



GAUTENG PROVINCE
EDUCATION
REPUBLIC OF SOUTH AFRICA

PREPARATORY EXAMINATION

2024

10612

MATHEMATICS

Stanmorephysics.com
(PAPER 2)

MATHEMATICS: Paper 2

TIME: 3 hours

MARKS: 150



P.T.O.



PREPARATORY EXAMINATION 2024

CANDIDATE'S NAME																	
DATE												BOOK NUMBER		OF		BOOKS	
TEACHER											PAPER NUMBER	2					
SUBJECT NAME	MATHEMATICS (10612)																

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						
TOTAL										TOTAL						

READ THE INSTRUCTIONS ON THE NEXT PAGE.

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.

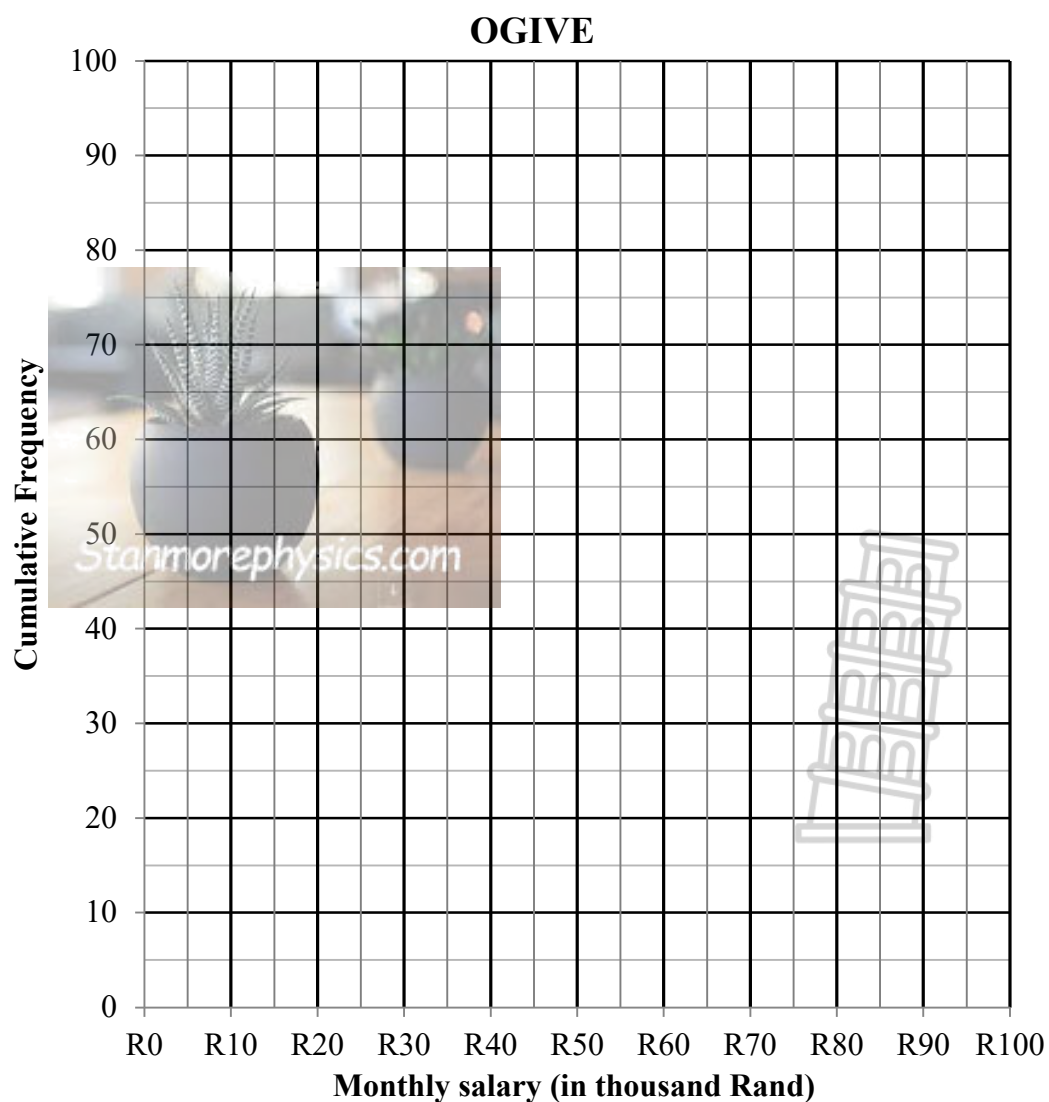
1. This question paper consists of 10 questions. Answer ALL questions in the spaces provided.
2. Clearly show ALL calculations, diagrams, graphs, et cetera that you have used in determining your answers.
3. Answers only will NOT necessarily be awarded full marks.
4. You may use an approved scientific 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.

QUESTION 1

The table below shows the monthly salaries of 100 employees at Adams Law.

Monthly salary (in thousand Rand)	Number of employees	Cumulative frequency
$R0 < x \leq R10$	3	
$R10 < x \leq R20$	4	
$R20 < x \leq R30$	13	
$R30 < x \leq R40$	20	
$R40 < x \leq R50$	21	
$R50 < x \leq R60$	12	
$R60 < x \leq R70$	12	
$R70 < x \leq R80$	8	
$R80 < x \leq R90$	5	
$R90 < x \leq R100$	2	

1.1 Draw an ogive (cumulative frequency graph) to represent the data given in the table.



(4)

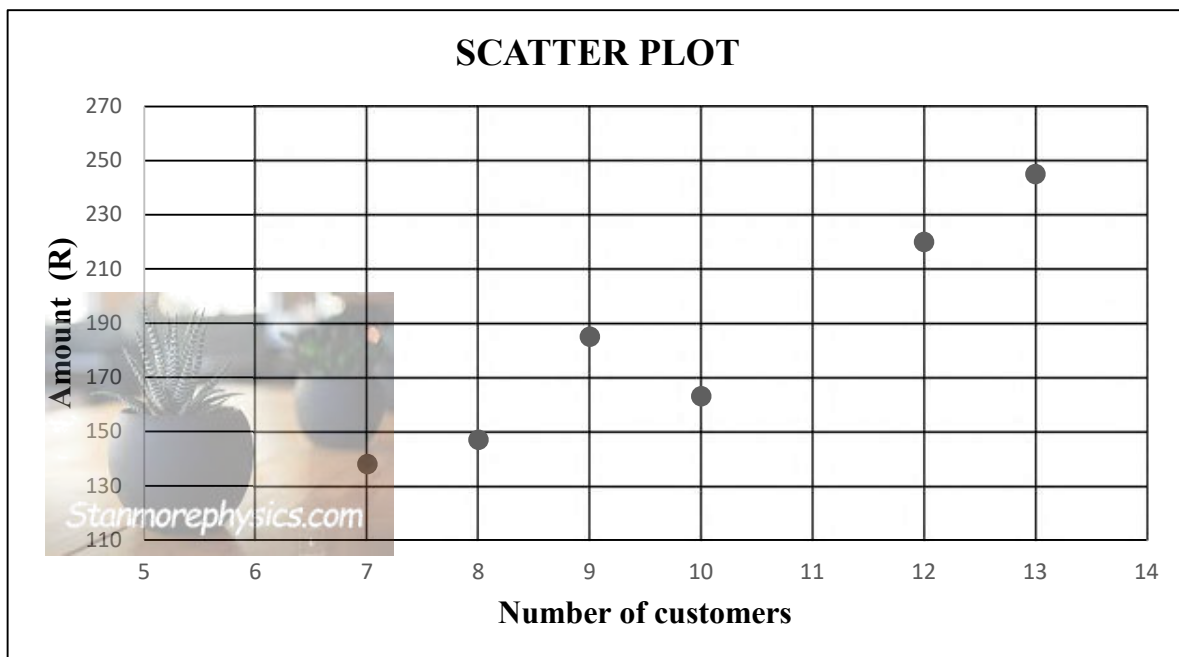
P.T.O.

1.2	Use the ogive to determine the number of employees that receive less than R35 000 per month.		(1)					
1.3	Determine the median of the data.		(1)					
1.4	The monthly salaries of the 5 employees in the interval $R80\,000 < x \leq R90\,000$ are given below: <table border="1"><tr><td>R84 000</td><td>R85 000</td><td>R87 000</td><td>R89 000</td><td>R89 000</td></tr></table> Two employees from the interval $R70\,000 < x \leq R80\,000$ are promoted and receive monthly salaries of R83 000 and R84 000 respectively.	R84 000	R85 000	R87 000	R89 000	R89 000		(1)
R84 000	R85 000	R87 000	R89 000	R89 000				
1.4.1	Determine the mean monthly salary in the interval $R80\,000 < x \leq R90\,000$.							
1.4.2	Calculate the standard deviation in this interval.		(1)					
1.4.3	Determine the percentage of employees whose monthly salary lie within one standard deviation of the mean.		(3)					
			[11]					

QUESTION 2

During a netball tournament, there are several stalls selling food and refreshments. In a period of 10 minutes at 6 stalls, the following was observed:

Stall	Number of customers	Amount of money spent (R)
1	10	163
2	7	138
3	9	185
4	12	220
5	8	147
6	13	245



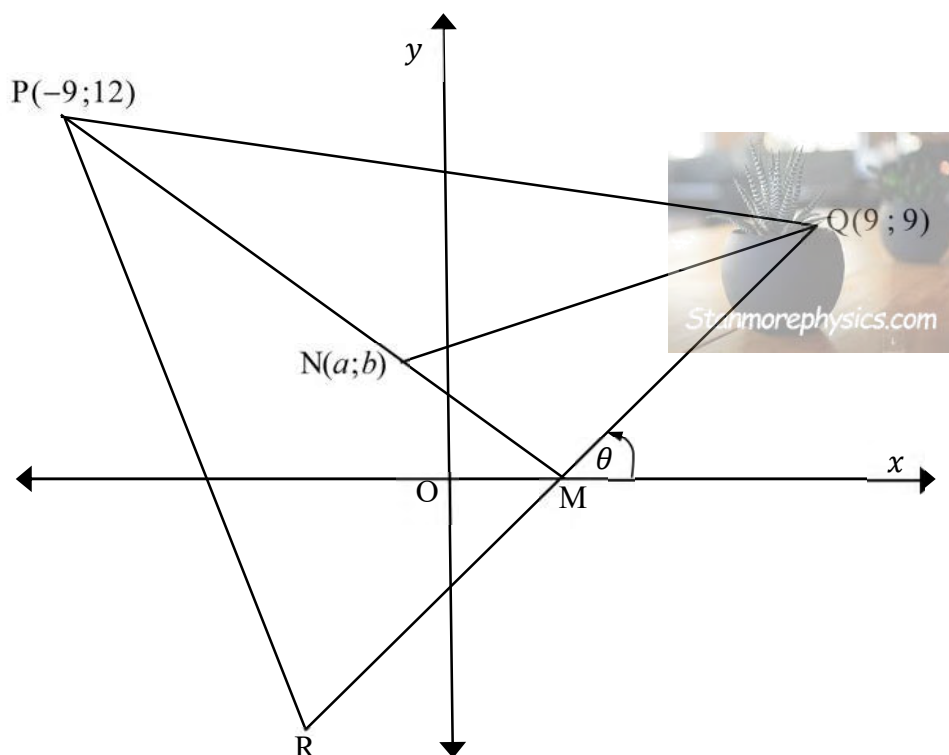
2.1	Determine the equation of the least squares regression line of the data.	(3)
2.2	Predict the amount of money spent by 11 customers.	(2)

P.T.O.

