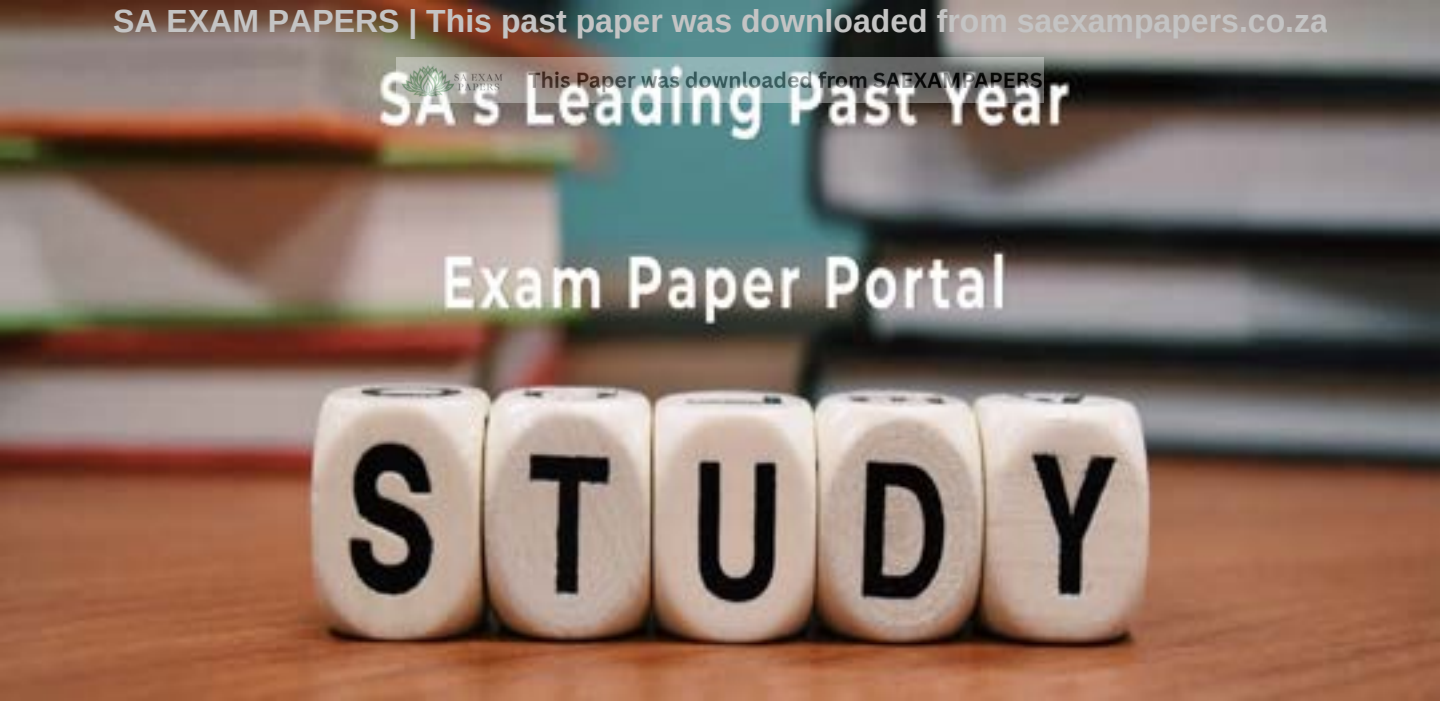


LIMPOPO

PROVINCIAL GOVERNMENT

REPUBLIC OF SOUTH AFRICA

DEPARTMENT OF

EDUCATION

NATIONAL SENIOR CERTIFICATE/*NASIONALE SENIOR SERTIFIKAAT*

GRADE/*GRAAD 12*

MATHEMATICS P2/*WISKUNDE P2*

MARKING GUIDELINES/*NASIENRIGLYNE*

SEPTEMBER 2025

MARKS/*PUNTE*: 150

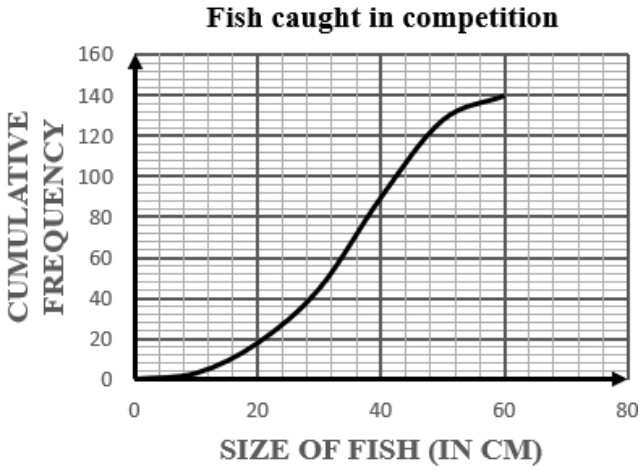
This marking guidelines consists of 19 pages/*Hierdie nasienriglyne bestaan uit 19 bladsye*

