



basic education

Department:
Basic Education
REPUBLIC OF SOUTH AFRICA

**SENIOR CERTIFICATE EXAMINATIONS/
NATIONAL SENIOR CERTIFICATE EXAMINATIONS
SENIORSERTIFIKAAT-EKSAMEN/
NASIONALE SENIORSERTIFIKAAT-EKSAMEN
GRADE/GRAAD: 12**

**TECHNICAL MATHEMATICS P2/TEGNIESE WISKUNDE V2
2022
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
NPU	No penalty for omitting units/Geen penalisering vir eenhede weggelaat nie
R	Rounding/Afronding
RE	Reason/Rede
S	Simplification/Vereenvoudiging
SF	Substitution in correct formula/Vervanging in korrekte formule
ST/RE	Statement with reason/Bewering met rede
F	Correct formula/Korrekte formule
PR	Penalty for rounding/Penalisering vir afronding

**These marking guidelines consist of 22 pages.
Hierdie nasienriglyne bestaan uit 22 bladsye.**

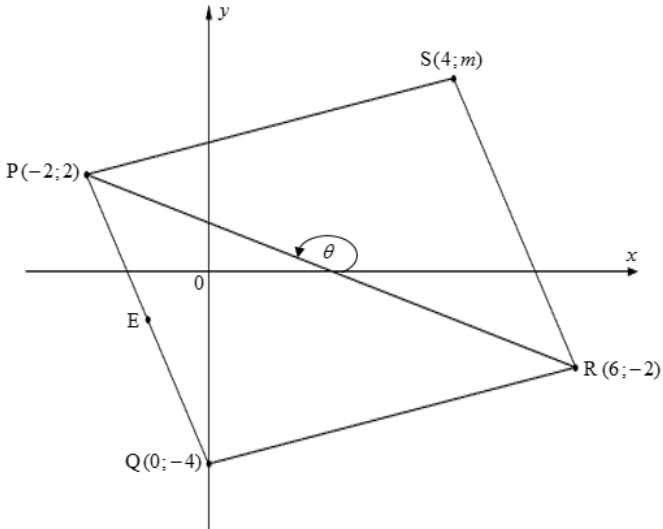
NOTE:

- 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 with the marking code CA
- If a candidate strikes off a response to a question and does not attempt the question again, then the struck off question should be marked

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, tot alle aspekte van die nasienriglyne toegepas word soos aangedui deur the nasienkode CA.
- Indien 'n kandidaat 'n antwoord deurhaal en nie poog om die vraag weer te beantwoord dan moet die deurgehaalde antwoord gemerk word.

