



basic education

Department:
Basic Education
REPUBLIC OF SOUTH AFRICA

NATIONAL SENIOR CERTIFICATE/ NASIONALE SENIOR SERTIFIKAAT

GRADE 12/GRAAD 12

TECHNICAL MATHEMATICS P2/TEGNIESE WISKUNDE V2

NOVEMBER 2021

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
SF	Substitution in correct formula/Vervanging in korrekte formule
ST / RE	Statement with reason/Bewering met rede

These marking guidelines consists of 25 pages.
Hierdie nasienriglyne bestaan uit 25 bladsye.

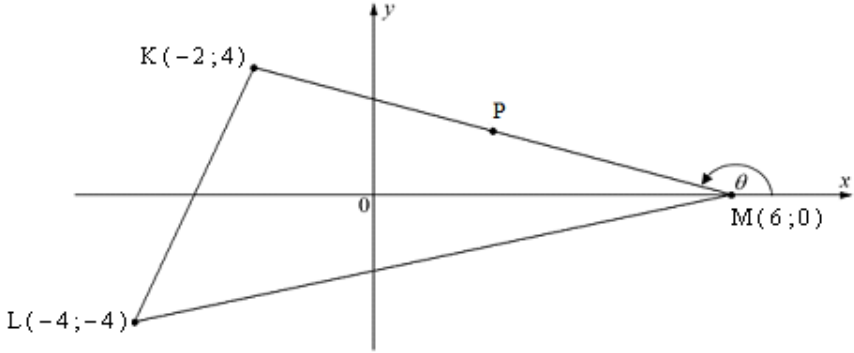
NOTE:

- If a candidate answers a question **TWICE**, only mark the **FIRST** attempt.
- The method of consistent accuracy marking must be applied to all aspects of the marking guideline where applicable as indicated with the marking code **CA**.
- If a candidate strikes off a response to a question and does not attempt the question again, then the struck-off question/response should be marked.
- # Shows questions where Tolerance Range will be applied:
Q4.2 ; Q 4.3 ; Q5.1 and Q7.2.2 (c)

LET WEL:

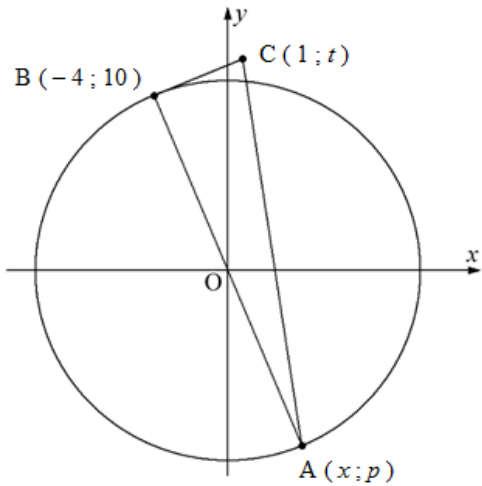
- Indien 'n kandidaat 'n vraag **TWEE** keer beantwoord, sien slegs die **EERSTE** poging na.
- Die metode van volgehoue akkuraatheid-nasien moet waar moontlik op alle aspekte van die nasienriglyne toegepas word soos aangedui deur die nasienkode **CA**.
- Indien 'n kandidaat 'n antwoord deurhaal en nie poog om die vraag weer te beantwoord dan moet die deurgehaalde antwoord gemerk word.
- # Toon vrae waar Toleransie Wydte (Verdraagsaamheids omvang) toegepas word:
V4.2 ; V 4.3 ; V 5.1 en V 7.2.2 (c)

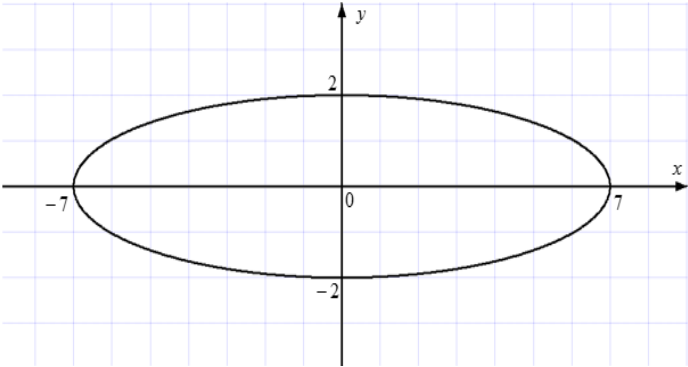
QUESTION/VRAAG 1

		
<p>1.1</p>	$m_{KM} = \frac{y_K - y_M}{x_K - x_M} = \frac{4 - 0}{-2 - 6}$ $= -\frac{1}{2} \text{ or/of } -0,5$ <p style="text-align: center;">OR/OF</p> $m_{KM} = \frac{y_M - y_K}{x_M - x_K} = \frac{0 - 4}{6 - (-2)}$ $= -\frac{1}{2} \text{ or/of } -0,5$	<p>✓ SF A</p> <p>✓ gradient/gradient CA</p> <p style="text-align: center;">OR/OF</p> <p>✓ SF A</p> <p>✓ gradient/gradient CA</p> <p style="border: 1px solid black; padding: 2px; display: inline-block;">AO Full marks/ Volpunte</p> <p style="text-align: right;">(2)</p>

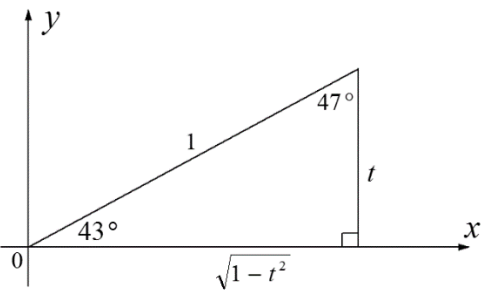
<p>1.2</p>	$\tan \theta = -\frac{1}{2} \quad \text{ref./verw. } \angle \approx 26,57^\circ$ $\theta \approx 180^\circ - 26,57^\circ \approx 153^\circ$	<p>✓ ref./verw. \angle CA ✓ value of /waarde van θ CA AO Full marks/ Volpunte (2)</p>
<p>1.3</p>	$P\left(\frac{x_K + x_M}{2}; \frac{y_K + y_M}{2}\right) \quad P\left(\frac{-2 + 6}{2}; \frac{4 + 0}{2}\right)$ $P(2; 2)$	<p>✓ x-value/ waarde A ✓ y-value/ waarde A (2)</p>
<p>1.4</p>	$LM = \sqrt{(x_M - x_L)^2 + (y_M - y_L)^2}$ $= \sqrt{(6 - (-4))^2 + (0 - (-4))^2} = \sqrt{116}$ $= 2\sqrt{29}$ <p style="text-align: center;">OR/OF</p> $LM = \sqrt{(x_L - x_M)^2 + (y_L - y_M)^2}$ $= \sqrt{(-4 - 6)^2 + (-4 - 0)^2} = \sqrt{116}$ $= 2\sqrt{29}$	<p>✓ SF A ✓ LM in simplified surd form/ in vereenvoudigde wortelvorm CA OR/OF ✓ SF A ✓ LM in simplified surd form/ In vereenvoudigde wortelvorm CA AO Full marks/ Volpunte (2)</p>
<p>1.5</p>	$m_{KL} = \frac{-4 - 4}{-4 - (-2)} \quad \text{or/of} \quad \frac{4 - (-4)}{-2 - (-4)} = 4$ $\therefore m_{\parallel} = 4$ <p>Using / gebruik $P(2; 2)$</p> $y = 4x + c$ $2 = 4(2) + c$ $\therefore c = -6$ <p style="text-align: center;">OR/OF</p> <p>Using midp. of / gebruik midp van LM : (1 ; -2)</p> $y = 4x + c$ $-2 = 4(1) + c$ $\therefore c = -6$ $\therefore y = 4x - 6$	<p>✓ gradient/ gradiënt A ✓ SF CA ✓ equation/ vergelyking CA (3)</p>
		<p>[11]</p>

