



**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.

NOTE:

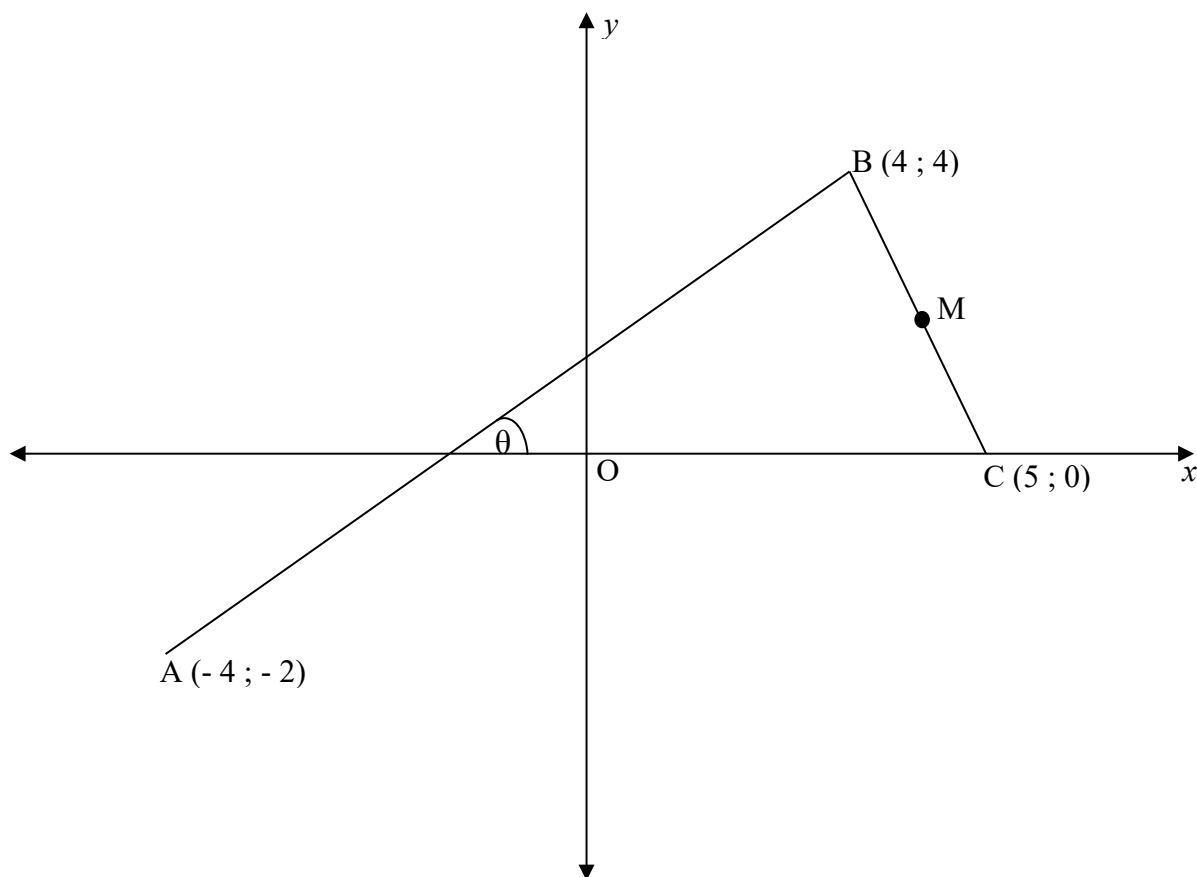
- Continuous accuracy (CA) applies only where indicated in this marking guideline.
- Assuming values/answers in order to solve a problem is unacceptable.

