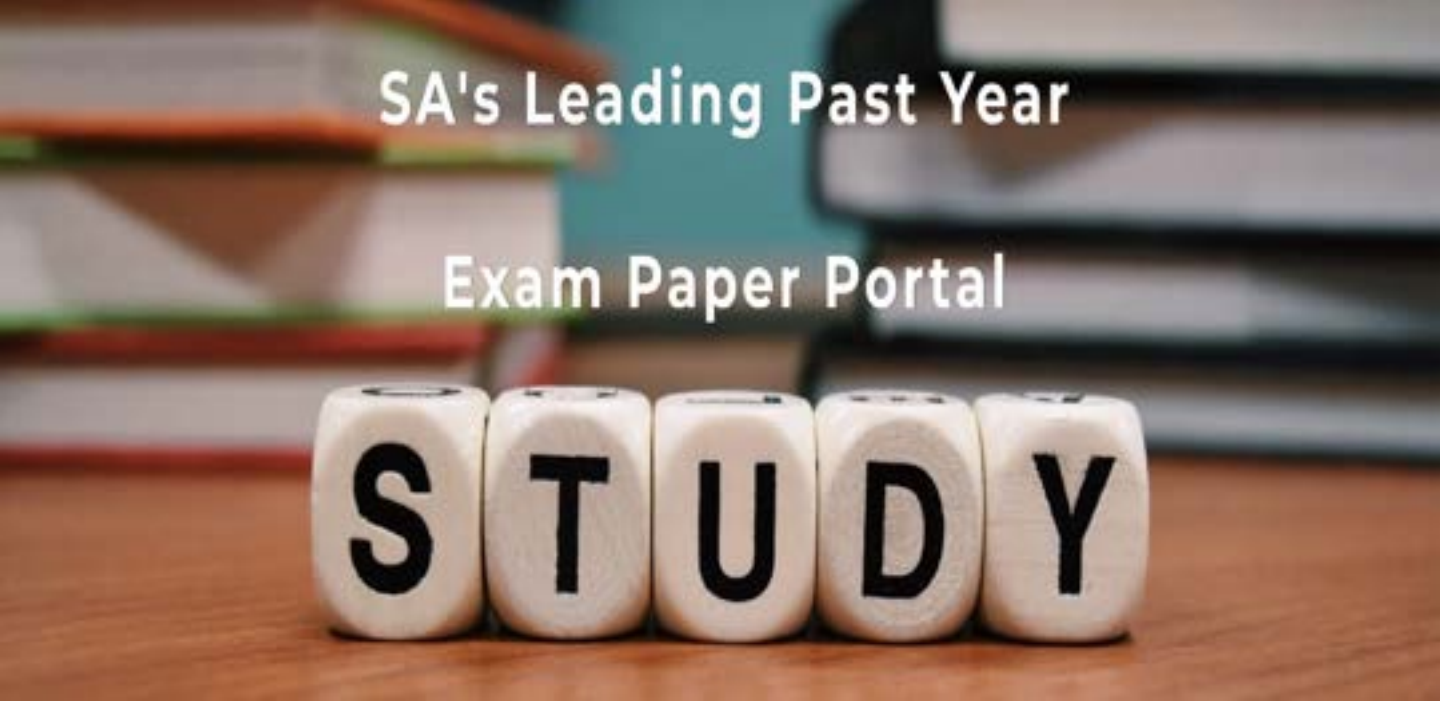

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GRADE/*GRAAD 12*

MATHEMATICS P2/*WISKUNDE V2*

NOVEMBER 2014

MEMORANDUM

MARKS/*PUNTE*: 150

This memorandum consists of 23 pages.
Hierdie memorandum bestaan uit 23 bladsye.

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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 memorandum.
- Assuming answers/values in order to solve a problem is NOT acceptable.

NOTA:
- *As 'n kandidaat 'n vraag TWEEKEER beantwoord, merk slegs die EERSTE poging.*
- *As 'n kandidaat 'n poging om die vraag te beantwoord, doodgetrek het en nie dit oorgedoen het nie, merk die doodgetrekte poging.*
- *Volgehoue akkuraatheid word in ALLE aspekte van die nasienmemorandum toegepas.*
- *Aanvaarding van antwoorde/waardes om 'n probleem op te los, is ONaanvaarbaar.*

QUESTION/*VRAAG* 1

1.1	$\bar{x} = \frac{816}{12} = 68$	✓ $\frac{816}{12}$ ✓ 68 (2)
1.2	$\sigma = 18{,}42$	✓ answer/*antw* (1)
1.3	$(68 - 18{,}42 ; 68 + 18{,}42) = (49{,}58 ; 86{,}42)$ $\therefore$ 6 candidates had a mark within one standard deviation of the mean/*6 kandidate het 'n punt binne een standaardafwyking vanaf die gemiddelde*.	✓✓ interval ✓ answer/*antw* (3)
1.4	$a = 22{,}828... = 22{,}83$ $b = 0{,}66429... = 0{,}66$ $\therefore \hat{y} = 0{,}66x + 22{,}83$ **OR/*OF*** $\hat{y} = 22{,}83 + 0{,}66x$	✓ value of *a/ waarde van a* ✓ value of *b/ waarde van b* ✓ equation/*vgl* (3)
1.5	$\hat{y} = 0{,}66x + 22{,}83$ $y = 0{,}66(60) + 22{,}83$ $62{,}43...\% \approx 62\%$ **OR/*OF*** $62{,}69\% \approx 63\%$	✓ subs of 60 into equation ✓ answer/*antw* (2) ✓✓ answer/*antw* (2)
1.6	(82 ; 62)	✓ answer/*antw* (1) **[12]**

QUESTION/*VRAAG* 2

2.1

$50 < x \leq 60$ **OR/*OF*** $50 \leq x < 60$ **OR/*OF***
between 50 and 60/*tussen 50 en 60*

✓ answer/*antw* (1)

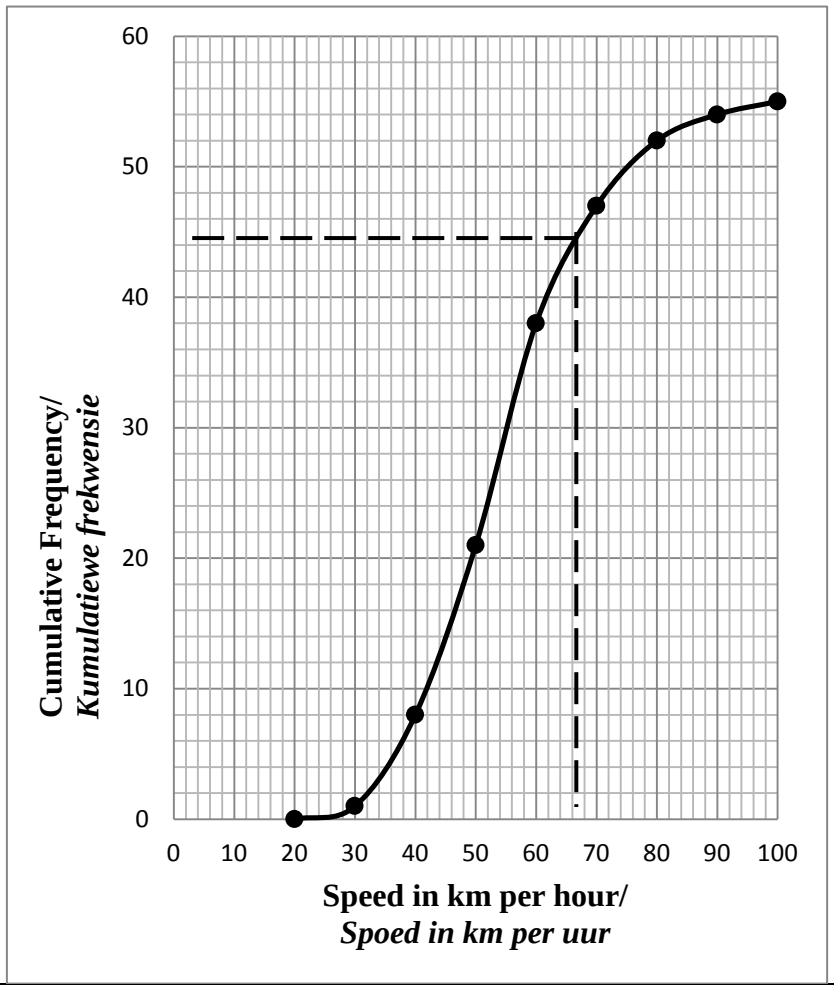
2.2.1

Class ***Klas***	**Frequency** ***Frekwensie***	**Cumulative frequency** ***Kumulatiewe frekwensie***
$20 < x \leq 30$	1	1
$30 < x \leq 40$	7	8
$40 < x \leq 50$	13	21
$50 < x \leq 60$	17	38
$60 < x \leq 70$	9	47
$70 < x \leq 80$	5	52
$80 < x \leq 90$	2	54
$90 < x \leq 100$	1	55

