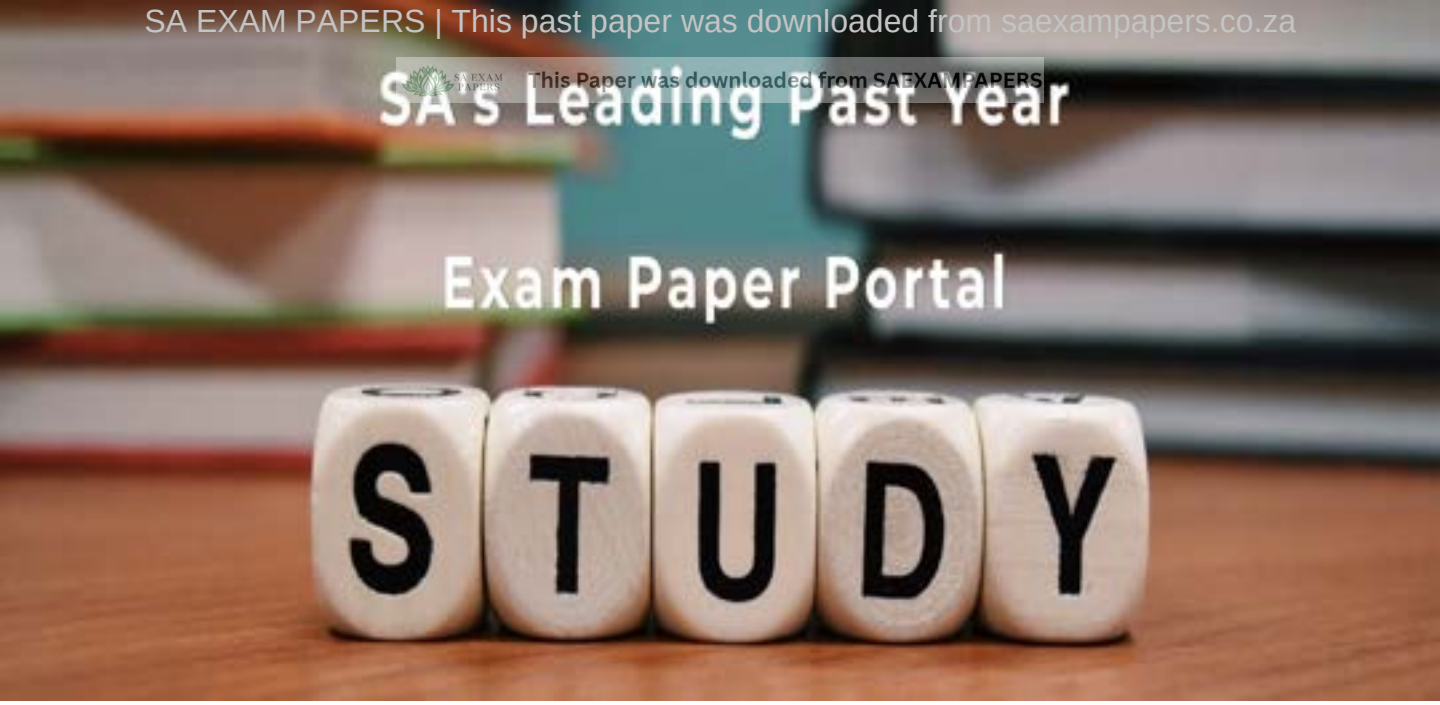


basic education

Department:
Basic Education
REPUBLIC OF SOUTH AFRICA

NATIONAL SENIOR CERTIFICATE/ *NASIONALE SENIOR SERTIFIKAAT*

GRADE 12/*GRAAD 12*

MATHEMATICS P2/*WISKUNDE V2*

NOVEMBER 2025

MARKING GUIDELINES/*NASIENRIGLYNE*

MARKS/*PUNTE*: 150

Approved
DBE/ Quality Assurance
11/11/2025

These marking guidelines consist of 26 pages./
Hierdie nasienriglyne bestaan uit 26 bladsye.

DEPARTMENT OF BASIC EDUCATION
2025 -11- 12
APPROVED MARKING GUIDELINE

Approved
DBE/ Quality Assurance
11/11/2025

Approved
2025-11-11

Please turn over/*Blaai om asseblief*

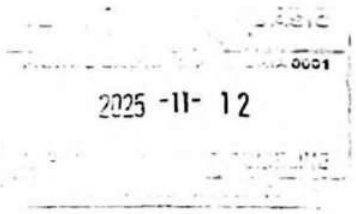
NOTE:

- 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.

