



basic education

Department:
Basic Education
REPUBLIC OF SOUTH AFRICA

**SENIOR CERTIFICATE EXAMINATIONS/
NATIONAL SENIOR CERTIFICATE EXAMINATIONS
*SENIORSERTIFIKAAT-EKSAMEN/
NASIONALE SENIORSERTIFIKAAT-EKSAMEN***

TECHNICAL MATHEMATICS P2/TEGNIJSE WISKUNDE V2

MAY/JUNE/MEI/JUNIE 2025

FINAL MARKING GUIDELINES/NASIENRIGLYNE

MARKS/PUNTE: 150

CODE/ KODE	EXPLANATION/VERDUIDELIKING
A	Accuracy/Akkuraatheid
AO	Answer only/Slegs antwoord
CA	Consistent accuracy/Volgehoue akkuraatheid
I	Identity/Identiteit
M	Method/Metode
NPR	No penalty for rounding/Geen penalisering vir afronding nie
NPU	No penalty for omitting units/Geen penalisering vir eenhede weggelaat nie
R	Rounding/Afronding
RE	Reason/Rede
S	Simplification/Vereenvoudiging
ST	Statement/Bewering
SF	Substitution in correct formula/Vervanging in korrekte formule
ST/RE	Statement with reason/Bewering met rede
F	Correct formula/Korrekte formule

**These marking guidelines consist of 28 pages.
*Hierdie nasienriglyne bestaan uit 28 bladsye.***

NOTE:

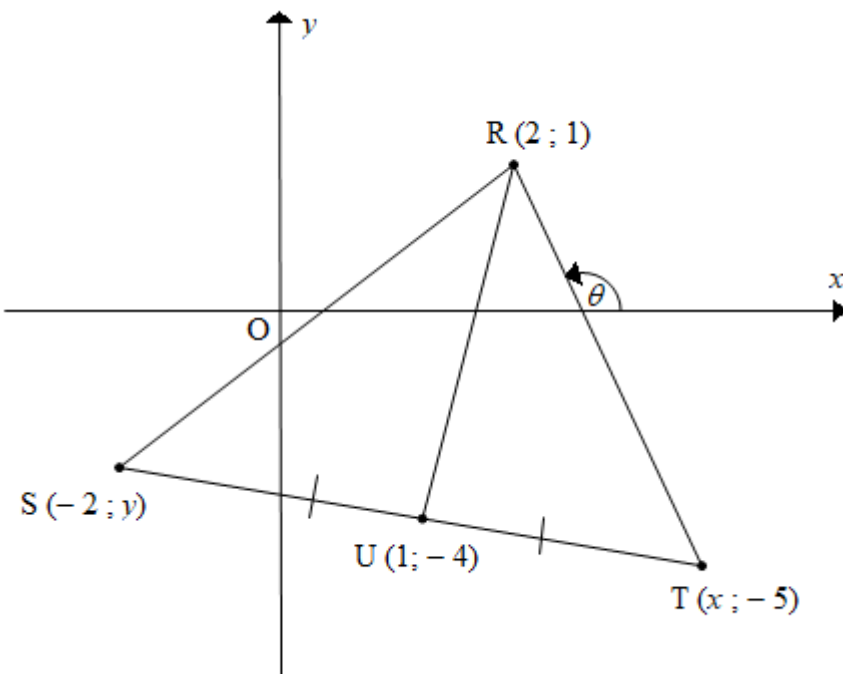
- If a candidate answers a question **TWICE**, only mark the **FIRST** attempt.
- Consistent Accuracy marking must be applied where indicated.
- # Shows question where a Tolerance Range will be applied:

Q 3.2.2 ; Q3.3 ; Q4.3 & Q 11.2.2

LET WEL:

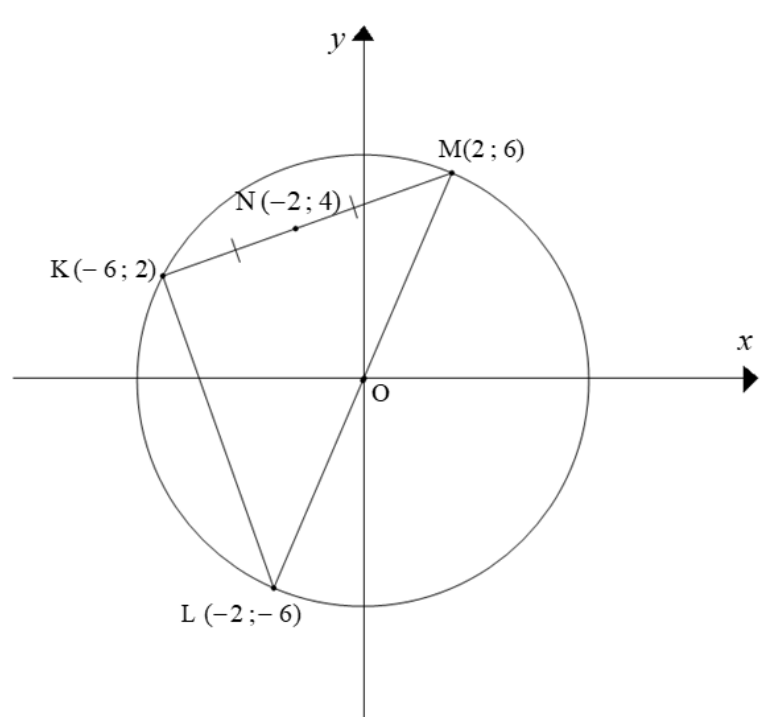
- Indien 'n kandidaat 'n vraag **TWEE** keer beantwoord, sien slegs die **EERSTE** poging na.
- Die nasien van Volgehoue Akkuraatheid moet waar aangedui, toegepas word.
- # Toon vrae waar Toleransie wydte (Verdraagsaamheids omvang) toegepas word:
V 3.2.2 ; V3.3 ; V4.3 & V 11.2.2

QUESTION/VRAAG 1

		
1.1	$RU = \sqrt{(x_R - x_U)^2 + (y_R - y_U)^2}$ $= \sqrt{(2 - 1)^2 + (1 - (-4))^2}$ $= \sqrt{26}$	<p>✓SF ✓ length/lengte RU AO:Full marks/Volpunte</p> <p style="text-align: right;">A CA (2)</p>
1.2	$1 = \frac{x - 2}{2} \text{ and/en } -4 = \frac{y - 5}{2}$ $x = 2 + 2 = 4 \text{ and/en } y = -8 + 5 = -3$	<p>✓ value of/waarde van x ✓ value of/waarde van y</p> <p style="text-align: right;">A A (2)</p>