QUESTION/VRAAG 2

		
<p>2.1.1</p>	$x^2 + y^2 = (-4)^2 + (10)^2 = 116$ $\therefore x^2 + y^2 = 116$ <p style="text-align: center;">OR/OF</p> $d = \sqrt{(-4 - 0)^2 + (10 - 0)^2}$ $d = \sqrt{116} \quad \text{or/of} \quad 4\sqrt{29}$ $\therefore y = \pm \sqrt{116 - x^2} \quad \text{or/of} \quad x = \pm \sqrt{116 - y^2}$	<p>✓SF A</p> <p>✓equation/ vergelyking CA</p> <p style="text-align: center;">OR/OF</p> <p>✓SF A</p> <p>✓equation/ vergelyking CA (2)</p>
<p>2.1.2</p>	<p>A(4; -10)</p>	<p>✓ x-value/waarde A</p> <p>✓ y-value/waarde A (2)</p>
<p>2.1.3</p>	$m_{OB} = \frac{10 - 0}{-4 - 0} \quad \text{or/of} \quad \frac{0 - 10}{0 - (-4)} = -\frac{5}{2}$ <p style="text-align: center;">OR/OF</p> $m_{OA} = \frac{-10 - 0}{4 - 0} \quad \text{or/of} \quad \frac{0 - (-10)}{0 - (4)} = -\frac{5}{2}$ <p style="text-align: center;">OR/OF</p> $m_{AB} = \frac{-10 - (-10)}{4 - (-4)} \quad \text{or/of} \quad \frac{10 - (-10)}{-4 - (4)} = -\frac{5}{2}$ $m_{OB} \times m_{BC} = -1 \quad \therefore -\frac{5}{2} \times m_{BC} = -1$ $\therefore m_{BC} = \frac{2}{5}$	<p>✓ SF CA</p> <p style="text-align: center;">Option/ opsie 2 & 3</p> <p>✓ M CA (2)</p>

<p>2.1.4</p>	$y = \frac{2}{5}x + c \quad B(-4; 10)$ $\therefore y - 10 = \frac{2}{5}(x + 4) \quad \text{or/of} \quad 10 = \frac{2}{5}(-4) + c$ $\therefore y - 10 = \frac{2}{5}x + \frac{8}{5} \quad \text{or/of} \quad 10 = -\frac{8}{5} + c$ $c = \frac{58}{5}$ $\therefore y = \frac{2}{5}x + \frac{58}{5} \quad \text{or/of} \quad y = \frac{2}{5}x + 11\frac{3}{5} \quad \text{or/of} \quad y = 0,4x + 11,6$ <p style="text-align: center;">OR/OF</p> $x \cdot x_1 + y \cdot y_1 = r^2$ $-4x + 10y = 116$ $10y = 4x + 116$ $\therefore y = \frac{2}{5}x + \frac{58}{5} \quad \text{or/of} \quad y = \frac{2}{5}x + 11\frac{3}{5} \quad \text{or/of} \quad y = 0,4x + 11,6$	<p>✓SF (-4; 10) A</p> <p>✓equation/vergelyking CA</p> <p style="text-align: center;">OR/OF</p> <p>✓SF (-4; 10) A</p> <p>✓equation/vergelyking CA (2)</p>
<p>2.1.5</p>	$\therefore y = \frac{2}{5}x + \frac{58}{5} \quad \text{or/of} \quad y = \frac{2}{5}x + 11\frac{3}{5} \quad \text{or/of} \quad y = 0,4x + 11,6$ <p>C(1;t)</p> $\therefore t = \frac{2}{5}(1) + \frac{58}{5} \quad \text{or/of} \quad t = \frac{2}{5}(1) + 11\frac{3}{5} \quad \text{or/of} \quad t = 0,4(1) + 11,6$ $\therefore t = 12$ <p style="text-align: center;">OR/OF</p> $\frac{2}{5} = \frac{t - 10}{1 - (-4)}$ $10 = 5t - 50 \quad \text{or/of} \quad 2 = t - 10$ $\therefore t = 12$	<p>✓subst./vervang. CA</p> <p>✓value of / waarde van t CA</p> <p style="text-align: center;">OR/OF</p> <p>✓subst./vervang. CA</p> <p>✓value of / waarde van t CA</p> <p>AO Full marks/ Volpunte (2)</p>
<p>2.2</p>	$\frac{x^2}{7^2} + \frac{y^2}{2^2} = 1$ 	<p>✓both x-intercepts/ beide x-afsnitte A</p> <p>✓both y-intercepts/ beide y-afsnitte A</p> <p>✓elliptical shape/ <i>elliptiese</i> <i>vorm</i> CA (3)</p>
<p>[13]</p>		

QUESTION/VRAAG 3

<p>3.1.1</p>	<p>$\cos R - \cos 2K$ $= \cos 15,8^\circ - \cos(2 \times 74,1^\circ)$ $\approx 1,81$</p>	<p>✓ subst./ vervang. A ✓ value/ waarde CA AO Full marks/ Volpunte (2)</p>
<p>3.1.2</p>	<p>$3 \operatorname{cosec}\left(\frac{R}{4} + 84^\circ\right) = 3 \operatorname{cosec}\left(\frac{15,8^\circ}{4} + 84^\circ\right)$ $= \frac{3}{\sin\left(\frac{15,8^\circ}{4} + 84^\circ\right)}$ $\approx 3,00$ OR/OF $3 \operatorname{cosec}\left(\frac{R}{4} + 84^\circ\right) = 3 \operatorname{cosec}\left(\frac{15,8^\circ}{4} + 84^\circ\right)$ $= 3 \operatorname{cosec} 87,85^\circ$ $= 3 \times \frac{1}{\sin 87,85^\circ}$ $\approx 3,00$</p>	<p>✓ subst./ vervang. A ✓ I A ✓ value/ waarde CA OR/OF ✓ substitution/ vervanging A ✓ I A ✓ value/ waarde CA AO Full marks/ Volpunte (3)</p>
<p>3.2.1</p>	 <p>$x^2 + t^2 = 1^2$ $\therefore x = \sqrt{1 - t^2}$ $\cos 43^\circ = \frac{\sqrt{1 - t^2}}{1} = \sqrt{1 - t^2}$ OR/OF $\cos 43^\circ = \sqrt{1 - \sin^2 43^\circ}$ $= \sqrt{1 - t^2}$</p>	<p>✓ Pythagoras or/of diagram A ✓ value of/ waarde van x A ✓ value of/ waarde van $\cos 43^\circ$ CA OR/OF ✓ I A ✓ ✓ value of/ waarde van $\cos 43^\circ$ CA (3)</p>
<p>3.2.2</p>	<p>$\sec 47^\circ = \frac{1}{t}$</p>	<p>✓ value of/ waarde van $\sec 47^\circ$ CA From/vanaf diagram Q/V 3.2.1 (1)</p>

