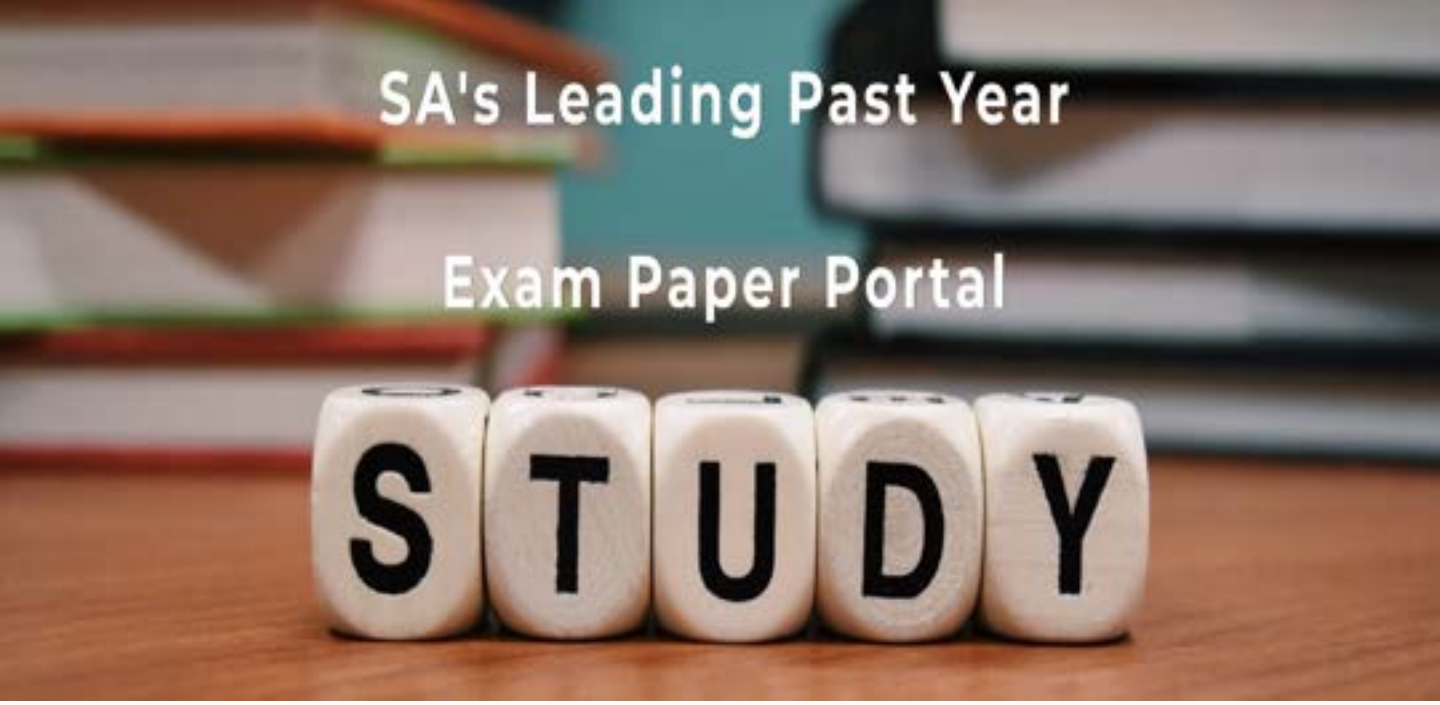

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2022

11092

TECHNICAL MATHEMATICS P2/
TEGNIESE WISKUNDE V2

MARKING GUIDELINES/*NASIENRIGLYNE*

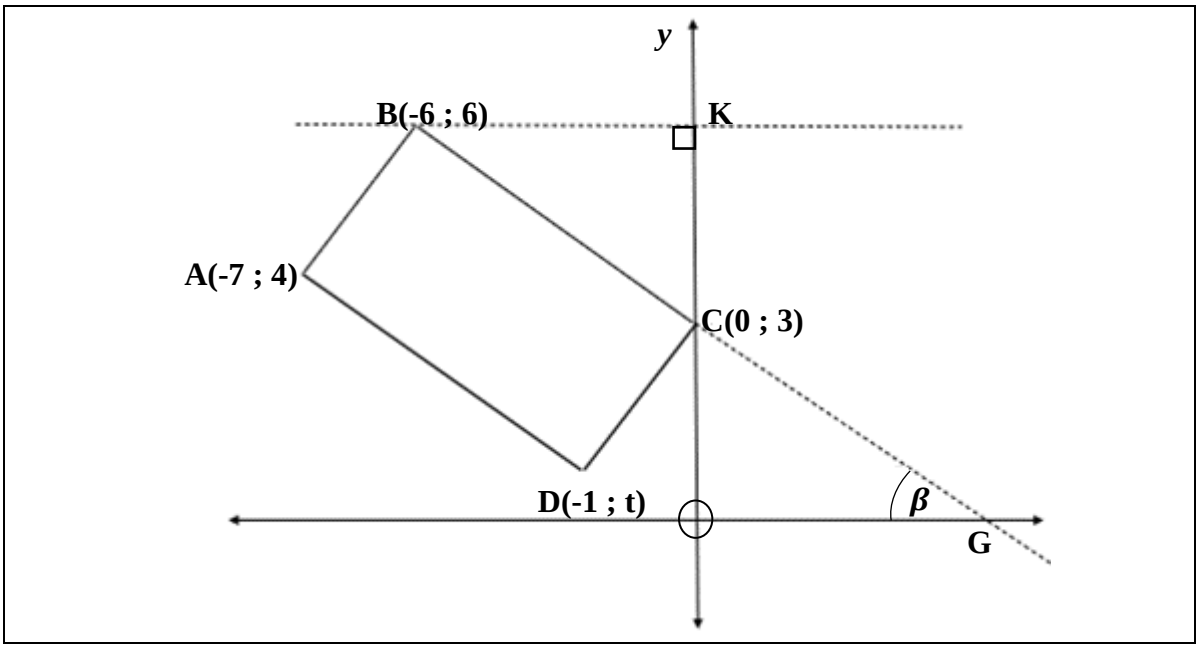
19 pages/*bladsye*

Marking Codes/*Nasien kodes*	
A	Accuracy/*Akkuraatheid*
CA	Consistent Accuracy/*Konstante akkuraatheid*
M	Method/*Metode*
R	Rounding/*Afronding*
NPR	No penalty for rounding/*Geen penalisering vir afronding*
NPU	No penalty for units omitted/*Geen penalisering indien eenhede uitgelos word*
S	Simplification/*Vereenvoudiging*
SF	Substitution in correct formula/*Substitusie in die regte formule*
ST	Statement/*Stelling*
RE	Reason/*Rede*
ST/RE	Statement and Reason/*Stelling en Rede*
AO	Answer Only/*Slegs Antwoord*

