



education

Department:
Education
North West Provincial Government
REPUBLIC OF SOUTH AFRICA

PROVINCIAL ASSESSMENT

GRADE 12

MATHEMATICS P2
JUNE 2024

MARKS: 150

TIME: 3 hours



**This question paper consists of 11 pages, 1 information sheet
and an answer book of 21 pages.**

INSTRUCTIONS AND INFORMATION

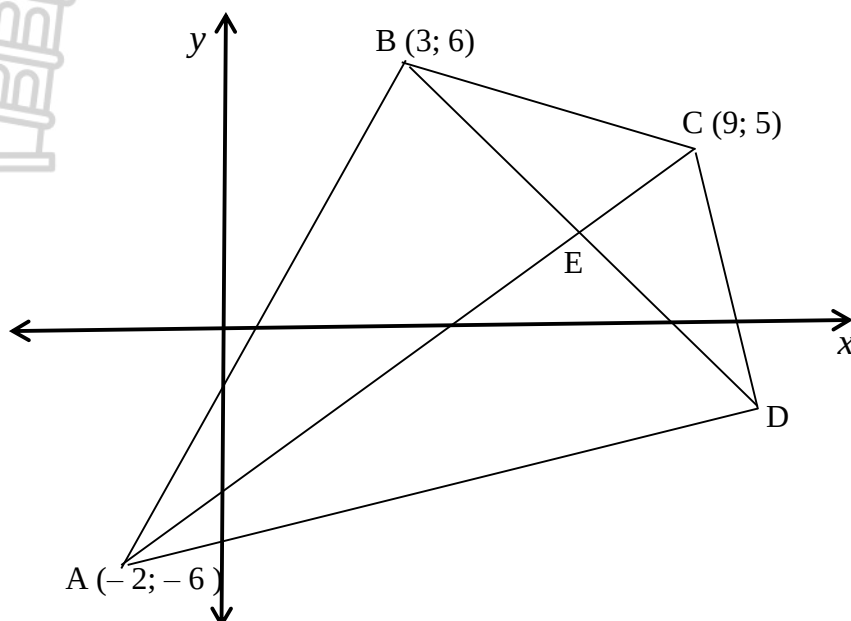
Read the following instructions carefully before answering the questions.

1. This question paper consists of 9 questions.
2. Answer ALL the questions.
3. Write ALL the answers in the ANSWER BOOK provided.
4. Clearly show ALL calculations, diagrams, graphs, et cetera that you have used in determining the answers.
5. Answers only will NOT necessarily be awarded full marks.
6. You may use an approved scientific calculator (non-programmable and non-graphical), unless stated otherwise.
7. If necessary, answers should be rounded off to TWO decimal places, unless stated otherwise.
8. Diagrams are NOT necessarily drawn to scale.
9. Number the answers correctly according to the numbering system used in this question paper.
10. An information sheet with formulae is included at the end of the question paper.
11. Write neatly and legibly.



QUESTION 1

In the figure below, A (- 2; - 6), B(3; 6), C(9; 5) and D are joined to form a kite.



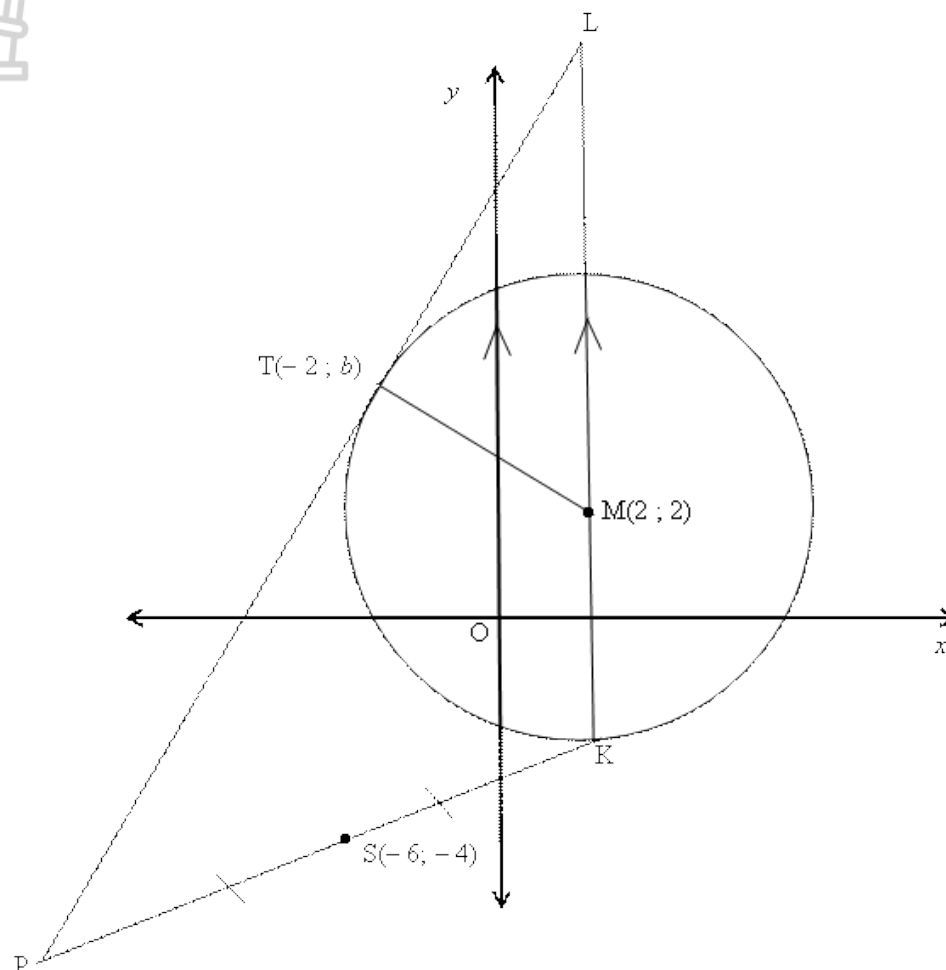
- 1.1 Calculate the length of AC and give your answer in simplest surd form. (2)
- 1.2 Calculate the gradient of AC. (2)
- 1.3 Determine the equation of AC. (2)
- 1.4 Give a reason why $AE \perp BD$. (1)
- 1.5 Determine the equation of BD. (3)
- 1.6 Determine the coordinates of E. (3)
- 1.7 Determine, with reasons, the coordinates of D. (3)
- 1.8 Calculate the size of $\hat{ADC}$. (5)



[21]

QUESTION 2

In the diagram, the circle is centred at $M(2; 2)$. Radius KM is produced to L , a point outside the circle, such that $KML \parallel y$ -axis. LTP is a tangent to the circle at $T(-2; b)$. $S(-6; -4)$ is the midpoint of PK .



2.1 Given that the radius of the circle is 5 units, show that $b = 5$. (4)

2.2 Determine:

2.2.1 The coordinates of K . (2)

2.2.2 The equation of the tangent LTP in the form $y = mx + c$. (4)

2.2.3 The area of $\triangle LPK$. (7)

2.3 Another circle with equation $(x - 2)^2 + (y - n)^2 = 25$ is drawn. Determine, with an explanation, the value(s) of n for which the two circles will touch each other externally. (4)

[21]

QUESTION 3

3.1 Simplify the expression below to a single trigonometric ratio:

$$\frac{\cos(90^\circ + x) \cdot \sin(540^\circ + x)}{\tan(x - 180^\circ) \cdot \cos(-x)} \quad (6)$$

3.2 Given $\cos(P + Q) = \cos P \cdot \cos Q - \sin P \cdot \sin Q$

Use the above identity and express $\cos 2P$ in terms of $\cos P$. (4)

3.3 If $\tan A = \frac{4}{3}$, where $A \in [90^\circ; 360^\circ]$

Use a sketch to determine the following:

3.3.1 $\sin A$ (3)

3.3.2 $\cos(A + 30^\circ)$ (4)

3.4 Given: $\cos 12^\circ = p$. With the aid of the diagram, determine the following without using a calculator, in terms of p .

3.4.1 $\sin 78^\circ$ (2)

3.4.2 $\sin 6^\circ$ (4)

[23]

QUESTION 4

4.1 Prove that: $\frac{\sin 2x - \cos 2x + 1}{\sin 2x + \cos 2x + 1} = \tan x$ (7)

4.2 Hence, or otherwise, determine the value of $\tan 22,5^\circ$, without using the calculator. (Leave your answer in SURD form). (3)

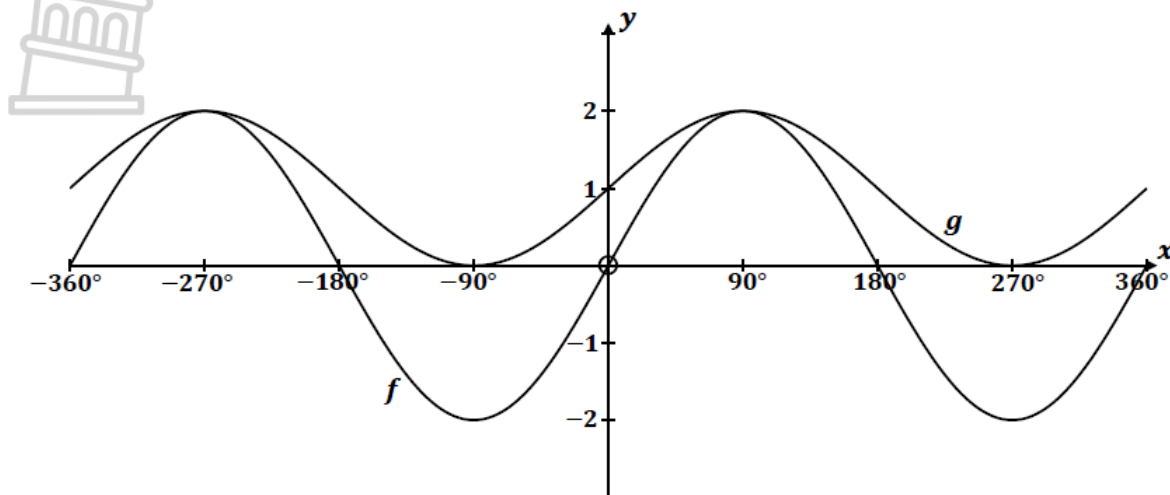
4.3 Determine the general solution of the equation:

$$3 \cos 2x = 1 + 5 \cos x. \quad (7)$$

[17]

QUESTION 5

The sketch below, shows the graphs of $f(x) = a \sin x$ and $g(x) = \sin x + b$, for $x \in [-360^\circ; 360^\circ]$.



