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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 11

NOVEMBER 2024

MATHEMATICS P2

MARKS: **150**

TIME: **3 hours**

IMAT2

This question paper consists of 16 pages, including 1-page information sheet, and an answer book of 25 pages.

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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.

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QUESTION 1

After utilising GeoGebra to teach geometry, the 14 participants marks out of 100 are displayed in the table below.

16	28	41	41	42	52	54
55	58	59	60	62	64	99

1.1 Write down the mode of the data. (1)

1.2 Identify any outlier. (1)

1.3 Determine the median of the data. (2)

1.4 Determine the interquartile range of the data. (3)

1.5 Draw a box and whisker diagram using the number line provided in the answer book. (2)

1.6 Comment on the skewness of the data by using the box and whisker diagram. (1)
[10]

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QUESTION 2

The weight of the boxers who underwent fitness and health checks is shown in the frequency table below.

WEIGHT OF BOXERS	FREQUENCY	CUMULATIVE FREQUENCY
$35 \leq x < 55$	1	
$55 \leq x < 75$	3	
$75 \leq x < 95$	9	
$95 \leq x < 115$	6	
$115 \leq x < 135$	3	
$135 \leq x < 155$	1	

2.1 Complete the cumulative frequency column provided in the table in the ANSWER BOOK. (2)

2.2 Write down the total number of boxers. (1)

2.3 Estimate the mean for the data. (3)

2.4 Use the grid provided in the ANSWER BOOK to draw a cumulative frequency graph (ogive) for the data. (3)

2.5 It is further given that, for a boxer to qualify for the next upcoming match, he must have a mass that is in the interval of $75 < x \leq 100$.

Using the cumulative frequency graph (ogive) and estimate the number of boxers that will qualify for the upcoming match. (2)

[11]

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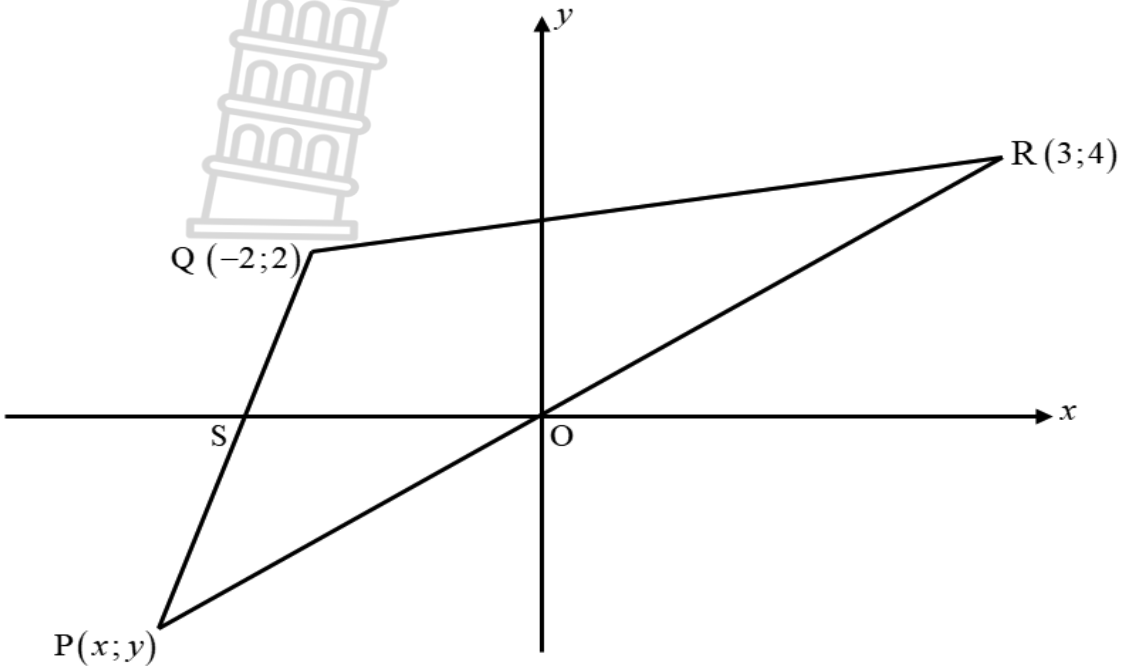
QUESTION 3

In the diagram, P$(x\ ;\ y)$, $Q(-2\ ;\ 2)$ and R$(2\ ;\ 3)$ are the vertices of triangle PQR. Line PR passes through the point of origin at O. The equation of line PQ is given as $y=6x+14$. S is the x-intercept of line QP.



3.1 Calculate the gradient of PR. (2)

3.2 Determine the equation of PR. (3)

3.3 Determine the coordinates of P. (4)

3.4 Determine the coordinates of S. (1)

[10]

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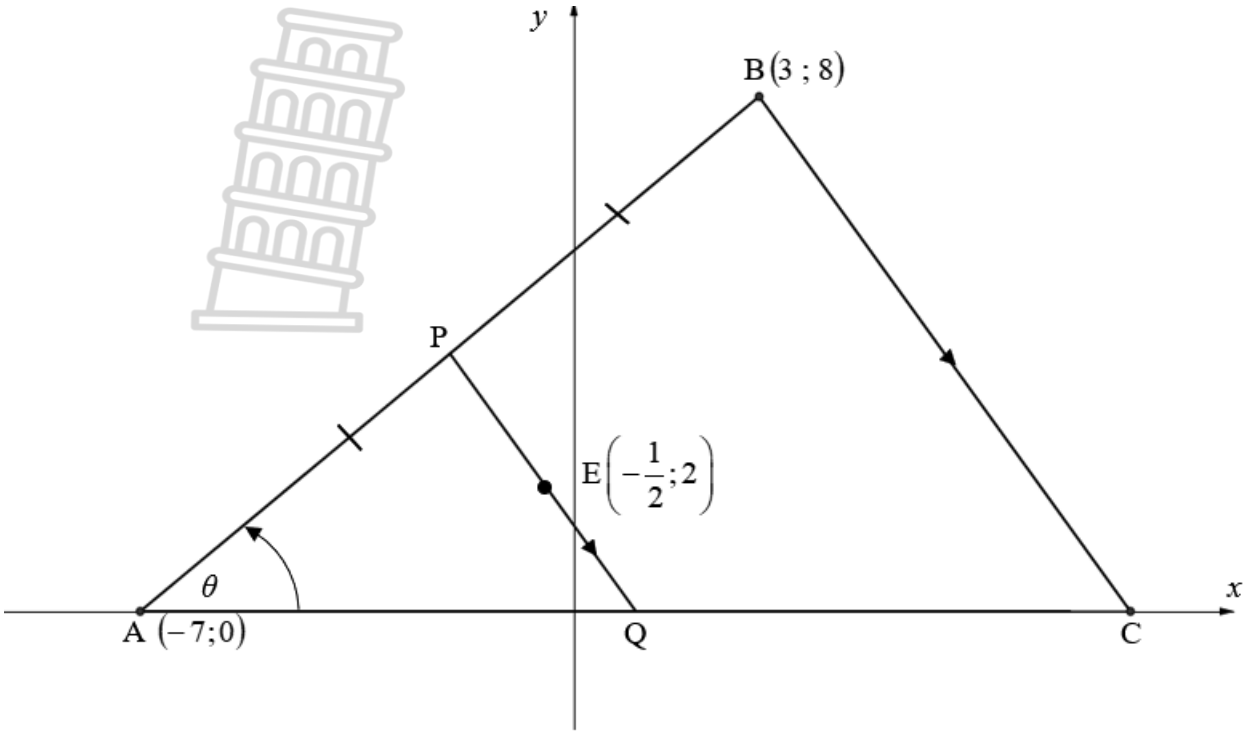
QUESTION 4

In the diagram, ΔABC is drawn with vertices A$(-7\ ;\ 0)$, B $(3\ ;\ 8)$ and C. P is the midpoint of line AB. Q is a point on line AC. AQC is a line on the *x*-axis. E $\left(-\frac{1}{2}\ ;\ 2\right)$ is a point on line PQ. PQ$\parallel$BC



4.1 Calculate the:

4.1.1 Coordinates of P (2)

4.1.2 Gradient of AB (2)

4.1.3 Size of θ (2)

4.2 Determine the equation of BC in the form $y = mx + c$. (5)

4.3 Calculate the:

4.3.1 Length of AC (3)

4.3.2 Area of trapezium PBCQ (6)

[20]

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QUESTION 5

5.1 If $-3\tan\beta-\sqrt{5}=0$ and $\sin\beta<0$. Determine the value of $\sin^2\beta-\cos^2\beta$ with the aid of a diagram. (5)

5.2 If $\cos 49° = k$, determine the values of the following in terms of k.

5.2.1 $\sin 131°$ (2)

5.2.2 $1-\cos^2 41°$ (2)

5.3 Simplify the expression to a single trigonometric ratio of x

$$\frac{\tan(180°-x).\cos(-x)+\sin^2(360^\circ-x)\cos(90°-x)}{\sin(180°-x)}$$ (7)

5.4 Simplify, **without the use of a calculator**:

$\sin(-15°).\cos 75° + \tan 75°.\cos 75°.\cos 165°$ (5)

5.5 Prove the identity: $\dfrac{3\cos x}{1+\sin x}+3\tan x=\dfrac{3}{\cos x}$ (4)

5.6 Determine the general solution of: $\sin^2 x-3\cos^2 x=0$ (5)

[30]

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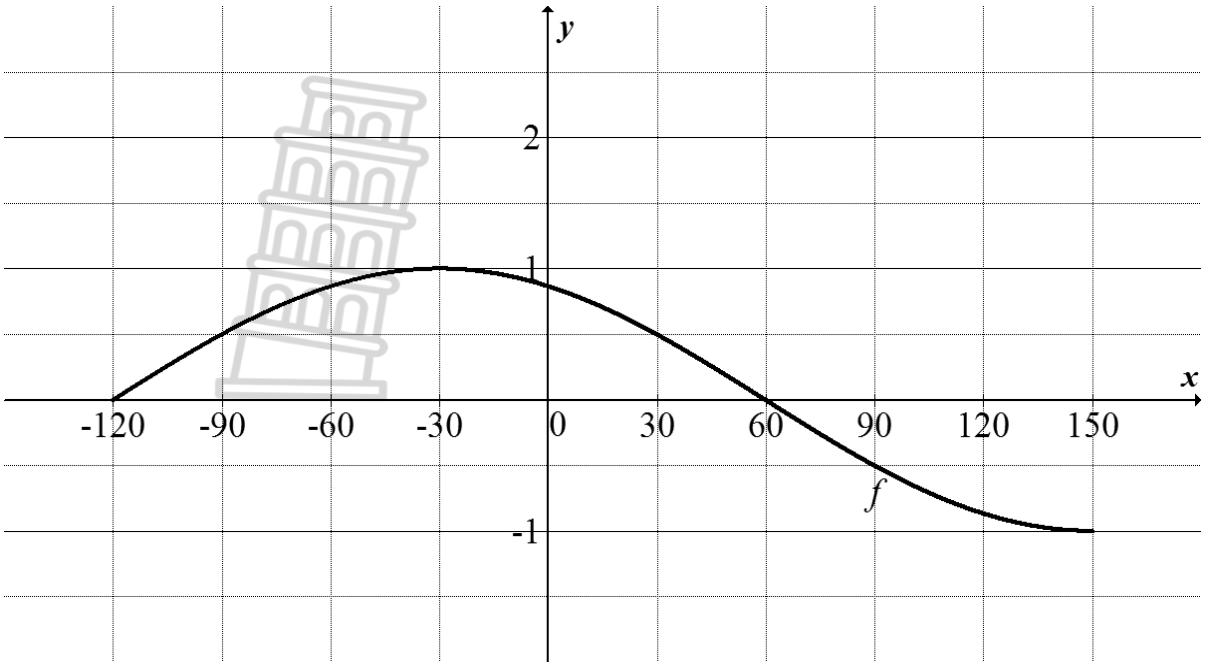
QUESTION 6

The graph of $f(x) = \cos(x + 30°)$ in the interval of $x \in [-120^0; 150^0]$ has been drawn in the diagram below.



