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 2024

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

These marking guidelines consist of 27 pages.
Hierdie nasienriglyne bestaan uit 27 bladsye.

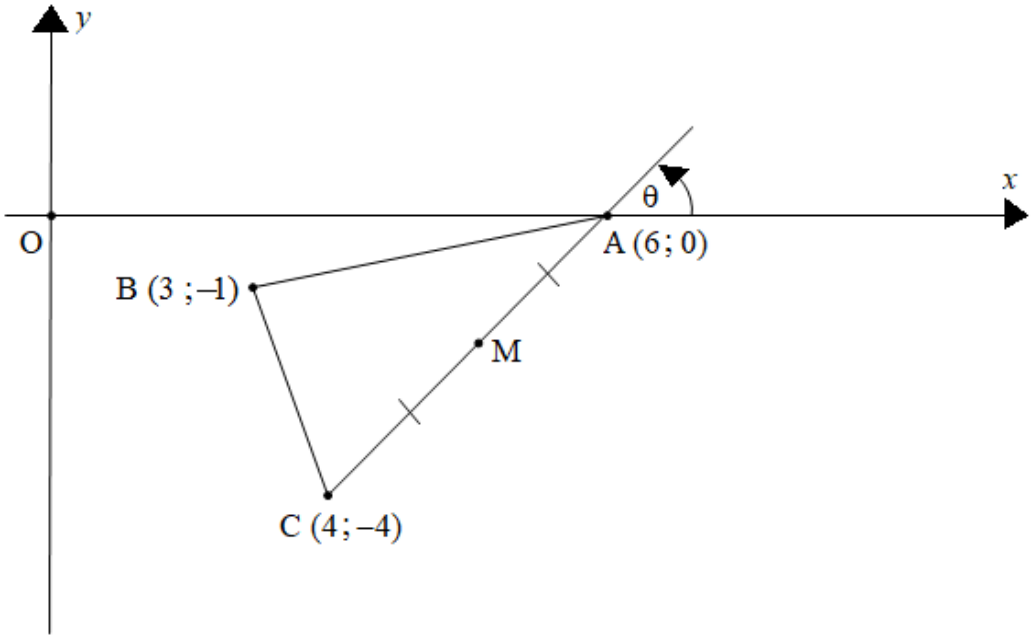
NOTE:

- If a candidate answers a question TWICE, only mark the FIRST attempt.
- The method of consistent accuracy marking must be applied in all aspects of the marking guidelines where applicable as indicated by the marking code CA.

LET WEL:

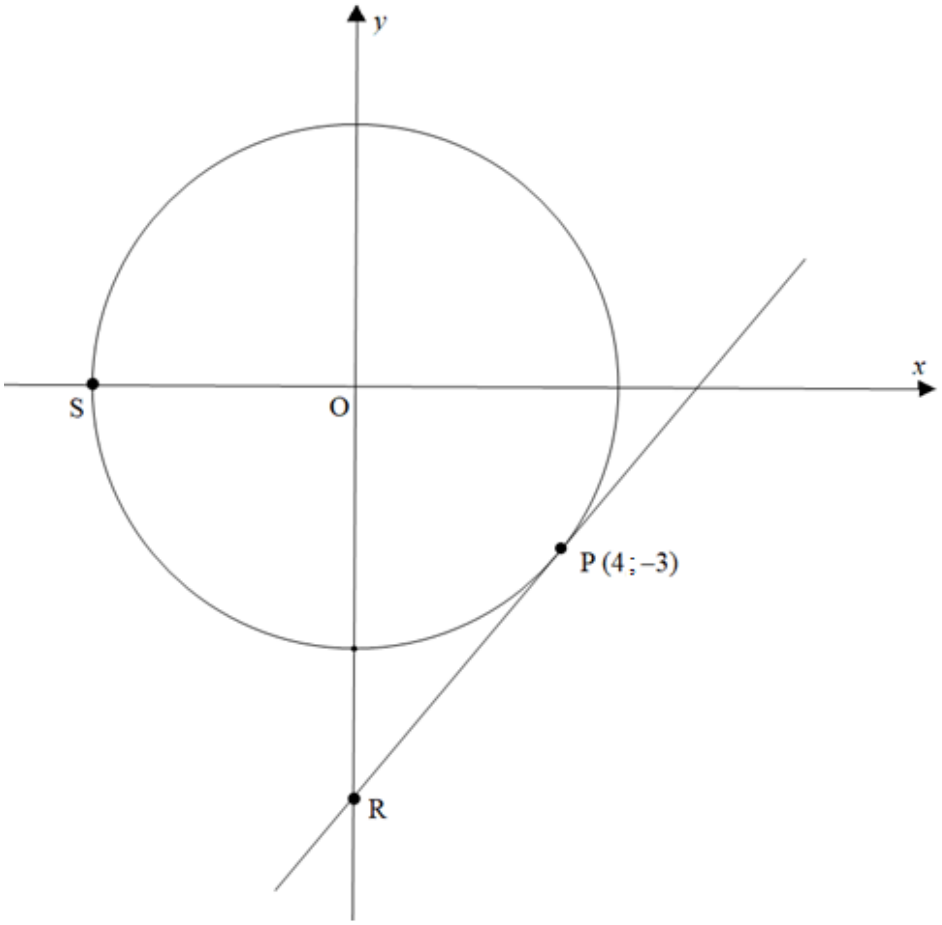
- *Indien 'n kandidaat 'n vraag TWEE keer beantwoord, sien slegs die EERSTE poging na.*
- *Die metode van volgehoue akkuraatheid-nasien moet waar moontlik op alle aspekte van die nasienriglyne toegepas word, soos aangedui deur die nasienkode* CA.

QUESTION/*VRAAG* 1

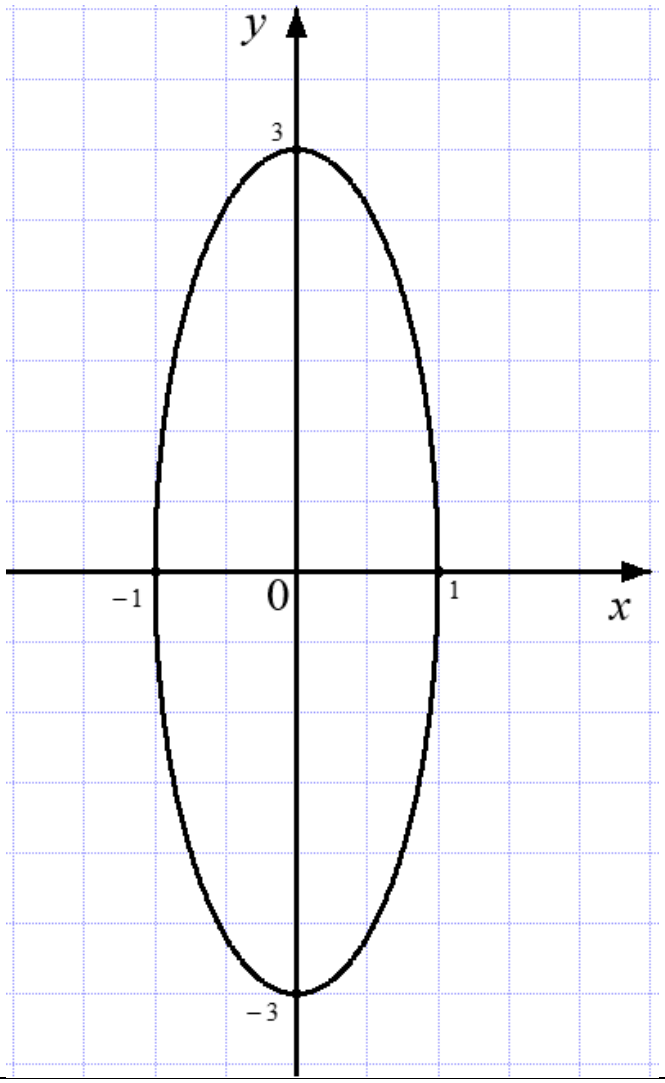
		
1.1	$m_{AC} = \frac{y_C - y_A}{x_C - x_A}$ $= \frac{-4-0}{4-6}$ $= 2$	✓ **SF** **A** ✓gradient / *gradiënt* **CA** (2) **AO: Full marks**
1.2	$\tan\theta = m_{AC}$ $\theta = \tan^{-1}(2)$ $\theta \approx 63,43°$	✓ **SF** **CA** ✓ value of / *waarde van* θ **CA** (2) **AO: Full marks**

