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Department:
Basic Education
REPUBLIC OF SOUTH AFRICA

**NATIONAL
SENIOR CERTIFICATE/
NASIONALE SENIOR
SERTIFIKAAT**

GRADE/GRAAD 12

MATHEMATICS P2/WISKUNDE V2
FEBRUARY/MARCH/FEBRUARIE/MAART 2018
MARKING GUIDELINES/NASIENRIGLYNE

MARKS/PUNTE: 150

These marking guidelines consist of 22 pages./
Hierdie nasienriglyne bestaan uit 20 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.

NOTA:

- As 'n kandidaat 'n vraag TWEE KEER beantwoord, merk slegs die EERSTE poging.
- As 'n kandidaat 'n antwoord van 'n vraag doodtrek en nie oordoen nie, merk die doodgetrekte poging.
- 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 a 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 the statement AND reason are both correct.
	Ken 'n punt toe as beide die bewering EN rede korrek is.

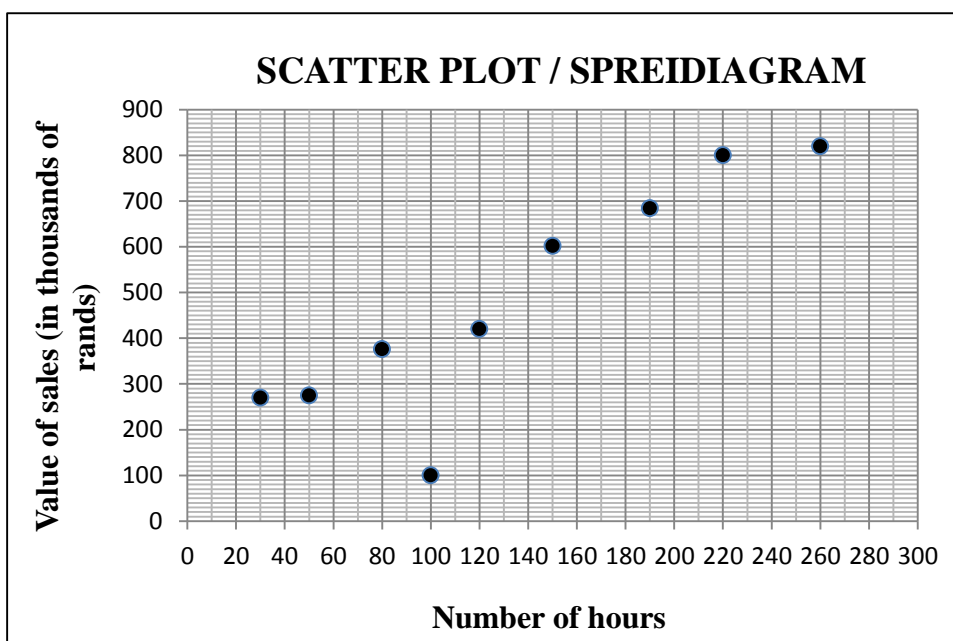
QUESTION/VRAAG 1

Days/Dae	1	2	3	4	5	6	7	8	9	10
Units of blood/ Eenhede bloed	45	59	65	73	79	82	91	99	101	106

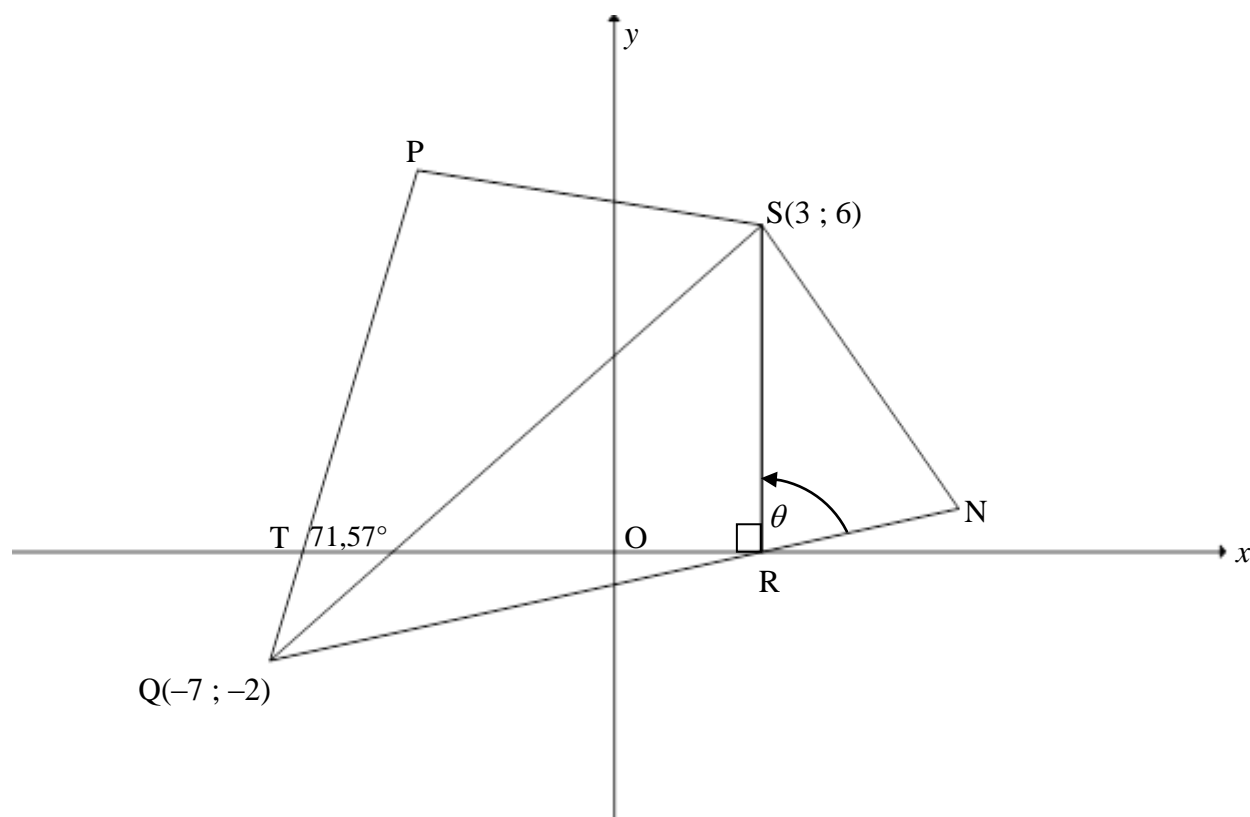
1.1.1	$\bar{x} = \frac{800}{10}$ $= 80$ <div>Answer only: full marks</div>	✓ 800 (addition of units) ✓ answer (CA if ÷ 10) (2)
1.1.2	$\sigma = 18,83$ <div>No penalty for rounding</div>	✓✓ answer (A) (2)
1.1.3	(61,17; 98,83) Days 1, 2, 8, 9 and 10 lie outside 1 standard deviation from the mean ∴ 5 days <div>Correct answer only: full marks provided that 1.1.1. & 1.1.2 both correct</div>	✓ mean – 1 SD ✓ mean + 1 SD ✓ answer (3)
1.2.1	Skewed to the left or negatively skewed/ <i>Skeef na links of negatief skeef</i>	✓ answer (1)
1.2.2	A = 65 B = 99 <div>Answers without labelling: 1/2</div>	✓ answer ✓ answer (2)
1.3	New total = $95 \times 10 = 950$ ∴ Units not counted = $950 - 800 = 150$	✓ answer (CA from 1.1.1) (1) [11]