✓ 8

✓ 55 (2)

2.2.2



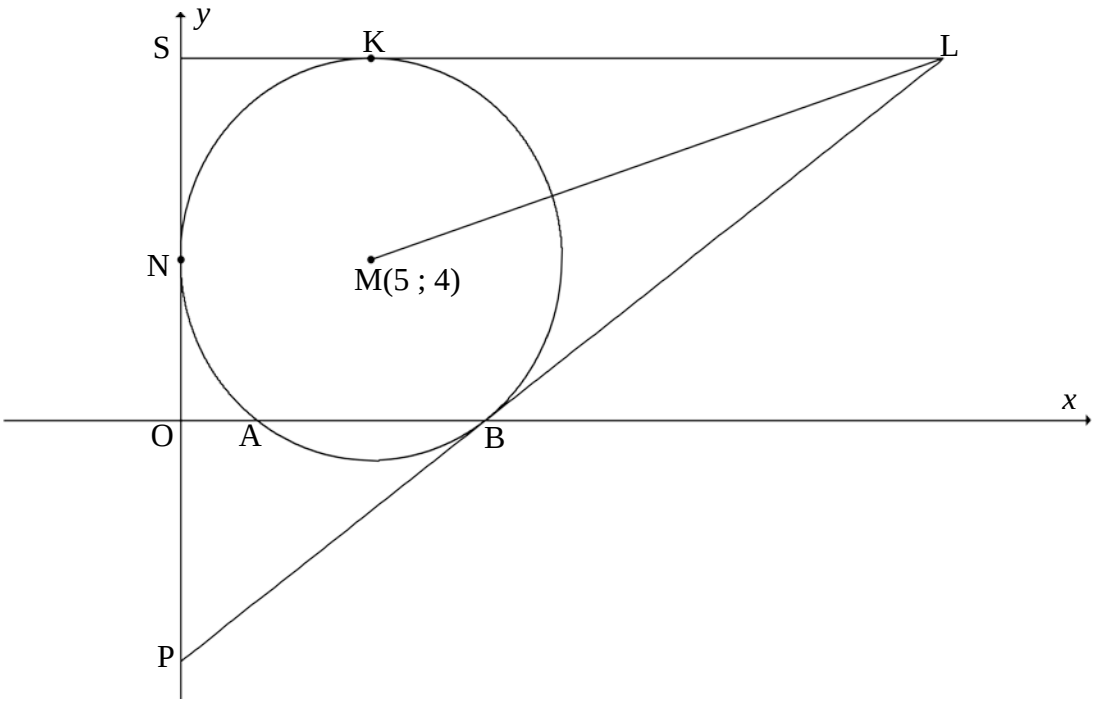
✓ grounding at (20 ; 0)/ *anker by* (20 ; 0)
✓ plotting at upper limits/ *plot by boonste limiete*
✓ smooth shape of curve/*gladde kurwe* (3)

2.3

55 – 44 (accept/*aanvaar* 43 – 45)
≈ 11 motorists/*motoriste*
(accept/*aanvaar* 10 – 12 motorists/*motoriste*)

✓ 44
✓ 11 (2)
[8]

QUESTION/*VRAAG* 3

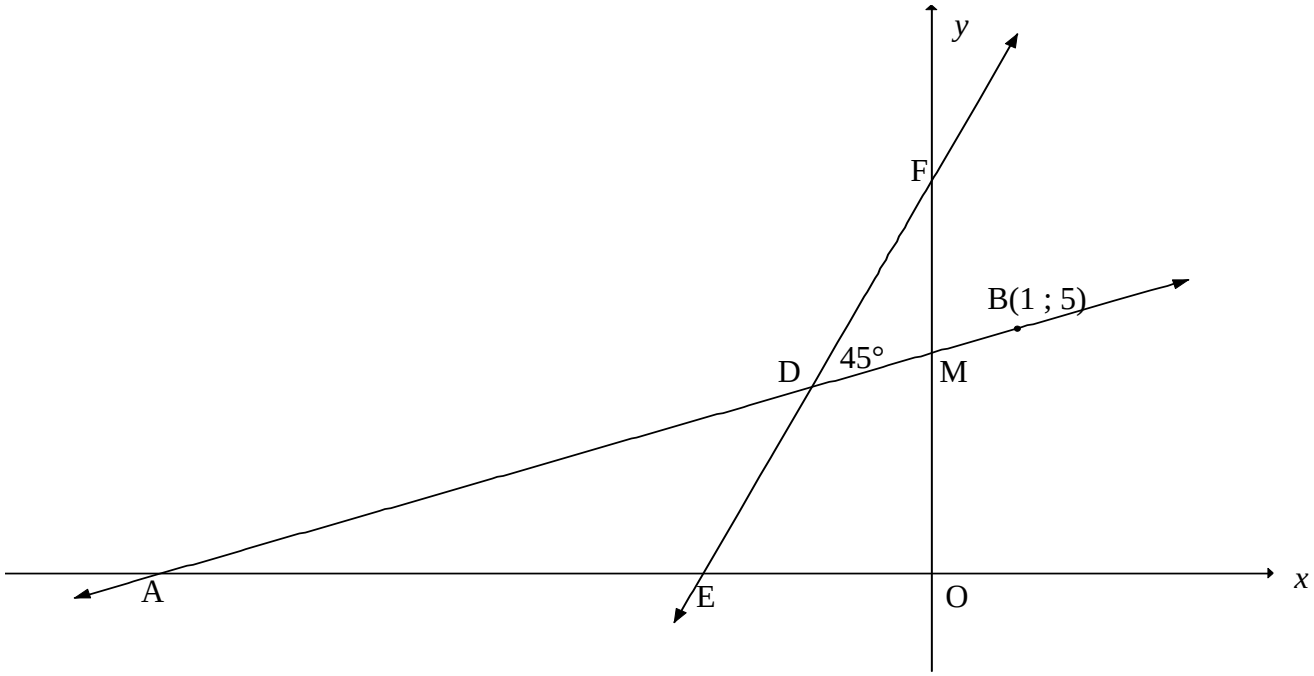


3.1	r = MN = 5	✓ answer/*antw* (1)
3.2	$(x-5)^2+(y-4)^2=25$	✓equation/*vgl* (1)
3.3	A(x ; 0) $(x-5)^2+(0-4)^2=25$ $x^2-10x+25+16=25$ $x^2-10x+16=0$ $(x-8)(x-2)=0$ $\therefore x=8$ or/*of* $x=2$ $\therefore$ A(2 ; 0) **OR/*OF*** $(x-5)^2+(0-4)^2=25$ $(x-5)^2+16=25$ $(x-5)^2=9$ $(x-5)=\pm 3$ $\therefore x=8$ or/*of* $x=2$ $\therefore$ A(2 ; 0)	✓ substitute into eq/ *vervang in vgl* $y=0$ ✓ standard form/ *standaardvorm* or perfect square form/*kwadr vorm* ✓ answer/*antw* (3)
3.4.1	$m_{MB}=\frac{4-0}{5-8}$ $=-\frac{4}{3}$	✓ subst M and B into form/*vervang M and B in form* ✓ $m_{MB}=-\frac{4}{3}$ (2)