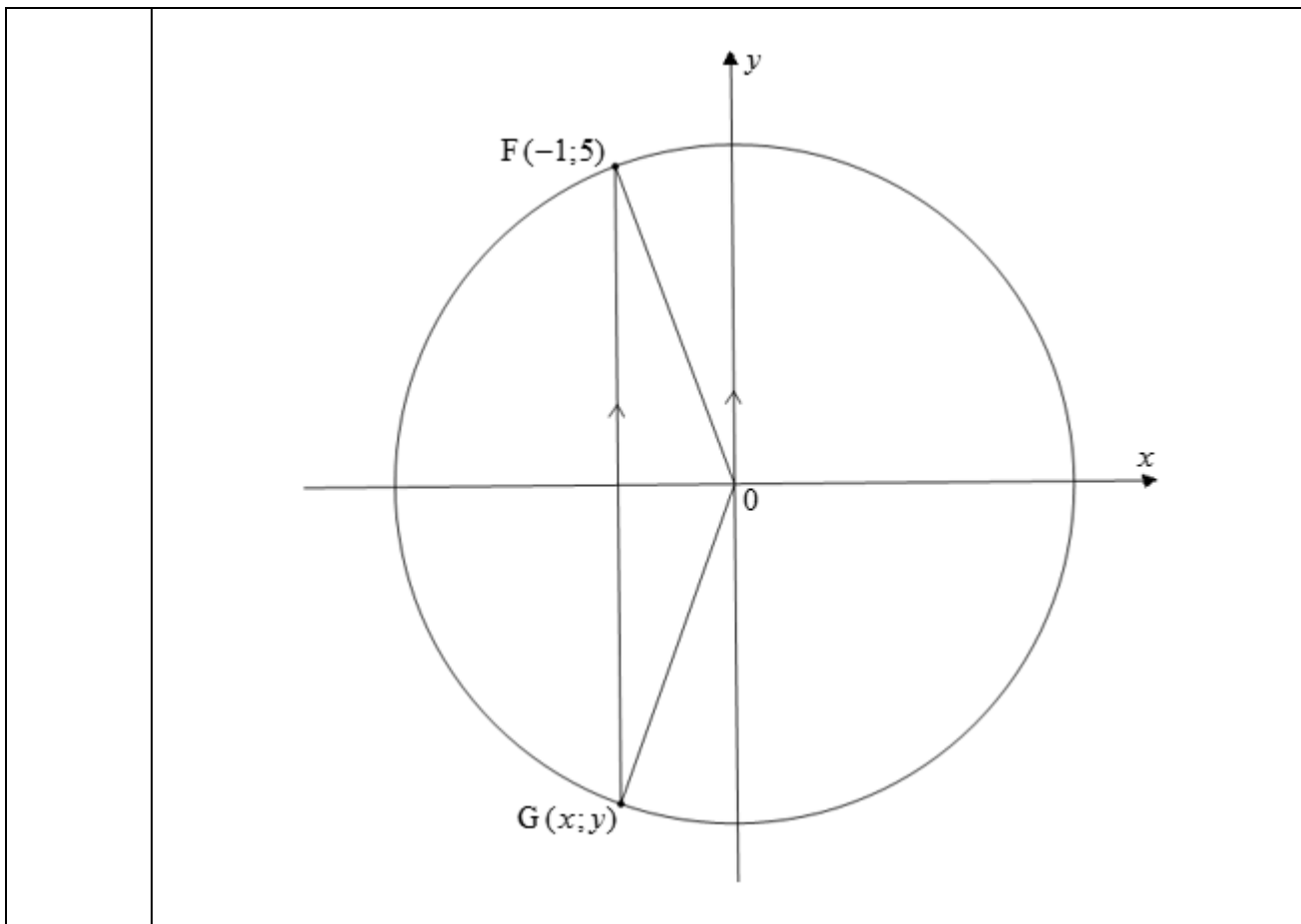
QUESTION/VRAAG 1

		
<p>1.1.1</p>	$m_{PR} = \frac{y_P - y_R}{x_P - x_R}$ $= \frac{2 - (-2)}{-2 - 6}$ $= -\frac{1}{2}$	<p>✓ SF A</p> <p>✓ gradient/gradiënt CA</p> <p>AO Full marks/</p> <p style="text-align: right;">(2)</p>
<p>1.1.2</p>	$\tan \theta = m = -\frac{1}{2}$ <p>ref. $\angle \approx 26,57^\circ$</p> $\therefore \theta \approx 180^\circ - 26,57^\circ$ $\approx 153,43^\circ$	<p>CA from/ vanaf Q/V1.1.1</p> <p>✓ SF CA</p> <p>✓ ref angle/verw. hoek CA</p> <p>✓ value of angle/waarde van hoek CA</p> <p>AO Full marks/Volpunte</p> <p style="text-align: right;">NPR</p> <p style="text-align: right;">(3)</p>

1.1.3	$QR = \sqrt{(x_Q - x_R)^2 + (y_Q - y_R)^2}$ $= \sqrt{(0 - 6)^2 + (-4 - (-2))^2}$ $= \sqrt{40} \text{ OR } 2\sqrt{10}$	<p>✓ SF A</p> <p>✓ Length of QR in surd form/ <i>Lengte in wortelvorm</i> CA AO Full marks/Volpunte</p>
(2)		
1.1.4	$E \left(\frac{x_P + x_Q}{2}; \frac{y_P + y_Q}{2} \right)$ $E \left(\frac{-2 + 0}{2}; \frac{2 + (-4)}{2} \right)$ $E (-1; -1)$ <p style="text-align: center;">OR/OF</p> $x_E = \frac{x_1 + x_2}{2}, y_E = \frac{y_1 + y_2}{2}$ $x_E = \frac{-2 + 0}{2}, y_E = \frac{2 + (-4)}{2}$ $E (-1; -1)$	<p>✓ x-value/waarde A</p> <p>✓ y-value /waarde A</p> <p>✓ x-value/waarde A</p> <p>✓ y-value /waarde A</p> <p>[Penalty of one mark if not simplified/ <i>Penaliseer met een punt indien nie vereenvoudig nie</i>]</p>
(2)		
1.1.5	$m_{PQ} = \frac{2 - (-4)}{-2 - 0} = -3$ $m_{SR} = -3$ $y = -3x + c$ $-2 = -3(6) + c$ $c = 16$ $\therefore y = -3x + 16$ <p style="text-align: center;">OR/OF</p> $m_{PQ} = \frac{2 - (-4)}{-2 - 0} = -3$ $y - y_1 = m(x - x_1)$ $y - (-2) = -3(x - 6)$ $y = -3x + 18 - 2$ $\therefore y = -3x + 16$	<p>✓ m_{PQ} A</p> <p>✓ m_{SR} CA</p> <p>✓ substitution/vervanging CA</p> <p>✓ equation/vergelyking CA</p> <p style="text-align: center;">OR/OF</p> <p>✓ m_{PQ} A</p> <p>✓ m_{SR} CA</p> <p>✓ substitution/vervanging CA</p> <p>✓ equation/vergelyking CA</p>
(4)		

<p>1.1.6</p>	$y = -3x + 16$ $= -3(4) + 16$ $= 4$ <p style="text-align: center;">OR/OF</p> $m_{RS} = -3$ $\frac{m + 2}{4 - 6} = -3$ $m + 2 = 6$ $\therefore m = 4$	<p>✓ SF CA ✓ y coordinate/-koördinaat CA</p> <p style="text-align: center;">OR/OF</p> <p>✓ subst./verv. (4;m) CA ✓ value of m/waarde van m CA AO Full marks/Volpunte (2)</p>
<p>1.2</p>	$m_{QR} = \frac{-2 - (-4)}{6 - 0}$ $= \frac{1}{3}$ $m_{PQ} \times m_{QR} = -3 \times \frac{1}{3} = -1$ <p style="text-align: center;">OR/OF</p> $PQ^2 = (-2 - 0)^2 + (2 - (-4))^2 = 40$ $PR^2 = (-2 - 6)^2 + (2 - (-2))^2 = 80$ $PR^2 = PQ^2 + QR^2$	<p>✓ gradient of/gradiënt van QR A ✓ product/produk A</p> <p style="text-align: center;">OR/OF</p> <p>✓ length of/lengte van PQ and PR A ✓ Pyth. theorem PR A (2) [17]</p>

QUESTION/VRAAG 2



2.1.1	$G(-1;-5)$	✓ x ✓ y	A A (2)
2.1.2(a)	$m_{OF} = -5$	✓ gradient/gradient	A (1)
2.1.2(b)	$m_{\text{tang}} = \frac{1}{5}$ $y = mx + c$ OR/OF $y - y_1 = m(x - x_1)$ $5 = \frac{1}{5}(-1) + c$ OR/OF $y - 5 = \frac{1}{5}(x - (-1))$ $c = \frac{26}{5}$ $\therefore y = \frac{1}{5}x + \frac{26}{5}$ or/of $y = 0,2x + 5,2$ OR/OF	✓ gradient/gradient ✓ substitution/vervanging ✓ equation/vergelyking	CA A CA OR/OF

$$r^2 = (-1)^2 + (5)^2$$

$$\therefore r^2 = 26$$

$$x_1 \cdot x + y_1 \cdot y = r^2$$

$$-x + 5y = 26$$

$$5y = x + 26$$

$$\therefore y = \frac{1}{5}x + \frac{26}{5} \text{ or / of } y = 0,2x + 5,2$$

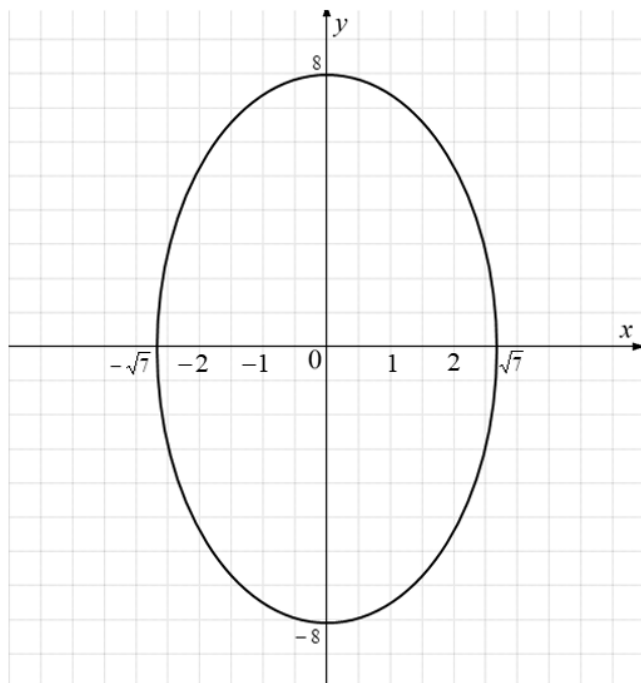
✓ value of r^2 /waarde van r^2 **A**

✓ substitution/vervanging **CA**

✓ equation/vergelyking **CA**

(3)