QUESTION/VRAAG 2

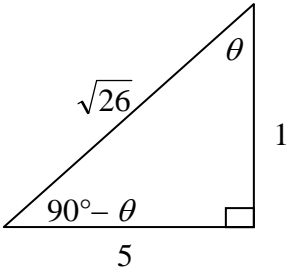
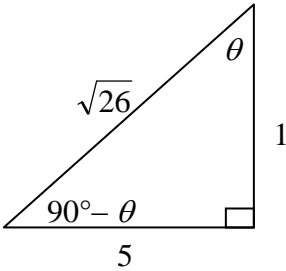
Number of hours Aantal uur	30	50	80	100	120	150	190	220	260
Value of sales (in thousands of rands) Waarde van verkope (in duisend rand)	270	275	376	100	420	602	684	800	820

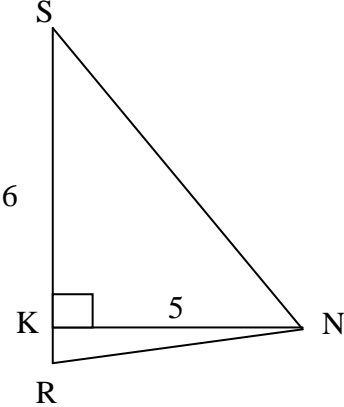


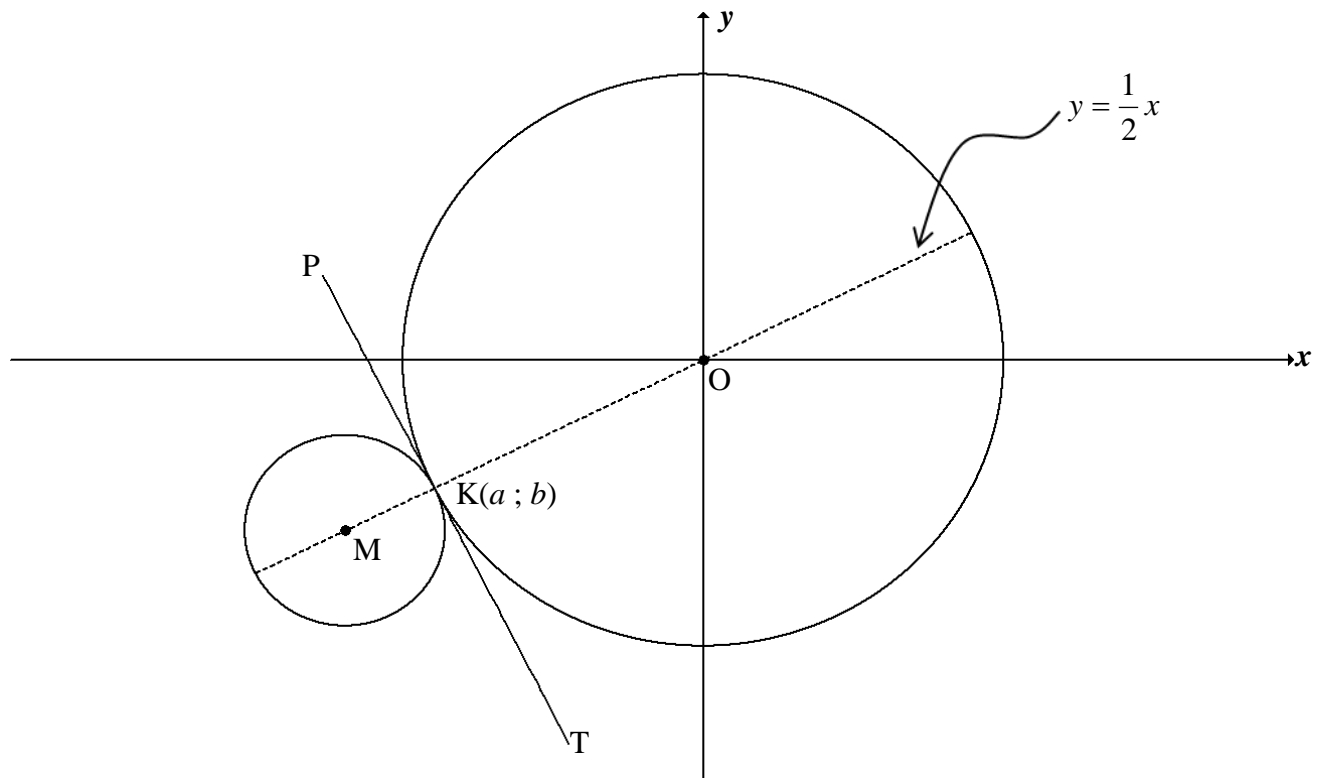
2.1	Outlier/Uitskieter: (100 ; 100)	accept: 100 as answer	✓ answer (1)
2.2	$a = 94,50273\dots$ $b = 2,913729\dots$ $\hat{y} = 94,50 + 2,91x$	Integral values: max 2/3 Swopped a and b : 2/3	✓ value of a ✓ value of b ✓ equation (3)
2.3	$\hat{y} = 2,91(240) + 94,50$ (CA from 2.1) $= 792,90$ Value = R793 000 OR/OF $\hat{y} = 793,7978142$ (calculator) Value = R794 000	Penalise 1 mark if answer not in thousands of Rands	✓ substitution ✓ answer in thousands of Rands (2) ✓✓ answer in thousands of Rands (2)
2.4	$b = 2,913729\dots$ \therefore R2 914 OR/OF R2 910 (calculator)	Answer only: full marks	✓ value of b ✓ answer (2) [8]