6.1 Write down the period of f. (1)

6.2 Write down the range of $h(x) = f(x + 60°) + 1$. (2)

6.3 Write down the equation of h in its simplest form. (2)

6.4 Draw the graph of $h(x)$ on the grid provided in your ANSWER BOOK. (3)

6.5 Use the graph to answer the following questions in the interval $x \in [-120^0; 150^0]$.

For which values of x is:

6.5.1 f having a minimum value? (1)

6.5.2 $h(x) \times f(x) \leq 0$? (2)

6.5.3 $f(x) = h(x)$? (1)

[12]

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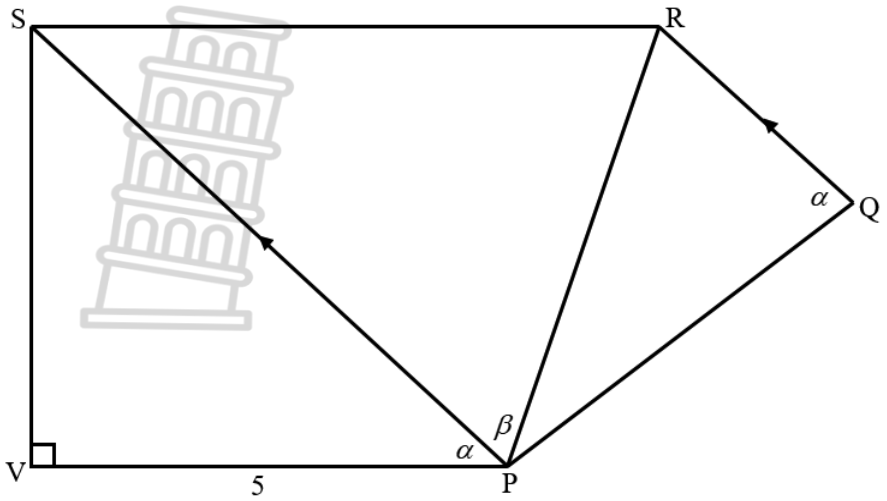
QUESTION 7

In the diagram, $VP = PQ = 5$ units, $R\hat{Q}P = S\hat{P}V = \alpha$, $S\hat{P}R = \beta$ and $PS \parallel QR$. SV is perpendicular to VP.



7.1 Express PS in terms of α. (1)

7.2 Determine RP in terms of α and β. (3)

7.3 Hence show that the area of $\Delta RPS = \dfrac{25.\tan\alpha}{2}$ (3)

[7]

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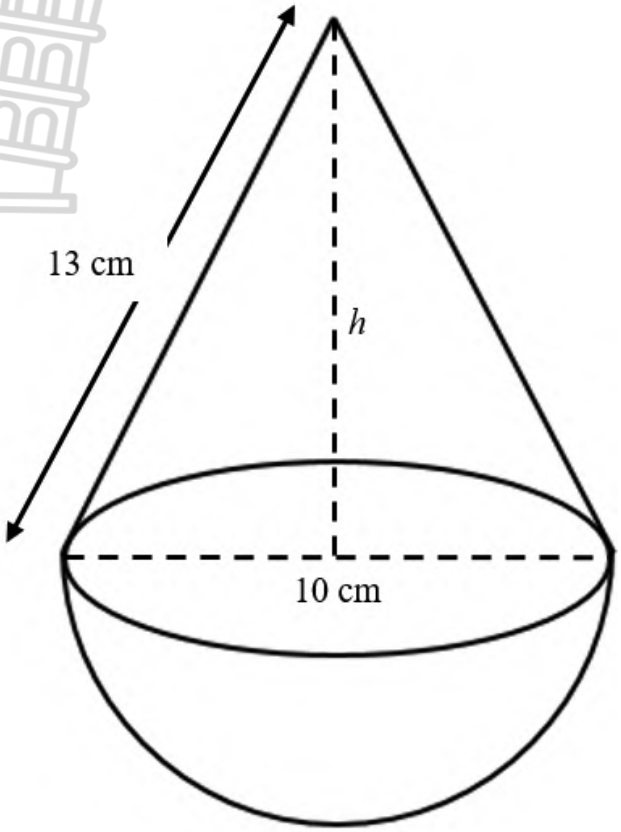
QUESTION 8

In the diagram, a lid with a hemispherical form seals an open cone. The slanted height of the cone is 13 cm, the diameter of the cone and hemisphere is 10 cm, the height of the cone h cm.

Formulae:

$V = \frac{2}{3}\pi r^3$ $V = \frac{1}{3}\pi r^2 h$ Surface Area $= \pi r^2 + \pi rs$ Surface Area $= 2\pi r^2$



8.1 Determine the height of the cone. (3)

8.2 Write down the height of the container (height of the whole shape). (1)

8.3 Calculate the volume of this container. (3)

8.4 Determine the total surface area of the container. (3)
[10]

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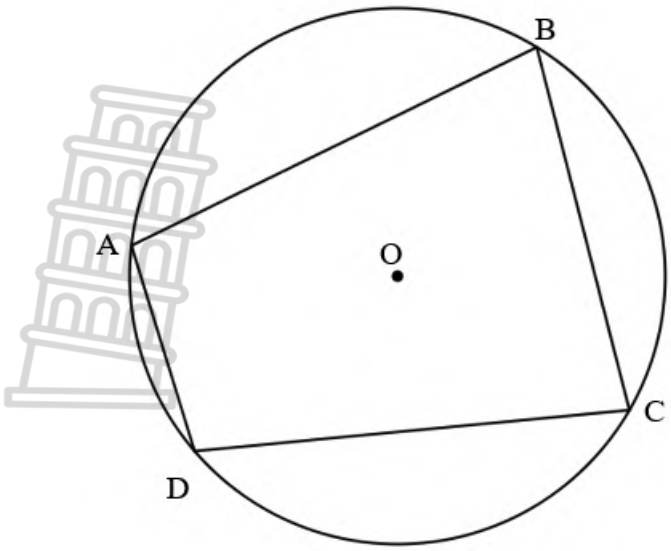
QUESTION 9

9.1 In the diagram, ABCD is a cyclic quadrilateral. O is the centre of the circle.



Use the diagram above to prove the THEOREM which states that, the opposite angles of a cyclic quadrilateral add up to 180°, then prove that, $\hat{B}+\hat{D}=180°$. (5)

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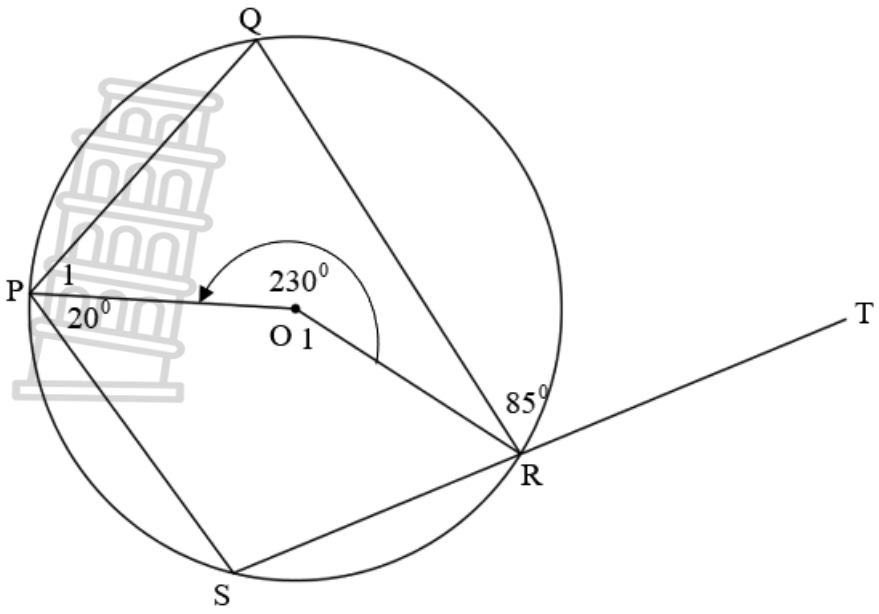
9.2 In the diagram, O is the centre of the circle with a reflex angle of $230°$. P, Q, R and S are points on the circumference of the circle with chord SR extended to point T. $Q\hat{R}T = 85°$ and $O\hat{P}S = 20°$.



Calculate the magnitude of the following angles:

9.2.1 $\hat{S}$ (2)

9.2.2 $\hat{Q}$ (2)

9.2.3 $\hat{P}_1$ (2)

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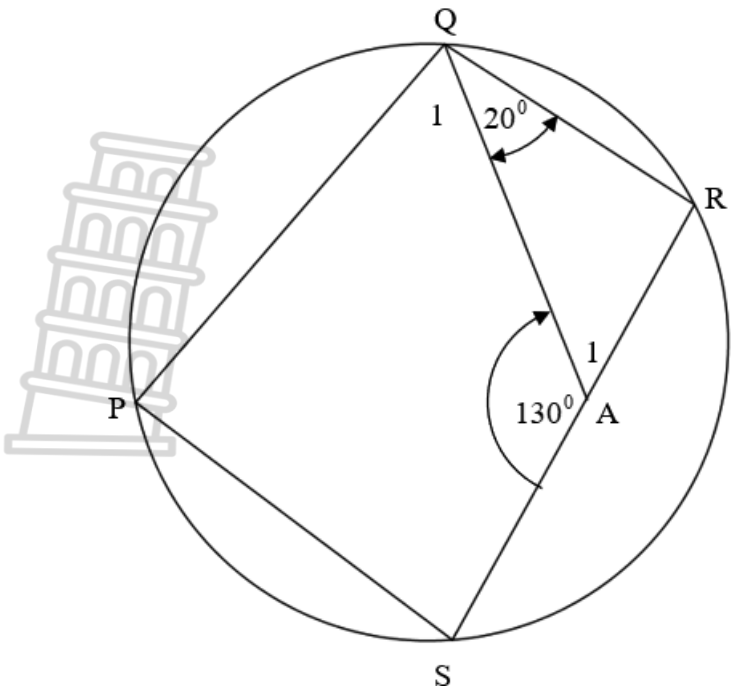
9.3 In the diagram, PQRS is a cyclic quadrilateral. QA intersects SR at point A. $S\widehat{A}Q = 130°$ and $A\widehat{Q}R = 20°$.



Calculate, giving reasons, the size of $\hat{P}$. (4)

[15]

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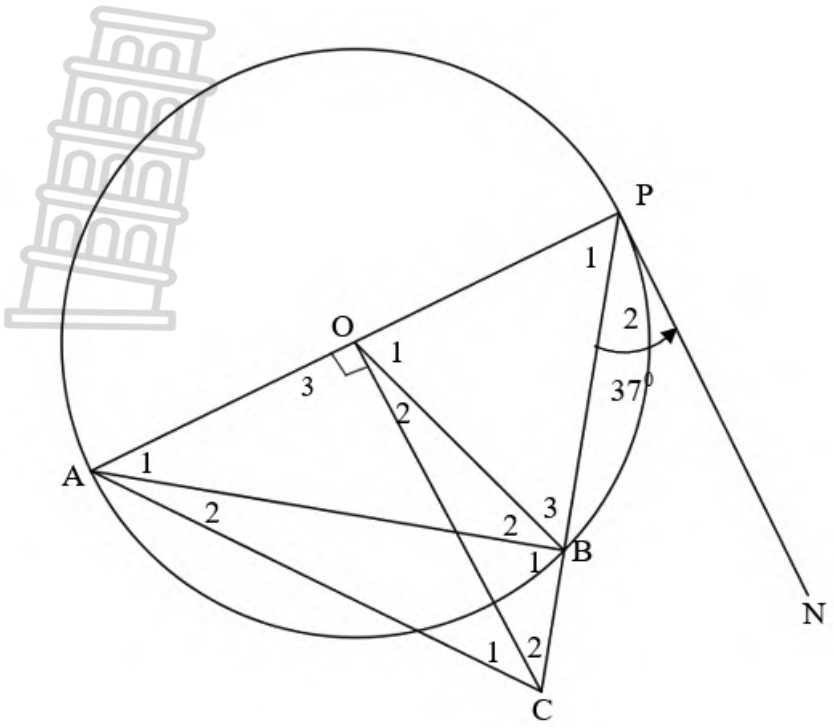
QUESTION 10

10.1 In the diagram, O is the centre of circle ABP. PB is extended to C. AC is drawn. PN is a tangent to the circle at P. OC intersects AP perpendicularly at point O.
$\hat{P}_2 = 37°$



10.1.1 Determine, giving reasons, the size of $\hat{O}_1$. (4)

10.1.2 Prove that:

(a) OACB is a cyclic quadrilateral (4)

