



Province of the
EASTERN CAPE
EDUCATION

**NATIONAL SENIOR
CERTIFICATE/*NASIONALE*
SENIOR SERTIFIKAAT**

GRADE/*GRAAD* 11

NOVEMBER 2018

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

MARKS/*PUNTE*: 150

This marking guideline consists of 15 pages./*Hierdie nasienriglyn
bestaan uit 15 bladsye.*

NOTE:

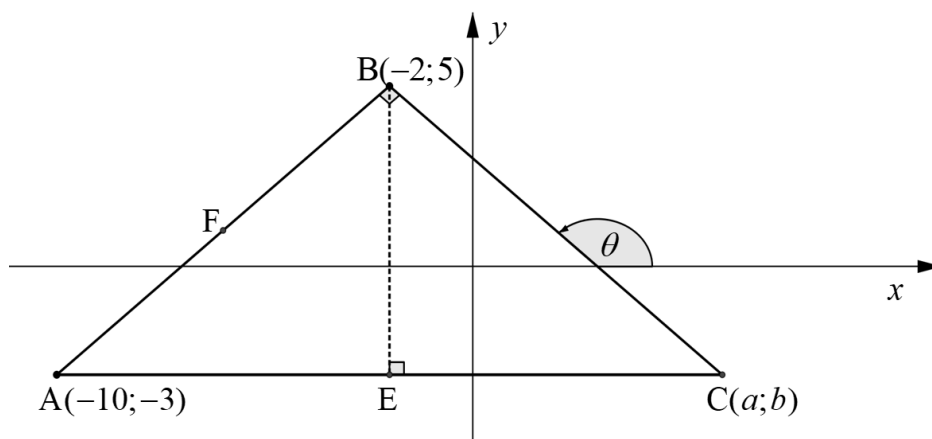
- Continuous accuracy (CA) applies in ALL aspects of the marking guideline.
- After two mistakes, do not apply CA marking.
- Assuming values/answers in order to solve a problem is unacceptable.

LET WEL:

- *Volgehoue akkuraatheid (CA) is deurgaans in ALLE aspekte van die nasienriglyn van toepassing.*
- *Na twee foute word CA nie toegepas nie.*
- *Aanvaarding van waardes/antwoorde om 'n problem op te los, is onaanvaarbaar.*

Symbol/Simbool	Explanation/Verduideliking
M	Method/Metode
MA	Method with accuracy/Metode met akkuraatheid
A	Accuracy/Akkuraat
CA	Consistent accuracy/Deurlopende akkuraatheid
S	Simplification or Statement/ Vereenvoudiging of bewering
R	Reason/Rede
SR	Statement and correct reason/Bewering en korrekte rede

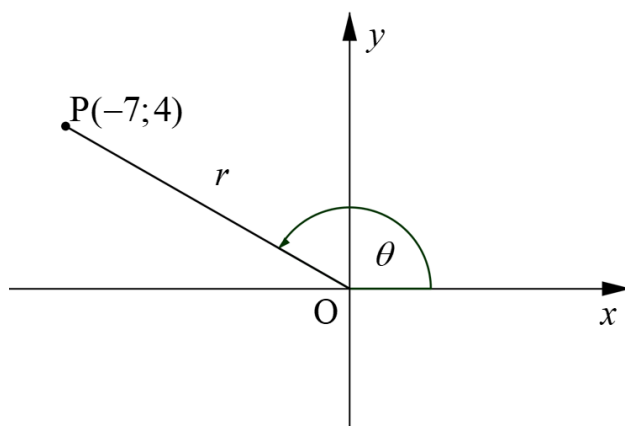
QUESTION/VRAAG 1



1.1	$AB = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$ $= \sqrt{(-2 + 10)^2 + (5 + 3)^2}$ $= \sqrt{64 + 64}$ $= \sqrt{128}$	✓M formula ✓A substitution/vervanging ✓CA Answer /antwoord	(3)
1.2	$m_{AB} = \frac{y_2 - y_1}{x_2 - x_1}$ $= \frac{5 + 3}{-2 + 10}$ $= 1$ $m_{BC} = -1 \quad (AB \perp BC; \text{product of gradients} = -1)$ $\tan \theta = m_{BC}$ $\theta = 180^\circ - 45^\circ$ $= 135^\circ$	✓M formula ✓A substitution/vervanging ✓CA Answer /antwoord ✓CA m_{BC} ✓M $\tan \theta = m_{BC}$ ✓CA Answer / antwoord	(6)
1.3	$\angle \text{adj } \theta = 45^\circ$ ($\angle$ s on straight line) $\hat{C} = 45^\circ$ (corr $\angle$ s; $AC \perp x$ -axis) $AB = BC$ (sides opp $= \angle$ s)	✓S ✓S ✓S	(3)

