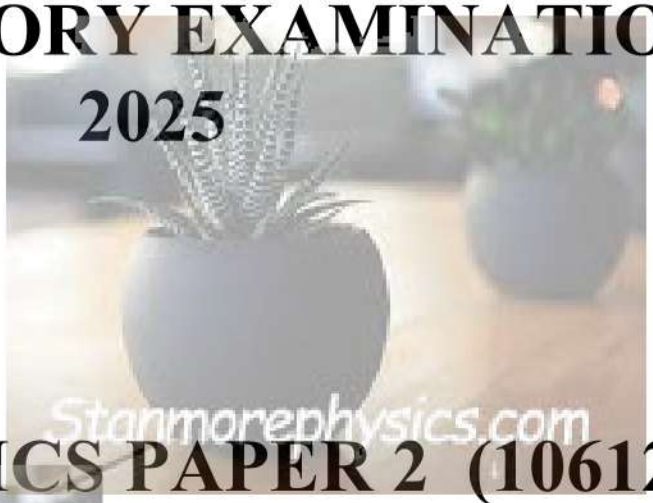
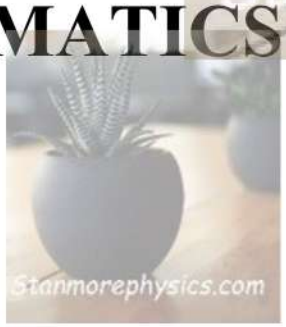
GAUTENG PROVINCE
EDUCATION
REPUBLIC OF SOUTH AFRICA

PREPARATORY EXAMINATION 2025



MATHEMATICS PAPER 2 (10612)



MATHEMATICS: Paper 2

10612E

X05

GAUTENG PROVINCE
EDUCATION
REPUBLIC OF SOUTH AFRICA

PREPARATORY EXAMINATION
2025

NAME OF SCHOOL	
CANDIDATE'S NAME	
DATE	D D M M Y Y Y Y
TEACHER	
SUBJECT NAME	MATHEMATICS (10612)

BOOK NUMBER		OF		BOOK(S)

PAPER NUMBER	2

ANSWER ALL THE QUESTIONS IN THE QUESTION PAPER.

MARKER					MODERATOR'S INITIALS IN RELEVANT BLOCK										RE-MARK/RE-CHECK				
Question	Marks			Marker's Code & Initials	Marks										Question	Marks			Initials
1															1				
2															2				
3															3				
4															4				
5															5				
6															6				
7															7				
8															8				
9															9				
10															10				
11															11				
				TOTAL											TOTAL				

TIME: 3 hours

MARKS: 150

34 pages + 1 information sheet

P.T.O.

INSTRUCTIONS AND INFORMATION

Read the following instructions carefully before answering the questions.

1. This question paper consists of 11 questions. Answer ALL questions in the spaces provided.
2. Clearly show ALL calculations, diagrams, graphs, etc. that you have used in determining your answers.
3. Answers only will NOT necessarily be awarded full marks.
4. You may use an approved scientific calculator (non-programmable and non-graphical), unless stated otherwise.
5. If necessary, round-off answers correct to TWO decimal places, unless stated otherwise.
6. Diagrams are NOT necessarily drawn to scale.
7. An information sheet with formulae is included at the end of the question paper.
8. No pages may be torn from this question paper.
9. Candidates may not retain a question paper or remove it from the examination room. Question papers must be returned to the invigilator at the end of the examination session.
10. Answers must be written in black/blue ink as distinctly as possible. Do NOT write in the margins.
11. Indicate the questions you have answered by drawing a circle around the relevant numbers on the front cover of the question paper where marks are to be recorded.
12. Draw a neat line through any work/rough work that must NOT be marked.
13. In the event that you use the additional space provided:

    13.1 Write down the number of the question.
    13.2 Leave a line and rule off after your answer.

14. Write neatly and legibly.

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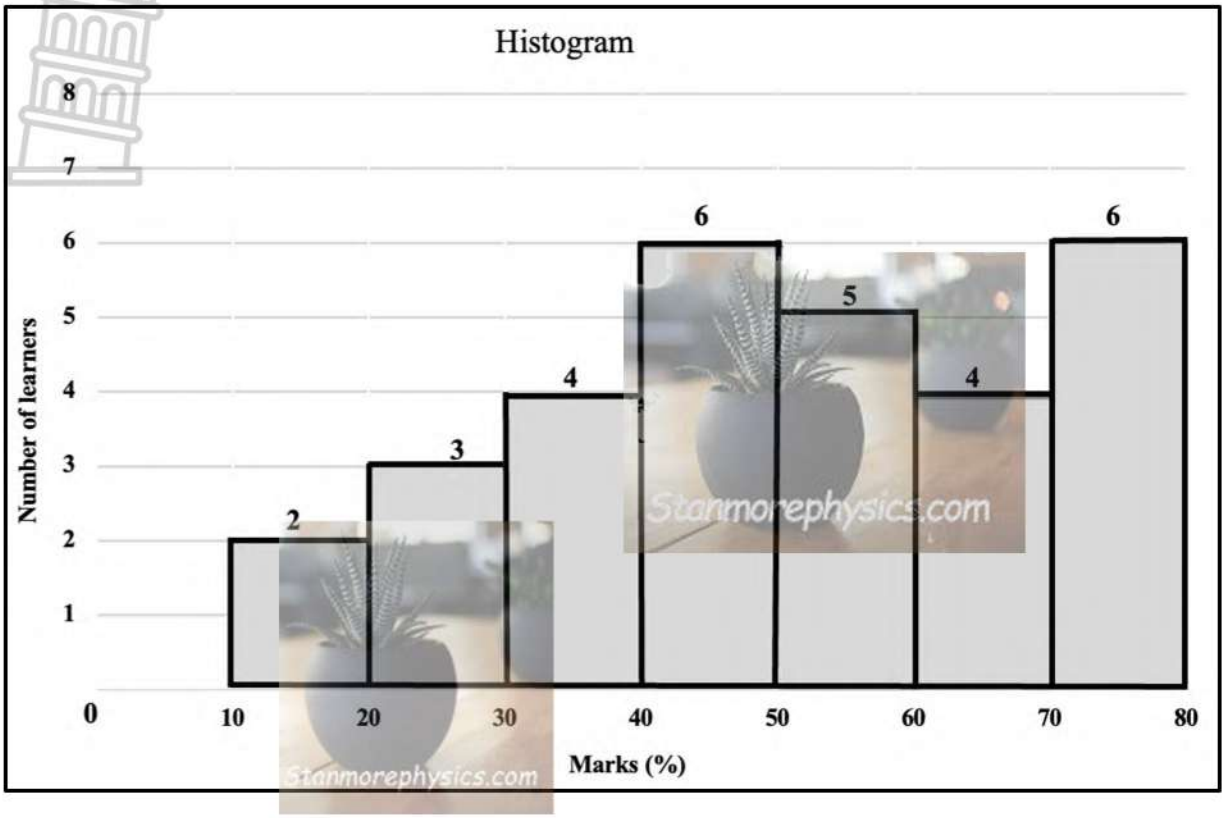
QUESTION 1

The histogram below shows the marks (in %) of Grade 11 learners in their November 2024 examination.

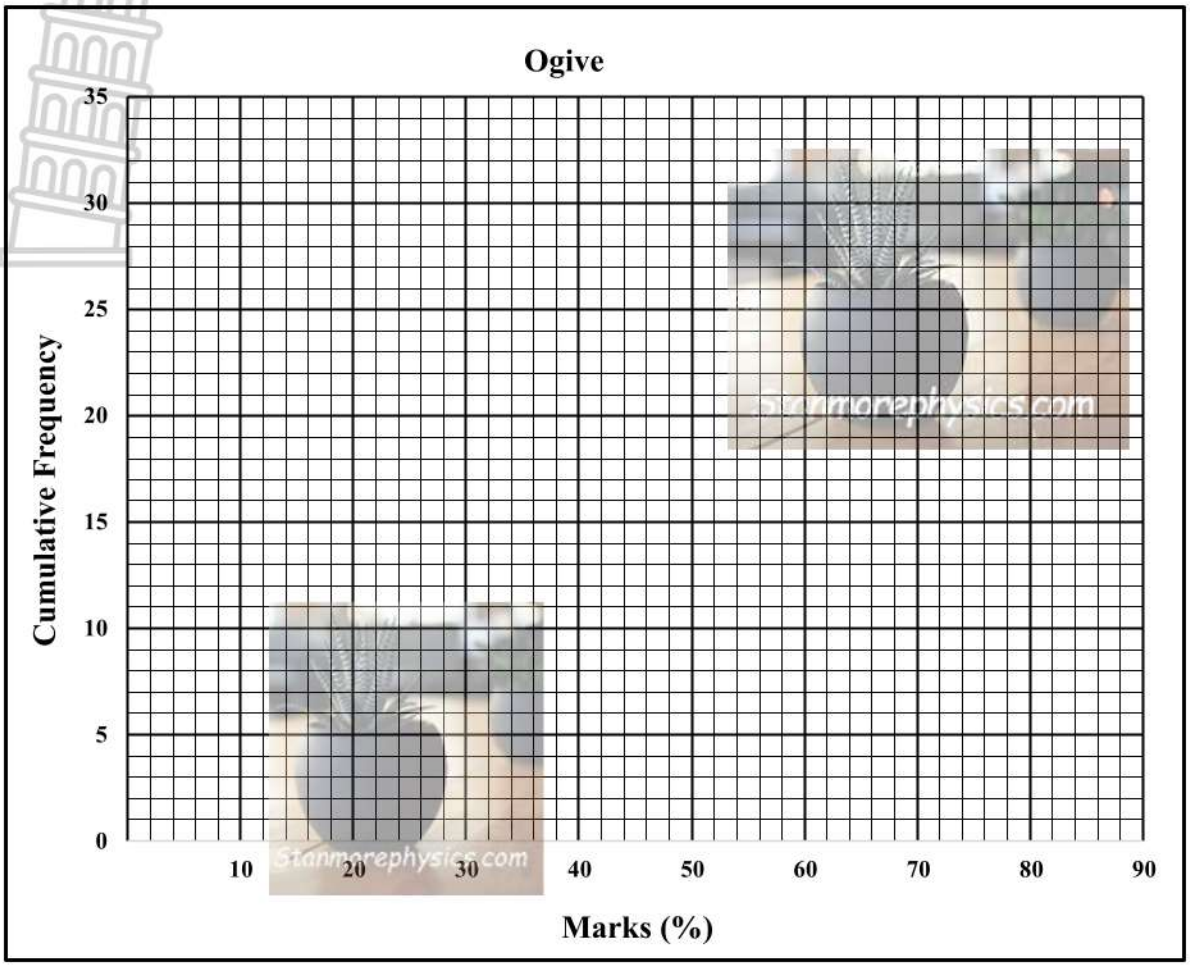


1.1	Complete the table below.	

Class Interval (Marks in %)	Frequency	Cumulative frequency
$10 \leq x < 20$		
$20 \leq x < 30$		
$30 \leq x < 40$		
$40 \leq x < 50$		
$50 \leq x < 60$		
$60 \leq x < 70$		
$70 \leq x < 80$		
TOTAL		

(2)

1.2 Draw an ogive (cumulative frequency graph) to represent the data.

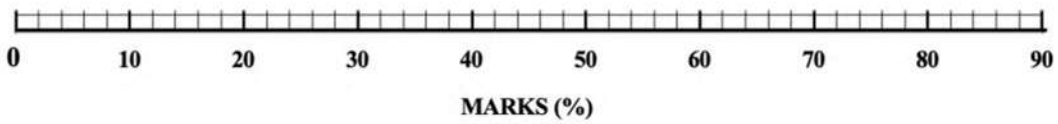


(3)

1.3 Use the ogive to estimate how many learners obtained at least 54% in the examination.

(2)

1.4 It is further given that the minimum mark is 12% and the range of the data is 66%.
Use the grid provided to draw a box-and-whisker diagram.



(4)

[11]

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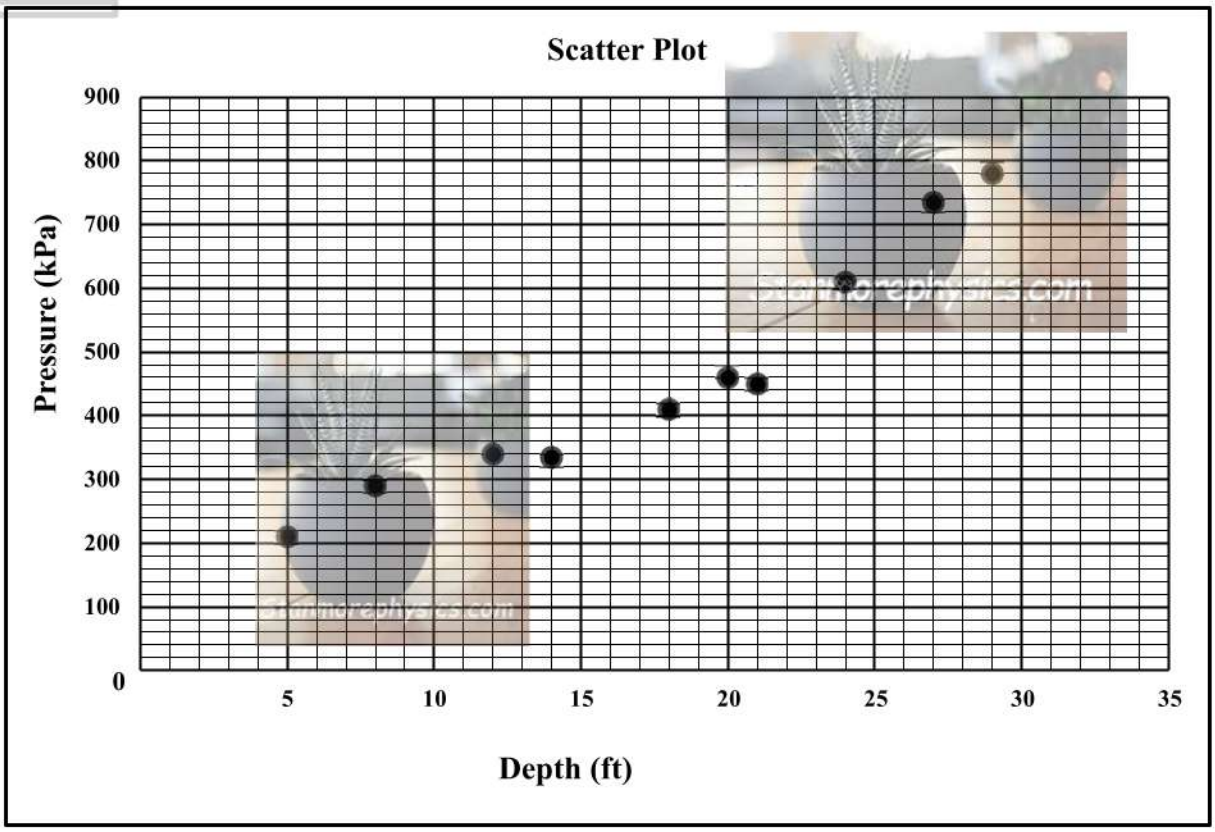
QUESTION 2

2.1 A town manager conducted a survey to measure the pressure of the sea level in his coastal city. The table and the scatter plot below shows the results of the survey:

Depth (ft)	5	8	12	14	18	20	21	24	27	29
Pressure (kPa)	210	290	340	335	410	460	450	610	735	780



2.1.1	Determine the equation of the least squares regression line for the data.	(3)
2.1.2	Use the scatter plot provided above to draw the least squares regression line.	(2)
2.1.3	Write down the correlation coefficient.	(1)

2.2 Research was conducted to measure the testosterone levels in runners at the Olympic Games. The table below shows the results of five runners who were tested for testosterone.