LET WEL:

- *As 'n kandidaat 'n vraag TWEE KEER beantwoord, sien slegs die EERSTE poging na.*
- *As 'n kandidaat 'n antwoord van '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 • MEETKUNDE	
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



Please turn over/*Blaai om asseblief*

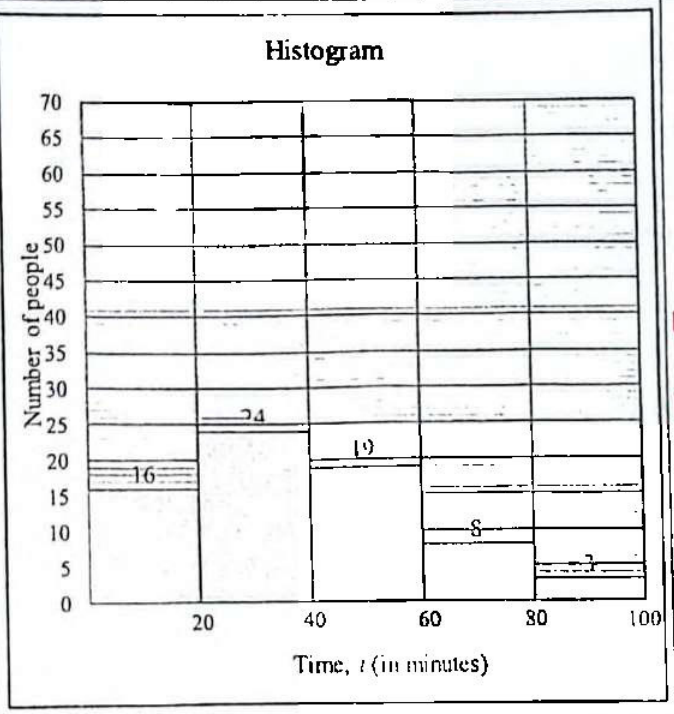
QUESTION/*VRAAG* 1

AGE OF CAR (IN YEARS)	SELLING PRICE OF CAR (IN RANDS)
2	293 000
3	265 000
3	256 000
4	219 000
4	241 000
4	246 000
6	226 000
6	176 000
7	154 000
7	180 000
8	148 000

1.1	$a = 331\,397,20$ ✓ $b = -22\,988,32$ ✓ $\hat{y} = 331\,397,20 - 22\,988,32x$ ✓ If a & b are wrong, but sub correctly: 1 (CA) AO: EM / AO but swapped: 1 mark.	✓ $a = 331\,397,20$ ✓ $b = -22\,988,32$ ✓ equation (3)
1.2	$\hat{y} = 331\,397,20 - 22\,988,32(5)$ ✓ $= 216\,455,60$ ✓ CA **OR/*OF*** $\hat{y} = 216\,455,61$ (calculator) ✓	✓ substitution ✓ answer (2) ✓✓ answer (2)
1.3	The strong correlation ($r = -0,95$) suggests that the data points lie close to the regression line. If r is not shown credit "strong correl" and answer ✓ Therefore, the prediction will be valid. *'n Sterk korrelasie ($r = -0,95$) dui aan dat die punte naby aan die regressielyn lê.* *Dus, die voorspelling is geldig.*	✓ strong correlation **OR** $r = -0,95$ ✓ answer (2)
1.4	The average decrease per year is R22 988,32. credit -22 988,32 ✓ answer *Die gemiddelde afname per jaar is* R 22 988,32.	(1)
	CA from 1.1.	[8]

QUESTION/*VRAAG* 2

TIME, t (IN MINUTES)	CUMULATIVE FREQUENCY
$0 < t \leq 20$	16
$0 < t \leq 40$	40
$0 < t \leq 60$	59
$0 < t \leq 80$	67
$0 < t \leq 100$	70

2.1.1	70 ✓	✓ 70 (1)
2.1.2	No. of people = 67 – 40 ✓ OR 19+8 = 27 = 27 ✓ AO: FM	✓ 67 – 40 ✓ 27 (2)
2.1.3		✓ two frequencies correct ✓ all frequencies correct ✓ no gaps between bars If CF used: max 1 1 mark if freq are wrong but bars are joined. (3)
2.1.4	Skewed to the right **OR** positively skewed *Skeef na regs* **OF** *positief skeef* CA	✓ answer (1)