3.4.2	$m_{MB} \times m_{PB} = -1$ (tangent ⊥ radius/ *rkl ⊥ radius*) $m_{PB} = \frac{3}{4}$ $y = \frac{3}{4}x + c$ **OR/*OF*** $y - y_1 = \frac{3}{4}(x - x_1)$ $0 = \frac{3}{4}(8) + c$ $y - 0 = \frac{3}{4}(x - 8)$ $y = \frac{3}{4}x - 6$ $y = \frac{3}{4}x - 6$	✓ $m_{MB} \times m_{PB} = -1$ ✓ $m_{PB} = \frac{3}{4}$ ✓ equation/*vgl* (3)
3.5	$y_K = y_M + r = 4 + 5$ $y = 9$	✓ 9 ✓ equation/*vgl* (2)
3.6	At/*By* L: $\frac{3}{4}x - 6 = 9$ $3x - 24 = 36$ $3x = 60$ $x = 20$ $\therefore$ L(20 ; 9)	✓ equating simultaneously ✓ simplification (2)
3.7	L(20 ; 9) $ML = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$ **OR/OF** $ML = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$ $= \sqrt{(20-5)^2 + (9-4)^2}$ $= \sqrt{(15)^2 + (5)^2}$ $= \sqrt{225 + 25}$ $= \sqrt{(5)^2(9+1)}$ $= \sqrt{250}$ *or / of* $5\sqrt{10}$ $= \sqrt{250}$ *or / of* $5\sqrt{10}$	✓ correct subst into distance formula/ *korrekte subst in afstand-formule* ✓ answer in surd form/*antw in wortelvorm* (2)
3.8	**MK ⊥ KL OR/OF M$\hat{K}$L** = 90° (radius ⊥ tangent/*radius ⊥ rkl*) $\therefore$ ML is a diameter as it subtends a right angle/*ML is middellyn* $r = \frac{ML}{2} = \frac{\sqrt{250}}{2} = \sqrt{\frac{125}{2}}$ or 7,91 Centre of circle = midpoint of ML/*Midpt van sirkel = midpt v ML* $x = \frac{5+20}{2} = \frac{25}{2} = 12{,}5$ $y = \frac{4+9}{2} = \frac{13}{2} = 6{,}5$ Centre/*midpt*: (12,5 ; 6,5) Equation of the circle KLM /*Vgl van sirkel KLM*: $\therefore \quad (x - 12{,}5)^2 + (y - 6{,}5)^2 = \frac{250}{4} = \frac{125}{2} = 62{,}5$ **OR/*OF***	✓ S ✓ value of/*waarde van r* ✓ $x = 12{,}5$ ✓ $y = 6{,}5$ ✓ answer in correct form/ *antw in korrekte vorm* (5)

	MK ⊥ KL OR/OF $\hat{MKL} = 90°$ (radius ⊥ tangent/*radius ⊥ rkl*) ∴ ML is a diameter as it subtends a right angle/*ML is middellyn* Centre of circle = midpoint of ML/*Midpt van sirkel = midpt v ML* $x = \frac{5+20}{2} = \frac{25}{2} = 12{,}5 \qquad y = \frac{4+9}{2} = \frac{13}{2} = 6{,}5$ Centre/*midpt*: (12,5 ; 6,5) Equation of the circle KLM /*Vgl van sirkel KLM*: $(x-12{,}5)^2 + (y-6{,}5)^2 = r^2$ subst (5 ; 4): $(5-12{,}5)^2 + (4-6{,}5)^2 = r^2$ $62{,}5 = r^2$ $\therefore \quad (x-12{,}5)^2 + (y-6{,}5)^2 = \frac{250}{4} = \frac{125}{2} = 62{,}5$ **OR/*OF*** By symmetry about LM/*deur simmetrie om LM*: **MK ⊥ KL OR/OF $\hat{MKL} = 90°$** (radius ⊥ tangent/*radius ⊥ rkl*) ∴ ML is a diameter as it subtends a right angle/*ML is middellyn* ML is a diameter /*ML is 'n middellyn* $r = \frac{ML}{2} = \frac{\sqrt{250}}{2} = \sqrt{\frac{125}{2}}$ or /of 7,91 Centre of circle = midpoint of ML/*Midpt van sirkel = midpt v ML* $x = \frac{5+20}{2} = \frac{25}{2} = 12{,}5 \qquad y = \frac{4+9}{2} = \frac{13}{2} = 6{,}5$ Centre/*midpt*: (12,5 ; 6,5) Equation of the circle KLM /*Vgl van sirkel KLM*: $\therefore \quad (x-12{,}5)^2 + (y-6{,}5)^2 = \frac{250}{4} = \frac{125}{2} = 62{,}5$	✓ S ✓ $x = 12{,}5$ ✓ $y = 6{,}5$ ✓ value of/*waarde van* r^2 ✓ answer in correct form/*antw in korrekte vorm* (5) ✓ S ✓ value of/*waarde van r* ✓ $x = 12{,}5$ ✓ $y = 6{,}5$ ✓ answer in correct form/*antw in korrekte vorm* (5) **[21]**

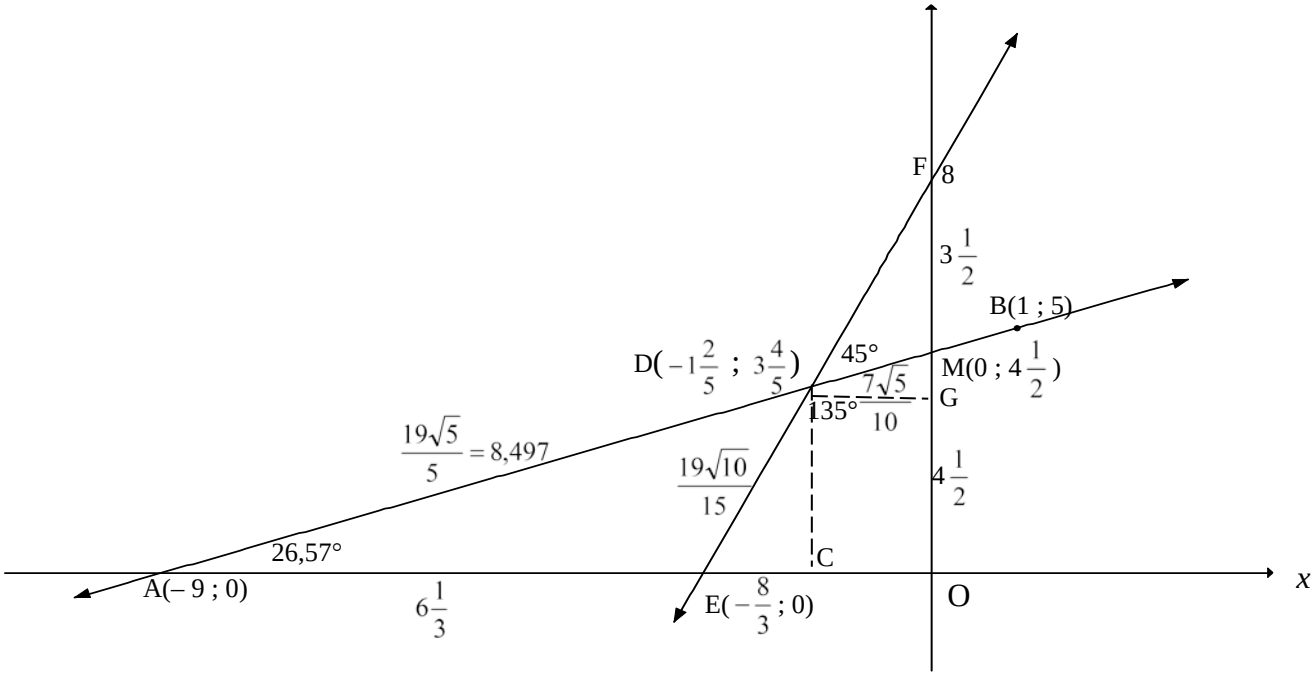
QUESTION/VRAAG 4



4.1	$y = 0$: $3x + 8 = 0$ $x = -\frac{8}{3}$ $\therefore \text{E}\left(-2\frac{2}{3};0\right)$ **OR/*OF*** $\text{E}\left(-\frac{8}{3};0\right)$	✓ *y*-value/*waarde* ✓ *x*-value/*waarde* (2)
4.2	$\tan \text{D}\hat{\text{E}}\text{O} = m_{\text{DE}} = 3$ $\therefore \text{D}\hat{\text{E}}\text{O} = 71{,}565... = 71{,}57°$ $\text{D}\hat{\text{A}}\text{E} = 71{,}565...° - 45°$ $= 26{,}57°$	✓ $\tan \text{D}\hat{\text{E}}\text{O} = 3$ ✓ 71,565…° ✓ 26,57° (3)
4.3	$m_{\text{AB}} = \tan 26{,}57°$ $= \frac{1}{2}$ $y = \frac{1}{2}x + c$ **OR/*OF*** $y - y_1 = \frac{1}{2}(x - x_1)$ $5 = \frac{1}{2}(1) + c$ $y - 5 = \frac{1}{2}(x - 1)$ $y = \frac{1}{2}x + 4\frac{1}{2}$ $y = \frac{1}{2}x + \frac{9}{2}$	✓ $m_{\text{AB}} = \tan 26{,}57°$ ✓ $m_{\text{AB}} = \frac{1}{2}$ ✓ subst of *m* and (1 ; 5)into formula/ *subst m en (1 ; 5) in formule* ✓ equation/*vgl* (4)