1.4	$E(-2; -3)$ $\frac{-10+a}{2} = -2 ; b = -3$ OR/OF $a = 6$ $b = -3$ $m_{BC} = \frac{b-5}{a+2}$ $\frac{-3-5}{a+2} = -1$ $-8 = -1(a+2)$ $a = 6$ $C(6; -3)$	✓A $E(-2; -3)$ ✓M formula ✓A substitution/vervanging ✓CA value/waarde a OR/OF ✓A $b = -3$ ✓MA substitution/vervanging ✓CA equating/gelykstelling. ✓CA value/waarde a	(4)
1.5	$m_{AB} = 1$ (from 1.2) $m_{EF} = -1$ (product of gradients = -1) Eq of EF: $y - y_1 = m(x - x_1)$ $y + 3 = -1(x + 2)$ $y = -x - 5$	✓CA m_{EF} ✓MA subt in equation/vervang in vergl ✓CA final answer/finale antwoord	(3)
			[17]
1.6	FE $\square$ BC & E midpt of AC $FE = \frac{1}{2} BC$ (midpt th) $= \frac{1}{2} AB$ ($AB = BC$) $= \frac{1}{2} \sqrt{128}$ $\approx 5,66$	✓S ✓S ✓S	(3)
1.7	Area $\triangle ADC = \frac{1}{2} \text{ base} \times \text{height}$ $= \frac{1}{2} AB \times BC$ $= \frac{1}{2} \times \sqrt{128} \times \sqrt{128}$ $= 64 \text{ sq units}$	✓M Area formula/formule ✓CA Substitution/vervanging ✓CA Answer/antwoord	(3)
			[25]

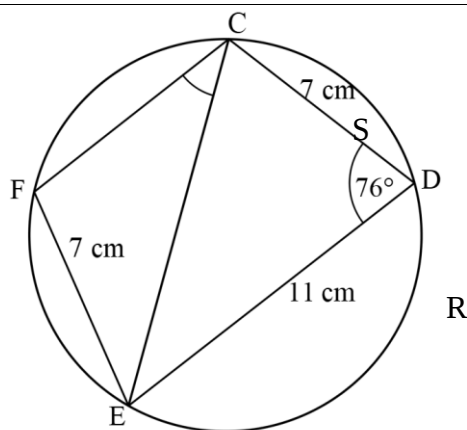
QUESTION/VRAAG 2



2.1.	$r = \sqrt{x^2 + y^2} \text{ (Pyth)}$ $= \sqrt{(-7)^2 + 4^2}$ $= \sqrt{65}$ $\approx 8,06$	✓M Substitution/Substitutie into Pyth ✓A Answer/antwoord Answer only – full marks Slegs antwoord – volpunte	(2)
2.2	$\operatorname{cosec} \theta = \frac{\sqrt{65}}{4}$	✓A Answer / antwoord	(1)
2.3	$\sec^2 \theta - \cot^2 \theta = \left(\frac{\sqrt{65}}{-7} \right)^2 - \left(\frac{4}{-7} \right)^2$ $= \frac{65}{49} - \frac{16}{49}$ $= \frac{49}{49}$ $= 1$	✓A $\frac{\sqrt{65}}{-7}$ ✓A $\frac{4}{-7}$ ✓CA Simplification/vereenvoudiging ✓CA Answer/antwoord Answer only /Slegs antwoord $\frac{1}{4}$	(4)
2.4	$\tan \theta = \frac{4}{-7}$ $\theta = 180^\circ - 29,7^\circ$ $= 150,3^\circ$	✓A Ratio/verhouding ✓A 180° - Ref/verw $\angle$ ✓CA Answer 2nd quad/antwoord 2de kwadr	(3)
			[10]