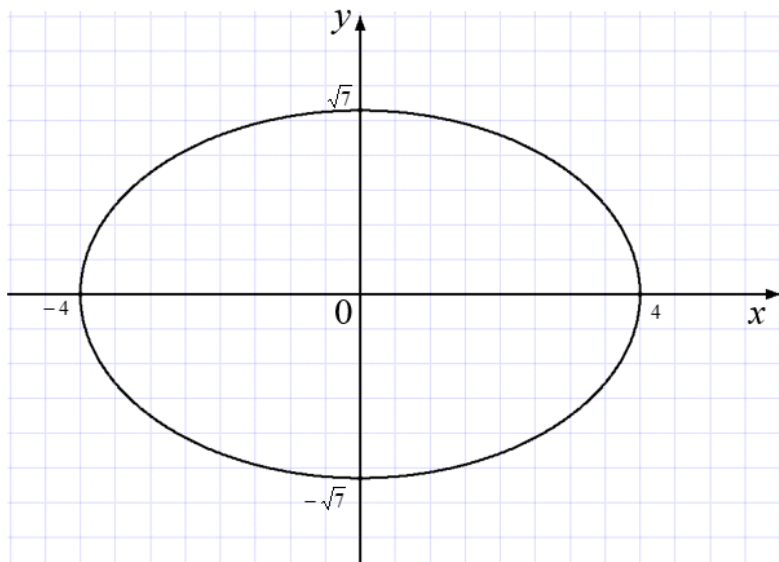
1.3	$m_{RT} = \frac{y_R - y_T}{x_R - x_T}$ $= \frac{1 - (-5)}{2 - 4}$ $= -3$	<p>✓ SF CA</p> <p>✓ gradient/gradiënt CA</p> <p>AO:Full marks/Volpunte (2)</p>
1.4	$\tan \theta = m_{RT}$ $\tan \theta = -3$ $\text{ref } \angle = \tan^{-1} (3)$ $\text{ref.}\angle/\text{verw.}\angle: \approx 71,57^\circ$ $\theta = 180^\circ - 71,57^\circ = 108,43^\circ$	<p>✓ SF CA</p> <p>✓ ref.∠/verw.∠ CA</p> <p>✓ value of/waarde van θ CA</p> <p>AO:Full marks/Volpunte (3)</p>
1.5	$x^2 + y^2 = r^2$ $(-2)^2 + (-3)^2 = r^2$ $r^2 = 13$ $\therefore x^2 + y^2 = 13 \text{ OR } y = \pm\sqrt{13 - x^2} \text{ OR } x = \pm\sqrt{13 - y^2}$	<p>✓SF CA</p> <p>✓ equation/vergelyking CA</p> <p>AO:Full marks/Volpunte (2)</p>
		[11]

QUESTION/VRAAG 2

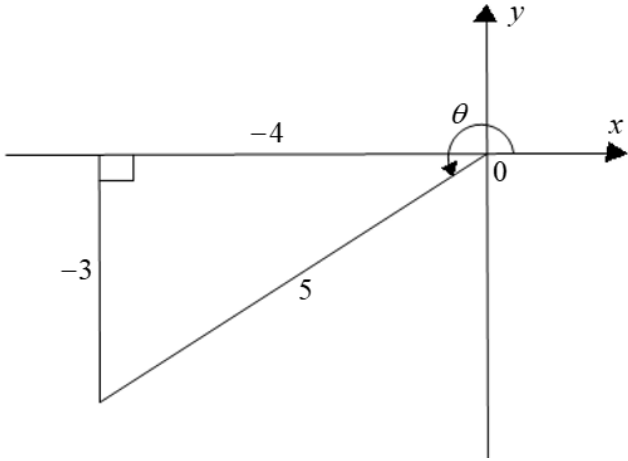
2.1			
2.1.1	<table border="0" style="width: 100%;"> <tr> <td style="vertical-align: top; width: 50%;"> $m_{OM} = \frac{y_O - y_M}{x_O - x_M}$ $= \frac{0 - 6}{0 - 2}$ $= 3$ $y - 6 = 3(x - 2) \quad \text{OR/OF} \quad 6 = 3(2) + c$ $\therefore y = 3x$ <p style="text-align: center;">OR/OF</p> $m_{OM} = \frac{y_O - y_M}{x_O - x_M}$ $= \frac{0 - 6}{0 - 2}$ $= 3$ $y - (-6) = 3(x - (-2)) \quad \text{OR/OF} \quad -6 = 3(-2) + c$ $\therefore y = 3x$ <p style="text-align: center;">OR/OF</p> </td><td style="vertical-align: top; width: 50%;"> <div style="display: flex; justify-content: space-between;"> ✓ SF A </div> <div style="display: flex; justify-content: space-between;"> ✓ gradient/gradjënt of/van OM CA </div> <div style="display: flex; justify-content: space-between;"> ✓ equation / vergelyking CA </div> <p style="text-align: center;">OR/OF</p> <div style="display: flex; justify-content: space-between;"> ✓ SF A </div> <div style="display: flex; justify-content: space-between;"> ✓ gradient/gradjënt of/van OM CA </div> <div style="display: flex; justify-content: space-between;"> ✓ equation/vergelýking CA </div> <p style="text-align: center;">OR/OF</p> </td></tr> </table>	$m_{OM} = \frac{y_O - y_M}{x_O - x_M}$ $= \frac{0 - 6}{0 - 2}$ $= 3$ $y - 6 = 3(x - 2) \quad \text{OR/OF} \quad 6 = 3(2) + c$ $\therefore y = 3x$ <p style="text-align: center;">OR/OF</p> $m_{OM} = \frac{y_O - y_M}{x_O - x_M}$ $= \frac{0 - 6}{0 - 2}$ $= 3$ $y - (-6) = 3(x - (-2)) \quad \text{OR/OF} \quad -6 = 3(-2) + c$ $\therefore y = 3x$ <p style="text-align: center;">OR/OF</p>	<div style="display: flex; justify-content: space-between;"> ✓ SF A </div> <div style="display: flex; justify-content: space-between;"> ✓ gradient/gradjënt of/van OM CA </div> <div style="display: flex; justify-content: space-between;"> ✓ equation / vergelyking CA </div> <p style="text-align: center;">OR/OF</p> <div style="display: flex; justify-content: space-between;"> ✓ SF A </div> <div style="display: flex; justify-content: space-between;"> ✓ gradient/gradjënt of/van OM CA </div> <div style="display: flex; justify-content: space-between;"> ✓ equation/vergelýking CA </div> <p style="text-align: center;">OR/OF</p>
$m_{OM} = \frac{y_O - y_M}{x_O - x_M}$ $= \frac{0 - 6}{0 - 2}$ $= 3$ $y - 6 = 3(x - 2) \quad \text{OR/OF} \quad 6 = 3(2) + c$ $\therefore y = 3x$ <p style="text-align: center;">OR/OF</p> $m_{OM} = \frac{y_O - y_M}{x_O - x_M}$ $= \frac{0 - 6}{0 - 2}$ $= 3$ $y - (-6) = 3(x - (-2)) \quad \text{OR/OF} \quad -6 = 3(-2) + c$ $\therefore y = 3x$ <p style="text-align: center;">OR/OF</p>	<div style="display: flex; justify-content: space-between;"> ✓ SF A </div> <div style="display: flex; justify-content: space-between;"> ✓ gradient/gradjënt of/van OM CA </div> <div style="display: flex; justify-content: space-between;"> ✓ equation / vergelyking CA </div> <p style="text-align: center;">OR/OF</p> <div style="display: flex; justify-content: space-between;"> ✓ SF A </div> <div style="display: flex; justify-content: space-between;"> ✓ gradient/gradjënt of/van OM CA </div> <div style="display: flex; justify-content: space-between;"> ✓ equation/vergelýking CA </div> <p style="text-align: center;">OR/OF</p>		