2.1.4 and also be wrong if the calculated used is CF in 2.1.3

2.2

11	14	19	20	8	10	2	14

	$\frac{11+14+19+20+8+10+2+14+x}{9} = 12$ ✓ $x+98 = 108$ $x = 10$ ✓ The 9th player scored 10 points $\sigma = 5{,}23$ ✓ (5,22812) $(\bar{x}-\sigma\,;\,\bar{x}+\sigma) = (12-5{,}23;\,12+5{,}23)$ ✓ $=(6{,}77;17{,}23)$ ✓ 3 players' points were outside one standard deviation of the mean. 3 *spelers se punte aangeteken lê buite een standaardafwyking van die gemiddeld.*	✓ equating using mean ✓ answer ✓ standard deviation ✓ interval ✓ answer (5)
		[12]

(1) If $n=8$, then $\sigma = 5{\cdot}49$
$\bar{x} = 12{\cdot}25$

$(6{\cdot}76\ ;\ 17{\cdot}74)$ ✓

3 players ✓

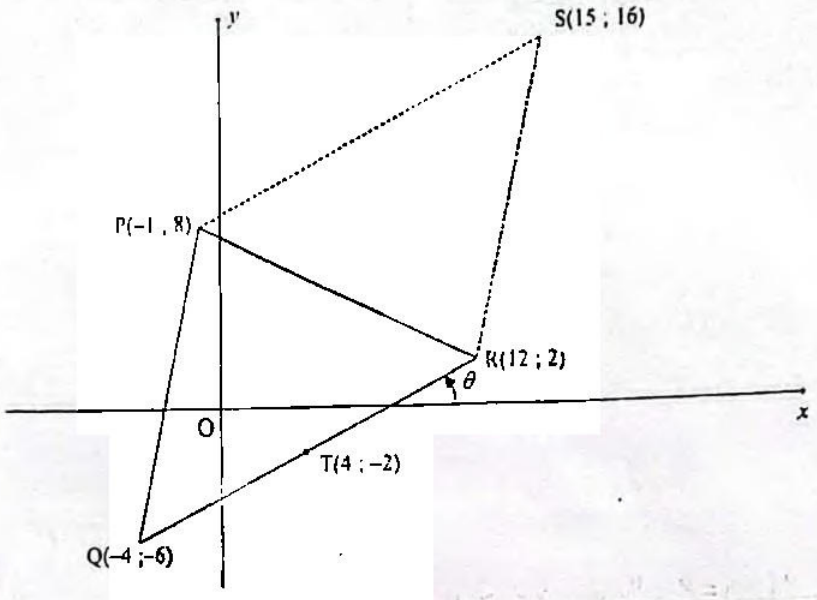
(2) If $n=8$ then $\sigma = 5{\cdot}49$
and $\bar{x} = 12$

$(6,51\ ;\ )$ ✓
3 players ✓

(3) AO: 1

2025 -11- 12

QUESTION/*VRAAG* 3



3.1	$QR=\sqrt{(-4-12)^2+(-6-2)^2}$ Ans in surd $\sqrt{320}$ OR $8\sqrt{5}$ OR dec. $=\sqrt{320}=8\sqrt{5}$ units	✓ $QR=\sqrt{(-4-12)^2+(-6-2)^2}$ ✓ answer AO; FM (2)
3.2	$m_{QR}=\frac{-6-2}{-4-12}$ OR $m_{QR}=\frac{2-(-6)}{12-(-4)}$ $\frac{x}{y}$ BA $m_{QR}=\frac{1}{2}$ $m_{QR}=\frac{1}{2}$ If values are swapped:	✓ correct substitution of Q(−4 ; −6) & R(12 ; 2) into gradient formula ✓ answer AO; FM (2)
3.3	$m_{QR}=\frac{1}{2}$ CA $\tan\theta=\frac{1}{2}$ ✓ $\theta=26{,}57°$ ✓ AO; FM	✓ $\tan\theta=m_{QR}$ ✓ answer (2)
3.4	$m_{QR}=\frac{1}{2}$ CA $-6=\frac{1}{2}(-4)+c$ OR $y-2=\frac{1}{2}(x-12)$ $c=-4$ $y-2=\frac{1}{2}x-6$ $y=\frac{1}{2}x-4$ $y=\frac{1}{2}x-4$	✓ correct substitution of gradient and point Q(−4 ; −6) or R(12 ; 2) ✓ answer (2)
3.5	$Q\rightarrow R:(x;y)\rightarrow(x+16;y+8)$ $\therefore S(15;16)$	✓ $x_S=15$ ✓ $y_S=16$ (2)

3.6

$m_{QR} = \frac{1}{2}$

$m_{PT} = -2$ ✓

Equation of PT:

$y = -2x + c$

$8 = -2(-1) + c$

$c = 6$

$y = -2x + 6$ ✓

OR

$y - y_1 = -2(x - x_1)$

$y - 8 = -2(x - (-1))$

$y - 8 = -2x - 2$

$y = -2x + 6$

✓ m_{PT}

✓ equation of PT

$-2x + 6 = \frac{1}{2}x - 4$ ✓

$-4x + 12 = x - 8$ ✓

✓ equation QR = equation PT.

