



Province of the  
**EASTERN CAPE**  
EDUCATION

**NATIONAL SENIOR  
CERTIFICATE/  
NASIONALE  
SENIOR SERTIFIKAAT**

**GRADE/GRAAD 12**

**SEPTEMBER 2020**

**TECHNICAL MATHEMATICS P2/TEGNIESE WISKUNDE V2  
MARKING GUIDELINE/NASIENRIGLYN**

**MARKS/PUNTE: 150**

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This marking guideline consists of 16 pages.  
*Hierdie nasienriglyn bestaan uit 16 bladsye.*

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**NOTE:**

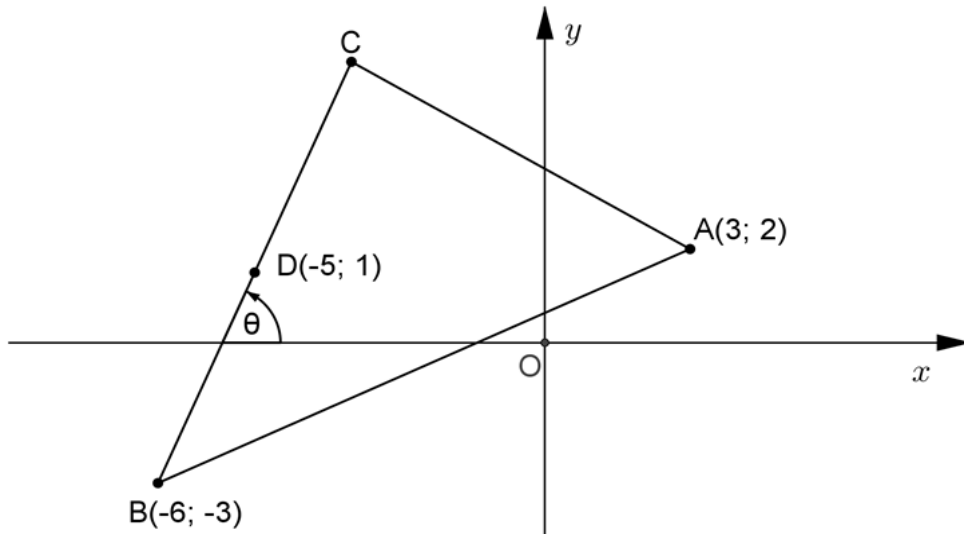
- Continuous accuracy (CA) applies only where indicated in this marking guideline.
- Assuming values/answers in order to solve a problem is unacceptable.

**LET WEL:**

- *Volgehoue akkuraatheid (CA) is slegs van toepassing soos in hierdie nasienriglyn aangedui.*
- *Aanvaarding van waardes/antwoorde om 'n problem op te los, is onaanvaarbaar.*

<b>MARKING CODES / NASIENKODES</b>	
<b>M</b>	<b>Method/Metode</b>
<b>A</b>	<b>Accuracy/Akkuraatheid</b>
<b>AO</b>	<b>Answer only/Slegs antwoord</b>
<b>CA</b>	<b>Consistent accuracy/Deurlopende akkuraatheid</b>
<b>F</b>	<b>Formula/Formule</b>
<b>I</b>	<b>Identity/Identiteit</b>
<b>R</b>	<b>Rounding/Afronding</b>
<b>S</b>	<b>Simplification/Vereenvoudiging</b>
<b>ST</b>	<b>Statement/Bewering</b>
<b>RE</b>	<b>Reason/Rede</b>
<b>ST RE</b>	<b>Statement and correct reason/Bewering en korrekte rede</b>
<b>SF</b>	<b>Substitution correctly in correct formula/Korrekte vervanging in die korrekte formule</b>
<b>NPU</b>	<b>No penalty for omitting units/Geen penalisering vir eenhede uitgelaat</b>

