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

MATHEMATICS P2/WISKUNDE V2

MARKING GUIDELINES/NASIENRIGLYNE

MAY/JUNE/MEI/JUNIE 2024

**MARKS: 150
PUNTE: 150**

**These marking guidelines consist of 26 pages./
Hierdie nasienriglyne bestaan uit 26 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 did not redo 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 op '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	
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

1.1	$a = -43,72$ $b = 2,36$ $y = -43,72 + 2,36x$	✓ $a = -43,72$ ✓ $b = 2,36$ ✓ equation (3)
1.2	<p style="text-align: center;">Scatter plot</p>	✓ any correct two points ✓ straight line joining the points for $x \in [85 ; 160]$ (2)
1.3	$y = -43,72 + 2,36(110)$ $y = 215,88$ OR $y = 215,90$ (calculator)	✓ substitution ✓ answer (2) ✓✓ answer (2)
1.4	$y = -43,72 + 2,36(130)$ $y = 263,08$ Percentage increase in weight = $\frac{263,08 - 215,88}{215,88} \times 100$ = 21,86% OR $y = 263,08$ Percentage = $\frac{263,08}{215,88} \times 100$ = 121,86 % Percentage increase in weight = $121,86 - 100 = 21,86$	✓ y -value ✓ difference between y-values ✓ +ve answer (3) ✓ y -value ✓ difference between % ✓ +ve answer (3)
		[10]

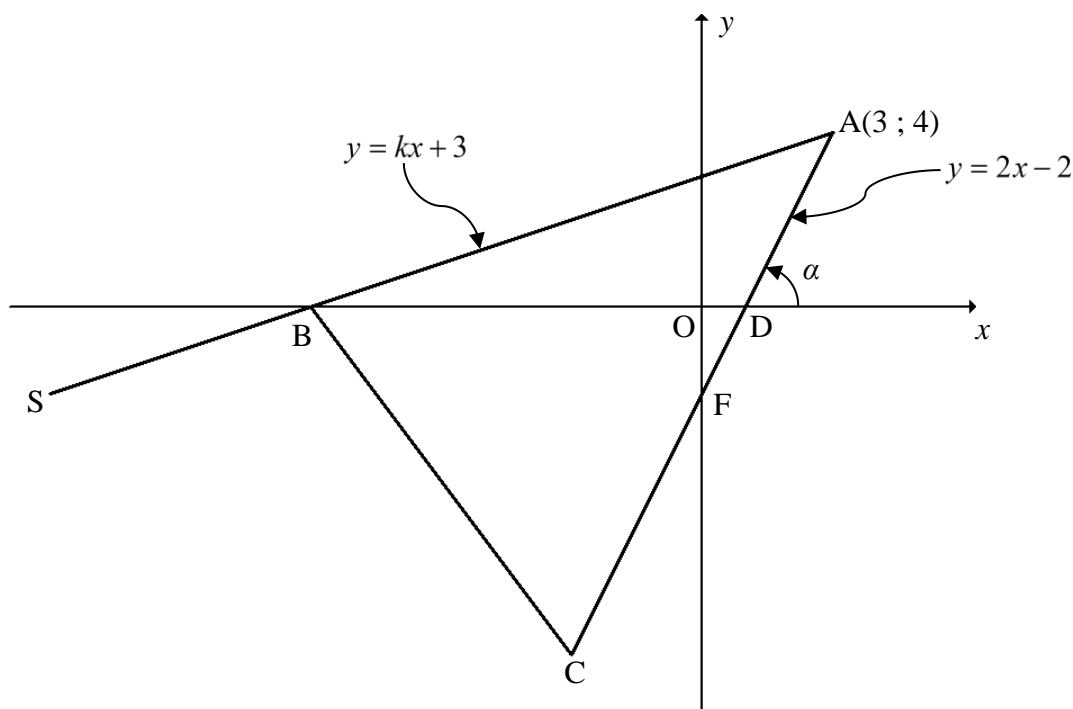
QUESTION/VRAAG 2

2.1	<table border="1"> <thead> <tr> <th>Distance (x km)</th><th>Frequency</th><th>Cumulative frequency</th></tr> </thead> <tbody> <tr> <td>$0 \leq x < 5$</td><td>3</td><td>3</td></tr> <tr> <td>$5 \leq x < 10$</td><td>7</td><td>10</td></tr> <tr> <td>$10 \leq x < 15$</td><td>20</td><td>30</td></tr> <tr> <td>$15 \leq x < 20$</td><td>12</td><td>42</td></tr> <tr> <td>$20 \leq x < 25$</td><td>5</td><td>47</td></tr> <tr> <td>$25 \leq x < 30$</td><td>3</td><td>50</td></tr> </tbody> </table>	Distance (x km)	Frequency	Cumulative frequency	$0 \leq x < 5$	3	3	$5 \leq x < 10$	7	10	$10 \leq x < 15$	20	30	$15 \leq x < 20$	12	42	$20 \leq x < 25$	5	47	$25 \leq x < 30$	3	50	<p>✓ 10 ✓ all values correct</p> <p>(2)</p>
Distance (x km)	Frequency	Cumulative frequency																					
$0 \leq x < 5$	3	3																					
$5 \leq x < 10$	7	10																					
$10 \leq x < 15$	20	30																					
$15 \leq x < 20$	12	42																					
$20 \leq x < 25$	5	47																					
$25 \leq x < 30$	3	50																					
2.2	<p style="text-align: center;"><i>Ogive/Ogief</i></p>	<p>✓ grounding</p> <p>✓ plotting a min of 3 points (cf at upper limits)</p> <p>✓ smooth, increasing curve</p> <p>(3)</p>																					
2.3	<p>$Q_3 = 17,8$ $Q_1 = 11$</p> <p>IQR = 6,8</p>	<p>✓ Q_3 (accept between 17-19) and Q_1 (accept between 10-12,5)</p> <p>✓ answer (accept 5-9)</p> <p>(2)</p>																					

2.4	$5 \leq x < 10$	✓ $5 \leq x < 10$ (1)
2.5	<p>Estimated mean = $\frac{2,5(3) + 7,5(11) + 12,5(20) + 17,5(8) + 22,5(5) + 27,5(3)}{50}$</p> <p>$= \frac{675}{50}$</p> <p>$= 13,5 \text{ km}$</p>	<p>✓ new frequencies</p> <p>✓ $\sum fx$</p> <p>✓ answer (3)</p>
		[11]