Use the given graphs to answer the following questions:

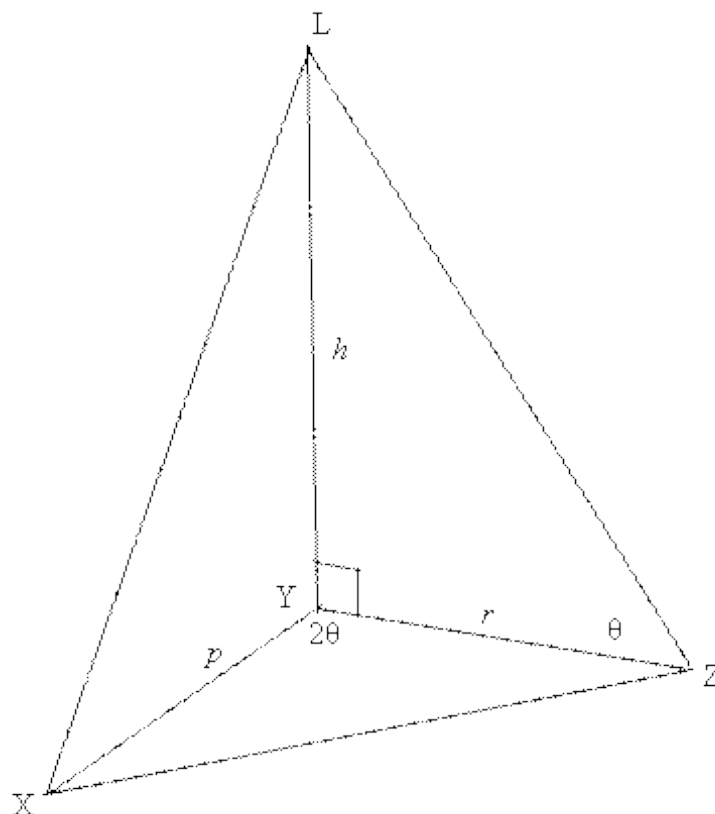
- 5.1 Write down the values of a and b . (2)
 - 5.2 What is the amplitude of g ? (1)
 - 5.3 Determine the value(s) of x , where $x \in [-360^\circ; 360^\circ]$, for which:
 - 5.3.1 $f(x) = g(x)$. (2)
 - 5.3.2 $f'(x) \cdot g(x) > 0$. (3)
 - 5.3.3 g decreases as x is increases. (2)
- [10]**

QUESTION 6

In the diagram below, a pole LY is placed at the corner of a triangular field XYZ.

The area of the field is $A \text{ m}^2$. $\angle XYZ = 2\theta$, $\angle YZL = \theta$ and $XY = p$ metres.

$LY = h$ metres and $YZ = r$ metres and $XZ = t$ metres



6.1 Determine, A, the area of $\triangle XYZ$ in terms of r , p and θ . (1)

6.2 Express r in terms of A, p and θ . (2)

6.3 Hence, show that the height of the pole, h , is given by:

$$h = \frac{A}{p \cos^2 \theta}$$

6.4 If $h = 20\text{m}$, $p = 10\text{m}$ and $\theta = 60^\circ$.

Determine:

6.4.1 A, the area of $\triangle XYZ$. (2)

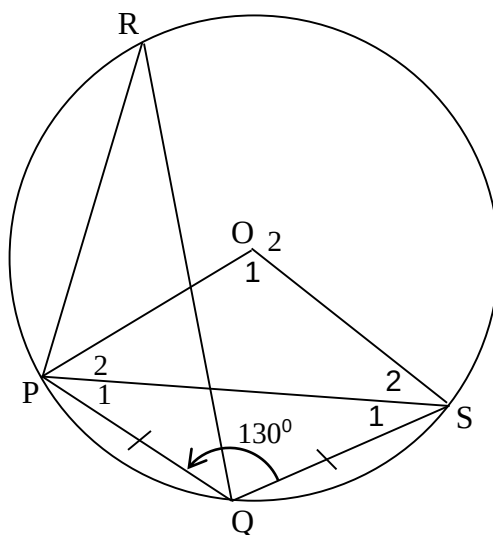
6.4.2 The length of t correct to 2 decimal places (4)

[14]

QUESTION 7

7.1 In the diagram below, O is the centre of the circle. P, Q, S and R, are points on the circumference of the circle.

$PQ = QS$ and $\hat{PQS} = 130^\circ$.



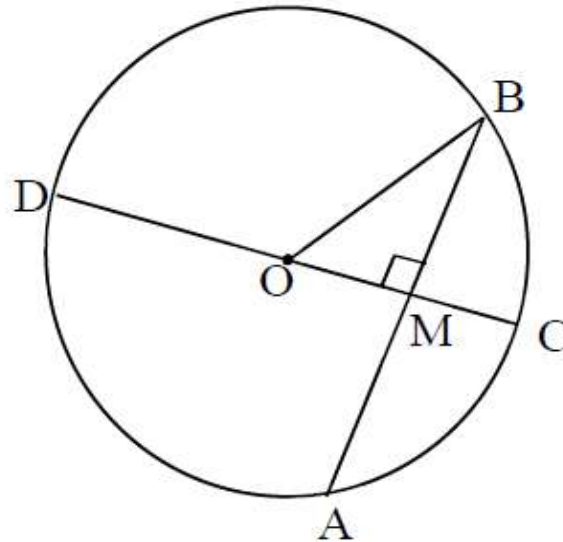
Determine, giving reasons, the sizes of:

7.1.1 $\hat{S}_1$ (3)

7.1.2 $\hat{R}$ (2)

7.1.3 $\hat{O}_1$ (3)

- 7.2 In the diagram below, O is the centre of the circle. AB is perpendicular to diameter DC. CM: MD = 2 : 7 and AB = 14 units.



If $CM = 2x$:

7.2.1 Express DC in terms of x . (1)

7.2.2 Express OM in terms of x . (2)

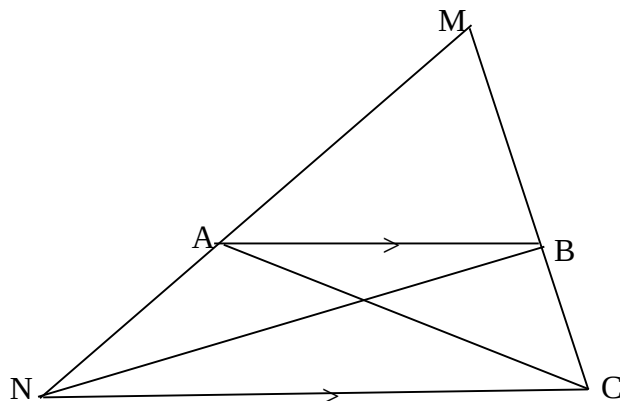
7.2.3 Hence, or otherwise, calculate the length of the radius. (5)

[16]



QUESTION 8

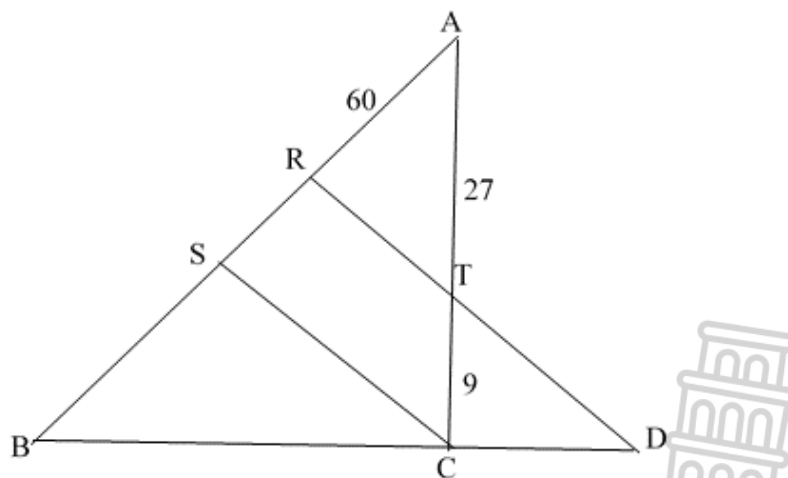
- 8.1 In the diagram below, $\triangle MNC$ is drawn. A is a point on MN and B is a point on MC such that $AB \parallel NC$. AC and NC are drawn.