4.4	Solve $x - 2y + 9 = 0$ and $y = 3x + 8$ simultaneously: $x - 2(3x+8) + 9 = 0$ $x - 6x - 16 + 9 = 0$ $-5x = 7$ $x = -1\frac{2}{5}$ $\therefore y = 3(-1\frac{2}{5}) + 8$ **OR/*OF*** $-1\frac{2}{5} - 2y + 9 = 0$ $y = 3\frac{4}{5}$ $y = 3\frac{4}{5}$ $\therefore$ D$(-1\frac{2}{5}\ ;\ 3\frac{4}{5})$ **OR/OF** $x = 2y - 9$ $y = 3(2y - 9) + 8$ $y = 6y - 27 + 8$ $\therefore y = 3\frac{4}{5}$ $x = 2(3\frac{4}{5}) - 9$ **OR/OF** $3\frac{4}{5} = 3x + 8$ $x = -1\frac{2}{5}$ $x = -1\frac{2}{5}$ $\therefore$ D$(-1\frac{2}{5}\ ;\ 3\frac{4}{5})$ **OR/*OF*** $3x + 8 = \frac{1}{2}x + 4\frac{1}{2}$ $6x + 16 = x + 9$ $5x = -7$ $\therefore\ x = -1\frac{2}{5}$ $\therefore y = 3(-1\frac{2}{5}) + 8$ **OR/*OF*** $y = \frac{1}{2}(-1\frac{2}{5}) + 4\frac{1}{2}$ $y = 3\frac{4}{5}$ $y = 3\frac{4}{5}$ $\therefore$ D$(-1\frac{2}{5}\ ;\ 3\frac{4}{5})$ **OR/*OF***	✓ subst/*vervang* ✓ *x*-value/*waarde* ✓ subst/*vervang* ✓ *y*-value/*waarde* (4) ✓ subst/*vervang* ✓ *y* value/*waarde* ✓ subst/*vervang* ✓ *x*-value/*waarde* (4) ✓ equating/*gelyk stel* ✓ *x* value/*waarde* ✓ subst/*vervang* ✓ *y*-value/*waarde* (4)

	$x - 2y = -9$ ……(1) $-6x + 2y = 16$ …...(2) (1) + (2): $-5x = 7$ $\therefore x = -1\frac{2}{5}$ $\therefore -1\frac{2}{5} - 2y = -9$ **OR/*OF*** $y = 3(-1\frac{2}{5}) + 8$ $y = 3\frac{4}{5}$ $y = 3\frac{4}{5}$ $\therefore$ D$(-1\frac{2}{5}\ ;\ 3\frac{4}{5})$ **OR/*OF*** $y = 3x + 8$ …….(1) $6y = 3x + 27$ …….(2) (1) – (2): $-5y = -19$ $\therefore y = 3\frac{4}{5}$ $3\frac{4}{5} = 3x + 8$ $x = 2(3\frac{4}{5}) - 9$ **OR/*OF*** $x = -1\frac{2}{5}$ $x = -1\frac{2}{5}$ $\therefore$ D$(-1\frac{2}{5}\ ;\ 3\frac{4}{5})$	✓ adding/*optelling* ✓ *x*-value/*waarde* ✓ subst/*vervang* ✓ *y*-value/*waarde* (4) ✓ subtracting/*aftrekking* ✓ *y*-value/*waarde* ✓ subst/*vervang* ✓ *x*-value/*waarde* (4)



4.5	area DMOE = area ΔAMO – area ΔADE $x_A = 2(0) - 9 \quad \therefore$ A(–9 ; 0) area ΔAMO $= \frac{1}{2}$. AO. OM $= \frac{1}{2}(9)(4\frac{1}{2})$ = 20,25 area ΔADE $= \frac{1}{2}$. AE . y_D $= \frac{1}{2}$. (AO – EO). y_D $= \frac{1}{2}\left(9 - 2\frac{2}{3}\right)\left(3\frac{4}{5}\right)$ = 12,03 **OR/OF** area ΔADE $= \frac{1}{2}$AD.AE.sin DÂE $= \frac{1}{2}\ (\frac{19\sqrt{5}}{5}).6\frac{1}{3}$.sin 26,57° = 12,03 $\therefore$ area DMOE = 8,22 square units/*vk eenh* **OR/*OF***	✓ correct method/ *korrekte metode* ✓ $x_A = -9$ ✓ $\frac{1}{2}(9)(4\frac{1}{2})$ ✓ AE = $9 - 2\frac{2}{3} = 6\frac{1}{3}$ ✓ $y_D = 3\frac{4}{5}$ **OR/OF** ✓ AD = $\frac{19\sqrt{5}}{5}$ ✓ AE = $6\frac{1}{3}$ ✓ answer/*antw* (6)

area DMOE = area rectangle DCOG + area ΔDMG + area ΔDEC

$= (1\frac{2}{5} \times 3\frac{4}{5}) + \frac{1}{2}\left(1\frac{2}{5}\right)(\frac{7}{10}) + \frac{1}{2}(3\frac{4}{5})(\frac{19}{15})$

= 8,22 square units/*vk eenh*

✓ correct method/ *korrekte metode*
✓ $3\frac{4}{5}$
✓ $1\frac{2}{5}$ ✓ 0,7
✓ $\frac{19}{15}$
✓ answer

(6)

OR/*OF*

area DMOE = area ΔEDO + area ΔODM

$= \frac{1}{2}(\text{EO} \times y_{\text{D}}) + \frac{1}{2}(\text{OM} \times -x_D)$

$= \frac{1}{2}\left[\left(\frac{8}{3} \times \frac{19}{5}\right) + \left(\frac{9}{2} \times \frac{7}{5}\right)\right]$

$= \frac{1}{2}\left(\frac{304+189}{30}\right)$

$= \frac{493}{60}$ or/*of* $8\frac{13}{60}$ or/*of* 8,22 square units/*vk eenh*

✓ correct method/ *korrekte metode*
✓ $y_{\text{D}} = \frac{19}{5}$ or $3\frac{4}{5}$
✓ EO = $\frac{8}{3}$
✓ $-x_{\text{D}} = \frac{7}{5}$
✓ OM = $\frac{9}{2}$ or $4\frac{1}{2}$
✓ answer/*antw*

(6)

OR/*OF*

area DMOE = area ΔEOF – area ΔDMF

$= \frac{1}{2}(\text{EO} \times \text{OF}) - \frac{1}{2}(\text{OF} - \text{OM})(-x_D)$

$= \frac{1}{2}\left[\left(\frac{8}{3} \times 8\right) + \left(\frac{7}{2} \times \frac{7}{5}\right)\right]$