2.3	Determine the correlation coefficient of the data.	(1)
2.4	The organisers of the event think that there is a very weak positive correlation between the number of customers and the amount of money received at stalls. Motivate whether you agree or not.	(1)
2.5	At another stall, 6 customers spent a total amount of R195. If this point is included in the data, will the gradient of the least squares regression line increase or decrease? Motivate your answer without any further calculations.	(2)
		[9]

QUESTION 3

In the diagram below, $P(-9; 12)$, $Q(9; 9)$ and R are vertices of $\triangle PQR$. M is the midpoint of QR and $N(a; b)$ is a point on PM in the second quadrant. The equation of QR is given by $2y - 3x + 9 = 0$. The angle of inclination of QR is θ .



3.1	Calculate the coordinates of M , the x -intercept of line PM .	
		(2)

P.T.O.

3.2	Determine the equation of PM in the form $y = mx + c$.	(4)
3.3	Calculate the size of θ .	(2)
3.4	Show that $b = 3 - a$, if P, N and M are collinear.	(1)

Hence, determine the value of a and b if $NQ = 5\sqrt{5}$ units.

Determine the equation of a circle having centre at O, the origin, and passing through point R.

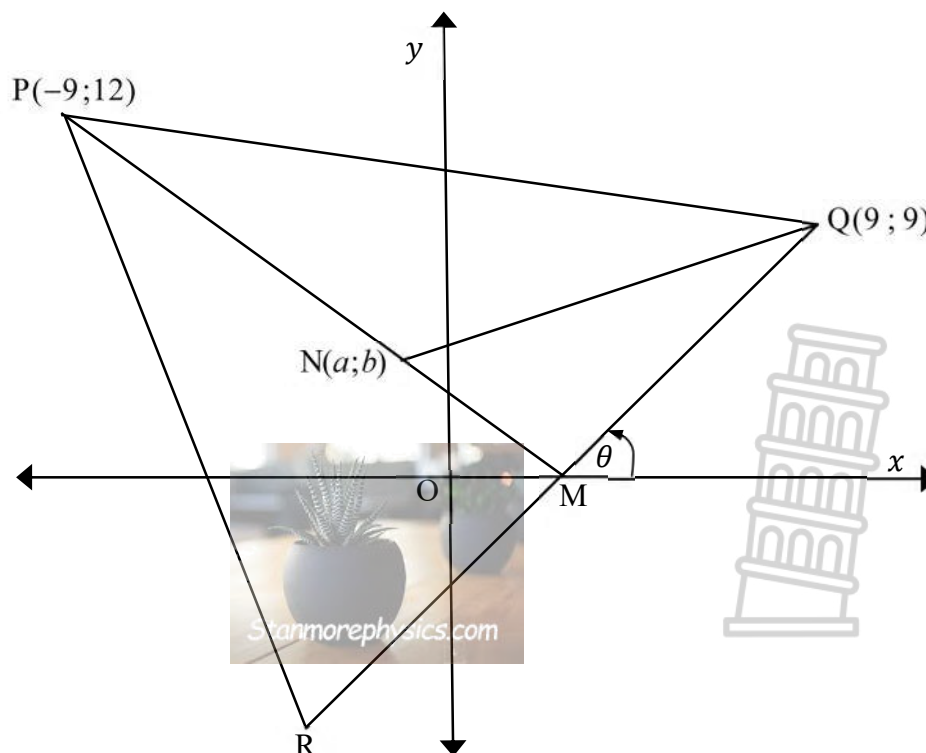
P.T.O.

3.7

The acute angle between the lines QR and the line with equation $y = mx + 4$ is 45° . Determine the possible value(s) of m .

(4)

[22]

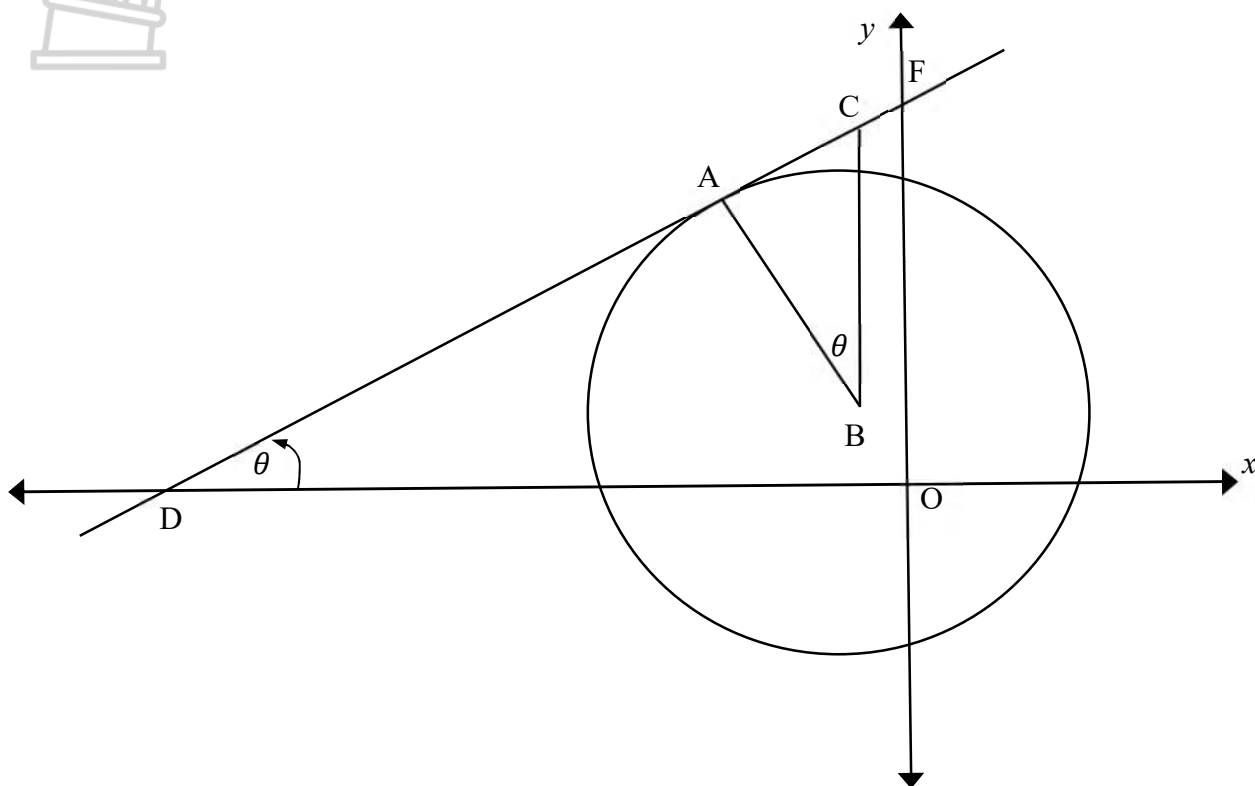


P.T.O.

QUESTION 4

In the diagram, the equation of the circle centred at B is given by $(x+1)^2 + (y-1)^2 = 20$.

DF is a tangent to the circle at A with D and F, the x- and y-intercepts respectively. C(-1; 6) is a point on DF with BC parallel to the y-axis. $\angle CBA = \angle ADO = \theta$.



4.1	Write down the coordinates of B.	(1)
4.2	Show that $AC = \sqrt{5}$.	(3)

P.T.O.



Show the



[18]

P.T.O.

QUESTION 5

5.1	Simplify $\frac{\sin^2(180^\circ + x) \cdot \sin(-x)}{-\sin(90^\circ + x) \cdot \tan x} - 1$ to a single trigonometric term.	(6)
5.2	Given: $\cos(A - B) = \cos A \cos B + \sin A \sin B$	
5.2.1	Use the above identity to deduce that $\sin(A + B) = \sin A \cos B + \cos A \sin B$.	(3)
5.2.2	Without using a calculator, simplify the following: $\cos 420^\circ \cos 15^\circ + \sin 300^\circ \cos 105^\circ$	(5)

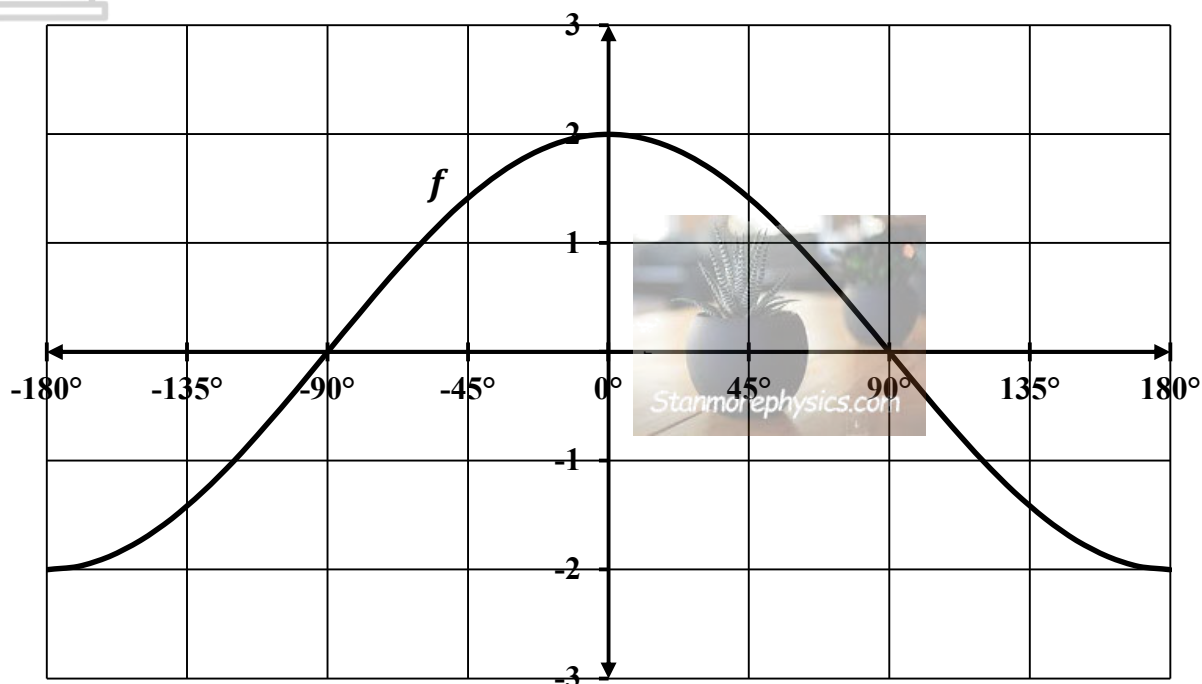


5.5	Given that $\sin \theta = \frac{1}{2}$, calculate the numerical value of $\sin 3\theta$, without using a calculator.	
		(7)
		[31]

QUESTION 6

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

- 6.1 On the grid below, draw the graph of $g(x) = -\cos 2x$ for $x \in [-180^\circ; 180^\circ]$. Clearly show all intercepts with the axes and the turning point(s) of the graph.



