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

TECHNICAL MATHEMATICS P2/TEGNIESE WISKUNDE V2

2021

MARKING GUIDELINES/NASIENRIGLYNE

MARKS/PUNTE: 150

Marking Codes/Nasienkodes	
A	Accuracy/Akkuraatheid
AO	Answer Only/Slegs antwoord
CA	Consistent accuracy/Volgehoue akkuraatheid
I	Identity/Identiteit
F	Correct Formula/Korrekte formule
M	Method/Metode
NPR	No penalty for rounding/Geen penaliseering vir afronding
NPU	No penalty for units/Geen penaliseering vir eenhede weggelaat
R	Rounding/Afronding
RE	Reason/Rede
S	Simplification/Vereenvoudiging
SF	Substitution in correct formula/Vervanging in korrekte formule
ST	Statement/Bewering
ST/RE	Statement with Reason/Bewering met rede

**These marking guidelines consists of 23 pages.
Hierdie nasienriglyne bestaan uit 23 bladsye.**

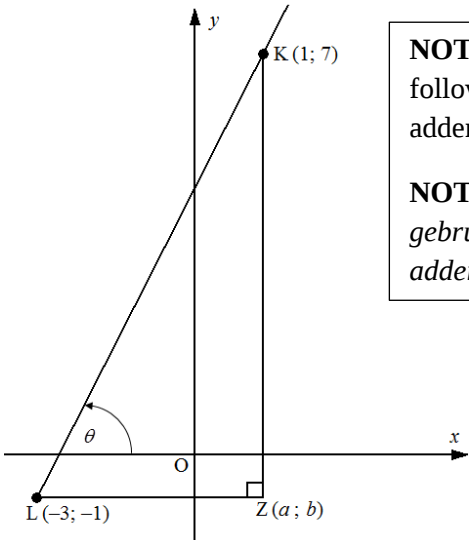
NOTE:

- If a candidate answers a question TWICE, only mark the FIRST attempt.
- Consistent accuracy applies in all aspects of the marking guidelines where indicated.
- # Indicates the questions where tolerance range will be applied:
Q4.1 , Q4.2 , Q5.1 , Q8.5

LET WEL:

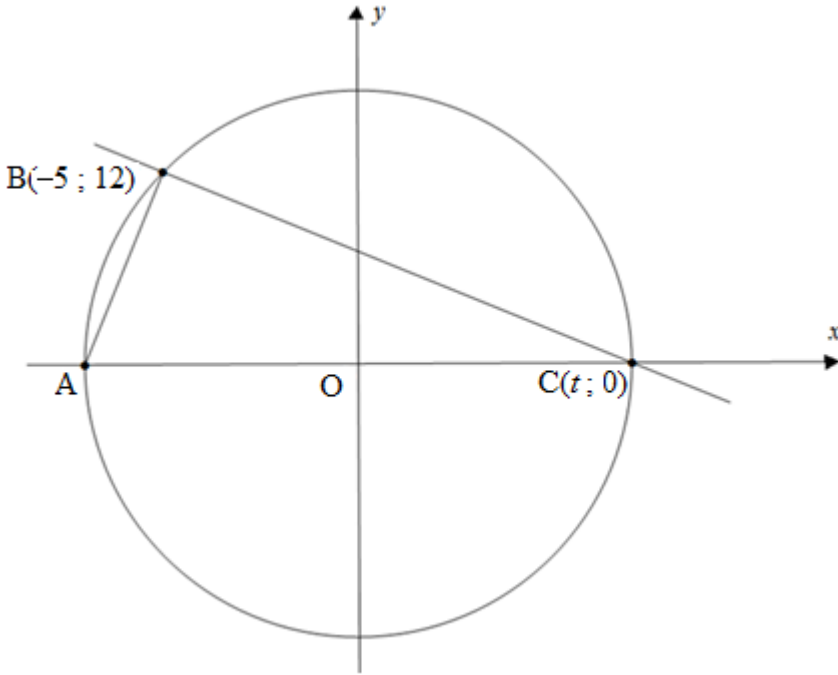
- Indien 'n kandidaat 'n vraag TWEE keer beantwoord, sien slegs die EERSTE poging na.
- Volgehoue akkuraatheid is deurgaans op alle aspekte van die nasienriglyne van toepassing.
- # Toon vrae waar Toleransie Wydte (Verdraagsaamheids omvang) toegepas word:
Q4.1 , Q4.2 , Q5.1 , Q8.5