QUESTION/VRAAG 3			
3.1	$\operatorname{cosec}(\theta - 30^\circ) = 1,57$ $\sin(\theta - 30^\circ) = \frac{1}{1,57} = 0,6369\dots$ $\operatorname{Ref} \angle = 39,56^\circ$ $\theta - 30^\circ = 39,56^\circ \quad \text{OR} \quad 180^\circ - 39,56^\circ$ $\theta = 69,6^\circ \quad \text{OR} \quad 110,4^\circ$	✓A Reciprocal ratio / omgekeerde verh ✓A Ref/verw $\angle$ ✓A $\angle$ s in 1th & 2 nd quadrant/kwadrant ✓CA Answer in 1th quadrant/kwadrant ✓CA Answer in 2 nd quadrant/kwadrant	(5)
3.2	$\frac{\sin(180^\circ - x) \cdot \operatorname{cosec}(360^\circ - x) \cdot \tan(180^\circ + x)}{\sec(360^\circ + x) \cdot \cos(360^\circ - x)}$ $= \frac{(\sin x)(-\operatorname{cosec} x)(\tan x)}{(\sec x)(\cos x)}$ $= \frac{(-1)\tan x}{1}$ $= -\tan x$	✓A $\sin x$ ✓A $-\operatorname{cosec} x$ ✓A $\tan x$ ✓A $\sec x$ ✓A $\cos x$ ✓A -1 ✓CA Answer / antwoord	(7)
3.3	$\text{RHS} = \frac{\tan x \cdot \operatorname{cosec} x}{\tan x + \cot x}$ $= \frac{\frac{\sin x}{\cos x} \times \frac{1}{\sin x}}{\frac{\sin x}{\cos x} + \frac{\cos x}{\sin x}}$ $= \left(\frac{1}{\cos x} \right) \div \left(\frac{\sin^2 x + \cos^2 x}{\sin x \cos x} \right)$ $= \frac{1}{\cos x} \times \frac{\sin x \cos x}{1}$ $= \sin x$ $= \text{LHS}$	✓A $\frac{\sin x}{\cos x}$ ✓A $\frac{1}{\sin x}$ ✓CA Simplify numerator / vereenvoudig teller ✓CA Simplify denominator / vereenvoudig noemer ✓A $\sin^2 x + \cos^2 x = 1$ ✓M Reciprocal / Resiprook	(6)
			[18]

