Downloaded from Stanmorephysics.com

MATHEMATICS
PREPARATORY EXAMINATION

GRADE 12

MATHEMATICS P2

SEPTEMBER 2024

MARKS: 150
TIME: 3 hours

This question paper consists of 12 pages, 1 information sheet and an answer book of 22 pages.

Copyright reserved

Downloaded from Stanmorephysics.com

INSTRUCTIONS AND INFORMATION

Read the following instructions carefully before answering the questions.

1. This question paper consists of 10 questions.
2. Answer ALL the questions in the SPECIAL ANSWER BOOK provided.
3. Clearly show ALL calculations, diagrams, graphs, etc. which you have used to determine 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.

Downloaded from Stanmorephysics.com

QUESTION 1

During a congress that took place in July, the ages of the 100 members who attended, were recorded in the following table:

AGE (x) (IN YEARS)	NUMBER OF PEOPLE
$15 < x \leq 25$	8
$25 < x \leq 35$	14
$35 < x \leq 45$	22
$45 < x \leq 55$	37
$55 < x \leq 65$	a
$65 < x \leq 75$	3

Stanmorephysics.com

1.1 Calculate the value of a. (1)

1.2 Write down the modal class of the given data. (1)

1.3 Complete the cumulative frequency column in the table given in the ANSWER BOOK. (2)

1.4 Draw a cumulative frequency graph (ogive) to represent the data on the grid provided in the ANSWER BOOK. (3)

1.5 The congress organisers discovered that a mistake was made, and that 3 people counted in the range $45 < x \leq 55$ should have been counted in the range $35 < x \leq 45$. Calculate the estimated average age of the people who attended the congress after the mistake was corrected. (2)

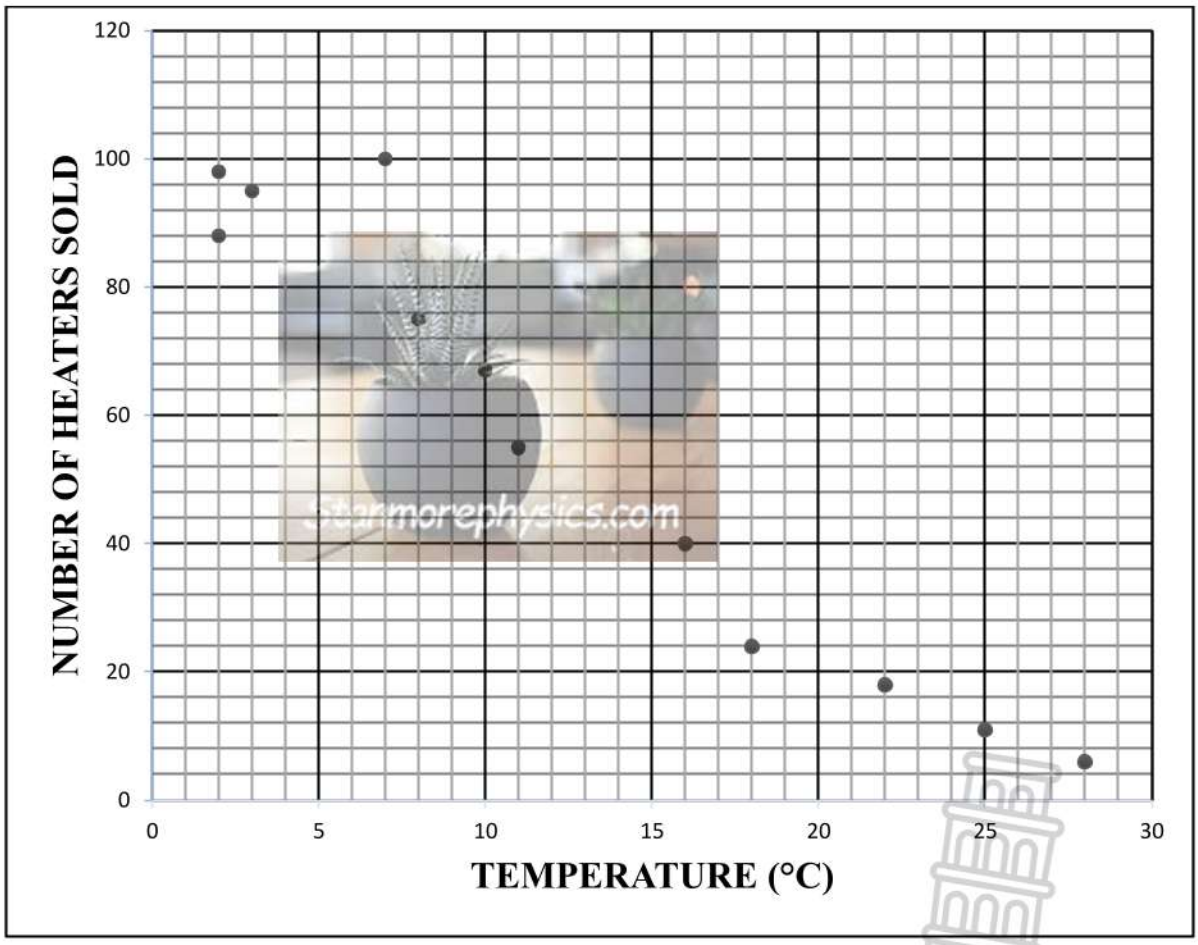
[9]

Downloaded from Stanmorephysics.com

QUESTION 2

The scatter plot below shows the number of heaters a company sold per month and the average temperature of that month in a certain year.
Both the temperature in °C and the number of heaters sold, are given in the table below.

MONTH	J	F	M	A	M	J	J	A	S	O	N	D
TEMPERATURE (°C)	2	7	8	10	18	22	28	25	16	11	2	3
NUMBER OF HEATERS SOLD	98	100	75	67	24	18	6	11	40	55	88	95



2.1 Describe the correlation between the number of heaters sold and the average temperature per month. Verify your answer by referring to the correlation coefficient. (2)

2.2 Determine the equation of the least squares regression line for the data. (3)

2.3 Predict the number of heaters sold for a month where the average temperature is 20°C. (2)

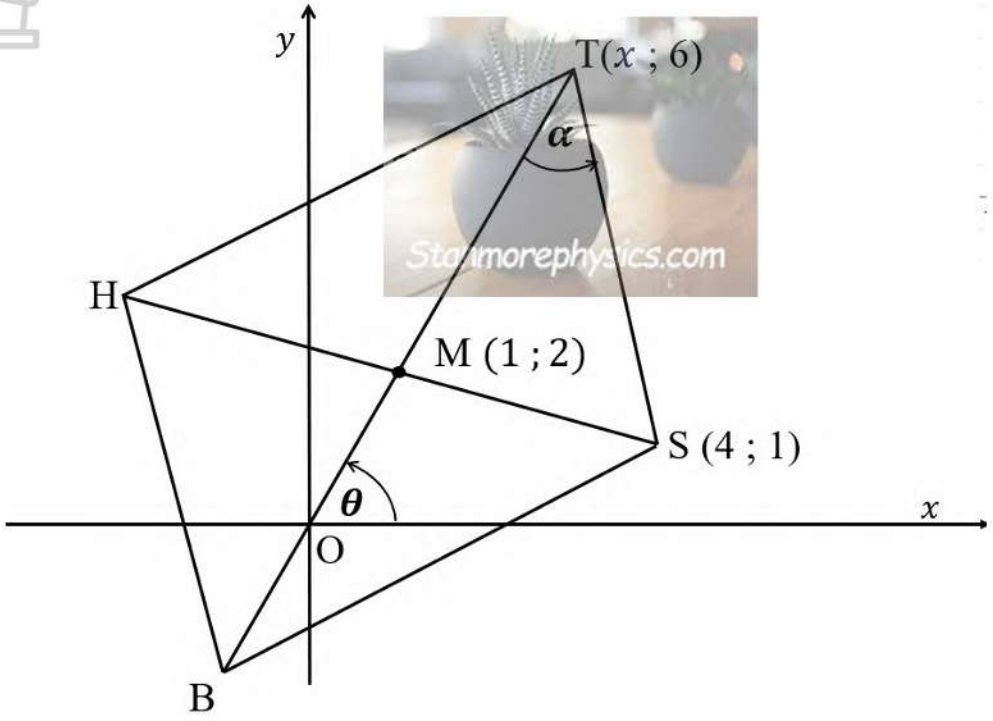
2.4 Draw the least squares regression line on the grid given in the ANSWER BOOK. (2)

2.5 Calculate the standard deviation of the number of heaters sold. (2)
[11]

QUESTION 3

In the diagram below HS and TB are the diagonals of parallelogram HTSB.

- HS and TB intersect at M(1; 2).
- TB intersect the x- and y-axes at the origin.
- T(x; 6) and S(4; 1) are vertices of HTSB.
- $\widehat{MTS} = \alpha$ and the inclination angle of TB is θ.



3.1 Determine:

3.1.1 the equation of the line TB in the form $y = mx + c$. (2)

3.1.2 the size of θ. (2)

3.1.3 the coordinates of H. (3)

3.2 Show that the x-coordinate of T is 3 if it is further given that TS = $\sqrt{26}$. (3)

3.3 Calculate α, the size of $\widehat{MTS}$. (4)

3.4 Calculate the area of ΔBTS. (4)

3.5 Determine the perpendicular height of the parallelogram if TS is the base. (3)

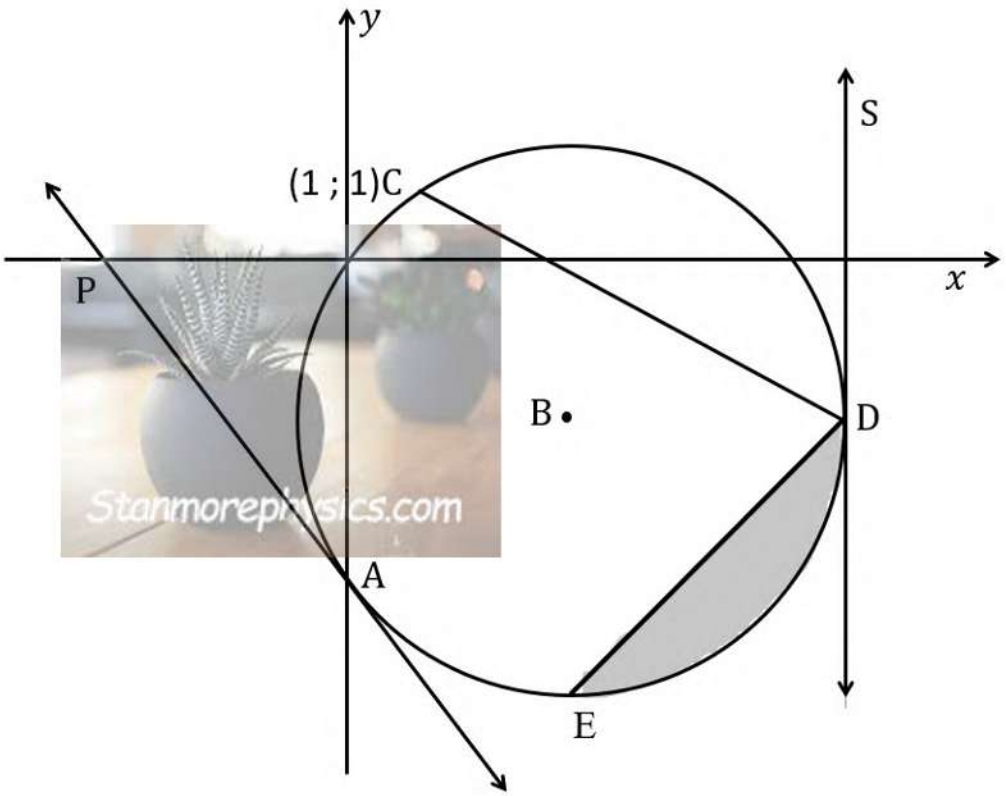
[21]

Downloaded from Stanmorephysics.com

QUESTION 4

In the diagram, the equation of the circle centred at B is given as: $x^2 - 8x + y^2 + 6y = 0$

- DS and PA are tangents to the circle at D and A respectively.
- A is the y-intercept of the circle.
- DS is parallel to the $y-$ axis.
- C(1; 1) is a point on the circumference of the circle.
- CD and DE are chords of the circle.
- BE, if drawn, is parallel to DS.
- The smaller segment of the circle on chord DE is shaded.



