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NATIONAL SENIOR CERTIFICATE/ *NASIONALE SENIOR SERTIFIKAAT*

GRADE/*GRAAD* 12

SEPTEMBER 2026

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

MARKS/*PUNTE*: 150

This marking guideline consists of 18 pages./
Hierdie nasienriglyn bestaan uit 18 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:

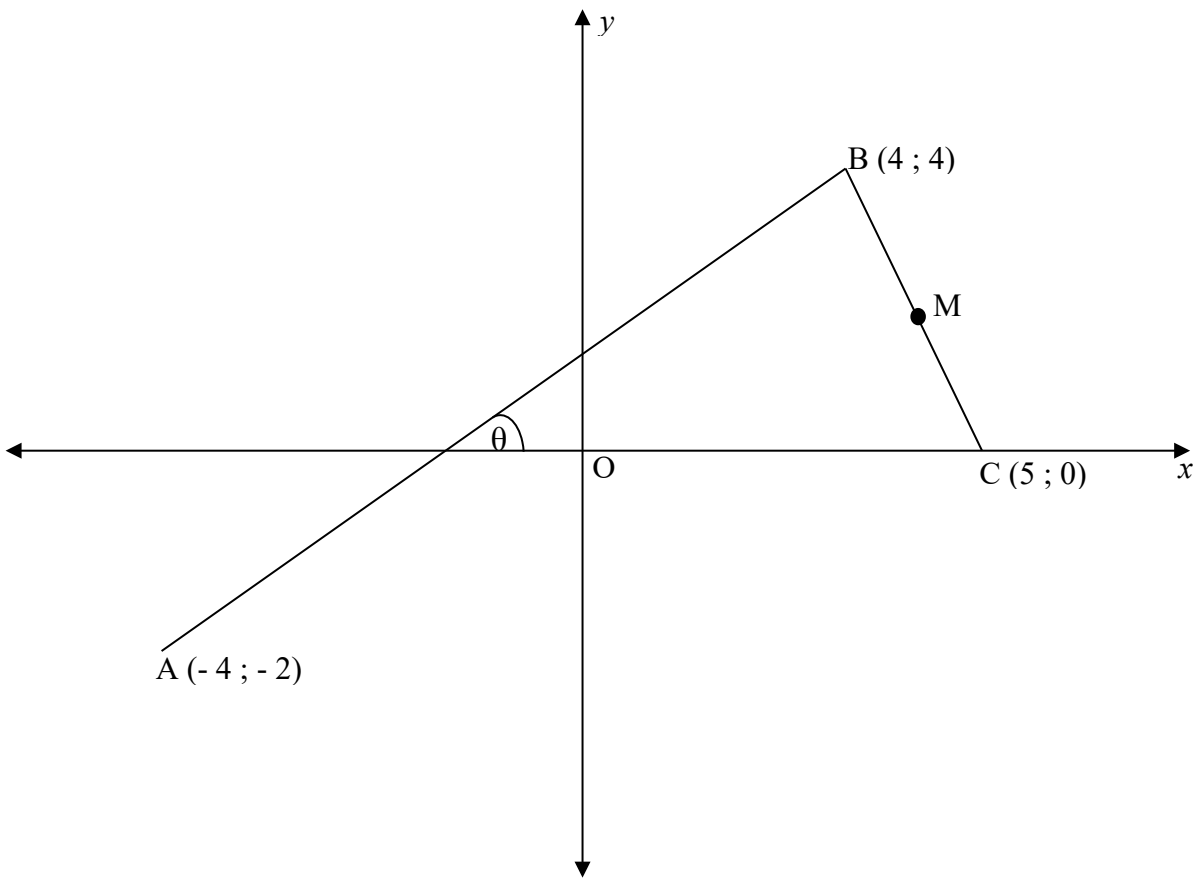
- *Volgehoue akkuraatheid (CA) is slegs van toepassing soos aangedui in hierdie nasienriglyn.*
- *Aanvaarding van waardes/antwoorde om 'n probleem op te los, is onaanvaarbaar.*

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*
NPR	No penalty for rounding

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QUESTION/*VRAAG* 1



1.1	$m_{AB} = \frac{4-(-2)}{4-(-4)}$ $= \frac{2}{9}$ $m_{AB} = \frac{3}{4}$	✓ **Subst. / *Vervang*** ✓ **Answer / *Antwoord***	**A** **A** (2)
1.2	$M\left(\frac{x_1+x_2}{2}\ ;\ \frac{y_1+y_2}{2}\right)$ $= M\left(\frac{4+5}{2}\ ;\ \frac{4+0}{2}\right)$ $= M\left(\frac{9}{2}\ ;\ 2\right)$	✓ ***x*-value / *waarde*** ✓ ***y*-value / *waarde***	**A** **A** (2)
1.3	$AM = \sqrt{(x_2-x_1)^2+(y_2-y_1)^2}$ $AM = \sqrt{\left(\frac{9}{2}-(-4)\right)^2+(2-(-2))^2}$ $AM = \frac{\sqrt{353}}{2}$ $AM = 9{,}39$ units/*eenhede*	✓ **F** ✓ **Subst. / *Vervang*** ✓ **Answer / *Antwoord***	**A** **A** **CA** (3)

