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NATIONAL SENIOR CERTIFICATE/ *NASIONALE SENIOR SERTIFIKAAT*

GRADE/*GRAAD* 11

NOVEMBER 2025

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

MARKS/*PUNTE*: 150

This marking guideline consists of 20 pages./
Hierdie nasienriglyn bestaan uit 20 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	**Substituting correctly in the correct formula/*Korrekte vervanging in die korrekte formule***
NPU	**No penalty for omitting units/*Geen penalisering vir eenhede uitgelaat***
NPR	**No penalty for rounding/*Geen penalisering vir afronding***

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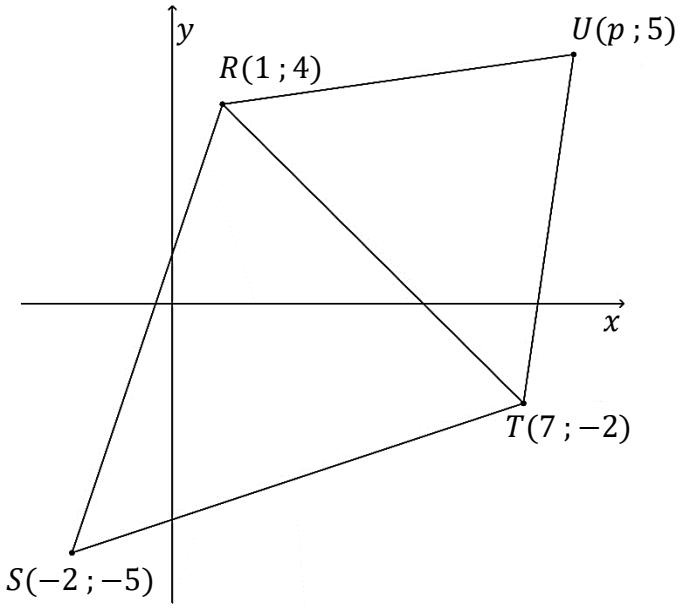
QUESTION/*VRAAG* 1



1.1	$m_{RT} = \frac{y_2 - y_1}{x_2 - x_1}$ $= \frac{-2-4}{7-1}$ $= -1$	✓ **S** **A** ✓ m_{RT} **CA**	(2)
1.2	$\text{Q}\left(\frac{x_1 + x_2}{2}; \frac{y_1 + y_2}{2}\right)$ $= \text{Q}\left(\frac{1+7}{2}; \frac{4+(-2)}{2}\right)$ $= \text{M}(4\ ;\ 1)$	✓ ***x*-value/ *x-waarde*** **A** ✓ ***y*-value/ *y-waarde*** **A**	(2)

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1.3	$RT = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$ $RT = \sqrt{(7-1)^2 + (-2-4)^2}$ $RT = \sqrt{6^2 + (-6)^2}$ $RT = 6\sqrt{2}$ *units / eenhede*	✓ **SF** **CA** ✓ **S** **CA** ✓ **RT** **CA**	(3)
1.4	$m_{SQ} = \frac{1-(-5)}{4-(-2)}$ $= 1$ $m_{RT} \times m_{SQ} = -1 \times 1$ $= -1$	✓ m_{SQ} **CA** ✓ **Su** **CA** ✓ **Prod** **CA**	(3)
1.5	$m = m_{RT} = -1$ $y - y_1 = m(x - x_1)$ $y - (-5) = -1(x - (-2))$ $y = -x - 2 - 5$ $y = -x - 7$	✓ $m = -1$ **CA** ✓ **SF** **A** ✓ **S** **CA** ✓ **Answer/** ***Antwoord*** **CA**	(4)
1.6	$\sqrt{(p-(-2))^2 + (5-(-5))^2} = 10\sqrt{2}$ $\sqrt{(p+2)^2 + (10)^2} = 10\sqrt{2}$ $(p+2)^2 + (10)^2 = \left(10\sqrt{2}\right)^2$ $(p+2)^2 = 200 - 100$ $p + 2 = \pm\sqrt{100}$ $p = -2 \pm 10$ $p = 8$ and/*en* $p \neq -12$	✓ **SF** **A** ✓ **Squaring/** ***Kwadratuur*** **CA** ✓ **Transpose/** ***Transponeer*** **CA** ✓ **S** **CA** ✓ $p = 8$ **CA**	(5)