✓ simplification

$5x = 20$

$x = 4$

Assuming that T is the midp of QR;

$y = \frac{1}{2}(4) - 4$

$\left(\frac{x_1+x_2}{2}; \frac{y_1+y_2}{2}\right)$: 1

$y = -2$

$T(4;-2)$ ✓

✓ $T(x_T; y_T)$

(5)

OR

AD: $\frac{1}{5}$; Assuming ISA Δ: $\frac{1}{5}$

$PQ = \sqrt{(-4-(-1))^2 + (-6-8)^2} = \sqrt{205}$

$PR = \sqrt{(12-(-1))^2 + (2-8)^2} = \sqrt{205}$

∴ ΔPQR is isosceles / ΔPQR *is 'n gelykbenige* Δ

∴ ⊥ height bisects the base QR / ⊥ *hoogte halveer die basis* QR

∴ T is midpoint of QR / T *is middelpunt van* QR

∴ T(4;−2)

✓ $PQ = \sqrt{205}$

✓ $PR = \sqrt{205}$

✓ ΔPQR is isosceles

✓ ⊥ height bisects the base QR

✓ T(4;−2)

(5)

3.7

$PT = \sqrt{(4-(-1))^2 + (-2-8)^2}$ ✓

$PT = \sqrt{125} = 5\sqrt{5}$ units = 11,18 units ✓

✓ length of PT

Area of PQRS = QR.PT

$= (8\sqrt{5})(5\sqrt{5})$ ✓

$= 200$ units^2 ✓

✓ substitution of QR and PT

✓ answer

(3)

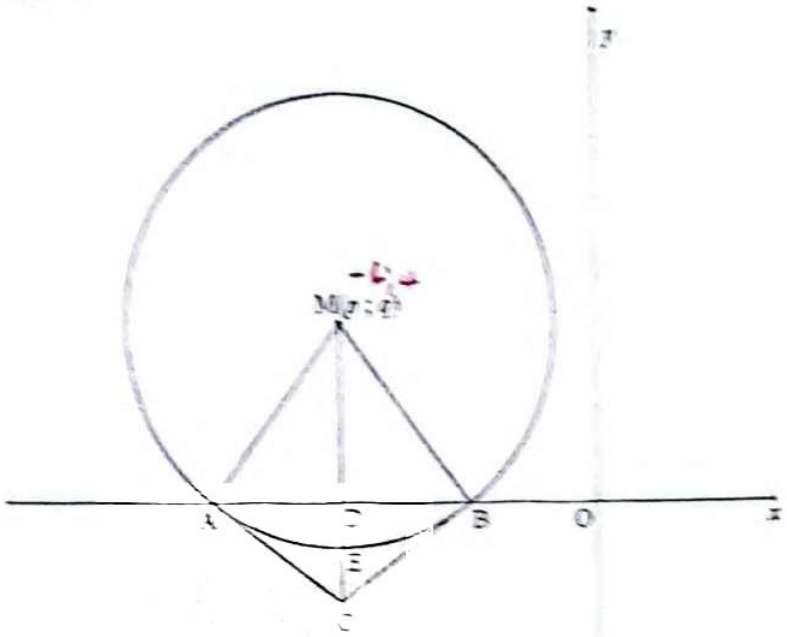
OR

Shoe-lace accepted.

CA only if $\frac{1}{2}bL$ or bh is used.

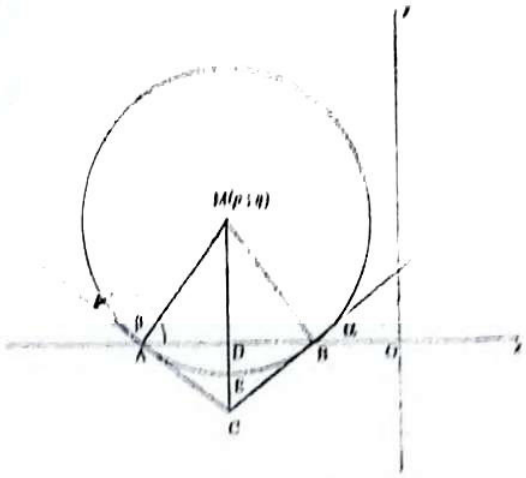
	$PT=\sqrt{\left(4-(-1)\right)^2+(-2-8)^2}$ ✓ $PT=\sqrt{125}=5\sqrt{5}$ units $= 11{,}18$ units	✓ length of PT
	Area of $\Delta PQR = \frac{1}{2}\left(8\sqrt{5}\right)\left(5\sqrt{5}\right)$ ✓ $= 100$ units^2	✓ substitution of QR and PT
	Area of PQRS $= 2\times$ Area of ΔPQR $= 200$ units^2 ✓	✓answer (3)
		[18]

