Province of the
EASTERN CAPE
EDUCATION

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

NATIONAL SENIOR CERTIFICATE

GRADE 12

SEPTEMBER 2024

MATHEMATICS P2

MARKS: **150**

TIME: **3 hours**

This question paper consists of 14 pages, including an information sheet and an answer book of 21 pages.

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 in determining the answers.
4. Answers only will NOT necessarily be awarded full marks.
5. You may use an approved scientific calculator (non-programmable and non-graphical), unless stated otherwise.
6. If necessary, round off answers to TWO decimal places, unless stated otherwise.
7. Diagrams are NOT necessarily drawn to scale.
8. An information sheet with formulae is included at the end of the question paper.
9. Write neatly and legibly.

QUESTION 1

1.1 The number of litres of diesel purchased by 15 truck drivers at a petrol station were recorded as follow.

82	64	55	50	41
71	78	88	98	96
63	66	80	84	88

1.1.1 Write down the mode. (1)

1.1.2 Write down the range. (1)

1.1.3 Calculate the mean. (2)

1.1.4 Calculate the standard deviation of the mean. (1)

1.1.5 Determine how many truck drivers purchased litres of diesel below one standard deviation of the mean. (3)

1.2 The mean weight of 8 people entering into a lift is 75 kg. The lift has weight limit of 1 000 kg.

How many people can still get into the lift assuming that the mean weight remains 75 kg? (4)

[12]

QUESTION 2

Grade 8 results of two tests each written out of 50 marks are listed below.

TEST A (x)	39	33	35	44	37	40	24	31	30	5
TEST B (y)	41	45	48	40	47	42	37	44	43	24

2.1 Identify an outlier from the given table. (1)

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

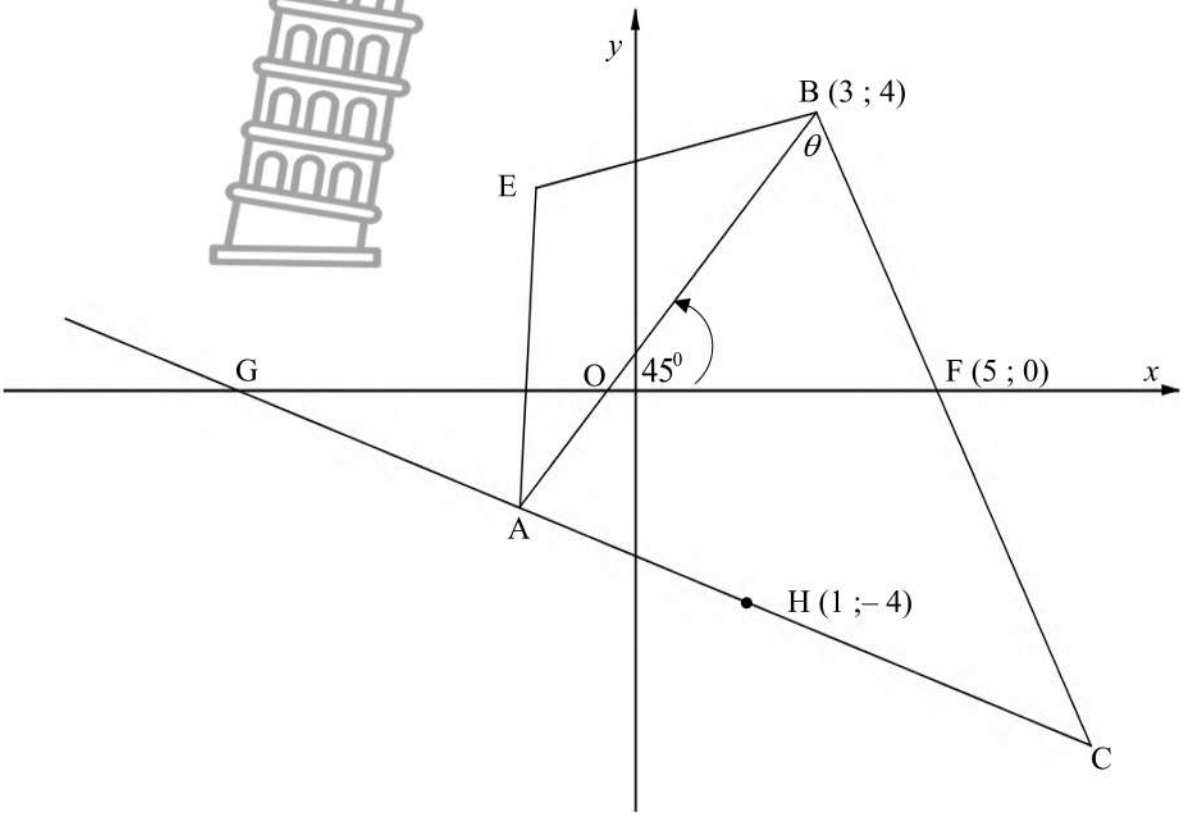
2.3 Use the equation of the least squares regression line to predict a mark for TEST B if a learner obtained 14 marks in TEST A. Round off your answer to the nearest whole number. (2)

2.4 Comment on the strength of correlation between TEST A and TEST B. (2)

[8]

QUESTION 3

Quadrilateral AEBC is drawn. Coordinates of B are (3 ; 4). G, O and F(5 ; 0) are x-intercepts of lines AC, AB and BC respectively. H(1 ; – 4) is a point on line AC. $A\hat{B}C = \theta$.
Area of $\Delta OBF = 12$ square units and inclination of line AB is 45°.
$HC = 2AH$



3.1 Calculate the length of BF. Leave your answer in simplest surd form. (2)

3.2 Calculate the gradient of BF. (2)

3.3 Calculate the size of θ. (3)

3.4 Prove that $HF \parallel AB$. (4)

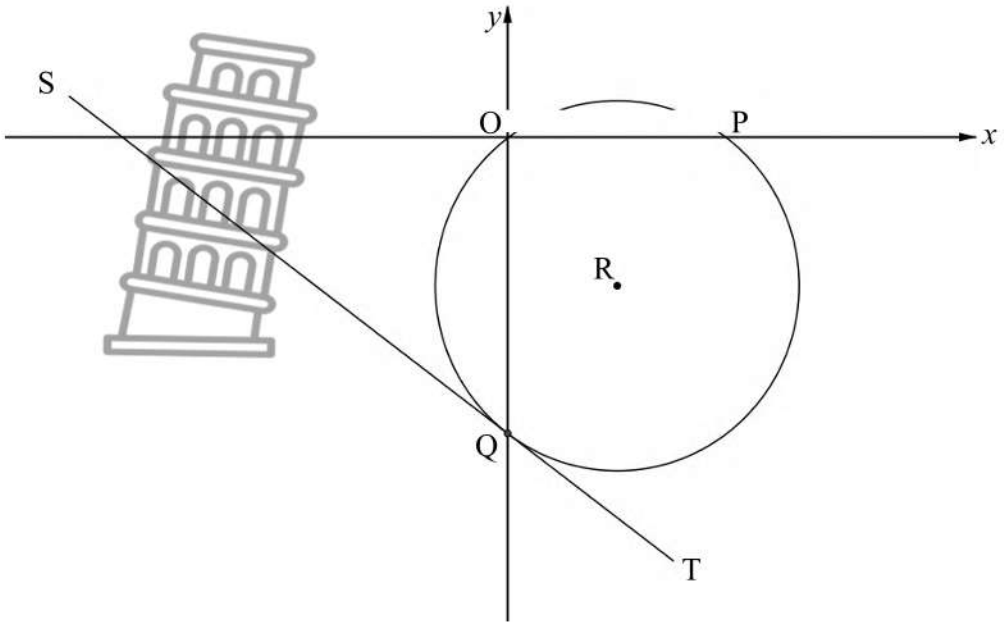
3.5 It is further given that, EC bisects AB perpendicularly. What type of quadrilateral is AEBC? (1)

3.6 Hence or otherwise calculate the length of AC. (4)

3.7 Calculate the area of quadrilateral AOFC. (3)
[19]

QUESTION 4

4.1 In the diagram below, R is the centre of the circle OPQ. Point Q is the y-intercept of the circle. SQT is the tangent of the circle at Q. The equation of SQT is $y=-\frac{3}{4}x-8$.



4.1.1 Calculate the coordinates of Q. (2)

4.1.2 Determine the equation of QR in the form $y=mx+c$. (3)

4.1.3 Calculate the coordinates of P, the x-intercept of line QR. (2)

4.1.4 Calculate the coordinates of R, the centre of the circle. (3)

4.1.5 Write down the equation of the circle centred at R in the form: $(x-a)^2+(y-b)^2=r^2$. (3)

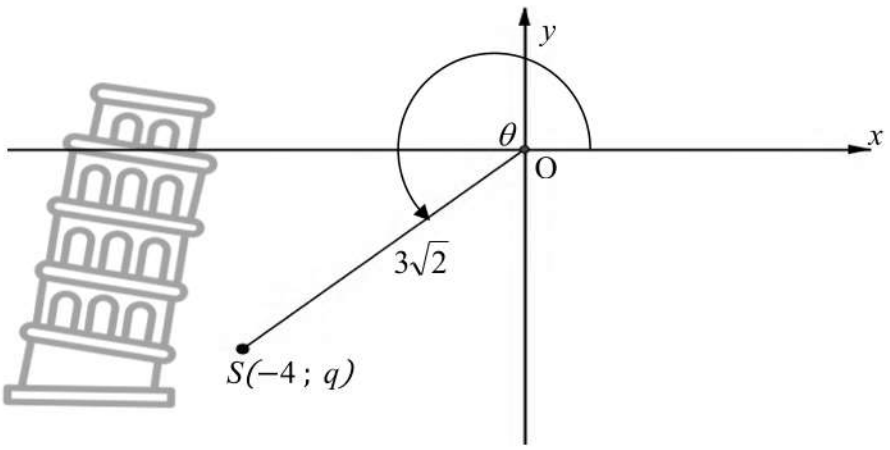
4.1.6 If $y=k$ is a tangent to the circle, determine the value(s) of k. (3)

4.2 Calculate the maximum length of the radius of the circle having equation $x^2+y^2-2x\sin\theta-4y\sin\theta=-2$. (5)

[21]

QUESTION 5

5.1 In the diagram below, point $S(-4\ ;\ q)$ and reflex angle θ are shown. O is the point at the origin. $OS = 3\sqrt{2}$.