(b) OC $\|$ PN (3)

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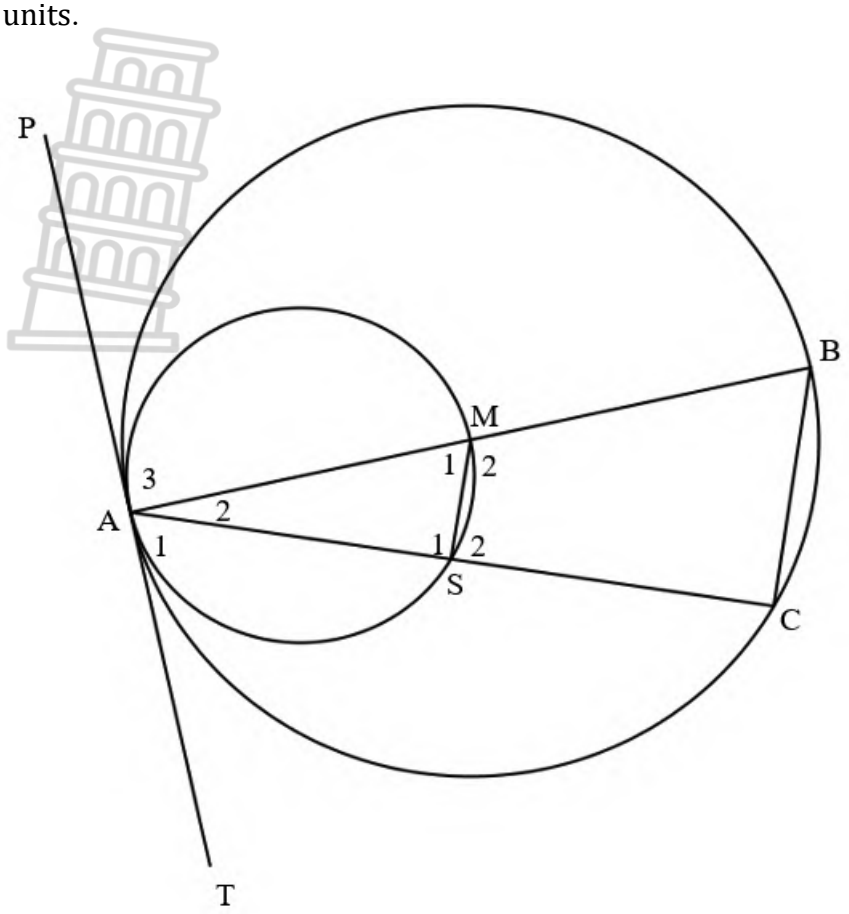
10.2 In the diagram, PAT is the common tangent of the smaller and larger circles at A. AMB is the diameter of the larger circle with M on the circumference of the smaller circle. ASC and BC are chords of the larger circle and MS chord of the smaller circle. M is the centre of the larger circle.

It is also given that, the length of AM = p units, AS = $(p - 1)$ units and BC = 6 units.



10.2.1 Name, giving reasons, 3 angles equal to 90^0. (6)

10.2.2 Give a reason why MS || BC. (1)

10.2.3 Write down the ratio of AS : SC with a reason. (2)

10.2.4 Write down the length of MS with a reason. (2)

10.2.5 Calculate the value of p. (3)
[25]

TOTAL: 150

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INFORMATION SHEET: MATHEMATICS

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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NAME AND SURNAME: *NAAM EN VAN*:	

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NOVEMBER 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*			**N M**
1																				
2																				
3																				
4																				
5																				
6																				
7																				
8																				
9																				
10																				
TOTAL *TOTAAL*																				

This special answer book consists of 25 pages. /
Hierdie spesiale antwoordeboek bestaan uit 25 bladsye.

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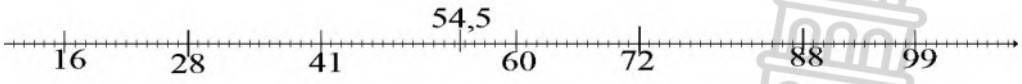
QUESTION/*VRAAG 1*

16	28	41	41	42	52	54
55	58	59	60	62	64	99

	Solution/*Oplossing*	**Marks/ *Punte***
1.1		(1)
1.2		(1)
1.3		(2)
1.4		(3)
1.5		(2)
1.6		(1)
		[10]

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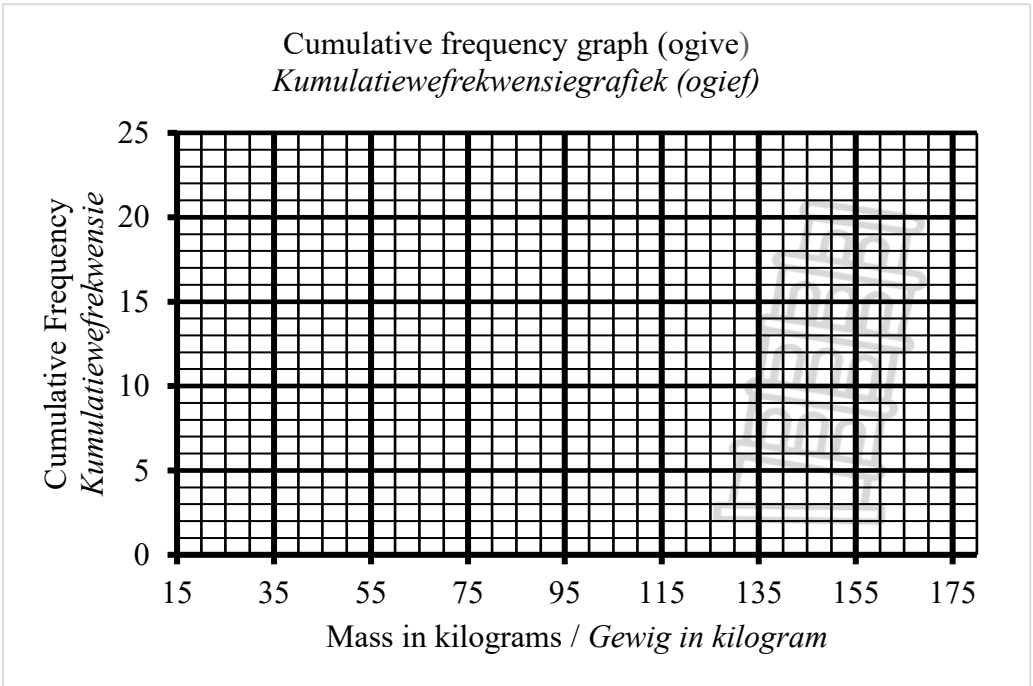
QUESTION/*VRAAG 2*

	Solution/*Oplossing*	**Marks/ *Punte***
2.1		(2)
2.2		(1)
2.3		(3)
2.4		(3)

WEIGHT OF BOXERS *GEWIG VAN BOKSERS*	FREQUENCY *FREKWENSIE*	CUMULATIVE FREQUENCY *KUMULATIEWE-FREKWENSIE*
$35 \leq x < 55$	1	
$55 \leq x < 75$	3	
$75 \leq x < 95$	9	
$95 \leq x < 115$	6	
$115 \leq x < 135$	3	
$135 \leq x < 155$	1	



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2.5		(2)
		[11]

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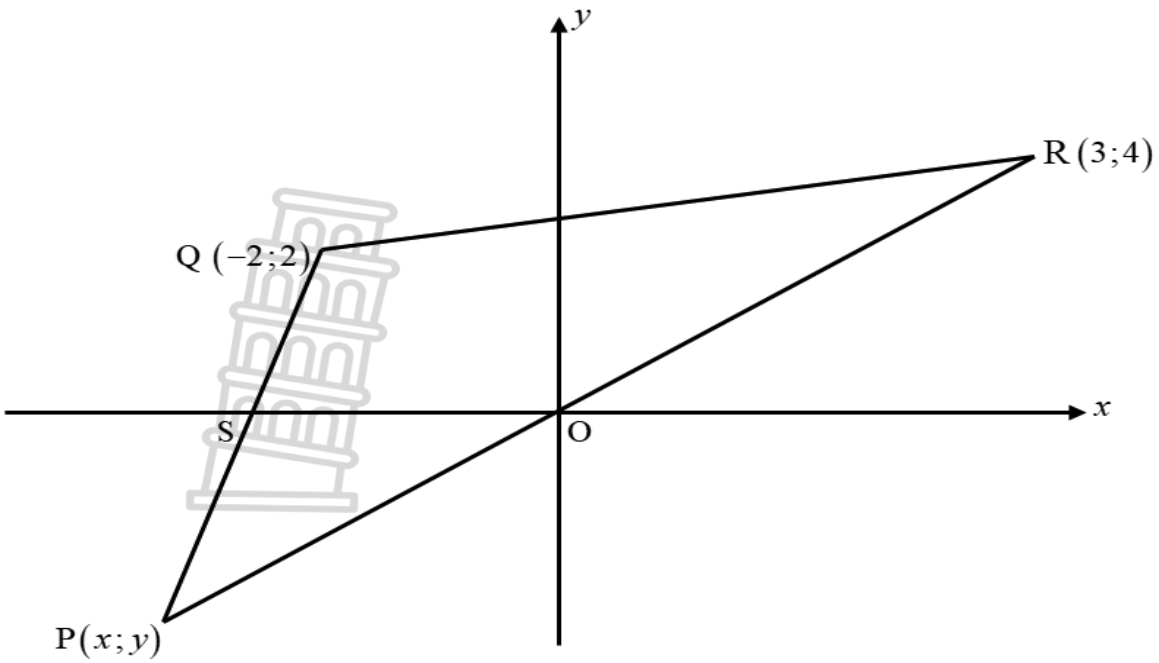
QUESTION/*VRAAG 3*



	Solution/*Oplossing*	**Marks/ *Punte***
3.1		(2)
3.2		(3)

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3.3		(4)
3.4		(1)
		[10]

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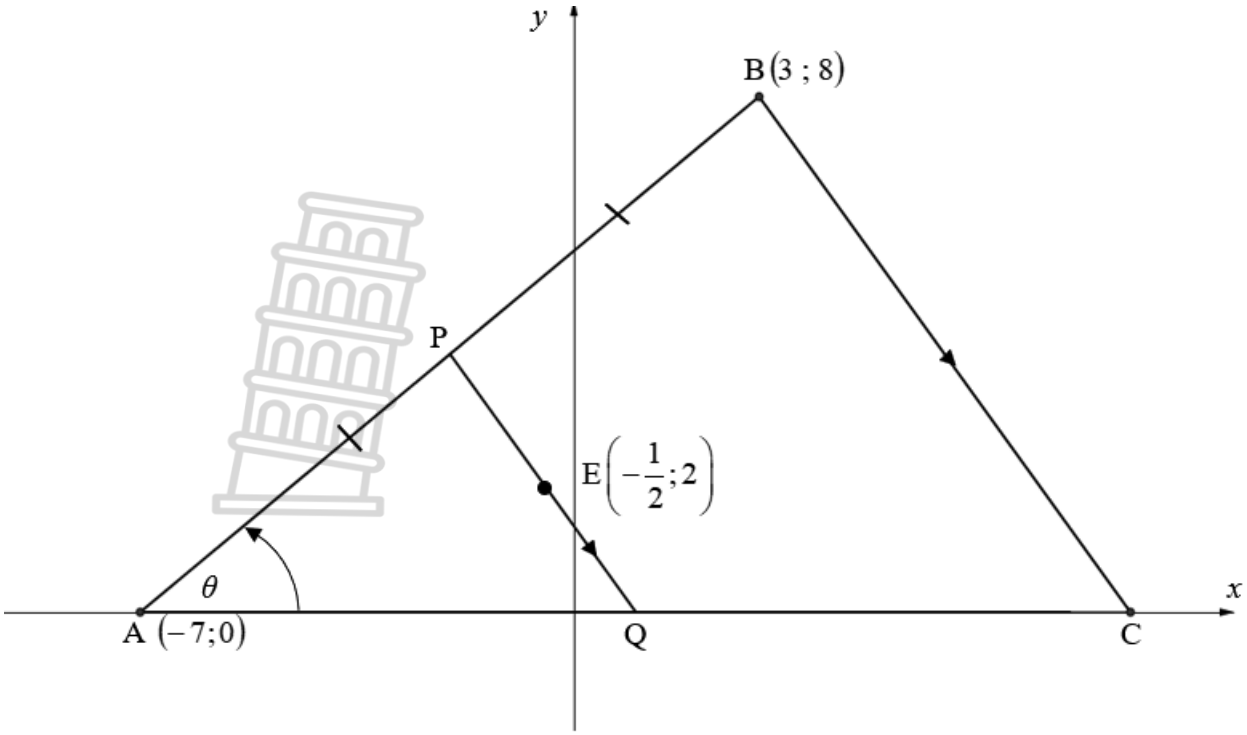
QUESTION/*VRAAG 4*



