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

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

NOTE:

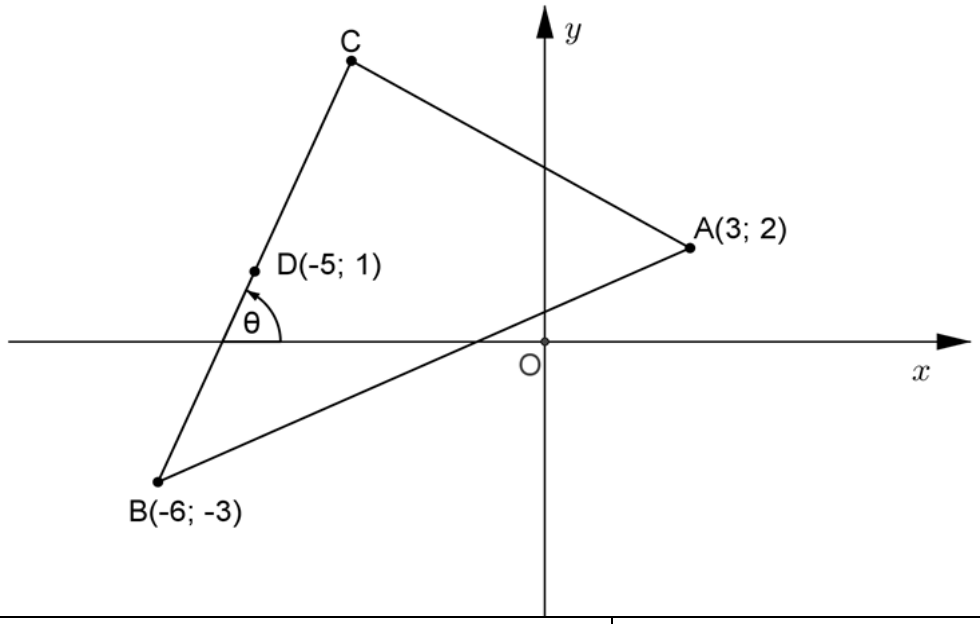
- Continuous accuracy (CA) applies only where indicated in this marking guideline.
- Assuming values/answers in order to solve a problem is unacceptable.

