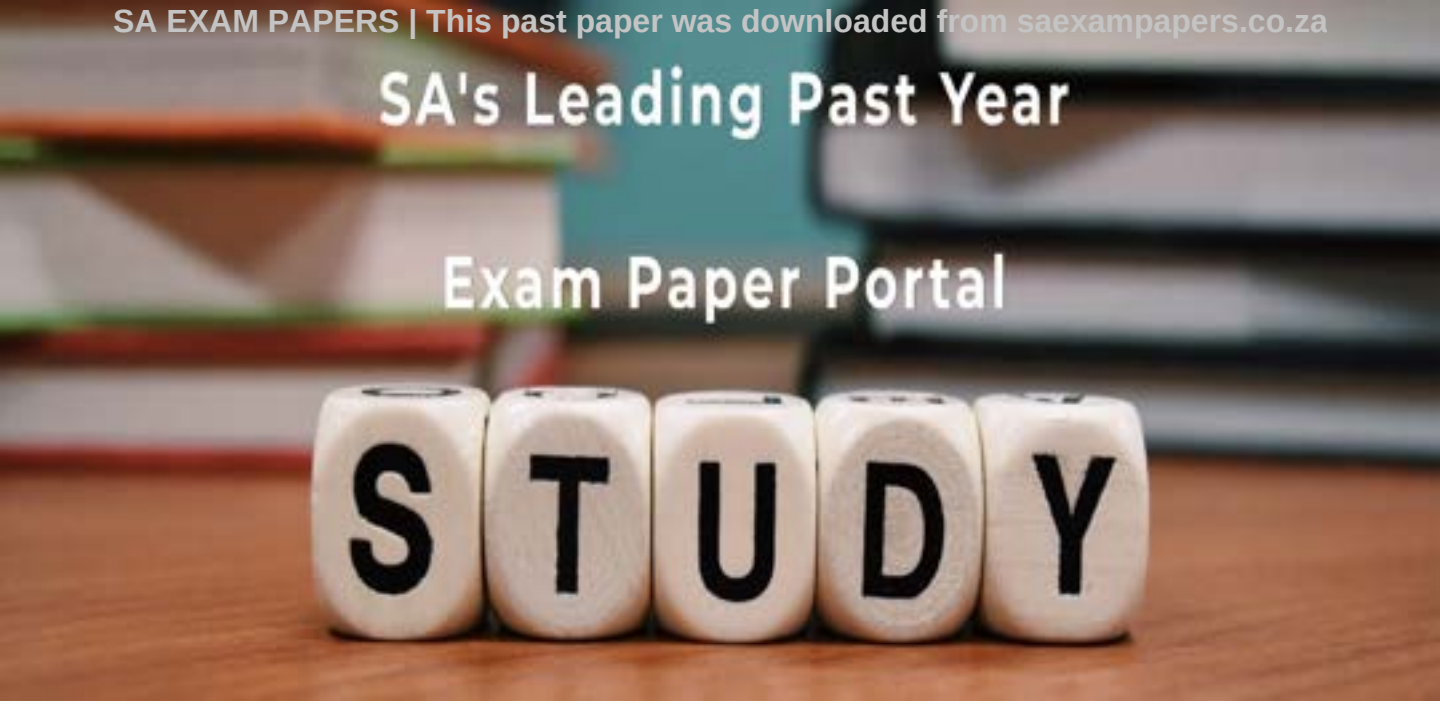


Province of the
EASTERN CAPE
EDUCATION

Iphondo leMpuma Kapa: Isebe leMfundo
Provinsie van die Oos Kaap: Department van Onderwys
Porafensie Ya Kapa Botjahabela: Lefapha la Thuto

NATIONAL SENIOR CERTIFICATE/ *NASIONALE SENIOR SERTIFIKAAT*

GRADE/*GRAAD* 12

JUNE/*JUNIE* 2025

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

MARKS/*PUNTE*: 150

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

NOTE:

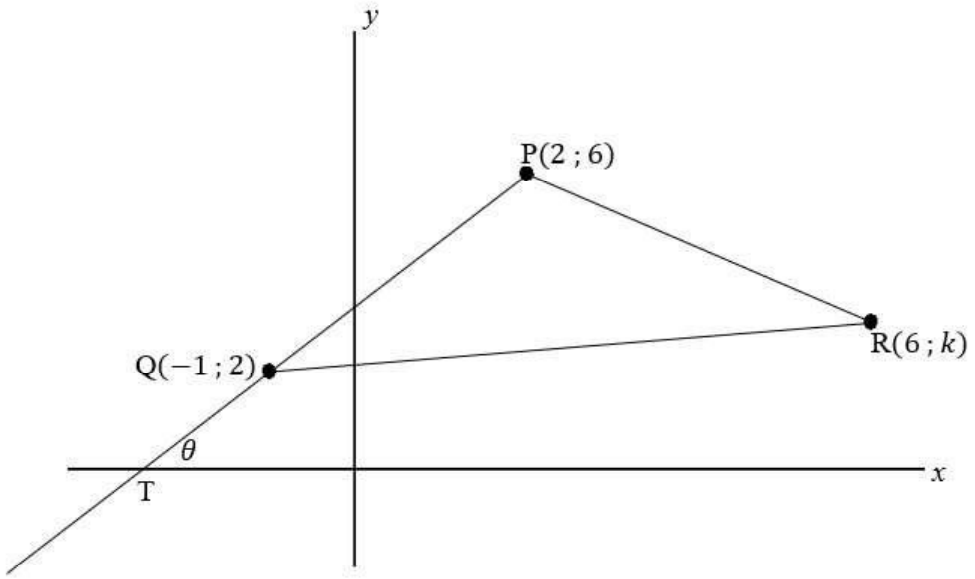
- Continuous accuracy (CA) applies only where indicated in this marking guideline.
- Assuming values/answers in order to solve a problem is unacceptable.