Use the diagram to prove the theorem which states that:

$$\frac{MA}{AN} = \frac{MB}{BC} \quad (7)$$

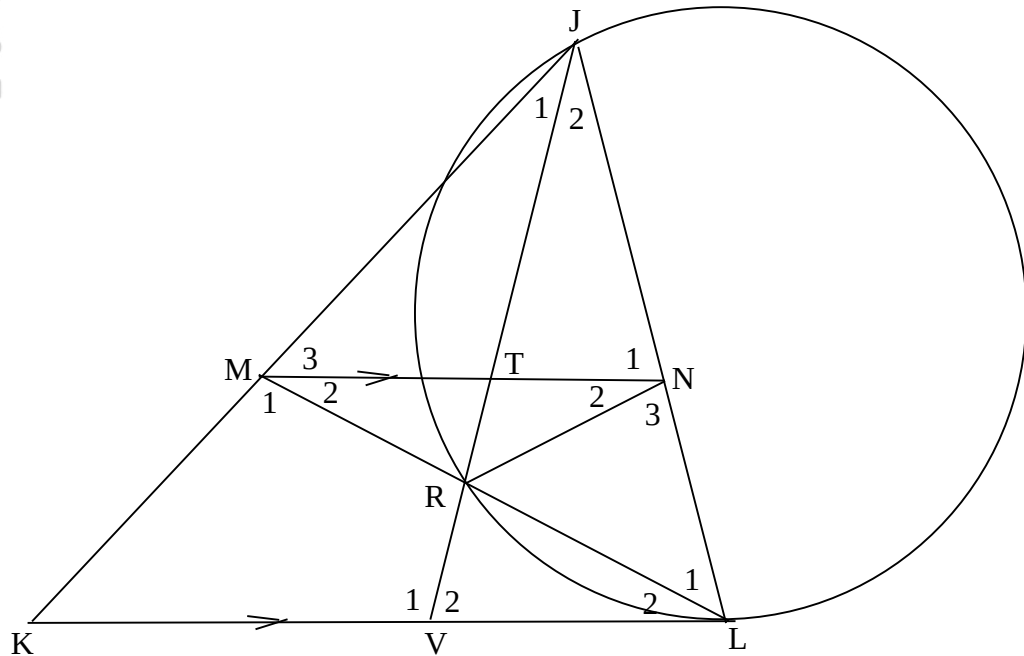
- 8.2 The figure below shows $\triangle ABC$ with BC produced to D. RD is drawn with point T on AC and R on BA. CS is drawn. TC = 9 cm, AT = 27 cm, AR = 60 cm and AS = 80 cm.



- 8.2.1 Prove that $SC \parallel RT$ (3)
- 8.2.2 Determine the length of RS (1)
- 8.2.3 If $AR : RB = 2 : 3$ and $BC = 30$ cm, calculate the length of CD. (5)
- [16]**

QUESTION 9

In the figure below, KL is a tangent to the circle. L, J and R are points on the circle and MN is parallel to KL.



Prove that:

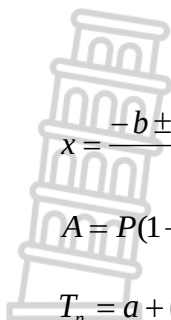
9.1 JMRN is a cyclic quadrilateral. (3)

9.2 $\triangle JNR \parallel \triangle LMK$ (3)

9.3 $\frac{NL \cdot JT}{TV} = \frac{LM \cdot NR}{MK}$ (6)

[12]

TOTAL : 150

INFORMATION SHEET: MATHEMATICS

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

$$y = mx + c$$

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

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

$$m = \tan \theta$$

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

$$\text{In } \triangle ABC: \frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

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

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

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

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

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

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

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

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

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

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

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

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

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

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



education

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NAME OF LEARNER: NAAM VAN LEERDER:	
CLASS: KLAS:	

MATHEMATICS P2/WISKUNDE V2

GRADE 12/GRAAD 12

JUNE 2024/JUNIE 2024

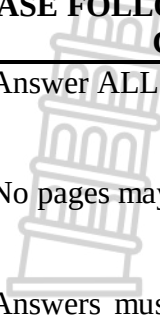
SPECIAL ANSWER BOOK

SPESIALE ANTWOORDEBOEK

QUESTION VRAAG	MARK PUNT			INITIAL PARAAF	MODERATION MODERERING			INITIAL PARAAF
1								
2								
3								
4								
5								
6								
7								
8								
9								
10								
TOTAL TOTAAL (150)								

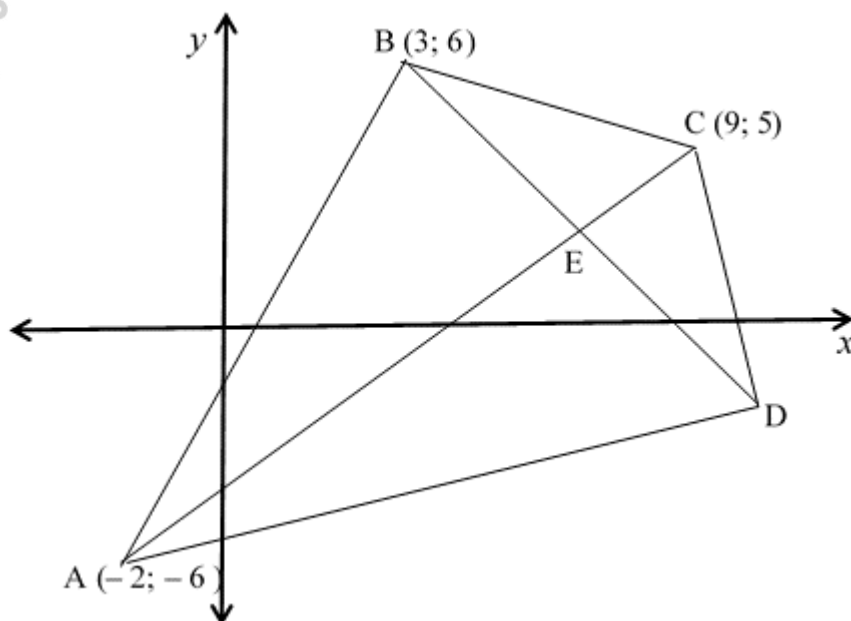
This answer book consists of 21 pages.

Hierdie antwoordeboek bestaan uit 21 bladsye.

PLEASE FOLLOW THESE INSTRUCTIONS CAREFULLY.	VOLG ASSEBLIEF HIERDIE INSTRUKSIES NOUKEURIG.
 1. Answer ALL questions in the spaces provided. 2. No pages may be torn from this answer book. 3. Answers must be written in black/blue ink as distinctly as possible. Do not write in the margins. 4. If you require additional space for your answers: 4.1 Use the additional space provided at the end of the answer book. 4.2 When answering a question in the additional provided space, indicate clearly the question number in the column on the LHS. 4.3 Rule off after each answer. 5. Draw a neat line through any work/rough work that must not be marked.	1. Beantwoord ALLE vrae in die ruimtes wat voorsien is. 2. Geen bladsye mag uit hierdie antwoordeboek geskeur word nie. 3. Skryf die antwoorde so duidelik moontlik met swart/blou ink. Laat die kantlyne oop. 4. In geval jy bykomende ruimte benodig vir jou antwoorde: 4.1 Gebruik die bykomende ruimte wat aan die einde van die antwoordeboek voorsien word. . 4.2 As 'n vraag in die bykomende ruimte beantwoord word, dui duidelik die vraagnommer in die kolom aan die LK aan. 4.3 Trek 'n lyn na elke antwoord. 5. Trek 'n netjiese lyn deur enige werk/rofwerk wat nie nagesien moet word nie.



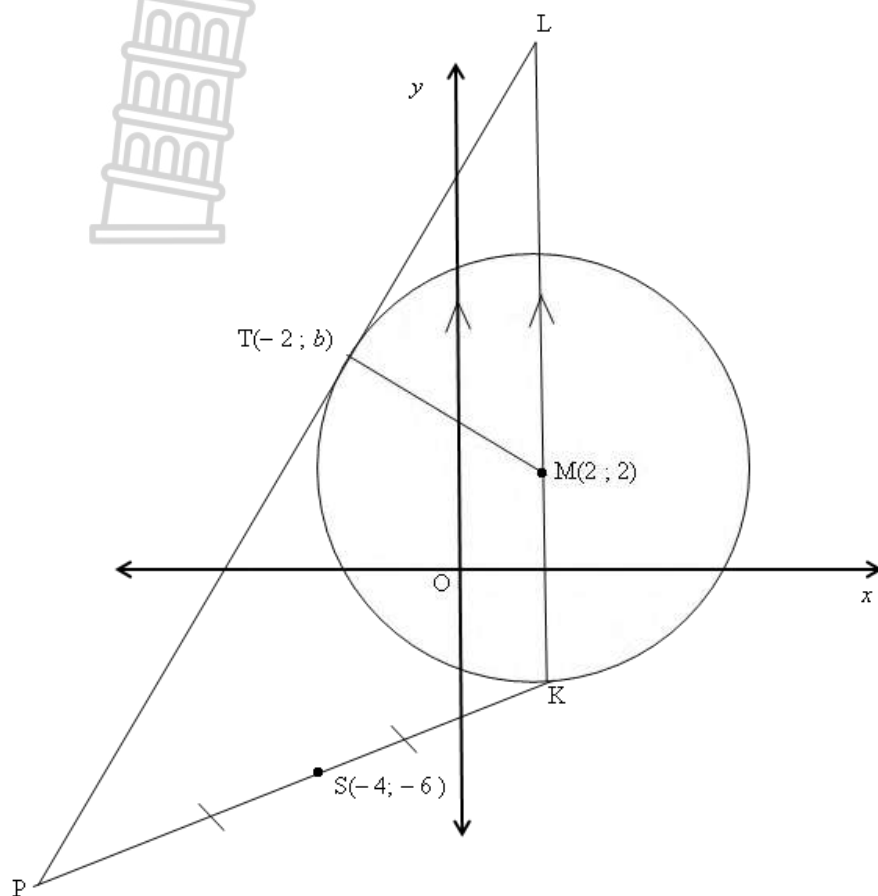
QUESTION 1/VRAAG 1



	Solution/Oplissing	MARKS/ PUNTE
1.1		(2)
1.2		(2)
1.3		(2)
1.4		(1)
1.5		(3)

1.6		(3)
1.7		(3)
1.8		(5)
		[21]

QUESTION 2/VRAAG 2



	Solution/Oplossing	MARKS/ PUNTE
2.1		
		(4)

2.2.1		(2)
2.2.2		(4)
2.2.3		(7)
2.3		(4)
		[21]

QUESTION 3/VRAAG 3

	Solution/Oplossing	MARKS/ PUNTE
3.1		(6)
3.2		(4)
3.3.1		(3)