Without using a calculator, determine the value of:

5.1.1 q (2)

5.1.2 $\sin(\theta + 45^\circ)$ (4)

5.1.3 $\cos(2\theta - 360^\circ)$ (4)

5.2 Simplify the following without using a calculator:

$$\frac{\sin(90^\circ - \theta).\cos 480^\circ + \cos(180^\circ - \theta)}{\cos\theta.\sin 150^\circ - \tan 180^\circ}$$ (5)

5.3 Prove that $\frac{\cos x}{\sin 2x} - \frac{\cos 2x}{2\sin x} = \sin x$ (5)

5.4 Given: $\frac{\cos 60^\circ}{\sin x} - \frac{\sin 60^\circ}{\cos x} = 2$

5.4.1 Show that the equation $\frac{\cos 60^\circ}{\sin x} - \frac{\sin 60^\circ}{\cos x} = 2$ can be written as $\cos(x + 60^\circ) = \cos(90^\circ - 2x)$ (3)

5.4.2 Hence, or otherwise, determine the general solution of $\frac{\cos 60^\circ}{\sin x} - \frac{\sin 60^\circ}{\cos x} = 2$ (4)

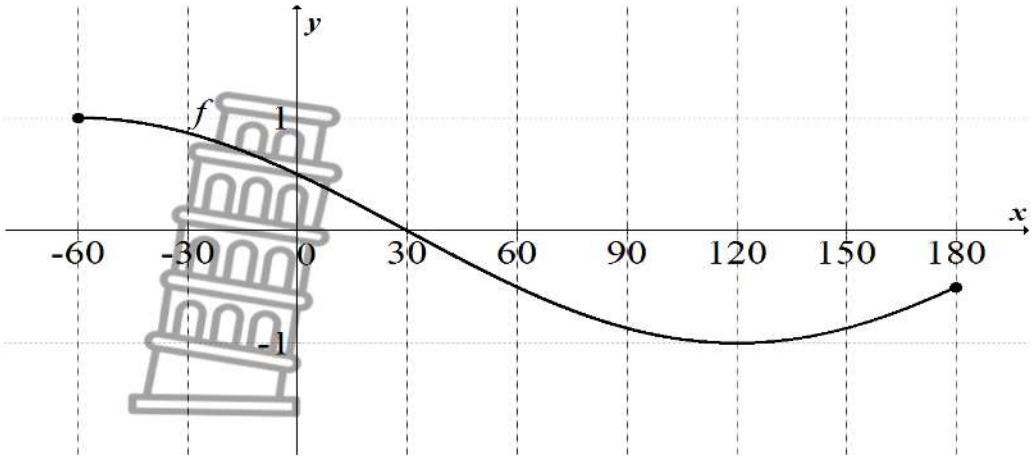
5.5 Given that $\cos 22{,}5^\circ = \frac{a}{c}$ and $a^2 + b^2 = c^2$.

With the aid of a diagram, or otherwise, show that $\frac{2ab}{c^2} = \frac{\sqrt{2}}{2}$. (5)

[32]

QUESTION 6

The graph of $f(x) = -\sin(x - 30^\circ)$ is drawn in the interval of $x \in [-60^\circ ; 180^\circ]$.



Use the graph to answer the following questions.

6.1 Write down the period of f. (1)

6.2 Write down the minimum value of f. (1)

6.3 Determine the range of $f(x) + 1$. (2)

6.4 For which values of x is the graph of f increasing, where $x \in [-60^\circ ; 180^\circ]$? (2)

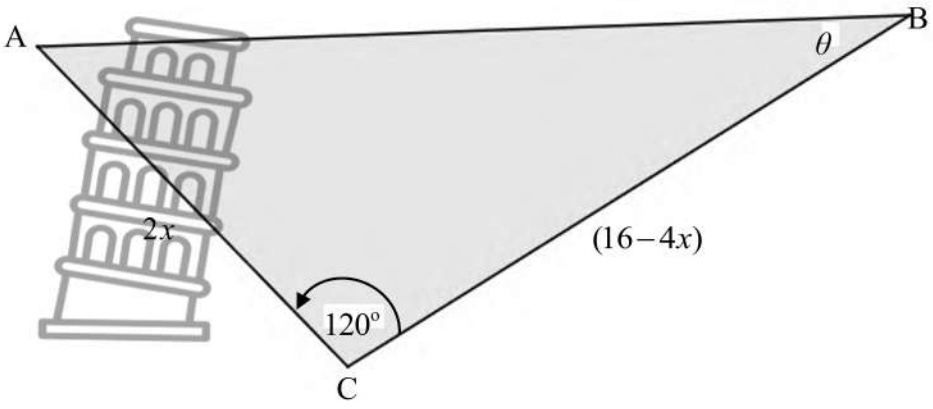
6.5 The graph of f is shifted 60° to the right and then reflected in the x-axis to form a new graph of g. Determine the equation of g in its simplest form. (3)

6.6 Draw the graph of g on the same set of axes. Clearly show the intercepts with the axis and the turning points in the interval of $x \in [-60^\circ ; 180^\circ]$. (3)

[12]

QUESTION 7

In ΔABC below, AC = $2x$, BC = $(16 - 4x)$, $\hat{C} = 120^\circ$, $\hat{B} = \theta$.

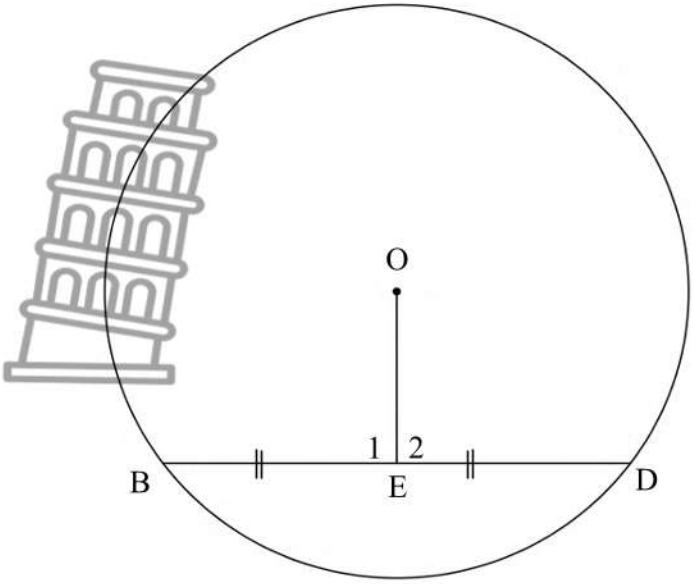


7.1 Determine the area of ΔABC in terms of x, without using a calculator. (3)

7.2 For which value(s) of x will the area of ΔABC be a maximum? (3)
[6]

QUESTION 8

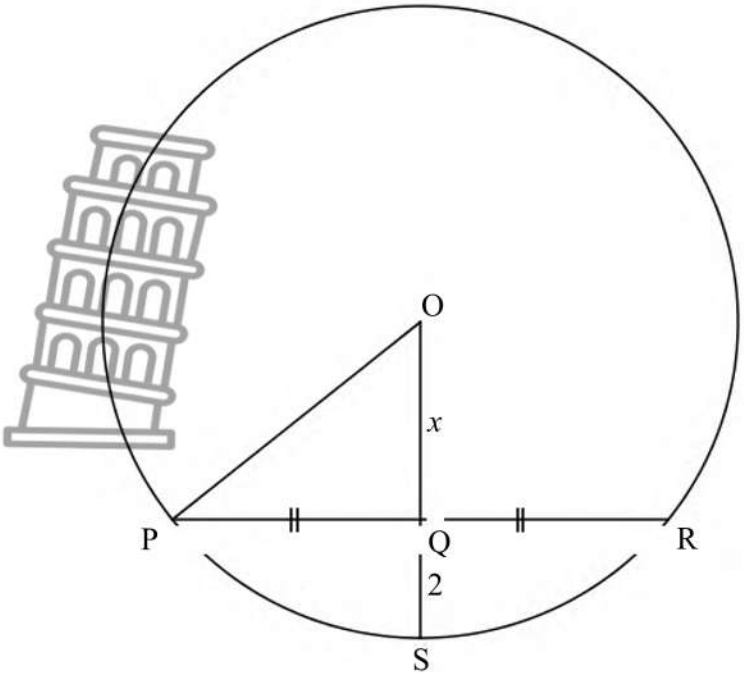
8.1 In the diagram below, O is the centre of the circle. BD is the chord of the circle. E is the midpoint of chord BD.



Use the diagram provided in the ANSWER BOOK to prove the theorem which states that: The line drawn from the centre of a circle that bisects a chord is perpendicular to the chord.

In other words, prove that: OE ⊥ BD. (5)

8.2 In the diagram below, O is the centre of the circle. Q is the midpoint of chord PR. OQS is the radius of the circle. PR = 8 units, OQ = x units and QS = 2 units.

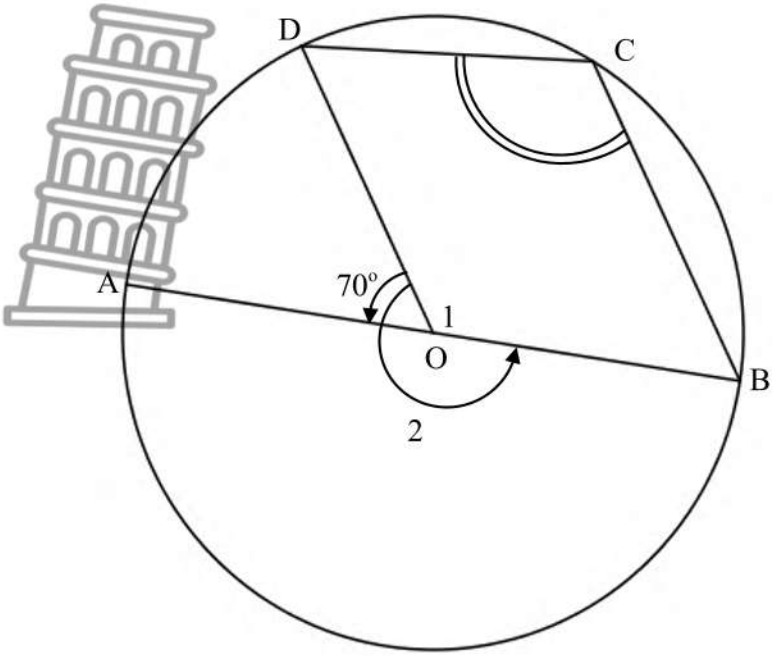


8.2.1 Determine, giving reasons, the size of $O\hat{Q}P$. (2)

8.2.2 Calculate the length of PO. (5)
[12]

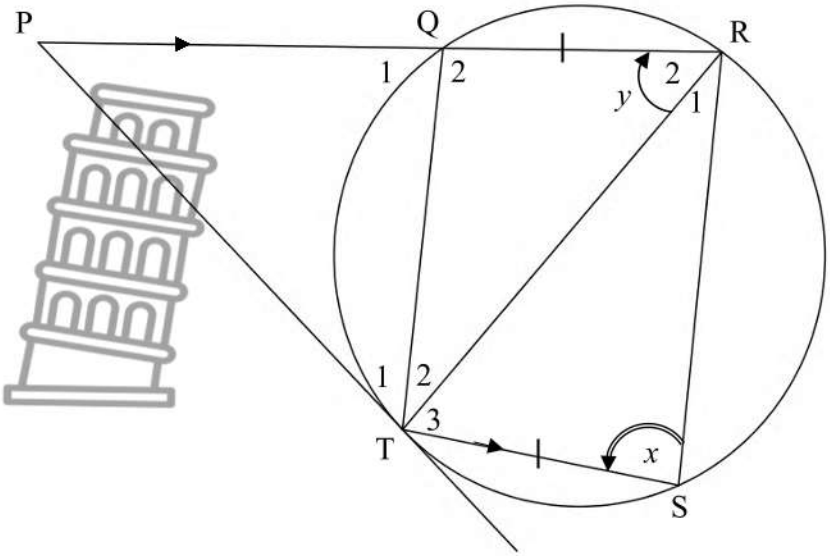
QUESTION 9

9.1 A, B, C and D are points on the circumference of the circle with centre O. AOB is the diameter of the circle. $A\hat{O}D = 70^{\circ}$.