<p>3.2.3</p>	$\tan 317^\circ$ $\tan 317^\circ = \tan(360^\circ - 43^\circ)$ $= -\tan 43^\circ$ $= -\frac{t}{\sqrt{1-t^2}}$ <p style="text-align: center;">OR/OF</p> $\tan 317^\circ$ $\tan 317^\circ = \tan(360^\circ - 43^\circ)$ $= -\tan 43^\circ$ $= -\frac{\sin 43^\circ}{\cos 43^\circ}$ $= -\frac{t}{\sqrt{1-t^2}}$	\checkmark reduction/ <i>reduksie</i> A \checkmark numerator/ <i>teller</i> CA \checkmark denominator/ <i>noemer</i> CA From/ <i>vanaf</i> diagram Q/V 3.2.1 <p style="text-align: center;">OR/OF</p> \checkmark reduction/ <i>reduksie</i> A \checkmark numerator/ <i>teller</i> CA \checkmark denominator/ <i>noemer</i> CA From/ <i>vanaf</i> diagram Q/V 3.2.1 (3)
<p>3.3</p>	$7 \cos x - \tan 56^\circ = 0 \text{ for / vir } x \in [180^\circ; 360^\circ]$ $7 \cos x = \tan 56^\circ$ $\cos x = \frac{\tan 56^\circ}{7}$ $\therefore \text{ref./verw. } \angle \approx 77,77^\circ$ $x \approx 360^\circ - 77,77^\circ$ $= 282,23^\circ$	\checkmark S A \checkmark ref. / <i>verw.</i> \angle CA \checkmark IV quadrant/ <i>kwadrant</i> A \checkmark size of/ <i>grootte van</i> x CA (4)
		[16]

QUESTION/VRAAG 4

4.1	-1	✓ -1 A (1)
4.2 #	$\cos(360^\circ + x) \cdot \tan^2(180^\circ + x) + \cos(180^\circ - x) \cdot \sec^2(360^\circ - x)$ $= \cos x \cdot \tan^2 x + (-\cos x) \cdot \sec^2 x$ $= \cos x \cdot \tan^2 x - \cos x \cdot \sec^2 x$ $= \cos x (\tan^2 x - \sec^2 x)$ $= \cos x (-1)$ $= -\cos x$ <p style="text-align: center;">OR/OF</p> $\cos(360^\circ + x) \cdot \tan^2(180^\circ + x) + \cos(180^\circ - x) \cdot \sec^2(360^\circ - x)$ $= \cos x \cdot \tan^2 x + (-\cos x) \cdot \sec^2 x$ $= \cos x \cdot \tan^2 x - \cos x (1 + \tan^2 x)$ $= \cos x \cdot \tan^2 x - \cos x - \cos x \cdot \tan^2 x$ $= -\cos x$ <p style="text-align: center;">OR/OF</p> $\cos(360^\circ + x) \cdot \tan^2(180^\circ + x) + \cos(180^\circ - x) \cdot \sec^2(360^\circ - x)$ $= \cos x \cdot \tan^2 x + (-\cos x) \cdot \sec^2 x$ $= \cos x \left(\frac{\sin^2 x}{\cos^2 x} \right) - \cos x \left(\frac{1}{\cos^2 x} \right)$ $= \frac{\sin^2 x}{\cos x} - \frac{1}{\cos x}$ $= \frac{\sin^2 x - 1}{\cos x}$ $= \frac{-\cos^2 x}{\cos x}$ $= -\cos x$	$\checkmark \cos x$ A $\checkmark \tan^2 x$ A $\checkmark -\cos x$ A $\checkmark \sec^2 x$ A $\checkmark \text{common factor/ gemene faktor}$ A $\checkmark \mathbf{I} (-1)$ A $\checkmark -\cos x$ CA <p style="text-align: center;">OR/OF</p> $\checkmark \cos x$ A $\checkmark \tan^2 x$ A $\checkmark -\cos x$ A $\checkmark \sec^2 x$ A $\checkmark \mathbf{I} (1 + \tan^2 x)$ A $\checkmark \mathbf{S}$ A $\checkmark -\cos x$ CA <p style="text-align: center;">OR/OF</p> $\checkmark \cos x$ A $\checkmark \tan^2 x$ A $\checkmark -\cos x$ A $\checkmark \sec^2 x$ A $\checkmark \mathbf{S}$ A $\checkmark \mathbf{I} (-\cos^2 x)$ A $\checkmark -\cos x$ CA (7)