NOTES/*AANTEKENINGE*

- If a candidate answers a question TWICE, only mark the FIRST attempt./*Indien 'n kandidaat 'n vraag TWEE keer beantwoord, merk slegs die eerste poging*.
- If a candidate has crossed out an attempt of a question and did not redo it, mark the crossed-out version./*Indien 'n kandidaat 'n antwoord doodgetrek het, maar dit nie oorgedoen het nie, merk die doodgetrekte weergawe.*
- Consistent Accuracy applies in all aspects of the marking guidelines./*Volgehoue akkuraatheid is in al die nasienriglyne van toepassing.*

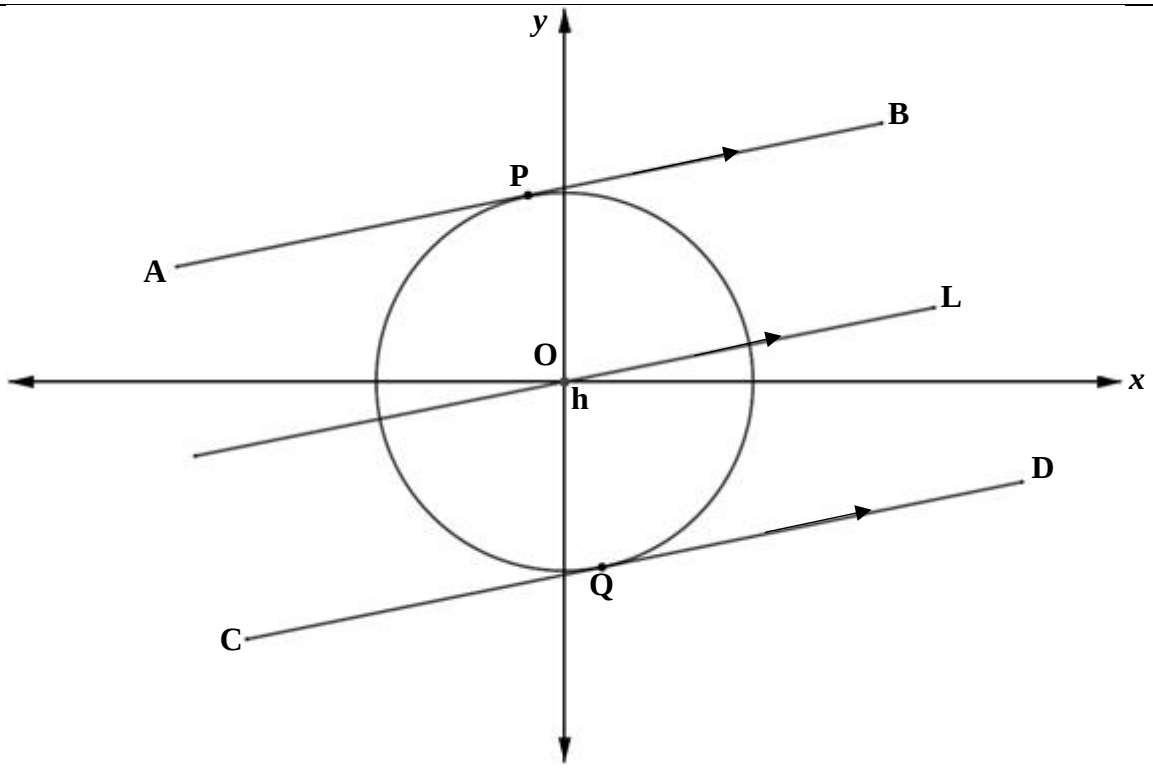
QUESTION/*VRAAG* 1



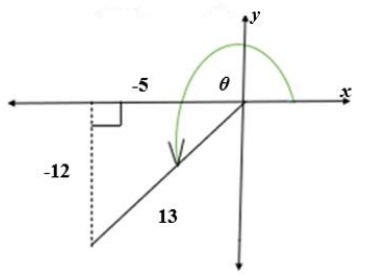
1.1	$AC = \sqrt{(x_C - x_A)^2 + (y_C - y_A)^2}$ $= \sqrt{(0-(-7))^2 - (3-4)^2}$ $AC = \sqrt{49+1}$ $AC = \sqrt{50}$ $AC = 5\sqrt{2}$ units/*eenhede*	✓ SF ✓ $AC = 5\sqrt{2}$ or/*of* $\sqrt{50}$ **AO – Full marks/*Volpunte***	A CA (2)
1.2	$K(0;6)$	✓ $(0;6)$ **ACCEPT/*AANVAAR*:** $\boldsymbol{x = 0}$ **and/*en*** $\boldsymbol{y = 6}$	A (1)
1.3	$\text{M}\left(\frac{-7+0}{2};\frac{4+3}{2}\right)$ $\text{M}\left(-\frac{7}{2};\frac{7}{2}\right)$ $M(-3{,}5\,;3{,}5)$	✓ $x = -\frac{7}{2} = -3{,}5 = -3\frac{1}{2}$ ✓ $y = \frac{7}{2} = 3{,}5 = 3\frac{1}{2}$	A A (2)

1.4	$m_{DC} = \frac{y_D - y_C}{x_D - x_C}$ **OR/*OF*** $m_{CD} = \frac{y_C - y_D}{x_C - x_D}$ $= \frac{t-3}{-1-0}$ $= \frac{3-t}{0+1}$ $= -t + 3$ $= 3 - t$	✓ SF ✓ $-t + 3$	A CA (2)
1.5	$m_{DC} = m_{AB}$ $-t + 3 = \frac{y_A - y_B}{x_A - x_B}$ $-t + 3 = \frac{4-6}{-7-(-6)}$ $-t + 3 = 2$ $-t = -1$ $t = 1$ **OR/*OF*** $\frac{y_B + y_D}{2} = M_y$ $\frac{t+6}{2} = \frac{7}{2}$ $\therefore t + 6 = 7$ $t = 1$ **OR/*OF*** With/*Met* $AD \perp DC$ $m_{AD} \times m_{CD} = -1$ $\frac{4-t}{-6} \times \frac{3-t}{1} = -1$ $(4-t)(3-t) = 6$ $12 - 7t + t^2 - 6 = 0$ $t^2 - 7t + 6 = 0$ $(t-6)(t-1) = 0$ $t = 6$ or/*of* $t = 1$ $\therefore t = 1$ **OR/*OF*** With/*Met* BC⊥ DC $m_{BC} \times m_{CD} = -1$ $\frac{6-3}{-6} \times \frac{t-3}{1} = -1$ $\frac{3}{-6} \times \frac{t-3}{-1} = -1$ $t - 3 = -2$ $t = 1$	**CA from/*van* 1.1.4** ✓SF ✓ $-t + 3 = 2$ ✓ $t = 1$ **OR/*OF*** **CA from/*van* 1.1.3** ✓SF ✓ $t + 6 = 7$ ✓ $t = 1$ **OR/*OF*** **CA from/*van* 1.1.4** ✓SF ✓ $t^2 - 7t + 6 = 0$ ✓ $t = 1$ **OR/*OF*** **CA from/*van* 1.1.4** ✓SF ✓ $t - 3 = -2$ ✓ $t = 1$ **AO – Full marks/*Volpunte***	CA CA CA CA CA CA CA CA CA CA CA CA CA CA (3)

