



basic education

Department:
Basic Education
REPUBLIC OF SOUTH AFRICA

**SENIOR CERTIFICATE EXAMINATIONS/
NATIONAL SENIOR CERTIFICATE EXAMINATIONS/
*SENIORSERTIFIKAAT-EKSAMEN/
NASIONALE SENIORSERTIFIKAAT-EKSAMEN***

MATHEMATICS P2/*WISKUNDE V2*

MAY/JUNE 2026/*MEI/JUNIE 2026*

MARKING GUIDELINES/*NASIENRIGLYNE*

MARKS/*PUNTE*: 150

**These marking guidelines consist of 24 pages./
*Hierdie nasienriglyne bestaan uit 24 bladsye.***

NOTE:

- If a candidate answers a question TWICE, only mark the FIRST attempt.
- If a candidate has crossed out an attempt of a question and not redone the question, mark the crossed-out version.
- Consistent accuracy applies in ALL aspects of the Marking Guidelines. Stop marking at the second calculation error.
- Assuming answers/values in order to solve a problem is NOT acceptable.

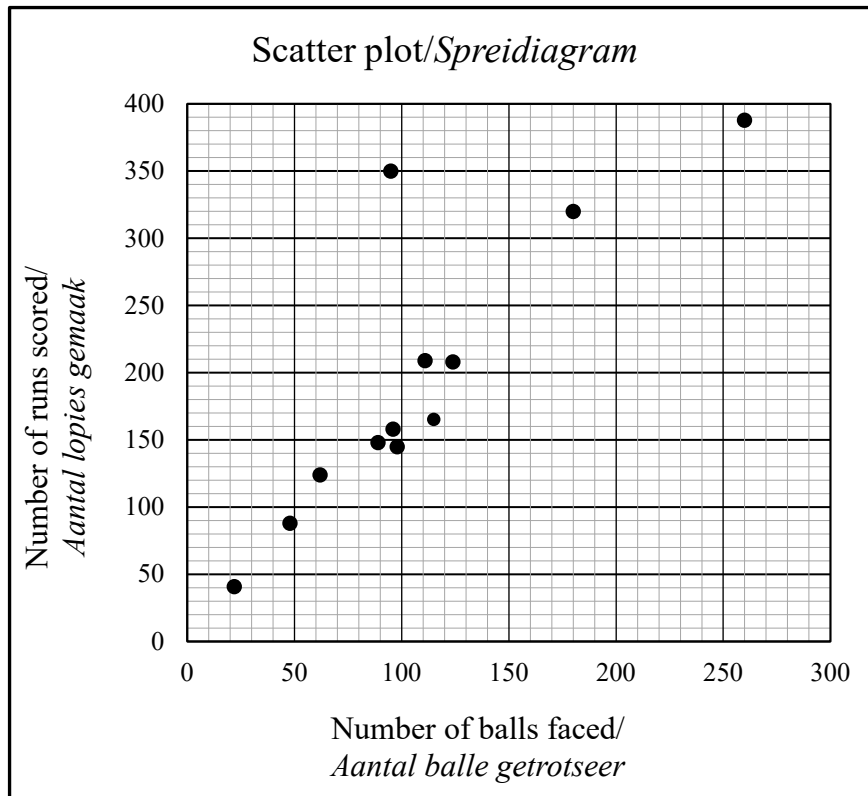
LET WEL:

- *As 'n kandidaat 'n vraag TWEE KEER beantwoord, sien slegs die EERSTE poging na.*
- *As 'n kandidaat 'n antwoord van 'n vraag doodtrek en nie oordoen nie, sien die doodgetrekte poging na.*
- *Volgehoue akkuraatheid word in ALLE aspekte van die Nasienriglyne toegepas. Hou op nasien by die tweede berekeningsfout.*
- *Aanvaar van antwoorde/waardes om 'n probleem op te los, word NIE toegelaat nie.*

GEOMETRY • MEETKUNDE	
S	A mark for a correct statement (A statement mark is independent of a reason)
	'n Punt vir 'n korrekte bewering ('n Punt vir 'n bewering is onafhanklik van die rede)
R	A mark for the correct reason (A reason mark may only be awarded if the statement is correct)
	'n Punt vir 'n korrekte rede ('n Punt word slegs vir die rede toegeken as die bewering korrek is)
S/R	Award a mark if statement AND reason are both correct
	Ken 'n punt toe as die bewering EN rede beide korrek is

QUESTION/VRAAG 1

NUMBER OF BALLS FACED (x)/ GETAL BALLE GETROTSEER (x)	62	111	22	48	124	180	89	96	95	260	98	115
NUMBER OF RUNS SCORED (y)/ GETAL LOPIES GEMAAK (y)	124	209	41	88	208	320	148	158	350	388	145	165

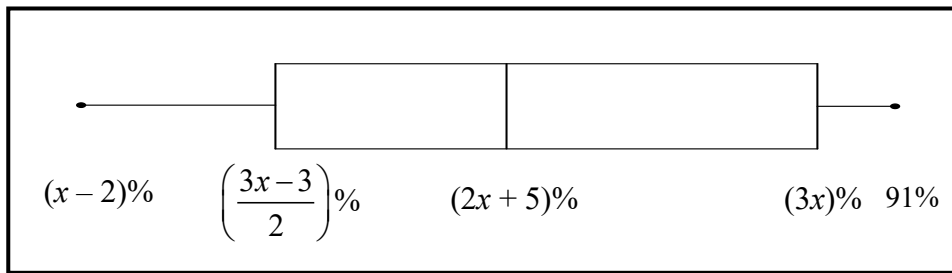


1.1	$a = 39,47$ $b = 1,44$ $\hat{y} = 39,47 + 1,44x$	✓ $a = 39,47$ ✓ $b = 1,44$ ✓ equation (3)
1.2	$y = 39,47 + 1,44(150)$ $y = 255,47$ OR $y = 255,28$ (calculator)	✓ substitution ✓ answer (2) ✓✓ answer (2)
1.3	$\bar{y} = 195,33$ $\sigma_y = 101,84$ One σ above the $\bar{y}$: $195,33 + 101,84$ $= 297,17$ No. of players = 3	✓ $\bar{y} = 195,33$ ✓ $\sigma_y = 101,84$ ✓ $\bar{y} + \sigma$ ✓ answer (4)
1.4	This player scored many more runs than the other players who faced a similar number of balls. / Hierdie speler het meer lopies as enige ander speler, wat dieselfde hoeveelheid balle getrotseer het, gemaak.	✓ answer (1)
[10]		