LET WEL:

- *Volgehoue akkuraatheid (CA) is slegs van toepassing soos 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***

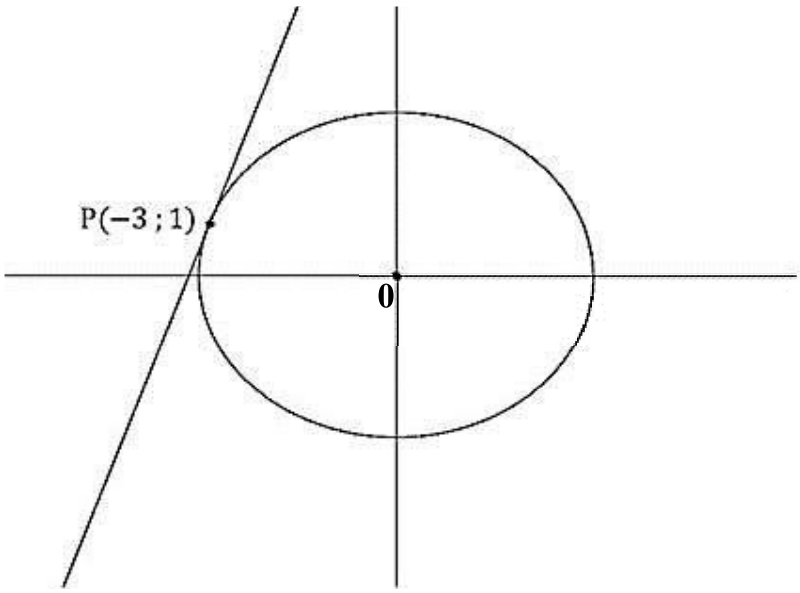
QUESTION/*VRAAG* 1

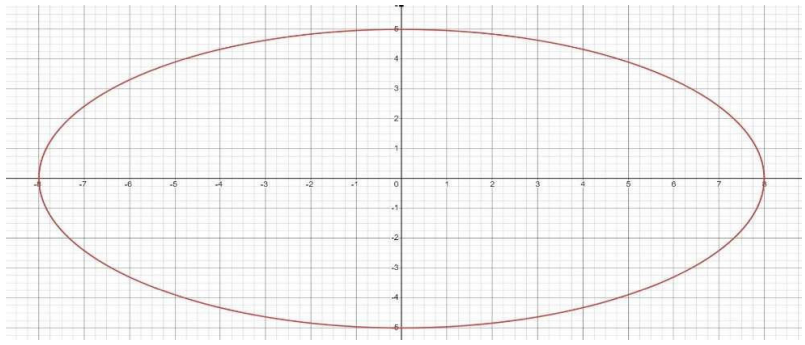


1.1	- 1	✓ answ/*antw* **A** (1)
1.2	$m_{PQ} \times m_{PR} = -1$ $\frac{6-2}{2-(-1)} \times \frac{6-k}{2-6} = -1$ $\frac{4}{3} \times \frac{6-k}{-4} = -1$ $\frac{24-4k}{-12} = -1$ $24 - 4k = 12$ $-4k = -12$ $k = 3$	✓ Subst./*vervang* **A** ✓ **S** **CA** ✓ **S** **CA** ✓ answ/*antw* **CA** (4)
1.3	$M_{QR} = M_{PS}$ $\left(\frac{-1+6}{2}; \frac{2+3}{2}\right) = \left(\frac{2+x_s}{2}; \frac{6+y_s}{2}\right)$ $\left(\frac{5}{2}; \frac{5}{2}\right) = \left(\frac{2+x_s}{2}; \frac{6+y_s}{2}\right)$ $\therefore \frac{2+x_s}{2} = \frac{5}{2}$ and/*en* $\frac{6+y_s}{2} = \frac{5}{2}$ $\therefore 2 + x_s = 5$ and/*en* $6 + y_s = 5$ $\therefore x_s = 3$ and/*en* $y_s = -1$ $\therefore S(3; -1)$	✓✓Subst./*vervang* **A** ✓ x_s **CA** ✓ y_s **CA** (4)
1.4	$m_{PQ} = m_{PT} = \frac{4}{3}$ $\tan\theta = \frac{4}{3}$ $\therefore \theta = 53{,}13°$	✓ Gradient/*Gradiënt* **CA** ✓ Subst./*vervang* **CA** ✓ answ/*antw* **CA** (3)