NOTE/*NOTA*:

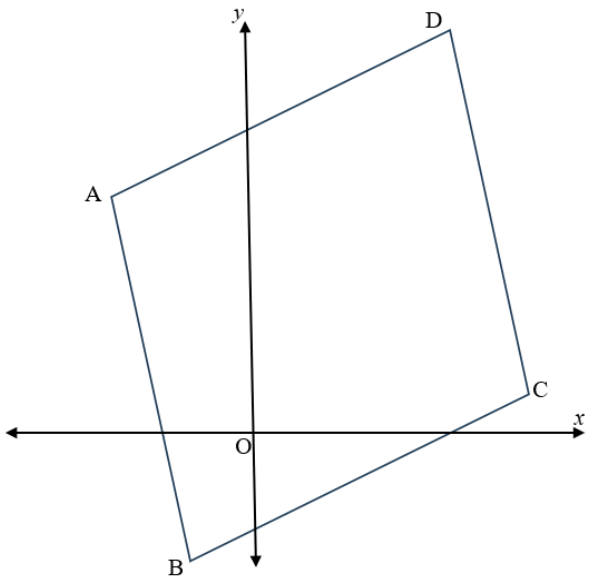
- If a candidate answers a question TWICE, only mark the FIRST attempt/ *As 'n kandidaat 'n vraag twee keer beantwoord, merk slegs die EERSTE poging.*
- Consistent Accuracy applies in all aspects of the marking guidelines/ *Konsekwente akkuraatheid is van toepassing in alle aspekte van die nasienriglyne*

<table>
<tr><td colspan="4">QUESTION 1 / VRAAG 1</td></tr>
<tr><td>1.1.1</td><td>$130\text{g} \times 2000 = 260\ 000\text{ g} = 260\text{ kg}$</td><td>✓answer / antwoord</td><td>(1)</td></tr>
<tr><td>1.1.2</td><td>Distributor D. The standard deviation is the smallest and the average grams per packet is the closest to 130g / Verspreider D. Die standaardafwyking is die kleinste en die gemiddelde gram per pakkie is die naaste aan 130g</td><td>✓D
✓reason / rede</td><td>(2)</td></tr>
<tr><td>1.1.3</td><td>Distributor A. Even when the packets are filled above the standard deviation of the mean, they do not fill it up to the recommended grams / Verspreider A. Selfs wanneer die pakkies bo die standaardafwyking van die gemiddelde gevul word, vul hulle dit nie tot die aanbevole gram nie</td><td>✓A
✓reason / rede</td><td>(2)</td></tr>
<tr><td>1.2.1</td><td>Range / Waardeversameling $= 58 - 9 = 49$</td><td>✓answer / antwoord</td><td>(1)</td></tr>
<tr><td>1.2.2</td><td>
<table>
<tr><th>Interval</th><th>Frequency
Frekwensie</th><th>Cumulative Frequency
Kumulatiewe Frekwensie</th></tr>
<tr><td>$0 < x \leq 10$</td><td>3</td><td>3</td></tr>
<tr><td>$10 < x \leq 20$</td><td>15</td><td>18</td></tr>
<tr><td>$20 < x \leq 30$</td><td>27</td><td>45</td></tr>
<tr><td>$30 < x \leq 40$</td><td>45</td><td>90</td></tr>
<tr><td>$40 < x \leq 50$</td><td>38</td><td>128</td></tr>
<tr><td>$50 < x \leq 60$</td><td>12</td><td>140</td></tr>
</table>
</td><td>✓45

✓140</td><td>(2)</td></tr>
</table>

1.2.3		✓grounding / *anker* ✓use cumulative freq / *gebruik kumulatiewe frekwensie* ✓shape / *vorm*	(3)
1.2.4	$60\% \times 140 = 84$ $x < 39$ [accept / *aanvaar* 37 – 39]	✓84 ✓answer / *antwoord*	(2)
			[13]
QUESTION 2 / *VRAAG 2*			
2.1	$\bar{x} = \frac{232}{10} = 23,2$	✓232 ✓answer / *antwoord*	(2)
2.2	$a = 19,86 \quad b = 1,22$ $y = 19,86 + 1,22x$	✓19,86 ✓1,22 ✓equation / *vergelyking*	(3)
2.3	$y = 19,86 + 1,22(29) = 55,24 \text{ min}$	✓substitute / *vervang* ✓answer / *antwoord*	(2)
			[7]