4.1 Show that the coordinates of B is $(4\,;\,-3)$. Show all your calculations. (3)

4.2 Determine:

4.2.1 the equation of the tangent DS. (2)

4.2.2 the length of chord CD. (3)

4.2.3 the equation of the tangent PA in the form $y = mx + c$. (5)

4.2.4 the area of the shaded segment. (3)

4.3 Another circle with center M and equation $(x + 1)^2 + (y - 2)^2 = 8$ is drawn. Determine, with an explanation, whether the two circles will intersect or not. (3)

[19]

Downloaded from Stanmorephysics.com

QUESTION 5

5.1 **Without using a calculator,** simplify the following expression completely:

$$\cos(-\theta) \times \sin(90° - \theta) \times (1 + \tan^2 \theta) \quad (5)$$

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

5.2.1 Use the formula for $\cos(A + B)$ to derive a formula for $\sin(A - B)$. (4)

5.2.2 **Without using a calculator,** show that:

$$\sin(x + 63°).\cos(x + 378°) + \cos(x + 63°).\cos(x + 108°) = \frac{1}{\sqrt{2}} \quad (5)$$

5.3 Given that $\sin 10° = \sqrt{k}$

Without using a calculator, write each of the following in terms of k:

5.3.1 $\sin 190°$ (2)

5.3.2 $\cos 20°$ (3)

5.3.3 $\cos 50°$ (4)

5.4 Given:

$$\frac{1}{(\cos\theta + \sin\theta)(\cos\theta - \sin\theta)} - \frac{(\cos\theta + \sin\theta)}{(\cos\theta - \sin\theta)}$$

5.4.1 Simplify the expression above to a single trigonometry ratio. (5)

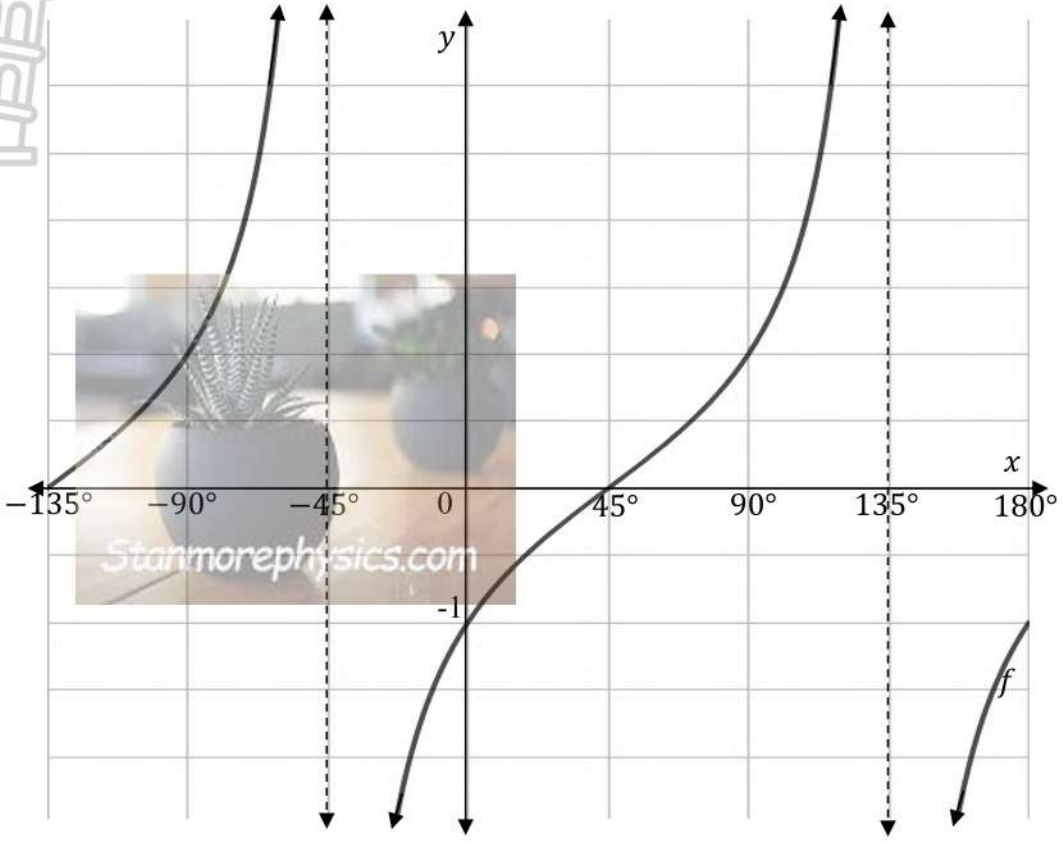
5.4.2 Determine the general solution of θ for which this expression will be undefined? (3)

[31]

Downloaded from Stanmorephysics.com

QUESTION 6

In the diagram, the graph of $f(x) = \tan(x + p°)$ is drawn for the interval $x \in [-135°; 180°]$ with asymptotes at $x = -45°$ and $x = 135°$.



6.1 Write down the value of p. (1)

6.2 Draw the graph of $g(x) = \sin 2x$ for the interval $x \in [-135° ; 180°]$ on the grid given in the ANSWER BOOK. Show ALL intercepts with axes, as well as the minimum and maximum points on the graph. (3)

6.3 Write down the period of g. (1)

6.4 The graph of g is shifted 45° to the left to form the graph of h. Determine the equation of h in the simplest form. (2)

6.5 Use the graph to determine the values of x in the interval $x \in [-135° ; 0°]$ for which:

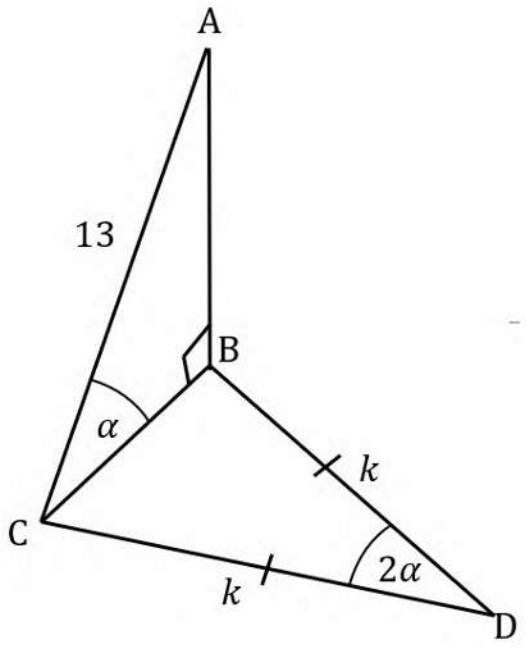
6.5.1 $f(x) \leq -1$ (2)

6.5.2 $\sin x \cos x + 2 < 2$ (3)

[12]

QUESTION 7

In the diagram below, ABC is a vertical triangular wall on the floor CBD.
CA = 13 meters, CD = BD = k meters, $A\hat{C}B = \alpha$ and $B\hat{D}C = 2\alpha$



7.1 Show that:

7.1.1 $CB = 13\cos\alpha$ (1)

7.1.2 $k = \dfrac{13}{2\tan\alpha}$ (4)

7.2 Calculate the area of the floor ΔBCD if $\alpha = 26°$ (2)
[7]

Downloaded from Stanmorephysics.com

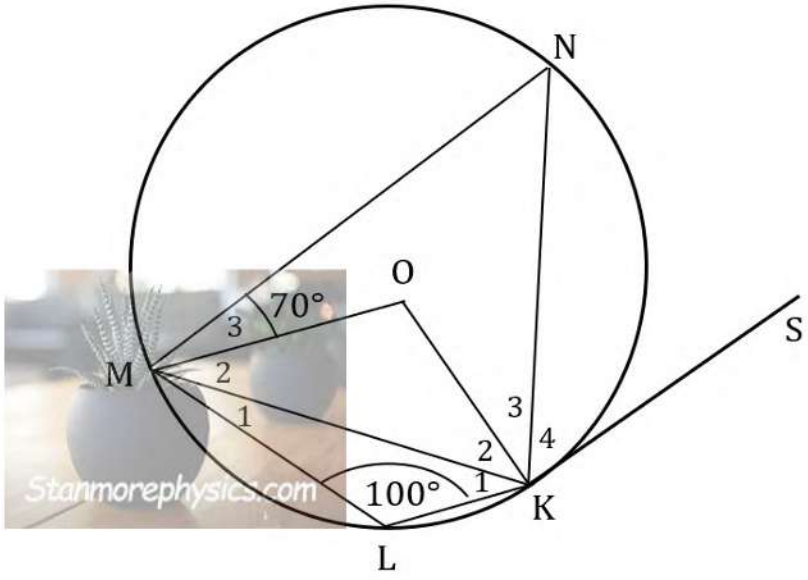
QUESTION 8

8.1 Complete the following theorem:

The angle at the centre of a circle is twice the angle _____ subtended by _____.

. (2)

8.2 In the diagram below, O is the centre of the circle.
K, L, M and N are points on the circumference of the circle.
KS is a tangent to the circle at K and $\hat{L} = 100°$



8.2.1 Determine, with reasons:

(a) the size of $\hat{N}$. (2)

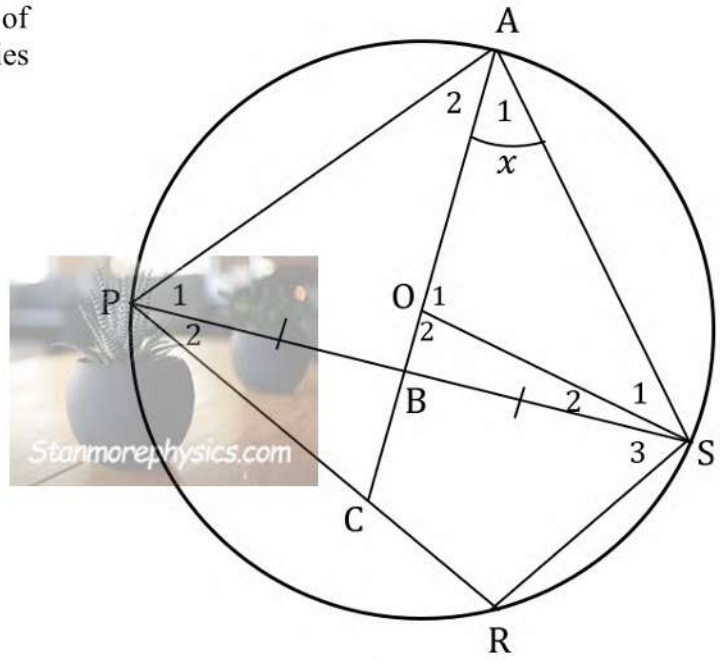
(b) the size of $\hat{K}_2$. (3)

8.2.2 Prove, giving reasons, that: MN ∥ KS (4)
[11]

Downloaded from Stanmorephysics.com

QUESTION 9

In the diagram below, O is the centre of the circle. P, R, S and A are points on the circumference of the circle. AOBC is a straight line such that B lies on PS with PB = BS and $\hat{A}_1 = x$



9.1 Determine, with reasons, $\hat{P}_1$ in terms of x. (4)

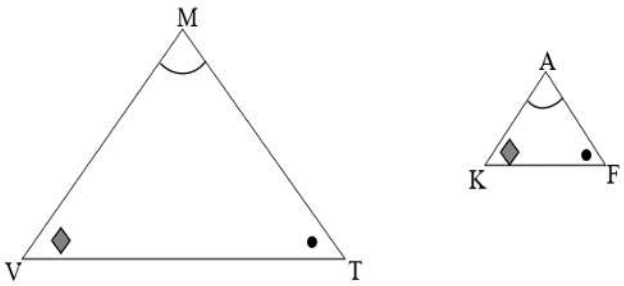
9.2 Prove, giving reasons, that:

9.2.1 AC bisects $P\hat{A}S$. (4)

9.2.2 COSR is a cyclic quadrilateral. (4)
[12]

QUESTION 10

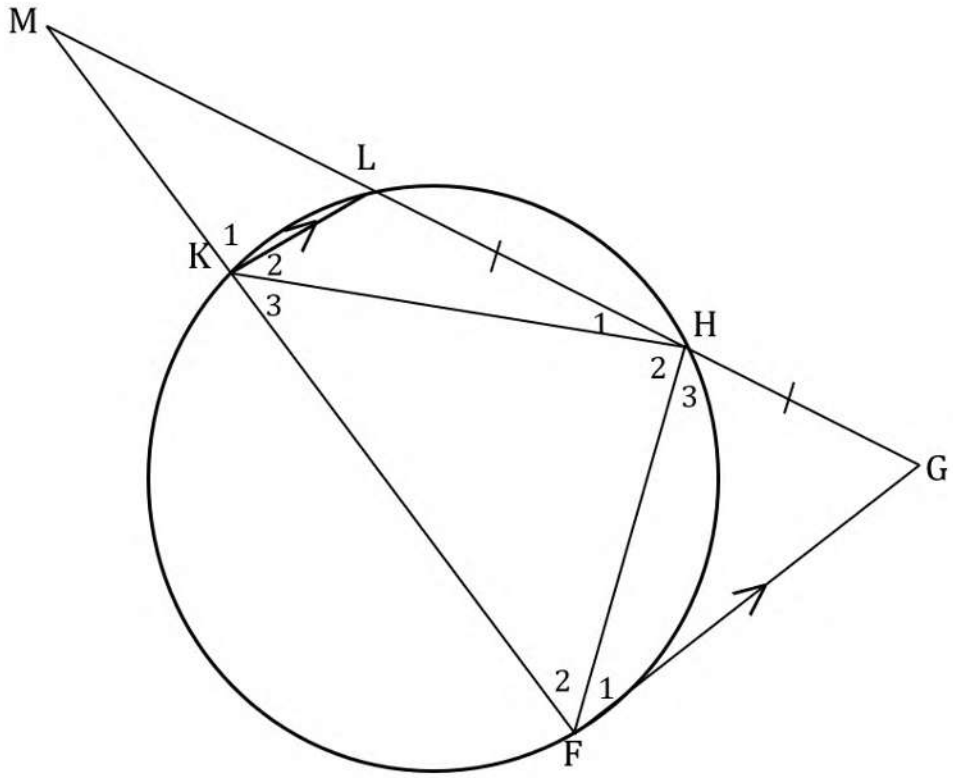
10.1 In the diagram, ΔMVT and ΔAKF are drawn such that $\hat{M} = \hat{A}$, $\hat{V} = \hat{K}$ and $\hat{T} = \hat{F}$.



Use the diagram in the ANSWER BOOK to prove the theorem which states that if two triangles are equiangular, then the corresponding sides are in proportion, that is prove that $\frac{MV}{AK} = \frac{MT}{AF}$.

(7)

10.2 In the diagram, HLKF is a cyclic quadrilateral. The chords HL and FK are produced to intersect at M. The line FG parallel to KL, meets MH produced at G.
$\frac{MK}{KF} = \frac{1}{2}$ and LH = HG.



10.2.1 Give a reason why $G\hat{F}M = L\hat{K}M$. (1)

10.2.2 Prove, giving reasons, that:

(a) $\Delta MFH \;|||\; \Delta MGF$ (4)

(b) $\frac{MF}{ML} = \sqrt{6}$ (5)

[17]

TOTAL: 150

Downloaded from Stanmorephysics.com

INFORMATION SHEET

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

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

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

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

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

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

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

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

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

In ΔABC:

$$\frac{a}{\sin \mathrm{A}} = \frac{b}{\sin \mathrm{B}} = \frac{c}{\sin \mathrm{C}}$$

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

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

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

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

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

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

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

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

Copyright reserved

Downloaded from Stanmorephysics.com

Answer Book
Antwoordboek

MATHEMATICS P2 / *WISKUNDE V2*
GR 12
SEPTEMBER 2024

NAME *NAAM*	
SURNAME *VAN*	
DATE *DATUM*	
TEACHER *ONDERWYSER*	
SUBJECT NAME *VAKNAAM*	**MATHEMATICS/*WISKUNDE***

BOOK NUMBER *BOEKNOMMER*		**OF** *VAN*		**BOOKS** *BOEKE*
PAPER NUMBER *VRAESTELNOMMER*	**2**			

Stanmorephysics.com

MARKER/*NASIENER*					**MODERATOR**			
Question *Vraag*	**Marks** *Punte*			**Marker's Initials** *Nasiener se Voorletters*	**Marks** *Punte*			**Moderator's Initials** *Moderator se Voorletters*
1								
2								
3								
4								
5								
6								
7								
8								
9								
10								
				TOTAL *TOTAAL*				

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

Copyright reserved/*Kopiereg voorbehou*

Downloaded from Stanmorephysics.com

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

Copyright reserved/*Kopiereg voorbehou*

Downloaded from Stanmorephysics.com

QUESTION/*VRAAG* 1

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

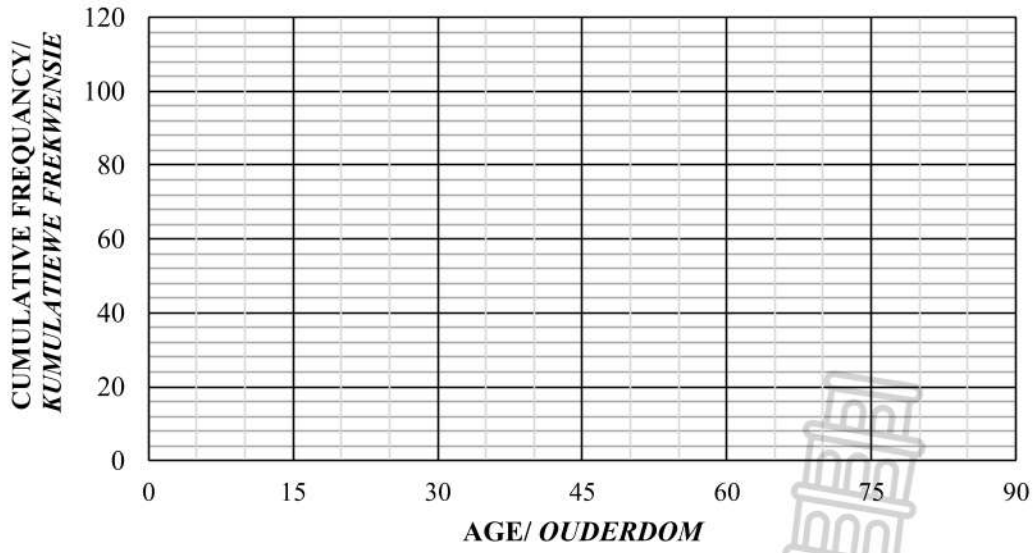
1. 3

Age / *Ouderdom* (x) (in years /*jare*)	**Number of people** ***Aantal mense***	**Cumulative frequency** ***Kumulatiewe frekwensie***
$15 < x \leq 25$	8	
$25 < x \leq 35$	14	
$35 < x \leq 45$	22	
$45 < x \leq 55$	37	
$55 < x \leq 65$	a	
$65 < x \leq 75$	3	

(2)

1. 4

OGIVE/ *OGIEF*



(3)

1.5

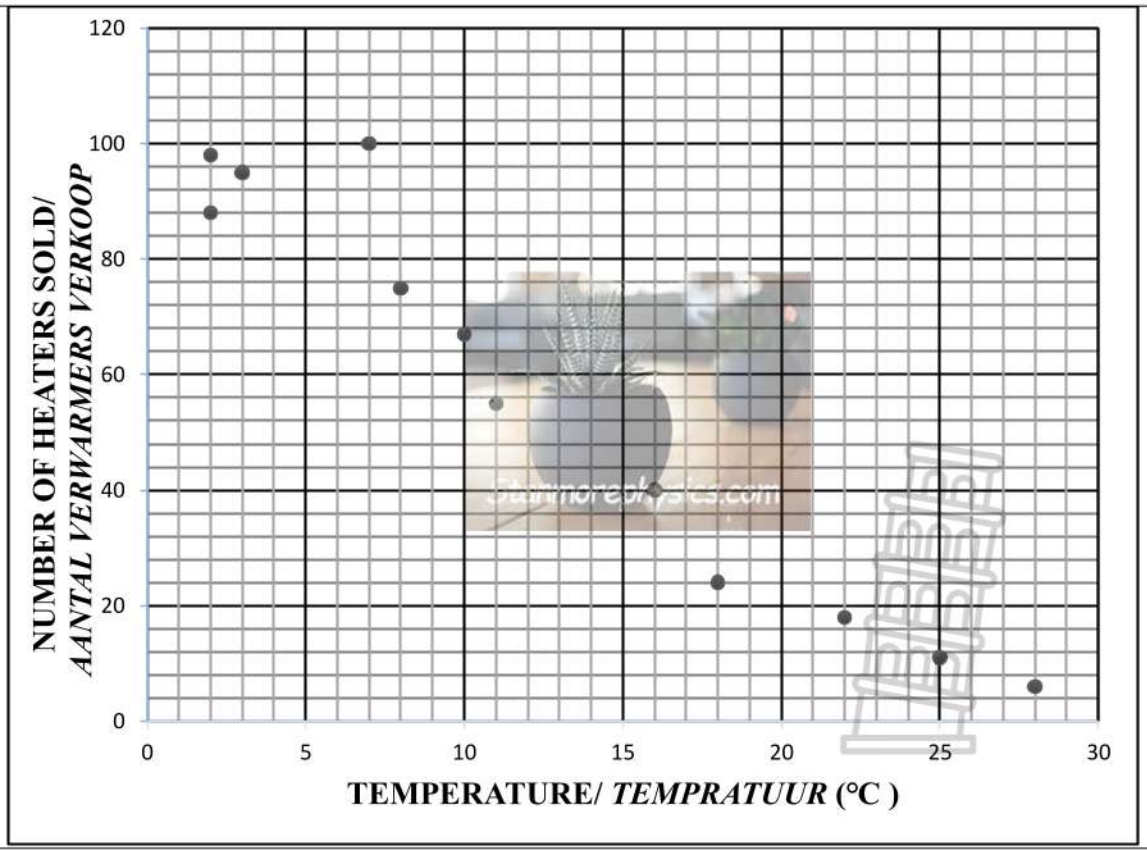
(2)

[9]

Downloaded from Stanmorephysics.com

QUESTION/*VRAAG* 2

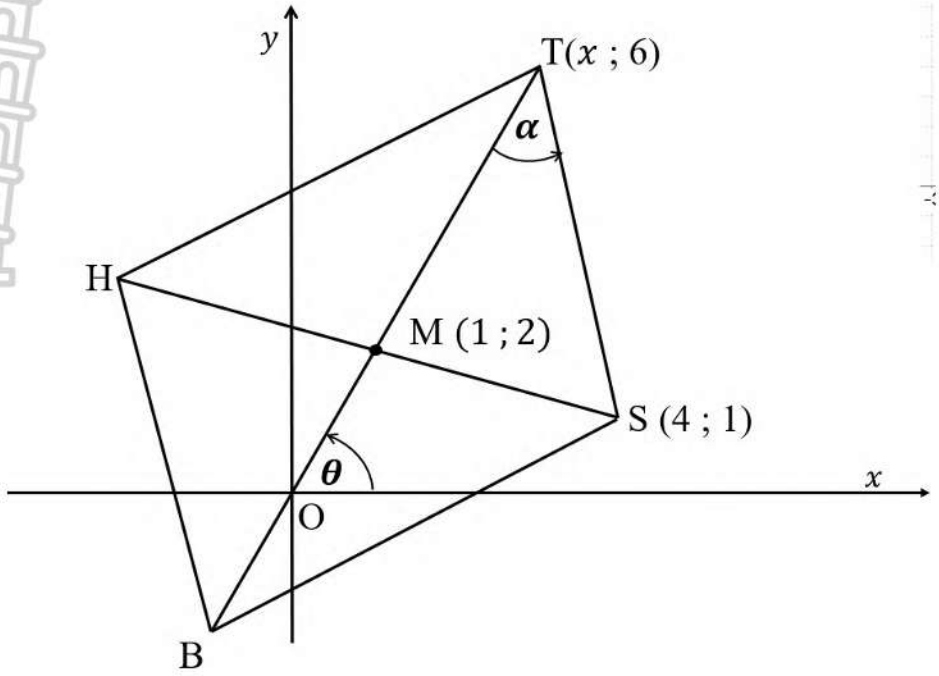
MONTH/ *MAAND*	**J**	**F**	**M**	**A**	**M**	**J**	**J**	**A**	**S**	**O**	**N**	**D**
TEMPERATURE/ *TEMPRATUUR* (°C)	2	7	8	10	18	22	28	25	16	11	2	3
NUMBER OF HEATERS SOLD/ *AANTAL VERWARMERS VERKOOP*	98	100	75	67	24	18	6	11	40	55	88	95

