Province of the EASTERN CAPE EDUCATION

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GRADE 11/*GRAAD 11*	

NATIONAL SENIOR CERTIFICATE/ *NASIONALE SENIOR SERTIFIKAAT*

GRADE 11/*GRAAD 11*

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MATHEMATICS P2/*WISKUNDE V2* SPECIAL ANSWER BOOK/*SPESIALE ANTWOORDEBOEK*

Marker/*Merker*				Moderator's Initials / *Moderator se paraaf*											
Question *Vraag*	Mark *Punt*	Initial Parafeer	Marks *Punte*	S M	Marks *Punte*	D M	Marks *Punte*	P M	Marks *Punte*	N M
1															
2															
3															
4															
5															
6															
7															
8															
9															
10															
TOTAL *TOTAAL*															

[SM = School/*Skool* Mod : DM = District/*Distrik* Mod : PM = Provincial/*Provinsiale* Mod : NM = National/*Nasionale* Mod]

This special answer book consists of 23 pages. /
Hierdie spesiale antwoordeboek bestaan uit 23 bladsye.

QUESTION/*VRAAG 1*

GIVEN !!!
$\bar{x} = 21\,770$

- $Q_1 = 5400$
- $Q_3 = 31\,500$
- IQR $= 26\,100$

Data Set / *Datastel*:

	T_1	T_2	Q_1 T_3	T_4	T_5	M T_6	T_7	Q_3 T_8	T_9	UF T_{10}
Prizes / *Pryse*	3 600	4 500	5 400	6 200	x	12 300	15 800	y	43 800	87 500
					7100			31500		

	Solution/*Oplossing*	Marks/ *Punte*
1.1	$M = T_{\frac{1}{2}(1+10)} = T_{5,5} = \frac{T_5 + T_6}{2}$ $9700 = \frac{x + 12300}{2}$ ✓ $R\ 7\,100 = x$ ✓	2
		(2)
1.2	$\bar{x} = \frac{3600 + 4500 + \ldots + y + 43800 + 87500}{10}$ ✓ $21\,770 = \frac{186\,200 + y}{10}$ ✓ $R\ 31\,500 = y$ ✓	3
		(3)
1.3	R 87 500 ✓	1
		(1)
1.4	$\sigma = R\ 25\,258,19$ ✓✓	2
		(2)
1.5	$\bar{x}$ = increase by R 200 to R 21 970 ✓ M = increase by R 200 to R 9 900 ✓ σ = no change ✓	3
		(3)
		[11]

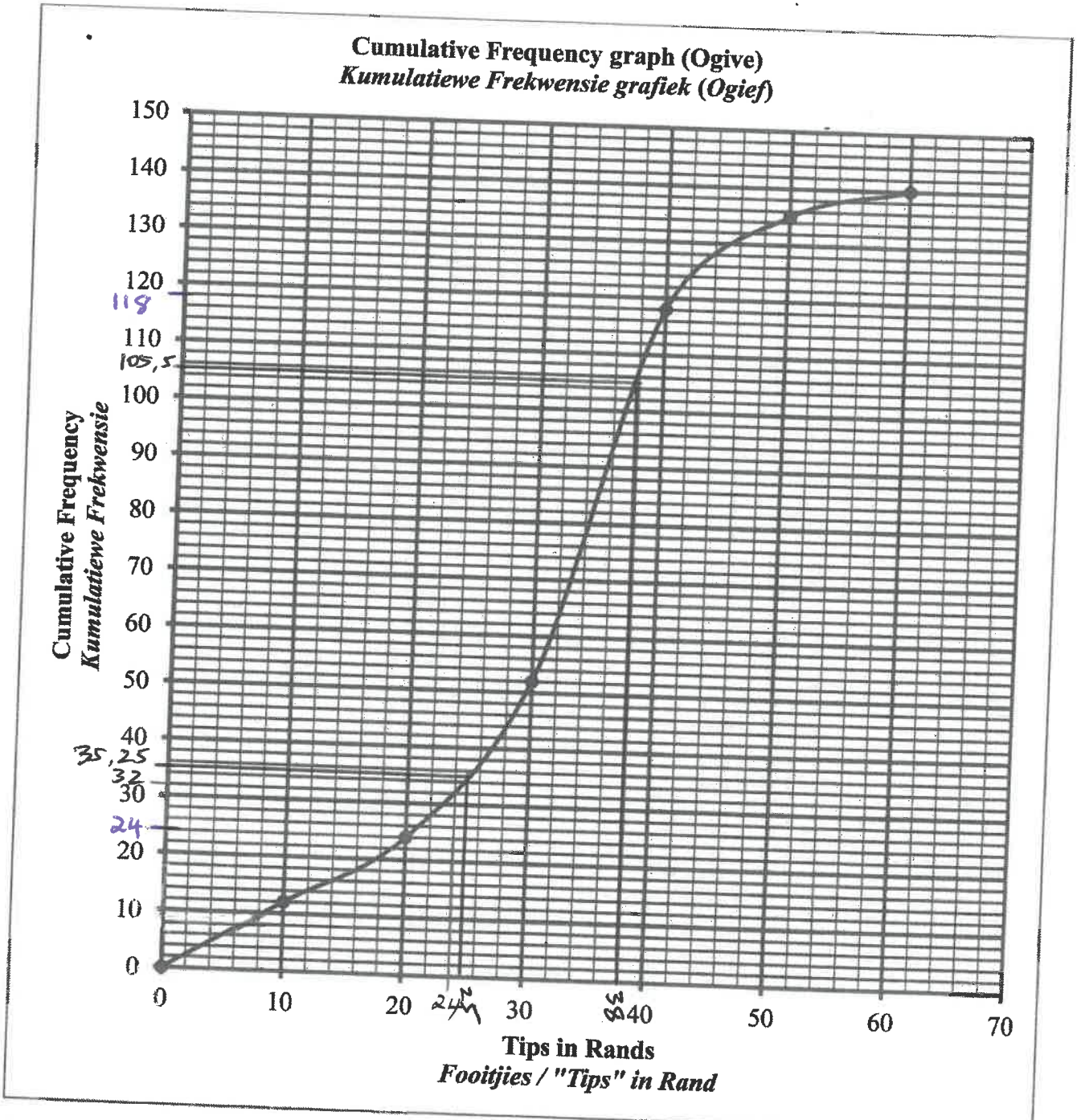
1.3. LF $= 5400 - 1,5 \cdot 26100 = -33\,750$