1.3	$BC = \sqrt{(x_B - x_C)^2 + (y_B - y_C)^2}$ $= \sqrt{(3-4)^2 + (-1-(-4))^2}$ $= \sqrt{10} \approx 3{,}16$	✓**SF** **A** ✓ length/ *lengte* **BC** **CA** (2) **AO: Full marks**
1.4	$M\left(\frac{x_A + x_C}{2}; \frac{y_A + y_C}{2}\right)$ $M\left(\frac{6+4}{2}; \frac{0+(-4)}{2}\right)$ $M\ (5;-2)$	✓ *x*-coordinate/*koördinaat* **A** ✓ *y*-coordinate/*koördinaat* **A** (2)
1.5	$m_{perp.\,bisector} = -\frac{1}{2}$ $y-(-2) = -\frac{1}{2}(x-5)$ **OR/OF** $-2 = -\frac{1}{2}(5) + c$ $y = -\frac{1}{2}x + \frac{5}{2} - 2$ $\quad c = \frac{5}{2} - 2$ $\therefore y = -\frac{1}{2}x + \frac{1}{2}$	✓*m* of perp bisect/ *van loodregte Middellyn* **CA** ✓ substitution/ *vervang m* **CA** ✓ substitution/ *vervang*(5 ; –2) **CA** ✓ equation in form $y = ...$ / *vergelyking in vorm y =...* **CA** (4)
		[12]

QUESTION/*VRAAG* 2

2.1		
2.1.1	$x^2 + y^2 = r^2$ $(4)^2 + (-3)^2 = r^2$ $r^2 = 25$ $\therefore x^2 + y^2 = 25$ **OR/*OF*** $\therefore x = \pm\sqrt{25 - y^2}$ **OR/*OF*** $y = \pm\sqrt{25 - x^2}$ **OR/*OF*** $x^2 + y^2 = (4)^2 + (-3)^2$ $= 25$	✓ **SF** **A** ✓ equation/*vergelyking* **CA** **OR/*OF*** ✓ **SF** **A** ✓ equation/*vergelyking* **CA** **(2)** **AO: Full marks**
2.1.2	S $(-5; 0)$	✓ -5 **CA** ✓ 0 **A** (2)

2.1.3	$m_{OP} = -\frac{3}{4}$ $m_{PR} = \frac{4}{3}$ $y-(-3)=\frac{4}{3}(x-4)$ **O**R/*OF* $-3=\frac{4}{3}(4)+c$ $y=\frac{4}{3}x-\frac{16}{3}-3$ $c=-\frac{16}{3}-3$ $\therefore y=\frac{4}{3}x-\frac{25}{3}$ **OR/*OF*** $x\cdot x_1+y\cdot y_1=r^2$ $4x-3y=25$ $-3y=-4x+25$ $y=\frac{4}{3}x-\frac{25}{3}$	✓ gradient/*gradiënt* of/*van* OP **A** ✓gradient/*gradiënt* of/*van* PR **CA** ✓ subst / *vervang* $(4;-3)$ **A** ✓equation/ *vergelyking* **CA** **OR/*OF*** ✓ **F** **A** ✓ subst / *vervang* $(4;-3)$ **A** ✓ subst / *vervang* r^2 **CA** ✓ equation /*vergelyking* **CA** (4)
2.1.4	$y=-\frac{25}{3}\approx -8,33$ **OR/*OF*** $\left(0\ ;-\frac{25}{3}\right)$	✓ *y*-intercept/*afsnit* **CA** (1)

2.2.1	$\frac{x^2}{1^2}+\frac{y^2}{3^2}=1$	✓ standard form / *std vorm* **A** (1)
2.2.2		✓*x*- and *y*-intercepts/*afsnitte* **CA** ✓elliptical shape/*elliptiese vorm* **CA** (2)
		[12]

QUESTION/*VRAAG* 3

3.1.1	$A = \frac{17}{60}\pi = 51°$	✓ A in degrees / *grade* **A** (1)
3.1.2	$\sqrt{\text{cosec } B}$ $= \sqrt{\text{cosec } 34°}$ OR/*OF* $= \sqrt{\text{cosec}\left(34° \times \frac{\pi}{180}\right)}$ $= \sqrt{\frac{1}{\sin 34°}}$ $= \sqrt{\text{cosec } \frac{17}{90}\pi}$ $\approx 1,34$	✓ substitution / *vervanging* **A** ✓ **S** **CA** (2)
3.1.3	$\tan(A + B)$ $= \tan(51° + 34°)$ OR / *OF* $= \tan\left(85° \times \frac{\pi}{180°}\right)$ $\approx 11,43$	✓ substitution / *vervanging* **CA** ✓ **S** **CA** (2)

3.2.1	$\sec\theta = -\frac{13}{5}$ **OR / *OF*** $\frac{1}{\cos\theta} = \frac{1}{\frac{-5}{13}}$	✓ ratio / *verhouding*	**A** (1)
3.2.2	$x^2 + y^2 = r^2$ $(-5)^2 + n^2 = (13)^2$ $n^2 = 144$ $n = 12$ $1 + \sin^2\theta$ $= 1 + \left(\frac{12}{13}\right)^2$ $= \frac{313}{169}$ **OR/*OF*** $1 + \sin^2\theta = 1 + 1 - \cos^2\theta$ $= 2 - \cos^2\theta$ $= 2 - \left(\frac{-5}{13}\right)^2$ $= \frac{313}{169}$	✓ **SF** ✓ value of/*waarde van n* ✓ sin ratio / *verh* ✓ **S** **OR/*OF*** ✓ **I** ✓ $2 - \cos^2\theta$ ✓ $\frac{-5}{13}$ ✓ **S**	**A** **CA** **CA** **CA** **A** **CA** **CA** **CA** (4)