(3)

- 6.2 Write down the period of $2g(x+10^\circ)$.

(1)

- 6.3 Use the graphs to determine the value(s) of x in the interval $x \in [0^\circ; 180^\circ]$ for which $f(x) \cdot g(x) \leq 0$.

(2)

- 6.4 Write down the maximum value of $f(x) - g(x)$.

(1)

P.T.O.

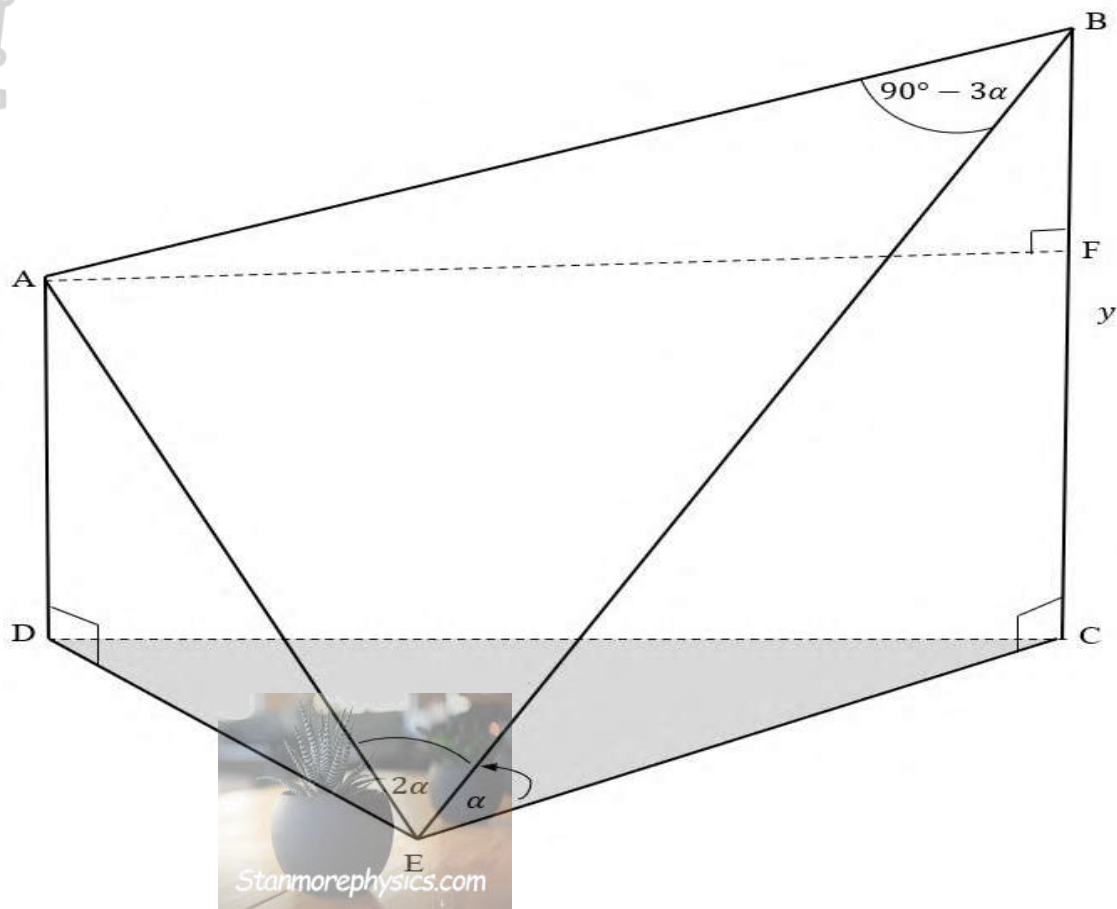
6.5	Determine the range of $y = 2^{2\cos x + 2}$	
		(2)
		[9]



QUESTION 7

The diagram below shows two vertical poles, AD and BC. Point E lies on the same horizontal plane as bases D and C of poles AD and BC.

$\angle AEB = 2\alpha$; $\angle BEC = \alpha$; $\angle ABE = 90^\circ - 3\alpha$ and $BC = y$ metres



7.1	Determine BE in terms of α and y .	
		(2)

P.T.O.

Show that $AB = 2y$.

(5)

It is further given that $AF = \frac{7}{4} BC$.

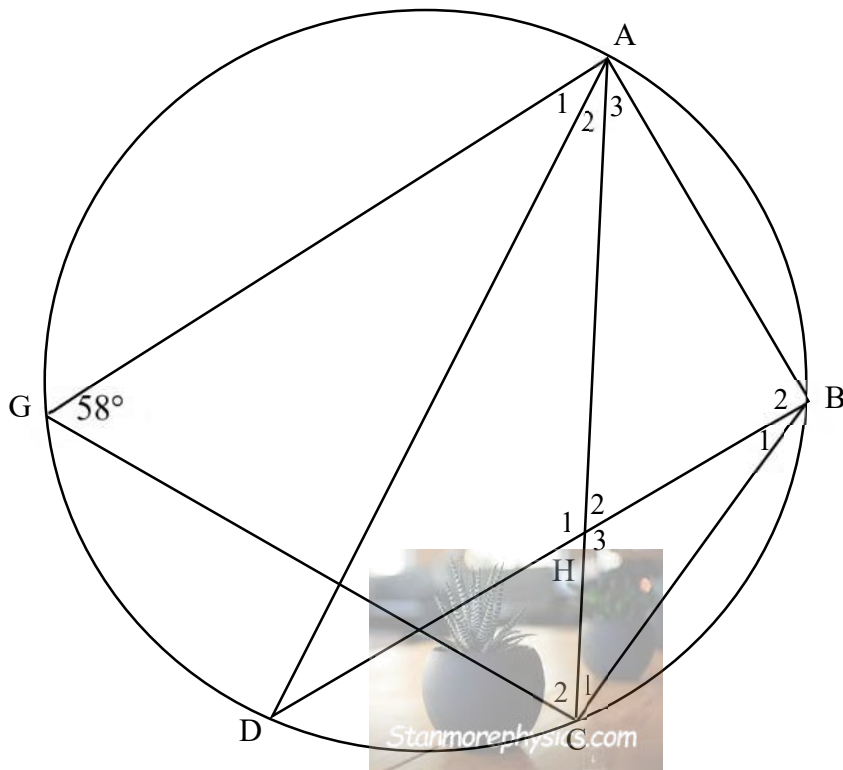
Determine $\hat{B}AF$, the angle of elevation of B from A. Give your answer to the nearest degree.

(3)

[10]

QUESTION 8

In the diagram below, the circle passes through points A, B, C, D and G. AD is the diameter of the circle. BD and AC intersect at H and $\angle AGC = 58^\circ$.



8.1 Determine, giving reasons, the size of the following angles:

8.1.1 $\hat{B}_2$

8.1.2 $\hat{B}_1$

8.1.3 $\hat{A}_2$

8.1.1		(2)
8.1.2		(2)
8.1.3		(2)

P.T.O.

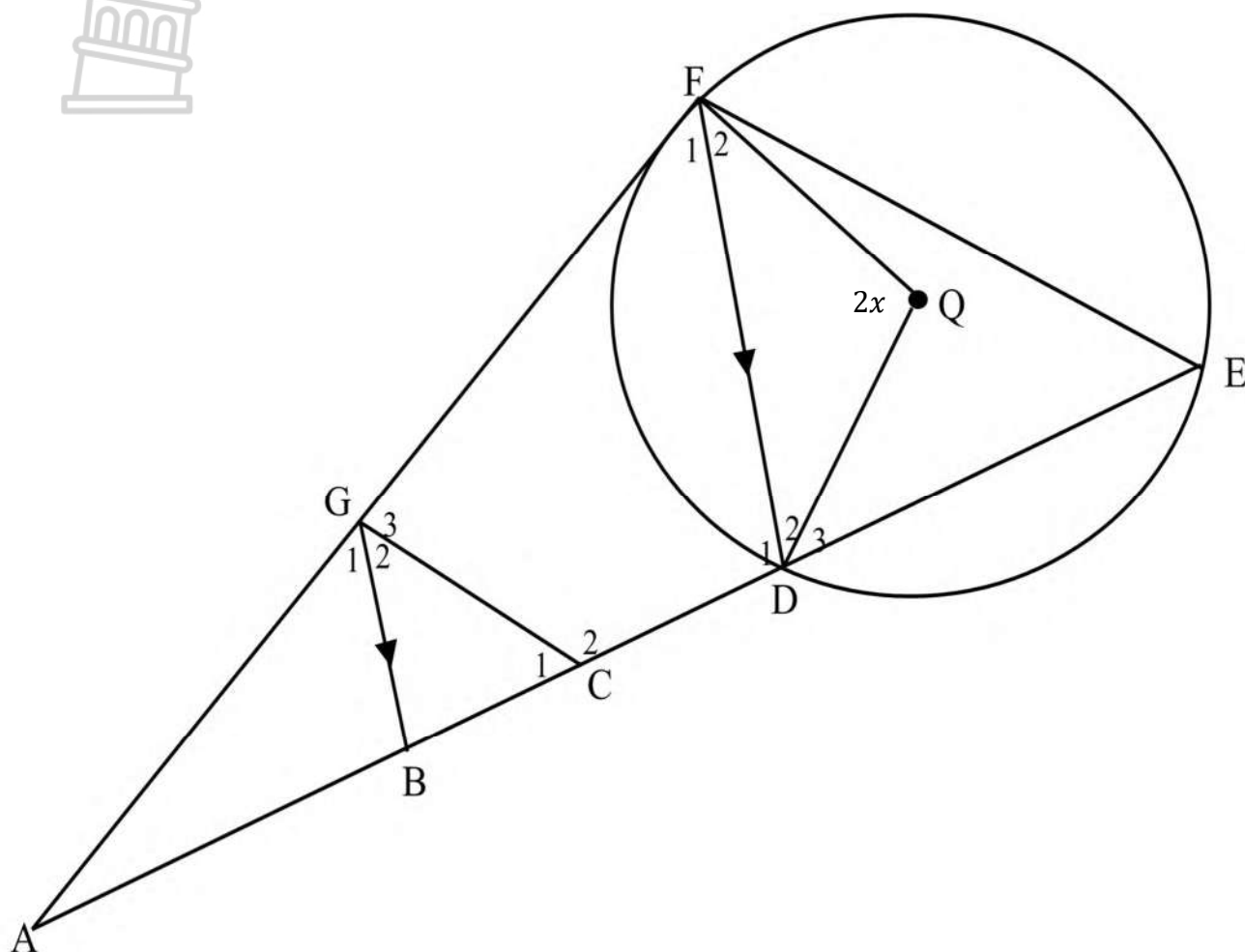
8.2	If it is given that $AB = BC$. Prove that AB is a tangent to the circle passing through A , H and D .	
		(3)
		[9]



In the diagram
QS is a tangent

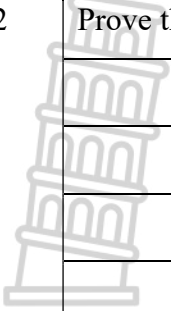
(

- 9.2 In the diagram below, D, E and F are points on the circle centred at Q. AGF is a tangent to the circle at F. ED is produced to meet the tangent at A. B and C are points on AE such that $GB \parallel FD$. GC is joined. GCDF is a cyclic quadrilateral and $\hat{FQD} = 2x$.