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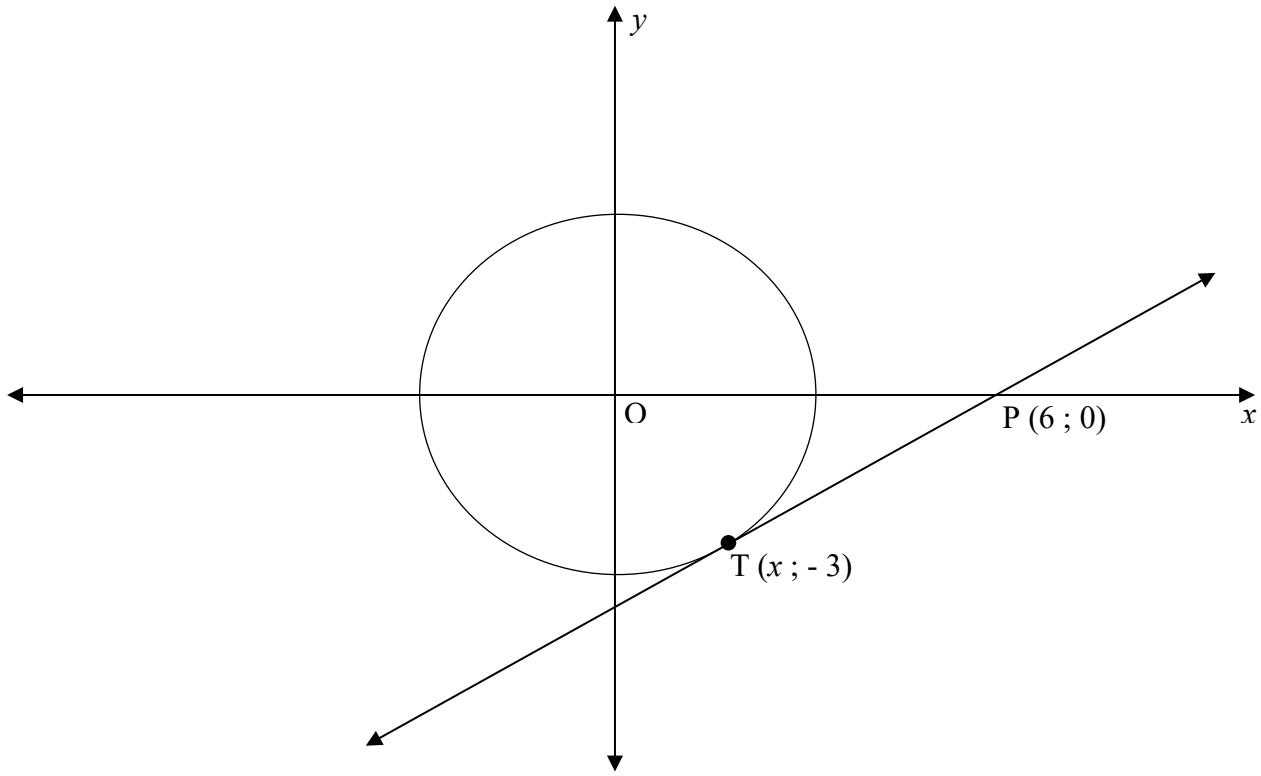
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1.4	$tan\theta = m_{AB}$ $tan\theta = \frac{3}{4}$ $\theta = tan^{-1}\left(\frac{3}{4}\right)$ $\theta = 36{,}87°$	✓ **F** ✓ **Subst. / *Vervang*** ✓ **Answer / *Antwoord***	**A** **CA** **CA** (3)
1.5	$m_{AB} = m_l = \frac{3}{4}$ $D(-4;2)$ $y - 2 = \frac{3}{4}(x + 4)$ $y = \frac{3}{4}x + 3 + 4$ $y = \frac{3}{4}x + 5$ **OR/*OF*** $m_{AB} = m_l = \frac{3}{4}$ $D(-4;2)$ $y = \frac{3}{4}x + C$ $2 = \frac{3}{4}(-4) + C$ $C = 5$ $y = \frac{3}{4}x + 5$	✓ $m_l = \frac{3}{4}$ ✓ $D(-4;2)$ ✓ **Subst. / *Vervang*** ✓ **S** ✓ **Answer / *Antwoord*** **OR/*OF*** ✓ $m_l = \frac{3}{4}$ ✓ $D(-4;2)$ ✓ **Subst. / *Vervang*** ✓ **S** ✓ **Answer / *Antwoord***	**CA** **CA** **CA** **CA** **CA** **A** **CA** **CA** **CA** **CA** (5)
			[15]