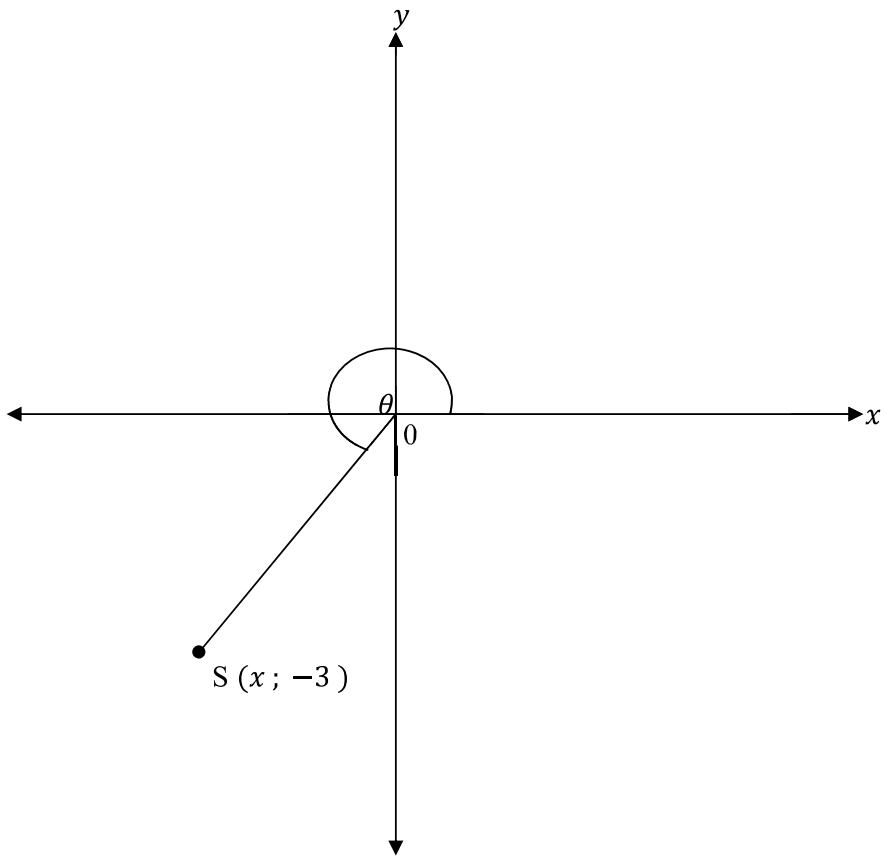
1.5	$m_{PT} = \frac{4}{3}$ $y = mx + c$ $y = \frac{4}{3}x + c$ $(6\,;3): 3 = \frac{4}{3}(6) + c$ $3 = 8 + c$ $-5 = c$ $\therefore y = \frac{4}{3}x - 5$	$m_{PT} = \frac{4}{3}$ $y - y_1 = m(x - x_1)$ $y - 3 = \frac{4}{3}(x - 6)$ $-3 = \frac{-2}{3}(-2) + c$ $y + 3 = \frac{-2}{3}(x + 2)$ $\therefore y = \frac{4}{3}x - 5$	✓ Gradient/*Gradiënt* **CA** ✓ Subst./*vervang* pt**A** ✓ **S** **CA** ✓ Eqn/*Vgl* **CA** (4)
			[16]

QUESTION/*VRAAG* 2

2.1		
2.1.1	$r = \sqrt{10}$	✓ **A** (1)
2.1.2	$x.x_1 + y.y_1 = r^2$ $x(-3) + y(1) = 10$ $-3x + y = 10$ $y = 3x + 10$ **OR/*OF*** $m_{radius} = \frac{1}{-3}$ $\therefore m_{tangent} = 3$ $y - y_1 = m(x - x_1)$ $y - 1 = 3(x - (-3))$ $y - 1 = 3(x + 3)$ $y - 1 = 3x + 9$ $y = 3x + 10$ **OR/OF** $m_{radius} = \frac{1}{-3}$ $\therefore m_{tangent} = 3$ $y = mx + c$ $1 = 3(-3) + c$ $1 = -9 + c$ $10 = c$ $y = 3x + 10$	✓ **F** **A** ✓ **SF** **A** ✓ **S** **CA** ✓ equation/*verg* **CA** **OR/*OF*** ✓ grad radius **A** ✓ grad tan/*raakl* **CA** ✓ **SF** **A** ✓ equation/*vergl* **CA** **OR/*OF*** ✓ grad radius **A** ✓ grad tan/*raakl* **CA** ✓ **SF** **A** ✓ equation/*vergl* **CA** (4)
2.1.3	$y = \sqrt{10 - x^2}$	✓✓ answ/*antw* **A** (2)