Calculate the size of $\hat{C}$, giving reasons. (5)

9.2 PT is a tangent to the circle at T. PR $\parallel$ TS and PQR is a straight line. Q, R and S are points on the circumference of the circle. $\hat{R}_2 = y$ and $\hat{S} = x$. QR = TS.



9.2.1 Name, giving reasons, TWO other angles each equal to y. (4)

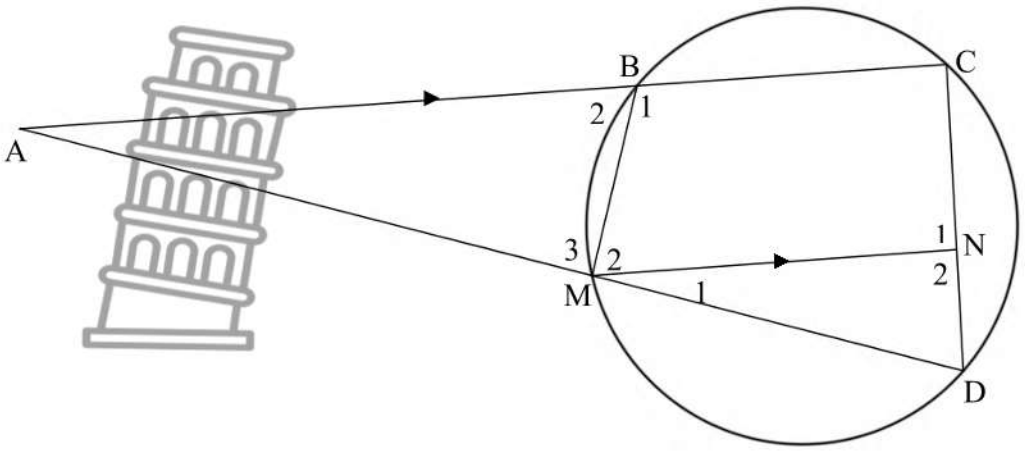
9.2.2 Determine, giving reason, another angle which is equal to $\hat{T}_2$. (2)

9.2.3 Prove that TR is the diameter of the circle. (4)
[15]

QUESTION 10

BCDM is a cyclic quadrilateral. Chords MD and BC are produced to meet at point A. N is a point on CD. $AC \parallel MN$ and $AM = CD$.

AC = 36 units, AD = 48 units and BM = 24 units.



10.1 Prove that $\Delta ABM \,|||\, \Delta ADC$. (4)

10.2 Prove that $CD^2 = BM \times AC$. (3)

10.3 Calculate the length of CN. (6)
[13]

TOTAL: 150

INFORMATION SHEET: MATHEMATICS

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

GRADE 12/*GRAAD* 12	

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NASIONALE SENIORSERTIFIKAAT

GRADE 12/*GRAAD 12*

SEPTEMBER 2024

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

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

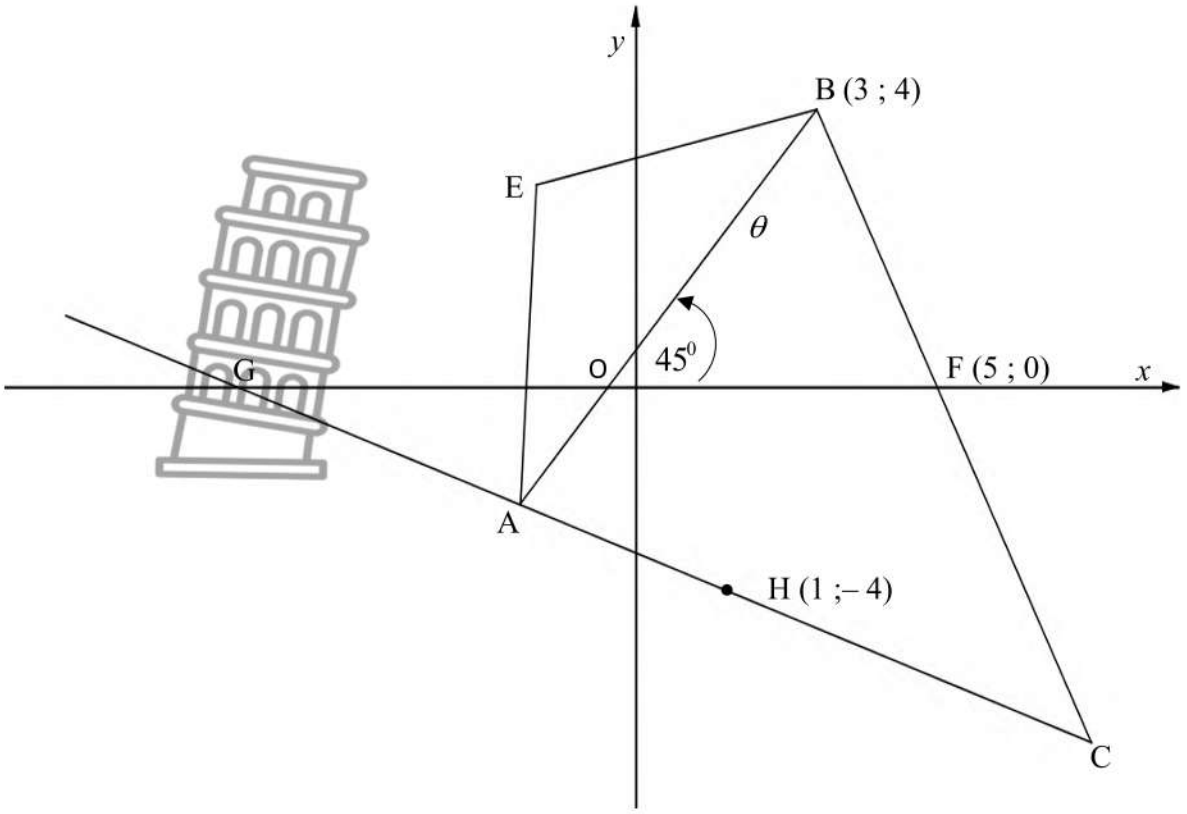
This special answer book consists of 21 pages. /
Hierdie spesiale antwoordeboek bestaan uit 21 bladsye.

QUESTION 1/*VRAAG* 1

82	64	55	50	41
71	78	88	98	96
63	66	80	84	88

	Solution/*Oplossing*	**Marks/ *Punte***
1.1.1		(1)
1.1.2		(1)
1.1.3		(2)
1.1.4		(1)
1.1.5		(3)
1.2		(4)
		[12]

QUESTION 3/*VRAAG* 3

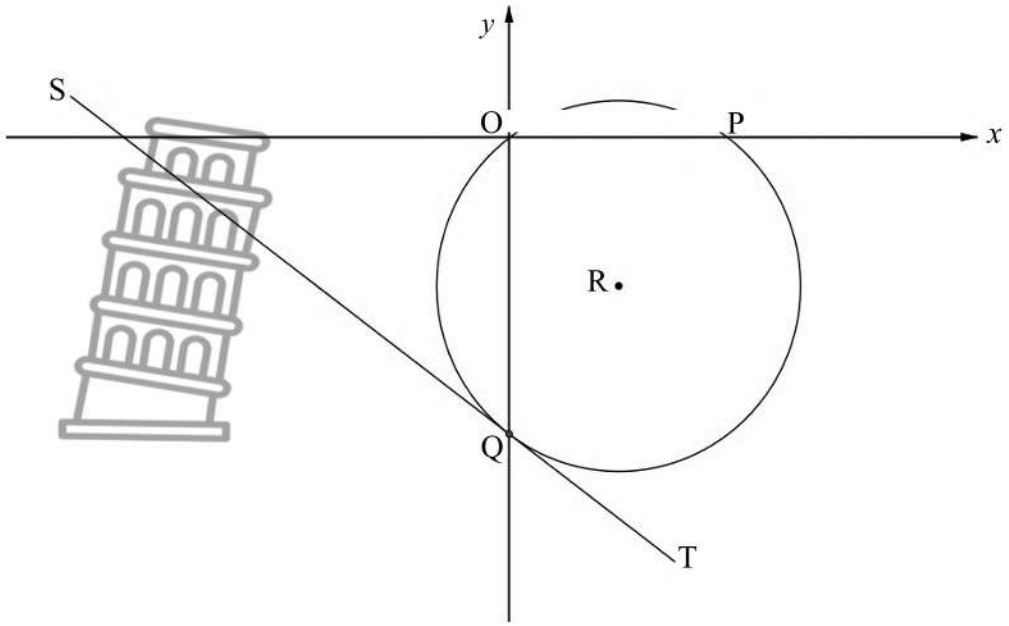


	Solution/*Oplossing*	**Marks/ *Punte***
3.1		(2)
3.2		(2)

3.3		(3)
3.4		(4)
3.5		(1)
3.6		(4)

3.7		(3)
		[19]