Runners	**1**	**2**	**3**	**4**	**5**
Level of testosterone	6,7	$2k + 2{,}4$	p	3,8	4,3

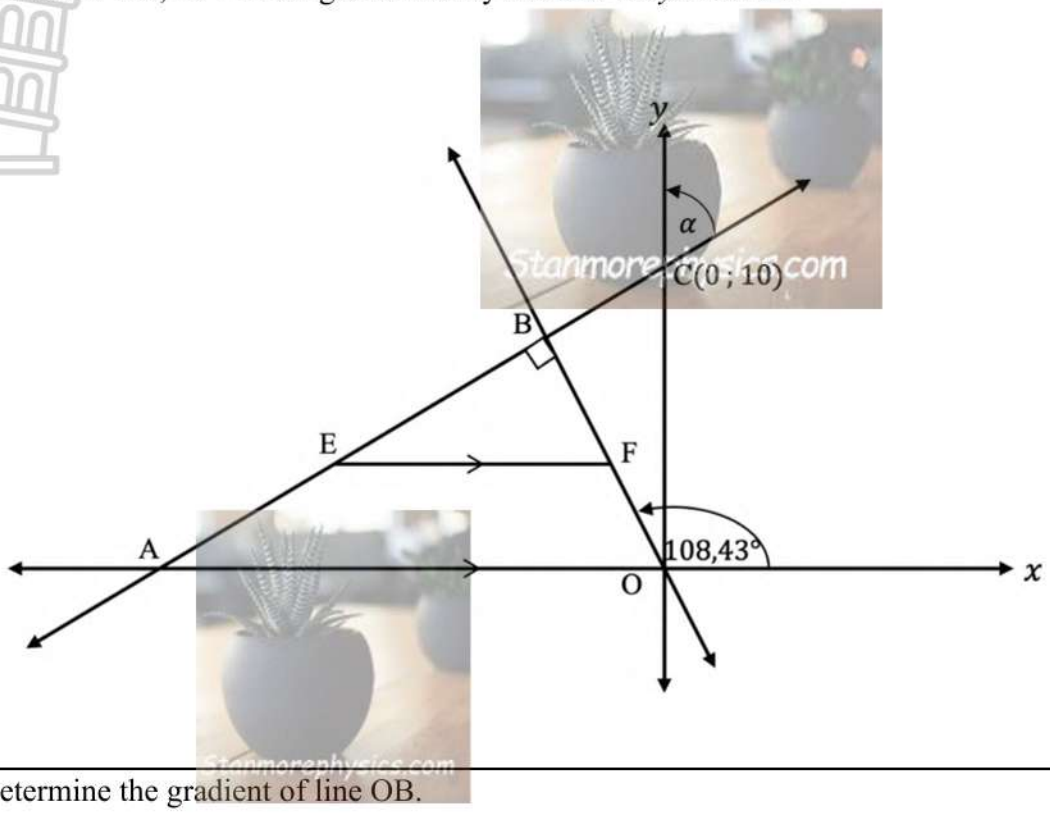
The mean of the five runners is 7,7 and the values of the last three runners form an arithmetic sequence. Determine the value of k and p.

(5)

[11]

QUESTION 3

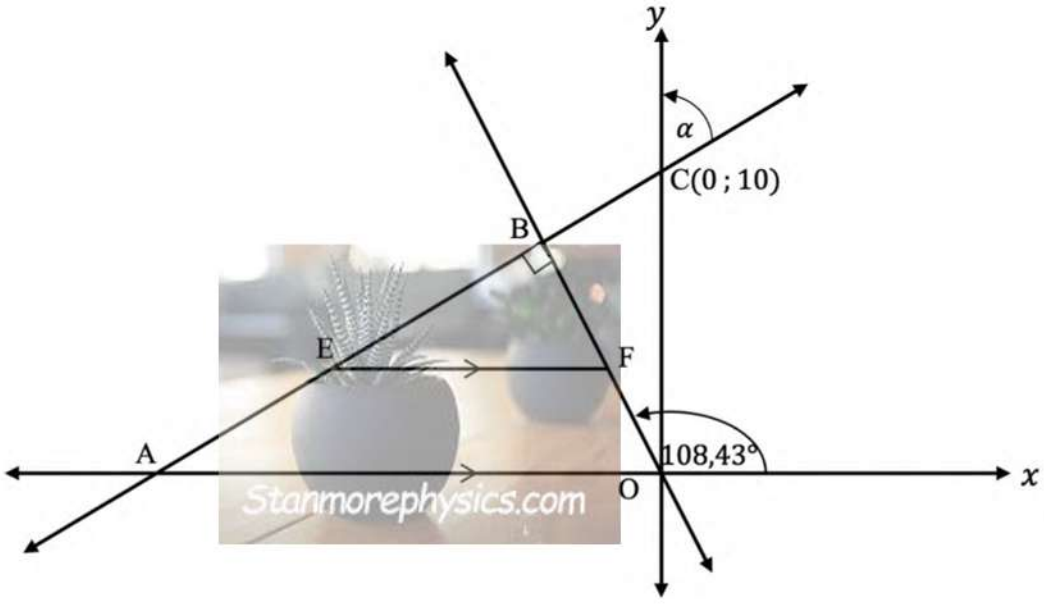
In the diagram, ΔABO is drawn. E is the midpoint of AB which is produced to C. A is the x-intercept and C(0 ; 10) is the y-intercept of AC. Line EF is drawn parallel to the x-axis. AB⊥OB and the angle of inclination of OB is $108,43^{\circ}$. The angle formed by AC and the y-axis is α.



3.1	Determine the gradient of line OB.	(2)
3.2	Determine the equation of line AB in the form $y = mx + c$.	(2)

3.3	Calculate the coordinates of B.	(3)
3.4	Calculate the length of BF.	(4)

3.5	Calculate the area of ΔCBO.	(4)
3.6	Determine the size of α.	(3)
		[18]



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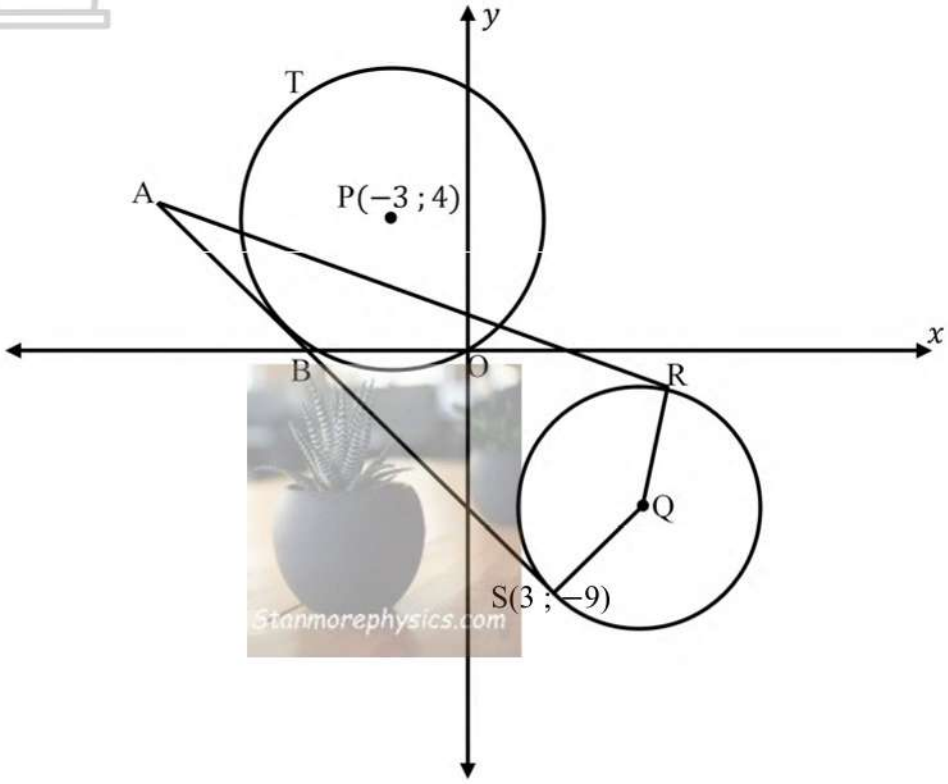
QUESTION 4

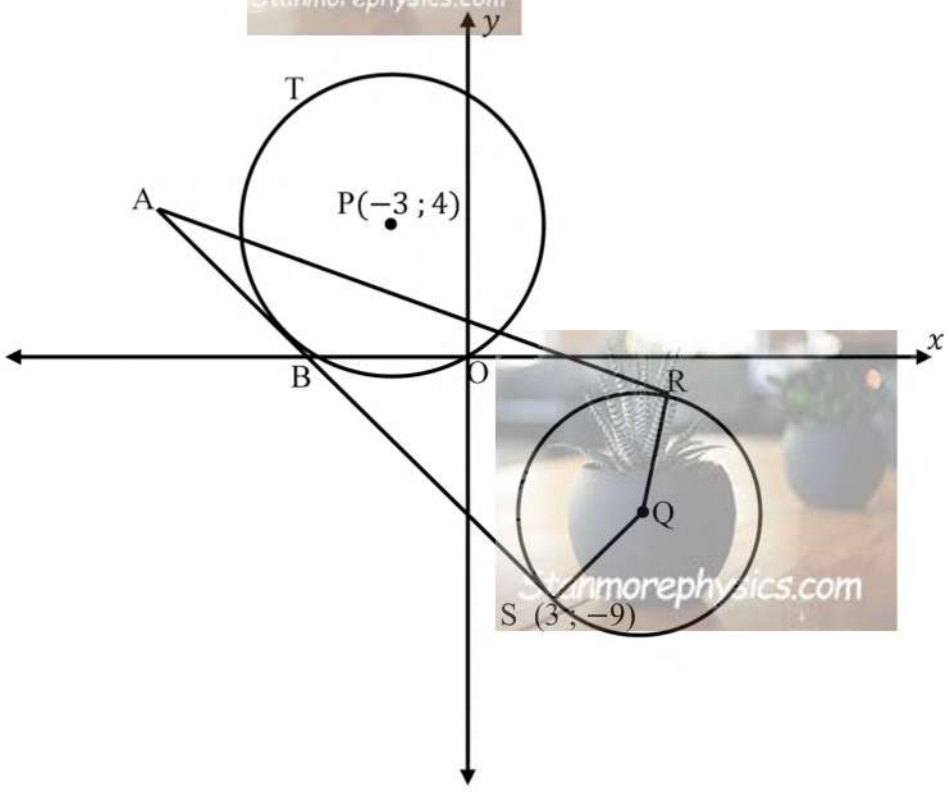
In the diagram, $P(-3\,;4)$ is the centre of the circle passing through points B, T and the origin. A second circle is drawn, with centre Q and equation $x^2 - 12x + y^2 + 12y + 54 = 0$. Points R and $S(3\,;-9)$ lie on the circle. AS and AR are both tangents to the circle with centre Q. B is the x-intercept of AS.



4.1	Determine the equation of the circle with centre P.	(3)
4.2	OT is the diameter of the circle with centre P. Determine the coordinates of T.	(3)

4.3	Calculate the coordinates of Q.	(3)
4.4	Determine the equation of AS in the form $y = mx + c$.	(5)
4.5	Identify the type of quadrilateral that ASQR is and substantiate your answer.	(2)

4.6	Determine the scale factor k by which the radius of the circle with centre Q should be increased such that the two circles touch once.	(4)
		[20]



QUESTION 5

5.1	Given: $\sin\beta = \frac{12}{13}$, where $\tan\beta < 0$. With the aid of a diagram, and **without the use of a calculator**, determine the value of $\sin 2\beta$.	(4)
5.2	Given: $\cos(\alpha - \theta) = \cos\alpha\cos\theta + \sin\alpha\sin\theta$	
5.2.1	Use the above identity to deduce that $\sin(\alpha - \theta) = \sin\alpha\cos\theta - \cos\alpha\sin\theta$	(3)
5.2.2	Hence, or otherwise, evaluate $\sin 76°.\sin 44° - \sin 14°.\sin 46°$	(3)

5.3	Given: $f(x) = \sin x$	
	Show that $\frac{f(x+h)-f(x)}{h}$ can be written as $\sin x\left(\frac{\cos h-1}{h}\right)+\cos x\left(\frac{\sin h}{h}\right)$.	
		(4)
		[14]

