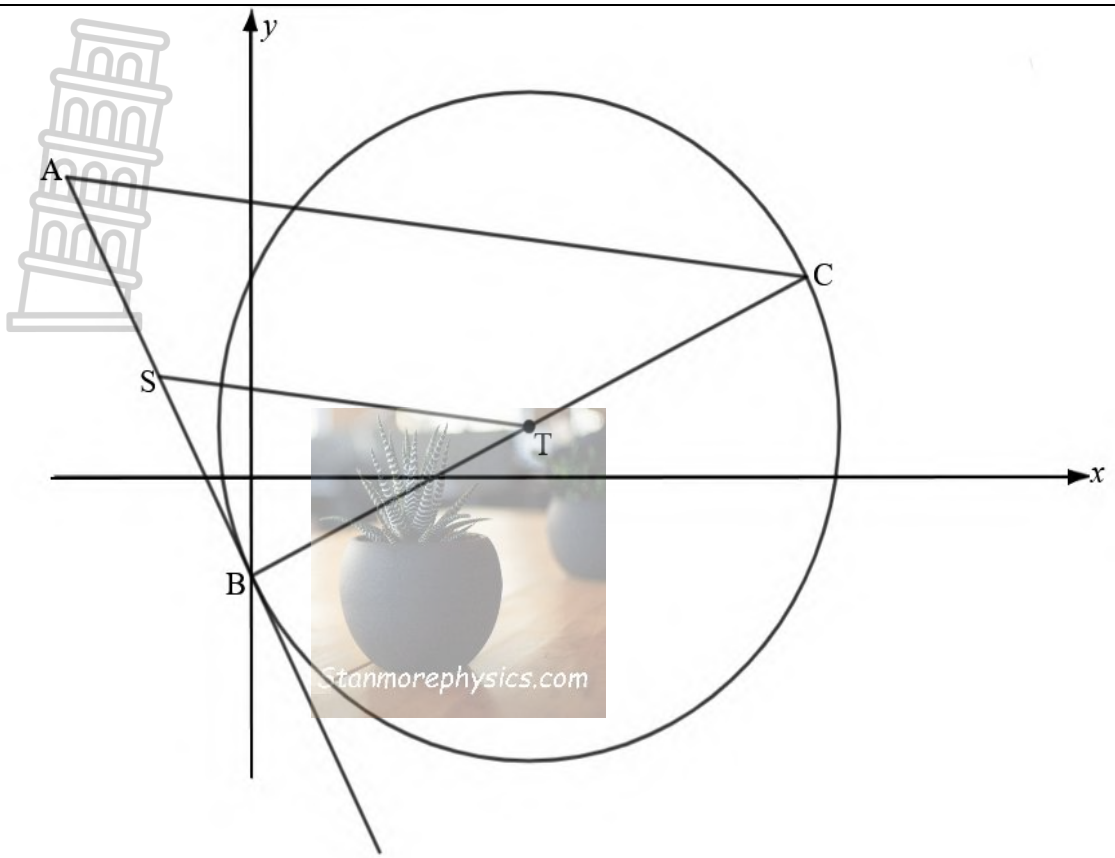


	Solution/*Oplossing*	**Marks/ *Punte***
2.1		(2)
2.2		(2)

2.3		(3)
2.4		(2)
2.5		(3)

2.6		(4)
2.7		(4)
		[20]

QUESTION/*VRAAG* 3

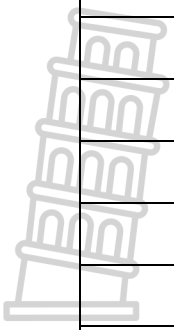
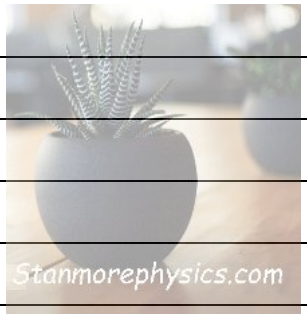


	Solution/*Oplossing*	**Marks/ *Punte***
3.1		(3)
3.2		(3)

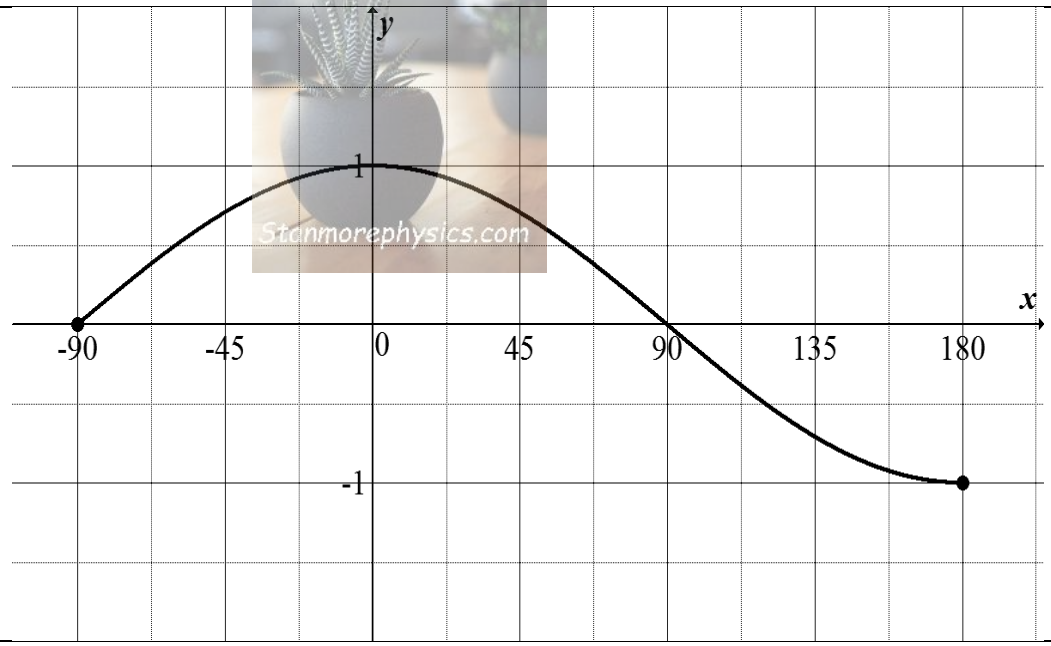
3.3		(3)
3.4.1		(2)
3.4.2		(2)
3.4.3		(3)

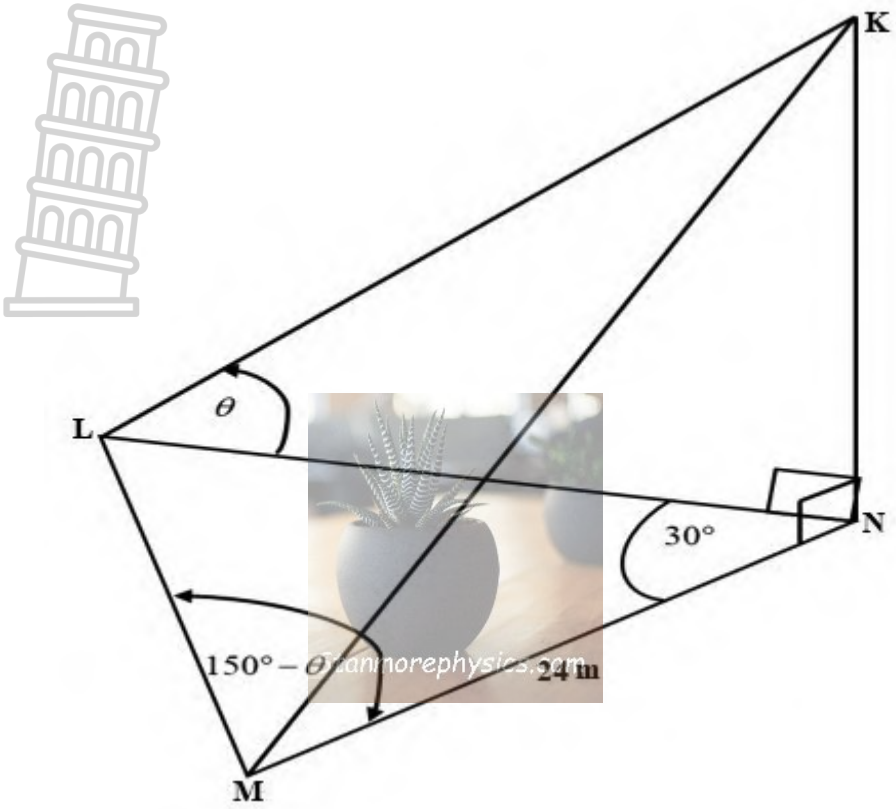
3.4.4		
		(4)
		[20]

QUESTION/*VRAAG* 4		
	Solution/*Oplossing*	**Marks/ *Punte***
4.1.1		(2)
4.1.2		(3)
4.1.3		(4)