QUESTION 3 / *VRAAG 3*			
3.1.1	$PQ = \sqrt{(-3-5)^2 + (2-8)^2}$ $PQ = 10$	✓subst into formula / *vervang in formule* ✓answer / *antwoord*	(2)
3.1.2	$m(PQ) = \frac{2-8}{-3-5} = \frac{3}{4}$ $\tan\theta = \frac{3}{4}$ $\theta = 36{,}87° \approx 37°$	✓gradient ✓trig ratio / *trig verh* ✓answer / *antwoord*	(3)
3.1.3	$y - y_1 = m(x - x_1)$ $y - 5 = -\frac{4}{3}(x-1)$ $y - 5 = -\frac{4}{3}x + \frac{4}{3}$ $y = -\frac{4}{3}x + \frac{19}{3}$	midpt: $(1\ ;\ 5)$ $m(PQ) = \frac{3}{4}$ $m(\perp \text{ line}) = -\frac{4}{3}$	✓midpt ✓gradient of $\perp$ bisector / *gradiënt midloodlyn* ✓subst into formula / *vervang in formule* ✓simplify/*vereenvoudig* ✓answer / *antwoord*	(5)

3.2			
3.2.1	$x+3y=10$ $3y=-x+10$ $y=-\frac{1}{3}x+\frac{10}{3}$ $m(\text{AC})=-\frac{1}{3}$ $m(\text{BD})=3$ point / *punt* $(3\ ;\ 9)$ $y-9=3(x-3)$ $y=3x$	✓ $m(\text{AC})=-\frac{1}{3}$ ✓ $m(\text{BD})=3$ ✓ $y=3x$	(3)
3.2.2	$y=3x$ …..① $x+3y=10$ …..② ① in ②: $x+3(3x)=10$ $x+9x=10$ $10x=10$ $x=1$ Subst / *vervang* $x=1$ in ①: $y=3(1)=3$ $\text{K}(1\ ;\ 3)$	✓subst ① into ② / *vervang ① in ②* ✓simplify / *vereenvoudig* ✓ $x=1$ ✓ $y=3$	(4)
3.2.3	$\text{B}(-1\ ;\ -3)$	✓ x – value / *waarde* ✓ y – value / *waarde*	(2)

3.2.4	$AD = 5\sqrt{2}$ and / *en* $x+3y=10$ $x=10-3y$ $5\sqrt{2}=\sqrt{(x-3)^2+(y-9)^2}$ $5\sqrt{2}=\sqrt{(10-3y-3)^2+(y-9)^2}$ $5\sqrt{2}=\sqrt{(7-3y)^2+(y-9)^2}$ $5\sqrt{2}=\sqrt{49-42y+9y^2+y^2-18y+81}$ $50=10y^2-60y+130$ $0=10y^2-60y+80$ $0=y^2-6y+8$ $0=(y-4)(y-2)$ $y=4$ or / *of* $y=2$ $x=-2$ or / *of* $x=4$ $A(-2\ ;4)$ $C(4\ ;2)$	✓subst / *vervang* $5\sqrt{2}$ ✓subst / *vervang* $x=10-3y$ ✓simplify / *vereenvoudig* ✓std form / *vorm* ✓factors / *faktore* ✓ y – values / *waardes* ✓ x – values / *waardes*	(7)
3.2.5	$A'(4\ ;4)$	✓ y – value / *waarde* ✓ x – value / *waarde*	(2)
			[28]

QUESTION 4 / *VRAAG 4*			
4.1	$y-y_1=m(x-x_1)\quad m_1=-\frac{1}{2}\qquad m_2=2$ Point / *punt* $(-4\ ;\ 2)$ $y-2=2(x+4)$ $y=2x+10\qquad$ …..① $y=-\frac{1}{2}x+\frac{5}{2}$ …..② Subst / *vervang* ① in ②: $2x+10=-\frac{1}{2}x+\frac{5}{2}$ $4x+20=-x+5$ $5x=-15$ $x=-3$ $y=4\qquad\therefore \text{A}(-3\ ;\ 4)$	✓ $m_2=2$ ✓equation / *vergelyking* ✓equating / *gelykstel* ✓ x – value / *waarde* ✓ y – value / *waarde*	(5)
4.2	$\text{rad}=\sqrt{(-4+3)^2+(2-4)^2}=\sqrt{5}$ $(x+4)^2+(y-2)^2=5$	✓rad $=\sqrt{5}$ ✓LHS / *LK* ✓RHS / *RK*	(3)
4.3	y – intercepts at 3 and 5 / y – *afsnitte by 3 en 5*: R $(a\ ;\ 4)$ $(x-a)^2+(y-4)^2=5$ through / *deur* $(0\ ;\ 3)$ $(0-a)^2+(3-4)^2=5$ $a^2+1=5$ $a^2=4$ $a=\pm 2$ $a=2\qquad\therefore \text{R}(2\ ;\ 4)$	✓ y – value / *waarde* = 4 ✓subst point and / *vervang punt en* $y=4$ ✓simplify / *vereenvoudig* ✓value of / *waarde van* a	(4)
			[12]