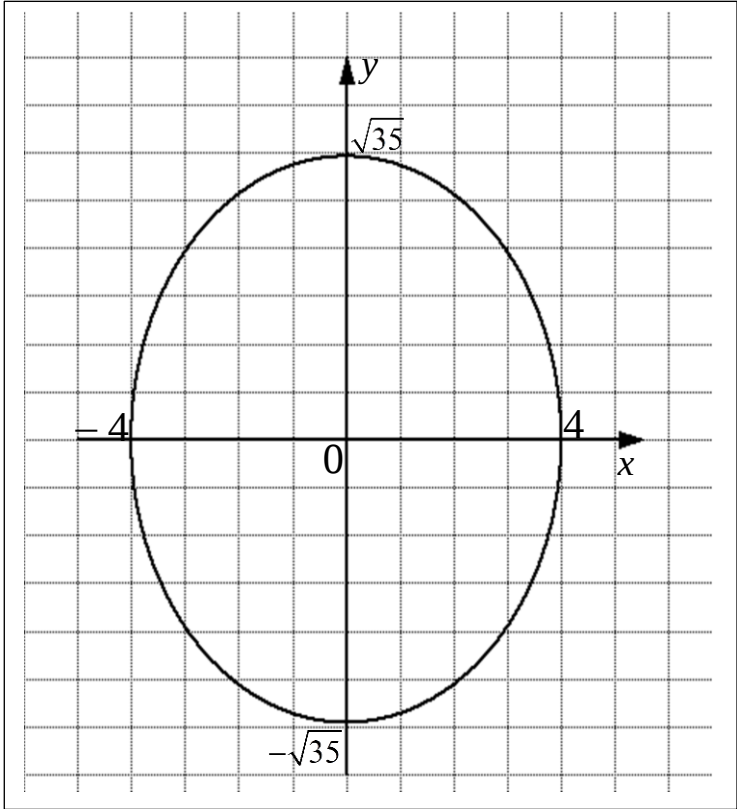
QUESTION/VRAAG 1

		NOTE: if the candidate used $(-3 ; 1)$ follow the marking guidelines in the addendum NOTA: Indien die kandidaat $(-3 ; 1)$ gebruik volg die nasienriglyne in die addendum
1.1	$a = 1$ $b = -1$	✓ value of/waarde van a A ✓ value of/ waarde van b A (2)
1.2	$KL = \sqrt{(x_K - x_L)^2 + (y_K - y_L)^2}$ $= \sqrt{(1 - (-3))^2 + (7 - (-1))^2}$ $= \sqrt{80}$ OR/OF $4\sqrt{5}$ OR/OF $\approx 8,94$	✓ SF A ✓ Length / Lengte CA AO Full marks /Volpunte (2)
1.3	$M\left(\frac{x_K + x_L}{2}; \frac{y_K + y_L}{2}\right)$ $M\left(\frac{1 + (-3)}{2}; \frac{7 + (-1)}{2}\right)$ $M(-1; 3)$ OR/OF $x_M = \frac{x_1 + x_2}{2}, y_M = \frac{y_1 + y_2}{2}$ $x_M = \frac{1 + (-3)}{2}, y_M = \frac{7 + (-1)}{2}$ $M(-1; 3)$	✓ x-value/waarde A ✓ y-value /waarde A [Penalty of one mark if not simplified/ Penaliseer met een punt indien nie vereenvoudig nie] (2) AO Full marks /Volpunte

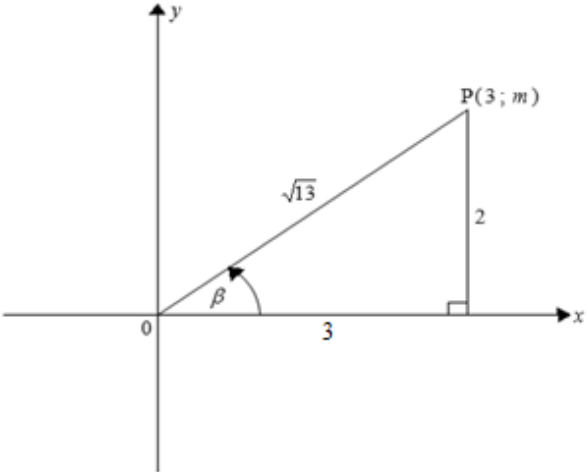
1.4	$m_{KL} = \frac{y_L - y_K}{x_L - x_K}$ $= \frac{-1 - 7}{-3 - 1}$ $= 2$	✓ SF A ✓ gradient/gradiënt CA AO Full marks /Volpunte (2)
1.5	$\tan \theta = m = 2$ $\theta \approx 63,4^\circ$ Penalty for rounding/ Penaliseering vir afronding	CA from/ vanaf Q/V1.4 ✓ gradient CA ✓ value of /waarde van θ (rounded)/ (afgerond) CA AO Full marks/ Volpunte (2)
1.6	$y = 2x + c$ $1 = 2(-5) + c$ $c = 11$ $\therefore y = 2x + 11$ OR/OF $y - y_1 = m(x - x_1)$ $y - 1 = 2(x - (-5))$ $y = 2x + 10 + 1$ $\therefore y = 2x + 11$	✓ gradient/gradiënt CA ✓ SF (-5; 1) A ✓ equation/ verg CA OR/OF ✓ gradient/gradiënt CA ✓ SF (-5; 1) A ✓ equation/ vergelyking CA (3)
1.7	$\therefore y = \frac{3}{2}x + \frac{17}{2}$ LHS/LK = -2 $RHS/RK = \frac{3}{2}(-4) + \frac{17}{2} = \frac{5}{2}$ LHS/LK $\neq$ RHS/RK $\therefore$ the point does NOT lie on the line $\therefore$ die punt lê NIE op die lyn OR/OF $m_{KL} = 2$ $m_{New/Nuwe} = \frac{y_1 - y_2}{x_1 - x_2} = \frac{-2 - 1}{-4 + 5} = -3$ $m_{New/Nuwe} \neq m_{KL}$ $\therefore$ the point does NOT lie on the line $\therefore$ die punt lê NIE op die lyn OR/OF $y + 2 = 2(x + 4)$ $y = 2x + 6$ $\therefore (-4; -2)$ does NOT lie on $y = 2x + 11$ lê NIE op $y = 2x + 11$	✓ M LHS/LK $\neq$ RHS/RK CA ✓ conclusion/ gevolgtrekking CA OR/OF ✓ M $m_{New/Nuwe} \neq m_{KL}$ A ✓ conclusion/ gevolgtrekking CA OR/OF ✓ M equation/vergeliking CA ✓ conclusion/ gevolgtrekking CA (2) [15]

QUESTION/VRAAG 2

		
2.1.1	$r^2 = x^2 + y^2$ $= (-5)^2 + (12)^2$ $= 169$ $\therefore x^2 + y^2 = 169 \quad \text{OR / OF} \quad x^2 + y^2 = 13^2$ $x = \pm\sqrt{169 - y^2} \quad \text{OR / OF} \quad y = \pm\sqrt{169 - x^2}$	✓ SF A ✓ equation/ vergelyking CA AO Full marks/ Volpunte (2)
2.1.2	$t = \sqrt{169} = 13$	✓ value of / waarde van t CA (1)
2.1.3	$m_{OB} = -\frac{12}{5}$ $m_{\text{tang/raaklyn}} = \frac{5}{12}$ $y = mx + c \quad \text{OR / OF} \quad y - y_1 = m(x - x_1)$ $12 = \frac{5}{12}(-5) + c \quad \text{OR / OF} \quad y - 12 = \frac{5}{12}(x - (-5))$ $c = \frac{169}{12}$ $\therefore y = \frac{5}{12}x + \frac{169}{12}$ OR/OF	✓ gradient/gradiënt A ✓ gradient/gradiënt CA ✓ substitution/ vervanging $(-5; 1)$ A ✓ equation/ vergelyking CA OR/OF