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 / <i>Metode</i>
A	Accuracy / <i>Akkuraatheid</i>
AO	Answer only / <i>Slegs antwoord</i>
CA	Consistent accuracy / <i>Deurlopende akkuraatheid</i>
F	Formula / <i>Formule</i>
I	Identity / <i>Identiteit</i>
R	Rounding / <i>Afronding</i>
S	Simplification / <i>Vereenvoudiging</i>
ST	Statement / <i>Bewering</i>
RE	Reason / <i>Rede</i>
ST RE	Statement and correct reason / <i>Bewering en korrekte rede</i>
SF	Substitution correctly in correct formula / <i>Korrekte vervanging in die korrekte formule</i>
NPU	No penalty for omitting units / <i>Geen penalisering vir eenhede uitgelaat</i>
NPR	No penalty for rounding

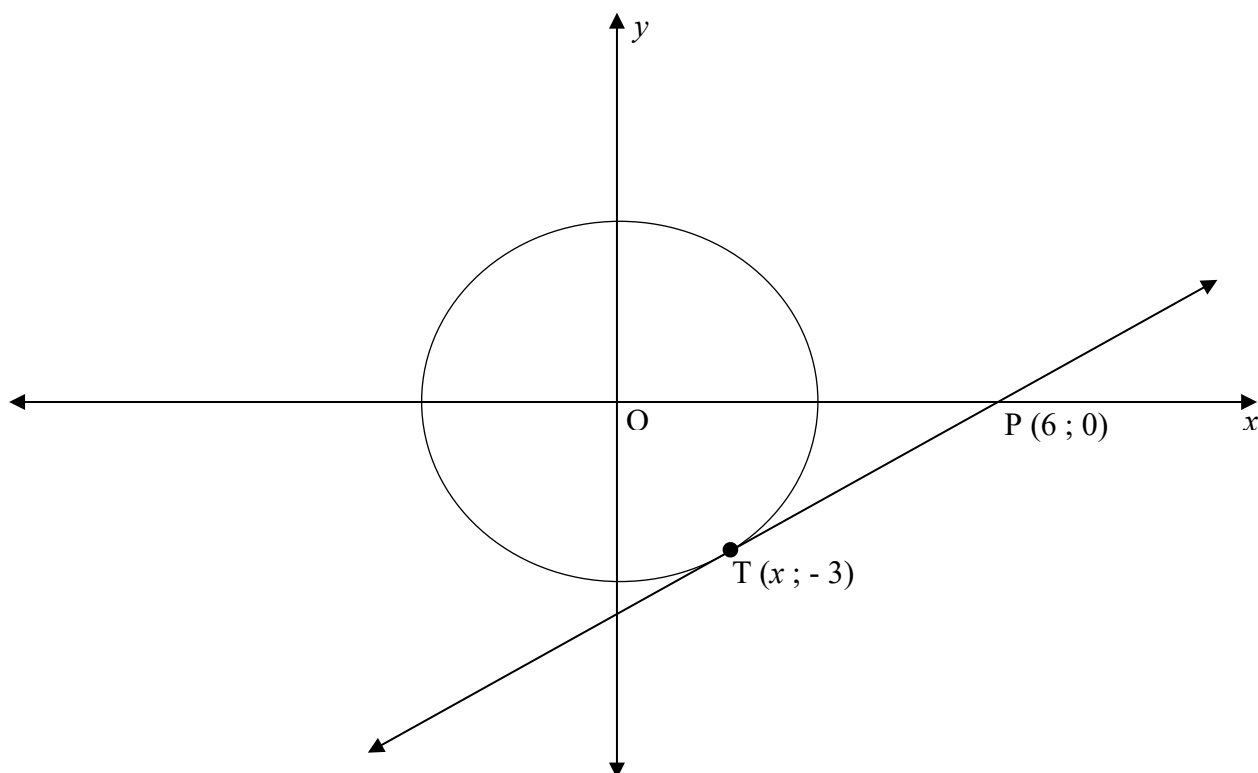
QUESTION/VRAAG 1



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	$AM = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$ $AM = \sqrt{\left(\frac{9}{2} - (-4)\right)^2 + (2 - (-2))^2}$ $AM = \frac{\sqrt{353}}{2}$ $AM = 9,39 \text{ units/eenhede}$	✓ F ✓ Subst. / Vervang ✓ Answer / Antwoord	A A CA (3)

1.4	$\tan\theta = m_{AB}$ $\tan\theta = \frac{3}{4}$ $\theta = \tan^{-1}\left(\frac{3}{4}\right)$ $\theta = 36,87^\circ$	✓ 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 A CA CA CA CA (5)
			[15]