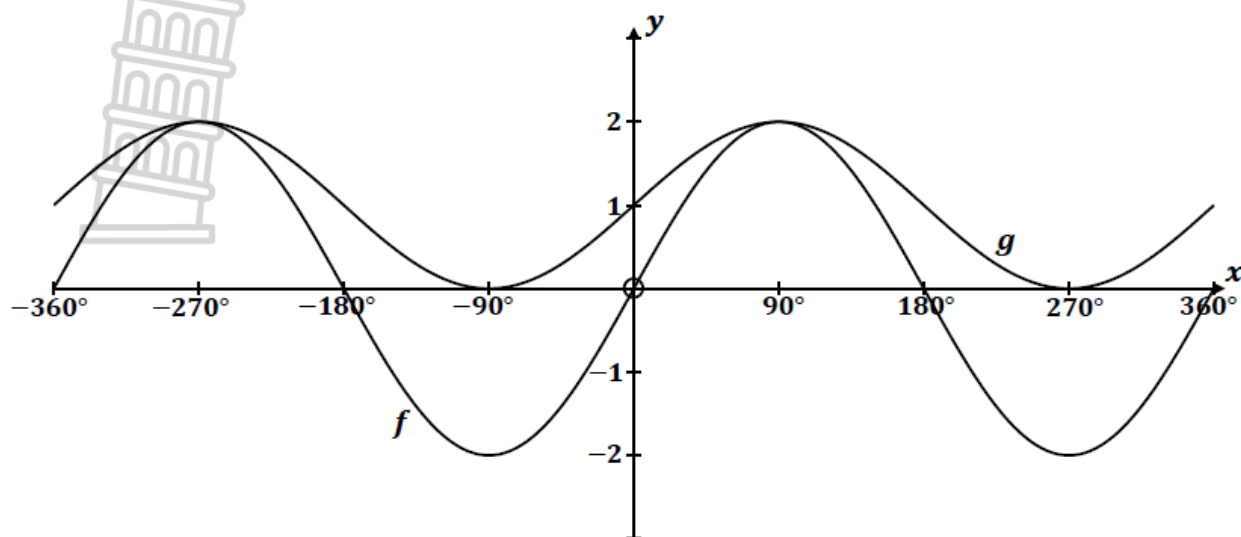
	Solution/<i>Oplossing</i>	MARKS/ <i>PUNTE</i>
3.3.2		(4)
3.4.1		(2)
3.4.2		(4)
		[23]

QUESTION 4/VRAAG 4

	Solution/Oplissing	MARKS/ PUNTE
4.1		(7)
4.2		(3)

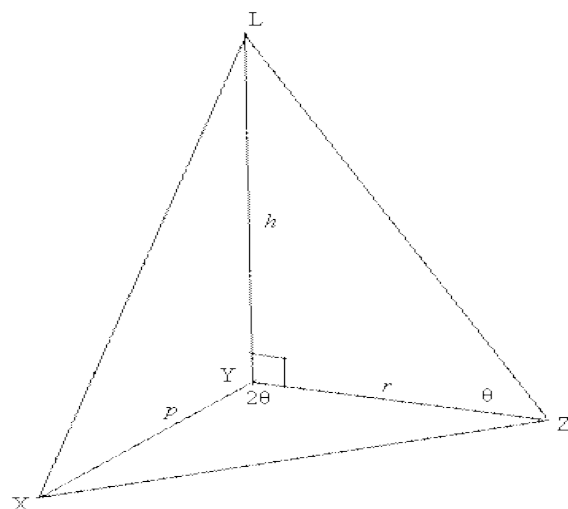
4.3		
		(7)
		[17]

QUESTION 5/VRAAG 5



	Solution/Oplissing	MARKS/ PUNTE
5.1		(2)
5.2		(1)
5.3.1		(2)
5.3.2		(3)
5.3.3		(2)
		[10]

QUESTION 6/VRAAG 6

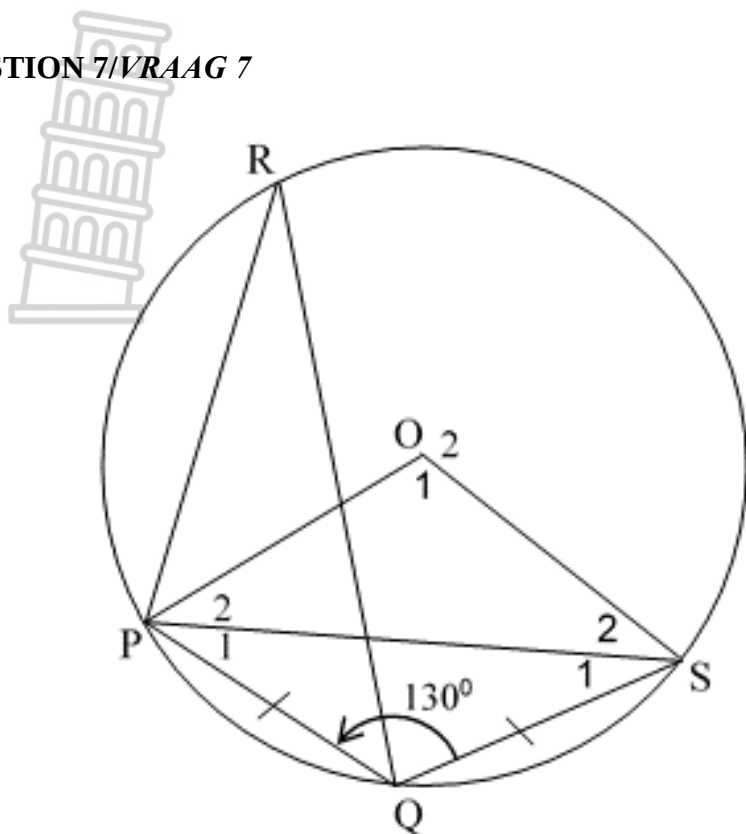


	Solution/Oplissing	MARKS/ PUNTE
6.1		(1)
6.2		(2)

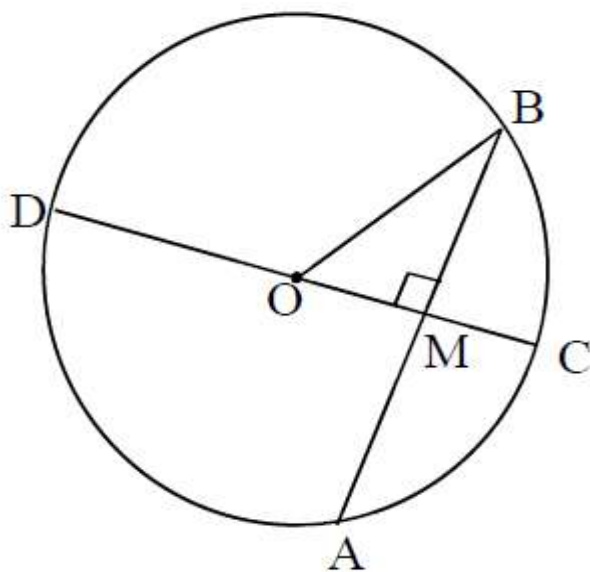


	Solution/Oplossing	MARKS/ PUNTE
6.3		(5)
6.4.1		(2)
6.4.2		(4)
		[14]

QUESTION 7 / VRAAG 7

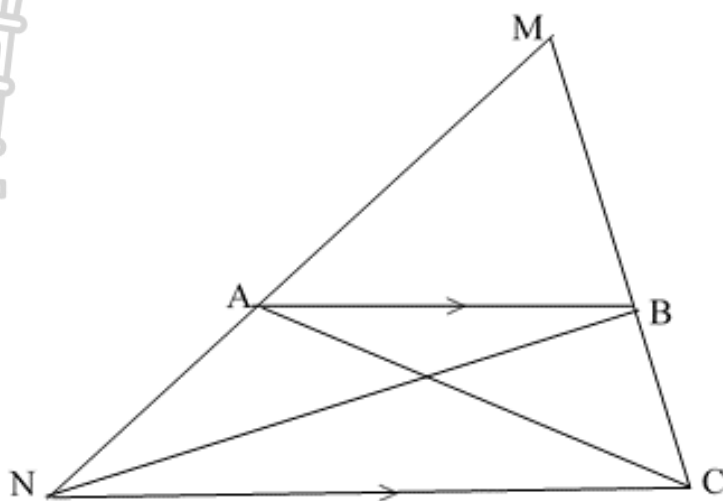


	Solution/Oplossing	MARKS/ PUNTE
7.1.1		(3)
7.1.2		(2)
7.1.3		(3)



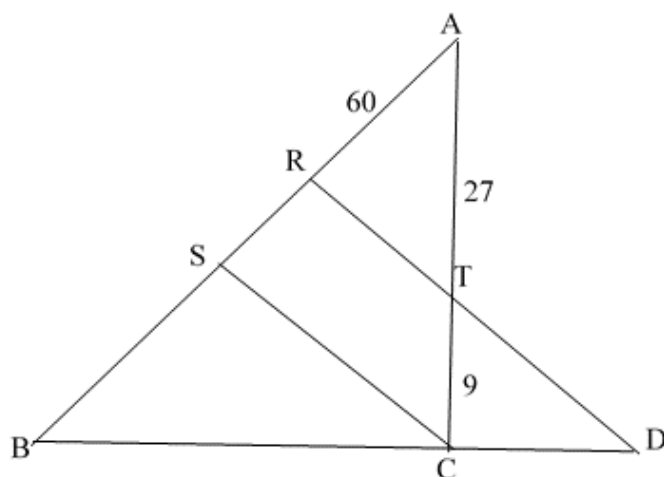
	Solution/Oplissing	MARKS/ PUNTE
7.2.1		(1)
7.2.2		(2)
7.2.3		(5)
		[16]

QUESTION 8/VRAG 8



	Solution/Oplissing	MARKS/ PUNTE
8.1		
		(7)