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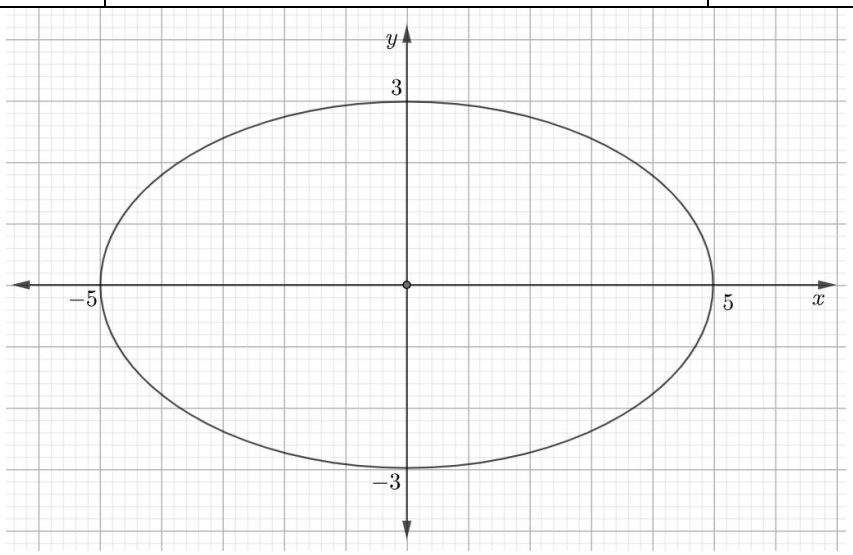
QUESTION/*VRAAG* 2



2.1	2.1.1	Tangent / raaklyn	✓ **Answer / *Antwoord***	**A** (1)
	2.1.2	$4y-3x+18=0$ $4y=3x-18$ $y=\frac{3}{4}x-\frac{9}{2}$	✓ **Transpos.** ✓ **Equation / *Vergelyking***	**A** **A** (2)
	2.1.3	$-3=\frac{3}{4}x-\frac{9}{2}$ $-3+\frac{9}{2}=\frac{3}{4}x$ $\frac{3}{2}=\frac{3}{4}x$ $x=2$	✓ **SF** ✓ **S** ✓ $x=2$	**CA** **CA** **CA** (3)

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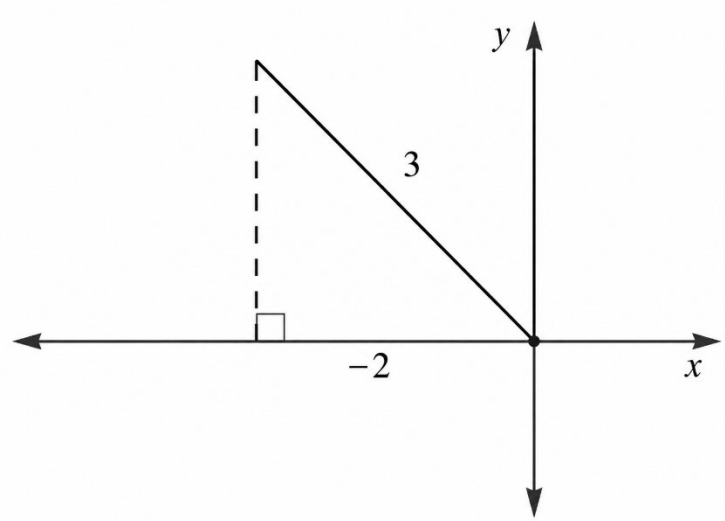
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	2.1.4	$x^2 + y^2 = r^2$ $2^2 + (-3) = r^2$ $4 + 9 = r^2$ $13 = r^2$ $x^2 + y^2 = 13$	✓ **Subst. / *Vervang*** ✓ $13 = r^2$ ✓ **Equation / Vergelyking**	**CA** **CA** **CA** (3)
2.2			✓**elliptical shape / *elliptiese vorm*** ✓***x*-int/*as*** ✓ **y-int/*as***	**A** **A** **A** (3)
				[12]

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QUESTION/*VRAAG* 3

3.1	$\frac{\cos ec\,X}{\tan Y}=\frac{\cos ec(27°)}{\tan(123,57°)}$ $=\frac{\left(1\middle/\sin(27°)\right)}{\tan(123,57°)}$ $=-1,46$		✓ **Subst. / *Vervang*** ✓ $\frac{1}{\sin(27°)}$ ✓ **Answer / *Antwoord***	**A** **A** **A** (3)
3.2	3.2.1		✓ **Diagram**	**A**
		$x^2+y^2=r^2$ $(-2)^2+y^2=3^2$ $y=\sqrt{3^2-(-2)^2}$ $y=\sqrt{5}$ $\sin\theta=\frac{\sqrt{5}}{3}$	✓ **Subst. / Vervang** ✓ ***y*-value / *waarde*** ✓ $\sin\theta=\frac{\sqrt{5}}{3}$	**A** **A** **CA** (4)

