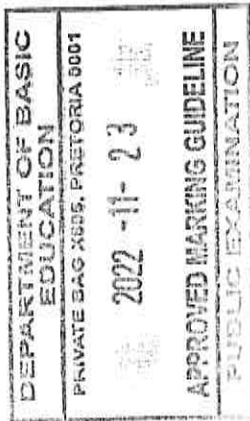




basic education

Department:
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REPUBLIC OF SOUTH AFRICA



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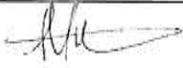
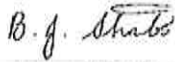
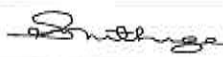
GRADE 12/GRAAD 12

TECHNICAL MATHEMATICS P2/TEGNIESE WISKUNDE V2 NOVEMBER 2022 FINAL MARKING GUIDELINES/FINALE 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
F	Formula/Formule
SF	Substitution in correct formula/Vervanging in korrekte formule
ST/RE	Statement with reason/Bewering met rede

These marking guidelines consist of 26 pages. Hierdie nasienriglyne bestaan uit 26 bladsye.

EXTERNAL/EKSTERNE MODERATORS	INTERNAL /INTERNE MODERATORS
M.A. HENDRICKS	N. TOM
 MA HENDRICKS External Moderator UMALUSI	
B.J SHABANGU	N.S MUTHIGE
	
DATE APPROVED/DATUM GOEDGEKEUR	20 NOVEMBER 2022

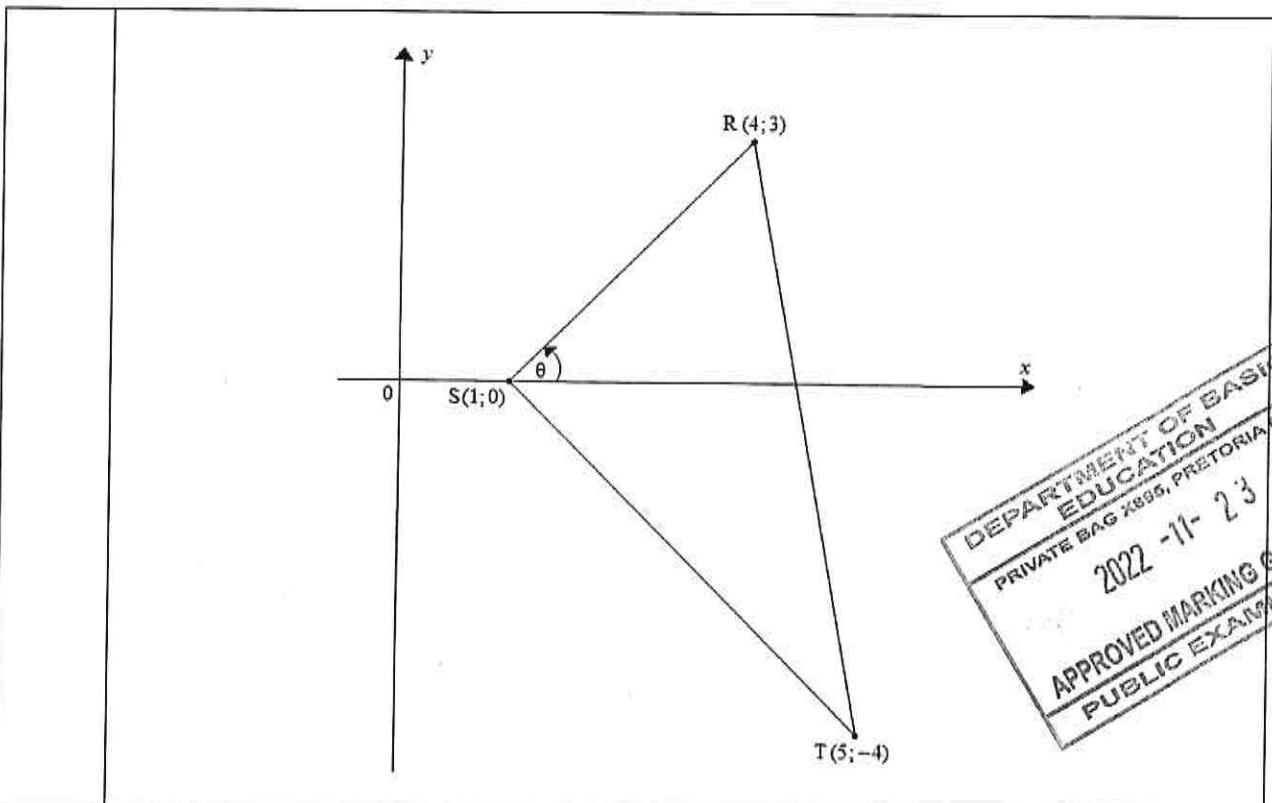
NOTE:

- If a candidate answers a question **TWICE**, only mark the **FIRST** attempt.
- Consistent Accuracy marking to be applied where indicated.
- Penalty for incorrect rounding only in QUESTION 10.2.3
- # Shows questions where Tolerance Range will be applied: Q 3.3; Q 4.1.3; Q 10.1.2; Q10.2.3

LET WEL:

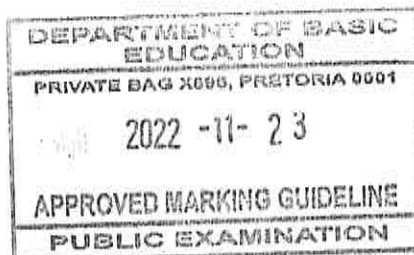
- Indien 'n kandidaat 'n vraag **TWEE** keer beantwoord, sien slegs die **EERSTE** poging na.
- Volgehoue akkuraatheid-nasien moet toegepas word soos aangedui.
- Penalisering vir foutiewe afronding slegs in **VRAAG 10.2.3**
- # Toon vrae waar Toleransie wyde toegepas word: V 3.3; V 4.1.3; V10.1.2; V 10.2.3

QUESTION/VRAAG 1

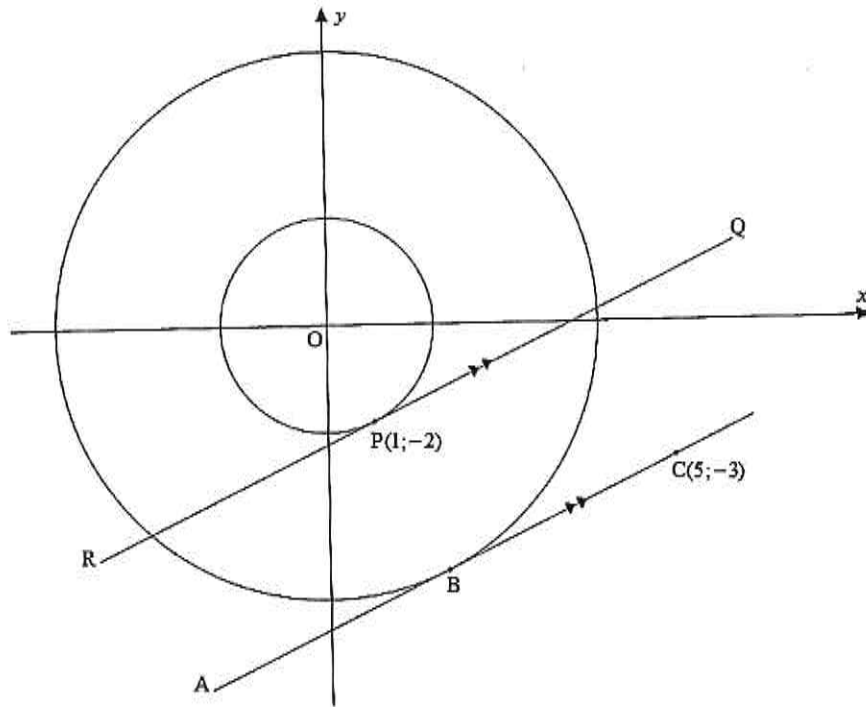


1.1	$m_{RS} = \frac{y_R - y_S}{x_R - x_S} = \frac{3 - 0}{4 - 1}$ $= 1$	✓ SF A ✓ gradient CA AO Full marks/ Volpunte (2)
1.2.1	$m = \tan \theta$ OR/OF $\theta = \tan^{-1}(m)$	✓ F A (1)