1.6	$m_{BCG} = -\frac{1}{2}$ $\frac{1}{2} = tan\beta$ $\beta = 26,6°$ (Interior angle/*Binnehoek*) $C\hat{B}K = \beta = 26,6^o$ Alt. $\angle^s$ =; ($BK//\ x$ −axis *Verw.* $\angle^e$=; ($BK//\ x$ −*as*)	✓$m_{BCG} = -\frac{1}{2}$ ✓ SF ✓ $\beta = 26,6^o$ ✓ $C\hat{B}K = \beta = 26,6^o$ **NPR**	A A CA A (4)
			[14]

QUESTION/*VRAAG* 2	
2.1	
	
2.1.1	**DO NOT MARK. / *MOENIE MERK NIE.*** **MARKS REDISTRIBUTED IN QUESTION 2. / *PUNTE IS HERVERDEEL IN VRAAG 2.***

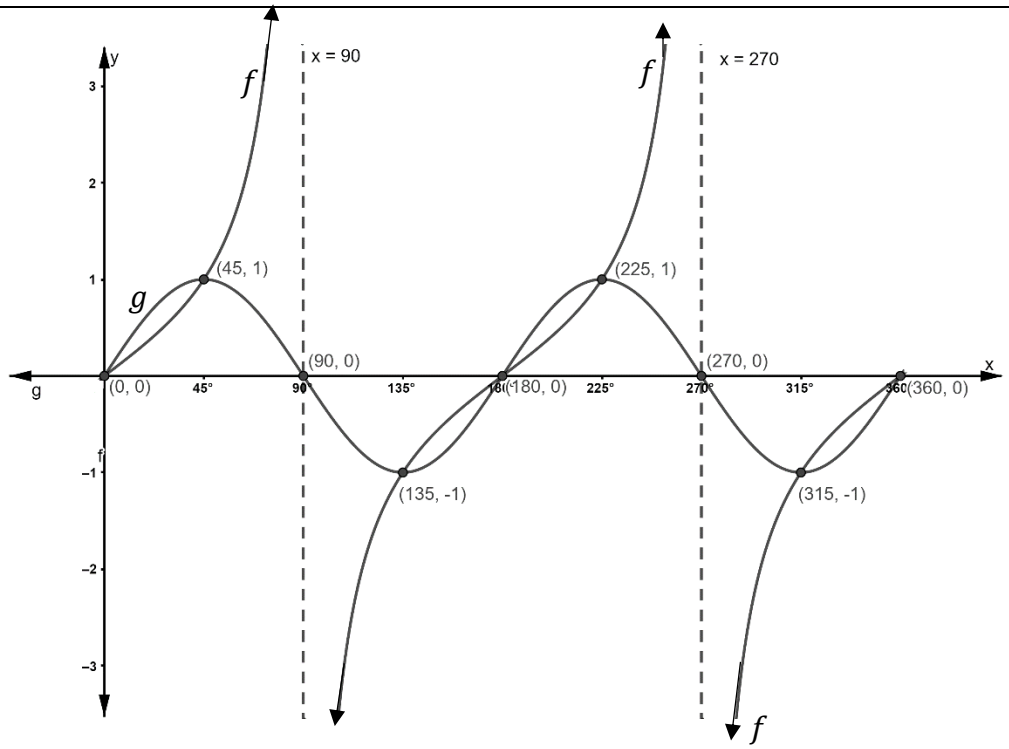
2.1.2	$x - 5y = 0$ $y = \frac{1}{5}x$ $m_{OP} = -5$ ⊥ lines/*lyne* $y - 0 = -5(x - 0)$ $y = -5x$ $x^2 + y^2 = 26$ $x^2 + (-5x)^2 = 26$ $x^2 + 25x^2 = 26$ $26x^2 = 26$ $x^2 = 1$ $x = \pm 1$ $\therefore x = -1$ $y = -5(-1)$ $y = 5$ $\therefore P(-1; 5)$	✓ $y = \frac{1}{5}x$ ✓ $m_{OP} = -5$ ✓ SF ✓ $y = -5x$ ✓ SF ✓ $x = -1$ ✓ SF ✓ $y = 5$ ✓ $(-1; 5)$	A A CA CA CA CA CA CA CA (9)
2.1.3	Q$(1; -5)$	✓ $x = 1$ ✓ $y = -5$	CA CA (2)
2.1.4	$y - y_1 = m(x - x_1)$ $y - (-5) = \frac{1}{5}(x - 1)$ $y + 5 = \frac{1}{5}x - \frac{1}{5}$ $y = \frac{1}{5}x - \frac{26}{5}$ **OR/*OF*** $x.x_1 + y.y_1 = r^2$ $x(1) + y(-5) = 26$ $-5y = -x + 26$ $y = \frac{1}{5}x - \frac{26}{5}$	✓ F ✓ SF ✓ $y = \frac{1}{5}x - \frac{26}{5}$ **OR/*OF*** ✓ F ✓ SF ✓ Equation/*Vergelyking*	A CA CA A CA CA (3)
2.2	**DO NOT MARK. / *MOENIE MERK NIE.*** **MARKS REDISTRIBUTED IN QUESTION 2. / *PUNTE IS HERVERDEEL IN VRAAG 2.***		
			[14]