$= \frac{1}{2}\left(\frac{640-147}{30}\right)$

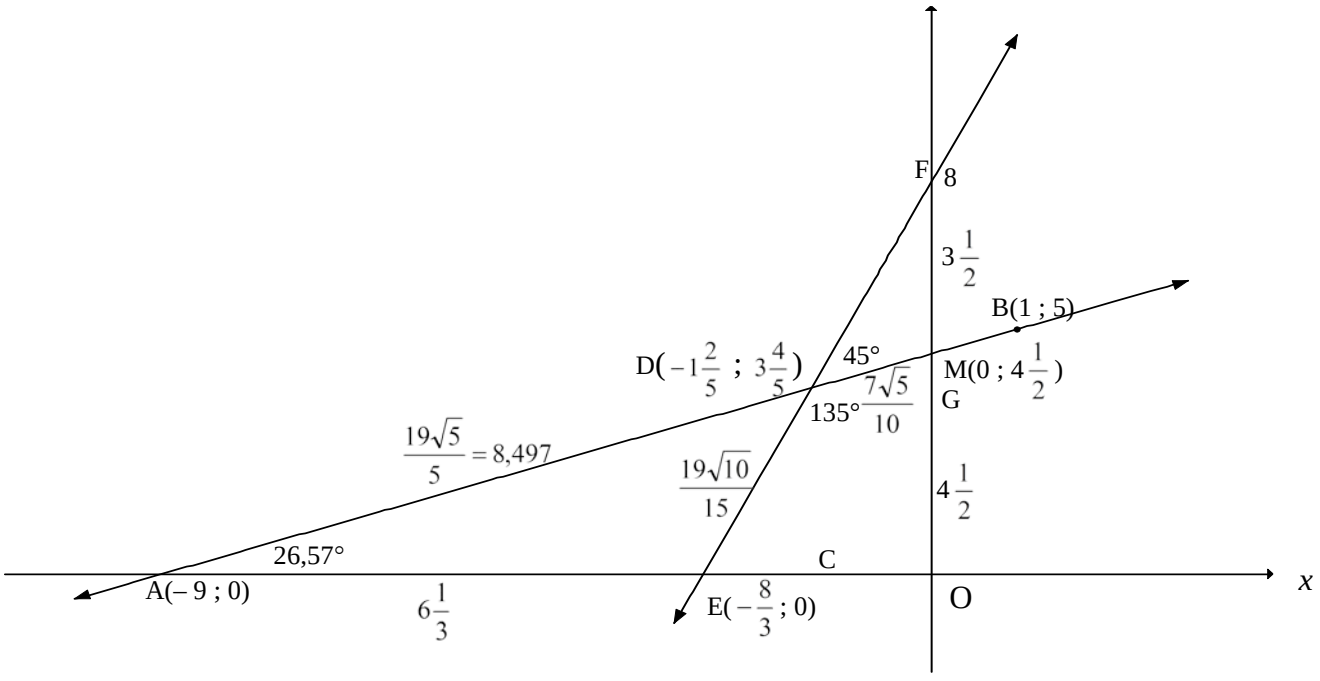
$= \frac{493}{60}$ or $8\frac{13}{60}$ or 8,22 square units/*vk eenh*

✓ correct method/ *korrekte metode*
✓ $y_{\text{F}} = 8$
✓ EO = $\frac{8}{3}$
✓ $-x_{\text{D}} = \frac{7}{5}$
✓ FM = $3\frac{1}{2}$
✓ answer/*antw*

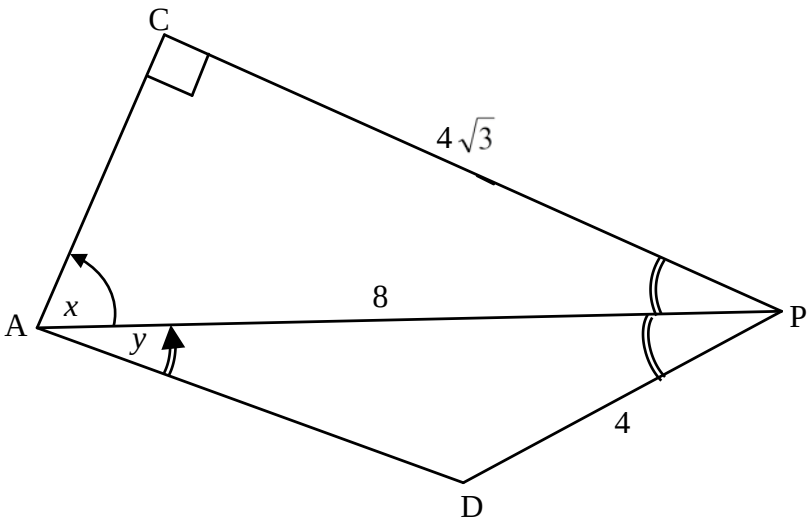
(6)

OR/*OF*

	area $\Delta EOM = \frac{1}{2}(EO \times OM)$ $= \frac{1}{2}\left(\frac{8}{3} \times \frac{9}{2}\right)$ $=$ 6 sq units/*vk eenh*	✓ area ΔEOM
	ED $= \sqrt{\left(-\frac{7}{5}+\frac{8}{3}\right)^2+\left(\frac{19}{5}\right)^2}$ and DM $= \sqrt{\left(\frac{7}{5}\right)^2+\left(\frac{9}{2}-\frac{19}{5}\right)^2}$ $= \frac{19\sqrt{10}}{15}$ or 4,005... $= \frac{7\sqrt{5}}{10}$ or 1,565..	✓ ED $= \frac{19\sqrt{10}}{15}$ ✓ DM $= \frac{7\sqrt{5}}{10}$
	area $\Delta EDM = \frac{1}{2}(ED \times DM \times \sin E\hat{D}M)$ $= \frac{1}{2}\left(\frac{19\sqrt{10}}{15}\right)\left(\frac{7\sqrt{5}}{10}\right)\sin 135°$ $= \frac{133}{60}$ or 2,216...	✓ area ΔEDM ✓ correct method/ *korrekte metode*
	$\therefore$ area DMOE = area ΔEOM + area ΔEDM $=$ 6 + 2,216... $= \frac{493}{60}$ or/*of* $8\frac{13}{60}$ or/*of* 8,22 square units/*eenh*^{2}	✓ answer/*antw* (6) **[19]**



QUESTION/VRAAG 5



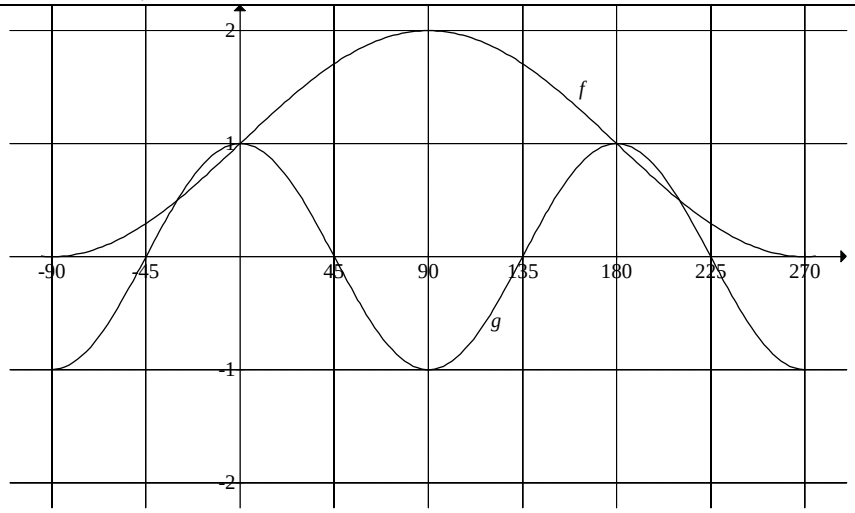
5.1	$\sin C\hat{A}P = \frac{CP}{AP}$ $\sin x = \frac{4\sqrt{3}}{8} = \frac{\sqrt{3}}{2}$ $x = 60°$ OR/OF $\frac{\sin 90°}{8} = \frac{\sin x}{4\sqrt{3}}$ $\sin x = \frac{4\sqrt{3}}{8} = \frac{\sqrt{3}}{2}$ $x = 60°$	✓ correct sine ratio/ *korrekte sin-verh* ✓ $\frac{\sqrt{3}}{2}$ (2) ✓ correct sine ratio/ *korrekte sin-verh* ✓ $\frac{\sqrt{3}}{2}$ (2)
5.2	$C\hat{P}A = D\hat{P}A = 30°$ (AP bisects $D\hat{P}C$) $AD^2 = AP^2 + DP^2 - 2.AP.DP.\cos A\hat{P}D$ $= 8^2 + 4^2 - 2(8)(4)\cos 30°$ $= 8^2 + 4^2 - 2(8)(4)(\frac{\sqrt{3}}{2})$ $= 24{,}57...$ $AD = 4{,}96$	✓ $D\hat{P}A = 30°$ ✓ correct subst into cosine rule/ *korrekte subst in cos-reël* ✓ 24,57... ✓ 4,96 (4)

5.3	$\frac{\sin D\hat{A}P}{DP} = \frac{\sin A\hat{P}D}{AD}$ $\frac{\sin y}{4} = \frac{\sin 30°}{4,96}$ $\sin y = \frac{4\sin 30°}{4,96}$ $= 0,403...$ $y = 23,78°$ **OR/*OF*** $AD^2 = AP^2 + DP^2 - 2.AP.DP.\cos D\hat{A}P$ $4^2 = 8^2 + (4,96)^2 - 2(8)(4,96).\cos y$ $\cos y = \frac{8^2 + (4,96)^2 - 4^2}{2(8)(4,96)}$ $\cos y = 0,9148...$ $y = 23,82°$	✓ correct subst into sine rule/ *korrekte subst in sin-reël* ✓ sin *y* subject ✓ 23,78° (3) ✓ correct subst into cosine rule/ *korrekte subst in cos-reël* ✓ cos *y* subject ✓ 23,82° (3) **[9]**