UF $= 31500 + 1,5 \cdot 26100 = 70\,650$

1.1. $x =$

1.2. $y = 21\,790c - (179\,100 + x)$

QUESTION/*VRAAG 2*



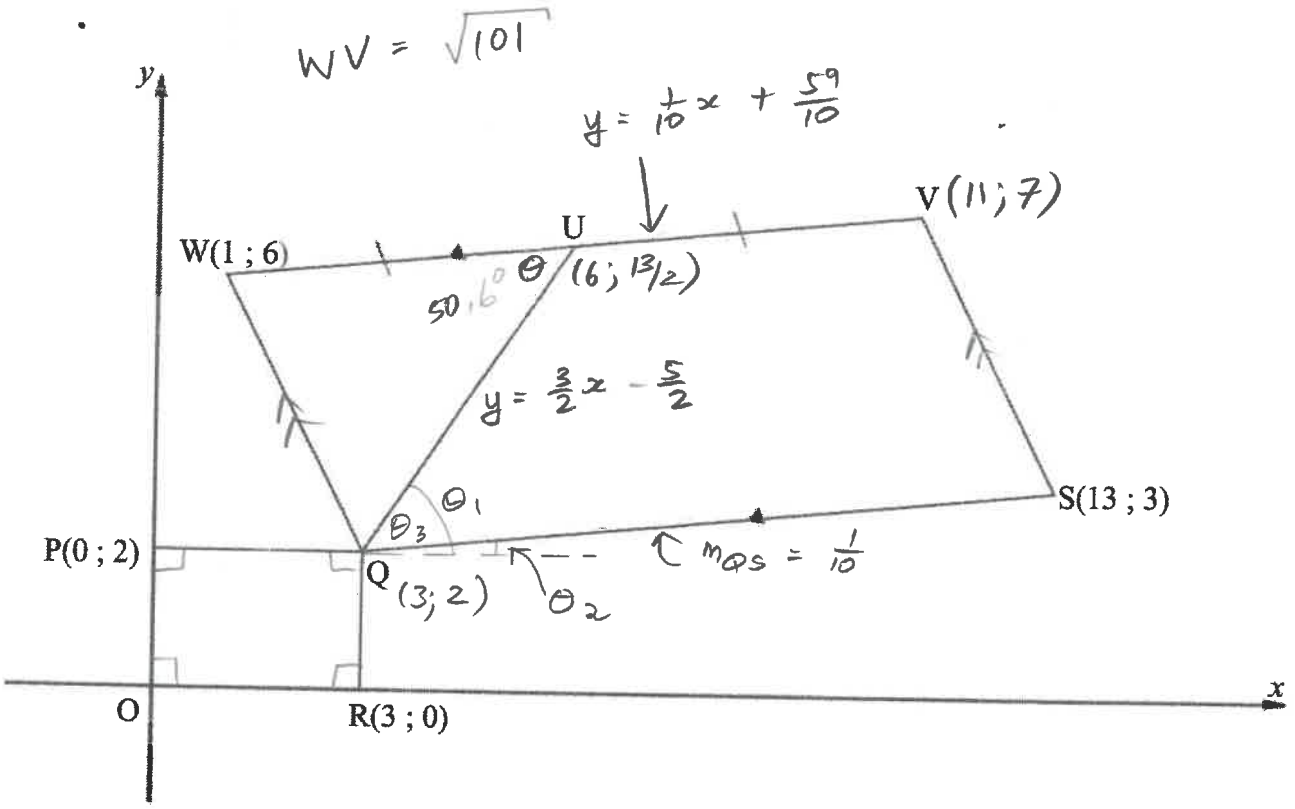
	Solution/*Oplossing*	Marks/ *Punte*
2.1	$n = 140$ ✓	1 (1)
2.2	Modal class is $R30 < x \leq R40$ ✓ $30 - 40$	1 (1)

	Solution/*Oplossing*	Marks/ *Punte*
2.3	$\leq R24 = 32$ ✓✓	2 (2)
2.4	$R20 - R40 = 118 - 24 = 94$ ✓	2 (2)
2.5	$P_{25} = T_{\frac{25}{100}(1+140)} = T_{35,25} = R\,25$ ✓ $Q_3 = T_{\frac{3}{4}(71+140)} = T_{105,5} = R\,38$ ✓	2 (2)
2.6	$Q_1 = T_{\frac{1}{2}(1+70)} = T_{35,5} \approx 25 \approx P_{25}$ $\therefore IQR = 38 - 25$ ✓ $= R\,13$ ✓	2 (2)
		[10]