9.2.1	Give a reason why $\hat{E}$ is equal to x .	
		(1)

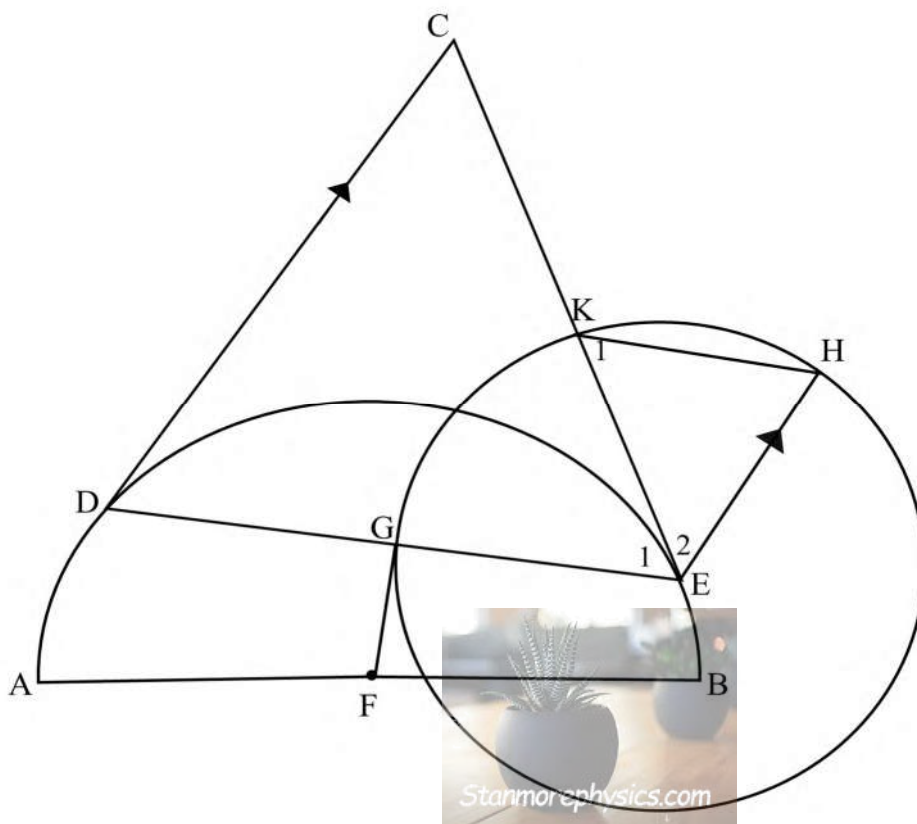
P.T.O.

9.2.2	Prove that $GC \parallel FE$. 	(3)
9.2.3	Prove that $\frac{AB}{BD} = \frac{AC}{CE}$. 	(3)



QUESTION 10

In the diagram below, K, H and G are points on the circle with centre E. FG is a tangent to the circle with centre E. Semi-circle with centre F is drawn. Points D and E lie on the semi-circle. CD and CE are tangents to the semi-circle at D and E respectively. $CD \parallel HE$.

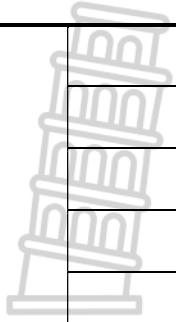


10.1	Give a reason why $DC = EC$.	(1)
10.2	Prove that $\triangle DCE \parallel \triangle HEK$.	(6)

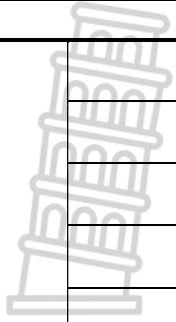
P.T.O.

[13]

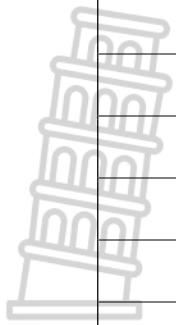
Additional space



Additional space



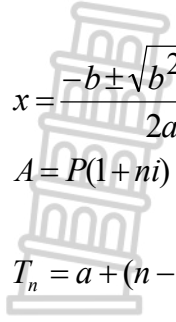
Additional space



TOTAL: 150

END

INFORMATION SHEET



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

$$A = P(1+ni)$$

$$A = P(1-ni)$$

$$A = P(1-i)^n$$

$$A = P(1+i)^n$$

$$T_n = a + (n-1)d$$

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

$$T_n = ar^{n-1}$$

$$S_n = \frac{a(r^n - 1)}{r - 1}; r \neq 1$$

$$S_\infty = \frac{a}{1-r}; -1 < r < 1$$

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

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

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

$$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$

$$M\left(\frac{x_1 + x_2}{2}; \frac{y_1 + y_2}{2}\right)$$

$$y = mx + c$$

$$y - y_1 = m(x - x_1)$$

$$m = \frac{y_2 - y_1}{x_2 - x_1}$$

$$m = \tan \theta$$

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

In ΔABC :

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

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

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

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

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

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

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

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

$$\sin 2\alpha = 2 \sin \alpha \cos \alpha$$

$$\bar{x} = \frac{\sum x}{n}$$

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

$$P(A) = \frac{n(A)}{n(S)}$$

$$P(A \text{ or } B) = P(A) + P(B) - P(A \text{ and } B)$$

$$\hat{y} = a + bx$$

$$b = \frac{\sum (x - \bar{x})(y - \bar{y})}{\sum (x - \bar{x})^2}$$



PREPARATORY EXAMINATION VOORBEREIDENDE EKSAMEN

A background image of a potted plant, possibly a succulent, with a blurred background.

2024 OFFICIAL/ AMPTELIKE MARKING GUIDELINES/ NASIENRIGLYNE

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

20 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.
- Question 7.3 will be the only question in this marking guideline to have a rounding off penalty.

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.
- Vraag 7.3 is die enigste vraag in die nasienriglyne waar afronding gepenaliseer sal word.

GEOMETRY/MEETKUNDE	
S	A mark for a correct statement (A statement mark is independent of a reason.)
	<i>'n Punt vir 'n korrekte bewering</i> <i>('n Punt vir 'n bewering is onafhanklik van die rede.)</i>
R	A mark for a correct reason (A reason mark may only be awarded if the statement is correct.)
	<i>'n Punt vir 'n korrekte rede</i> <i>('n Punt word slegs vir die rede toegeken as die bewering korrek is.)</i>
S/R	Award a mark if the statement AND reason are both correct.
	<i>Ken 'n punt toe as die bewering EN rede beide korrek is.</i>



QUESTION/VRAAG 1

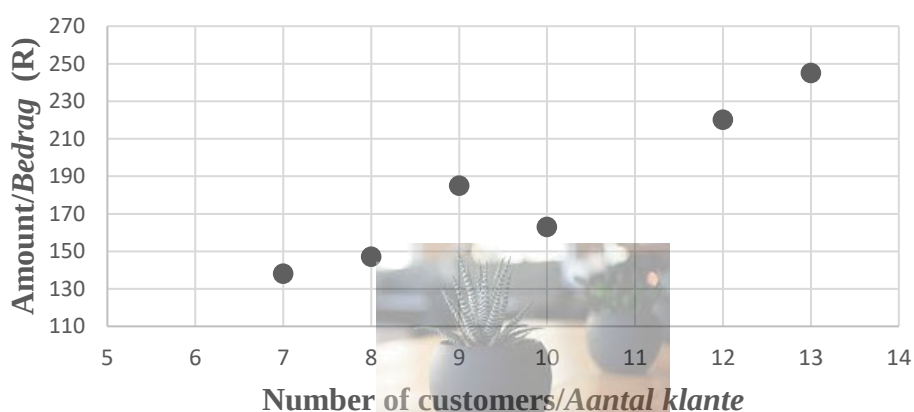
Monthly salary (in thousand Rand) <i>Maandelikse salaris (in duisend Rand)</i>		Number of employees <i>Aantal werknemers</i>
$R0 < x \leq R10$		3
$R10 < x \leq R20$		4
$R20 < x \leq R30$		13
$R30 < x \leq R40$		20
$R40 < x \leq R50$		21
$R50 < x \leq R60$		12
$R60 < x \leq R70$		12
$R70 < x \leq R80$		8
$R80 < x \leq R90$		5
$R90 < x \leq R100$		2

1.1	 Monthly salaries in thousand Rand/<i>Maandelikse salaris in duisend Rand</i>	✓ (0 ; 0) ✓ Upper limit/<i>Boonste limiet</i> ✓ Cumulative frequency/ <i>Kumulatiewe frekwensie</i> ✓ Shape/<i>Vorm</i>
1.2	30 employees/ <i>werknemers</i>	✓ answer/<i>antwoord</i> - Accept/<i>aanvaar</i> 29-31
1.3	Median/ <i>Mediaan</i> = R45 000	✓ answer/<i>antwoord</i> - Accept/<i>aanvaar</i> R44 000 – R46 000
1.4.1	Mean/ <i>Gemiddeld</i> = R85 857,14	✓ answer/<i>antwoord</i>
1.4.2	Standard deviation/ <i>Standaardafwyking</i> = R2 294,63	✓ answer/<i>antwoord</i>
1.4.3	$(83\ 562,51 ; 88\ 151,77)$ $\frac{4}{7} \times 100$ $= 57,14\%$	✓ interval ✓ 4 ✓ answer/<i>antwoord</i>
		[11]

QUESTION/VRAAG 2

Stall <i>Stalletjie</i>	Number of customers/ <i>Aantal klante</i>	Amount of money spent (R)/ <i>Bedrag spandeer</i> (R)
1	10	163
2	7	138
3	9	185
4	12	220
5	8	147
6	13	245