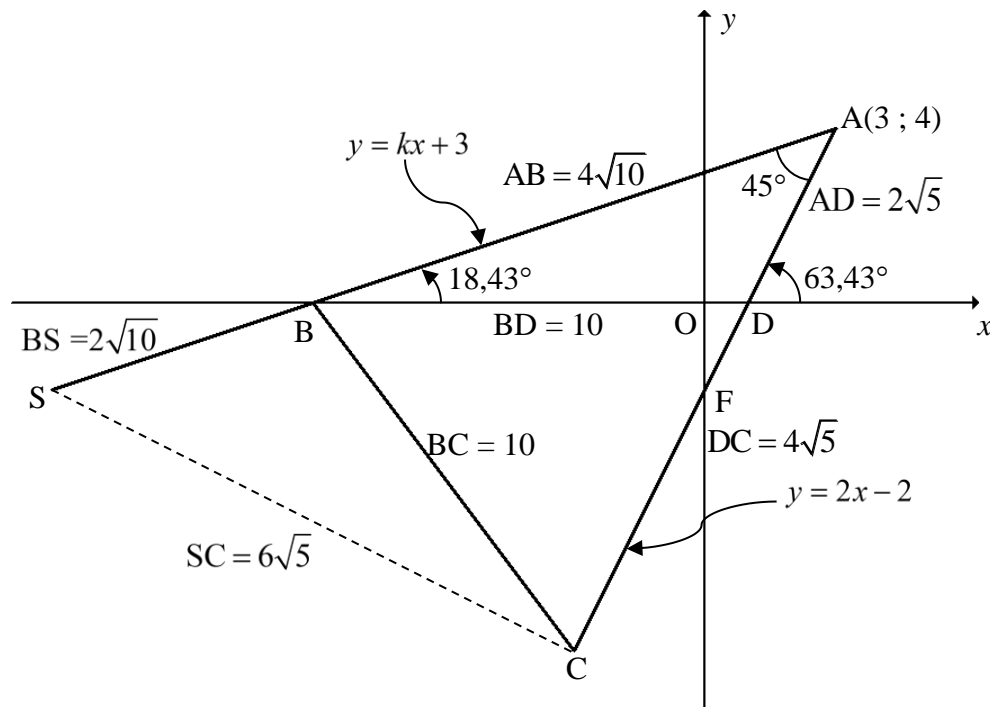


QUESTION/VRAAG 3



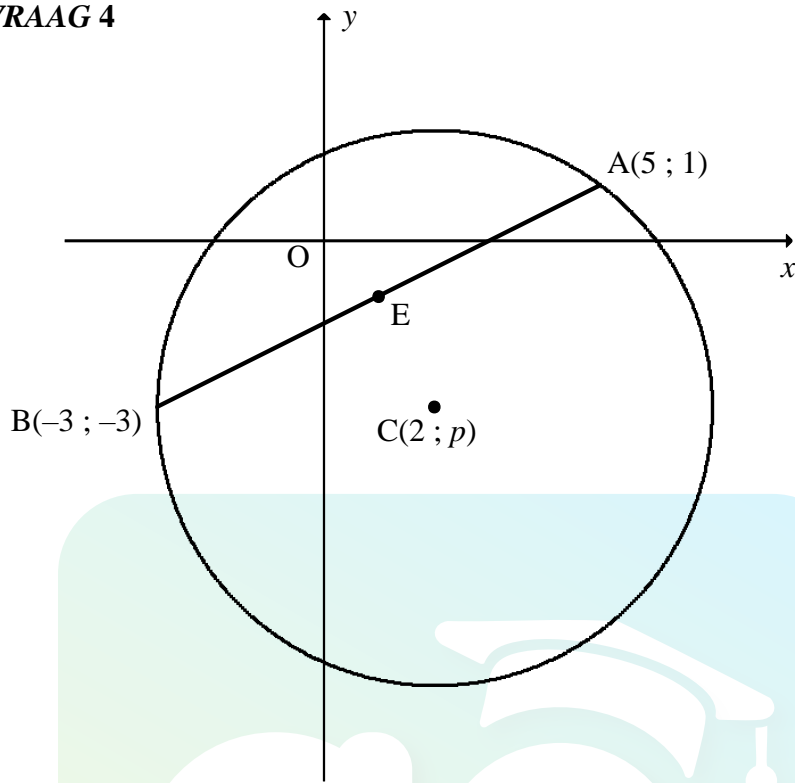
3.1	$y = kx + 3$ $4 = k(3) + 3$ $3k = 1$ $\therefore k = \frac{1}{3}$ OR y-intercept of AB: (0 ; 3) $m_{AB} = \frac{4-3}{3-0}$ $= \frac{1}{3}$ $\therefore k = \frac{1}{3}$	✓ substitution (3 ; 4) ✓ substitution (0 ; 3)	(1) (1)
3.2	$0 = \frac{1}{3}x + 3$ $-3 = \frac{1}{3}x$ $x = -9$ $B(-9 ; 0)$	✓ $y = 0$ ✓ answer	 (2)