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	3.2.2	$\sec^2\theta+\tan^2\theta$ $=\left(-\frac{3}{2}\right)^2+\left(-\frac{\sqrt{5}}{2}\right)^2$ $=-\frac{1}{4}$	✓ $\left(-\frac{3}{2}\right)^2$ ✓ $\left(-\frac{\sqrt{5}}{2}\right)^2$ ✓ **Answer / *Antwoord***	**CA** **CA** **CA** (3)
3.3	$\sin x = \frac{-2}{3}$ $x = sin^{-1}\left(-\frac{2}{3}\right)$ Ref / *Verw*$\angle = 41{,}81°$ $x = 180° + 41{,}81°$ $x = 221{,}81°$ for $x \in [0°; 270°]$	✓ $sin^{-1}\left(-\frac{2}{3}\right)$ ✓ Ref $\angle$ ✓ $x = 221{,}81°$	**A** **A** **CA** (3)
				[13]

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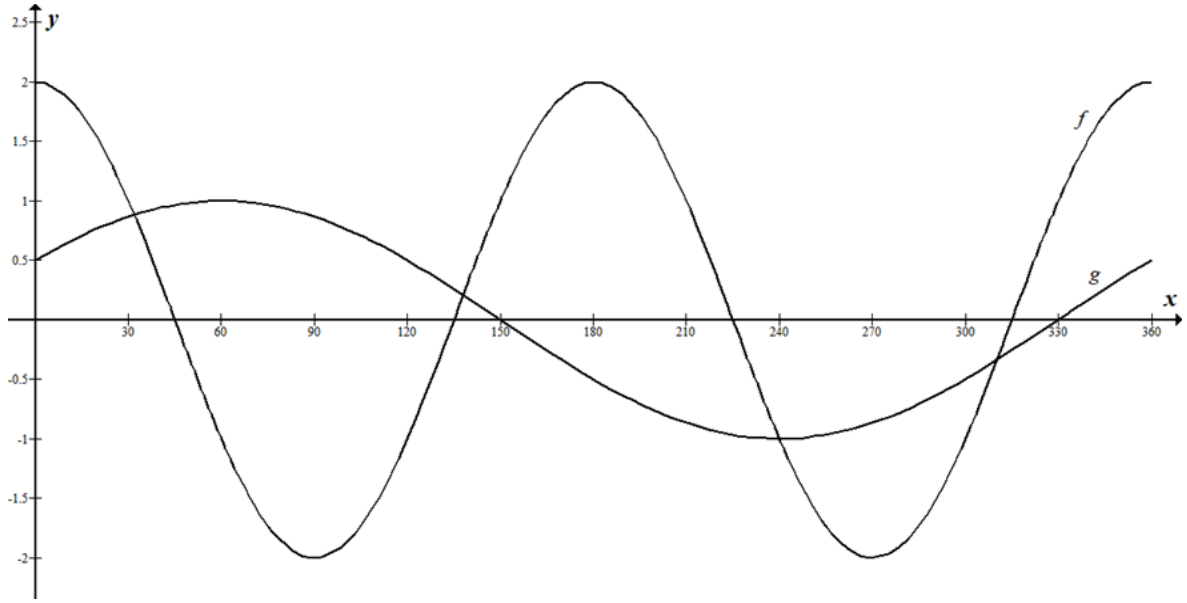
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QUESTION/*VRAAG* 4

4.1	$\dfrac{\cos^2(\pi-\theta)\cdot\cos 180°}{\sin(180°+\theta)\cdot\cos(-\theta)\cdot\tan(360°+\theta)}$ $=\dfrac{(-\cos\theta)^2\cdot(-1)}{(-\sin\theta)\cdot\cos\theta\cdot\tan\theta}$ $=\dfrac{-\cos^2\theta}{-\sin\theta\cdot\cos\theta\cdot\dfrac{\sin\theta}{\cos\theta}}$ $=\dfrac{\cos^2\theta}{\sin^2\theta}$ $=\tan^2\theta$ **OR/*OF*** $=\sec^2\theta-1$	✓ $(-\cos\theta)^2$ ✓ -1 ✓ $-\sin\theta$ ✓ $\cos\theta$ ✓ $\tan\theta$ ✓ S ✓ $\tan^2\theta$	**A** **A** **A** **A** **A** **A** **A** (7)
4.2	$\sin^2 x\left(\dfrac{1}{1+\cos x}+\dfrac{1}{1-\cos x}\right)=2\left(\cos^2 x+\sin^2 x\right)$ LHS / *LK* $=\sin^2 x\left(\dfrac{1}{1+\cos x}+\dfrac{1}{1-\cos x}\right)$ $=\sin^2 x\left(\dfrac{1-\cos x+1+\cos x}{1-\cos^2 x}\right)$ $==\sin^2 x\left(\dfrac{2}{\sin^2 x}\right)$ $=2$ RHS / *RK* $=2\left(\cos^2 x+\sin^2 x\right)$ $=2(1)$ $\therefore$LHS=RHS / *LK* = *RK*	✓ S ✓ $1-\cos^2 x$ ✓ $\sin^2 x$ ✓ 2 ✓ 1	**A** **A** **A** **A** **A** (5)
			[12]