QUESTION 4/VRAAG 4



4.1	$p=-6$ ✓		✓ $p=-6$ (1)
4.2	$M\hat{D}B=90^\circ$ $AM=ME=q+1$ $MD=q$ $AM^2=AD^2+MD^2$ $(q+1)^2=(q-1)^2+q^2$ $q^2+2q+1=q^2-2q+1+q^2$ $q^2-4q=0$ $q(q-4)=0$ $q\neq 0$ or $q=4$	[MC] [y-axis] [radii] [Pythagoras]	✓ $AM=q+1$ ✓ $MD=q$ ✓ substitution into Pythagoras ✓ standard form (4)
4.3	$AM=5$ units ✓ $(x+6)^2+(y-4)^2=25$ ✓	CA from 4.1 & 4.2	✓ LHS ✓ RHS (2)
4.4	5 units ✓	6-4+3	✓ answer (1)

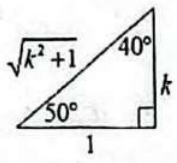
4.5	$(x+6)^2+(0-4)^2=25$ ✓ $(x+6)^2=9$ $x+6=3$ or $x+6=-3$ $x=-3$ $x=-9$ A(−9 ; 0) ✓ B(−3 ; 0) ✓ CA from 4.3 Credit even if A and B are not named (labled) **OR** $(x+6)^2+(0-4)^2=25$ $x^2+12x+36+16-25=0$ $x^2+12x+27=0$ $(x+3)(x+9)=0$ $x=-3$ or $x=-9$ A(−9 ; 0) B(−3 ; 0) Credit even if there are not no (coordinates) i.e. $x=-3$ or $x=-9$ **OR** 1 $q-1=3$ DB = AD = 3 [**line** from centre ⊥ to chord/ ***lyn vanuit*** *midpt ⊥ op koord*] A(−9 ; 0) B(−3 ; 0)	✓ substituting $y=0$ into equation of circle ✓ coordinates of A ✓ coordinates of B (3) ✓ substituting $y=0$ into equation of circle ✓ coordinates of A ✓ coordinates of B (3) ✓ DB = 3 ✓ coordinates of A ✓ coordinates of B (3)
4.6	$m_{MB}=\frac{4-0}{-6-(-3)}$ $=-\frac{4}{3}$ $m_{BC}=\frac{3}{4}$ $y=\frac{3}{4}x+c$ $0=\frac{3}{4}(-3)+c$ $c=\frac{9}{4}$ $y=\frac{3}{4}x+\frac{9}{4}$ **OR** $y-y_1=\frac{3}{4}(x+x_1)$ $y-0=\frac{3}{4}[x-(-3)]$ $y=\frac{3}{4}(x+3)$ $y=\frac{3}{4}x+\frac{9}{4}$	✓ m_{MB} ✓ m_{BC} ✓ substitution of gradient BC and coordinates of B ✓ answer (4)
4.7	$C\left(-6;-\frac{9}{4}\right)$ CA from 4.1 & 4.6 3/4 if wrong grad is used.	✓ x_C ✓ y_C (2)



4.8	$\tan\alpha = \frac{3}{4}$ $\alpha = 36,87^\circ$ ✓	✓ $\alpha = 36,87^\circ$
	$m_{AC} = -\frac{3}{4}$ $\tan\beta = -\frac{3}{4}$ ✓ $\beta = 180^\circ - 36,87^\circ$ $\beta = 143,13^\circ$ ✓ $\therefore A\hat{C}B = 106,26^\circ$ ✓	✓ $\tan\beta = m_{AC}$ ✓ value of β ✓ answer (4)
	OR $\tan M\hat{A}B = m_{MA} = \frac{4}{3}$ $M\hat{A}B = 53,13^\circ$ $A\hat{M}D = 90^\circ - 53,13^\circ$ $A\hat{M}D = 36,87^\circ$ $M\hat{A}C = 90^\circ$ [tangent ⊥ radius / *raaklyn⊥radius*] $A\hat{C}M = 53,13^\circ$ $\therefore A\hat{C}B = 106,26^\circ$ [property of kite /*eienskappe van vlieër*]	✓ $M\hat{A}B$ ✓ $A\hat{M}D$ ✓ $A\hat{C}M$ ✓ answer (4)
	OR $\tan A\hat{C}D = \frac{AD}{DC}$ $\tan A\hat{C}D = \frac{3}{\frac{9}{4}} = \frac{4}{3}$ $A\hat{C}D = 53,13^\circ$ $\therefore A\hat{C}B = 106,26^\circ$ [property of kite/*eienskappe van vlieër*]	✓ trig ratio in ΔACD or ΔBCD ✓ $\tan A\hat{C}D$ ✓ $A\hat{C}D$ ✓ answer (4)