3.3	$F(0; -2)$ $F\left(\frac{x+3}{2}; \frac{y+4}{2}\right)$ $\frac{x+3}{2} = 0 \quad \frac{y+4}{2} = -2$ $x = -3 \quad y = -8$ $C(-3; -8)$ OR by translation $F(0; -2)$ $A \rightarrow F(x; y) \rightarrow (x-3; y-6)$ $F \rightarrow C(0; -2) \rightarrow (0-3; -2-6) = (-3; -8)$	$\checkmark F(0; -2)$ $\checkmark \frac{x+3}{2} = 0; \frac{y+4}{2} = -2$ $\checkmark x\text{-value} \quad \checkmark y\text{-value}$ <p style="text-align: right;">(4)</p> $\checkmark F(0; -2)$ $\checkmark (x-3; y-6)$ $\checkmark x\text{-value} \quad \checkmark y\text{-value}$ <p style="text-align: right;">(4)</p>
3.4	$m_{BC} = \frac{0 - (-8)}{-9 - (-3)} \quad \text{OR} \quad m_{BC} = \frac{-8 - 0}{-3 - (-9)}$ $m_{BC} = -\frac{4}{3}$ $y = -\frac{4}{3}x + c$ $(-2) = -\frac{4}{3}(-15) + c$ $c = -22$ $y = -\frac{4}{3}x - 22$ OR $m_{BC} = \frac{0 - (-8)}{-9 - (-3)} \quad \text{OR} \quad m_{BC} = \frac{-8 - 0}{-3 - (-9)}$ $m_{BC} = -\frac{4}{3}$ $y - y_1 = -\frac{4}{3}(x - x_1)$ $y - (-2) = -\frac{4}{3}(x - (-15))$ $y + 2 = -\frac{4}{3}x - 20$ $y = -\frac{4}{3}x - 22$	\checkmark substitution of B and C into the gradient formula $\checkmark m_{BC}$ $\checkmark m_{\text{line}} = m_{BC}$ \checkmark substitution of $S(-15; -2)$ \checkmark equation <p style="text-align: right;">(5)</p> \checkmark substitution into the gradient formula $\checkmark m_{BC}$ $\checkmark m_{\text{line}} = m_{BC}$ \checkmark substitution of $S(-15; -2)$ \checkmark equation <p style="text-align: right;">(5)</p>



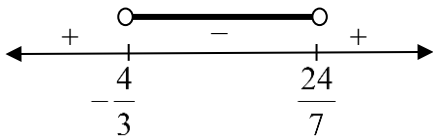
3.5	$\tan \alpha = m_{AC} = 2$ $\alpha = 63,43^\circ$ $\tan \hat{A}BD = m_{AS} = \frac{1}{3}$ $\hat{A}BD = 18,43^\circ$ $\hat{B}AC = \alpha - \hat{A}BD$ $\hat{B}AC = 63,43^\circ - 18,43^\circ$ $\hat{B}AC = 45^\circ$ OR $AB = \sqrt{(-9-3)^2 + (0-4)^2}$ $AB = 4\sqrt{10}$ $BD = 10$ $AD = \sqrt{(3-1)^2 + (4-0)^2}$ $AD = 2\sqrt{5}$ $BD^2 = AB^2 + AD^2 - 2AB \cdot AD \cos \hat{B}AC$ $(10)^2 = (4\sqrt{10})^2 + (2\sqrt{5})^2 - 2(4\sqrt{10})(2\sqrt{5}) \cos \hat{B}AC$ $\cos \hat{B}AC = \frac{\sqrt{2}}{2}$ $\hat{B}AC = 45^\circ$	$\checkmark \tan \alpha = m_{AC} = 2$ $\checkmark \alpha = 63,43^\circ$ $\checkmark \tan \hat{A}BD = m_{AS} = \frac{1}{3}$ $\checkmark \hat{A}BD = 18,43^\circ$ \checkmark answer \checkmark length of AB \checkmark calculation of remaining 2 lengths \checkmark substitution into cosine-rule \checkmark rewriting in terms of $\cos \hat{B}AC$ \checkmark answer (5)
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QUESTION/VRAAG 4



4.1	$E\left(\frac{5+(-3)}{2}; \frac{1+(-3)}{2}\right)$ $\therefore E(1; -1)$	$\checkmark x=1 \quad \checkmark y=-1$ <p>(2)</p>
4.2	$AB = \sqrt{(x_A - x_B)^2 + (y_A - y_B)^2}$ $AB = \sqrt{(5 - (-3))^2 + (1 - (-3))^2}$ $AB = \sqrt{80} = 4\sqrt{5} = 8,94 \text{ units}$	$\checkmark AB = \sqrt{80} = 4\sqrt{5} = 8,94$ <p>(1)</p>
4.3	$m_{AB} = \frac{1 - (-3)}{5 - (-3)}$ $m_{AB} = \frac{1}{2}$ $\therefore m_{CE} = -2 \quad [CE \perp AB]$ $E(1; -1)$ $y = -2x + c$ $(-1) = -2(1) + c$ $c = 1$ $y = -2x + 1$ <p style="text-align: center;">OR</p> $y - y_1 = -2(x - x_1)$ $y - (-1) = -2(x - 1)$ $y = -2x + 1$	$\checkmark m_{AB} = \frac{1}{2}$ $\checkmark m_{CE}$ <p>✓ substitution of E</p> <p>✓ equation</p> <p>(4)</p>

4.4	$y = -2x + 1$ $p = -2(2) + 1$ $p = -3$ OR $m_{CE} = -2$ $\frac{p - (-1)}{2 - 1} = -2$ $p + 1 = -2$ $p = -3$	✓ substitution of C(2 ; p) into \perp bisector of AB (1) ✓ substitution of C and E into the gradient formula (1)
4.5	$BC = r = 5$ units $\therefore (x - 2)^2 + (y + 3)^2 = 25$ $x^2 - 4x + 4 + y^2 + 6y + 9 = 25$ $x^2 + y^2 - 4x + 6y - 12 = 0$	✓ $BC = r = 5$ units ✓ $(x - 2)^2 + (y + 3)^2 = r^2$ ✓ $x^2 - 4x + 4 + y^2 + 6y + 9 = 25$ (4)

4.6	$(x - 2)^2 + (y + 3)^2 = 25$ $y = tx + 8$ $(x - 2)^2 + (tx + 8 + 3)^2 = 25$ $x^2 - 4x + 4 + t^2x^2 + 22tx + 121 - 25 = 0$ $x^2(t^2 + 1) + x(22t - 4) + 100 = 0$ $\Delta < 0$ $(22t - 4)^2 - 4(t^2 + 1)(100) < 0$ $484t^2 - 176t + 16 - 400t^2 - 400 < 0$ $84t^2 - 176t - 384 < 0$ $21t^2 - 44t - 96 < 0$ $(7t - 24)(3t + 4) < 0$ CV: $\frac{24}{7}$; $-\frac{4}{3}$  $\therefore t \in \left(-\frac{4}{3} ; \frac{24}{7}\right)$ OR $-\frac{4}{3} < t < \frac{24}{7}$	✓ substitution of $y = tx + 8$ ✓ standard form ✓ $\Delta < 0$ ✓ standard form of Δ ✓ critical values ✓ answer (6)
		[18]