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1.7	$SQ = \sqrt{(4+2)^2 + (1+5)^2}$ $SQ = 6\sqrt{2}$ $RQ = 3\sqrt{2}$ $QT = 3\sqrt{2}$ $\text{Area/}oppervlakte\ \Delta SQR = \frac{1}{2} RQ \times SQ$ $= \frac{1}{2} \times 3\sqrt{2} \times 6\sqrt{2}$ $= 18 units^2 \ / \ eenhede^2$ $\text{Area/}oppervlakte\ \Delta SQT = \frac{1}{2} QT \times SQ$ $= \frac{1}{2} \times 3\sqrt{2} \times 6\sqrt{2}$ $= 18 units^2 \ / \ eenhede^2$ $\text{Area/}oppervlakte\ \Delta SQR = Area/oppervlakte\ \Delta SQT$ ∴ SQ divides ΔSRT into two equal parts/SQ *verdeel* ΔSRT *in twee gelykedele*	✓**SF** **A** ✓ **SQ** **CA** ✓ **SF** **A** ✓ Area/*Oppervlakte* △ SQR **CA** ✓ **SF** **CA** ✓**Conclusion/*Slot*** **CA**	(6)
			[25]

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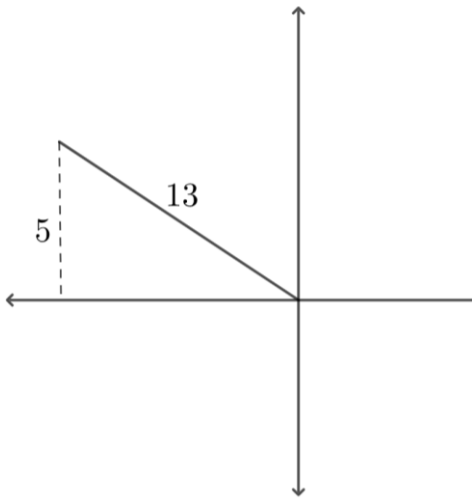
QUESTION/*VRAAG* 2

2.1.1	$\sin(207{,}21° - 22{,}32°)$ $= -0{,}09$	✓ **Subst/*Vervanging*** ✓ **Answer/*Antwoord***	(2)
2.1.2	$= \dfrac{13}{\left(\dfrac{1}{\tan(2\times 22{,}31° + 207{,}21°)}\right)^2}$ $= 120{,}69$	✓ **Subst/*Vervanging*** **A** ✓ $\frac{1}{\tan}$ **A** ✓ **Answer/*Antwoord*** **CA**	(3)
2.2.1	 $x^2 + y^2 = r^2$ $x^2 + 5^2 = 13^2$ $x^2 = 169 - 25$ $x = \pm\sqrt{144}$ $x = -12$ $\cos\theta = \dfrac{-12}{13}$	✓**Diagram** **A** ✓ **SF** **A** ✓ $x = -12$ **CA** ✓ $\cos\theta$ **CA**	(4)
2.2.2	$\tan\theta = -\dfrac{5}{12}$	✓ **S** **A**	(1)

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2.2.3	$\cos ec^2 + \sec^2 = \left(\frac{13}{5}\right)^2 + \left(-\frac{13}{12}\right)^2$ $= \frac{28561}{3600}$ $= 7,93$	✓ $\left(\frac{13}{5}\right)$ **A** ✓ $\left(-\frac{13}{12}\right)$ **CA** ✓**Answer/*Antwoord*** **CA** **NPR**	(3)
2.3	$5\cot\beta + 7 = 13$ $5\cot\beta = 6$ $\cot\beta = \frac{6}{5}$ $\therefore \tan\beta = \frac{5}{6}$ $\beta = \tan^{-1}\left(\frac{5}{6}\right)$ $\text{Ref}\angle = 39,81°$ 1*st* Quadrant/*Kwadrant* $\beta = 39,81°$ 3*rd* Quadrant/*Kwadrant* $\beta = 180° + 39,81°$ $\beta = 219,81°$	✓ **S** **A** ✓ $\boldsymbol{tan^{-1}\left(\frac{5}{6}\right)}$ **A** ✓ $\boldsymbol{Ref\angle}$ **CA** ✓ $\beta = 39,81°$ **CA** ✓ $\beta = 219,81°$ **A**	(5)
			[18]