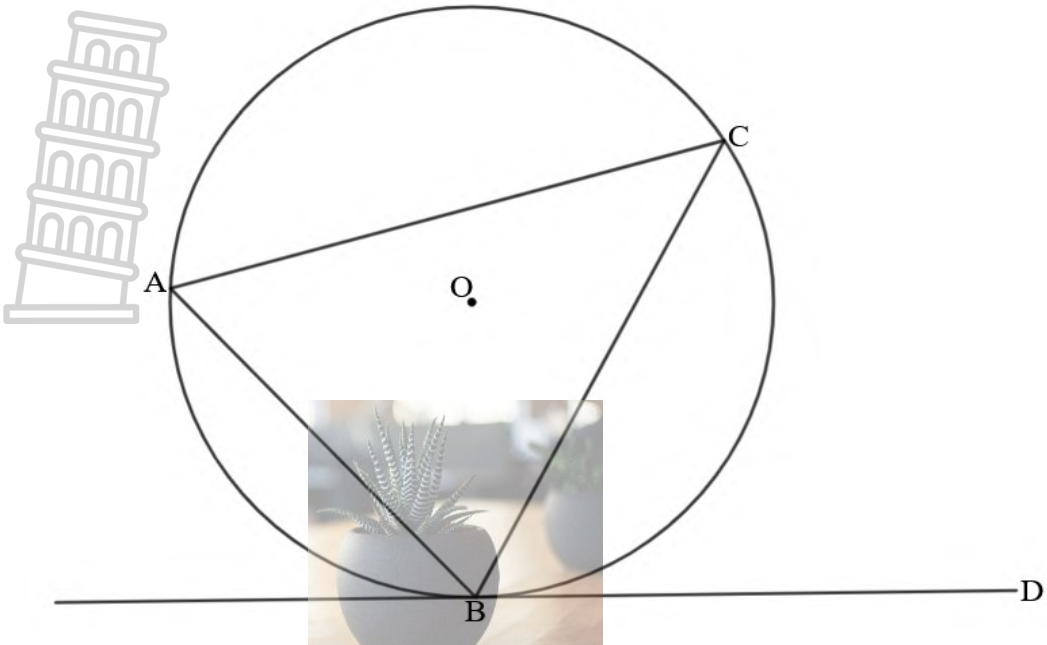
4.2	 	(6)
4.3.1		(6)

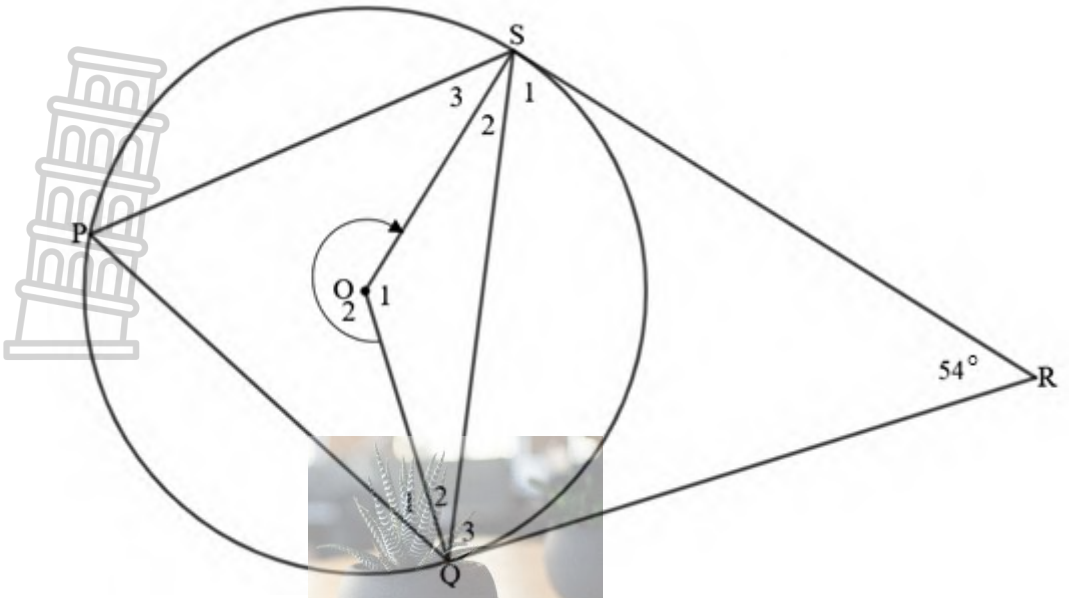
4.3.2		(2)
4.4.1		(4)
4.4.2		(2)
		[29]

QUESTION/*VRAAG* 5		
	Solution/*Oplossing*	**Marks/ *Punte***
5.1		(1)
5.2		(2)
5.3		(3)
5.4		(1)
5.5		(3)
		[10]

QUESTION/*VRAAG* 6		
		
	Solution/*Oplossing*	**Marks/ *Punte***
6.1		(1)
6.2		(4)

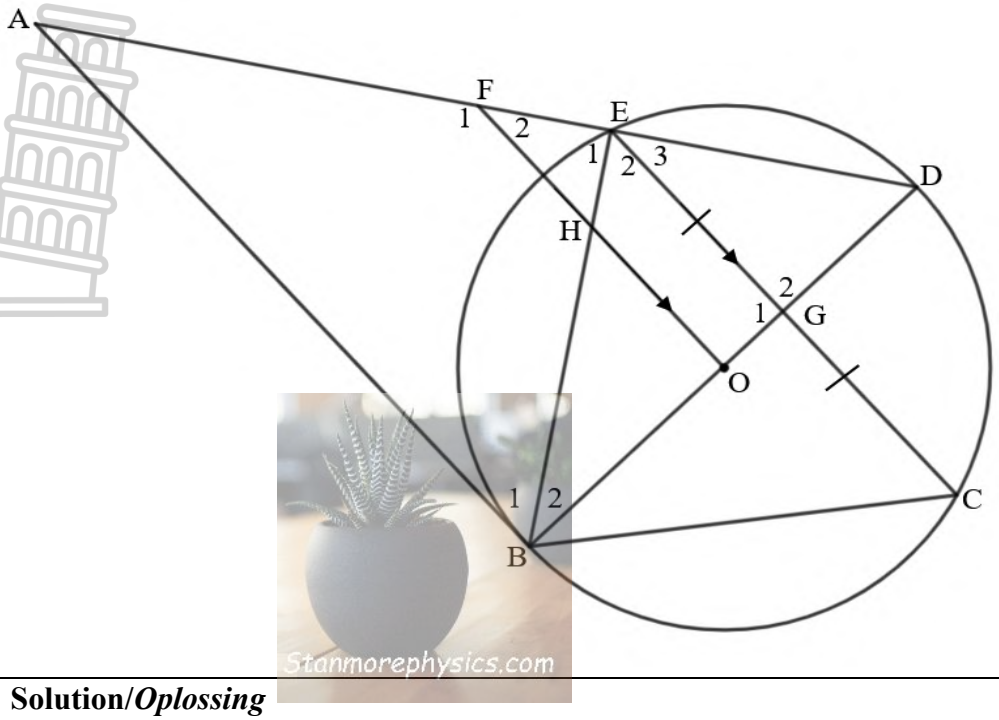
6.3		(3)
6.4		(3)
		[11]

QUESTION/*VRAAG* 7		
		
	Solution/*Oplossing*	**Marks/ *Punte***
7.1		(5)



7.2.1		(4)
7.2.2		(2)
7.2.3		(2)
		[13]

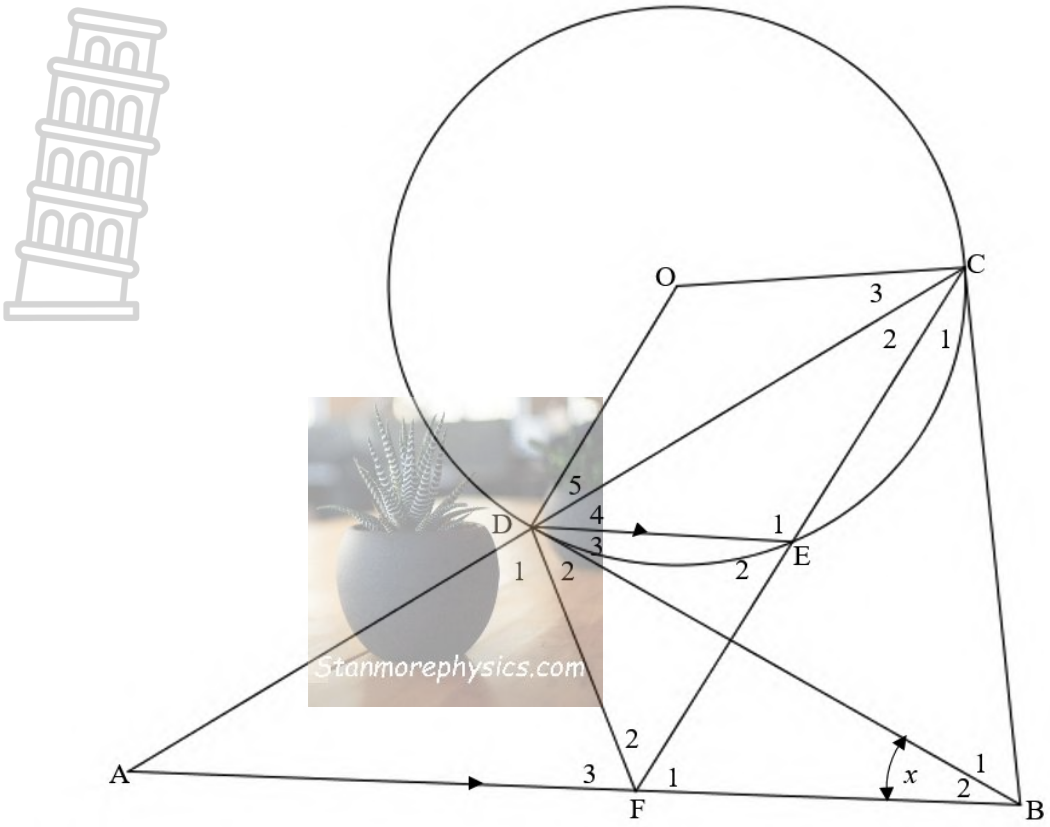
QUESTION/*VRAAG* 8



	Solution/*Oplossing*	**Marks/ *Punte***
8.1		(4)
8.2		(4)

8.3		(3)
8.4		(3)
		[14]

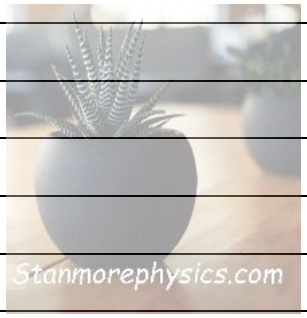
QUESTION/*VRAAG 9*



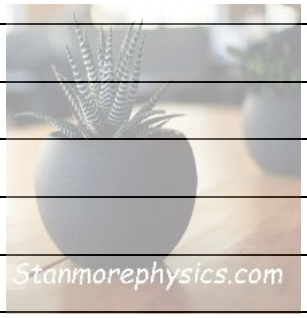
	Solution/*Oplossing*	**Marks/ *Punte***
9.1		(4)
9.2		(4)

9.3		(4)
9.4		(3)
		[15]
	TOTAL/*TOTAAL*:	**150**

Additional Space/*Addisionele Ruimte*		



Additional Space/*Addisionele Ruimte*		



ERRATUM

Amendments and corrections to Marking Guideline.