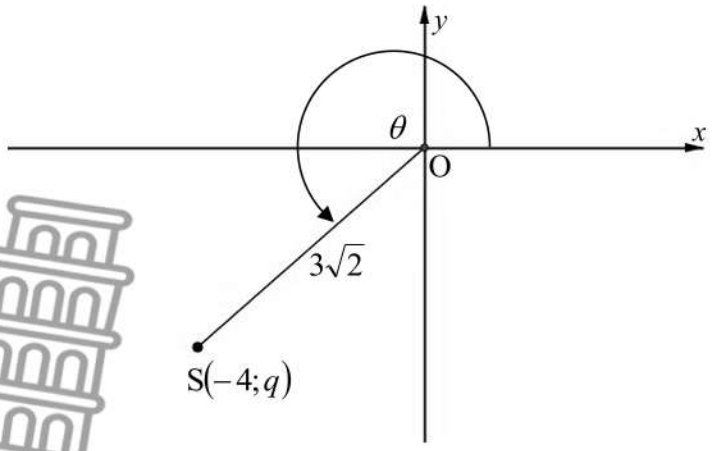
QUESTION 4/*VRAAG 4*



	Solution/*Oplossing*	**Marks/ *Punte***
4.1.1		(2)
4.1.2		(3)

4.1.3		(2)
4.1.4		(3)
4.1.5		(3)
4.1.6		(3)
4.2		(5)
		[21]

QUESTION 5/*VRAAG 5*

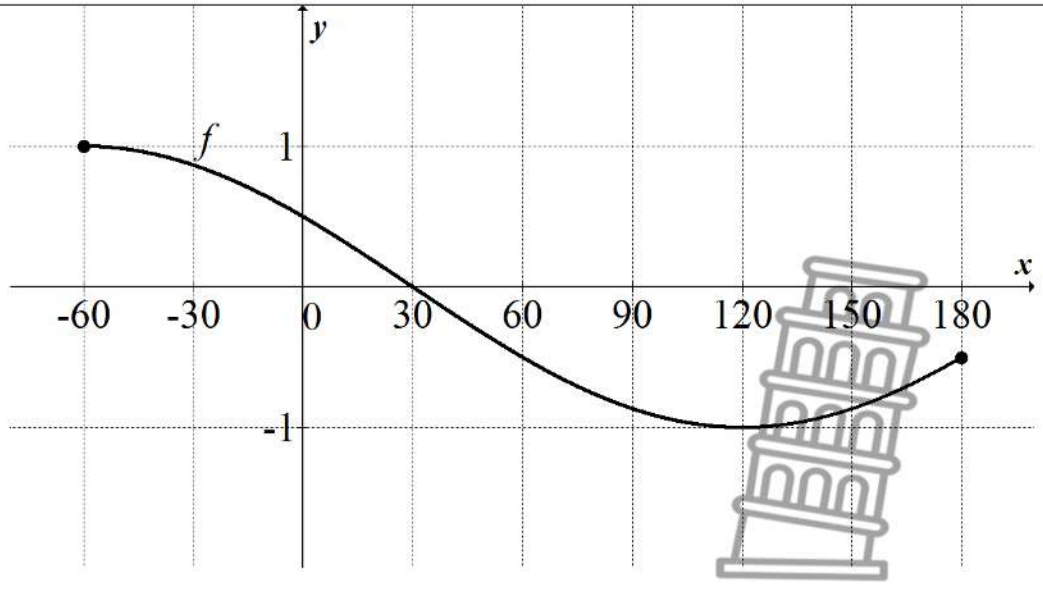


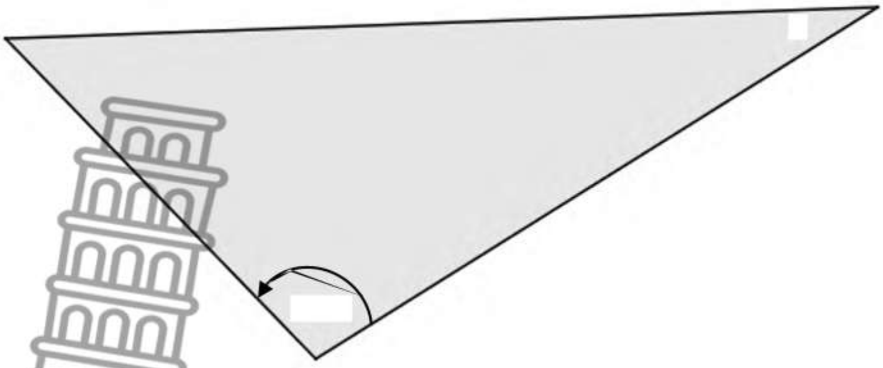
	Solution/*Oplossing*	**Marks/ *Punte***
5.1.1		(2)
5.1.2		(4)
5.1.3		(4)

5.2		(5)
5.3		(5)

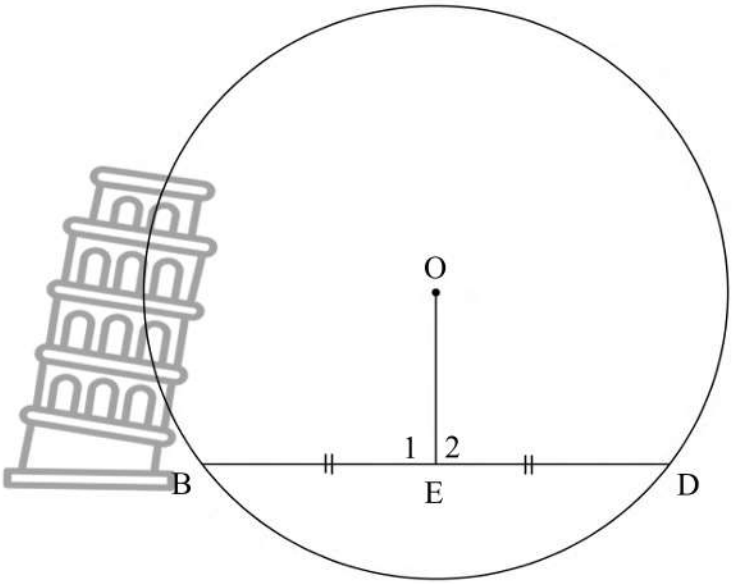
5.4.1		(3)
5.4.2		(4)
5.5		(5)
		[32]

QUESTION 6/*VRAAG* 6

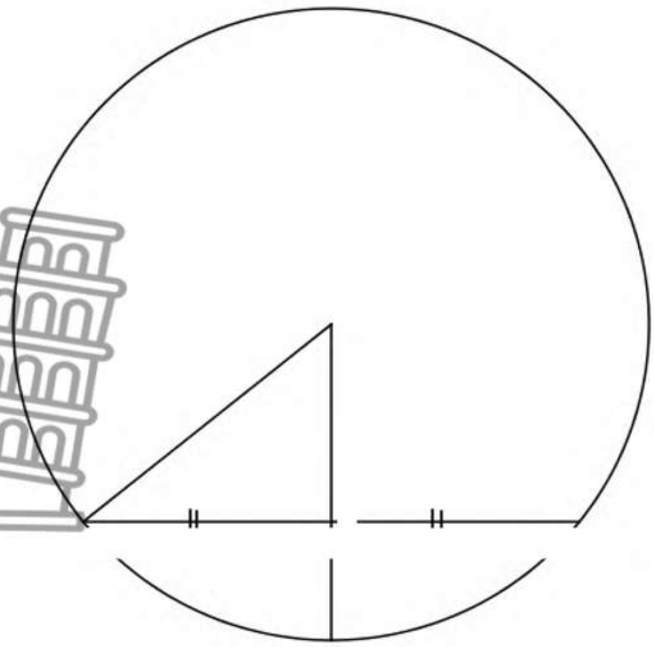
	Solution/*Oplossing*	**Marks/ *Punte***
6.1		(1)
6.2		(1)
6.3		(2)
6.4		(2)
6.5		(3)
6.6		(3)
		[12]



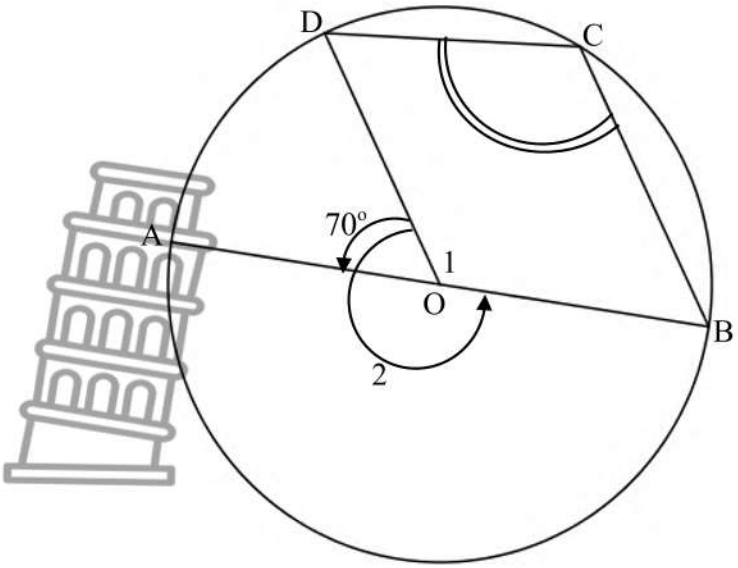
QUESTION 8/*VRAAG 8*



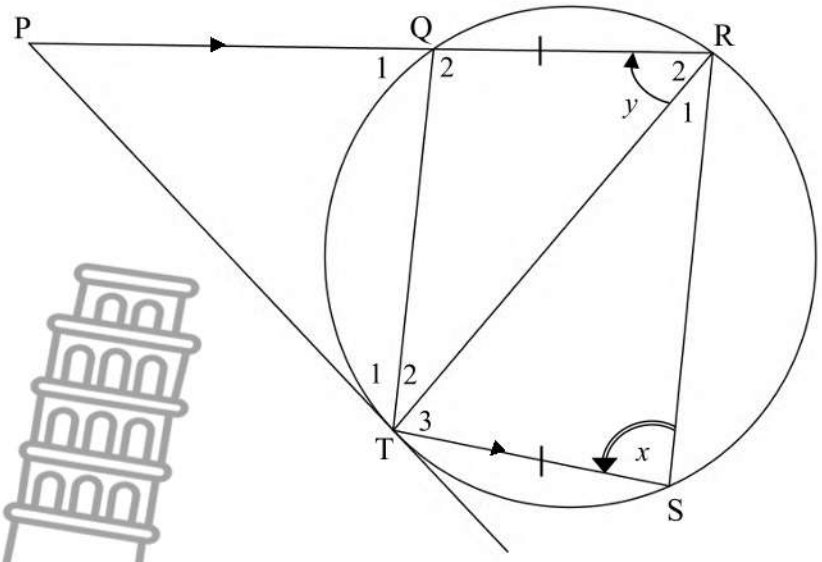
	Solution/*Oplossing*	**Marks/ *Punte***
8.1		(5)