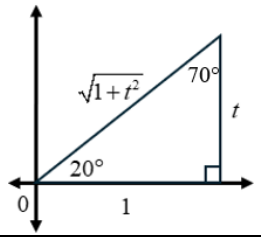
QUESTION 5 / *VRAAG 5*

5.1.1

$\text{hyp}^2 = 1^2 + t^2$

$\text{hyp} = \sqrt{1+t^2}$

$\tan 70° = \frac{1}{t}$



✓ $\text{hyp} = \sqrt{1+t^2}$

✓answer / *antwoord*

(2)

5.1.2

$\sin 50°$

$= \sin(70° - 20°)$

$= \sin 70° \cos 20° - \cos 70° \sin 20°$

$= \left(\frac{1}{\sqrt{1+t^2}}\right)\left(\frac{1}{\sqrt{1+t^2}}\right) - \left(\frac{t}{\sqrt{1+t^2}}\right)\left(\frac{t}{\sqrt{1+t^2}}\right)$

$= \frac{1-t^2}{1+t^2}$

✓ $70° - 20°$

✓expansion / *uitbrei*

✓subst/*vervang* term 1

✓subst/*vervang* term 2

(4)

OR / *OF*

$\sin 50°$

$= \cos 40°$

$= \cos 2.20°$

$= 2\cos^2 20° - 1$

$= 2\left(\frac{1}{\sqrt{1+t^2}}\right)^2 - 1$

$= \frac{2}{1+t^2} - 1$

$= \frac{2-(1+t^2)}{1+t^2}$

$= \frac{1-t^2}{1+t^2}$

✓co-function / *kofunksie*

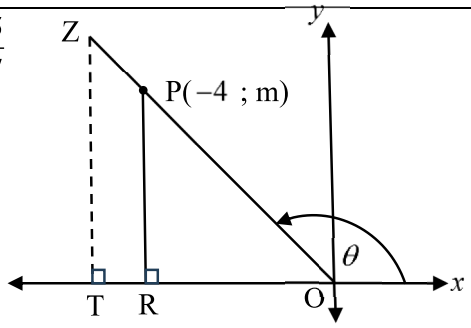
✓ $\cos 2.20°$

✓expansion / *uitbrei*

✓subst / *vervang* $\frac{1}{\sqrt{1+t^2}}$

(4)

	OR / *OF* $\sin 50°$ $= \cos 40°$ $= \cos 2.20°$ $= 1 - 2\sin^2 20°$ $= 1 - 2\left(\frac{t}{\sqrt{1+t^2}}\right)^2$ $= 1 - \frac{2t^2}{1+t^2}$ $= \frac{1+t^2-2t^2}{1+t^2}$ $= \frac{1-t^2}{1+t^2}$	✓co-function / *kofunksie* ✓ $\cos 2.20°$ ✓expansion / *uitbrei* ✓subst / *vervang* $\frac{t}{\sqrt{1+t^2}}$	(4)
5.1.3	$\cos 20° = 2\cos^2 10° - 1$ $\frac{1}{\sqrt{1+t^2}} = 2\cos^2 10° - 1$ $\frac{1}{\sqrt{1+t^2}} + 1 = 2\cos^2 10°$ $\frac{1}{2\sqrt{1+t^2}} + \frac{1}{2} = \cos^2 10°$ $\cos 10° = \sqrt{\frac{1}{2\sqrt{1+t^2}} + \frac{1}{2}}$	✓double angle / *dubbelhoek* ✓substitution / *vervang* ✓ $\cos^2 10°$ the subject / *onderwerp* ✓answer / *antwoord*	(4)

5.2	If: $\sin\theta = \frac{15}{17}$  $r^2 = x^2 + y^2$ $17^2 = x^2 + 15^2$ $x^2 = 64$ $x = -8$ $\therefore \tan\theta = \frac{15}{-8}$ In ΔPRO: $\tan\theta = \frac{m}{-4}$ $\frac{m}{-4} = \frac{15}{-8}$ $-60 = -8m$ $m = \frac{15}{2}$ **OR / *OF*** $\sin\theta = \frac{15}{17}$ In ΔPRO: $PO^2 = (-4)^2 + m^2 = 16 + m^2$ $PO = \sqrt{16+m^2}$ $\sin\theta = \frac{m}{\sqrt{16+m^2}}$ $\frac{m}{\sqrt{16+m^2}} = \frac{15}{17}$ $17m = 15\sqrt{16+m^2}$ $289m^2 = 225(16+m^2)$ $289m^2 = 3600 + 225m^2$ $64m^2 = 3600$ $m^2 = \frac{225}{4}$ $\therefore m = \frac{15}{2}$	✓subst in / *vervang in* Pyth ✓ $x = -8$ with selection / *met seleksie* ✓tan ratio ✓equating / *gelykstel* ✓simplify / *vereenvoudig* ✓answer / *antwoord* ✓subst / *vervang* in Pyth ✓ $PO = \sqrt{16+m^2}$ ✓sin ratio ✓equating / *gelykstel* ✓simplify / *vereenvoudig* ✓answer with selection / *antwoord met seleksie*	(6) (6)
			[16]