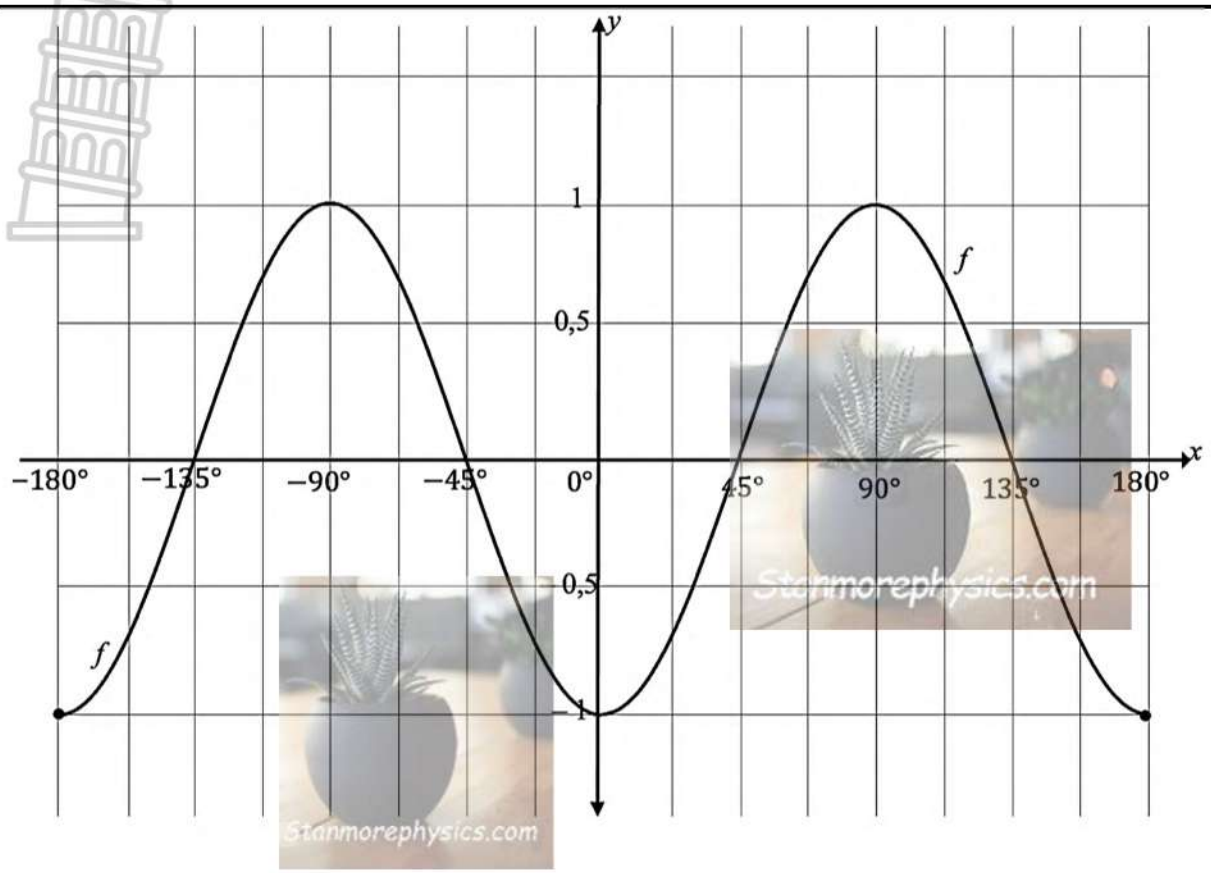
QUESTION 6

6.1	Simplify the following to a single trigonometric term, **without the use of a calculator**: $\frac{\tan(180° - x)\cos(180° - x)}{\cos 240° \left(\tan^2 y - \frac{1}{\cos^2 y}\right)}$	(7)
6.2	Prove the identity: $\frac{\sin 3x}{\sin x \cos x} = \frac{4\cos^2 x - 1}{\cos x}$	(5)

6.3	Determine the general solution of $\cos x + 1 = \sin x$.	
		(7)
		[19]

QUESTION 7

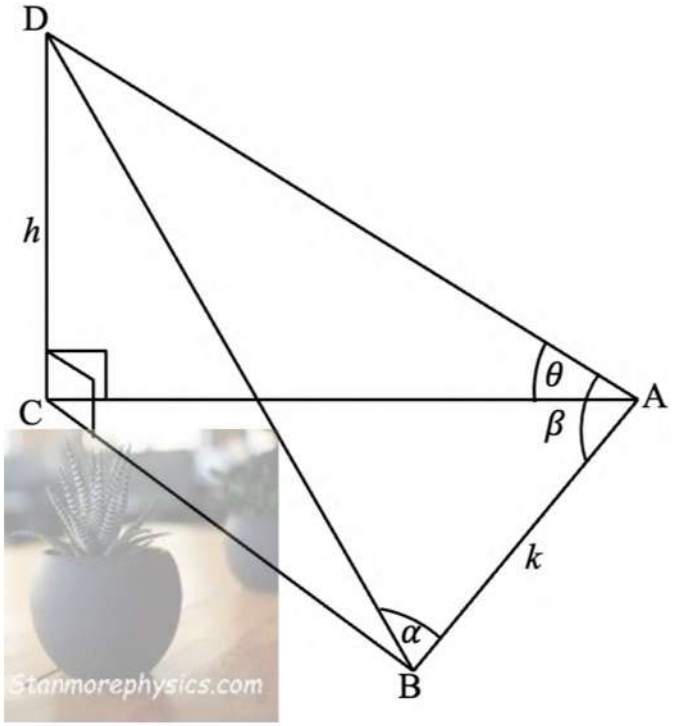
In the diagram below, the graph of $f(x) = -\cos 2x$ is drawn for the interval $x \in [-180° ; 180°]$.



7.1	Write down the period of f.	(1)
7.2	Write down the range of f.	(1)
7.3	On the grid provided above, draw the graph of $g(x) = \tan(x - 45°)$ for the interval $x \in [-180° ; 180°]$. Clearly show the asymptotes and intercepts with the axes.	(3)
7.4	For which value(s) of x is $f(x) \leq g(x)$, for the interval $x \in [-180° ; 0°]$.	(2)
7.5	What is the maximum value of $h(x) = 4^{\,2\sin^2 x - 1}$ for $x \in \mathbb{R}$.	(2)
		[9]

QUESTION 8

In the diagram below, A, B and C lie in the same horizontal plane.
The vertical pole DC is h units and AB $= k$ units.
$C\widehat{A}D = \theta$, $B\widehat{A}D = \beta$ and $D\widehat{B}A = \alpha$.

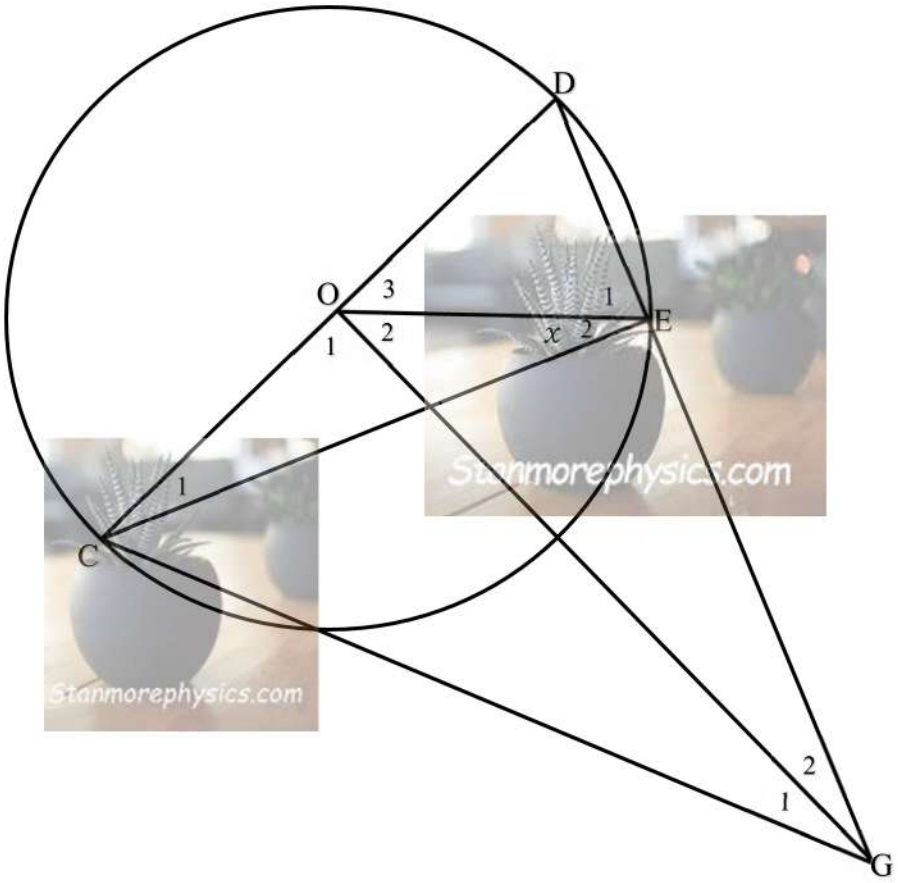


8.1	Determine the size of $C\widehat{D}A$ in terms of θ.	(1)
8.2	Determine the length of AD in terms of h and θ.	(2)

8.3	Show that CD can be written as: $$h = \frac{k \,.\sin\alpha\,.\sin\theta}{\sin(\alpha+\beta)}$$	(5)
8.4	Calculate the length of the vertical pole CD to the nearest metre, if $k = 95$ m, $\theta = 43{,}9°$, $\beta = 61°$ and $\alpha = 32{,}7°$.	(2)
		[10]

QUESTION 9

In the diagram below, CD is the diameter of the circle with centre O. E is a point on the circle such that DE is produced to G. OE, OG, CE and CG are drawn. Let $O\hat{E}C = x$ and $C\hat{O}G = 90°$.

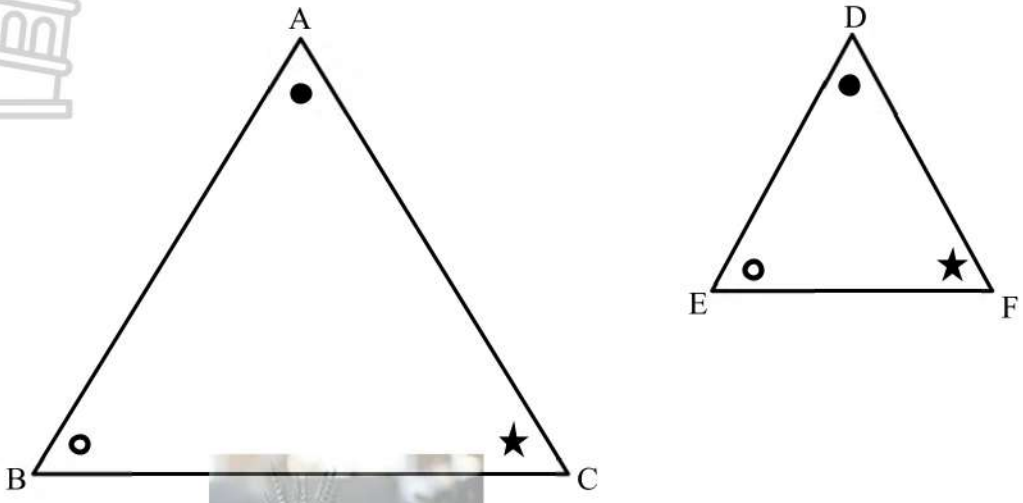


9.1	Prove that OCGE is a cyclic quadrilateral.	
		(3)

9.2	Name, with reasons, THREE other angles equal to x.	(3)
9.3	Determine the size of $D\widehat{O}E$ in terms of x.	(2)
		[8]

QUESTION 10

10.1 In the diagram below, ΔABC and ΔDEF are drawn with $\hat{A} = \hat{D}$; $\hat{B} = \hat{E}$ and $\hat{C} = \hat{F}$.



Use the diagram above to prove the theorem that states that if two triangles are equiangular, then their corresponding sides are in the same proportion, that is $\frac{DE}{AB} = \frac{DF}{AC}$	
	(6)

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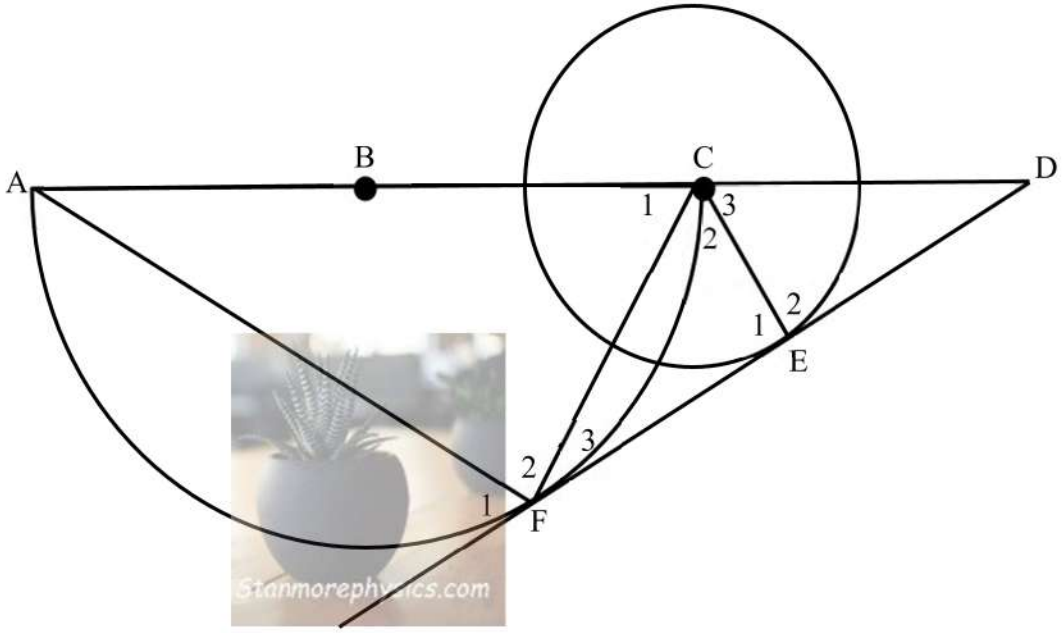
10.2 In the diagram below A, C and F are points on a semi-circle with centre B. A circle with centre C is drawn. The radius of the semi-circle is twice the radius of circle C.
FED is a tangent to both circles at F and E respectively. ABCD is a straight line.

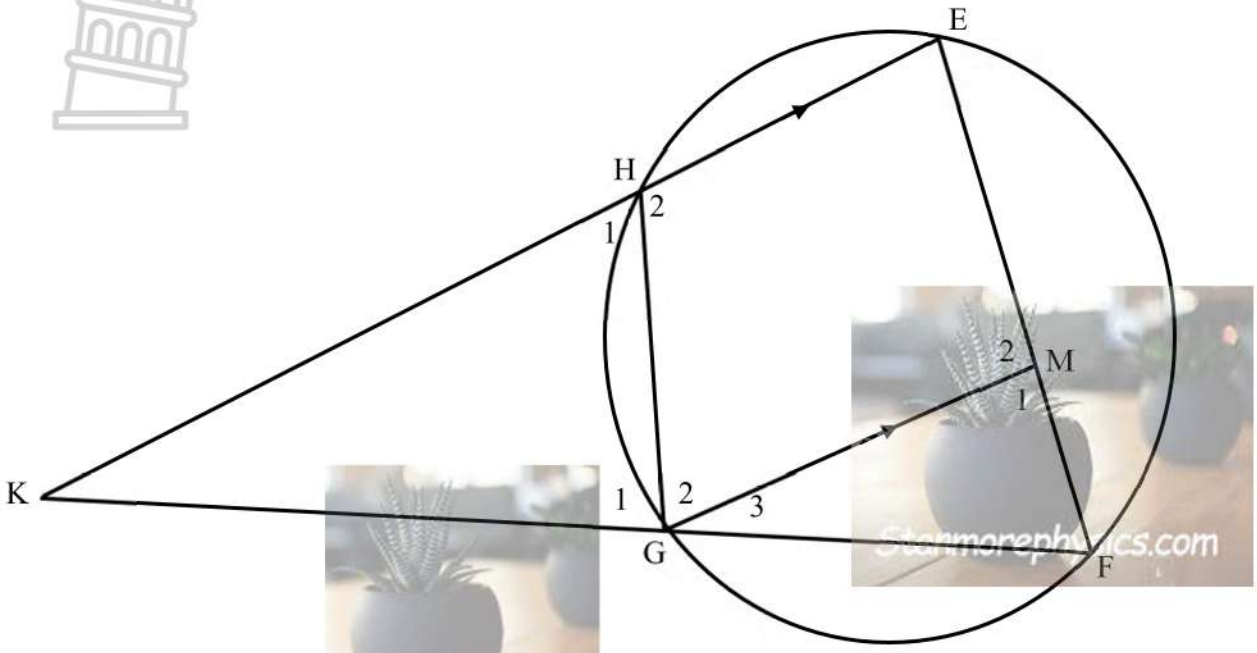


10.2.1	Prove that ΔAFC ||| Δ FEC.	
		(5)

10.2.2	If the radius of the smaller circle is p, determine the following in terms of p:	
(a)	The length of FC	(4)
(b)	The length of FD, if it is given that FE = ED	(3)
		[18]

QUESTION 11

In the diagram below, cyclic quadrilateral EFGH is drawn. Chords EH and FG are produced to meet at K. M is a point on EF such that MG ∥ EK. KG = EF.