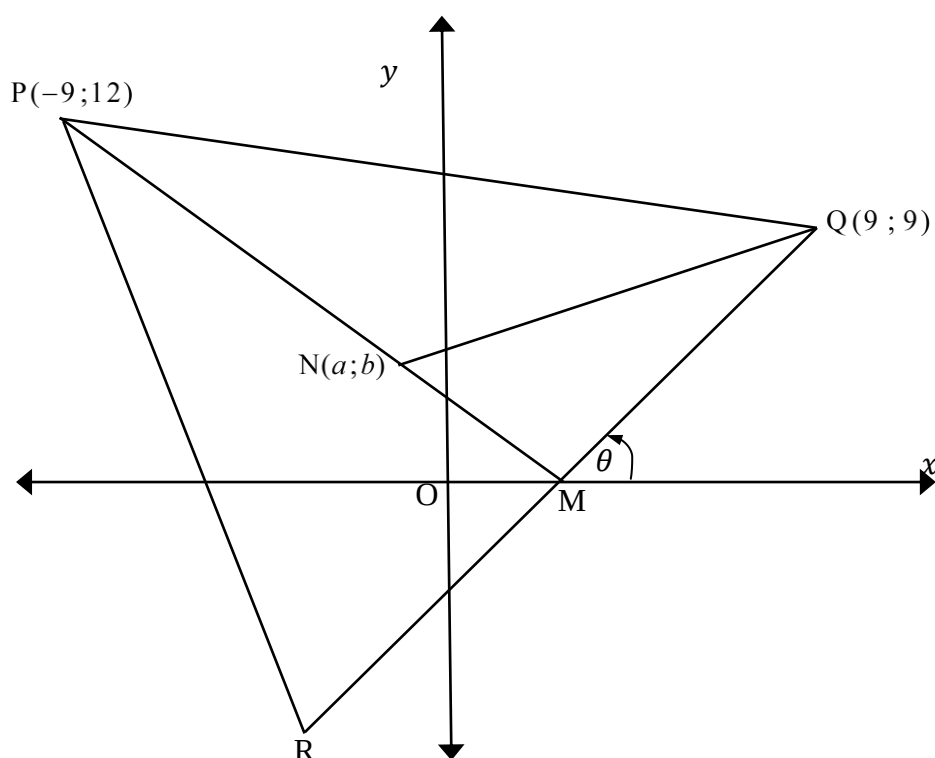
SCATTER PLOT/SPREIDIAGRAM



2.1	$a = 12,59627329$ $b = 17,32919255$ $\hat{y} = 12,60 + 17,33x$	ANSWER ONLY: full marks SLEGS ANTWOORD: volpunte	✓ a ✓ b ✓ equation/vergelyking (3)
2.2	$\hat{y} = 12,60 + 17,33(11)$ $\hat{y} = 203,23$ OR/OF $\hat{y} = 203,22$ (with calculator/met sakrekenaar)	ANSWER ONLY: full marks SLEGS ANTWOORD: volpunte	✓ substitution/substitusie ✓ R203,23 ✓✓ answer/antwoord (2)
2.3	$r = 0,949501084$ $r = 0,95$		✓ value of r /waarde van r (1)
2.4	No/Nee The correlation shows a positive strong correlation between the money spent and the number of customers./Daar is 'n sterk positiewe korrelasie tussen die geld spandeer en die aantal klante.		✓ no, strong positive correlation/nee sterk positiewe korrelasie NO marks for NO only/ Geen punte vir slegs NEE nie (1)

2.5	The gradient will decrease as the line will become less steep. The point is far away from the line. Or the point is above the data./Die gradiënt sal afneem want die lyn word minder steil. Die punt is ver van die lyn af. Of die punt lê bokant die data.	✓ decrease/afneem ✓ point is above the data/far away from the line/punt is bokant die lyn/punt is ver weg van die lyn af
		(2)
		[9]

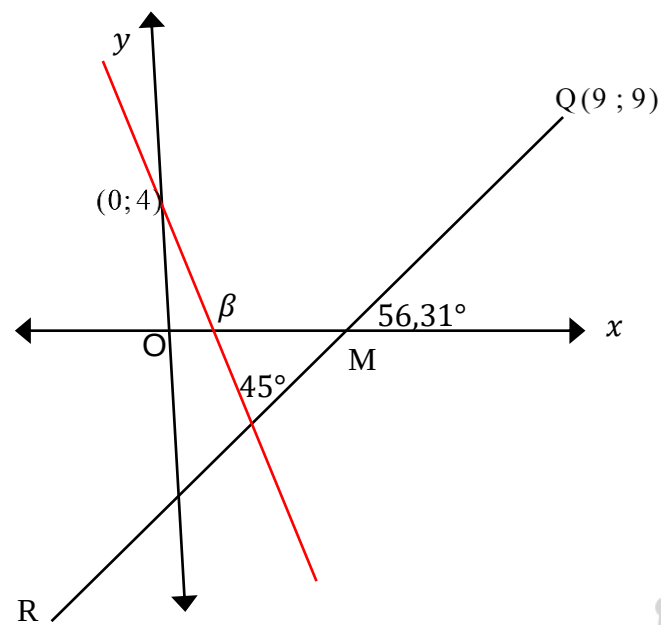
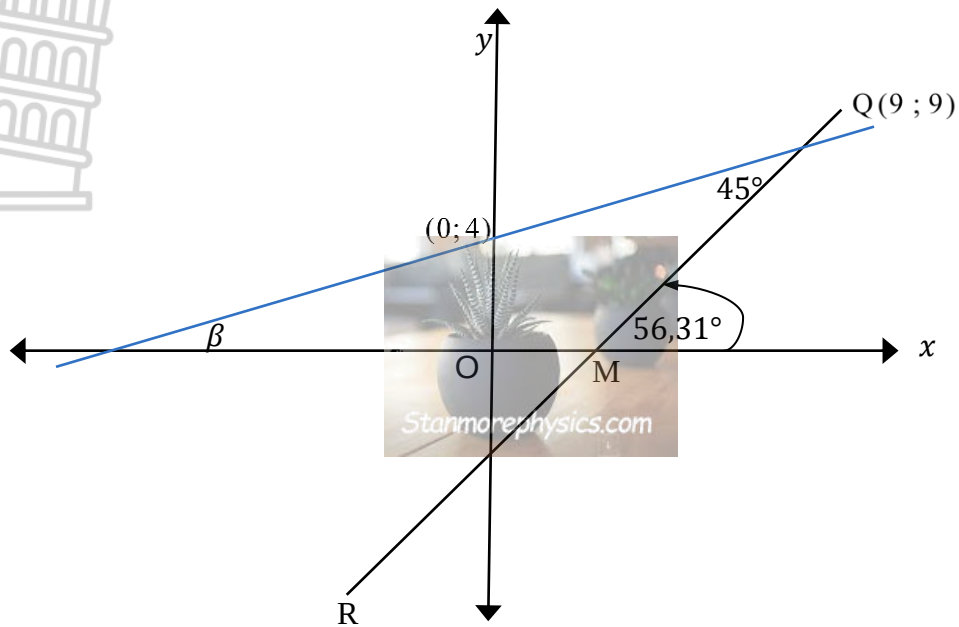
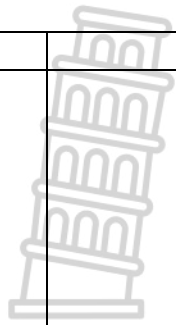
QUESTION/VRAAG 3



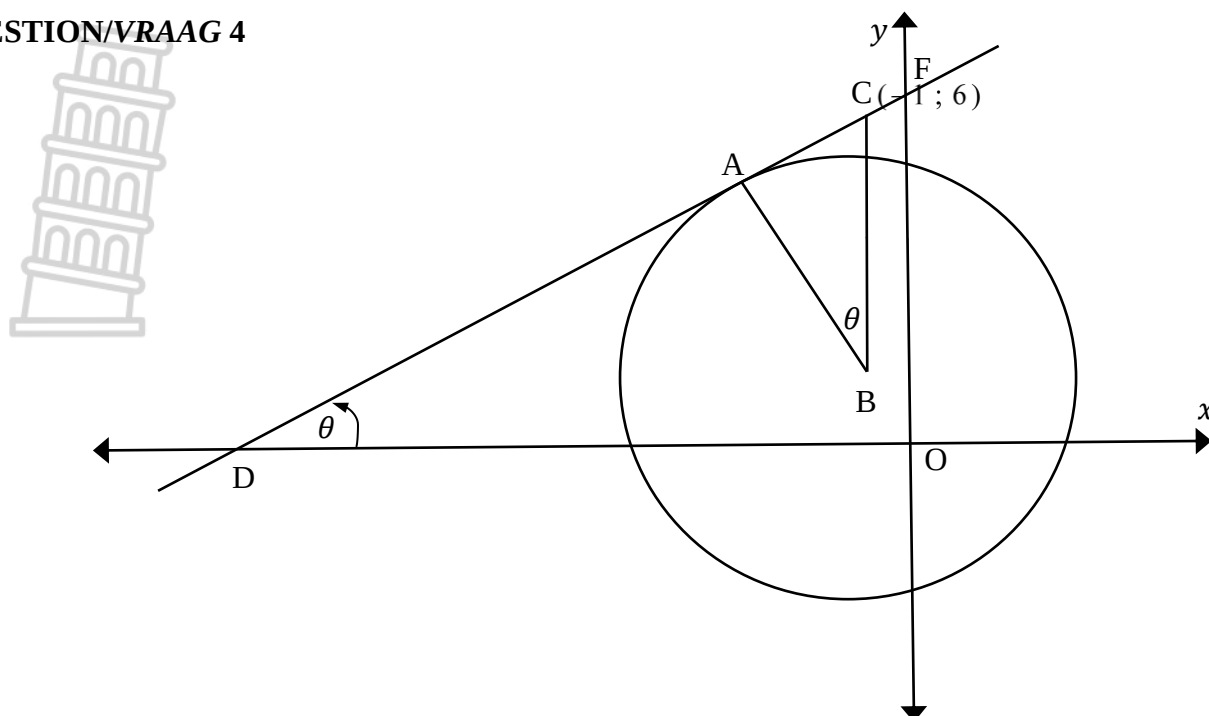
3.1	$2y - 3x + 9 = 0$ $2(0) - 3x = -9$ $x = 3$ $\therefore M(3; 0)$	✓ $y = 0$ ✓ $x = 3$
		(2)
3.2	$m_{PM} = \frac{12 - 0}{-9 - 3}$ $= -1$ Substitute/Vervang $P(-9; 12)$ $y - 12 = -(x + 9)$ $y = -x - 9 + 12$ $y = -x + 3$	✓ correct substitution of P and M into gradient formula/korrekte substitusie van P en M in die gradiënt formule ✓ $m_{PM} = -1$ ✓ sub of point P or M/vervang punt P of M ✓ equation/vergelyking
		(4)