$m_{ML} = \frac{y_M - y_L}{x_M - x_L}$ $= \frac{6 - (-6)}{2 - (-2)}$ $= 3$ $y - (6) = 3(x - 2) \quad \text{OR/OF} \quad -6 = 3(-2) + c$ $\therefore y = 3x$ <p style="text-align: center;">OR/OF</p> $m_{OL} = \frac{y_L - y_O}{x_L - x_O}$ $= \frac{-6 - 0}{-2 - 0}$ $= 3$ $y - (-6) = 3(x - (-2)) \quad \text{OR/OF} \quad 0 = 3(0) + c$ $\therefore y = 3x$	<p>✓ SF A</p> <p>✓ gradient/gradjënt of/van OM CA</p> <p>✓ equation/vergelyking CA</p> <p style="text-align: center;">OR/OF</p> <p>✓ SF A</p> <p>✓ gradient/gradjënt of/van OM CA</p> <p>✓ equation/vergelyking CA</p> <p>AO:Full marks/Volpunte</p> <p style="text-align: right;">(3)</p>
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2.1.2	$m_{KL} = \frac{y_K - y_L}{x_K - x_L}$ $= \frac{2 - (-6)}{-6 - (-2)}$ $= -2$ $m_{KM} = \frac{y_K - y_M}{x_K - x_M}$ $= \frac{2 - 6}{-6 - 2}$ $= \frac{1}{2}$ $m_{KL} \times m_{KM} = -2 \times \frac{1}{2} = -1$ $\therefore KL \perp KM$ <p style="text-align: center;">OR/OF</p> $KL^2 = (x_K - x_L)^2 + (y_K - y_L)^2$ $= (-6 - (-2))^2 + (2 - (-6))^2$ $= 80$ $KM^2 = (-6 - 2)^2 + (2 - 6)^2 = 80$ $\therefore KL^2 + KM^2 = 80 + 80 = 160$ $ML^2 = (2 - (-2))^2 + (6 - (-6))^2 = 160$ $\therefore KL^2 + KM^2 = ML^2$ $\therefore KL \perp KM$	<p>✓ SF A</p> <p>✓ gradient/gradiënt CA</p> <p>✓ gradient/gradiënt CA</p> <p>✓ M A</p> <p style="text-align: center;">OR/OF</p> <p>✓ SF A</p> <p>✓ KL^2 CA</p> <p>✓ ML^2 CA</p> <p>✓ M A</p> <p style="text-align: right;">(4)</p>
2.1.3	$ON = \sqrt{(x_O - x_N)^2 + (y_O - y_N)^2}$ $= \sqrt{(0 - (-2))^2 + (0 - 4)^2}$ $= 2\sqrt{5} \approx 4,47$ $KL = \sqrt{(x_K - x_L)^2 + (y_K - y_L)^2}$ $= \sqrt{(-6 - (-2))^2 + (2 - (-6))^2}$ $= 4\sqrt{5} \approx 8,94$ $\therefore ON = \frac{1}{2}KL$ <p style="text-align: center;">OR/OF</p>	<p>✓ SF A</p> <p>✓ ON CA</p> <p>✓ KL A</p> <p style="text-align: center;">OR/OF</p>

	$KN = NM$ (Given/Gegee) $MO = OL$ (Radii) $\therefore ON = \frac{1}{2} KL$ (Midpt theorem/Midpt stelling)	\checkmark ST \checkmark ST \checkmark RE	A A A (3)
2.2		\checkmark x-intercepts/afsnitte \checkmark y-intercepts/afsnitte \checkmark elliptical shape/elliptiese vorm	A A CA Accept if the y value is between 2 and 3 and closer to 3 Aanvaar as die y-waarde tussen 2 en 3 is en nader aan 3 is. (3)
			[13]

QUESTION/VRAAG 3

3.1.1	$\tan(A + B)$ $= \tan(103^\circ + 52^\circ)$ $\approx -0,47$	✓ substitution/vervanging A ✓ S CA AO: Full marks / Volpunte NPR (2)
3.1.2	$\frac{2 \operatorname{cosec} B}{\cos A}$ $= \frac{2 \operatorname{cosec} 52^\circ}{\cos 103^\circ}$ $= \frac{2}{\sin 52^\circ} \div \cos 103^\circ$ $\approx -11,28$	✓ substitution/vervanging A ✓ $\frac{2}{\sin 52^\circ}$ I A ✓ S CA NPR (3)
3.2.1	$\operatorname{cosec} \theta = -\frac{5}{3}$	✓ $-\frac{5}{3}$ A (1)
3.2.2	$(5)^2 - (-3)^2 = x^2$ $x = \pm 4$ $x = -4$  $\cos \theta - \cot \theta$ $= \left(\frac{-4}{5} \right) - \left(\frac{-4}{-3} \right)$ $= -\frac{32}{15}$	✓ SF A ✓ x-value /waarde CA (negative value / negatiewe waarde) ✓ cos ratio/verhouding CA ✓ cot ratio/verhouding CA ✓ S CA (5)

3.3	$\sin 3x = -0,43$ $\text{ref.}\angle / \text{verw.}\angle = 25,47^\circ$ $3x = 180^\circ + 25,47^\circ$ or/of $3x = 360^\circ - 25,47^\circ$ $3x = 205,47^\circ$ or/of $3x = 334,53^\circ$ $\therefore x = 68,49^\circ$ or/of $x = 111,51^\circ$	\checkmark ref. \angle / verw. \angle A \checkmark 3rd quadrant/kwadrant A \checkmark 4th quadrant/kwadrant A \checkmark x-value/waarde CA \checkmark x-value/waarde CA (5)
		[16]