11.1	Prove that:	
11.1.1	$EF^2 = KE \cdot GH$	(6)

11.1.2	$KG^2 = EM \cdot KF$	(3)
11.2	If it is given that KE = 20 units, KF = 16 units and GH = 4 units, calculate the length of EM.	(3)
		[12]

Additional space

Additional space

Additional space

TOTAL: 150

END

INFORMATION SHEET

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

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

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

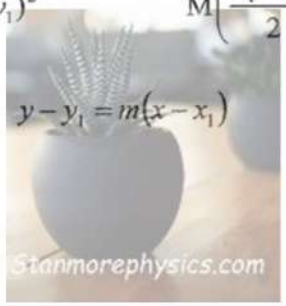
$$T_n = ar^{n-1} \qquad S_n = \frac{a(r^n - 1)}{r-1} \; ; r \neq 1 \qquad S_\infty = \frac{a}{1-r} \; ; -1 < r < 1$$

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

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

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

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



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

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

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

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

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

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

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

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

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

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

GAUTENG PROVINCE
EDUCATION
REPUBLIC OF SOUTH AFRICA

PREPARATORY EXAMINATION
VOORBEREIDENDE EKSAMEN

2025

MARKING GUIDELINES/*NASIENRIGLYNE*

MATHEMATICS/*WISKUNDE* (PAPER/*VRAESTEL* 2) (10612)

25 pages/*bladsye*

NOTE:

- **If a candidate answers a question TWICE, only mark the FIRST attempt.**
- **If a candidate has crossed out an attempted 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 to solve a problem is NOT acceptable.**

LET WEL:

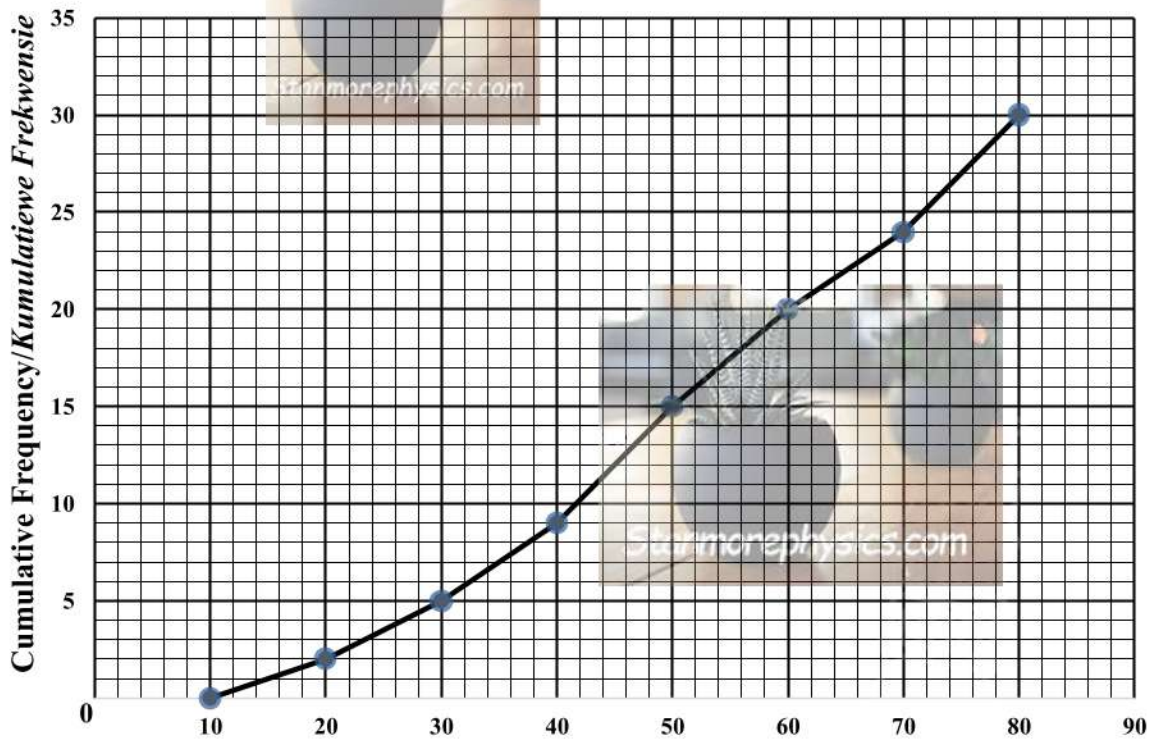
- ***As 'n kandidaat 'n vraag TWEE KEER beantwoord, sien slegs die EERSTE poging na.***
- ***As 'n kandidaat 'n antwoord tot 'n vraag doodtrek en nie oordoen nie, sien die doodgetrekte poging na.***
- ***Volgehoue akkuraatheid word in ALLE aspekte van die nasienriglyne toegepas. Hou op nasien by die tweede berekeningsfout.***
- ***Aannames 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 a 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 the statement AND reason are both correct.
	Ken 'n punt toe as beide die bewering EN rede beide korrek is.

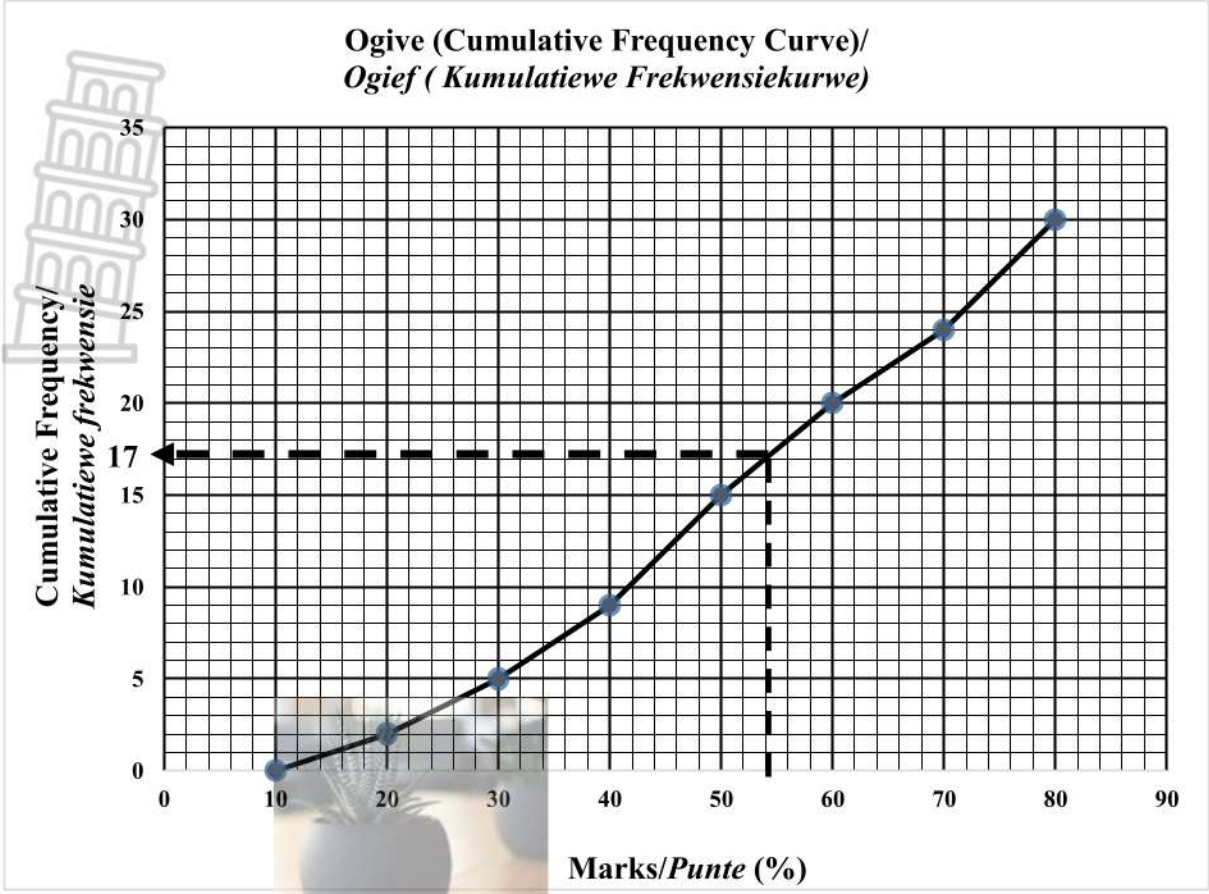
QUESTION/*VRAAG* 1

	SOLUTIONS/*OPLOSSINGS*			Mark descriptions/ *Punt omskrywing*	Marks/ *Punte*
1.1	**Class Interval/ *Klasinterval* (Marks/*Punte* in %)**	**Frequency/ *Frekwensie***	**Cumulative frequency/ *Kumulatiewe frekwensie***	✓ frequency column/ *frekwensiekolom* ✓ cumulative frequency column/*kumulatiewe frekwensiekolom*	(2)
	$10 \leq x < 20$	2	2		
	$20 \leq x < 30$	3	5		
	$30 \leq x < 40$	4	9		
	$40 \leq x < 50$	6	15		
	$50 \leq x < 60$	5	20		
	$60 \leq x < 70$	4	24		
	$70 \leq x < 80$	6	30		
	TOTAL/*TOTAAL*	30			
1.2					

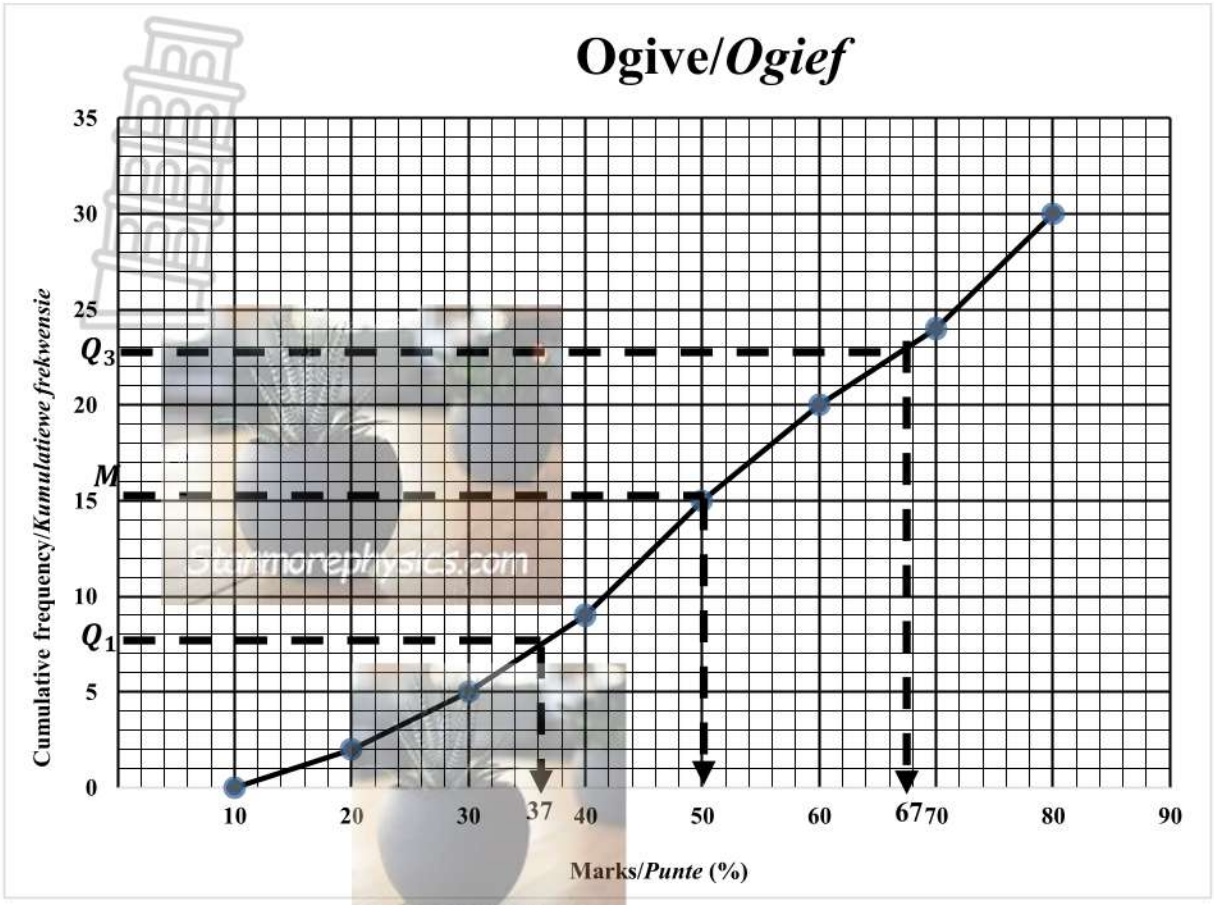
Ogive/*Ogief*

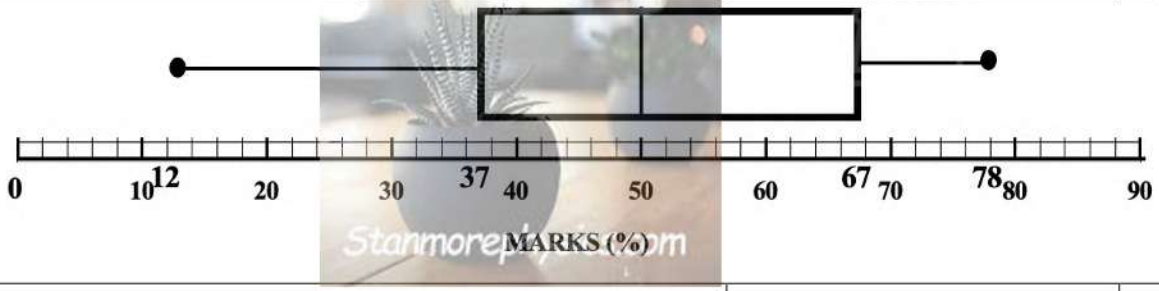


✓ ground point & ending point/ *Grond begin en eindpunt* ✓ six remaining points plotted correctly/ *ander ses punte reg geplot* ✓ shape/ *vorm* (3)