QUESTION/VRAAG 5

5.1.1	$\sin 220^\circ$ $= -\sin 40^\circ$ $= -p$	✓ $-\sin 40^\circ$ ✓ answer (2)
5.1.2	$\cos^2 50^\circ$ $= \sin^2 40^\circ$ $= p^2$	✓ $\sin^2 40$ ✓ answer (2)
5.1.3	$\cos(-80^\circ)$ $= \cos 80^\circ$ $= 1 - 2\sin^2 40^\circ$ $= 1 - 2p^2$ OR $\cos(-80^\circ)$ $= \cos 80^\circ$ $= \cos(30^\circ + 50^\circ)$ $= \cos 30^\circ \cos 50^\circ - \sin 30^\circ \sin 50^\circ$ $= \frac{\sqrt{3}p}{2} - \frac{\sqrt{1-p^2}}{2}$	✓ $\cos 80^\circ$ ✓ double angle ✓ answer (3) ✓ $\cos 80^\circ$ ✓ expansion ✓ answer (3)
5.2.1	$\text{LHS} = \tan x(1 - \cos^2 x) + \cos^2 x$ $= \frac{\sin x}{\cos x}(\sin^2 x) + \cos^2 x$ $= \frac{\sin^3 x + \cos^3 x}{\cos x}$ $= \frac{(\sin x + \cos x)(\sin^2 x - \sin x \cos x + \cos^2 x)}{\cos x}$ $= \frac{(\sin x + \cos x)(1 - \sin x \cos x)}{\cos x}$ $= \text{RHS}$ OR	✓ $\frac{\sin x}{\cos x}$ ✓ $\sin^2 x$ ✓ simplification ✓ factorisation of cubes ✓ $\sin^2 x + \cos^2 x = 1$ (5)

	$\begin{aligned} \text{RHS} &= \frac{(\sin x + \cos x)(1 - \sin x \cos x)}{\cos x} \\ &= \frac{\sin x - \sin^2 x \cos x + \cos x - \sin x \cos^2 x}{\cos x} \\ &= \tan x - \sin^2 x + 1 - \sin x \cos x \\ &= \tan x + \cos^2 x - \sin x \cos x \\ &= \tan x \left(1 - \frac{\sin x \cos x}{\tan x} \right) + \cos^2 x \\ &= \tan x \left(1 - \frac{\sin x \cos x}{\frac{\sin x}{\cos x}} \right) + \cos^2 x \\ &= \tan x (1 - \cos^2 x) + \cos^2 x \\ &= \text{LHS} \end{aligned}$	<p>✓ multiplication</p> <p>✓ \div by $\cos x$</p> <p>✓ $-\sin^2 x + 1 = \cos^2 x$</p> <p>✓ factorisation</p> <p>✓ $\tan x = \frac{\sin x}{\cos x}$</p> <p>(5)</p>
5.2.2	<p>$\cos x = 0$ or where $\tan x$ is undefined</p> <p>$x = 90^\circ + k \cdot 360^\circ$ or $x = 270^\circ + k \cdot 360^\circ$</p> <p>$x = 90^\circ$ or $x = -90^\circ$</p>	<p>✓ $\cos x = 0$ or $\tan x$ undefined</p> <p>✓ $x = 90^\circ$ ✓ $x = -90^\circ$</p> <p>(3)</p>
5.3.1	$\begin{aligned} &\frac{\sin 150^\circ + \cos^2 x - 1}{2} \\ &= \frac{\sin 30^\circ + \cos^2 x - 1}{2} \\ &= \frac{\frac{1}{2} - (1 - \cos^2 x)}{2} \\ &= \left(\frac{1}{2} - \sin^2 x \right) \times \frac{1}{2} \\ &= \frac{1 - 2\sin^2 x}{4} \\ &= \frac{\cos 2x}{4} \end{aligned}$	<p>✓ $\sin 30^\circ$</p> <p>✓ $\sin 30^\circ = \frac{1}{2}$ ✓ factor</p> <p>✓ $1 - \cos^2 x = \sin^2 x$</p> <p>✓ simplification</p> <p>✓ answer in terms of $\cos 2x$</p> <p>(6)</p>
5.3.2	$\begin{aligned} \frac{\sin 150^\circ + \cos^2 x - 1}{2} &= \frac{1}{25} \\ \frac{\cos 2x}{4} &= \frac{1}{25} \\ \cos 2x &= \frac{4}{25} \\ \text{ref } \angle &= 80,79\dots^\circ \\ 2x &= 80,79\dots^\circ + k \cdot 360^\circ \quad \text{or} \quad 2x = 279,20\dots^\circ + k \cdot 360^\circ \\ x &= 40,40^\circ + k \cdot 180^\circ \quad \text{or} \quad x = 139,60^\circ + k \cdot 180^\circ \quad ; k \in \mathbb{Z} \end{aligned}$	<p>✓ answer 5.3.1 = $\frac{1}{25}$</p> <p>✓ $2x = 80,79^\circ$</p> <p>✓ $2x = 279,20\dots^\circ$</p> <p>✓ $x = 40,40^\circ$ and $x = 139,60^\circ$</p> <p>✓ $+ k \cdot 180^\circ$; $k \in \mathbb{Z}$</p> <p>(5)</p>

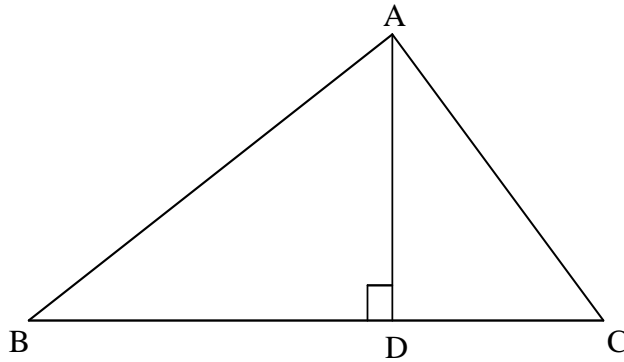
	<p>OR</p> $\frac{\sin 150^\circ + \cos^2 x - 1}{2} = \frac{1}{25}$ $\sin 150^\circ + \cos^2 x - 1 = \frac{2}{25}$ $\sin 30^\circ + \cos^2 x - 1 = \frac{2}{25}$ $\cos^2 x = \frac{29}{50}$ $\cos x = \pm \sqrt{\frac{29}{50}}$ $x = 40,40^\circ + k.360^\circ \quad \text{or} \quad x = 319,60^\circ + k.360^\circ ; k \in \mathbb{Z}$ <p>or</p> $x = 139,60^\circ + k.360^\circ \quad \text{or} \quad x = 220,40^\circ + k.360^\circ ; k \in \mathbb{Z}$	$\checkmark \cos^2 x = \frac{29}{50}$ $\checkmark x = 40,40^\circ \quad \checkmark x = 139,60^\circ$ $\checkmark x = 220,40^\circ \text{ and } x = 319,60^\circ$ $\checkmark + k.360^\circ ; \quad k \in \mathbb{Z}$ <p>(5)</p>
		[26]