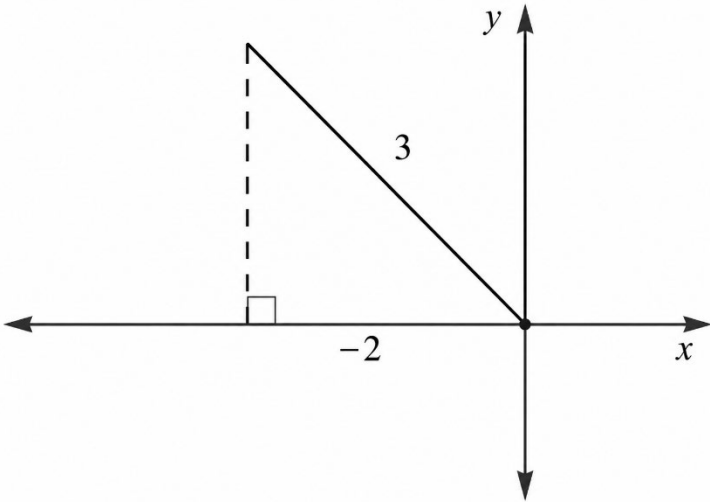
QUESTION/VRAAG 2



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)

	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. / <i>Vervang</i> ✓ $13 = r^2$ ✓ Equation / Vergelyking	CA CA CA (3)
2.2			✓ elliptical shape / <i>elliptiese vorm</i> ✓ x-int/as ✓ y-int/as	A A A (3)
				[12]

QUESTION/VRAAG 3

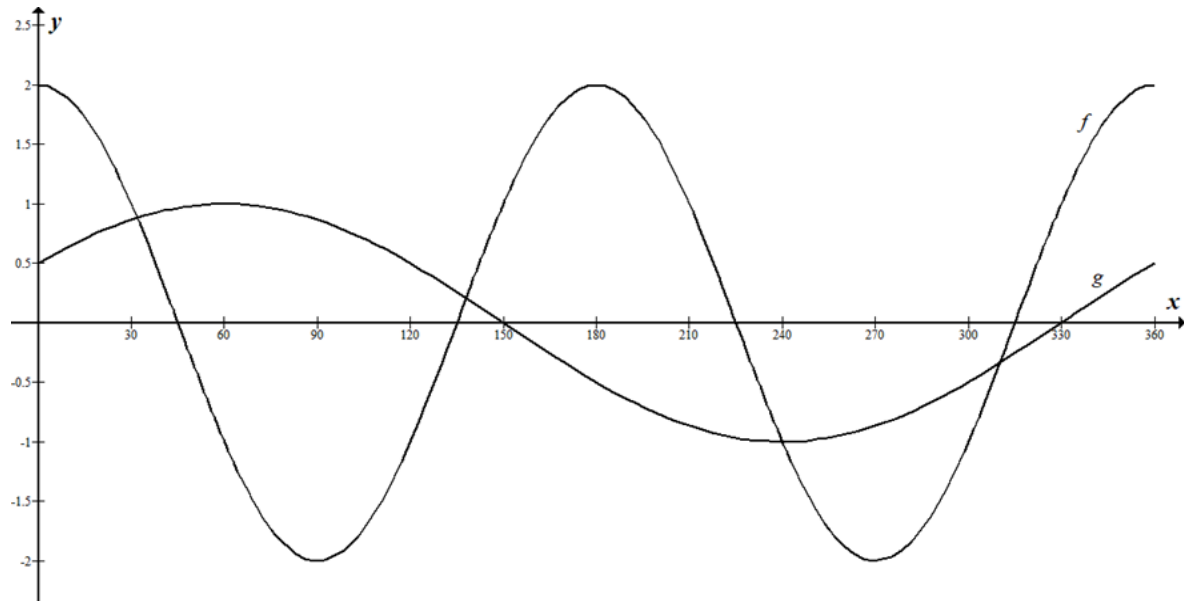
3.1	$\frac{\operatorname{cosec} X}{\tan Y} = \frac{\operatorname{cosec}(27^\circ)}{\tan(123,57^\circ)}$ $= \frac{\left(\frac{1}{\sin(27^\circ)}\right)}{\tan(123,57^\circ)}$ $= -1,46$		✓ Subst. / Vervang	A
			✓ $\frac{1}{\sin(27^\circ)}$	A
			✓ Answer / Antwoord	A (3)
3.2	3.2.1		✓ Diagram	A
		$x^2 + y^2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