QUESTION 6 / *VRAAG 6*

6.1

$$\frac{2\cos 105^\circ \cos 15^\circ}{\cos(45^\circ - x)\cos x - \sin(45^\circ - x)\sin x}$$

$$= \frac{-2\cos 75^\circ \cos 15^\circ}{\cos\left[(45^\circ - x) + x\right]}$$ ✓ $\cos 75^\circ$

✓cos compound angle/ *saamgestelde hoek*

$$= \frac{-2\sin 15^\circ \cos 15^\circ}{\cos\left[45^\circ - x + x\right]}$$

$$= \frac{-\sin 30^\circ}{\cos 45^\circ}$$ ✓sin double angle / *dubbel hoek*

$$= \frac{-\left(\frac{1}{2}\right)}{\left(\frac{\sqrt{2}}{2}\right)}$$ ✓special values / *spesiale waardes*

$$= -\frac{\sqrt{2}}{2}$$ ✓answer / *antwoord*

(5)

6.2

$1 - \tan x = \cos 2x$

$1 - \frac{\sin x}{\cos x} = \cos^2 x - \sin^2 x$ ✓ $\frac{\sin x}{\cos x}$

✓cos double angle / *dubbel hoek*

$\cos x - \sin x = \cos x\left(\cos^2 x - \sin^2 x\right)$

$0 = \cos x\left(\cos^2 x - \sin^2 x\right) - \left(\cos x - \sin x\right)$ ✓ grouping / *groepering*

$0 = \cos x\left(\cos x - \sin x\right)\left(\cos x + \sin x\right) - \left(\cos x - \sin x\right)$

But $\sin x \neq \cos x$

$\cos x\left(\cos x + \sin x\right) - 1 = 0$

$\cos^2 x + \cos x \sin x - \sin^2 x - \cos^2 x = 0$

$\cos x \sin x - \sin^2 x = 0$ ✓std form / *vorm*

$\sin x\left(\cos x - \sin x\right) = 0$

$\sin x = 0$ of / *or* $\cos x = \sin x$ ✓both equations / *beide vergelykings*

$x = 0^\circ + k.360^\circ; k \in \mathbb{Z}$ NA

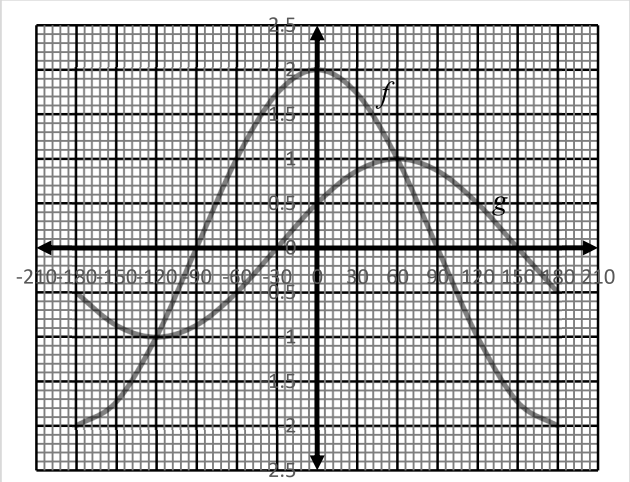
or /*of*

$x = 180^\circ + k.360^\circ; k \in \mathbb{Z}$ ✓ $x = 0^\circ + k.360^\circ; k \in \mathbb{Z}$

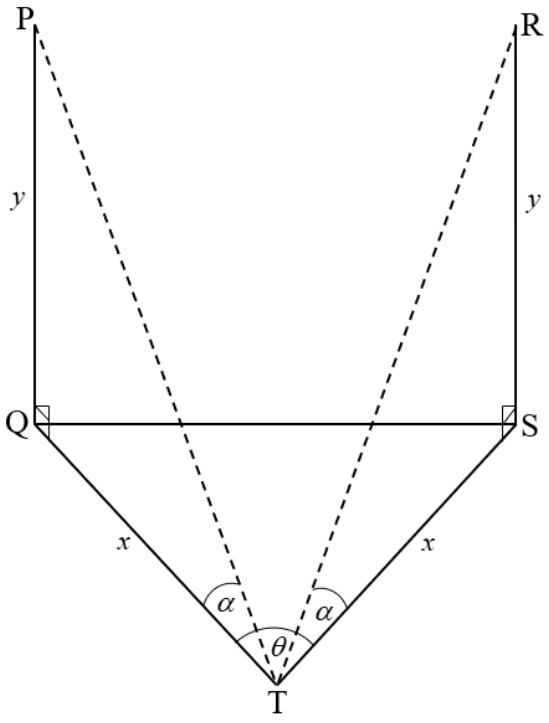
$x = 180^\circ + k.360^\circ; k \in \mathbb{Z}$

(6)