QUESTION/VRAAG 6

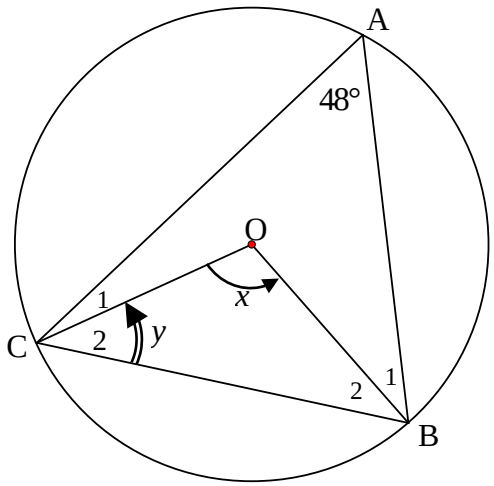
6.1	$\cos^2(180°+x)+\tan(x-180°)\sin(720°-x)\cos x$ $=(-\cos x)^2+[-(-\tan x)](-\sin x)(\cos x)$ $=\cos^2 x+\left(\frac{\sin x}{\cos x}\right)(-\sin x)(\cos x)$ $=\cos^2 x-\sin^2 x$ $=\cos 2x$	✓ $(-\cos x)^2$ or $\cos^2 x$ ✓ $\tan x$ or $-(-\tan x)$ ✓ $-\sin x$ ✓ $\tan x=\frac{\sin x}{\cos x}$ ✓ $\cos^2 x-\sin^2 x$ (5)
6.2	$\sin(\alpha-\beta)$ $=\cos[90°-(\alpha-\beta)]$ $=\cos[(90°-\alpha)+\beta]$ $=\cos(90°-\alpha)\cos\beta-\sin(90°-\alpha)\sin\beta$ $=\sin\alpha\cos\beta-\cos\alpha\sin\beta$ **OR/*OF*** $\sin(\alpha-\beta)$ $=\cos[90°-(\alpha-\beta)]$ $=\cos[(90°+\beta)+(-\alpha)]$ $=\cos(90°+\beta)\cos(-\alpha)-\sin(90°+\beta)\sin(-\alpha)$ $=(-\sin\beta)\cos\alpha-\cos\beta(-\sin\alpha)$ $=\sin\alpha\cos\beta-\cos\alpha\sin\beta$	✓rewrite as/*herskryf* $\cos[(90°-\alpha)+\beta]$ ✓ expansion/ *uitbreiding* ✓simpl/*vereenv* (3) ✓ rewrite as/*herskryf* $\cos[(90°+\beta)+(-\alpha)]$ ✓ expansion/ *uitbreiding* ✓simpl/*vereenv* (3)
6.3	x^2-y^2 $=\sin^2 76°-\cos^2 76°$ $=-(\cos^2 76°-\sin^2 76°)$ $=-\cos 2(76°)$ $=-\cos 152°$ $=-(-\cos 28°)$ $=\cos 28°$ $=\cos(90°-62°)$ $=\sin 62°$ **OR/*OF*** $=-\cos(90°+62°)$ $=-(-\sin 62°)$ $=\sin 62°$ **OR/*OF*** x^2-y^2 $=\sin^2 76°-\cos^2 76°$ $=\sin 76°\sin 76°-\cos 76°\cos 76°$ $=\sin 76°\cos 14°-\cos 76°\sin 14°$ $=\sin(76°-14°)$ $=\sin 62°$ **OR/*OF*** x^2-y^2 $=\sin^2 76°-\cos^2 76°$ $=\cos^2 14°-\sin^2 14°$ $=\cos 2(14°)$ $=\cos 28°$ $=\sin 62°$	✓$-(\cos^2 76°-\sin^2 76°)$ ✓ recognition of cos double angle ✓ $-\cos 152°$ ✓ $\cos 28°$ (4) ✓ $\cos 14°$ ✓ $\sin 14°$ ✓ recognition of sine compound angle ✓ $\sin(76°-14°)$ (4) ✓ $\cos^2 14°$ ✓ $\sin^2 14°$ ✓ recognition of cos double angle ✓ $\cos 28°$ (4) **[12]**

QUESTION/VRAAG 7

7.1	$0 \leq y \leq 2$ or $y \in [0 ; 2]$	✓ critical values/ *kritieke waardes* ✓ notation/*notasie* (2)
7.2	$\sin x + 1 = \cos 2x$ $\sin x + 1 = 1 - 2\sin^2 x$ $2\sin^2 x + \sin x = 0$ $\sin x(2\sin x + 1) = 0$	✓ $1 - 2\sin^2 x$ ✓ st form/*st vorm* (2)
7.3	$\sin x(2\sin x + 1) = 0$ $\sin x = 0$ *or* $\sin x = -\frac{1}{2}$ $x = 0° + k.360°$ or $x = 210° + k.360°$ or $x = 180° + k.360°$ $x = 330° + k.360°, k \in Z$ **OR/*OF*** $x = k.180°, k \in Z$	✓ $\sin x = 0$ *or* $\sin x = -\frac{1}{2}$ ✓ 0° ; 180° **OR/*OF*** $x = k.180°$ ✓ 210° ; 330° ✓ $k.360°$, $k \in Z$ (4)
7.4		✓ *y*-intercept/*afsnit* ✓ *x*-intercepts/*afsnitte* ✓ min/max points/ *min/maks punte* (3)
7.5	$f(x) = g(x)$ at/*by*: $x = –30° ; 0° ; 180° ; 210°$ $\therefore f(x + 30°) = g(x + 30°)$ at/*by*: $x = –60° ; –30° ; 150° ; 180°$	✓ –30° ; 0° ; 180° ; 210° ✓✓ –60° ; –30° ; 150° ; 180° (3)
7.6	Series will converge if/*Reeks sal konvergeer as:* $–1 < r < 1$ $–1 < 2\cos 2x < 1$ $-\frac{1}{2} < \cos 2x < \frac{1}{2}$ $\therefore$ $30° < x < 60°$ or $x \in (30° ; 60°)$	✓ $–1 < r < 1$ ✓ $r = 2\cos 2x$ ✓ $-\frac{1}{2} < \cos 2x < \frac{1}{2}$ ✓✓ $30° < x < 60°$ (5) **[19]**

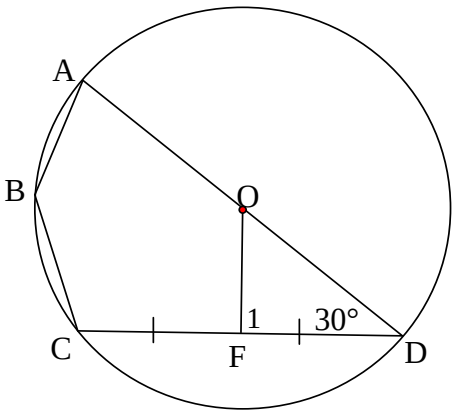
QUESTION/VRAAG 8

8.1



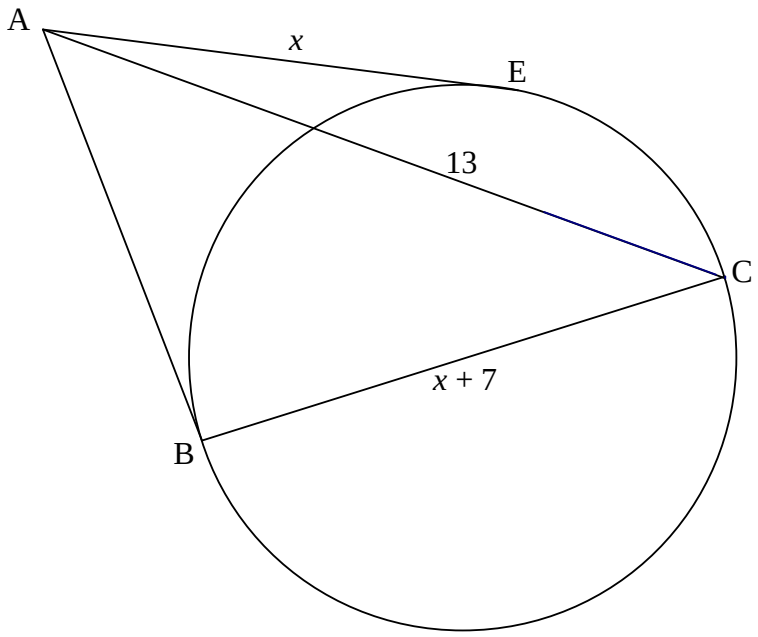
8.1.1	$x = 96°$	(∠ at centre = 2∠ at circumference/ *∠by midpt = 2∠by omtrek*)	✓ S ✓ R (2)
8.1.2	$\hat{C}_2 + \hat{B}_2 = 180° - 96° = 84°$ $y = \hat{B}_2 = 42°$	(sum of ∠s in Δ/ *som v∠e in Δ*) (∠s opp = sides/*∠e teenoor = sye*)	✓ S ✓ S (2)