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

QUESTION/VRAAG 4

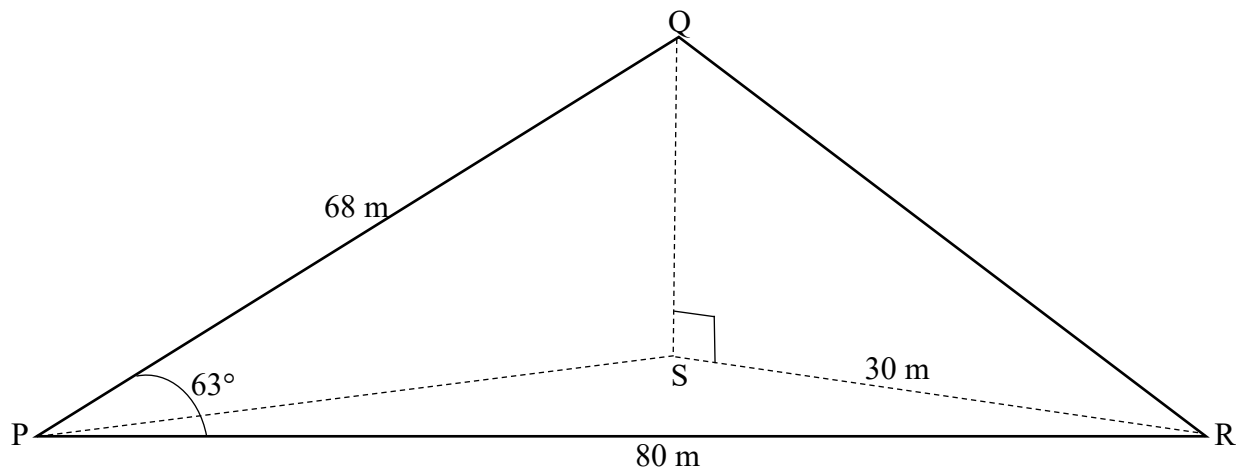
4.1	$\frac{\cos^2(\pi - \theta) \cdot \cos 180^\circ}{\sin(180^\circ + \theta) \cdot \cos(-\theta) \cdot \tan(360^\circ + \theta)}$ $= \frac{(-\cos \theta)^2 \cdot (-1)}{(-\sin \theta) \cdot \cos \theta \cdot \tan \theta}$ $= \frac{-\cos^2 \theta}{-\sin \theta \cdot \cos \theta \cdot \frac{\sin \theta}{\cos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

QUESTION/VRAAG 5



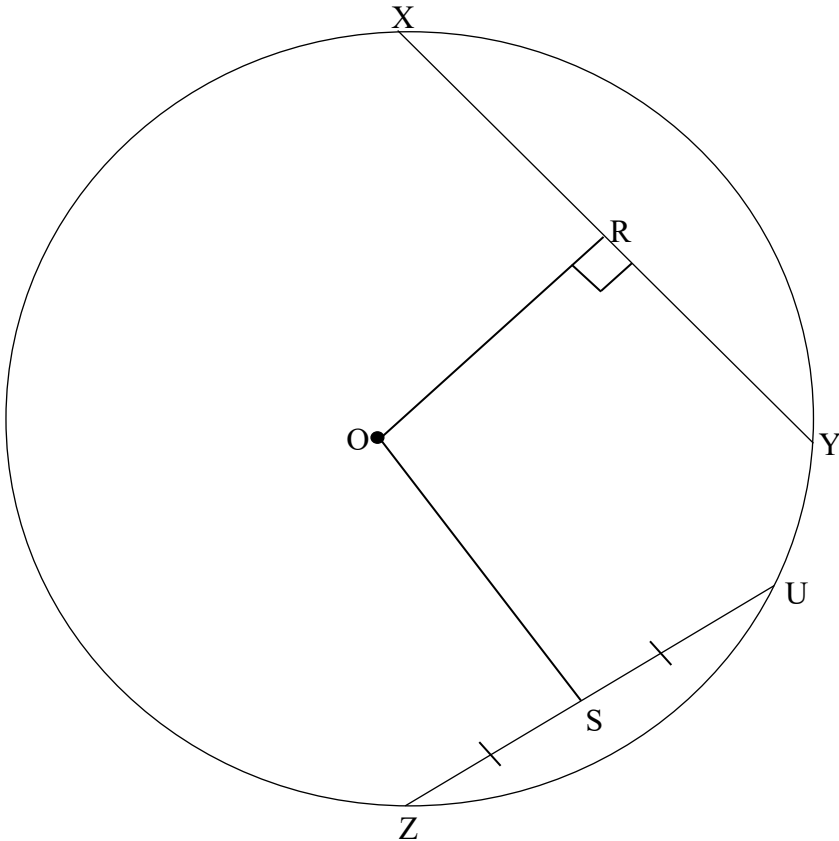
5.1	$a = 1$	✓ $a = 1$	A
	$b = 1$	✓ $b = 1$	A
	$p = 30^\circ$	✓ $p = 30^\circ$	A
			(3)
5.2	$\frac{360^\circ}{2} = 180^\circ$	✓ M ✓ 180° AO Full Marks / Volpunte	A A (2)
5.3	$x = 0^\circ$ OR / <i>OF</i> $x = 360^\circ$	✓ $x = 0^\circ$ ✓ $x = 360^\circ$	A A (2)
			[7]