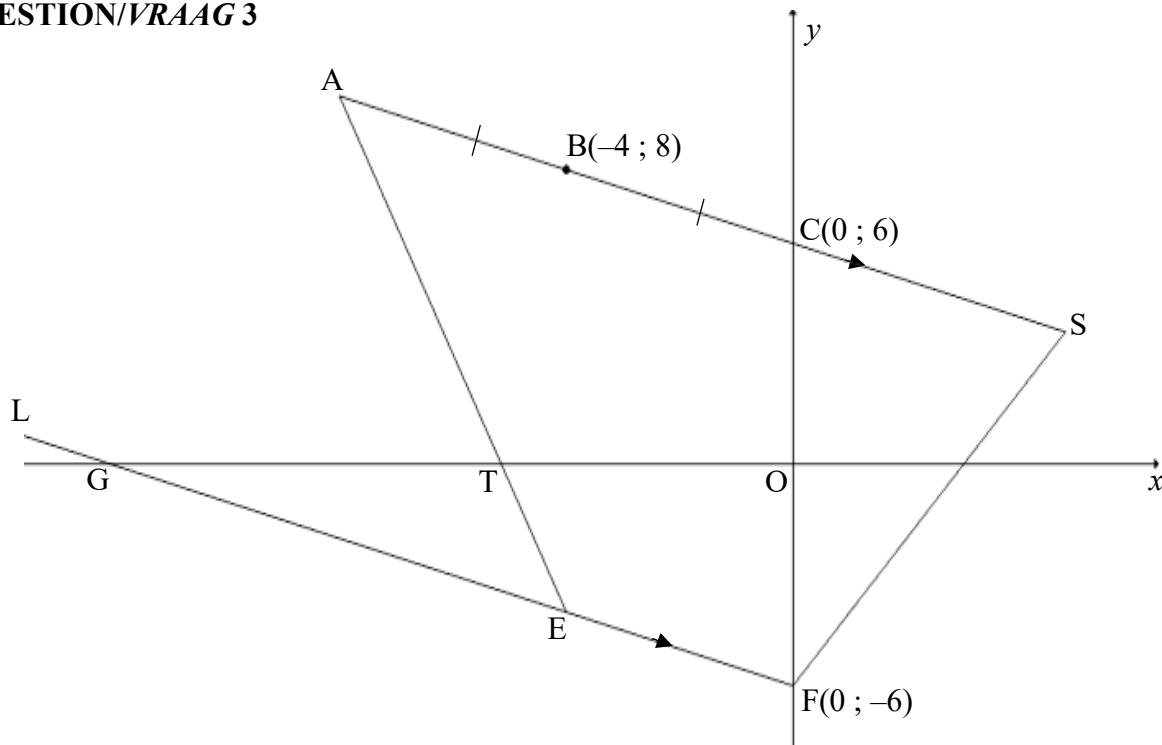
QUESTION/VRAAG 2

2.1.1	$50 < x \leq 60$	✓ $50 < x \leq 60$ (1)																											
2.1.2	<table border="1"> <thead> <tr> <th>CLASS INTERVALS (AS A %)/ <i>KLASINTERVALLE</i> (AS 'N %)</th><th>FREQUENCY/ <i>FREKWENSIE</i></th><th>CUMULATIVE FREQUENCY/ <i>KUMULATIEWE</i> <i>FREKWENSIE</i></th></tr> </thead> <tbody> <tr> <td>$20 < x \leq 30$</td><td>8</td><td>8</td></tr> <tr> <td>$30 < x \leq 40$</td><td>14</td><td>22</td></tr> <tr> <td>$40 < x \leq 50$</td><td>16</td><td>38</td></tr> <tr> <td>$50 < x \leq 60$</td><td>21</td><td>59</td></tr> <tr> <td>$60 < x \leq 70$</td><td>16</td><td>75</td></tr> <tr> <td>$70 < x \leq 80$</td><td>9</td><td>84</td></tr> <tr> <td>$80 < x \leq 90$</td><td>6</td><td>90</td></tr> <tr> <td>$90 < x \leq 100$</td><td>2</td><td>92</td></tr> </tbody> </table>	CLASS INTERVALS (AS A %)/ <i>KLASINTERVALLE</i> (AS 'N %)	FREQUENCY/ <i>FREKWENSIE</i>	CUMULATIVE FREQUENCY/ <i>KUMULATIEWE</i> <i>FREKWENSIE</i>	$20 < x \leq 30$	8	8	$30 < x \leq 40$	14	22	$40 < x \leq 50$	16	38	$50 < x \leq 60$	21	59	$60 < x \leq 70$	16	75	$70 < x \leq 80$	9	84	$80 < x \leq 90$	6	90	$90 < x \leq 100$	2	92	✓ first four correct values ✓ last four values (2)
CLASS INTERVALS (AS A %)/ <i>KLASINTERVALLE</i> (AS 'N %)	FREQUENCY/ <i>FREKWENSIE</i>	CUMULATIVE FREQUENCY/ <i>KUMULATIEWE</i> <i>FREKWENSIE</i>																											
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$90 < x \leq 100$	2	92																											
2.1.3	<i>Ogive/Ogief</i> Cumulative Frequency/ <i>Kumulatiewe frekwensie</i> Marks obtained by learners (as a percentage)/ <i>Punte wat leerders behaal het (as 'n persentasie)</i>	✓ Grounding at (20 ; 0) ✓ plotting cumulative frequency at upper boundaries ✓ smooth curve (3)																											
2.1.4	Median = 54	✓ answer (1)																											

2.2



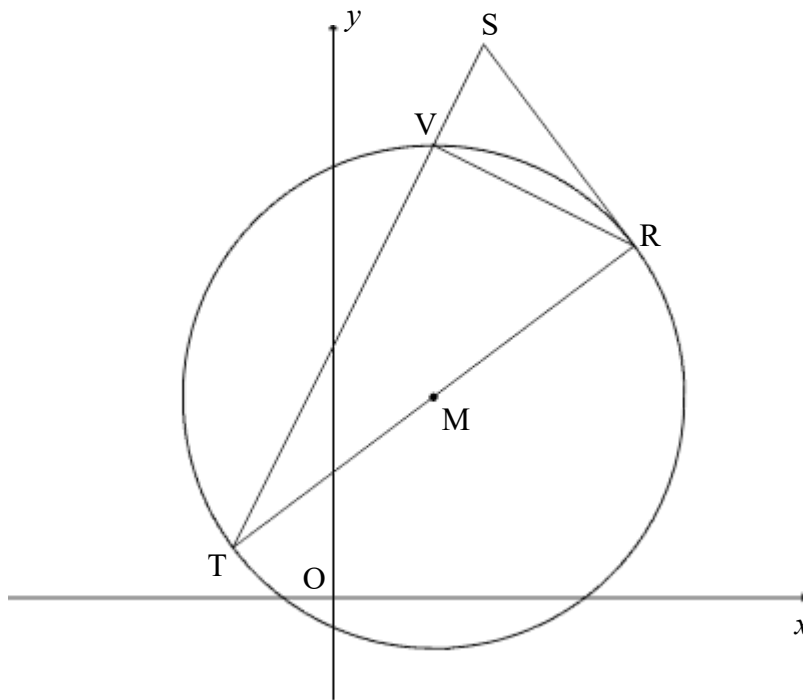
2.2	IQR as a %: $3x - \frac{3x-3}{2} = 45$ $6x - 3x + 3 = 90$ $x = 29$ Min % = $(29 - 2)\%$ $= 27\%$	✓ $3x - \frac{3x-3}{2} = 45$ ✓ value of x ✓ answer (3)
[10]		