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

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4.1.3		(2)
4.2		(5)
4.3.1		(3)

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4.3.2		(6)
		[20]

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QUESTION/*VRAAG 5*

	Solution/*Oplossing*	**Marks/ *Punte***
5.1		(5)
5.2.1		(2)

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5.2.2		(2)
5.3		(7)
5.4		(5)

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5.5		(4)
5.6		(5)
		[30]

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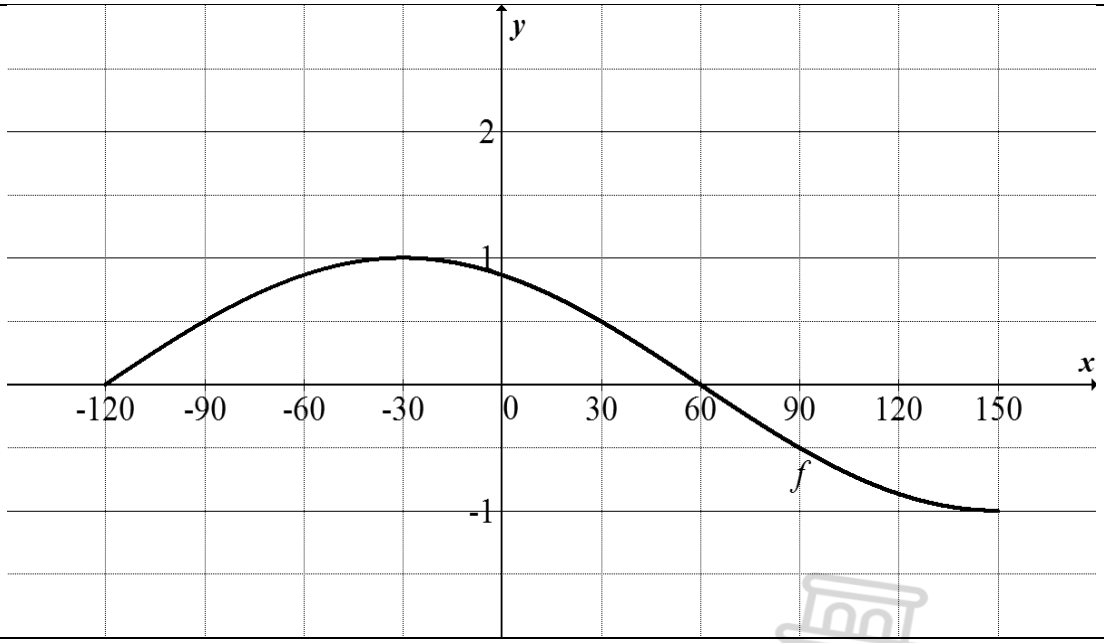
QUESTION/*VRAAG 6*

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

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6.5.3		(1)
		[12]

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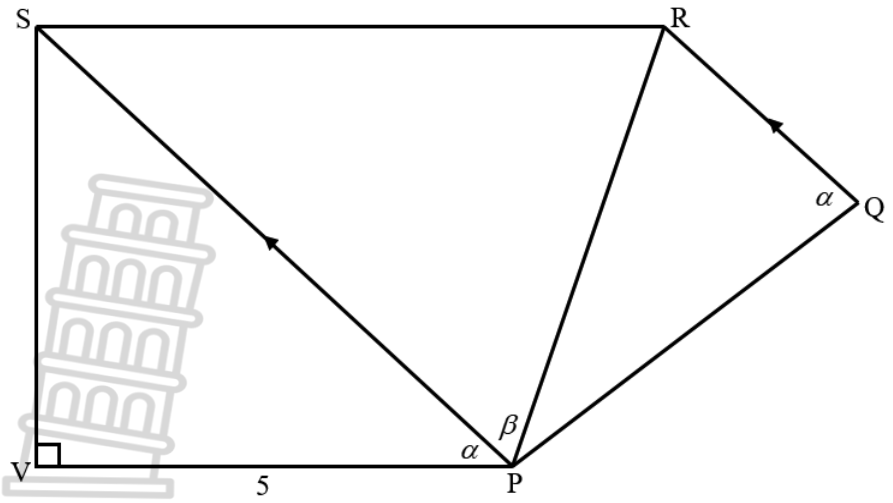
QUESTION/*VRAAG 7*



	Solution/*Oplossing*	**Marks/ *Punte***
7.1		(1)
7.2		(3)
7.3		(3)
		[7]

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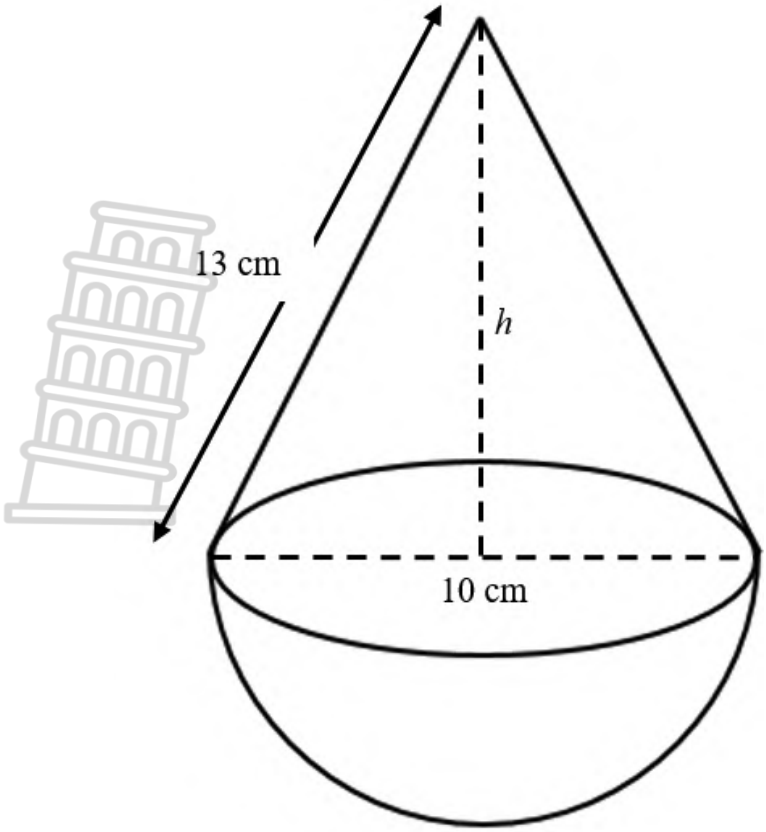
QUESTION/*VRAAG 8*



	Solution/*Oplossing*	**Marks/ *Punte***
8.1		(3)
8.2		(1)

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8.3		(3)
8.4		(3)
		[10]

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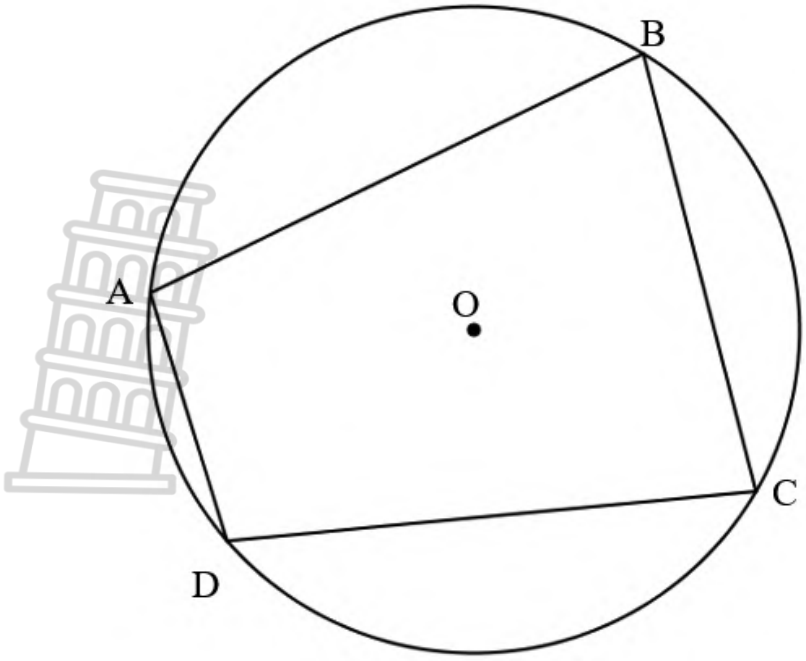
QUESTION/*VRAAG 9*



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

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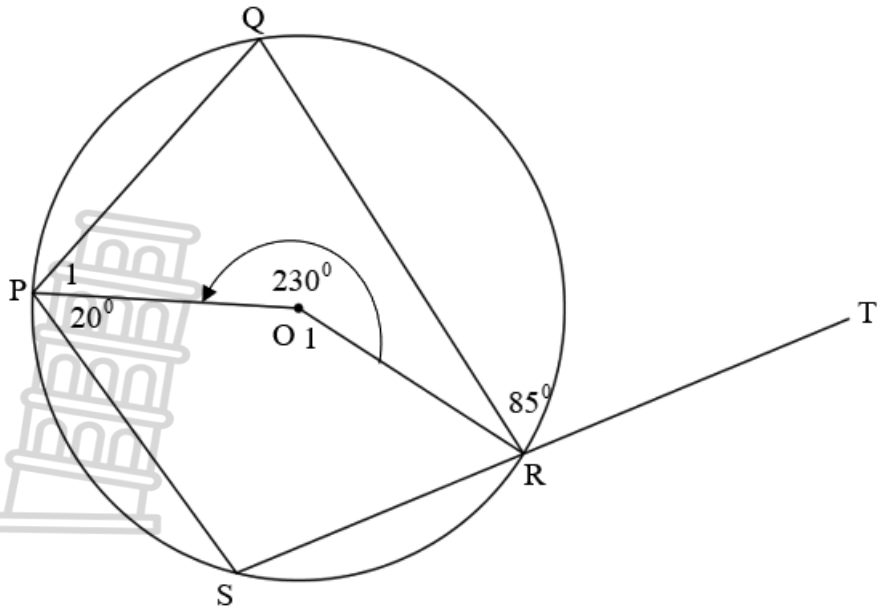
9.2



9.2.1		(2)
9.2.2		(2)
9.2.3		(2)

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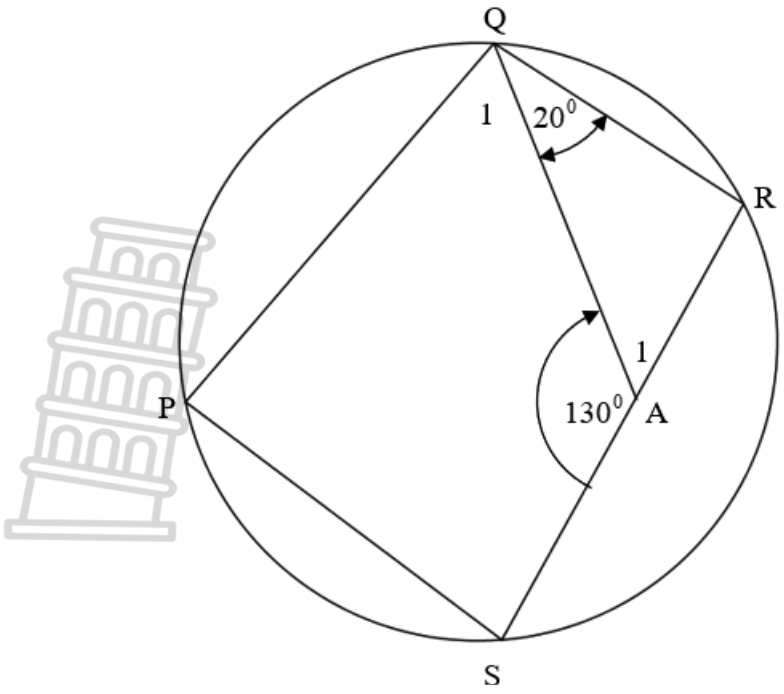