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.*

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

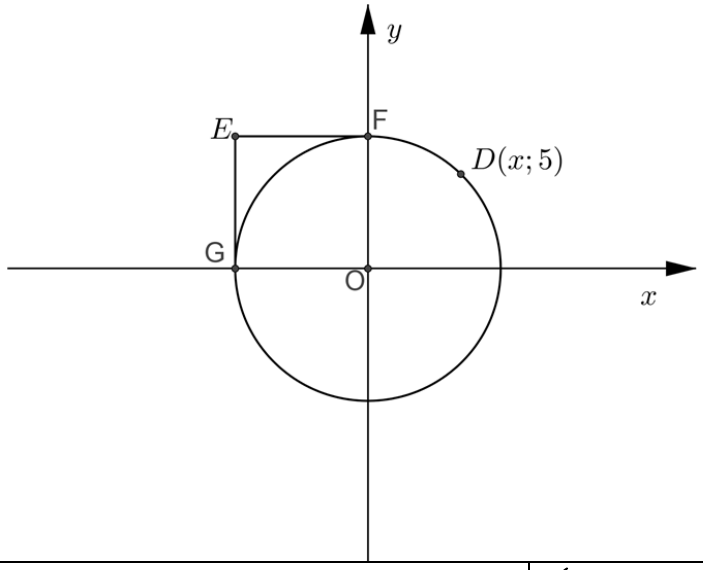
QUESTION/*VRAAG* 1

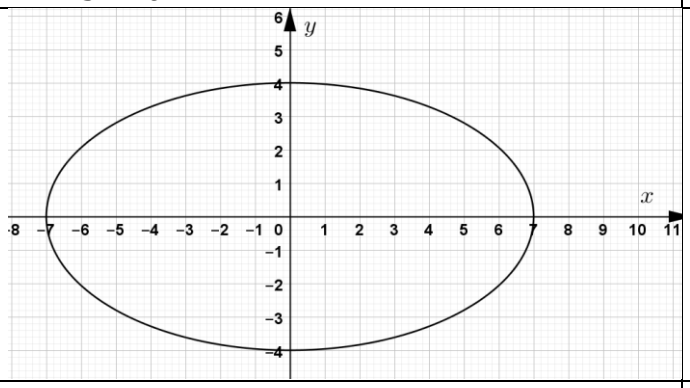


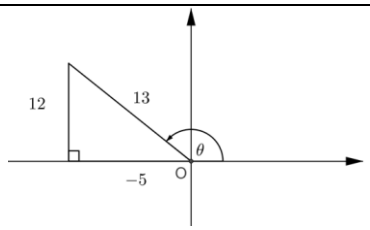
1.1	$AB = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$ $= \sqrt{(3+6)^2 + (2+3)^2} = \sqrt{(-6-3)^2 + (-3-2)^2}$ $= \sqrt{106}$	✓**SF** **A** ✓**CA**	(2)
1.2.1	$m_{BC} = m_{BD}$ $= \frac{y_2 - y_1}{x_2 - x_1}$ $= \frac{1+3}{-5+6} = \frac{-3-1}{-6+5}$ $= 4$	✓**SF** **A** ✓ gradient / *gradiënt* **CA**	(2)
1.2.2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

1.2.4	$m_{\substack{\text{new line}\\ \textit{nuwe lyn}}} = 4$ $y - y_1 = m(x - x_1)$ $\therefore \quad y - 2 = 4(x - 3)$ $\therefore \quad y - 2 = 4x - 12$ $\therefore \quad y = 4x - 10$ **OR/OF** $m_{\substack{\text{new line}\\ \textit{nuwe lyn}}} = 4$ $y = mx + c$ $\therefore \quad 2 = -4(-3) + c$ $\therefore \quad c = -10$ $\therefore \quad y = 4x - 10$	✓**CA** gradient of new line / *gradiënt van nuwe lyn* ✓**SF CA** gradient and point A / *gradiënt en punt A* ✓**S CA** **OR/OF** ✓**CA** gradient of new line / *gradiënt van nuwe lyn* ✓**SF CA** gradient and point A / *gradiënt en punt A* ✓**S CA**	(3)
			[13]