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QUESTION/*VRAAG* 5

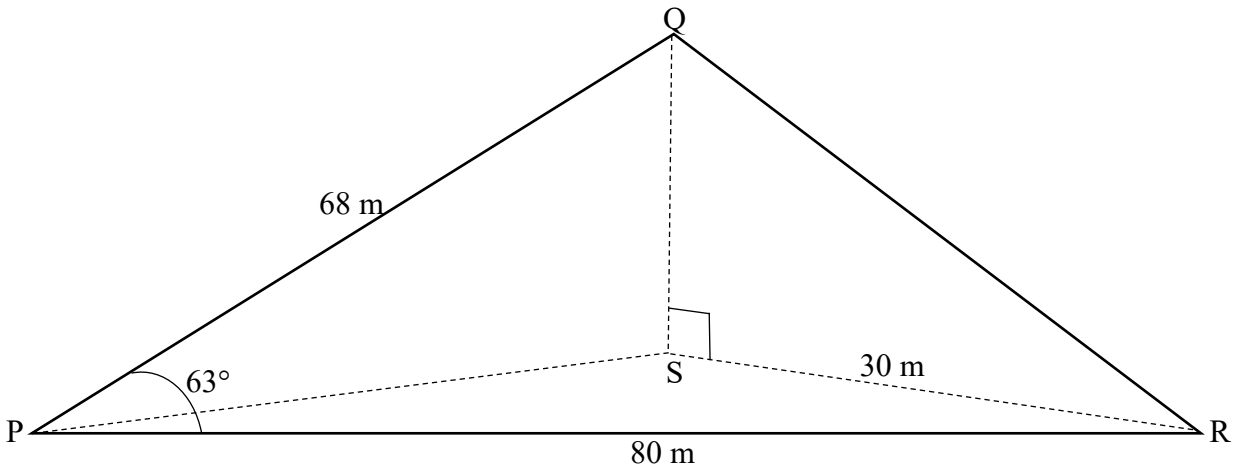


5.1	$a=1$ $b=1$ $p=30°$	✓ $a=1$ ✓ $b=1$ ✓ $p=30°$	**A** **A** **A** (3)
5.2	$\frac{360°}{2}=180^{o}$	✓ **M** ✓ 180^{o} **AO Full Marks / *Volpunte***	**A** **A** (2)
5.3	$x=0°$ **OR** / *OF* $x=360°$	✓ $x=0°$ ✓ $x=360°$	**A** **A** (2)
			[7]