	OR $AB = 6$ units $AC = BC = \frac{15}{4}$ units [tangent from same point/ *raaklyne vanuit dieselfde punt*] $(AB)^2 = (AC)^2 + (BC)^2 - 2(AC)(BC)\cos\hat{C}$ $(6)^2 = \left(\frac{15}{4}\right)^2 + \left(\frac{15}{4}\right)^2 - 2\left(\frac{15}{4}\right)\left(\frac{15}{4}\right)\cos\hat{C}$ $\cos A\hat{C}B = -0,28$ $A\hat{C}B = 106,26°$ **OR** $\tan M\hat{A}B = m_{MA} = \frac{4}{3}$ $M\hat{A}B = 53,13°$ AMBC is a cyclic quad/ AMBC *is 'n kvh* $\therefore M\hat{C}B = 53,13°$ [$\angle$s in the same seg/$\angle e$ *in dies segm*] $\therefore A\hat{C}B = 106,26°$ [property of kite/*eienskappe v vlieër*]	✓ AC = BC ✓ substitution into cosine-rule ✓ simplification ✓ answer (4) ✓ $M\hat{A}B$ ✓ AMBC is a cyclic quad/*kvh* ✓ $M\hat{C}B$ ✓ answer (4)
		[21]

QUESTION/*VRAAG* 5

5.1.1	$r^2 = k^2 + 1^2$ [Pythagoras] $r = \sqrt{k^2+1}$ ✓  $\cos 40°$ $= \frac{k}{\sqrt{k^2+1}}$ ✓	✓ third side = $\sqrt{k^2+1}$ ✓ answer (2)
5.1.2	$\frac{2\sin 25°\cos 25°}{-2+4\sin^2 25°}$ $= \frac{\sin 50°}{-2(1-2\sin^2 25°)}$ ✓ $= \frac{\sin 50°}{-2\cos 50°}$ ✓ $= \left(\frac{k}{\sqrt{k^2+1}}\right) \div \left(\frac{-2}{\sqrt{k^2+1}}\right)$ ✓ OR $= -\frac{1}{2}\tan 50°$ $= -\frac{1}{2}k$ ✓	✓ $\sin 50°$ ✓ $-2(1-2\sin^2 25°)$ ✓ double angle ✓ subst OR quotient identity ✓ answer (5)
5.1.3	$\sin 10° = \sin(50° - 40°)$ ✓ $= \sin 50°\cos 40° - \cos 50°\sin 40°$ ✓ $= \left(\frac{k}{\sqrt{k^2+1}}\right)\left(\frac{k}{\sqrt{k^2+1}}\right) - \left(\frac{1}{\sqrt{k^2+1}}\right)\left(\frac{1}{\sqrt{k^2+1}}\right)$ ✓ $= \frac{k^2-1}{k^2+1}$ **OR** $\sin 10°$ $= \cos 80°$ ✓ $= \cos 2(40°)$ $= 2\cos^2 40° - 1$ ✓ $= 2\left(\frac{k}{\sqrt{k^2+1}}\right)^2 - 1$ ✓ ✓ $= \frac{2k^2}{k^2+1} - 1$ $= \frac{k^2-1}{k^2+1}$ **OR**	✓ $\sin 10° = \sin(50° - 40°)$ ✓ correct expansion ✓ first term ✓ second term (4) ✓ $\sin 10° = \cos 80°$ ✓ correct expansion ✓✓ substitution (4)

	$\sin 10^\circ = \sin(60^\circ - 50^\circ)$ ✓ $= \sin 60^\circ \cos 50^\circ - \cos 60^\circ \sin 50^\circ$ ✓ $= \left(\frac{\sqrt{3}}{2}\right)\left(\frac{1}{\sqrt{k^2+1}}\right) - \left(\frac{1}{2}\right)\left(\frac{k}{\sqrt{k^2+1}}\right)$ ✓ $= \frac{\sqrt{3}-k}{2\sqrt{k^2+1}}$	✓ $\sin 10^\circ = \sin(60^\circ - 50^\circ)$ ✓ correct expansion ✓ first term ✓ second term (4)
5.2.1	$\frac{\sin(540^\circ + x).\cos(90^\circ + x)}{\sin(-x)}$ $= \frac{(-\sin x)(-\sin x)}{(-\sin x)}$ $= -\sin x$	✓ $\sin(540^\circ + x) = -\sin x$ ✓ $\cos(90^\circ + x) = -\sin x$ ✓ $\sin(-x) = -\sin x$ ✓ answer (4)
5.2.2	$x \in (180^\circ; 360^\circ)$ **OR** $180^\circ < x < 360^\circ$	✓✓ $x \in (180^\circ; 360^\circ)$ (2) ✓✓ $180^\circ < x < 360^\circ$ (2)
		[17]