In this paper there are sub-questions which were found faulty from the question paper during memo discussion. We agreed that the questions affected be marked in the following way:

- 4.2 will be marked out of 4 instead of 6 marks
- 8.4 must not be marked at all in **ENGLISH VERSION.**
- 9.3 must be marked out of 2 instead of 4

Note: Please use conversion tables for Question 4, 8 and 9. Conversion tables have been included for affected questions. This paper will be marked out of 150 marks

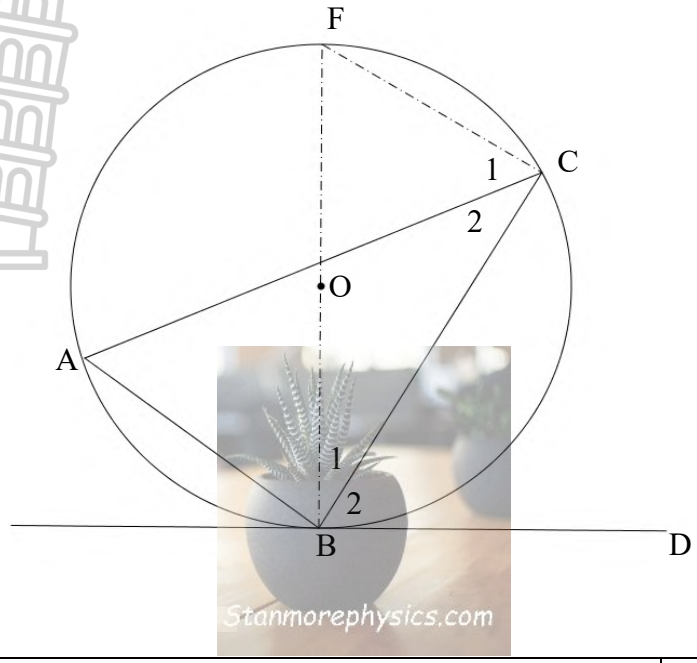
1.7	Position $= \frac{75}{100} \times 50 = 37{,}5$ 75th percentile $= 48$ **OR** **Reading from the graph acceptable**	✓position ✓ answer	(2)
1.8	$IQR = 48 - 32$ $= 26$	✓ $Q_3 - Q_1$ ✓ answer	(2)
1.9	Also accept 12 as number of motorists greater or equal to 75th percentile Total reward for motorists at 75th or above $= 12 \times 60 \times R0{,}40$ $= 288$	✓ 12 ✓ 288	(2)

2.1	$m_{RV} = \frac{a - 12 - 4}{a + 2 + 6}$ $= \frac{a - 16}{a + 8}$ **Accept gradient of RV in terms of *a***	✓ substitution into correct formula ✓ answer	(2)
2.6	$\tan\theta = \boldsymbol{m_{SU}} = 2$ $\theta = 63{,}44^0$ $\tan\alpha = \boldsymbol{m_{RV}} = -\frac{1}{3}$ $\alpha = 161{,}57^0$ $\therefore \hat{TUV} = 161{,}57^0 - 63{,}44^0$ [ext.∠of a Δ] $= 98{,}13^0$ **No penalty for rounding off.**	✓ $\tan\theta = \boldsymbol{m_{SU}}$ ✓ $\theta = 63{,}44^0$ ✓ $\tan\alpha = \boldsymbol{m_{RV}}$ ✓ $\alpha = 161{,}57^0$ ✓ answer	(5)

2.7	$TV = 4 \times 2\sqrt{10}$ $= 8\sqrt{10}$ $UT = \sqrt{(-12+6)^2 + (-8-4)^2}$ $= 6\sqrt{5}$ Area of $\Delta TUV = \frac{1}{2} \times 8\sqrt{10} \times 6\sqrt{5} \times \sin 98{,}13^0$ $= 168$	✓ $TV = 8\sqrt{10}$ ✓ $UT = 6\sqrt{5}$ ✓correct substitution ✓answer	(4)
OR			

	Alternative solution if pupils worked out the length of TV $TV = 3 \times 2\sqrt{10}$ $= 6\sqrt{10}$ $UT = \sqrt{(-12+6)^2 + (-8-4)^2}$ $= 6\sqrt{5}$ Area of $\Delta TUV = \frac{1}{2} \times 6\sqrt{10} \times 6\sqrt{5} \times \sin 98{,}13^0$ $= 126$ If pupil worked out all three sides and worked out a different angle (using the cosine rule) the educators will have to follow what the pupil has done.	✓ $TV = 6\sqrt{10}$ ✓ $UT = 6\sqrt{5}$ ✓correct substitution ✓answer	(4)
3.4.3	$m_{BC} = \frac{1}{2}$ $\therefore m_{AB} = -2 \quad [A\hat{B}C = 90^0]$ Equation of AB: $y = -2x - 2$ $k = -2(-4) - 2$ $= 6$	✓ $m_{AB} = -2$ ✓ $y = -2x - 2$ ✓ $k = 6$	(3)

4.2	$\sin A.\tan\left(\frac{1}{2}A - 360^0\right) + 1$ $= 2\sin\frac{1}{2}A.\cos\frac{1}{2}A.\tan\frac{1}{2}A + 1$ $= 2\sin\frac{1}{2}A.\cos\frac{1}{2}A.\frac{\sin\frac{1}{2}A}{\cos\frac{1}{2}A} + 1$ $= 2\sin^2\frac{1}{2}A + 1$	✓ $2\sin\frac{1}{2}A\cos\frac{1}{2}A$ ✓ $\tan\frac{1}{2}A$ ✓ $\frac{\sin\frac{1}{2}A}{\cos\frac{1}{2}A}$ ✓ simplification	(4)
Question was asked with a positive 1 and not a negative as in Memo. Answer should end as follows: $2\sin^2\frac{1}{2}A + 1$ **4.2 must be marked out of 4 marks**			

2nd option			
7.1	Constructions: Draw diameter BF and join FC $F\hat{C}B = 90^0$ [∠ in semi – circle] $\hat{F} = 90^0 - \hat{B}_1$ [sum of ∠s in a Δ] $F\hat{B}D = 90^0$ [tan ⊥ diameter] $\hat{B}_2 = 90^0 - \hat{B}_1$ $\hat{A} = \hat{F}$ [∠s same segment] $\therefore C\hat{B}D = \hat{A}$	✓ construction ✓ S/R ✓S ✓R ✓S/R	

8.1	$A\hat{B}D = 90^0$ [tan chord theo] $G_1 = 90^0$ [line from centre to the midpoint] $\therefore AB \parallel EC$ [co – int ∠s add to 180^0]	**Co-int angles correct 4enalt not corresp angles**
8.2	$\hat{B}_1 = \hat{E}_2$ [alt ∠s, $EG \parallel AB$] $\hat{B}_1 = \hat{C}$ [tan chord theo] $\therefore \hat{E} = \hat{C}$	✓ S ✓R **4enalty applies if || not mentioned** ✓S ✓R
8.4	**English version question paper must not mark 8.4, length of hypotenuse side in ΔEDG does not make sense. ED is shorter than DG.**	

9.3	The first two lines in the memo answers the question that was stated , the last two lines should be ignored. **9.3 must be marked out of 2 marks.**		
9.4	$\frac{AC}{AD}=\frac{CF}{AE}$ [line $\|\|$ to one side of a Δ] $AD=\frac{AC.AE}{CF}$ $\frac{AC.AE}{CF}=\frac{DF.CB}{BF}$	✓ S ✓R ✓ $AD=\frac{AC.AE}{CF}$	(3)

Note: Please use the following conversion tables for Question 4, 8 and 9.

CONVERSION TABLE OF QUESTION 4	
Mark out of 27 marks	**Mark out of 29 marks**
1	**1**
2	**2**
3	**3**
4	**4**
5	**5**
6	**6**
7	**8**
8	**9**
9	**10**
10	**11**
11	**12**
12	**13**
13	**14**
14	**15**
15	**16**
16	**17**
17	**18**
18	**19**
19	**20**
20	**21**
21	**23**
22	**24**
23	**25**
24	**26**
25	**27**
26	**28**
27	**29**

CONVERSION TABLE OF QUESTION 8	
Out of 11 marks	**Out of 14 marks**
1	1
2	3
3	4
4	5
5	6
6	8
7	9
8	10
9	12
10	13
11	14

CONVERSION TABLE OF QUESTION 9	
Mark out of 13	**Mark out of 15**
1	1
2	2
3	4
4	5
5	6
6	7
7	8
8	9
9	10
10	12
11	13
12	14
13	15

Province of the
EASTERN CAPE
EDUCATION

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

NATIONAL/*NASIONALE* SENIOR CERTIFICATE/*SERTIFIKAAT*

GRADE/*GRAAD* 12

JUNE/*JUNIE* 2025

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

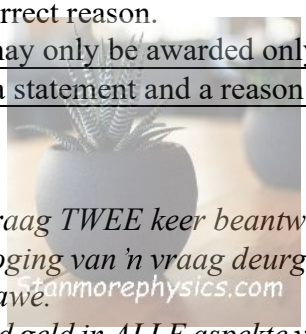
MARKS/*PUNTE*: 150

This marking guideline consists of 18 pages.
Hierdie nasienriglyn bestaan uit 18 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.