QUESTION 9/*VRAAG 9*

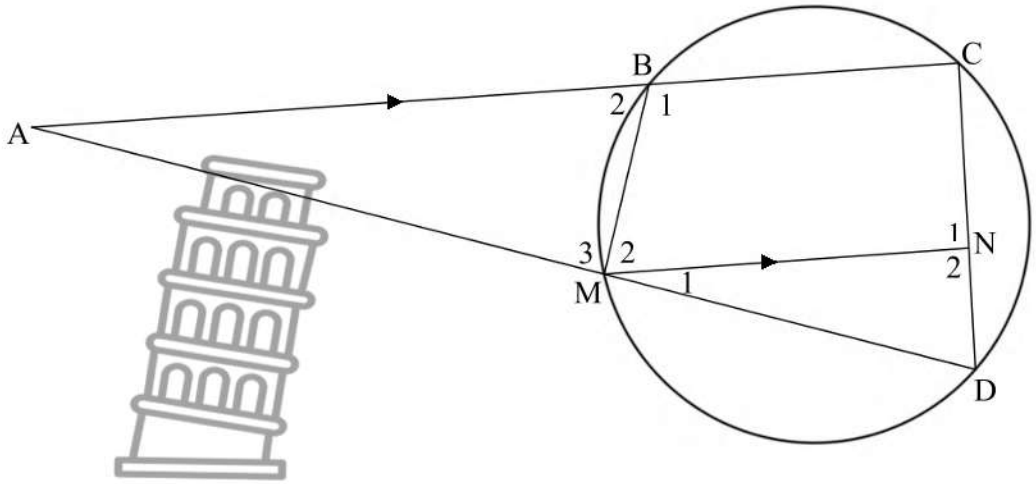


	Solution/*Oplossing*	**Marks/ *Punte***
9.1		
		(5)



	Solution/*Oplossing*	Marks/ *Punte*
9.2.1		(4)
9.2.2		(2)
9.2.3		(4)
		[15]

QUESTION 10/*VRAAG 10*



	Solution/*Oplossing*	**Marks/ *Punte***
10.1		(4)
10.2		(3)

	Solution/*Oplossing*	Marks/ *Punte*
10.3		(6)
		[13]

TOTAL/*TOTAAL*: 150

Additional Space/*Addisionele Ruimte*

Additional Space/*Addisionele Ruimte*

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GRADE/*GRAAD* 12

SEPTEMBER 2024

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

MARKS/*PUNTE*: 150

This marking guideline consists of 17 pages.
Hierdie nasienriglyn bestaan uit 17 bladsye.

NOTE:

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

GEOMETRY	
S	A mark for a correct statement (A statement mark is independent of a reason)
R	A mark for the correct reason. (A reason mark may only be awarded only if the statement is correct
S/R	Award a mark if a statement AND a reason are both correct

NOTA:

- *As 'n kandidaat 'n vraag TWEEKEER beantwoord, merk slegs die EERSTE poging.*
- *As 'n kandidaat 'n poging van 'n vraag doodtrek en dit nie oordoen nie, merk die doodgetrekte poging.*
- *Volgehoue akkuraatheid word in ALLE aspekte van die Nasienriglyn toegepas. Hou op nasien by die tweede berekeningsfout.*
- *Aanvaar van antwoorde/waardes om 'n probleem op te los, word NIE toegelaat nie.*

MEETKUNDE	
S	*'n Punt vir korrekte bewering* (*'n Punt vir 'n bewering is onafhanklik van die rede*)
R	*'n Punt vir 'n korrekte rede* (*'n Punt word slegs vir die rede toegeken as die bewering korrek is*)
S/R	*Ken 'n punt toe as die bewering EN rede beide korrek is*

QUESTION 1/*VRAAG* 1

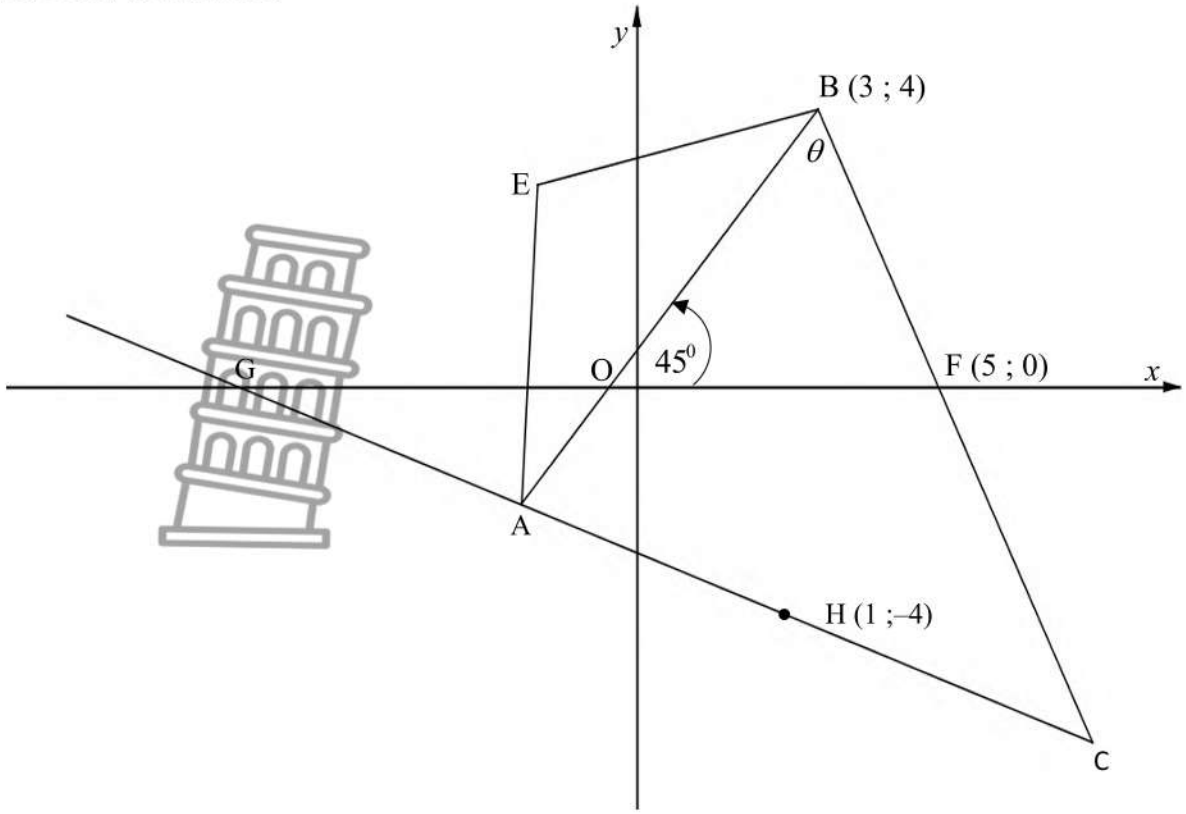
1.1	82 64 55 50 41 71 78 88 98 96 63 66 80 84 88		
1.1.1	88	✓ answer / *antwoord*	(1)
1.1.2	Range / *Omvang* $= 98 - 41 = 57$	✓ answer / *antwoord*	(1)
1.1.3	$\bar{x} = \frac{1104}{15}$ $= 73{,}60$	✓ 1104 ✓ answer / *antwoord*	(2)
1.1.4	$\sigma = 16{,}30$	✓ answer / *antwoord*	(1)
1.1.5	$\bar{x} - \sigma = 73{,}60 - 16{,}30$ $= 57{,}30$ $\therefore$ There were 3 truck drivers. *Daar was 3 trokbestuurders*	✓ $73{,}60 - 16{,}30$ ✓ $57{,}30$ ✓ answer / *antwoord*	(3)
1.2	let total mass of 8 people be x: *laat die totale massa van 8 mense x wees* : number of people to be added be k: *aantal mense wat by moet kom k wees* : $\frac{x}{8} = 75$ $x = 600$ $75k + 600 = 1000$ $\therefore k = \frac{1000 - 600}{75}$ $k = 5{,}333$ It will be approximately equal to 5 people *Dit sal ongeveer gelyk aan 5 mense wees*	✓ $\frac{x}{8} = 75$ ✓ mass of 8 people (600) *massa van 8 mense (600)* ✓ equation / *vergelyking* $(75k + 600 = 1\,000)$ ✓ answer / *antwoord*	(4)
			[12]

QUESTION 2/*VRAAG* 2

TEST A / *TOETS A*	39	33	35	44	37	40	24	31	30	5
TEST B / *TOETS B*	41	45	48	40	47	42	37	44	43	24

2.1	(44 ; 40)	✓ 44 in TEST A / *TOETS A*	(1)
2.2	$a = 25{,}48$ $b = 0{,}49$ $y = 25{,}48 + 0{,}49x$	✓ $a = 25{,}48$ ✓ $b = 0{,}49$ ✓ $y = 25{,}48 + 0{,}49x$	(3)
2.3	$y = 25{,}48 + 0{,}49(14)$ $= 32$	✓correct substitution / *korrekte vervanging* ✓ answer / *antwoord*	(2)
2.4	$r = 0{,}79$ Strong positive correlation *Sterk positiewe korrelasie*	✓ $r = 0{,}79$ ✓comment / *kommentaar (opmerking)*	(2)
			[8]