2.2



✓ both x-intercepts/
 beide x-afsnitte **A**

✓ both y-intercepts
 beide y-afsnitte **A**

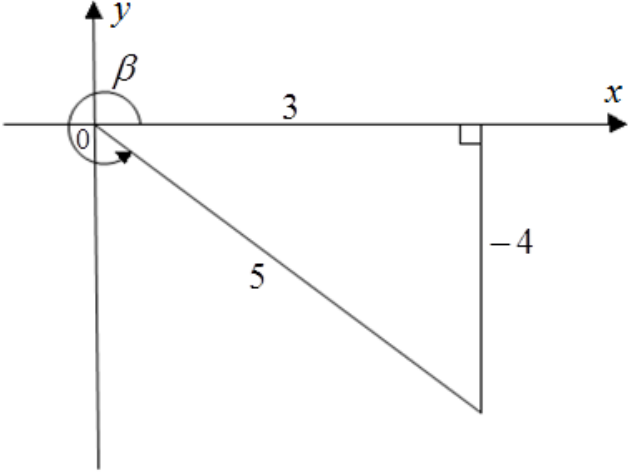
✓ elliptical shape/eliptiese vorm
CA

(3)

[9]

QUESTION/VRAAG 3

3.1.1	$\cot(P - Q)$ $= \cot(71^\circ - 42^\circ)$ $= \frac{1}{\tan(29^\circ)}$ $\approx 1,80$	<p>✓ substitution/vervanging A</p> <p>✓ I A</p> <p>✓ 1,80 A</p> <p>AO Full marks/Volpunte</p> <p>(3)</p>
3.1.2	$\frac{\cos Q}{\sec P}$ $= \frac{\cos 42^\circ}{\sec 71^\circ}$ $= \cos 42^\circ \div \frac{1}{\cos 71^\circ}$ $\approx 0,24$	<p>✓ substitution/vervanging A</p> <p>✓ I A</p> <p>✓ 0,24 CA</p> <p>(3)</p>

<p>3.2</p>	<p>$3\sec \beta - 5 = 0$</p> <p>$\sec \beta = \frac{5}{3}$ OR/OF $\cos \beta = \frac{3}{5}$</p> <p>$(5)^2 = (3)^2 + y^2$</p> <p>$y^2 = 16$</p> <p>$y = \pm 4$</p> <p>$\therefore y = -4$</p>  <p>$\sin^2 \beta - \cos^2 \beta$</p> <p>$= \left(-\frac{4}{5}\right)^2 - \left(\frac{3}{5}\right)^2$</p> <p>$= \frac{7}{25}$</p>	<p>✓ sec/cos ratio/-verhouding A</p> <p>✓ substitution/vervanging A</p> <p>✓ correct y-value/korrekte y-waarde CA</p> <p>✓ diagram CA</p> <p>✓ sin ratio/-verhouding CA</p> <p>✓ cos/-verhouding CA</p> <p>✓ simplification/vereenv. CA (7)</p>
<p>3.3</p>	<p>$\cos 2x - \tan 29^\circ = 0$</p> <p>$\cos 2x = \tan 29^\circ$</p> <p>$\cos 2x = 0,554309051$</p> <p>ref. $\angle \square 56,34^\circ$</p> <p>$2x = 56,34^\circ$ or $2x = 360^\circ - 56,34^\circ$</p> <p>$\therefore x \square 28,17^\circ$ or $x \square 151,83^\circ$</p>	<p>✓ $\cos 2x = \tan 29^\circ$ A</p> <p>✓ ref. angle/verwys. hoek CA</p> <p>✓ correct quadrants/korrekte kwadrante A</p> <p>✓ $28,17^\circ$ CA</p> <p>✓ $151,83^\circ$ CA (5)</p>
<p>[18]</p>		