QUESTION/VRAAG 3

3.1	$\frac{x_A + 0}{2} = -4 \quad \frac{y_A + 6}{2} = 8$ $x_A = -8 \quad y_A = 10$ $A(-8; 10)$ OR $C \rightarrow B : (x; y) \rightarrow (x - 4; y + 2)$ $B \rightarrow A : (-4; 8) \rightarrow (-4 - 4; 8 + 2)$ $\therefore A(-8; 10)$ OR $m_{AS} = \frac{8 - 6}{-4 - 0}$ $m_{AS} = -\frac{1}{2}$ $y = -\frac{1}{2}x + 6$ $-\frac{1}{2}x + 6 = -\frac{7}{2}x - 18$ $-x + 12 = -7x - 36$ $6x = -48$ $x = -8$ $y = -\frac{1}{2}(-8) + 6$ $y = 10$ $A(-8; 10)$	✓ substitution into midpoint formula ✓ x_A ✓ y_A (3) ✓ translation: 4 left and 2 up from B ✓ x_A ✓ y_A (3) ✓ $-\frac{1}{2}x + 6 = -\frac{7}{2}x - 18$ ✓ x_A ✓ y_A (3)
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3.2	$m_{AS} = \frac{8-6}{-4-0}$ $m_{AS} = -\frac{1}{2}$ $m_{LF} = m_{AS} = -\frac{1}{2} \text{ (AS LF)}$ $y = -\frac{1}{2}x - 6$	✓ substitution into gradient formula ✓ m_{AS} ✓ $c = -6$
3.3	$-\frac{1}{2}x - 6 = -\frac{7}{2}x - 18$ $-x - 12 = -7x - 36$ $6x = -24$ $x = -4$ $y = -\frac{1}{2}(-4) - 6$ $y = -4$ $E(-4; -4)$	✓ equating ✓ x_E ✓ y_E
3.4	$m_{AS} = -\frac{1}{2}$ $m_{FS} = \frac{\frac{18}{5} - (-6)}{\frac{24}{5} - 0} \quad \text{OR} \quad m_{FS} = \frac{-6 - \frac{18}{5}}{0 - \frac{24}{5}}$ $= 2$ $m_{AS} \times m_{FS} = -\frac{1}{2} \times 2$ $= -1$ $\therefore \hat{CSF} = 90^\circ$ CF is a diameter [CF subtends a right $\angle$] / CF is 'n middellyn [omgekeerde $\angle$ in halwe sirkel] $\therefore$ centre O(0 ; 0) and $r = 6$ $x^2 + y^2 = 36$	✓ m_{FS} ✓ $m_{AS} \times m_{FS} = -1$ ✓ $\hat{CSF} = 90^\circ$ or CF is a diameter ✓ r ✓ $x^2 + y^2 = r^2$
3.5	$\tan \hat{ATO} = m_{AE} = -\frac{7}{2}$ $\hat{ATO} = 105,95\dots^\circ$ $\tan \hat{LGT} = m_{LF} = -\frac{1}{2}$ $\hat{LGT} = 153,43\dots^\circ$ $\hat{AEG} = 153,43\dots^\circ - 105,95\dots^\circ$ $= 47,49^\circ$ OR	✓ $\tan \hat{ATO} = m_{AE}$ or $\tan \hat{LGT} = m_{LF}$ ✓ $\hat{ATO}$ ✓ $\hat{LGT}$ ✓ answer

	$\tan \hat{A}\hat{T}O = m_{AE} = -\frac{7}{2}$ $\hat{A}\hat{T}O = 105,95\dots^\circ$ Inclination of AS produced = $153,43\dots^\circ$ $\hat{T}\hat{A}S = 47,49^\circ \quad [\text{ext. } \angle \text{ s of } \Delta / \text{buite } \angle \text{ van } \Delta]$ $\hat{A}\hat{E}G = 47,49^\circ \quad [\text{alt } \angle \text{ s; } LF \parallel AS / \text{verw } \angle \text{ s; } LF \parallel AS]$ OR $G(-12; 0) \text{ and } T\left(-\frac{36}{7}; 0\right)$ $TG = \frac{48}{7} \text{ units}$ $GE = \sqrt{80} \text{ units}$ $TE = \frac{4\sqrt{53}}{7} \text{ units}$ $\left(\frac{48}{7}\right)^2 = (\sqrt{80})^2 + \left(\frac{4\sqrt{53}}{7}\right)^2 - 2(\sqrt{80})\left(\frac{4\sqrt{53}}{7}\right)\cos \hat{A}\hat{E}G$ $\hat{A}\hat{E}G = 47,49^\circ$	✓ $\tan \hat{A}\hat{T}O = m_{AE}$ ✓ $\hat{A}\hat{T}O$ ✓ $\hat{T}\hat{A}S$ ✓ answer (4) ✓ length of TG ✓ length of GE and TE ✓ substitution in cosine-rule ✓ answer (4)
		[18]

QUESTION/VRAAG 4

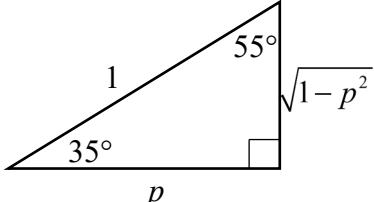
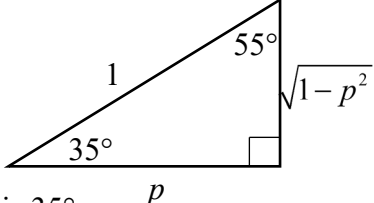
4.1	M(2 ; 4)	✓ $x = 2$ ✓ $y = 4$ (2)
4.2	$(x - 2)^2 + (2x + 5 - 4)^2 = 25$ $x^2 - 4x + 4 + 4x^2 + 4x + 1 - 25 = 0$ $5x^2 - 20 = 0$ $x^2 - 4 = 0$ $(x - 2)(x + 2) = 0$ $x = 2$ or $x = -2$ $y = 2(-2) + 5$ $y = 1$ $\therefore T(-2 ; 1)$	✓ substituting $y = 2x + 5$ into equation of circle ✓ standard form ✓ factors ✓ substituting $x = -2$ (4)
4.3	V(2 ; 9)	✓ $x_V = 2$ ✓ $y_V = 9$ (2)
4.4	$m_{TR} = m_{TM} = \frac{4 - 1}{2 + 2}$ $= \frac{3}{4}$	✓ substitution into the gradient formula ✓ answer (2)