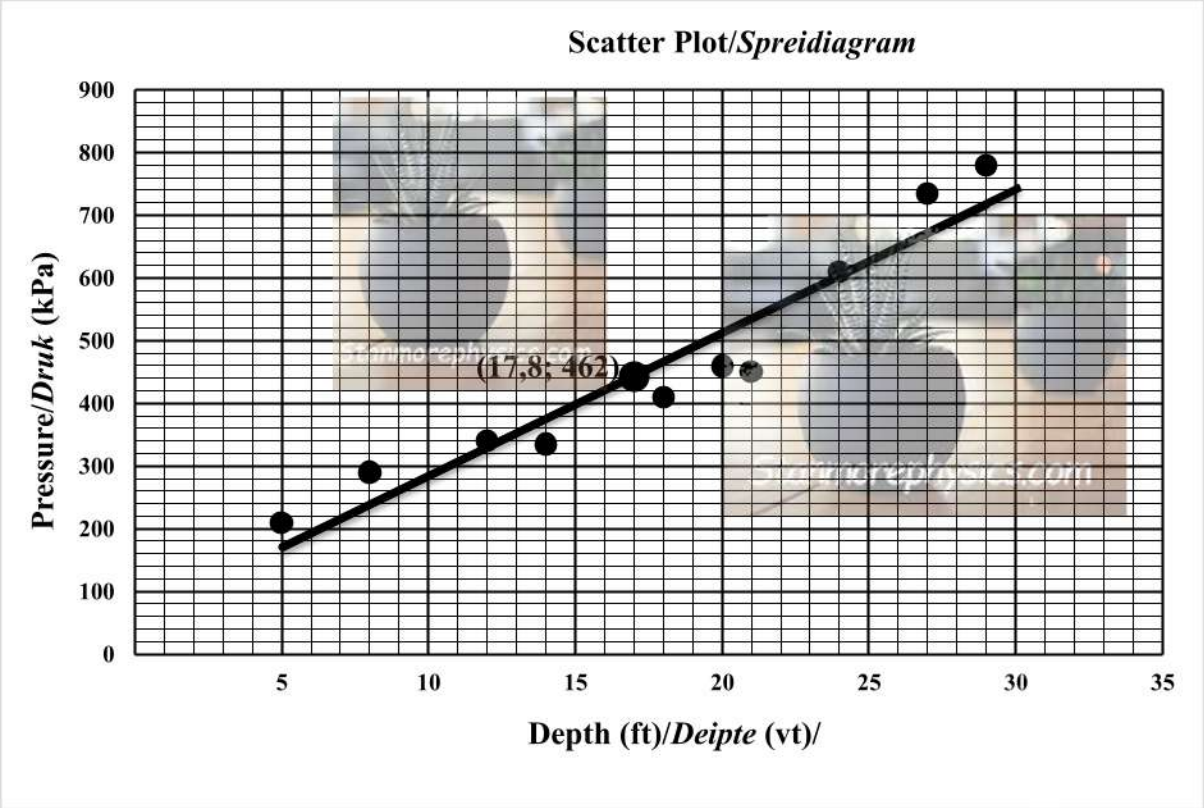
1.3	Approximately 17 learners obtained 54%/ *Ongeveer 17 leerders behaal 54%* ∴ No of learners obtained 54% of more/ *Aantal leerders wat 54% of meer behaal het* = 30 – 17 = 13 Answer only: Full marks *Slegs Antwoord: Volpunte* **NOTES – Accept the following range:** • **Approximately 16 – 18 learners** • **No of learners: 12 – 14** ***NOTAS-Aanvaar die volgende:*** • ***Ongeveer 16 – 18 leerders*** • ***Aantal leerders: 12- 14***	✓ 17 ✓ 13	(2)



1.4	Lower quartile/*Onderste kwartiel* = 37 % (accept/*aanvaar* 36 – 38) Median/*Mediaan* = 50 % (accept/*aanvaar* 50 – 51) Upper quartile/*Boonste kwartiel* = 67% (accept/*aanvaar* 66 – 68) Range = Max – Min/*Omvang = Maks - Min* 66% = Max/*Maks* – 12 % ∴ Max/*Maks* = 78% Min = 12%	✓ lower quartile/ *onderste kwartiel* ✓ median/*mediaan* ✓ upper quartile/ b*oonste kwartiel* ✓ whiskers/*snor*	(4)
			
			[11]

QUESTION/*VRAAG* 2

	SOLUTIONS/*OPLOSSINGS*	**Mark descriptions/ *Punt omskrywing***	**Marks/ *Punte***
2.1.1	$a = 55{,}96$ $b = 22{,}81$ $\therefore \hat{y} = 55{,}96 + 22{,}81x$ Answer only: Full marks *Slegs Antwoord: Volpunte*	✓ value of *a/waarde van a* ✓ value of *b/waarde van b* ✓ equation/*vergelyking*	(3)
2.1.2	**SEE THE DIAGRAM BELOW/** ***SIEN DIE DIAGRAM HIERONDER***	✓ any correct 2 points *enige 2 punte korrek* ✓ straight line joining the points for $x \in [5\ ;\ 29]$/ *reguitlyn wat die punte verbind vir* $x \in [5\ ;\ 29]$	(2)

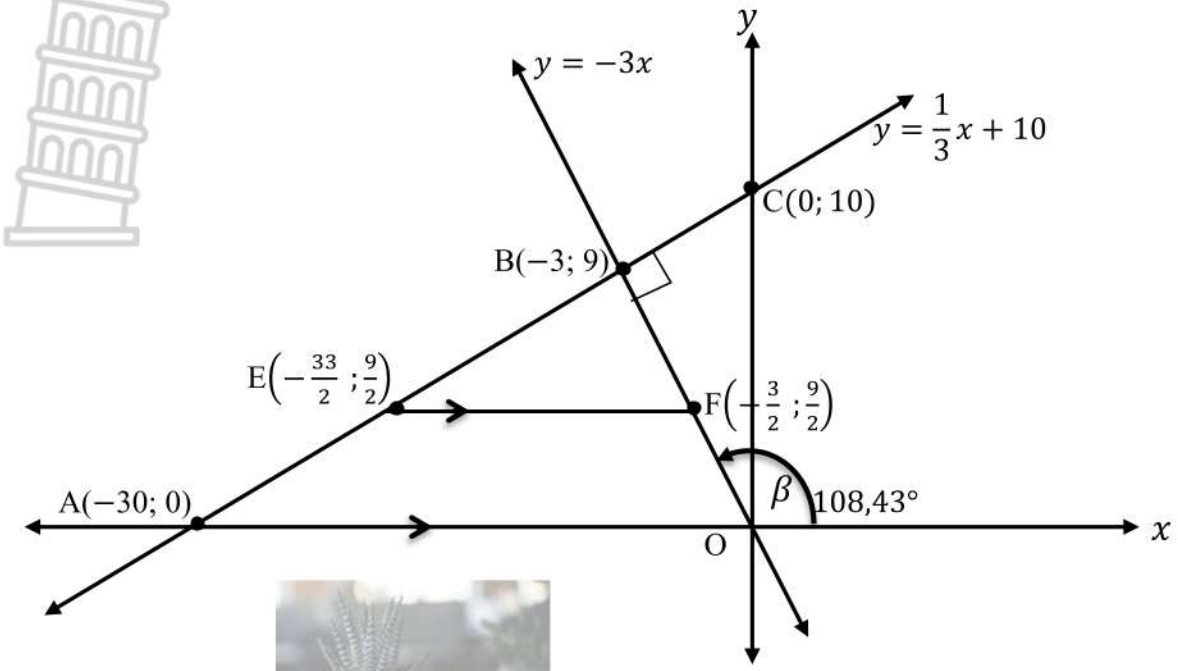


Line must be sketched within the domain in future, no penalty given for this session if a candidate extended the line. *Lyn moet in die toekoms slegs binne in die omvang geteken word, geen penaliseering sal gegee word in hierdie sessie as 'n leerder die lyn verleng het nie.*

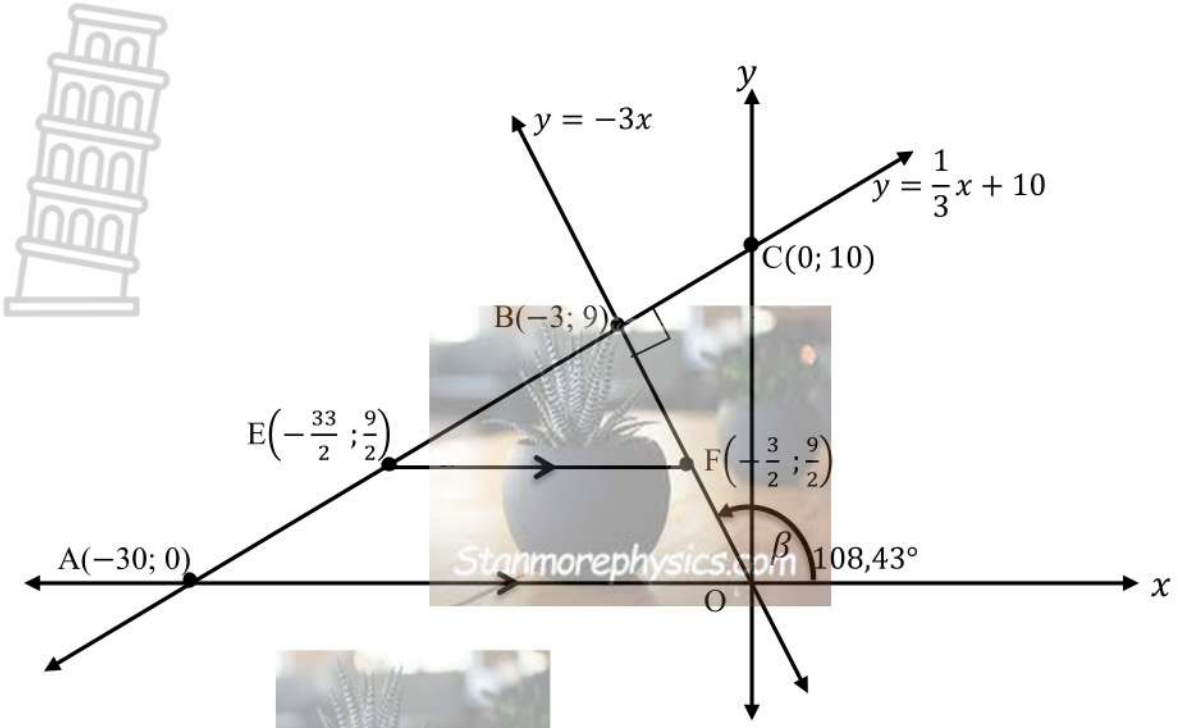
2.1.3	$r = 0{,}96$	✓ answer/*antwoord*	(1)

2.2	$3{,}8 - p = 4{,}3 - 3{,}8$ $\therefore p = 3{,}3$ The mean of the five runners: *Die gemiddeld van die vyf nallopers:* $\frac{6{,}7+(2k+2{,}4)+3{,}3+3{,}8+4{,}3}{5} = 7{,}7$ $2k = 18$ $\therefore k = 9$ **OR/*OF*** The mean of the five runners: *Die gemiddeld van die vyf nallopers:* $\frac{6{,}7+(2k+2{,}4)+p+3{,}8+4{,}3}{5} = 7{,}7$ $17{,}2 + 2k + p = 38{,}5$ $\therefore 2k + p = 21{,}3$ . . . . . (1) $3{,}8 - p = 4{,}3 - 3{,}8$ $\therefore p = 3{,}3$ . . . . . (2) Subs (2) into (1)/*Vervang* (2) *in* (1) $2k + 3{,}3 = 21{,}3$ $2k = 18$ $\therefore k = 9$	✓ $3{,}8 - p = 4{,}3 - 3{,}8$ ✓ $p = 3{,}3$ ✓correct use of formula *korrekte gebruik van formule* ✓substitution p and $\bar{x}$ correctly into formula *Vervang p en $\bar{x}$ korrek in formule* ✓answer/*antwoord* ✓ $\frac{6{,}7+(2k+2{,}4)+p+3{,}8+4{,}3}{5} = 7{,}7$ ✓ $2k + p = 21{,}3$ ✓ $3{,}8 - p = 4{,}3 - 3{,}8$ ✓ $p = 3{,}3$ ✓ answer/*antwoord*	(5) (5)
			[11]

QUESTION/*VRAAG* 3



	SOLUTION/*OPLOSSING*	**Mark descriptions** ***Punte omskrywing***	**Marks** ***Punte***
3.1	$m_{OB} = \tan 108{,}43°$ $\therefore m_{OB} = -3$	✓ substitution/*substitusie* ✓ correct answer/*korrekte antwoord*	(2)
3.2	Since/*Omdat* AB ⊥ OB $\therefore m_{AB} = \frac{1}{3}$ $\therefore y = \frac{1}{3}x + 10$ **OR/*OF*** Since/*Omdat* AB ⊥ OB $\therefore m_{AB} = \frac{1}{3}$ $y - y_1 = \frac{1}{3}(x - x_1)$ Substituting point/*Vervang punt* (0;10) $y - 10 = \frac{1}{3}(x - 0)$ $\therefore y = \frac{1}{3}x + 10$	✓gradient of AB *gradiënt van AB* ✓ answer/*antwoord* ✓gradient of AB *gradiënt van AB* ✓ answer/*antwoord*	(2) (2)