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QUESTION/*VRAAG* 3

3.1	$\dfrac{\cos(360°-x)\cdot\sin(180°+x)\cdot\tan(180°+x)}{\cos^2(180°+x)\cdot\cos\pi}$ $=\dfrac{\cos x\cdot\sin x\cdot\tan x}{(-\cos x)^2\cdot(-1)}$ $=\dfrac{\cos x\cdot(-\sin x)\cdot\dfrac{\sin x}{\cos x}}{(-\cos x)^2\cdot(-1)}$ $=\dfrac{\sin^2(x)}{\cos^2(x)\cdot}$ $=\tan^2 x$ **OR/*OF*** $=\sec^2 x-1$	✓$\cos x$ **A** ✓ $\sin x$ **A** ✓ $\tan x$ **A** ✓$(-\cos x)^2\cdot$ **A** ✓ $\frac{\sin x}{\cos x}$ **A** ✓ (-1) **A** ✓ Answer/*Antwoord* **CA**	(7)
3.2	$\dfrac{\cos x-\cos x\cdot\sin x}{\sin x-1+\cos^2 x}=\cot x$ $LHS=\dfrac{\cos x(1-\sin x)}{\sin x-1+1-\sin^2 x}$ $=\dfrac{\cos x(1-\sin x)}{\sin x(1-\sin x)}$ $=\dfrac{\cos x}{\sin x}$ $=\cot x$ $=RHS$	✓ $(1-\sin x)$ **A** ✓ $1-\sin^2 x$ **A** ✓ **S** **A** ✓ $\dfrac{\cos x}{\sin x}$ **CA**	(4)
			[11]

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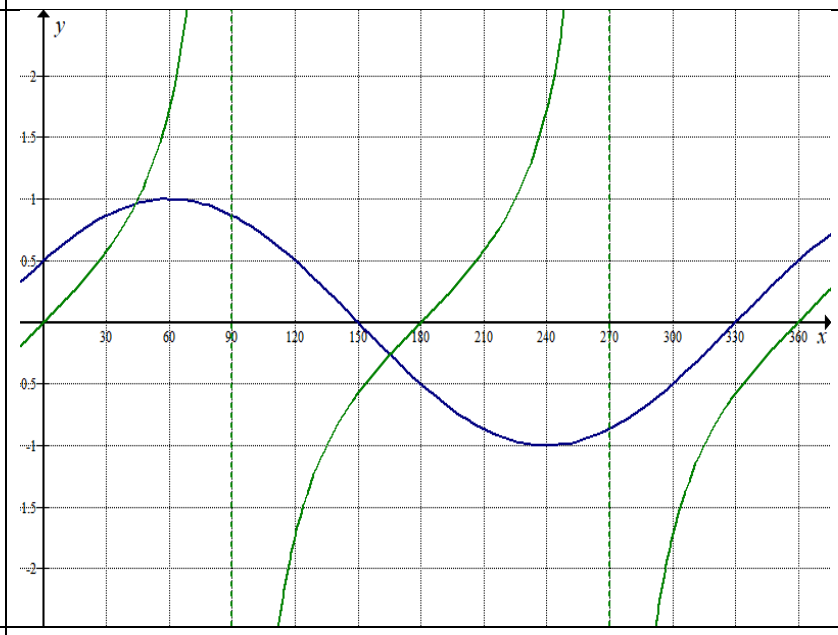
QUESTION/*VRAAG* 4			
4.1		*f:* ✓ shape/*vorm* ✓ start and end point/ *begin- en eindpunt* ✓ Asymptotes/*asimptote* *g:* ✓ intercepts/*afsnitte* ✓ shape/*vorm* ✓ start and end point/ *begin- en eindpunt* ✓ turning points/ *draaipunte*	(7)
4.2	$x = 90°$ $x = 270°$	✓$x = 90°$ **A** ✓ $x = 270°$ **A**	(2)
4.3	$Per_g = 360°$	✓ Answer/*Antwoord* **A**	(1)
4.4	$0° < x < 90°$ $150° < x < 180°$ $270° < x < 330°$	✓$0° < x < 90°$ **A** ✓$150° < x < 180°$ ✓$120° < x < 330°$ **A**	(3)
			[13]