<p>4.3 #</p>	<p>LHS/LK = $\cot(\pi + \theta) - \sec^2 \theta \cdot \cot \theta$ $= \cot \theta - (1 + \tan^2 \theta) \cdot \cot \theta$ $= \cot \theta - \cot \theta - \tan^2 \cdot \cot \theta$ $= -\tan^2 \theta \cdot \frac{1}{\tan \theta}$ $= -\tan \theta = RHS / RK$</p> <p style="text-align: center;">OR/OF</p> <p>LHS/LK = $\cot(\pi + \theta) - \sec^2 \theta \cdot \cot \theta$ $= \cot \theta - \sec^2 \theta \cdot \cot \theta$ $= \cot \theta (1 - \sec^2 \theta)$ $= \cot \theta (-\tan^2 \theta)$ $= \frac{1}{\tan \theta} \times -\tan^2 \theta$ or / of $\frac{\cos \theta}{\sin \theta} \times -\frac{\sin^2 \theta}{\cos^2 \theta}$ $= -\tan \theta$ $= -\frac{\sin \theta}{\cos \theta}$ $= RHS / RK$ $= -\tan \theta = RHS / RK$</p> <p style="text-align: center;">OR/OF</p> <p>LHS/LK = $\cot(\pi + \theta) - \sec^2 \theta \cdot \cot \theta$ $= \cot \theta - \sec^2 \theta \cdot \cot \theta$ $= \frac{\cos \theta}{\sin \theta} - \frac{1}{\cos^2 \theta} \times \frac{\cos \theta}{\sin \theta}$ $= \frac{\cos \theta}{\sin \theta} - \frac{1}{\cos \theta \sin \theta}$ $= \frac{\cos^2 \theta - 1}{\sin \theta \cos \theta}$ $= \frac{-\sin^2 \theta}{\sin \theta \cos \theta}$ $= -\frac{\sin \theta}{\cos \theta}$ $= -\tan \theta$ $= RHS / RK$</p> <p style="text-align: center;">OR/OF</p>	<p>✓ $\cot \theta$ A ✓ I $1 + \tan^2 \theta$ A ✓ S A ✓ I $\frac{1}{\tan \theta}$ A</p> <p style="text-align: center;">OR/OF</p> <p>✓ $\cot \theta$ A ✓ common factor/gemene faktor A ✓ I $-\tan^2 \theta$ A ✓ I $\frac{1}{\tan \theta}$ or / of A $\frac{\cos \theta}{\sin \theta} \times -\frac{\sin^2 \theta}{\cos^2 \theta}$ A</p> <p style="text-align: center;">OR/OF</p> <p>✓ $\cot \theta$ A ✓ I $\frac{\cos \theta}{\sin \theta}$ and/en $\frac{1}{\cos^2 \theta}$ A ✓ S $\frac{\cos^2 \theta - 1}{\sin \theta \cos \theta}$ A ✓ I $-\sin^2 \theta$ A</p> <p style="text-align: center;">OR/OF</p>
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5.2	$y \in [0; 2]$ OR/OF $0 \leq y \leq 2$ OR/OF $y \geq 0$ and/en $y \leq 2$	✓ end points/ <i>eindpunte</i> ✓ correct notation/ <i>korrekte notasie</i>	CA A (2)
5.3	360°	✓ 360°	CA (1)
5.4.1	$x = 270^\circ$ or/of $x = 360^\circ$	✓ 270° ✓ 360°	CA CA (2)
5.4.2	$x \in (90^\circ; 270^\circ)$ OR/OF $90^\circ < x < 270^\circ$ OR/OF $x > 90^\circ$ and/en $x < 270^\circ$	✓ end points/ <i>eindpunte</i> ✓ correct notation/ <i>korrekte notasie</i>	CA A (2)
			[14]

QUESTION/VRAAG 6

<p>6.1.1</p>	$\tan 22^\circ = \frac{LN}{9}$ $LN = 9 \tan 22^\circ \approx 3,6 \text{ m}$ <p style="text-align: center;">OR/OF</p> $\frac{LN}{\sin 22^\circ} = \frac{9}{\sin 68^\circ}$ $LN = \frac{9}{\sin 68^\circ} \times \sin 22^\circ \approx 3,6 \text{ m}$	<p>✓ tan ratio/verh. A</p> <p>✓ value of/ waarde van LN A</p> <p style="text-align: center;">OR/OF</p> <p>✓ sin rule/sin reël A</p> <p>✓ value/ waarde van LN A</p> <p style="text-align: right;">(2)</p>
<p>6.1.2</p>	$\tan 54^\circ = \frac{9}{KL}$ $KL = \frac{9}{\tan 54^\circ} = 6,5 \text{ m}$ $KN = KL - LN \approx 6,5 - 3,6$ $\approx 2,9 \text{ m}$ <p style="text-align: center;">OR/OF</p> $\frac{KL}{\sin 36^\circ} = \frac{9}{\sin 54^\circ}$ $KL = \frac{9 \times \sin 36^\circ}{\sin 54^\circ} = 6,5 \text{ m}$ $KN = KL - LN \approx 6,5 - 3,6$ $\approx 2,9 \text{ m}$ <p style="text-align: center;">OR/OF</p> $\hat{LMK} = 36^\circ$ $\tan 36^\circ = \frac{KL}{9}$ $KL = 9 \cdot \tan 36^\circ = 6,5 \text{ m}$ $KN = KL - LN \approx 6,5 - 3,6$ $\approx 2,9 \text{ m}$ <p style="text-align: center;">OR/OF</p>	<p>✓ length of/lengte van KL A</p> <p>✓ M A</p> <p>✓ length of/lengte van KN CA</p> <p style="text-align: center;">OR/OF</p> <p>✓ length of/lengte van KL A</p> <p>✓ M A</p> <p>✓ length of/lengte van KN CA</p> <p style="text-align: center;">OR/OF</p> <p>✓ length of/lengte van KL A</p> <p>✓ M CA</p> <p>✓ length of/lengte van KN CA</p> <p style="text-align: center;">OR/OF</p>

	$\hat{KMN} = 180^\circ - (90^\circ + 54^\circ + 22^\circ) = 14^\circ$ $\frac{\sin 14^\circ}{KN} = \frac{\sin 54^\circ}{9,69}$ $KN = \frac{9,69 \times \sin 14^\circ}{\sin 54^\circ}$ $\approx 2,9\text{m}$ <p style="text-align: center;">OR/OF</p> $\frac{MN}{\sin 90^\circ} = \frac{9}{\sin 68^\circ}$ $MN = \frac{9 \sin 90^\circ}{\sin 68^\circ} \approx 9,71$ $KN = MN - LN \approx 6,5 - 3,6$ $\approx 2,9\text{m}$	<p>✓ size of / grootte van \hat{KMN} A ✓ M A</p> <p>✓ length of/lengte van KN CA</p> <p style="text-align: center;">OR/OF</p> <p>✓ length of/lengte van MN A</p> <p>✓ M A ✓ length of/lengte van KN CA (3)</p>
<p>6.2</p>	$RT = RQ = 67,3 \text{ m}$ $QT^2 = RT^2 + RQ^2 - 2RT \cdot RQ \cos R$ $= (67,3)^2 + (67,3)^2 - 2(67,3)(67,3) \cos 36^\circ$ $QT = \sqrt{(67,3)^2 + (67,3)^2 - 2(67,3)(67,3) \cos 36^\circ}$ $\approx 41,59 \text{ m}$ <p style="text-align: center;">OR/OF</p> $RT = RQ = 67,3 \text{ m}$ $\therefore \hat{RQT} = \hat{RTQ} = 72^\circ \quad \angle \text{ opp.} = \text{sides} / \angle \text{ teenoor.} = \text{sye}$ $\frac{QT}{\sin R} = \frac{RT}{\sin Q}$ $\frac{QT}{\sin 36^\circ} = \frac{67,3}{\sin 72^\circ}$ $QT \approx \frac{67,3 \times \sin 36^\circ}{\sin 72^\circ}$ $\approx 41,59 \text{ m}$	<p>✓ deduce/aflei $RT = RQ$ A ✓ formula/formule A</p> <p>✓ SF CA</p> <p>✓ length of/lengte van QT CA</p> <p style="text-align: center;">OR/OF</p> <p>✓ deduce/aflei $RT = RQ$ A</p> <p>✓ formula/formule A</p> <p>✓ SF CA</p> <p>✓ length of/lengte van QT CA (4)</p>
[9]		