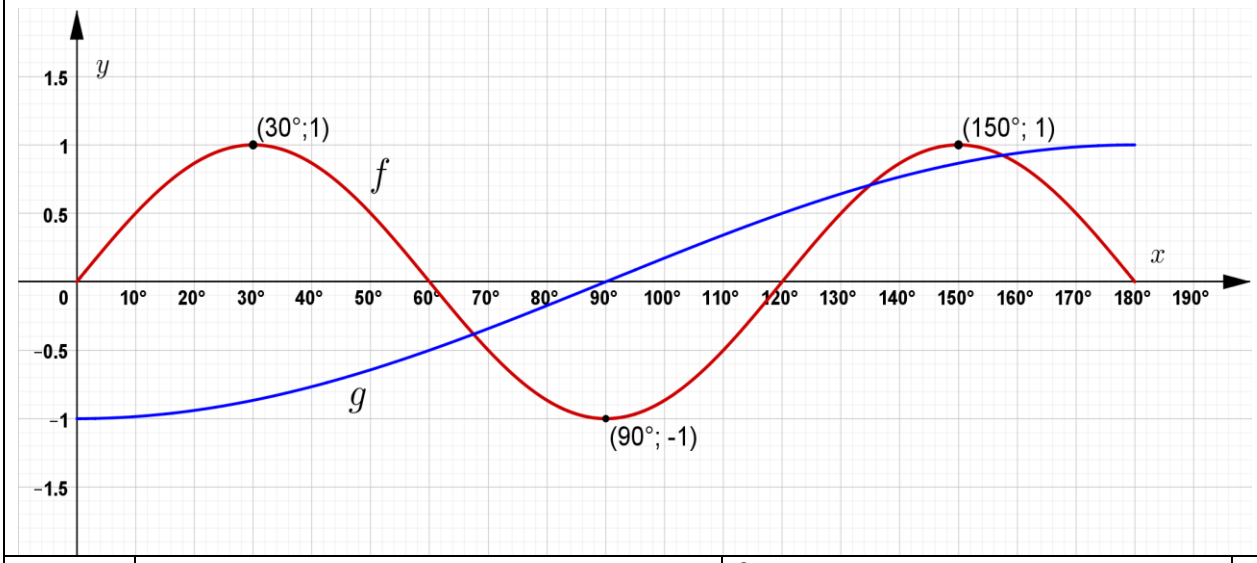
QUESTION/*VRAAG* 2



2.1.1	$x^2 + y^2 = 49$ $\therefore \quad x^2 + 25 = 49$ $\therefore \quad x^2 = 24$ $\therefore \quad x = \sqrt{24} = 2\sqrt{6}$	✓**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)
			[13]

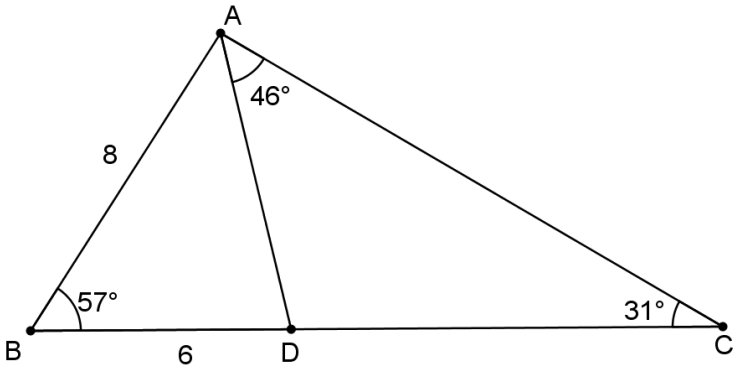
QUESTION/*VRAAG* 3			
3.1.1	$\text{cosec } A - \tan B$ $= \text{cosec}123° - \tan 65°$ $= \frac{1}{\sin 123°} - \tan 65°$ $\approx -0,95$	✓**A** $\frac{1}{\sin 123°}$ ✓**A** -0,95 **AO: Full marks / Volpunte**	(2)
3.1.2	$\cot^2(A+2B)$ $= \left[\frac{1}{\tan(123° + 2\times 65°)}\right]^2$ $\approx 0,09$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

QUESTION/*VRAAG* 4



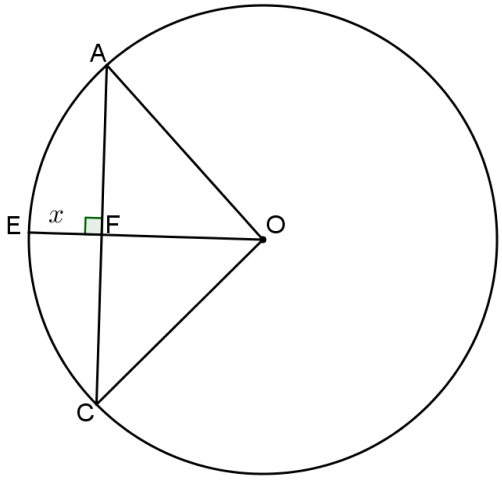
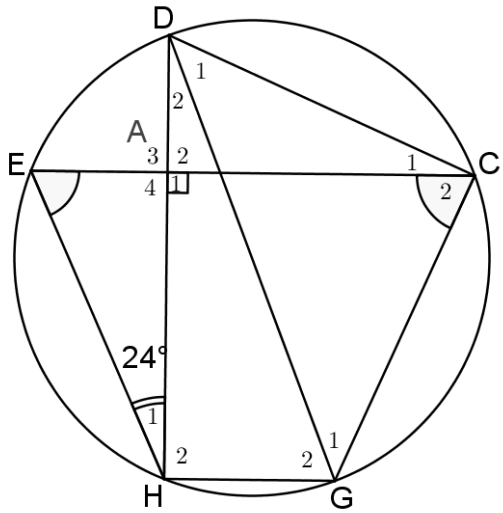
4.1		**f:** ✓**A** *x*-intercepts / *afsnitte* ✓**A** turning points / *draaipunte* ✓**A** shape – starting at origin / *vorm – getrek vanuit oorsprong* **g:** ✓**A** start and endpoint / *begin en eindpunt* ✓**A** *x*-intercept / *afsnit*	(5)
4.2.1	120° **OR/OF** Period = $\frac{360°}{3} = 120°$	✓**A**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