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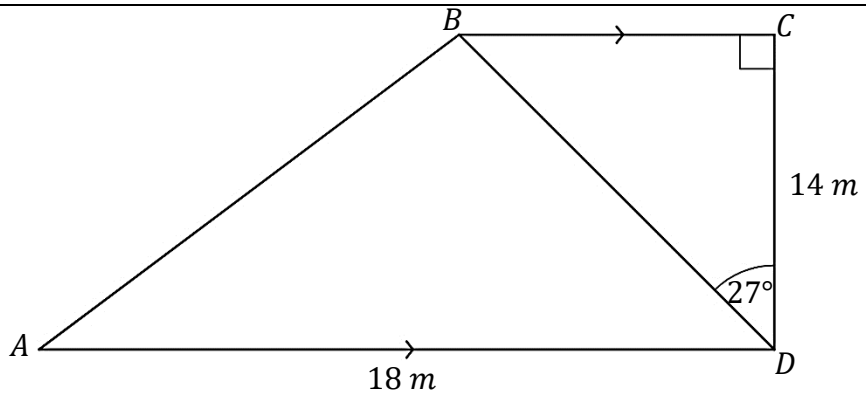
QUESTION/*VRAAG* 5



5.1	$\cos 27° = \frac{CD}{BD}$ $BD = \frac{14}{\cos 27°}$ $BD = 15,71m$ **OR** $\sin 27° = \frac{CD}{BD}$ $BD = \frac{14}{\sin 63°}$ $BD = 15,71m$	✓ $\cos 27° = \frac{CD}{BD}$ **A** ✓ BD **A** **OR/*OF*** ✓ $\sin 27° = \frac{CD}{BD}$ **A** ✓ BD **A**	(2)
5.2	$A\hat{D}B = 63°$ $\quad \hat{D} + \hat{C} = 180°$ $\quad co-\text{int}\angle s, BC \parallel AD$ $AB^2 = BD^2 + AD^2 - 2 \cdot BD \cdot AD \cdot \cos \hat{D}$ $AB^2 = 18^2 + (15.71)^2 - (2 \times 18 \times 15.71 \times \cos 63°$ $SG = \sqrt{314,0452}$ $SG = 17,72m$	✓**ST/RE** **A** ✓ **Cosine Rule/ *Kosinusreël*** **A** ✓**SF** **CA** ✓ **S** **CA** ✓**Answer/*Antwoord*** **CA**	(5)

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5.3	$P\hat{B}A + A\hat{B}D + D\hat{B}C = 180°$ $P\hat{B}A = 180° - (65° + 63°)$ $P\hat{B}A = 52°$ $Area\ \Delta ABP = \frac{1}{2} \times BA \times BP \times \sin P\hat{B}A$ $= \frac{1}{2} \times (17,72) \times \left(\frac{1}{3} \times 18\right) \times \sin 52°$ $= 41,89m^2$	✓ $P\hat{B}A = 52°$ **A** ✓**SF** **CA** ✓**Answer/*Antwoord*** **CA**	(3)
			[10]

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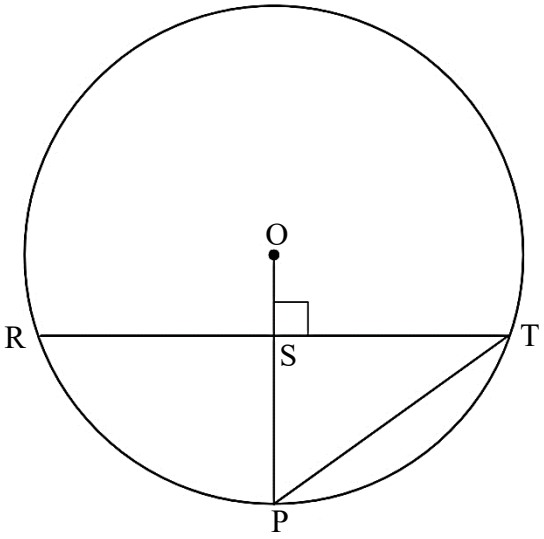
QUESTION/*VRAAG* 6