1.2.2	$\tan \theta = 1$ $\theta = 45^\circ$	✓ SF CA ✓ value of / waarde van θ CA AO Full marks/ Volpunte (2)
1.3	$RT = \sqrt{(x_T - x_R)^2 + (y_T - y_R)^2}$ $= \sqrt{(5 - 4)^2 + (-4 - 3)^2}$ $= \sqrt{50}$ or / of $5\sqrt{2}$	✓ SF A ✓ S CA AO Full marks/ Volpunte (2)
1.4	$M_{ST} \left(\frac{x_S + x_T}{2}; \frac{y_S + y_T}{2} \right)$ $= \left(\frac{5+1}{2}; \frac{-4+0}{2} \right)$ $= (3; -2)$	✓ x-value/ waarde A ✓ y-value/ waarde A AO Full marks/ Volpunte (2)
1.5.1	Equal/ the same / gelyk / dieselfde	✓ answer / antwoord A (1)
1.5.2	$m_{\parallel \text{line} / \text{lyn}} = 1$ $y = 1x + c$ OR/OF $y + 2 = 1(x - 3)$ $-2 = 1 \times 3 + c$ $y + 2 = x - 3$ $c = -5$ $y = x - 3 - 2$ $\therefore y = x - 5$	✓ gradient value/ waarde CA CA From/vanaf Q1.1 ✓ SF CA CA From/vanaf Q1.4 ✓ equation / vergelyking CA (3)
		[13]



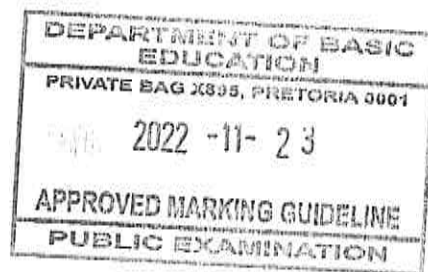
QUESTION/VRAAG 2



<p>2.1.1</p>	$x^2 + y^2 = r^2$ $(1)^2 + (-2)^2 = r^2$ $r^2 = 5$ $\therefore x^2 + y^2 = 5$ <p style="text-align: center;">OR/OF</p> $x^2 + y^2 = (1)^2 + (-2)^2$ $= 5$ <p style="text-align: center;">OR/OF</p> $x^2 + y^2 = (1)^2 + (-2)^2$ $= 5$ $y = \pm\sqrt{5-x^2} \quad \text{OR/OF} \quad x = \pm\sqrt{5-y^2}$	<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</p> <p style="text-align: center;">OR/OF</p> <p>✓ SF A</p> <p>✓ equation/vergelyking CA</p> <p style="text-align: right;">AO Full marks/ Volpunte</p> <p style="text-align: right;">(2)</p>
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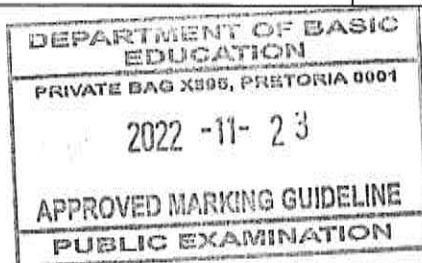
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2.1.2	$m_{OP} = -2$	✓ gradient of/van OP	A (1)
2.1.3	Radius/Diameter is perpendicular to tangent <i>Radius/middel lyn is loodreg aan die raaklyn</i>	✓ RE	A (1)
2.1.4	$m_{RQ} = \frac{1}{2}$ OR/OF $\therefore m_{AC} = \frac{1}{2}$	$m_{AC} \times m_{OP} = -1$ $m_{AC} \times (-2) = -1$ $m_{AC} = \frac{1}{2}$	✓ gradient of/van RQ CA ✓ gradient of/van AC CA AO Full marks/ Volpunte (2)
2.1.5	$y - (-3) = \frac{1}{2}(x - 5)$ OR/OF $-3 = \frac{1}{2}(5) + c$ $y = \frac{1}{2}x - \frac{5}{2} - 3$ $c = -3 - \frac{5}{2}$ $y = \frac{1}{2}x - \frac{11}{2}$	✓ substitution/ vervanging CA ✓ S CA ✓ equation/ vergelyking CA (3)	
2.2.1	$\frac{x^2}{6^2} + \frac{y^2}{4^2} = 1$	✓ standard form/standaard vorm	A (1)
2.2.2		✓ x and y –intercepts/ afsnitte CA ✓ elliptical shape/ eliptiese vorm CA (2)	
			[12]



QUESTION/VRAAG 3

3.1.1	$\frac{2}{7}\pi \text{ rad} = \frac{2}{7}\pi \times \frac{180^\circ}{\pi} = \frac{360^\circ}{7} \text{ OR/OF}$ $\approx 51,43^\circ$	✓ angle in degrees/ <i>hoek in grade</i> A <div style="border: 1px solid black; padding: 2px; display: inline-block;">NPR</div> (1)
3.1.2	$\text{cosec } P - \cos Q$ $= \text{cosec } (51,43^\circ) - \cos(37^\circ)$ $\approx 0,48$ <p style="text-align: center;">OR/OF</p> $\text{cosec } P - \cos Q$ $= \text{cosec} \left(\frac{2}{7}\pi \right) - \cos \left(37^\circ \times \frac{\pi}{180^\circ} \right)$ $\approx 0,48$	✓ substitution/ <i>vervanging</i> CA ✓ S CA <p style="text-align: center;">OR/OF</p> ✓ substitution/ <i>vervanging</i> CA ✓ S CA <div style="border: 1px solid black; padding: 2px; display: inline-block;">NPR</div> <div style="border: 1px solid black; padding: 2px; display: inline-block;">AO Full marks/ <i>Volpunte</i></div> (2)
3.2.1	$(-\sqrt{5})^2 + k^2 = 3^2$ $\therefore k^2 - 4 = 0 \quad \text{OR/OF} \quad k^2 = 4$ $(k-2)(k+2) = 0 \quad \quad \quad k = \pm 2$ $k = 2 \text{ or / of } k = -2$ $\therefore k = 2$	✓ substitution/ <i>vervanging</i> A ✓ factors or square root / <i>faktore of vierkantswortel</i> CA ✓ correct value of/ <i>korrekte waarde van k</i> CA <div style="border: 1px solid black; padding: 2px; display: inline-block;">AO Full marks/ <i>Volpunte</i></div> (3)
3.2.2	$\sqrt{5} \cot \theta + 1 \quad \text{OR/OF} \quad \sqrt{5} \left(\frac{1}{\tan \theta} \right) + 1$ $= \sqrt{5} \left(-\frac{\sqrt{5}}{2} \right) + 1 \quad \quad \quad \sqrt{5} \left(\frac{1}{-\frac{\sqrt{5}}{2}} \right) + 1$ $= -\frac{5}{2} + 1$ $= -\frac{3}{2}$	✓ substitution/ <i>vervanging</i> CA ✓ S CA ✓ S CA (3)



[Signature]

B. J. Shab

[Signature]

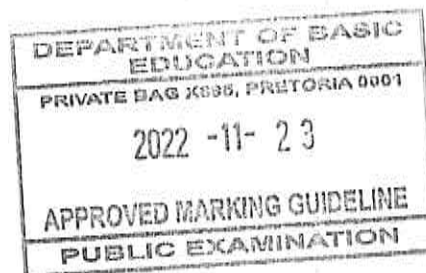
[Signature]

<p>3.3</p>	<p> $3 \tan x = -0,531$ $\tan x = -0,177$ Ref/ verw. $\angle \approx 10,04^\circ$ $x \approx 180^\circ - 10,04^\circ$ or/of $x \approx 360^\circ - 10,04^\circ$ $\therefore x \approx 169,96^\circ$ $\therefore x \approx 349,96^\circ$ <p style="text-align: center;">OR / OF</p> $3 \tan x = -0,531$ $\tan x = -0,177$ $x = 180^\circ - \tan^{-1} 0,177$ OR/OF $x = 360^\circ - \tan^{-1} 0,177$ $\therefore x \approx 169,96^\circ$ $x \approx 349,96^\circ$ </p>	<p> \checkmark S A \checkmark ref. Angle/verw. hoek CA \checkmark both quadrants/beide kwadrante A \checkmark both values of/beide wrde van x CA <p style="text-align: center;">OR / OF</p> \checkmark S A \checkmark S CA \checkmark both quadrants/beide kwadrante A \checkmark both values of/beide wrde van x CA (4) </p>
		<p>[13]</p>