2.2		✓ elliptical shape/ elliptiese *vorm* **A** ✓ *x*-intercepts/ *afsnitte* **A** ✓ *y*-intercepts/ *afsnitte* **A** (3)
		[10]

QUESTION/*VRAAG* 3

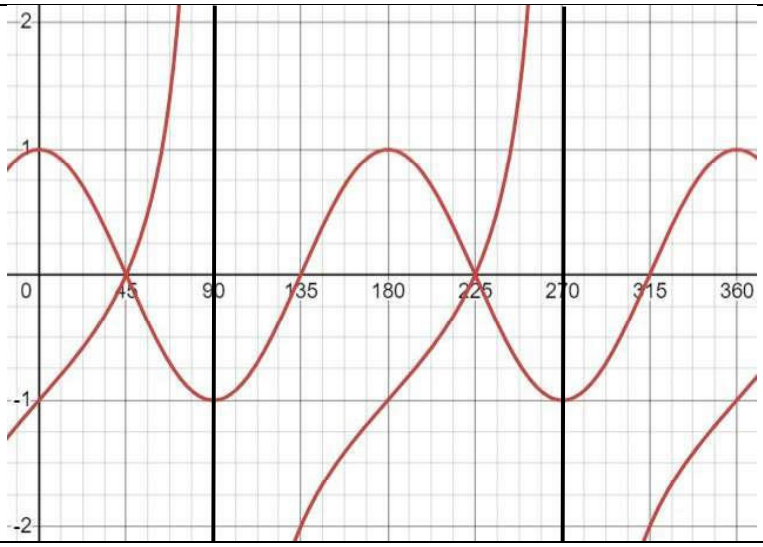
3.1		
3.1.1	$x^2 + y^2 = r^2$ $x^2 + (-3)^2 = (5)^2$ $x^2 + 9 = 25$ $x^2 = 16$ $x = \pm\sqrt{16}$ $\therefore x = -4$	✓ **SF** **A** ✓ **S** **CA** ✓ value of/*waarde van* *x* **CA** (3)
3.1.2	$\frac{-4}{5}$	✓ answ/*antw* **A** (1)

3.1.3	$\text{cosec}\,(180° - \theta) = \text{cosec}\,\theta$ $\therefore \text{cosec}\theta = \frac{5}{-3}$	✓ Reduction/*reduksie* **A** ✓ cosec ratio/*verh* **CA** (2)
3.2	$3sin2x = 1{,}465$ $sin2x = 0{,}4883\ldots$ Ref./*verw.* $<= sin^{-1}(0{,}4883\ldots)$ Ref./*verw.* $<= 29{,}23°$ $\therefore$ I: $2x = 29{,}23°$ $\therefore \quad x = 14{,}62°$ And/*en* $\therefore$ II: $2x = 180° - 29{,}23°$ $\therefore \quad 2x = 150{,}77°$ $\therefore \quad x = 75{,}38°$	✓ **S** **A** ✓ Ref/*Verw* ∠ **CA** ✓✓ values of *x*/ *waardes van x* **CA** (4)
		[10]

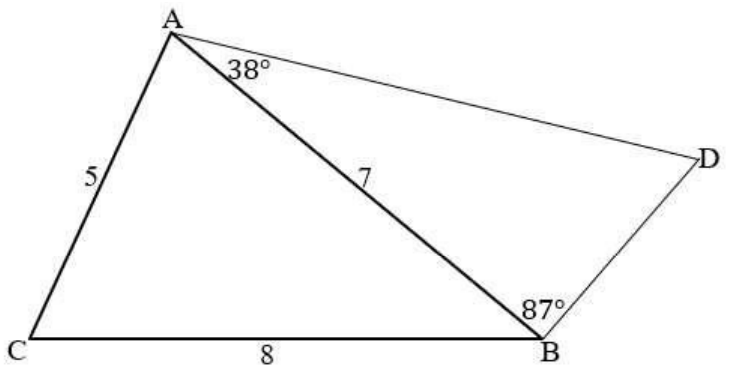
QUESTION/*VRAAG* 4

4.1	$\frac{\tan(180°-\theta).\cot(360°-\theta)-\sin^2(180°+\theta)}{\sec(180°-\theta)\cdot\sec\theta+\tan^2\theta}$ $= \frac{-\tan\theta.-\cot\theta-\sin^2\theta}{-\sec\theta.\sec\theta+\tan^2\theta}$ $= \frac{\tan\theta.\frac{1}{\tan\theta}-\sin^2\theta}{-\sec^2\theta+\tan^2\theta}$ $= \frac{1-\sin^2\theta}{\tan^2\theta-\sec^2\theta}$ $= \frac{\cos^2\theta}{-1}$ $= -\cos^2\theta$	✓ $-tan\theta$ **A** ✓ $-cot\theta$ **A** ✓ -1 **A** ✓ $-sin^2\theta$ **A** ✓ $-sec\theta$ **A** ✓ $\frac{1}{tan\theta}$ **A** ✓ $-cos^2\theta$ **CA** (7)
4.2	$\frac{\sin x}{-\text{cosec}\,x} + \frac{\cos^2(x).\tan x}{\tan(180°-x)} = -1$ $LHS = \frac{\sin x}{-\text{cosec}\,x} + \frac{\cos^2(x).\tan x}{\tan(180°-x)}$ $LHS = \frac{\sin x}{-\frac{1}{sinx}} + \frac{\cos^2(x).\tan x}{-\tan x}$ $LHS = \sin x \times \frac{-\sin x}{1} + \frac{\cos^2(x).\tan x}{-\tan x}$ $LHS = -\sin^2 x - \cos^2 x$ $LHS = -(\sin^2 x + \cos^2 x)$ $LHS = -(1)$ $LHS = -1 = RHS$	✓ $\frac{1}{sinx}$ **A** ✓ $-tanx$ **A** ✓ $-sin^2x - cos^2x$ **CA** ✓ common fact / *gemene fakt* **CA** ✓ I **A** ✓ -1 **CA** (6)
		[13]