QUESTION/VRAAG 3

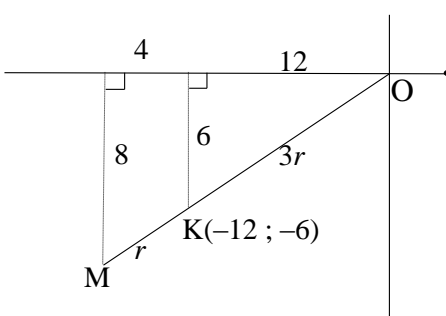
3.1	$x = 3$	✓ answer (1)
3.2	$m_{QP} = \tan 71,57^\circ$ $= 3$ <div style="border: 1px solid black; padding: 5px; display: inline-block; margin-left: 20px;">Answer only: full marks</div>	✓ $m_{QP} = \tan 71,57^\circ$ ✓ answer (2)
3.3	$y = mx + c$ $y - y_1 = m(x - x_1)$ $-2 = 3(-7) + c$ or $y + 2 = 3(x + 7)$ $y = 3x + 19$	(m CA from 3.2 if > 0) ✓ substitution of m & Q ✓ equation (2)
3.4	$R(3; 0)$ $QR = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$ $= \sqrt{(-7 - 3)^2 + (-2 - 0)^2}$ $= \sqrt{104}$ or $2\sqrt{26}$	(wrong R: CA if $x > 0$) ✓ substitution ✓ answer (in surd form) (2)

3.5	$\tan(90^\circ - \theta) = m_{QR}$ $= \frac{0 - (-2)}{3 - (-7)}$ $= \frac{1}{5}$ <div style="border: 1px solid black; padding: 5px; display: inline-block; margin-top: 10px;">Answer only: full</div> <div style="border: 1px solid black; padding: 5px; display: inline-block; margin-top: 10px;">$\tan \theta = \frac{1}{5} : 1/3$</div>	(wrong R: CA if $x > 0$) ✓ gradient of QR/RN/QN ✓ substitution of Q & R ✓ answer (3)
3.6	<div style="border: 1px solid black; padding: 5px; width: fit-content; margin-bottom: 10px;">using calculator: max 4 marks</div> $RN = \frac{1}{2} \cdot 2\sqrt{26} = \sqrt{26}$ $SR = 6$  $\text{Area } \triangle RSN = \frac{1}{2} SR \cdot RN \cdot \sin \theta$ $= \frac{1}{2} \times 6 \times \sqrt{26} \times \frac{5}{\sqrt{26}}$ $= 15 \text{ square units}$ <p>OR/OF</p> $RN = \frac{1}{2} \cdot 2\sqrt{26} = \sqrt{26}$ $SR = 6$  $\text{Area } \triangle RSN = \frac{1}{2} SR \cdot RN \cdot \sin \theta$ $= \frac{1}{2} (6) \left(\frac{1}{2} QP \right) \cdot \sin \theta$ $= \frac{3}{2} (\sqrt{104}) \cdot \sin \theta$ $= \frac{3}{2} (\sqrt{104}) \left(\frac{5}{\sqrt{26}} \right)$ $= 15 \text{ square units}$	✓ RN ✓ SR ✓ diagram (5 & $\sqrt{26}$) ✓ use of correct area rule ✓ substitution of $\sin \theta$ ✓ answer (6)

	<p>OR/OF</p> <p>SR = 6 \perp height = 5</p>  <p>$A = \frac{1}{2} SR \times \perp h$ $= \frac{1}{2} (6)(5)$ $= 30$ square units</p> <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>Using $A = \frac{1}{2} b \times \perp h$ incorrectly: max 1/6</p> </div>	<p>✓ SR ✓✓ \perp height</p> <p>✓ use of correct area formula ✓ substitution of $\sin \theta$ ✓ answer</p> <p style="text-align: right;">(6)</p> <p style="text-align: right;">[16]</p>
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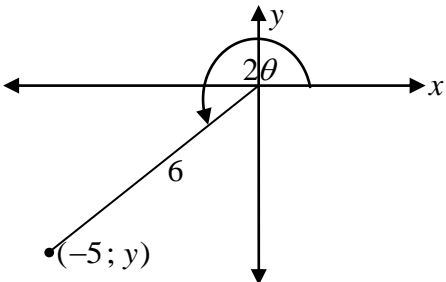
QUESTION/VRAAG 4

4.1	$OK = \sqrt{180}$ or $6\sqrt{5}$	✓ answer (1)
4.2	$a^2 + b^2 = 180$ $b = \frac{1}{2}a$ $a^2 + \left(\frac{1}{2}a\right)^2 = 180$ $a^2 + \frac{1}{4}a^2 = 180$ $a^2 = 144 \quad \therefore a = -12$ $b = \frac{1}{2}(-12)$ $K(-12; -6)$ (given) OR/OF $a^2 + b^2 = 180$ $a = 2b$ $(2b)^2 + b^2 = 180$ $5b^2 = 180$ $b^2 = 36 \quad \therefore b = -6$ $a = 2(-6)$ $K(-12; -6)$ (given)	✓ b in terms of a ✓ substitution ✓ $a^2 = 144$ ✓ substitution ✓ a in terms of b ✓ substitution ✓ $b^2 = 36$ ✓ substitution (4)