			
6.1(i)	Centre	✓ Answ/*Ant* **A**	(1)
6.1(ii)	Bisects	✓ Answ/*Ant* **A**	(1)
6.2.1	$RS = 12cm$ *line from cntr* bisects *the chrd* $OP^2 = OS^2 + RS^2$ *Pythagoras Thm* $OP = \sqrt{12^2 + 5^2}$ $OP = \sqrt{169}$ $OP = 13cm$ $SP = 13 - 5$ $= 8cm$	✓ **ST/RE** **A** ✓ **ST/RE** **A** ✓ OP **CA** ✓SP **CA**	(4)
6.2.1	$PT^2 = SP^2 + ST^2$ *Pythagoras thm* $PT = \sqrt{8^2 + 12^2}$ $PT = 4\sqrt{13}$ $PT = 14,42cm$	✓ **ST/RE** **A** ✓ **S** **CA** ✓**PT** **CA**	(3)
			[9]

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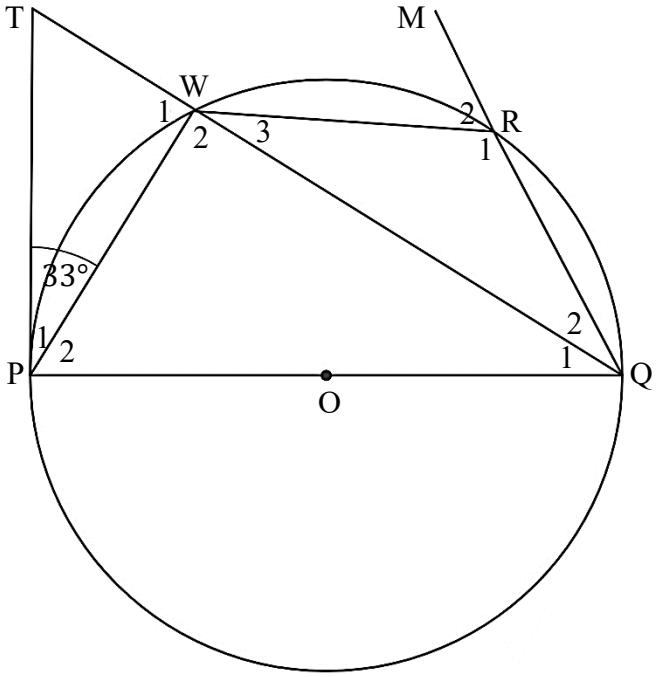
QUESTION/*VRAAG* 7



7.1(i)	Exterior/*Buite*	✓ **Answ/*Ant*** **A**	(1)
7.1(ii)	Interior/*Binne*	✓ **Answ/*Ant*** **A**	(1)
7.2	Tan ⊥ Rad	✓ **RE** **A**	
7.3.1	$\hat{Q}_1 = 33°$ Tan *Chord / Koord*	✓**ST** ✓ **RE** **A**	(2)
7.3.2	$\hat{P}_2 = 90° - 33°$ Tan ⊥Rad $= 57°$ $\hat{R}_2 = \hat{P}_2$ *ext ∠ cyclic quad / koordevierhoek* $= 57°$	✓**ST** **A** ✓ **ST** **CA**	(2)
7.3.3	$\hat{T} + \hat{P} + \hat{Q}_1 = 180°$ *sum ∠s in Δ* $\hat{T} = 180° - (90° + 33)$ $\hat{T} = 57°$	✓ **ST/RE** **A** ✓ $\hat{T}$ **CA**	(2)

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7.3.4	$\hat{R}_2 = \hat{Q}_2 + \hat{W}_3$ *ext* $\angle$ *of* Δ $\hat{Q}_2 = \hat{W}_3$ $\angle s$ *opp* = *sides* $\hat{Q}_2 = \frac{57°}{2}$ $\hat{Q}_2 = 28,5°$	✓**ST** **A** ✓ **RE** **A** ✓ **ST** **A**	(3)
7.4	*in* ΔTQP $\hat{Q} = 33°$ $P = 90°$ Tan $\perp$ Rad $T = 57°$ 3*rd* $\angle$ *in* ΔPQW $\hat{Q} = 33°$ $W = 90°$ $\angle$ *in semi – circle / sirkel* $P = 57°$ 3*rd* $\angle$ $\therefore \Delta TQP \,|||\, \Delta PQW$ *AAA*	✓ **ST/ RE** **A** ✓ **ST** **A** ✓ **RE** **A** ✓ **RE** **A**	(4)
			[16]