	Solution/*Oplossing*	**Marks *Punte***
2.1		(2)
2.2		(3)
2.3		(2)
2.4		(2)
2.5		(2)
		[11]

Copyright reserved/Kopiereg voorbehou

Downloaded from Stanmorephysics.com

QUESTION/*VRAAG* 3



	Solution/*Oplossing*	**Marks** ***Punte***
3.1.1		(2)
3.1.2		(2)
3.1.3		(3)

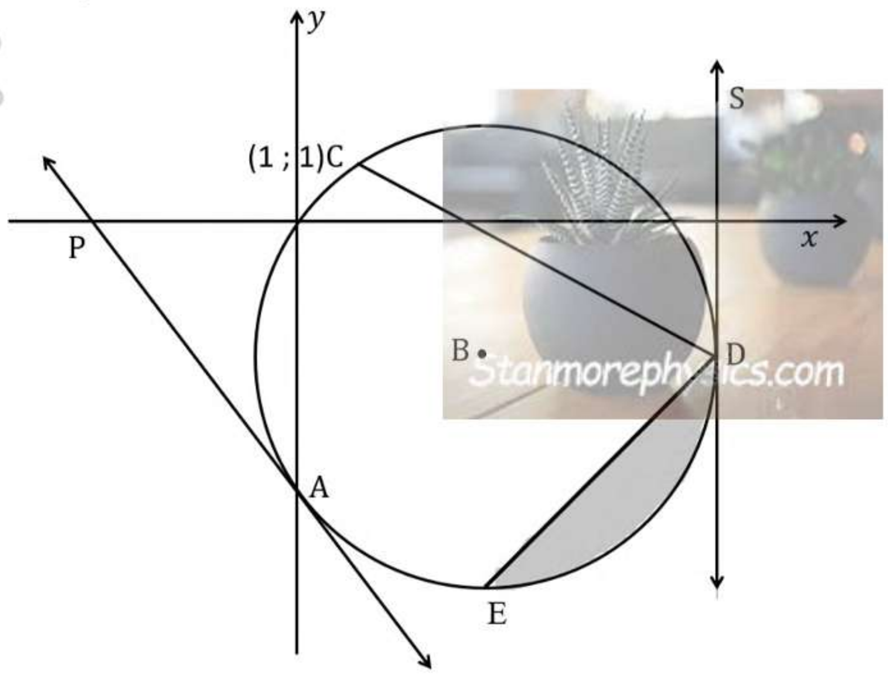
Downloaded from Stanmorephysics.com

	Solution/*Oplossing*	Marks *Punte*
3.2		(3)
3.3		(4)
3.4		(4)
3.5		(3)
		[21]

Stanmorephysics.com

Downloaded from Stanmorephysics.com

QUESTION/*VRAAG* 4



	Solution/*Oplossing*	Marks *Punte*
4.1		(3)
4.2.1		(2)
4.2.2		(3)

Downloaded from Stanmorephysics.com

4.2.3		(5)
4.2.4		(3)

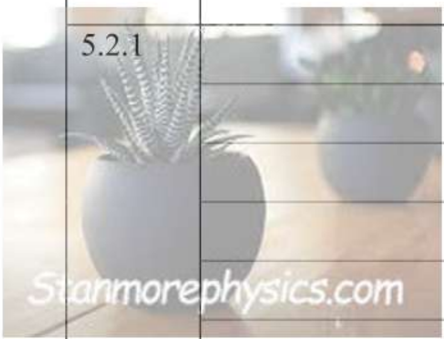
Downloaded from Stanmorephysics.com

	Solution/*Oplossing*	Marks *Punte*
4.3		(3)
		[19]

Downloaded from Stanmorephysics.com

QUESTION/*VRAAG* 5

	Solution/*Oplossing*	**Marks *Punte***
5.1		(5)
5.2.1		(4)
5.2.2		(5)



Downloaded from Stanmorephysics.com

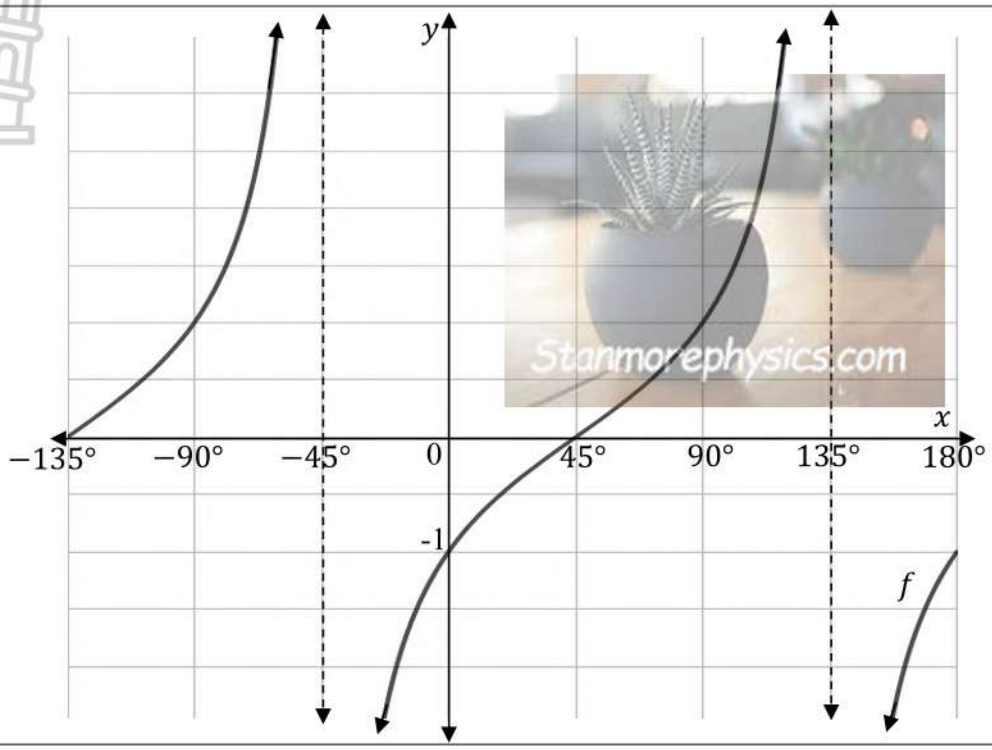
	Solution/*Oplossing*	Marks *Punte*
5.3.1		(2)
5.3.2		(3)
5.3.3		(4)

Downloaded from Stanmorephysics.com

	Solution/*Oplossing*	Marks *Punte*
5.4.1		(5)
5.4.2		(3)
		[31]

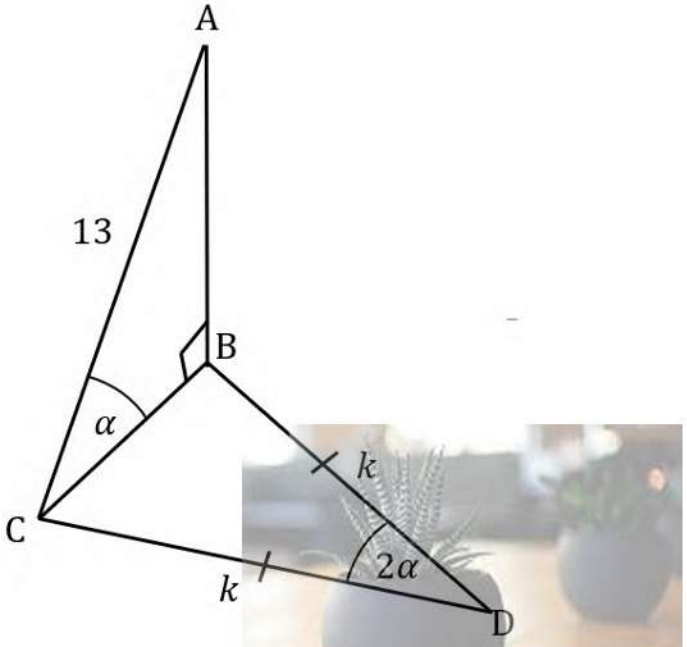
Downloaded from Stanmorephysics.com

QUESTION/*VRAAG* 6

	Solution/*Oplossing*	**Marks *Punte***
6.1		(1)
6.2		(3)
6.3		(1)
6.4		(2)
6.5.1		(2)
6.5.2		(3)
		[12]

Downloaded from Stanmorephysics.com

QUESTION/*VRAAG* 7



	Solution/*Oplossing*	**Marks** ***Punte***
7.1.1		(1)
7.1.2		(4)

Stanmorephysics.com

Downloaded from Stanmorephysics.com

	Solution/*Oplossing*	Marks *Punte*
7.2		(2)
		[7]

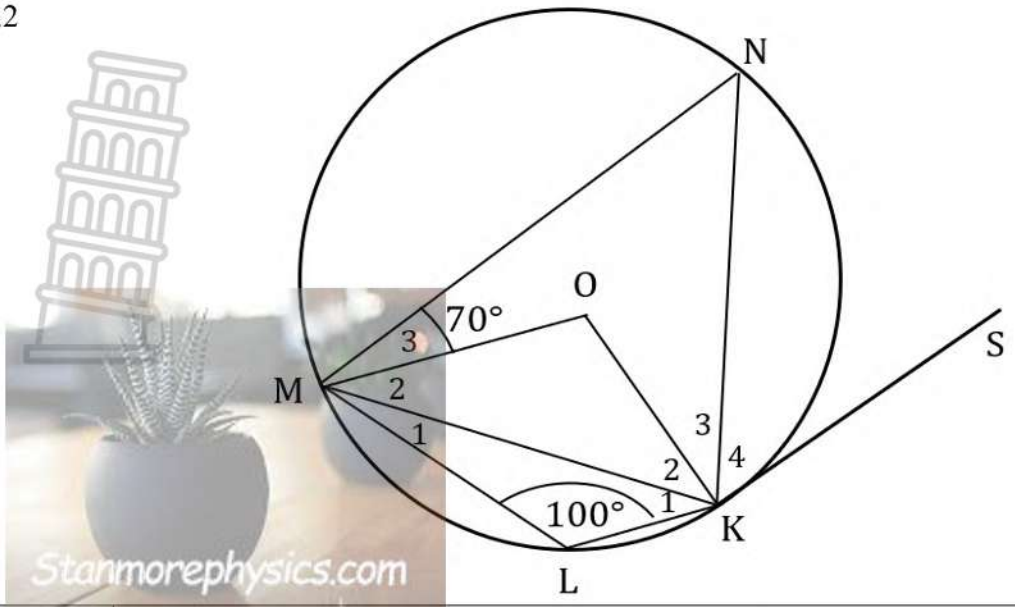
- **Give reasons** for your statements in QUESTIONS 8, 9 and 10.
- ***Gee redes*** *vir jou bewerings in VRAAG 8, 9 en 10.*