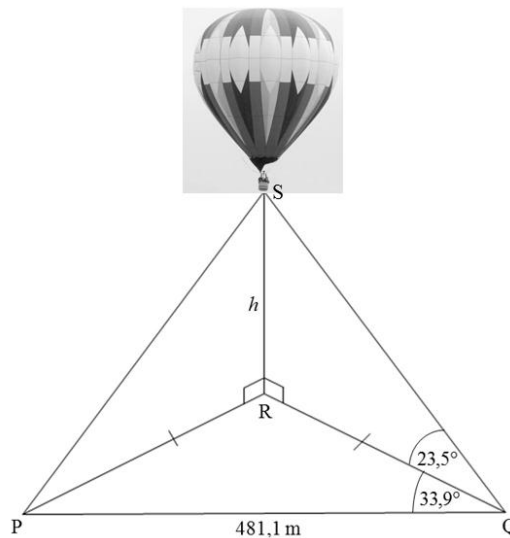
QUESTION/VRAAG 4

4.1	$\cot^2 A \cdot \sin^2 A + \cos^2 A \cdot \tan^2 A$ $= \frac{\cos^2 A}{\sin^2 A} \cdot \sin^2 A + \cos^2 A \cdot \frac{\sin^2 A}{\cos^2 A}$ $= \cos^2 A + \sin^2 A$ $= 1$	✓ I for/ vir $\frac{\cos^2 A}{\sin^2 A}$ A ✓ I for/ vir $\frac{\sin^2 A}{\cos^2 A}$ A ✓ S CA ✓ I for/ vir 1 CA (4)
4.2	$\frac{\sin^2(\pi + \theta) + \cos(180^\circ - \theta) \cdot \sec(360^\circ - \theta)}{\tan(2\pi - \theta) \cdot \cot(180^\circ + \theta)} = \cos^2 \theta$ $\text{LHS} = \frac{\sin^2 \theta + (-\cos \theta) \cdot \sec \theta}{-\tan \theta \cdot \cot \theta}$ $= \frac{\sin^2 \theta - \cos \theta \cdot \frac{1}{\cos \theta}}{-\tan \theta \cdot \frac{1}{\tan \theta}}$ $= \frac{\sin^2 \theta - 1}{-1}$ $= \frac{-(1 - \sin^2 \theta)}{-1} = \frac{-\cos^2 \theta}{-1}$ $= \cos^2 \theta$ $\therefore \text{LHS} = \text{RHS}$	✓ $\sin^2 \theta$ A ✓ $-\cos \theta$ A ✓ $\sec \theta$ A ✓ $-\tan \theta$ A ✓ $\cot \theta$ A ✓ I for/ vir $\frac{1}{\cos \theta}$ A ✓ I for/ vir $\frac{1}{\tan \theta}$ A ✓ simplification/vereenv. CA ✓ I for/ vir $-\cos^2 \theta$ A (9)
		[13]

QUESTION/VRAAG 5

5.1	180°	✓ period/periode A (1)
5.2		f: ✓ shape/vorm A ✓ intercepts/afsnitte ✓ turning point/ draaipunt A g: ✓ shape/vorm A ✓ intercepts/afsnitte A ✓ end-points/ eindpunte A (6)
		[7]

QUESTION/VRAAG 6



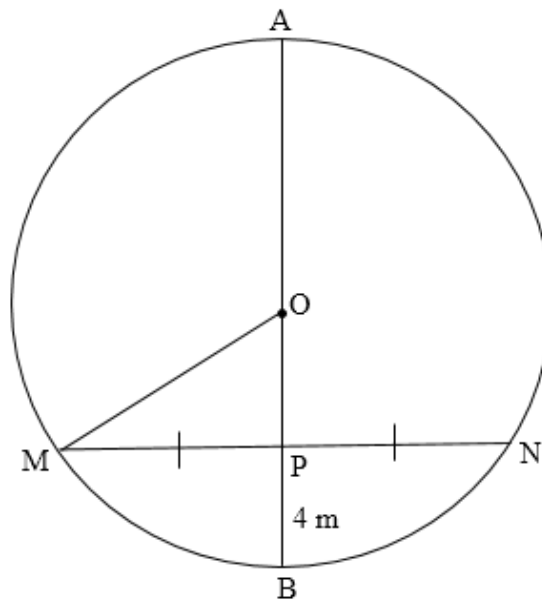
6.1	$\hat{P}RQ + 33,9^\circ + 33,9^\circ = 180^\circ$ $\therefore \hat{P}RQ = 112,2^\circ$	✓ M A ✓ size of/grootte van $\hat{P}RQ$ CA AO Full marks/Volpunte (2)
6.2	$\frac{RQ}{\sin 33,9^\circ} = \frac{481,1}{\sin 112,2^\circ}$ $RQ = \frac{481,1 \cdot \sin 33,9^\circ}{\sin 112,2^\circ}$ $\therefore RQ \approx 289,81 \text{ m}$ <p style="text-align: center;">OR/OF</p> $RQ^2 \approx PR^2 + (481,1)^2 - 2(481,1)PR \cos 33,9^\circ$ $962,2PR \cos 33,9^\circ \approx 231\,457,21$ $PR \approx \frac{231\,457,21}{962,2 \cos 33,9^\circ}$ $RQ \approx 289,81 \text{ m} \qquad PR = RQ$	✓ SF CA ✓ RQ subject/ -onderwerp A ✓ value of/waarde van RQ CA <p style="text-align: center;">OR/OF</p> ✓ SF CA ✓ PR subject/ -onderwerp A ✓ value of/waarde van RQ CA (3)
6.3	$\tan 23,5^\circ = \frac{h}{289,81}$ $h = 289,81 \cdot \tan 23,5^\circ$ $\therefore h = 126 \text{ m}$	✓ tan ratio/-verhouding A ✓ h subject/-onderwerp CA ✓ value of/waarde van h CA PR (3)

6.4	$\text{Area of } \triangle QPR = \frac{1}{2}(481,1)(289,81)\sin 33,9^\circ$ $\square 38\,882,53 \text{ m}^2$ <p style="text-align: center;">OR/OF</p> $\text{Area of } \triangle QPR = \frac{1}{2}(289,81)(289,81)\sin 112^\circ$ $\square 38\,881,86 \text{ m}^2$	<p>✓ SF CA ✓ area value/ <i>oppervlaktewaarde</i> CA from/vannuit 6.1 and 6.2</p> <p style="text-align: center;">OR/OF</p> <p>✓ SF CA ✓ area value/ <i>oppervlaktewaarde</i> CA from/vannuit 6.1 and 6.2</p> <p style="text-align: right;">(2) [10]</p>
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QUESTION/VRAAG 7

7.1	Perpendicular to the chord/ <i>Loodreg op die koord</i>	✓ answer/antw. A (1)
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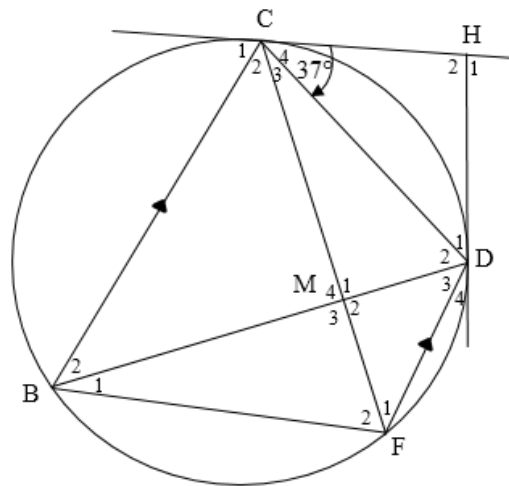
7.2



7.2.1	Diameter// <i>middellyn</i> : $16\text{m} + 4\text{m} = 20\text{m}$ $OM = 10\text{ m}$	✓ ST A (1)
7.2.2	$\hat{O}PM = 90^\circ$ (line from centre to midpoint of chord/ <i>lyn van middelpunt na mdpt van koord</i>) $OM^2 = OP^2 + MP^2$ (pythagoras) $10^2 = 6^2 + MP^2$ $MP^2 = 100 - 36$ $MP = 8\text{ m}$ <p style="text-align: center;">OR/OF</p>	✓ M A ✓ 6 A ✓ SF CA ✓ S CA ✓ Value of/Waarde van MP CA <p style="text-align: center;">OR/OF</p>