QUESTION/VRAAG 6

6.1	Period = 360°	✓ 360° (1)
6.2	Amplitude = 1	✓ 1 (1)
6.3	$a = -45^\circ$	✓ $a = -45^\circ$ (1)
6.4	$\sin 2x = k$ $k = \sin(2 \times 165^\circ)$ OR $k = \sin(2 \times (-75^\circ))$ $k = \sin 330^\circ$ $k = \sin(-150^\circ)$ $k = -\sin 30^\circ$ $k = -\frac{1}{2}$ OR $k = \cos(165^\circ - 45^\circ)$ OR $k = \cos(-75^\circ - 45^\circ)$ $k = \cos 120^\circ$ $k = \cos(-120^\circ)$ $k = -\cos 60^\circ$ $k = -\frac{1}{2}$	✓ $-\sin 30^\circ$ ✓ $-\frac{1}{2}$ ✓ $-\cos 60^\circ$ ✓ $-\frac{1}{2}$ (2)
6.5	Points of intersection are translated 60° to the left $x = -15^\circ$	✓ $x = -15^\circ$ (1)
6.6	$\sqrt{2} \sin 2x = \sin x + \cos x$ $\sin 2x = \frac{1}{\sqrt{2}} \sin x + \frac{1}{\sqrt{2}} \cos x$ $\sin 2x = \sin 45^\circ \sin x + \cos 45^\circ \cos x$ $\sin 2x = \cos(45^\circ - x)$ OR $\sin 2x = \cos(x - 45^\circ)$ $\therefore 2$ roots in the interval $x \in [-90^\circ; 90^\circ]$	✓ division by $\sqrt{2}$ ✓ special angles ✓ $\cos(45^\circ - x)$ or $\cos(x - 45^\circ)$ ✓ answer (4)
		[10]

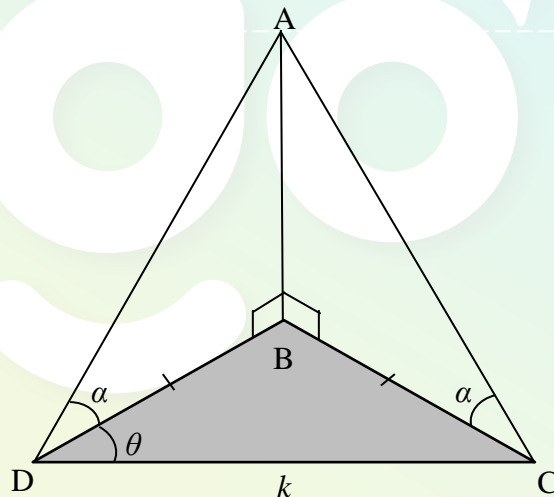
QUESTION/VRAAG 7

7.1



7.1.1	$\sin \hat{B} = \frac{AD}{AB}$ $AD = AB \sin \hat{B}$	$\checkmark \sin \hat{B} = \frac{AD}{AB}$ \checkmark answer (2)
7.1.2	$\text{Area of } \triangle ABC = \frac{1}{2}(BC)(AD)$ $\therefore \text{Area of } \triangle ABC = \frac{1}{2}(BC)(AB) \sin \hat{B}$	$\checkmark \frac{1}{2}(BC)(AD)$ (1)

7.2



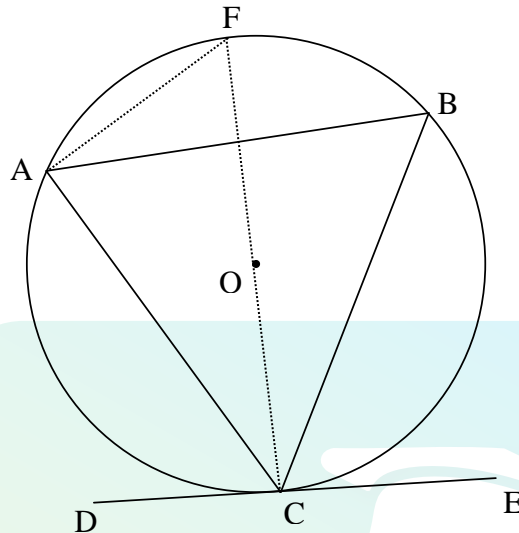
7.2.1	<p>In $\triangle ADB$</p> $\sin \alpha = \frac{AB}{AD}$ $AD = \frac{AB}{\sin \alpha}$ <p>In $\triangle ABC$</p> $\sin \alpha = \frac{AB}{AC}$ $AC = \frac{AB}{\sin \alpha}$ <p>$AD = AC$ OR In $\triangle ADB$ and $\triangle ACB$</p>	$\checkmark \sin \alpha = \frac{AB}{AD}$ $\checkmark \sin \alpha = \frac{AB}{AC}$ (2)
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	<p> $AB = AB$ [common side] $\hat{A}BD = \hat{A}BC = 90^\circ$ [given] $BD = BC$ [given] $\triangle ADB \equiv \triangle ACB$ [S\angleS] $\therefore AD = AC$ </p> <p>OR</p> <p> In $\triangle ADB$ and $\triangle ACB$ $\hat{A}DB = \hat{A}CB = \alpha$ [given] $\hat{A}BD = \hat{A}BC = 90^\circ$ [given] $AB = AB$ OR $BD = BC$ [common side OR given] $\therefore \triangle ADB \equiv \triangle ACB$ [$\angle\angle$S] $\therefore AD = AC$ </p> <p>OR</p> <p> $AD^2 = AB^2 + DB^2$ [Pythagoras] $AC^2 = AB^2 + BC^2$ [Pythagoras] But $DB = BC$ [given] $\therefore AD^2 = AC^2$ $\therefore AD = AC$ </p>	<p> $\checkmark \triangle ADB \equiv \triangle ACB$ \checkmark R (2) </p> <p> $\checkmark \triangle ADB \equiv \triangle ACB$ \checkmark R (2) </p> <p> \checkmark both Pythagoras statements $\checkmark DB = BC$ (2) </p>
7.2.2	<p> $\frac{BD}{\sin \theta} = \frac{k}{\sin(180^\circ - 2\theta)}$ $BD = \frac{k \sin \theta}{\sin 2\theta}$ $BD = \frac{k \sin \theta}{2 \sin \theta \cos \theta}$ $BD = \frac{k}{2 \cos \theta}$ </p> <p>OR</p> <p> $BC^2 = k^2 + BD^2 - 2k(BD)\cos \theta$ $BD^2 = k^2 + BD^2 - 2k(BD)\cos \theta$ $k^2 - 2k(BD)\cos \theta = 0$ $2k(BD)\cos \theta = k^2$ $\therefore BD = \frac{k}{2 \cos \theta}$ </p>	<p> \checkmark substitution of $(180^\circ - 2\theta)$ into sine rule \checkmark reduction \checkmark double angle (3) </p> <p> \checkmark substitution into cosine-rule \checkmark substitution BC with BD into cosine-rule \checkmark simplification in terms of BD (3) </p>