QUESTION/*VRAAG* 5

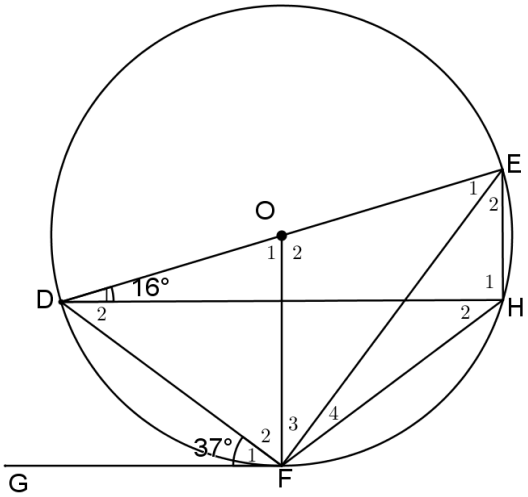


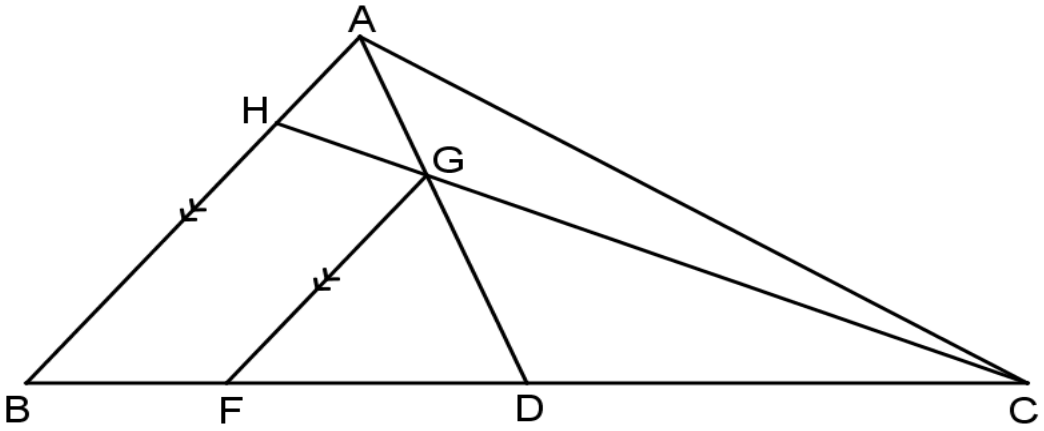
5.1	$\text{Area } \Delta ABD = \frac{1}{2}ad\sin B$ $= \frac{1}{2}\times 6\times 8\sin 57°$ $= 20{,}13 \text{ sq units } /vk \text{ } eenhede$	✓**F** ✓**SF A** ✓**CA**	(3)
5.2	$AD^2 = AB^2 + BD^2 - 2AB.BD\cos B$ $= 8^2 + 6^2 - 2\times 8\times 6\cos 57°$ $= 47{,}714...$ $AD \approx 6{,}91 \text{ units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