	$4h^2 - 4hd + x^2 = 0$ $4(4)^2 - 4(4)(20) + MN^2 = 0$ $MN^2 = 256$ $MN = 16$ $MP = 8 \text{ m}$	✓ F A ✓ SF A ✓ simplification/vereenv. A ✓ Value of/Waarde van MN A ✓ Value of/Waarde van MP A (5)
		[7]

QUESTION/VRAAG 8



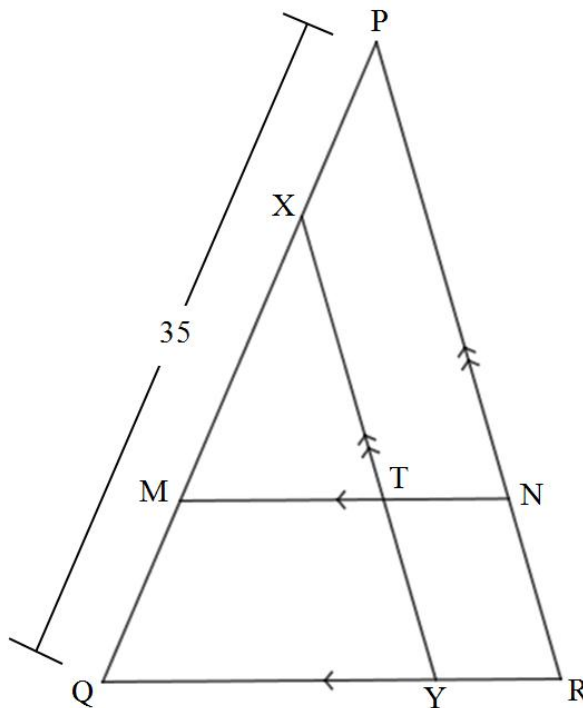
<p>8.1</p>	<p>$\hat{D}_1 = 37^\circ$ (tangents from the same point/<i>raaklyne van dieselfde punt</i>) $\hat{H}_1 = 74^\circ$ (exterior/<i>buite</i> \angle in Δ)</p> <p style="text-align: center;">OR/OF</p> <p>$\hat{C}_4 = \hat{B}_2 = 37^\circ$ (tan-chord th./<i>rklyn-koord st</i>) $\hat{D}_1 = \hat{B}_2 = 37^\circ$ (tan-chord th./<i>rklyn-koord st</i>) $\hat{C}_4 = \hat{D}_1 = 37^\circ$ $\hat{H}_1 = 74^\circ$ (exterior/<i>buite</i> \angle in Δ)</p>	<p>✓ ST A ✓ RE A ✓ ST A ✓ RE A</p> <p style="text-align: center;">OR/OF</p> <p>✓ ST A ✓ RE A</p> <p>✓ ST A ✓ RE A</p> <p style="text-align: right;">(4)</p>
<p>8.2</p>	<p>$\hat{C}_4 = \hat{F}_1 = 37^\circ$ (tan-chord th./<i>rklyn-koord st</i>) $\hat{C}_2 = \hat{F}_1 = 37^\circ$ (alt/ <i>verw.</i> \angle^s, $BC \parallel FD$)</p>	<p>✓ ST A ✓ RE A ✓ ST CA ✓ RE A</p> <p style="text-align: right;">(4)</p>
<p>8.3</p>	<p>$\hat{C}_2 = \hat{D}_3 = 37^\circ$ (\angles in the same segment/<i>in dieselfde segment</i>) $\hat{F}_1 = 37^\circ$ (proven/<i>bewys</i> in 8.2) $\therefore MD = MF$ (sides opp./<i>sye teenoor</i> = \angle)</p> <p style="text-align: center;">OR/OF</p> <p>$\hat{F}_1 = \hat{B}_2$ (\angles in the same segment/<i>in dieselfde segment</i>) $\hat{D}_3 = \hat{B}_2$ (alt/ <i>verw.</i> \angles, $BC \parallel FD$) $\hat{F}_1 = \hat{D}_3$ $\therefore MD = MF$</p>	<p>✓ ST CA ✓ RE A ✓ RE A</p> <p style="text-align: center;">OR/OF</p> <p>✓ ST CA ✓ RE A</p> <p>✓ ST A</p> <p style="text-align: right;">(3)</p>

8.4	$\hat{M}_1 = 74^\circ$ (exterior/buite \angle of Δ)	✓ ST	CA
	$\hat{H}_1 = \hat{M}_1$ (exterior/buite \angle of Δ)	✓ RE	A
	\therefore CHDM is a cyclic quad. (exterior $\angle =$ opp pint \angle) <i>CHDM is 'n koordevierhoek./ (buite $\angle =$ teenst \angle)</i>	✓ ST	CA
	OR/OF	✓ RE	A
	$\hat{H}_2 = 180^\circ - 74^\circ = 106^\circ$ sum of/som van \angle s of Δ	✓ ST	CA
$\hat{M}_1 = 74^\circ$ ext./buite \angle of Δ	✓ RE	A	
		✓ ST	CA
$\hat{H}_2 + \hat{M}_1 = 180^\circ$			
\therefore CHDM is a cyclic quad. (opp. \angle s are supplementary) <i>CHDM is 'n koordevierhoek. (teenst \angle e is supplim.)</i>	✓ RE	A	
			(4)
			[15]