QUESTION/*VRAAG* 3			
3.1.1	$cosec\theta$ $= \dfrac{1}{\sin\left(\frac{\pi}{3} \times \frac{180^o}{\pi}\right)}$ **OR/*OF*** $= \dfrac{1}{\sin\frac{\pi}{3}}$ $= \dfrac{1}{sin60^o}$ $= 1,15$ $= 1,15$	✓ SF & I ✓ $1,15$ **AO – Full marks/*Volpunte***	A CA (2)
3.1.2	$\cos(2\theta + \alpha)$ $= \cos\left[2\left(\frac{\pi}{3}\right) + \frac{\pi}{6}\right]$ $= cos\left(\frac{5}{6}\pi \times \frac{180^o}{\pi}\right)$ $= cos150^o$ $= -0,87$ **OR/*OF*** $\cos(2\theta + \alpha)$ $= \cos\left[2\left(\frac{\pi}{3}\right) + \frac{\pi}{6}\right]$ $= cos\left(\frac{5}{6}\pi\right)$ $= -0,87$	✓ SF ✓ Conversion/ *Omskakeling* ✓ 150° ✓ $-0,87$ **OR/*OF*** ✓ $\left(\frac{\pi}{3}\right)$ ✓ $\frac{\pi}{6}$ ✓ $\frac{5}{6}\pi$ ✓ $-0,87$ **AO – Full marks/*Volpunte***	A A CA CA A A A CA (4)
3.2.1	$13\cos\theta = -5$  $cos\theta = -\dfrac{5}{13}$ $x^2 + y^2 = r^2$ $(-5)^2 + y^2 = (13)^2$ $y^2 = 169 - 25$ $y = \pm 12$ $\therefore y = -12$ $\sin\theta = -\dfrac{12}{13}$	✓ Ratio/*Verhouding* $-\frac{5}{13}$ ✓ Method/*Metode* ✓ $y = -12$ **OR/*OF*** Diagram ✓ Ratio/*Verhouding*	A CA CA CA (4)

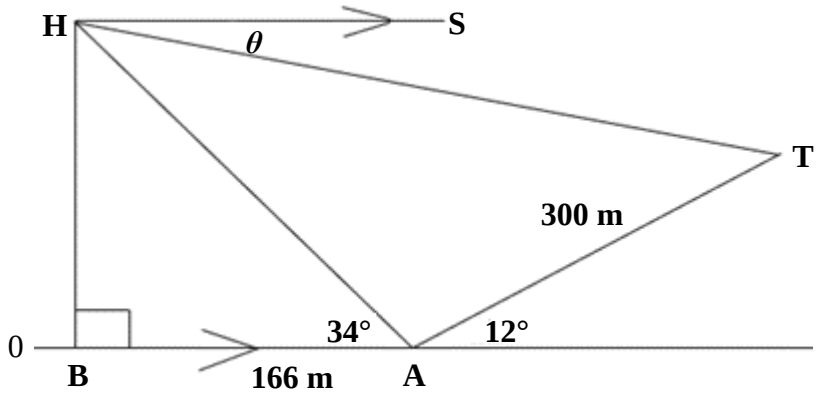
3.2.2	$2\tan\theta - 5sec^2\theta$ $= 2\left(\frac{-12}{-5}\right) - 5\left(\frac{13}{-5}\right)^2$ $= \frac{24}{5} - \frac{169}{5}$ $= -29$	✓ SF $\tan\theta = \frac{-12}{-5}$ ✓ SF $\sec\theta = \frac{13}{-5}$ ✓ -29 **AO 1 mark/punt**	CA CA CA (3)
			[13]

QUESTION/*VRAAG* 4			
4.1	$cot^2x - cosec^2x = -1$	✓ I $cosec^2x$	A (1)
4.2	$tanx.cotx - \frac{sinx}{cosecx} = cos^2x$ LHS $= tanx.\frac{1}{tanx} - \frac{sinx}{cosecx}$ $= 1 - \frac{sinx}{\frac{1}{sinx}}$ $= 1 - sinx \times \frac{sinx}{1}$ $= 1 - sin^2x$ $= cos^2x$ **OR/*OF*** LHS $= \frac{sinx}{cosx}.\frac{cosx}{sinx} - \frac{sinx}{\frac{1}{sinx}}$ $= 1 - sinx \times \frac{sinx}{1}$ $= 1 - sin^2x$ $= cos^2x$ LHS = RHS	✓ I $\frac{1}{tanx}$ ✓ I $\frac{1}{sinx}$ ✓ I $1 - sin^2x$ **OR/*OF*** ✓ I $\frac{sinx}{cosx}.\frac{cosx}{sinx}$ ✓ I $\frac{1}{sinx}$ ✓ I $1 - sin^2x$	A A CA A A CA (3)

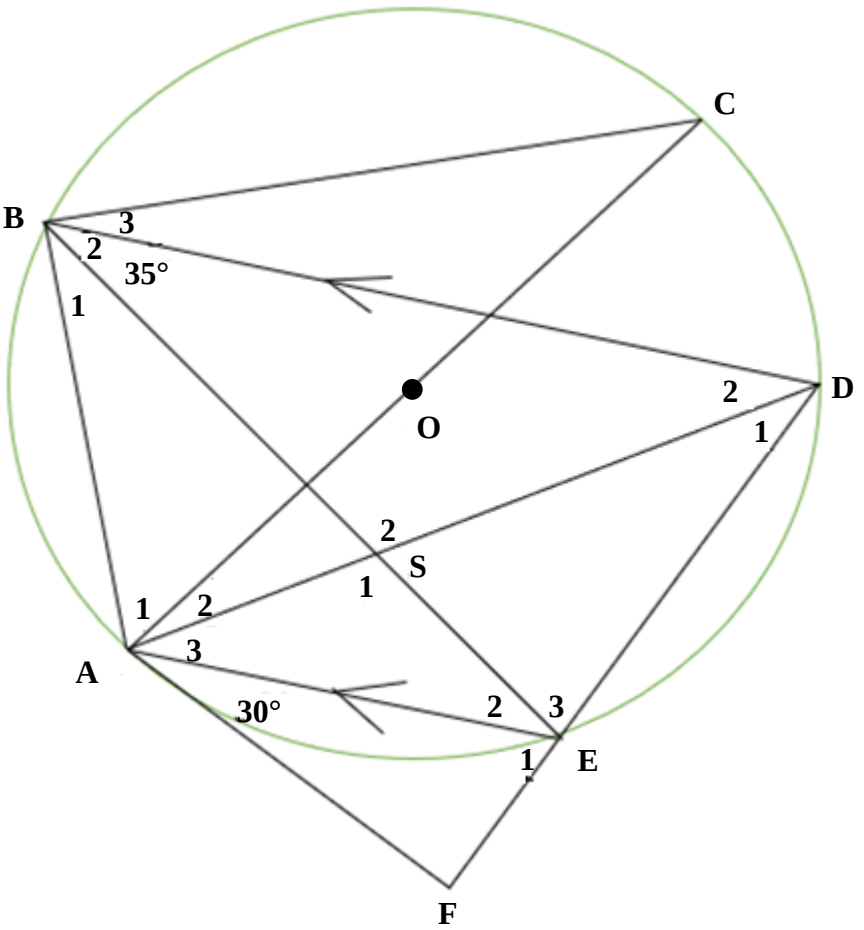
4.3	$\dfrac{\cos(180^o - x).\,tan(180^o + x).\,sin240^o}{sin^2x.\,tan210^o}$ $= \dfrac{\cos(180^o - x).\tan(180^o + x).\,sin(180^o + 60^o)}{sin^2x.\tan(180^o + 30^o)}$ $= \dfrac{-\,cosx.\tan x.(-sin60^o)}{sin^2x.\tan30^0}$ $= \dfrac{cosx.\dfrac{sinx}{cosx}.\dfrac{\sqrt{3}}{2}}{sin^2x.\dfrac{\sqrt{3}}{3}}$ $= \dfrac{3}{2sinx}$ $= \dfrac{3}{2}cosecx$	✓ $-\cos x$ ✓ $tanx$ ✓ $-sin60^o$ ✓ $\tan30^0$ ✓ I $\frac{sinx}{cosx}$ ✓ $\frac{\sqrt{3}}{2}$ and/*en* $\frac{\sqrt{3}}{3}$ ✓ $\frac{3}{2sinx}$ **OR/OF** $\frac{3}{2}cosecx$	A A A A A A CA (7)
4.4	$sin2\alpha = \dfrac{\sqrt{3}}{2}$ Ref. ∠/*Verw.* ∠ $= 60^o$ $2\alpha = 60^o$ or/*of* $2\alpha = 180^o - 60^o$ $\alpha = 30^o$ or/*of* $2\alpha = 120^o$ $\alpha = 60^o$	✓ $sin2\alpha = \frac{\sqrt{3}}{2}$ ✓ ref. angle/*Verw.* ∠ ✓ $\alpha = 30^o$ ✓ $\alpha = 60^o$	A CA CA CA (4)
			[15]