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QUESTION/VRAAG 4

4.1.1	$-\sin \alpha$	✓ reduction/ reduksie	A (1)
4.1.2	$(-\tan \alpha)^2 = \tan^2 \alpha$ OR/OF $\frac{\sin^2 \alpha}{\cos^2 \alpha}$	✓ $-\tan \alpha$ ✓ $\tan^2 \alpha = \frac{\sin^2 \alpha}{\cos^2 \alpha}$	A A
		AO Full marks/ Volpunte	(2)
4.1.3	$\frac{\sin(360^\circ - \alpha) \cdot \tan(180^\circ - \alpha) \cdot \operatorname{cosec}(2\pi - \alpha)}{\cos(360^\circ + \alpha) \cdot \operatorname{cosec}(180^\circ - \alpha) \cdot \tan^2(\pi - \alpha)}$ $= \frac{(-\sin \alpha) \cdot (-\tan \alpha) \cdot (-\operatorname{cosec} \alpha)}{(\cos \alpha) \cdot (\operatorname{cosec} \alpha) \cdot (\tan^2 \alpha)}$ $= \frac{-\sin \alpha}{(\cos \alpha) \cdot \left(\frac{\sin \alpha}{\cos \alpha}\right)}$ $= \frac{-\sin \alpha}{\sin \alpha}$ $= -1$ <p style="text-align: center;">OR/OF</p> $\frac{\sin(360^\circ - \alpha) \cdot \tan(180^\circ - \alpha) \cdot \operatorname{cosec}(2\pi - \alpha)}{\cos(360^\circ + \alpha) \cdot \operatorname{cosec}(180^\circ - \alpha) \cdot \tan^2(\pi - \alpha)}$ $= \frac{(-\sin \alpha) \cdot (-\tan \alpha) \cdot (-\operatorname{cosec} \alpha)}{(\cos \alpha) \cdot (\operatorname{cosec} \alpha) \cdot (\tan^2 \alpha)}$ $= \frac{(-\tan \alpha)(-\tan \alpha)(-1)}{(\tan^2 \alpha)}$ $= -1$	CA From Q4.1.1 and Q4.1.2 CA Vanuit V4.1.1 en V4.1.2 ✓ $-\tan \alpha$ A ✓ $-\operatorname{cosec} \alpha$ A ✓ $\cos \alpha$ A ✓ $\operatorname{cosec} \alpha$ A ✓ I $\frac{\sin \alpha}{\cos \alpha}$ A ✓ -1 CA <p style="text-align: center;">OR/OF</p> ✓ $-\tan \alpha$ A ✓ $-\operatorname{cosec} \alpha$ A ✓ $\cos \alpha$ A ✓ $\operatorname{cosec} \alpha$ A ✓ I $\tan \alpha$ A ✓ -1 CA	(6)

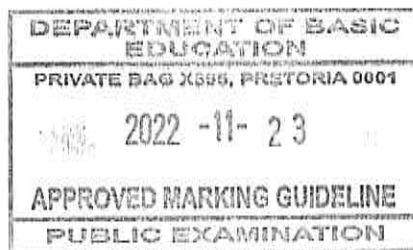


4.2	$\cos^2 x$	✓ I A (1)
4.3	<p>$\operatorname{cosec} x - \sin x = \cot x \cdot \cos x$</p> <p>LHS/LK = $\operatorname{cosec} x - \sin x$</p> $= \frac{1}{\sin x} - \sin x$ $= \frac{1 - \sin^2 x}{\sin x}$ $= \frac{\cos^2 x}{\sin x}$ $= \frac{\cos x}{\sin x} \cdot \cos x$ $= \cot x \cdot \cos x = \text{RHS} / \text{RK}$ <p style="text-align: center;">OR / OF</p> <p>RHS/RK = $\cot x \cdot \cos x$</p> $= \frac{\cos x}{\sin x} \cdot \cos x$ $= \frac{\cos^2 x}{\sin x}$ $= \frac{1 - \sin^2 x}{\sin x}$ $= \frac{1}{\sin x} - \frac{\sin^2 x}{\sin x}$ $= \operatorname{cosec} x - \sin x$ $= \text{LHS} / \text{LK}$ <p style="text-align: center;">OR / OF</p> <p>LHS/LK = $\operatorname{cosec} x - \sin x$</p> $= \frac{1}{\sin x} - \sin x$ $= \frac{1 - \sin^2 x}{\sin x}$ $= \frac{\cos^2 x}{\sin x}$ <p>RHS/ RK = $\cot x \cdot \cos x$</p> $= \frac{\cos x}{\sin x} \cdot \cos x$ $= \frac{\cos^2 x}{\sin x} = \text{LHS} / \text{LK}$	<p>✓ I $\frac{1}{\sin x}$ A</p> <p>✓ S CA</p> <p>✓ I $\cos^2 x$ A</p> <p>✓ I $\frac{\cos x}{\sin x}$ A</p> <p style="text-align: center;">OR / OF</p> <p>✓ I $\frac{\cos x}{\sin x}$ A</p> <p>✓ S CA</p> <p>✓ I $1 - \sin^2 x$ A</p> <p>✓ I $\frac{1}{\sin x}$ A</p> <p style="text-align: center;">OR / OF</p> <p>✓ I $\frac{1}{\sin x}$ A</p> <p>✓ S CA</p> <p>✓ I $\cos^2 x$ A</p> <p>✓ I $\frac{\cos x}{\sin x}$ A</p> <p>(4)</p>
		[14]

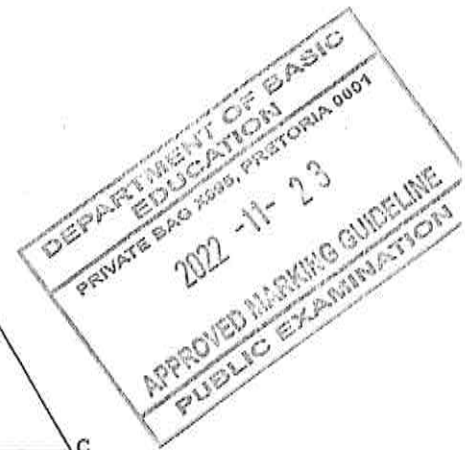
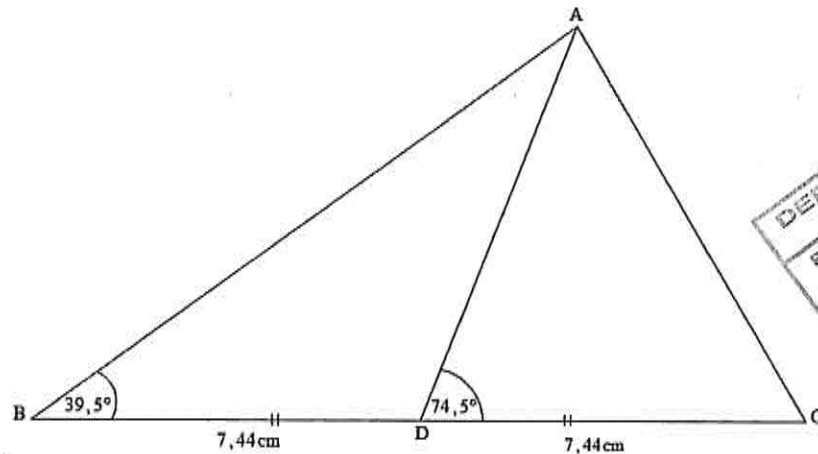


QUESTION/VRAAG 5

5.1.1	360°	✓ period/ periode A (1)
5.1.2	1	✓ amplitude A (1)
5.2		<p>f:</p> <ul style="list-style-type: none"> ✓ shape/vorm A ✓ y-intercept/ afsnt A ✓ x-intercepts/ afsnt A ✓ end point/ eindpunt (360°;0,5) A <p>g:</p> <ul style="list-style-type: none"> ✓ shape/vorm A ✓ y-intercept/ afsnt A ✓ x-intercepts/ afsnt A <p>(7)</p>
5.3	$x \in (180^\circ ; 360^\circ)$ OR/OF $180^\circ < x < 360^\circ$	<ul style="list-style-type: none"> ✓ Critical values/kritiese waardes CA ✓ correct notation/korrekte notasie CA <p>(2)</p> <p style="text-align: right;">[11]</p>