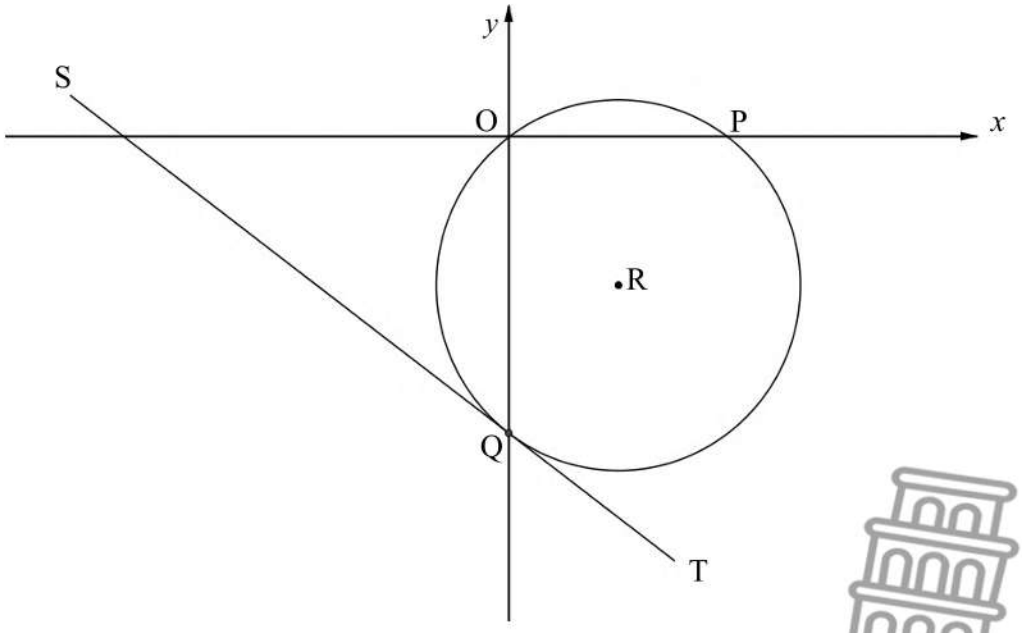
QUESTION 3/*VRAAG* 3



3.1	$BF = \sqrt{(3-5)^2 + (4-0)^2}$ $= \sqrt{20}$	✓ correct substitution *korrekte vervanging* ✓ answer / *antwoord*	(2)
3.2	$m_{BF} = \frac{4-0}{3-5}$ $= -2$	✓ correct substitution *korrekte vervanging* ✓ answer / *antwoord*	(2)
3.3	$\tan\alpha = -2$ $\alpha = 116,57^\circ$ $\theta = 116,57^\circ - 45^\circ = 71,57^\circ$ $[ext\angle of\ a\ \Delta]$	✓ $\tan\alpha = m_{BF} = -2$ ✓ $\alpha = 116,57^\circ$ ✓ $\theta = 71,57^\circ$	(3)
3.4	$\tan 45^\circ = m_{AB} = 1$ $m_{HF} = \frac{1-5}{-4-0}$ $= 1$ $\therefore HF \parallel AB$ $[m_{AB} = m_{HF} = 1]$	✓ $m_{AB} = 1$ ✓ correct substitution/ *korrekte vervanging* ✓ $m_{HF} = 1$ ✓ Reason /*Rede* [$m_{AB} = m_{HF}$]	(4)

3.5	Kite / *Vlieër*	✓ answer / *antwoord*	(1)
3.6	$\frac{HC}{AH}=\frac{FC}{BF}$ [line/*lyn* ∥ to one side of a Δ / *aan een sy van* Δ] $\frac{2}{1}=\frac{FC}{2\sqrt{5}}$ $FC=4\sqrt{5}$ $BC=4\sqrt{5}+2\sqrt{2}=6\sqrt{5}$ $AC=6\sqrt{5}$ [adj.sides of a kite / *aangr.sye van vlieër*]	✓ correct ratio / *korrekte verhouding* ✓ correct substitution *korrekte vervanging* ✓ FC ✓ AC = BC	(4)
3.7	$\hat{B}=\hat{A}=71,57°$ [∠s opp = sides / ∠*e teenoor* = *sye*] $\therefore \hat{C}=36,87°$ Area of/*van* AOFC = Area of/*van* ΔABC – Area of/*van* ΔOBF $=\frac{1}{2}\times 6\sqrt{5}\times 6\sqrt{5}\times \sin 36,87°-12$ $=42$	✓ $\hat{C}=36,87°$ ✓ Area of/*van* ΔABC ✓ answer / *antwoord*	(3)
			[19]

QUESTION 4/*VRAAG* 4

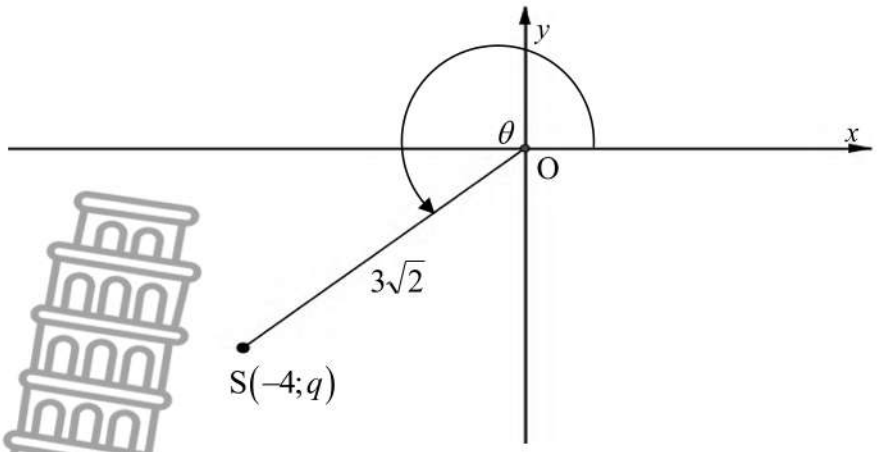


4.1.1	$y=-\frac{3}{4}(0)-8$ $=-8$ $Q(0\ ;-8)$	✓ $x=0$ ✓ y- coordinate / *y-koördinaat*	(2)

4.1.2	$m_{QR}=\frac{4}{3}$ [tan ⊥ rad / *raakl ⊥ rad*] $y+8=\frac{4}{3}(x-0)$ $y=\frac{4}{3}x-8$	✓ m_{QR} ✓ substituting m_{QR} and $Q(0\,;-8)$ *vervanging* m_{QR} *en* $Q(0\,;-8)$ ✓ equation / *vergelyking*	(3)
4.1.3	$\frac{4}{3}x-8=0$ $x=6$ $P(6;0)$	✓ $y=0$ ✓ $x=6$	(2)
4.1.4	$x_R=\frac{0+6}{2}$; $y_R=\frac{-8+0}{2}$ $x_R=3$; $y_R=-4$	✓ correct substitution *korrekte vervanging* ✓ $x_R=3$ ✓ $y_R=-4$	(3)
4.1.5	$r^2=(0-3)^2+(-8+4)^2$ $=25$ $(x-3)^2+(y+4)^2=25$	✓ correct substitution *korrekte vervanging* ✓ $r^2=25$ ✓ equation / *vergelyking*	(3)
4.1.6	$k=-4+5$ or / *of* $k=-4-5$ $k=1$ or / *of* $k=-9$	✓ method / *metode* ✓ $k=1$ ✓ $k=-9$	(3)
4.2	$(x-\sin\theta)^2+(y+2\sin\theta)^2=-2+\sin^2\theta+4\sin^2\theta$ $r^2=-2+5\sin^2\theta$ For any value of θ maximum of $\sin^2\theta=1$ *Vir enige waarde van* θ *is maksimum van* $\sin^2\theta=1$ $\therefore\ r=\sqrt{-2+5(1)}$ $=\sqrt{3}$	✓ $(x-\sin\theta)^2+(y+2\sin\theta)^2$ ✓ $r^2=-2+5\sin^2\theta$ ✓ maximum of $\sin^2\theta=1$ *maksimum van* $\sin^2\theta=1$ ✓ $r=\sqrt{-2+5(1)}$ ✓ answer / *antwoord*	(5)
			[21]

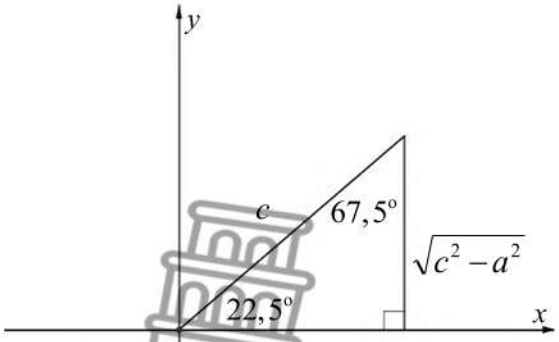
QUESTION 5/*VRAAG* 5

5.1

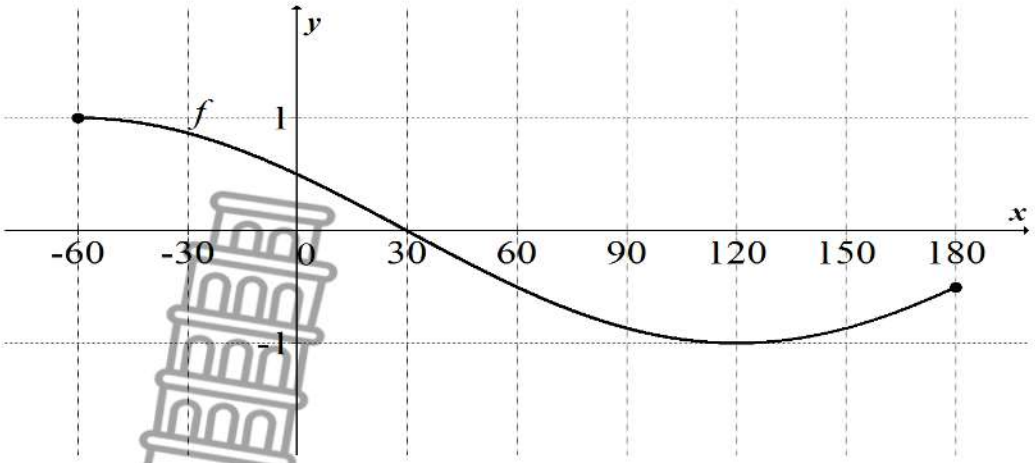


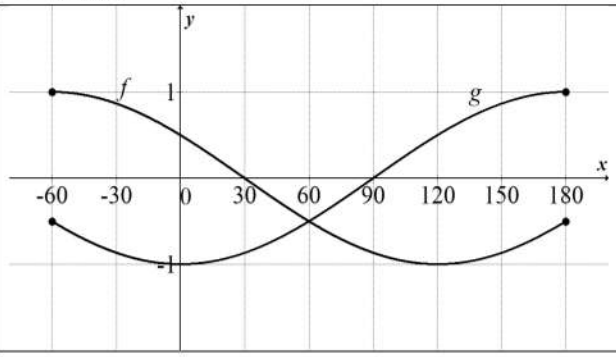
5.1.1	$q=-\sqrt{\left(3\sqrt{2}\right)^2-(-4)^2}$ *Pyth* $=-\sqrt{2}$	✓ correct substitution/ *korrekte vervanging* ✓ answer / *antwoord*	(2)
5.1.2	$\sin(\theta+45^\circ)=\sin\theta.\cos45^\circ+\cos\theta\sin45^\circ$ $=\frac{-\sqrt{2}}{3\sqrt{2}}.\frac{\sqrt{2}}{2}+\left(\frac{-4}{3\sqrt{2}}\right).\frac{\sqrt{2}}{2}$ $=\frac{-1-2\sqrt{2}}{3\sqrt{2}}$	✓ expansion / *vergelyking* ✓ ratios of / *verhoudings van* $\sin\theta$ & $\cos\theta$ ✓ special angles / *spesiale hoeke* ✓ answer / *antwoord*	(4)
5.1.3	$\cos(2\theta-360^\circ)=\cos2\theta$ $=2\cos^2\theta-1$ $=2\left(\frac{-4}{3\sqrt{2}}\right)^2-1$ $=\frac{7}{9}$	✓ $\cos2\theta$ ✓ identity / *identiteit* ✓ ratio of / *verhouding van* $\cos\theta$ ✓ answer / *antwoord*	(4)
5.2	$\frac{\sin(90^\circ-\theta).\cos480^\circ+\cos(180^\circ-\theta).\tan45^\circ}{\cos\theta.\sin390^\circ-\tan180^\circ}$ $=\frac{\cos\theta.(-\cos60^\circ)+(-\cos\theta)(\tan45^\circ)}{\cos\theta(\sin30^\circ)-\tan180^\circ}$ $=\frac{-\frac{1}{2}\cos\theta-\cos\theta(1)}{\cos\theta\left(\frac{1}{2}\right)-0}$ $=\frac{-\frac{3}{2}\cos\theta}{\frac{1}{2}\cos\theta}$ $=-3$	✓ $\cos\theta$ ✓ $-\cos60^\circ$ ✓ $\sin30^\circ$ ✓ special angles / *spesiale hoeke* ✓ answer / *antwoord*	(5)