9.3		(4)
		[15]

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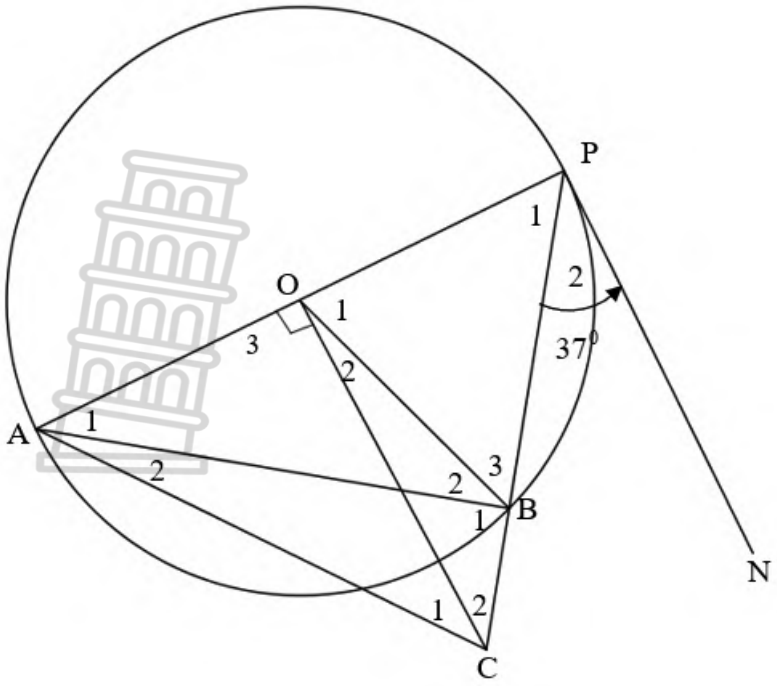
QUESTION/*VRAAG 10*

10.1



	Solution/*Oplossing*	**Marks/ *Punte***
10.1.1		(4)
10.1.2 (a)		(4)

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10.1.2 (b)		(3)

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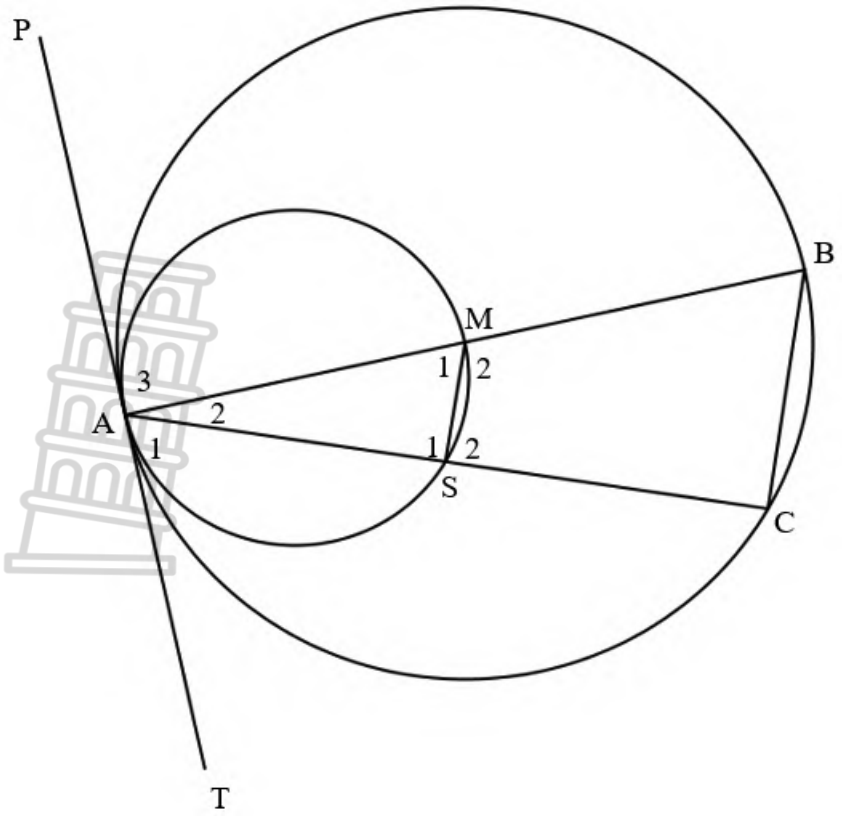
10.2



	Solution/*Oplossing*	**Marks/ *Punte***
10.2.1		(6)
10.2.2		(1)
10.2.3		(2)
10.2.4		(2)
10.2.5		(3)
		[25]

TOTAL/*TOTAAL*: 150

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NATIONAL SENIOR CERTIFICATE
NASIONALE SENIORSERTIFIKAAT

GRADE/*GRAAD* 11

NOVEMBER 2024

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

MARKS/*PUNTE*: 150

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

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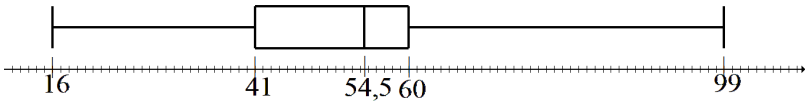
QUESTION 1 / *VRAAG 1*

Data Set / *Datastel*:

16	28	41	41	42	52	54
55	58	59	60	62	64	99

1.1	Mode / *Modus* = 41	✓ mode / *modus*	(1)
1.2	Outlier / *Uitskieter* = 99	✓ outlier / *uitskieter*	(1)
1.3	Median / *Mediaan* $= \frac{54+55}{2}$ $\therefore$ Median / *Mediaan* = 54,5 (Answer only full marks) (*Slegs antwoord – volpunte*)	✓ dividing a sum by 2 *deel 'n som deur 2* ✓ answer / *antwoord*	(2)
1.4	$Q_1 = 41$ $Q_3 = 60$ IQR / *IKW* $= Q_3 - Q_1 = 60 - 41$ $= 19$	✓ Q_1 ✓ Q_3 ✓ answer / *antwoord*	(3)
1.5		✓correct min and max *korrekte min en maks* ✓ correct box and whisker diagram. *korrekte mond-en-snordiagram*	(2)
1.6	The data is skewed to the left or negatively skewed. *Die data is skeef na links of negatief skeef.*	✓ for the correct comment *vir korrekte opmerking*	(1)
			[10]

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QUESTION 2 / *VRAAG 2*

2.1

Weight of players *Gewig van boksers*	Frequency *Frekwensie*	Cumulative frequency *Kumulatiewe frekwensie*
$35 \le x < 55$	1	1
$55 \le x < 75$	3	4
$75 \le x < 95$	9	13
$95 \le x < 115$	6	19
$115 \le x < 135$	3	22
$135 \le x < 155$	1	23

✓ 4 and/*en* 13

✓ 19 and/*en* 22 (2)

2.2

The total number of boxers is 23
Die totale aantal boksers is 23

✓ for answer/ *vir antwoord* (1)

2.3

$$\bar{x} = \frac{1\times 45 + 3\times 65 + 9\times 85 + 6\times 105 + 3\times 125 + 1\times 145}{23}$$

$$= \frac{2155}{23}$$

$$\bar{x} = 93,70$$

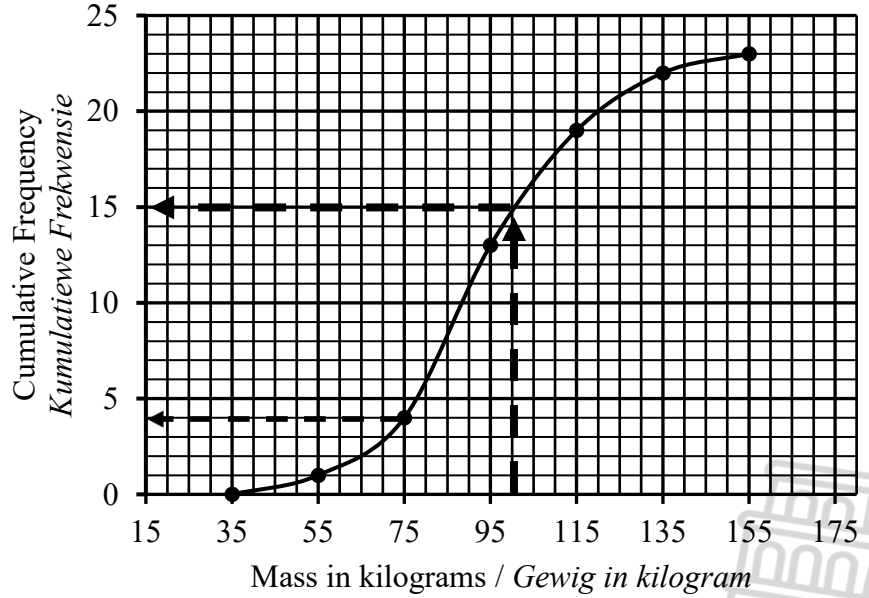
✓ f x xi

✓ 2 155

✓ answer/ *antwoord* (3)

2.4

Cumulative frequency graph (ogive)
Kumulatiewefrekwensiegrafiek (ogief)



✓ correct grounding/ *korrekte anker*

✓ plotting against the upper limits/ *afsteek by boonste limiete*

✓ correct shape/ *korrekte vorm* (3)

2.5

No. of boxers in the interval of $75 \le x < 100$ will be $15 - 4 = 11$
Aantal boksers in die interval $75 \le x < 100$ *sal* $15 - 4 = 11$ *wees*

✓ 15 or/*of* reading from the graph / *lees vanaf die grafiek*
✓ answer / *antwoord* (2)

[11]

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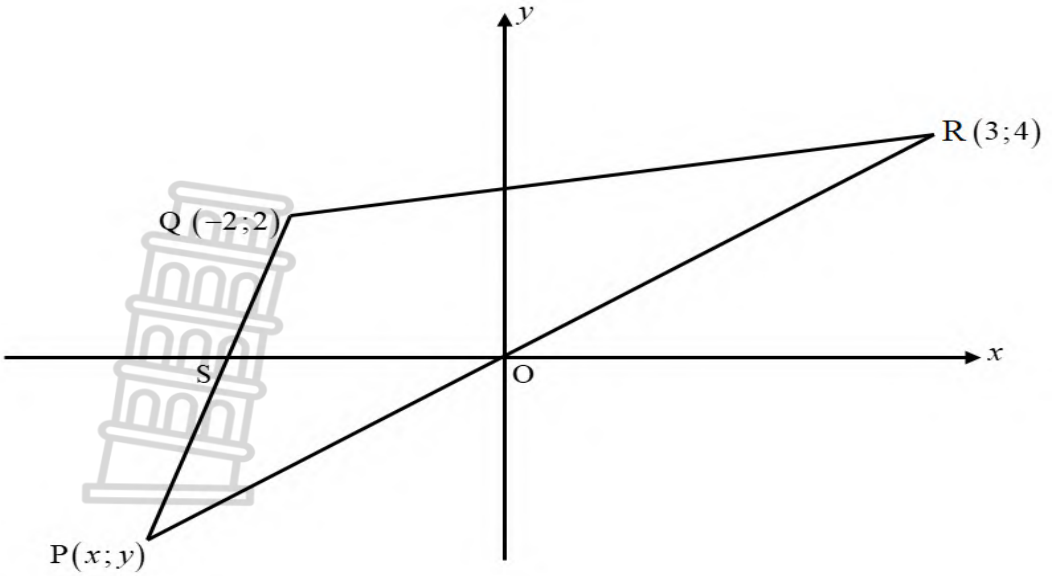
QUESTION 3 / *VRAAG 3*
MARKING GUIDELINE FOR: R(3;4)



3.1	$m_{PR}=\frac{4-0}{3-0}$ $=\frac{4}{3}$	✓ correct substitution/ *korrekte vervanging* ✓ answer / *antwoord*	(2)
3.2	$m_{PR}=\frac{4}{3}$ (P, O and R are collinear points) (P, O *en* R *is saamlynige punte*) $y-4=\frac{4}{3}(x-3)$ $=\frac{4}{3}x$	✓ gradient of/ *gradiënt van* PR ✓ substitution by R or O/ *vervanging met* R *of* O ✓ equation of PR/ *vergelyking van* PR	(3)
3.3	$6x+14=\frac{4}{3}x$ $6x-\frac{4}{3}x=-14$ $\frac{14}{3}x=-14$ $x=-3$ $y=6(-3)+14$ $y=-4$ $P(-3;-4)$	✓ for equating the equations/ *vir gelykstelling van vergelykings* ✓ simplification/ *vereenvoudiging* ✓ *x*–value/*waarde* ✓ *y*–value/*waarde*	(4)
3.4	$0=6(x)+14$ $x=-\frac{7}{3}$ $\therefore S\left(-\frac{7}{3};0\right)$	✓ $y=0$ ✓ *x*-coordinate/ *x*-koördinaat	(1)
			[10]