QUESTION/VRAAG 9

9.1	Divides the other two sides proportionally./Verdeel die ander twee sye eweredig.	✓ answer/antwoord	A (1)
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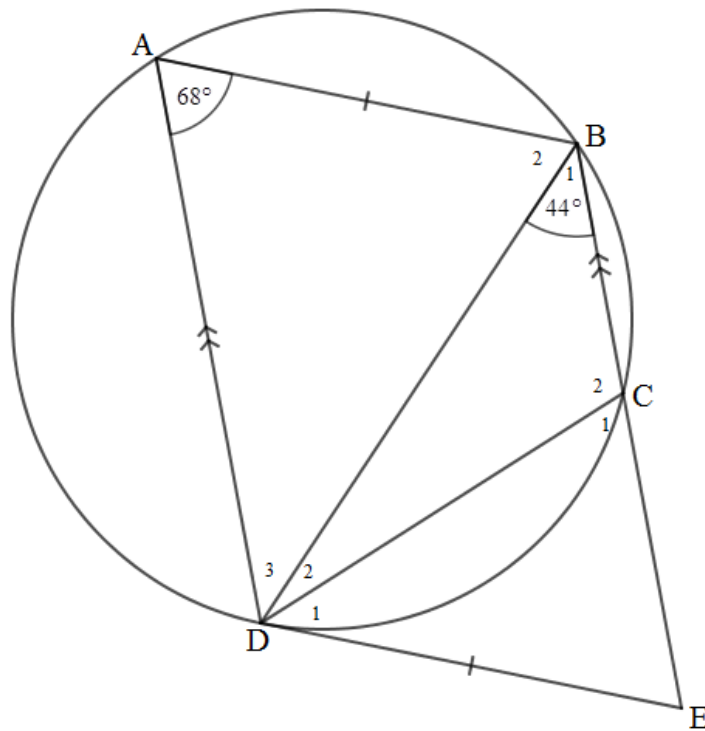
9.2



9.2.1	$\frac{PM}{PQ} = \frac{PN}{PR}$ (Prop. theorem/ewer.st.; $MN \parallel QR$)	✓ ST	A
		✓ RE	A
	$\frac{PM}{35} = \frac{5}{7}$	✓ substitution/verv.	A
	PM = 25 units	✓ length of/lengte van PM	CA

	OR/OF	OR/OF
	$\frac{PM}{MQ} = \frac{PN}{NR} \quad (\text{Prop. theorem/ewer.st.}; MN \parallel QR)$ $\frac{PM}{35 - PM} = \frac{5}{2}$ $PM = 25 \text{ units}$	\checkmark ST A \checkmark RE A \checkmark substitution/verv. A \checkmark length of/lengte van PM A (4)
9.2.2	$\frac{PX}{PQ} = \frac{RY}{RQ} \quad (\text{Prop. theorem/ewer.st.}; XY \parallel PR)$ $\frac{PX}{35} = \frac{1}{4}$ $PX = \frac{35}{4} = 8,75 \text{ units}$ $\therefore XM = PM - PX$ $= 25 - 8,75$ $= 16,25 \text{ units}$ <p style="text-align: center;">OR/OF</p> $\frac{PX}{XQ} = \frac{PX}{35 - PX} = \frac{RY}{QY} = \frac{1}{3} \quad (\text{Prop. theorem/ewer.st.}; XY \parallel PR)$ $PX = \frac{35}{4} = 8,75 \text{ units}$ $\therefore XM = PM - PX$ $= 25 - 8,75$ $= 16,25 \text{ units}$ <p style="text-align: center;">OR</p> $\frac{QX}{35} = \frac{3}{4} \quad (\text{prop. theorem/ewer.st.}; XY \parallel PR)$ $QX = 26,25$ $PX = 35 - 26,25 = 8,75$ $XM = 25 - 8,75 = 16,25 \text{ units}$	\checkmark ST A \checkmark RE A \checkmark length of/lengte van PX A \checkmark M A \checkmark Value of/Waarde van XM CA <p style="text-align: center;">OR/OF</p> \checkmark ST A \checkmark RE A \checkmark length of/lengte van PX A \checkmark M A \checkmark Value of/Waarde van XM CA <p style="text-align: center;">OR</p> \checkmark ST A \checkmark RE A \checkmark length of/lengte van PX A \checkmark M A \checkmark Value of/Waarde van XM CA (5)

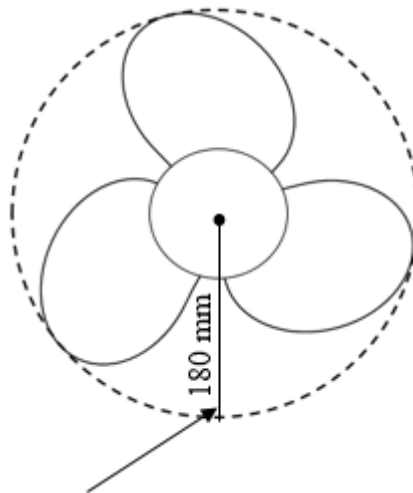
9.3



9.3.1	$\hat{D}_1 = \hat{B}_1 = 44^\circ$ (tan – chord theorem/rklyn-koord st) $\hat{D}_3 = \hat{B}_1 = 44^\circ$ (alt./verw. \angle s; $AD \parallel BC$)	✓ ST A ✓ RE A ✓ ST A ✓ RE A (4)
9.3.2	$\hat{C}_2 = 180^\circ - 68^\circ = 112^\circ$ (opp. \angle s of cyclic quad./ teenoorst \angle e van kvhk) OR/OF $\hat{C}_2 = 180^\circ - 68^\circ = 112^\circ$ (\angle s on straight line/ reguitlyn)	✓ ST A ✓ RE A OR/OF ✓ ST A ✓ RE A (2)
9.3.3	In $\triangle ABD$ and $\triangle CED$ $\hat{D}_1 = \hat{D}_3$ (proven/bewys) $\hat{A} = \hat{C}_1 = 68^\circ$ (ext. \angle of cyclic quad/ buite \angle van kvhk) $\hat{B}_2 = \hat{E}$ (3rd \angle s of/van Δ s) $\therefore \triangle ABD \parallel \triangle CED$ (\angle ; \angle ; \angle) or/of equiangular/gelykhoekig	✓ ST A ✓ ST/RE A ✓ RE A (3)
		[19]

QUESTION/VRAAG 10

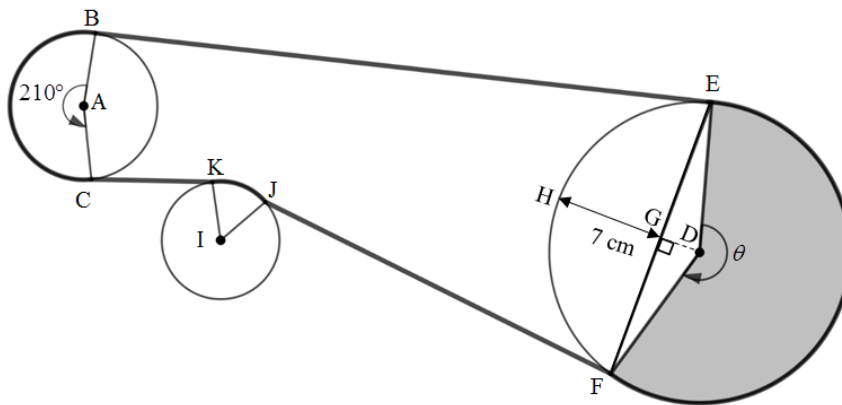
10.1



Radius of the circular path formed
 by the rotating propeller blades/
*Radius van die sirkelpad gevorm
 deur die roterende skroefblaaie*