***NEEM KENNIS*:**

- *Indien 'n kandidaat 'n vraag TWEE keer beantwoord, merk slegs die EERSTE poging.*
- *Indien 'n kandidaat 'n poging van 'n vraag deurgetrek het en dit nie oorgedoen het nie, merk die deurgetrekte weergawe.*
- *Volgehoue Akkuraatheid geld in ALLE aspekte van die nasienriglyn. Hou op merk by tweede berekeningsfout.*
- *Om antwoorde/waardes te aanvaar om 'n probleem op te los is NIE aanvaarbaar NIE.*

MEETKUNDE	
S	*'n Punt vir korrekte stelling.* *('n Stelling punt is onafhanklik van die rede).*
R	*'n Punt vir die korrekte rede.* *('n Rede punt mag net toegeken word as die stelling korrek is).*
S/R	*'n Punt word toegeken as die stelling en die rede beide korrek is.*

QUESTION/ *VRAAG* 1

1.1 50 motorists/*motoriste* ✓ answer/*antwoord* (1)

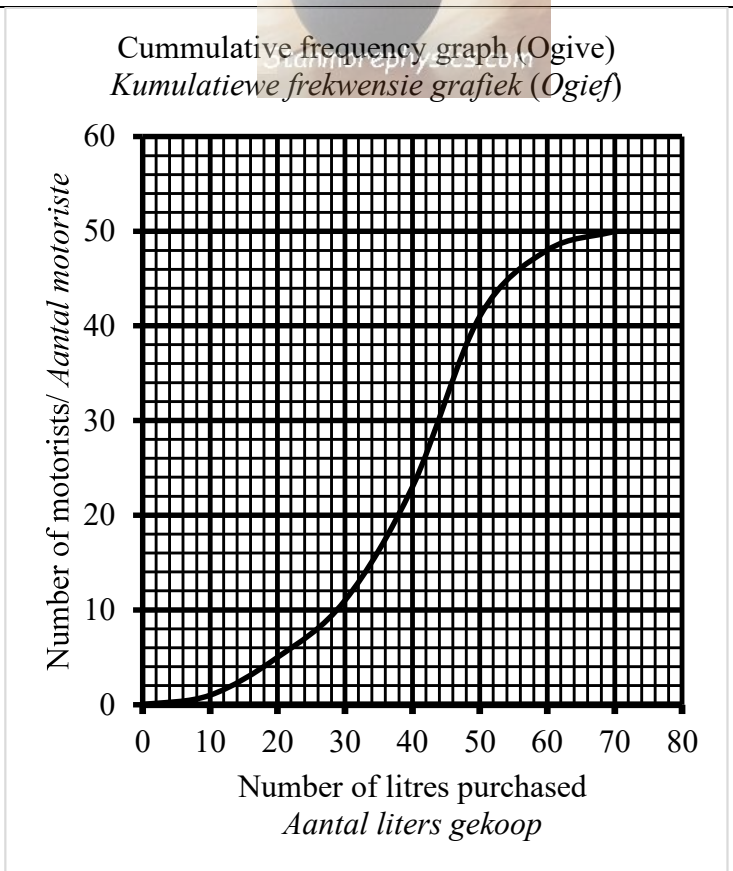
1.2 $40 \le x < 50$ ✓ answer/*antwoord* (1)

1.3

No. of litres purchased *Aantal liters gekoop*	Frequency *Frekwensie*	Cumulative Frequency *Kumulatiewe Frekwensie*
$0 \le x < 10$	1	1
$10 \le x < 20$	4	5
$20 \le x < 30$	6	11
$30 \le x < 40$	12	23
$40 \le x < 50$	18	41
$50 \le x < 60$	7	48
$60 \le x < 70$	2	50

✓ correct frequency *korrekte frekwensie*
✓ {1, 5; 11}CM
✓ {23; 41; 48} CM
(3)

1.4



✓ grounding/*anker*
✓ plotting against the upper limit/*steek af teenoor die boonste limiet*
✓ shape/*vorm*
(3)

1.5 $Q_1 = 32$ (Accept/*Aanvaar* 31) ✓ answer/*antwoord* (1)

1.6

$$\bar{x} = \frac{5\times1+15\times4+25\times6+35\times12+45\times18+55\times7+65\times2}{50}$$

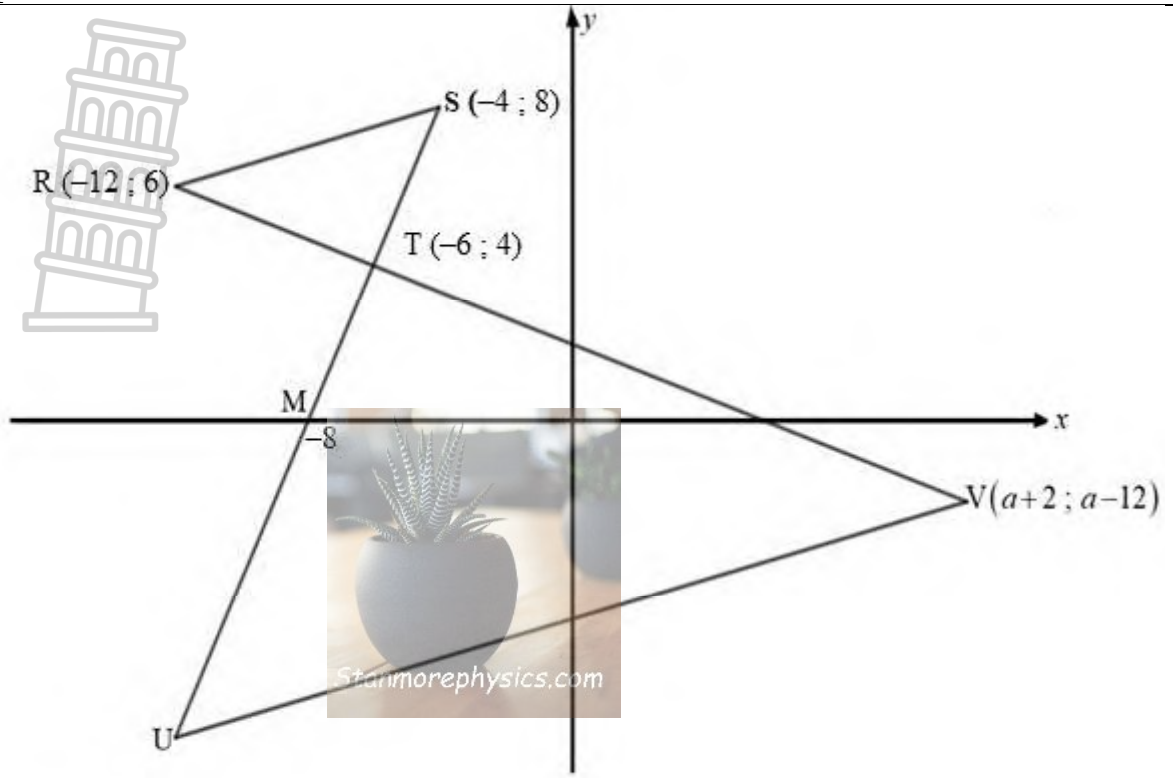
$$= \frac{1960}{50}$$

$$= 39,2$$

✓ correct frequency *korrekte frekwensie*
✓ division by 50/ *deel deur* 50
✓ answer/*antwoord*
(3)