QUESTION/VRAAG 6



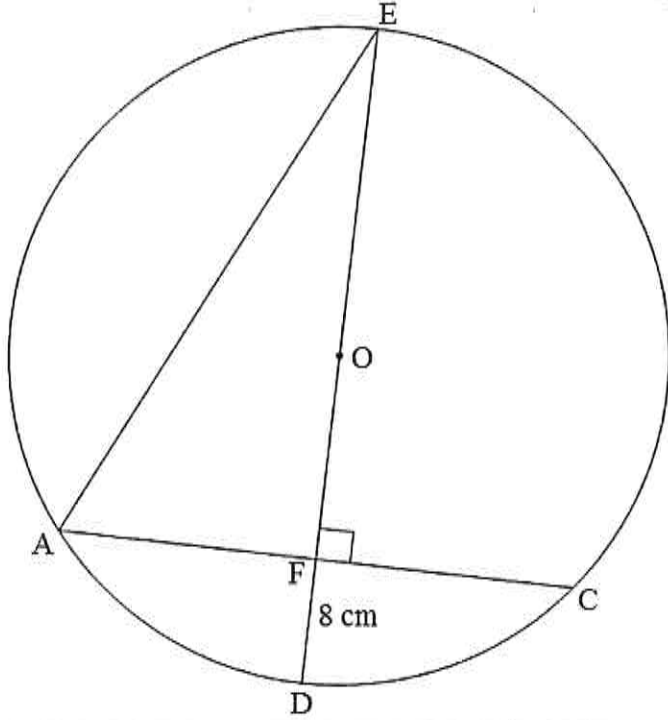
6.1.1	$\hat{B}AD = 74,5^\circ - 39,5^\circ = 35^\circ$	✓ size/ grootte — A (1)
6.1.2	$\hat{A}DB = 180^\circ - 74,5^\circ = 105,5^\circ$ OR/OF $\hat{A}DB = 180^\circ - 39,5^\circ - 35^\circ = 105,5^\circ$	✓ size/ grootte A OR/OF ✓ size/ grootte A (1)
6.2.1	$\frac{AB}{\sin \hat{B}DA} = \frac{BD}{\sin \hat{B}AD}$ OR/OF $\frac{d}{\sin \hat{B}DA} = \frac{BD}{\sin A}$ OR/OF $\frac{d}{\sin \hat{B}DA} = \frac{BD}{\sin 35^\circ}$	✓ Complete sine rule/voltooi sinus-reël A (1)
6.2.2	In $\triangle ABD$: $\frac{AB}{\sin 105,5^\circ} = \frac{7,44}{\sin 35^\circ}$ $AB = \frac{7,44 \sin 105,5^\circ}{\sin 35^\circ}$ $\approx 12,5 \text{ cm}$ OR/ OF In $\triangle ADB$: $\frac{AD}{\sin 39,5^\circ} = \frac{7,44}{\sin 35^\circ}$ $AD = \frac{7,44 \sin 39,5^\circ}{\sin 35^\circ} \approx 8,25 \text{ cm}$ $AB^2 = AD^2 + BD^2 - 2 \times AD \times BD \times \cos D$ $AB^2 = 8,25^2 + 7,44^2 - 2 \times 8,25 \times 7,44 \times \cos 105,5^\circ$ $AB \approx 12,5 \text{ cm}$	✓ SF CA ✓ length of/ lengte van AB CA OR/OF ✓ length of/ lengte van AD CA ✓ length of/ lengte van AB CA

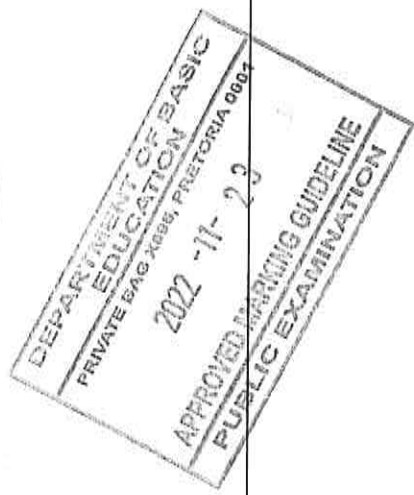
(2)

<p>6.3</p>	<p>In $\triangle ABC$:</p> $AC^2 = BC^2 + AB^2 - 2 BC \times AB \cos B$ $= 14,88^2 + 12,5^2 - 2(14,88)(12,5) \cos 39,5^\circ$ $= 90,62005498$ <p>$\therefore AC \approx 9,52 \text{ cm}$</p> <p style="text-align: center;">OR / OF</p> <p>In $\triangle ABD$:</p> $\frac{AD}{\sin 39,5^\circ} = \frac{7,44}{\sin 35^\circ}$ $AD = \frac{7,44 \sin 39,5^\circ}{\sin 35^\circ} \approx 8,25 \text{ cm}$ <p>\therefore In $\triangle ADC$:</p> $AC^2 = AD^2 + DC^2 - 2 AD \times DC \times \cos D$ $AC^2 = 8,25^2 + 7,44^2 - 2 \times 8,25 \times 7,44 \times \cos 74,5^\circ$ $AC^2 = 90,60991695$ <p>$\therefore AC \approx 9,52 \text{ cm}$</p>	<p>✓ M cosine rule/reël A</p> <p>✓ SF CA</p> <p>✓ length of/ lengte van AC CA</p> <p style="text-align: center;">OR / OF</p> <p>✓ length of AD A</p> <p>✓ M cosine rule/reël A</p> <p>✓ length of/ lengte van AC CA</p> <p style="text-align: right;">(3)</p>
<p>6.4</p>	<p>Area of/Oppervlakte van $\triangle ABC = \frac{1}{2} AB \times BC \sin B$</p> $= \frac{1}{2} (12,5)(14,88) \sin 39,5^\circ$ $\approx 59,16 \text{ cm}^2$ <p style="text-align: center;">OR/OF</p> <p>Height/Hoogte = $12,5 \sin 39,5^\circ \approx 7,95$</p> $= \frac{1}{2} bh = \frac{1}{2} AC \times h$ $\approx \frac{1}{2} (14,88)(7,95)$ $\approx 59,16 \text{ cm}$	<p>✓ M area rule/ oppervlakte reël A</p> <p>✓ SF CA</p> <p>✓ Area / oppervlakte CA</p> <p style="text-align: center;">OR/OF</p> <p>✓ M area rule/ oppervlakte reël A</p> <p>✓ SF CA</p> <p>✓ Area / oppervlakte CA</p> <p style="text-align: right;">(3)</p>
<p>[11]</p>		

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QUESTION/VRAAG 7

7.1	Perpendicular bisector / <i>middelloodlyn...</i>	✓ A (1)
7.2		
	<p>AF = 15 cm (line from centre \perp chord / <i>lyn vanaf middelpnt \perp koord</i>)</p> <p>EF = 34 cm – 8 cm = 26 cm</p> <p>AE = $\sqrt{AF^2 + EF^2} = \sqrt{26^2 + 15^2}$ (Pythagoras) $= \sqrt{901}$ or / of $\approx 30,02$ cm</p> <p style="text-align: center;">OR / OF</p> <p>AF = 15 cm (line from centre \perp chord / <i>lyn vanaf middelpnt \perp koord</i>)</p> <p>EF = 34 cm – 8 cm = 26 cm</p> <p>AE² = AF² + EF² – 2(AE)(EF) cos 90° $= (15)^2 + (26)^2 - 2(15)(26) \cos 90^\circ$</p> <p>AE = $\sqrt{901}$ or / of $\approx 30,02$ cm</p> <p style="text-align: center;">OR / OF</p>	<p>✓ ST A ✓ RE A</p> <p>✓ ST length of / <i>lengte van</i> EF A</p> <p>✓ ST CA ✓ ST CA</p> <p style="text-align: center;">OR / OF</p> <p>✓ ST A ✓ RE A</p> <p>✓ ST length of / <i>lengte van</i> EF A</p> <p>✓ ST CA</p> <p>✓ ST CA</p> <p style="text-align: center;">OR / OF</p>