4.5	R(6;7) [Translation OR midpoint] $m_{TR} = \frac{3}{4}$ $m_{SR} = -\frac{4}{3}$ $y = -\frac{4}{3}x + c$ $7 = -\frac{4}{3}(6) + c \quad \text{OR} \quad y - 7 = -\frac{4}{3}(x - 6)$ $y = -\frac{4}{3}x + 15 \quad y = -\frac{4}{3}x + 15$	✓ $x_R = 6$ ✓ $y_R = 7$ ✓ m_{SR} ✓ substitution of point R ✓ equation (5)
4.6	Let N be the centre of the circle. $N\left(\frac{-3+2}{2}; \frac{3-1}{2}\right)$ $N\left(-\frac{1}{2}; 1\right)$ $AC = \sqrt{(2 - (-3))^2 + (3 - (-1))^2}$ $AC = \sqrt{41}$ $\left(x + \frac{1}{2}\right)^2 + (y - 1)^2 = \frac{41}{4}$ $x^2 + x + \frac{1}{4} + y^2 - 2y + 1 = \frac{41}{4}$ $x^2 + x + y^2 - 2y - 9 = 0$ $x^2 + x + y^2 - 2y - 9 = x^2 - 4x + y^2 - 8y - 5$ $6y + 5x - 4 = 0$ OR $\hat{B} = 90^\circ \quad [\angle \text{ in semi-circle} / \angle \text{ in halwe sirkel}]$ $\frac{y+1}{x+3} \times \frac{y-3}{x-2} = -1$ $y^2 - 2y - 3 = -1(x^2 + x - 6)$ $x^2 + x + y^2 - 2y - 9 = 0$ $x^2 + x + y^2 - 2y - 9 = x^2 - 4x + y^2 - 8y - 5$ $6y + 5x - 4 = 0$	✓ midpoint of AC: $N\left(-\frac{1}{2}; 1\right)$ ✓ substitution into distance formula ✓ length of AC ✓ equation of new circle ✓ equating ✓ answer (6) ✓ $\frac{y+1}{x+3} \times \frac{y-3}{x-2} = -1$ ✓ simplification ✓ equation of new circle ✓ equating ✓ answer (6)
4.7	The radius of the circle gets smaller. / Die radius van die sirkel word kleiner. OR The circle will decrease in size. / Die sirkel word kleiner.	✓ correct statement (1) ✓ correct statement (1)
		[22]

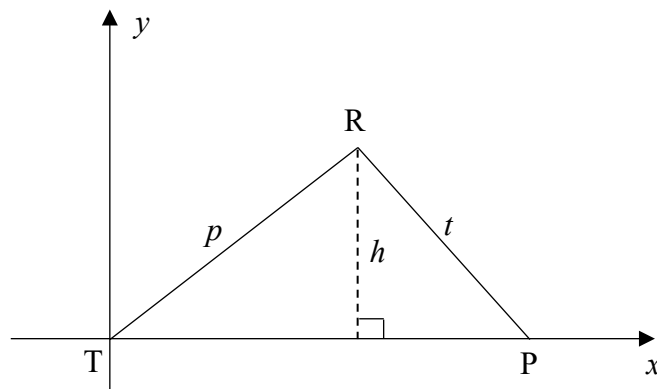
QUESTION/VRAAG 5

5.1.1	Given: $\sin(A - B) = \sin A \cos B - \cos A \sin B$ $\sin(A + B) = \sin(A - (-B))$ $= \sin A \cos(-B) - \cos A \sin(-B)$ $= \sin A(\cos B) - \cos A(-\sin B)$ $= \sin A \cos B + \cos A \sin B$	✓ $\sin(A - (-B))$ ✓ $\sin A \cos(-B) - \cos A \sin(-B)$ (2)
5.1.2	$\sqrt{3} \cos x = \sin(50^\circ + x) \cdot \cos(10^\circ - x) + \cos(50^\circ + x) \cdot \sin(10^\circ - x)$ $\sqrt{3} \cos x = \sin[(50^\circ + x) + (10^\circ - x)]$ $\sqrt{3} \cos x = \sin 60^\circ$ $\sqrt{3} \cos x = \frac{\sqrt{3}}{2}$ $\cos x = \frac{1}{2}$ ref $\angle = 60^\circ$ $x = 60^\circ$ or $x = 300^\circ$	✓ $\sin 60^\circ$ ✓ special angle value ✓ answer ✓ answers (4)
5.2	LHS = $\frac{\sin 2x}{2 \cos^2 x} + \frac{\sin x}{\tan x [1 + \cos(90^\circ - x)]}$ $= \frac{2 \sin x \cos x}{2 \cos^2 x} + \frac{\sin x}{\frac{\sin x}{\cos x} (1 + \sin x)}$ $= \frac{\sin x}{\cos x} + \frac{\cos x}{1 + \sin x}$ $= \frac{\sin x + \sin^2 x + \cos^2 x}{\cos x (1 + \sin x)}$ $= \frac{\sin x + 1}{\cos x (1 + \sin x)}$ $= \frac{1}{\cos x}$ $\therefore \text{LHS} = \text{RHS}$	✓ $\sin 2x = 2 \sin x \cos x$ ✓ $\tan x = \frac{\sin x}{\cos x}$ ✓ $\cos(90^\circ - x) = \sin x$ ✓ writing as a single fraction ✓ $\sin^2 x + \cos^2 x = 1$ (5)
5.3	LHS = $\sin 260^\circ$ $= -\sin 80^\circ$ $= -\cos 10^\circ$ RHS = $-\sqrt{\frac{\cos 20^\circ + 1}{2}}$ $= -\sqrt{\frac{(2 \cos^2 10^\circ - 1) + 1}{2}}$ $= -\sqrt{\cos^2 10^\circ}$ $= -\cos 10^\circ$ $\therefore \text{LHS} = \text{RHS}$	✓ $\sin 260^\circ = -\sin 80^\circ$ ✓ $\sin 80^\circ = \cos 10^\circ$ ✓ $\cos 20^\circ = 2 \cos^2 10^\circ - 1$ ✓ $-\sqrt{\cos^2 10^\circ}$ (4)
		[15]