QUESTION/VRAAG 7

7.1	Are equal in length/is gelyk in lengte	✓ Are equal in length/is gelyk in lengte A (1)
7.2		
7.2.1	Radius/diameter is perpendicular to tangent at point of contact. <i>Radius/middellyn is loodreg aan die raaklyn by die kontakpunt</i>	✓ RE A (1)
7.2.2(a)	$52^\circ + \hat{V}_1 + \hat{M}_1 = 180^\circ$ (sum of \angle s of a Δ /som \angle e van Δ) But/Maar $\hat{V}_1 = \hat{M}_1$ (\angle opp. = sides/ \angle teenoor. = sye) $\therefore \hat{V}_1 = \frac{180^\circ - 52^\circ}{2} = 64^\circ$	✓ RE A ✓ 64° A (2)
7.2.2(b)	$\hat{S}_2 = \hat{V}_1 = 64^\circ$ (tan-chord theorem/ <i>rklyn-koord st</i>) OR $\hat{M}_2 = \hat{V}_2$ (radii/ <i>radiusse</i>) $\hat{V}_2 + \hat{V}_3 = 90^\circ$ (\angle in a semi circle/ 'n <i>halfsirkel</i>) $\hat{S}_2 = 180^\circ - 90^\circ - 26^\circ = 64^\circ$ (sum of \angle s of/som <i>binne</i> \angle e Δ)	✓ ST CA ✓ RE A OR ✓ ST CA ✓ RE A (2)
7.2.2(c)	$64^\circ + \hat{V}_3 + \hat{O}_1 = 180^\circ$ (sum of \angle s of a Δ /som \angle e van Δ) But /Maar $\hat{V}_3 = \hat{S}_2 = 64^\circ$ (\angle s opp. = sides/ \angle teenoor. = sye) $\therefore \hat{O}_1 = 180^\circ - 64^\circ - 64^\circ = 52^\circ$ OR/OF $\hat{V}_1 = \hat{S}_2 = 64^\circ$ $\hat{S}_2 = \hat{V}_3 = 64^\circ$ $\hat{O}_1 = 180^\circ - 64^\circ - 64^\circ$ (sum of \angle s of/som <i>binne</i> \angle e Δ) $\therefore \hat{O}_1 = 52^\circ$ OR/OF	✓ 64° CA ✓ RE CA ✓ 52° CA OR/OF ✓ 64° CA ✓ RE CA ✓ 52° CA OR/OF

<p>#</p>	<p>$\hat{E}MO = 90^\circ$ (tan/rklyn \perp rad) $\hat{E}VO = 90^\circ$ (tan/rklyn \perp rad) EMOV is a cyclic quad./ is 'n koordevierhoek (sum of opp. $\angle = 180^\circ$ / som teenorst. $\angle = 180^\circ$) $\therefore \hat{O}_1 = 52^\circ$ (ext. \angle of cyclic quad./buite \angle van kvhk) OR/OF $\hat{E}MO = 90^\circ$ (tan /rklyn. \perp rad) $\hat{M}_1 = 64^\circ$ $\hat{M}_2 = 90^\circ - 64^\circ = 26^\circ$ $\hat{O}_2 = 2 \times 26^\circ = 52^\circ$ (\angle at cent. = 2 \angle at circum./ mdpts $\angle = 2 \times$ omtreks \angle) OR/OF $\hat{M}_2 = \hat{V}_2 = 90^\circ - 64^\circ = 26^\circ$ (\angles opp.= sides/\anglee teenoor = sye) $\hat{O}_1 = 26^\circ + 26^\circ = 52^\circ$ (ext. \angle of Δ / buite \angle van Δ)</p>	<p>✓ ST CA ✓ RE CA ✓ 52° CA OR/OF ✓ 64° CA ✓ 52° CA ✓ RE CA OR/OF ✓ ST/RE CA ✓ RE CA ✓ 52° CA (3)</p>
<p>7.2.2(d)</p>	<p>$2\hat{M}_2 = 52^\circ$ (\angle at cent. = 2 \angle at circum./ mdpts $\angle = 2 \times$ omtreks \angle) $\hat{M}_2 = \frac{52^\circ}{2} = 26^\circ$ $\therefore \hat{V}_4 = \hat{M}_2 = 26^\circ$ (tan-chord theorem/ rklyn-koord st) OR/OF $\hat{V}_4 + \hat{V}_3 = 90^\circ$ (tan/rkl \perp rad) $\hat{V}_3 = \hat{S}_2 = 64^\circ$ (\angle^s opp. = sides/ \angle teenoor. = sye) $\hat{V}_4 = 26^\circ$ OR/OF $\hat{M}\hat{V}\hat{S} = 90^\circ$ (\angle in a semi-circle/'n halfsirkel) $\hat{V}_4 = 180^\circ - 90^\circ - 64^\circ = 26^\circ$</p>	<p>✓ ST CA ✓ $\hat{V}_4 = 26^\circ$ CA ✓ RE A OR/OF ✓ ST A ✓ RE A ✓ $\hat{V}_4 = 26^\circ$ CA OR/OF ✓ ST A ✓ RE A ✓ $\hat{V}_4 = 26^\circ$ CA</p>

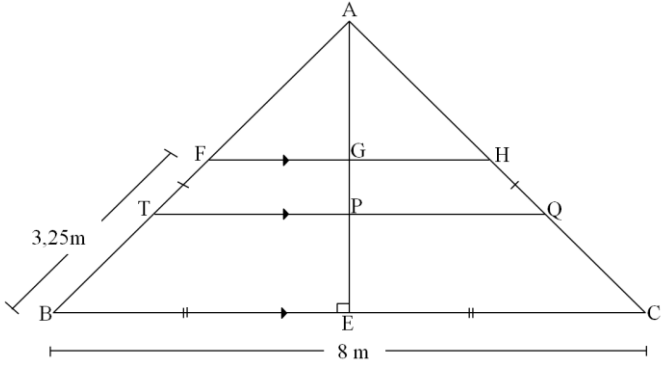
	<p style="text-align: center;">OR/OF</p> <p>$\hat{M}_2 = 26^\circ$ (tan/ rklyn \perp rad)</p> <p>$\hat{V}_4 = 26^\circ$ (tan– chord / rklyn – koord)</p> <p style="text-align: center;">OR/OF</p> <p>$\hat{T} = 38^\circ$ (int \angle of Δ / binne \angle van Δ)</p> <p>$\therefore \hat{V}_4 = 26^\circ$ (ext \angle of Δ / buite \angle van Δ)</p>	<p style="text-align: center;">OR/OF</p> <p>✓ ST A</p> <p>✓ RE A</p> <p>✓ $\hat{V}_4 = 26^\circ$ CA</p> <p style="text-align: center;">OR/OF</p> <p>✓ ST A</p> <p>✓ RE A</p> <p>✓ $\hat{V}_4 = 26^\circ$ CA</p> <p style="text-align: right;">(3)</p>
7.2.2(e)	<p>$\hat{T} = 180^\circ - (90^\circ + 52^\circ)$ (sum of \angle's of Δ / som \angle'e van Δ)</p> <p>$= 38^\circ$</p> <p style="text-align: center;">OR/OF</p> <p>$\hat{T} = \hat{S}_2 - \hat{V}_4$ (ext \angle of Δ / buite \angle van Δ)</p> <p>$\hat{T} = 64^\circ - 26^\circ = 38^\circ$</p>	<p>✓ $\hat{T} = 38^\circ$ CA</p> <p>✓ RE A</p> <p style="text-align: center;">OR/OF</p> <p>✓ $\hat{T} = 38^\circ$ CA</p> <p>✓ RE A</p> <p style="text-align: right;">(2)</p>
		[14]