8.2



8.2.1	$\hat{F}_1 = 90°$	(line from centre to midpt chord/ *lyn vanaf midpt na midpt kd)*	✓ S ✓ R (2)
8.2.2	$A\hat{B}C = 150°$	(opposite ∠s of cyclic quad/ *tos ∠e v koordevh*)	✓ S ✓ R (2)

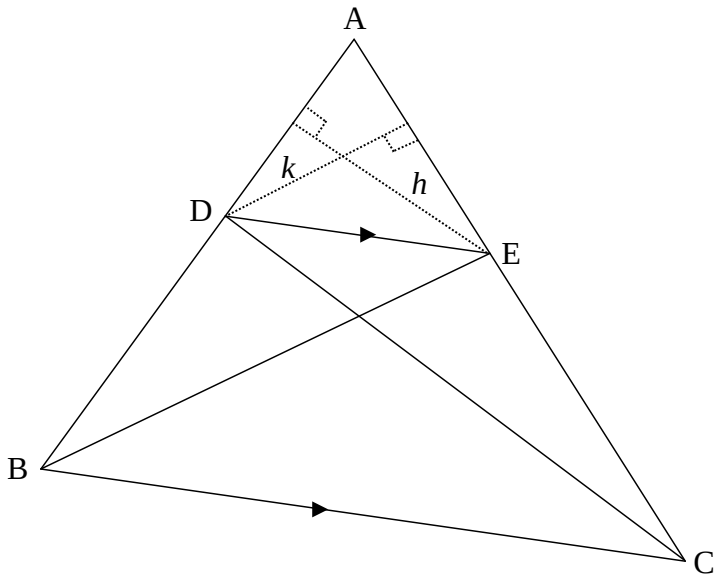
8.3



8.3.1 (a)	tangent ⊥ radius/diameter / *raaklyn ⊥ radius/middellyn*	✓ R (1)
8.3.1 (b)	tangents from common pt **OR** tangents from same pt / *raaklyne v gemeensk pt **OF** raaklyne vanaf dies pt*	✓ R (1)
8.3.2	$AB^2 + BC^2 = AC^2$ $x^2 + (x+7)^2 = 13^2$ (Theorem of/*Stelling van*Pythagoras) $x^2 + x^2 + 14x + 49 = 169$ $2x^2 + 14x - 120 = 0$ $x^2 + 7x - 60 = 0$ $(x-5)(x+12) = 0$ $x = 5 \quad (x \neq -12)$	✓ $AB^2 + BC^2 = AC^2$ ✓ $x^2 + (x+7)^2 = 13^2$ ✓ standard form ✓ answer (4) **[14]**

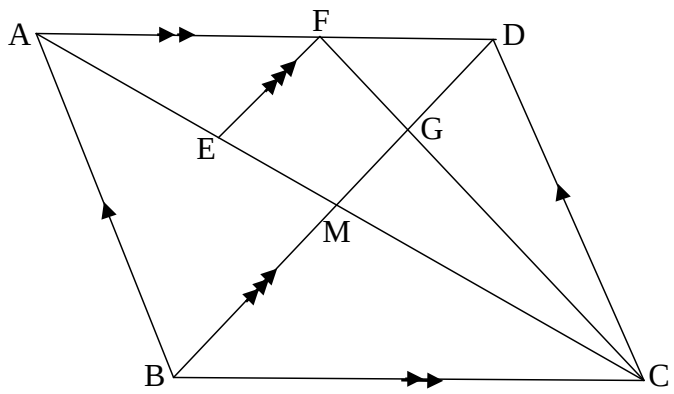
QUESTION/VRAAG 9

9.1



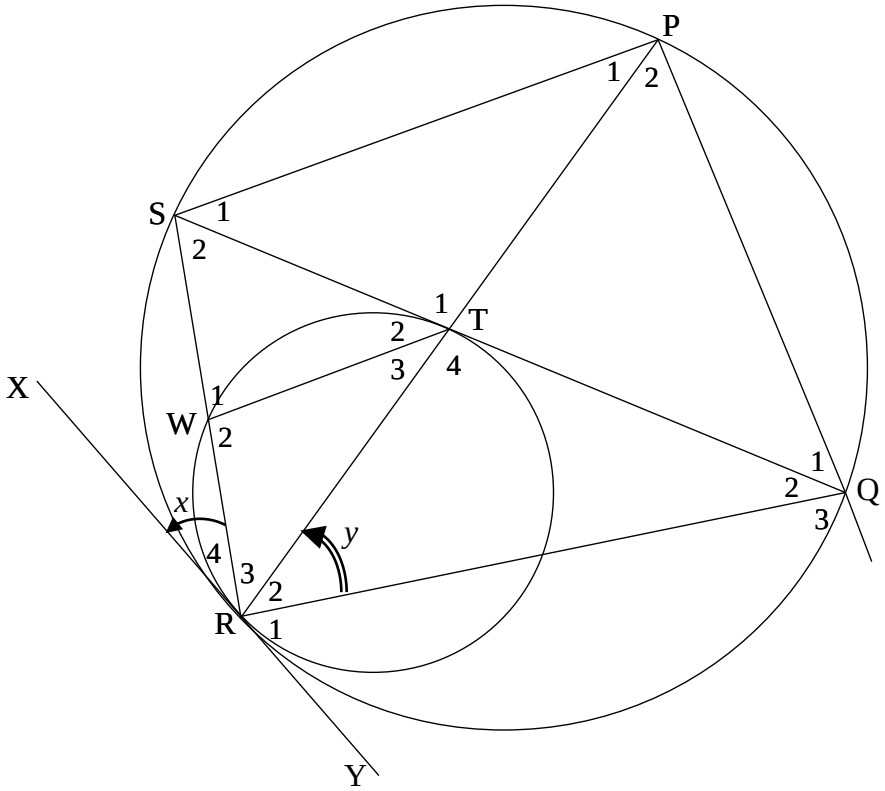
9.1.1	Same base (DE) and same height (between parallel lines) *Dieselfde basis (DE) en dieselfde hoogte (tussen ewewydige lyne)*	✓ same base/*dies basis* between || lines/ *tussen* || *lyne* (1)
9.1.2	$\frac{AD}{DB}$ $\frac{\frac{1}{2}AE \times k}{\frac{1}{2}EC \times k}$ But/*Maar* area ΔDEB = area ΔDEC (Same base and same height/*dieselfde basis en dieselfde hoogte*) $\therefore \frac{\text{area } \Delta ADE}{\text{area } \Delta DEB} = \frac{\text{area } \Delta ADE}{\text{area } \Delta DEC}$ $\therefore \frac{AD}{DB} = \frac{AE}{EC}$	✓ S ✓ S ✓ S ✓ R ✓ S (5)