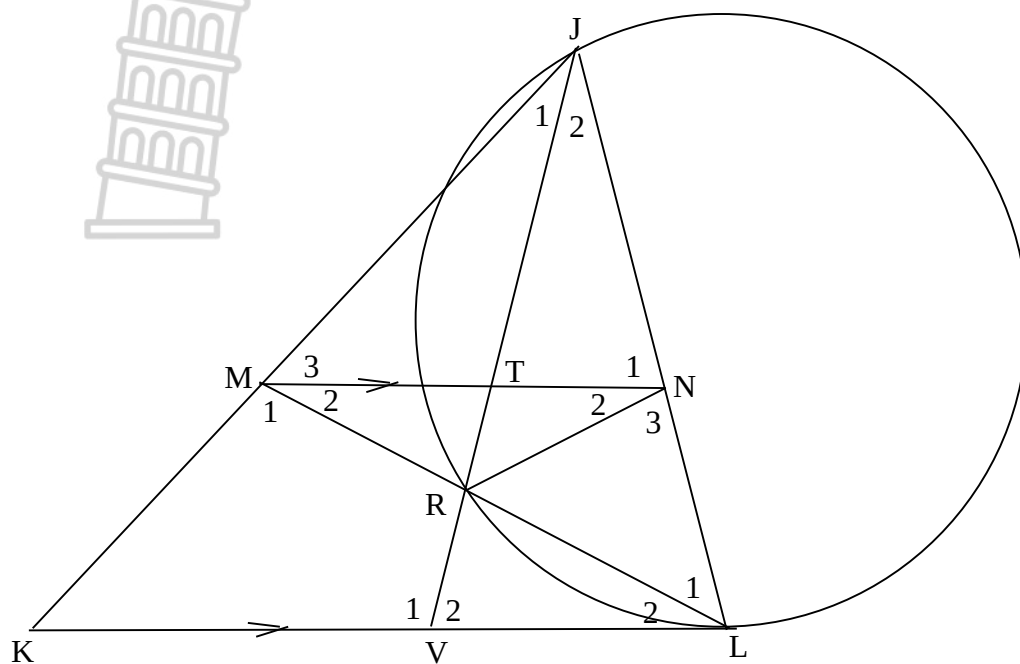




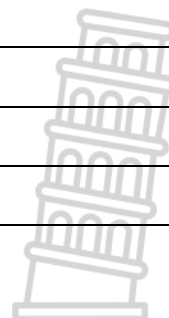
	Solution/Oplissing	MARKS/ PUNTE
8.2.1		(3)
8.2.2		(1)
8.2.3		(5)
		[16]



TION 9/17/24



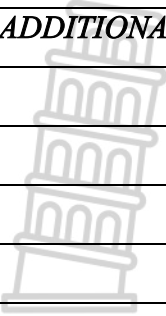
	Solution/<i>Oplossing</i>	MARKS/ <i>PUNTE</i>
9.1		(3)
9.1.2		(3)



9.3		
		(6)
		[12]

TOTAL/TOTAAL: 150

ADDITIONAL SPACE/BYKOMENDE RUIMTE

	ADDITIONAL SPACE/BYKOMENDE RUIMTE	
		



education

Department:
Education
North West Provincial Government
REPUBLIC OF SOUTH AFRICA

PROVINCIAL ASSESSMENT/ PROVINSIALE ASSESSERING

GRADE 12/GRAAD 12

**MATHEMATICS P2/WISKUNDE V2
JUNE/JUNIE 2024
MARKING GUIDELINES/NASIENRIGLYNE**

MARKS: 150/PUNTE: 150



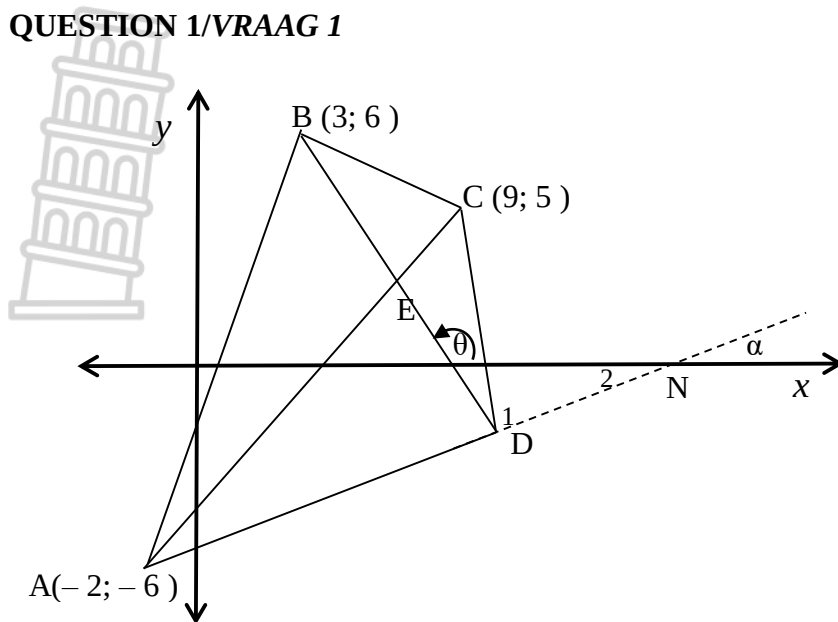
**These marking guidelines consist of 16 pages.
*Hierdie nasienriglyne bestaan uit 16 bladsye.***

NOTE

- If a candidate answers a question twice, only mark the **FIRST** attempt/ *Indien 'n kandidaat 'n vraag twee keer antwoord, word slegs die EERSTE poging gemerk./*
- If a candidate has crossed out an attempt of a question and not redone the question, mark the crossed out version./*Indien 'n kandidaat 'n poging doodgetrek het en NIE orgedoen het nie, word die doodgetrekte poging gemerk.*
- Consistent accuracy applies in **ALL** aspects of the marking memorandum. Stop marking at the second calculation error./*Konsekwente akkuraatheid word dwarsdeur die memorandum toegepas. Met die tweede berekeningsfout word nasien gestop.*
- Assuming answers or values in order to solve a problem is **NOT** acceptable./*Die aanvaarding van antwoorde of waardes om 'n problem op te los word NIE aanvaar nie./*

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

QUESTION 1/VRAAG 1

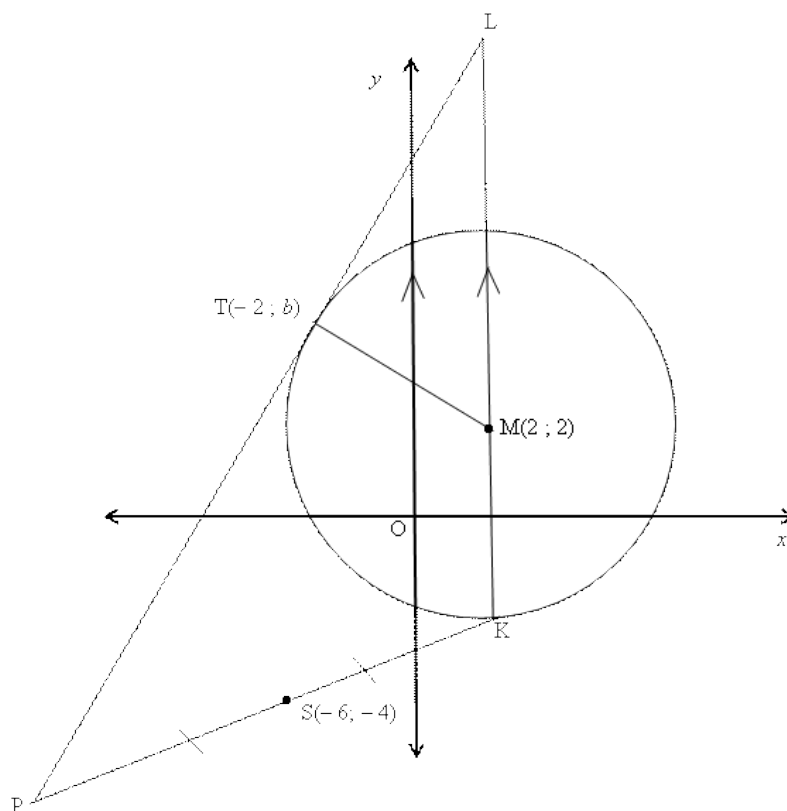


1.1	$AC = \sqrt{(5 + 6)^2 + (9 + 2)^2}$ $AC = 11\sqrt{2}$	✓ substitution/vervanging ✓ answer/antwoord (2)
1.2	$m_{AC} = \frac{5 + 6}{9 + 2}$ $m_{AC} = 1$	✓ substitution/vervanging ✓ $m_{AC} = 1$ (2)
1.3	$y - y_1 = m(x - x_1)$ $\begin{array}{ll} \text{C (9,5)} & \text{or} & \text{A (-2; -6)} \\ y - 5 = x - 9 & & y + 6 = x + 2 \\ y = x - 4 & & y = x - 4 \end{array}$	✓ substituting point A or C /vervang punt A of C ✓ answer/antwoord (2)
1.4	Diagonals of a kite intersect at right angles/ Hoeklyne van vlieër sny loodreg/ So $BE \perp AC$.	✓ answer/antwoord (1)
1.5	$m_{BD} = -1$ B (3; 6) $y - 6 = -1(x - 3)$ $y = -x + 9$	✓ $m_{BD} = -1$ ✓ substitution/vervanging ✓ answer/antwoord (3)