QUESTION/*VRAAG 8*

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

Downloaded from Stanmorephysics.com

8.2

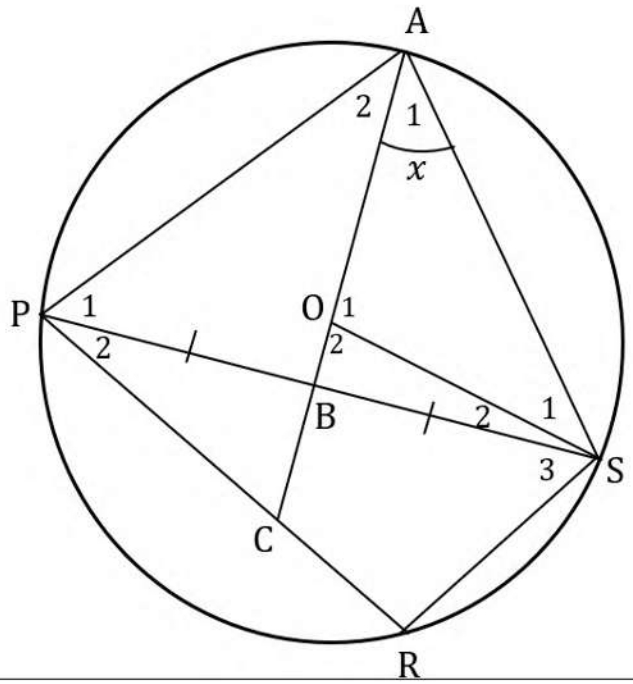


Stanmorephysics.com

	Solution/*Oplossing*	Marks *Punte*
8.2.1(a)		(2)
8.2.1(b)		(3)
8.2.2		(4)
		[11]

Downloaded from Stanmorephysics.com

QUESTION/*VRAAG* 9



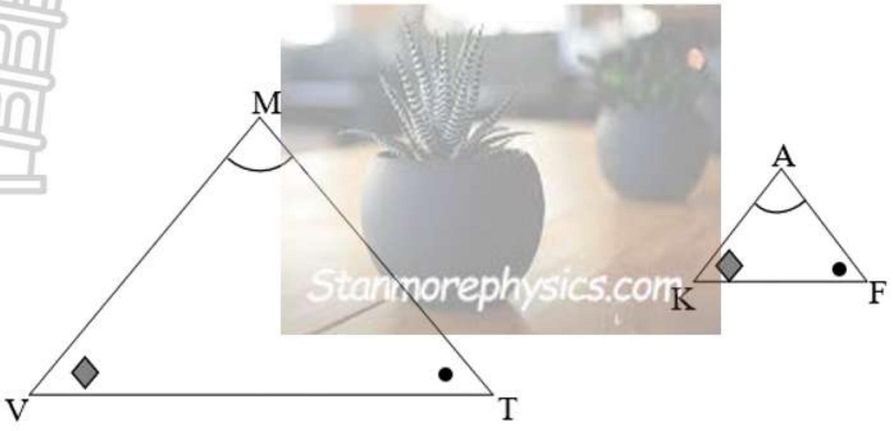
	Solution/*Oplossing*	**Marks** ***Punte***
9.1		(4)
9.2.1		(4)
9.2.2		(4)
		[12]

Copyright reserved/Kopiereg voorbehou

Downloaded from Stanmorephysics.com

QUESTION/*VRAAG* 10

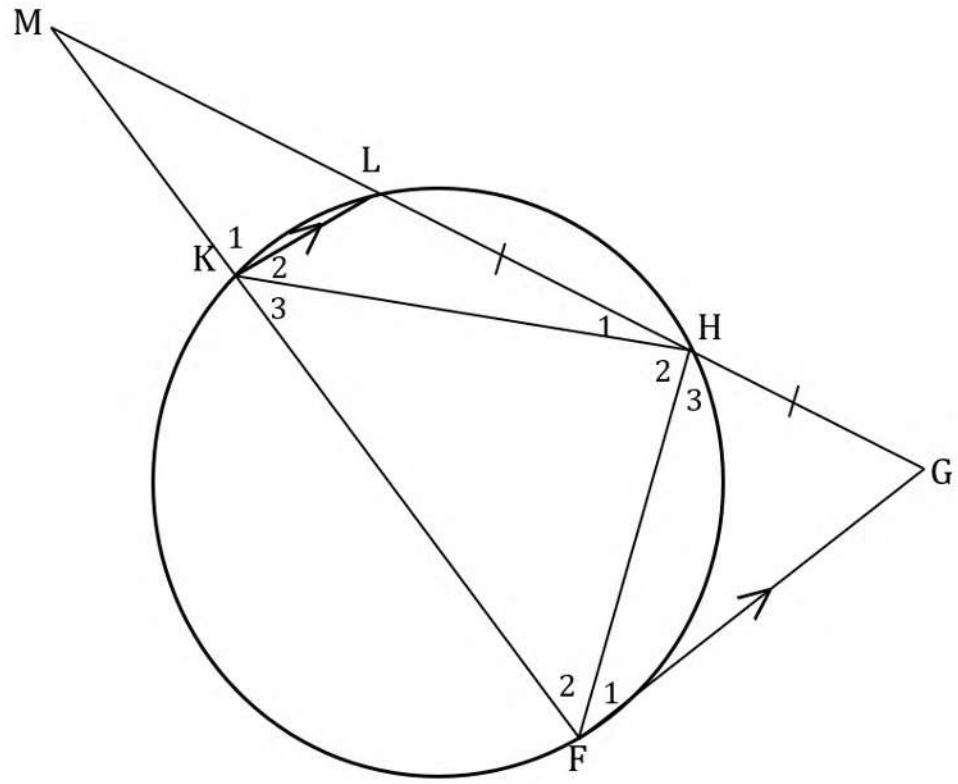
10.1



	Solution/*Oplossing*	**Marks *Punte***
10.1		
		(7)

Downloaded from Stanmorephysics.com

10.2



	Solution/*Oplossing*	Marks *Punte*
10.2.1		(1)
10.2.2(a)		(4)

Downloaded from Stanmorephysics.com

	Solution/*Oplossing*	Marks *Punte*
10.2.2(b)		(5)
		[17]

TOTAL/*TOTAAL*: 150

Downloaded from Stanmorephysics.com

	Additional space/*Bykomende ruimte*	Marks *Punte*

Copyright reserved/Kopiereg voorbehou

Downloaded from Stanmorephysics.com

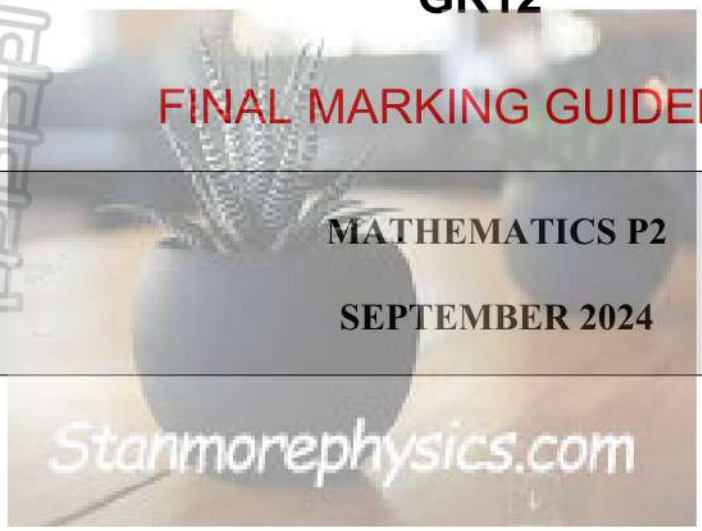
	Additional space/*Bykomende ruimte*	Marks *Punte*

Copyright reserved/Kopiereg voorbehou

Downloaded from Stanmorephysics.com

MATHEMATICS
GR12

FINAL MARKING GUIDELINE



MATHEMATICS P2

SEPTEMBER 2024

MARKS: 150

TIME: 3 hours

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

NOTA:
- 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.
- Om antwoorde/waardes te aanvaar 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

Downloaded from Stanmorephysics.com

QUESTION 1 / VRAAG 1

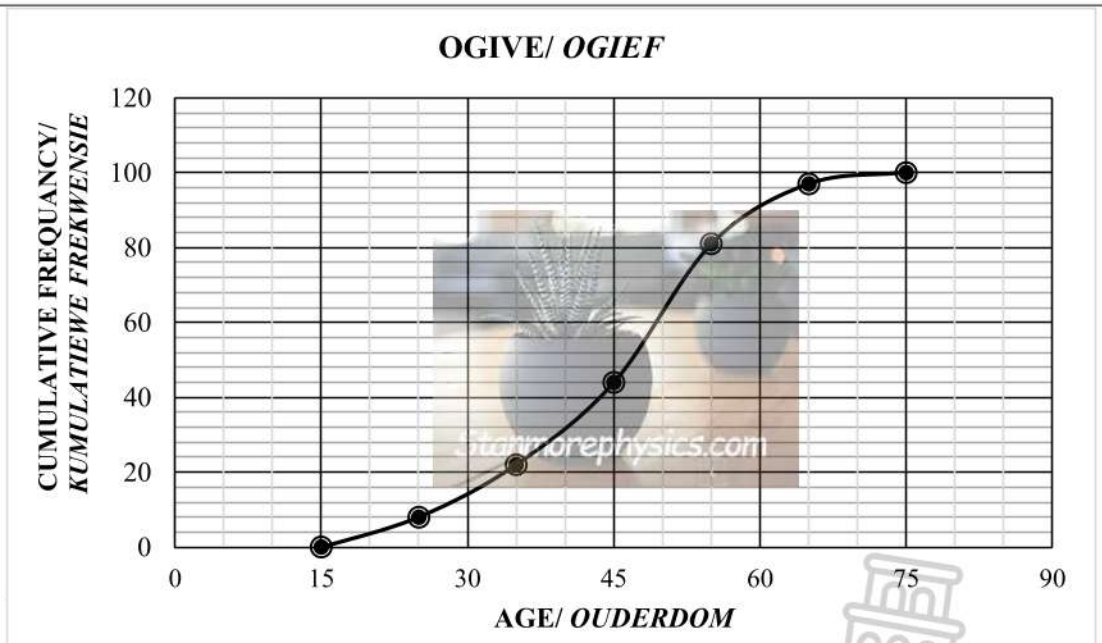
1.1	$a = 16$	✓ 16	(1)
1.2	$45 < x \leq 55$ or accept 45 - 55	✓ $45 < x \leq 55$	(1)

1.3

AGE (x) (IN YEARS)	NUMBER OF PEOPLE	Cumulative frequency *Kumulatiewe frekwensie*
$15 < x \leq 25$	8	**8**
$25 < x \leq 35$	14	**22**
$35 < x \leq 45$	22	**44**
$45 < x \leq 55$	37	**81**
$55 < x \leq 65$	a=16	**97**
$65 < x \leq 75$	3	**100**

✓8 and 22
✓ others (2)

1.4



✓grounding at 15
✓upper limits
✓shape (3)