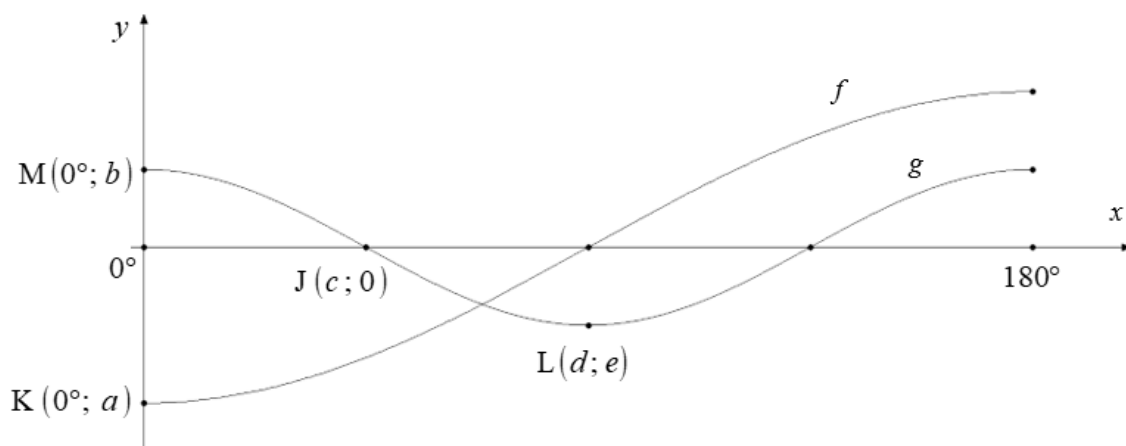
QUESTION/VRAAG 4

4.1.1	$\cos^2 \alpha$ OR/OF $(-\cos \alpha)^2$	✓ $\cos^2 \alpha / (-\cos \alpha)^2$ A (1)
4.1.2	1	✓ 1 A (1)
4.2	$\frac{\tan(\pi - \alpha) \cdot \sqrt{1 - \sin^2 \alpha}}{\cos^2(180^\circ + \alpha) + \sin^2(360^\circ - \alpha)}$ $= \frac{-\tan \alpha \cdot \sqrt{\cos^2 \alpha}}{\cos^2 \alpha + (-\sin \alpha)^2}$ $= \left(\frac{-\sin \alpha}{\cos \alpha} \cdot \cos \alpha \right) \div (\cos^2 \alpha + \sin^2 \alpha)$ $= -\sin \alpha \div 1$ $= -\sin \alpha$	✓ $-\tan \alpha$ A ✓ $\sqrt{\cos^2 \alpha}$ A ✓ $-\sin \alpha / \sin^2 \alpha$ A ✓ $\frac{\sin \alpha}{\cos \alpha}$ A ✓ $\cos \alpha$ A ✓ S CA (6)
4.3	$\sec^2 \theta + \operatorname{cosec}^2 \theta = \operatorname{cosec}^2 \theta \cdot \sec^2 \theta$ $\text{L.H.S./LK} = \sec^2 \theta + \operatorname{cosec}^2 \theta$ $= \frac{1}{\cos^2 \theta} + \frac{1}{\sin^2 \theta}$ $= \frac{\sin^2 \theta + \cos^2 \theta}{\sin^2 \theta \cdot \cos^2 \theta}$ $= \frac{1}{\sin^2 \theta \cdot \cos^2 \theta}$ $= \frac{1}{\sin^2 \theta} \cdot \frac{1}{\cos^2 \theta}$ $= \operatorname{cosec}^2 \theta \cdot \sec^2 \theta = \text{R.H.S./RK}$ <p style="text-align: center;">OR/OF</p> $\sec^2 \theta + \operatorname{cosec}^2 \theta = \operatorname{cosec}^2 \theta \cdot \sec^2 \theta$ $\text{R.H.S./RK} = \operatorname{cosec}^2 \theta \cdot \sec^2 \theta$ $= \operatorname{cosec}^2 \theta (\tan^2 \theta + 1)$ $= \frac{1}{\sin^2 \theta} \left(\frac{\sin^2 \theta}{\cos^2 \theta} + 1 \right)$ $= \frac{1}{\cos^2 \theta} + \frac{1}{\sin^2 \theta}$ $= \sec^2 \theta + \operatorname{cosec}^2 \theta = \text{L.H.S./LK}$ <p style="text-align: center;">OR/OF</p>	✓ $\frac{1}{\cos^2 \theta}$ A ✓ $\frac{1}{\sin^2 \theta}$ A ✓ S A ✓ $\frac{1}{\sin^2 \theta} \cdot \frac{1}{\cos^2 \theta}$ A <p style="text-align: center;">OR/OF</p> ✓ $\tan^2 \theta + 1$ A ✓ $\frac{1}{\sin^2 \theta}$ A ✓ $\frac{\sin^2 \theta}{\cos^2 \theta}$ A ✓ $\frac{1}{\cos^2 \theta} + \frac{1}{\sin^2 \theta}$ A <p style="text-align: center;">OR/OF</p>