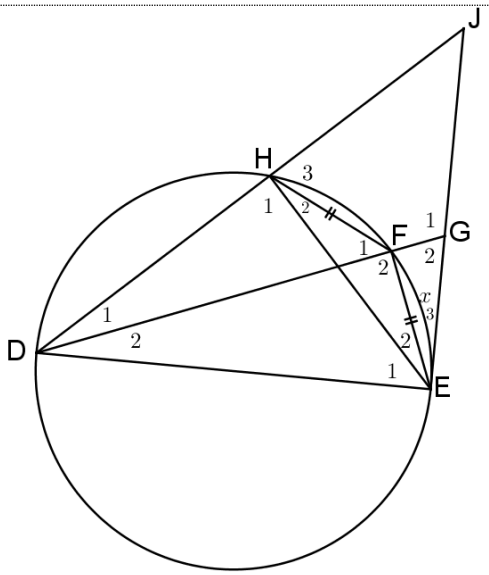
QUESTION/*VRAAG* 6

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

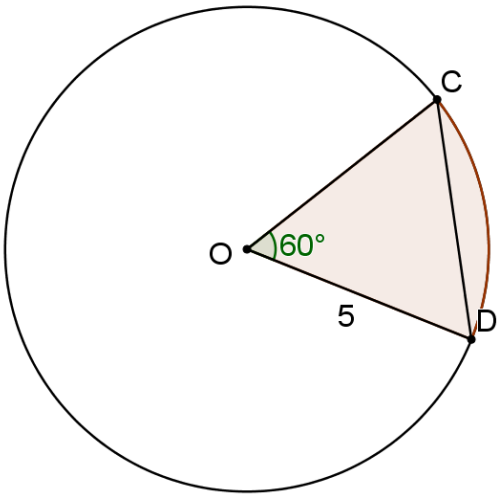
6.3.2	$H\hat{G}C = 114°$ (opp ∠s of cyclic quad / *teenoorst ∠e van kdvh*)	✓**ST** ✓**RE**	(2)
6.3.3	$\hat{C}_1 = 24°$ (∠s in same seg / *∠e in dieselfde segm*) $\therefore \hat{C} = 90°$ ∴ DG is a diameter/*is 'n middellyn* (chord subtends 90°/ *koord onderspan* 90°) **OR/OF** ∴ DG is a diameter / is 'n middellyn (converse ∠ in semi-circle/omgekeerd ∠ in semi-sirkel)	✓**ST** ✓**RE** ✓**RE**	(3)
			[16]

QUESTION/*VRAAG* 7			
7.1	tangent to the circle / *raaklyn tot die sirkel*	**✓A**	(1)
7.2			
7.2.1	$\hat{H}_2 = 37°$ (tan-chord / *raaklyn koord*)	**✓ST ✓RE**	(2)
7.22	$\hat{F}_2 = 53°$ (rad $\perp$ tangent / *rad* $\perp$ *raaklyn*)	**✓ST ✓RE**	(2)
7.2.3	$\hat{D} = 53°$ ($\angle s$ opp equal sides: DO and FO radii / *$\angle e$ teenoor gelyke sye: DO en FO radiusse*) $\therefore \hat{O}_2 = 106°$ (ext $\angle$ of Δ / *buite $\angle$ van Δ*) **OR / OF** $\hat{D} = 53°$ ($\angle s$ opp equal sides: DO and FO radii / *$\angle e$ teenoor gelyke sye: DO en FO radiusse*) $\therefore \hat{O}_2 = 106°$ ($\angle$ at centre = 2 × $\angle$ at circumf / *middelpts$\angle$ = 2 × $\angle$ by omtrek*)	**✓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 / *$\angle e$ in dies. segm*) $\hat{E}_2 = 53° - 16°$ $= 37°$	**✓ST ✓RE** **✓ST**	(3)
			[10]