	$x \cdot x_1 + y \cdot y_1 = r^2$ $x(-5) + y(12) = 169$ $12y = 5x + 169$ $y = \frac{5}{12}x + \frac{169}{12}$	✓ substitution/ <i>vervanging</i> $(-5; 1)$ A ✓ 169 CA ✓ S CA ✓ equation/ <i>vergelyking</i> CA (4)
2.2		✓ both x-intercepts/ <i>beide x-afsnitte</i> A ✓ both y-intercepts <i>beide y-afsnitte</i> A ✓ elliptical shape/ <i>eliptiese vorm</i> CA (3) [10]

QUESTION/VRAAG 3

3.1.1	 $(\sqrt{13})^2 = (3)^2 + (m)^2$ $13 = 9 + m^2$ $m^2 = 4 \quad \text{OR/OF} \quad m = \sqrt{(\sqrt{13})^2 - 3^2}$ $\therefore m = 2$	✓ value of / waarde van m A AO Full marks / Volpunte (1)
3.1.2	$\sec^2 \beta + \tan^2 \beta$ $= \left(\frac{\sqrt{13}}{3}\right)^2 + \left(\frac{2}{3}\right)^2$ $= \frac{13}{9} + \frac{4}{9}$ $= \frac{17}{9}$ OR/OF $\sec^2 \beta + \tan^2 \beta$ $= 1 + \tan^2 \beta + \tan^2 \beta$ $= 1 + 2 \tan^2 \beta$ $= 1 + 2 \left(\frac{2}{3}\right)^2$ $= 1 + \frac{8}{9}$ $= \frac{17}{9}$	CA from/ vanaf Q/V3.1.1 ✓ ratio of/ verh $\sec \beta$ A ✓ ratio of/ verh $\tan \beta$ CA ✓ simplification/ vereenv CA ✓ value of/ waarde van $\sec^2 \beta + \tan^2 \beta$ CA OR/OF ✓ I A ✓ S A ✓ ratio of / verh van $\tan \beta$ CA ✓ value of/waarde van $\sec^2 \beta + \tan^2 \beta$ CA (4)

3.2.1	$\cos \theta = \frac{1}{2}$ $\therefore \theta = 60^\circ$	✓ value of/waarde van θ A (1)
3.2.2	$\tan \alpha = -1$ ref/verw. $\angle = 45^\circ$ $\alpha = 180^\circ - 45^\circ$ $\alpha = 135^\circ \quad 0^\circ \leq \alpha \leq 180^\circ$	✓ ref./ verw $\angle$ A ✓ 2nd quadrant/ 2de kwadrant A ✓ value/waarde CA AO Full marks / Volpunte (3)
3.2.3	$\cos(\alpha - \theta)$ $= \cos(135^\circ - 60^\circ)$ $= \cos 75^\circ$ $\approx 0,26 \quad \text{OR/OF} \quad \frac{\sqrt{6} - \sqrt{2}}{4}$	✓ substitution/ vervanging CA ✓ value of/waarde van $\cos(\alpha - \theta)$ CA NPR (2) AO Full marks / Volpunte
3.3	$2 \tan x + 0,924 = 0$ $2 \tan x = -0,924$ $\tan x = -0,462$ ref/verw $\angle \approx 24,8^\circ$ $x \approx 180^\circ - 24,8^\circ$ or/of $x \approx 360^\circ - 24,8^\circ$ $\therefore x \approx 155,2^\circ$ or/of $x \approx 335,2^\circ$	 ✓ S A ✓ ref./verw $\angle$ CA ✓ $x \approx 155,2^\circ$ CA ✓ $x \approx 335,2^\circ$ CA NPR (4) [15]