10.1.1	$V = 30 \times \frac{1000}{3600}$ $= \frac{25}{3} \text{ or / of } \square 8,33 \text{ m/s}$	✓ multiplying by/ <i>vermenigvuldig met</i> $\frac{1000}{3600}$ A ✓ 8,33 m/s CA (2)
10.1.2	$V = \omega r$ $\frac{25}{3} = \omega(0,18)$ $\omega = \frac{1\ 250}{27} \text{ rad/s or / of } \square 46,30 \text{ rad/s}$ <p style="text-align: center;">OR/OF</p> $V = \pi D n$ $\frac{25}{3} = \pi (0,36)n$ $n = \frac{625}{27\pi} \text{ rev/s or / of } \square 7,37 \text{ rev/s}$ $\omega = 2\pi n$ $= 2\pi \frac{625}{27\pi} \text{ or / of } \square 2\pi(7,37)$ $= \frac{1250}{27} \text{ rad/s or / of } \square 46,31 \text{ rad/s}$	✓ formula/formule A ✓ converting/herlei r to 0,18 m A ✓ SF CA ✓ angular velocity/ <i>hoeksnelheid</i> CA <p style="text-align: center;">OR/OF</p> ✓ converting/herlei D to 0,36 m A ✓ rotational frequency/ <i>rotasiesnelheid</i> A ✓ SF CA ✓ angular velocity/ <i>hoeksnelheid</i> CA NPR (4)

10.2

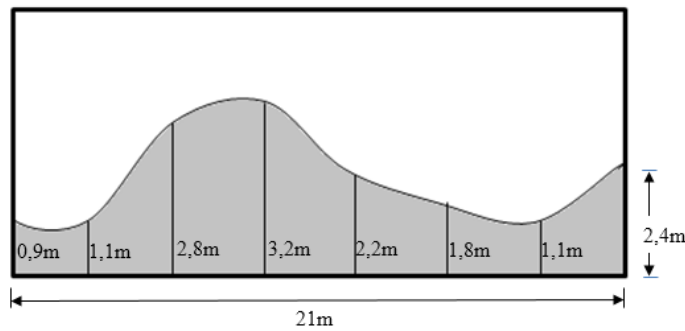


10.2.1	$210^\circ \times \frac{\pi}{180^\circ} = \frac{7}{6}\pi$ or / of $\square 3,67$ rads	$\checkmark \frac{7}{6}\pi$ rads A (1)
10.2.2	$s = r \theta$ $= (5) \left(\frac{7}{6}\pi \right)$ $= \frac{35}{6}\pi \approx 18,33$ cm	\checkmark formula/formule A \checkmark SF CA \checkmark arc length BC/booglengte CA (3)
10.2.3	$A = \frac{r^2 \theta}{2}$ $54\pi = \frac{(9)^2 \theta}{2}$ $\theta = \frac{2(54\pi)}{(9)^2}$ $\theta = \frac{4}{3}\pi$ rad or/of = 240° or/of $\square 1,33\pi$ rad or/of $\square 4,19$ rad OR/OF $A = \frac{rs}{2}$ $54\pi = \frac{9s}{2}$ $s = 12\pi$ or/of $\square 37,70$ cm $\theta = \frac{s}{r}$ $= \frac{12\pi}{9}$ or/of $\square \frac{37,70}{9}$ $= \frac{4}{3}\pi$ rad or/of $\square 4,19$ rad	\checkmark formula/formule A \checkmark SF A $\checkmark \theta$ CA OR/OF \checkmark formula/formule A \checkmark SF A $\checkmark \theta$ CA (3)

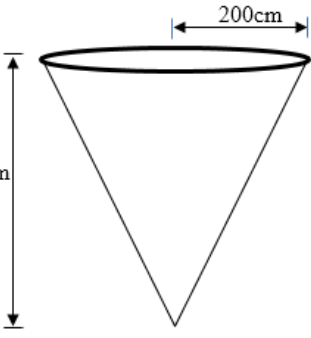
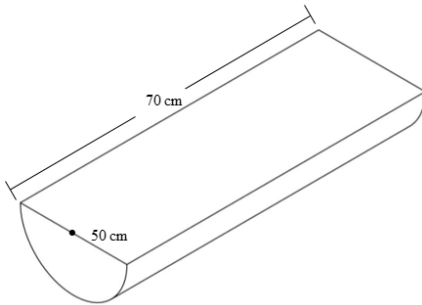
<p>10.2.4</p>	$4h^2 - 4dh + x^2 = 0$ $4(7)^2 - 4(18)(7) + x^2 = 0$ $x = \sqrt{4(18)(7) - 4(7)^2}$ $\therefore x = EF = 2\sqrt{77} \approx 17,55 \text{ cm}$ <p style="text-align: center;">OR/OF</p> <p>Half-chord method/Halfkoord metode: $GD = DH - GH = 9 - 7 = 2 \text{ cm}$ $GE = \sqrt{9^2 - 2^2} = \sqrt{77}$ (Pythagoras Thm.) $EF = 2GE = 2\sqrt{77} \approx 17,55 \text{ cm}$</p> <p style="text-align: center;">OR/OF</p> $\hat{FDE} = 154,32^\circ$ $FE = \sqrt{FD^2 + DE^2 - 2FD \cdot DE \cos \hat{FDE}}$ $= \sqrt{(9)^2 + (9)^2 - 2(9)(9) \cos 154,32^\circ}$ <p>□ $\sqrt{307,9989914}$ □ 17,55 m</p>	<p>✓ formula/formule A</p> <p>✓ SF A</p> <p>✓ length of chord/lengte van koord CA</p> <p style="text-align: center;">OR/OF</p> <p>✓ length of/lengte van GD A</p> <p>✓ length of/lengte van GE A</p> <p>✓ length of/lengte van EF CA</p> <p style="text-align: center;">OR/OF</p> <p>✓ cos rule/reël A</p> <p>✓ SF A</p> <p>✓ length of/lengte van EF CA</p> <p style="text-align: right;">(3)</p>
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10.2.5	<p>Length of major arc/<i>Lengte van grootboog EF</i>:</p> $s = r \theta$ $= (9) \left(\frac{4}{3} \pi \right)$ $= 12\pi \approx 37,70 \text{ cm}$ <p style="text-align: center;">OR/ OF</p> $A = \frac{rs}{2}$ $54\pi = \frac{9s}{2}$ $s = 12\pi \approx 37,70 \text{ cm}$ <p>Length of rubber belt not in contact with pulleys/ <i>Lengte van rubberband wat nie met katrolle kontak maak nie</i>:</p> <p><input type="checkbox"/> $140 - (4,19 + 18,33 + 37,70)$</p> <p><input type="checkbox"/> $140 - 60,21$</p> <p><input type="checkbox"/> $79,78 \text{ cm}$</p>	<p>✓ F A</p> <p>✓ SF CA</p> <p>✓ length of arc/<i>lengte van grootboog EF</i> CA</p> <p>✓ M A</p> <p>✓ length/<i>lengte</i> CA (5)</p> <p style="text-align: right;">[21]</p>
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QUESTION/ VRAAG 11