QUESTION/*VRAAG* 5			
5.1			
		For/Vir $g(x)$:	
		✓ Shape/*Vorm* ✓ x −intercepts/*afsnitte* ✓ Turning points/*Draaipunte*	A A A (3)
5.2	1	✓ 1	A (1)
5.3	180°	✓ 180°	A (1)
5.4	$-2 \leq y \leq 0$ **OR/*OF*** $y \in [-2; 0]$	✓ Endpoints/*Eindpunte* ✓ Notation/*Notasie*	A A (2)
5.5	$90^o < x < 180^o$ **OR/*OF*** $x \in (90°; 180°)$	✓ Endpoints/*Eindpunte* ✓ Notation/*Notasie*	A A (2)
			[9]

QUESTION/*VRAAG* 6

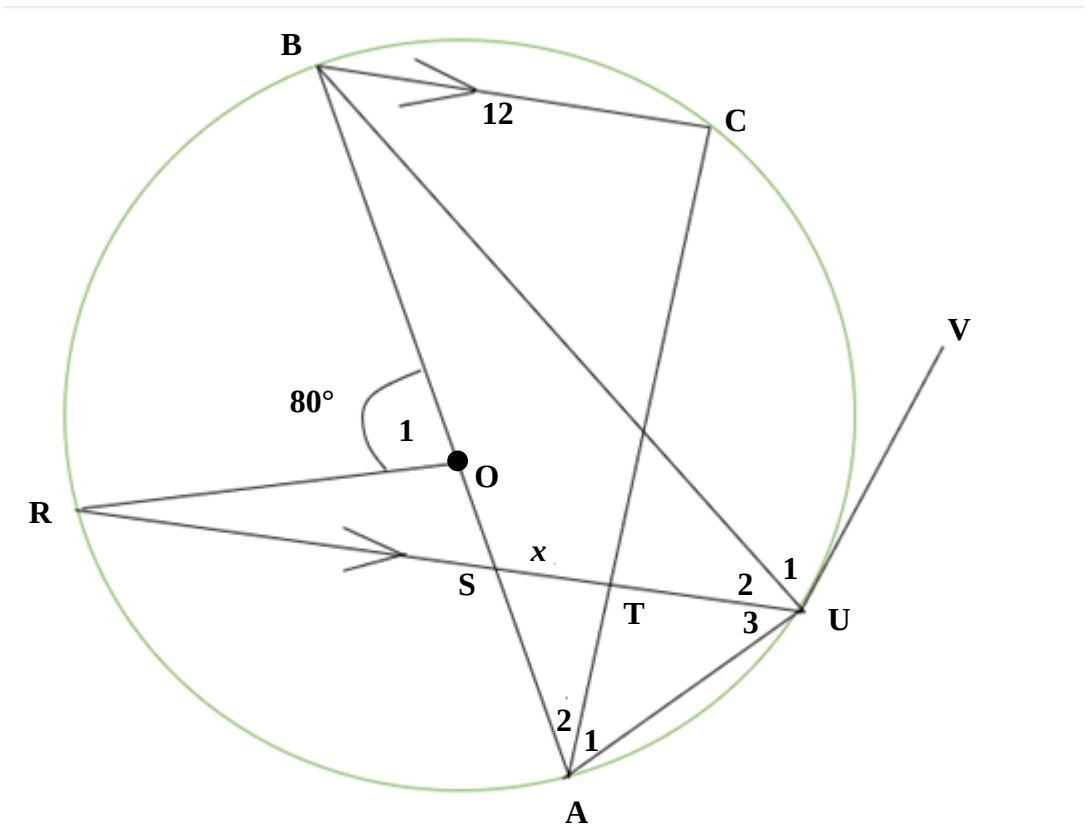


6.1	$H\hat{A}T = 180° - 12° - 34°$ $H\hat{A}T = 134°$	✓ $H\hat{A}T = 134°$	A (1)
6.2	In ΔAHB: $cos34^o = \frac{166}{AH}$ $AH = \frac{166}{cos34^o} = 200{,}232$ $AH = 200\ m$	✓ $cos34^o = \frac{166}{AH}$ ✓ $AH = \frac{166}{cos34^o}$ **AO 0 marks/punte**	A A (2)
6.3	In ΔAHT: $HT^2 = AH^2 + AT^2 - 2AH.AT.cos H\hat{A}T$ $HT^2 = 200^2 + 300^2 - 2(200)(300)cos134^o$ $HT^2 = 213359{,}0045$ $HT = 462\ m$	✓ F ✓ SF ✓ $HT^2 = 213359{,}0045$ ✓ $HT = 462\ m$ **PR**	A A CA CA (4)
6.4	In ΔAHT: $\frac{\sin A\hat{H}T}{300\ m} = \frac{sin T\hat{A}H}{462\ m}$ $\sin A\hat{H}T = \frac{300 \times \sin 134^o}{462}$ $A\hat{H}T = sin^{-1}0{,}467 ....$ $A\hat{H}T = 27{,}8^o$	✓ $\frac{\sin A\hat{H}T}{300\ m} = \frac{sin T\hat{A}H}{462\ m}$ ✓ $\sin A\hat{H}T = \frac{300 \times \sin 134^o}{462}$ ✓ $A\hat{H}T = 27{,}8^o$ **NPR**	A CA CA (3)
			[10]