QUESTION/VRAAG 4

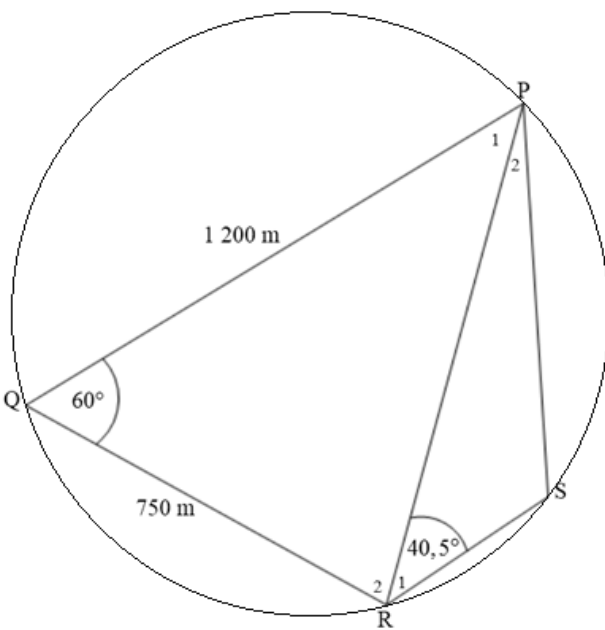
4.1	$\cos \theta (\tan \theta + \cot \theta)$ $= \cos \theta \left(\frac{\sin \theta}{\cos \theta} + \frac{\cos \theta}{\sin \theta} \right)$ $= \cos \theta \left(\frac{\sin^2 \theta + \cos^2 \theta}{\cos \theta \cdot \sin \theta} \right)$ $= \cos \theta \left(\frac{1}{\cos \theta \cdot \sin \theta} \right)$ $= \frac{1}{\sin \theta} \quad \text{OR/OF} \quad \operatorname{cosec} \theta$ OR/OF $\cos \theta (\tan \theta + \cot \theta)$ $= \cos \theta \cdot \tan \theta + \cos \theta \cdot \cot \theta$ $= \cos \theta \cdot \frac{\sin \theta}{\cos \theta} + \cos \theta \cdot \frac{\cos \theta}{\sin \theta}$ $= \sin \theta + \frac{\cos^2 \theta}{\sin \theta}$ $= \frac{\sin^2 \theta + \cos^2 \theta}{\sin \theta}$ $= \frac{1}{\sin \theta} \quad \text{OR/OF} \quad \operatorname{cosec} \theta$ OR/OF $\cos \theta \left(\tan \theta + \frac{1}{\tan \theta} \right)$ $= \cos \theta \cdot \left(\frac{\tan^2 \theta + 1}{\tan \theta} \right)$ $= \cos \theta \cdot \left(\frac{\sec^2 \theta}{\tan \theta} \right)$ $= \cos \theta \cdot \left(\frac{1}{\cos^2 \theta} \cdot \frac{\cos \theta}{\sin \theta} \right)$ $= \frac{1}{\sin \theta} \quad \text{OR/OF} \quad \operatorname{cosec} \theta$	$\checkmark \text{I} \quad \frac{\sin \theta}{\cos \theta} \quad \text{A}$ $\checkmark \text{I} \quad \frac{\cos \theta}{\sin \theta} \quad \text{A}$ $\checkmark \text{S} \quad \text{CA}$ $\checkmark \text{I} \quad \text{A}$ $\checkmark \text{S} \quad \text{CA}$ OR/OF $\checkmark \text{M} \text{ expanding/uitbrei} \quad \text{A}$ $\checkmark \text{I} \quad \frac{\sin \theta}{\cos \theta} \quad \text{A}$ $\checkmark \text{I} \quad \frac{\cos \theta}{\sin \theta} \quad \text{A}$ $\checkmark \text{S} \quad \text{A}$ $\checkmark \text{I} \quad \text{A}$ OR/OF $\checkmark \text{I} \quad \frac{1}{\tan \theta} \quad \text{A}$ $\checkmark \text{S} \quad \text{A}$ $\checkmark \text{I} \quad \sec^2 \theta \quad \text{A}$ $\checkmark \text{I} \quad \frac{1}{\cos^2 \theta} \cdot \frac{\cos \theta}{\sin \theta}$ A $\checkmark \text{S} \quad \text{CA}$ (5)
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4.2	$\frac{\sin^2(180^\circ + B) \cdot \operatorname{cosec}(\pi - B)}{\sec(2\pi - B) \cdot \cos(180^\circ - B)}$ $= \frac{\sin^2 B \cdot \operatorname{cosec} B}{\sec B \cdot (-\cos B)}$ $= \frac{\sin^2 B \cdot \frac{1}{\sin B}}{-\frac{1}{\cos B} \cdot \cos B}$ $= -\sin B$ OR/OF $= \frac{\sin^2(180^\circ + B) \cdot \frac{1}{\sin(\pi - B)}}{\frac{1}{\cos(2\pi - B)} \cdot \cos(180^\circ - B)}$ $= \frac{\sin^2 B \cdot \frac{1}{\sin B}}{\frac{1}{\cos B} \cdot (-\cos B)}$ $= \frac{\sin^2 B \cdot \frac{1}{\sin B}}{-\frac{1}{\cos B} \cdot \cos B}$ $= -\sin B$	$\checkmark \sin^2 B$ A $\checkmark \operatorname{cosec} B$ A $\checkmark \sec B$ A $\checkmark -\cos B$ A $\checkmark \text{I } \frac{1}{\sin B}$ A $\checkmark \text{I } \frac{1}{\cos B}$ A $\checkmark \text{S}$ CA OR/OF $\checkmark \text{I } \frac{1}{\sin(\pi - B)}$ A $\checkmark \text{I } \frac{1}{\cos(2\pi - B)}$ A $\checkmark \sin^2 B$ A $\checkmark \sin B$ A $\checkmark \cos B$ A $\checkmark -\cos B$ A $\checkmark \text{S}$ CA (7)
		[12]

QUESTION 5

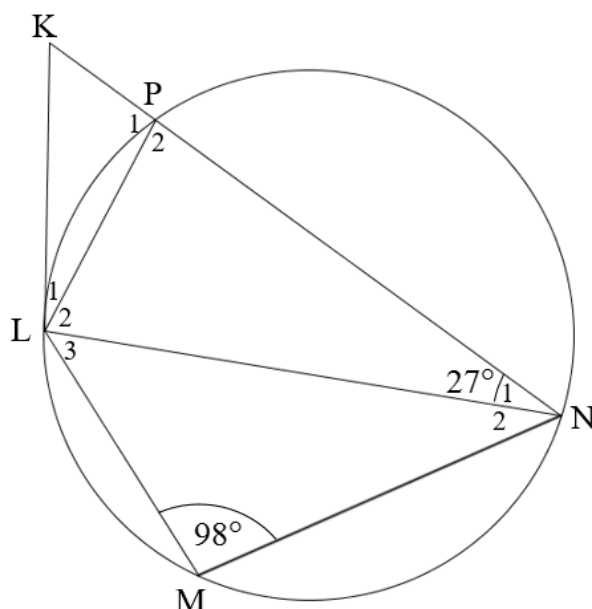
5.1		<table><tr><th><i>f</i></th><th></th><th><i>g</i></th><th></th></tr><tr><td>✓shape/vorm</td><td>A</td><td>✓shape/vorm</td><td>A</td></tr><tr><td>✓x-intercepts/x-afsnitte</td><td>A</td><td>✓x-intercepts/x-afsnitte</td><td>A</td></tr><tr><td>✓asymptotes/ asimptote</td><td>A</td><td>✓turning points/ draaipunte</td><td>A</td></tr><tr><td>✓(0° ; 0)</td><td>A</td><td>✓endpoints/eindpunte</td><td>A</td></tr><tr><td></td><td></td><td></td><td>(8)</td></tr></table>	<i>f</i>		<i>g</i>		✓shape/vorm	A	✓shape/vorm	A	✓x-intercepts/x-afsnitte	A	✓x-intercepts/x-afsnitte	A	✓asymptotes/ asimptote	A	✓turning points/ draaipunte	A	✓(0° ; 0)	A	✓endpoints/eindpunte	A				(8)
<i>f</i>		<i>g</i>																								
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✓asymptotes/ asimptote	A	✓turning points/ draaipunte	A																							
✓(0° ; 0)	A	✓endpoints/eindpunte	A																							
			(8)																							
5.2.1	$x = 90^\circ$ and/en $x = 270^\circ$	<table><tr><td>✓ 90°</td><td>A</td></tr><tr><td>✓ 270°</td><td>A</td></tr><tr><td></td><td>(2)</td></tr></table>	✓ 90°	A	✓ 270°	A		(2)																		
✓ 90°	A																									
✓ 270°	A																									
	(2)																									
5.2.2	$x \in (90^\circ ; 135^\circ]$ or/of $x=180^\circ$ OR/OF $90^\circ < x \leq 135^\circ$ or/of $x=180^\circ$	<table><tr><td>✓ $x \in (90^\circ ; 135^\circ]$</td><td>CA</td></tr><tr><td>✓ $x=180^\circ$</td><td>CA</td></tr><tr><td></td><td></td></tr><tr><td>OR/OF</td><td></td></tr><tr><td>✓ $90^\circ < x \leq 135^\circ$</td><td>CA</td></tr><tr><td>✓ $x=180^\circ$</td><td>CA</td></tr><tr><td></td><td>(2)</td></tr><tr><td></td><td>[12]</td></tr></table>	✓ $x \in (90^\circ ; 135^\circ]$	CA	✓ $x=180^\circ$	CA			OR/OF		✓ $90^\circ < x \leq 135^\circ$	CA	✓ $x=180^\circ$	CA		(2)		[12]								
✓ $x \in (90^\circ ; 135^\circ]$	CA																									
✓ $x=180^\circ$	CA																									
OR/OF																										
✓ $90^\circ < x \leq 135^\circ$	CA																									
✓ $x=180^\circ$	CA																									
	(2)																									
	[12]																									