<p>11.1.1</p>	$a = \frac{21}{7} = 3\text{m}$ $A_T = a \left(\frac{o_1 + o_n}{2} + o_2 + o_3 + \dots + o_{n-1} \right)$ $= 3 \left(\frac{0,9 + 2,4}{2} + 1,1 + 2,8 + 3,2 + 2,2 + 1,8 + 1,1 \right) \text{m}^2$ $= 3 (1,65 + 1,1 + 2,8 + 3,2 + 2,2 + 1,8 + 1,1) \text{m}^2$ $= 41,55 \text{ m}^2$ <p style="text-align: center;">OR/OF</p> $a = \frac{21}{7} = 3\text{m}$ $A_T = a (m_1 + m_2 + m_3 + \dots + m_n)$ $= 3 \left(\frac{0,9 + 1,1}{2} + \frac{1,1 + 2,8}{2} + \frac{2,8 + 3,2}{2} + \frac{3,2 + 2,2}{2} + \frac{2,2 + 1,8}{2} + \frac{1,8 + 1,1}{2} + \frac{1,1 + 2,4}{2} \right) \text{m}^2$ $= 3 (1 + 1,95 + 3 + 3 + 2,7 + 2 + 1,45 + 1,75) \text{m}^2$ $= 41,55 \text{ m}^2$	<p>✓ value of/waarde van a A</p> <p>✓ formula/formule A</p> <p>✓ SF CA</p> <p>✓ value of/ waarde van A_T CA</p> <p style="text-align: center;">OR/OF</p> <p>✓ value of/waarde van a A</p> <p>✓ F A</p> <p>✓ SF CA</p> <p>✓ value of/waarde van A_T CA</p> <p style="text-align: right;">(4)</p>
<p>11.1.2</p>	$A_T = 41,55 \times \frac{180}{100}$ $= 74,79 \text{ m}^2$ <p style="text-align: center;">OR/OF</p> $21 \times \frac{180}{100} = 37,8\text{m}$ $a = 5,4\text{m}$ $A_T = 5,4 \left(\frac{0,9 + 2,4}{2} + 1,1 + 2,8 + 3,2 + 2,2 + 1,8 + 1,1 \right)$ $= 74,79 \text{ m}^2$	<p>✓ $\frac{180}{100}$ A</p> <p>✓ value of area CA</p> <p style="text-align: center;">OR/OF</p> <p>✓ value of/waarde van a A</p> <p>✓ value of area/waarde van oppervlakte CA</p> <p style="text-align: right;">(2)</p>

<p>11.2</p> 		
<p>11.2.1</p>	<p>Exterior surface area = $\frac{1}{2}(2\pi r^2 + 2\pi rh)$</p> $= \frac{1}{2}(2\pi (50)^2 + 2\pi (50)(70))$ $= 6000\pi \text{ or / of } \square 18849,56 \text{ cm}^2$ <p style="text-align: center;">OR/OF</p> <p>TSA = $\pi r^2 + \pi rh$</p> $= \pi(50)^2 + \pi(50)(70)$ $\square 18\ 849,56 \text{ cm}^2$ <p style="text-align: center;">OR/OF</p> <p>A = $2\pi r^2 + 2\pi rh$</p> $= 2\pi(50)^2 + 2\pi(50)(70)$ $\square 37\ 699,12 \text{ cm}^2$ $\therefore \text{TSA } \square \frac{1}{2}(37\ 699,12) \square 18849,56$	<p>✓F A</p> <p>✓SF A</p> <p>✓ value of/waarde van TSA CA</p> <p style="text-align: center;">OR/OF</p> <p>✓F A</p> <p>✓SF A</p> <p>✓ value of/waarde van TSA CA</p> <p style="text-align: center;">OR/OF</p> <p>✓F A</p> <p>✓SF A</p> <p>✓ value of/waarde van TSA CA</p> <p style="text-align: right;">NPR (3)</p>
<p>11.2.2</p>	<p>Volume of cone = $\frac{1}{3}(\pi r^2 h)$</p> $= \frac{1}{3}(\pi (200)^2 (150))$ $= 2000000\pi \text{ cm}^3 \text{ or / of } \square 6\ 283\ 185,307 \text{ cm}^3$ <p>Volume of half cylinder = $\frac{1}{2}(\pi r^2 h)$</p> $= \frac{1}{2}(\pi (50)^2 (70))$ $= 87500\pi \text{ cm}^3 \text{ or / of } \square 274889,3572 \text{ cm}^3$ <p>number of times = $\frac{2000000\pi \text{ cm}^3}{87500\pi \text{ cm}^3} = 22,86$</p> <p>He can fully fill the half-cylindrical tank 22 times./ Hy kan die halfsilindriese tenk 22 keer heeltemal vol maak.</p>	<p>✓SF A</p> <p>✓ value of/waarde van V CA</p> <p>✓SF A</p> <p>✓ value of/waarde van V CA</p> <p>✓ 22 CA</p> <p style="text-align: right;">PR (5)</p>
[14]		