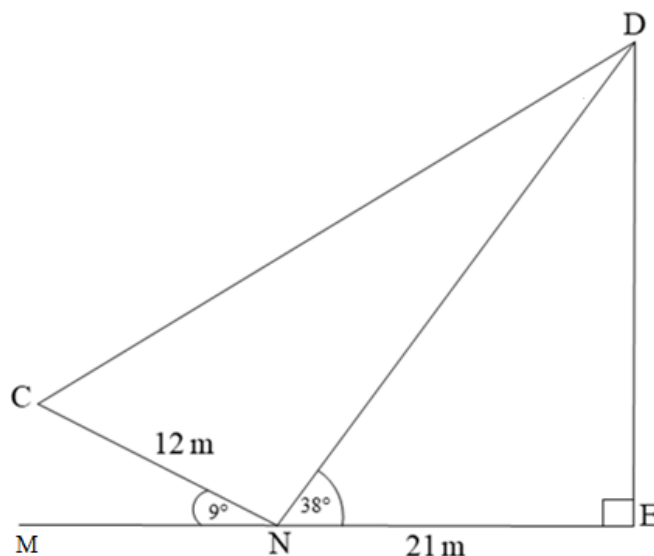
$\sec^2 \theta + \operatorname{cosec}^2 \theta = \operatorname{cosec}^2 \theta \cdot \sec^2 \theta$ $\text{R.H.S/RK} = \operatorname{cosec}^2 \theta \cdot \sec^2 \theta$ $= \frac{1}{\sin^2 \theta} \cdot \frac{1}{\cos^2 \theta}$ $= \frac{\sin^2 \theta + \cos^2 \theta}{\sin^2 \theta \cdot \cos^2 \theta}$ $= \frac{\sin^2 \theta}{\sin^2 \theta \cdot \cos^2 \theta} + \frac{\cos^2 \theta}{\sin^2 \theta \cdot \cos^2 \theta}$ $= \frac{1}{\cos^2 \theta} + \frac{1}{\sin^2 \theta}$ $= \sec^2 \theta + \operatorname{cosec}^2 \theta = \text{LHS/LK}$ <p style="text-align: center;">OR/OF</p> $\sec^2 \theta + \operatorname{cosec}^2 \theta = \operatorname{cosec}^2 \theta \cdot \sec^2 \theta$ $\text{R.H.S/RK} = \operatorname{cosec}^2 \theta \cdot \sec^2 \theta$ $= (1 + \cot^2 \theta) \cdot \sec^2 \theta$ $= \left(1 + \frac{\cos^2 \theta}{\sin^2 \theta}\right) \cdot \frac{1}{\cos^2 \theta}$ $= \frac{1}{\cos^2 \theta} + \frac{1}{\sin^2 \theta}$ $= \sec^2 \theta + \operatorname{cosec}^2 \theta = \text{LHS / LK}$ <p style="text-align: center;">OR/OF</p> $\sec^2 \theta + \operatorname{cosec}^2 \theta = \operatorname{cosec}^2 \theta \cdot \sec^2 \theta$ $\text{L.H.S/LK} = \sec^2 \theta + \operatorname{cosec}^2 \theta$ $= 1 + \tan^2 \theta + 1 + \cot^2 \theta$ $= 2 + \tan^2 \theta + \cot^2 \theta$ $\text{R.H.S/RK} = (1 + \cot^2 \theta)(1 + \tan^2 \theta)$ $= 1 + \tan^2 \theta + \cot^2 \theta + \cot^2 \theta \tan^2 \theta$ $= 1 + \tan^2 \theta + \cot^2 \theta + 1$ $= 2 + \tan^2 \theta + \cot^2 \theta$ $\therefore \text{L.H.S/LK} = \text{R.H.S/RK}$ <p style="text-align: center;">OR/OF</p>	$\checkmark \sin^2 \theta + \cos^2 \theta \quad \mathbf{A}$ $\checkmark \mathbf{S} \quad \mathbf{A}$ $\checkmark \frac{1}{\cos^2 \theta} \quad \mathbf{A}$ $\checkmark \frac{1}{\sin^2 \theta} \quad \mathbf{A}$ <p style="text-align: center;">OR/OF</p> $\checkmark 1 + \cot^2 \theta \quad \mathbf{A}$ $\checkmark \frac{\cos^2 \theta}{\sin^2 \theta} \quad \mathbf{A}$ $\checkmark \frac{1}{\cos^2 \theta} \quad \mathbf{A}$ $\checkmark \frac{1}{\cos^2 \theta} + \frac{1}{\sin^2 \theta} \quad \mathbf{A}$ <p style="text-align: center;">OR/OF</p> $\checkmark 1 + \tan^2 \theta \quad \mathbf{A}$ $\checkmark 1 + \cot^2 \theta \quad \mathbf{A}$ $\checkmark \mathbf{S} \quad \mathbf{A}$ $\checkmark \mathbf{S} \quad \mathbf{A}$
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	$\begin{aligned} \text{L.H.S/LK} &= 1 + \tan^2 \theta + 1 + \cot^2 \theta \\ &= \tan^2 \theta + 2 + \cot^2 \theta \\ &= \frac{\sin^2 \theta}{\cos^2 \theta} + 2 + \frac{\cos^2 \theta}{\sin^2 \theta} \\ &= \frac{\sin^4 \theta + 2\sin^2 \theta \cdot \cos^2 \theta + \cos^4 \theta}{\sin^2 \theta \cdot \cos^2 \theta} \\ &= \frac{(\sin^2 \theta + \cos^2 \theta)(\sin^2 \theta + \cos^2 \theta)}{\sin^2 \theta \cdot \cos^2 \theta} \\ &= \frac{(1)(1)}{\sin^2 \theta \cdot \cos^2 \theta} \\ &= \operatorname{cosec}^2 \theta \cdot \sec^2 \theta = \text{RHS / RK} \end{aligned}$	<p style="text-align: center;">OR/OF</p> <div style="display: flex; justify-content: space-between;"> <div> $\checkmark 1 + \tan^2 \theta$ $\checkmark 1 + \cot^2 \theta$ $\checkmark S$ $\checkmark \text{ factors/faktore}$ </div> <div style="text-align: right;"> A A A A </div> </div> <p style="text-align: right;">(4)</p>
		[12]

QUESTION/VRAAG 5



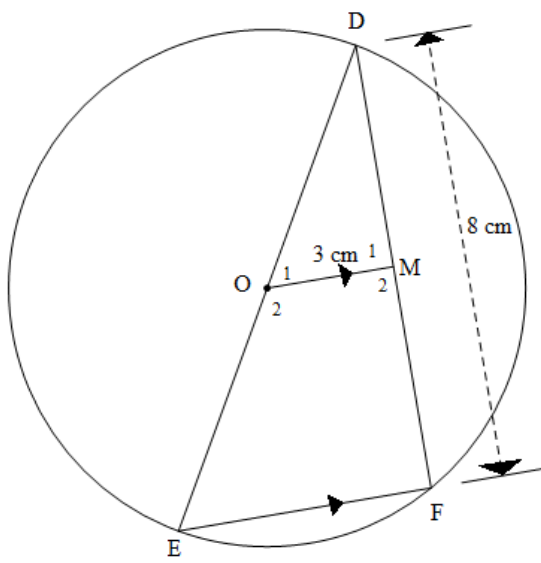
5.1	$a = -2$ $b = 1$ $c = 45^\circ$ $d = 90^\circ$ $e = -1$	✓ a value/waarde A ✓ b value/waarde A ✓ c value/waarde A ✓ d value/waarde A ✓ e value/waarde A (5)
5.2	2	✓ amplitude/amplitude A (1)
5.3	180°	✓ period/periode A (1)
5.4	Interval 1: $x \in (45^\circ; 90^\circ)$ OR / OF $45^\circ < x < 90^\circ$ OR / OF $x > 45^\circ$ and / en $x < 90^\circ$ OR / OF between / tussen 45° and / en 90° Interval 2: $x \in (135^\circ; 180^\circ]$ OR / OF $135^\circ < x \leq 180^\circ$ OR / OF $x > 135^\circ$ and / en $x \leq 180^\circ$ OR / OF between / tussen 135° and including / en ingesluit 180°	✓ critical values/kritieke waardes CA ✓ notation/notasie A ✓ critical values/kritieke waardes CA ✓ notation/notasie A (4)
		[11]

QUESTION/VRAAG 6

6.1	$\cos 38^\circ = \frac{21}{ND}$ $ND = \frac{21}{\cos 38^\circ}$ $\approx 26,65 \text{ m}$ <p style="text-align: center;">OR/OF</p> $DE = 21 \tan 38^\circ$ $ND = \sqrt{(21 \tan 38^\circ)^2 + (21)^2}$ $= \sqrt{710,1895}$ $\approx 26,65$ <p style="text-align: center;">OR/OF</p> $\hat{NDE} = 52^\circ \quad \text{Int. } \angle s \Delta$ $\sin 52^\circ = \frac{21}{DN}$ $DN = \frac{21}{\sin 52^\circ}$ $DN \approx 26,65 \text{ m}$ <p style="text-align: center;">OR/OF</p> $\frac{ND}{\sin 90^\circ} = \frac{21}{\sin 52^\circ}$ $ND \sin 52^\circ = 21 \sin 90^\circ$ $ND = \frac{21 \sin 90^\circ}{\sin 52^\circ}$ $\approx 26,65$	<p>✓ cos ratio/verhouding A</p> <p>✓ S CA</p> <p>✓ length of/lengte van ND CA</p> <p style="text-align: center;">OR/OF</p> <p>✓ length of/lengte van DE A</p> <p>✓ Substitution/ Vervanging CA</p> <p>✓ length of/lengte van ND CA</p> <p style="text-align: center;">OR/OF</p> <p>✓ size of/grootte van \hat{NDE} A</p> <p>✓ sin ratio/verhouding CA</p> <p>✓ length of/lengte van ND CA</p> <p style="text-align: center;">OR/OF</p> <p>✓ sin rule/sin reël A</p> <p>✓ S CA</p> <p>✓ length of/lengte van ND CA</p> <p style="text-align: right;">(3)</p>
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6.2	$\hat{CND} = 133^\circ$	✓ angle size/ <i>hoekgrootte</i> A (1)
6.3	$CD^2 = NC^2 + ND^2 - 2 \cdot NC \cdot ND \cos \hat{CND}$ $= (12)^2 + (26,65)^2 - 2(12)(26,65)\cos 133^\circ$ $= 1\,290,428651$ $\therefore CD \approx 35,92 \text{ m}$	✓ cos rule/ <i>reël</i> A ✓ substitution in cos rule/ <i>vervangings in cos-reël</i> CA ✓ S CA ✓ length of/ <i>lengte van</i> CD CA NPU (4)
6.4	Area of/ <i>van</i> $\triangle CND = \frac{1}{2} \times NC \times ND \times \sin \hat{CND}$ $= \frac{1}{2} \times 12 \times 26,65 \times \sin 133^\circ$ $\approx 116,94 \text{ m}^2$	✓ Area formula/ <i>formule</i> A ✓ substitution/ <i>vervangings</i> CA ✓ Area of $\triangle NDC$ CA NPU (3)
		[11]