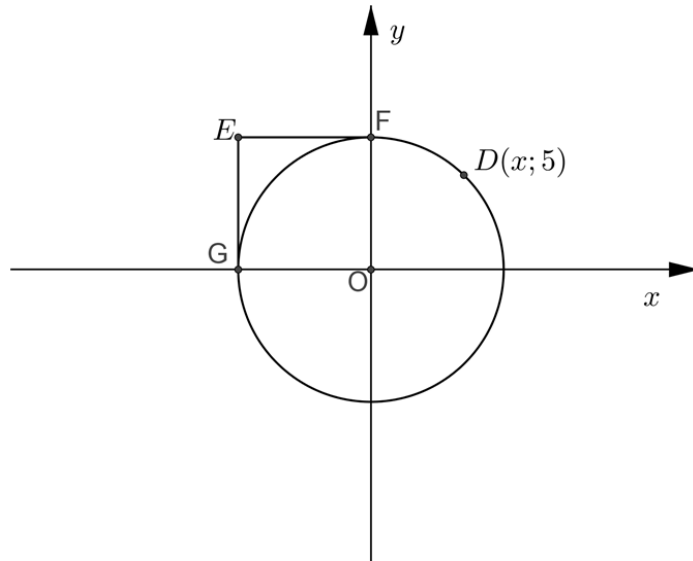
QUESTION/VRAAG 1



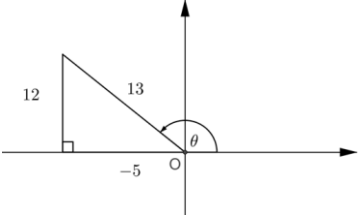
1.1	$AB = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$ $= \sqrt{(3 + 6)^2 + (2 + 3)^2} = \sqrt{(-6 - 3)^2 + (-3 - 2)^2}$ $= \sqrt{106}$	✓SF      A ✓CA	(2)
1.2.1	$m_{BC} = m_{BD}$ $= \frac{y_2 - y_1}{x_2 - x_1}$ $= \frac{1 + 3}{-5 + 6} = \frac{-3 - 1}{-6 + 5}$ $= 4$	✓SF      A  ✓ gradient / gradiënt      CA	(2)
1.2.2	$\tan \theta = m_{BC} = 4$ $\therefore \theta = \tan^{-1}(4)$ $\therefore \theta \approx 76^\circ$	✓M ✓CA Rounded answer / afgeronde antwoord	(2)
1.2.3	$(-5; 1) = \left( \frac{x_C - 6}{2}; \frac{y_C - 3}{2} \right)$ $\therefore x_C - 6 = -10 \qquad y_C - 3 = 2$ $\therefore x_C = -4 \qquad y_C = 5$	✓M ✓S ✓S ✓CA both answers / beide antwoorde	(4)

1.2.4	$m_{\substack{\text{new line} \\ \text{nuwe lyn}}} = 4$ $y - y_1 = m(x - x_1)$ $\therefore y - 2 = 4(x - 3)$ $\therefore y - 2 = 4x - 12$ $\therefore y = 4x - 10$ <p style="text-align: center;"><b>OR/OF</b></p> $m_{\substack{\text{new line} \\ \text{nuwe lyn}}} = 4$ $y = mx + c$ $\therefore 2 = -4(-3) + c$ $\therefore c = -10$ $\therefore y = 4x - 10$	<p>✓CA gradient of new line / gradiënt van nuwe lyn</p> <p>✓SF CA gradient and point A / gradiënt en punt A</p> <p>✓S CA</p> <p><b>OR/OF</b></p> <p>✓CA gradient of new line / gradiënt van nuwe lyn</p> <p>✓SF CA gradient and point A / gradiënt en punt A</p> <p>✓S CA</p>	<p>(3)</p> <p><b>[13]</b></p>
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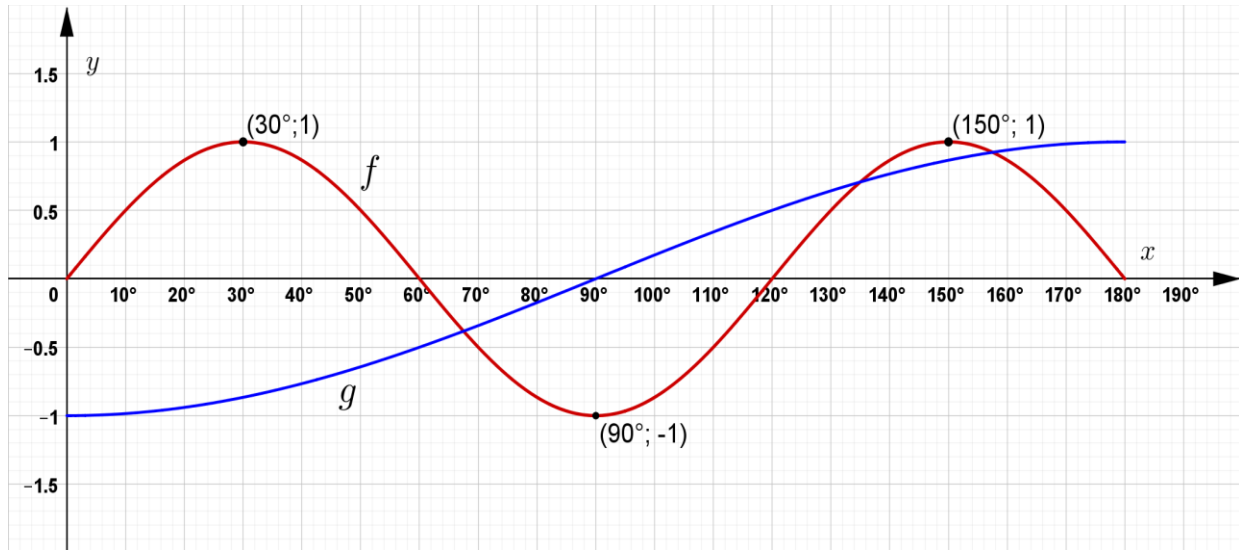
QUESTION/VRAAG 2