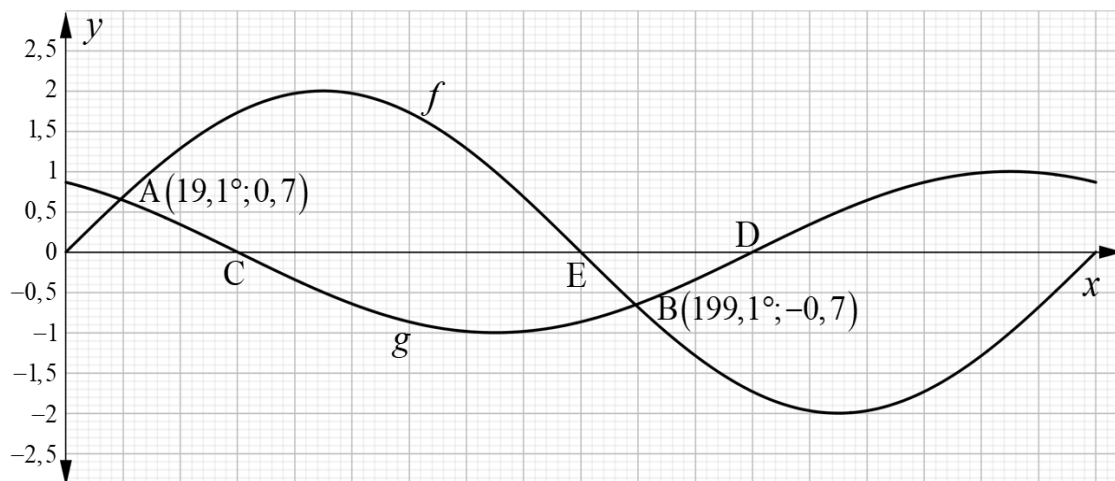
QUESTION/VRAAG 4



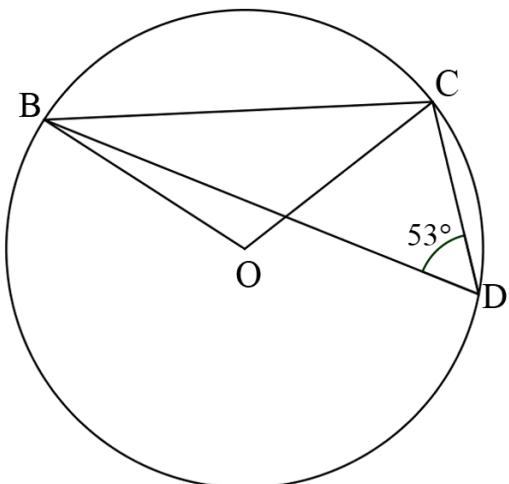
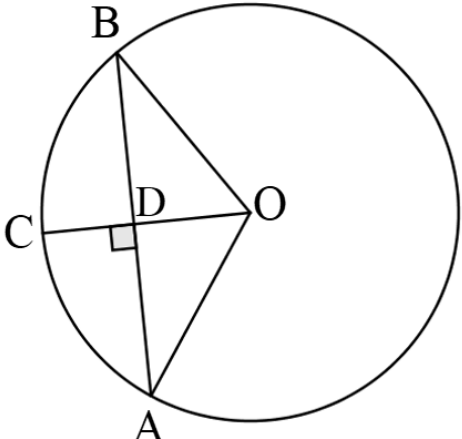
4.1	In $\triangle DCE$: $d^2 = c^2 + e^2 - 2ce \cos \hat{D}$ $= 11^2 + 7^2 - 2 \times 11 \times 7 \cos 76^\circ$ $= 132,744\dots$ $d = 11,5 \text{ cm}$ $= CE$	✓M Cos-rule/reël ✓A Substitution/vervanging ✓CA Simplification / vereenvoudiging ✓CA Answer/antwoord	(4)
4.2	$\hat{F} = 104^\circ$ (opp $\angle$s of cyclic quad) In $\triangle CFE$: $\frac{\sin C}{c} = \frac{\sin F}{f}$ $\frac{\sin C}{7} = \frac{\sin 104^\circ}{11,5}$ $\sin C = 0,5906\dots$ $\hat{C} = 36,2^\circ$ $\therefore \hat{FCE} = 36,2^\circ$	✓A $\hat{F} = 104^\circ$ ✓M Sin-rule/reël ✓A Substitution/vervanging ✓CA Simplification / vereenvoudiging ✓CA Answer/antwoord	(5)
4.3	$\hat{FEC} = 39,8^\circ$ (int. angle of cyclic quad) $= \frac{1}{2} \times FE \times CE \sin \hat{FEC}$ $= \frac{1}{2} \times 7 \times 11,5 \sin 39,8$ $\approx 25,8 \text{ cm}^2$	✓A $\hat{FEC} = 40^\circ$ ✓M area-rule/reël ✓A Substitution/vervanging ✓CA Answer/antwoord	(4)
			[13]