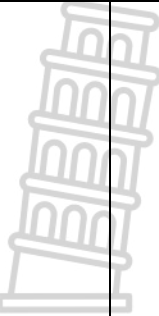
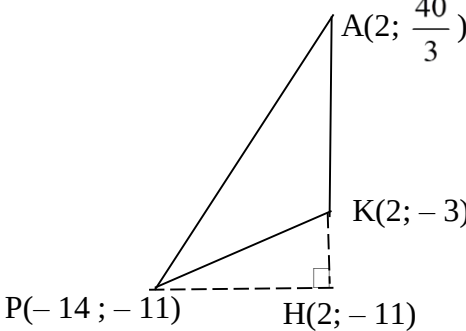
1.6	At E, $x - 4 = -x + 9$ $2x = 13$ $x = 6,5$ $y = 2,5$ E (6,5; 2,5)	✓ $x - 4 = -x + 9$ ✓ $x = 6,5$ ✓ $y = 2,5$ (3)
1.7	D(10; -1) [AC symmetry line of kite/AC lyn van simmetrie van vlieër, so $AB = BD$] Answer only: 3/3	✓ $x = 10$ ✓ $y = -1$ ✓ motivation/motivering (3)
1.8	$\tan \alpha = m_{AD} = \frac{5}{12}$ $\alpha = 22,62^\circ$ $\hat{N}_2 = \alpha = 22,62^\circ$ $\tan \theta = m_{CD} = -6$ $\theta = 99,46^\circ$ $\hat{D}_1 = 76,84^\circ$ [ext $\angle$ of Δ/buite $\angle$ van Δ] $\hat{ADC} = 103,16^\circ$ [$\angle$s on a str line/reguit lyn/] OR/OF $AB = 13$, $BC = \sqrt{37}$ and/en $AC = 11\sqrt{2}$ $AC^2 = AB^2 + BC^2 - 2AB \times BC \cos \hat{ABC}$ $(11\sqrt{2})^2 = 13^2 + (\sqrt{37})^2 - 2(13)(\sqrt{37}) \cos \hat{ABC}$ $\cos \hat{ABC} = -0,227...$ $\hat{ABC} = 103,16^\circ$ $\therefore \hat{ADC} = 103,16^\circ$ OR/OF $BE = \sqrt{3,5^2 + (-3,5)^2} = \frac{7\sqrt{2}}{2}$ $\cos \hat{ADE} = \frac{3,5\sqrt{2}}{13}$ $\hat{ADE} = 67,62^\circ$ $\cos \hat{CDE} = \frac{3,5\sqrt{2}}{\sqrt{37}}$ $\hat{CDE} = 35,54^\circ$ $\hat{ADC} = 103,16^\circ$	✓ $\alpha = 22,62^\circ$ ✓ $\hat{N}_2 = 22,62^\circ$ ✓ $\theta = 99,46^\circ$ ✓ $\hat{D}_1 = 76,84^\circ$ ✓ $\hat{ADC} = 103,16^\circ$ ✓ correct lengths/korrekte lengtes ✓ substitution/vervanging ✓ $\cos \hat{ABC} = -0,227...$ ✓ $\hat{ABC} = 103,16^\circ$ ✓ answer/antwoord ✓ $BE = \frac{7\sqrt{2}}{2}$ ✓ $\cos \hat{ADE} = \frac{3,5\sqrt{2}}{13}$ ✓ $\hat{ADE} = 67,62^\circ$ ✓ $\hat{CDE} = 35,54^\circ$ ✓ answer/antwoord (5)

[21]

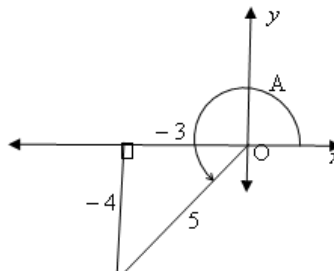
QUESTION 2/VRAAG 2



2.1	$(x - 2)^2 + (y - 2)^2 = 25$ $(-2 - 2)^2 + (b - 2)^2 = 25$ $(b - 2)^2 = 9 \quad \text{or} \quad 16 + b^2 - 4b + 4 = 25$ $b - 2 = \pm 3 \quad \text{or} \quad b^2 - 4b - 5 = 0$ $(b - 5)(b + 1) = 0$ $b = 5 \quad \text{or} \quad b \neq -1$	✓ equation of the circle/ vergelyking van sirkel ✓ substituting point T/ vervang T ✓ simplification/ vereenvoudiging Factors /Faktore ✓ answer /antwoord/ (4)
2.2.1	$K(2; 2 - 5)$ $K(2; -3)$	✓ $x = 2$ ✓ $y = -3$ (2)
2.2.2	$m_{MT} = \frac{5 - 2}{-2 - 2} = -\frac{3}{4}$ $\therefore m_{PL} = \frac{4}{3}$ $y - y_1 = m(x - x_1)$ $y - 5 = \frac{4}{3}(x + 2)$ $y = \frac{4}{3}x + \frac{23}{3}$ OR	✓ $m_{MT} = -\frac{3}{4}$ ✓ $m_{PL} = \frac{4}{3}$ ✓ substitution /vervanging/ ✓ antwoord/answer

	$m_{PL} = \frac{5+11}{-2+14}$ $m_{PL} = \frac{4}{3}$ $y - y_1 = m(x - x_1)$ $y - 5 = \frac{4}{3}(x + 2)$ $y = \frac{4}{3}x + \frac{23}{3}$	✓ substitution/ vervanging ✓ $m_{PL} = \frac{4}{3}$ ✓ substituting P or T/ vervang P of T ✓ answer/ antwoord (4)
2.2.3	 $y = \frac{4}{3}x + \frac{23}{3}$ $y = \frac{4}{3}(2) + \frac{23}{3}$ $y = \frac{31}{3}$ $LK = \frac{31}{3} + 3 = \frac{40}{3}$ Koordinate van P/Coordinates of P $\frac{x+2}{2} = -6 \quad \frac{y-3}{2} = -4$ $x = -14 \quad y = -5$ PH –hoogte/Height = $2 - (-14) = 16$ $\text{Area of PKL} = \frac{1}{2} \times \frac{40}{3} \times 16$ $= \frac{320}{3} / 106,67 \text{ vk eenhede/sq units}$	✓ $y_L = \frac{31}{3}$ ✓ $LK = \frac{40}{3}$ ✓ $x = -14$ ✓ $y = -11$ ✓ PH = 18 ✓ substitution/vervanging ✓ answer/antwoord (7)
2.3	The centres of the two circles lie on the same vertical line $x = 2$ and the sum of the radii is 10/ Die middelpunte van die twee sirkels lê op dieselfde vertikale lyn $x = 2$ en die som van die radius = 10 $n - 2 = 10 \quad \text{or} \quad 2 - n = 10$ $n = 12 \quad \text{or} \quad n = -8$ Answer only: full mark/ Slegs antwoord: vol punte	✓ correct method/korrekte metode ✓ sum of radii = 10/ som van ri = 10 ✓ $n = 12$ ✓ $n = -8$ (4)

QUESTION 3/VRAAG 3

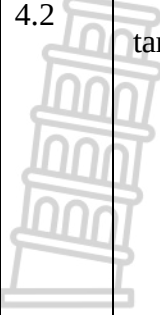
3.1	$\frac{\cos(90^\circ + x) \cdot \sin(540^\circ + x)}{\tan(x - 180^\circ) \cdot \cos(-x)}$ $= \frac{-\sin x \cdot \sin(180^\circ + x)}{\tan x \cdot \cos x}$ $= \frac{-\sin x \cdot (-\sin x)}{\frac{\sin x}{\cos x} \cdot \cos x}$ $= \sin x$	✓ $-\sin x$ ✓ $\tan x$ ✓ $\cos x$ ✓ $-\sin x$ ✓ $\frac{\sin x}{\cos x}$ ✓ $\cos x$ ✓ answer/antwoord
3.2	$\cos(P + Q) = \cos P \cdot \cos Q - \sin P \cdot \sin Q$ $\cos(2P) = \cos(P + P) = \cos P \cdot \cos P - \sin P \cdot \sin P$ $= \cos P \cdot \cos P - \sin P \cdot \sin P$ $= \cos^2 P - \sin^2 P$ $= \cos^2 P - (1 - \cos^2 P)$ $= \cos^2 P - 1 + \cos^2 P$ $= 2\cos^2 P - 1$	✓ $\cos 2P = \cos P \cdot \cos P - \sin P \cdot \sin P$ ✓ $\cos^2 P - \sin^2 P$ ✓ $1 - \cos^2 P$ ✓ $2\cos^2 P - 1$
3.3.1	$\tan A = \frac{4}{3}, \quad A \in [90^\circ; 360^\circ]$  $\sin A = -\frac{4}{5}$	✓ $r = 5$ ✓ correct sketch and quad/ korrekte skets en kwadrant ✓ answer/antwoord
3.3.2	$\cos(A + 30^\circ) = \cos A \cdot \cos 30^\circ - \sin A \sin 30^\circ$ $= -\frac{3}{5} \left(\frac{\sqrt{3}}{2} \right) - \left(-\frac{4}{5} \right) \left(\frac{1}{2} \right)$ $= \frac{4 - 3\sqrt{3}}{10} \text{ OR/OF } -0,12$	✓ expansion/uitbreiding ✓ $\frac{3}{5} \left(\frac{\sqrt{3}}{2} \right)$ ✓ $\left(-\frac{4}{5} \right) \left(\frac{1}{2} \right)$ ✓ answer/antwoord

3.4.1	$\sin 78^\circ = \cos 12^\circ$ $= p$	✓ $\cos 12^\circ$ ✓ answer/antwoord (2)
3.4.2	$\cos 12^\circ = \cos 2(6^\circ)$ $p = 1 - 2 \sin^2 6^\circ$ $p - 1 = -2 \sin^2 6^\circ$ $\frac{1-p}{2} = \sin^2 6^\circ$ $\sin 6^\circ = \pm \sqrt{\frac{1-p}{2}}$	✓ $\cos 2(6^\circ)$ ✓ $p = 1 - 2 \sin^2 6^\circ$ ✓ $\frac{1-p}{2} = \sin^2 6^\circ$ ✓ answer/antwoord (4)

[23]