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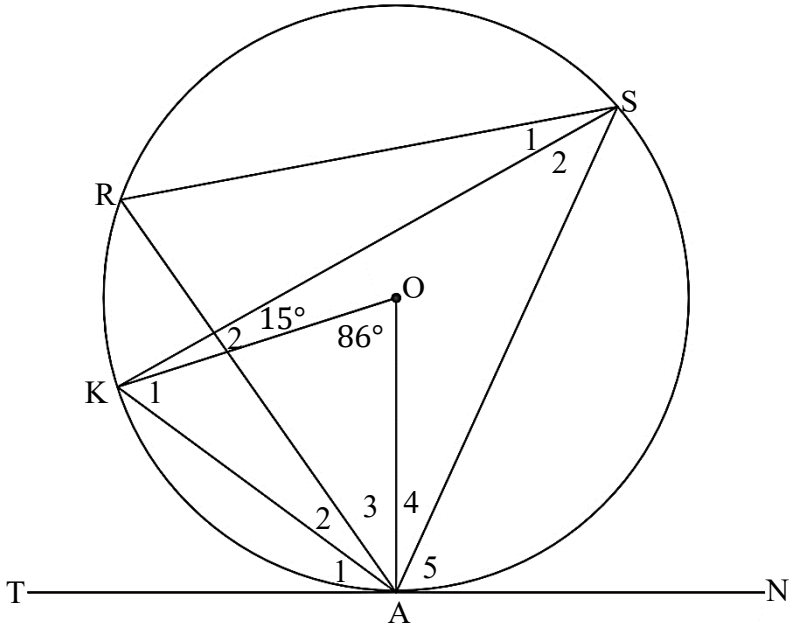
QUESTION/*VRAAG* 8

			
8.1	$\hat{O} = 2 \times \hat{S}_2$ $\angle$ *at centre / bymiddelpunt* $= 2 \times \angle$ *at circum*f/by oppervlakte $\hat{S}_2 = \frac{86^\circ}{2} = 43^\circ$ $\hat{A}_1 = \hat{S}_2$ Tan *Chord thm / Koord* $= 43^\circ$	✓**ST** ✓**RE** **A** ✓ **RE** **A** ✓ $\hat{A}_1$ **CA**	(4)
8.2.	$\hat{K}_1 = \hat{A}_{2+3}$ $\angle s$ opp = sides $\hat{K}_1 = \frac{180^\circ - 86^\circ}{2}$ *sum of* $\angle s$ Δ / *som van* $\angle s$ Δ $\hat{K}_1 = 47^\circ$	✓ **RE** **A** ✓**ST** **A**	(2)
8.3	$\hat{R} = \hat{K}_1 + \hat{K}_2$ $\angle$ *in – semi seg / inhalf – seg* $R = 47^\circ + 15^\circ$ $\hat{R} = 62^\circ$	✓**ST** ✓**RE** **A** ✓**ST** **CA**	(3)

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8.4	$\hat{R} = \hat{A}_5$ Tan *Chord / Koord* $\hat{A}_4 = 90° - 62°$ Tan $\perp$ Rad $= 28°$	✓**ST** **A** ✓ **RE** **A** ✓**ST** **CA**	(3)
8.5	*in* ΔAMO $A\hat{M}O = 90°$ *line from centre / lynvanoppervlak* $\perp$ *to chord / nakoord* $\hat{A}_3 = 90° - 86°$ *sum of* $\angle s$ *in* Δ */ som van* $\angle s$ *in* Δ $= 4°$	✓**ST**✓ **RE** **A** ✓**ST** **CA**	(3)
			[15]

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QUESTION/*VRAAG* 9

9.1.1	$\frac{30}{60}=0,5rps$		✓ **Answer/*Antwoord*** **A**	(1)
9.1.2	$\omega=2\pi n$ $=2\times\pi\times0,5$ $=\pi rad/s$ $\approx3,14rad/s$	$\omega=2\pi n$ $=2\times\pi\times30$ $=60\pi rad/\min$ $\approx188,50rad/\min$	✓***F*** **A** ✓ ***SF*** **CA** ✓***Answer/Antwoord*** **CA**	(3)
9.1.3	$v=\pi Dn$ $v=\pi\times\left(\frac{27\times2}{100}\right)\times0,5$ $v=\frac{27\pi}{100}\text{ m}/s$ $v\approx0,85\text{ m}/s$		✓**F** **A** ✓ **SF** **CA** ✓ **Conversion/*Herleiding*** **A** ✓ **Answer/*Antwoord*** **CA** ***NPR, NPU***	(4)
9.2.1	$s=r\theta$ $s=\left(\frac{28}{2}\right)\times\left(135°\times\frac{\pi}{180°}\right)$ $s=\frac{21}{2}\pi$ $s=32,99\text{cm}$		✓ **F** **A** ✓ **SF** **A** ✓ s **CA** ***NPR, NPU***	(3)