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

8.3			
8.3.1	$\hat{D}_2 = x$ (tan-chord / *raaklyn - krd*) $\hat{H}_2 = x$ ($\angle s$ in same seg / *hoek in dies segm*) $\hat{E}_2 = x$ ($\angle$s opp equal sides / $\angle$e teenoor gelyke sye) **OR/OF** $\hat{D}_2 = x$ (tan-chord / *raaklyn - krd*) $\hat{H}_2 = x$ (tan – chord / *raaklyn – krd*) $\hat{E}_2 = x$ ($\angle$s opp equal sides / $\angle$e teenoor gelyke sye)	✓**ST** ✓ **RE** ✓**ST** ✓ **RE** ✓**ST** **RE** **OR/OF** ✓**ST** ✓ **RE** ✓**ST** ✓ **RE** ✓**ST** **RE**	(5)
8.3.2	In ΔDFE and / *en* ΔDEG: $\hat{D}_2$ (common/*gemeen*) $\hat{F}_2 = 90°$ ($\angle$ in semi-circle / $\angle$ *in semi - sirkel*) $\hat{E} = 90°$ (tan/*raaklyn* $\perp$ radius) $\therefore \Delta DFE /// \Delta DEG$ (*AAA*)	✓**ST** **RE** ✓**ST** ✓ **RE** ✓**ST** ✓ **RE** ✓ **RE**	(6)
			[18]

QUESTION/*VRAAG* 9



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

9.3 (b)	$4h^2 - 4dh + x^2 = 0$ $4h^2 - 4(10)h + (5)^2 = 0$ $4h^2 - 40h + 25 = 0$ $h = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$ $= \frac{40 \pm \sqrt{40^2 - 4 \times 4 \times 25}}{8}$ $= \frac{40 \pm \sqrt{1200}}{8}$ $= 0,67$ or/of $9,33$ ∴ required height / *vereiste hoogte* = 0,67 cm	✓**F** ✓**SF A** ✓**S CA** ✓**CA** ✓**C**	(5)
			[15]
QUESTION/*VRAAG* 10			
10.1.1	$180 \text{ rpm} = \frac{180 \text{ rev}}{1 \text{ min}} \times \frac{1 \text{ min}}{60 \text{ sec/sek}} = 3 \text{ rps}$	✓ conversion / *herleiding* ✓**S A** **AO: Full marks**	(2)
10.1.2	$n = 3 \text{ rps}$ $\quad v = \pi D n$ $r = 6 \Rightarrow d = 12$ $\quad v = \pi \times 12 \times 3$ $= 36\pi \text{ cm/s}$	✓**F** ✓**SF A** ✓**CA**	(3)
10.1.3	$\omega = \frac{v}{r}$ $= \frac{36\pi}{6}$ $= 6\pi \text{ rad/s}$	✓**F** ✓**SF A** ✓**CA**	(3)
10.2	$V_{\text{cylinder}} = \pi r^2 h$ $1l = \pi (12 \text{ cm})^2 h$ $1000 \text{ cm}^3 = 144\pi h \text{ cm}^2$ $h \approx 2,2 \text{ cm}$	✓**F** ✓**A** $1\ell = 1\,000\ cm^3$ ✓**SF A** ✓**CA**	(4) **[12]**

QUESTION/*VRAAG* 11			
11.1	$A_T = a\left(\frac{o_1 + o_n}{2} + o_2 + o_3 + o_4 + ... + o_{n-1}\right)$ $256 = a\left(\frac{2,2+2,1}{2} + 2,8 + 3,1 + 3,2 + 2,9 + 2,6\right)$ $= 16,75a$ $a = 15,28$ **OR / OF** $A_T = a(m_1 + m_2 + m_3 + ... + m_{n-1})$ $256 = a\left(\frac{2,2+2,8}{2} + \frac{2,8+3,1}{2} + \frac{3,1+3,2}{2} + \frac{3,2+2,9}{2} + \frac{2,9+2,6}{2} + \frac{2,6+2,1}{2}\right)$ $= 16,75a$ $a = 15,28$	✓**F** ✓**SF A** ✓**CA** ✓ value of *a* / *waarde van a* **OR / OF** ✓**F** ✓**SF A** ✓**CA** ✓ value of *a* / *waarde van a*	(4)
11.2	Length of straight edge / *Lengte van reguitsy* = 15, 28 × 6 = 91,68 m	✓**M** ✓**CA**	(2)
			[6]

TOTAL/*TOTAAL*: 150