3.2.2	$x^2 + y^2 = r^2$ $(-5)^2 + n^2 = (13)^2$ $n^2 = 144$ $n = 12$ $1 + \sin^2\theta$ $= 1 + \left(\frac{12}{13}\right)^2$ $= \frac{313}{169}$ **OR/*OF*** $1 + \sin^2\theta = 1 + 1 - \cos^2\theta$ $= 2 - \cos^2\theta$ $= 2 - \left(\frac{-5}{13}\right)^2$ $= \frac{313}{169}$	✓ **SF** ✓ value of/*waarde van* n ✓ sin ratio / *verh* ✓ **S** **OR/*OF*** ✓ **I** ✓ $2 - \cos^2\theta$ ✓ $\frac{-5}{13}$ ✓ **S**	A **CA** **CA** **CA** **A** **CA** **CA** **CA** (4)
3.3	$2\sin x = 3\cos x$ $\frac{2\sin x}{2\cos x} = \frac{3\cos x}{2\cos x}$ **OR / *OF*** $\frac{2\sin x}{3\sin x} = \frac{3\cos x}{3\sin x}$ $\tan x = \frac{3}{2}$ $\cot x = \frac{2}{3}$ Ref. angle /*verw hoek* $= 56,31°$ $x = 180° + 56,31°$ $\therefore x = 236,31°$	✓ dividing by / *deel deur* $\cos x$ or $\sin x$ ✓ tan/cot ratio / *verh* ✓ Ref. angle /*verw hoek* ✓ size of / *grootte van* x	**A** **CA** **CA** **CA** (4)
			[14]

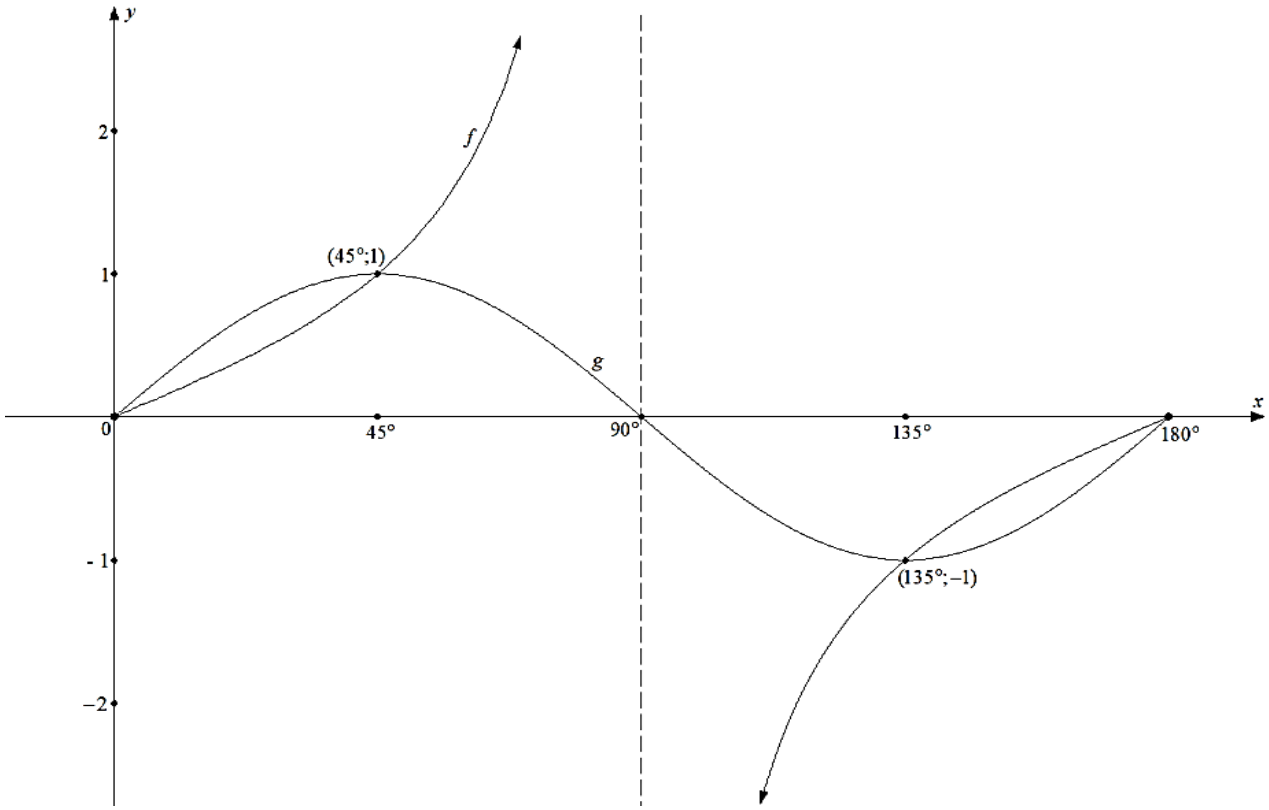
QUESTION/*VRAAG* 4

4.1.1	$-\sin x$	✓ reduction /*reduksie* **A** (1)
4.1.2	$-\cos x$	✓ reduction /*reduksie* **A** (1)
4.1.3	$\dfrac{\cot(180° + x) \cdot \sin(2\pi - x)}{\cos(180° - x) \cdot \cos(360° - x) + 2\cos^2(180° + x)}$ $= \dfrac{\cot x \cdot -\sin x}{-\cos x \cdot \cos x + 2(-\cos x)^2}$ $= \left(\dfrac{\cos x}{\sin x} \cdot -\dfrac{\sin x}{1}\right) \div \left(-\cos^2 x + 2\cos^2 x\right)$ $= \dfrac{-\cos x}{\cos^2 x}$ $= -\dfrac{1}{\cos x}$ **OR / *OF*** $-\sec x$	✓ $\cot x$ **A** ✓ $\cos x$ **A** ✓ $(-\cos x)^2 / \cos^2 x$ **A** ✓ cot quotient identity/ *kwosiënt identiteit* **A** ✓ **S** **CA** ✓ **S** **CA** (6)
4.2.1	$\cos^2\theta$	✓ identity/*identiteit* **A** (1)
4.2.2	$\dfrac{1}{\sin\theta} - \dfrac{\sin\theta}{1 + \cos\theta} = \cot\theta$ L.H.S /*LK*. $= \dfrac{1 + \cos\theta - \sin^2\theta}{\sin\theta(1 + \cos\theta)}$ $= \dfrac{\cos\theta + \cos^2\theta}{\sin\theta(1 + \cos\theta)}$ $= \dfrac{\cos\theta(1 + \cos\theta)}{\sin\theta(1 + \cos\theta)}$ $= \dfrac{\cos\theta}{\sin\theta} = \cot\theta$ = RHS/*RK* **OR/*OF*** L.H.S /*LK*. $= \dfrac{1 + \cos\theta - \sin^2\theta}{\sin\theta(1 + \cos\theta)}$ $= \dfrac{1 + \cos\theta - (1 - \cos^2\theta)}{\sin\theta(1 + \cos\theta)}$ $= \dfrac{1 + \cos\theta - 1 + \cos^2\theta}{\sin\theta(1 + \cos\theta)}$ $= \dfrac{\cos\theta + \cos^2\theta}{\sin\theta(1 + \cos\theta)}$ $= \dfrac{\cos\theta(1 + \cos\theta)}{\sin\theta(1 + \cos\theta)}$ $= \dfrac{\cos\theta}{\sin\theta} = \cot\theta$ = RHS/*RK* **OR/*OF***	✓ **I** $\cos^2\theta$ **A** ✓ **LCD/*KGV*** **A** ✓ common factor / *gemene faktor* **A** ✓**S** $\left(\dfrac{\cos\theta}{\sin\theta}\right)$ **A** **OR/*OF*** ✓ **I** $1 - \cos^2\theta$ **A** ✓ **LCD/*KGV*** **A** ✓ common factor / *gemene faktor* **A** ✓**S** $\left(\dfrac{\cos\theta}{\sin\theta}\right)$ **A** **OR/*OF***