5.3	$\text{LHS / } LK = \dfrac{\cos x}{\sin 2x} - \dfrac{\cos 2x}{2\sin x}$ $= \dfrac{2\sin x\cos x - \cos 2x\sin 2x}{2\sin 2x\sin x}$ $= \dfrac{\sin 2x - \cos 2x\sin 2x}{2\sin 2x\sin x}$ $= \dfrac{\sin 2x(1-\cos 2x)}{2\sin 2x\sin x}$ $= \dfrac{1-(1-2\sin^2 x)}{2\sin x}$ $= \dfrac{2\sin^2 x}{2\sin x}$ $= \sin x$	✓ simplification / *vereenvoudiging* ✓ $\sin 2x$ ✓ common factor / *gemene faktor* ✓ identity / *identiteit* $1-2\sin^2 x$ ✓ $\dfrac{2\sin^2 x}{\sin x}$	(5)
5.4.1	$\dfrac{\cos 60^\circ}{\sin x} - \dfrac{\sin 60^\circ}{\cos x} = 2$ $\dfrac{\cos 60^\circ\cos x - \sin 60^\circ\sin x}{\sin x\cos x} = 2$ $\cos(x+60^\circ) = 2\sin x\cos x$ $\cos(x+60^\circ) = \sin 2x$ $\cos(x+60^\circ) = \cos(90^\circ - x)$	✓ simplification / *vereenvoudiging* ✓ $\cos(x+60^\circ)$ ✓ $\sin 2x$	(3)
5.4.2	$\cos(x+60^\circ) = \cos(90^\circ - 2x)$ $x+60^\circ = \pm(90^\circ - 2x) + 360^\circ.k$ $x+60^\circ = 90^\circ - 2x + 360^\circ.k$ or / *of* $x+60^\circ = -90^\circ + 2x + 360^\circ.k$ $3x = 30^\circ + 360^\circ.k$ or / *of* $-x = -120^\circ + 360^\circ.k$ $x = 10^\circ + 120^\circ.k$ or / *of* $x = 120^\circ - 360^\circ.k,\ k \in \mathbb{Z}$ **OR / *OF*** $x+60^\circ = 90^\circ - 2x + 360^\circ.k$ or / *of* $x+60^\circ = 360^\circ - 90^\circ + 2x + 360^\circ.k$ $3x = 30^\circ + 360^\circ.k$ or / *of* $-x = 240^\circ + 360^\circ.k$ $x = 10^\circ + 120^\circ.k$ or / *of* $x = -240^\circ - 360^\circ.k,\ k \in \mathbb{Z}$	✓ $x+60^\circ = 90^\circ - 2x$ ✓ $\begin{bmatrix} 3x = 30^\circ + 360^\circ.k \\ or / of \\ -x = -120^\circ + 360^\circ.k \end{bmatrix}$ ✓ $\begin{bmatrix} x = 10^\circ + 120^\circ.k \\ or / of \\ x = 120^\circ - 360^\circ.k \end{bmatrix}$ ✓ $360^\circ.k,\quad k \in \mathbb{Z}$	(4)

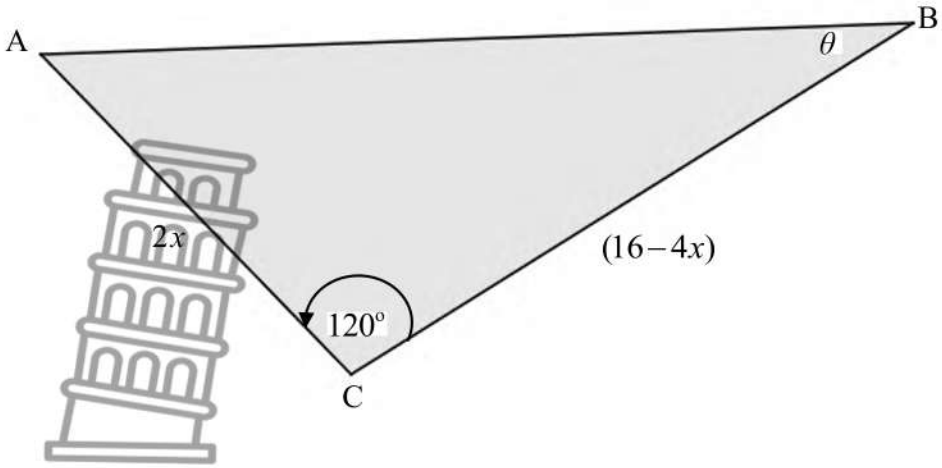
5.5	$y=\sqrt{c^2-a^2}$ Pyth Theorem / *Stelling*  $\frac{\sqrt{2}}{2}=\sin 45^\circ$ $=2\sin 22,5^\circ\cos 22,5^\circ$ $=2.\frac{\sqrt{c^2-a^2}}{c}.\frac{a}{c}$ $=2.\frac{\sqrt{a^2+b^2-a^2}}{c}.\frac{a}{c}$ $=\frac{2ab}{c^2}$	✓ $y=\sqrt{c^2-a^2}$ *Pyth Theorem / Stelling* **OR/*OF*** correct diagram/ *korrekte diagram* ✓ $\sin 45^\circ$ ✓ $2\sin 22,5^\circ.\cos 22,5^\circ$ ✓ substition / *vervanging* ✓ c^2 i.t.o./ *i.t.v* a^2 & b^2	(5)
			[32]

QUESTION 6/*VRAAG 6*



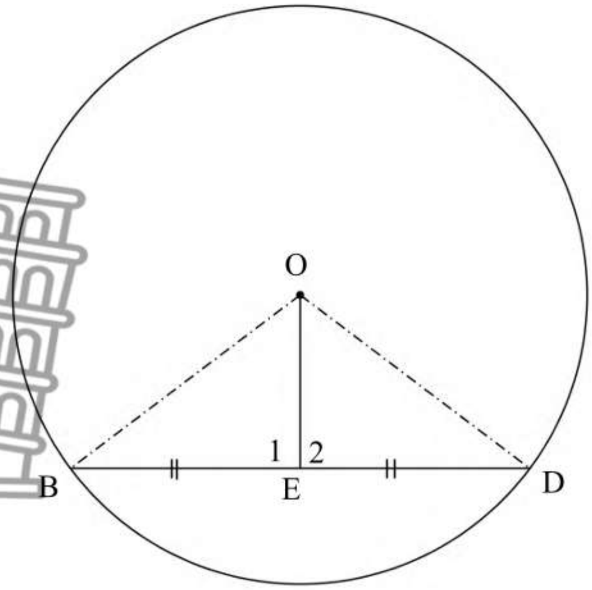
6.1	Period / *Periode* is 360°	✓ answer / *antwoord*	(1)
6.2	Min value / *waarde* = -1	✓answer / *antwoord*	(1)
6.3	$-1 \le y \le 1$ $-1+1 \le y \le 1+1$ $0 \le y \le 2$	✓correct critical values *korrekte kritieke waardes* ✓ correct notation / *korrekte notasie*	(2)
6.4	$120^\circ < x < 180^\circ$	✓ correct critical values *korrekte kritieke waardes* ✓correct notation / *korrekte notasie*	(2)
6.5	$g(x) = -\sin(x - 30^\circ - 60^\circ)$ $= -\sin(x - 90^\circ)$ $= -\cos x$	✓$-(-\sin x - 30^\circ - 60^\circ)$ ✓ $\sin(x - 90^\circ)$ ✓ $-\cos x$	(3)
6.6		✓ intercepts with the axes *afsnitte met die asse* ✓ turning points / *draaipunte* ✓ shape / *vorm*	(3)
			[12]

QUESTION 7 / *VRAAG 7*



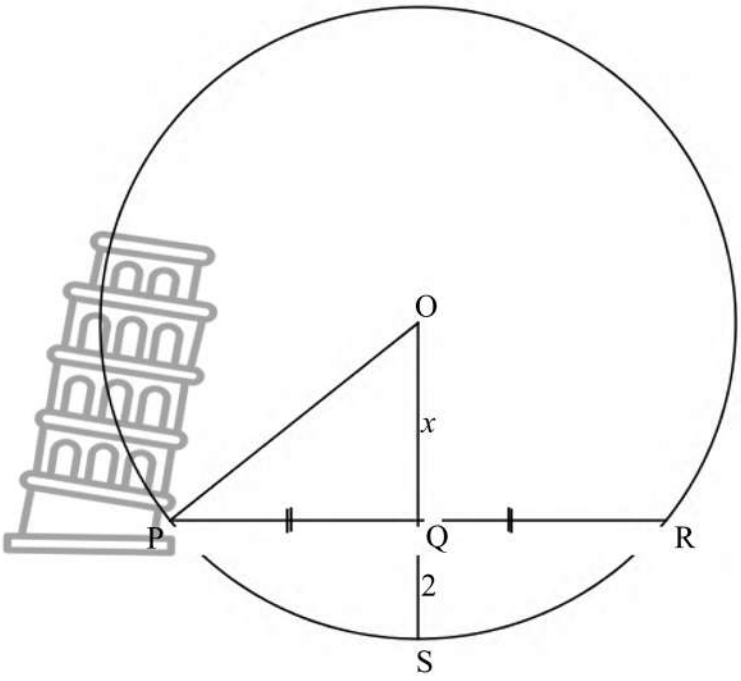
7.1	$A\ of\ \Delta ABC = \frac{1}{2}\times 2x\times(16-4x)\times\sin 120^\circ$ $=(16x-4x^2)\times\sin 60^\circ$ $=8\sqrt{3}x-2\sqrt{3}x^2$	✓correct substitution / *korrekte vervanging* ✓ $\sin 60^\circ$ ✓ answer / *antwoord*	(3)
7.2	$A'=0$ $8\sqrt{3}-4\sqrt{3}x=0$ $x=2$	✓ derivative / *afgeleide* = 0 ✓ $8\sqrt{3}-4\sqrt{3}x$ ✓answer / *antwoord*	(3)
			[6]