QUESTION 4/ VRAAG 4

4.1	$\frac{\sin 2x - \cos 2x + 1}{\sin 2x + \cos 2x + 1} = \tan x$ $\text{LHS} = \frac{\sin 2x - \cos 2x + 1}{\sin 2x + \cos 2x + 1}$ $= \frac{2 \sin x \cos x - (\cos^2 x - \sin^2 x) + 1}{2 \sin x \cos x + (\cos^2 x - \sin^2 x) + 1}$ $= \frac{2 \sin x \cos x - \cos^2 x + \sin^2 x + 1}{2 \sin x \cos x + \cos^2 x - \sin^2 x + 1}$ $= \frac{2 \sin x \cos x + 2 \sin^2 x}{2 \sin x \cos x + 2 \cos^2 x}$ $= \frac{2 \sin x (\cos x + \sin x)}{2 \cos x (\sin x + \cos x)}$ $= \frac{\sin x}{\cos x}$ $= \tan x$ $\text{LHS} = \text{RHS}$	Both numerator and denominator/ Sowel teller as noemer ✓ $2 \sin x \cos x$ ✓ $\cos^2 x - \sin^2 x$ ✓ $2 \sin x \cos x + 2 \sin^2 x$ ✓ $2 \sin x \cos x + 2 \cos^2 x$ ✓ $2 \sin x (\cos x + \sin x)$ ✓ $2 \sin x (\sin x + \cos x)$ ✓ $\frac{\sin x}{\cos x}$ (7)
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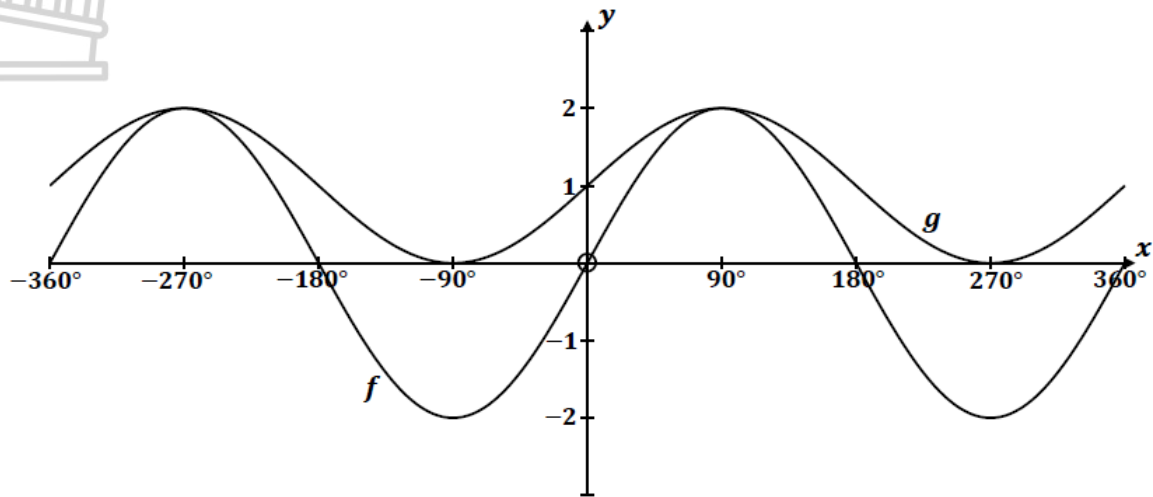
4.2	 $\tan 22,5^\circ = \frac{\sin 45^\circ - \cos 45^\circ + 1}{\sin 45^\circ + \cos 45^\circ + 1}$ $= \frac{\frac{\sqrt{2}}{2} - \frac{\sqrt{2}}{2} + 1}{\frac{\sqrt{2}}{2} + \frac{\sqrt{2}}{2} + 1}$ $= \frac{1}{\sqrt{2} + 1} \text{ or } \sqrt{2} - 1$	✓ expansion/ <i>uitbreiding</i> ✓ substitution/<i>vervanging</i> ✓ answer/<i>antwoord</i> (3)
4.3	$3\cos 2x = 1 + 5\cos x$ $3(2\cos^2 x - 1) = 1 + 5\cos x$ $6\cos^2 x - 3 = 1 + 5\cos x$ $6\cos^2 x - 5\cos x - 4 = 0$ $(3\cos x - 4)(2\cos x + 1) = 0$ $\cos x = \frac{4}{3} \text{ or } \cos x = -\frac{1}{2}$ No solution $x = 120^\circ + k.360^\circ, k \in \mathbb{Z}$ $x = 240^\circ + k.360^\circ, k \in \mathbb{Z}$ OR/OF $x = \pm \cos^{-1}\left(-\frac{1}{2}\right) + k.360^\circ$ $x = \pm 120^\circ + k.360^\circ, k \in \mathbb{Z}$	✓ $2\cos^2 x - 1$ ✓ std form/<i>std form</i> ✓ factors/<i>faktore</i> ✓ both equations/<i>beide vergelykings</i> ✓ No solution/<i>geen oplossing</i> ✓ Gen Solution 1/<i>alg oplossing1</i> ✓ Gen Solution 2/<i>alg oplossing2/</i> <i>- 1 as/if $k \in \mathbb{Z}$ is not included</i> <i>nie aangedui</i> (7)

[17]



QUESTION 5/VRAAG 5

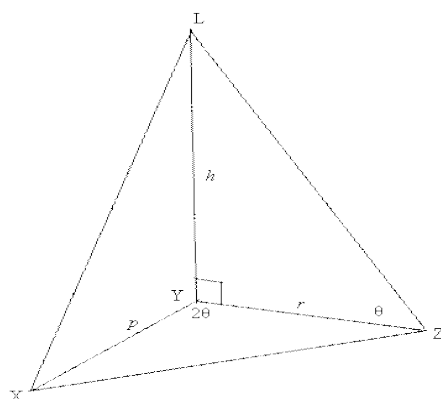
$f(x) = a \sin x$ en/and $g(x) = \sin x + b$; $x \in [-360^\circ; 360^\circ]$.



5.1	$a = 2$ $b = 1$	✓ $a = 2$ ✓ $b = 1$ (2)
5.2	Amplitude = 1	✓ answer/antwoord (1)
5.3.1	$x = -270^\circ$ of/or $x = 90^\circ$	✓ $x = -270^\circ$ ✓ $x = 90^\circ$ (2)
5.3.2	$-360^\circ < x < -270^\circ$ or $-90^\circ < x < 90^\circ$ or $270^\circ < x < 360^\circ$ OF/ OR $x \in (-360^\circ; -270^\circ)$ or $x \in (-90^\circ; 90^\circ)$ or $x \in (270^\circ; 360^\circ)$	✓ $-360^\circ < x < -270^\circ$ ✓ $-90^\circ < x < 90^\circ$ ✓ $270^\circ < x < 360^\circ$ OF/OR ✓ $x \in (-360^\circ; -270^\circ)$ ✓ $x \in (-90^\circ; 90^\circ)$ ✓ $x \in (270^\circ; 360^\circ)$ (3)
5.3.3	$-270^\circ < x < -90^\circ$ or $90^\circ < x < 270^\circ$ $x \in (-270^\circ; -90^\circ)$ or $x \in (90^\circ; 270^\circ)$	✓ $-270^\circ < x < -90^\circ$ ✓ $90^\circ < x < 270^\circ$ OF/OR ✓ $x \in (-270^\circ; -90^\circ)$ ✓ $x \in (90^\circ; 270^\circ)$ (2)

[10]

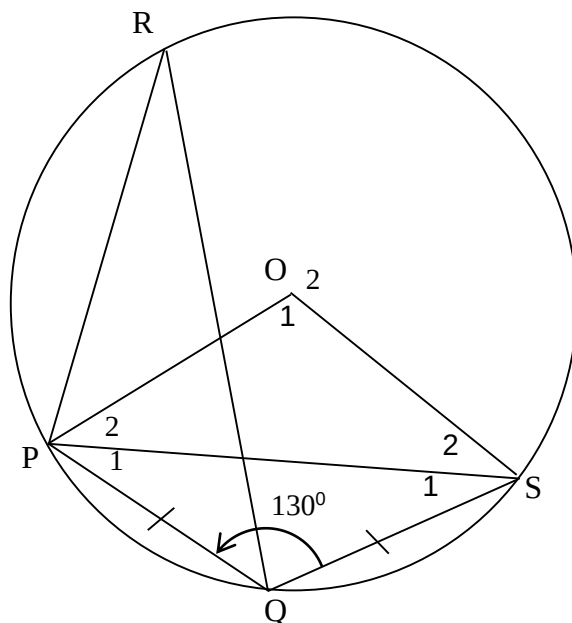
QUESTION 6/VRAAG 6



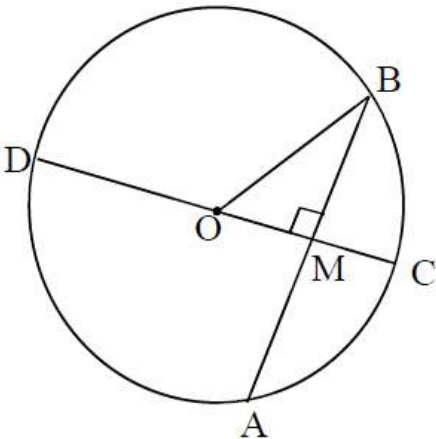
6.1	$A = \frac{1}{2} \times p \times r \times \sin 2\theta$	✓ answer/antwoord (1)
6.2	$A = \frac{1}{2} \times p \times r \times \sin 2\theta$ $r = \frac{A}{\frac{1}{2} p \sin 2\theta}$ $r = \frac{2A}{p \sin 2\theta}$	✓ $r = \frac{A}{\frac{1}{2} p \sin 2\theta}$ ✓ $r = \frac{2A}{p \sin 2\theta}$ (2)
6.3	$\tan \theta = \frac{h}{r}$ $h = r \tan \theta$ $h = \frac{2A}{p \sin 2\theta} \times \frac{\sin \theta}{\cos \theta}$ $h = \frac{2A}{p \times 2 \sin \theta \cos \theta} \times \frac{\sin \theta}{\cos \theta}$ $h = \frac{A}{p \cos^2 \theta}$	✓ $\tan \theta = \frac{h}{r}$ ✓ $h = r \tan \theta$ ✓ $h = \frac{2A}{p \sin 2\theta} \times \frac{\sin \theta}{\cos \theta}$ ✓ $2 \sin \theta \cos \theta$ ✓ answer/antwoord (5)
6.4.1	$h = \frac{A}{p \cos^2 \theta}$ $20 = \frac{A}{10 \cos^2 60^\circ}$ $A = 50 \text{ m}^2$	✓ substitution/ vervanging ✓ answer/antwoord (2)
6.4.2	$r = \frac{2A}{p \sin 2\theta}$ $r = \frac{2(50)}{10 \sin 2(60^\circ)}$ $r = 11,55 \text{ m}$ $t^2 = 10^2 + (11,55)^2 - 2(10)(11,55) \cos 2(60^\circ)$ $t = 18,68 \text{ m}$	✓ substitution/ vervanging ✓ $r = 11,55 \text{ m}$ ✓ correct substitution korrekte vervanging ✓ substitution/vervanging (4)