3.3	$\tan \theta = \frac{3}{2}$ $\theta = 56,31^\circ$	$\checkmark \tan \theta = \frac{3}{2}$ $\checkmark$ answer/antwoord (2)
3.4	Substitute/vervang $(a; b)$ into/in $y = -x + 3$: $\therefore b = -a + 3$ $\therefore b = 3 - a$	$\checkmark$ substitution/substitusie (1)
3.5	$(5\sqrt{5})^2 = (a - 9)^2 + (b - 9)^2$ Substitute/vervang $b = 3 - a$: $125 = (a - 9)^2 + (3 - a - 9)^2$ $\therefore 125 = a^2 - 18a + 81 + (-a - 6)^2$ $\therefore 125 = a^2 - 18a + 81 + a^2 + 12a + 36$ $\therefore 125 = 2a^2 - 6a + 117$ $\therefore 0 = 2a^2 - 6a - 8$ $\therefore 0 = a^2 - 3a - 4$ $\therefore 0 = (a - 4)(a + 1)$ $\therefore a = 4$ or $a = -1$ Since N is in the second quadrant, we choose $a = -1$. Omdat N in die tweede kwadrant is, kies $a = -1$. $\therefore b = 3 - (-1)$ $\therefore b = 4$	$\checkmark$ substitution into correct formula/substitusie in die korrekte formule $\checkmark$ subs of a /vervang a $\checkmark$ standard form/standaardvorm $\checkmark$ correct value of a /korrekte waarde van a $\checkmark$ correct value of b /korrekte waarde van b (5)
3.6	$3 = \frac{9 + x}{2}$ $0 = \frac{9 + y}{2}$ $R(-3; -9)$ $(-3)^2 + (-9)^2 = r^2$ $x^2 + y^2 = 90$	$\checkmark x_R = -3$ $\checkmark y_R = -9$ $\checkmark$ substitution of R/vervang R $\checkmark x^2 + y^2 = 90$ (4)
3.7	Let β be the inclination angle of the line/Laat β die inklinasiehoek wees van die lyn $v = mx + 4$ $\beta = 56,31^\circ - 45^\circ$ or/of $\beta = 56,31^\circ + 45^\circ$ $\beta = 11,31^\circ$ or/of $\beta = 101,31^\circ$ $m = \tan 11,31^\circ$ or/of $m = \tan 101,31^\circ$ $m = 0,20$ or/of $m = -5,00$	$\checkmark \beta = 11,31^\circ$ $\checkmark \beta = 101,31^\circ$ $\checkmark m = 0,20$ $\checkmark m = -5,0$ (4)
	See diagram for Q3.7 on the next page./ Sien die diagram vir V3.7 op die volgende bladsy.	
		[22]

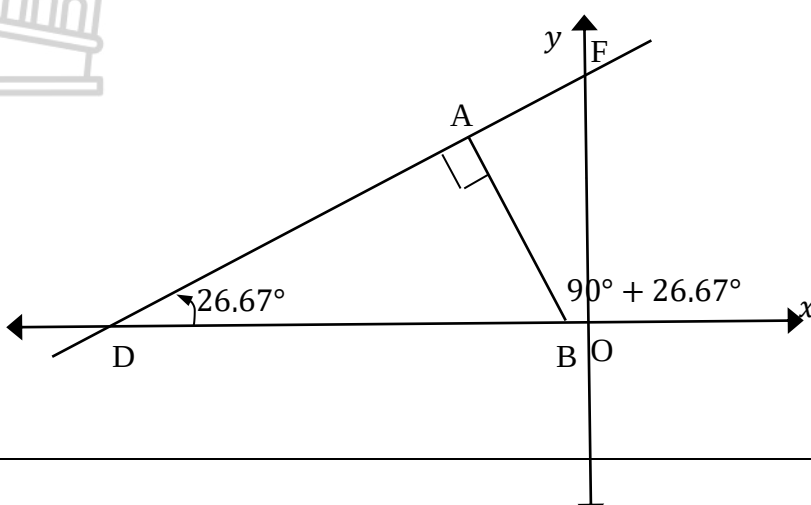
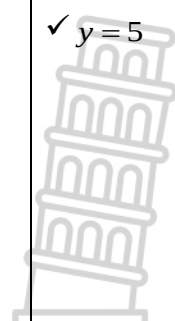
3.7



QUESTION/VRAAG 4



4.1	$B(-1; 1)$	✓ answer/antwoord (1)
4.2	$BC = 6 - 1 = 5$ $AB = \sqrt{20}$ $\hat{CAB} = 90^\circ$ <i>tan ⊥ rad/rklyn ⊥ rad</i> $AC^2 = (5)^2 - (\sqrt{20})^2$ $AC = \sqrt{5}$	✓ $BC = 5$ ✓ $\hat{CAB} = 90^\circ$ ✓ subs in Pythagoras/ vervang in Pythagoras (3)
4.3	$\tan \theta = \frac{AC}{AB} = \frac{\sqrt{5}}{\sqrt{20}} = \frac{1}{2}$	✓ $\tan \theta = \frac{1}{2}$ (1)
4.4	$m_{DC} \times m_{AB} = -1$ $m_{DC} = \tan \theta = \frac{1}{2}$ $m_{AB} = -2$ Substitute/Vervang $B(-1; 1)$ $y - 1 = -2(x + 1)$ $y = -2x - 1$ OR/OF	✓ $m_{DC} = \frac{1}{2}$ ✓ $m_{AB} = -2$ ✓ substitution of m and B / substitusie van m en B (3)

	$m_{AB} = \tan(90 + 26,57^\circ)$ $m_{AB} = -2$ Substitute/ Vervang $B(-1; 1)$ $y - 1 = -2(x + 1)$ $y = -2x - 1$ 	$\checkmark m_{AB} = \tan(90 + 26,57^\circ)$ $\checkmark m_{AB} = -2$ $\checkmark$ substitution of m and B / <i>substitusie van m en B</i> (3)
4.5	$(x + 1)^2 + (-2x - 1 - 1)^2 = 20$ $x^2 + 2x + 1 + 4x^2 + 8x + 4 = 20$ $5x^2 + 10x - 15 = 0$ $x^2 + 2x - 3 = 0$ $(x + 3)(x - 1) = 0$ $x = -3$ or/of $x = 1$ $y = -2(-3) - 1$ $y = 5$ $A(-3; 5)$ OR/OF	$\checkmark$ substitution into correct formula/substitusie in die korrekte formule $\checkmark$ standard form/ standaardvorm $\checkmark x = -3$ $\checkmark y = 5$ 

(4)

	Eq of DC/Verg van DC: $y - 6 = \frac{1}{2}(x + 1)$ $y = \frac{1}{2}x + 6,5$ $\frac{1}{2}x + 6,5 = -2x - 1$ $x + 13 = -4x - 2$ $5x = -15$ $x = -3$ $y = -2(-3) - 1$ $y = 5$ $\therefore A(-3; 5)$	✓ equation of DC/ vergelyking van DC ✓ equate/gelykstel ✓ $x = -3$ ✓ $y = 5$ (4)
4.6	Area of/van $\triangle ABC = \frac{1}{2}(\sqrt{20})(\sqrt{5}) \sin 26,57^\circ$ $= 5$ Area of/van $\triangle ODF = \frac{1}{2}(13)(14,53) \sin 26,57^\circ$ $= 42,25$ Area of/van $\triangle ABC$: Area of $\triangle ODF = 20 : 169$ OR/OF Area $\triangle ABC = \frac{1}{2} \times \sqrt{5} \times \sqrt{20} = 5$ Equation of DC/Vergelyking van DC: $y - 6 = \frac{1}{2}(x + 1)$ $y = \frac{1}{2}x + 6,5$ Equation of/verg van DC is $y = \frac{1}{2}x + \frac{13}{2}$ OF = $\frac{13}{2}$ and/en OD = 13 Area of $\triangle ODF = \frac{1}{2} \times \left(\frac{13}{2}\right) \times 13 = \frac{169}{4}$ Area $\triangle ABC$: Area $\triangle ODF = 20 : 169$	✓ $\frac{1}{2}(\sqrt{20})(\sqrt{5}) \sin 26,57^\circ$ ✓ area of / van $\triangle ABC = 5$ ✓ 13 and/en 14,53 ✓ $\sin 26,57^\circ$ ✓ area of / van $\triangle ODF = 42,25$ ✓ answer/antwoord (6) ✓ $\frac{1}{2} \times \sqrt{5} \times \sqrt{20}$ ✓ $y = \frac{1}{2}x + \frac{13}{2}$ ✓ OF = $\frac{13}{2}$ ✓ OD = 13 ✓ $\frac{1}{2} \times \frac{13}{2} \times 13$ ✓ answer/antwoord (6)
		[18]

QUESTION/VRAAG 5

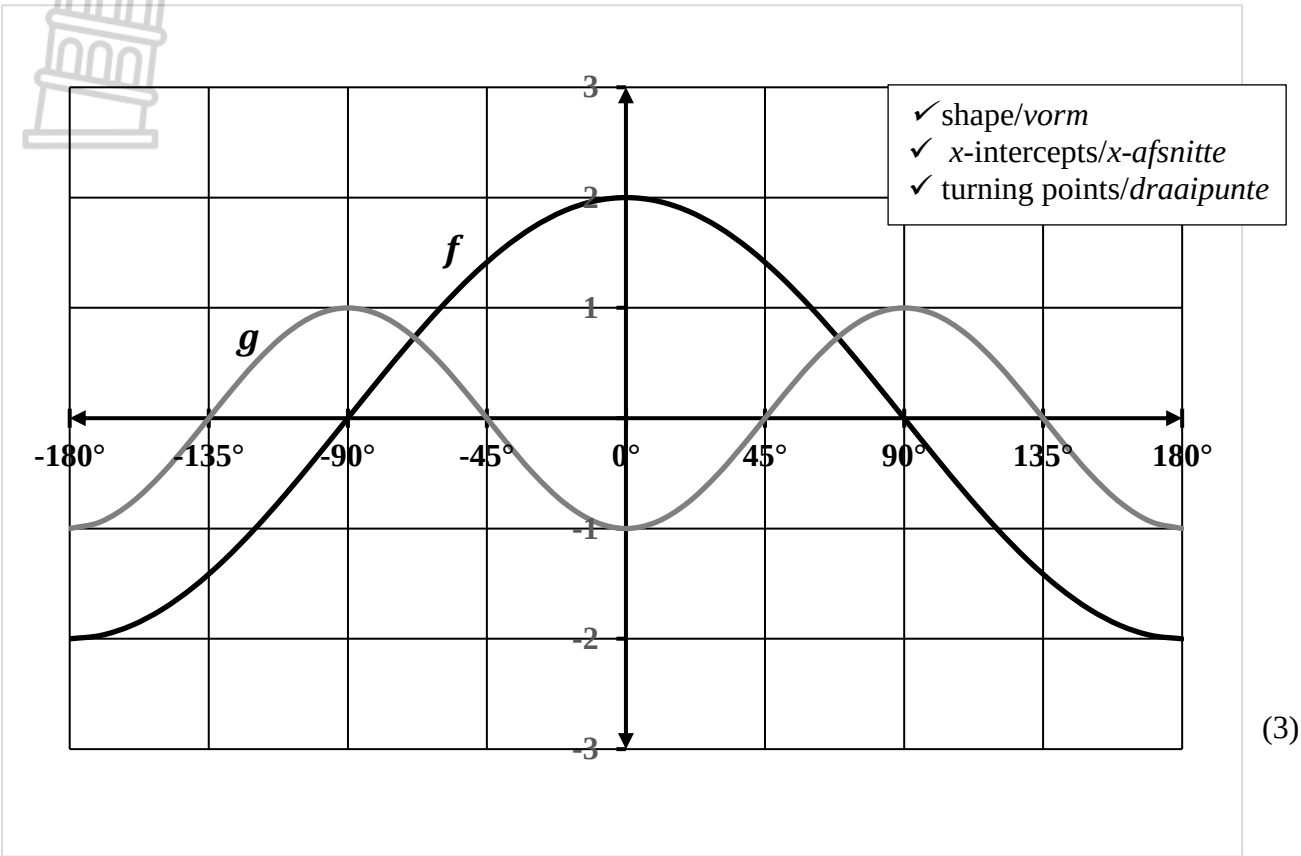
5.1	$\frac{\sin^2(180^\circ + x) \cdot \sin(-x)}{-\sin(90^\circ + x) \cdot \tan x} - 1$ $= \frac{(-\sin x)^2 \cdot -\sin x}{-\cos x \cdot \frac{\sin x}{\cos x}} - 1$ $= \sin^2 x - 1$ $= -1(1 - \sin^2 x)$ $= -\cos^2 x$	$\checkmark (-\sin x)^2$ $\checkmark -\sin x$ $\checkmark -\cos x$ $\checkmark \frac{\sin x}{\cos x}$ $\checkmark \sin^2 x - 1$ $\checkmark -\cos^2 x$ (6)
5.2.1	$\sin(A + B)$ $= \cos[90^\circ - (A + B)]$ $= \cos[(90^\circ - A) - B]$ $= \cos(90^\circ - A)\cos B + \sin(90^\circ - A)\sin B$ $= \sin A \cos B + \cos A \sin B$	$\checkmark \cos[90^\circ - (A + B)]$ $\checkmark \cos[(90^\circ - A) - B]$ $\checkmark \text{expansion/uitbreiding}$ (3)
5.2.2	$\cos 420^\circ \cos 15^\circ + \sin 300^\circ \cos 105^\circ$ $= \cos 60^\circ \cos 15^\circ + (-\sin 60^\circ)(-\sin 15^\circ)$ $= \cos(60^\circ - 15^\circ)$ $= \cos 45^\circ$ $= \frac{\sqrt{2}}{2}$	$\checkmark \cos 60^\circ$ $\checkmark -\sin 60^\circ$ $\checkmark -\sin 15^\circ$ $\checkmark \cos(60^\circ - 15^\circ)$ $\checkmark \frac{\sqrt{2}}{2}$ (5)
5.3.1	$\text{LHS/LK} = \tan^2 x \left(\frac{1}{\tan^2 x} - 1 \right)$ $= 1 - \tan^2 x$ $= 1 - \frac{\sin^2 x}{\cos^2 x}$ $= \frac{\cos^2 x - \sin^2 x}{\cos^2 x}$ $= \frac{\cos 2x}{\cos^2 x}$ $= \text{RHS/RK}$	$\checkmark 1 - \tan^2 x$ $\checkmark \frac{\sin^2 x}{\cos^2 x}$ $\checkmark \frac{\cos^2 x - \sin^2 x}{\cos^2 x}$ (3)
5.3.2	$x = 90^\circ$	$\checkmark \text{answer/antwoord}$ (1)