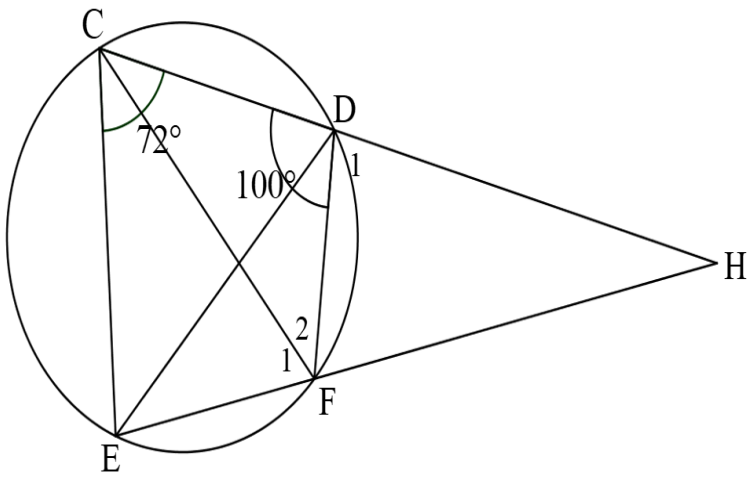
QUESTION/VRAAG 5

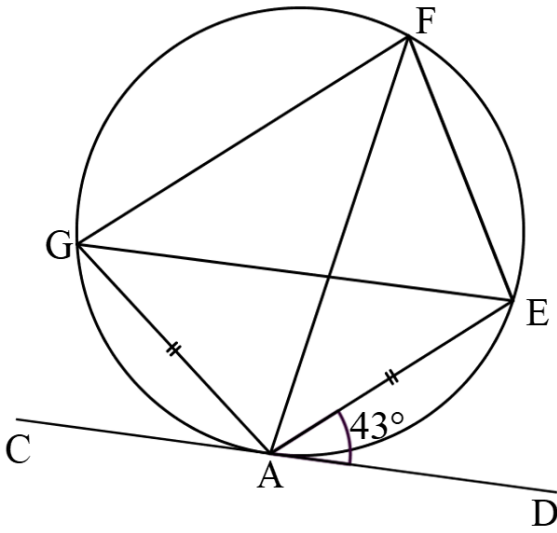
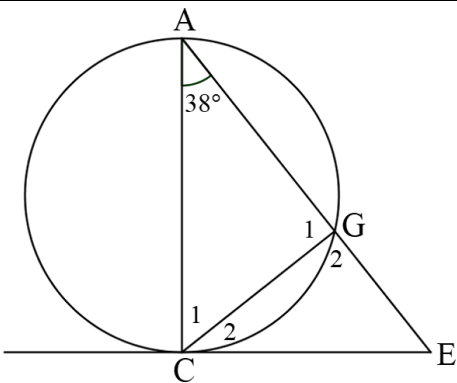
5.1.



5.1	C(60°; 0) E(180°; 0) D(240°; 0)	✓A C ✓A E ✓A D	(3)
5.2	2	✓A Answer/antwoord	(1)
5.3(a)	$0^\circ \leq x \leq 180^\circ$	✓CA End-points/eindpunte ✓A Notation/notasie	(2)
5.3(b)	$60^\circ < x < 180^\circ$ OR $240^\circ < x < 360^\circ$	✓CA ✓CA Interval 1 ✓CA ✓CA Interval 2	(4)
			[10]

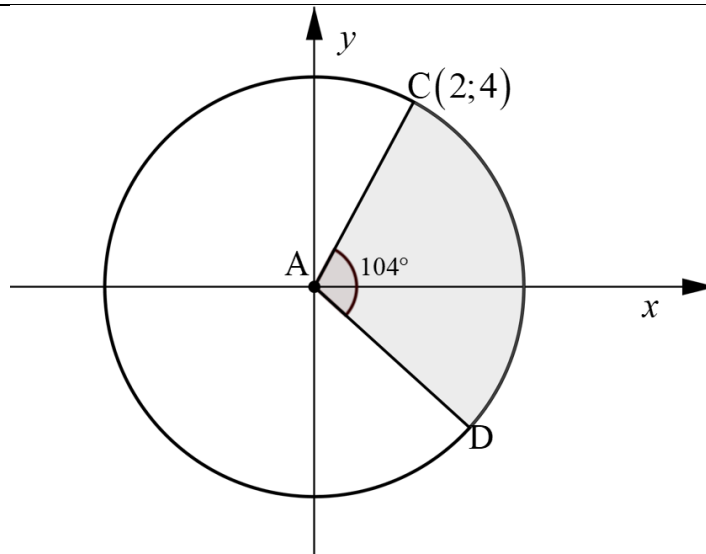
QUESTION/VRAAG 6			
6.1			
	$\hat{B}OC = 106^\circ$ ($\angle$ at centre = $2 \times \angle$ at circumf) $\hat{B}CO = \frac{180^\circ - 106^\circ}{2}$ (OB = OC: radii; $\angle$ s opp = sides) $= 37^\circ$	$\checkmark S \checkmark R$ $\checkmark S \checkmark R$ $\checkmark CA$ Value/ waarde x	(5)
6.2			
	$BD = 30$ units (line from centre $\perp$ to chord) $OD^2 = OB^2 - BD^2$ (Pyth) $= 40^2 - 30^2$ $= 700$ $OD = 26,457...$ ≈ 26 units	$\checkmark S \checkmark R$ $\checkmark SR$ $\checkmark S$ $\checkmark S$	(5)