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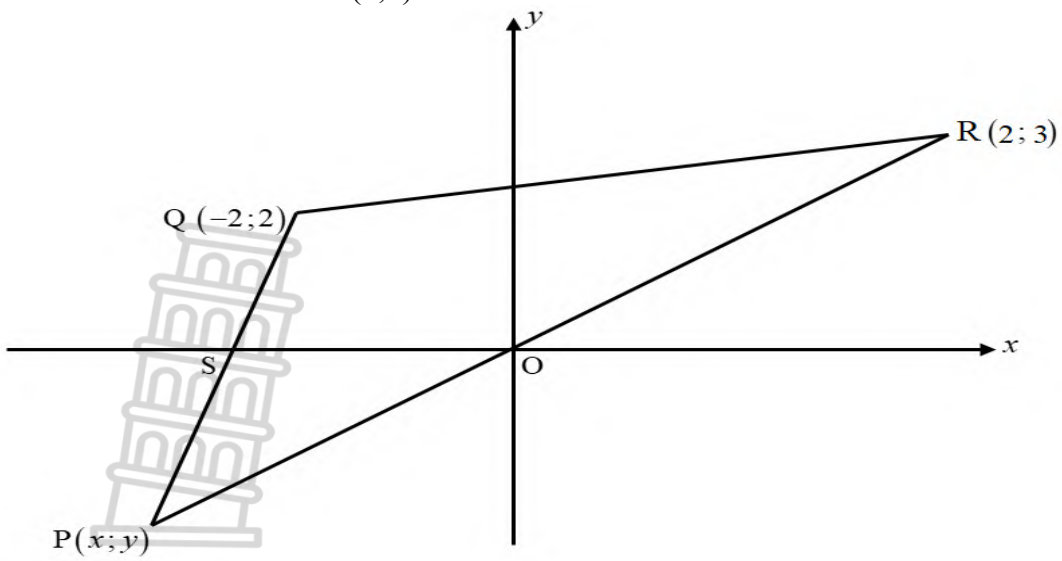
MARKING GUIDELINE FOR: R(2;3)



3.1	$m_{PR} = \frac{3-0}{2-0}$ $= \frac{3}{2}$	✓ correct substitution/ *korrekte vervanging* ✓ answer / *antwoord*	(2)
3.2	$m_{PR} = \frac{3}{2}$ (P, O and R are collinear points) (P, O *en* R *is saamlynige punte*) $y - 3 = \frac{3}{2}(x-2)$ $= \frac{3}{2}x$	✓ gradient of/ *gradiënt van* PR ✓ substitution by R or O/ *vervanging met* R *of* O ✓ equation of PR/ *vergelyking van* PR	(3)
3.3	$6x + 14 = \frac{3}{2}x$ $6x - \frac{3}{2}x = -14$ $\frac{9}{2}x = -14$ $x = -\frac{28}{9}$ $y = 6\left(-\frac{28}{9}\right) + 14$ $y = -\frac{14}{3}$ $P\left(-\frac{28}{9}; -\frac{14}{3}\right)$	✓ for equating the equations/ *vir gelykstelling van vergelykings* ✓ simplification/ *vereenvoudiging* ✓ *x*–value/*waarde* ✓ *y*–value/*waarde*	(4)
3.4	$0 = 6(x) + 14$ $x = -\frac{7}{3}$ $\therefore S\left(-\frac{7}{3}; 0\right)$	✓ $y = 0$ ✓ *x*-coordinate/ *x*-koördinaat	(1)
			[10]

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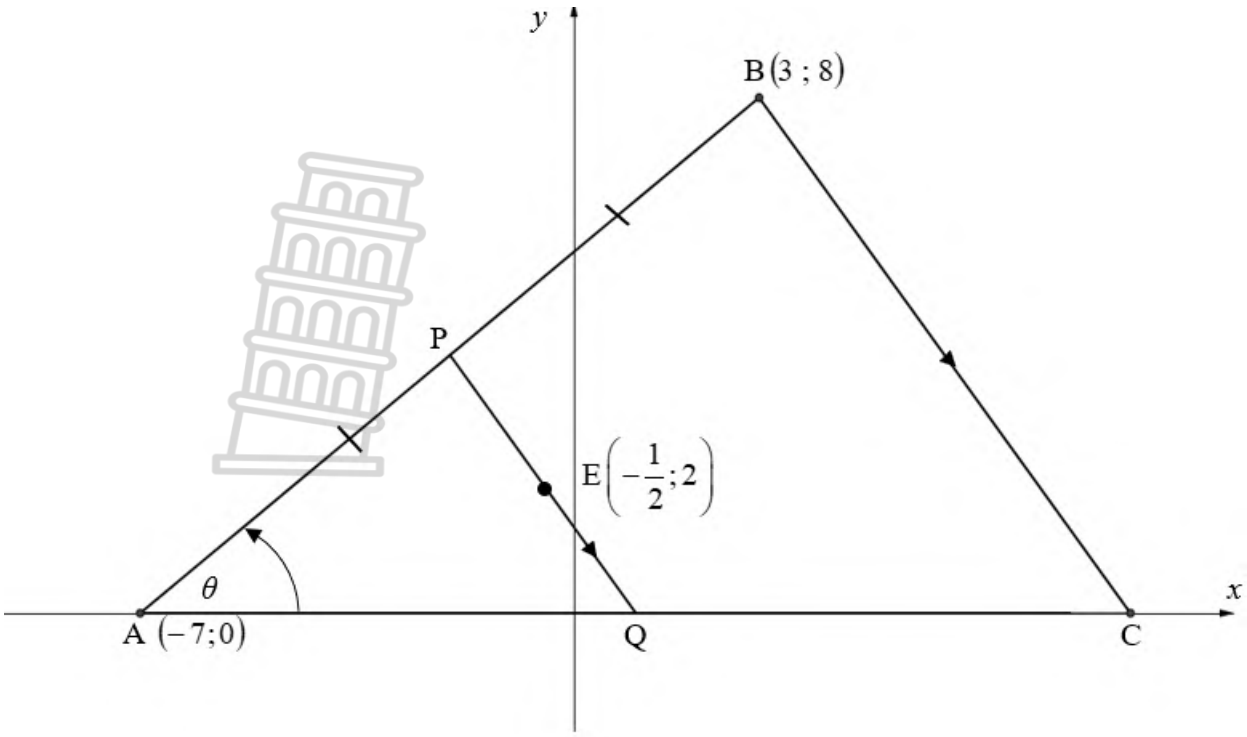
QUESTION 4 / *VRAAG 4*



4.1.1	$M = \frac{-7+3}{2} ; \frac{0+8}{2}$ $= -2 \ ; \ 4$ $P(-2 ; 4)$	✓ *x*-value/*waarde* ✓ *y*-value/*waarde*	(2)
4.1.2	$\boldsymbol{m} = \frac{8-0}{3+7}$ $= \frac{4}{5}$	✓ substitution / *vervanging* ✓ answer / *antwoord*	(2)
4.1.3	$\tan\theta = \frac{4}{5}$ $\theta = 38{,}66^0$	✓ $\tan\theta = \frac{4}{5}$ ✓ answer / *antwoord*	(2)
4.2	$m_{PQ} = \frac{4-2}{-2+\frac{1}{2}}$ $= -\frac{4}{3}$ $m_{BC} = m_{PQ} = -\frac{4}{3}$ gradients||lines = *gradiënte||lyne* = $y - 8 = -\frac{4}{3}(x-3)$ $y = -\frac{4}{3}x + 12$	✓ correct substitution/ *korrekte vervanging* ✓ answer / *antwoord* ✓ gradient of BC/ *gradiënt van* BC ✓ substitute B(3 ; 8) and *m* *vervang* B(3 ; 8) *en m* ✓ equation / *vergelyking*	(5)

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4.3.1	$-\frac{4}{3}x+12=0$ $x=9$ $AC=16$	✓ $y=0$ ✓ $x=9$ ✓ AC = 16	(3)
4.3.2	$AB=\sqrt{(3+7)^2+(8-0)^2}$ $=\sqrt{164}$ A. of/*van* $\Delta ABC=\frac{1}{2}\times\sqrt{164}\times 16\sin 38,65^0$ $=63,99$ A. of/*van* $\Delta APQ=\frac{1}{2}\times\frac{\sqrt{164}}{2}\times 8\sin 38,65^0$ $=16,00$ A. of/*van* PBCQ = 47,99	✓ $AB=\sqrt{164}$ ✓ correct substitution in A of ΔABC / *korrekte vervanging in* A *van* ΔABC ✓ 63,99 ✓ correct substitution in A of ΔAPQ *korrekte vervanging in* A *van* ΔAPQ ✓ 16,00 ✓ answer / *antwoord*	(6)
			[20]

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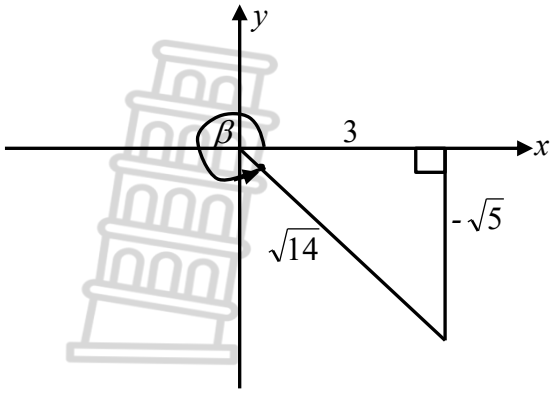
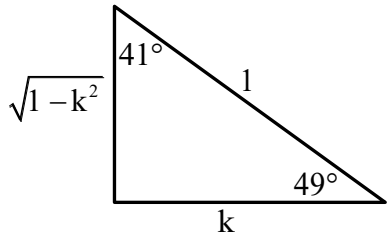
QUESTION 5 / *VRAAG 5*

5.1	$-3\tan\beta = 5$ $\tan\beta = \dfrac{-\sqrt{5}}{3}$  $r = \sqrt{(3)^2 + (-\sqrt{5})^2}$ (*Pyth*) $= \sqrt{14}$ $\sin^2\beta - \cos^2\beta$ $= \left(\dfrac{-\sqrt{5}}{\sqrt{14}}\right)^2 - \left(\dfrac{3}{\sqrt{14}}\right)^2$ $= -\dfrac{2}{7}$	✓ $\tan\beta = \dfrac{-\sqrt{5}}{3}$ ✓ diagram in the correct quadrant *diagram in die korrekte kwadrant* ✓ for / *vir* $r = \sqrt{14}$ ✓ substitution / *vervanging* ✓ answer / *antwoord*	(5)
5.2	$r^2 = x^2 + y^2$ (*Pyth*) $(1)^2 = (k)^2 + (y)^2$ $y^2 = 1 - k^2$ $y = \sqrt{1-k^2}$  		
5.2.1	$\sin 131° = \sin(180° - 49°)$ $= \sin 49°$ $= \sqrt{1-k^2}$	✓ $\sin 49°$ ✓ answer / *antwoord*	(2)