QUESTION/VRAAG 6

			
6.1	$PR^2 = QR^2 + PQ^2 - 2QR \cdot PQ \cos Q$ $= (750)^2 + (1200)^2 - 2(750)(1200) \cos 60^\circ$ $= 1\,102\,500$ $\therefore PR = 1\,050 \text{ m}$	✓ cosine rule/ <i>reël</i> ✓ SF ✓ value/PR/ <i>wrde</i>	A A CA (3)
6.2	$\hat{S} = 120^\circ$	✓ size of/ <i>grootte van</i> $\hat{S}$	A (1)
6.3	$\frac{PS}{\sin R_1} = \frac{PR}{\sin S}$ $\frac{PS}{\sin 40,5^\circ} = \frac{1\,050}{\sin 120^\circ}$ $PS = \frac{1\,050 \sin 40,5^\circ}{\sin 120^\circ}$ $\therefore PS \approx 787,41 \text{ m}$	✓ sine rule/ <i>reël</i> ✓ SF ✓ value of PS/ <i>waarde van</i> NPR	A CA CA (3)
6.4	$\text{Area/Oppervlakte } \triangle QPR = \frac{1}{2} QR \cdot QP \sin Q$ $= \frac{1}{2} (750)(1\,200) \sin 60^\circ$ $\approx 389\,711,43 \text{ m}^2$	✓ area rule/ <i>reël</i> ✓ SF ✓ value of/ <i>waarde van</i>	A A CA (3) [10]

	OR/OF $\hat{O}_2 + \hat{O}_3 = 112^\circ \quad \left[\begin{array}{l} \angle \text{at centre} = 2 \times \angle \text{at circum.} \\ \text{mdpts} \angle = 2 \times \text{omtrk} \angle \end{array} \right]$ $\hat{S}_2 = \hat{T}_2 = 34^\circ \quad [\angle s \text{ opp.} = \text{sides/teenoorg} = \text{sy}]$ $\therefore \hat{S}_3 = 90^\circ - 68^\circ = 22^\circ \quad \left[\begin{array}{l} \angle \text{in the semi-circle/} \\ \angle \text{in halfsirkel} \end{array} \right]$	OR/OF ✓ST/RE CA ✓ST/RE A ✓ST CA (3)
7.2.2	$\hat{O}_3 = 44^\circ \quad \left(\begin{array}{l} \angle \text{at centre} = 2 \times \angle \text{at circum./} \\ \text{mdpts} \angle = 2 \times \text{omtrk} \angle \end{array} \right)$ $\hat{O}_3 \neq \hat{R}_1$ ∴ OT is not parallel to SR (alt. ∠s are not equal) ∴ OT is nie parallel an SR (verw ∠^e nie gelyk) OR/OF $\hat{O}_3 = 44^\circ \quad \left(\begin{array}{l} \angle \text{at centre} = 2 \times \angle \text{at circum./} \\ \text{mdpts} \angle = 2 \times \text{omtrk} \angle \end{array} \right)$ $\hat{O}_2 = 68^\circ \quad \left(\begin{array}{l} \angle \text{at centre} = 2 \times \angle \text{at circum./} \\ \text{mdpts} \angle = 2 \times \text{omtrk} \angle \end{array} \right)$ $\hat{SOT} + \hat{OSR} = 44^\circ + 68^\circ + 56^\circ = 168^\circ \neq 180^\circ$ ∴ OT is not parallel to SR (co-int ∠s ≠ 180°) ∴ OT is nie parallel an SR (ko - binne ∠s ≠ 180°) OR/OF $\hat{S}_2 = \hat{T}_2 = 34^\circ \quad [\angle s \text{ opp.} = \text{sides/teenoorg} = \text{sy}]$ $\hat{S}_3 = 90^\circ - 68^\circ = 22^\circ \quad \left[\begin{array}{l} \angle \text{in the semi-circle/} \\ \angle \text{in dieslfde segment} \end{array} \right]$ $\hat{T}_2 \neq \hat{S}_3$ ∴ OT is not parallel to SR (alt. ∠s are not equal) ∴ OT is nie parallel an SR (verwisselende ∠^e nie gelyk)	✓ST ✓RE A ✓RE A OR/OF ✓ST A ✓ST A ✓RE A OR/OF ✓ST A ✓ST A ✓RE A (3)
		[15]