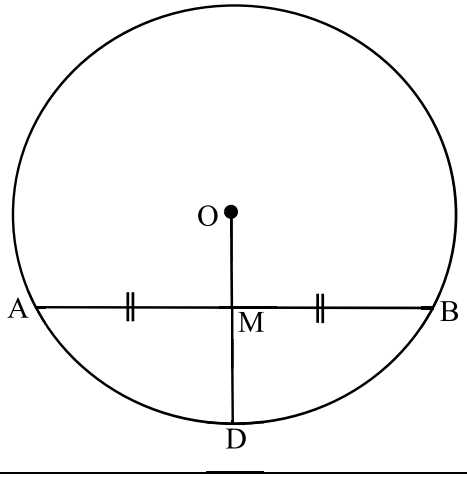
QUESTION/*VRAAG* 5

	$f(x) = \tan x - 1$ and/*en* $g(x) = \cos 2x$ for/*vir* $x \in [0°; 360°]$	
5.1		*f:* ✓ intercepts/*afsnitte* ✓ shape/*vorm* ✓ start and end point/ *begin- en eindpunt* ✓ Asymptotes/ *Asymptote g:* ✓ intercepts/*afsnitte* ✓ shape/*vorm* ✓ start and end point / *begin- en eindpunt* ✓ turning points / *draaipunte* (8)
5.2	$Per_g = 180°$	✓✓ answ/*antw* **A** (2)
5.3	$h(x) = \tan x - 1 + 3$ $h(x) = \tan x + 2$	✓✓ answ/*antw* **A** (2)
5.4.1	$45° \leq x < 90°$ $225° \leq x < 270°$	✓$45° \leq x < 90°$ **CA** ✓$225° \leq x < 270°$ **CA** (2)
5.4.2	$45° < x < 135°$ $225° < x < 315°$	✓$45° < x < 135°$ **CA** ✓$225° < x < 315°$ **CA** (2)
		[16]