4.3.1	$m_{OK} = \frac{1}{2} \quad \left[y = \frac{1}{2}x \right]$ $m_{PT} = -2 \quad [\text{radius} \perp \text{tangent/raaklyn}]$ $y = mx + c \quad \text{OR/OF} \quad y - y_1 = m(x - x_1)$ $-6 = -2(-12) + c \quad y - (-6) = -2(x - (-12))$ $c = -30 \quad c = -30$ $y = -2x - 30$ <div style="border: 1px solid black; padding: 5px; margin: 10px auto; width: fit-content;"> Using $m = \frac{1}{2} : 0/3$ Using $m = -\frac{1}{2} \text{ or } 2 : 2/3$ </div>	✓ $m_{PT} = -2$ ✓ substitution of m & $K(-12; -6)$ ✓ equation (3)
4.3.2	$3MK = OK$ $\Rightarrow OM = \frac{4}{3} OK$ $M = \frac{4}{3}(-12; -6)$ <div style="border: 1px solid black; padding: 5px; margin: 10px auto; width: fit-content;">Answer only: 0/6</div> $\therefore M(-16; -8)$ <p>OR/OF</p> $3MK = OK$ $9MK^2 = OK^2 = 180$ $\therefore MK^2 = 20$ <p>Let $M(x; y)$, then :</p> $(x+12)^2 + (y+6)^2 = 20$ $(x+12)^2 + \left(\frac{1}{2}x+6\right)^2 = 20$ $x^2 + 24x + 144 + \frac{1}{4}x^2 + 6x + 36 = 20$ $\frac{5}{4}x^2 + 30x + 160 = 0$ $x^2 + 24x + 128 = 0$ $(x+16)(x+8) = 0$ $x = -16 \quad x \neq -8 \text{ [since M is outside the large circle]}$ $y = -8$ $M(-16; -8)$ <p>OR/OF</p> <div style="text-align: center;">  </div> $\therefore M(-16; -8)$ <p>OR/OF</p>	✓ $3MK = OK$ ✓ $OM = \frac{4}{3} OK$ ✓✓ $M = \frac{4}{3}(-12; -6)$ ✓ x -coordinate ✓ y -coordinate (6)

	$3MK = OK$ $9MK^2 = OK^2 = 180$ $\therefore MK^2 = 20$ Let $M(x; y)$, then $y = \frac{1}{2}x$: $(x+12)^2 + (y+6)^2 = 20$ $(x+12)^2 + \left(\frac{1}{2}x + 6\right)^2 = 20$ $4(x+12)^2 + (x+12)^2 = 80$ $(x+12)^2 = 16$ $x+12 = \pm 4$ $x = -16 \quad x \neq -8$ [since M is outside the large circle] $y = -8$ $M(-16; -8)$	$\checkmark 3MK = OK$ $\checkmark MK^2 = 20$ \checkmark equation \checkmark substitution \checkmark x-coordinate \checkmark y-coordinate (6)
4.3.3	$(x - (-16))^2 + (y - (-8))^2 = \left(\frac{1}{3}\sqrt{180}\right)^2$ $(x+16)^2 + (y+8)^2 = 20$	\checkmark LHS (CA from 4.3.2) \checkmark RHS (CA from 4.1) (2)
4.4	$OK < r < OK + 2KM$ $\sqrt{180} < r < \sqrt{180} + \frac{2}{3}\sqrt{180}$ $6\sqrt{5} < r < 10\sqrt{5}$ <div style="border: 1px solid black; padding: 5px; display: inline-block;"> Answer only: full marks (No need to simplify) </div>	$\checkmark\checkmark$ values \checkmark inequality (3)
4.5	$x^2 + 32x + (16)^2 + y^2 + 16y + (8)^2 = 256 + 64 - 240$ $(x+16)^2 + (y+8)^2 = 80$ New circle/ <i>nuwe sirkel</i> : Centre/ <i>middelpt</i> $(-16; -8)$ & $r = 4\sqrt{5}$ Original circle/ <i>oorspronklike sirkel</i> : $M(-16; -8)$ & $r = 2\sqrt{5}$ This circle will never cut the circle with centre M as they have the same centre (concentric circles) but unequal radii / <i>Hierdie sirkel sal nooit die sirkel met middelpnt M sny nie, want hulle is konsentries, want het dieselfde middelpunt met verskillende radii.</i>	\checkmark equation in centre, radius form \checkmark Centre: $(-16; -8)$ $\checkmark r = 4\sqrt{5}$ (new) $\checkmark r = 2\sqrt{5}$ (original) \checkmark conclusion (“concentric” must be stated) (5) [24]