QUESTION/*VRAAG* 7			
7.1	is perpendicular to the chord (⊥ to chord)/ *is loodreg op die koord (⊥ op koord)*	✓ ST	A (1)
7.2			
7.2.1	$F\hat{A}E = \hat{B}_1 = 30°$ tan chord/*raaklyn koord* $F\hat{A}E = \hat{D}_1 = 30°$ tan chord/*raaklyn koord*	✓ ST ✓ RE ✓ ST/RE	A A A (3)
7.2.2 (a)	$\hat{D}_2 = \hat{E}_2 = 35°$ $\angle^s$ in the same segment/ $\angle^e$ *in dies. sirkel segment*	✓ ST ✓ RE	A A (2)
7.2.2 (b)	$A\hat{B}C = 90°$ ∠ in semicircle/ ∠ *in halwe sirkel* **OR/*OF*** $A\hat{B}C = 90°$ diameter subtends right angle/ *deursnee onderspan regtehoek*	✓ ST ✓ RE ✓ ST ✓ RE	A A A A (2)

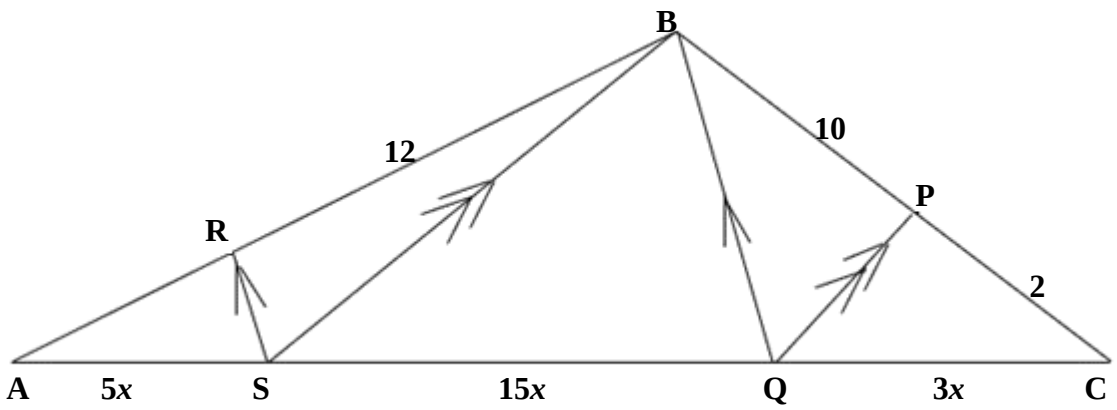
7.2.2 (c)	$B\hat{A}E + (\hat{D}_1 + \hat{D}_2) = 180°$ opp. $\angle^s$ cyclic quad. / *teenoorst.* $\angle^e$ *kdvh.* $B\hat{A}E + 30° + 35° = 180°$ $B\hat{A}E = 115°$	✓ RE ✓ ST	A A (2)
7.2.2 (d)	$\hat{E}_1 = \hat{B}_1 + \hat{B}_2$ ext. $\angle$ cyclic quad. / *buite* $\angle$ *kdvh.* $\hat{E}_1 = 30° + 35°$ $\hat{E}_1 = 65°$	✓ ST ✓ RE ✓ S	A A CA (3)
			[13]

QUESTION/*VRAAG* 8

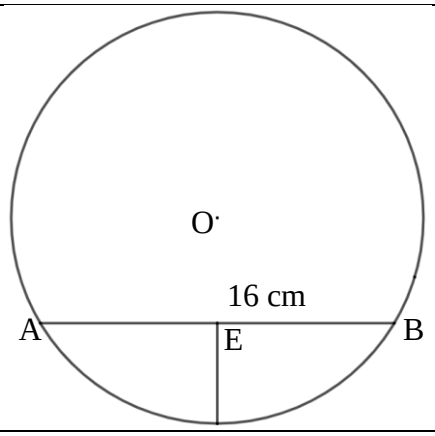


8.1	$A\hat{C}B = 90°$ $\angle$ in semicircle/$\angle$ in halwe sirkel $A\hat{U}B = 90°$ diameter subtends right angle/ *middellyn onderspan regte hoek* **OR/*OF*** $A\hat{C}B = 90°$ $\angle^s$ in semicircle/$\angle$ in halwe sirkel $A\hat{U}B = A\hat{C}B$ $\angle^s$ in same segment/$\angle^e$ *in dies. segment*	✓ ST ✓ RE ✓ ST **OR/*OF*** ✓ ST ✓ RE ✓ ST	A A A A A A (3)