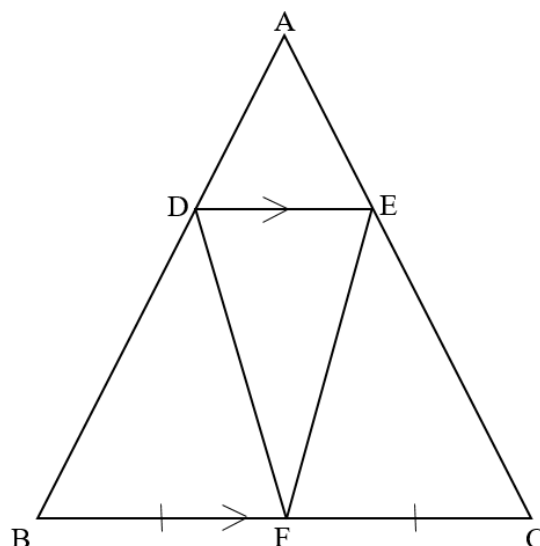
QUESTION/VRAAG 8



8.1	$\hat{M} = 98^\circ \neq 90^\circ$ $\therefore LN$ is not a diameter ($\angle$ subtended by $LN \neq 90^\circ$) $\therefore LN$ is nie 'n middellyn ($\angle$ deur LN onderspan $\neq 90^\circ$) OR/OF $\hat{P}_2 + 98^\circ = 180^\circ$ (Opp. $\angle$ s of cyclic quad.) / (teens $\angle^e$ KVHK) $\hat{P}_2 = 82^\circ \neq 90^\circ$ $\therefore LN$ is not a diameter ($\angle$ subtended by $LN \neq 90^\circ$) $\therefore LN$ is nie 'n middellyn ($\angle$ deur LN onderspan $\neq 90^\circ$)	$\checkmark$ ST $\hat{M} = 98^\circ \neq 90^\circ$ A $\checkmark$ RE A OR/OF $\checkmark$ ST $\hat{P}_2 = 82^\circ \neq 90^\circ$ A $\checkmark$ RE A (2)
8.2.1	$\hat{P}_2 + 98^\circ = 180^\circ$ (Opp. $\angle$ s of cyclic quad.) (teenst $\angle^e$ van 'n kvhk) $\hat{P}_2 = 82^\circ$	$\checkmark$ ST / RE A $\checkmark$ $\hat{P}_2 = 82^\circ$ A (2)
8.2.2	$\hat{P}_1 + 82^\circ = 180^\circ$ ($\angle$ s on straight line) / ($\angle$ op 'n r.lyn) $\therefore \hat{P}_1 = 98^\circ$ OR/OF $\hat{P}_1 = 98^\circ$ (Ext. $\angle$ of a cyclic quad.) / (buite $\angle$ van kvhk)	$\checkmark$ ST / RE A $\checkmark$ $\hat{P}_1 = 98^\circ$ CA OR/OF $\checkmark$ ST / RE A $\checkmark$ $\hat{P}_1 = 98^\circ$ CA (2)
8.2.3	$\hat{L}_1 = 27^\circ$ (tan-chord theorem) / rkl.koord st.	$\checkmark$ ST A $\checkmark$ RE A (2)

8.3.1	$\hat{K}$ is common/ <i>gemeen</i> $\hat{L}_1 = \hat{N}_1$ (both = 27° / <i>tan-chord / rkl – koord</i>) $\hat{P}_1 = \hat{KLN}$ (3rd $\angle$ of Δ / <i>3de $\angle$ van Δ</i>) $\therefore \Delta KLP \parallel \Delta KNL$ ($\angle, \angle, \angle$) OR Equiangular/ <i>gelykhoekig</i>	$\checkmark$ ST $\checkmark$ ST $\checkmark$ ST/RE	A A A (3)
8.3.2	$\frac{KL}{KN} = \frac{KP}{KL}$ ($\parallel \Delta$ s) $\therefore KL^2 = KN.KP$	$\checkmark$ ST $\checkmark$ RE	A A (2)
8.4	$KL^2 = KN.KP$ $(6)^2 = 13.KP$ $\therefore KP \approx 2,77$ units/ <i>eenhede</i>	$\checkmark$ subst/ verv $\checkmark$ value of / <i>waarde van</i> KP NPR	A A A (2)
8.5	$\hat{K} + 27^\circ + 98^\circ = 180^\circ$ ($\angle$ s of/ <i>van Δ</i>) $\therefore \hat{K} = 55^\circ$ $\hat{K} + \hat{M} = 55^\circ + 98^\circ \neq 180^\circ$ $\therefore KLMN$ is not a cyclic quad. $\therefore KLMN$ is <i>nie'n kvhk nie</i> OR/OF $\hat{K} + \hat{L}_1 = 86^\circ$ $\left(\begin{array}{l} \text{ext } \angle = \text{sum of opp.in t } \angle\text{s /} \\ \text{buite } \angle = \text{som vanteenoost.binne } \angle\text{e} \end{array} \right)$ $\therefore \hat{K} = 55^\circ$ $\hat{K} + \hat{M} = 55^\circ + 98^\circ \neq 180^\circ$ $\therefore KLMN$ is not a cyclic quad. $\therefore KLMN$ is <i>nie'n kvhk nie</i>	$\checkmark$ ST/RE $\checkmark$ value of / <i>waarde van</i> K $\checkmark$ Conclusion/ <i>gevolgt.</i> OR/OF $\checkmark$ ST/RE $\checkmark$ value of / <i>waarde van</i> K $\checkmark$ Conclusion/ <i>gevolgt.</i>	CA A A A CA A A (3)
			[18]