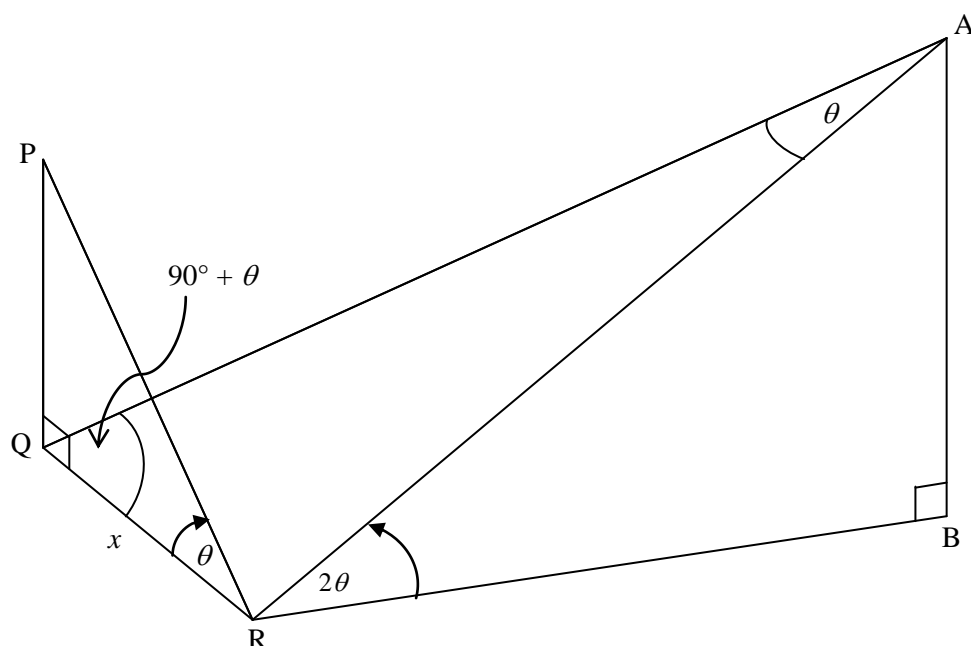
QUESTION/VRAAG 5

<p>5.1.1</p> <div style="border: 1px solid black; padding: 5px; width: fit-content; margin: 10px auto;">no calculator in 5.1</div>	<p>$\cos 2\theta = -\frac{5}{6}$, where $2\theta \in [180^\circ; 270^\circ]$</p>  <p>$y^2 = 6^2 - (-5)^2$ [Pythagoras] $y = \pm\sqrt{11}$ $(-5; y)$ is in 3rd quadrant: $\therefore y = -\sqrt{11}$ $\sin 2\theta = -\frac{\sqrt{11}}{6}$</p> <p>OR/OF</p> <div style="border: 1px solid black; padding: 5px; width: fit-content; margin: 10px auto;">Getting to $\sin 2\theta = \frac{\sqrt{11}}{6}$: 3/4</div> <p>$\sin^2 2\theta = 1 - \cos^2 2\theta$ $= 1 - \left(-\frac{5}{6}\right)^2$ $= 1 - \frac{25}{36}$ $= \frac{11}{36}$ $\sin 2\theta = -\frac{\sqrt{11}}{6}$</p>	<p>✓ diagram (3rd quadrant only)</p> <p>✓ using Pythagoras</p> <p>✓ y – value</p> <p>✓ answer (4)</p> <p>✓ $\sin^2 2\theta = 1 - \cos^2 2\theta$</p> <p>✓ substitution</p> <p>✓ value of $\sin^2 2\theta$</p> <p>✓ answer (4)</p>
<p>5.1.2</p>	<p>$\cos 2\theta = 1 - 2\sin^2 \theta$ $2\sin^2 \theta = 1 - \cos 2\theta$ $\sin^2 \theta = \frac{1 - \left(-\frac{5}{6}\right)}{2}$ $= \frac{11}{6} \times \frac{1}{2}$ $= \frac{11}{12}$</p>	<p>✓ $\cos 2\theta = 1 - 2\sin^2 \theta$</p> <p>✓ substitution</p> <p>✓ answer (3)</p>

5.2	$\sin(180^\circ - x) \cdot \cos(-x) + \cos(90^\circ + x) \cdot \cos(x - 180^\circ)$ $= \sin x \cdot \cos x - \sin x(-\cos x)$ $= 2 \sin x \cdot \cos x$ $= \sin 2x$	<div style="border: 1px solid black; padding: 5px; display: inline-block;"> Second line written as $\sin x \cos x + \sin x \cos x$: max 5/6 </div> $\checkmark \sin x$ $\checkmark \cos x$ $\checkmark -\sin x$ $\checkmark -\cos x$ \checkmark simplification \checkmark answer	(6)
5.3	$\sin 3x \cdot \cos y + \cos 3x \cdot \sin y$ $\sin(3x + y)$ $= \sin 270^\circ$ $= -1$	\checkmark compound angle \checkmark answer	(2)
5.4.1	$2 \cos x = 3 \tan x$ $2 \cos x = \frac{3 \sin x}{\cos x}$ $2 \cos^2 x = 3 \sin x$ $2(1 - \sin^2 x) = 3 \sin x$ $2 - 2 \sin^2 x = 3 \sin x$ $2 \sin^2 x + 3 \sin x - 2 = 0$	$\checkmark \tan x = \frac{\sin x}{\cos x}$ \checkmark multiplying by $\cos \theta$ $\checkmark \cos^2 x = 1 - \sin^2 x$	(3)
5.4.2	$2 \sin^2 x + 3 \sin x - 2 = 0$ $(2 \sin x - 1)(\sin x + 2) = 0$ $\sin x = \frac{1}{2}$ or $\sin x = -2$ (no solution) $x = 30^\circ + k \cdot 360^\circ$ or $x = 150^\circ + k \cdot 360^\circ$; $k \in \mathbb{Z}$	\checkmark factors \checkmark both values of $\sin x$ \checkmark no solution $\checkmark 30^\circ + k \cdot 360^\circ$ $\checkmark 150^\circ + k \cdot 360^\circ$; $k \in \mathbb{Z}$	(5)
5.4.3	$5y = 30^\circ + k \cdot 360^\circ$ or $5y = 150^\circ + k \cdot 360^\circ$ $y = 6^\circ + k \cdot 72^\circ$ or $y = 30^\circ + k \cdot 72^\circ$ $\therefore y = 144^\circ + 6^\circ$ or $y = 144^\circ + 30^\circ$ $y = 150^\circ$ or $y = 174^\circ$ OR/OF $144^\circ \leq y \leq 216^\circ$ $720^\circ \leq 5y \leq 1080^\circ$ $5y = 750^\circ$ or $5y = 870^\circ$ $y = 150^\circ$ or $y = 174^\circ$	$\checkmark y = 6^\circ + k \cdot 72^\circ$ $\checkmark y = 30^\circ + k \cdot 72^\circ$ $\checkmark 150^\circ$ $\checkmark 174^\circ$ $\checkmark 5y = 750^\circ$ $\checkmark 5y = 870^\circ$ $\checkmark 150^\circ$ $\checkmark 174^\circ$	(4)
5.5.1	$g(x) = -4 \cos(x + 30^\circ)$ maximum value = 4	\checkmark answer	(1)