6.3			
6.3.1	$\widehat{FCD} = 36^\circ$ (FC bisect $\widehat{C}$)	✓S	(1)
6.3.2	$\widehat{DEF} = 36^\circ$ ($\angle$ s in same segment)	✓S ✓R	(2)
6.3.3	$\widehat{CED} = 44^\circ$ (opp $\angle$ s of cyclic quad)	✓S ✓R	(2)
6.3.4	$\widehat{DFH} = 72^\circ$ (ext $\angle$ of cyclic quad)	✓S ✓R	(2)
6.3.5	$\widehat{CHE} = 28^\circ$ (int $\angle$ s of Δ)	✓S ✓R	(2)
			[19]

QUESTION/VRAAG 7			
7.1.1	90° OR is a right angle	✓S	(1)
7.1.2	the angle in the opposite segment / die hoek in die teenoorstaande segment	✓S	(1)
7.2			
	$\hat{A}GE = 43^\circ$ (tan chord) $\hat{AFE} = 43^\circ$ (tan chord or $\angle$ s in same segm) $\hat{GEA} = 43^\circ$ ($\angle$ s opp equal sides) $\hat{GFA} = 43^\circ$ ($\angle$ s in same segment) $\hat{GAC} = 43^\circ$ (tan chord)	✓S ✓R ✓S ✓R ✓S ✓R ✓S ✓R ✓S ✓R	(10)
7.3			
7.3.1	$\hat{G}_1 = 90^\circ$ ($\angle$ in semi-circle) $\hat{C}_1 = 52^\circ$ (int $\angle$ s of Δ)	✓S ✓R ✓SR	(3)
7.3.2	$\hat{C}_2 = 38^\circ$ (tan-chord OR rad $\perp$ tangent) $\hat{E} = 52^\circ$ (ext $\angle$ of Δ)	✓S ✓R ✓SR	(3)
			[18]

QUESTION/VRAAG 8

8.1



8.1.1

$$r^2 = 2^2 + 4^2 = 20$$

$$x^2 + y^2 = 20$$

✓M Substitute pt C

✓A Value of r^2

✓CA Equation of circle

(3)

8.1.2

$$\hat{CAD} = 104^\circ \times \frac{\pi}{180^\circ} = 1,82 \text{ radians}$$

✓M multiply with the factor

✓CA answer

(2)

8.1.3

CD:

$$s = r\theta$$

$$= \sqrt{20} \times 1,82$$

$$= 8,14 \text{ units}$$

✓A Formula/formule

✓A Substitution/vervang

✓CA Answer/antwoord

(3)

8.1.4

$$\text{Area} = \frac{1}{2} r^2 \theta$$

$$= \frac{1}{2} (\sqrt{20})^2 (1,82)$$

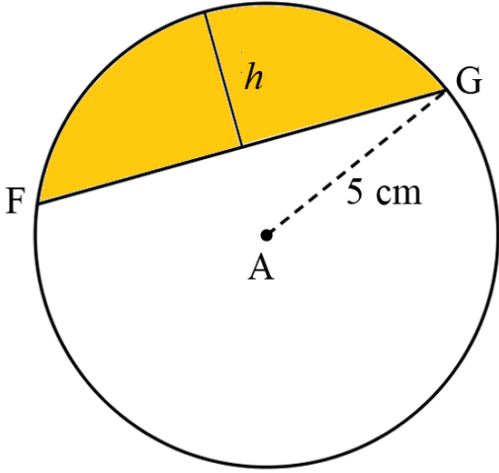
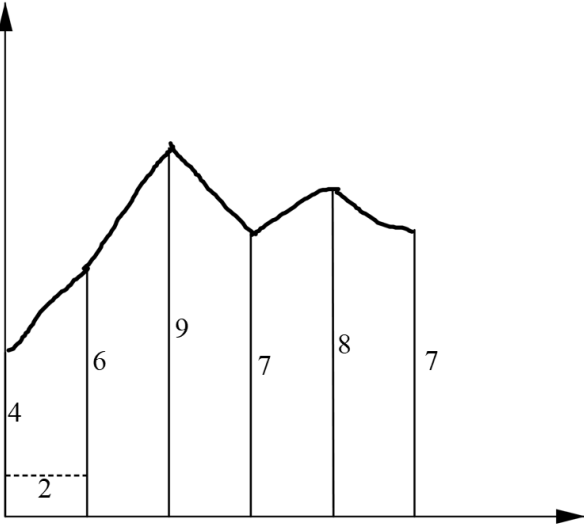
$$= 364 \text{ sq units}$$