$T_1; \ldots; T_{140}$ $\quad M = T_{\frac{1}{2}(1+140)} = T_{70,5}$

$T_1; \ldots; T_{70}$ $\quad T_{71}; \ldots; T_{140}$

QUESTION/*VRAAG 3*



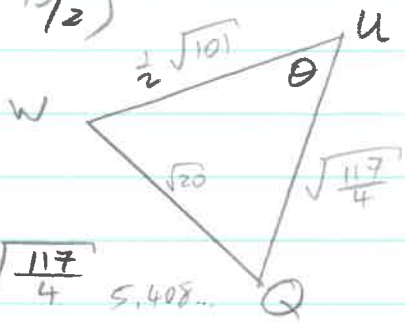
	Solution/*Oplossing*	Marks/ *Punte*
3.1	Q (3; 2) ✓ opp sides rect =	1 (1)
3.2	$M_{QS} = \frac{3-2}{13-3}$ ✓ $= \frac{1}{10}$ ✓	2 (2)
3.3	$y = \frac{1}{10}x + c$ ✓ WV ∥ QS sub W(1; 6) $6 = \frac{1}{10}\cdot(1) + c$ ✓ $\frac{59}{10} = c$ $\therefore y = \frac{1}{10}x + \frac{59}{10}$ ✓	3 (3)

	Solution/*Oplossing*	Marks/ *Punte*
3.4	$u: \quad \frac{1}{10}x + \frac{59}{10} = \frac{3}{2}x - \frac{5}{2}$ ✓	
	$-\frac{7}{5}x = -\frac{42}{5}$ ✓	
	$x = 6$ ✓	
	$\therefore y = \frac{3}{2}(6) - \frac{5}{2}$	
	$= \frac{13}{2}$ ✓ $\quad u\left(6; \frac{13}{2}\right)$	
	$WU = UV \quad 6 = \frac{1+x_V}{2}$ ✓ $\quad \frac{13}{2} = \frac{6+y_V}{2}$	
	$\times 2: \quad 12 = 1 + x_V \quad 13 = 6 + y_V$	
	$11 = x_V \quad 7 = y_V$	
	$\therefore V(11; 7)$ ▷	5
		(5)
3.5	$m_{VS} = \frac{7-3}{11-13} = -2$ ✓	
	$m_{WQ} = \frac{6-2}{1-3} = -2$ ✓	
	$\therefore VS \parallel WQ$ ✓S $\quad m_{VS} = m_{WQ} = -2$	
	but $WV \parallel QS$ given	
	$\therefore WVSQ$ is $\parallel gm$ ✓R both prs opp sides quad $\parallel$ ▷	4
		(4)

	Solution/*Oplossing*	Marks/ *Punte*
3.6	$WV = \sqrt{(7-6)^2 + (11-1)^2} = \sqrt{101}$ ✓ ✓	2
		(2)
3.7	QU $\tan \hat{\theta}_1 = \frac{3}{2}$ QS $\tan \theta_2 = \frac{1}{10}$ ✓ ref $\angle$ = 56,30... ref $\angle$ = 5,71...° tan + in tan + in I: $\theta_1 = 56,30...°$ ✓ I: $\theta_2 = 5,71...°$ ✓ $\therefore \theta_3 = 56,30...° - 5,71...° = 50,59...°$ $\therefore W\hat{U}Q = \theta$ $= 50,6°$ alt $\angle$'s =, WV ∥ QS ✓S	4
		(4)
3.8	Area PQRO = 3 x 2 = 6 WUQ = 50,6° WU = $\frac{1}{2}(\sqrt{101})$ ✓ (3.6.) 5,024... QU = $\sqrt{(\frac{13}{2}-2)^2 + (6-3)^2} = \sqrt{\frac{117}{4}} = \frac{3}{2}\sqrt{13}$ ✓ 5,408... area $\Delta WUQ = \frac{1}{2}(\frac{1}{2}\sqrt{101})(\frac{3}{2}\sqrt{13})\sin 50,6°$ ✓ $= 10,5...$ ✓ $\therefore \frac{\text{area PQRO}}{\text{area } \Delta QUW} = \frac{6}{10,5...}$ ✓ $= 0,57$ ✓ $\approx \frac{4}{7}$	6
		(6)
		[27]

3.7. OR

$W(1;6)$ $Q(3;2)$ $U(6;\ 13/2)$



$WU = \frac{1}{2}\sqrt{101}$ 5,024...

$UQ = \sqrt{(\frac{13}{2}-2)^2 + (6-3)^2} = \sqrt{\frac{117}{4}}$ ✓ 5,408...

$WQ = \sqrt{(6-2)^2 + (1-3)^2} = \sqrt{20}$ ✓ 4,471...

$\theta = W\hat{U}Q$

$(\sqrt{20})^2 = (\sqrt{\frac{117}{4}})^2 + (\frac{1}{2}\sqrt{101})^2 - 2(\sqrt{\frac{117}{4}})(\frac{1}{2}\sqrt{101})\cos\theta$ ✓