QUESTION 8/*VRAAG* 8



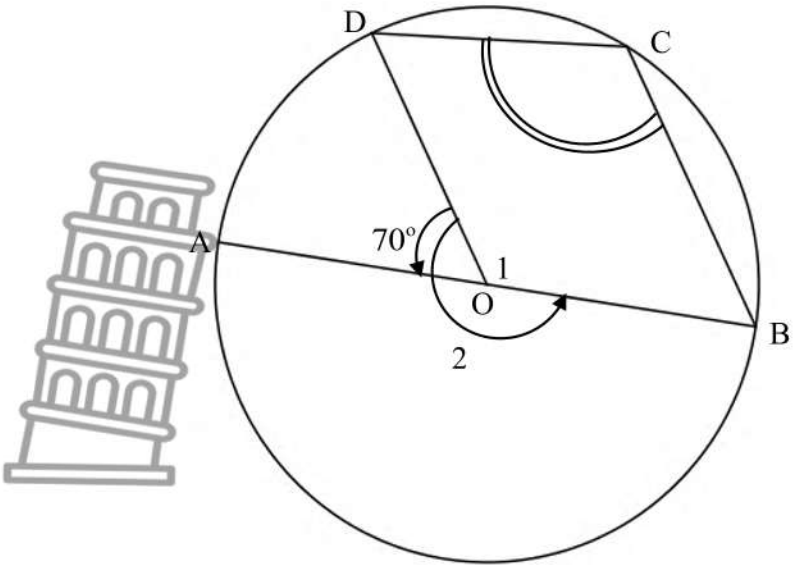
8.1	Construction: Draw DO and OB Proof: In ΔODE and ΔOEB $DE = EB$ [given] $OD = OB$ [radii] $OE = OE$ [common] $\therefore \Delta ODE \equiv \Delta OEB$ [SSS] $\hat{E}_1 + \hat{E}_2 = 180^\circ$ [$\angle$s on str line] $\therefore \hat{E}_1 = \hat{E}_2 = 90^\circ$ [$\Delta ODE \equiv \Delta OEB$]	✓ construction ✓ first statement (radii) ✓ other 2 statements ✓ reason for congruency ✓ R	
	Konstruksie: Trek DO en OB *Bewys*: In ΔODE *en* ΔOEB $DE = EB$ [*gegee*] $OD = OB$ [*radiusse*] $OE = OE$ [*gemeen*] $\therefore \Delta ODE \equiv \Delta OEB$ [SSS] $\hat{E}_1 + \hat{E}_2 = 180^\circ$ [$\angle$*e op reguitlyn*] $\therefore \hat{E}_1 = \hat{E}_2 = 90^\circ$ [$\Delta ODE \equiv \Delta OEB$]	✓ *konstruksie* ✓ *eerste stelling* (*radiusse*) ✓ *ander 2 stellings* ✓ *rede vir kongruensie* ✓ R	(5)

8.2



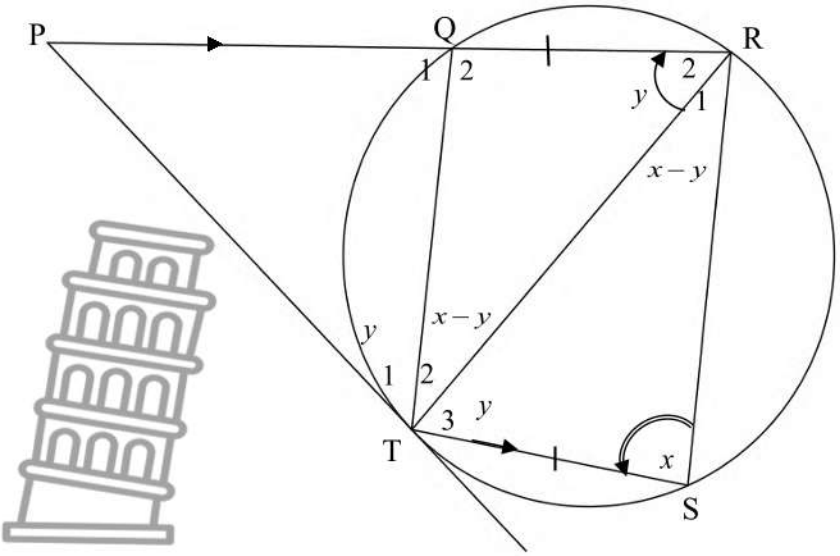
8.2.1	$O\hat{Q}P = 90^\circ$ [line from centre to the midpoint] [*lyn vanaf middelpunt van sirkel na middelpunt van koord*]	✓S ✓R	(2)
8.2.2	$PQ = 4$ $OP^2 = PQ^2 + OQ^2$ [*Pyth*] $(x+2)^2 = 4^2 + x^2$ $x^2 + 4x + 4 = 16 + x^2$ $4x = 12$ $x = 3$ $OP = OS = 5$ [radii / *radiusse*]	✓ PQ ✓ substitution into Pythagoras *vervanging in Pythagoras* ✓ simplification / *vereenvoudiging* ✓ *x*-value /*x–waarde* ✓ PO	(5)
			[12]

QUESTION 9/*VRAAG* 9



9.1	$\hat{O}_1 = 110^\circ$	[∠s on a str. line / *∠e op reguitlyn*]	✓ S/R	
	$\hat{O}_2 = 250^\circ$	[∠s around a point / *∠e om 'n punt*]	✓ S ✓ R	
	$\therefore \hat{C} = 125^\circ$	[∠at centre = 2 × ∠at circumf]	✓S ✓ R	
		[*Middelpunts* ∠ = 2 × *Omtreks* ∠]		(5)

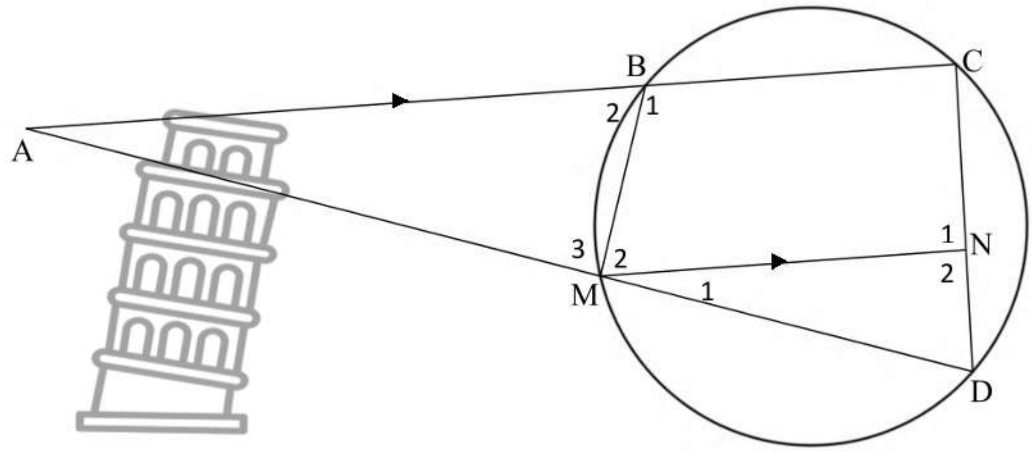
9.2



9.2.1	$\hat{T}_1 = y$ [tan chord theorem / *raaklyn koord Stelling*] $\hat{T}_3 = y$ [alt ∠s / *verw. ∠e*, PR||TS]	✓ S ✓ R ✓ S ✓ R	(4)
9.2.2	$\hat{T}_2 = \hat{R}_1$ [∠s subt by equal chords / *∠e onderspan deur gelyke koorde*]	✓ S ✓ R	(2)
9.2.3	$\hat{T}_2 = x - y$ [ext.∠ of a Δ / *buite ∠ van 'n Δ*] $\hat{R}_1 = \hat{T}_2 = x - y$ [proved / *bewys*] $y + x - y + x = 180^\circ$ [∠s in ΔTRS / *∠e in ΔTRS*] $2x = 180^\circ$ $x = 90^\circ$ ∴ TR is the diameter of the circle [chord subt. 90°] *TR is die middellyn van die sirkel* [*koord onderspan* 90°]	✓ S ✓ S/R ✓ $x = 90^\circ$ ✓ R	(4)
			[15]

QUESTION 10 / *VRAAG* 10

AC = 36 units/*eenhede*, AD = 48 units/*eenhede* and/*en* BM = 24 units/*eenhede*



10.1	$\hat{A} = \hat{A}$ [common / *gemeen*] $\hat{B}_2 = \hat{D}$ [ext ∠ of a cylic quad / *buite ∠ van koordev.*] $\hat{M}_3 = \hat{C}$ [ext ∠ of a cylic quad / *buite ∠ van koordev.*] or / *of* $\left[3^{rd/de}\angle\right]$ ΔABM|||ΔADC [∠∠∠]	✓S ✓S ✓R ✓ R 3rd angle/3*de hoek* **OR/*OF*** ✓ R ∠∠∠	(4)
10.2	$\frac{BM}{DC} = \frac{AM}{AC}$ [||| Δs] but/*maar* AM = DC [given / *gegee*] $\frac{BM}{DC} = \frac{DC}{AC}$ $CD^2 = BM \times AC$	✓ S ✓R ✓ AM = DC	(3)
10.3	$CD^2 = 24 \times 36 = 864$ $\frac{CN}{CD} = \frac{AM}{AD}$ [line || to one side of a Δ] [*lyn*□*aan een sy van 'n* Δ] $AM = CD$ $CN = \frac{CD^2}{AD}$ $= \frac{864}{48}$ $= 18$	✓ length of CD^2 *lengte van* CD^2 ✓ S ✓ R ✓ CN in terms of CD^2 CN *in terme van* CD^2 ✓ correct substitution *korrekte vervanging* ✓ length of CN *lengte van* CN	(6)
			[13]
		TOTAL/*TOTAAL*:	**150**