✓A Formula/formule

✓A Substitution/vervang

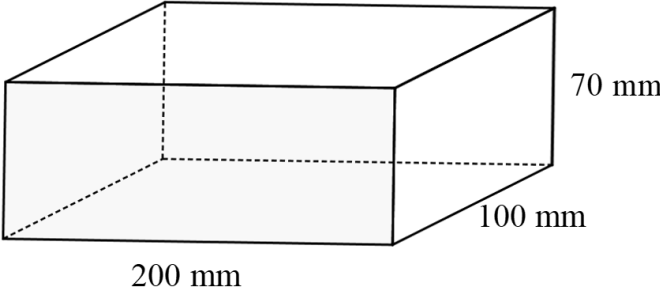
✓CA Answer/antwoord

(3)

8.2		
	$4h^2 - 4dh + x^2 = 0$ $4h^2 - 4(10)h + 9,18^2 = 0$ $4h^2 - 40h + 84,2724 = 0$ $h = \frac{40 \pm \sqrt{(-40)^2 - 4(4)(84,2724)}}{8}$ $= \frac{40 \pm \sqrt{251,6416}}{8}$ $= 6,98; 3,02$ $\therefore h = 3,02 \text{ cm (shorter height)}$	✓A Substitution / vervanging ✓CA Standard form / standaardvorm ✓A Quadratic / kwadratische formula ✓A Substitution / vervanging ✓CA Simplification / vereenvoudiging ✓CA Answer / antwoord (6)
8.3		

	$\text{Area} = 2 \left[\frac{4+7}{2} + 6 + 9 + 7 + 8 \right]$ $= 2(35,5)$ $= 71 \text{ cm}^2$	✓A Correct formula / korrekte formule ✓A Substitution/vervanging ✓CA Simplification / vereenvoudiging ✓CA Answer/antwoord	(4)
			[21]

QUESTION/VRAAG 9			
9.1	$D = 10m$ $v = 45m / s$ $v = \pi Dn$ $n = \frac{v}{\pi D}$ $= \frac{45}{\pi(10)}$ $= 1,43 \text{ r/s}$	✓A Correct formule/korrekte formule ✓A Changing subject/verander onderwerp ✓A Substitution/vervanging ✓CA Answer/antwoord	(4)
9.2	$w = 2\pi n$ $= 2\pi(1,43)$ $= 8,98 \text{ rad/s}$	✓A Correct formule/korrekte formule ✓CA Substitution/vervanging ✓CA Answer/antwoord	(3)
			[7]

QUESTION/VRAAG 10			
10.1			
	Surface area = $2lh + 2bh + 2bl$ $= 2(200)(70) + 2(100)(70) + 2(100)(200)$ $= 82\,000 \text{ mm}^2$		(3)
10.2	Area sphere = $4\pi r^2$ $4\pi r^2 = 48\pi$ $r^2 = 12$ $r = \sqrt{12}$ Vol of sphere = $\frac{4}{3}\pi r^3$ $= \frac{4}{3}\pi (\sqrt{12})^3$ $= 174,12 \text{ cm}^3$	✓A Area formula / formule ✓M Equating / gelykstelling ✓CA Simplification / vereenvoudiging ✓A Vol formula / formule ✓CA Substitution / vervanging ✓CA Answer / antwoord	(6)
			[9]
		TOTAL/TOTAAL	150