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5.2.2	$1-\cos^2 41^0 = \sin^2 41^0$ $= k^2$ **OR/*OF*** $1-\cos^2 41^0 = 1-\left(\sqrt{1-k^2}\right)^2$ $= 1-1+k^2$ $= k^2$	✓ for $\sin^2 41°$ ✓ answer / *antwoord* **OR/*OF*** ✓ substitution in terms of k/ *vervanging in terme van k* ✓ answer / *antwoord*	(2)
5.3	$\frac{\tan(180^0-x).\cos(-x)+\sin^2(360^0-x)\cos(90°-x)}{\sin(180°-x)}$ $= \frac{-\tan x.\cos x+\sin^2 x.\sin x}{\sin x}$ $= \frac{-\frac{\sin x}{\cos x}.\cos x+\sin^3 x}{\sin x}$ $= \frac{-\sin x+\sin^3 x}{\sin x}$ $= \frac{-\sin x(1-\sin^2 x)}{\sin x}$ $= -\cos^2 x$	✓ $-\tan x$ ✓ $\cos \boldsymbol{x}$ ✓ $\sin^2 \boldsymbol{x}$ ✓ $\sin \boldsymbol{x}$ ✓ $\frac{\sin \boldsymbol{x}}{\cos \boldsymbol{x}}$ ✓ simplification/ *vereenvoudiging* ✓ answer / *antwoord*	(7)
5.4	$\sin(-15^0)\cos 75^0 + \tan 75^0.\cos 75^0.\cos 165^0$ $= (-\cos 75^0)\cos 75^0 + \frac{\sin 75^0}{\cos 75^0}.\cos 75^0(-\sin 75^0)$ $= -\cos^2 75^0 - \sin^2 75^0$ $= -(\cos^2 75^0 + \sin^2 75^0)$ $= -1$ **OR/*OF*** $\sin(-15^0)\cos 75^0 + \tan 75^0.\cos 75^0.\cos 165^0$ $= (-\sin 15^0)\sin 15^0 + \frac{\cos 15^0}{\sin 15^0}.\sin 15^0(-\cos 15^0)$ $= -\sin^2 15^0 - \cos^2 15^0$ $= -(\sin^2 15 + \cos^2 15)$ $= -1$	✓ $-\cos 75°$ ✓ $\frac{\sin 75^0}{\cos 75^0}$ ✓ $-\sin 75^0$ ✓ common factor/ *gemene faktor* ✓ identity / *identitieit* $\cos^2 75^0 + \sin^2 75^0 = 1$ **OR/*OF*** ✓ $-\sin 15°$ and/*en* $\sin 15°$ ✓ $\frac{\cos 15^0}{\sin 15^0}$, [$\sin 15°$ and/ en$(-\cos 15^0)$] ✓ ✓ common factor/ *gemene faktor* ✓ identity / *identitieit* $\cos^2 15^0 + \sin^2 15^0 = 1$	(5)

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5.5	$\frac{3\cos x}{1+\sin x}+3\tan x=\frac{3}{\cos x}$ $\text{LHS / } LK=\frac{3\cos x}{1+\sin x}+3\tan x$ $=\frac{3\cos x}{1+\sin x}+\frac{3\sin x}{\cos x}$ $=\frac{3\cos^2 x+3\sin x+3\sin^2 x}{\cos x(1+\sin x)}$ $=\frac{3(\cos^2 x+\sin^2 x)+3\sin x}{\cos x(1+\sin x)}$ $=\frac{3(1+\sin x)}{\cos x(1+\sin x)}$ $=\frac{3}{\cos x}$	✓ identity / *identiteit* $\frac{\sin x}{\cos x}$ ✓ simplification / *vereenvoudiging* ✓ square identity / *vierkantsidentiteit* ✓ common factor / *gemene faktor*	(4)
5.6	$\sin^2 x-3\cos^2 x=0$ $\sin^2 x=3\cos^2 x$ $\frac{\sin^2 x}{\cos^2 x}=3$ $\tan^2 x=3$ $\tan x=\pm\sqrt{3}$ $x=\pm 60°$ $x=60°+k.180$ or/*of* $x=-60°+k.180°, k\in Z$ or/*of* $x=120°+180°\,k, k\in Z$ **OR/*OF*** $\sin^2 x-3\cos^2 x=0$ $\sin^2 x-3(1-\sin^2 x)=0$ $\sin^2 x-3+3\sin^2 x=0$ $4\sin^2 x-3=0$ $\sin^2 x=\frac{3}{4}$ $\sin x=\pm\frac{\sqrt{3}}{2}$ $x=60°+360.k$ or/*of* $120°+360°.k, k\in Z$ or/*of* $x=240°+k.360°$ or/*of* $x=300°+k.360°$	✓ isolating trig ratios/ *isoleer trig. verhoudings* ✓ $\tan^2 x=3$ ✓ correct equations/ *korrekte vergelykings* ✓ $x=60°+180°.k$ ✓ $x=-60°+180°.k, k\in Z$ or /*of* $x=12+180°.k, k\in Z$ **OR/*OF*** ✓ $\cos^2 x=1-\sin^2 x$ ✓standard form/ *standaardvorm* ✓ correct equations/ *korrekte vergelykings* ✓ $x=60°+360.k$ $x=120°+360°.k$ both quads/*beide kwadrante* ✓ $x=240°+k.360°$ $x=300°+k.360°, k\in Z$ both quads / *beide kwadrante*	(5)
			[30]

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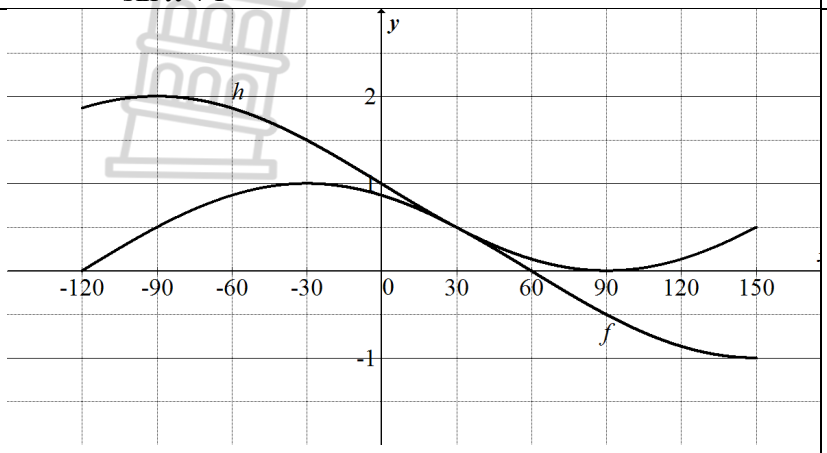
QUESTION 6 / *VRAAG 6*			
6.1	Period is / *Periode is* 360°	✓ answer/ *antwoord*	(1)
6.2	$y \in [0\,;\,2]$ or/*of* $0 \leq y \leq 2$	✓ correct interval/ *korrekte interval* ✓ correct notation/ *korrekte notasie*	(2)
6.3	$h(x) = \cos(60^0 + x + 30^0) + 1$ $= \cos(90^0 + x) + 1$ $= -\sin x + 1$	✓ $\cos(90° + x)$ ✓ $-\sin x$	(2)
6.4		$h(x)$ ✓ x-intercept/ *afsnit* ✓ y-intercept/ *y-afsnit* ✓ correct shape/ *korrekte vorm*	(3)
6.5.1	$x = 150°$	✓ answer/ *antwoord*	(1)
6.5.2	$60° \leq x \leq 150°$	✓ correct interval/ *korrekte interval* ✓ correct notation/ *korrekte notasie*	(2)
6.5.3	$x = 30°$	✓ answer/ *antwoord*	(1)
			[12]

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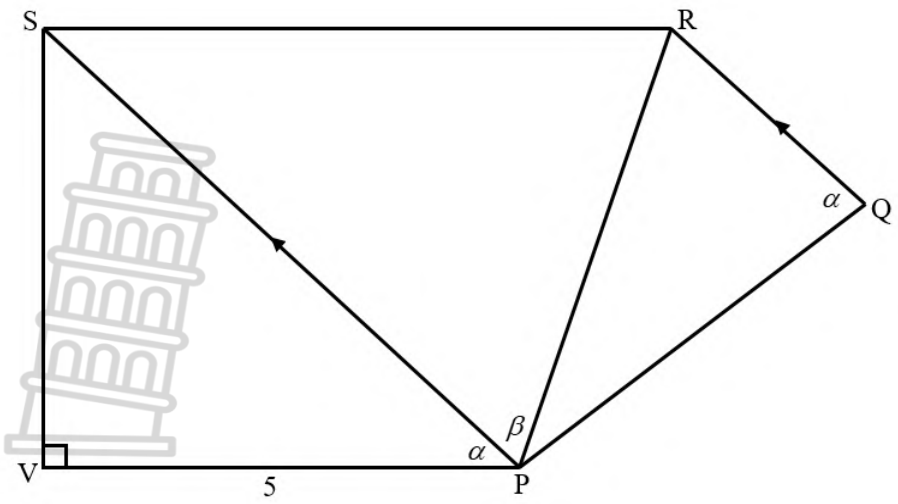
QUESTION 7 / *VRAAG 7*



7.1	$\cos\alpha = \frac{5}{SP}$ $SP = \frac{5}{\cos\alpha}$	✓ $SP = \frac{5}{\cos\alpha}$	(1)
7.2	$P\hat{R}Q = \beta$ $(\textit{alt } \angle s; RQ \parallel SP)$ $\frac{\sin\alpha}{RP} = \frac{\sin\beta}{5}$ $RP = \frac{5\sin\alpha}{\sin\beta}$	✓ $P\hat{R}Q = \beta$ ✓ application of sine rule/ *toepassing van sinusreël* ✓answer / *antwoord*	(3)
7.3	$\text{area of/}\textit{van}\ \Delta RPS = \frac{1}{2}(RP)(PS)\sin\beta$ $= \frac{1}{2}\left(\frac{5\sin\alpha}{\sin\beta}\right)\left(\frac{5}{\cos\alpha}\right)\sin\beta$ $= \frac{25\sin\alpha}{2\cos\alpha}$ $\therefore \text{area of/}\textit{van}\ \Delta RPS = \frac{25\tan\alpha}{2}$	✓ correct formula for area rule/ *korrekte formule vir oppervlaktereël* ✓ substitution / *vervanging* ✓ simplification / *vereenvoudiging*	(3)
			[7]

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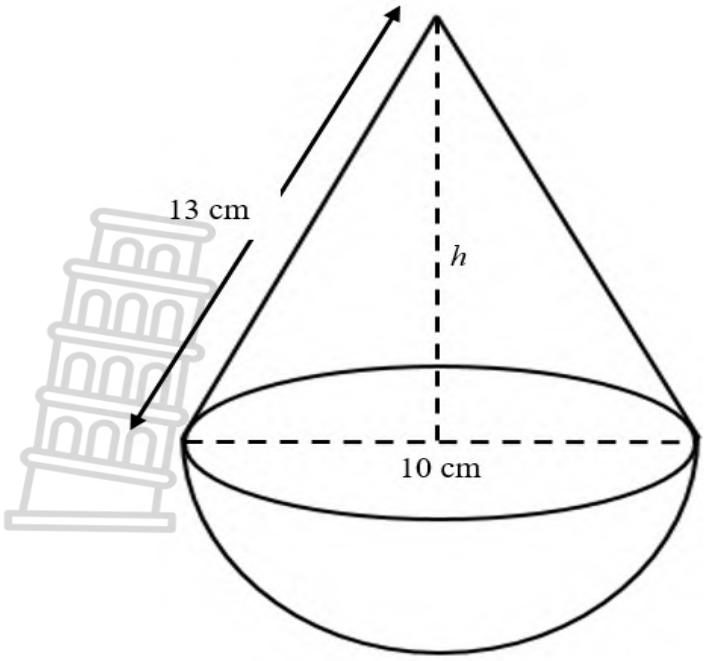
QUESTION 8 / *VRAAG 8*



8.1	$(h_s)^2 = r^2 + h^2$ $(13)^2 = (5)^2 + h^2$ $h^2 = 169 - 25$ $h^2 = 144$ $h = 12$ cm	✓ correct formula/ *korrekte formule* ✓ substitution/ *vervanging* ✓ answer / *antwoord*	(3)
8.2	height of the whole shape / *hoogte van die hele vorm* $= r + h$ $= 5 + 12$ $= 17$cm	✓ answer / *antwoord*	(1)
8.3	volume of the whole shape / *volume van die hele vorm* $= \frac{2}{3}\pi r^3 + \frac{1}{3}\pi r^2 h$ $= \frac{2}{3}\pi(5)^3 + \frac{1}{3}\pi(5)^2(12)$ $= \frac{550}{3}\pi$ $= 575{,}96$ cm^3	✓ correct formula/ *korrekte formule* ✓ substitution/ *vervanging* ✓ answer / *antwoord*	(3)
8.4	outer surface area of the whole shape/ *buite – oppervlakte van die hele vorm* $= 2\pi r^2 + \pi r h_s$ $= 2\pi(5)^2 + \pi(5)(13)$ $= 115\pi$ $= 361{,}28$ cm^2	✓ correct formula/ *korrekte formule* ✓ substitution/ *vervanging* ✓ answer / *antwoord*	(3)
			[10]