2.1.1	$x^2 + y^2 = 49$ $\therefore x^2 + 25 = 49$ $\therefore x^2 = 24$ $\therefore x = \sqrt{24} = 2\sqrt{6}$	✓SF A ✓S CA ✓CA surd form / wortelvorm	(3)
2.1.2 (a)	EF: $y = 7$ EG: $x = -7$	✓A y ✓A 7 ✓A x ✓A -7	(4)
2.1.2 (b)	E(-7 ; 7)	✓CA	(1)
2.2.1	$16x^2 + 49y^2 = 784$ $\frac{x^2}{49} + \frac{y^2}{16} = 1$	✓A LHS / LK ✓A RHS / RK	(2)
2.2.2		✓CA x-intercepts/ afsnitte ✓CA y-intercepts/ afsnitte ✓CA elliptical shape/ elliptiese vorm	(3)
			<b>[13]</b>

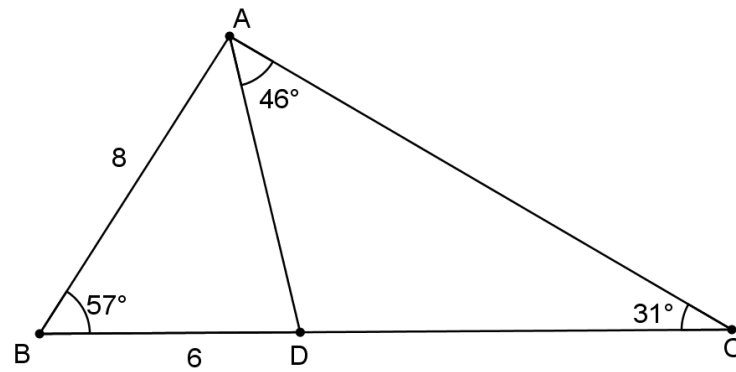
QUESTION/VRAAG 3			
3.1.1	$\begin{aligned} & \operatorname{cosec} A - \tan B \\ & = \operatorname{cosec} 123^\circ - \tan 65^\circ \\ & = \frac{1}{\sin 123^\circ} - \tan 65^\circ \\ & \approx -0,95 \end{aligned}$	$\begin{aligned} & \checkmark A \frac{1}{\sin 123^\circ} \\ & \checkmark A -0,95 \end{aligned}$ <p><b>AO: Full marks / Volpunte</b></p>	(2)
3.1.2	$\begin{aligned} & \cot^2(A + 2B) \\ & = \left[ \frac{1}{\tan(123^\circ + 2 \times 65^\circ)} \right]^2 \\ & \approx 0,09 \end{aligned}$	$\begin{aligned} & \checkmark A \left[ \frac{1}{\tan(123^\circ + 2 \times 65^\circ)} \right]^2 \\ & \checkmark A 0,09 \end{aligned}$ <p><b>AO: Full marks / Volpunte</b></p>	(2)
3.2	$\begin{aligned} \sin \frac{\pi}{6} + \sec^2 \frac{\pi}{4} & = \sin 30^\circ + \frac{1}{\cos^2 45^\circ} \\ & = 0,5 + 2 \\ & = 2,5 \end{aligned}$	$\begin{aligned} & \checkmark A 0,5 \\ & \checkmark A 2 \\ & \checkmark CA 2,5 \end{aligned}$ <p><b>AO: Full marks / Volpunte</b></p>	(3)
3.3	 $\begin{aligned} \cot \theta - \sec \theta & = \frac{-5}{12} - \frac{13}{-5} \\ & = \frac{131}{60} \\ & \approx 2,18 \end{aligned}$	$\begin{aligned} & \checkmark A \text{ diagram in correct quadrant /} \\ & \text{diagram in korrekte kwadrant} \\ & \checkmark A \text{ values of sides / waardes van sye} \\ & \checkmark CA \cot \theta = \frac{-5}{12} \\ & \checkmark CA \sec \theta = \frac{13}{-5} \\ & \checkmark 2,18 \end{aligned}$	(5)