QUESTION/VRAAG 9

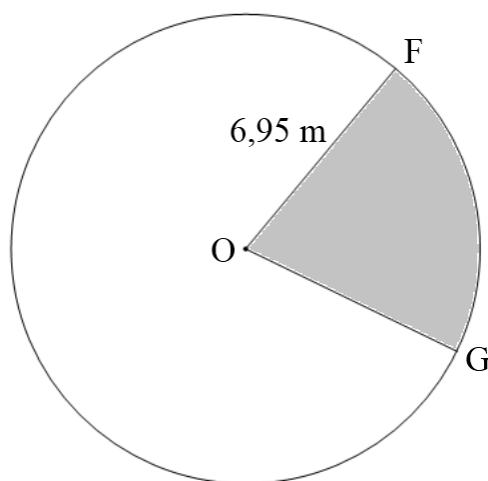


9.1.1	$\frac{AB}{DB} = \frac{AC}{EC} \quad (\text{Prop. theorem/ ewerd.st; } DE \parallel BC)$ $\frac{1,8}{DB} = \frac{3}{2}$ $DB = \frac{2}{3} \times 1,8 \text{ m}$ $\therefore DB = 1,2 \text{ m}$	✓ST/RE ✓length of / lengte van DB	A A (2)
9.1.2	$AD = \frac{1,8}{3} = 0,6 \text{ m} \quad \text{or/of } AD = 1,8 - 1,2 = 0,6 \text{ m}$ $\therefore DF = \frac{3}{2}(0,6 \text{ m}) = 0,9 \text{ m}$	✓M ✓length of / lengte van DF	CA CA (2)
9.2	$\frac{CF}{FB} = \frac{1}{1} = 1 \quad (\text{BF = FC; F is the midpoint of/ is die middelpunt van BC})$ $\frac{CE}{EA} = \frac{2}{1} = 2$ $\therefore \frac{CF}{FB} \neq \frac{CE}{EA}$ $\therefore EF \text{ is NOT parallel to/aan AB} \quad (\text{sides are not prop./ sye nie in verhouding})$ OR/OF $BF = FC; \text{ F is the midpoint of/ mdpt van BC}$ $AE \neq EC; \text{ ; E is NOT the midpoint of/ is NIE die middelpunt van AC}$ $\therefore EF \text{ is NOT parallel to/aan AB}$ $(\text{FE not joining midpoints of two sides of a triangle/ verbind nie twee middelpunte van 'n driehoek})$	✓ST ✓ST ✓Conclusion/ gevolg. OR/OF ✓ F is the midpoint of/ mdpt van BC ✓ E is NOT the midpoint of/ is NIE die middelpunt van AC ✓Conclusion/ gevolg	A A CA (3) A CA (3)
			[7]

QUESTION/VRAAG 10

10.1.1(a)	$BC = 6,95 - 4 = 2,95\text{m}$	✓height of segment/ hoogte van segment NPU	A (1)
10.1.1(b)	$h = 2,95\text{m}$ and/en $d = 13,9\text{m}$ $4h^2 - 4dh + x^2 = 0$ $4(2,95)^2 - 4(13,9)(2,95) + x^2 = 0$ $-129,21 + x^2 = 0$ $x^2 = 129,21$ $x = 11,36$ $ED \approx 11,37$ OR/OF Using the half chord of /Gebruik halfkoord van PQ $\frac{1}{2}ED = \sqrt{(6,95)^2 - (4)^2}$ $\frac{1}{2}ED = \sqrt{32,3025}$ $\frac{1}{2}ED = 5,68$ $ED \approx 11,37$	✓formula/ formule ✓SF ✓S ✓length /lengte OR/OF ✓Pythagoras ✓SF ✓S ✓length /lengte NPR NPU	A CA CA CA CA (4)

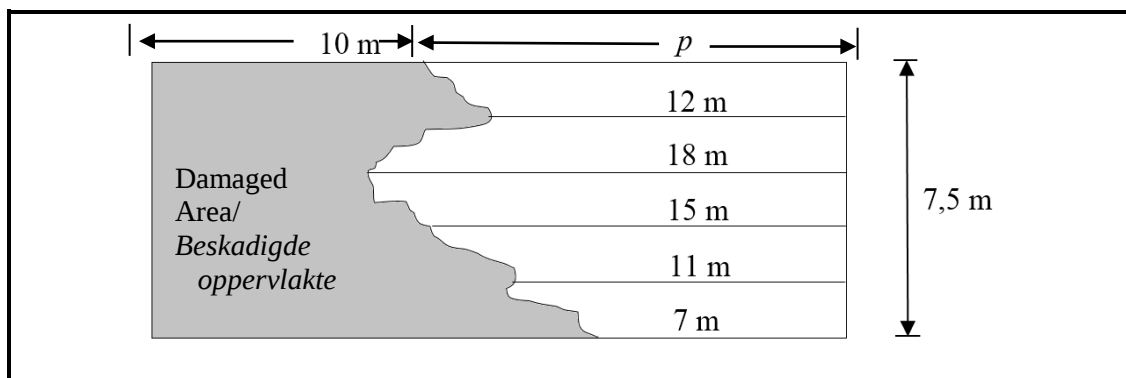
10.1.2



10.1.2(a)	angle of sector/ <i>hoek van sektor</i>, $\hat{FOG} = 20\% \times 2\pi$ $= \frac{2}{5}\pi = 1,26 \text{ rad}$ OR/OF angle of sector/<i>hk van sektor</i>, $\hat{FOG} = 360^\circ \times \frac{20}{100} = 72^\circ$ $72^\circ = 72^\circ \times \frac{\pi}{180^\circ}$ $= \frac{2}{5}\pi$ OR / OF 1,26 rad OR/OF Circmf. / <i>Omtrek</i> $= 2\pi r$ $= 2\pi(6,95)$ $= 43,67 \text{ m}$ $20\% \times 43,67 \text{ m} = 8,73$ $s = r\theta$ $8,73 = 6,95\theta$ $\theta = 1,26 \text{ rad}$	✓M A ✓✓ radian/ <i>radiaal</i> CA OR/OF ✓angle size/ <i>hoek grootte</i> A ✓M A ✓radian/ <i>radiaal</i> A OR/OF ✓Circumf. / <i>omtrek</i> A ✓M CA ✓ radian/ <i>radiaal</i> CA NPR NPU (3)
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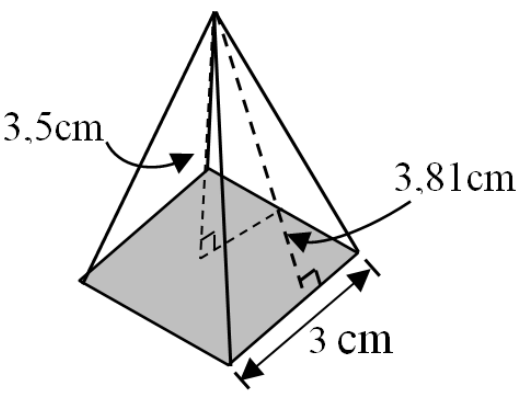
10.1.2(b)	$A = \frac{r^2 \theta}{2}$ $= \frac{(6,95)^2 (1,26)}{2}$ $\approx 30,43 \text{ m}^2$ OR/OF $A = \frac{r s}{2}$ $= \frac{(6,95)(8,73)}{2}$ $\approx 30,43 \text{ m}^2$ $A = 20\% \times \pi r^2$ $= 20\% \times \pi (6,95)^2$ $\approx 30,35 \text{ m}^2$	✓Formula/ formule A ✓SF A ✓area/ oppervlakte CA NPU OR/OF ✓Formula/ formule A ✓SF A ✓area/ oppervlakte CA NPU NPR (3)
10.2.1	$n = \frac{18}{3600}$ $n(\text{in rev/sec/sek}) = 0,005 \text{ rev/sec/sek}$ $n(\text{in rad/sec/sek}) = 0,005 \text{ rev/sec/sek} \times 2\pi$ $= 0,01\pi \text{ rad/sec/sek or/of}$ $0,03141.. \text{rad/sec/sek}$	✓M n (in rev/sec/sek) A ✓value of/ waarde van n CA NPU NPR AO Full marks/ Volpunte (2)
10.2.2	$D = 2 \times 10 \text{ m} = 20 \text{ m}$ $v = \pi D n$ $= \pi \times 20 \times \left(\frac{18}{3600} \right)$ $= 0,1\pi \text{ m/s}$ OR/OF $v = 2\pi r n$ $= 2\pi \times 10 \times \left(\frac{18}{3600} \right)$ $\approx 0,31 \text{ m/s}$	✓Formula/ formule A ✓SF CA ✓circum.velocity/ omtrekssnelheid CA NPU NPR (3)
10.2.3	$\omega = 2\pi n$ $= 2\pi \left(\frac{18}{3600} \right)$ $= 0,01\pi \text{ rad/sec/sek}$ OR/OF $\approx 3,14 \times 10^{-2} \text{ rad/sec/sek}$	✓Formula/ formule A ✓SF CA ✓ang.velocity/ hoeksnelheid CA NPU NPR (3)
		[19]