	<p>AF = 15 cm (line from centre \perp chord / lyn vanaf middelpnt \perp koord)</p> <p>EF = 34 cm – 8 cm = 26 cm</p> <p>$\tan E = \frac{AF}{FE} = \frac{15}{26}$</p> <p>$\hat{E} \approx 29,98^\circ$</p> <p>$\sin E = \frac{AF}{AE}$</p> <p>$AE \approx \frac{15}{\sin 29,98^\circ}$ $\approx 30,02 \text{ cm}$</p>	<p>✓ ST A ✓ RE A</p> <p>✓ ST length of / lengte van EF A</p> <p>✓ ST CA</p> <p>✓ ST CA</p> <p>(5)</p> <p>[6]</p>
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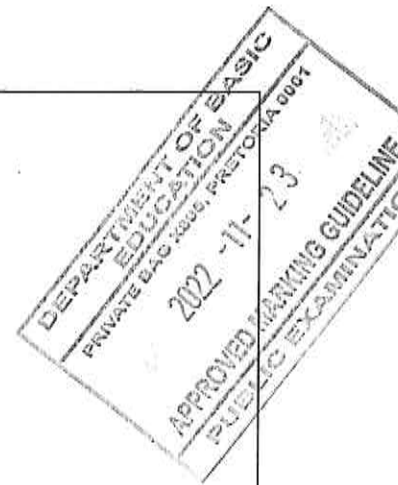


QUESTION/VRAAG 8

8.1	Interior opposite angle / teenoorstaande binnehoek	✓	A (1)
8.2			
8.2.1 a)	$\hat{A}_2 = 30^\circ$ (\angle s in the same segment / \angle e in dieselfde segment)	✓ ST ✓ RE	A A (2)
8.2.1 b)	$\hat{C}_1 = 52^\circ$ (ext \angle of Δ / buite \angle van Δ)	✓ ST ✓ RE	CA A (2)
8.2.1 c)	$\hat{C}_3 = 96^\circ$ (ext \angle of cyclic quad / buite \angle van kdvh)	✓ ST ✓ RE	CA A (2)
8.2.2	<p> $\hat{M}_3 = 82^\circ$ (ext \angle of Δ / buite \angle van Δ) </p> <p> $\hat{M}_3 + \hat{N} = 82^\circ + 22^\circ = 104^\circ \neq 180^\circ$ \therefore MCND is NOT cyclic / NIE siklies NIE </p> <p> (opp \angles NOT suppl/ teenoorst \anglee NIE suppl) </p> <p>OR/OF</p> <p> From/vanaf Q/V8.2.1 b) $\hat{C}_1 = 52^\circ \neq \hat{M}_3 = 128^\circ$ </p> <p> \therefore MCND is NOT cyclic / NIE siklies NIE (ext $\angle \neq$ int opp \angle / buite $\angle \neq$ teen. binne \angle) </p> <p>OR/OF</p> <p> $\hat{M}_2 = 98^\circ \neq \hat{N} = 22^\circ$ </p> <p> \therefore MCND is NIE cyclic / NIE siklies NIE (ext $\angle \neq$ int opp \angle / buite $\angle \neq$ teen. binne \angle) </p>		

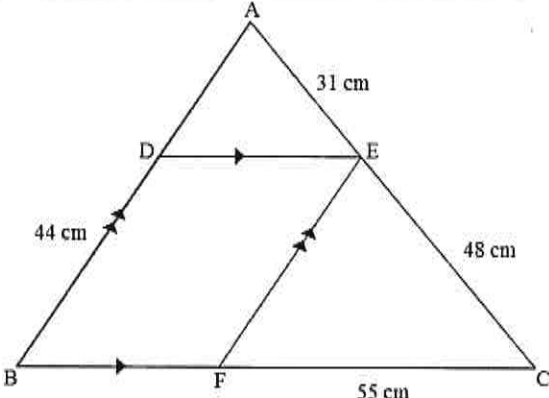
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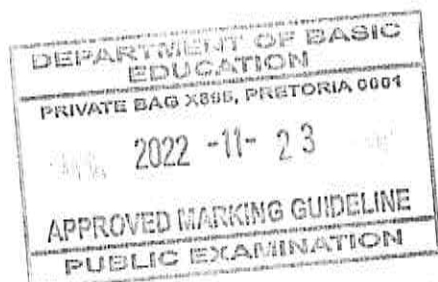
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<p>8.3</p>		
<p>8.3.1</p>	<p>$\hat{OBT} = 90^\circ$ $\hat{OCT} = 90^\circ$ tan/raaklyn \perp rad</p>	<p>✓ \hat{OBT} A ✓ \hat{OCT} A ✓ RE..... A (3)</p>
<p>8.3.2 a)</p>	<p>$\hat{BOC} = 120^\circ$ $\left(\begin{array}{l} \text{sum of int } \angle\text{s of a quad /} \\ \text{som vd binne } \angle\text{e van 'n vkh} \end{array} \right)$ $\hat{A} = 60^\circ$ $\left(\begin{array}{l} \angle \text{at centre} = 2 \times \angle \text{at circum /} \\ \text{midpts } \angle = 2 \times \text{omtreks } \angle \end{array} \right)$</p> <p style="text-align: center;">OR/ OF</p> <p>TBOC is cyclic/siklies $\left(\begin{array}{l} \text{CONVERSE opp } \angle\text{s of cyclic quad /} \\ \text{OMGEKEERDE teenoorst } \angle\text{e van kdvh} \end{array} \right)$</p> <p>$\hat{BOC} = 120^\circ$ $\left(\begin{array}{l} \text{opp } \angle\text{s of cyclic quad /} \\ \text{teenoorst } \angle\text{e van kdvh} \end{array} \right)$ $\hat{A} = 60^\circ$ $\left(\begin{array}{l} \angle \text{at centre} = 2 \times \angle \text{at circum /} \\ \text{midpts } \angle = 2 \times \text{omtreks } \angle \end{array} \right)$</p>	<p>✓ ST A ✓ RE A ✓ ST CA ✓ RE A</p> <p style="text-align: center;">OR/ OF</p> <p>✓ RE A ✓ ST A ✓ ST CA ✓ RE A (4)</p>
<p>8.3.2 b)</p>	<p>$\hat{E} = 120^\circ$ $\left(\begin{array}{l} \text{opp } \angle\text{s of cyclic quad} \\ \text{teenoorst } \angle\text{e van kdvh} \end{array} \right)$ OR/ OF reflex /inspringend $\hat{BOC} = 240^\circ$ (Revolution /omwenteling) $\hat{E} = 120^\circ$ $\left(\begin{array}{l} \angle \text{at centre} = 2 \times \angle \text{at circm} \\ \text{midpts } \angle = 2 \times \text{omtreks } \angle \end{array} \right)$</p>	<p>✓ ST CA ✓ RE A OR/ OF ✓ RE A ✓ ST CA (2)</p>
		<p>[18]</p>

QUESTION/VRAAG 9

9.1	In proportion/ Proportionally / In verhouding/ eweredig	✓ A (1)
9.2		
9.2.1	<ul style="list-style-type: none"> Both pairs of opposite sides are equal / <i>beide pare teenoorst sye is gelyk</i> Both pairs of opposite angles are equal / <i>beide pare teenoorst hoeke is gelyk</i> Diagonals bisect each other / <i>Hoeklyne halveer mekaar</i> 	✓ RE A ✓ RE A Any two / enige twee (2)
9.2.2	$\frac{AD}{DB} = \frac{AE}{EC} \quad \left(\begin{array}{l} \text{prop th / ewer st; DE} \parallel \text{BC OR / OF} \\ \text{line} \parallel \text{one side of } \Delta \text{ / lyn} \parallel \text{een sy van } \Delta \end{array} \right)$ $\therefore \frac{AD}{44} = \frac{31}{48}$ $\therefore AD = \frac{341}{12} \quad \text{or / of } \approx 28,42 \text{ cm}$ <p style="text-align: center;">OR/OF</p> $\frac{AD}{AB} = \frac{AE}{AC} \quad \left(\begin{array}{l} \text{prop th / ewer st; DE} \parallel \text{BC OR/OF} \\ \text{line} \parallel \text{one side of } \Delta \text{ / lyn} \parallel \text{eensy van } \Delta \end{array} \right)$ $\frac{AD}{AD + 44} = \frac{31}{79}$ $79AD = 31AD + 1364$ $48AD = 1364$ $AD = \frac{1364}{48} \quad \text{or / of } \approx 28,42 \text{ cm}$	✓ ST ✓ RE A ✓ ST A <p style="text-align: center;">OR/OF</p> ✓ ST ✓ RE A ✓ ST CA (3)