$-\frac{69}{2} = -54,35... \cos\theta$

$0,63... = \cos\theta$

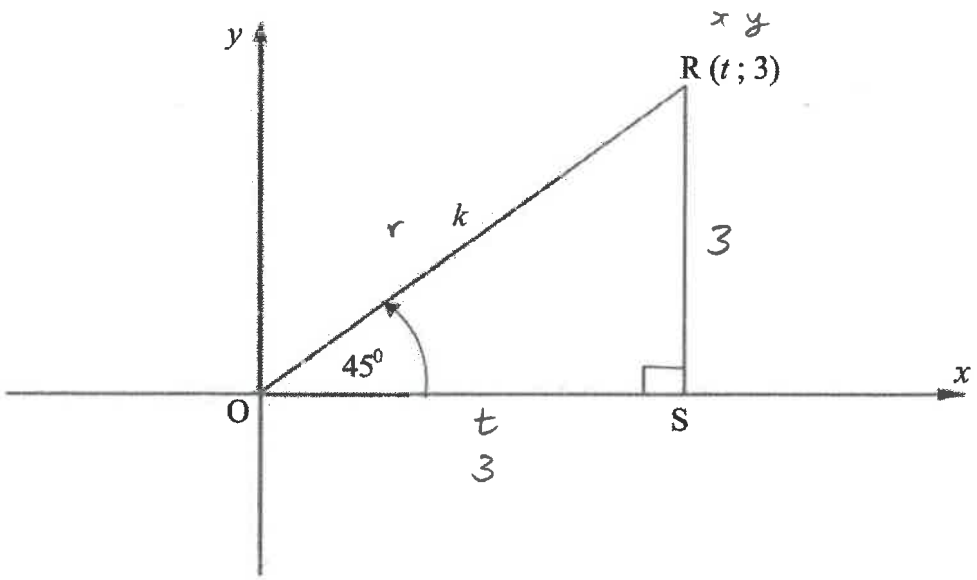
ref $^1 = 50,59...°$

Cos + in

I : $\theta = 50,60°$ ✓ 4

7.1

QUESTION/*VRAAG 4*



	Solution/*Oplossing*	Marks/ *Punte*
4.1.1	$\tan 45^\circ = \frac{3}{t}$ ✓ $\quad \frac{y}{x}$ $\frac{1}{1} = \frac{3}{t}$ $t = 3$ ✓	2 (2)
4.1.2	$\sin 45^\circ = \frac{3}{k}$ ✓ $\quad \frac{y}{r}$ $\frac{1}{\sqrt{2}} = \frac{3}{k}$ $k = 3\sqrt{2}$ ✓	2 (2)
4.2.1	$8\cos^2\alpha - 2 = 0 \quad \therefore \cos^2\alpha = \frac{1}{4}$ ✓ $\cos\alpha = \pm\sqrt{\frac{1}{4}}$ reject − $\cos\alpha = \frac{1}{2}$ ✓	2 (2)

4.1. 2. $k^2 = (3)^2 + (3)^2$ Pythag

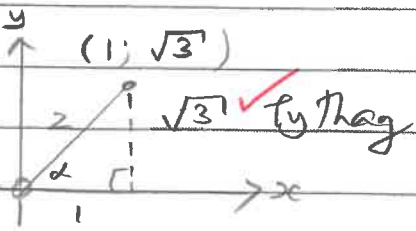
$= 18$

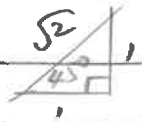
$k = \pm\sqrt{18}$ reject - r

$= \sqrt{9.2}$

$= \sqrt{9}\sqrt{2}$

$= 3\sqrt{2}$

	Solution/*Oplossing*	Marks/ *Punte*
4.2.2	$\cos\alpha = \frac{1}{2}$ $\frac{x}{r}$ (I) IV $0° < \alpha < 180°$ (I) II  ✓ Pythag $4[\tan^2\alpha - \cos^2\alpha]$ $= 4\left[3 - \frac{1}{4}\right]$ $= 4\left[\left(\frac{y}{x}\right)^2 - \left(\frac{x}{r}\right)^2\right]$ $= 12 - 1$ $= 4\left[\left(\frac{\sqrt{3}}{1}\right)^2 - \left(\frac{1}{2}\right)^2\right]$ ✓ $= 11$ ✓	3 (3)
4.3.1	Num $= \cos x \cdot \tan x$ $= \cos x \cdot \frac{\sin x}{\cos x}$ ✓ $= \sin x$ ✓ Den • $\cos(x-90°)$ $= \cos(x+270°)$ $= \cos(270°+x)$ $= \sin x$ • $\cos(-x) = \cos x$ $\therefore 2[\sin x \cdot \sin x + \cos x \cdot \cos x]$ ✓ ✓ $= 2[\sin^2 x + \cos^2 x]$ $= 2 \cdot 1$ $= 2$ ✓ $\therefore \frac{\sin x}{2}$ ✓	6 (6)
4.3.2	Period $= 360°$ ✓	1 (1)

	Solution/*Oplossing*	Marks/ *Punte*
4.4	 • $\sin 48^\circ = \sin(90^\circ - 42^\circ) = \cos 42^\circ$ ✓ • $\cos 132^\circ = \cos(90^\circ + 42^\circ) = -\sin 42^\circ$ ✓ $\tan(-45^\circ) = -\tan 45 = -1$ ✓ $\therefore \frac{\cos 42^\circ \cdot (\cos 42^\circ) - (\tan(-45^\circ))^2}{(\cos 132^\circ)^2}$ $= \frac{\cos^2 42^\circ - (-1)^2}{(-\sin 42^\circ)^2}$ ✓ $= \frac{\cos^2 42^\circ - 1}{\sin^2 42^\circ}$ $= \frac{-(1 - \cos^2 42^\circ)}{\sin^2 42^\circ}$ $= \frac{-\sin^2 42^\circ}{\sin^2 42^\circ} = -1$ ✓ ✓	5 (5)
4.5.1	LHS $= \frac{\sin\beta}{\cos\beta} - \frac{\sin\beta\cos\beta}{1}$ ✓ $= \frac{\sin\beta - \sin\beta\cos\beta \cdot \cos\beta}{\cos\beta}$ ✓ $= \frac{\sin\beta(1 - \cos^2\beta)}{\cos\beta}$ ✓ $= \frac{\sin\beta \cdot \sin^2\beta}{\cos\beta}$ $= \frac{\sin\beta}{\cos\beta} \cdot \frac{\sin^2\beta}{1}$ • LHS = RHS RHS $= \frac{\sin\beta}{\cos\beta} \cdot \frac{\sin^2\beta}{1}$	3 (3)
4.5.2	• $\tan\beta = UD$ $\frac{\sin\beta}{\cos\beta} = UD$ $\cos\beta = 0$ $\beta = 90^\circ + k.180^\circ \; ; k \in \mathbb{Z}$ • $\beta = 90^\circ$ or -90° ✓ ✓	2 (2)