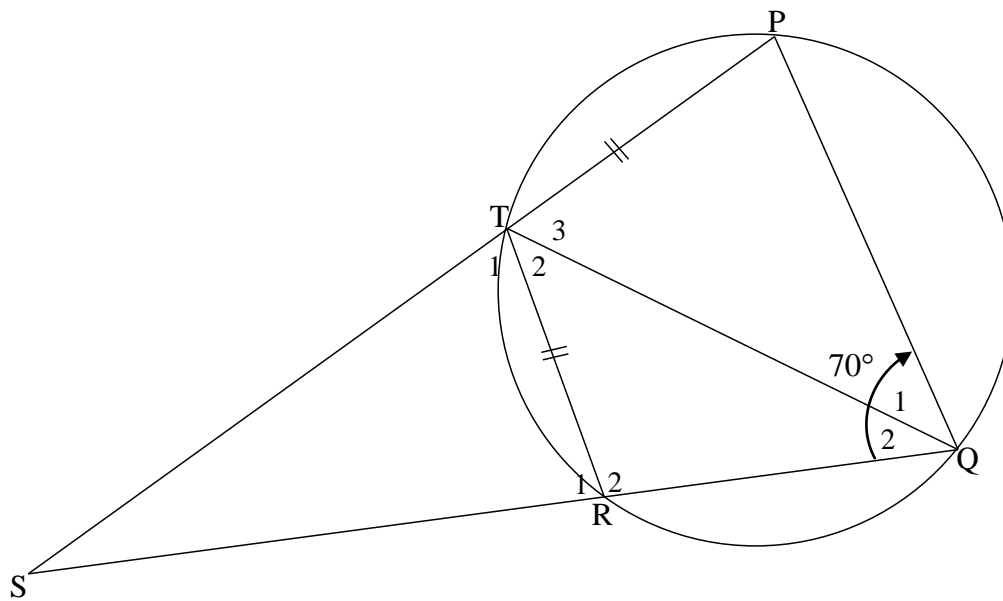
5.5.2	<p>range of/waardeversameling van $g(x)$: $-4 \leq y \leq 4$ OR/OF $y \in [-4 ; 4]$</p> <p>\therefore range of/waardeversameling van $g(x) + 1$: $-3 \leq y \leq 5$ OR/OF $y \in [-3 ; 5]$</p> <div style="border: 1px solid black; padding: 5px; width: fit-content; margin: 10px auto;">Answer only: full marks</div>	<p>✓ range of $g(x)$</p> <p>✓ answer</p> <p style="text-align: right;">(2)</p>
5.5.3	<p>$y = -4\cos(x + 30^\circ)$ shifted to the left/skuif na links: $y = -4\cos(x + 30^\circ + 60^\circ)$ $= -4\cos(x + 90^\circ)$ $= 4\sin x$</p> <p>$\therefore h(x) = -4\sin x$</p> <div style="border: 1px solid black; padding: 5px; width: fit-content; margin: 10px auto;">Answer only: full marks</div>	<p>✓ shift of 60° to the left</p> <p>✓ reduction</p> <p>✓ equation of h</p> <p style="text-align: right;">(3)</p>

[33]

QUESTION/VRAAG 6

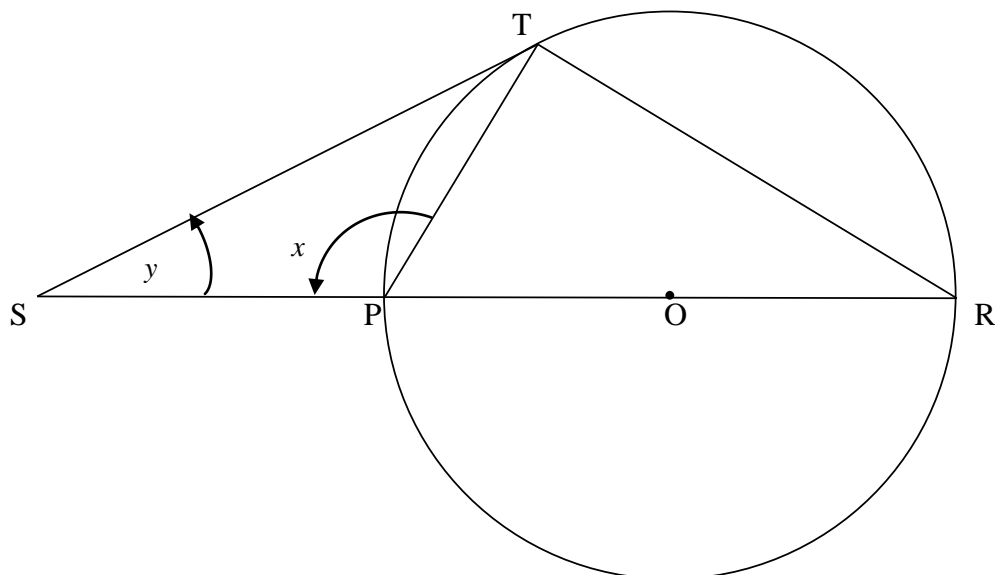
6.1.1	$\tan \theta = \frac{PQ}{QR} = \frac{PQ}{x}$ $\therefore PQ = x \tan \theta$ <div style="border: 1px solid black; padding: 5px; width: fit-content; margin: 10px auto;">Answer only: full marks</div> <p>OR/OF</p> $\frac{QR}{\sin P} = \frac{PQ}{\sin \hat{P}RQ}$ $\therefore PQ = \frac{x \cdot \sin \theta}{\sin(90^\circ - \theta)}$	✓ trig ratio ✓ answer <div style="text-align: right;">(2)</div>
6.1.2	$\frac{AR}{\sin \hat{A}QR} = \frac{QR}{\sin \hat{Q}AR}$ $AR = \frac{x \sin(90^\circ + \theta)}{\sin \theta}$ <div style="border: 1px solid black; padding: 5px; width: fit-content; margin: 10px auto;">Answer only: full marks</div>	✓ use of sine rule ✓ substitution into sine rule correctly <div style="text-align: right;">(2)</div>

6.2	$\sin 2\theta = \frac{AB}{AR}$ $AB = AR \sin 2\theta$ $= \frac{x \sin(90^\circ + \theta) \cdot \sin 2\theta}{\sin \theta}$ $= \frac{x \cos \theta \cdot \sin 2\theta}{\sin \theta}$ $= \frac{x \cos \theta \cdot 2 \sin \theta \cos \theta}{\sin \theta}$ $= 2x \cos^2 \theta$	<p>✓ substitution into trig ratio and AB as subject</p> <p>✓ substitution of AR</p> <p>✓ co-ratio</p> <p>✓ $\sin 2\theta = 2 \sin \theta \cos \theta$</p> <p>(4)</p>
6.3	$\frac{AB}{QP} = \frac{2x \cos^2 12^\circ}{x \tan 12^\circ}$ $= 9$	<p>✓ substitution CA from 6.1.1)</p> <p>✓ answer</p> <p>(2)</p> <p>[10]</p>

