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**NATIONAL
SENIOR CERTIFICATE/
NASIONALE
SENIOR SERTIFIKAAT**

GRADE/*GRAAD* 12

JUNE/*JUNIE* 2025

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

MARKS/*PUNTE*: 150

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



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2 TECHNICAL MATHEMATICS P2/TEGNIJSE WISKUNDE V2 (EC/JUNE/JUNIE 2025)**NOTE:**

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

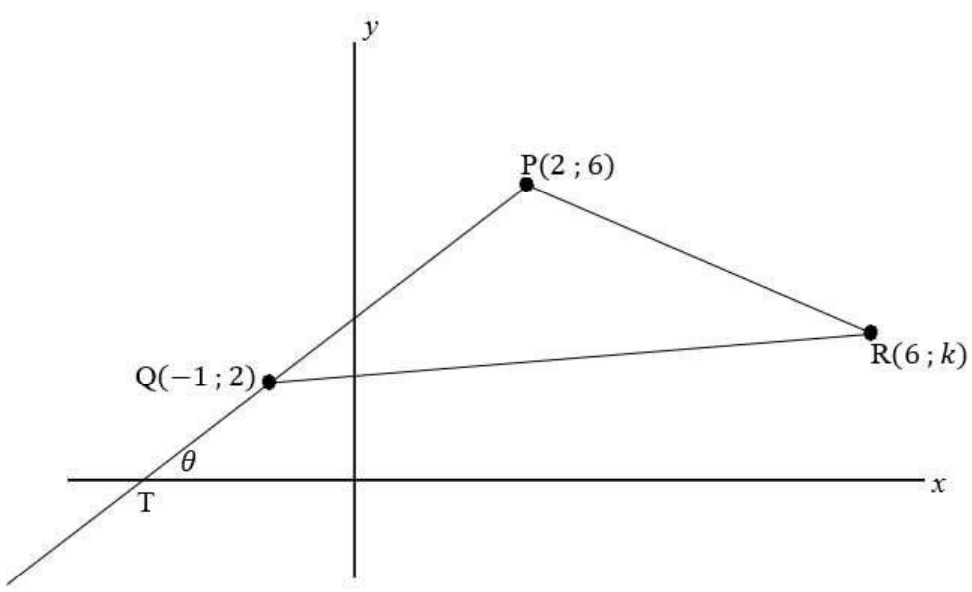
LET WEL:

- *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 penaliserings 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	$m_{PQ} = m_{PT} = \frac{4}{3}$ $\tan \theta = \frac{4}{3}$ $\therefore \theta = 53,13^\circ$	✓ Gradient/Gradiënt CA ✓ Subst./vervang CA ✓ answ/antw CA (3)

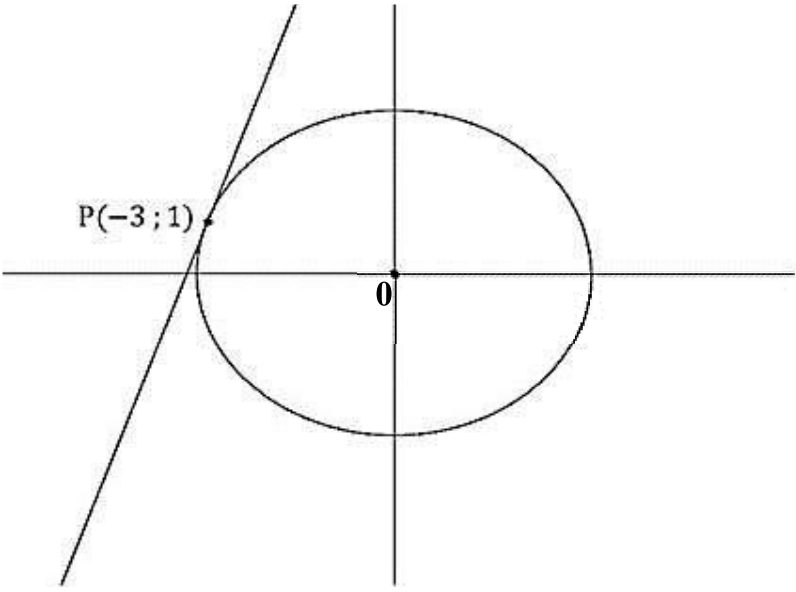


4 TECHNICAL MATHEMATICS P2/TEGNIJSE WISKUNDE V2**(EC/JUNE/JUNIE 2025)**

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/ <i>Gradiënt</i> CA ✓ Subst./ <i>vervang</i> ptA ✓ S CA ✓ Eqn/ <i>Vgl</i> CA (4)
			[16]