QUESTION/VRAAG 6

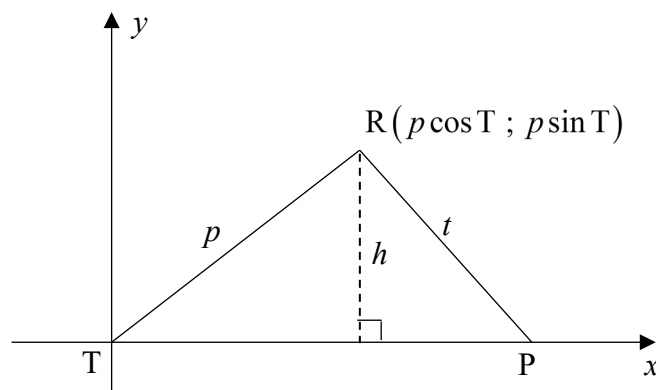
6.1.1	$\begin{aligned} & \cos 330^\circ \cdot \cos 365^\circ + \sin 175^\circ \cdot \sin 210^\circ \\ &= \cos 30^\circ \cdot \cos 5^\circ + \sin 5^\circ (-\sin 30^\circ) \\ &= \cos 30^\circ \cdot \cos 5^\circ - \sin 30^\circ \cdot \sin 5^\circ \\ &= \cos(30^\circ + 5^\circ) \\ &= \cos 35^\circ \end{aligned}$ OR $\begin{aligned} & \cos 330^\circ \cdot \cos 365^\circ + \sin 175^\circ \cdot \sin 210^\circ \\ &= \sin 60^\circ \cdot \cos 5^\circ + \sin 5^\circ (-\cos 60^\circ) \\ &= \sin 60^\circ \cdot \cos 5^\circ - \sin 5^\circ \cdot \cos 60^\circ \\ &= \sin(60^\circ - 5^\circ) \\ &= \sin 55^\circ \end{aligned}$	$\checkmark \cos 330^\circ = \cos 30^\circ$ $\checkmark \cos 365^\circ = \cos 5^\circ$ $\checkmark \sin 175^\circ = \sin 5^\circ$ $\checkmark \sin 210^\circ = -\sin 30^\circ$ $\checkmark$ answer (5) $\checkmark \cos 330^\circ = \sin 60^\circ$ $\checkmark \cos 365^\circ = \cos 5^\circ$ $\checkmark \sin 175^\circ = \sin 5^\circ$ $\checkmark \sin 210^\circ = -\cos 60^\circ$ $\checkmark$ answer (5)
6.1.2	$\begin{aligned} & \cos 35^\circ = p \\ & \sin 70^\circ \\ &= 2 \sin 35^\circ \cos 35^\circ \\ &= 2p\sqrt{1-p^2} \end{aligned}$  OR  $\begin{aligned} & \sin 70^\circ \\ &= \cos 20^\circ \\ &= \cos(55^\circ - 35^\circ) \\ &= \cos 55^\circ \cdot \cos 35^\circ + \sin 55^\circ \cdot \sin 35^\circ \\ &= \sqrt{1-p^2} \cdot p + p\sqrt{1-p^2} \\ &= 2p\sqrt{1-p^2} \end{aligned}$	$\checkmark$ 3rd side = $\sqrt{1-p^2}$ $\checkmark$ expansion of double $\angle$ $\checkmark$ substitution (3) $\checkmark$ 3rd side = $\sqrt{1-p^2}$ $\checkmark$ expansion of compound $\angle$ $\checkmark$ substitution (3)

6.2	$\frac{2^{3\sin^2 x}}{4 \cdot 2^{\sin x}} = 1$ $\frac{2^{3\sin^2 x}}{2^{\sin x + 2}} = 1$ $2^{3\sin^2 x} = 2^{\sin x + 2}$ $3\sin^2 x = \sin x + 2$ $3\sin^2 x - \sin x - 2 = 0$ $(3\sin x + 2)(\sin x - 1) = 0$ $\sin x = -\frac{2}{3} \quad \text{or} \quad \sin x = 1 \text{ (N/A)}$ $\text{ref } \angle = 41,810\dots^\circ$ $x = 221,81^\circ + k \cdot 360^\circ \text{ or } x = 318,19^\circ + k \cdot 360^\circ, k \in \mathbb{Z}$ OR $\frac{2^{3\sin^2 x}}{4 \cdot 2^{\sin x}} = 1$ $\frac{2^{3\sin^2 x}}{2^2 \cdot 2^{\sin x}} = 2^0$ $2^{3\sin^2 x - 2 - \sin x} = 2^0$ $3\sin^2 x - \sin x - 2 = 0$ $(3\sin x + 2)(\sin x - 1) = 0$ $\sin x = -\frac{2}{3} \quad \text{or} \quad \sin x = 1 \text{ (N/A)}$ $\text{ref } \angle = 41,810\dots^\circ$ $x = 221,81^\circ + k \cdot 360^\circ \text{ or } x = 318,19^\circ + k \cdot 360^\circ, k \in \mathbb{Z}$	✓ exponential law ✓ cross multiplication ✓ equation from exponents ✓ equation ✓ both x - values ✓ $+k \cdot 360^\circ; k \in \mathbb{Z}$ (6) ✓ 2^0 ✓ exponential law ✓ equation from exponents ✓ equation ✓ both x - values ✓ $+k \cdot 360^\circ; k \in \mathbb{Z}$ (6)
[14]		

QUESTION/VRAAG 8

8.1	Construction of perpendicular height, h $\sin T = \frac{h}{p} \quad \text{and} \quad \sin P = \frac{h}{t}$ $h = p \sin T \quad \text{and} \quad h = t \sin P$ $p \sin T = t \sin P$ $\frac{p \sin T}{pt} = \frac{t \sin P}{pt}$ $\frac{\sin T}{t} = \frac{\sin P}{p}$	✓ correct construction ✓ $\sin T = \frac{h}{p} \quad \text{and} \quad \sin P = \frac{h}{t}$ ✓ $h = p \sin T \quad \text{and} \quad h = t \sin P$ ✓ $p \sin T = t \sin P$
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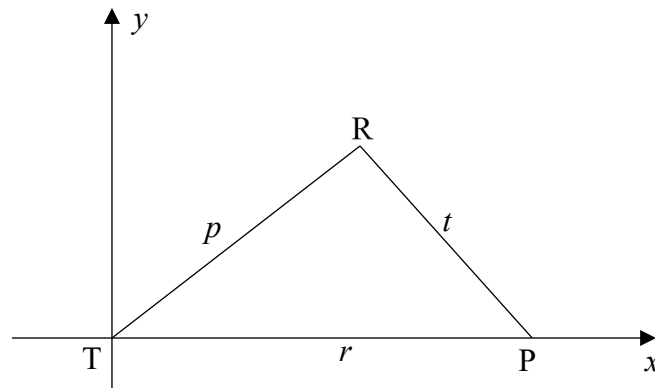
(4)