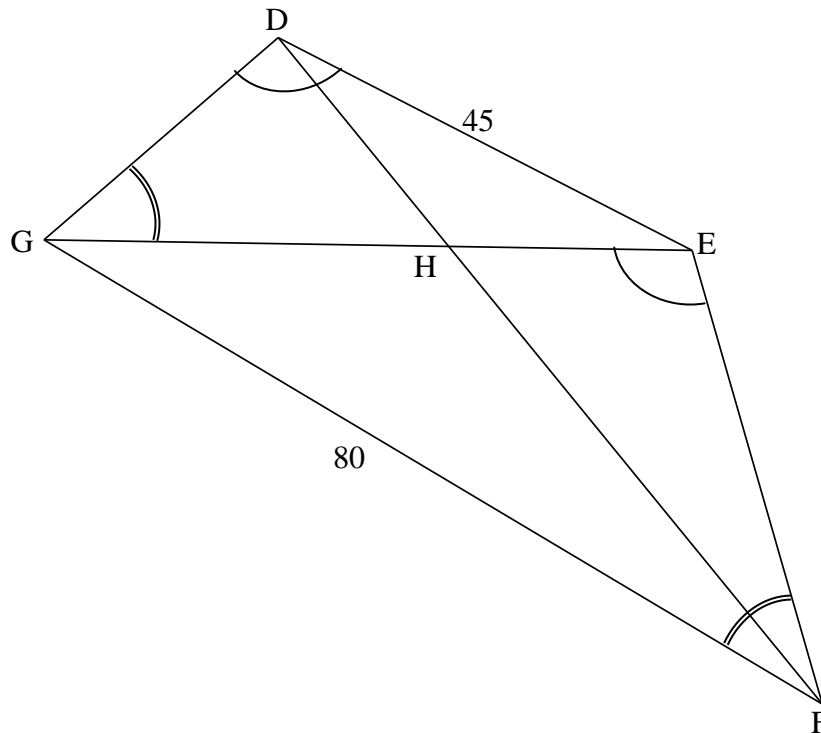
QUESTION/VRAAG 7

7.1.1	$\hat{T}_1 = 70^\circ$ [ext \angle of cyclic quad/ <i>buite \angle van koordevh</i>]	✓ S ✓ R (2)
7.1.2	$\hat{Q}_1 = \hat{Q}_2 = 35^\circ$ [equal chords; equal \angle s/ <i>gelyke koorde; gelyke \anglee</i>]	✓ S ✓ R (2)
7.2.1	$\hat{T}_2 = \hat{Q}_1 = 35^\circ$ [alt \angle s/ <i>verwiss \anglee</i> ; $PQ \parallel TR$]	✓ S ✓ R (2)
7.2.2	$\frac{PT}{TS} = \frac{QR}{RS}$ $\therefore \frac{TR}{TS} = \frac{QR}{RS}$ [<i>prop theorem/eweredighst</i> ; $PQ \parallel TR$] [PT = TR]	✓ S ✓ R (2) [8]

QUESTION/VRAAG 8

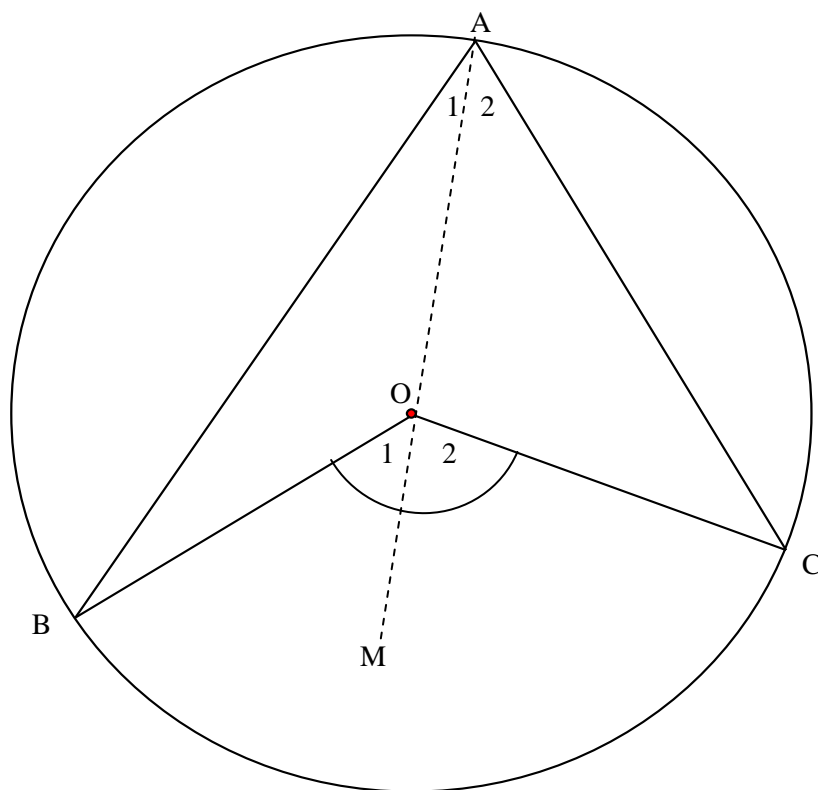


	$\hat{P}TR = 90^\circ$	[\angle in semi-circle/ <i>halfsirkel</i>]	✓ S/R
	$x = 90^\circ + \hat{R}$	[ext/ <i>buite</i> \angle of/ <i>van</i> Δ]	✓ S/R
	$\therefore \hat{R} = x - 90^\circ$		
	$\hat{S}TP = x - 90^\circ$	[tan chord theorem/ <i>raakl koordstelling</i>]	✓ S ✓ R
	$x + x - 90^\circ + y = 180^\circ$	[sum of/ <i>som van</i> \angle s/ <i>e</i> in Δ]	✓ S
	$\therefore y = 270^\circ - 2x$		✓ answer
			[6]