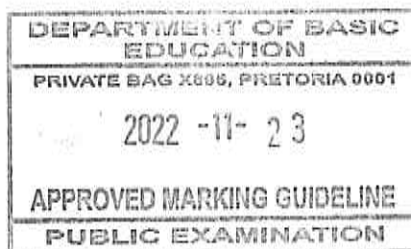
M. Hendricks

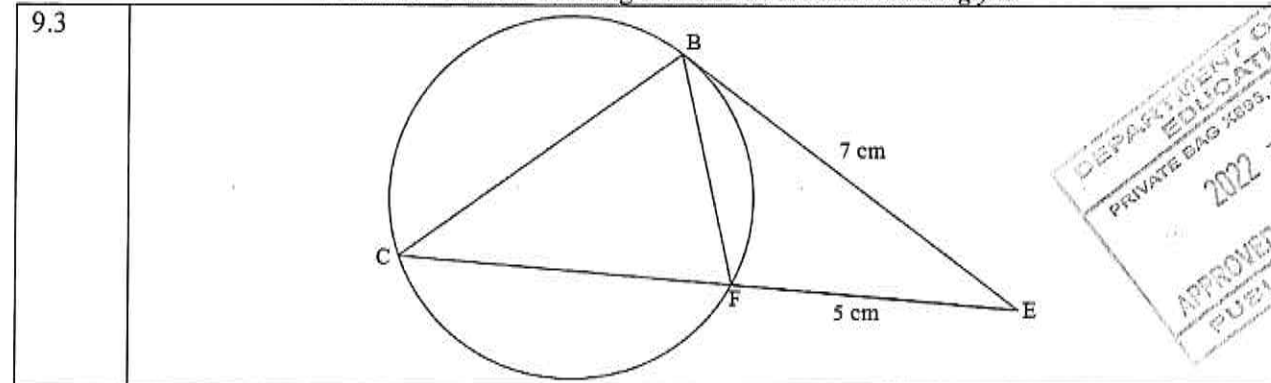
B. J. Shabo

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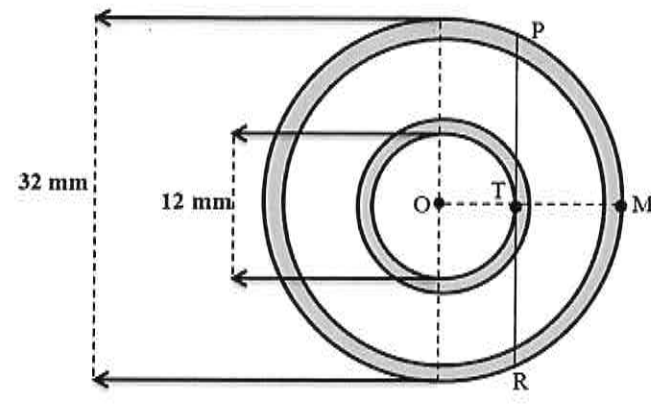
<p>9.2.3</p>	$\frac{BF}{FC} = \frac{AE}{EC} \quad \left(\begin{array}{l} \text{prop th / ewer st; FE} \parallel \text{AB OR / OF} \\ \text{line} \parallel \text{one side of } \Delta / \text{lyn} \parallel \text{een sy van } \Delta \end{array} \right)$ $\frac{BF}{55} = \frac{31}{48}$ $BF = \frac{31 \times 55}{48} = \frac{1705}{48}$ $DE = \frac{1705}{48} \text{ or / of } \approx 35,52 \text{ cm}$ <p style="text-align: center;">OR/OF</p> $\frac{BC}{FC} = \frac{AC}{EC} \quad \left(\begin{array}{l} \text{prop th / ewer st; FE} \parallel \text{AB OR/OF} \\ \text{line} \parallel \text{one side of } \Delta / \text{lyn} \parallel \text{een sy van } \Delta \end{array} \right)$ $\frac{BC}{55} = \frac{79}{48}$ $\therefore BC = \frac{4345}{48}$ $\therefore BF = \frac{1705}{48} \text{ cm}$ $\therefore DE = \frac{1705}{48} \text{ or / of } \approx 35,52 \text{ cm}$ <p style="text-align: center;">OR / OF</p> $\frac{DE}{BC} = \frac{AE}{AC} \quad (\parallel \Delta's/e)$ $\frac{DE}{DE + 55} = \frac{31}{79}$ $79DE = 31DE + 1705$ $48DE = 1705$ $DE = \frac{1705}{48} \text{ or / of } \approx 35,52 \text{ cm}$	<p>✓ ST proportion/eweredig A</p> <p>✓ ST value of/ waarde van BF CA</p> <p>✓ ST value of/ waarde van DE CA</p> <p>OR/OF</p> <p>✓ ST proportion/eweredig A</p> <p>✓ ST value of/ waarde van BF CA</p> <p>✓ ST value of/ waarde van DE CA</p> <p style="text-align: center;">OR / OF</p> <p>✓ ST proportion/eweredig A</p> <p>✓ SF CA</p> <p>✓ ST value of/ waarde van DE CA (3)</p>
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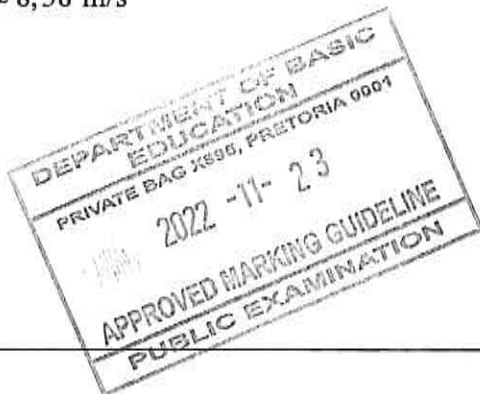




<p>9.3.1</p>	<p>In $\triangle EBF$ and/en $\triangle ECB$: \hat{E} is common / <i>gemeen</i> $\hat{EBF} = \hat{ECB}$ (tan - chord / <i>raaklyn - koord</i>) $\therefore \hat{BFE} = \hat{CBE}$ (int \angles of \triangle / <i>binne \anglee van \triangle</i>) $\therefore \triangle EBF \parallel \triangle ECB$ ($\angle \angle \angle$)</p> <p style="text-align: center;">OR / OF</p> <p>In $\triangle EBF$ and/en $\triangle ECB$: \hat{E} is common / <i>gemeen</i> $\hat{EBF} = \hat{ECB}$ (tan - chord / <i>raaklyn - koord</i>) $\therefore \triangle EBF \parallel \triangle ECB$ ($\angle \angle \angle$)</p>	<p>✓ ST A ✓ ST A ✓ RE A ✓ ST / RE A</p> <p style="text-align: center;">OR / OF</p> <p>✓ ST A ✓ ST A ✓ RE A ✓ ST/RE A (4)</p>
<p>9.3.2</p>	<p>$\frac{EB}{EC} = \frac{EF}{EB}$ $\therefore EB^2 = EF \times EC$</p>	<p>✓ ST proportion/ <i>eweredigheid</i> A (1)</p>
<p>9.3.3</p>	<p>from/<i>vanuit</i> 9.3.2 $\therefore 7^2 = (CF + 5).5$ $\therefore 7^2 = (CF + 5).5$ $\therefore 49 = 5CF + 25$ OR/OF $\therefore 5CF = 24$ $\therefore CF + 5 = \frac{49}{5}$ $\therefore CF = \frac{24}{5}$ $\therefore CF = 4,8 \text{ cm}$ $\therefore CF = 4,8 \text{ cm}$</p> <p style="text-align: center;">OR/OF</p> <p>$\therefore 7^2 = EC \times 5$ $\therefore EC = 9,8$ $\therefore EC = 9,8$ $\therefore CF = EC - 5$ $= 9,8 - 5 = 4,8 \text{ cm}$</p>	<p>✓ ST $EC = CF + 5$ A ✓ ST substitution/ <i>vervanging</i> CA</p> <p>✓ ST length of CF/ <i>lengte van CF</i> CA</p> <p style="text-align: center;">OR / OF</p> <p>✓ ST $7^2 = EC \times 5$ A ✓ ST length of EC/ <i>lengte van EC</i> CA</p> <p>✓ ST length of CF/ <i>lengte van CF</i> CA (3)</p>
		[17]