OR

8.1	$R(p \cos T ; p \sin T)$ $h = p \sin T$ $\sin P = \frac{h}{t}$ $\sin P = \frac{p \sin T}{t}$ $\frac{\sin T}{t} = \frac{\sin P}{p}$ OR	✓ $x_R = p \cos T \quad \checkmark \quad y_R = p \sin T$ ✓ $\sin P = \frac{h}{t}$ ✓ $\sin P = \frac{p \sin T}{t}$
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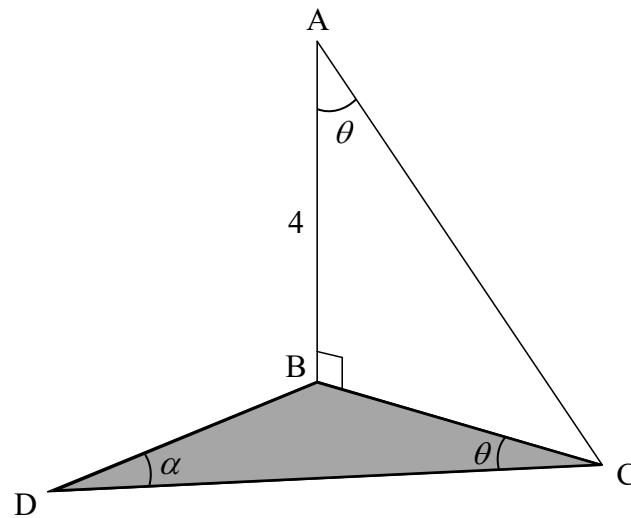
(4)

8.1

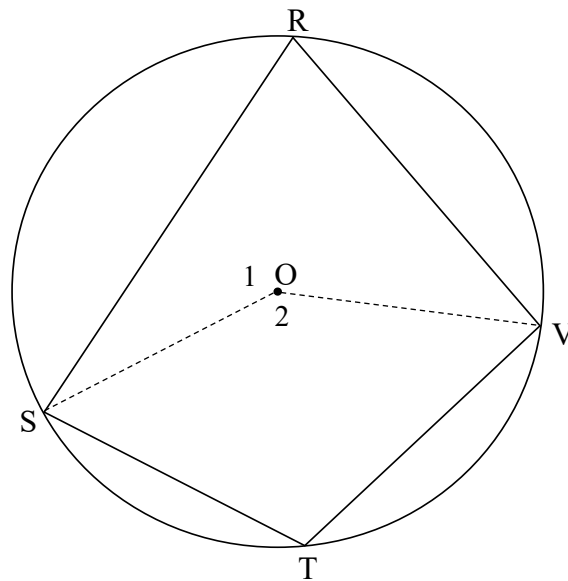


	$\text{Area of } \triangle PRT = \frac{1}{2} pr \sin T$ $\text{Area of } \triangle PRT = \frac{1}{2} tr \sin P$ $\therefore \frac{1}{2} pr \sin T = \frac{1}{2} tr \sin P$ $\frac{\frac{1}{2} pr \sin T}{\frac{1}{2} ptr} = \frac{\frac{1}{2} tr \sin P}{\frac{1}{2} ptr}$ $\frac{\sin T}{t} = \frac{\sin P}{p}$	$\checkmark \text{ Area of } \triangle PRT = \frac{1}{2} pr \sin T$ $\checkmark \text{ Area of } \triangle PRT = \frac{1}{2} tr \sin P$ $\checkmark \text{ equating of areas}$ $\checkmark \text{ dividing by } \frac{1}{2} ptr$ (4)
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8.2

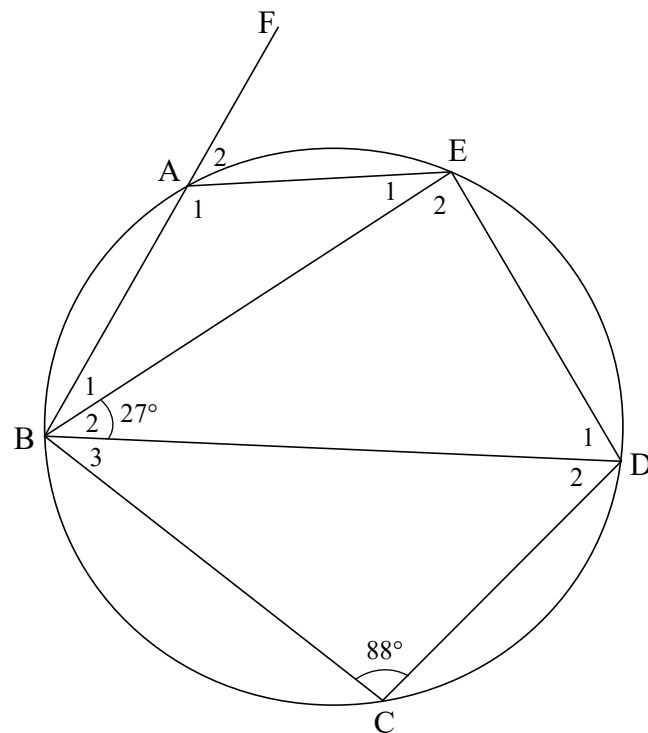


8.2.1	$\tan \theta = \frac{BC}{4}$ $BC = 4 \tan \theta$	$\checkmark \tan \theta = \frac{BC}{4}$ (1)
8.2.2	$\hat{D}BC = 180^\circ - (\alpha + \theta)$ $\frac{DC}{\sin[180^\circ - (\alpha + \theta)]} = \frac{4 \tan \theta}{\sin \alpha}$ $DC = \frac{4 \tan \theta \sin(\alpha + \theta)}{\sin \alpha}$ $= \frac{4 \tan \theta (\sin \alpha \cdot \cos \theta + \cos \alpha \cdot \sin \theta)}{\sin \alpha}$ $= \frac{4 \sin \theta (\sin \alpha \cdot \cos \theta + \cos \alpha \cdot \sin \theta)}{\cos \theta \cdot \sin \alpha}$ $= 4 \sin \theta \left(\frac{\sin \alpha \cdot \cos \theta}{\cos \theta \cdot \sin \alpha} + \frac{\cos \alpha \cdot \sin \theta}{\cos \theta \cdot \sin \alpha} \right)$ $= 4 \sin \theta \left(1 + \tan \theta \frac{1}{\tan \alpha} \right)$ $= 4 \sin \theta \left(1 + \frac{\tan \theta}{\tan \alpha} \right)$	$\checkmark$ correct use of sine rule $\checkmark \sin[180^\circ - (\alpha + \theta)] = \sin(\alpha + \theta)$ $\checkmark$ compound angle expansion $\checkmark$ separating into two fractions $\checkmark$ using quotient identity (5)
[10]		