QUESTION/VRAAG 7

			
7.1	\angle in semi-circle / <i>sirkel</i> OR / OF \angle subtended by diameter / <i>ondersp deur middellyn</i>	✓ RE	A (1)
7.2	$\hat{M}_1 = 90^\circ$ $\left(\begin{array}{l} \text{Corr } \angle s; OM \parallel EF / \\ \text{Ooreenk } \angle e; OM \parallel EF \end{array} \right)$ OR/OF $\hat{M}_2 = 90^\circ$ $\left(\begin{array}{l} \text{Co-int } \angle s; OM \parallel EF / \\ \text{Ko-binne } \angle e; OM \parallel EF \end{array} \right)$	✓ ST ✓ RE OR/OF ✓ ST ✓ RE	A A A A (2)
7.3	Line from centre \perp chord / <i>loodlyn vanuit midpt \perp op koord</i> OR/OF Line from midpt \parallel to 2nd side / <i>Lyn vanaf midpt \parallel aan 2de sy</i>	✓ RE ✓ RE	A A (1)

7.4	<p>EF = 6 units / <i>eenhede</i> (Midpt th / <i>Midpt st</i>)</p> <p>$\therefore DE^2 = DF^2 + EF^2$ (Pythagoras)</p> <p>$= (8)^2 + (6)^2$</p> <p>$= 100$</p> <p>$\therefore DE = 10$ units / <i>eenhede</i></p> <p style="text-align: center;">OR/OF</p> <p>DM = 4 units / <i>eenhede</i> ⎧ Line from centre \perp chord / <i>loodlyn uit midpt</i> <i>van sirkel na koord</i> ⎫</p> <p>$\therefore DO^2 = OM^2 + DM^2$ (Pythagoras)</p> <p>$= 3^2 + 4^2$</p> <p>$= 25$</p> <p>$\therefore DO = 5$ units / <i>eenhede</i></p> <p>$\therefore DE = 2 DO$ (diameter = $2 \times$ radius)</p> <p>$\therefore DE = 10$ units / <i>eenhede</i></p>	<p>✓ ST A</p> <p>✓ RE A</p> <p>✓ SF CA</p> <p>✓ DE length/<i>lengte</i> CA</p> <p style="text-align: center;">OR/OF</p> <p>✓ ST A</p> <p>✓ RE A</p> <p>✓ SF CA</p> <p>✓ length of/<i>lengte van</i> DE CA</p> <p style="text-align: right;">(4)</p>
		[8]

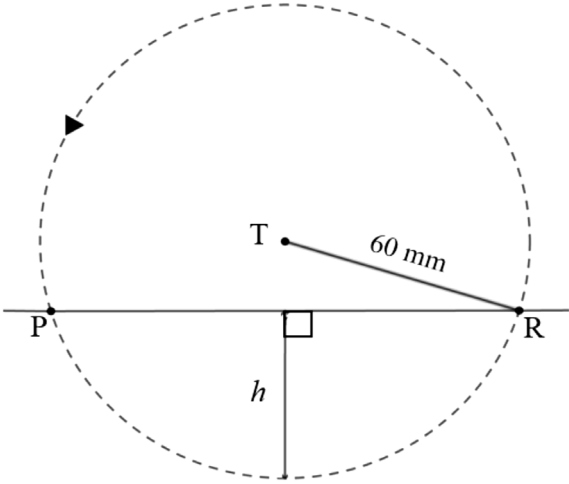
8.2			
8.2.1 a)	$\hat{P} = 33^\circ$ $\left(\begin{array}{l} \angle \text{s in the same segment /} \\ \angle \text{e in dies segment} \end{array} \right)$	✓ ST ✓ RE	A A (2)
8.2.1 b)	$\hat{O}_1 = 66^\circ$ $\left(\begin{array}{l} \angle \text{ at centre} = 2 \times \angle \text{ at circumf /} \\ \text{Midpts} \angle = 2 \times \text{Omtreks} \angle \end{array} \right)$ OR/OF $\hat{R}_2 = 33^\circ$ $\left(\begin{array}{l} \angle \text{s opp} = \text{sides /} \\ \angle \text{e teenoor} = \text{sye} \end{array} \right)$ $\hat{O}_1 = 66^\circ$ $\left(\begin{array}{l} \text{ext } \angle \text{ of } \Delta / \\ \text{buite } \angle \text{e van } \Delta \end{array} \right)$	✓ ST ✓ RE OR/OF ✓ ST ✓ ST	A A A (2)
8.2.1 c)	$\hat{R}_1 = 90^\circ$ (Tan/Raaklyn \perp Rad) $\therefore \hat{T} = 24^\circ$ $\left(\begin{array}{l} \text{Int } \angle \text{ of } \Delta / \\ \text{Binne } \angle \text{e } \Delta \end{array} \right)$	✓ ST ✓ RE ✓ ST	A A CA (3)
8.2.2	$\hat{R}_2 = 33^\circ$ $\left(\begin{array}{l} \angle \text{s opp} = \text{sides /} \\ \angle \text{e teenoor} = \text{sye} \end{array} \right)$ $\therefore PV \parallel SR$ $\left(\begin{array}{l} \text{alt } \angle \text{s} = / \\ \text{verw } \angle \text{e} = \end{array} \right)$ OR/OF	✓ ST ✓ RE ✓ RE OR/OF	A A A