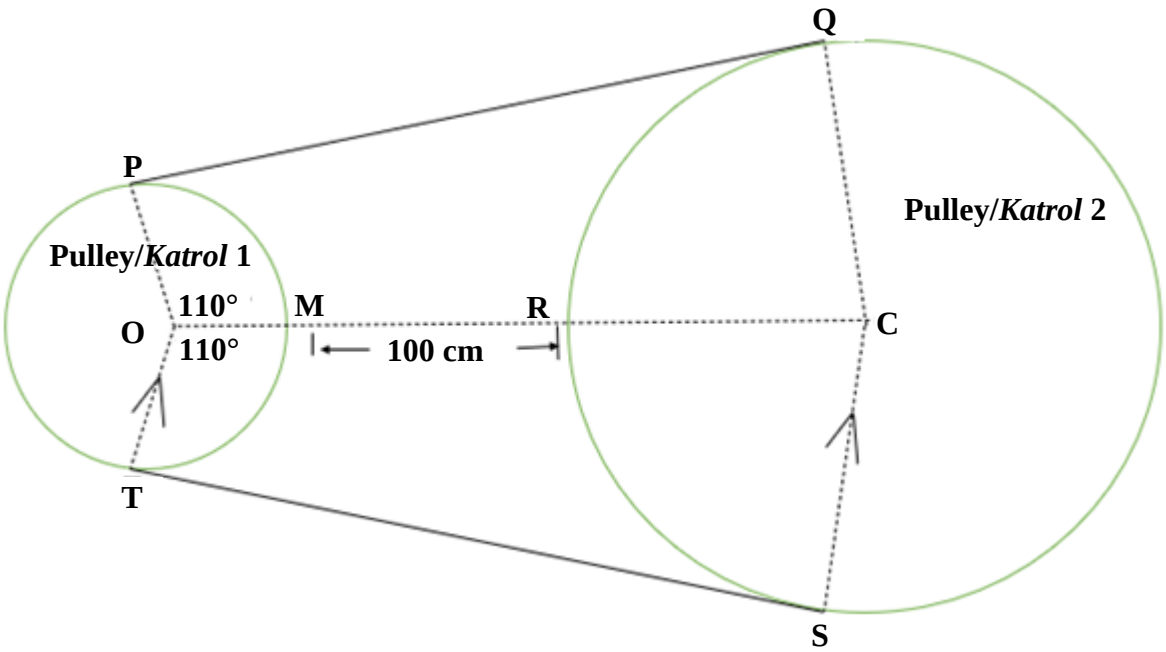
8.2.1	$\hat{O}_1 = 2\,\hat{U}_2$ ∠ at centre = 2 ×∠ at circ./ *Mdpt.∠ = 2 × Omtreks.∠*	✓ RE	A
	$80° = 2\,\hat{U}_2$		
	$\therefore\ \hat{U}_2 = 40°$	✓ ST	A
	$\hat{U}_2 + \hat{U}_3 = 90°$ ∠ in semicircle/∠ *in halwe sirkel*	✓ ST	A
	$\hat{U}_3 = 90° - 40°$	✓ RE	A
	$\hat{U}_3 = 50°$	✓ ST	CA
	OR/OF	**OR/OF**	
	$R\hat{O}A = 180° - 80°$ Adj. $\angle^s$ on str. line / *Aangr. $\angle^e$op reguitlyn*	✓ RE	A
	$R\hat{O}A = 100°$	✓ ST	A
	$R\hat{O}A = 2 \times \hat{U}_3$ ∠ at centre = 2 ×∠ at circ./ *Mdpt.∠ = 2 × Omtreks.∠*	✓ RE	A
	$100° = 2 \times \hat{U}_3$	✓ ST	A
	$\hat{U}_3 = 50°$	✓ ST	CA (5)
8.2.2	$A\hat{B}U + A\hat{U}B + B\hat{A}U = 180°$ Int. $\angle^s$ Δ/ *Binne $\angle^e$ Δ*		
	$20° + 90° + B\hat{A}U = 180°$		
	$B\hat{A}U = 70°$	✓ ST	A
	$\hat{U}_1 = B\hat{A}U = 70°$ tan chord/*raaklyn koord*	✓ ST ✓ RE	CA A (3)
8.2.3	ΔABC///ΔAST equiangular Δ/*gelykhoekige Δ*	✓ ST/RE	A
	$\frac{AB}{AS} = \frac{BC}{ST} = \frac{AC}{AT}$		
	$\frac{12}{x} = \frac{8}{2}$	✓ Ratio/*Verhouding*	A
	$24 = 8x$	✓ $24 = 8x$	CA
	$x = 3$	✓ $x = 3$	CA (4)
			[15]

QUESTION/*VRAAG* 9			
9.1	proportionally/*eweredig*	✓ ST	A (1)
9.2			
9.2.1	In ΔABQ $\frac{AR}{RB} = \frac{AS}{SQ}$ Proportionality/*Eweredigheid*; SR ∥ BQ $\frac{AR}{12} = \frac{5x}{15x}$ $AR = 4$	✓ ST ✓ RE ✓ SF ✓ $AR = 4$ **AO – Full marks/*Volpunte***	A A A CA (4)
9.2.2	• Trapezium/*Trapesium* • One pair of opposite sides are parallel/*Een paar teenoorstaande sye is ewewydig*.	✓ ST ✓ RE	A A (2)
9.2.3	In ΔPQC **AND/*EN*** ΔBSC: $\frac{PC}{BC} = \frac{2}{12} = \frac{1}{6}$ $\frac{QC}{CS} = \frac{3}{18} = \frac{1}{6}$ $\frac{PQ}{BS} = \frac{2}{12} = \frac{1}{6}$ $\therefore \frac{PC}{BC} = \frac{QC}{CS} = \frac{PQ}{BS} = \frac{1}{6}$ $\therefore \Delta PQC \parallel\parallel \Delta BSC$ Corr. sides in proportion/ *Ooreenst. sye in verhouding*	✓ ST ✓ ST ✓ ST ✓ RE	A A A A (4)
			[11]

QUESTION/*VRAAG* 10			
			
10.1.1	5 280 revolutions per minute/5 280 *revolusies per minuut* $n = \frac{5\,280}{60}$ $n = 88$ rev/s	✓ $n = 88$ rev/s **NPU**	A (1)
10.1.2	$v = \pi Dn$ $v = \pi(0{,}3)(88)$ $v = 26{,}40\pi$ m/s $v = 82{,}94$ m/s **OR/OF** $\omega = 2\pi n$ $\omega = 2\pi\left(\frac{5280}{60}\right)$ $\omega = 552{,}920 \ldots . rad/s$ $\therefore v = \omega r$ $v = (552{,}920 \ldots)(0{,}15)$ $v = 82{,}94\ m/s$	✓ F ✓ SF from/*van* 10.1.1 ✓ $v = 82{,}94$ m/s **OR/OF** ✓ $\omega = 552{,}920 \ldots.$ ✓ F ✓ $v = 82{,}94$ m/s **P – If 30 used, MAX 2 marks** **- As 30 gebruik is, MAKS 2 punte** **NPR**	A CA CA A A CA (3)
10.1.3	$\omega = 2\pi n$ $\omega = 2\pi(88)$ $\omega = 176\pi$ rad/s $\omega = 552{,}8\ rad/s$ **OR/OF**	✓ F ✓ SF from/*van* 10.1.1 ✓ $\omega = 552{,}8\ rad/s$ **OR/OF**	A CA CA