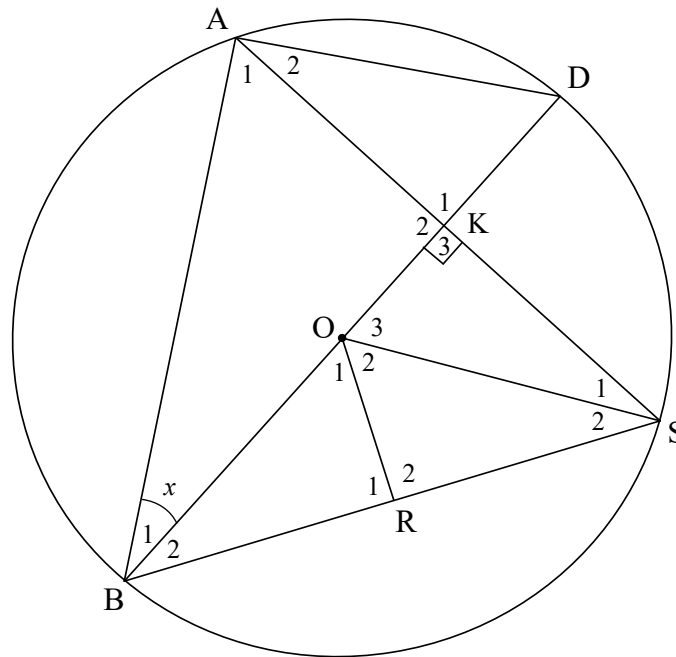
QUESTION/VRAAG 9

9.1	Draw radii OS and OV $\hat{O}_2 = 2\hat{R}$ $\hat{O}_1 = 2\hat{T}$ $\hat{O}_1 + \hat{O}_2 = 360^\circ$ $2\hat{R} + 2\hat{T} = 360^\circ$ $2(\hat{R} + \hat{T}) = 360^\circ$ $\hat{R} + \hat{T} = 180^\circ$	[$\angle$ at centre = $2 \times \angle$ at circumference/ midpts $\angle = 2 \times$ omtreks $\angle$] [$\angle$ at centre = $2 \times \angle$ at circumference midpts $\angle = 2 \times$ omtreks $\angle$] [$\angle$s round a pt/$\angle$e om 'n punt]	✓ construction ✓ S ✓ R ✓ S ✓ S/R
(5)			

9.2



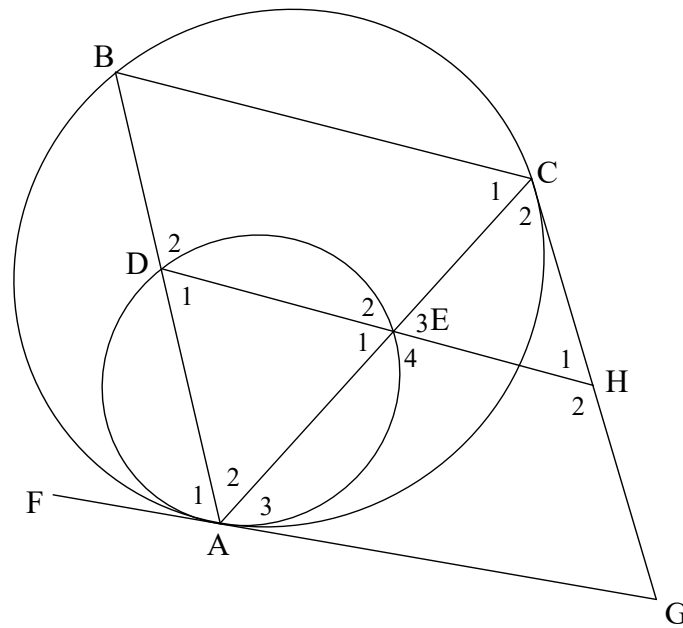
9.2.1	$\hat{E}_2 = 92^\circ$	[opp $\angle$ s of cyclic quad/teenoorst $\angle$ e v kvh]	✓ S ✓ R	(2)
9.2.2	$\hat{B}_3 = \hat{B}_2 = 27^\circ$	[equal chords ; equal $\angle$ s/ gelyke koorde; gelyke $\angle$ e]	✓ S ✓ R	(2)
9.2.3	$\hat{D}_1 = 61^\circ$ $\therefore \hat{A}_2 = 61^\circ$	[sum of $\angle$ s in a Δ /binne $\angle$ e v Δ] [ext $\angle$ of cyclic quad/buite $\angle$ v kvh]	✓ S ✓ S ✓ R	(3)
				[12]

QUESTION/VRAAG 10

10.1	The angles subtended by a chord at the circumference of the circle, on the same side of the chord, are equal. <i>Die hoeke wat deur 'n koord op die sirkel aan dieselfde kant van die koord onderspan word, is gelyk.</i>	✓ S (1)
10.2.1	$\hat{DAB} = 90^\circ$ [$\angle$ in semi-circle/$\angle$ in halwe sirkel] $\hat{D} = 90^\circ - x$ [sum of $\angle$s in a Δ/binne $\angle$e v Δ]	✓ S ✓ R ✓ S/R (3)
10.2.2	$\hat{S}_1 + \hat{S}_2 = 90^\circ - x$ [$\angle$s in the same segment/$\angle$e in dies. segment] $\hat{B}_2 = x$ [sum of $\angle$s in a Δ/binne $\angle$e v Δ] OR $\hat{A}_2 = x$ [ext $\angle$ of Δ/ buite $\angle$ v Δ] $\therefore \hat{B}_2 = x$ [$\angle$s in the same segment/$\angle$e in dies. segment]	✓ S ✓ R ✓ S (3) ✓ S ✓ S ✓ R (3)
10.2.3	$\hat{S}_2 = x$ [$\angle$s opp equal sides/$\angle$e teenoor gelyke sye] $\hat{S}_1 = 90^\circ - 2x$ OR $\hat{O}_3 = 2x$ [$\angle$ at centre = $2 \times \angle$ at circumference midpts $\angle = 2 \times$ omtreks $\angle$] $\hat{S}_1 = 90^\circ - 2x$ [sum of $\angle$s in a Δ/ binne $\angle$e v Δ] OR	✓ S/R ✓ S (2) ✓ S/R ✓ S (2)