QUESTION 11



11.1.1	Area = length $\times$ breadth/ <i>Oppervlakte = lengte $\times$ breedte</i> 187,5 = length $\times$ 7,5 OR/OF length / lengte = $\frac{A}{b} = \frac{187,5}{7,5}$ length / lengte = 25 m	✓M A ✓length/lengte A AO Full marks/ Volpunte (2)
11.1.2	p = 15 m	✓values of/waarde van p CA (1)
11.1.3	$A_T = a \left(\frac{o_1 + o_n}{2} + o_2 + o_3 + \dots + o_{n-1} \right)$ $= 1,5 \left(\frac{15+7}{2} + 12+18+15+11 \right) m^2$ $= 1,5 (11+12+18+15+11) m^2$ $= 100,50 m^2$ Damaged area/beskadigde oppervlakte = 187,5 – 100,50 = 87 m² It will take 87 $\times$ 0,25 hours = 21,75 hours to repair the damaged area Dit sal 87 $\times$ 0,25 uur = 21,75 ure vat om die beskadigde oppervlakte te herstel OR/OF $A_T = a (m_1 + m_2 + m_3 + \dots + m_n)$ $= 1,5 \left(\frac{15+12}{2} + \frac{12+18}{2} + \frac{18+15}{2} + \frac{15+11}{2} + \frac{11+7}{2} \right) m^2$ $= 1,5 (13,5 + 15 + 16,5 + 13 + 9) m^2$ $= 100,50 m^2$ Damaged area/ beskadigde oppervlakte = 187,5 – 100,50 = 87 m² It will take 87 $\times$ 0,25 hours = 21,75 hours to repair the damaged area Dit sal 87 $\times$ 0,25 uur = 21,75 ure vat om die beskadigde oppervlakte te herstel OR/OF	✓formula/formule A ✓value of/ waarde van a A ✓SF CA ✓value of/waarde van A_T CA ✓87 m² CA ✓time/tyd CA OR/OF ✓F A ✓value of/ waarde van a A ✓SF CA ✓value of/waarde van A_T CA ✓87 m² CA ✓Time/tyd CA OR/OF

$A_T = a \left(\frac{o_1 + o_n}{2} + o_2 + o_3 + \dots + o_{n-1} \right)$ $= 1,5 \left(\frac{10+18}{2} + 13 + 7 + 10 + 14 \right) m^2$ $= 1,5 (14 + 13 + 7 + 10 + 14) m^2$ $= 87 m^2$ It will take $87 \times 0,25$ hours = 21,75 hours to repair the damaged area <i>Dit sal $87 \times 0,25$ uur = 21,75 ure vat om die beskadigde oppervlakte te herstel</i>	✓F A ✓value of/ waarde van a A ✓NEW ordinates/NUWE ordinate CA ✓SF CA ✓value of/waarde van A_T CA ✓Time/tyd CA (6)
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11.2		
11.2.1	$1 \ell = 1\,000 \text{ cm}^3$ $1,5 \ell = 1500 \text{ cm}^3$	✓ value of/ waarde van volume A (1)
11.2.2	$\text{TSA/TBO} = 4 \left(\frac{1}{2} \text{side length of base} \times \text{slant height} \right) + (\text{side length})^2 /$ $= 4 \times \left[\frac{1}{2} (\text{sylengte van basis}) \times (\text{skuinshoogte}) \right] + (\text{sylengte})^2$ $= 4 \left(\frac{1}{2} \times 3 \times 3,81 \right) + (3 \times 3)$ $= 22,86 + 9$ $= 31,86 \text{ cm}^2$	✓ F A ✓ SF A ✓ value of/ waarde van TSA CA NPR/NPU AO Full marks/ Volpunte

11.2.3	Volume of pyramid = $\frac{1}{3}(\text{length} \times \text{breadth}) \times \perp \text{Height}$ / <i>Volume van piramide = $\frac{1}{3} \times (\text{lengte} \times \text{breedte}) \times \perp \text{hoogte}$</i> $= \frac{1}{3}(3 \times 3) \times 3,5$ $= 10,5 \text{ cm}^3$ number of small pyramids / <i>aantal klein piramide</i> = $\frac{1500}{10,5}$ $\approx 142,86$ $\therefore 142$ Remaining milk / <i>Oorblywende melk</i> = $1500 - (142 \times 10,5)$ OR/OF $0,86 \times 10,5$ $= 9 \text{ cm}^3$ OR/OF <i>9 ml</i>	✓SF A ✓ value of/ waarde van $V_{\text{pyramid /piramide}}$ CA ✓M CA ✓ value of/ waarde van CA NPU/NPR (4) [17]
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TOTAL/TOTAAL: 150