3.4	$\begin{aligned} & (\tan^2 \theta + 1)(1 - \cos^2 \theta) \\ & = \sec^2 \theta \times \sin^2 \theta \\ & = \frac{1}{\cos^2 \theta} \times \sin^2 \theta \\ & = \tan^2 \theta \end{aligned}$	$\begin{aligned} & \checkmark A \sec^2 \theta \\ & \checkmark A \sin^2 \theta \\ & \checkmark A \frac{1}{\cos^2 \theta} \\ & \checkmark A \tan^2 \theta \end{aligned}$	(4)
3.5	$\begin{aligned} & \frac{\sin(180^\circ + x) \cdot \tan 135^\circ}{\sec(180^\circ - x) \cdot \cos(360^\circ - x)} \\ & = \frac{(-\sin x)(-1)}{(-\sec x)(\cos x)} \\ & = \frac{\sin x}{-1} \\ & = -\sin x \end{aligned}$	$\begin{aligned} & \checkmark A \sin x \\ & \checkmark A -1 \\ & \checkmark A -\sec x \\ & \checkmark A \cos x \\ & \checkmark A -1 \\ & \checkmark CA -\sin x \end{aligned}$	(6)
			<b>[22]</b>

QUESTION/VRAAG 4



4.1		<b>f:</b> ✓A <i>x</i> -intercepts / <i>afsnitte</i> ✓A turning points / <i>draaipunte</i> ✓A shape – starting at origin / <i>vorm – getrek vanuit oorsprong g:</i> ✓A start and endpoint / <i>begin en eindpunt</i> ✓A <i>x</i> -intercept / <i>afsnit</i>	(5)
4.2.1	120° <b>OR/OF</b> Period = $\frac{360^\circ}{3} = 120^\circ$	✓A	(1)
4.2.2 (a)	$90^\circ \leq x \leq 180^\circ$	✓CA interval ✓CA notation / <i>notasie</i>	(2)
4.2.2 (b)	$0^\circ \leq x \leq 60^\circ$ <b>OR/OF</b> $90^\circ \leq x \leq 120^\circ$	✓CA interval 1 ✓CA notation / <i>notasie</i> ✓CA interval 2 ✓CA notation / <i>notasie</i>	(4)
4.2.2 (c)	$x = 90^\circ$ and/ <i>en</i> $x = 180^\circ$	✓CA 90° ✓CA 180°	(2)
			<b>[14]</b>

## QUESTION/VRAAG 5



5.1	$\text{Area } \triangle ABD = \frac{1}{2} ad \sin B$ $= \frac{1}{2} \times 6 \times 8 \sin 57^\circ$ $= 20,13 \text{ sq units /vk eenhede}$	✓F ✓SF A ✓CA	(3)
5.2	$AD^2 = AB^2 + BD^2 - 2AB \cdot BD \cos B$ $= 8^2 + 6^2 - 2 \times 8 \times 6 \cos 57^\circ$ $= 47,714\dots$ $AD \approx 6,91 \text{ units /eenhede}$	✓F ✓SF A ✓CA ✓R	(4)
5.3	$\frac{CD}{\sin CAD} = \frac{AD}{\sin C}$ $\frac{CD}{\sin 46^\circ} = \frac{6,91}{\sin 31^\circ}$ $CD = \frac{6,91 \sin 46^\circ}{\sin 31^\circ}$ $\approx 9,65 \text{ units /eenhede}$	✓F ✓SF A ✓S CA ✓CA	(4)
			<b>[11]</b>