	LHS/*LK* $= \dfrac{(1+\cos\theta)-\sin^2\theta}{\sin\theta(1+\cos\theta)}$ $= \dfrac{(1+\cos\theta)-(1-\cos^2\theta)}{\sin\theta(1+\cos\theta)}$ $= \dfrac{(1+\cos\theta)-\left[(1+\cos\theta)(1-\cos\theta)\right]}{\sin\theta(1+\cos\theta)}$ $= \dfrac{(1+\cos\theta)\left[1-(1-\cos\theta)\right]}{\sin\theta(1+\cos\theta)}$ $= \dfrac{1-1+\cos\theta}{\sin\theta}$ $= \dfrac{\cos\theta}{\sin\theta}$ $= \cot\theta$ = RHS/*RK*	✓ **I** $1-\cos^2\theta$ **A** ✓ factors/*faktore* **A** ✓ **S** **A** ✓ **S** $\left(\dfrac{\cos\theta}{\sin\theta}\right)$ **A** (4)
		[13]

QUESTION/*VRAAG* 5

5.1

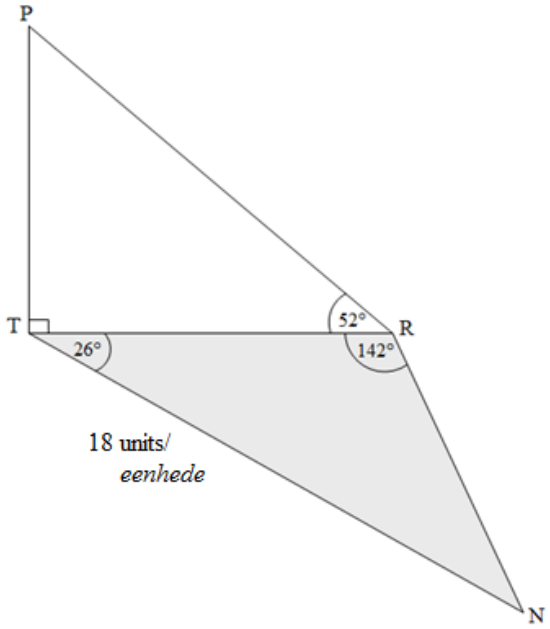


For/*vir* f:		For/*vir* g:	
✓ shape / *vorm*	**A**	✓ shape / *vorm*	**A**
✓ asymptote / *asimptoot*	**A**	✓ intercepts / *afsnitte*	**A**
✓ intercepts / *afsnitte*	**A**	✓ turning points / *draaipte*	**A**

(6)

5.2.1	$180°$	✓ period /*periode*	**CA** (1)
5.2.2	$x = 0°$ $x = 45°$ $x = 135°$ $x = 180°$	Any Two/*Enig twee* ✓ x value/ *waarde* ✓ x value/ *waarde*	 **CA** **CA** (2)
5.2.3	2	✓ amplitude	**CA** (1)
5.2.4	$g(x) = 5\sin 4x$	✓ 5 ✓ $\sin 4x$	**A** **A** (2)
			[12]

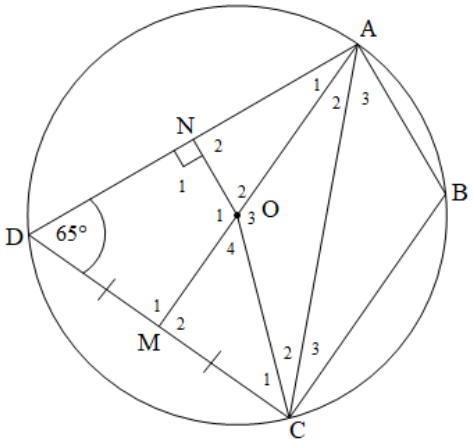
QUESTION/*VRAAG* 6



6.1	$\hat{N} = 12°$	✓angle size/*hoek grootte* **A** (1)
6.2	$\frac{TR}{\sin N} = \frac{TN}{\sin T\hat{R}N}$ **OR / *OF*** $\frac{n}{\sin N} = \frac{r}{\sin T\hat{R}N}$ $\frac{TR}{\sin 12°} = \frac{18}{\sin 142°}$ $TR = \frac{18\sin 12°}{\sin 142°}$ $\approx 6,08$ units/*eenhede*	✓ sine rule /*sinus reël* **A** ✓ substitution in sine rule / *vervanging in sine reël* **CA** ✓ length of / *lengte van* TR **CA** (3)
6.3	$\tan 52° = \frac{PT}{6,08}$ $PT = 6,08\tan 52°$ $\approx 7,78$ units/*eenhede* **OR/*OF*** $\hat{P} = 38°$ $\tan 38° = \frac{6,08}{PT}$ $PT = \frac{6,08}{\tan 38°}$ $\approx 7,78$ units **OR/*OF***	✓ tan ratio /*verh* **CA** ✓ length of / *lengte van* PT **CA** **OR/*OF*** ✓ tan ratio /*verh* **CA** ✓ length of / *lengte van* PT **CA** **OR/*OF***

	$\frac{PR}{\sin 90°} = \frac{6,08}{\sin 38°}$ $PR = \frac{6,08 \cdot \sin 90°}{\sin 38°}$ $\approx 9,88$ units $PT = \sqrt{(9,88)^2 - (6,08)^2}$ $\approx 7,79$ units	✓ length of PR **CA** ✓ length of / *lengte van* PT **CA** (2)
6.4	Area of/*van* $\Delta TRN = \frac{1}{2} \times 18 \times 6,08 \times \sin 26°$ $\approx 23,99$ Area of/*van* $\Delta PTR = \frac{1}{2} \times 7,78 \times 6,08$ $\approx 23,65$ $\frac{\text{Area of/van } \Delta TRN}{\text{Area of/van } \Delta PTR} \approx \frac{23,99}{23,65} \approx 1,01$ **OR/*OF*** Area of/*van* $\Delta TRN = \frac{1}{2} \times 18 \times 6,08 \times \sin 26°$ $\approx 23,99$ Area of/*van* $\Delta PTR = \frac{1}{2} \times 6,08 \times 9,87$ $\approx 23,64$ $\frac{\text{Area of/van } \Delta TRN}{\text{Area of/van } \Delta PTR} \approx \frac{23,99}{23,64} \approx 1,01$ **OR/*OF*** Area of/*van* $\Delta TRN = \frac{1}{2} \times 18 \times 6,08 \times \sin 26°$ $\approx 23,99$ Area of/*van* $\Delta PTR = \frac{1}{2} \times 6,08 \times 7,78 \sin 90°$ $\approx 23,65$ $\frac{\text{Area of/van } \Delta TRN}{\text{Area of/van } \Delta PTR} \approx \frac{23,99}{23,65} \approx 1,01$	✓ substitution /*vervanging* **CA** ✓ Area of/*van* ΔTRN **CA** ✓ substitution /*vervanging* **CA** ✓ Area of/*van* ΔPTR **CA** ✓ ratio / *verhouding* **CA** **OR/*OF*** ✓ substitution /*vervanging* **CA** ✓ Area of/*van* ΔTRN **CA** ✓ substitution /*vervanging* **CA** ✓ Area of/*van* ΔPTR **CA** ✓ ratio / *verhouding* **CA** **OR/*OF*** ✓ substitution /*vervanging* **CA** ✓ Area of/*van* ΔTRN **CA** ✓ substitution /*vervanging* **CA** ✓ Area of/*van* ΔPTR **CA** ✓ ratio / *verhouding* **CA** (5)
		[11]