QUESTION/VRAAG 10

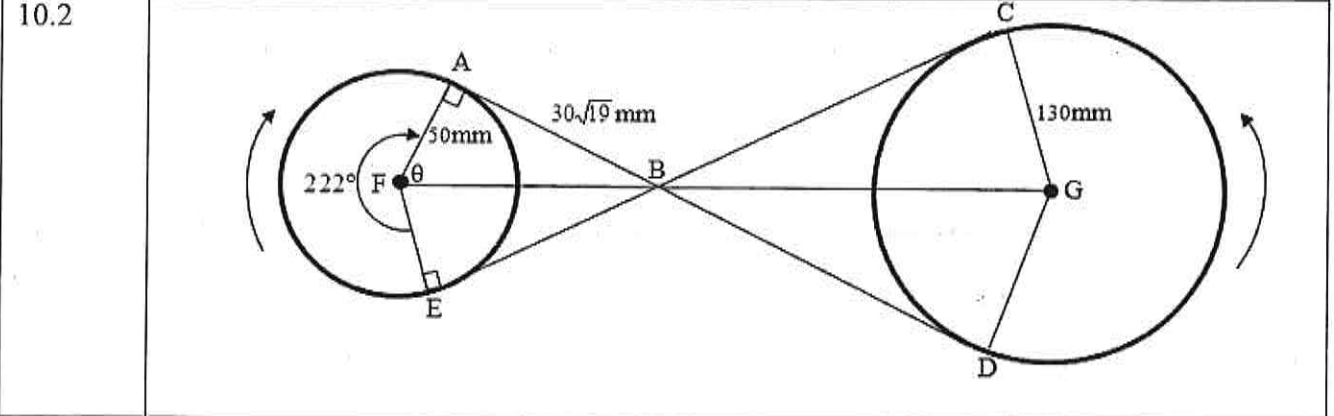
<p>10.1</p>		
<p>10.1.1</p>	<p>$D = 32 \div 1000 = 0,032 \text{ m}$</p> <p>$n = \frac{5000}{60} = \frac{250}{3} \text{ or / of } 83,33 \text{ rev/s / omw/s}$</p> <p>$v = \pi D n$</p> <p>$= \pi \times 0,032 \times \frac{250}{3}$</p> <p>$= \frac{8}{3} \pi \text{ or / of } \approx 8,38 \text{ m/s}$</p> <p style="text-align: center;">OR/OF</p> <p>$v = \pi D n$</p> <p>$= \pi \times 32 \times 5000$</p> <p>$= 160\,000\pi \text{ mm/min}$</p> <p>$\approx \frac{160\,000}{60\,000} \pi = \frac{8}{3} \pi \text{ or / of } \approx 8,38 \text{ m/s}$</p> <p style="text-align: center;">OR/OF</p> <p>$v = \omega r$</p> <p>$= \frac{2\pi \times 5000 \times 0,016}{60}$</p> <p>$= \frac{8}{3} \pi \text{ or / of } \approx 8,38 \text{ m/s}$</p>	<p>✓ M both Conversions/ beide herleidings A</p> <p>✓ F A</p> <p>✓ SF CA</p> <p>✓ circ.velocity/ omtrksnelhd CA</p> <p style="text-align: center;">OR/OF</p> <p>✓ F A</p> <p>✓ SF CA</p> <p>✓ M both Conversion/ beide herleidings A</p> <p>✓ circ.velocity/ omtrksnelhd CA</p> <p style="text-align: center;">OR/OF</p> <p>✓ F A</p> <p>✓ SF CA</p> <p>✓ M both Conversion/ beide herleidings A</p> <p>✓ circ.velocity/ omtrksnelhd CA</p> <p style="text-align: right;">NPU/NPR (4)</p>



<p>10.1.2</p>	<p>Radius of the larger circle/ <i>Radius van die grootter sirkel</i> = 16mm Radius of the smaller circle/ <i>Radius van die kleiner sirkel</i> = 6 mm $TM = OM - OT$ $= 16 - 6$ OR/OF $TM = \frac{32 - 12}{2}$ $= 10 \text{ mm}$ $= 10 \text{ mm}$</p> <p>$h = 10 \text{ mm}$ and/en $d = 32 \text{ mm}$</p> <p>$4h^2 - 4dh + x^2 = 0$ $4(10)^2 - 4(32)(10) + x^2 = 0$ $400 - 1280 + x^2 = 0$ $x^2 = 880$ $x = 4\sqrt{55}$ or / of $\approx 29,66 \text{ mm}$ $PR = 4\sqrt{55}$ or / of $\approx 29,66 \text{ mm}$</p> <p style="text-align: center;">OR/OF</p> <p>Using the half chord of / <i>Gebruik halfkoord van RQ</i></p> <p>$OP^2 = OT^2 + PT^2$ $16^2 = (6)^2 + PT^2$ $PT^2 = 220$ $PT = \sqrt{220}$ $PR = 2 \times \sqrt{220}$ $PR \approx 29,66 \text{ mm}$</p> <p style="text-align: center;">OR/OF</p> <p>Height of major segment = 22 mm $4h^2 - 4dh + x^2 = 0$ $4(22)^2 - 4(32)(22) + x^2 = 0$ $x^2 = 880$ $x = 4\sqrt{55}$ or / of $\approx 29,66 \text{ mm}$ $PR = 4\sqrt{55}$ or / of $\approx 29,66 \text{ mm}$</p> <p style="text-align: center;">OR/OF</p>	<p>✓ both Radii/<i>beide radiusse</i> A</p> <p>✓ length/<i>lengte</i> CA</p> <p>✓ F A</p> <p>✓ SF CA</p> <p>✓ Length/<i>lengte</i> CA</p> <p style="text-align: center;">OR/OF</p> <p>✓ both Radii/<i>beide radiusse</i> A</p> <p>✓ Pythagoras A</p> <p>✓ SF CA</p> <p>✓ Length of/<i>Lengte van PT</i> CA</p> <p>✓ length/<i>lengte</i> CA</p> <p style="text-align: center;">OR / OF</p> <p>✓ Height / <i>Hoogte</i> A</p> <p>✓ F A</p> <p>✓ SF CA</p> <p>✓ S CA</p> <p>✓ Length/<i>lengte</i> CA</p> <p style="text-align: center;">OR/OF</p>
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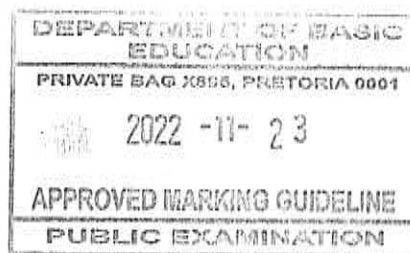
	<p>In $\triangle OTP$</p> $\cos \hat{POT} = \frac{6}{16}$ $\hat{POT} = \cos^{-1}\left(\frac{6}{16}\right)$ $\approx 67,98^\circ$ $\therefore \tan 67,98^\circ = \frac{PT}{6}$ $PT = 6 \tan 67,98^\circ$ $\approx 14,83$ $PR \approx 2(14,83)$ $\approx 29,66 \text{ mm}$	<p>✓ trig ratio / <i>verh</i> A</p> <p>✓ size of / <i>grootte van</i> \angle CA</p> <p>✓ trig ratio / <i>verh</i> CA</p> <p>✓ Length/<i>lengte</i> PT CA</p> <p>✓ Length/<i>lengte</i> PR CA</p> <p style="border: 1px solid black; padding: 2px; display: inline-block;">NPU/NPR</p> <p style="text-align: right;">(5)</p>
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10.2.1	$222^\circ \times \frac{\pi}{180^\circ} = \frac{37}{30} \pi \text{ or / of } \approx 3,87 \text{ rad.}$	<p>✓ Conversion/ <i>herleiding</i> A</p> <p style="border: 1px solid black; padding: 2px; display: inline-block;">NPR NPU</p> <p style="border: 1px solid black; padding: 2px; display: inline-block;">AO Full marks/ <i>Volpunte</i></p> <p style="text-align: right;">(1)</p>
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10.2.2	$A = \frac{\theta}{360^\circ} \pi r^2$ $= \frac{222^\circ}{360^\circ} \pi (50)^2$ $\approx 4843,29 \text{ mm}^2$ <p style="text-align: center;">OR/OF</p>	<p>✓ Formula/ <i>formule</i> A</p> <p>✓ SF CA</p> <p>✓ Area of sector/ <i>oppervlakte van sektor</i> CA</p> <p style="text-align: center;">OR/OF</p>
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$A = \frac{r^2\theta}{2}$ $= \frac{(50)^2 \left(\frac{37}{30}\pi\right)}{2}$ $= \frac{4625}{3}\pi \text{ or / of } \approx 4843,29 \text{ mm}^2$	<p>✓Formula/ <i>formule</i> A</p> <p>✓SF CA</p> <p>✓ Area of sector/ <i>oppervlakte van sektor</i> CA</p>
OR/OF	
$s = r\theta$ $= (50)\left(\frac{37}{30}\pi\right)$ $= \frac{185}{3}\pi \text{ or / of } \approx 193,73 \text{ mm}$	<p>✓arc length/ <i>booglengte</i> CA</p>
$A = \frac{rs}{2}$ $= \frac{(50)\left(\frac{185}{3}\pi\right)}{2}$ $= \frac{4625}{3}$ $\approx 4843,29 \text{ mm}^2$	<p>✓Formula/ <i>formule</i> A</p> <p>✓ Area of sector/ <i>oppervlakte van sektor</i> CA NPU (3)</p>