QUESTION/*VRAAG* 6

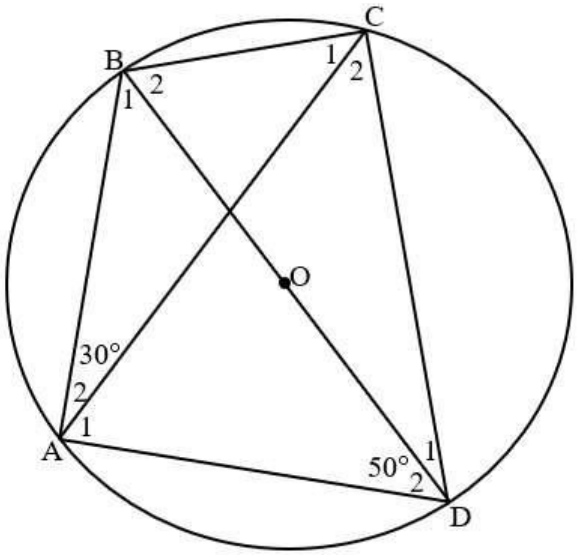
		
6.1	$AB^2 = AC^2 + CB^2 - 2(AC)(CB)\cos A\hat{C}B$	✓ **ST** **A** (1)
6.2	In ΔABD: $\frac{DB}{\sin \hat{A}} = \frac{AB}{\sin \hat{D}}$ $\hat{D} = 55°$ (Int. <'s of Δ / *binne <'e van* Δ) $\therefore \frac{DB}{\sin 38°} = \frac{7}{\sin 55°}$ $\therefore \text{DB} = \frac{7}{\sin 55°} \times \sin 38°$ $\therefore \text{DB} = 5{,}3$	✓ $\hat{D}$ **A** ✓ Subst./*vervang* **A** ✓ answ/*antw* **CA** (3)
6.3	$CB^2 = AC^2 + AB^2 - 2(AC)(AB)\cos C\hat{A}B$ $(8)^2 = (5)^2 + (7)^2 - 2(5)(7)\cos C\hat{A}B$ $\frac{1}{7} = \cos C\hat{A}B$ $\therefore C\hat{A}B = 81{,}79°$	✓ **F** **A** ✓ **SF** **A** ✓ answ/*antw* **CA** (3)
6.4	Area of ΔABC= $\frac{1}{2}(AC)(AB)\sin C\hat{A}B$ Area of ΔABC= $\frac{1}{2}(5)(7)\sin 81{,}79°$ Area of ΔABC= 17,49	✓ **F** **A** ✓ **SF** **A** ✓ answ/*antw* **CA** (3)
6.5	$\frac{1}{2}\text{AB} = 3{,}5$ $(\text{bisector})^2 = \text{AC}^2 + (\frac{1}{2}\text{AB})^2 - 2(\text{AC})\left(\frac{1}{2}\text{AB}\right)\cos \text{C}\hat{\text{A}}\text{B}$ $(\text{bisector})^2 = (5)^2 + (3{,}5)^2 - 2(5)(3{,}5)\cos 81{,}79$ bisector = 5,68	✓ **M** **A** ✓ **F** **A** ✓ **SF** **A** ✓ answ/*antw* **CA** (4)
		[14]

QUESTION/*VRAAG* 7



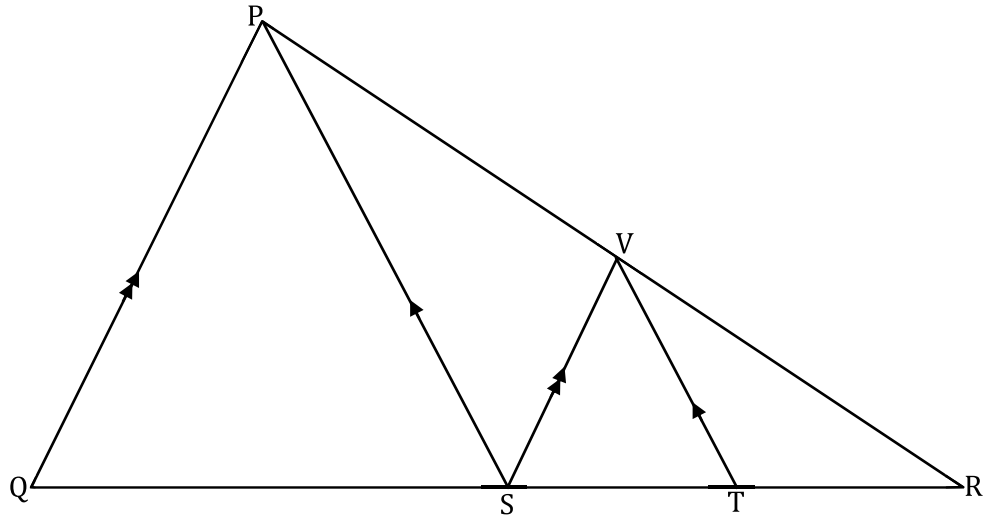
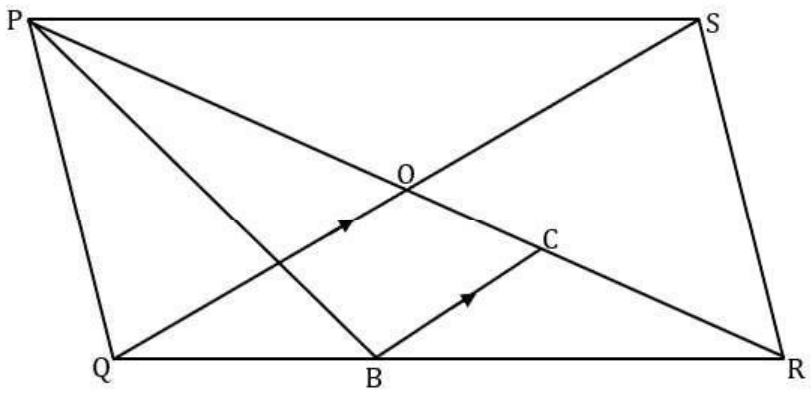
7.1	AM = MB = 12	✓ **ST**	**A** (1)
7.2	OD = $x + 8$	✓ **ST**	**A** (1)
7.3	Radii	✓ **ST**	**A** (1)
7.4	OM ⊥ AB (Line from centre to midpt of chord/*lyn van middelpt na middelpt van krd*) $OA^2 = OM^2 + AM^2$ $OA^2 = (x)^2 + (12)^2$ $OA^2 = x^2 + 144$ $OA = \sqrt{x^2 + 144}$	✓ **ST** ✓ **RE** ✓ Subst./*vervang* ✓ **S** ✓ answ/*antw*	**A** **A** **CA** **CA** (5)
7.5	$\sqrt{x^2 + 144} = x + 8$ $x^2 + 144 = (x + 8)^2$ $x^2 + 144 = x^2 + 16x + 64$ $80 = 16x$ $5 = x$	✓ **M** ✓ **S** ✓ **S** ✓ answ/*antw*	**A** **CA** **CA** **CA** (4)
7.6	OA = OB = OD = 5 + 8 = 13	✓✓ answ/*antw*	**CA** (2)
			[14]