QUESTION/*VRAAG* 7

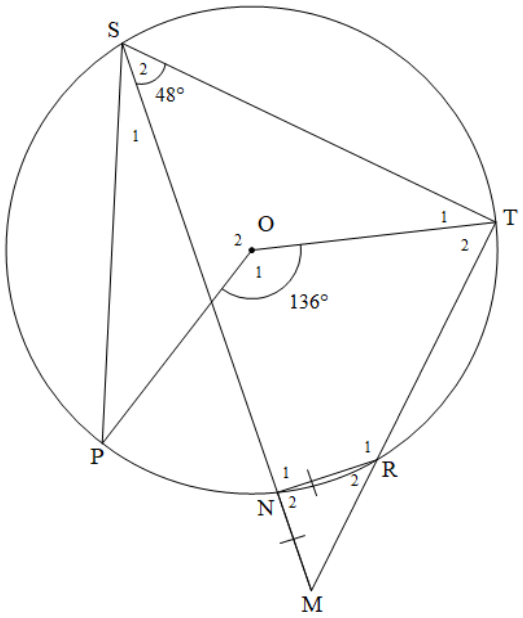


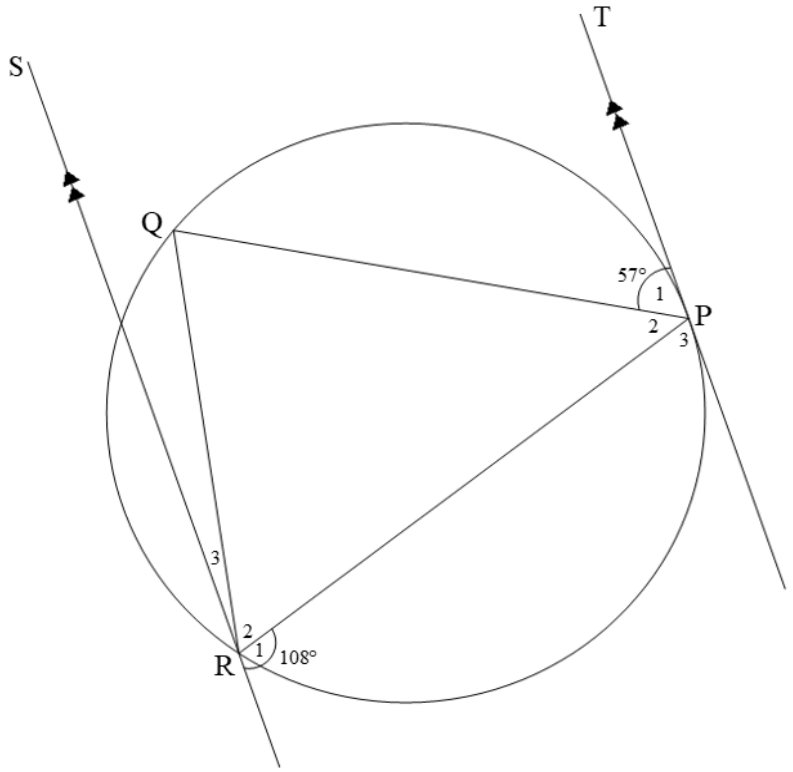
7.1	(line from centre to midpoint of chord / *lyn vanaf midpt na mdpt van koord*)	✓ **RE** **A** (1)
7.2	(opp ∠'s supplementary / *teenoorst ∠'e is supplementêr)* **OR/*OF*** ext ∠ = opp interior ∠ / *buite ∠ = teenoort binne ∠*	✓ **RE** **A** **OR/*OF*** ✓ **RE** **A** (1)
7.3		

Statement/ *Bewering*	**Reason / *Rede***	
$\hat{O}_1 = 115°$	Opp ∠s of cyclic quad / *Teenoorst ∠e van kdvh*	✓ **ST** **A**
$\hat{B} = 115°$	Opp ∠s of cyclic quad / *Teenoorst ∠e van kdvh*	✓ **ST** **A**
DN = NA **OR/*OF*** $DN = \frac{1}{2}DA$	Line from centre ⊥ to chord *Lyn vanaf midpt ⊥ op koord*	✓ **ST** **A** ✓ **RE** **A** (4)

7.4	In ΔADM &ΔACM : AM is common/ *gemeenskaplik* $\hat{M}_1 = 90° = \hat{M}_2$ $\begin{pmatrix}\angle\text{s on str line /}\\ \angle e\ op\ reguitlyn\end{pmatrix}$ $DM = MC$ (given / *gegee*) $\therefore \Delta ADM \equiv \Delta ACM$ (S∠S) **OR/*OF*** In ΔADM &ΔACM : $\hat{M}_1 = \hat{M}_2 = 90°$ $\begin{pmatrix}\text{line from cent. } \perp \text{ to chord/}\\ lyn\ vanuit\ mdtp\ \perp op\ koord\end{pmatrix}$ AM is common/ *gemeenskaplik* AD = AC (Pyth. theorem/ *stelling*) $\therefore \Delta ADM \equiv \Delta ACM$ (RHS/ *RSS*)	✓ **ST** **A** ✓ **ST** **A** ✓**RE** (conclusion) **A** **OR/*OF*** ✓ **ST** **A** ✓ **ST** **A** ✓**RE** **A** (3)
7.5	$\hat{O}_3 = 130°$ $\begin{pmatrix}\angle \text{ at centre } = 2 \times \angle \text{ at circum /}\\ \text{midpts } \angle = 2 \times \text{omtreks } \angle\end{pmatrix}$ $\hat{O}_3 + \hat{B} = 130° + 115° \neq 180°$ $\therefore$ ABCO is not cyclic quad. (opp ∠s not suppl) / $\therefore$ *ABCO is nie 'n kvhk nie* (*teenoorst ∠e is nie* sup *pl*) **OR/*OF*** Since three points A, B and C of the quadrilateral lie on the existing circle✓ and point O lies within the circle✓, therefore AOCB cannot be a cyclic quadrilateral✓. *Aangesien drie punte A, B en C van die vierhoek op die bestaande sirkel lê✓ en punt O binne die sirkel lê✓, kan AOCB dus nie 'n koordevierhoek wees nie✓.*	✓ **ST** **A** ✓ **RE** **A** ✓ **RE** **A** **OR/*OF*** ✓ **ST** **A** ✓ **RE** **A** ✓ **RE** (3)
		[12]