1.5

$$\bar{x} = \frac{20(8) + 30(14) + 40(25) + 50(34) + 60(16) + 70(3)}{100}$$

$$= \frac{4450}{100}$$
$$= 44{,}5$$

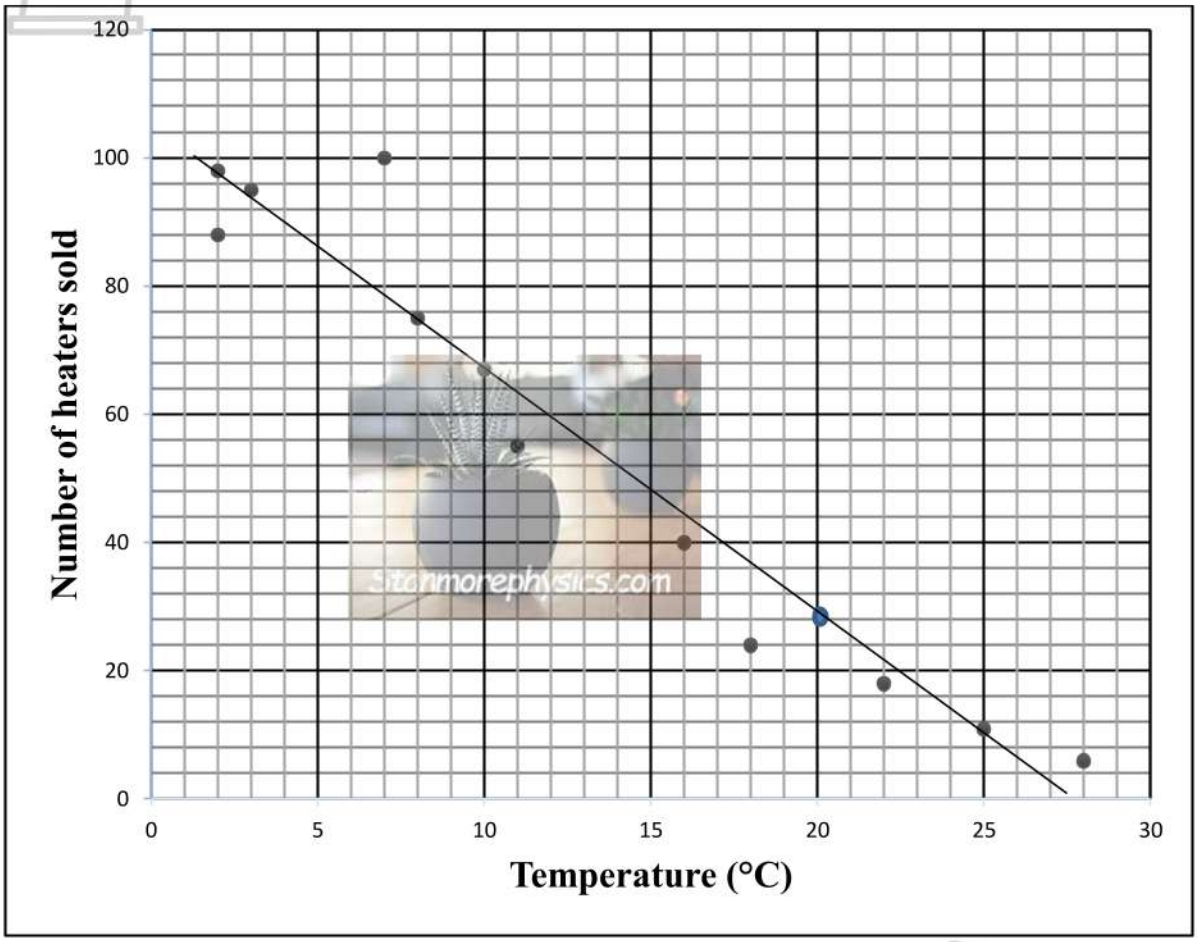
✓ or 4450
✓ answer
AO full marks (2)

[9]

Downloaded from Stanmorephysics.com

QUESTION 2 / *VRAAG 2*

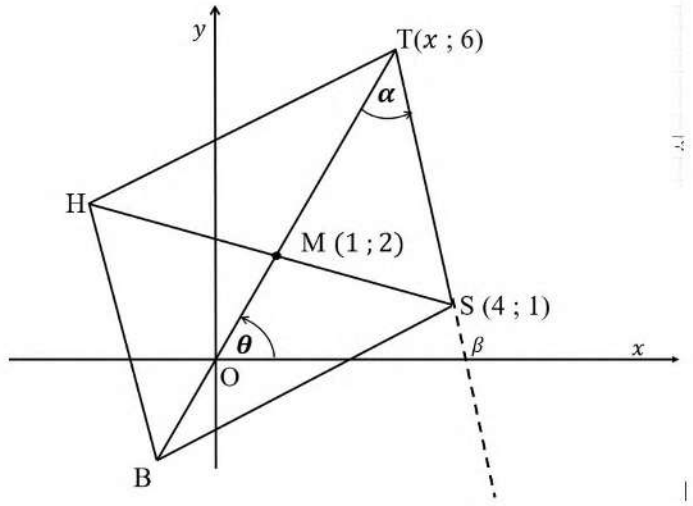
MONTH	J	F	M	A	M	J	J	A	S	O	N	D
TEMPERATURE (°C)	2	7	8	10	18	22	28	25	16	11	2	3
NUMBER OF HEATERS SOLD	98	100	75	67	24	18	6	11	40	55	88	95



2.1	**strong , negative** $r = -0{,}97$	✓ **strong, negative** ✓$r = -0{,}97$ (2)
2.2	$a = 104{,}80$ $b = -3{,}82$ $y = 104{,}80 - 3{,}82x$	✓ a ✓ b ✓ $equation$ (3)
2.3	$y = 104{,}80 - 3{,}82(20)$ $= 28{,}4 \approx 28$	✓ subst ✓ answer (2)
2.4	On sketch	✓line within domain ✓through 2 points (2)
2.5	$\sigma y = 34{,}13$	✓✓ answer (2)
		[11]

Downloaded from Stanmorephysics.com

QUESTION 3 / *VRAAG 3*



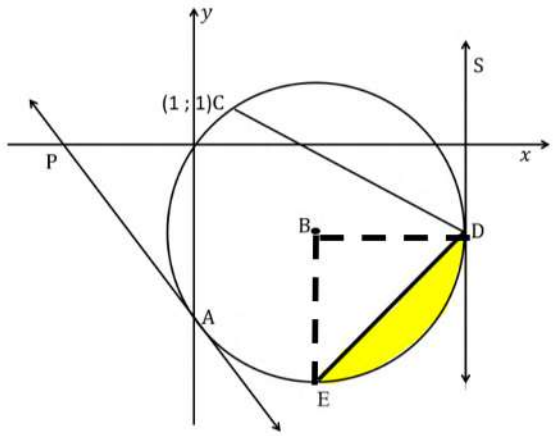
3.1.1	$m_{TB} = \frac{2-0}{1-0} = \frac{2}{1}$ $y = 2x + 0$	✓ m = 2 ✓c = 0 **AO**-full marks (2)
3.1.2	$\tan\theta = 2$ $\therefore\ \theta = 63{,}43°$	✓ $\tan\theta = 2$ ✓ $\theta = 63{,}43°$ (2)
3.1.3	$\frac{x+4}{2} = 1$ $\quad$ $\frac{y+1}{2} = 2$ $x = -2$ $\quad$ $y = 3$ $H(-2\,;3)$	✓ Method ✓ $x = -2$ ✓ $y = 3$ AO Full marks (3)
3.2	$TS = \sqrt{26}$ $\sqrt{(x-4)^2 + (6-1)^2} = \sqrt{26}$ $x^2 - 8x + 16 + 25 = 26$ $x^2 - 8x + 15 = 0$ $(x-5)(x-3) = 0$ $x \neq 5\,; x = 3$	✓sub ✓standard form ✓ factors / formula Answer given (3)
3.3	$m_{TS} = \frac{6-1}{3-4} = -5$ $\tan\beta = -5$ $\beta = 180° - 78{,}69\ldots = 101{,}31°$ $M\hat{T}S = \alpha = 101{,}31° - 63{,}43°$ $\alpha = 37{,}88°$	✓sub ✓ $\tan\beta = -5$ ✓ 101,31° ✓answer α (4)

Downloaded from Stanmorephysics.com

3.4	MT= $\sqrt{(3-1)^2+(6-2)^2}$ $=\sqrt{20}$	✓subst.
	BT= $2MT$ diaganals of parallelogram bisect each other / *hoeklyne van parallelogram halveer mekaar*	✓ Method
	area of Δ BTS= $\frac{1}{2}\times BT\times TS\times \sin\alpha$ $=\frac{1}{2}\times 2\sqrt{20}\times\sqrt{26}\times\sin 37{,}88°$ $=14$ units^2/ $eenhede^2$	✓ subst. ✓answer
	OR	**OR**
	MT= $\sqrt{(3-1)^2+(6-2)^2}$ $=\sqrt{20}$	✓subst.
	area of Δ MTS= $\frac{1}{2}\times MT\times TS\times\sin\alpha$ $=\frac{1}{2}\times\sqrt{20}\times\sqrt{26}\times\sin 37{,}88°$ $=7{,}00$ ∴ area of Δ BTS= 2×7 $=14$ units^2/$eenhede^2$	✓ subst. ✓answer ✓ Method /answer
		(4)
3.5	Area of parallelogram $=2\times 14=28\ units^2$	✓ area of parm
	Area of parallelogram $=TS\times h$ $28=\sqrt{26}\times h$ $h=5{,}49\ units/eenhede$	✓ subst. ✓answer
		(3)
		[21]

Downloaded from Stanmorephysics.com

QUESTION 4 / *VRAAG 4*



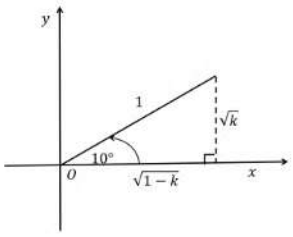
4.1	$x^2 - 8x + y^2 + 6y = 0$ $x^2 - 8x + (4)^2 + y^2 + 6y + (3)^2 = 0 + 16 + 9$ $(x-4)^2 + (y+3)^2 = 25$ $B(4\ ;\ -3)$	✓ $+16 + 9$ ✓$(x-4)^2$ and $(y+3)^2$ ✓ answer (3)
4.2.1	$D(9;-3)$ DS: $x = 9$	✓✓answer (2)
4.2.2	$D(9;-3)$ $C(1\ ;\ 1)$ $CD = \sqrt{(9-1)^2 + (-3-1)^2}$ $CD = \sqrt{80} = 4\sqrt{5} = 8{,}94$	✓ coordinates of D ✓ Subst ✓answer (3)
4.2.3	$x^2 - 8x + y^2 + 6y = 0$ $(0)^2 - 8(0) + y^2 + 6y = 0$ $y^2 + 6y = 0$ $y(y+6) = 0$ $\therefore y = -6$ $A\ (0\ ;\ -6)$ $B(4\ ;\ -3)$ $m_{BA} = \dfrac{-3-(-6)}{4-0}$ $m_{BA} = \dfrac{3}{4}$ $m_{PA} = -\dfrac{4}{3}$ (radius ⊥ tangent/ *radius ⊥ raaklyn*) $y = -\dfrac{4}{3}x - 6$	✓$x = 0$ ✓$y = -6$ ✓ $m_{BA} = \frac{3}{4}$ ✓ $m_{PA} = -\frac{4}{3}$ ✓ $c = -6$ (5)

Downloaded from Stanmorephysics.com

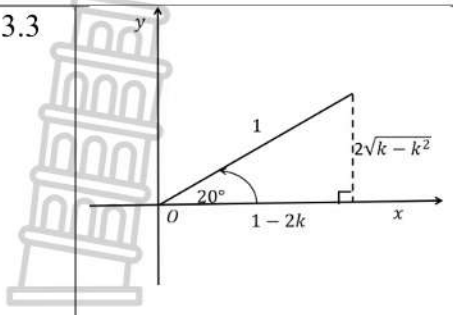
4.2.4	Area of a quarter cirle $= \frac{1}{4}\pi(5)^2$ $= 19{,}63$ Area of $\Delta BDE = \frac{1}{2} \times 5 \times 5$ $= 12{,}5$ Area of shaded area$= 19{,}63 - 12{,}5 = 7{,}13$	✓ answer ✓answer ✓answer (3)
4.3	M$(-1\,;2)$ radius $= \sqrt{8}$ B$(4\,;-3)$ radius$= 5$ MB$= \sqrt{(-1-4)^2 + \left(2-(-3)\right)^2}$ $= \sqrt{50} = 7{,}07$ $r_M + r_B = \sqrt{8} + 5 = 7{,}82$ $r_M + r_B > MB$ the two circles will intersect.	✓ lenght of MB ✓$r_M + r_B$ ✓conclusion and reason (3)
		[19]