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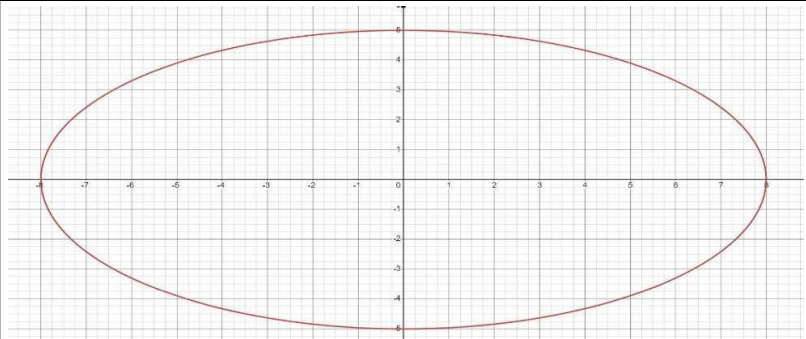
QUESTION/VRAAG 2

2.1		
2.1.1	$r = \sqrt{10}$	✓ A (1)
2.1.2	$x \cdot x_1 + y \cdot y_1 = r^2$ $x(-3) + y(1) = 10$ $-3x + y = 10$ $y = 3x + 10$ 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/vergl 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)

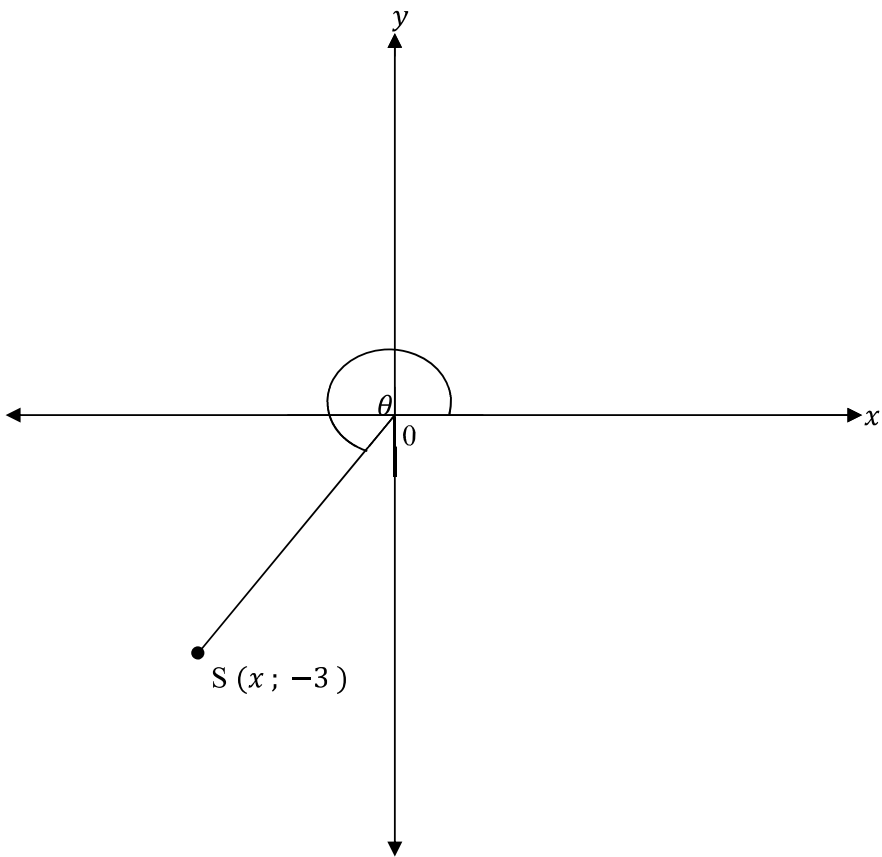


6 TECHNICAL MATHEMATICS P2/TEGNIJSE WISKUNDE V2

(EC/JUNE/JUNIE 2025)

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)