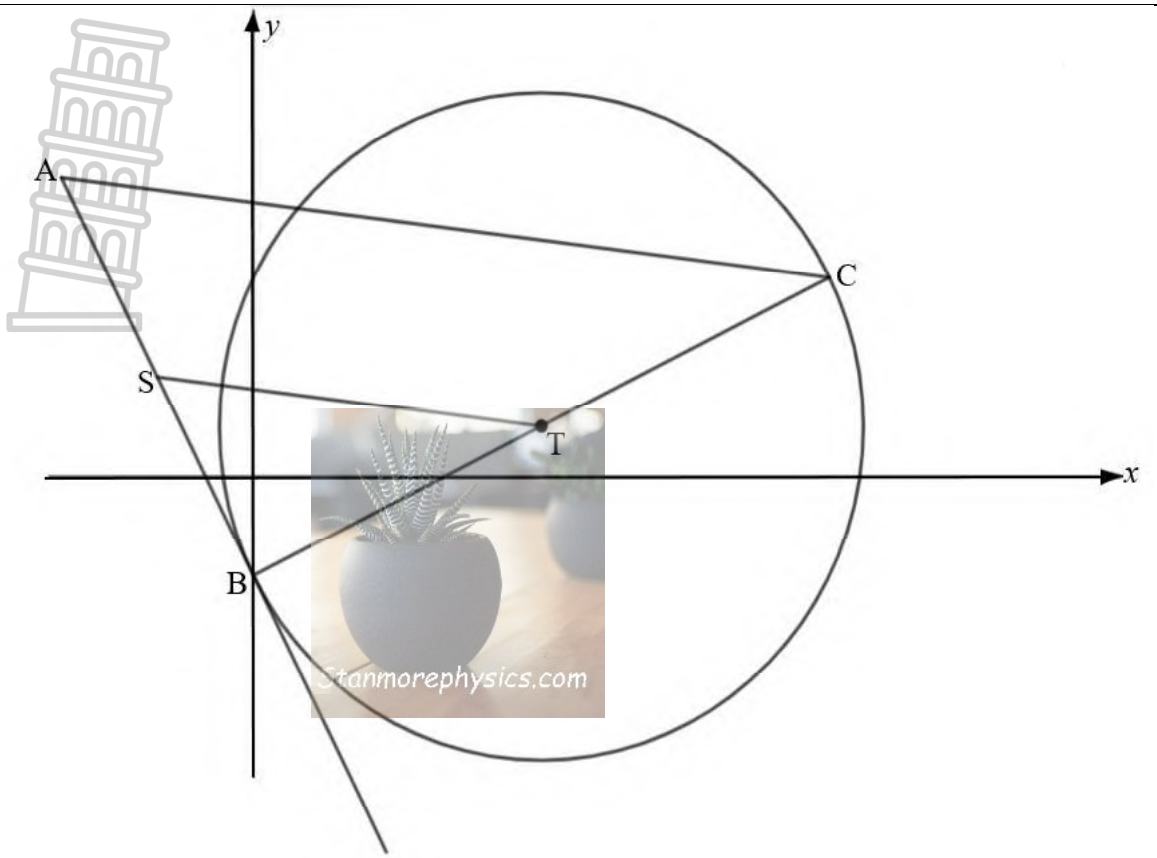
1.7	75^{th} percentile/75^{ste} *persentiel* $= \frac{75}{100} \times 50$ $= 37,5$	✓ multiplication by 50/ *vermenigvuldig met* 50 ✓ answer / *antwoord*	(2)
1.8	$Q_3 = 48$ $IQR = Q_3 - Q_1 = 48 - 32 = 16$	✓ Q_3 ✓ answer/*antwoord*	(2)
1.9	No. of motorists that are greater or equal to 75^{th} percentile is 13 number of motorists at 75^{th} percentile or above $= 13$ Total reward for motorists at 75^{th} *or above* $= 13 \times 60 \times R0,40$ $= 312$ *Aantal motoriste gelyk aan of groter as die* 75^{ste} *persentiel is* 13 *Aantal motoriste by* 75^{ste} *persentiel of bo* = 13 *Totale beloning vir motoriste by* 75^{ste} *persentiel of bo* = 13 x 60 x R0,40 = R312,00	✓ 13 ✓ 312	(2)
			[18]

QUESTION/*VRAAG* 2

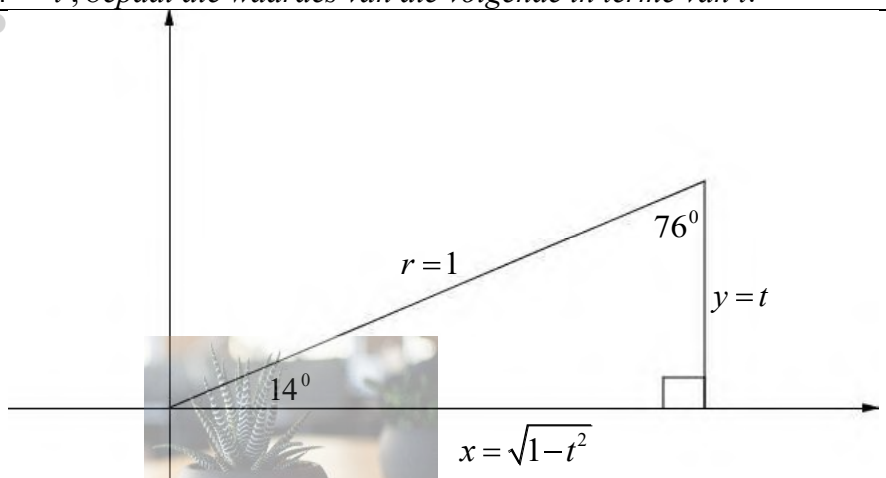


2.1	$m_{RV} = \frac{6-4}{-12+6}$ $= -\frac{1}{3}$	✓ substitution into correct formula *vervanging in korrekte formule* ✓ answer / *antwoord*	(2)
2.2	$RT = \sqrt{(-12+6)^2 + (6-4)^2}$ $= 2\sqrt{10}$	✓ substitution into correct formula *vervanging in korrekte formule* ✓ answer / *antwoord*	(2)
2.3	$\frac{a-12-4}{a+2+6} = -\frac{1}{3}$ $\frac{a-16}{a+8} = -\frac{1}{3}$ $3a-48 = -a-8$ $4a = 40$ $a = 10$	✓ $m_{RV} = m_{TV}$ ✓ simplification / *vereenvoudiging* ✓ answer/*antwoord*	(3)
2.4	$-8 = \frac{-4+x}{2}$; $0 = \frac{8+y}{2}$ $-12 = x$; $-8 = y$	✓ correct substitution/ *korrekte vervanging* ✓ both *x*-and *y*-value/ *beide x-en y-waarde*	(2)

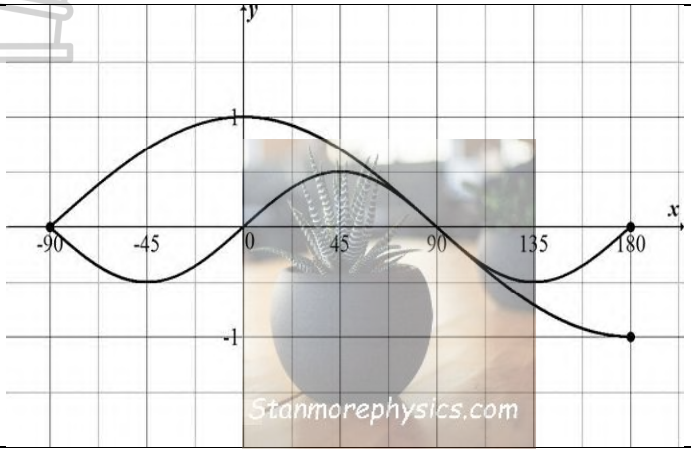
2.5	$m_{SU} = \frac{8-4}{-4+6}$ $= 2$ $y - 8 = 2(x+4)$ $y = 2x + 16$	✓ correct gradient / *korrekte gradiënt* ✓substitution of m_{SU} and *vervanging van* m_{SU} *en* S(–4 ; 8) or/*of* T(4 ; 6) or/*of* M(–8 ; 0) ✓ equation / *vergelyking*	(3)
2.6	$\tan\theta = m_{SU} = 2$ $\theta = 63,43°$ $\tan\alpha = m_{RV} = -\frac{1}{3}$ $\alpha = 161,57^0$ $\therefore$ T$\hat{U}$V $= 161,57° - 63,43°$ [ext.∠ of a Δ] $= 98,14°$ [buite∠ van 'n Δ]	✓ $\theta = 63,43°$ ✓ $\alpha = 161,57°$ ✓ $161,57° - 63,43°$ ✓ answer / *antwoord*	(4)
		°	
2.7	TV $= 4 \times 2\sqrt{10}$ $= 8\sqrt{10}$ UT $= \sqrt{(-12+6)^2 + (-8-4)^2}$ $= 6\sqrt{65}$ Area of ΔTUV $= \frac{1}{2} \times 8\sqrt{10} \times 6\sqrt{65} \times \sin 98,14°$ $= 168$	✓ TV $= 8\sqrt{10}$ ✓ UT $= 2\sqrt{73}$ ✓correct substitution/ *korrekte vervanging* ✓answer / *antwoord*	(4)
			[20]

QUESTION/*VRAAG* 3			
			
3.1	$x^2+y^2-12x-2y-8=0$ $(x-6)^2+(y-1)^2=45$ $T(6\,;1)$	✓ $(x-6)^2+(y-1)^2=45$ ✓ x-value / *waarde* ✓ y-value / *waarde*	(3)
3.2	$x^2+y^2-12x-2y-8=0$ $0^2+y^2-12(0)-2y-8=0$ $y^2-2y-8=0$ $(y-4)(y+2)=0$ $y\neq 4$ or / *of* $y=-2$ $B(0;-2)$	✓ $x=0$ ✓ standard form / *standaardvorm* ✓ $y=-2$	(3)