4.4. OR

- $\cos 42^\circ = \cos(90^\circ - 48^\circ) = \sin 48^\circ$
- $\cos 132^\circ = \cos(180^\circ - 48^\circ) = -\cos 48^\circ$
- $\tan(-45^\circ) = -\tan 45^\circ = -\frac{1}{1} = -1$

$$\therefore \frac{(\sin 48^\circ)\sin 48^\circ - (-1)^2}{(-\cos 48^\circ)^2}$$

$$= \frac{\sin^2 48^\circ - 1}{\cos^2 48^\circ}$$

$$= \frac{-(1 - \sin^2 48^\circ)}{\cos^2 48^\circ}$$

$$= \frac{-(\cos^2 48^\circ)}{\cos^2 48^\circ}$$

$$= -1$$

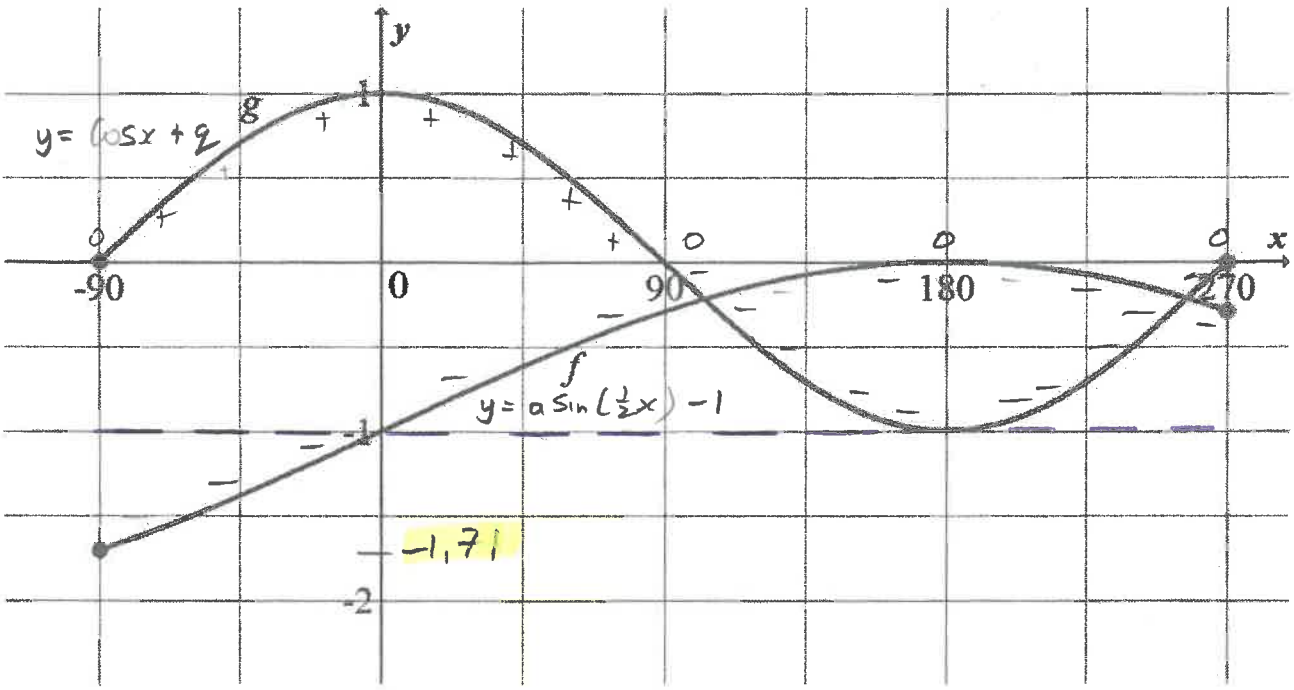
5

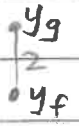
	Solution/*Oplossing*	Marks/ *Punte*
4.6	$3\sin\theta = -2\cos^2\theta$	
	$= -2(1-\sin^2\theta)$ ✓	
	$= -2 + 2\sin^2\theta$	
	$\therefore 0 = 2\sin^2\theta - 3\sin\theta - 2$ ✓	
	$= (\sin\theta - 2)(2\sin\theta + 1)$ ✓	
	$\therefore \sin\theta = 2$ or $\sin\theta = -\frac{1}{2}$ ✓ 2 $-\frac{1}{2}$	
	no soln ref $\angle = 30°$ no soln	
	sin − in	
	III: $\theta = 210° + k\cdot 360°$; $k \in \mathbb{Z}$ ✓	
	IV: $\theta = 330° + k\,360°$; $k \in \mathbb{Z}$ ✓	
		6
		(6)
		[32]