9.2

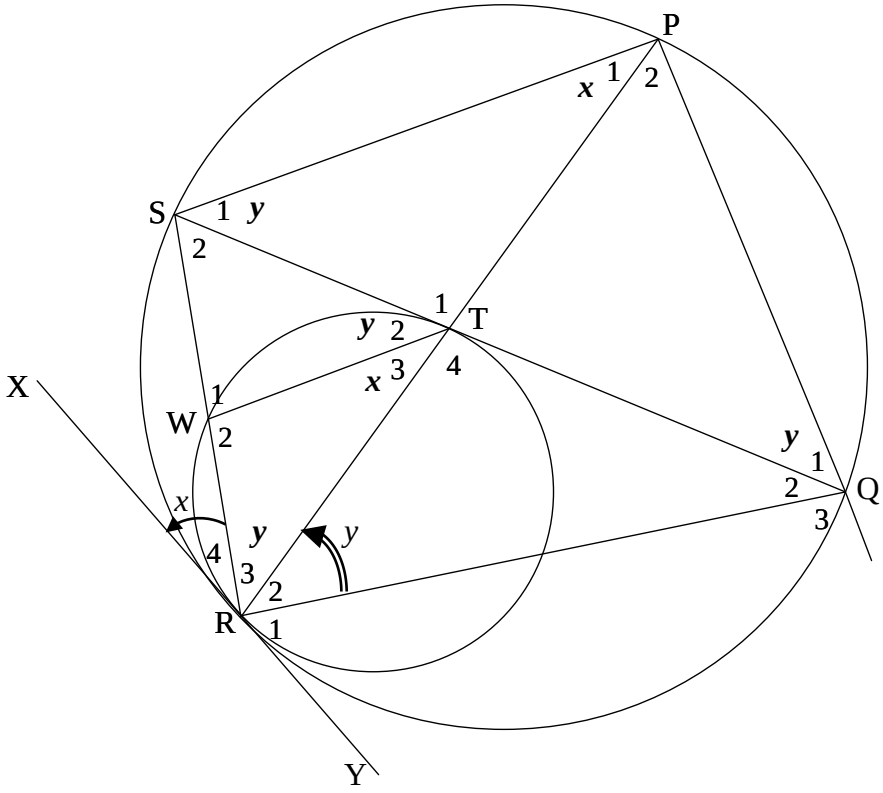


9.2.1	$\frac{EM}{AM}=\frac{FD}{AD}$ (Line parallel one side of Δ **OR** prop th; EF || BD) (*Lyn ewewydig aan sy v Δ* ***OF*** *eweredigst; EF ||BD)* $\frac{EM}{AM}=\frac{3}{7}$	✓ S ✓R ✓ answer/*antw* (3)
9.2.2	CM = AM (diags of parm bisect/*hoekl parm halv*) $\frac{CM}{ME}=\frac{AM}{ME}=\frac{7}{3}$ (from 9.2.1/*vanaf 9.2.1*)	✓ S ✓R ✓ answer/*antw* (3)
9.2.3	*h* of ΔFDC = *h* of ΔBDC (AD || BC) $\frac{\text{area }\Delta FDC}{\text{area }\Delta BDC}=\frac{\frac{1}{2}FD.h}{\frac{1}{2}BC.h}$ $=\frac{FD}{AD}$ (opp sides of parm =) *(tos sye v parm =)* $=\frac{3}{7}$ **OR/*OF*** $\frac{\text{area }\Delta FDC}{\text{area }\Delta ADC}=\frac{FD}{AD}=\frac{3}{7}$ (same heights) *(dieselfde hoogtes)* But Area ΔADC = Area ΔBDC (diags of parm bisect area) *(hoekl v parm halv opp)* $\frac{\text{area }\Delta FDC}{\text{area }\Delta BDC}=\frac{3}{7}$	✓ AD || BC ✓ subst into area form/ *subst in opp formule* ✓ S ✓ answer/*antw* (4) ✓ S ✓ R ✓ S ✓ answer/*antw* (4) **[16]**

QUESTION/VRAAG 10



10.1.1	Tangent chord theorem/*Raaklyn-koordstelling*	✓ R (1)
10.1.2	Tangent chord theorem/*Raaklyn-koordstelling*	✓ R (1)
10.1.3	Corresponding angles equal/*Ooreenkomstige ∠e gelyk*	✓ R (1)
10.1.4	∠s subtended by chord PQ **OR** ∠s in same segment *∠e onderspan deur dieselfde koord* ***OF*** *∠e in dieselfde segment*	✓ R (1)
10.1.5	alternate ∠s/*verwisselende ∠e* ; WT | | SP	✓ R (1)
10.2	$\frac{RW}{RS}=\frac{RT}{RP}$ (Line parallel one side of Δ **OR** prop th; WT | | SP) $\therefore RT=\frac{WR.RP}{RS}$ (*Lyn ewewydig aan sy v Δ* ***OF*** *eweredighst: WT | | SP)* **OR/*OF*** ΔRTW | | | ΔRPS (∠; ∠; ∠) $\therefore \frac{RW}{RS}=\frac{RT}{RP}$ (ΔRTW | | | ΔRPS) $\therefore RT=\frac{RW.RP}{RS}$	✓ S ✓ R (2) ✓ S ✓ S (2)
10.3	$y=\hat{T}_2=\hat{R}_3$ (tan chord theorem/*Rkl-koordst*) $y=\hat{R}_3=\hat{Q}_1$ (∠s in same segment/*∠e in dieselfde segment*)	✓ S ✓ R ✓ S ✓ R (4)



10.4	$\hat{Q}_3 = P\hat{S}R$	(ext ∠ of cyc quad/*buite∠ v kdvh*)	✓ S ✓ R
	$P\hat{S}R = \hat{W}_2$	(corresp∠s/*ooreenk ∠e* ; WT || SP)	✓ S
	$\therefore \hat{Q}_3 = \hat{W}_2$		(3)
	OR/OF		
	$\hat{Q}_2 = x$	(∠s in same segment/*∠e in dies segment*)	✓ R
	$\hat{Q}_3 = 180° - (x + y)$	(∠s on straight line/*∠e op reguitlyn*)	✓ S
	$\hat{W}_2 = 180° - (x + y)$	(∠s of ΔWRT/*∠e v ΔWRT*)	✓ S
	$\therefore \hat{Q}_3 = \hat{W}_2$		(3)
10.5	In ΔRTS and ΔRQP:		
	$\hat{R}_3 = \hat{R}_2 = y$	(proven above/*hierbo bewys*)	✓ S
	$\hat{S}_2 = \hat{P}_2$	(∠s in same segment/*∠e in dies segment*)	✓ S/R
	$R\hat{T}S = R\hat{Q}P$	(3rd angle of Δ)	✓ S **OR/OF**
	$\therefore \Delta RTS \mid\mid\mid \Delta RQP$	(∠; ∠; ∠)	(∠; ∠; ∠)
			(3)

10.6	$\frac{RT}{RQ}=\frac{RS}{RP}$	($\Delta RTS \mid\mid\mid \Delta RQP$)	✓ S
	$\frac{RS}{RP}\times\frac{RS}{RP}=\frac{RT}{RQ}\times\frac{RS}{RP}$		✓ $\times\frac{RS}{RP}$ on both sides
	$\left(\frac{RS}{RP}\right)^2=\left(\frac{RT}{RP}\right)\left(\frac{RS}{RQ}\right)$		
	$=\left(\frac{RW}{RS}\right)\left(\frac{RS}{RQ}\right)$	(proven in 10.2/*bewys in 10.2*)	✓ $\left(\frac{RT}{RP}\right)\left(\frac{RS}{RQ}\right)$ (3)
	$=\frac{RW}{RQ}$		
	OR/OF		
	$\frac{RT}{RQ}=\frac{RS}{RP}$	($\Delta RTS \mid\mid\mid \Delta RQP$)	✓ S
	But $RT=\frac{WR.RP}{RS}$	(proven in 10.2/*bewys in 10.2*)	✓ $RT=\frac{WR.RP}{RS}$
	$\therefore \frac{RT}{RQ}=\frac{WR.RP}{RQ.RS}=\frac{RS}{RP}$		
	$WR.RP^2=RQ.RS^2$		✓multiplication/ *vermenigvuldig*
	$\therefore \frac{WR}{RQ}=\frac{RS^2}{RP^2}$		(3)
	OR/OF		
	$\frac{RT}{RS}=\frac{RQ}{RP}$	($\Delta RTS \mid\mid\mid \Delta RQP$)	✓ S
	$RQ=\frac{RT.RP}{RS}$		
	and $WR=\frac{RT.RS}{RP}$	(proven in 10.2/*bewys in 10.2*)	✓ $WR=\frac{RT.RS}{RP}$
	$\frac{WR}{RQ}=\frac{\frac{RT.RS}{RP}}{\frac{RT.RP}{RS}}$		
	$=\frac{RT.RS}{RP}\times\frac{RS}{RT.RP}$		✓ simplification/ *vereenvoudiging*
	$=\frac{RS^2}{RP^2}$		(3) **[20]**

TOTAL/TOTAAL: 150

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