QUESTION/*VRAAG* 8

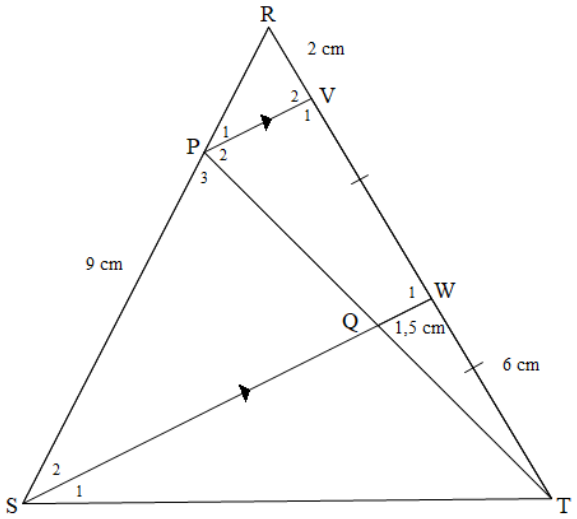
8.1			
8.1.1	$\hat{PST} = 68°$	$\begin{pmatrix}\angle \text{ at centre} = 2 \times \angle \text{ at circum} / \\ midpts\angle = 2 \times omtreks\angle\end{pmatrix}$	✓ **ST** **A** ✓ **RE** **A**
	$\hat{S}_1 = 20°$		✓ **ST** **CA** (3)
8.1.2	$\hat{R}_2 = 48°$	$\begin{pmatrix}\text{ext } \angle \text{ of cyclic quad} / \\ buite\ \angle\ van\ kdvk\end{pmatrix}$	✓ **ST** **CA** ✓ **RE** **A**
	$\therefore \hat{M} = 48°$	$\begin{pmatrix}\angle s \text{ opp} = \text{sides} / \\ \angle e\ teenoor = sye\end{pmatrix}$	✓ **ST** **CA** ✓ **RE** **A**
	$\therefore \hat{N}_2 = 84°$	$\begin{pmatrix}\text{Int } \angle s \text{ of } \Delta / \\ Binne\ \angle e\ van\ \Delta\end{pmatrix}$	✓ **ST** **CA** ✓ **RE** **A**
		OR/*OF*	**OR/*OF***
	$\hat{R}_1 = 132°$	$\begin{pmatrix}\text{opp.} \angle s \text{ of cyclic quad suppl.} / \\ teenst\angle^e van\ kvhk \text{ sup } pl\end{pmatrix}$	✓ **ST** **CA** ✓ **RE** **A**
	$\hat{R}_2 = 48°$	$\left(\angle s \text{ on a str. line} / \angle^e op'n\ reguitlyn\right)$	✓ **ST** **CA** ✓ **RE** **A**
	$\hat{M} = 48°$	$\left(\angle s \text{ opp.} = \text{sides} / \angle^e teenoor = sye\right)$	✓ **ST** **CA**
	$\hat{N}_2 = 84°$	$\left(\angle s \text{ of a } \Delta / \angle^e van\ \Delta\right)$	✓ **ST** **A** (6)

8.2			
8.2.1	$\hat{R}_2 = 57°$	$\begin{pmatrix}\text{tan - chord thm /}\\ \textit{raaklyn - koord st}\end{pmatrix}$	✓ **ST** **A** ✓ **RE** **A** (2)

8.2.2	$\therefore S\hat{R}P = 72°$	$\begin{pmatrix}\angle\text{s on a str. line/}\\ \angle e\, op\, reguitlyn\end{pmatrix}$	✓**ST** **CA**
	$\hat{P}_3 = 72°$	$\begin{pmatrix}\text{co-int.}\angle\text{s; RS} \parallel \text{PT}\\ ko-binne\ \angle e;\ RS \parallel PT\end{pmatrix}$	✓ **ST** **CA** ✓ **RE** **A**
	$\hat{Q} = 72°$	$\begin{pmatrix}\text{tan}-\text{chord th /}\\ raaklyn-koord\ st\end{pmatrix}$	✓ **ST** **CA**

	OR/*OF*		
	$\hat{P}_2 + 57° = 108° = 51°$ $\left(\begin{matrix}\text{alt } \angle\text{s; RS} \parallel \text{PT} / \\ \textit{verw. } \angle e;\ RS \parallel PT\end{matrix}\right)$	**OR/*OF***	
	$\therefore \hat{Q} = 72°$ $\left(\begin{matrix}\text{Int } \angle\text{s of } \Delta / \\ \textit{Binne } \angle e \textit{ van } \Delta\end{matrix}\right)$	✓ **ST/RE**	**A**
	$\hat{R}_3 = 15°$ $\left(\begin{matrix}\angle\text{s on str line} / \\ \angle e \textit{ op 'n reguit lyn}\end{matrix}\right)$	✓ **ST**	**CA**
	$S\hat{R}P = 15° + 57° = 72°$	✓ **ST**	**CA**
	$\therefore S\hat{R}P = \hat{Q}$	✓ **ST**	**CA**
	OR/*OF*		
	$\hat{P}_3 = 72°$ $(\text{co-int./ } ko\text{-}binne \angle\text{s; SR} \parallel \text{TP})$	**OR/*OF***	
	$\hat{P}_2 = 51°$ $(\angle\text{s on a str.line/} op'n\, reguitlyn)$		
	$\hat{Q} = 72°$ $(\text{int.}\angle\text{s of } \Delta / binne \angle^e van\, \Delta)$	✓ **ST/RE**	**A**
	$S\hat{R}P = 72°$ $(\text{int.}\angle\text{s of } \Delta / binne \angle^e van\, \Delta)$	✓ **ST**	**CA**
	$\therefore S\hat{R}P = \hat{Q}$	✓ **ST**	**CA**
		✓ **ST**	**CA**
			(4)
			[15]

QUESTION/*VRAAG* 9

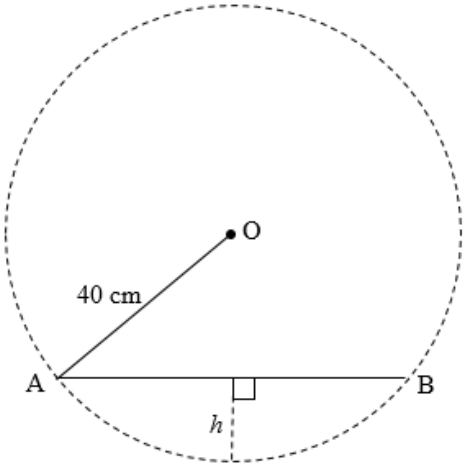


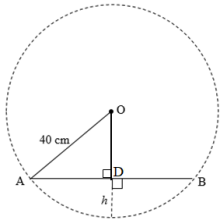
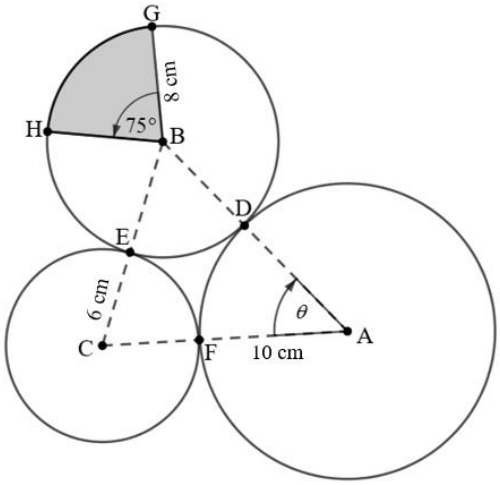
9.1	VW = 6 cm	✓ **ST** **A** (1)
9.2	$\frac{RP}{PS} = \frac{RV}{VW}$ (prop th, PV ‖ SW / *ewerdig st*; PV ‖ SW) **OR/OF** (line ‖ one side of Δ/ *lyn* ‖ *een sy van Δ*) $\therefore \frac{RP}{9} = \frac{2}{6}$ $\therefore$ RP = 3 cm	✓ **ST** **A** ✓ **RE** **A** ✓ **ST** **CA** (3)
9.3	$\frac{PV}{QW} = \frac{VT}{VW}$ $\frac{PV}{1,5} = \frac{12}{6}$ PV = 3 cm **OR/*OF*** PQ = QT (line from midpt. ‖ to side/ *lyn* vanuit mdpt ‖ aa*n sy*) PV = 2QW (mid-point theorem/ *mdpts stelling*) = 3 cm	✓ **ST** **A** ✓ **ST** **A** **OR/*OF*** ✓ **ST** **A** ✓ **ST** **A** (2) **AO: Full marks/*volpunte***