QUESTION/*VRAAG 5*

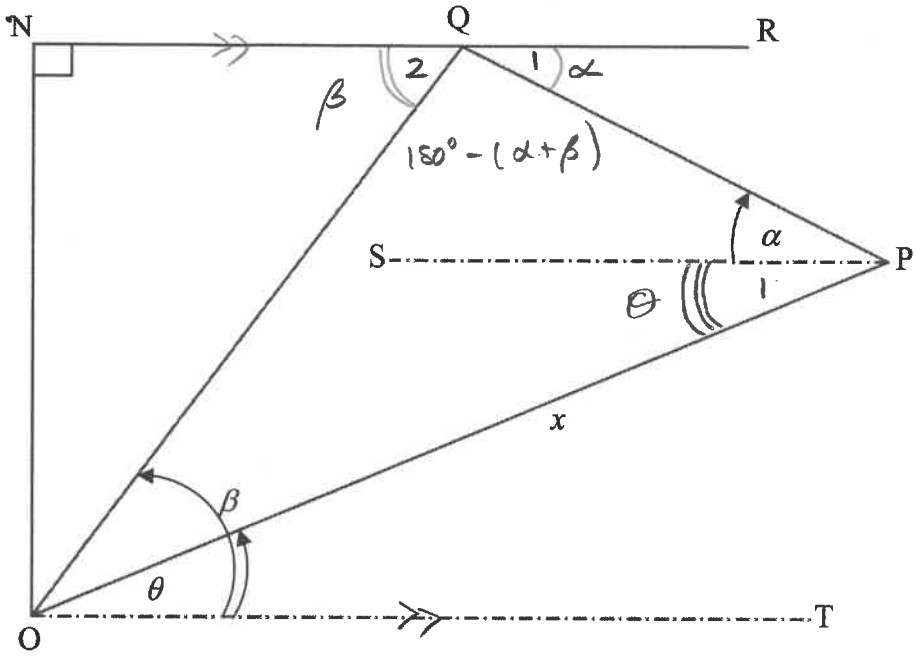
f: $y = \sin(\frac{1}{2}x) - 1$

$y = \sin(\frac{1}{2}(-90°)) - 1 = -1,71$



	Solution/*Oplossing*	Marks/ *Punte*
5.1	$a = 1$ ✓ $\quad q = 0$ ✓	2 (2)
5.2	R_f : $y \in [-1,71; 0]$ ✓int ✓not^n	2 (2)
5.3	$Amp_g = 1$ ✓	1 (1)
5.4	$y_f - y_g = -2 \therefore x = 0°$ ✓ 	1 (1)
5.5	$y_f \times y_g \leq 0 \therefore x \in [-90°; 90°]$ or $x = 180°$ or $270°$ ✓A ✓A	2 (2)
5.6	h: $y = \cos(x + 90°)$ ✓ $+ 0$ $= \cos(90° + x)$ $= -\sin x$ ✓	2 (2)
		[10]

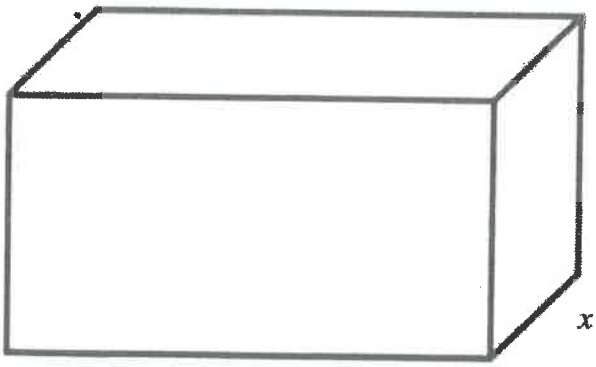
QUESTION/*VRAAG 6*



	Solution/*Oplossing*	**Marks/ *Punte***
6.1	$\hat{Q}_1 = \alpha$ } SR alt ^'s = , NR // OT $\hat{Q}_2 = \beta$ alt ^'s = , NR // OT $\therefore O\hat{Q}P = 180° - (\alpha+\beta)$ "R" ^'s on str line = 180°	2 (2)
6.2	$\hat{P}_1 = \theta$ alt ^'s = , SP // OT $\frac{OQ}{\sin(\theta+\alpha)} = \frac{x}{\sin(180° - (\alpha+\beta))}$ f, sub, NB $\frac{OQ}{\sin(\theta+\alpha)} = \frac{x}{\sin(\alpha+\beta)}$ red $\therefore OQ = \frac{x\sin(\theta+\alpha)}{\sin(\alpha+\beta)}$	3 (3)

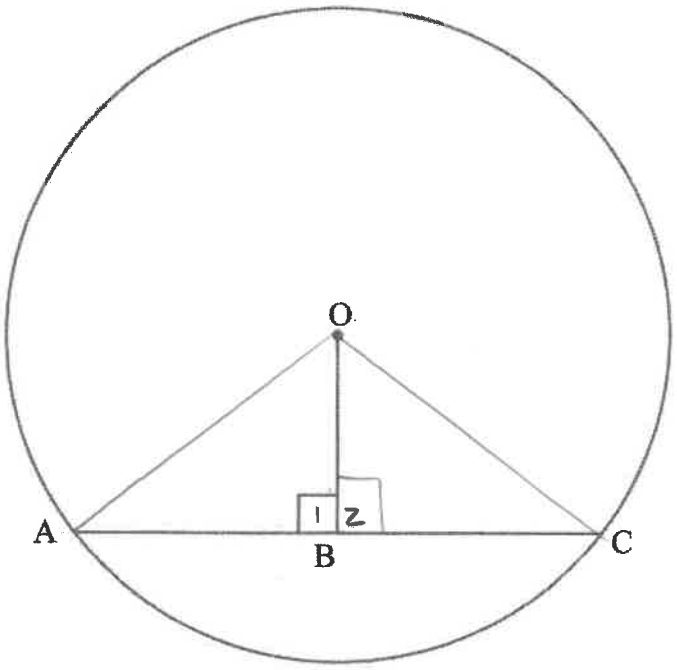
	Solution/*Oplossing*	**Marks/ *Punte***
6.3.	$5\sqrt{2} = \frac{x \sin(30° + 15°)}{\sin(60° + 30°)}$ ✓ $5\sqrt{2} = x \cdot \frac{\sqrt{2}}{2}$ $10 = x$ ✓	2 (2)
		[7]