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

QUESTION/VRAAG 4

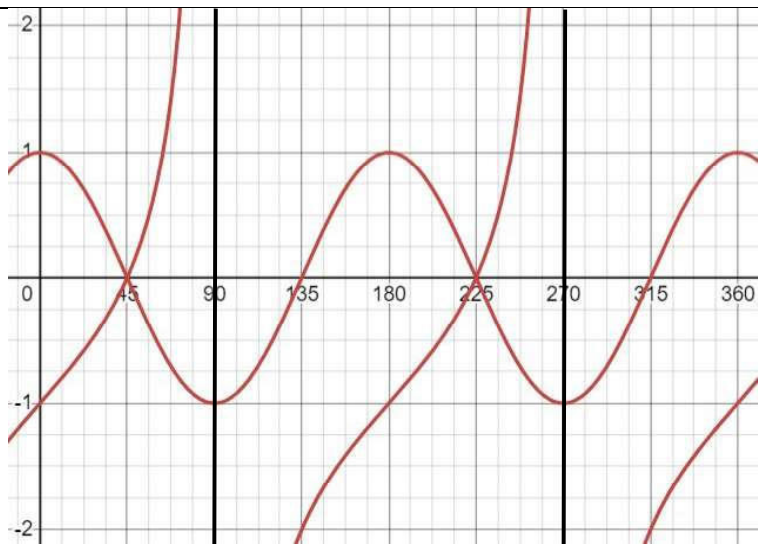
4.1	$\frac{\tan(180^\circ - \theta) \cdot \cot(360^\circ - \theta) - \sin^2(180^\circ + \theta)}{\sec(180^\circ - \theta) \cdot \sec \theta + \tan^2 \theta}$ $= \frac{-\tan \theta \cdot -\cot \theta - \sin^2 \theta}{-\sec \theta \cdot \sec \theta + \tan^2 \theta}$ $= \frac{\tan \theta \cdot \frac{1}{\tan \theta} - \sin^2 \theta}{-\sec^2 \theta + \tan^2 \theta}$ $= \frac{1 - \sin^2 \theta}{\tan^2 \theta - \sec^2 \theta}$ $= \frac{\cos^2 \theta}{-1}$ $= -\cos^2 \theta$	✓ $-\tan \theta$ 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	$\frac{\sin x}{-\operatorname{cosec} x} + \frac{\cos^2(x) \cdot \tan x}{\tan(180^\circ - x)} = -1$ $LHS = \frac{\sin x}{-\operatorname{cosec} x} + \frac{\cos^2(x) \cdot \tan x}{\tan(180^\circ - x)}$ $LHS = \frac{\sin x}{-\frac{1}{\sin x}} + \frac{\cos^2(x) \cdot \tan x}{-\tan x}$ $LHS = \sin x \times \frac{-\sin x}{1} + \frac{\cos^2(x) \cdot \tan x}{-\tan x}$ $LHS = -\sin^2 x - \cos^2 x$ $LHS = -(\sin^2 x + \cos^2 x)$ $LHS = -(1)$ $LHS = -1 = RHS$	✓ $\frac{1}{\sin x}$ A ✓ $-\tan x$ A ✓ $-\sin^2 x - \cos^2 x$ CA ✓ common fact / gemene fakt CA ✓ 1 A ✓ -1 CA (6)
		[13]



8 TECHNICAL MATHEMATICS P2/TEGNIJSE WISKUNDE V2

(EC/JUNE/JUNIE 2025)

QUESTION/VRAAG 5

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

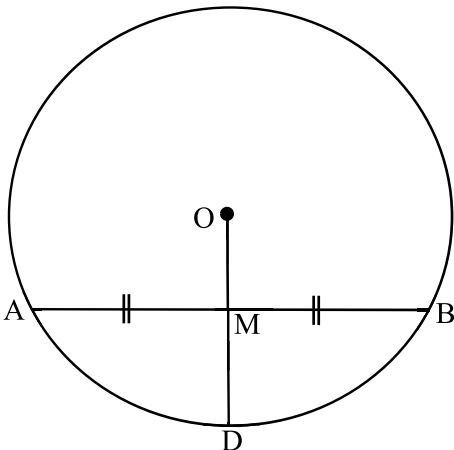
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QUESTION/VRAAG 6