	OR /*OF*		
	$1-\tan x=\cos 2x$		
	$1-\dfrac{\sin x}{\cos x}=\cos^2 x-\sin^2 x$	✓ $\dfrac{\sin x}{\cos x}$ ✓cos double angle / *dubbel hoek*	
	$\dfrac{\cos x-\sin x}{\cos x}=(\cos x-\sin x)(\cos x+\sin x)$	✓ factors / *faktore*	
	But $\sin x\neq\cos x$		
	$\dfrac{1}{\cos x}=(\cos x+\sin x)$		
	$1=\cos x(\cos x+\sin x)$		
	$\cos^2 x+\cos x\sin x-\sin^2 x-\cos^2 x=0$		
	$\cos x\sin x-\sin^2 x=0$	✓std form / *vorm*	
	$\sin x(\cos x-\sin x)=0$		
	$\sin x=0$ of / *or* $\cos x=\sin x$	✓both equations / *beide vergelykings*	
	$x=0°+k.360°;k\in\mathbb{Z}$ NA	✓ $x=0°+k.360°;k\in\mathbb{Z}$	
	or /*of*	$x=180°+k.360°;k\in\mathbb{Z}$	
	$x=180°+k.360°;k\in\mathbb{Z}$		(6)
6.3	$\cos 90°,\ \sin 30°,\ \tan\theta$		
	$=\ 0\ ;\ \dfrac{1}{2}\ ;\ \tan\theta$	✓special angles / *spesiale hoeke*	
	AS / *RR*: $T_2-T_1=T_3-T_2$		
	$\dfrac{1}{2}-0=\tan\theta-\dfrac{1}{2}$	✓common diff / *konstante verskil*	
	$\tan\theta=1$	✓trig equation / *vergelyking*	
	$\theta=45°$	✓answer / *antwoord*	(4)
			[15]

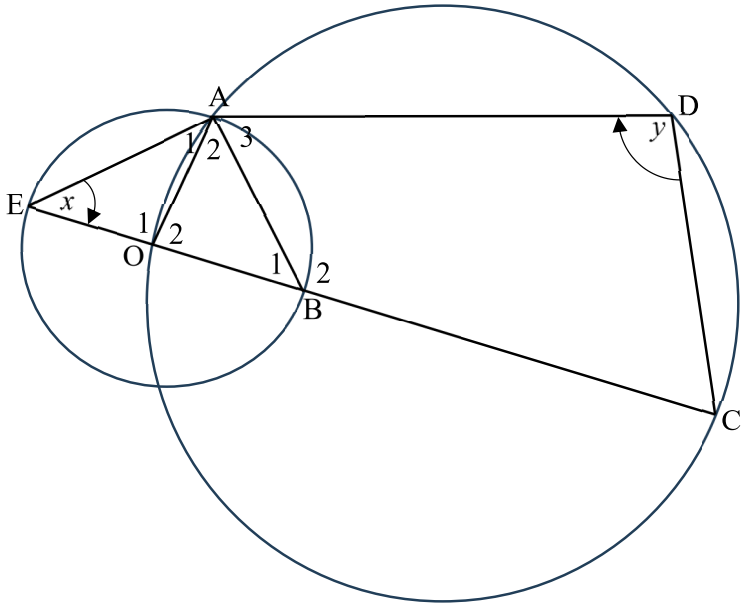
QUESTION 7 / *VRAAG 7*			
7.1.1	$2\cos x = \sin(x+30°)$ $2\cos x = \sin x\cos 30° + \cos x \sin 30°$ $2\cos x = \sin x\left(\frac{\sqrt{3}}{2}\right) + \cos x\left(\frac{1}{2}\right)$ $4\cos x = \sqrt{3}\sin x + \cos x$ $3\cos x = \sqrt{3}\sin x$	✓expansion / *uitbrei* ✓special values / *spesiale waardes* ✓simplify / *vereenvoudig*	(3)
7.1.2	$2\cos x = \sin(x+30°)$ $3\cos x = \sqrt{3}\sin x$ $\tan x = \frac{3}{\sqrt{3}} = \sqrt{3}$ $x = 60° + k.180° \; ; k \in \mathbb{Z}$ $x = \{-120° \; ; 60°\}$	✓change to tan x / *verander na* tan x ✓general sol / *algemene opl* ✓ $-120°$ ✓ $60°$	(4)
7.2.1		✓ x – intercept / *afsnit* ✓ y – intercept / *afsnit* ✓shape / *vorm*	(3)
7.2.2 (a)	$x \in (-120° \; ; 60°)$	✓interval ✓notation / *notasie*	(2)
7.2.2 (b)	$x \in (-180° \; ; \text{-}90°]$ and / *en* $x = 0°$	✓interval ✓notation / *notasie* ✓ $x = 0°$	(3)
			[15]