QUESTION/*VRAAG* 8

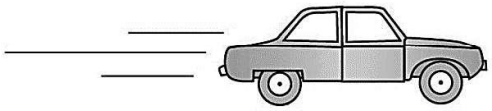
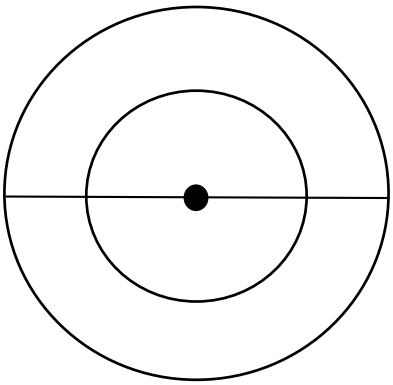


8.1	$\hat{D}_1 = 30°$ (<'s in same segment / *< 'e in dieselfde segment*)	✓ **ST**✓ **RE**	**A** (2)
8.2	$\hat{A}_1 = 60°$ (< in semi-circle / *< in semi-sirkel)*	✓ **ST**✓ **RE**	**A** (2)
8.3	$\hat{C}_1 = 50°$ (<'s in same segment / *< 'e in dieselfde segment*)	✓ **ST**✓ **RE**	**A** (2)
8.4	$\hat{C}_2 = 40°$ (< in semi-circle / *< in semi-sirkel)*	✓ **ST**✓ **RE**	**A** (2)
8.5	$\hat{B}_1 = 40°$ (<'s in same segment / *< 'e in dieselfde segment*)	✓ **ST**✓ **RE**	**A** (2)
8.6	$\hat{B}_2 = 60°$ (Int <'s of Δ / *binne < 'e van* Δ)	✓ **ST**✓ **RE**	**A** (2)
			[12]

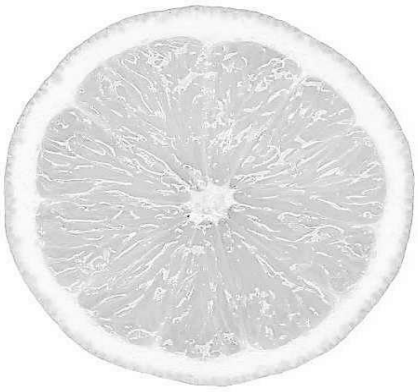
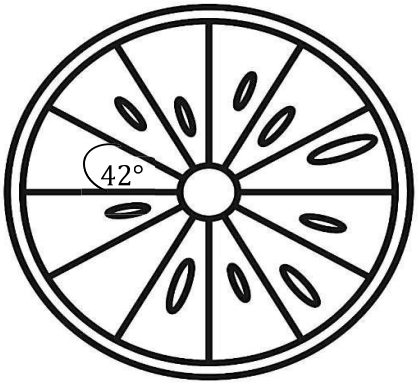
QUESTION/*VRAAG* 9

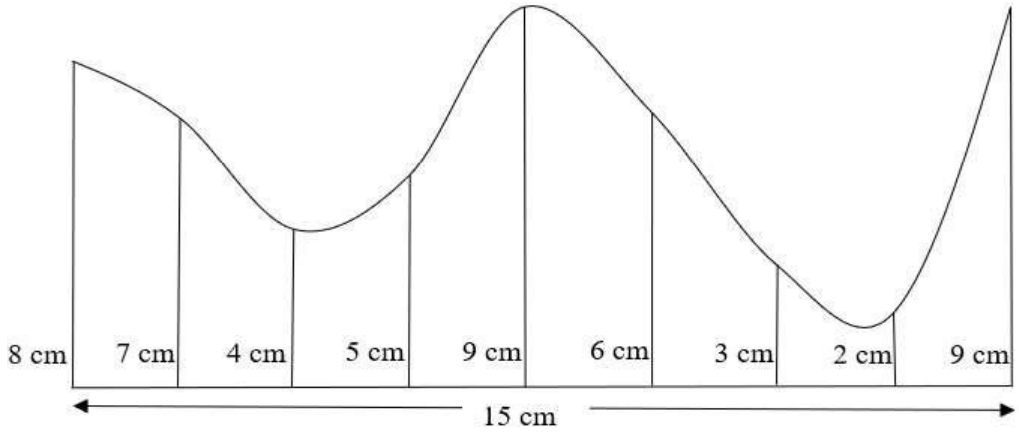
		
9.1.1	$\frac{TR}{ST} = \frac{VR}{PV}$ (line ‖ one side of Δ / *lyn* ‖ *een sy van* Δ) $\frac{TR}{12} = \frac{22}{24}$ $TR = 11$	✓ **ST** ✓ **RE** **A** ✓ Subst./*vervang* **CA** ✓ answ/*antw* **CA** (4)
9.1.2	$\frac{SR}{QR} = \frac{VR}{PR}$ (line ‖ one side of Δ / *lyn* ‖ *een sy van* Δ) $\frac{23}{QR} = \frac{22}{46}$ $TR = 48{,}1$	✓ **ST** ✓ **RE** **A** ✓ Subst./*vervang* **CA** ✓ answ/*antw* **CA** (4)
9.2		
	$\frac{OC}{OR} = \frac{2}{5}$ PO = OR (diag. of parm / *hoeklyne van parm*) $\frac{PO}{OC} = \frac{5}{2}$	✓ **ST** **A** ✓ **ST** ✓ **RE** **A** ✓ answ/*antw* **CA** (4)
		[12]