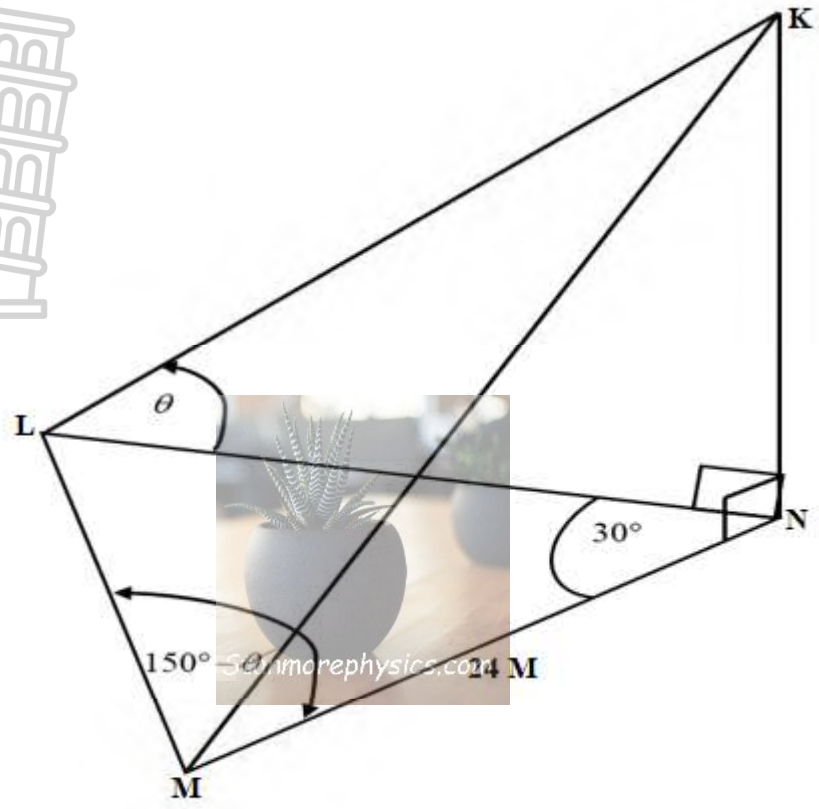
3.3	$y=-\frac{x}{8}+\frac{7}{8}$ $m_{ST}=-\frac{1}{8}$ $\tan\beta=-\frac{1}{8}$ $\beta=172,875^0$ Inclination of AC = inclination of ST *Inklinasie van* AC = *inklinasie van* ST AC||ST	✓ equation of ST in the form $y=mx+c$ *Vergelyking van ST in die vorm* $y=mx+c$ ✓ $m_{ST}=-\frac{1}{8}$ ✓ angle of inclination of ST *hoogtehoek van* ST	
	OR / *OF* $y=-\frac{x}{8}+\frac{7}{8}$ $m_{ST}=-\frac{1}{8}$ $=-0,125$ $m_{AC}=\tan 172,825$ $=-0.125$	**OR / *OF*** ✓ equation of ST in the form $y=mx+c$ *Vergelyking van ST in die vorm* $y=mx+c$ ✓ $m_{ST}=-0,125$ ✓ $m_{AC}=-0,125$	(3)
3.4.1	$ST=\sqrt{65}$ $AC=2ST$ [midpoint theorem] [*middelpunt – stelling*] $=2\sqrt{65}$	✓ AC = 2ST ✓answer / *antwoord*	(2)
3.4.2	$6=\frac{0+x}{2}\ ;\ 1=\frac{-2+y}{2}$ $x=12\ ;\ y=4$ $C(12\ ;\ 4)$	✓ *x*-value / *waarde* ✓ *y*-value / *waarde*	(2)
3.4.3	$\left(2\sqrt{65}\right)^2=(-4-12^2+(k-4)^2$ $4=(k-4)^2$ $k-4=\pm 2$ $k=6\ or\ k\neq 2$	✓ substitution into correct formula *vervanging in die korrekte formule* ✓ standard form/*standaardvorm* ✓ *k*-value/*waarde*	(3)
3.4.4	$A\hat{B}C=90°$ [diameter ⊥ tan] / [*middellyn* ⊥ *raaklyn*] ∴AC is the diameter [line subt 90°] *AC is die middellyn* [*lynstuk onderspan* 90°] $M_{AC}(4\ ;\ 5)$ $r^2=65$ $(x-4)^2+(y-5)^2=65$	✓ $A\hat{B}C=90°$ ✓ midpoint of AC *middelpunt van* AC ✓ r^2 ✓ correct equation *korrekte vergelyking*	(4)
			[20]

QUESTION/*VRAAG* 4			
4.1	If $\sin 14° = t$, determine the values of the following in terms of t: *As* $\sin 14° = t$, *bepaal die waardes van die volgende in terme van* t:		
	 		
4.1.1	$x = \sqrt{1-t^2}$ Pyth theorem/*Pythagoras Stelling* $\cos 14^0 = \dfrac{\sqrt{1-t^2}}{1}$	✓ $x = \sqrt{1-t^2}$ ✓ answer / *antwoord*	(2)
4.1.2	$\sin 38°$ can be expressed as: $\sin 38°$ *kan uitgedruk word as*: $1-2\sin^2 38° = \cos 76°$ $\sin^2 38° = \dfrac{1-\cos 76°}{2}$ $\sin 38° = \sqrt{\dfrac{1-\cos 76°}{2}}$ $= \sqrt{\dfrac{1-t}{2}}$	✓ $\sin^2 38°$ ✓ $\sin 38°$ ✓ answer / *antwoord*	(3)
4.1.3	$\sin 59° = \sin(45°+14°)$ $= \sin 45°\cos 14° + \sin 14°\cos 45°$ $= \dfrac{\sqrt{2}}{2} \times \dfrac{\sqrt{1-t^2}}{1} + t \times \dfrac{\sqrt{2}}{2}$ $= \dfrac{\sqrt{2}\left(\sqrt{1-t^2}+t\right)}{2}$	✓ compound angle *saamgestelde hoek* ✓ expansion / *uitbreiding* ✓ ✓ each term / *elke term*	(4)

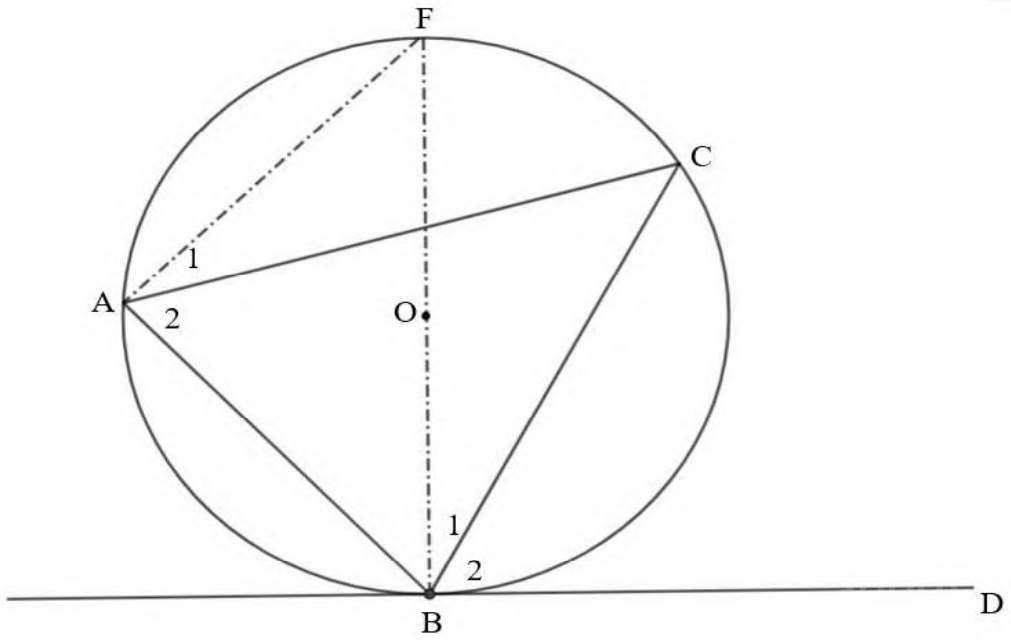
4.2	$\sin A.\tan\left(\frac{1}{2}A-360°\right)-1$ $=2\sin\frac{1}{2}A.\cos\frac{1}{2}A.\tan\frac{1}{2}A-1$ $=2\sin\frac{1}{2}A.\cos\frac{1}{2}A.\frac{\sin\frac{1}{2}A}{\cos\frac{1}{2}A}-1$ $=2\sin^2\frac{1}{2}A-1$ $=-\left(1-2\sin^2\frac{1}{2}A\right)$ $=-\cos A$	✓ $2\sin\frac{1}{2}A\cos\frac{1}{2}A$ ✓ $\tan\frac{1}{2}A$ ✓ $\frac{\sin\frac{1}{2}A}{\cos\frac{1}{2}A}$ ✓ simplification / *vereenvoudiging* ✓ factors / *faktore* ✓ answer / *antwoord*	(6)
4.3.1	$f(x)=\frac{2\cos x\cos(90°-x)}{\cos^2 x+\sin(180°+x).\cos(-x).\tan x}$ $=\frac{2\cos x.\sin x}{\cos^2 x+(-\sin x).\cos x\frac{\sin x}{\cos x}}$ $=\frac{2\cos x.\sin x}{\cos^2 x-\sin^2 x}$ $=\frac{\sin 2x}{\cos 2x}$ $=\tan 2x$	✓ $\sin x$ ✓ $-\sin x$ ✓ $\cos x$ ✓ $\frac{\sin x}{\cos x}$ ✓ $\sin 2x$ ✓ $\cos 2x$	(6)
4.3.2	$x=-45°$ and/*en* $x=45°$	✓ $x=-45°$ ✓ $x=45°$	(2)
4.4.1	$\cos(\theta+30^0)=\frac{1}{2}\sin\theta$ $\cos\theta\cos 30°-\sin\theta\sin 30°=\frac{1}{2}\sin\theta$ $\frac{\sqrt{3}}{2}\cos\theta-\frac{1}{2}\sin\theta-\frac{1}{2}\sin\theta=0$ $\frac{\sqrt{3}}{2}\cos\theta-\sin\theta=0$ $\sin\theta=\frac{\sqrt{3}}{2}\cos\theta$ $\tan\theta=\frac{\sqrt{3}}{2}$ $\theta=40,89°+180°.k$ or/*of* $\theta=220,89°+180°.k \quad k\in Z$	✓ correct expansion / *korrekte uitbreiding* ✓ standard form of equation / *standaardvorm van vergelyking* ✓ $\tan\theta=\frac{\sqrt{3}}{2}$ ✓ $\theta=40,89°+180°.k, \quad k\in Z$	(4)
4.4.2	$\theta=40,89°$ and/*en* $-139,11°$	✓✓ each value / *elke waarde*	(2)
			[29]