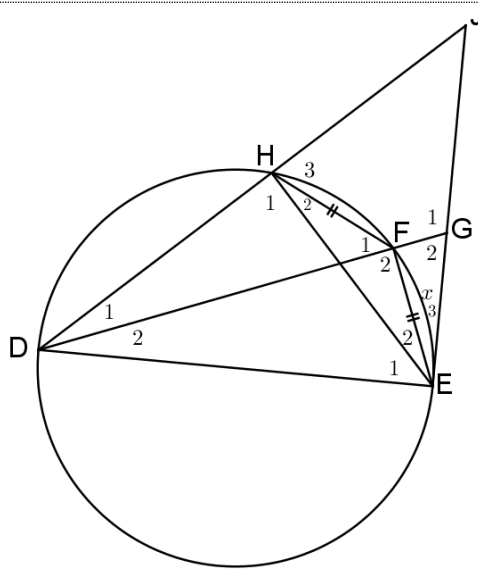
QUESTION/VRAAG 6			
6.1	Bisect the chord / <i>halveer die koord</i>	✓A	(1)
6.2			
6.2.1	$AO = x + 7$	✓A	(1)
6.2.2	$AF = 24$ units $AO^2 = AF^2 + OF^2$ $\therefore (x+7)^2 = 24^2 + 7^2$ $\therefore x^2 + 14x + 49 = 625$ $\therefore x^2 + 14x - 576 = 0$ $\therefore (x+32)(x-18) = 0$ $\therefore x \neq -32$ or/of $x = 18$	(line from centre $\perp$ to chord) ( <i>lyn vanaf midpt <math>\perp</math> op koord</i> ) (Pyth) ✓ST ✓RE ✓M ✓ST CA ✓ST CA	(5)
6.3			
6.3.1	$\hat{E} = 66^\circ$ (Int $\angle$ s of $\Delta$ ) ( <i><math>\angle</math>e van <math>\Delta</math></i> ) $\therefore \hat{C}_2 = 66^\circ$ (given / <i>gegee</i> ) $\hat{D} = 66^\circ$ ( $\angle$ s in same seg) ( <i><math>\angle</math>e in dies <math>\square</math> segm</i> )	✓ST RE ✓ST ✓ST ✓RE	(4)



QUESTION/VRAAG 7			
7.1	tangent to the circle / raaklyn tot die sirkel	✓A	(1)
7.2			
7.2.1	$\hat{H}_2 = 37^\circ$ (tan-chord raaklyn koord)	✓ST ✓RE	(2)
7.2.2	$\hat{F}_2 = 53^\circ$ (rad $\perp$ tangent rad $\perp$ raaklyn)	✓ST ✓RE	(2)
7.2.3	$\hat{D} = 53^\circ$ ( $\angle$ s opp equal sides: DO and FO radii <i>∠e teenoor gelyke sye: DO en FO radiusse</i> ) $\therefore \hat{O}_2 = 106^\circ$ (ext $\angle$ of $\Delta$ buite $\angle$ van $\Delta$ ) <b>OR / OF</b> $\hat{D} = 53^\circ$ ( $\angle$ s opp equal sides: DO and FO radii <i>∠e teenoor gelyke sye: DO en FO radiusse</i> ) $\therefore \hat{O}_2 = 106^\circ$ ( $\angle$ at centre = $2 \times \angle$ at circumf <i>middelpts <math>\angle</math> = <math>2 \times \angle</math> by omtrek</i> )	✓ST RE ✓ST RE OR/OF ✓ST RE ✓ST RE	(2)
7.2.4	$\hat{E}_2 = \hat{D}_2$ ( $\angle$ s in same segm <i>∠e in dies. segm</i> ) $\hat{E}_2 = 53^\circ - 16^\circ$ $= 37^\circ$	✓ST ✓RE ✓ST	(3)
			[10]