QUESTION/*VRAAG* 10

	 	
10.1	1 500 ÷ 60 = 25 rps	✓ answ / *antw* **A** (2)
10.2	$v = \pi Dn$ $v = \pi(55{,}9 \times 10)(25)$ $v = 13975\pi$ mm/s $v \approx 43903{,}76$ mm/s	✓**F** **A** ✓ conv / *herlei* **A** ✓ **SF** **CA** ✓ answ / *antw* **CA** (4)
10.3	$\omega = 2\pi n$ $\omega = 2\pi(25)$ $\omega = 50\pi$ rad/sec /*sek* $\omega \approx 157{,}08$ rad/h	✓**F** **A** ✓ **SF** **CA** ✓ answ / *antw* **CA** (3)
10.4	$\frac{1}{3} \times 55{,}9 = 18{,}63 \ldots$ $\therefore$ Diameter/*middellyn* $= 37{,}27$ cm **OR/OF** $\frac{2}{3} \times 55{,}9 = 37{,}2666 \ldots$ $\therefore$ Diameter/*middellyn* $= 37{,}27$ cm	✓✓**M** **A** ✓ answ / *antw* **CA** **OR / *OF*** ✓✓**M** **A** ✓ answ / *antw* **CA** (3)
10.5	$v = \pi Dn$ $v = \pi(37{,}27)(1500)$ $v = 55900\pi$ cm/min $v \approx 175615{,}03$ cm/min	✓**F** **A** ✓ **SF** **CA** ✓ answ / *antw* **CA** (3)
		[15]

QUESTION/*VRAAG* 11

11.1	 	
11.1.1	$s = r\theta$ $s = \left(\frac{8}{2}\right)\left(42° \times \frac{\pi}{180°}\right)$ $\therefore CD = \frac{14}{15}\pi \approx 2{,}93$ cm	✓**F** **A** ✓ conv/*herlei* **A** ✓ **SF** **CA** ✓ answ/*antw* **CA** (4)
11.1.2	Area $= \frac{rs}{2}$ Area $= \frac{(4)(\frac{14}{15}\pi)}{2}$ Area $= \frac{28}{15}\pi \approx 5{,}86$ cm^2 **OR / OF** Area $= \frac{r^2\theta}{2}$ Area $= \frac{(4)^2\left(42° \times \frac{\pi}{180°}\right)}{2}$ Area $= \frac{28}{15}\pi \approx 5{,}86$ cm^2	✓**F** **A** ✓ **SF** **CA** ✓ answ/*antw* **CA** **OR / *OF*** ✓**F** **A** ✓ **SF** **CA** ✓ answ/*antw* **CA** (3)
11.1.3	Total Area/*Totale oppervlakte* $= 5{,}86 \times 12 = 70{,}32$ cm^2	✓✓ answ/*antw* **CA** (2)

11.2	 	
	$4h^2 - 4\text{dh} + x^2 = 0$ $4h^2 - 4(10)h + (7)^2 = 0$ $4h^2 - 40h + 49 = 0$ $h = \frac{-\text{b} \pm \sqrt{b^2-4ac}}{2a}$ $h = \frac{-(-40) \pm \sqrt{(-40)^2-4(4)(49)}}{2(4)}$ $\therefore h = 8{,}57$ cm or / of $h = 1{,}43$cm $\therefore h = 8{,}57$ cm	✓**F** **A** ✓ **SF** **CA** ✓ **S** **CA** ✓ **SF** **CA** ✓ answ / *antw* **CA** (5)
11.3		
	$A_T = a\left(\frac{o_1+o_n}{2} + o_2 + o_3 + o_4 + \ldots + o_{n-1}\right)$ $A_T = \left(\frac{15}{8}\right)\left(\frac{8+9}{2} + 7 + 4 + 5 + 9 + 6 + 3 + 2\right)$ $A_T = 83{,}44$ **OR/*OF*** $A_T = a(m_1 + m_2 + m_3 + \ldots + m_{n-1})$ $A_T = \left(\frac{15}{8}\right)(7{,}5 + 5{,}5 + 4{,}5 + 7 + 7{,}5 + 4{,}5 + 2{,}5 + 5{,}5)$ $A_T = 83{,}44$	✓**F** **A** ✓ **SF** **CA** ✓ a-value / *waarde* **CA** ✓ answ / *antw* **CA** **OR/*OF*** ✓**F** **A** ✓ **SF** **CA** ✓ a-value / *waarde* **CA** ✓ answ / *antw* **CA** (4)
		[18]
		TOTAL/*TOTAAL*: 150