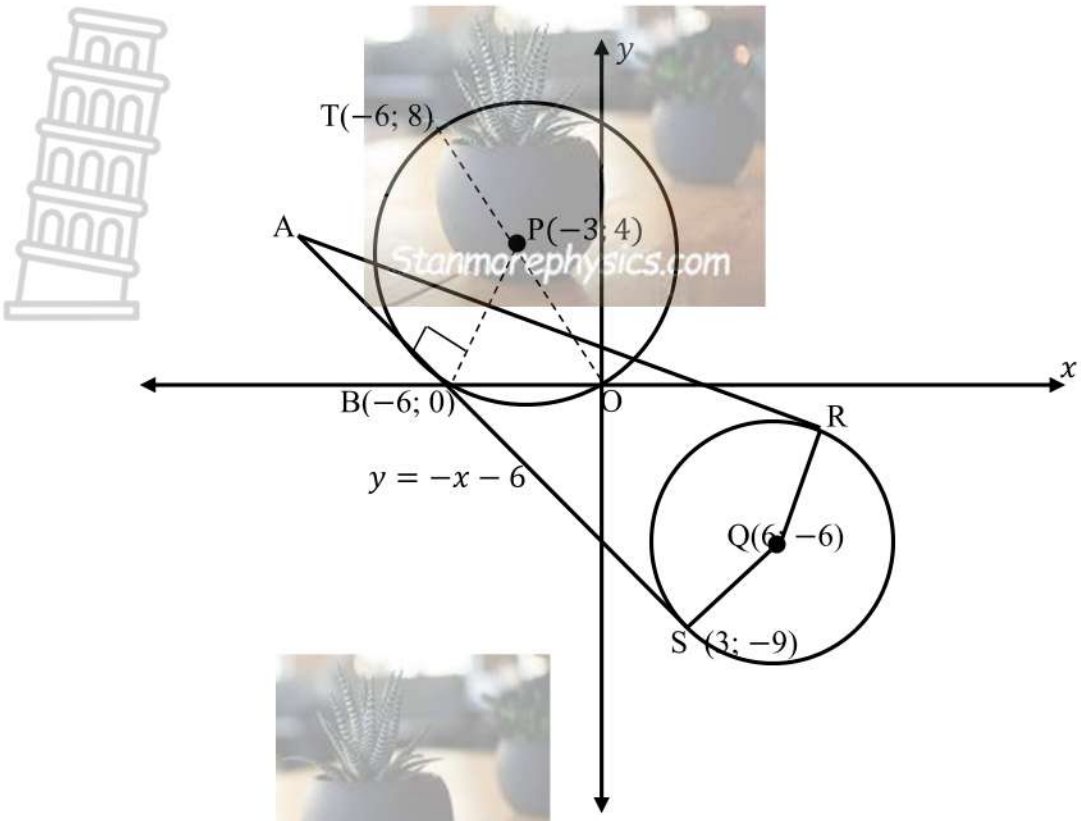


	SOLUTION/*OPLOSSING*	Mark descriptions ***Punte omskrywing***	Marks ***Punte***
3.3	At B, $\frac{1}{3}x + 10 = -3x$ $x + 30 = -9x$ $10x = -30$ $\therefore x = -3$ $\therefore y = 9$ $\quad \therefore$ B $(-3; 9)$	✓ equate/*gelykstel* ✓ x – value/x - *waarde* ✓ y – value/y - *waarde*	(3)
3.4	$BO = \sqrt{(0+3)^2 + (0-9)^2}$ $= 3\sqrt{10}$ BE = EA and/*en* EF∥AO $\therefore$ BF $= \frac{1}{2}$BO (line from midpt ∥ to 2nd side/*lyn uit midpt//aan 2de sy*) $\therefore$ BF $= \frac{3\sqrt{10}}{2}$ **OR/*OF***	✓ correct substitution of B and O *korrekte substitusie van B en O* ✓ BO $= 3\sqrt{10}$ ✓ S ✓ BF $= \frac{3\sqrt{10}}{2}$	(4)

	E is the midpoint of AB and EF//AO *E is die midpt van AB en EF//AO* $\therefore$ F is the midpoint of OB (line from midpt ∥ to 2nd side) $\therefore$ *F is die midpt van OB (lyn uit midpt//aan 2de sy)* $F\left(\frac{0-3}{2};\frac{0+9}{2}\right)$ $\quad \therefore F\left(\frac{-3}{2};\frac{9}{2}\right)$ $BF = \sqrt{\left(-\frac{3}{2}+3\right)^2+\left(\frac{9}{2}-9\right)^2}$ $= \frac{3\sqrt{10}}{2}$ **OR/*OF*** $\frac{1}{3}x + 10 = 0$ $x = -30$ $E\left(\frac{-30-3}{2};\frac{0+9}{2}\right)$ $E = \left(-16\frac{1}{2};4\frac{1}{2}\right)$ $F\left(x;\frac{9}{2}\right)$ $y = -3x$ $-3x = \frac{9}{2}$ $x = -\frac{3}{2}$ $F\left(-\frac{3}{2};\frac{9}{2}\right)$ $BF = \sqrt{\left(-\frac{3}{2}+3\right)^2+\left(\frac{9}{2}-9\right)^2}$ $= \frac{3\sqrt{10}}{2}$	✓ S ✓ coordinates of F *koördinate van F* ✓ substitution/*substitusie* ✓ $BF = \frac{3\sqrt{10}}{2}$ ✓ coordinates of E *koördinate van E* ✓ equate/*gelykstel* ✓ substitution/*substitusie* ✓ $BF = \frac{3\sqrt{10}}{2}$	(4) (4)
3.5	Area Δ CBO $= \frac{1}{2}$. BC . OB Area Δ CBO $= \frac{1}{2}.(\sqrt{10}).(3\sqrt{10})$ Area Δ CBO = 15 square units/*vierkante eenheid* **OR/*OF***	✓ correct use of area formula *korrekte gebruik van opp formule* ✓ BC $= \sqrt{10}$ ✓ OB$= 3\sqrt{10}$ ✓ answer/*antwoord*	(4)

	$\hat{BOC} = 108{,}43° - 90°$ $= 18{,}43°$ $BF = \frac{3\sqrt{10}}{2}$ Area of $\Delta ABC = \frac{1}{2}(BO)(OC)\sin 18{,}43°$ $= \frac{1}{2}(3\sqrt{10})(10)\sin 18{,}43°$ $= 15$ units^2/ *eenh*^{2}	✓ $18{,}43°$ ✓ BF ✓ OC = 10 ✓ answer/*antwoord*	(4)
3.6	$\tan\theta = \frac{1}{3}$ $\theta = 18{,}43°$ $\alpha = 90° - 18{,}43°$ $= 71{,}57°$ **OR/*OF*** $C\hat{O}B = 108{,}43° - 90°$ $= 18{,}43°$ $\alpha = B\hat{C}O$ vert opp ∠'s/*regoorst hoeke* $B\hat{C}O = 180° - 90° - 18{,}43°$ sum of ∠'s in Δ *binne ∠'e van Δ* $\therefore \alpha = 71{,}57°$	✓ $\tan\theta = \frac{1}{3}$ ✓ $\theta = 18{,}43°$ ✓ answer/*antwoord* ✓ $108{,}43° - 90°$ ✓ $18{,}43°$ ✓ answer/*antwoord*	(3) (3)
			[18]

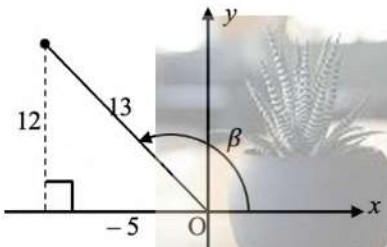
QUESTION/*VRAAG* 4



	SOLUTION/*OPLOSSING*	**Mark descriptions** ***Punte omskrywing***	**Marks** ***Punte***
4.1	$r^2 = (-3)^2 + (4)^2$ (Pythagoras) $\therefore r^2 = 25$ $\therefore (x+3)^2 + (y-4)^2 = 25$	✓ $r^2 = (-3)^2 + (4)^2$ ✓ value of r^2/ *waarde van* r^2 ✓ equation of circle *vergelyking van sirkel*	(3)
4.2	$x_P = \frac{x_O + x_T}{2}$ $\quad y_P = \frac{y_O + y_T}{2}$ $-3 = \frac{0+x_T}{2}$ $\quad 4 = \frac{0+y_T}{2}$ $\therefore x_T = -6$ $\quad \therefore y_T = 8$ $\therefore$ T $(-6\ ;\ 8)$	✓ $-3 = \frac{0+x_T}{2}$ ✓ $4 = \frac{0+y_T}{2}$ ✓ T $(-6\ ;\ 8)$ Answer only: Full marks *Slegs Antwoord: Volpunte*	(3)
4.3	$x^2 - 12x + y^2 + 12y + 54 = 0$ $x^2 - 12x + 36 + y^2 + 12y + 36 = -54 + 36 + 36$ $(x-6)^2 + (y+6)^2 = 18$ $\therefore$ Q $(6\ ;\ -6)$	✓ completing the square LHS *voltooi die vierkant LHS* ✓$(x-6)^2 + (y+6)^2$ ✓ Q $(6\ ;\ -6)$	(3)

	SOLUTION/*OPLOSSING*	**Mark descriptions** ***Punte omskrywing***	**Marks** ***Punte***
4.4	$m_{QS} = \frac{-6-(-9)}{6-3}$ $\therefore m_{QS} = 1$ $\therefore m_{AS} = -1$ (tan⊥rad/*raakl* ⊥ *radius*) $y - y_1 = -1(x - x_1)$ Subs point/*Vervang punt* S(3; −9) $y + 9 = -(x - 3)$ $\therefore y = -x - 6$ **OR/*OF*** $m_{QS} = \frac{-6-(-9)}{6-3}$ $\therefore m_{QS} = 1$ $\therefore m_{AS} = -1$ (tang⊥rad/*raakl* ⊥ *radius*) $y = -x + c$ Subs point/*Vervang punt* S (3; −9) $-9 = -3 + c$ $\therefore c = -6$ $\therefore y = -x - 6$	✓correct substitution into gradient formula *korrekte substitusie* ✓ $m_{QS} = 1$ ✓ $m_{AS} = -1$ ✓ substituting point S(3; −9) *substitusie van punt* ✓ answer/*antwoord* ✓ correct substitution into gradient formula *korrekte substitusie* ✓ $m_{QS} = 1$ ✓ $m_{AS} = -1$ ✓ substituting point S(3; −9) *substitusie van punt* ✓ answer/*antwoord*	(5) (5)
4.5	• SQ = QR = $3\sqrt{2}$ (radii) • AS = AR (tang from same pt/ *rklyne vanuit dieselfde punt*) ∴ ASQR is a Kite (two pairs of adjacent sides equal) ∴ ASQR *is 'n vlieër (2 pare aangrensende sye is gelyk)*	✓ kite/*vlieër* ✓ reason/*rede*	(2)
4.6	$PQ = \sqrt{(-3-6)^2 + (4+6)^2}$ $= \sqrt{181}$ $PQ = r_P + k.r_Q$ OR/OF $PQ = r_Q - kr_p$ $\sqrt{181} = 5 + \sqrt{18}\,k$ $\sqrt{181} = \sqrt{18}k - 5$ $\sqrt{18}k = \sqrt{181} - 5$ $\sqrt{181} + 5 = \sqrt{18}k$ $k = 1{,}99$ $k = 4{,}35$	✓ correct substitution into distance formula *korrekte substitusie* ✓ length of/*lengte van* PQ ✓ k = 1,99 ✓ k = 4,35	(4)
			[20]

QUESTION/*VRAAG* 5

	SOLUTIONS/OPLOSSINGS	**Mark descriptions** ***Punte omskrywing***	**Marks** ***Punte***
5.1	$\sin\beta = \frac{12}{13}$  $x^2 + (12)^2 = (13)^2$ *(Pythagoras)* $\therefore x = -5$ $\sin 2\beta = 2\sin\beta\cos\beta$ $= 2\left(\frac{12}{13}\right)\left(\frac{-5}{13}\right)$ $= -\frac{120}{169}$	✓ diagram in correct quadrant *diagram in korrekte kwadrant* ✓ $x = -5$ ✓ substitution into double angle / *vervang in dubbelhoek* ✓answer / *antwoord*	(4)
5.2.1	$\sin(\alpha - \theta)$ $= \cos[90° - (\alpha - \theta)]$ $= \cos[90° - \alpha + \theta]$ $= \cos[(90° - \alpha) - (-\theta)]$ $= \cos(90° - \alpha).\cos(-\theta) + \sin(90° - \alpha).\sin(-\theta)$ $= \sin\alpha.\cos\theta + \cos\alpha.-\sin\theta$ $= \sin\alpha.\cos\theta - \cos\alpha.\sin\theta$ OR/OF $\sin(\alpha - \theta) = \cos[90° - (\alpha - \theta)]$ $= \cos[(90° + \theta) - \alpha]$ $= \cos(90° + \theta)\cos\alpha + \sin(90° + \theta)\sin\alpha$ $= -\sin\theta\cos\alpha + \cos\theta\sin\alpha$ $= \sin\alpha.\cos\theta - \cos\alpha.\sin\theta$	✓co-ratio/*ko-funksie* ✓ compound angle *saamgestelde hoek* ✓reduction/*reduksie* ✓co-ratio/*ko-funksie* ✓ compound angle *saamgestelde hoek* ✓reduction/*reduksie*	(3)
5.2.2	$\sin 76°.\sin 44° - \sin 14°.\sin 46°$ $= \sin 76°.\cos 46° - \cos 76°.\sin 46°$ $= \sin(76° - 46°)$ $= \sin 30°$ $= \frac{1}{2}$	✓ $\cos 46°$ and/*en* $\cos 76°$ ✓ $\sin(76° - 46°)$ ✓ answer/*antwoord*	

	OR/*OF*		(3)
	$\sin 76°.\sin 44° - \sin 14°.\sin 46°$ $= \cos 14°.\cos 46° - \sin 14°.\sin 46°$ $= \cos(14° + 46°)$ $= \cos 60°$ $= \frac{1}{2}$	✓ $\cos 14°$ and/*en* $\cos 46°$ ✓ $\cos(14° + 46°)$ ✓ answer/*antwoord*	(3)
5.3	$f(x) = \sin x$ $f(x+h) = \sin(x + h)$ $= \sin x.\cos h + \cos x.\sin h$ $\frac{f(x+h)-f(x)}{h}$ $= \frac{\sin x.\cos h + \cos x.\sin h - (\sin x)}{h}$ $= \frac{\sin x.\cos h - \sin x + \cos x.\sin h}{h}$ $= \frac{\sin x(\cos h - 1) + \cos x.\sin h}{h}$ $= \frac{\sin x(\cos h - 1)}{h} + \frac{\cos x.\sin h}{h}$ $= \sin x\left(\frac{\cos h - 1}{h}\right) + \cos x\left(\frac{\sin h}{h}\right)$ **OR/*OF*** $\frac{f(x+h)-f(x)}{h}$ $= \frac{\sin(x+h) - (\sin x)}{h}$ $= \frac{\sin x.\cos h + \cos x.\sin h - (\sin x)}{h}$ $= \frac{\sin x.\cos h - \sin x + \cos x.\sin h}{h}$ $= \frac{\sin x(\cos h - 1) + \cos x.\sin h}{h}$ $= \frac{\sin x(\cos h - 1)}{h} + \frac{\cos x.\sin h}{h}$ $= \sin x\left(\frac{\cos h - 1}{h}\right) + \cos x\left(\frac{\sin h}{h}\right)$	✓ compound expansion/ *uitbrei van saamgestelde hoek* ✓ substitution/ *substitusie* ✓ grouping and factorising *groepering en faktorisering* ✓simplification *vereenvoudiging* ✓ substitution *substitusie* ✓ compound expansion *uitbrei van saamgestelde hoek* ✓ grouping and factorising *groepering en faktorisering* ✓ simplification *vereenvoudiging*	(4) (4)
			[14]