Downloaded from Stanmorephysics.com

QUESTION 5 / VRAAG 5

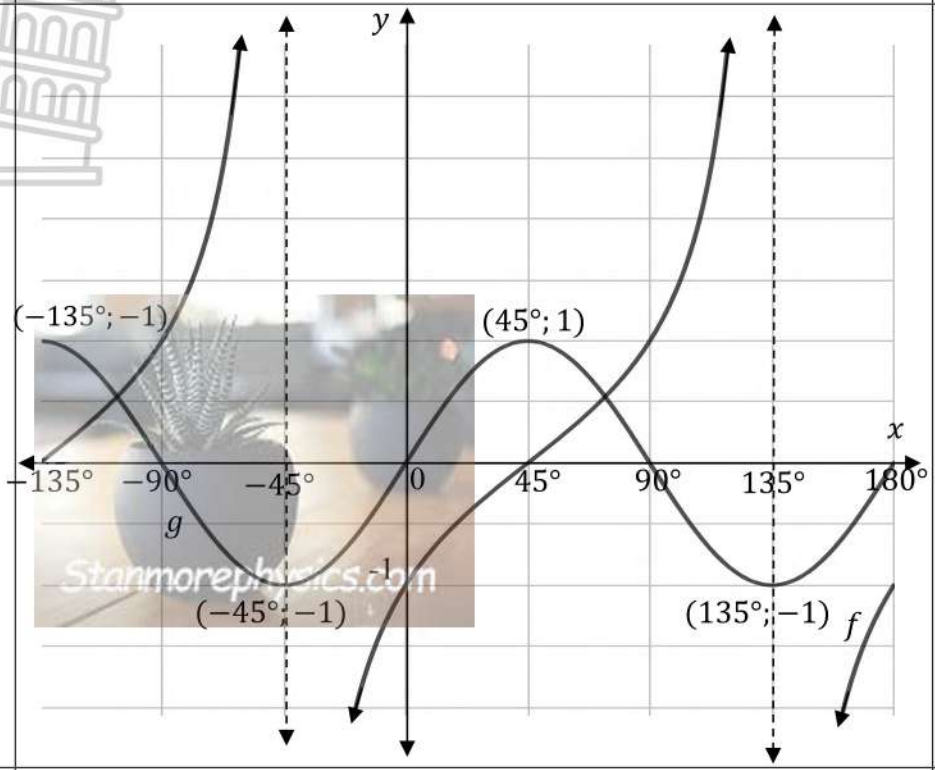
5.1	$\cos(-\theta) \times \sin(90° - \theta) \times (1 + \tan^2\theta)$ $= \cos\theta \times \cos\theta \times \left(1 + \frac{\sin^2\theta}{\cos^2\theta}\right)$ $= \cos^2\theta \times \left(1 + \frac{\sin^2\theta}{\cos^2\theta}\right)$ $= \cos^2\theta + \sin^2\theta$ $= 1$	✓ neg angle ✓co-function ✓$\frac{\sin^2\theta}{\cos^2\theta}$ ✓ **S** ✓ answer (5)
5.2.1	$\sin(A - B) = \cos[90° - (A - B)]$ $= \cos[(90° - A) + B]$ $= \cos(90° - A).\cos B - \sin(90° - A).\sin B$ $= \sin A.\cos B - \cos A.\sin B$	✓co-function ✓re-group ✓ compound angle ✓co-functions (4)
5.2.2	$LHS = \sin(x + 63°).\cos(x + 378°) + \cos(x + 63°).\cos(x + 108°)$ $= \sin(x + 63°).\cos(x + 18°) + \cos(x + 63°).\cos(x + 90° + 18°)$ $= \sin(x + 63°).\cos(x + 18°) - \cos(x + 63°).\sin(x + 18°)$ $= \sin[(x + 63°) - (x + 18°)]$ $= \sin 45°$ $= \frac{1}{\sqrt{2}}$ $\therefore LHS = RHS$	✓$\cos(x + 18°)$ ✓$\cos(x + 90° + 18°)$ ✓$-\sin(x + 18°)$ ✓compound formula ✓ $\sin 45°$ (5)
5.3.1	$\sin 190°$ $= \sin(180° + 10°)$ $= -sin10°$ $= -\sqrt{k}$	✓$-\sin 10°$ ✓ answer (2)
5.3.2	$\cos 20°$ $= \cos 2(10°)$ $= 1 - 2\sin^2(10°)$ $= 1 - 2k$	✓ $\cos 2(10°)$ ✓double angle ✓$1 - 2k$ (3)
5.3.3	 $\cos 50°$ $= \cos(60° - 10°)$ $= \cos 60°.\cos 10° + \sin 60°.\sin 10°$ $= \frac{1}{2} \times \frac{\sqrt{1-k}}{1} + \frac{\sqrt{3}}{2} \times \sqrt{k}$ $= \frac{\sqrt{1-k} + \sqrt{3k}}{2}$ **OR**	✓ compound angle ✓ sketch ✓ subst. special angles ✓subst $\cos 10°$ & $\sin 10°$ (4) **OR**

Downloaded from Stanmorephysics.com

5.3.3	 $\cos 50°$ $= \cos(30° + 20°)$ $= \cos 30°.\cos 20° - \sin 30°.\sin 20°$ $= \frac{\sqrt{3}}{2} \times (1-2k) - \frac{1}{2} \times \left(\sqrt{k-k^2}\right)$ $= \frac{\sqrt{3}(1-2k) - \sqrt{k-k^2}}{2}$	✓ compound angle ✓ sketch ✓ subst. special angles ✓subst cos 10° & sin 10° (4)
5.4.1	$\frac{1}{(\cos\theta + \sin\theta)(\cos\theta - \sin\theta)} - \frac{(\cos\theta + \sin\theta)}{(\cos\theta - \sin\theta)}$ $= \frac{1 - (\cos\theta + \sin\theta)^2}{(\cos\theta + \sin\theta)(\cos\theta - \sin\theta)}$ $= \frac{1 - (\cos^2\theta + 2\sin\theta\cos\theta + \sin^2\theta)}{(\cos\theta + \sin\theta)(\cos\theta - \sin\theta)}$ $= \frac{1 - (1 + \sin 2\theta)}{(\cos^2\theta - \sin^2\theta)}$ $= \frac{-\sin 2\theta}{\cos 2\theta}$ $= -\tan 2\theta$	✓ Simplify ✓ $\sin^2\theta + \cos^2\theta = 1$ ✓$\sin 2\theta$ ✓ $\cos 2\theta$ ✓ answer (5)
5.4.2	$\cos\theta = \sin\theta$ or $\cos\theta = -\sin\theta$ $\tan\theta = 1$ $\tan\theta = -1$ $\theta = 45° + 180°k$ $\theta = 135° + 180°k\ ;\ k \in Z$ **OR** $\cos 2\theta = 0$ $2\theta = 90° + 180°k$ $\theta = 45° + 90°k\ ;\ k \in Z$ **OR** $\cos 2\theta = 0$ $2\theta = 90° + 360°k$ *or* $2\theta = 270° + 360°k$ $\theta = 45° + 180°k$ $\theta = 135° + 180°k\ ;\ k \in Z$	✓ $\tan\theta = \pm 1$ ✓ 45° & 135° ✓ $+ 180°k\ ;\ k \in Z$ **OR** ✓$\cos 2\theta = 0$ ✓$2\theta = 90° + 180°$ ✓$\theta = 45° + \mathbf{90°k}\ ;\ \boldsymbol{k \in Z}$ **OR** ✓ $\cos 2\theta = 0$ ✓ 45° & 135° ✓ $+180°k\ ;\ k \in Z$ (3)
		[31]

Downloaded from Stanmorephysics.com

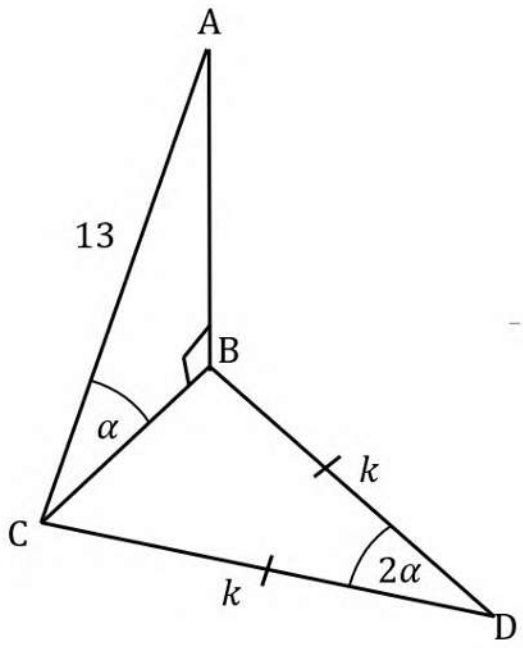
QUESTION 6 / VRAAG 6

6.1	$p = -45°$	✓ 45° (1)
6.2		✓ x-intercepts ✓ TPs ✓shape (3)
6.3	180°	✓ 180° (1)
6.4	$g(x) = \sin 2x$ $h(x) = \sin 2\,(x + 45°)$ $h(x) = \sin(2x + 90°)$ $h(x) = \cos 2\,x$	✓ $\sin 2\,(x + 45°)$ ✓ $h(x) = \cos 2\,x$ (2)
6.5.1	$-45° < x \leq 0°$	✓ CV ✓ inequality (2)
6.5.2	$\sin x \cos x + 2 < 2$ $\sin x \cos x < 0$ $2\sin x \cos x < 0$ $\sin 2x < 0$ $-90° < x < 0°$	✓$\sin 2x < 0$ ✓ CV ✓ inequality (3)
		[12]

Downloaded from Stanmorephysics.com

QUESTION 7 / VRAAG 7

In the diagram below, ABC is a fixed triangular wall on floor CBD.
CA = *13 meters*, CD =BD = k *meters*, $A\hat{C}B = \alpha$ and $B\hat{D}C = 2\alpha$



7.1.1	$\frac{CB}{13} = \cos\alpha$ or $\frac{CB}{\sin(90°-\alpha)} = \frac{13}{\sin 90°}$ $CB = 13\cos\alpha$	✓ Method (1)
7.1.2	$CB^2 = k^2 + k^2 - 2(k)(k)\cos 2\alpha$ $(13\cos\alpha)^2 = 2k^2 - 2k^2\cos 2\alpha$ $169\cos^2\alpha = 2k^2(1-\cos 2\alpha)$ $169\cos^2\alpha = 2k^2[1-(1-2\sin^2\alpha)]$ $169\cos^2\alpha = 2k^2[2\sin^2\alpha]$ $\frac{169\cos^2\alpha}{4\sin^2\alpha} = k^2$ $k = \frac{13}{2\tan\alpha}$ **OR** $\frac{CB}{\sin 2\alpha} = \frac{k}{\sin(90°-\alpha)}$ $\frac{13\cos\alpha}{\sin 2\alpha} = \frac{k}{\cos\alpha}$ $\frac{13\cos\alpha\cos\alpha}{2\sin\alpha\cos\alpha} = k$ $k = \frac{13}{2\tan\alpha}$	✓ subst. ✓factorisation ✓ double angle ✓S (4) ✓ subst. ✓ co – function ✓ double angle ✓$\tan\alpha$ (4)

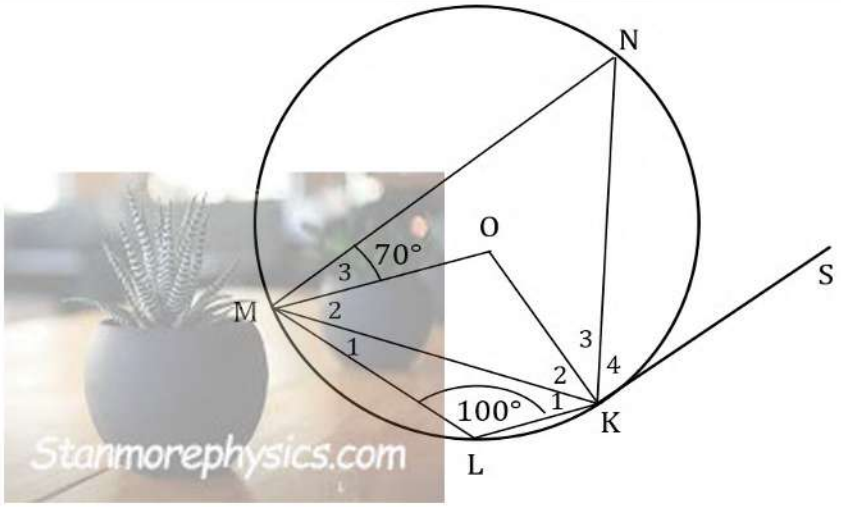
Downloaded from Stanmorephysics.com

7.2	Area $\Delta BCD = \frac{1}{2}CD\ BD \sin 2\alpha$ $= \frac{1}{2} \times k \times k \times \sin 2(26°)$ $= \frac{1}{2} \times \frac{13}{2\tan 26°} \times \frac{13}{2\tan 26°} \times \sin 52°$ $= 69{,}98\ \text{unit}^2\ /\ eenhede^2$	✓ subst. ✓ 69,98 (2)
		[7]