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9.2.2	$Area\ of\ \text{sector} = \frac{1}{2}r^2\theta$ $= \frac{1}{2}\times\left(\frac{28}{2}\right)^2\times\left(\frac{3\pi}{4}\right)$ $= \frac{147}{2}\pi$ $= 230,91\text{m}^2$ **OR/*OF*** $Area\ of\ \text{sector/}Oppervlakte\ van\ sektor = \frac{rs}{2}$ $= \frac{\left(\frac{28}{2}\right)\times\frac{3\pi}{4}}{2}$ $= \frac{147}{2}\pi$ $= 230,91\text{m}^2$	✓**F** **A** ✓ **SF** **CA** ✓ ***θ*** **A** ✓ *Area* **CA** ***NPU, NPR*** **AO ONE Mark/** ***EEN Punt*** **OR/*OF*** ✓**F** **A** ✓ **SF** **CA** ✓ ***radius*** **CA** ✓ *Area/oppervlakte* **CA** ***NPU, NPR*** **AO ONE Mark/** ***EEN Punt***	(4)
9.3	$4h^2 - 4dh + x^2 = 0$ $4h^2 - 4(2\times 30)h + \left(\frac{200}{10}\right)^2 = 0$ $4h^2 - 240h + 400 = 0$ $h = \frac{-b \pm \sqrt{b^2 - 4ac}}{4a}$ $h = \frac{-(-240) \pm \sqrt{(-240)^2 - (4\times 4\times 400)}}{2\times 4}$ $h = 58,28 \quad or\ /\ of \quad h = 1,72$ $\therefore\ h = 1,72$	✓**F** **A** ✓ $\frac{200}{10}$ **A** ✓ **SF** **A** ✓ **Stnd form/** **Stnd vorm** **CA** ✓**S** **CA** ✓ $h = 1,72$ **CA** ***NPR, NPU***	(6)
			[21]

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QUESTION/*VRAAG* 10			
10.1	$A_T = a\left(\frac{o_1+o_8}{2}+o_2+o_3+o_4+o_5+o_6+o_7\right)$ $=\frac{320}{8}\left(\frac{140+155}{2}+147+150+138+166+170+160\right)$ $=40(1078,5)$ $=43140\ \text{m}^2$	✓**F** **A** ✓ **SF** **A** ✓ $a=\frac{320}{8}$ **A** ✓**S** **CA** ✓ **Area** **CA**	(5)
	OR/*OF* $A_T = a\left(m_1+m_2+m_3+m_4+.....+m_n\right)$ $=\frac{320}{8}\left(\frac{140+147}{2}+\frac{147+150}{2}+\frac{150+138}{2}+\frac{138+166}{2}+\frac{166+170}{2}+\frac{170+160}{2}+\frac{160+155}{2}\right)$ $=40(1078,5)$ $=43140\text{m}^2$	✓**F** **A** ✓ **SF** **A** ✓ $a=\frac{320}{8}$ **A** ✓**S** **CA** ✓ **Area/*Oppervlakte*** **CA**	(5)
10.2.1	$V = lbh$ $V = 0,35\times0,2\times0,6$ $V = 0,042m^3$ $V = 0,042\times1000$ $V = 42l$	✓ **SF** **CA** ✓ **Conversion/ *Herleiding*** **CA** ✓ **Volume** CA	(3)

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10.2.2	$A_T = 2(lb + lh + bh)$ $= 2((0,35 \times 0,2) + (0,35 \times 0,6) + (0,2 \times 0,6))$ $= 0,8m^2$ $\text{Cost of material for } 1 \text{ bin} = R15,80 \times 0,8$ $= R120,64$ $\text{Cost of material for } 15 \text{ bins} = R120,64 \times 15$ $= R1809,60$	✓**F** **A** ✓ **SF** **CA** ✓ ***Area/Oppervlakte*** **CA** ✓ **Cost/*Koste*** **CA**	(4)
			[12]
		TOTAL/*TOTAAL*:	**150**

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