QUESTION 8 / *VRAAG 8*



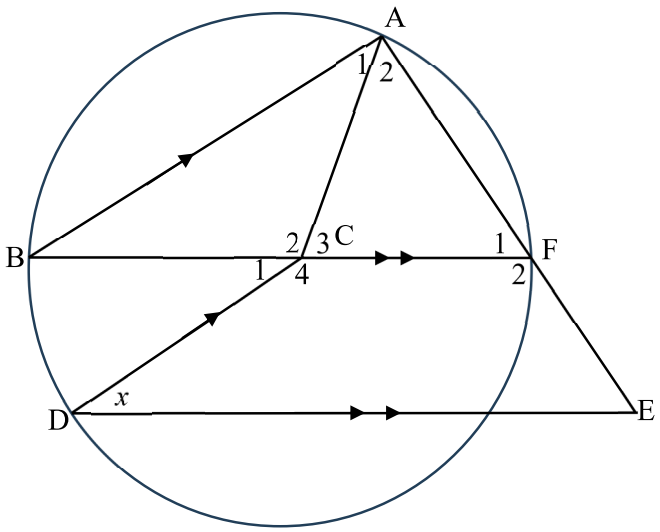
	In ΔPQT : $\tan\alpha = \frac{y}{x}$	✓tan ratio	
	$x = \frac{y}{\tan\alpha}$	✓answer / *antwoord*	
	In ΔQST : $QS^2 = x^2 + x^2 - 2(x)(x)\cos\theta$	✓subst in cos rule / *vervang in cosreël*	
	$QS^2 = 2x^2 - 2x^2\cos\theta$		
	$QS^2 = 2x^2(1-\cos\theta)$	✓common factor / *gemeenskaplike faktor*	
	$QS^2 = 2\left(\frac{y}{\tan\alpha}\right)^2(1-\cos\theta)$	✓substitute / *vervang* x	
	$QS^2 = \frac{2y^2(1-\cos\theta)}{\tan^2\alpha}$		(5)
			[5]

QUESTION 9 / *VRAAG 9*



9.1	$\hat{E}+\hat{A}_1+\hat{A}_2+\hat{B}_1=180°$ $\hat{A}_1+\hat{A}_2=90°$ $x+90°+35°=180°$ $x=55°$	int $\angle$'*s* of Δ / *binne* $\angle e$ Δ $\angle$ in semi Θ	✓S ✓S/R ✓answer / *antwoord*	(3)
9.2	$\hat{O}_2=2\hat{E}=110°$ $\hat{O}_2+\hat{D}=180°$ $\hat{D}=180°-110°=70°$	$\angle$ at centre $=2\times$circumf $\angle$ / *midpt* $\angle=2\times$ *omtr* $\angle$ opp $\angle$'*s* cyclic quad / *teenoorst* $\angle e$ *kvh*	✓S ✓R ✓S/R ✓answer / *antwoord*	(4)
				[7]