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QUESTION/*VRAAG* 6

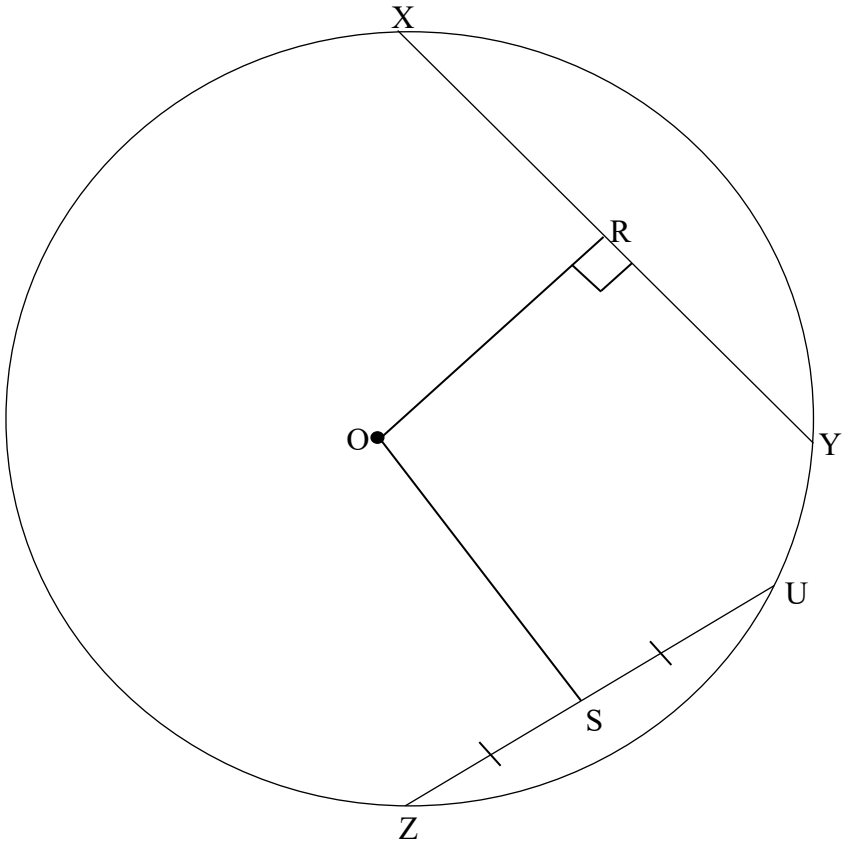


6.1	$QR^2 = PQ^2 + PR^2 - 2 \cdot PQ \cdot PR \cos \hat{P}$ $= (68)^2 + (80)^2 - 2 \cdot (68) \cdot (80) \cos 63°$ $= \sqrt{6084,58}$ $= 78,0$ m	✓ **F** ✓ **Subt. / *Vervang*** ✓ **S** ✓ **QR**	**A** **A** **A** **A** (4)
6.2	$QR^2 = QS^2 + SR^2$ $SQ^2 = 78^2 - 30^2$ $SQ = \sqrt{78^2 - 30^2}$ SQ = 72 m	✓ **Subt. / *Vervang*** ✓ **SQ**	**A** **A** (2)
6.3	Area of $\Delta PQR = \frac{1}{2} PQ \times PR \times \sin \hat{P}$ $= \frac{1}{2}(68 \times 80 \times \sin 63°)$ $= 2423,54 m^2$	✓ **F** ✓ **SF** ✓ **Area**	**A** **CA** **CA** (3)
			[9]

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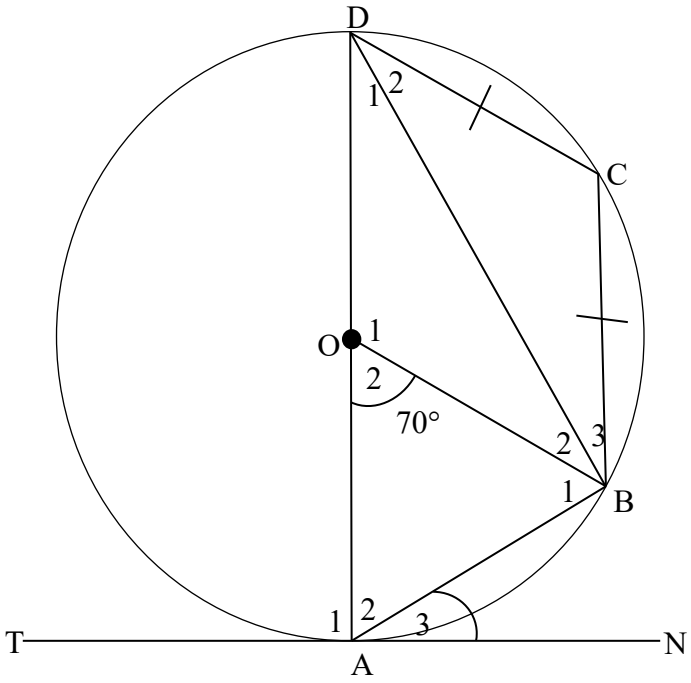
QUESTION/*VRAAG* 7

7.1	(i)	Perpendicular / Loodreg	✓ **RE**	**A** (1)
	(ii)	Bisects / Halveer	✓ **RE**	**A** (1)
				
7.2	7.2.1	$OZ^2 = OS^2 - SZ^2$ Pythagoras $OZ = \sqrt{7^2 + 5^2}$ $OZ = 8,6\,cm$	✓ **ST/RE** ✓ **ST** ✓ **ST**	**A** **A** **A** (3)
	7.2.2	$XR^2 = 8,6^2 - 4^2$ *Pythagoras* $= \sqrt{57,96}$ $= 7,6cm$ $XY = 2 \times 7,6$ *line frm centre perp to a chrd/ lyn van midpt loodreg op koord* $XY = 15,21cm$	✓ **ST** ✓ **ST** ✓ **ST/RE** ✓ **ST**	**A** **CA** **CA** **CA** (4)
	7.2.3	$OX + OZ = 8,6 + 8,6 = 17,2cm$	✓ **ST**	**CA** (1)
	7.2.4	False/*Onwaar* $OY = OU$ *radii*	✓ **ST** ✓ **RE**	**A** (2)
				[12]

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QUESTION/*VRAAG* 8

8.1	Perpendicular or 90° / *Loodreg of* 90°			✓ **ST**	**A** (1)
					
8.2	8.2.1	Tan ⊥Rad		✓ **RE**	**A** (1)
	8.2.2	$D\hat{A}N = 90°$ Tan ⊥Rad $A\hat{B}D = 90°$ *∠in semi – circle / ∠in semi – sirkel*		✓ **ST** ✓ **ST** ✓ **RE**	**A** **A** (3)
	8.2.3	(a)	$\hat{O}_2 = 2 \times \hat{D}_1$ *∠ at centre = 2 × ∠ at circmf* $\hat{D}_1 = \frac{70°}{2} = 35°$	✓ **ST** ✓ **RE** ✓ **ST**	**A** **A** (3)
		(b)	$\hat{A}_3 = \hat{D}_1 = 35°$ Tan – chord *thm* / raaklyn / kord	✓ **ST** ✓ **RE**	**CA** **A** (2)
		(c)	$\hat{B}_2 = 35°$ *∠ opp = sides / ∠'eteenoor = sye*	✓ **ST** ✓ **RE**	**CA** **A** (2)
		(d)	$A\hat{B}D = 90°$ *∠in semi – circle / ∠in semi – sirkel* $\hat{B}_1 = 90° - 35° = 55°$ **OR/*OF*** $\hat{B}_1 = \hat{A}_2$ *∠ opp = sides / ∠'eteen = sye* $\hat{B}_1 = \frac{180° - 70°}{2} = 55°$	✓ **ST RE** ✓ **ST** **OR/*OF*** ✓ **ST RE** ✓ **ST**	**A** **CA** **A** **A** (2)