	$\hat{R}_2 = 33^\circ \quad \left(\begin{array}{l} \text{ext } \angle \text{ of } \Delta / \\ \text{buite } \angle \text{ van } \Delta \end{array} \right)$	✓ ST ✓ RE	CA A
	$\therefore PV \parallel SR \quad \left(\begin{array}{l} \text{alt } \angle s = / \\ \text{verw } \angle e = \end{array} \right)$	✓ RE	A
	<p style="text-align: center;">OR/OF</p>	<p style="text-align: center;">OR/OF</p>	
	$\hat{V}_1 = 33^\circ \quad \left(\begin{array}{l} \angle s \text{ opp} = \text{sides } / \\ \angle e \text{ teenoor} = \text{sye} \end{array} \right)$	✓ ST ✓ RE	CA A
	$\therefore PV \parallel SR \quad \left(\begin{array}{l} \text{alt } \angle s = / \\ \text{verw } \angle e = \end{array} \right)$	✓ RE	A
	<p style="text-align: center;">OR/OF</p>		
	$\hat{R}_2 = \hat{P} \quad \left(\begin{array}{l} \text{proven above } / \\ \text{bewys bo} \end{array} \right)$	✓ ST ✓ RE	CA A
	$\therefore PV \parallel SR \quad \left(\begin{array}{l} \text{alt } \angle s = / \\ \text{verw } \angle e = \end{array} \right)$	✓ RE	A (3)
			[16]

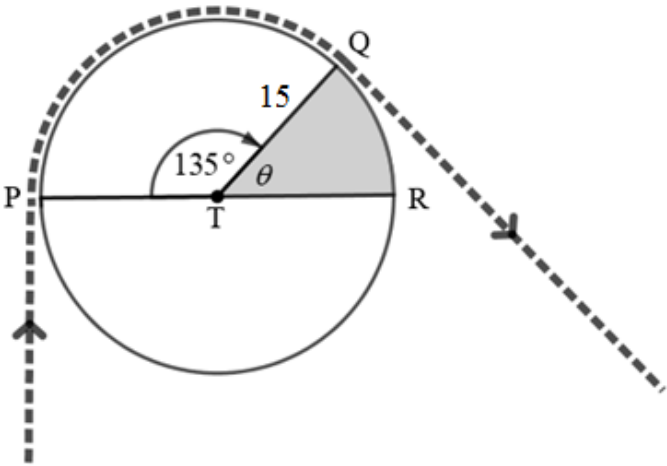
QUESTION/VRAAG 9

9.1	<p>In $\triangle ABC$ and $\triangle CBE$:</p> <p>$\hat{A} = \hat{C}_2$ $\left(\begin{array}{l} \text{tan - chord /} \\ \text{raaklyn-koord} \end{array} \right)$</p> <p>$\hat{B}$ is common / <i>gemeenskaplik</i></p> <p>$\therefore \triangle ABC \parallel \triangle CBE$ ($\angle\angle\angle$)</p>	<p>✓ ST</p> <p>✓ RE</p> <p>✓ ST</p> <p>✓ conclusion/gevolgtrekking OR/OF third pair of equal angles / /derde paar gelyke hoeke</p>	<p>A</p> <p>A</p> <p>A</p> <p>A (4)</p>
9.2	<p>$\frac{AB}{CB} = \frac{BC}{BE}$ ($\parallel \Delta s$)</p> <p>$\therefore BC^2 = AB \cdot BE$</p>	<p>✓ ST</p> <p>✓ RE</p>	<p>A</p> <p>A</p> <p>(2)</p>
9.3	<p>$\therefore BC^2 = 14 \times 4 = 56$</p> <p>$\therefore BC = \sqrt{56} \approx 7,48 \text{ cm}$</p>	<p>✓ subt/verv.</p> <p>✓ length of/lengte van BC</p>	<p>A</p> <p>CA (2)</p>
9.4.1	<p>$\frac{AD}{AC} = \frac{AE}{AB}$ $\left(\begin{array}{l} \text{prop th; DE} \parallel \text{CB/} \\ \text{ewerdig.st; DE} \parallel \text{CB} \end{array} \right) /$</p> <p>OR / OF $\left(\begin{array}{l} \text{line} \parallel \text{one} \\ \text{side of } \Delta / \\ \text{lyn} \parallel \text{aan een sy} \\ \text{van } \Delta \end{array} \right)$</p>	<p>✓ ST</p> <p>✓ RE</p> <p>✓ ST</p>	<p>A</p> <p>A</p> <p>CA (3)</p>

QUESTION/VRAAG 10

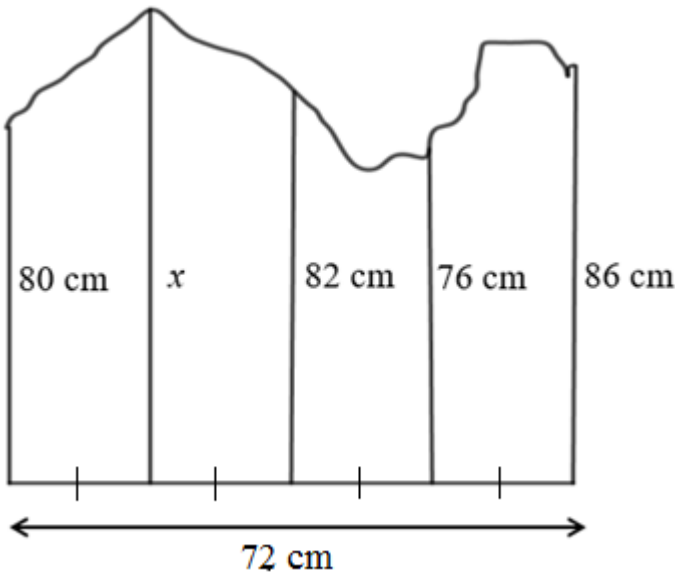
10.1			
10.1.1	0,06 m	✓ 0,06 m	A (1)
10.1.2	0,12 m	✓ 0,12 m	CA (1)
10.1.3	$\frac{1200 \div 100}{60}$ $= \frac{1}{5} = 0,2 \text{ m/s}$	✓ M ✓ $\frac{1}{5}$ or 0,2	A A (2)
10.1.4	$\omega = \frac{v}{r}$ $= \frac{0,2}{0,06}$ $= \frac{10}{3} \approx 3,33 \text{ rad/s}$ <p style="text-align: center;">OR/OF</p> $v = \pi D n$ $0,2 = \pi \times (0,12) \times n$ $n = \frac{5}{3\pi} \text{ OR/OF } \approx 0,53 \text{ rev/s}$ $\omega = 2\pi n$ $= 2\pi \times \left(\frac{5}{3\pi}\right)$ $= \frac{10}{3} \text{ OR/OF } \approx 3,33 \text{ rad/s}$	✓ F ✓ SF ✓ angular velocity/ <i>hoeksnelheid</i> <p style="text-align: center;">OR/OF</p> ✓ SF ✓ F ✓ angular velocity/ <i>hoeksnelheid</i>	A CA CA CA A CA (3)