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



10 TECHNICAL MATHEMATICS P2/TEGNIJSE WISKUNDE V2 (EC/JUNE/JUNIE 2025)**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	$OM \perp AB$ (Line from centre to midpt of chord/ <i>lyn van middelpnt na middelpnt van krd</i>) $OA^2 = OM^2 + AM^2$ $OA^2 = (x)^2 + (12)^2$ $OA^2 = x^2 + 144$ $OA = \sqrt{x^2 + 144}$	✓ ST ✓ RE ✓ Subst./vervang ✓ S ✓ answ/antw	A 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	$\hat{D}_1 = 30^\circ$ ($\angle$'s in same segment / $\angle$ 'e in dieselfde segment)	✓ ST ✓ RE	A (2)
8.2	$\hat{A}_1 = 60^\circ$ ($\angle$ in semi-circle / $\angle$ in semi-sirkel)	✓ ST ✓ RE	A (2)
8.3	$\hat{C}_1 = 50^\circ$ ($\angle$'s in same segment / $\angle$ 'e in dieselfde segment)	✓ ST ✓ RE	A (2)
8.4	$\hat{C}_2 = 40^\circ$ ($\angle$ in semi-circle / $\angle$ in semi-sirkel)	✓ ST ✓ RE	A (2)
8.5	$\hat{B}_1 = 40^\circ$ ($\angle$'s in same segment / $\angle$ 'e in dieselfde segment)	✓ ST ✓ RE	A (2)
8.6	$\hat{B}_2 = 60^\circ$ (Int $\angle$'s of Δ / binne $\angle$ 'e van Δ)	✓ ST ✓ RE	A (2)
			[12]

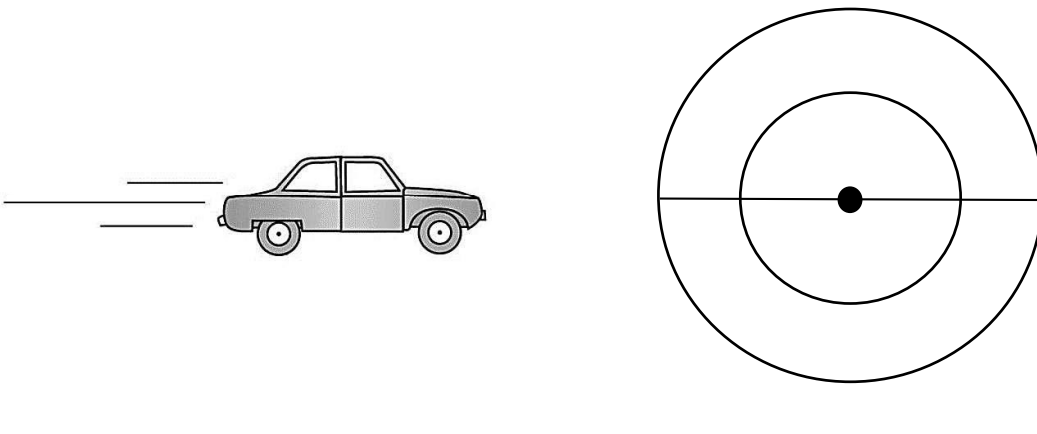


QUESTION/VRAAG 9

9.1.1	$\frac{TR}{ST} = \frac{VR}{PV}$ (line $\parallel$ one side of Δ / lyn $\parallel$ 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 $\parallel$ one side of Δ / lyn $\parallel$ 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]