QUESTION/VRAAG 8

8.1	Interior opposite angle/ <i>teenoorstaande binnehoek</i>	✓ interior opposite/ <i>teenoorstaande binnehoek</i> A (1)
8.2		
8.2.1	angle in the semi-circle/ <i>hoek in 'n halfsirkel</i> OR/ OF angle subtended by diameter/ <i>hoek onderspan deur middellyn</i>	✓ RE A (1)
8.2.2	$\hat{M}_2 = \hat{P}_3 = 11^\circ$ (\angle s in the same segment/ <i>in dieselfde segment</i>) $\hat{L}_4 = \hat{M}_2 = 11^\circ$ (alt./ <i>verw</i> \angle s ; $RM \parallel LN$) $\hat{P}_1 = \hat{L}_4 = 11^\circ$ (\angle s in the same segment/ <i>in dieselfde segment</i>)	✓ \hat{M}_2 A ✓ \hat{L}_4 A ✓ \hat{P}_1 A ✓ any correct reason / <i>enige korrekte rede</i> A (4)

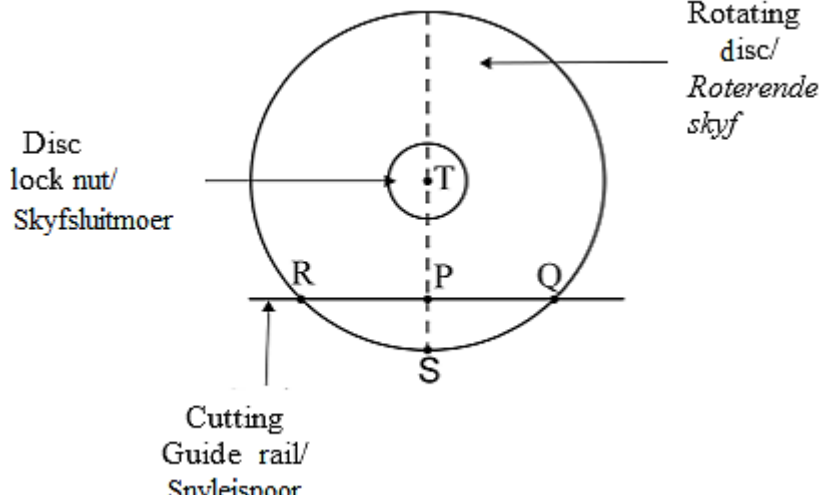
8.2.3	Equal angles are subtended by equal chords/ <i>gelyke hoeke onderspan deur gelyke koorde</i>	✓✓ RE A (2)
8.2.4	$\hat{L}_2 + \hat{L}_3 + \hat{L}_4 + \hat{M}_1 + \hat{M}_2 = 180^\circ$ (Opp. \angle s of cyclic quad.) <i>(teenoor \angle e van koordevierhoek)</i> But/ <i>Maar</i> $\hat{L}_2 + \hat{L}_3 = 90^\circ$ (\angle s in semi-circle/in <i>halfsirkel</i>) $90^\circ + 11^\circ + \hat{M}_1 + 11^\circ = 180^\circ$ $\therefore \hat{M}_1 = 68^\circ$ <p style="text-align: center;">OR/OF</p> $\hat{P}_1 + \hat{P}_2 + \hat{P}_3 = 90^\circ$ (\angle s in semi-circle/in <i>halfsirkel</i>) $\hat{P}_2 = 90^\circ - 11^\circ - 11^\circ - 68^\circ$ $\hat{P}_2 = \hat{M}_1$ (\angle s / <i>e</i> in the same segment/in <i>dieselfde segment</i>) $\therefore \hat{M}_1 = 68^\circ$	✓ ST A ✓ ST A ✓✓ $\hat{M}_1 = 68^\circ$ CA <p style="text-align: center;">OR/OF</p> ✓ ST CA ✓ ST CA ✓✓ $\hat{M}_1 = 68^\circ$ CA AO Full marks/ Volpunte (4)
8.2.5	$\hat{L}_1 + (\hat{L}_2 + \hat{L}_3) + \hat{L}_4 = 180^\circ$ (Sum \angle on str. line./ <i>Som \angle op reg lyn.</i>) $\hat{L}_1 = 180^\circ - (90^\circ + 11^\circ) = 79^\circ$ <p style="text-align: center;">OR/OF</p> $\hat{L}_1 = \hat{P}_2 + \hat{P}_3$ (ext \angle of cyclic quad/ <i>buite \angle van koordevierhoek</i>) $\hat{M}_1 = \hat{P}_2 = 68^\circ$ (\angle s / <i>e</i> in the same segment/in <i>dieselfde segment</i>) $\hat{L}_1 = 68^\circ + 11^\circ = 79^\circ$ <p style="text-align: center;">OR/OF</p> $\hat{L}_1 = \hat{M}_1 + \hat{M}_2$ (ext \angle of cyclic quad/ <i>buite \angle van koordevierhoek</i>) $\hat{L}_1 = 68^\circ + 11^\circ = 79^\circ$	✓ ST A ✓ $\hat{L}_1 = 79^\circ$ CA <p style="text-align: center;">OR/OF</p> ✓ ST A ✓ $\hat{L}_1 = 79^\circ$ CA <p style="text-align: center;">OR/OF</p> ✓ ST A ✓ $\hat{L}_1 = 79^\circ$ CA AO Full marks/ Volpunte (2)
		[14]