7.2.3	<p>Area of $\triangle BCD = \frac{1}{2}(DC)(BD)(\sin \hat{CDB})$</p> $= \frac{1}{2}k \left(\frac{k}{2\cos \theta} \right) \sin \theta$ $= \frac{1}{4}k^2 \tan \theta$ <p>OR</p> <p>Area of $\triangle BCD = \frac{1}{2}(BD)(BC)(\sin(180^\circ - 2\theta))$</p> $= \frac{1}{2} \left(\frac{k}{2\cos \theta} \right) \left(\frac{k}{2\cos \theta} \right) (\sin 2\theta)$ $= \frac{2k^2 \sin \theta \cos \theta}{8\cos \theta \cos \theta}$ $= \frac{1}{4}k^2 \tan \theta$	<p>✓ substitution into area rule</p> <p>✓ $\frac{\sin \theta}{\cos \theta} = \tan \theta$</p> <p>✓ $\frac{1}{4}k^2 \tan \theta$</p> <p>(3)</p> <p>✓ substitution into area rule</p> <p>✓ $\frac{\sin \theta}{\cos \theta} = \tan \theta$</p> <p>✓ $\frac{1}{4}k^2 \tan \theta$</p> <p>(3)</p>
		[11]

QUESTION/VRAAG 8

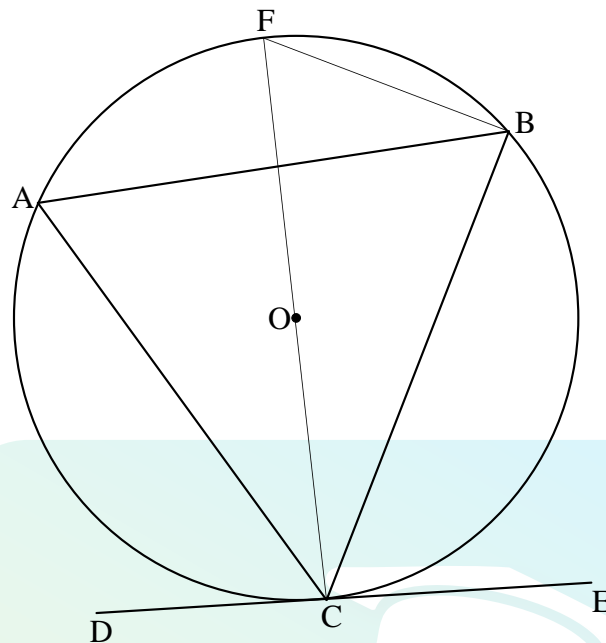
8.1



	<p>Construction: Draw diameter CF and draw AF <i>Konstruksie: Trek middellyn CF en verbind AF</i></p>	✓ Constr
	<p>$\hat{FCE} = 90^\circ$ [tan \perp radius/raaklyn \perp radius]</p>	✓ S ✓ R
	<p>$\hat{FAC} = 90^\circ$ [\angle in semi circle/\angle in halwe sirkel]</p>	✓ S/R
	<p>$\hat{FAB} = \hat{FCB}$ [\angles same segment/\anglee dieselfde segm]</p>	✓ S/R
	<p>$\therefore \hat{BAC} = \hat{BCE}$ $\therefore \hat{BCE} = \hat{A}$</p>	(5)