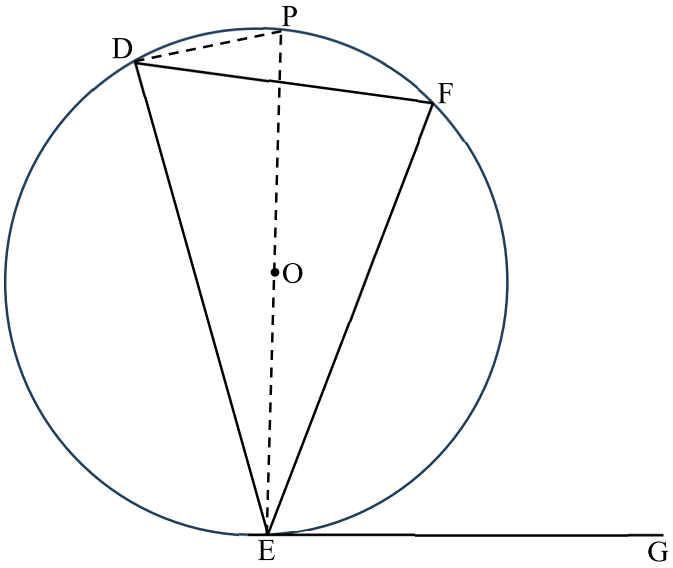
QUESTION 10 / *VRAAG 10*



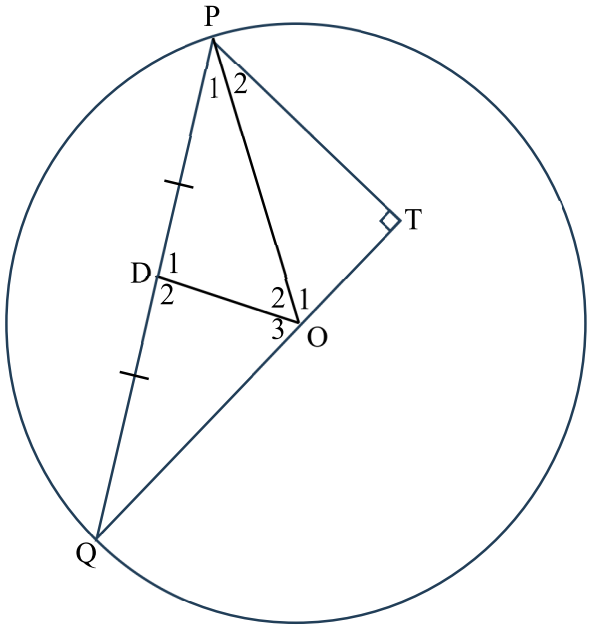
10.1	$\hat{D} = \hat{C}_1 = x$ $\hat{C}_1 = \hat{B} = x$ $\hat{B} = \hat{A}_1 = x$	alt ∠'s / *verw* ∠e BF ∥ DE alt ∠'s / *verw* ∠e DC ∥ BA ∠'s opp equal sides / ∠e *teenoor gelyke sye*	✓S ✓R ✓S/R ✓S ✓R	(5)
10.2	$\hat{A}_1 + \hat{A}_2 = 90°$ AB ⊥ AE	∠ in semi Θ	✓R	(1)
10.3	$\hat{F}_1 = 90° - x$ $\hat{D} = x$ $\hat{F}_1 \neq D$ CDEF is not a cyclic quad	int ∠'s Δ / *binne* ∠e Δ ext ∠ not equal opp int ∠ / *buite* ∠ *nie gelyk aan teenoorst binne* ∠ *nie*	✓S ✓R ✓concl / *gevolgtr* ✓R	(4)
				[10]

QUESTION 11 / *VRAAG 11*

11.1



Draw EO produced to P on the circumference. Join PD / *Trek EO verleng na P op die omtrek. Verbind PD*		✓construction / *konstruksie*
$P\hat{E}G = 90°$	rad $\perp$ tan / *rad* $\perp$ *rklyn*	✓S ✓R
$E\hat{D}P = 90°$	$\angle$ in semi Θ	✓S/R
$P\hat{E}G = E\hat{D}P$	$\angle$'*s* in same segment / $\angle$ *e in dies segment*	✓S/R
But $P\hat{E}F = P\hat{D}F$		
$\therefore F\hat{E}G = \hat{D}$		(5)

11.2				
11.2.1	$\hat{D}_1 = \hat{D}_2 = 90°$	line from centre to midpt chord / *lyn van midpt na midpt v krd*	✓S ✓R	
	$\hat{O}_3 = 90° - \hat{Q}$	int $\angle$'*s* of Δ / *binne* $\angle$ *e* Δ	✓S	
	$\hat{P}_1 + \hat{P}_2 = 90° - \hat{Q}$ $\hat{O}_3 = \hat{P}_1 + \hat{P}_2$	int $\angle$'*s* of Δ / *binne* $\angle$ *e* Δ	✓S	(4)
11.2.2	In ΔPTQ and / *en* ΔODQ:			
	(i) $\hat{O}_3 = \hat{P}_1 + \hat{P}_2$	Proven / *bewys*	✓S	
	(ii) $\hat{Q} = \hat{Q}$	Common / *gemeensk*	✓S	
	(iii) $\hat{D}_2 = \hat{T}$	3rd $\angle$ of Δ / *3de hoek v* Δ	✓S	
	$\therefore \Delta PTQ \text{ III } \Delta ODQ$			(3)
	OR / *OF*			
	In ΔPTQ and / *en* ΔODQ:			
	(i) $\hat{O}_3 = \hat{P}_1 + \hat{P}_2$	Proven / *bewys*	✓S	
	(ii) $\hat{Q} = \hat{Q}$	Common / *gemeensk*	✓S	
	$\therefore \Delta PTQ \text{ III } \Delta ODQ$	AAA / *HHH*	✓R	(3)

11.2.3	$\frac{TQ}{DQ} = \frac{PQ}{OQ}$	$\Delta PTQ \text{ III } \Delta ODQ$	✓S ✓R	
	$TQ.OQ = PQ.DQ$		✓S	
	$PQ = 2PD$			
	$DQ = PD$	radii	✓S	
	$TQ.OQ = 2PD.PD = 2PD^2$		✓substitute / *vervang*	(5)
11.2.4	$TQ.OQ = 2PD^2$	From / *van* 10.2.3		
	$TQ = \frac{2PD^2}{OQ}$		✓S	
	$PQ^2 = QT^2 + PT^2$	Pyth	✓S/R	
	And $PQ = 2PD$			
	$\therefore (2PD)^2 = QT^2 + PT^2$		✓S	
	$4PD^2 = QT^2 + PT^2$		✓simplify / *vereenvoudig*	
	$TQ = \frac{2PD^2}{OQ} = \frac{4PD^2}{2OQ}$	Equivalent fraction / *ekwivalente breuke*	✓S	
	$TQ = \frac{QT^2 + PT^2}{2OQ}$			(5)
				[22]