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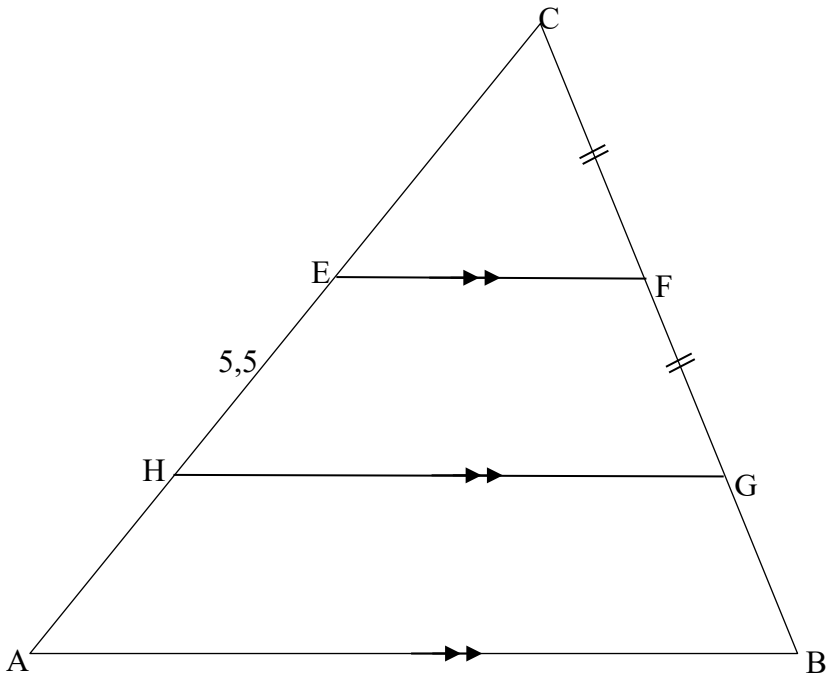
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		(e)	$\hat{A}_2 = 55°$ $\angle$ *opp = sides* / $\angle$*'eteenoor = sye* $\hat{C} + \hat{A}_2 = 180°$ *opp* $\angle$*s* of cyclic quad / *teenoorst* $\angle$*'evankvh* $\hat{C} = 180° - 55°$ $\hat{C} = 125°$	✓ **ST** ✓ **RE** ✓ **ST**	**CA** **A** **CA** (3)
		(f)	$\hat{D}_2 = \hat{B}_3$ $\angle$ *opp = sides* / $\angle$*teen = sye* $\hat{D}_2 = \frac{180° - 125°}{2} = 27,5°$	✓ **ST RE** ✓ **ST**	**A** **CA** (2)
8.3	**NO** Because in Quadrilateral / *Omdat in vierhoek*: **OBCD** $\hat{C} + \hat{O}_1 \neq 180°$ $\hat{B} + D \neq 180°$ Thus opp angles are not supplementary / *Dus is teen hoeke nie*			✓ **ST** ✓ **ST** ✓ **ST** ✓ **conclusion / *gevolgtrekking***	**A** **A** **A** **A** (4)
					[23]

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QUESTION/*VRAAG* 9

9.1	(i)	Parallel / *Eweredig*	✓ **ST**	**A** (1)
	(ii)	Proportionally / *Verhouding*	✓ **ST**	**A** (1)
9.2				
	9.2.1	$\frac{EC}{CH}=\frac{CF}{CG}$ *prop theorem* HG || EF $\frac{EC}{HE+EC}=\frac{1}{2}$ $2EC=5,5+EC$ $EC=5,5\,units\ /\ eenhede$	✓ **ST** ✓ **RE** ✓ **ST**	**A** **A** (3)
	9.2.2	$AH=\frac{2}{5}AC$ $AH=\frac{2}{5}(AH+HE+EC)$ $AH=\frac{2}{5}(AH+5,5+5,5)$ $\frac{3}{5}AH=\frac{22}{5}$ $AH=7,33\,units\ /\ eenhede$	✓ **ST** ✓ **S** ✓ **ST**	**A** **CA** **CA** (3)

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	9.2.3	$\frac{GB}{CG}=\frac{AH}{CH}$ *prop theorem* AB□HG $\frac{GB}{8}=\frac{7,3}{11}$ $GB=\frac{7,33\times 8}{11}$ $GB=5,33\ units\ /\ eenhede$	✓ **ST** ✓ **RE** ✓ **Subt. /** ***Vervang*** ✓ **ST**	**A** **CA** **CA** (4)
				[12]