Downloaded from Stanmorephysics.com

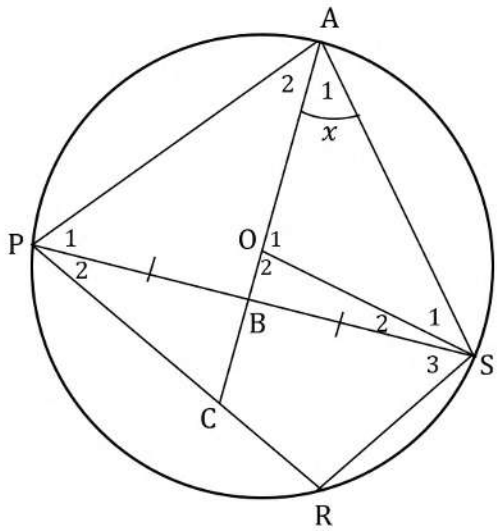
QUESTION 8 / VRAAG 8

8.1	At the circumference / by die omtrek The same chord (bow) / dieselfde koord (boog)	✓ ✓ (2)

8.2	 Stanmorephysics.com	
8.2.1(a)	$\hat{N} = 80°$ [opp ∠s of cyclic quad/*teenoorst ∠e v koordevh*]	✓ S ✓R (2)
8.2.1(b)	$\hat{O} = 160°$ [∠ at centre = 2× ∠ at circumf/*middelpts∠ =2omtreks∠*] $\hat{M}_2 = \hat{K}_2 = 10°$ [sum of ∠s of Δ] / *som v ∠e v Δ*] [∠'s opp = sides/*∠e teenoor = sye*]	✓ S ✓R ✓S (3)
8.2.2	$\hat{K}_4 = 80°$ [tan-chord theorem/ *raakl koordst*] $\hat{N} = 80°$ [proven/*reeds bewys*] $\therefore \hat{K}_4 = \hat{N}$ $\therefore$ MN ∥ KS [alternate angles = / *verwis hoeke gelyk*)	✓ S ✓R ✓ S ✓R (4)
		[11]

Downloaded from Stanmorephysics.com

QUESTION 9/ *VRAAG 9*

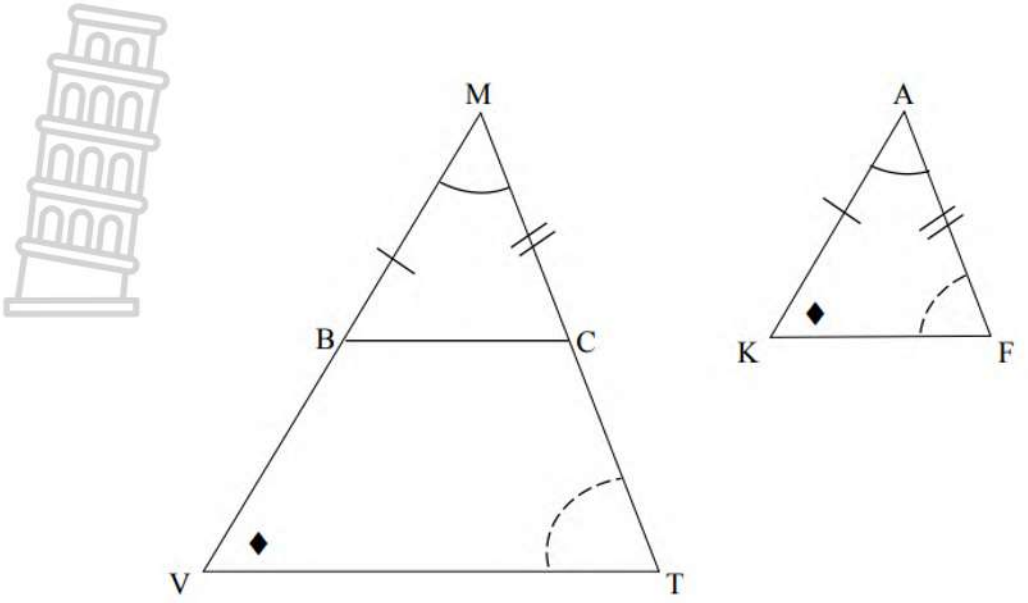


9.1	$\hat{S}_1 = x$ [∠'s opp = radii/*∠e teenoor = radiusse*] $\hat{O}_1 = 180° - 2x$ [sum of ∠s of Δ] / *som v ∠e v Δ]* $\hat{P}_1 = 90° - x$ [∠ at centre = 2× ∠ at circumf/*middelpts∠ =2omtreks∠*]	✓ S / R ✓ S ✓ S ✓ R (4)
9.2.1	$O\hat{B}P = 90°$[line from centre to midpt chord/*lyn v midpt na midpt kd*] $\hat{A}_2 = x$ [sum of ∠s of Δ] / *som v ∠e v Δ*] $\hat{A}_1 = \hat{A}_2 = x$ ∴ CA bisects $P\hat{A}S$ **OR** In ΔAPB and ΔASB: 1) $O\hat{B}P = A\hat{B}S = 90°$ [line from centre to midpt chord / *lyn v midpt na midpt kd*] 2) PB = BS [given / *gegee*] 3) AB=AB [common side / *gemene sy*] ∴ ΔAPB ≡ ΔASB (s; ∠; s) ∴ $\hat{A}_1 = \hat{A}_2 = x$ ∴ CA bisects $P\hat{A}S$	✓ S ✓ R ✓ S / R ✓ conclusion **OR** ✓ S ✓ R ✓ both sides ✓ conclusion (4)
9.2.2	$\hat{R} = 180° - 2x$ [opp ∠s of cyclic quad/ *teenoorst ∠e v koordevh*] $\hat{O}_1 = 180° - 2x$ [proven/ *bewys*] ∴ $\hat{R} = \hat{O}_1$ COSR is a cyclic quad / *is 'n kvh* [converse: ext ∠ of cyclic quad/ *omgekeerde buite ∠ v koordevh*]	✓ S ✓ R ✓ $\hat{R} = \hat{O}_1$ ✓ R (4)
		[12]

Stanmorephysics.com

Downloaded from Stanmorephysics.com

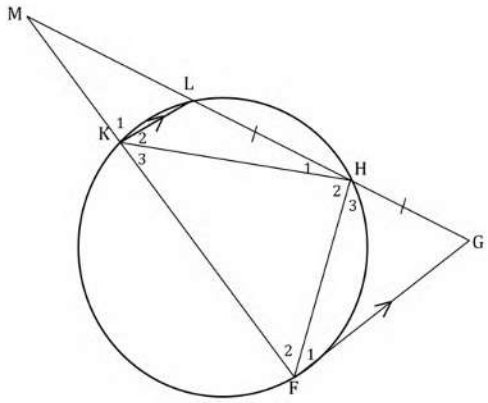
QUESTION 10 / VRAAG 10



10.1	Constr/*Konstr* : Draw line BC such that MB = AK and MC = AF *Trek lyn BC sodat MB = AK en MC = AF* Proof/*Bewys* : In ΔBMC and/*en* ΔKAF MB = AK [constr/*konstr*] $\hat{M} = \hat{A}$ [given/*gegee*] MC = AF [constr/*konstr*] ΔBMC ≡ ΔKAF [s∠s] $\therefore M\hat{B}C = A\hat{K}F$ or $M\hat{C}B = A\hat{F}K$ [≡Δ] but /*maar* $\hat{V} = \hat{K}$ or $\hat{T} = \hat{F}$ [given/*gegee*] $\therefore M\hat{B}C = \hat{V}$ or $M\hat{C}B = \hat{T}$ But these are corresponding ∠s/*maar hulle is ooreenk ∠e* ∴ BC || VT [corr ∠s = /*ooreenk∠e* =] $\therefore \frac{MV}{MB} = \frac{MT}{MC}$ [prop theorem/*eweredighst*; BC || VT] but /*maar* MB = AK and MC = AF [constr/*konstr*] $\therefore \frac{MV}{AK} = \frac{MT}{AF}$	✓ constr/*konstr* ✓ S / R ✓ S ✓ S ✓ S / R ✓S ✓R (7)

Downloaded from Stanmorephysics.com

10.2



10.2.1	[corresp∠s /ooreenkomstige ∠e ; KL ‖ FG]	✓ R	(1)
10.2.2(a)	In ΔMFH and ΔMGF: 1) $G\hat{F}M = \hat{K}_1$ [proven/*bewys*] $\hat{K}_1 = L\hat{H}F$ [ext ∠ of cyclic quad / *buite ∠ v koordevh*] ∴ $L\hat{H}F = G\hat{F}M$ 2) $\hat{M} = \hat{M}$ [common/*gemeen*] ∴ ΔMFH lll ΔMGF [∠, ∠, ∠]	✓ S / R ✓$L\hat{H}F = G\hat{F}M$ ✓S ✓ ∠, ∠, ∠	
	OR	**OR**	
	In ΔMFH and ΔMGF: 1) $G\hat{F}M = \hat{K}_1$ [proven/ *bewys*] $\hat{K}_1 = L\hat{H}F$ [ext ∠ of cyclic quad / *buite ∠ v koordevh*] ∴ $L\hat{H}F = G\hat{F}M$ 2) $\hat{M} = \hat{M}$ [common/*bewys*] 3) $\hat{F}_2 = \hat{G}$ [sum of ∠s of Δ] / *som v ∠e v Δ*] ∴ ΔMFH lll ΔMGF [∠, ∠, ∠]	✓ S / R ✓$L\hat{H}F = G\hat{F}M$ ✓S ✓ S	
	OR		
	In ΔMFH and ΔMGF: 1) $M\hat{L}K = \hat{G}$ [corresp∠s /*ooreenkomstige ∠e* ; KL ‖ FG]] $M\hat{L}K = M\hat{F}H$ [ext ∠ of cyclic quad / *buite ∠ v koordevh*] ∴ $\hat{G} = M\hat{F}H$ 2) $\hat{M} = \hat{M}$ [common/ *bewys*] ∴ ΔMFH lll ΔMGF [∠, ∠, ∠]	✓S / R ✓ S /R ✓S ✓∠, ∠, ∠	
	OR		
	In ΔMFH and ΔMGF: 1) $M\hat{L}K = \hat{G}$ [corresp∠s /*ooreenkomstige ∠e* ; KL ‖ FG]] $M\hat{L}K = M\hat{F}H$ [ext ∠ of cyclic quad / *buite ∠ v koordevh*] ∴ $\hat{G} = M\hat{F}H$ 2) $\hat{M} = \hat{M}$ [common/ *bewys*] 3) $L\hat{H}F = G\hat{F}M$ [sum of ∠s of Δ] / som v ∠e v Δ] ∴ ΔMFH lll ΔMGF [∠, ∠, ∠]	✓S / R ✓ S / R ✓S ✓S or ∠, ∠, ∠	(4)

Copyright reserved

Downloaded from Stanmorephysics.com

10.2.2(b)	$\frac{MK}{KF} = \frac{ML}{LG}$ $= \frac{1}{2}$ [line || one side of Δ OR prop theorem; KL ||FG]	✓ R
	$LG = 2ML$ $LH + HG = 2ML$ But $LH = HG$ [given] $\therefore LH = HG = ML$	✓S
	$\frac{MH}{MF} = \frac{MF}{MG}$ [ΔMFH lll ΔMGF]	✓R
	$MF^2 = MH.MG$	✓ S
	$MF^2 = 2ML \times 3\,ML$ $MF^2 = 6\,ML^2$ $\frac{MF^2}{ML^2} = 6$ $\frac{MF}{ML} = \sqrt{6}$	✓ $MF^2 = 6\,ML^2$ (5)
		[17]

TOTAL = 150

Downloaded from Stanmorephysics.com

INFORMATION SHEET: MATHEMATICS

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Copyright reserved