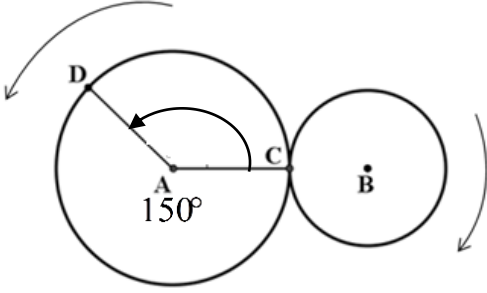
QUESTION/VRAAG 9

9.1	Divides the other two sides proportionally/ <i>verdeel die ander twee sye eweredig</i>	✓ Answer/ <i>antwoord</i> A (1)
9.2		
9.2.1	SSS OR/OF 90° HS OR/OF $S \angle S$ OR/OF $\angle \angle S$	✓ RE A (1)
9.2.2	BE = 4 m	✓ ST A (1)
9.2.3(a)	$AB^2 = 3^2 + 4^2$ (Pythagoras Theorem/ <i>Stelling</i>) $\therefore AB = 5$ m	✓ RE A ✓ length/ <i>lengte</i> A (2)
9.2.3(b)	$\frac{AT}{AB} = \frac{AP}{AE}$ (Prop. Theorem/ <i>Eweredigh. st</i> ; $TQ \parallel BC$) $\frac{AT}{5} = \frac{2}{3}$ $\therefore AT = \frac{10}{3} \approx 3,33$ m	✓ ST CA ✓ RE A ✓ Value of/ <i>waarde van</i> AT CA (3)
9.2.4	$AF = 5 - 3,25 = 1,75$ m OR/OF $TB = 5 - \frac{10}{3} \approx 1,67$ $FT = \frac{10}{3} - 1,75$ OR/OF $FT \approx 3,25 - 1,67$ $\therefore FT \approx 1,58$ m OR/OF $AT + TB - FT = 5$ $AT + TB - 5 = FT$ $FT = \frac{10}{3} + 3,25 - 5$ $\approx 1,58$ m OR/OF	✓ Value of/ <i>waarde van</i> AF CA ✓ M A ✓ Value of/ <i>waarde van</i> FT CA OR/OF ✓ equation/ <i>vergelyking</i> CA ✓ M A ✓ Value of/ <i>waarde van</i> FT CA OR/OF

	$TB = 5 - \frac{10}{3} \approx 1,67 \text{ m}$ $FT \approx 3,25 \text{ m} - 1,67 \text{ m}$ $\approx 1,58 \text{ m}$ <p style="text-align: center;">OR/OF</p> $\frac{AT}{AB} = \frac{AP}{AE}$ <p style="text-align: center;">prop. theorem/ ewer. st</p> $\frac{FT + 1,75}{5} = \frac{2}{3}$ $FT = \frac{10}{3} - 1,75$ $\approx 1,58 \text{ m}$	<p>✓ Value of/waarde van TB CA</p> <p>✓ M A</p> <p>✓ Value of/waarde van FT CA</p> <p style="text-align: center;">OR/OF</p> <p>✓ substitution/ <i>vervanging</i> CA</p> <p>✓ M A</p> <p>✓ Value of/waarde van FT CA (3)</p>
		[11]

QUESTION/VRAAG 10

<p>10.1</p>		
<p>10.1.1</p>	$n = \frac{2700}{60} = 45 \text{ rev.s}^{-1} / \text{omw.s}^{-1}$ $\omega = 2\pi n$ $= 2\pi(45)$ $= 90\pi \approx 282,74 \text{ rad.s}^{-1}$ <p style="text-align: center;">OR / OF</p> $\omega = 2\pi n$ $= 2\pi\left(\frac{2700}{60}\right)$	<p>✓ conversion/ herleiding A</p> <p>✓ formula/ formule A</p> <p>✓ SF CA</p> <p>✓ ang.velocity/ hoeksnelhd CA (4)</p>
<p>10.1.2</p>	<p style="text-align: center;">$x = 55 \text{ mm}$ and $d = 115 \text{ mm}$</p> $4h^2 - 4dh + x^2 = 0$ $4h^2 - 4(115)h + (55)^2 = 0$ $4h^2 - 460h + 3025 = 0$ $h = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$ $= \frac{-(-460) - \sqrt{(-460)^2 - 4(4)(3025)}}{2(4)}$ <p style="text-align: center;">$h = \text{PS} \approx 7 \text{ mm}$</p> <p style="text-align: center;">OR / OF</p> <p style="text-align: center;">Using the half chord of /Gebruik halfkoord van RQ</p> $\text{TP} = \sqrt{r^2 - \left(\frac{1}{2}\text{RQ}\right)^2} = \sqrt{\left(\frac{1}{2}(115)\right)^2 - \left(\frac{1}{2}(55)\right)^2}$ <p style="text-align: center;">$\approx 50,5 \text{ mm}$</p> <p style="text-align: center;">$\therefore h = \text{PS} = 57,5 - 50,5 \approx 7 \text{ mm}$</p>	<p>✓ formula/ formule A</p> <p>✓ SF A</p> <p>✓ SF CA</p> <p>✓ height / hoogte CA</p> <p style="text-align: center;">OR / OF</p> <p>✓ Pythagoras A</p> <p>✓ S CA</p> <p>✓✓ height/ hoogte CA (4)</p>

<p>10.2</p>		
<p>10.2.1</p>	$150^\circ \times \frac{\pi}{180^\circ} = \frac{5}{6}\pi \text{ rad. OR / OF } \approx 2,62 \text{ rad.}$	<p>✓ Conversion/ herleiding A</p> <p>AO Full marks/ Volpunte</p> <p>(1)</p>
<p>10.2.2</p>	$A = \frac{r^2 \theta}{2}$ $= \frac{(30)^2 \left(\frac{5}{6}\pi\right)}{2}$ $= 375\pi \text{ OR/OF } \approx 1178,10 \text{ cm}^2$ <p style="text-align: center;">OR/OF</p> $s = r\theta$ $= (30)\left(\frac{5}{6}\pi\right)$ $= 25\pi \text{ cm OR/OF } \approx 78,54 \text{ cm}$ $A = \frac{r s}{2}$ $= \frac{(30)(25\pi)}{2}$ $= 375\pi$ $\approx 1178,10 \text{ cm}^2$ <p style="text-align: center;">OR/OF</p> $A = \frac{\theta}{360^\circ} \pi r^2$ $= \frac{150^\circ}{360^\circ} \pi (30)^2$ $= 1178,1 \text{ cm}^2$	<p>✓ Formula/ formule A</p> <p>✓ SF CA</p> <p>✓ Area of Sector/ oppervlakte van sektor CA</p> <p style="text-align: center;">OR/OF</p> <p>✓ Formula/ formule A</p> <p>✓ SF A</p> <p>✓ Area of Sector/ oppervlakte van sektor CA</p> <p style="text-align: center;">OR/OF</p> <p>✓ formula/ formule A</p> <p>✓ SF A</p> <p>✓ Area of Sector/ oppervlakte van sektor CA</p> <p>(3)</p>