	$\omega = \frac{v}{r}$ $\omega = \frac{82{,}94}{0{,}15}$ $\omega = 552{,}8\ rad/s$	✓ F ✓ SF from/*van* 10.1.2 ✓ $\omega = 552{,}8\ rad/s$ **NPU/NPR**	A CA CA (3)
10.2			
	$4h^2 - 4dh + x^2 = 0$ $4h^2 - 4(18) + (16)^2 = 0$ $4h^2 - 72h + 256 = 0$ $h = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$ $h = \frac{-(-72) \pm \sqrt{(-72)^2 - 4(4)(256)}}{2(4)}$ $h = \frac{72 \pm \sqrt{1088}}{8}$ $h = 13{,}12$ **OR/*OF*** $h = 4{,}88$ $\therefore h = 13{,}12\ cm$ **OR/*OF*** If/*as* OE⊥AB then/*dan* $AE = EB = 8cm$ $OA^2 = OE^2 + AE^2$ Pythagoras $9^2 = OE^2 + 8^2$ $OE^2 = 17$ $OE = \sqrt{17}$ $CE = CO + OE$ $CE = 9 + \sqrt{17}$ $CE = 13{,}12$ **OR/*OF***	✓ F ✓ SF ✓ S ✓ SF ✓ $h = 13{,}12\ cm$ **OR/*OF*** ✓ ST ✓ Method/*Metode* ✓ $OE = \sqrt{17}$ ✓ Method/*Metode* ✓ $h = 13{,}12\ cm$ **OR/*OF***	A CA CA CA CA A CA CA CA CA

	$D = h + \frac{x^2}{4h}$ $18 = h + \frac{16^2}{4h}$ $72h = 4h^2 + 256$ $4h^2 - 72h + 256 = 0$ $h = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$ $h = \frac{-(-72) \pm \sqrt{(-72)^2 - 4(4)(256)}}{2(4)}$ $h = \frac{72 \pm \sqrt{1088}}{8}$ $h = 13{,}12$ **OR/*OF*** $h = 4{,}88$ $\therefore h = 13{,}12\ cm$	✓ F ✓ SF ✓ S ✓ SF ✓ $h = 13{,}12\ cm$ **NPU/NPR**	A CA CA CA CA (5)
			[11]

QUESTION/*VRAAG* 11			
			
11.1	$S\hat{C}R + 110° = 180°$ $\therefore\ S\hat{C}R = 70°$	✓ $S\hat{C}R = 70°$	A (1)
11.2	$OC = OM + MR + RC$ $OC = 15 + 100 + 25$ $OC = 140\ cm$	✓ M ✓ $OC = 140\ cm$ **AO – Full marks/*Volpunte*** **NPU/NPR**	A CA (2)

11.3	$70° \times \frac{\pi}{180°}$ $= \frac{7}{18}\pi$ $= 1{,}22$ radians/*radiale*	✓ M ✓ 1,22 or/*of* $\frac{7}{18}\pi$ **AO – Full marks/*Volpunte*** **NPU/NPR**	A CA (2)
11.4	$Q\hat{C}S + S\hat{C}R + R\hat{C}Q = 360°$ $Q\hat{C}S = 360° - 70° - 70°$ $Q\hat{C}S = 220°$	✓ M ✓ $Q\hat{C}S = 220°$ **AO – Full marks/*Volpunte***	A CA (2)
11.5	$s = r\theta$ $s = (25)\left(220° \times \frac{\pi}{180°}\right)$ $s = 96\ cm$	✓ SF ✓ $\times \frac{\pi}{180°}$ ✓ $s = 96\ cm$ **NPU/NPR**	A A CA (3)
11.6	Length of belt /= $s_1 + PQ + TS + s_2$ *Lengte van band* $= (15)\left(140° \times \frac{\pi}{180°}\right) + 220 + 220 + 96$ $= 572{,}65$ cm	✓ M ✓ $(15)(140°)$ ✓ $\times \frac{\pi}{180°}$ ✓ 572,65 cm **NPU/NPR**	CA CA A CA (4)
			[14]

QUESTION/*VRAAG* 12			
12.1.1	$V = \pi r^2 h$ $V = \pi(4)^2(15)$ $V = 240\pi\ cm^3$ $V = 753{,}98\ cm^3$	✓ SF ✓753,98 cm^3 or/*of* $240\pi\ cm^3$ **NPU/NPR**	A CA (2)
12.1.2 (a)	Curved area of cone/*Geboë area van die keël* = πrl $= \pi(4)(5)$ $= 20\pi\ cm^2$ $= 62{,}83\ cm^2$	✓ SF ✓62,83 cm^2 or/*of* $20\pi\ cm^2$ **NPU/NPR**	A CA (2)

12.1.2 (b)	Surface area of cylinder/*Oppervlakte van silinder* $= \pi r^2 + 2\pi rh$ $= \pi(4)^2 + 2\pi(4)(15)$ $= 136\pi\ cm^2$ $= 427{,}96\ \text{cm}^2$	✓ F ✓ SF ✓$427{,}96\ \text{cm}^2$ of/*of* $136\pi\ cm^2$ **NPU/NPR**	A CA CA (3)
12.1.3	Total surface area/*Totale oppervlakte* $= 62{,}83 + 427{,}96$ Total surface area/*Totale oppervlakte*$= 490{,}09\ \text{cm}^2$	CA from/*van* 12.1.2 a & b ✓$490{,}09\ \text{cm}^2$ or/*of* $156\pi\ cm^2$ **NPU/NPR**	CA (1)
12.2	$A_T = a\left(\frac{O_1 + O_n}{2} + O_2 + O_3 + \ldots + O_{n-1}\right)$ $A_T = 3\left(\frac{1{,}7 + 1{,}8}{2} + 2{,}0 + 1{,}9 + 2{,}4 + 1{,}5\right)$ $A_T = 3(9{,}55)$ $A_T = 28{,}65\ \text{m}^2$ **OR/*OF*** $A_T = a(m_1 + m_2 + m_3 + \cdots + m_n)$ $A_T = 3\left(\frac{1{,}7 + 2}{2} + \frac{2 + 1{,}9}{2} + \frac{1{,}9 + 2{,}4}{2} + \frac{2{,}4 + 1{,}5}{2} + \frac{1{,}5 + 1{,}8}{2}\right)$ $A_T = 3(1{,}85 + 1{,}95 + 2{,}15 + 1{,}95 + 1{,}65)$ $A_T = 3(9{,}55)$ $A_T = 28{,}65\ \text{m}^2$	✓ F ✓ SF ✓ $28{,}65\ \text{m}^2$ **OR/*OF*** ✓ F ✓ SF ✓ $28{,}65\ \text{m}^2$ AO – Full marks/Volpunte **NPU/NPR**	A A CA A A CA (3)
			[11]
			TOTAL/*TOTAAL*: 150