QUESTION/VRAAG 6

6.1

$$\text{LHS} = \left[\tan(180^\circ - x)\right]\left(1-\cos^2 x\right) + \cos^2 x$$
$$= (-\tan x)\left(\sin^2 x\right) + \cos^2 x$$
$$= \left(-\frac{\sin x}{\cos x}\right)\left(\sin^2 x\right) + \cos^2 x$$
$$= -\frac{\sin^3 x}{\cos x} + \cos^2 x$$
$$= \frac{\sin^3 x - \cos^3 x}{-\cos x}$$
$$= \frac{(\sin x - \cos x)\left(\sin^2 x + \sin x.\cos x + \cos^2 x\right)}{-\cos x}$$
$$= \frac{(\sin x - \cos x)(1 + \sin x.\cos x)}{-\cos x}$$
$$= \text{RHS}$$

- ✓ $\tan(180^\circ - x) = -\tan x$
- ✓ $1-\cos^2 x = \sin^2 x$
- ✓ quotient identity
- ✓ simplification to a single fraction
- ✓ factors for a difference of cubes
- ✓ $\sin^2 x + \cos^2 x = 1$

(6)

OR

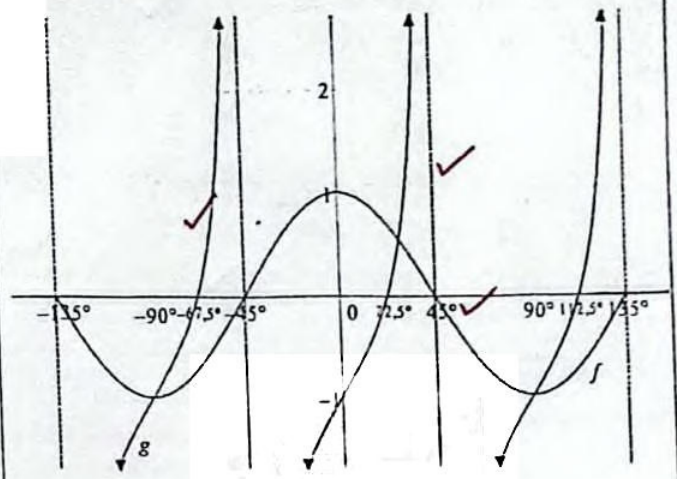
$$\text{RHS} = \frac{(\sin x - \cos x)(1 + \sin x.\cos x)}{-\cos x}$$
$$= \frac{(\sin x - \cos x)\left(\cos^2 x + \sin^2 x + \sin x.\cos x\right)}{-\cos x}$$
$$= \frac{\sin x\cos^2 x + \sin^3 x + \sin^2 x\cos x - \cos^3 x - \sin^2 x\cos x - \sin x.\cos^2 x}{-\cos x}$$
$$= \frac{\sin^3 x - \cos^3 x}{-\cos x}$$
$$= \frac{\sin^3 x}{-\cos x} + \cos^2 x$$
$$= \frac{-\sin x}{\cos x}\left(\sin^2 x\right) + \cos^2 x$$
$$= -\tan x\left(1-\cos^2 x\right) + \cos^2 x$$
$$= \text{LHS}$$

- ✓ $1 = \sin^2 x + \cos^2 x$
- ✓ expansion
- ✓ simplification
- ✓ split fraction
- ✓ quotient identity
- ✓ $\sin^2 x = 1 - \cos^2 x$

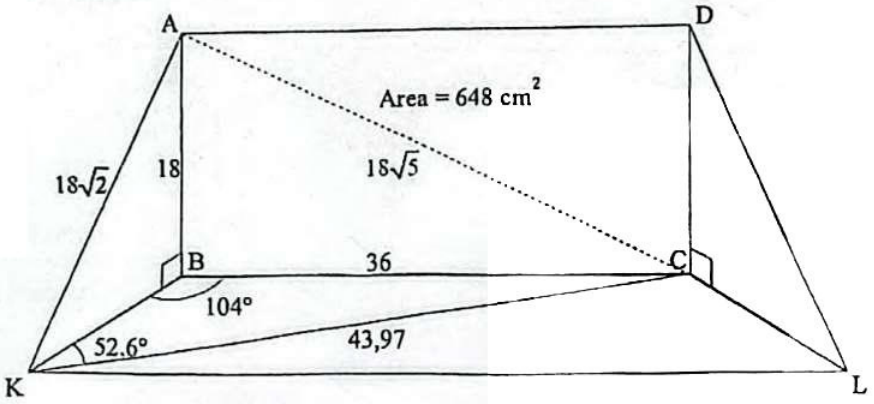
(6)