<p>10.2.3</p>	$s = r\theta$ $= (30) \left(\frac{5}{6} \pi \right)$ $= 25\pi \text{ cm} \quad \text{OR/OF} \approx 78,54 \text{ cm}$ <p style="text-align: center;">OR/OF</p> $s = \frac{\theta}{360^\circ} \cdot 2\pi r$ $= \frac{150^\circ}{360^\circ} \cdot 2\pi(30)$ $\therefore s = 25\pi \text{ cm} \quad \text{OR/OF} \approx 78,54 \text{ cm}$	<p>✓ Formula/ formule A</p> <p>✓ SF CA</p> <p>✓ Arc length/Booglengte CA</p> <p style="text-align: center;">OR/OF</p> <p>✓ Formula/ formule A</p> <p>✓ SF CA</p> <p>✓ Arc length/Booglengte CA (3)</p>
<p>10.2.4</p>	$\text{rot. } \angle = 1\frac{1}{2} \times 360^\circ = 540^\circ \quad \text{or/of} \quad \frac{3}{2} \times (2\pi) \text{ rad}$ $\theta = 3\pi \text{ rad.}$ <p>Since the length of the arcs of both circles will be equal./ <i>die lengte van beide die boë van die sirkels is dieselfde</i></p> $\therefore s = r\theta$ $25\pi = r(3\pi)$ $\therefore r = \frac{25\pi}{3\pi}$ $\approx 8,33 \text{ cm}$ <p style="text-align: center;">OR/OF</p> <p>Let r be the radius of the small circle and R the radius of the bigger circle. <i>Laat r die radius van die klein sirkel en R die radius van die groter sirkel wees</i></p> $\frac{3}{2}(2\pi r) = \left(\frac{150^\circ}{360^\circ} \right) (2\pi R)$ $\therefore \frac{3}{2} r = \left(\frac{150^\circ}{360^\circ} \right) (30) = \frac{25}{2}$ $\therefore r = \frac{2}{3} \times \frac{25}{2}$ $= \frac{25}{3} \approx 8,33$	<p>✓ Angle size in radians/ <i>hoek in radiale</i> CA</p> <p>✓ F A</p> <p>✓ SF CA</p> <p>✓ Length of radius/ <i>Lengte van radius</i> CA</p> <p style="text-align: center;">OR/OF</p> <p>✓ Proportion/Eweredigheid A</p> <p>✓ subst. / /vervang. A</p> <p>✓ S CA</p> <p>✓ Length of radius/ <i>Lengte van radius</i> CA (4)</p>
		<p style="text-align: right;">[19]</p>

QUESTION/VRAAG 11

<p>11.1.1</p>	$A_T = a \left(\frac{o_1 + o_n}{2} + o_2 + o_3 + \dots + o_{n-1} \right)$ $= 0,4 \left(\frac{2,3+1,3}{2} + 1,6+1,8+1,4 \right) m^2$ $= 0,4(1,8 + 1,6+1,8+1,4) m^2$ $\approx 2,64 m^2$ <p style="text-align: center;">OR/OF</p> $A_T = a(m_1 + m_2 + m_3 + \dots + m_n)$ $= 0,4 \left(\frac{2,3+1,6}{2} + \frac{1,6+1,8}{2} + \frac{1,8+1,4}{2} + \frac{1,4+1,3}{2} \right) m^2$ $= 0,4(1,95 + 1,7+1,6+1,35) m^2$ $\approx 2,64 m^2$	<p>✓ formula/formule A</p> <p>✓ value of/ waarde van a A</p> <p>✓ SF A</p> <p>✓ value of/ waarde van A_T CA</p> <p style="text-align: center;">OR/OF</p> <p>✓ formula/formule A</p> <p>✓ value of/ waarde van a A</p> <p>✓ SF A</p> <p>✓ value of/waarde van A_T CA</p> <p>AO Full marks/ Volpunte</p> <p style="text-align: right;">(4)</p>
<p>11.1.2</p>	<p>Area of rectangle/oppervlakte van reghoek = 2,3 × 1,6</p> $= 3,68 m^2$ <p>Trimmed off grass/afgesnyde grass =</p> $3,68 m^2 - 2,64 m^2 = 1,04 m^2$ <p>Amount wasted/bedrag wat gemors word =</p> $R106,80 \times 1,04 = R111,07$ <p style="text-align: center;">OR / OF</p> <p>Area of ONE piece / oppervlakte van EEN stuk</p> $= 0,92 m^2$ <p>Area of FOUR pieces/ oppervlakte van VIER stukke =</p> $4 \times 0,92 m^2 = 3,68 m^2$ <p>Cost of FOUR pieces/ koste van VIER stukke =</p> $R106,80 \times 3,68 m^2 = R393,02$ <p>Cost of used grass/Koste van gebruikte gras</p> $= R106,80 \times 2,64 m^2 = R 281, 95$ <p>Amount wasted/bedrag wat gemors word</p> $= R393,02 - R 281, 95$ $= R 111,07$	<p>✓ Area of rectangle/ oppervlakte van reghoek A</p> <p>✓ value of area/ waarde van oppervlakte CA</p> <p>✓ Area of trimmed grass/ oppervlakte van afgesnyde gras CA</p> <p>✓ amount wasted/ bedrag gemors CA</p> <p style="text-align: center;">OR / OF</p> <p>✓ Area of four pieces/oppervlakte van vier stukke A</p> <p>✓ Cost of four pieces / koste van vier stukke CA</p> <p>✓ Cost of used grass/ Koste van gebruikte gras CA</p> <p>✓ amount wasted/ bedrag gemors CA</p> <p style="text-align: right;">(4)</p>

<p>11.2.1</p>	$A_{cyl/sil} = 2\pi r^2 + 2\pi rh$ $= 2\pi (3,46\text{ cm})^2 + 2\pi (3,46\text{ cm})(20\text{ cm})$ $\approx 510,02\text{ cm}^2$ $A_{cyl/sil} \text{ (with opening/met opening)} \approx 510,02\text{ cm}^2 - 0,45\text{ cm}^2$ $= 509,57\text{ cm}^2$	<p>✓ formula/formule A</p> <p>✓ SF A</p> <p>✓ M Subtracting opening/ aftrek van opening A</p> <p>✓ Area/Oppervlakte CA</p> <p>(4)</p>
<p>11.2.2</p>	$25l \times \frac{1000}{1} = 25000\text{ cm}^3$ $V_{bottle/bottel} = \pi r^2 h$ $= \pi (3,46\text{ cm})^2 (20\text{ cm})$ $\approx 752,20\text{ cm}^3$ <p>Number of times that bottle can be filled/ aantal kere wat bottel gevul kan word</p> $\approx \frac{25\ 000}{752,20}$ $\approx 33,24 \approx 33 \text{ times / keer}$ <p style="text-align: center;">OR/OF</p> $V = \pi r^2 h$ $= \pi (3,46\text{ cm})^2 (20\text{ cm})$ $\approx 752,20\text{ cm}^3$ $V \approx \frac{752,20}{1\ 000} = 0,75221$ <p>Number of times that bottle can be filled/ aantal kere wat bottel gevul kan word</p> $\approx \frac{25}{0,7522}$ $\approx 33,23 \approx 33 \text{ times / keer}$	<p>✓ converting/ herleiding A</p> <p>✓ SF A</p> <p>✓ V_{bottle}/V_{bottel} CA</p> <p>✓ M A</p> <p>✓ Number of times/ aantal kere CA</p> <p style="text-align: center;">OR/OF</p> <p>✓ SF A</p> <p>✓ V_{bottle}/V_{bottel} CA</p> <p>✓ converting/ herleiding A</p> <p>✓ M A</p> <p>✓ Number of times/ aantal kere CA</p> <p>(5)</p> <p>[17]</p>

TOTAL/TOTAAL: 150