OR

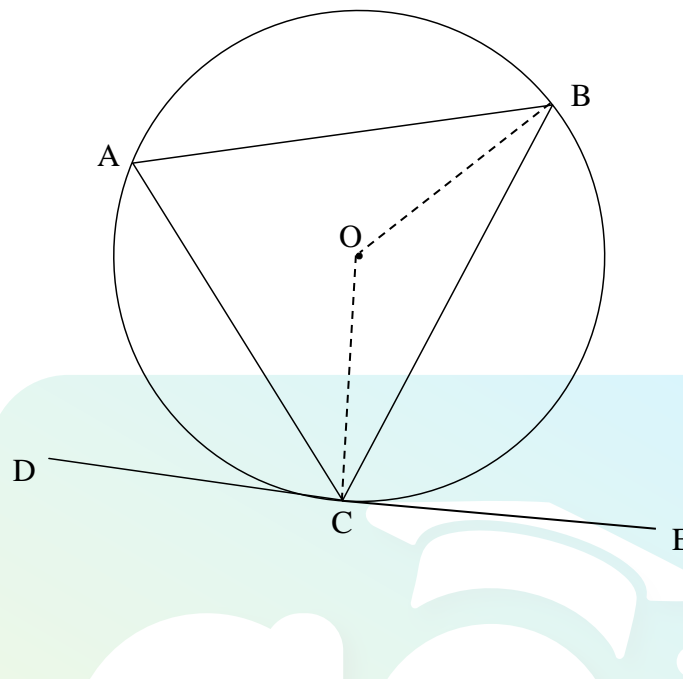
8.1



	<p>Construction: Draw diameter CF and draw FB <i>Konstruksie: Trek middellyn CF en verbind FB</i></p> <p>$\hat{FBC} = 90^\circ$ [∠ in semi circle/∠ in halwe sirkel] $\hat{BFC} + \hat{FCB} = 90^\circ$ [sum of ∠s in Δ/binne ∠e v Δ]</p> <p>$\hat{OCE} = 90^\circ$ [tan ⊥ radius/ raaklyn ⊥ radius] $\therefore \hat{BCE} = \hat{F}$ but $\hat{A} = \hat{F}$ [∠s in same seg/∠ in dies. segment] $\therefore \hat{BCE} = \hat{A}$</p>	<p>✓ construction</p> <p>✓ S / R</p> <p>✓ S ✓ R</p> <p>✓ S / R</p> <p>(5)</p>
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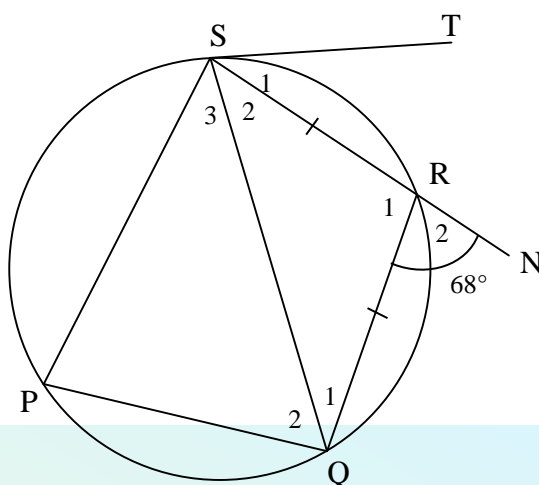
OR

8.1



	<p>Construction: Draw radii BO and OC <i>Konstruksie: Trek radiusse BO en OC</i></p> <p>$\hat{OCE} = 90^\circ$ or $\hat{BCE} = 90^\circ - \hat{OCB}$ [tan \perp radius / <i>raaklyn \perp radius</i>]</p> <p>$\hat{OCB} = \hat{OBC}$ [\angles opp equal sides/ <i>\anglee teenoor gelyke sye</i>]</p> <p>$\therefore \hat{COB} = 180^\circ - 2\hat{OCB}$ [\angles of Δ/<i>\anglee van Δ</i>]</p> <p>$\hat{CAB} = 90^\circ - \hat{OCB}$ [\angle at centre = $2 \times \angle$ circumf/ <i>midpts \angle = $2 \times$ omtreks \angle</i>]</p> <p>$\therefore \hat{BCE} = \hat{CAB}$</p>	<p>✓ construction</p> <p>✓ S ✓R</p> <p>✓ S</p> <p>✓ S/R</p>
		(5)

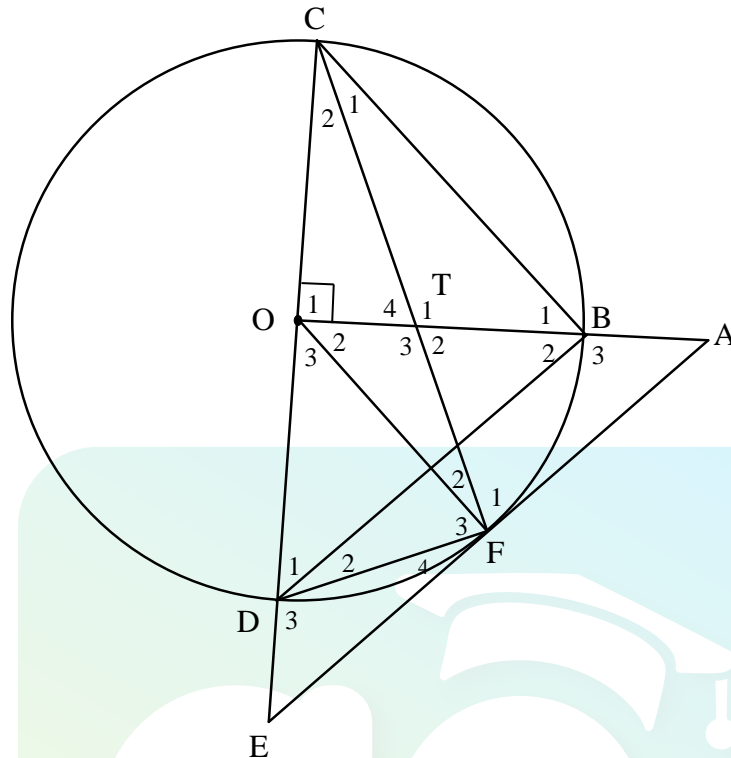
8.2



8.2.1	$\hat{P} = \hat{R}_2 = 68^\circ$ [ext \angle of cyclic quad / buite \angle van kvh]	✓ S ✓ R (2)
8.2.2	$\hat{Q}_1 = \hat{S}_2$ [\angle s opp equal sides / \angle e teenoor gelyke sye] $\hat{Q}_1 + \hat{S}_2 = 68^\circ$ [ext \angle of Δ / buite \angle van Δ] $\therefore \hat{Q}_1 = 34^\circ$	✓ S ✓ S (2)
8.2.3	$\hat{S}_1 = \hat{Q}_1 = 34^\circ$ [tan-chord theorem / \angle tussen rkl en koord]	✓ S ✓ R (2)
		[11]