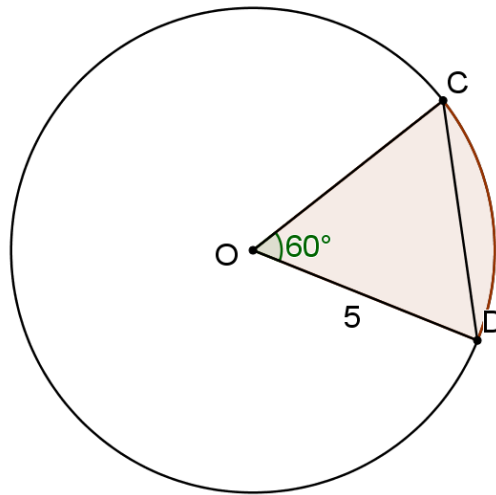
QUESTION/VRAAG 8			
8.1	Parallel / ewewydig	✓A	(1)
8.2			
8.2.1	$\frac{BF}{FD} = \frac{AG}{GD}$ $= \frac{1}{2}$	(line $\parallel$ to one side of $\Delta$ ) (lyn $\parallel$ aan een sy van $\Delta$ )	✓ST ✓RE  ✓ST
8.2.2	$\frac{CG}{CH} = \frac{CF}{CB}$ $\frac{CF}{CB} = \frac{CD + DF}{CD + DB}$ $= \frac{3 + 2}{3 + 3}$ $\frac{CG}{CH} = \frac{5}{6}$	(line $\parallel$ to one side of $\Delta$ ) (lyn $\parallel$ aan een sy van $\Delta$ )  (D midpoint / middelpnt)	✓ST RE  ✓ST  ✓ST

8.3



<p>8.3.1</p>	<p> <math>\hat{D}_2 = x</math> (tan-chord raaklyn - krd)  <math>\hat{H}_2 = x</math> (<math>\angle</math>s in same seg hoek in dies segm)  <math>\hat{E}_2 = x</math> (<math>\angle</math>s opp equal sides <math>\angle</math>e teenoor gelyke sye)  <b>OR/OF</b>  <math>\hat{D}_2 = x</math> (tan-chord raaklyn - krd)  <math>\hat{H}_2 = x</math> (tan-chord raaklyn - krd)  <math>\hat{E}_2 = x</math> (<math>\angle</math>s opp equal sides <math>\angle</math>e teenoor gelyke sye)                 </p>	<p>                     ✓ST ✓ RE                       ✓ST ✓ RE                       ✓ST RE                       OR/OF                      ✓ST ✓ RE                       ✓ST ✓ RE                       ✓ST RE                 </p>	<p>(5)</p>
<p>8.3.2</p>	<p>                     In <math>\triangle DFE</math> and / en <math>\triangle DEG</math>:  <math>\hat{D}_2</math> (common/gemeen)  <math>\hat{F}_2 = 90^\circ</math> (<math>\angle</math> in semi-circle <math>\angle</math> in semi - sirkel)  <math>\hat{E} = 90^\circ</math> (tan/raaklyn <math>\perp</math> radius)  <math>\therefore \triangle DFE \sim \triangle DEG</math> (AAA)                 </p>	<p>                     ✓ST RE                      ✓ST ✓ RE                      ✓ST ✓ RE                      ✓ RE                 </p>	<p>(6)</p>
			<p>[18]</p>