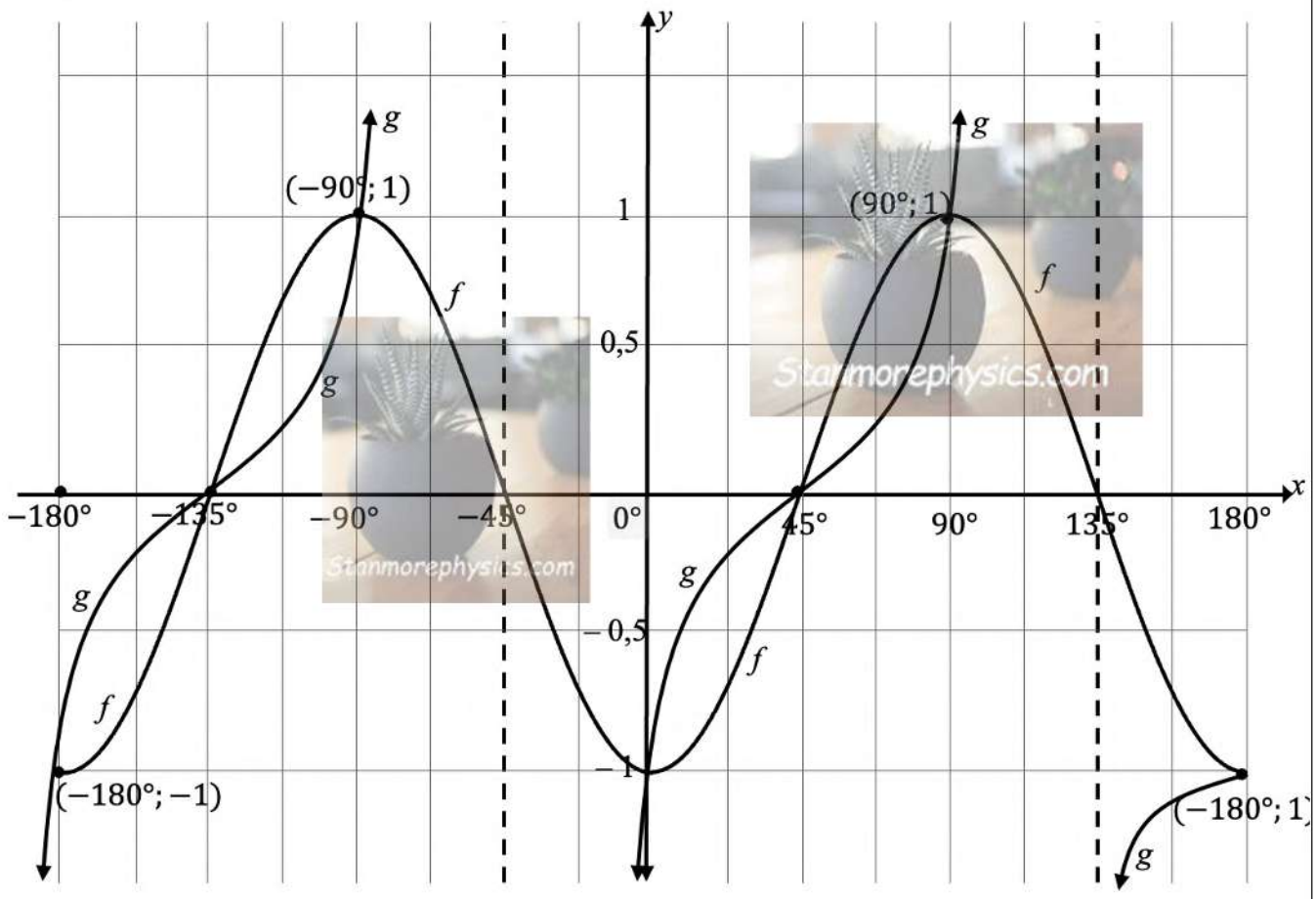
QUESTION/*VRAAG* 6

	SOLUTIONS/*OPLOSSINGS*	**Mark descriptions** *Punte omskrywing*	**Marks** *Punte*
6.1	$\frac{\tan(180°-x).\cos(180°-x)}{\cos 240°.\left(\tan^2 y-\frac{1}{\cos^2 y}\right)}$ $= \frac{-\tan x \times -\cos x}{-\cos 60°\left(\frac{\sin^2 y}{\cos^2 y}-\frac{1}{\cos^2 y}\right)}$ $= \frac{-\frac{\sin x}{\cos x}\times -\cos x}{-\frac{1}{2}\left(\frac{-(1-\sin^2 y)}{\cos^2 y}\right)}$ $= \frac{\sin x}{-\frac{1}{2}\left(\frac{-\cos^2 y}{\cos^2 y}\right)}$ $= 2\sin x$	✓ $-\tan x$ ✓ $-\cos x$ ✓ $-\cos 60°$ ✓ $-\frac{\sin x}{\cos x}$ and/*en* $\frac{\sin^2 y}{\cos^2 y}$ ✓ $-\cos^2 y$ ✓ $-\frac{1}{2}$ ✓ $2\sin x$	(7)
6.2	LHS $= \frac{\sin 3x}{\sin x\cos x}$ $= \frac{\sin(2x+x)}{\sin x\cos x}$ $= \frac{\sin 2x.\cos x+\cos 2x.\sin x}{\sin x\cos x}$ $= \frac{2\sin x.\cos x.\cos x+(2\cos^2 x-1).\sin x}{\sin x\cos x}$ $= \frac{2\sin x.\cos^2 x+2\sin x.\cos^2 x-\sin x}{\sin x\cos x}$ $= \frac{4\sin x.\cos^2 x-\sin x}{\sin x\cos x}$ $= \frac{\sin x\,(4\cos^2 x-1)}{\sin x\cos x}$ $= \frac{4\cos^2 x-1}{\cos x}$ $\therefore$ LHS = RHS	✓ compound expansion *brei saamgestelde hoek uit* ✓ $2\sin x\,.\cos x$ ✓ $2\cos^2 x-1$ ✓ simplification/ *vereenvoudiging* ✓ common factor/ *gemene faktor*	(5)

	SOLUTIONS/*OPLOSSINGS*	Mark descriptions *Punte omskrywing*	Marks *Punte*
6.3	$\cos x + 1 = \sin x$ $(\cos x + 1)^2 = (\sin x)^2$ $\cos^2 x + 2\cos x + 1 = \sin^2 x$ $\cos^2 x + 2\cos x + 1 = 1 - \cos^2 x$ $2\cos^2 x + 2\cos x = 0$ $2\cos x\,(\cos x + 1) = 0$ $\therefore \cos x = 0$ or $\cos x = -1$ for/*vir* $\cos x = 0$: ref/*verw* $\angle = 90°$ $x \neq 270^o$ $\therefore x = 90° + k.360°; k \in \mathbb{Z}$ **OR/*OF*** for/*vir* $\cos x = -1$: ref/*verw* $\angle = 0°$ $\therefore x = 180° + k.360°; k \in \mathbb{Z}$	✓ squaring both sides k*wadreer beide kante* ✓ $\sin^2 x = 1 - \cos^2 x$ ✓ factors/*faktore* ✓ both values for $\cos x$ *albei waardes van* $\cos x$ ✓ 90° OR/*OF* 90° ✓ $+ k.360°; k \in \mathbb{Z}$ ✓ $x = 180° + k.360°; k \in \mathbb{Z}$	(7)
			[19]

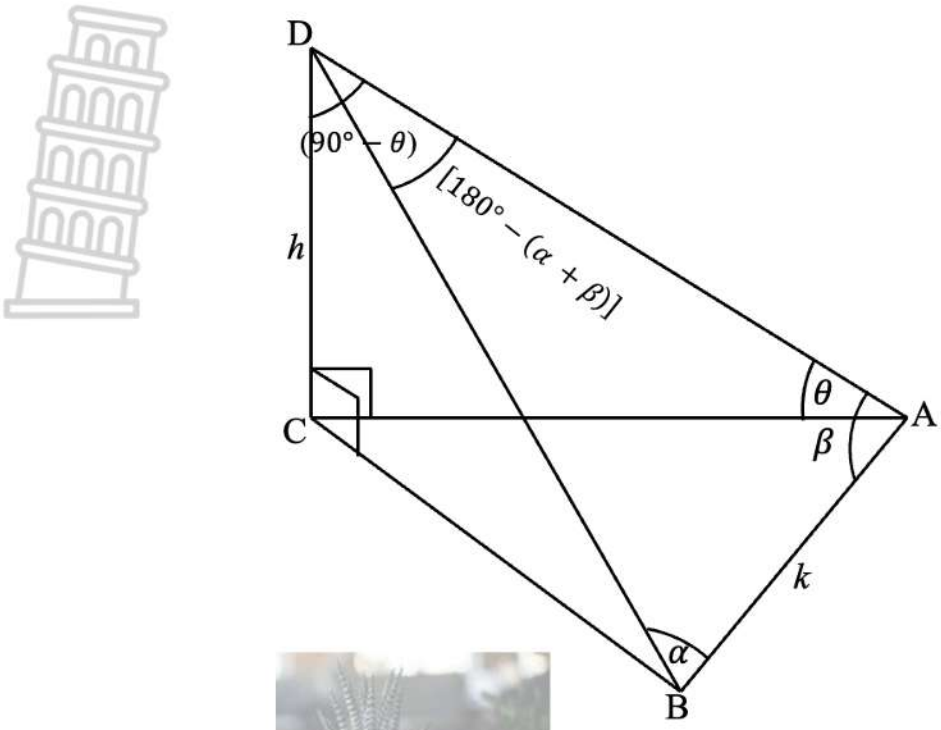
QUESTION/*VRAAG* 7

	SOLUTIONS/*OPLOSSINGS*	**Mark descriptions** ***Punte omskrywing***	**Marks** ***Punte***
7.1	Period/*Periode* is 180°	✓ answer/*antwoord*	(1)
7.2	$y \in [-1; 1]$ **OR/*OF*** $-1 \leq y \leq 1$	✓ answer/*antwoord*	(1)
7.3	✓shape/ *vorm* ✓ asymptotes/*assimptote* ✓ intercepts/*afsnitte*		(3)

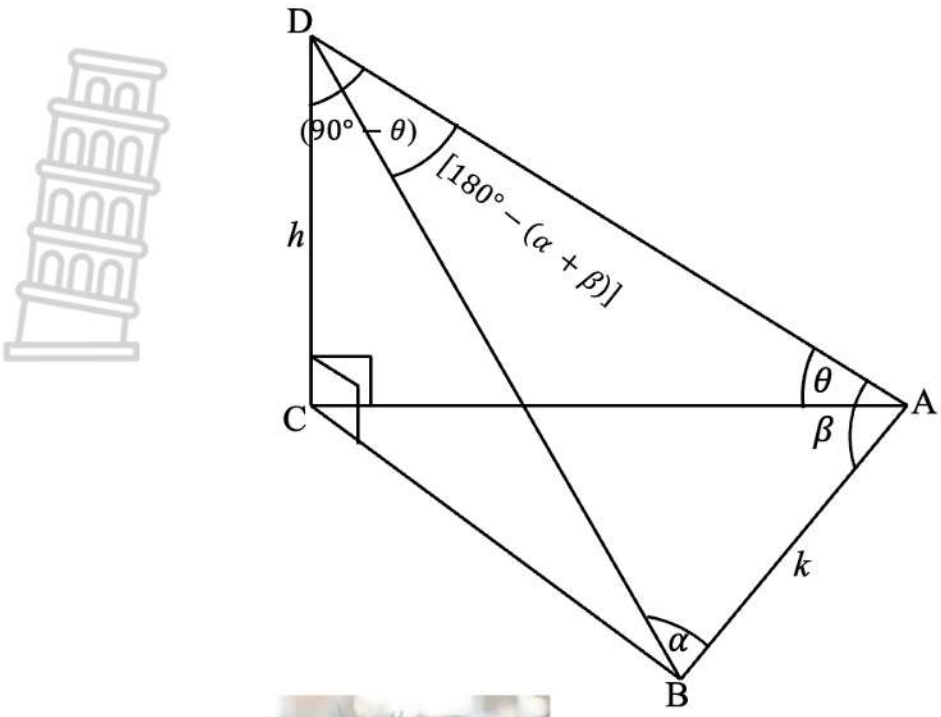


7.4	$-180° \leq x \leq -135°$ or/*of* $-90° \leq x < -45°$	✓$-180° \leq x \leq -135°$ ✓$-90° \leq x < -45°$	(2)
7.5	$h(x) = 4^{2\sin^2 x - 1}$ $h(x) = 4^{-(1-2\sin^2 x)}$ $h(x) = 4^{-\cos 2x}$ max of/*maks van* $h(x) = 4^1 = 4$ Answer only: Full marks *Slegs Antwoord: Volpunte*	✓ *max* = 1 ✓ answer/ *antwoord*	(2)
			[9]

QUESTION/*VRAAG* 8

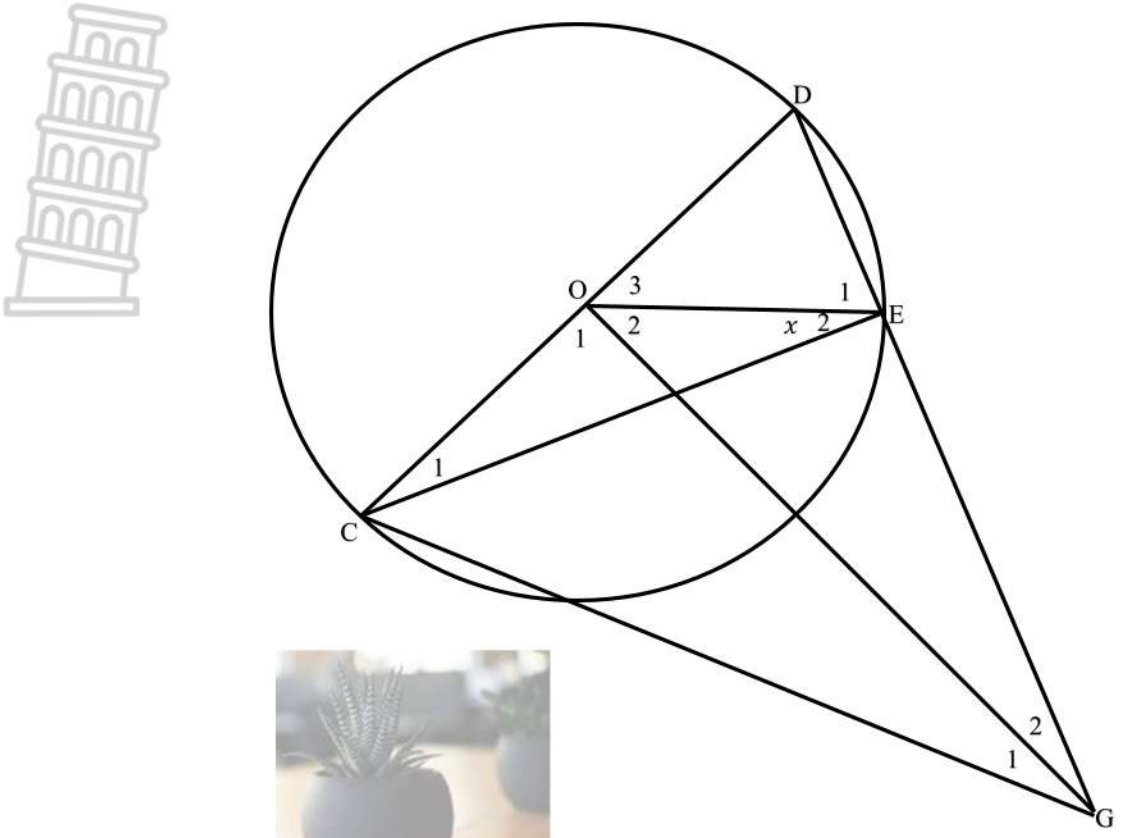


	SOLUTIONS/*OPLOSSINGS*	**Mark descriptions** ***Punte omskrywing***	**Marks** ***Punte***
8.1	$C\hat{D}A = 90° - \theta$ [sum of angles in Δ/*binne hoeke van* Δ]	✓ $C\hat{D}A = 90° - \theta$	(1)
8.2	$\frac{h}{AD} = \sin\theta$ $\therefore AD = \frac{h}{\sin\theta}$ **OR/*OF*** $\frac{h}{AD} = \cos(90° - \theta)$ $\frac{h}{AD} = \sin\theta$ $\therefore AD = \frac{h}{\sin\theta}$	✓ $\frac{h}{AD} = \sin\theta$ ✓answer/*antwoord* ✓ $\cos(90° - \theta) = \sin\theta$ ✓ answer/*antwoord*	(2) (2)