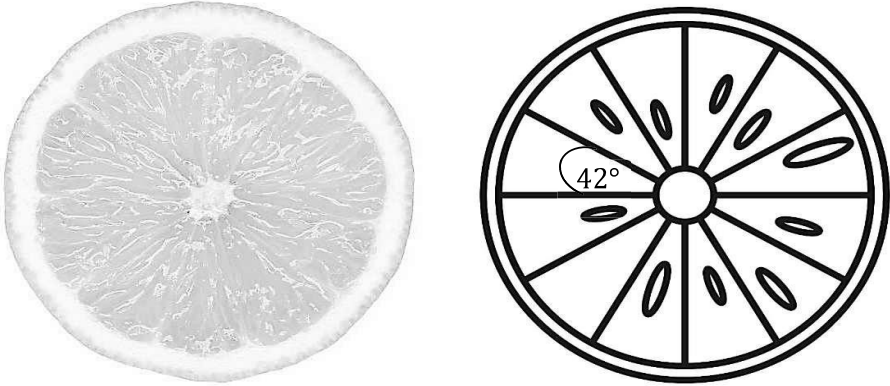


QUESTION/VRAAG 10

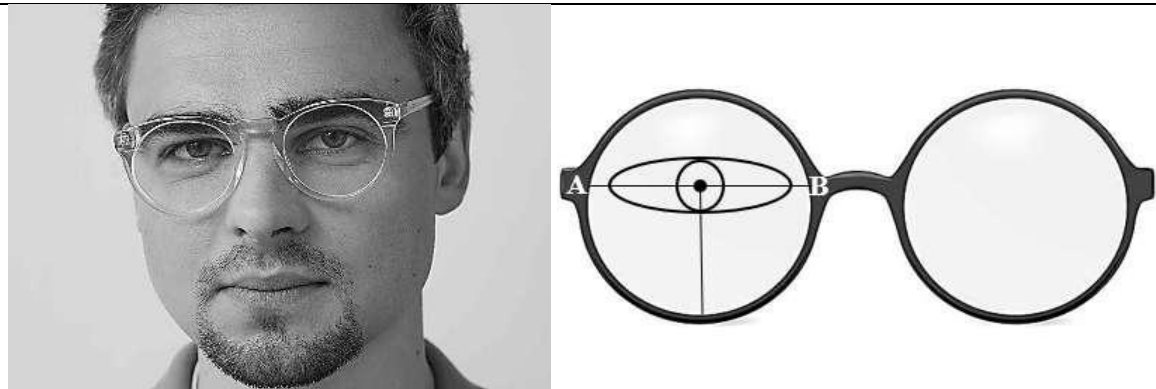
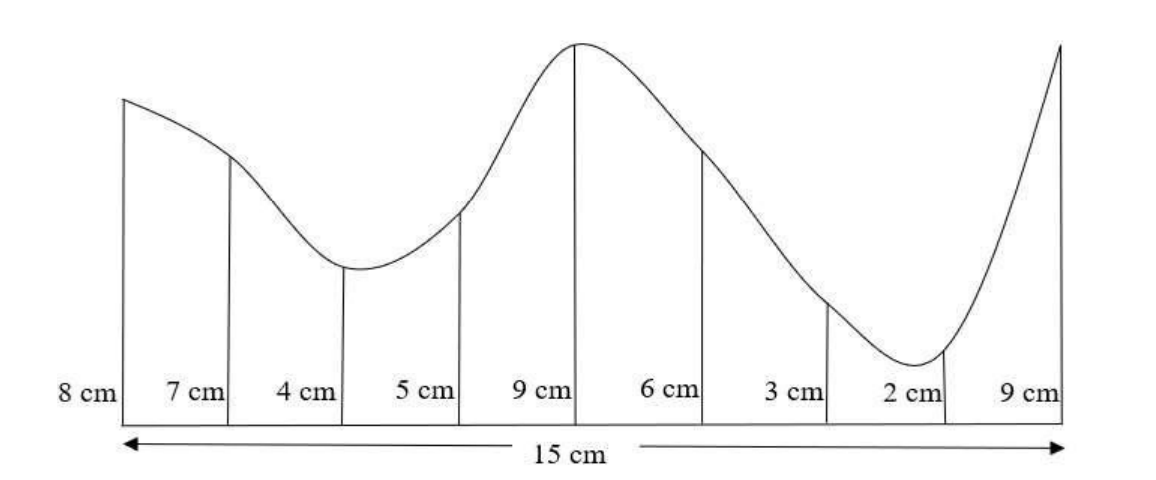
		
10.1	$1\,500 \div 60 = 25 \text{ rps}$	✓ answ / antw A (2)
10.2	$v = \pi Dn$ $v = \pi(55,9 \times 10)(25)$ $v = 13975\pi \text{ mm/s}$ $v \approx 43903,76 \text{ mm/s}$	✓F A ✓ conv / herlei A ✓ SF CA ✓ answ / antw CA (4)
10.3	$\omega = 2\pi n$ $\omega = 2\pi(25)$ $\omega = 50\pi \text{ rad/sec / sek}$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



QUESTION/VRAAG 11

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



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