## QUESTION/VRAAG 9



9.1	$s = r\theta$ $= (5) \left( 60^\circ \times \frac{\pi}{180^\circ} \right)$ $= \frac{5\pi}{3}$ $\approx 5,24 \text{ cm}$	✓F ✓SF A $\times \frac{\pi}{180^\circ}$ ✓M ✓CA	(4)
9.2	$\text{Area of sector} = \frac{rs}{2}$ $\text{Opp van sektor} = \frac{5 \times \frac{5\pi}{3}}{2}$ $= \frac{25}{6} \pi$ $\approx 13 \text{ cm}^2$ <p><b>OR / OF</b></p> $\text{Area of sector} = \frac{r^2\theta}{2}$ $\text{Opp van sektor} = \frac{5^2 \times \frac{\pi}{3}}{2}$ $= \frac{25}{6} \pi$ $\approx 13 \text{ cm}^2$	✓F ✓SF A ✓CA ✓R <b>OR / OF</b> ✓F ✓SF A ✓CA ✓R	(4)
9.3 (a)	$\hat{O}CD = \hat{O}DC$ $\left( \begin{array}{l} \angle s \text{ opp} = \text{sides} \\ \angle e \text{ teenoor} = \text{sye} \end{array} \right)$ $CD = 5 \text{ cm}$ $\left( \begin{array}{l} \text{equiangular } \Delta \\ \text{gelyksydige } \Delta \end{array} \right)$	✓ST ✓ST <b>AO: Full marks</b>	(2)

9.3 (b)	$4h^2 - 4dh + x^2 = 0$ $4h^2 - 4(10)h + (5)^2 = 0$ $4h^2 - 40h + 25 = 0$ $h = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$ $= \frac{40 \pm \sqrt{40^2 - 4 \times 4 \times 25}}{8}$ $= \frac{40 \pm \sqrt{1200}}{8}$ $= 0,67 \text{ or/of } 9,33$ <p><math>\therefore</math> required height / vereiste hoogte = 0,67 cm</p>	<p>✓F</p> <p>✓SF A ✓S CA</p> <p>✓CA ✓C</p>	(5)
			[15]
<b>QUESTION/VRAAG 10</b>			
10.1.1	$180 \text{ rpm} = \frac{180 \text{ rev}}{1 \text{ min}} \times \frac{1 \text{ min}}{60 \text{ sec/sek}} = 3 \text{ rps}$	<p>✓ conversion / herleiding</p> <p>✓S A</p> <p>AO: Full marks</p>	(2)
10.1.2	$n = 3 \text{ rps} \quad v = \pi Dn$ $r = 6 \Rightarrow d = 12 \quad v = \pi \times 12 \times 3$ $= 36\pi \text{ cm/s}$	<p>✓F</p> <p>✓SF A ✓CA</p>	(3)
10.1.3	$\omega = \frac{v}{r}$ $= \frac{36\pi}{6}$ $= 6\pi \text{ rad/s}$	<p>✓F</p> <p>✓SF A</p> <p>✓CA</p>	(3)
10.2	$V_{\text{cylinder}} = \pi r^2 h$ $1l = \pi (12 \text{ cm})^2 h$ $1000 \text{ cm}^3 = 144\pi h \text{ cm}^2$ $h \approx 2,2 \text{ cm}$	<p>✓F</p> <p>✓A <math>1\ell = 1000 \text{ cm}^3</math></p> <p>✓SF A</p> <p>✓CA</p>	(4) [12]

QUESTION/VRAAG 11			
11.1	$A_T = a \left( \frac{o_1 + o_n}{2} + o_2 + o_3 + o_4 + \dots + o_{n-1} \right)$ $256 = a \left( \frac{2,2 + 2,1}{2} + 2,8 + 3,1 + 3,2 + 2,9 + 2,6 \right)$ $= 16,75a$ $a = 15,28$ <p style="text-align: center;"><b>OR / OF</b></p> $A_T = a(m_1 + m_2 + m_3 + \dots + m_{n-1})$ $256 = a \left( \frac{2,2 + 2,8}{2} + \frac{2,8 + 3,1}{2} + \frac{3,1 + 3,2}{2} + \frac{3,2 + 2,9}{2} + \frac{2,9 + 2,6}{2} + \frac{2,6 + 2,1}{2} \right)$ $= 16,75a$ $a = 15,28$	<p>✓F</p> <p>✓SF A</p> <p>✓CA</p> <p>✓ value of <math>a</math> / waarde van <math>a</math></p> <p><b>OR / OF</b></p> <p>✓F</p> <p>✓SF A</p> <p>✓CA</p> <p>✓ value of <math>a</math> / waarde van <math>a</math></p>	(4)
11.2	<p>Length of straight edge / <i>Lengte van reguitsy</i></p> $= 15,28 \times 6 = 91,68 \text{ m}$	<p>✓M</p> <p>✓CA</p>	(2)
			[6]

**TOTAL/TOTAAL: 150**