QUESTION/*VRAAG 7*



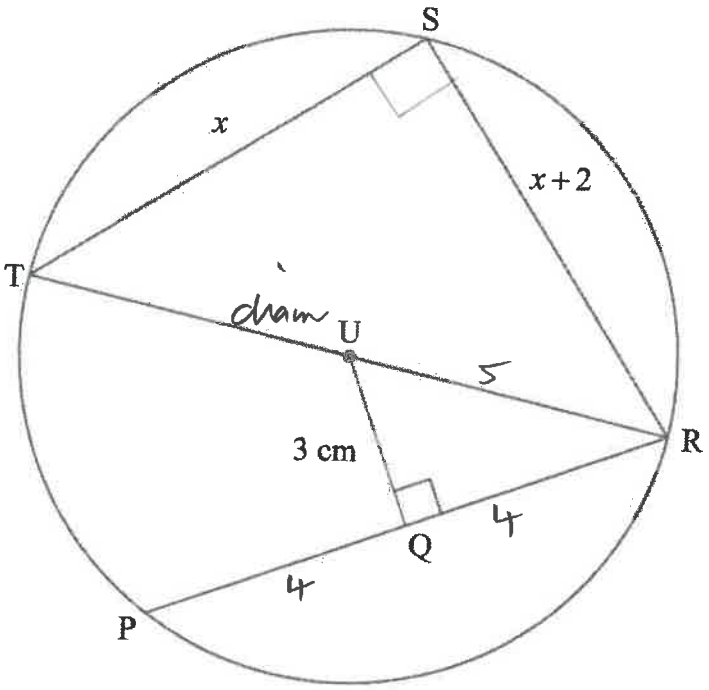
	Solution/*Oplossing*	Marks/ *Punte*
7.1	$L = 2x$ ✓ $H = x+3$ ✓ cm	2 (2)
7.2	$TSA = 2x(2x \times x) + 2x(x(x+3)) + 2(2x \times (x+3))$ ✓ $= 4x^2 + 2x^2 + 6x + 4x^2 + 12x$ ✓ $= 10x^2 + 18x \ cm^2$ ✓	3 (3)
7.3	$10x^2 + 18x = 784$ ✓ $10x^2 + 18x - 784 = 0$ $\div 2$: $5x^2 + 9x - 392 = 0$ ✓ $(x-8)(5x+49) = 0$ ✓ $x = 8$ or $-$ ~~49~~ reject $\therefore x = 8$ cm ✓ ans + selection	4 (4)
7.4	$V = (2(8) \times 8) \times (8+3)$ ✓ $= 16 \times 8 \times 11$ $= 1408 \ cm^3$ ✓	2 (2)
		[11]

QUESTION/*VRAAG 8*



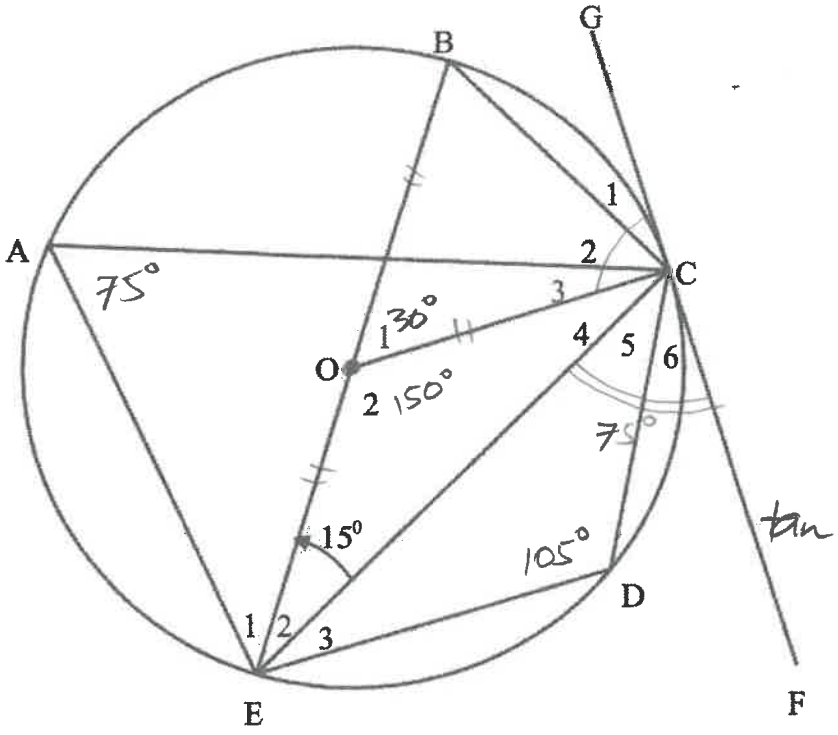
✓ constr

	Solution/*Oplossing*	**Marks/ *Punte***
8.1	In Δ's OAB, OCB	
	1. $\hat{B}_1 = \hat{B}_2 = 90°$ ✓S given	
	2. OA = OC ✓SR radii	
	3. OB = OB ✓S common	
	$\therefore \Delta OAB \equiv \Delta OCB$ RHS ✓R	
	$\therefore AB = CB$ $\Delta OA\hat{B} \equiv \Delta OC\hat{B}$	
		5
		(5)