9.4	In Δs RPV and RSW: $\hat{R}$ is common / *gemeen* $\hat{P}_1 = \hat{S}_2$ (corresp. $\angle$s; PV $\parallel$ SW / *ooreenkst* $\angle e$; PV $\parallel$ SW) $\hat{V}_2 = \hat{W}_1$ (corrsp. $\angle$s; PV $\parallel$ SW / *ooreenkst* $\angle e$; PV $\parallel$ SW) $\therefore \Delta RPV \ ||| \ \Delta RSW$ $(\angle\angle\angle)$ **OR/*OF*** $\hat{R} = \hat{V}_2$ $(\angle s \text{ opp.} = \text{sides}/\angle^e \text{ teenoor} = \text{sye})$ $\hat{V}_2 = \hat{W}_1$ (corr./*ooreenk* $\angle$s; PV $\parallel$ SW) RS = SW (sides opp. = $\angle$s/ *sye teenoor* = $\angle^e$) $\frac{RV}{RW} = \frac{2}{8} = \frac{1}{4}$ $\frac{PR}{RS} = \frac{3}{12} = \frac{1}{4}$ $\frac{PV}{SW} = \frac{3}{12} = \frac{1}{4}$ $\therefore \Delta RPV ||| \Delta RSW$ (corr.sides are in prop./ *ooreenst sye in verh*)	✓ **ST** **A** ✓ **ST** **A** ✓ **RE/3rd statement/*3de stelling*** **A** **OR/*OF*** ✓ **ST** **A** ✓ **ST** **A** ✓ **RE** **A** (3)
9.5	$\therefore \frac{SW}{RS} = \frac{PV}{RP}$ $(\ ||| \Delta s)$ $\therefore \frac{SW}{12} = \frac{3}{3}$ $\therefore SW = 12$ **OR / OF** $\therefore \frac{SW}{RW} = \frac{PV}{RV}$ $(\ ||| \Delta s)$ $\therefore \frac{SW}{8} = \frac{3}{2}$ $\therefore SW = 12$ **OR/*OF***	✓ **ST** **CA** ✓ **ST** **CA** **OR / OF** ✓ **ST** **CA** ✓ **ST** **CA** **OR/*OF***

	$\frac{RP}{RS}=\frac{PV}{SW}$ $\frac{3}{12}=\frac{3}{SW}$ $SW=12$ **OR/*OF*** $\frac{PV}{SW}=\frac{RV}{RW}$ $\frac{3}{SW}=\frac{2}{8}$ $SW=12$ **OR/*OF*** $\hat{V}_2=\hat{W}_1$ $(\text{corr./}ooreenk\angle;\text{PV} \parallel \text{SW})$ $\hat{V}_2=\hat{R}$ $\begin{pmatrix}\angle\text{s opp.}=\text{sides/}\\ \angle e\,teenoor=sye\end{pmatrix}$ $\hat{R}=\hat{W}_1$ $SR=SW$ $\therefore SR=12$	✓ **ST** **CA** ✓ **ST** **CA** **OF/*OF*** ✓ **ST** **CA** ✓ **ST** **CA** **OR/*OF*** ✓ **ST** **CA** ✓ **ST** **CA** (2) **AO: Full marks/*volpunte***
		[11]

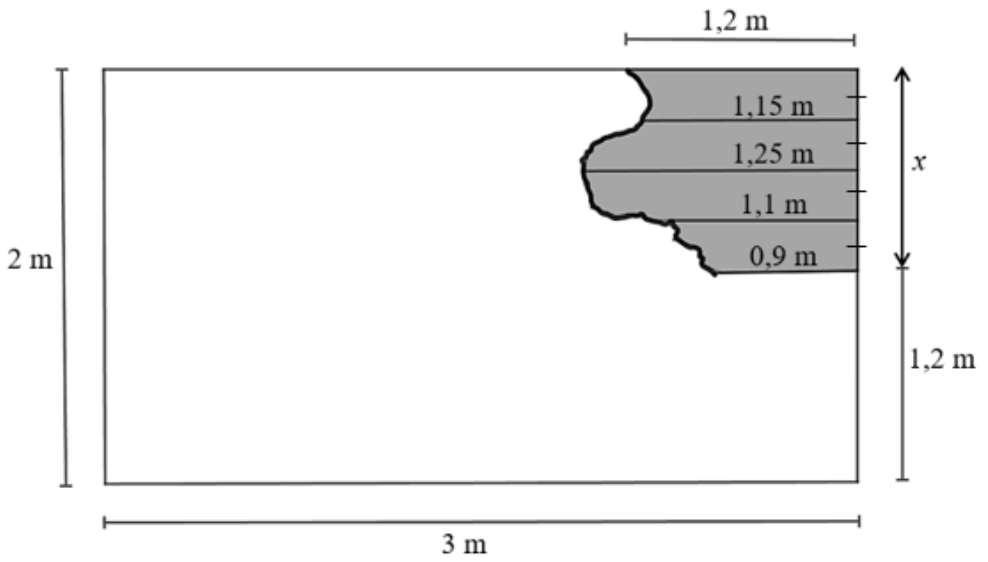
QUESTION/*VRAAG* 10

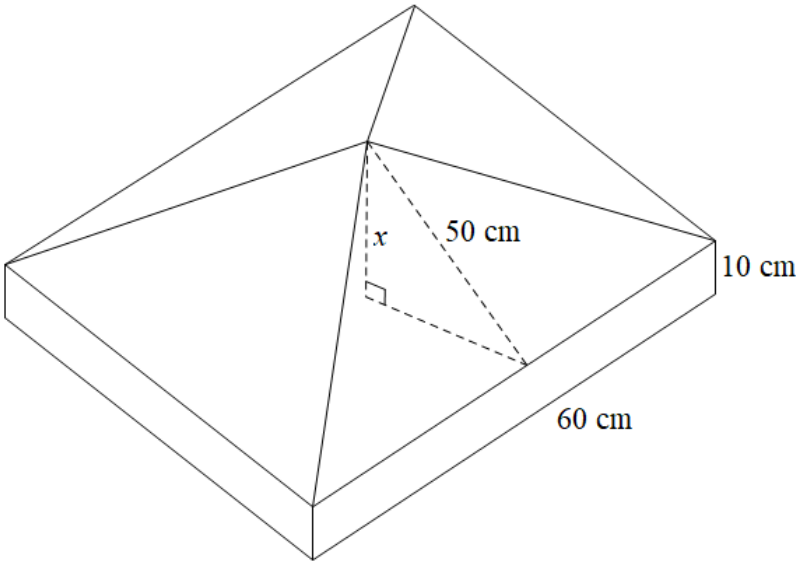
10.1		
10.1.1	$\frac{48}{60}=\frac{4}{5}=0,8$ rev/s	✓$\frac{4}{5}$ or/*of* $0,8$ **A** (1)
10.1.2	0,4 m	✓0,4 **A** (1)
10.1.3	0,8 m	✓ 0,8 **CA** (1)
10.1.4	$v=\pi D n$ $=\pi\times(0,8)\times(0,8)$ $=\frac{16}{25}\pi$ **OR/*OF*** $\approx 2,01$ m/s **OR/*OF*** $\omega=2\pi n$ $=2\pi\times(0,8)=\frac{8}{5}\pi\approx 5,03$ $v=\omega r$ $=\frac{8}{5}\pi\times 0,4$ $=\frac{16}{25}\pi$ **OR/*OF*** $\approx 2,01$ m/s	✓ **F** **A** ✓ **SF** **CA** ✓ circm vel /*omtreksnld* **CA** **OR/*OF*** ✓ **F** **A** ✓ **SF** **CA** ✓ circm vel /*omtreksnld* **CA** (3)
10.1.5	$4h^2-4dh+x^2=0$ $4(8)^2-4(80)(8)+x^2=0$ $x^2=2304$ $x=48$ cm **OR/*OF***	✓ **F** **A** ✓ **SF** **CA** ✓ **S** **CA** ✓ value of / *waarde van x* **CA** **OR/*OF***