QUESTION/*VRAAG* 10

10.1	10.1.1	$\omega=2\pi n$ $\omega=2\pi\left(\frac{320}{60}\right)$ $\omega=\frac{32}{3}\pi$ $\omega=33,51\ rad\ /\ s$	✓ **F** ✓ **conv /** ***herleid*** ✓ **SF** ✓ **Answer /** ***Antwoord*** ***NPU, NPR***	**A** **A** **CA** **CA** (4)
	10.1.2	$D=2\times 38=68\ cm$ $D=\frac{68}{100}=0,68\ m$ $v=\pi Dn$ $v=\pi(0,68)\left(\frac{16}{3}\right)$ $v=\frac{272}{75}\pi\ m/s$ $v=11,39\ m/s$ **OR/*OF***	✓ $D=68cm$ ✓ **conv /** ***herleid*** ✓ **F** ✓ **SF** ✓ **Answer /** ***Antwoord***	**A** **CA** **A** **CA** **CA**

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		$r = \frac{38}{100} = 0,38m$ $V = \omega r$ $V = 33,51 \times 0,38$ $V = 11,39\,m/s$	✓ **conv / *herleid*** ✓ **F** ✓ **SF** ✓ 11,39 ✓ **units / *eenhede***	**A** **A** **CA** **CA** **A** (5)
	10.2.1	$= 155° \times \frac{\pi}{180} = \frac{31\pi}{36}\,rad$ $\approx 2,71\,rad$	✓ **Answer / *Antwoord***	**A** (1)
	10.2.2	$s = r\theta$ $s = 1,12\left(\frac{31\pi}{36}\right)$ $s = \frac{217}{225}\pi$ $s \approx 3,03m$	✓ **F** ✓ **SF** ✓ **Answer / A*ntwoord***	**A** **CA** **CA** (3)
	10.2.3	Length of the rope / *Lengte van tou*: $= 4,7 + 2,1 + 5 + 3,03 + 3,5$ $= 18,33m$	✓ **M** ✓ **Answer / *Antwoord***	**A** **CA** (2)
10.3		$4h^2 - 4dh + x^2 = 0$ $4h^2 - 4(14)h + (12)^2 = 0$ $4h^2 - 56h + 144 = 0$ $h = \frac{-(-56) + \sqrt{(-56)^2 - (4 \times 4 \times 144)}}{2 \times 4}$ $h = 10,6 \quad or \quad h = 3,4$ $h = 10,6$	✓ **F** ✓ **SF** ✓ $d = 14$ ✓ **Std form** ✓ **Both Values / *Beide Waarde h*** ✓ **Concl / *Gevolgtrek*** ***NPU, NPR***	**A** **A** **A** **CA** **CA** **CA** (6)
				[21]

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QUESTION/*VRAAG* 11

11.1	$A_T = a\left(\frac{o_1+o_6}{2}+o_2+o_3+o_4+o_5\right)$ $234,75 = x\left(\frac{12,1+11}{2}+13,2+15,5+12+14,5\right)$ $234,75 = x(66,75)$ $x = 3,5\,\text{m}$ **OR/*OF*** $A_T = a\,(\,m_1+m_2+m_3+m_4+.....+m_n)$ $234,75 = x\left(\frac{12,1+13,2}{2}+\frac{13,2+15,5}{2}+\frac{15,5+12}{2}+\frac{12+14,5}{2}+\frac{14,5+11}{2}\right)$ $234,75 = x\left(\frac{267}{4}\right)$ $x = 3,5$		✓ **F** ✓ **SF** ✓ **S** ✓ $x = 3,5\text{m}$ **OR/*OF*** ✓ **F** ✓ **SF** ✓ **S** ✓ $x = 3,5\text{m}$ ***NPU, NPR***	**A** **A** **CA** **CA** **A** **A** **CA** **CA** (4)
11.2	11.2.1	Length of the straight side / *Lengte van die reguit kant*: $= 3,5 \times 5 = 17,5m$	✓ **Answer / *Antwoord***	**CA** (1)
	11.2.1	$400ml = 400cm * cm^3??$	✓ **conv / *herleid***	**A** (1)
	11.2.2	$\pi r^2 h = V$ $\pi r^2(12) = 400$ $r = \sqrt{\left(\frac{400}{12\pi}\right)}$ $r = 3,26cm$	✓ **SF** ✓ **S** ✓ $r = 3,26cm$	**A** **A** **CA** (3)
	11.2.3	$SA = 2\pi(3,26)^2 + 2\pi(3,26)(12)$ $SA = 312,57cm^2$	✓ **SF** ✓ **SA**	**CA** **CA** (2)
	11.2.4	$50l = 50\,000ml$ $\text{cans in a day / blik per dag} = \frac{50000}{400} = 200\,\text{cans /}$ *blikke* $\text{cans in 5 days} = 5 \times 200 = 1000\,\text{cans / } blikke$	✓ **conv / *herleid*** ✓ **M** ✓ **1 000 cans / *blikke***	**A** **A** **CA** (3)
				[14]
			TOTAL/*TOTAAL*:	**150**

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