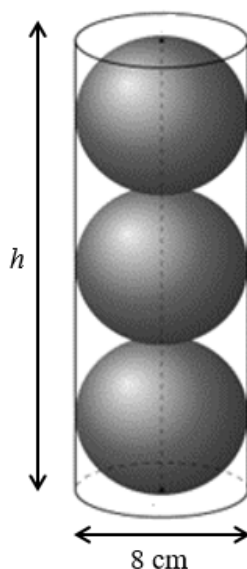
10.1.5	$4h^2 - 4dh + x^2 = 0$ $4h^2 - 4(120)h + (115)^2 = 0$ $4h^2 - 480h + 13\,225 = 0$ $h = \frac{-(-480) \pm \sqrt{(-480)^2 - 4(4)(13\,225)}}{2(4)}$ $h = 42,86 \text{ mm or/of } h \neq 77,14 \text{ mm}$ $\therefore h = 42,86 \text{ mm}$	✓ F A ✓ SF CA ✓ SF CA ✓ value of / waarde van h CA
	<p style="text-align: center;">OR/OF</p> <p>Let the length from T to the chord be x/ <i>Laat die lengte vanaf T na die koord x wees</i></p> $x = \sqrt{(60)^2 - (57,5)^2}$ $x = 17,1391365$ $h = 60 - 17,1391365$ $h \approx 42,86 \text{ mm}$	<p style="text-align: center;">OR/OF</p> ✓ Pyth. Theorem/stelling A ✓ value of/waarde van x CA ✓ M A ✓ value of / waarde van h CA
	<p style="text-align: center;">OR/OF</p> $4h^2 - 4dh + x^2 = 0$ $4h^2 - 4(0,12)h + (0,115)^2 = 0$ $4h^2 - 0,48 + 0,013225 = 0$ $h = \frac{-(-0,48) \pm \sqrt{(-0,48)^2 - 4(4)(0,013225)}}{2(4)}$ $h \neq 0,077 \text{ m or } h = 0,04286 \text{ m}$ $h = 42,86 \text{ mm}$	<p style="text-align: center;">OR/OF</p> ✓ F A ✓ SF CA ✓ SF CA ✓ value of / waarde van h CA (4)

10.2			
10.2.1	$135^\circ = 135^\circ \times \frac{\pi}{180^\circ} = \frac{3\pi}{4}$ OR/OF = 2,36 rad	✓ angle/hoek in rad	A (1)
10.2.2	Arc length / booglengte PQ: $s = r \times \theta$ $s = (15) \times \left(\frac{3\pi}{4} \right)$ $= \frac{45\pi}{4}$ cm OR/OF $\approx 35,34$ cm	✓ F ✓ SF ✓ arc length/booglengte NPR	A CA CA (3)
10.2.3	45° OR/OF $\frac{\pi}{4}$ OR/OF 0,79 rad	✓ angle/hoek	A (1)

10.2.4	<p>Area of sector/ $= \frac{r^2 \theta}{2}$ <i>Area van sektor</i></p> $= \frac{(15)^2 \times \left(45^\circ \times \frac{\pi}{180^\circ}\right)}{2}$ $= \frac{225\pi}{8} \text{ cm}^2 \text{ OR/OF } \approx 88,36 \text{ cm}^2$ <p style="text-align: center;">OR/OF</p> <p>Area of sector/ $= \frac{r s}{2}$ <i>Area van sektor</i></p> $= \frac{(15) \times \left(15 \times 45^\circ \times \frac{\pi}{180^\circ}\right)}{2}$ $= \frac{225\pi}{8} \text{ cm}^2 \text{ OR/OF } \approx 88,36 \text{ cm}^2$	<p>✓ F A</p> <p>✓ SF CA</p> <p>✓ area CA</p> <p style="text-align: center;">OR/OF</p> <p>✓ F A</p> <p>✓ SF CA</p> <p>✓ area CA NPU</p> <p style="text-align: right;">(3)</p>
10.2.5	<p>1 circumference of pulley/<i>1 omtrek van katrol</i> $C = 2\pi r$ OR / OF $C = \pi D$ $= 2\pi(15)$ $= \pi(30)$ $= 30\pi \approx 94,25 \text{ cm}$</p> <p>$\therefore 24 \text{ rotations/rotasies} = 24 \times 30\pi$ $= 720\pi \approx 2261,95 \text{ cm}$</p> <p>Length of rope required/<i>lengte van tou benodig</i> $= (720\pi \div 100) \text{ m} + 3 \text{ m}$ $\approx 25,62 \text{ m}$</p>	<p>✓ F A</p> <p>✓ SF A</p> <p>✓ circumference/<i>omtrek</i> CA</p> <p>✓ M A</p> <p>✓ conversion to/<i>herlei na m</i> A</p> <p>✓ length/<i>lengte</i> CA</p> <p style="text-align: right;">(6)</p>
		[25]

QUESTION/VRAAG 11

11.1			
11.1.1	18 cm	✓ 18	A (1)
11.1.2	$A_T = a \left(\frac{o_1 + o_n}{2} + o_2 + o_3 + \dots + o_{n-1} \right)$ $5940 = (18) \left(\frac{80 + 86}{2} + x + 82 + 76 \right)$ $330 = x + 241$ $x = 89 \text{ cm}$ <p style="text-align: center;">OR/OF</p> $A_T = a (m_1 + m_2 + m_3 + \dots + m_n)$ $5940 = (18) \left(\frac{80 + x}{2} + \frac{x + 82}{2} + \frac{82 + 76}{2} + \frac{76 + 86}{2} \right)$ $330 = x + 241$ $x = 89 \text{ cm}$		
		✓ F	A
		✓ SF	CA
		✓ S	CA
		✓ value of/waarde van x	CA
		OR/OF	
		✓ F	A
		✓ SF	CA
		✓ S	CA
		✓ value of/waarde van x	CA (4)



11.2.1	24 cm	✓ 24	A (1)
11.2.2	<p>Vol. of a sphere/<i>van sfeer</i>:</p> $V = \frac{4}{3} \pi (4)^3$ $= \frac{256}{3} \pi \approx 268,08 \text{ cm}^3$ <p>Vol. of cylinder/<i>van silinder</i>:</p> $V = \pi (4)^2 (24)$ $= 384 \pi \approx 1206,37 \text{ cm}^3$ <p>Vol. carved off = $384 \pi - \left(3 \times \frac{256}{3} \pi \right)$</p> <p><i>Vol afgekerf</i> = $128 \pi \text{ cm}^3$ OR/OF $\approx 402,12 \text{ cm}^3$</p> <p>Mass of wood carved off/<i>Massa van hout afgekerf</i></p> $= \frac{128 \pi}{384 \pi} \times 1,5$ $= 0,5 \text{ kg}$	<p>✓ SF</p> <p>✓ Vol. of sphere/<i>van sfeer</i></p> <p>✓ SF</p> <p>✓ Vol. of cylinder/<i>van silinder</i></p> <p>✓ Vol. carved off/<i>afgekerf</i></p> <p>✓ M</p> <p>✓ Mass carved off/<i>massa afgekerf</i></p>	<p>A</p> <p>CA</p> <p>CA</p> <p>CA</p> <p>CA</p> <p>A</p> <p>CA</p> <p>(7)</p>
			[13]

TOTAL/TOTAAL: 150