	OD = 40 − 8 = 32 AD = $\sqrt{40^2 - 32^2}$ AD = 24 DB = 24 AB = 48 cm 	✓ length of/*lengte van* OD **A** ✓ substitution/ *vervanging* **CA** ✓ length of/*lengte van* AD **CA** ✓ length of/*lengte van* AB **CA** (4)
10.2		
10.2.1	$75° = 75° \times \frac{\pi}{180°} = \frac{5\pi}{12}$ **OR/*OF*** $\approx$ 1,31 rad	✓ angle/*hoek in* rad **A** (1)
10.2.2	Area of sector/ *Area van sektor* $= \frac{r^2\theta}{2}$ $= \frac{(8)^2 \times \left(\frac{5\pi}{12}\right)}{2}$ **OR/OF** $\frac{(8)^2 \times (1{,}31)}{2}$ $= \frac{40\pi}{3} \approx 41{,}89 \text{ cm}^2$ **OR/OF** $\approx 41{,}92 \text{ cm}^2$ **OR/*OF*** Area of sector/ *Area van sektor* $= \frac{rs}{2}$ $= \frac{(8) \times \left(8 \times \frac{5\pi}{12}\right)}{2}$ **OR/OF** $\frac{(8) \times (8 \times 1{,}31)}{2}$ $= \frac{40\pi}{3} \approx 41{,}89 \text{ cm}^2$ **OR/OF** $\approx 41{,}92 \text{ cm}^2$ **OR/*OF***	✓ **F** **A** ✓ **SF** **CA** ✓ area **CA** **OR/*OF*** ✓ **F** **A** ✓ **SF** **A** ✓ area **CA** **OR/*OF***

	Area of sector/ *Area van sektor* $= \frac{\theta}{360°}\pi r^2$ $= \frac{75°}{360°} \times \pi \times (8)^2$ $= \frac{40\pi}{3}$ cm^2 **OR/*OF*** $\approx 41{,}89$ cm^2	✓ **F** **A** ✓ **SF** **A** ✓ area **CA** (3)
10.2.3	16 cm	✓length / *lengte* **A** (1)
10.2.4	In Δ ABC $\cos\theta = \frac{16^2 + 18^2 - 14^2}{2(16)(18)}$ $\theta = \cos^{-1}\left(\frac{16^2 + 18^2 - 14^2}{2(16)(18)}\right)$ $\theta = 48{,}19°$ Arc length /*Booglengte* DF: $s = r \times \theta$ $s = (10) \times \left(48{,}19° \times \frac{\pi}{180°}\right)$ $= \frac{4819}{1800}\pi$ cm **OR/*OF*** $\approx 8{,}41$ cm **OR/*OF*** In Δ ABC $\cos\theta = \frac{16^2 + 18^2 - 14^2}{2(16)(18)}$ $\theta = \cos^{-1}\left(\frac{16^2 + 18^2 - 14^2}{2(16)(18)}\right)$ $\theta = 48{,}19°$ $\frac{48{,}19°}{360°} = \frac{s}{20\pi}$ $\therefore s = \frac{48{,}19° \times 20\pi}{360°}$ $\approx 8{,}41$ cm	✓use Cosine rule / *gebruik van kosinusreël* **A** ✓ **SF** **CA** ✓ value of / *waarde van* θ **CA** ✓ **F** **A** ✓ arc length / *booglengte* **CA** **OR/*OF*** ✓use Cosine rule / *gebruik van kosinusreël* **A** ✓ **SF** **CA** ✓ value of / *waarde van* θ **CA** ✓ **M** proportion / *eweredigheid* **A** ✓ arc length / *booglengte* **CA** (5)
		[20]

QUESTION/*VRAAG* 11

11.1		
11.1.1	$x = 0,8$ m	✓ 0,8 **A** (1)
11.1.2	$a = 0,2$ m	✓ $a = 0,2$ m **CA** (1)
11.1.3	$A_T = a\left(\frac{o_1 + o_n}{2} + o_2 + o_3 + ... + o_{n-1}\right)$ $= (0,2)\left(\frac{1,2 + 0,9}{2} + 1,15 + 1,25 + 1,1\right)$ $= 0,91 \text{ m}^2$ **OR/*OF*** $A_T = a(m_1 + m_2 + m_3 + ... + m_n)$ $= (0,2)\left(\frac{1,2 + 1,15}{2} + \frac{1,15 + 1,25}{2} + \frac{1,25 + 1,1}{2} + \frac{1,1 + 0,9}{2}\right)$ $= 0,91 \text{ m}^2$	✓ **F** **A** ✓ **SF** **CA** ✓ area **CA** **OR/*OF*** ✓ **F** **A** ✓ **SF** **CA** ✓ area **CA** (3)
11.1.4	Area of Wall / *van muur* $= 3 \times 2 = 6 \text{ m}^2$ Area of un-plastered section / *Area van ongepleisterde gedeelte* $= 6 - 0,91 = 5,09 \text{ m}^2$ Cost to plaster rest of the wall / *Koste om die res van die muur te pleister* $= 5,09 \times 300$ $= \text{R } 1\,527$ R1700 > R1527 ∴ the money will be suffiient	✓ Area of wall /*van muur* **A** ✓Area of un-plastered section / *Area van ongepleisterde gedeelte* **CA** ✓ **M** **CA** ✓Cost / *Koste* **CA** ✓Conclusion **CA** (5)

11.2		
11.2.1	$TSA = l\,b + 2\,l\,h + 2\,b\,h$ $= (60)(60) + 2(60)(10) + 2(60)(10)$ $= 6000\ \text{cm}^2$	✓ **F** **A** ✓ **SF** **CA** ✓ Surface area / *Buite-oppervl* **CA** (3)
11.2.2	$x = \sqrt{50^2 - 30^2}$ $= 40\ \text{cm}$	✓Pyth. **A** ✓length / *lengte* **CA** (2)
11.2.3	Vol. of rect. Prism / *regh prisma* $= 60 \times 60 \times 10 = 36\ 000\ \text{cm}^3$ Vol. of pyramid / v*an piramied* $= \frac{1}{3} \times (60 \times 60) \times 40 = 48\ 000\ \text{cm}^3$ Total Vol. / *totale Vol* $= 36\ 000 + 48\ 000$ $= 84\ 000\ \text{cm}^3$	✓ Vol. of rect. Prism / *van reghoekige prisma* **A** ✓ Vol. of pyramid / *van piramied* **CA** ✓Total Vol / *totale Vol* **CA** (3)
		[18]

TOTAL/*TOTAAL*: 150