9.3	<p>$\hat{F}_2 = 2\hat{D}_1 = 74^\circ$ OR $\hat{F}_2 = 2\hat{A}_2 = 74^\circ$ [\angle at centre = $2 \times \angle$ at circum./ midpt. $\angle s = 2 \times \text{omtreks} \angle$]</p> <p>$\frac{FG}{20} = \cos 74^\circ$ $FG = 5,51$ $\therefore BG = 14,49$ units</p> <p>OR</p> <p>$\hat{F}_2 = 2\hat{D}_1 = 74^\circ$ [\angle at centre = $2 \times \angle$ at circumference midpt. $\angle = 2 \times \text{omtreks} \angle$]</p> <p>$\frac{FG}{20} = \sin 16^\circ$ $FG = 5,51$ $\therefore BG = 14,49$ units</p> <p>OR</p> <p>$\frac{DG}{20} = \cos 16^\circ$ $DG = 19,23$</p> <p>$\frac{BG}{19,23} = \tan 37^\circ$ $BG = 14,49$ units</p> <p>OR</p> <p>$\frac{DG}{20} = \cos 16^\circ$ $DG = 19,23$</p> <p>$FG^2 = FD^2 - DG^2$ [Pythagoras] $FG^2 = 20^2 - (19,23)^2$ $FG = 5,51$</p> <p>$BG = 20 - 5,51$ $= 14,49$ units</p>	<p>✓ S</p> <p>✓ trig ratio</p> <p>✓ FG</p> <p>✓ answer (4)</p> <p>✓ S</p> <p>✓ trig ratio</p> <p>✓ FG</p> <p>✓ answer (4)</p> <p>✓ trig ratio</p> <p>✓ length of DG</p> <p>✓ trig ratio</p> <p>✓ answer (4)</p> <p>✓ trig ratio</p> <p>✓ length of DG</p> <p>✓ correct use of Pythagoras</p> <p>✓ answer (4)</p> <p>[12]</p>
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QUESTION/VRAAG 10



10.1	$\hat{O}_1 = 90^\circ$ $\hat{F}_2 + \hat{F}_3 = 90^\circ$ $\hat{O}_1 = \hat{F}_2 + \hat{F}_3 = 90^\circ$ \therefore TODF is a cyclic quad	[given/gegee] [\angle in semi circle/ \angle in halwe sirkel] [ext \angle = int opp \angle / buite \angle = teenoorst. binne \angle] OR [converse ext \angle of cyclic quad/ omgekeerde buite \angle v kvh]	\checkmark S \checkmark R \checkmark S \checkmark R	(4)
10.2	$\hat{T}_1 = \hat{T}_3$ But $\hat{D}_3 = \hat{T}_3$ $\therefore \hat{T}_1 = \hat{D}_3$	[vert opp \angle s =/ regoorstaande \angle e] [ext \angle of cyclic quad/ buite \angle v kvh]	\checkmark S / R \checkmark S \checkmark R	(3)
10.3	In $\triangle DFE$ and $\triangle TFO$ 1) $\hat{D}_3 = \hat{T}_3$ 2) $\hat{F}_4 = \hat{C}_2$ but $\hat{C}_2 = \hat{F}_2$ $\therefore \hat{F}_4 = \hat{F}_2$ 3) $\hat{E} = \hat{O}_2$ $\triangle TFO \parallel \triangle DFE$	[ext \angle of cyclic quad/ buite \angle v kvh] [tan-chord theorem/ \angle tussen rkl en koord] [\angle s opp equal sides/ \angle e teenoor gelyke sye] [3^{rd} \angle of \triangle / \angle e van \triangle] [$\angle \angle \angle$]	\checkmark S \checkmark S / R \checkmark S \checkmark S \checkmark S OR R	(5)

	<p>OR In $\triangle DFE$ and $\triangle TFO$</p> <p>1) $\hat{D}_3 = \hat{T}_3$ [ext \angle of cyclic quad/<i>buite \angle van Δ</i>]</p> <p>2) $\hat{F}_4 = \hat{C}_2$ [tan-chord theorem/<i>\angle tussen rkl en koord</i>] $\hat{F}_2 + \hat{F}_3 = 90^\circ$ [\angle in semi circle/<i>\angle in halwe sirkel</i>] $\hat{D}_1 + \hat{D}_2 = 90^\circ - \hat{C}_2$ [sum of \angles in Δ/ <i>binne \anglee van Δ</i>] $\hat{E} = 90^\circ - 2\hat{F}_4$ [ext \angle of Δ/ <i>buite \angle van Δ</i>] $\hat{O}_3 = 2\hat{C}_2$ [\angle at centre = $2 \times \angle$ at circumference/<i>midpt. \angles = $2 \times$ omtreks \angle</i>] $\hat{O}_2 = 90^\circ - 2\hat{F}_4$ [\angles on a str line/<i>\anglee op 'n reguitlyn</i>] $\hat{O}_2 = \hat{E}$</p> <p>3) $\therefore \hat{F}_4 = \hat{F}_2$ [3^{rd} \angle of Δ/ <i>\anglee van Δ</i>]</p> <p>$\triangle TFO \parallel \triangle DFE$ [$\angle \angle \angle$]</p>	<p>✓ S</p> <p>✓ S / R</p> <p>✓ S</p> <p>✓ S</p> <p>✓ S OR R (5)</p>
10.4	<p>$\hat{B}_2 = \hat{D}_1$ [\angles opp equal sides/<i>\anglee teenoor gelyke sye</i>] $\hat{B}_2 = \hat{E}$ [given/<i>gegee</i>] $\therefore \hat{D}_1 = \hat{E}$ $\therefore DB \parallel EA$ [corresp \angles = <i>ooreenkomstige \anglee gelyk</i>]</p>	<p>✓ S / R</p> <p>✓ R (2)</p>
10.5	<p>In $\triangle OEA$ $DB \parallel EA$ [proven/<i>reeds bewys</i>] $\frac{OD}{DE} = \frac{OB}{BA}$ [line \parallel one side of Δ/ <i>lyn \parallel een sy van Δ</i>]</p> <p>OR [<i>prop theorem; $DB \parallel EA$/ eweredigheid stelling; $DB \parallel EA$</i>]</p> <p>$\therefore DE = \frac{DO \cdot AB}{OB}$</p> <p>$\frac{FO}{FE} = \frac{TO}{DE}$ [$\triangle TFO \parallel \triangle DFE$]</p> <p>$DE = \frac{TO \cdot FE}{FO}$</p> <p>$\therefore \frac{DO \cdot AB}{OB} = \frac{TO \cdot FE}{FO}$</p> <p>$\therefore \frac{DO \cdot AB}{DO} = \frac{TO \cdot FE}{DO}$ [$DO = OB = FO$]</p> <p>$\therefore DO = \frac{TO \cdot FE}{AB}$</p>	<p>✓ R</p> <p>✓ S</p> <p>✓ S / R</p> <p>✓ S</p> <p>✓ S</p> <p>(5)</p>
		[19]

TOTAL/TOTAAL: 150