5.4	$\cos 2x = \cos x$ $2\cos^2 x - 1 = \cos x$ $2\cos^2 x - \cos x - 1 = 0$ $(2\cos x + 1)(\cos x - 1) = 0$ $\cos x = -\frac{1}{2} \text{ or / of } \cos x = 1$ $x = 180^\circ - 60^\circ + k360^\circ; k \in \mathbb{Z} \text{ or } x = k360^\circ; k \in \mathbb{Z}$ $x = 120^\circ + k360^\circ; k \in \mathbb{Z}$ or/of $x = 180^\circ + 60^\circ + k360^\circ; k \in \mathbb{Z}$ $x = 240^\circ + k360^\circ; k \in \mathbb{Z}$	$\checkmark \cos 2x = 2\cos^2 x - 1$ $\checkmark \text{standard form}$ <i>standaardvorm</i> $\checkmark \text{both answers for } \cos x$ <i>albei antwoorde vir</i> $\cos x$ $\checkmark x = k360^\circ; k \in \mathbb{Z}$ $\checkmark$ $x = 120^\circ \text{ and / en } x = 240^\circ$ $\checkmark x = +k360^\circ; k \in \mathbb{Z}$ (6)										
5.5	$\sin 3\theta = \sin (2\theta + \theta)$ $= \sin 2\theta \cos \theta + \cos 2\theta \sin \theta$ $= (2\sin \theta \cos \theta) \cos \theta + (1 - 2\sin^2 \theta) \sin \theta$ $= 2\sin \theta \cos^2 \theta + \sin \theta - 2\sin^3 \theta$ $= 2\sin \theta (1 - \sin^2 \theta) + \sin \theta - 2\sin^3 \theta$ $= 2\sin \theta - 2\sin^3 \theta + \sin \theta - 2\sin^3 \theta$ $= 3\sin \theta - 4\sin^3 \theta$ $= 3\left(\frac{1}{2}\right) - 4\left(\frac{1}{2}\right)^3$ $= 1$ OR/OF $\sin \theta = \frac{1}{2}$ $\theta = 30^\circ \text{ or } \theta = 150^\circ$ <table><tr><td>$\sin 3\theta$</td><td>$\sin 3\theta$</td></tr><tr><td>$= \sin 3(30^\circ)$</td><td>$= \sin 3(150^\circ)$</td></tr><tr><td>$= \sin 90^\circ$</td><td>$= \sin 450^\circ$</td></tr><tr><td>$= 1$</td><td>$= \sin 90^\circ$</td></tr><tr><td></td><td>$= 1$</td></tr></table>	$\sin 3\theta$	$\sin 3\theta$	$= \sin 3(30^\circ)$	$= \sin 3(150^\circ)$	$= \sin 90^\circ$	$= \sin 450^\circ$	$= 1$	$= \sin 90^\circ$		$= 1$	$\checkmark \sin 3\theta = \sin (2\theta + \theta)$ $\checkmark \text{compound expansion/}$ <i>saamgestelde</i> <i>uitbreiding</i> $\checkmark \sin 2\theta = 2\sin \theta \cos \theta$ $\checkmark \cos 2\theta = 1 - 2\sin^2 \theta$ $\checkmark \cos^2 \theta = 1 - \sin^2 \theta$ $\checkmark \text{sub/vervang } \sin \theta = \frac{1}{2}$ $\checkmark \text{answer/antwoord}$ (7) $\checkmark \theta = 30^\circ$ $\checkmark \theta = 150^\circ$ $\checkmark \sin 3(30^\circ)$ $\checkmark \sin 3(150^\circ)$ $\checkmark \sin 450^\circ$ $\checkmark \sin 450^\circ = \sin 90^\circ$ $\checkmark \sin 90^\circ = 1$ (7)
$\sin 3\theta$	$\sin 3\theta$											
$= \sin 3(30^\circ)$	$= \sin 3(150^\circ)$											
$= \sin 90^\circ$	$= \sin 450^\circ$											
$= 1$	$= \sin 90^\circ$											
	$= 1$											

[31]

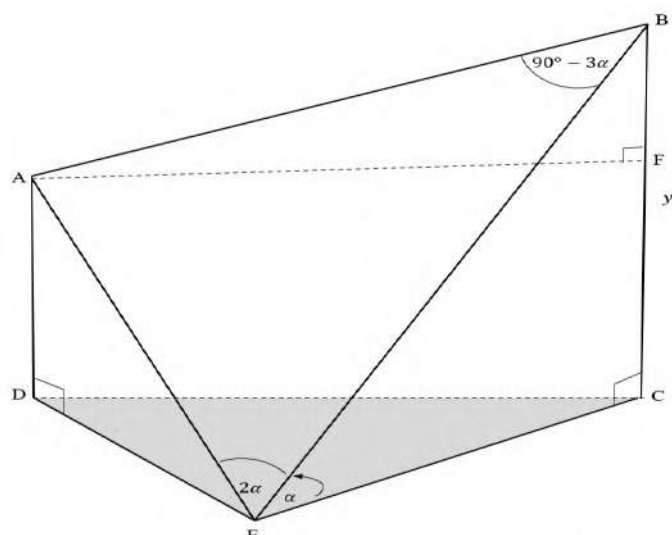
QUESTION/VRAAG 6

6.1



6.2	180°	✓ 180° (1)
6.3	$x \in [0^\circ ; 45^\circ]$ $x \in [90^\circ ; 135^\circ]$	✓ $x \in [0^\circ ; 45^\circ]$ ✓ $x \in [90^\circ ; 135^\circ]$ (2)
6.4	Maximum value of / <i>Maksimum waarde van</i> $f(x) - g(x) = 2 - (-1) = 3$	✓ 3 (1)
6.5	$y = 2^{2\cos x + 2}$ Range of / <i>Waardevers van</i> $2\cos x$: $-2 \leq y \leq 2$ Range of / <i>Waardevers van</i> $2\cos x + 2$: $0 \leq y \leq 4$ Range of / <i>Waardevers van</i> $2^{2\cos x + 2}$: $2^0 \leq y \leq 2^4$ $\therefore 1 \leq y \leq 16$	✓✓ $1 \leq y \leq 16$ (2)
[9]		