QUESTION/VRAAG 6



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

QUESTION/VRAAG 7

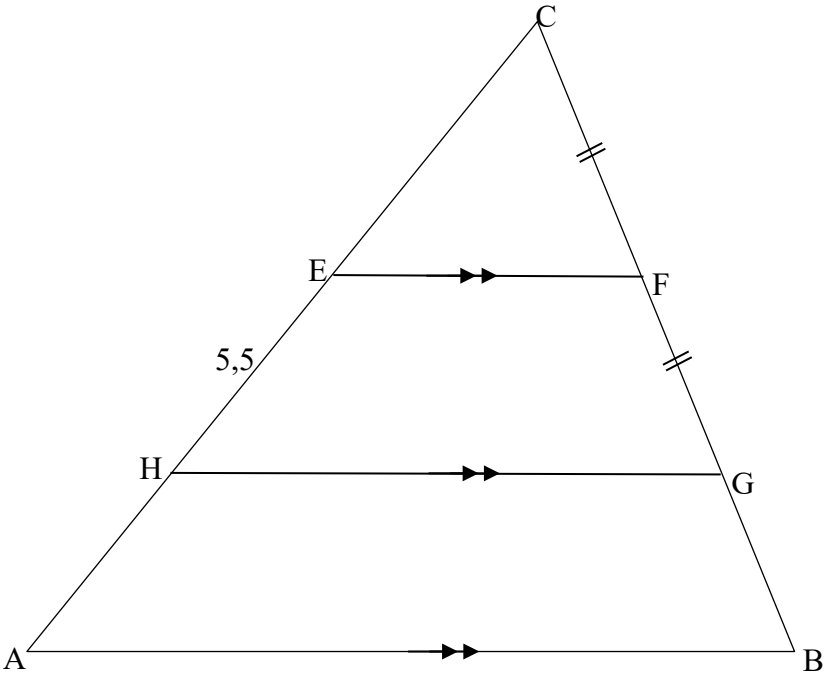
7.1	(i)	Perpendicular / Loodreg	✓ RE	A (1)
	(ii)	Bisects / Halveer	✓ RE	A (1)
				
7.2	7.2.1	$OZ^2 = OS^2 - SZ^2$ Pythagoras $OZ = \sqrt{7^2 + 5^2}$ $OZ = 8,6 \text{ cm}$	✓ ST/RE ✓ ST ✓ ST	A A A (3)
	7.2.2	$XR^2 = 8,6^2 - 4^2$ Pythagoras $= \sqrt{57,96}$ $= 7,6 \text{ cm}$ $XY = 2 \times 7,6$ line frm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

QUESTION/VRAAG 8

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

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

QUESTION/VRAAG 9

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

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

QUESTION/VRAAG 10

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

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

QUESTION/VRAAG 11

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