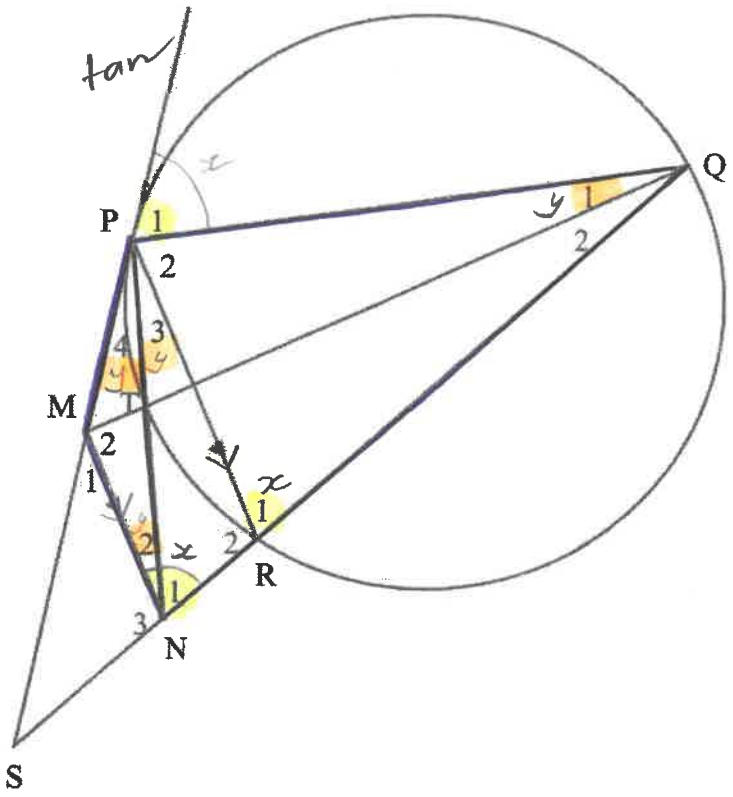
8.2.1	$QR = 4$ ✓S ✓R line from centre ⊙ ⊥ to chord $UR^2 = 3^2 + 4^2$ Pythag ✓R $UR = 5$ ✓S	4 (4)
8.2.2	$TU = 5$ radii $\hat{S} = 90°$ ✓S ✓R ∠ in semi ⊙ = 90° $(10)^2 = (x)^2 + (x+2)^2$ ✓S Pythag $100 = x^2 + x^2 + 4x + 4$ $0 = 2x^2 + 4x - 96$ $0 = x^2 + 2x - 48$ ✓ ÷ 2 $0 = (x+8)(x-6)$ ✓ $\therefore x = -8$ or 6 reject $\therefore TS = 6$ ✓ ans + selection	6 (6)
		[15]

QUESTION/*VRAAG 9*



	Solution/*Oplossing*	Marks/ *Punte*
9.1.1	$\hat{O}_1 = 30°$ ✓S ✓R ^@ centre = 2x ^@ circum	2 (2)
9.1.2	$\hat{O}_2 = 150°$ ✓S ^'s on str line = 180° $\hat{A} = 75°$ ✓SR ^@centre = 2x ^@circum	2 (2)
9.1.3	$D = 105°$ ✓S ✓R opp ^'s cyclic quad = 180°	2 (2)
9.1.4	$E\hat{C}F = 75°$ ✓S ✓R tan chord thm	2 (2)
9.1.5	$O\hat{C}G = 90°$ ✓S ✓R tan ⊥ rad	2 (2)

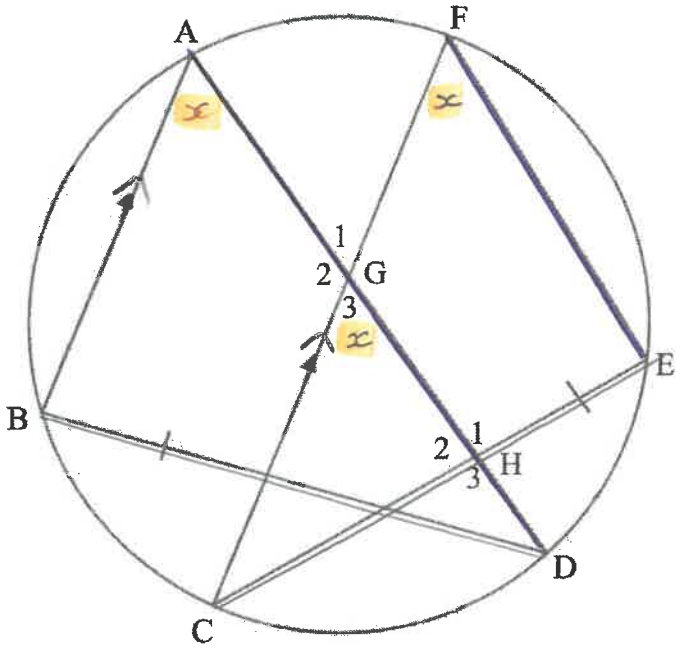
9.2



	Solution/*Oplossing*		Marks/ *Punte*
	Let $\hat{P}_1 = x$		
9.2.1	$\hat{P}_1 = \hat{R}_1$	✓S ✓R tan chord thm	
	$= \hat{N}_1 + \hat{N}_2$	✓S ✓R Ext ∠ = , PR ∥ MN	
	OR		
	$= P\hat{T}Q$	✓S ✓R tan chord thm	4
			(4)
9.2.2	$\hat{P}_1 = \hat{N}_1 + \hat{N}_2$	(9.2.1.)	
	∴ MNQP is a cyclic quad	conv ext ∠ cyclic quad	
		✓✓✓✓	4
			(4)

	Solution/*Oplossing*			Marks/ *Punte*
	let $\hat{P}_4 = y$			
9.2.3	$\hat{Q}_1 = y$	✓SR	tan chord thm	
	$\hat{N}_2 = y$	✓S ✓R	∠'s in same ⊙ segm =	
	$P_3 = y$	✓SR	alt ∠'s =, PR ∥ MN	
	$\therefore \hat{P}_4 = \hat{P}_3$		both = y	4
	$\therefore$ MN bisects $\hat{SPR}$			
				(4)
				[22]

QUESTION/*VRAAG 10*



	Solution/*Oplossing*	**Marks/ *Punte***
	let $A = x$	
	$\therefore \hat{F} = x$ ✓S ✓R = chords = ^'s @ circum	
	$G_2 = x$ ✓S ✓R corr ^'s =, AB // FC	
	$\therefore \hat{G}_3 = \hat{F}$ both $= x$	
	$\therefore$ FE // AD ✓R corr ^'s =	
		5
		[5]

TOTAL/*TOTAAL*: 150