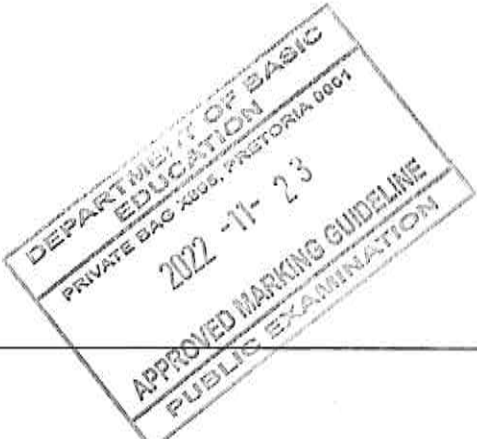


<p>10.2.3</p>	<p> $BG^2 = BC^2 + CG^2$ $BC^2 = BG^2 - CG^2$ $BC^2 = (360)^2 - (130)^2$ $BC = 70\sqrt{23} \approx 335,71 \text{ mm}$ $s = r\theta$ $= (50)\left(\frac{37}{30}\pi\right)$ $AE = \frac{185}{3}\pi$ or / of $\approx 193,73 \text{ mm}$ LENGTH OF BELT/ LENGTE VAN BAND $= AE + AB + BC + CD + BD + BE$ $= \frac{185}{3}\pi + 30\sqrt{19} + 70\sqrt{23} + 503 + 70\sqrt{23} + 30\sqrt{19}$ $\approx 1629,68 \text{ mm}$ <p style="text-align: center;">OR/OF</p> $\triangle ABF \parallel \triangle DBG$ $\frac{AB}{DB} = \frac{AF}{DG}$ $\frac{30\sqrt{19}}{DB} = \frac{50}{130}$ $DB \approx 339,99$ LENGTH OF BELT/ LENGTE VAN BAND $= AE + 2 \times AB + 2 \times BC + CD$ $= \frac{185}{3}\pi + 2 \times 30\sqrt{19} + 2 \times 339,99 + 503$ $\approx 1638,25 \text{ mm}$ </p>	<p> \checkmark length/ lengte BG A \checkmark length / lengte BC CA \checkmarkF A \checkmarkSF CA $\checkmark \frac{185}{3}\pi$ CA \checkmarkM A \checkmark length/lengte CA <p style="text-align: center;">OR / OF</p> \checkmark Similarity/gelykvormig A \checkmark Proportion/ verhouding A \checkmark SF A \checkmark length / lengte DB CA \checkmarkM A \checkmarkSF CA \checkmark length/lengte CA <div style="border: 1px solid black; padding: 5px; width: fit-content; margin: 0 auto;"> Penalty for rounding/ Penalisering vir afronding </div> <p style="text-align: right;">(7)</p> <p style="text-align: right;">[20]</p> </p>
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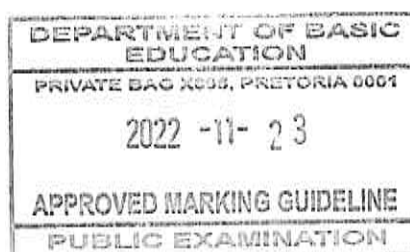
DEPARTMENT OF BASIC EDUCATION
 PRIVATE BAG X895, PRETORIA 0001
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 PUBLIC EXAMINATION

QUESTION/VRAAG 11

<p>11.1</p>		
<p>11.1.1</p>	$1,2 \text{ km} \times \frac{1000 \text{ m}}{1 \text{ km}} = 1200 \text{ m}$	<p>✓ A (1)</p>
<p>11.1.2</p>	$A_T = a \left(\frac{o_1 + o_n}{2} + o_2 + o_3 + \dots + o_{n-1} \right)$ $6948 = \frac{1200}{4} \left(\frac{7,72 + 6,72}{2} + 5,32 + q + 4,36 \right)$ $= 300(16,9 + q)$ $16,9 + q = 23,16$ $q = 6,26 \text{ m}$ <p style="text-align: center;">OR/OF</p> $A_T = a(m_1 + m_2 + m_3 + \dots + m_n)$ $6948 = \frac{1200}{4} \left(\frac{7,72 + 5,32}{2} + \frac{5,32 + q}{2} + \frac{q + 4,36}{2} + \frac{4,36 + 6,72}{2} \right)$ $6948 = 300 \left(6,52 + \frac{9,68 + 2q}{2} + 5,54 \right)$ $23,16 = 12,06 + \frac{9,68 + 2q}{2}$ $\frac{9,68 + 2q}{2} = 11,1$ $9,68 + 2q = 22,2$ $2q = 12,52$ $q = 6,26 \text{ m}$	<p>✓ F A</p> <p>✓ value of/waarde van a CA</p> <p>✓ SF CA</p> <p>✓ S CA</p> <p>✓ value of/waarde van q CA</p> <p style="text-align: center;">OR/OF</p> <p>✓ F A</p> <p>✓ value of/waarde van a CA</p> <p>✓ SF CA</p> <p>✓ S CA</p> <p>✓ value of/waarde van q CA</p> <p style="text-align: right;">(5)</p>



<p>11.2.1</p>	$A_{\text{cylinder/silinder}} = 2\pi r^2 + 2\pi rh$ $= 2\pi (1,5\text{ m})^2 + 2\pi (1,5\text{ m})(10)$ $= 108,38\text{ m}^2$ <p>cost/koste = R 8,93 × 108,38 m²</p> <p>= R 967,83 < R1000</p>	<p>✓ formula/formule A</p> <p>✓ SF A</p> <p>✓ value of/ waarde van A CA</p> <p>✓ Cost not exceeding R1000/ Koste nie meer as R1000 CA</p> <p style="text-align: right;">NPR (4)</p>
<p>11.2.2</p>	<p>Airspace for cylindrical tank/ lugruimte vir silindriese tenk</p> $= 70,69\text{ m}^3 - 68\text{ m}^3$ $= 2,69\text{ m}^3$ <p>percentage/ persentasie = $\frac{2,69\text{ m}^3}{70,69\text{ m}^3} \times 100 = 3,81\%$</p> <p>Airspace for car tank/ lugruimte vir kar tenk</p> $= 55\text{ l} - 52\text{ l}$ $= 3\text{ l}$ <p>percentage / persentasie = $\frac{3}{55} \times 100 = 5,45\%$</p> <p>The car fuel tank has a bigger percentage airspace/ die kar brandstoftenk het 'n groter persentasie lugruimte.</p> <p style="text-align: center;">OR / OF</p> <p>percentage/ persentasie = $\frac{68\text{ m}^3}{70,69\text{ m}^3} \times 100\% = 96,19\%$</p> <p>percentage / persentasie = $\frac{52}{55} \times 100\% = 94,55\%$</p> <p>The car fuel tank has a bigger percentage airspace/ die kar brandstoftenk het n groter persentasie lugruimte.</p>	<p>✓ M A</p> <p>✓ percentage/persentasie CA</p> <p>✓ M A</p> <p>✓ percentage/persentasie CA</p> <p>✓ conclusion/ gvlgtrekng CA</p> <p style="text-align: center;">OR / OF</p> <p>✓ M A</p> <p>✓ percentage/persentasie CA</p> <p>✓ M A</p> <p>✓ percentage/persentasie CA</p> <p>✓ conclusion/ gvlgtrekng CA</p> <p style="text-align: right;">(5) [15]</p>



TOTAL/TOTAAL: 150