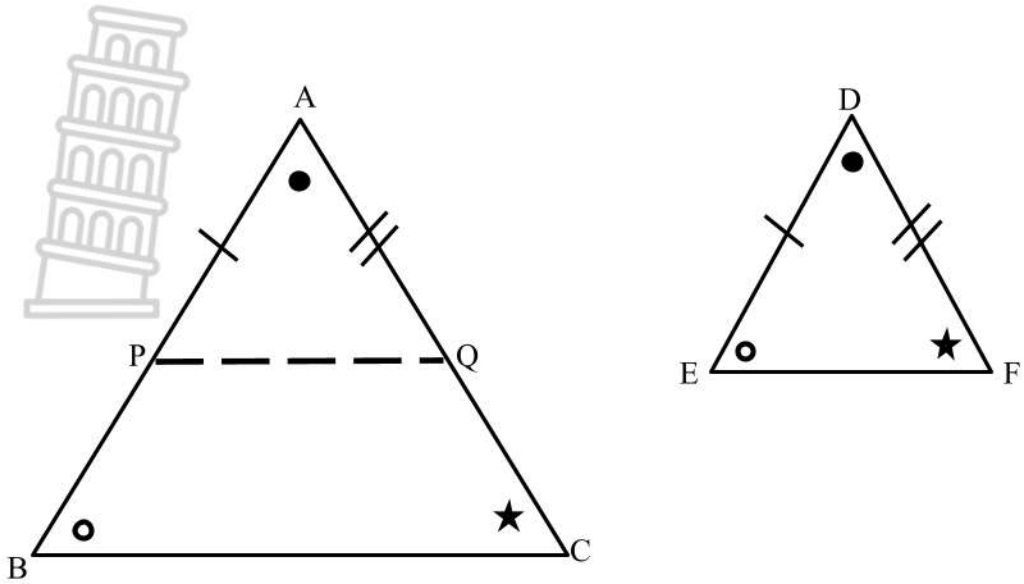
8.3	In Δ ABD $\therefore B\hat{D}A = 180° - (\alpha + \beta)$ [sum of angles in Δ/ *binne hoeke van* Δ]] $\frac{AD}{\sin D\hat{B}A} = \frac{AB}{\sin B\hat{D}A}$ $\frac{AD}{\sin \alpha} = \frac{k}{\sin[180°-(\alpha+\beta)]}$ $\therefore AD = \frac{k\,.\,\sin\alpha}{\sin(\alpha+\beta)}$ From/*Uit* 8.2 $AD = \frac{h}{\sin\theta}$ $\frac{k\,.\,\sin\alpha}{\sin(\alpha+\beta)} = \frac{h}{\sin\theta}$ $h = \frac{k\,.\,\sin\alpha\,\sin\theta}{\sin(\alpha+\beta)}$ $CD = h = \frac{k\,.\,\sin\alpha\,\sin\theta}{\sin(\alpha+\beta)}$	✓ $B\hat{D}A = 180° - (\alpha + \beta)$ ✓ correct substitution into sine rule/*korrekte substitusie in sinreël* ✓ $\sin(\alpha + \beta)$ ✓ $AD = \frac{k\,.\,\sin\alpha}{\sin(\alpha+\beta)}$ ✓ equating the lengths of AD *stel die lengtes van AD gelyk*	(5)
8.4	$CD = \frac{95 \times \sin 32{,}7° \times \sin 43{,}9°}{\sin(32{,}7°+61°)}$ $CD = 35{,}66167701$ $CD = 36\ m$	✓ substitution/*substitusie* ✓ answer/*antwoord*	(2)
			[10]

QUESTION/*VRAAG* 9

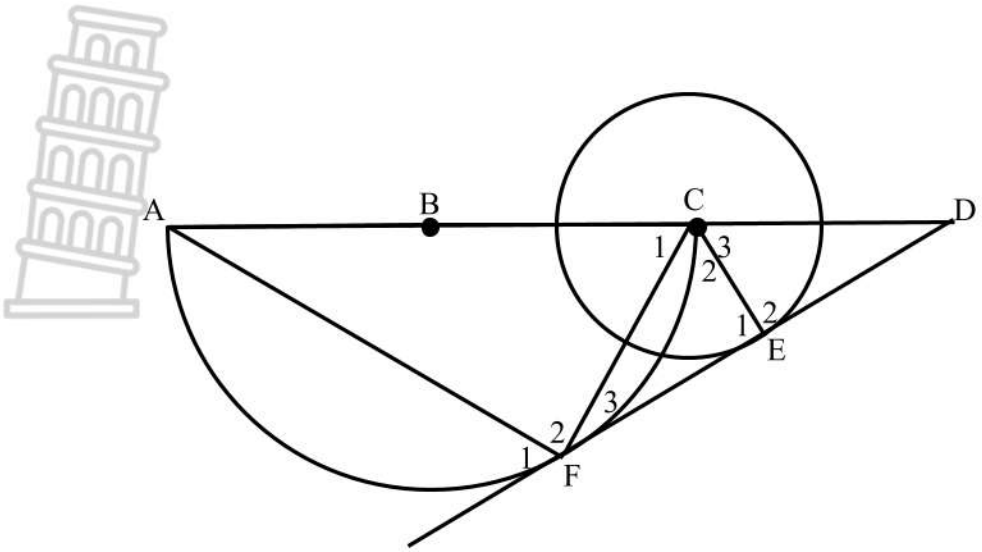


	SOLUTION/*OPLOSSING*	**Mark descriptions** *Punte omskrywing*	**Marks** *Punte*
9.1	$\hat{O}_1 = 90°$ given/*gegee* $C\hat{E}D = 90°$ angle in semi-circle/ *hoek in halwe sirkel* $\therefore C\hat{E}G = 90°$ adj sup ∠'s/∠'*e op reguitlyn* $\therefore \hat{O}_1 = C\hat{E}G$ ∴ OCGE is a cyclic quad conv of ∠'s in same seg ∴ OCGE *is 'n krdevierh omgek ∠'e in selfde sirkel segment*	✓ S/R ✓ S ✓ R	(3)
9.2	$\hat{G}_1 = \hat{E}_2 = x$ ∠'s in same segment *∠'e in selfde sirkel segment* $\hat{C}_1 = \hat{E}_2 = x$ ∠'s opp radii/equal sides *∠'e teen gelyke sye* $\hat{G}_2 = \hat{C}_1 = x$ ∠'s in same segment *∠'e in selfde sirkel segment*	✓ S/R ✓ S ✓ S/R	(3)
9.3	$\hat{O}_3 = 2x$ ∠ at centre =2× ∠ at circumference/ ext ∠ of Δ *midpts ∠ is 2× omtreks∠'/buite ∠ van Δ*	✓ S ✓ R	(2)
			[8]

QUESTION/*VRAAG* 10



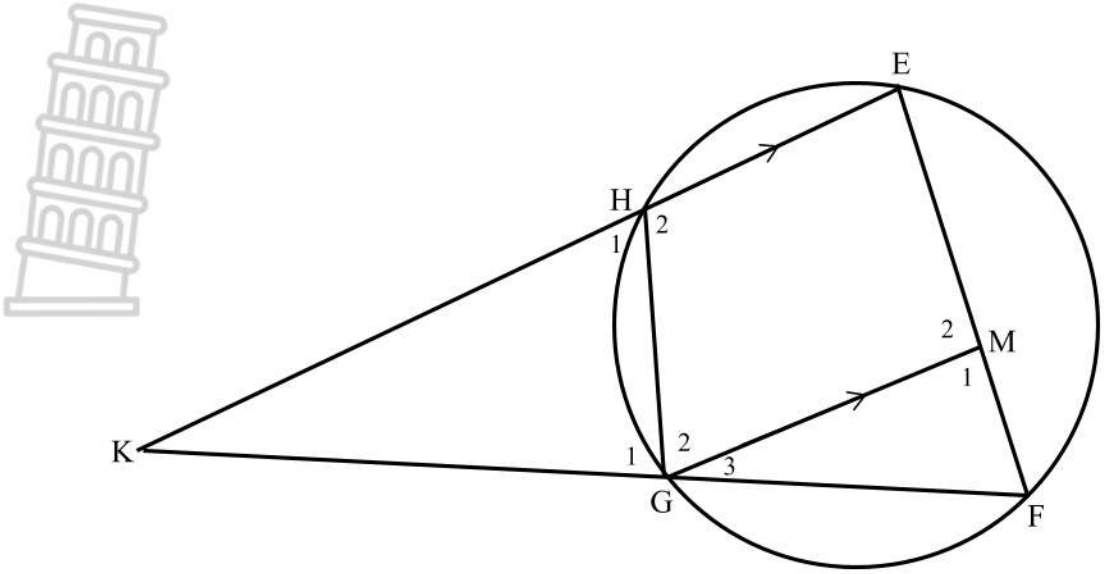
10.1	On AB, mark off AP = DE and on AC mark off AQ = DF *Op AB merk af AP=DE en op AC merk af AQ=DF* In ΔAPQ and/*en* ΔDEF: i) $\hat{A} = \hat{D}$ given/*gegee* ii) AP = DE construction/*konstruksie* iii) AQ = DF construction/*konstruksie* ∴ ΔAPQ ≡ ΔDEF s∠s $A\hat{P}Q = \hat{E}$ ΔAPQ ≡ ΔDEF $\hat{E} = \hat{B}$ given/*gegee* ∴ $A\hat{P}Q = \hat{B}$ ∴ PQ ∥ BC corr ∠'s are =/*ooreenk ∠'e is gelyk* $\frac{AP}{AB} = \frac{AQ}{AC}$ prop th/*ewered st*, PQ ∥ BC / line ∥ one side of Δ / *lyn ∥ een sy van* Δ but/*maar* AP = DE and/*en* AQ = DF ∴ $\frac{DE}{AB} = \frac{DF}{AC}$	✓ Construction/ *Konstruksie* ✓ S/R ✓ S ✓ R ✓ S ✓ R	(6)



	SOLUTION/*OPLOSSING*	Mark descriptions *Punte omskrywing*	Marks *Punte*
10.2.1	In Δ AFC and/*en* Δ FEC		
	I. $\hat{A} = \hat{F}_3$ (tan – chord theorem) *(rklyn krd stelling)*	✓ S ✓R	
	II. $\hat{F}_2 = 90°$ (∠ in semi - circle) *(∠ in halwe sirkel)*	✓ S	
	$\hat{E}_1 = 90°$ (tangent ⊥ radius) *(rklyn ⊥ radius)*	✓ S/R	
	$\therefore \hat{F}_2 = \hat{E}_1$		
	III. $\hat{C}_1 = \hat{C}_2$ (sum of ∠s in Δ) *(binne hoeke van Δ)*		
	$\therefore$ Δ AFC/// Δ FEC (∠∠∠)	✓ R	
	OR/*OF*		
	In Δ AFC and/*en* Δ FEC		
	I. $\hat{A} = \hat{F}_3$ (tan – chord theorem) *(rklyn krd stelling)*	✓ S ✓R	
	II. $\hat{F}_2 = 90°$ (∠ in semi - circle) *(∠ in halwe sirkel)*	✓ S	
	$\hat{E}_1 = 90°$ (tangent ⊥ radius) *(rklyn ⊥ radius)*	✓ S/R	
	$\therefore \hat{F}_2 = \hat{E}_1$		
	III. $\hat{C}_1 = \hat{C}_2$ (sum of ∠s in Δ) *(binne hoeke van Δ)*	✓ S/R	(5)

10.2.2 (a)	EC = p BC = 2p AC = 4*p* $\frac{FC}{EC} = \frac{AC}{FC}$ (Δ AFC/// Δ FEC) $FC^2 = AC.EC$ $\therefore FC^2 = 4p \times p$ $FC = \sqrt{4p^2}$ $\therefore FC = 2p$	✓ AC = 4*p* ✓ S/R ✓ substitution/*substitusie* ✓ answer/*antwoord*	(4)
10.2.2 (b)	$FE^2 = FC^2 - CE^2$ (Pythagoras) $FE^2 = (2p)^2 - p^2$ $\therefore FE = \sqrt{3}p$ $\therefore FD = 2\sqrt{3}p$ **OR/*OF*** $\cos 30° = \frac{FE}{2p}$ $\frac{\sqrt{3}}{2} = \frac{FE}{2p}$ $\therefore FE = \sqrt{3}p$ $\therefore FD = 2\sqrt{3}p$	✓ correct substitution into Pythagoras *korrekte substitusie in Pythagoras* ✓ FE= $\sqrt{3}p$ ✓ answer/*antwoord* ✓ correct ratio and substitution *korrekte verhouding en substitusie* ✓ FE= $\sqrt{3}p$ ✓ answer/*antwoord*	(3) (3)
			[18]

QUESTION/*VRAAG* 11



11.1.1	In ΔKHG and/*en* ΔKFE: 1) $\widehat{K} = \widehat{K}$ common/*gemeenskaplik* 2) $\widehat{H_1} = \widehat{F}$ ext ∠ of cyclic quad *buite ∠ van krdevierh* 3) $\widehat{G_1} = \widehat{E}$ sum of ∠s in Δ *binne hoeke van Δ* ∴ ΔKHG///ΔKFE ∠∠∠ ∴ $\frac{KG}{KE} = \frac{HG}{FE}$ $KG \cdot EF = KE \cdot HG$ but/*maar* $KG = EF$ ∴ $EF^2 = KE \cdot GH$	✓ S ✓ S ✓ R ✓ R ✓ S ✓ substitution KG = EF	(6)
11.1.2	$\frac{EF}{EM} = \frac{KF}{KG}$ prop theorem/*ewered st* EK∥ MG / line ∥ one side of Δ / *lyn* ∥ *een sy* Δ EF. KG = EM. KF but/*maar* EF = KG ∴ $KG^2 = EM. KF$	✓ S ✓R ✓ substitution KG = EF	(3)
11.2	EF = KG given/*gegee* $EF^2 = KG^2$ ∴ EM. KF = KE · GH $EM = \frac{KE \cdot GH}{KF}$ $= \frac{20(4)}{16}$ = 5 units/*eenhede*	✓ S ✓ substitution/*substitusie* ✓ answer/*antwoord*	(3)
			[12]

TOTAL/*TOTAAL*: 150