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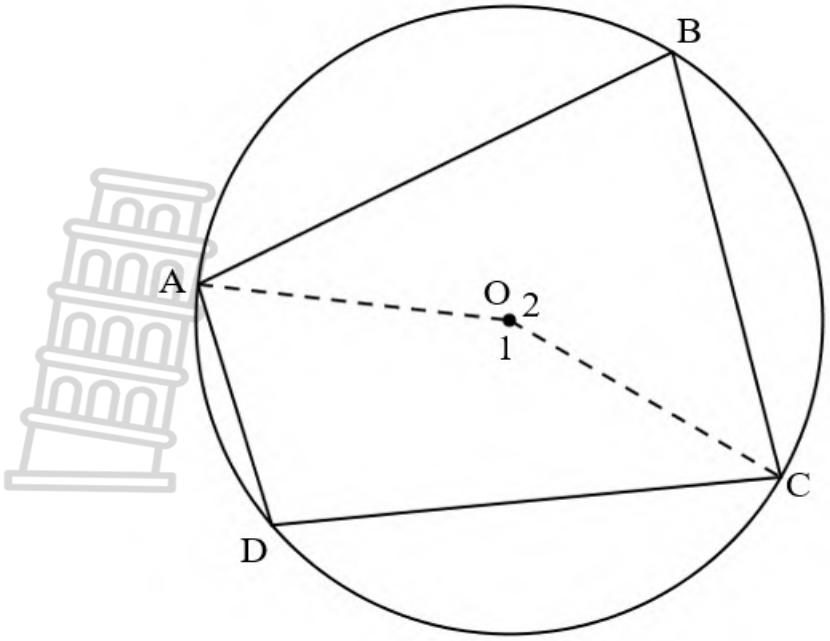
QUESTION 9 / *VRAAG 9*			
9.1.1			
	Construction: Draw AO and OC $\hat{O}_1 = 2\hat{B}$[∠at centre = 2 × ∠at circumf] $\hat{O}_2 = 2\hat{D}$[∠at centre = 2 × ∠at circumf] $\therefore \hat{O}_1 + \hat{O}_2 = 360^0$[∠*s* around a point] $\therefore 2\hat{B} + 2\hat{D} = 360^0$ $\therefore \hat{B} + \hat{D} = 180^0$	✓ constructions ✓ S/R ✓ S ✓ S/R ✓ S	
	Konstruksie: *Teken* AO *en* OC $\hat{O}_1 = 2\hat{B}[Middelpunts\angle = 2 \times Omtreks\angle]$ $\hat{O}_2 = 2\hat{D}[Middelpunts\angle = 2 \times Omtreks\angle]$ $\therefore \hat{O}_1 + \hat{O}_2 = 360^0$[∠*e rondom 'n* punt] $\therefore 2\hat{B} + 2\hat{D} = 360^0$ $\therefore \hat{B} + \hat{D} = 180^0$	✓ *konstruksies* ✓ S/R ✓ S ✓ S/R ✓ S	(5)

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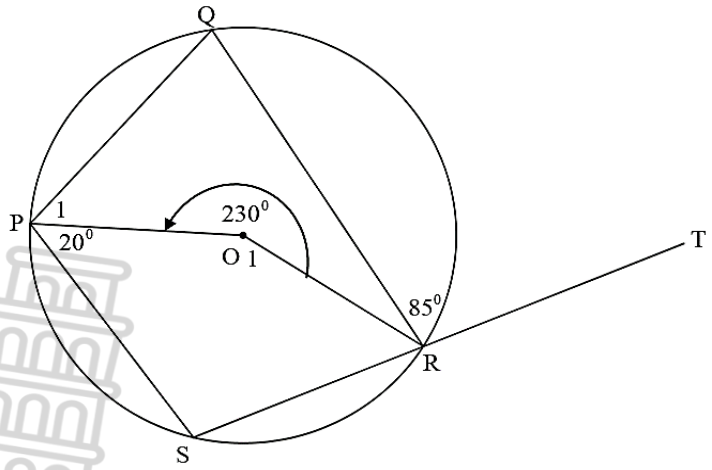
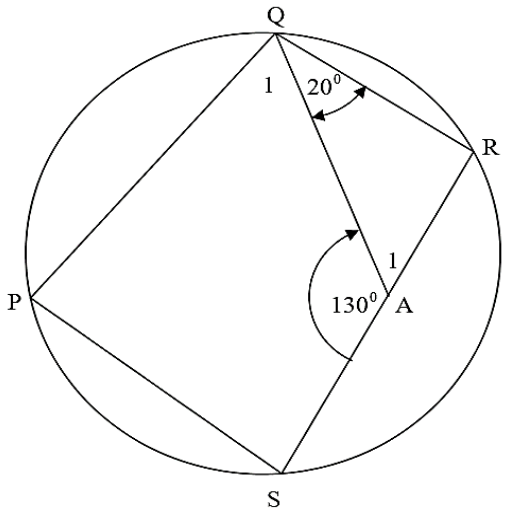
9.2			
9.2.1	$\hat{S} = 115^0$ [∠ at the centre = 2× ∠ at the circumference] [*Middelpunts* ∠ = 2 × *Omtreks* ∠]	✓ S ✓ R	(2)
9.2.2	$\hat{Q} = 65^0$ [opposite ∠s of cyclic quad] [*teenoorst.∠e van 'n koordevierhoek*]	✓ S ✓ R	(2)
9.2.3	$\hat{P}_1 + 20^0 = 85^0$ [ext.∠ of cyclic quad] [*buite.∠ van 'n koordevierhoek*] $\hat{P}_1 = 65^0$	✓ S ✓ R	(2)
9.3			
9.3.1	$\hat{A}_1 = 50^0$ [∠s in a str. line]/[∠*e op 'n reguitlyn*] $\hat{R} = 110^0$ [∠s in a Δ]/[∠*e in 'n driehoek*] $\hat{P} = 70^0$ [opp ∠s of a cyclic quad] [*teenoorst.∠e van 'n koordevierhoek*] **OR/*OF*** $\hat{R} = 130^0 - 20^0 = 110^0$ [ext ∠ of a Δ]/[*buite ∠ van Δ*] $\hat{P} = 70^0$ [opp.∠s of a cyclic quad]/[*teenoorst.∠e van 'n kv*]	✓ S ✓ S ✓ S ✓ R **OR/*OF*** ✓ S ✓ R ✓ S ✓ R	(4)
			[15]

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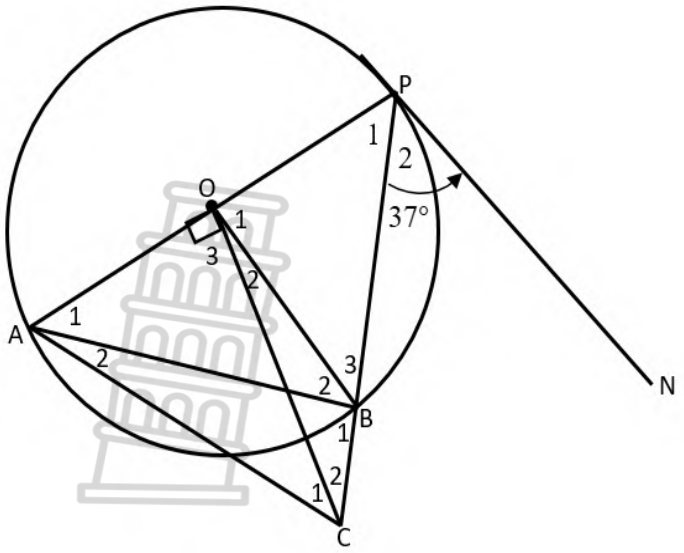
QUESTION 10 / *VRAAG 10*

10.1			
10.1.1	$\hat{A}_1 = 37^0$ [tan chord]/[*raaklyn – koord stelling*] $\hat{O}_1 = 2\hat{A}_1 = 74^0$ [∠at centre = 2 × ∠at circumf] [*Middelpunts ∠ = 2 × Omtreks ∠*]	✓ S ✓ R ✓ S ✓ R	(4)
10.1.2 (a)	$A\hat{B}P = 90^0$ [∠in a semi-circle]/[*∠in 'n semi – sirkel*] $\therefore \hat{B}_1 = 90^0$ [∠s in a str. line]/[*∠e op 'n reguitlyn*] $\hat{O}_3 = 90^0$ [given]/[*gegee*] OACB is a cyclic quadrilateral OACB *is 'n koordevierhoek* [converse ∠s same seg]/[*Omgekeerde ∠e in dies segment*]	✓ S ✓ R ✓ S ✓ R	(4)
10.1.2 (b)	$\hat{C}_2 = \hat{A}_1 = 37^0$ [∠s same seg]/[*∠e in dies segment*] $\therefore$ OC ∥ PN [alt. ∠s =]/[*verw. ∠e =*] **OR/*OF*** $A\hat{P}N = 90^0$ [diameter ⊥ tan]/[*middellyn ⊥ raaklyn*] $\hat{O}_3 = 90^0$ [given]/[*gegee*] $\therefore$ OC ∥ PN [corresp. ∠s =]/[*ooreenk. ∠e =*]	✓ S ✓ R ✓ R **OR/*OF*** ✓ S ✓ R ✓ R	(3)

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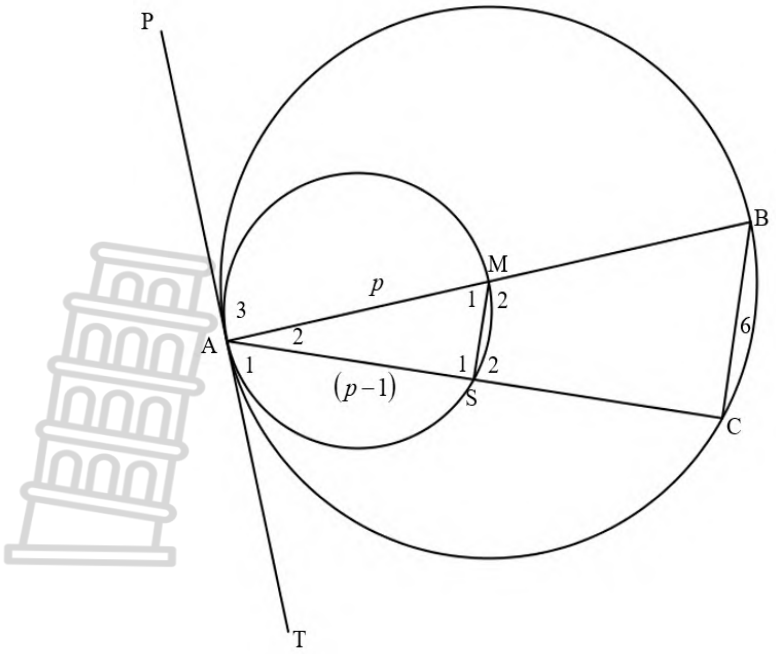
10.2			
10.2.1	$\hat{A}_3 = 90^0$ [tan ⊥ rad] / [*raaklyn ⊥ radius*] $\hat{S}_1 = 90^0$ [tan-chord theorem] / [*raaklyn – koord stelling*] $\hat{C} = 90^0$ [∠ in semi-circle] / [*∠ in 'n semi – sirkel*]	✓ S ✓ R ✓ S ✓ R ✓ S ✓ R	(6)
10.2.2	$\hat{S}_1 = \hat{C}$ [both / *beide* $= 90^0$] $\therefore MS \parallel BC$ [correspo. ∠s = / *ooreenkomst. ∠e =*]	✓ R	(1)
10.2.3	AS:SC = 1:1 [line drawn from the centre] [*lyn getrek vanaf middelpunt*]	✓ S ✓ R	(2)
10.2.4	MS = 3 [midpoint theorem] / [*middelpunt stelling*]	✓ S ✓ R	(2)
10.2.5	$p^2 = (p-1)^2 + 3^2$ Pyth. theorem / *stelling* $p^2 = p^2 - 2p + 1 + 9$ $2p = 10$ $p = 5$	✓ apply Pyth theo *toepassing van Pyth stelling* ✓ simplification/ *vereenvoudiging* ✓ answer / *antwoord*	(3)
			[25]

TOTAL / *TOTAAL*: 150

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