QUESTION/VRAAG 9

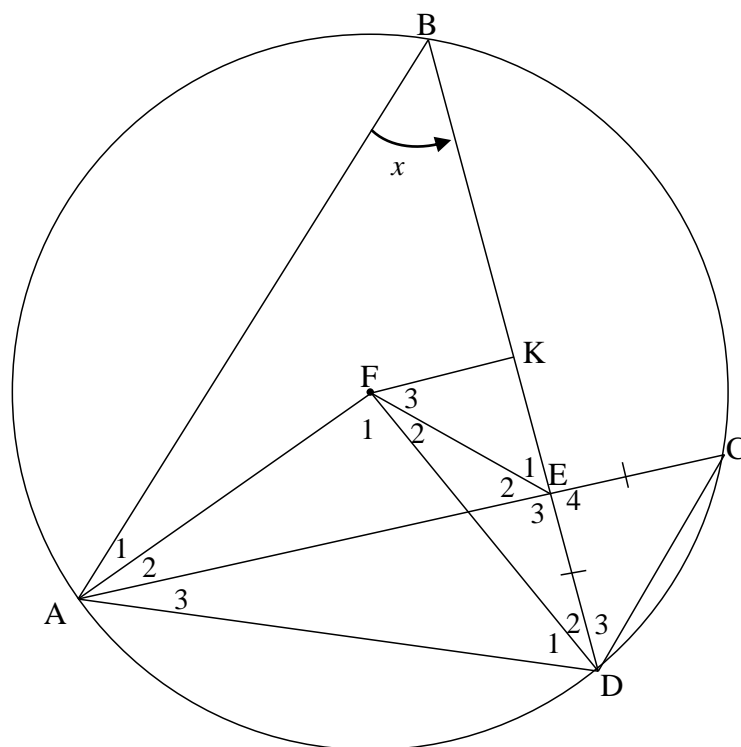
9.1	equiangular Δ s/gelykhoekige Δ e OR/OF ($\angle\angle\angle$)	✓ answer (1)
9.2	$\therefore \frac{GE}{GF} = \frac{DE}{GE}$ $GE^2 = 45 \times 80$ $GE = 60$ <div style="text-align: right;">[Δs]</div>	✓ proportion ✓ substitution ✓ answer (3)
9.3	In $\triangle DEH$ and $\triangle FGH$: $\hat{D}HE = \hat{F}HG$ [vert opp \angle s =/regoorst \angle e =] $\hat{D}EH = \hat{F}GH$ [Δ s] $\hat{EDH} = \hat{GFH}$ [sum of/som van \angle s/e in Δ] $\therefore \triangle DEH \parallel \triangle FGH$ OR/OF In $\triangle DEH$ and $\triangle FGH$: $\hat{D}HE = \hat{F}HG$ [vert opp \angle s =/regoorst \angle e =] $\hat{D}EH = \hat{F}GH$ [Δ s] $\therefore \triangle DEH \parallel \triangle FGH$ [$\angle\angle\angle$]	✓ S/R ✓ S/R ✓ S (3) ✓ S/R ✓ S/R ✓ R (3)

9.4	$\frac{GH}{EH} = \frac{FG}{DE}$ $\frac{GH}{60 - GH} = \frac{80}{45}$ $45 GH = 80(60 - GH)$ $45 GH = 4800 - 80 GH$ $125 GH = 4800$ $GH = 38,4$	<div> <div> <div> Δs]</div> <div>[EH = 60 – GH]</div> </div> <div> <div>✓ S</div> <div>✓ substitution</div> <div>✓ answer</div> <div>(3)</div> <div>[10]</div> </div> </div>
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QUESTION/VRAAG 10

10.1	<p>Construction: AO is drawn and produced to M</p> $\hat{O}_1 = \hat{A}_1 + \hat{B} \quad [\text{ext } \angle \text{ of } \Delta / \text{buite } \angle \text{ van } \Delta]$ <p>But $\hat{A}_1 = \hat{B} \quad [\angle \text{s opp} = \text{radii} / \angle \text{e teenoor} = \text{radii}]$</p> $\therefore \hat{O}_1 = 2\hat{A}_1$ <p>Similarly/Netso: $\hat{O}_2 = 2\hat{A}_2$</p> $\therefore \hat{O}_1 + \hat{O}_2 = 2\hat{A}_1 + 2\hat{A}_2$ $= 2(\hat{A}_1 + \hat{A}_2)$ $\hat{BOC} = 2\hat{BAC}$	<p>✓ Constr</p> <p>✓ S/R</p> <p>✓ S/R</p> <p>✓ S</p> <p>✓ S</p> <p>(5)</p>
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10.2



10.2.1(a)	$\hat{F}_1 = 2x$ [∠ centre = 2∠ at circum/midpts ∠ = 2omtreks ∠]	✓ S ✓ R (2)
10.2.1(b)	$\hat{C} = x$ [∠s in the same seg/∠e in dieselfde segment] OR/OF $\hat{C} = x$ [∠ centre = 2∠ at circum/midpts ∠ = 2omtreks ∠]	✓ S ✓ R (2) ✓ S ✓ R (2)
10.2.2	$\hat{D}_3 = x$ [∠s opp equal sides/∠e teenoor = sye] $\hat{E}_3 = 2x$ [ext ∠ of Δ/buite ∠ van Δ] $\therefore \hat{F}_1 = \hat{E}_3 = 2x$ \therefore AFED is a cyclic quadrilateral [converse ∠s in the same seg]/ Is 'n koordevierhoek [omgekeerde ∠e in dieselfde segm]	✓ S/R ✓ S/R ✓ S ✓ R (4)

10.2.3	$\hat{A}_2 + \hat{A}_3 + \hat{D}_1 + \hat{F}_1 = 180^\circ$ [sum of \angle s in Δ /som van \angle e in Δ] $\hat{A}_2 + \hat{A}_3 = \hat{D}_1$ [\angle s opp = sides/ \angle e teenoor = sye] $\therefore \hat{A}_2 + \hat{A}_3 = 90^\circ - x$ $\hat{E}_1 = \hat{A}_2 + \hat{A}_3$ [ext \angle of cyclic quad/buite \angle v koordevh] $= 90^\circ - x$ $\hat{F}\hat{K}\hat{E} = 90^\circ$ [line from centre bisects chord]/ [lyn van midpt halveer koord] $\hat{F}_3 = x$ [sum of \angle s in Δ /som van \angle e in Δ]	✓ S ✓ S ✓ R ✓ S ✓ S ✓ R (6)
10.2.4	$\hat{B}\hat{A}\hat{C} = \hat{D}_3$ [\angle s in the same seg/ \angle e in dieselfde segm] $AE = BE$ [sides opp equal \angle s/sye teenoor = \angle e] $\frac{\text{area } \triangle AEB}{\text{area } \triangle DEC} = \frac{\frac{1}{2}(BE)(AE) \cdot \sin \hat{A}\hat{E}\hat{B}}{\frac{1}{2}(EC)(ED) \cdot \sin \hat{D}\hat{E}\hat{C}}$ $6,25 = \frac{AE^2}{ED^2}$ $\therefore \frac{AE}{ED} = 2,5$	✓ S ✓ S ✓ substitution into area rule ✓ simplification of RHS ✓ answer (5) [24]

TOTAL/TOTAAL: 150