	$\hat{D} = \hat{S}_1 + \hat{S}_2$ [∠s in the same segment/∠e in dies. segment] $90^\circ - x = \hat{S}_1 + x$ $\therefore \hat{S}_1 = 90^\circ - 2x$ [sum of ∠s in a Δ/ binne ∠e v Δ]	✓ S/R ✓ S (2)
10.3	$\hat{R}_1 = \hat{R}_2 = 90^\circ$ [line from centre to midpt of chord/ lyn vanuit midpt na midpt van koord] $\therefore \hat{R}_2 + \hat{K}_3 = 180^\circ$ $\therefore$ OKSR is a cyclic quadrilateral [converse opp ∠s of cyclic quad/ omgekeerde teenoorst. ∠e v kvh] OR $\hat{K}_2 = 90^\circ$ [∠s on a str line/∠e op 'n reguitlyn] $\hat{R}_1 = \hat{R}_2 = 90^\circ$ [line from centre to midpt of chord/ lyn vanuit midpt na midpt van koord] $\therefore \hat{R}_2 = \hat{K}_2 = 90^\circ$ $\therefore$ OKSR is a cyclic quadrilateral [converse ext ∠ of cyclic quad/ omgekeerde buite ∠ v kvh] OR $\hat{A}\hat{D}\hat{K} = \hat{K}\hat{S}\hat{R} = 90^\circ - x$ [∠s in the same segment/ ∠e in dies. segment] $\hat{R}_1 = \hat{R}_2 = 90^\circ$ [line from centre to midpt of chord/ lyn vanuit midpt na midpt van koord] $\hat{B}\hat{O}\hat{R} = 90^\circ - x$ [sum of ∠s in a Δ/ binne ∠e v Δ] $\therefore \hat{B}\hat{O}\hat{R} = \hat{K}\hat{S}\hat{R} = 90^\circ - x$ $\therefore$ OKSR is a cyclic quadrilateral [converse ext ∠ of cyclic quad/ omgekeerde buite ∠ v kvh]	✓ S ✓ R ✓ R (3) ✓ S ✓ R ✓ R (3) ✓ S ✓ R ✓ R (3)
[12]		

QUESTION/VRAAG 11



11.1	In $\triangle ADE$ and $\triangle ABC$ 1. $\hat{A}_2 = \hat{A}_2$ [common/gemeenskaplik] 2. $\hat{A}_1 = \hat{E}_1$ [tan chord theorem/raaklyn koord st] $\hat{A}_1 = \hat{C}_1$ [tan chord theorem/ raaklyn koord st] $\therefore \hat{E}_1 = \hat{C}_1$ 3. $\hat{A}_3 = \hat{D}_1$ [tan chord theorem/ raaklyn koord st] $\hat{A}_3 = \hat{B}$ [tan chord theorem/ raaklyn koord st] $\therefore \hat{D}_1 = \hat{B}$ $\therefore \triangle ADE \parallel \triangle ABC$ [$\angle \angle \angle$]	✓ S ✓ S ✓ R ✓ S OR R (4)
11.2	$\hat{D}_1 = \hat{B}$ $DE \parallel BC$ [corresp $\angle$s =/ooreenk. $\angle$e =] $\frac{AD}{DB} = \frac{AE}{EC}$ [prop theorem; $DE \parallel BC$/eweredige st.; $DE \parallel BC$] OR [line $\parallel$ one side of $\triangle$/lyn $\parallel$ een sy v $\triangle$] $\frac{1k}{2k} = \frac{4}{EC}$ $\therefore EC = 8$ OR $\frac{AD}{AB} = \frac{AE}{AC}$ [$\triangle ADE \parallel \triangle ABC$] $\frac{1k}{3k} = \frac{4}{AC}$ [$AB = 3AD$] $AC = 12$ $\therefore EC = 12 - 4$ $\therefore EC = 8$	✓ S/R ✓ S ✓ R ✓ answer (4) ✓ S ✓ R ✓ AC ✓ answer (4)

11.3	In $\triangle ECH$ and $\triangle CBA$ $\hat{E}_3 = \hat{C}_1$ [alt $\angle$ s; $BC \parallel DE$/verw. $\angle$ e; $BC \parallel DE$] $\hat{C}_2 = \hat{B}$ [tan chord theorem/raaklyn koord st.] $\hat{H}_1 = \hat{A}_2$ [sum of $\angle$ s in a $\triangle$ / binne $\angle$ e v $\triangle$] $\therefore \triangle ECH \parallel \triangle CBA$ [$\angle \angle \angle$] $\therefore \frac{EH}{EC} = \frac{CA}{CB}$	✓ S/R ✓ S ✓ R ✓ S OR R (4)
11.4	$\frac{EH}{EC} = \frac{CA}{CB}$ [proved in 11.3] $EC = \frac{EH \cdot BC}{AC}$ $\frac{EC}{AC} = \frac{BD}{AB}$ [prop theorem; $DE \parallel BC$/eweredige st.; $DE \parallel BC$] OR [line $\parallel$ one side of $\triangle$/lyn $\parallel$ een sy v $\triangle$] $EC = \frac{AC \cdot BD}{AB}$ $EC \times EC = \frac{EH \cdot BC}{AC} \times \frac{AC \cdot BD}{AB}$ $EC^2 = \frac{EH \cdot BC \cdot DB}{AB}$ $EC^2 = \frac{EH \cdot BC \cdot DB}{3AD}$ [AD: AB = 1:3] $EC = \sqrt{\frac{EH \cdot BC \cdot DB}{3AD}}$ OR $\frac{EH}{EC} = \frac{CA}{CB}$ [proved in 11.3] $EC = \frac{EH \cdot BC}{AC}$ $\frac{EC}{AC} = \frac{BD}{AB}$ [prop theorem; $DE \parallel BC$/eweredige st.; $DE \parallel BC$] OR [line $\parallel$ one side of $\triangle$/lyn $\parallel$ een sy v $\triangle$] $AC = \frac{AB \cdot EC}{BD}$	✓ S ✓ S / R ✓ S ✓ S ✓ S (5) ✓ S ✓ S / R ✓ S

$EC = \frac{EH \cdot BC}{AB \cdot EC}$ $EC = \frac{EH \cdot BC \cdot DB}{AB \cdot EC}$ $EC^2 = \frac{EH \cdot BC \cdot DB}{3AD}$ $EC = \sqrt{\frac{EH \cdot BC \cdot DB}{3AD}}$ OR $\frac{AD}{AB} = \frac{AE}{AC} \quad [\triangle ADE \parallel \triangle ABC]$ $AB = \frac{AD \cdot AC}{AE}$ $3AD = \frac{AD \cdot AC}{AE} \quad [AD: AB = 1:3]$ $3 = \frac{AC}{AE}$ $\frac{EH}{EC} = \frac{CA}{CB} \quad [\text{proved in 11.3}]$ $AC = \frac{EH \cdot BC}{EC}$ $\frac{AD}{DB} = \frac{AE}{EC} \quad [\text{prop theorem; } DE \parallel BC / \text{eweredige st.; } DE \parallel BC]$ OR [line $\parallel$ one side of Δ / lyn $\parallel$ een sy v Δ] $AE = \frac{AD \cdot EC}{DB}$ $\therefore 3 = \frac{EH \cdot BC \cdot DB}{EC \cdot AD \cdot EC}$ $3 EC^2 = \frac{EH \cdot BC \cdot DB}{AD}$ $EC = \sqrt{\frac{EH \cdot BC \cdot DB}{3AD}}$	[AD: AB = 1:3] (5) ✓ S ✓ S ✓ S ✓ S ✓ S ✓ S / R ✓ S (5)
	[17]

TOTAL/TOTAAL: 150