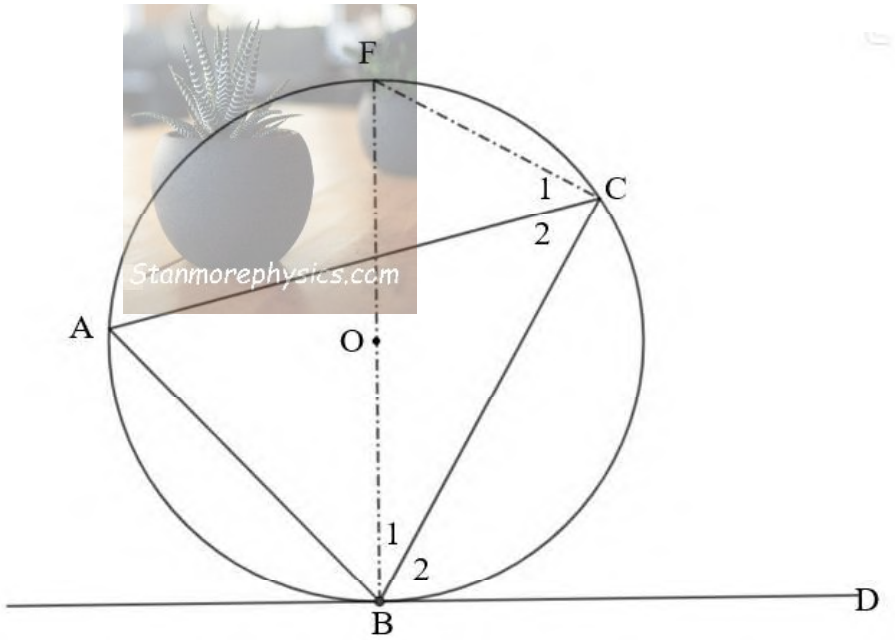
QUESTION/*VRAAG* 5			
5.1	Period/*Periode* = 720°	✓ answer / *antwoord*	(1)
5.2	$y \in [-2;0]$ **OR / *OF*** $-2 \le y \le 0$	✓ correct critical values/ *korrekte kritieke waardes* ✓ correct notation/ *korrekte notasie*	(2)
5.3		✓ correct *x*-intercepts *korrekte x-afsnitte* ✓ correct turning points *korrekte draaipunte* ✓ shape/*vorm*	(3)
5.4	$y = -\frac{1}{2}$	✓ answer / *antwoord*	(1)
5.5	$\sin x \cos x - \cos x = 0$ $\frac{1}{2}\sin 2x = \cos x$ $\therefore x = -90^0$ or $x = 90^0$	✓ identity/*identiteit* $\frac{1}{2}\sin 2x$ ✓ $x = -90°$ ✓ $x = -90°$	(3)
			[10]

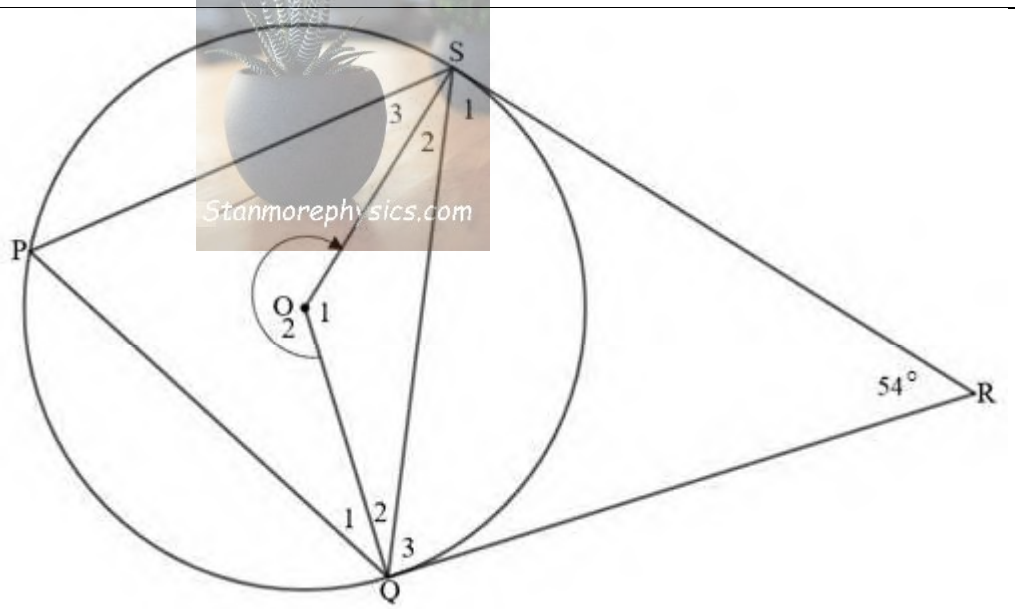
QUESTION/*VRAAG* 6



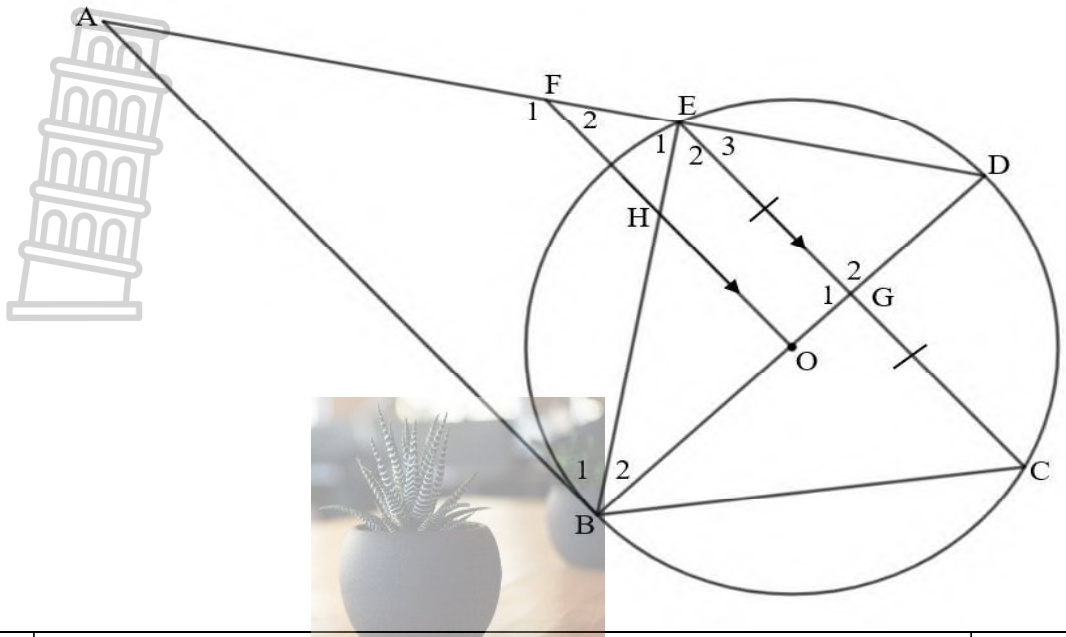
6.1	$M\hat{L}N = 180° - 30° - 150° + \theta = \theta$	✓ answer / *antwoord*	(1)
6.2	$\frac{LN}{\sin(150° - \theta)} = \frac{24}{\sin\theta}$ $LN = \frac{24 \times \sin(150° - \theta)}{\sin\theta}$ $= \frac{24[\sin 150° \cos\theta - \sin\theta \cos 150°]}{\sin\theta}$ $= \frac{24[\sin 30° \cos\theta - \sin\theta(-\cos 30°)]}{\sin\theta}$ $= \frac{24\left[\frac{1}{2}\cos\theta + \frac{\sqrt{3}}{2}\sin\theta\right]}{\sin\theta}$ $= \frac{12\cos\theta + 12\sqrt{3}\sin\theta}{\sin\theta}$	✓ correct substitution into sine rule/ *korrekte vervanging in die sinusreël* ✓ expansion of compound angle/ *uitbreiding van saamgestelde hoek* ✓ reduction for both trig ratios/ *reduksie vir beide trig. verhoudings* ✓ answer / *antwoord*	(4)

6.3	$\tan\theta = \frac{KN}{LN}$ $KN = \tan\theta \times \frac{12\cos\theta + 12\sqrt{3}\sin\theta}{\sin\theta}$ $= \frac{\sin\theta}{\cos\theta} \times \frac{12\cos\theta}{\sin\theta} + \frac{\sin\theta}{\cos\theta} \times \frac{12\sqrt{3}\sin\theta}{\sin\theta}$ $= 12 + 12\sqrt{3}\tan\theta$	✓ correct trig ratio/ *korrekte trig verhouding* ✓ correct substitution/ *korrekte vervanging* ✓ $\tan\theta$ in terms of $\sin\theta$ and $\cos\theta$ / $\tan\theta$ *in terme van* $\sin\theta$ *en* $\cos\theta$	(3)
6.4	$46 = 12 + 12\sqrt{3}\tan\theta$ $12\sqrt{3}\tan\theta = 34$ $\tan\theta = \frac{34}{12\sqrt{3}}$ $\theta = 58,56^0$	✓ substitution / *vervanging* ✓ $\tan\theta = \frac{34}{12\sqrt{3}}$ ✓ answer / *antwoord*	(3)
			[11]
QUESTION/*VRAAG* 7			
7.1			
	Constructions: Draw diameter BF and join FA Proof: $F\hat{B}D = 90°$ [tan ⊥ diameter] $\hat{A} = 90°$ [∠ in semi − circle] $\hat{A}_1 = \hat{B}_1$ [∠s same segment] $\therefore C\hat{A}B = C\hat{B}D$ $C\hat{B}D = \hat{A}$	✓ construction ✓ S/R ✓S ✓R ✓S/R	