QUESTION/VRAAG 7

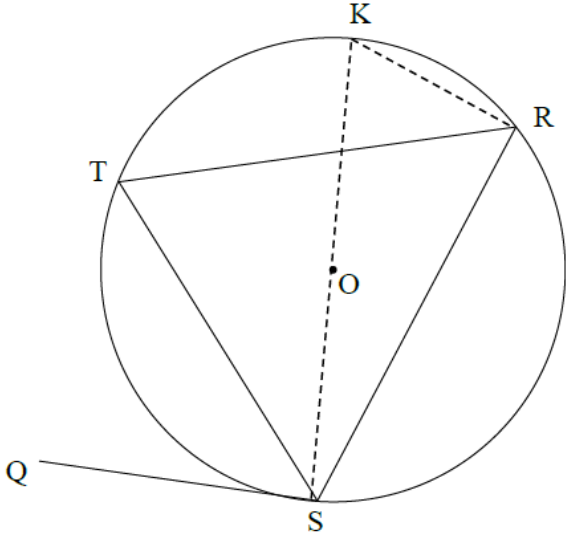


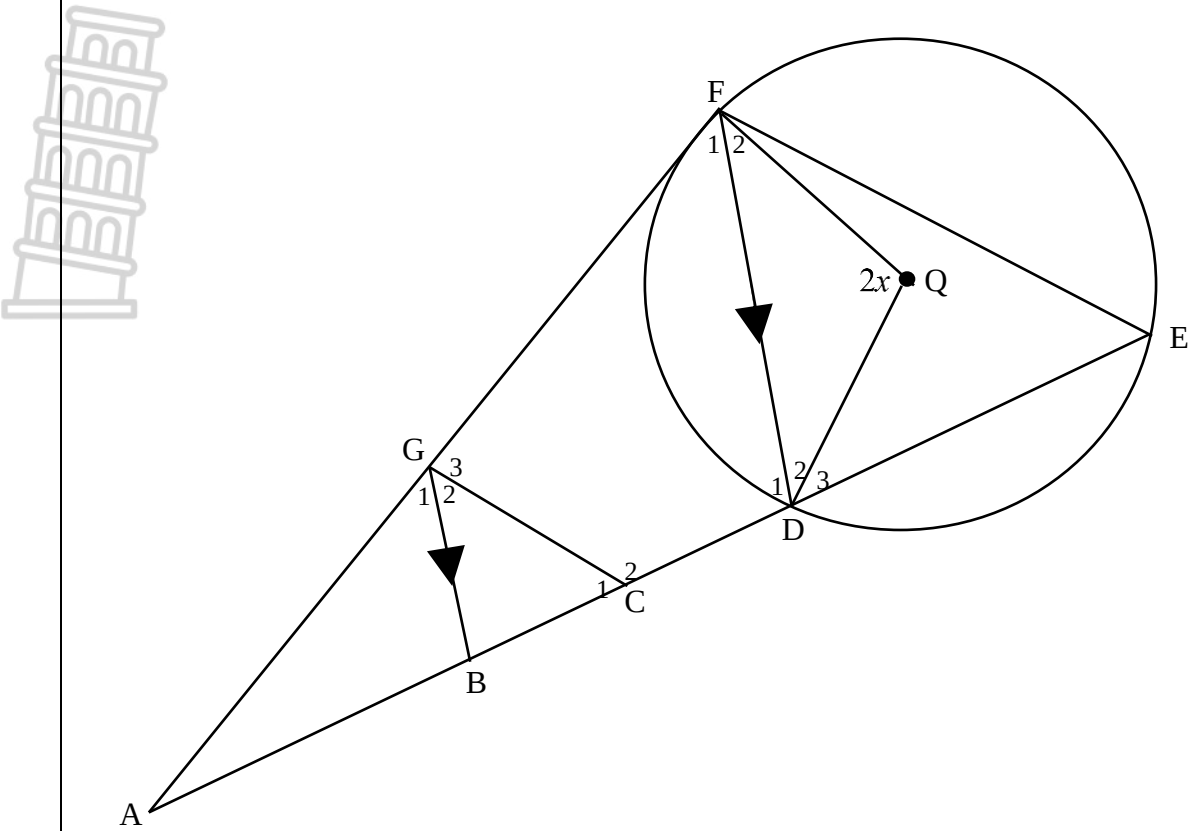
7.1	$\sin \alpha = \frac{y}{BE}$ $BE = \frac{y}{\sin \alpha}$	✓ correct ratio/ korrekte verhouding ✓ $BE = \frac{y}{\sin \alpha}$ (2)
7.2	In $\triangle ABE$: $\hat{BAE} = 90^\circ + \alpha$ $\frac{AB}{\sin 2\alpha} = \frac{BE}{\sin(90^\circ + \alpha)}$ $AB = \frac{BE \times \sin 2\alpha}{\cos \alpha}$ $= \frac{y}{\sin \alpha} \times 2 \sin \alpha \cos \alpha$ $= 2y$	✓ $\hat{BAE} = 90^\circ + \alpha$ ✓ correct use of sine rule/ korrekte gebruik van sin reël ✓ double angle/dubbelhoek ✓ co-function/ko-funksie ✓ substitution of BE/ vervang BE (5)
7.3	In $\triangle BAF$ is: $\cos \hat{BAF} = \frac{AF}{AB} = \frac{7y}{2y}$ $= \frac{7}{8}$ $\hat{BAF} = 28,955..^\circ$ $= 29^\circ$	✓ correct ratio in terms of y/korrekte verhouding in terme van y ✓ $\cos \hat{BAF} = \frac{7}{8}$ ✓ 29° / PENALTY for incorrect rounding off/ Penaliseer vir foutiewe afroning (3)
[10]		

QUESTION/VRAAG 8

8.				
8.1.1	$\hat{B}_2 = 90^\circ$	$\angle$ in semi-circle/ $\angle$ in 'n halwe sirkel	✓S ✓R	(2)
8.1.2	$\hat{B}_1 + \hat{B}_2 + \hat{G} = 180^\circ$ $\hat{B}_1 = 32^\circ$	opposite $\angle$ s of cyclic quad/teenoorst $\angle$ e van kvh	✓R ✓S	(2)
8.1.3	$\hat{A}_2 = \hat{B}_1 = 32^\circ$	$\angle$ s in the same segment/ $\angle$ e in dieselfde segment	✓S ✓R	(2)
8.2	$\hat{C}_1 = \hat{A}_3 = 29^\circ$ $\hat{D} = \hat{C}_1 = 29^\circ$ $\therefore \hat{A}_3 = \hat{D} = 29^\circ$ $\therefore AB$ is a tangent to the circle/ AB is 'n raaklyn aan die sirkel	$\angle$ s opposite equal sides/ $\angle$ e teenoor gelyke sye $\angle$ s in the same segment/ $\angle$ e in dieselfde segment converse tan chord theorem/ omgekeerde raaklyn koordstelling	✓S/R ✓S/R ✓R	(3)
				[9]

QUESTION/VRAAG 9

9.1		
	Construction/Konstruksie: Draw diameter KS and join KR/Trek middellyn KS en trek KR $\hat{QSK} = 90^\circ$ $\hat{SRK} = 90^\circ$ but/maar $\hat{TSK} = \hat{TRK}$ $\therefore \hat{QST} = \hat{R}$ radius $\perp$ tangent/raaklyn $\angle$ in semicircle/halwe sirkel $\angle$'s in the same segment/ $\angle$e in dieselfde segment	✓construction/ konstruksie ✓S ✓R ✓S/R ✓S ✓R (6)

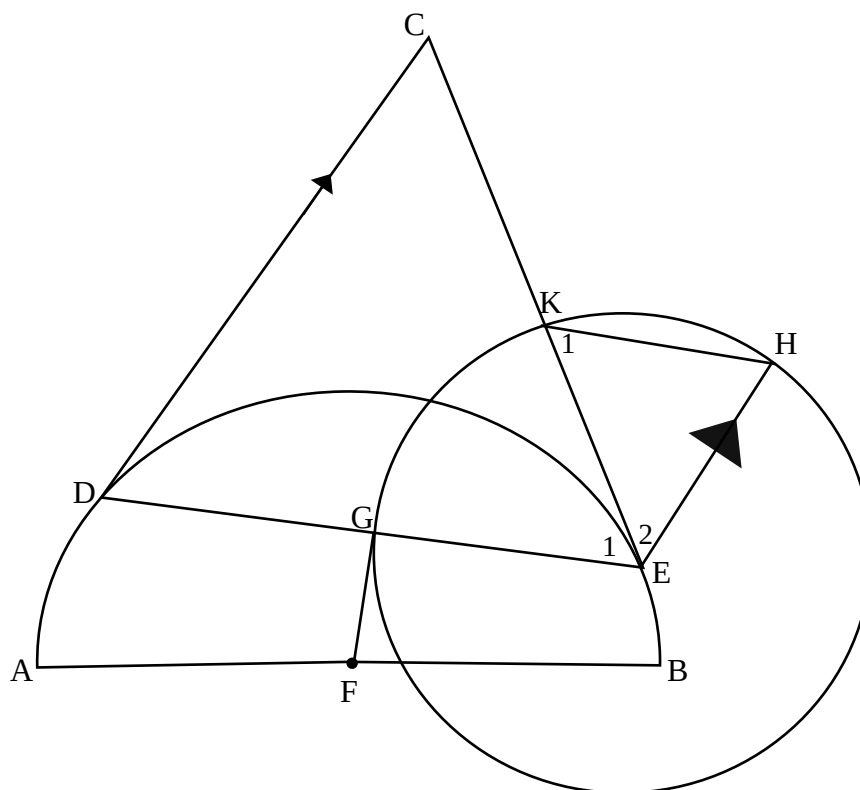
9.2			
9.2.1	$\hat{E} = x$	$\angle \text{centre} = 2 \times \angle \text{at circumference/}$ <i>midpts</i> $\angle = 2 \times \text{omtreks}$	$\checkmark R$ (1)
9.2.2	$\hat{F}_1 = \hat{E} = x$ $\hat{C}_1 = \hat{F}_1 = x$ $\therefore \hat{C}_1 = \hat{E}$ $\therefore GC \parallel FE$	tan chord theorem/ <i>rklyn koordstelling</i> ext. $\angle$ of cyclic quad/ <i>buite</i> $\angle$ van kvh corresponding $\angle$ s are equal/ <i>ooreenk</i> $\angle$ e <i>is gelyk</i>	$\checkmark S/R$ $\checkmark S/R$ $\checkmark R$ (3)
9.2.3	$\frac{AB}{BD} = \frac{AG}{GF}$ $\frac{AG}{GF} = \frac{AC}{CE}$ $\therefore \frac{AB}{BD} = \frac{AC}{CE}$	prop. theorem/ <i>eweredigheid-</i> <i>stelling</i> ; $GB \parallel FD$ prop. theorem/ <i>eweredigheid-</i> <i>stelling</i> ; $GC \parallel FE$	$\checkmark S$ $\checkmark R$ $\checkmark S$ (3)

9.2.4	$\frac{AB}{BD} = \frac{4}{5}$ and/en $\frac{AC}{CE} = \frac{4}{5}$ $\frac{12}{BD} = \frac{4}{5}$ and/en $\frac{AC}{22,5} = \frac{4}{5}$ $BD = 15$ and/en $AC = 18$ $BC = AC - AB$ $= 18 - 12$ $= 6$ $CD = BD - BC$ $= 15 - 6$ $= 9$	✓substitution/ <i>substitusie</i> ✓BD = 15 ✓AC = 18 ✓BC = 6 ✓CD = 9 (5)
		[18]



QUESTION/VRAAG 10

10.



10.1	Tangents from the same point	✓R (1)
10.2	In $\triangle DCE$ and $\triangle HEK$ is : 1. $\hat{C} = \hat{E}_2$ alt. $\angle$s./verw. $\angle$e ,DC $\parallel$ EH 2. $\hat{D} = \hat{E}_1$ $\angle$s opp equal sides/$\angle$e teenoor gelyke sye $2\hat{D} = 180^\circ - \hat{C}$ sum of $\angle$s in triangle/ binne $\angle$e van $\triangle$ $\hat{K}_1 = \hat{H}$ $\angle$s opp radii/ /$\angle$e teenoor gelyke radii $2\hat{H} = 180^\circ - \hat{E}_2$ sum of $\angle$s in triangle / binne $\angle$e van $\triangle$ but $\hat{C} = \hat{E}_2$ proved $\therefore \hat{D} = \hat{H}$ $\therefore \triangle DCE \parallel \triangle EHK$ $\angle\angle\angle$	✓S /R ✓S ✓S ✓S/R ✓S ✓R (6)

10.3	$\hat{FGE} = 90^\circ$ $\therefore DG = GE$	$\tan \angle radius / rkln \angle radius$ line from centre $\perp$ to chord/ <i>lyn vanuit midpt loodreg op koord</i>	$\checkmark S \quad \checkmark R$ $\checkmark R$ (3)
10.4	$\frac{DC}{HE} = \frac{DE}{HK}$ $DC \times HK = DE \times HE$ $DC \times HK = 2GE \times HE$ but $GE = HE$ $\therefore DC \times HK = 2HE^2$	$\triangle CDE \parallel \triangle EHK$ <i>radii/radiusse</i>	$\checkmark S/R$ $\checkmark$ substitute $DE = 2GE$ $\checkmark S$ (3)
			[13]

TOTAL/TOTAAL: 150