[14]

QUESTION 7/VRAAG 7

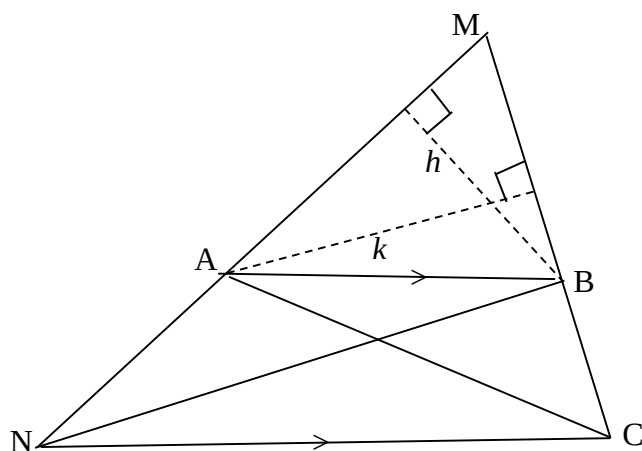


7.1.1	$\hat{S}_1 = \hat{P}_1$ [$\angle$ 'e teenoor = sye/ $\angle$ s opp = sides] $2\hat{S}_1 + 130^\circ = 180^\circ$ [binne $\angle$ 'e van Δ / $\angle$ s of a Δ] $\hat{S}_1 = 25^\circ$	✓ S/R ✓ S/R ✓ answer/antwoord (3)
7.1.2	$\hat{R} = \hat{S}_1 = 25^\circ$ [omtrekshoeke/ $\angle$ s subt by same chord]	✓ S ✓ R (2)
7.1.3	$\hat{O}_2 = 260^\circ$ [mdpt $\angle = 2 \times$ omtreks $\angle$ / angle at centre = $2 \angle$ at circumf] $\hat{O}_1 = 100^\circ$ [omwenteling/ $\angle$ s around a point]	✓ S ✓ R ✓ answer/antwoord (3)

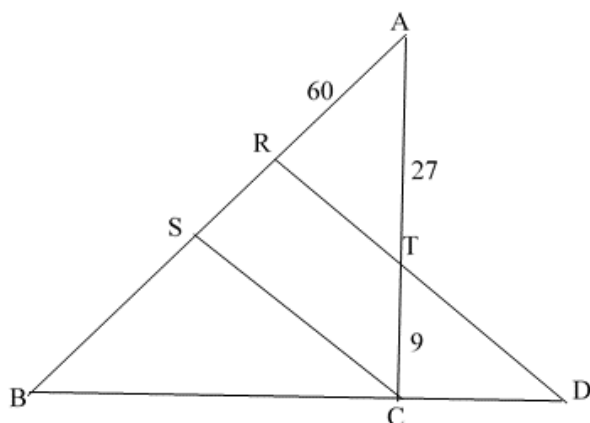
7.2		
7.2.1	$DC = 9x$	✓ answer/antwoord (1)
7.2.2	$OM = OC - MC$ $OM = \frac{9x}{2} - 2x$ $OM = 2,5x$	✓ method/metode ✓ answer/antwoord (2)
7.2.3	$OB^2 = BM^2 + OM^2$ $BM = 7$ [line from centre $\perp$ to chord/radius $\perp$ koord] $\left(\frac{9x}{2}\right)^2 = 7^2 + \left(\frac{5x}{2}\right)^2$ $\frac{81x^2}{4} = 49 + \frac{25x^2}{4}$ $14x^2 = 49$ $x^2 = 3,5$ $x = 1,87$ $\text{radius} = \frac{9}{2}(1,87) = 8.42 \text{ units}$	✓ S/R ✓ substitution/vervanging ✓ $x^2 = 3,5$ ✓ $x = 1,87$ ✓ radius = 8,42 eenhede/units (5)

[16]

QUESTION 8/VRAAG 8



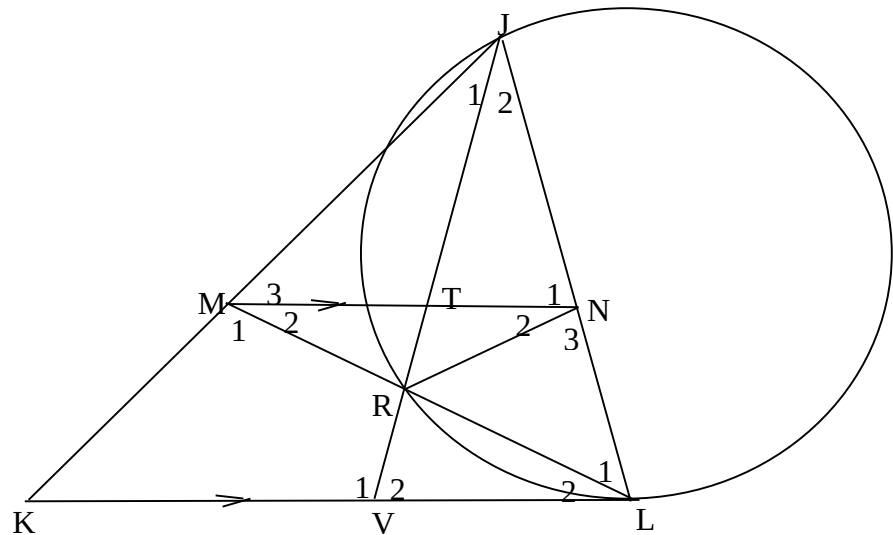
8.1	Const: Draw height k from A such that $k \perp MB$ and h from B such that $h \perp AM$. Konstr: Trek hoogte k vanaf A sodat $k \perp MB$ en h vanaf B sodat $h \perp AM$. Proof/Bewys:: $\frac{\text{area } \triangle MAB}{\text{area } \triangle ANB} = \frac{\frac{1}{2} MA \times h}{\frac{1}{2} AN \times h}$ $\frac{\text{area } \triangle MAB}{\text{area } \triangle ANB} = \frac{MA}{AN}$ $\frac{\text{area } \triangle MAB}{\text{area } \triangle ABC} = \frac{\frac{1}{2} MB \times k}{\frac{1}{2} BC \times k} = \frac{MB}{BC}$ Maar/But $\text{area } \triangle ANB = \text{area } \triangle ABC$ [same base and height/ selfde basis selfde hoogte of/or $RP \parallel TM$] $\frac{MA}{AN} = \frac{MB}{BC}$	✓ construction/konstruksie ✓ $\text{Area } \triangle MAB = \frac{1}{2} MA \times h$ ✓ $\text{Area } \triangle ANB = \frac{1}{2} AN \times h$ ✓ $\frac{\text{area } \triangle MAB}{\text{area } \triangle ANB} = \frac{MA}{AN}$ ✓ $\frac{\text{area } \triangle MAB}{\text{area } \triangle ABC} = \frac{MB}{BC}$ ✓ S ✓ R (7)
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8.2.1	$\frac{AC}{TA} = \frac{36}{27} = \frac{4}{3} \quad \frac{AS}{AR} = \frac{80}{60} = \frac{4}{3}$ $\frac{AC}{TA} = \frac{AS}{AR}$ SC $\parallel$ RD [converse line $\parallel$ to one side of Δ/ <i>omgekeerd lyn $\parallel$ een sy van Δ</i> OR Converse prop theorem, SC $\parallel$ RD/ <i>Omgekeerd eweredigheid</i> <i>stelling</i> SC $\parallel$ RD OR lyn verdeel sy eweredig	$\checkmark \frac{AC}{TA} = \frac{4}{3}$ $\checkmark \frac{AS}{AR} = \frac{4}{3}$ $\checkmark R$ (3)
8.2.2	$RS = 80 - 60 = 20 \text{ cm}$	$\checkmark \text{answer/antwoord}$ (1)
8.2.3	$RB = \frac{3}{2} AR$ $RB = \frac{3}{2} (60)$ $RB = 90 \text{ cm}$ $SB = 70 \text{ cm}$ $\frac{CD}{30} = \frac{20}{70} \text{ [line \parallel to one side of \Delta/lyn \parallel een sy}$ van Δ OR/OF [prop theorem, SC $\parallel$ RD] OR/OF <i>omgekeerd eweredigheid stelling</i> SC $\parallel$ RD] $CD = 8,57 \text{ cm}$	$\checkmark RB = 90 \text{ cm}$ $\checkmark SB = 70 \text{ cm}$ $\checkmark S \quad \checkmark R$ $\checkmark \text{answer/antwoord}$ (5)

[16]

QUESTION



$$J_N = \frac{NLJT}{TV}$$

(6)

[12]

TOTAAL/TOTAL: 150