	Konstruksies: Teken middellyn BF *en verbind* FA *Bewys*: $\hat{FBD} = 90°$ $[raaklyn \perp middellyn]$ $\hat{A} = 90°$ $[\angle in\ semi-sirkel]$ $\hat{A}_1 = \hat{B}_1$ $[\angle e\ in\ dieselfde\ segment]$ $\therefore C\hat{A}B = C\hat{B}D$ $C\hat{B}D = \hat{A}$	✓ *konstruksie* ✓ S/R ✓S ✓R ✓S/R	
	OR/*OF*		
			
	Constructions: Draw diameter BF and join FC	✓ construction	
	$F\hat{C}B = 90°$ $[\angle in\ semi-circle]$ $\hat{F} + \hat{B}_2 = 90°$ $[sum\ of\ \angle s\ in\ a\ \Delta]$ $F\hat{B}D = 90°$ $[tan \perp diameter]$ $\therefore \hat{B}_1 = \hat{F}$ $\therefore \hat{A}_1 = \hat{B}_1$ $[\angle s\ same\ segment]$ $\therefore C\hat{A}B = C\hat{B}D$ $C\hat{B}D = \hat{A}$	✓ S/R ✓S ✓R ✓S/R	

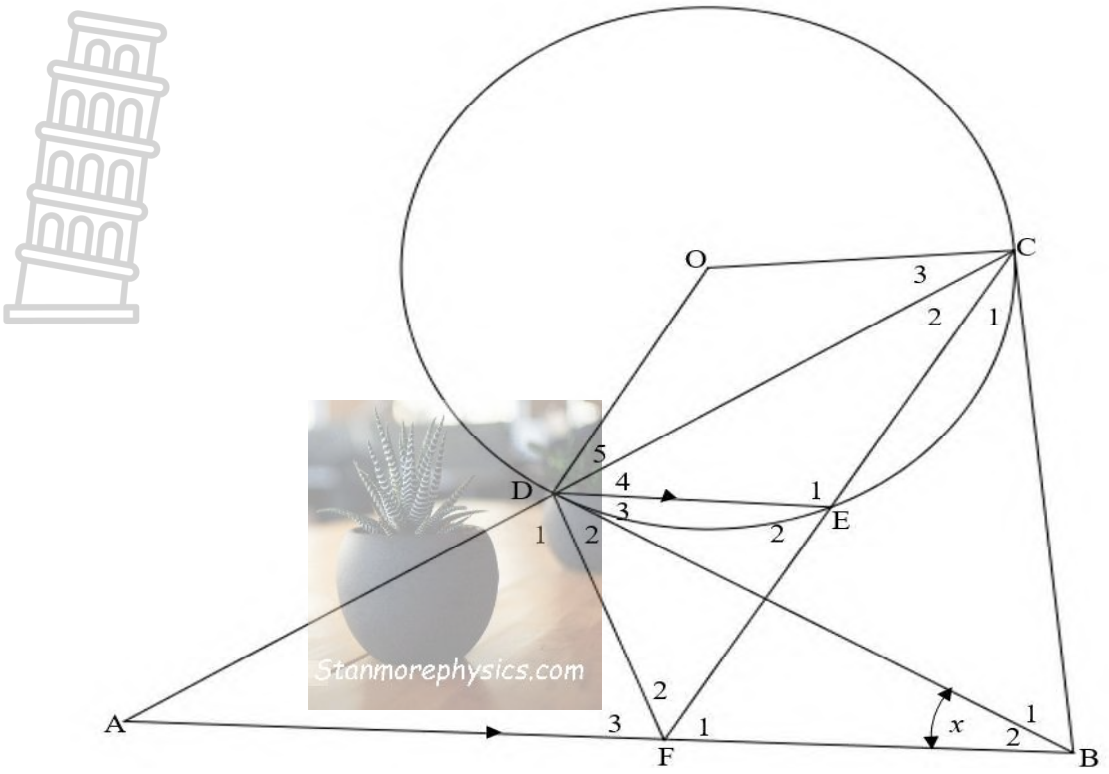
	Konstruksies: Teken middellyn BF *en verbind* FC $F\hat{C}B = 90°$ $[\angle in\ semi-sirkel]$ $\hat{F} + \hat{B}_2 = 90°$ $[som\ van\ \angle e\ in\ 'n\ \Delta]$ $F\hat{B}D = 90°$ $[raaklyn \perp middellyn]$ $\therefore \hat{B}_1 = \hat{F}$ $\therefore \hat{A}_1 = \hat{B}_1$ $[\angle e\ in\ dieselfde\ segment]$ $\therefore C\hat{A}B = C\hat{B}D$ $C\hat{B}D = \hat{A}$	✓ *konstruksie* ✓ S/R ✓S ✓R ✓S/R	(5)
7.2			
7.2.1	$QR = SR$ [tangents from same point] [*raaklyne vanaf dieselfde punt*] $\hat{Q}_3 = \hat{S}_1$ [∠s opp = sides] / [$\angle e$ *teenoor* = *sye*] $2\hat{Q}_3 = 180° - 54°$ [∠s in a Δ] / [*∠e in 'n Δ*] $\hat{Q}_3 = 63°$	✓ S/R ✓S ✓R ✓S	(4)
7.2.2	$\hat{P} = \hat{Q}_3 = 63°$ [tan chord theorem] / [*raaklyn – koord stelling*]	✓S ✓R	(2)
7.2.3	$\hat{O}_1 = 2\hat{P} = 126°$ [∠ at centre = 2 × ∠ at circumference] [*Middelpunts* ∠ = 2 × *omtrekshoek*]	✓S ✓R	(2)
			[13]

QUESTION/*VRAAG* 8



8.1	$A\hat{B}D = 90°$ [tan ⊥ rad]/[*raaklyn ⊥ radius*] $\hat{G}_1 = 90°$ [line from centre to midpoint] [*lyn vanaf middelpunt van sirkel*] $\therefore A\hat{B}D = \hat{G}_1$ $\therefore AB \parallel EC$ [corresp. ∠s =] / [*ooreenkomstige ∠e*]	✓ S ✓R ✓ S/R ✓ R	(4)
8.2	$\hat{B}_1 = \hat{D}$ [tan chord theo] / [*raaklyn – koord stelling*] $\hat{D} = \hat{C}$ [∠s same seg] / [*∠e in dieslefde segment*] $\hat{B} = \hat{E}_2$ [alt. ∠s / *verw.∠e*, AB∥EC] $\therefore \hat{C} = \hat{E}_2$ $\therefore BE = BC$ [sides opp = ∠s] / [*sye teenoor = ∠e*]	✓ S/R ✓ S/R ✓S ✓R	(4)
8.3	$GD + GO = OB$ [radii]/[*radiusse*] $\frac{HE}{HB} = \frac{OG}{BO} = \frac{2}{5}$ [line ∥ to one side of a Δ/ prop theo, FO∥EC] / [*lyn ∥ aan een sy van 'n Δ ewereidigh – st*: FO∥EC] $\frac{FE}{FA} = \frac{EH}{HB} = \frac{2}{5}$ [line ∥ to one side of a Δ/ prop theo, FO∥AB] / [*lyn ∥ aan een sy van 'n Δ ewereidigh – st*: FO∥EC]	✓ S ✓R ✓S	(3)
8.4	$BE^2 = 20^2 - 12^2$ [Pyth theorem]/[*Pyth.Stelling*] $BE = 16$ $\therefore BE = BC = 16$	✓ Pyth theorem/ *Pyth Stelling* ✓ BE ✓ BC	(3)
			[14]

QUESTION/*VRAAG* 9



9.1	$\hat{B}_2 = \hat{D}_3 = x$ [alt. $\angle$s, / *verw.* $\angle e$: DE$\parallel$ AB] $\hat{D}_3 = \hat{C}_2$ [tan chord theorem]/[*raaklyn – koord Stelling*] $\hat{B}_2 = \hat{C}_2$ $\therefore$ CDFB is a cyclic quad [converse $\angle$s in the same seg] *CDFB is 'n koordevierhoek* [*omgekeerde – $\angle e$ in dies.segment*]	✓ S/R ✓ S ✓R ✓R	(4)
9.2	$F\hat{B}C = \hat{D}_1$ [ext $\angle$ of a cyclic quad]/[*buite $\angle$ van koordevierhoek*] $\hat{C}_1 = \hat{D}_4$ [tan – chord theorem]/[*raaklyn – koord stelling*] $\hat{A} = \hat{D}_4$ [corresp.$\angle s$, DE $\square$ AB]/[*ooreenk.$\angle e$*, DE $\square$ AB] $\hat{A} = \hat{C}_1$ [both/*beide* $= D_4$] $\hat{F}_1 = \hat{F}_3$ [3rd/*de* $\angle$] $\therefore \Delta ADF \parallel\parallel \Delta CBF$ [$\angle\angle\angle$]	✓ S/R ✓ S/R ✓ S ✓ R	(4)

9.3	$\frac{AD}{CB}=\frac{DF}{BF}$ ||| $\Delta s/e$ $AD=\frac{DF.CB}{BF}$ but/*maar*: CB = DB [tan from common point] [*raaklyn vanaf gemene punt*] $\therefore AD=\frac{DF.DB}{BF}$	✓ S ✓R ✓ simplification/ *vereenvoudiging* ✓ S/R	(4)
9.4	$\frac{AC}{AD}=\frac{CF}{FE}$ [line ||to one side of a Δ] [*lyn* || *aan een sy van 'n* Δ] $AD=\frac{AC.FE}{CF}$ $\frac{AC.FE}{CF}=\frac{DF.DB}{BF}$	✓ S ✓R ✓ $AD=\frac{AC.FE}{CF}$	(3)
			[15]
		TOTAL/*TOTAAL*:	**150**