9.2	$\sin^2 x ; \cos^2 x ; \frac{1}{2}\sin 2x$	
	$\cos^2 x - \sin^2 x = \frac{1}{2}\sin 2x - \cos^2 x$ ✓	✓ $\cos^2 x - \sin^2 x = \frac{1}{2}\sin 2x - \cos^2 x$
	$\cos^2 x - \sin^2 x = \frac{1}{2}(2\sin x \cos x) - \cos^2 x$ ✓	✓ $\sin 2x = 2\sin x \cos x$
	$\cos^2 x - \sin^2 x = \sin x \cos x - \cos^2 x$	
	$2\cos^2 x - \sin x \cos x - \sin^2 x = 0$ ✓	✓ standard form
	$(2\cos x + \sin x)(\cos x - \sin x) = 0$ ✓	✓ factors
	$2\cos x = -\sin x$ or $\cos x = \sin x$ ✓ $\tan x = -2$ or $\tan x = 1$ ✓	✓ both equations
	ref $\angle = 63,43°$ or ref $\angle = 45°$	
	$x = 116,57° + k.180°$ or $x = 45° + k.180°; k \in Z$	✓ $x = 116,57°$ ✓ $116,57° + k.180°; k \in Z$
	OR	(7)
	$\sin^2 x ; \cos^2 x ; \frac{1}{2}\sin 2x$	
	$\cos^2 x - \sin^2 x = \frac{1}{2}\sin 2x - \cos^2 x$	✓ $\cos^2 x - \sin^2 x = \frac{1}{2}\sin 2x - \cos^2 x$
	$\cos^2 x - \sin^2 x = \frac{1}{2}(2\sin x \cos x) - \cos^2 x$	✓ $\sin 2x = 2\sin x \cos x$
	$\cos^2 x - \sin^2 x = \sin x \cos x - \cos^2 x$	
	$\cos^2 x - \sin^2 x - \sin x \cos x + \cos^2 x = 0$	
	$(\cos x - \sin x)(\cos x + \sin x) + \cos x(\cos x - \sin x) = 0$	✓ factors
	$(\cos x - \sin x)(\cos x + \sin x + \cos x) = 0$	✓ factors
	$\cos x = \sin x$ or $2\cos x = -\sin x$ $\tan x = 1$ $\tan x = -2$ ref $\angle = 45°$ ref $\angle = 63,43°$ $x = 45° + k.180°; k \in Z$ $x = 116,57° + k.180°$	✓ both equations
		✓ $x = 116,57°$ ✓ $116,57° + k.180°; k \in Z$
		(7)
		[13]

QUESTION/*VRAAG 7*

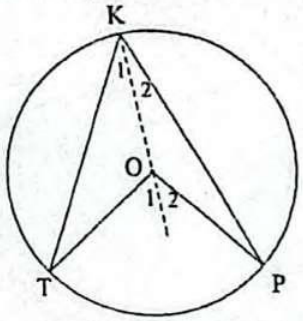
7.1	180° ✓	✓ answer (1)
7.2		✓ asymptotes ✓ shape ✓ intercepts with axes (3)
7.3	$f(x)=\cos 2x$ $h(x)=\cos 2(x+45°)$ $=\cos(2x+90°)$ $=-\sin 2x$ ✓	✓ answer (1)
7.4	$y\in[-1;1]$ ✓ Accuracy **OR** $-1\le y\le 1$	✓ $y\in[-1;1]$ (1) ✓ $-1\le y\le 1$ (1)
7.5	$\tan 2x-1=0$ $\tan 2x=1$ $2x=45°$ $x=22,5°$ ✓ ← Also check on the sketch. $(1-\tan 2x)(\cos 2x)\ge 0$ $-(\tan 2x-1)(\cos 2x)\ge 0$ $(\tan 2x-1)(\cos 2x)\le 0$ ✓ $x\in[0°;22,5°]\cup[112,5°;135°)$ ✓ **OR** $0°\le x\le 22,5°$ or $112,5°\le x<135°$	✓ $x=22,5°$ ✓ $(\tan 2x-1)(\cos 2x)\le 0$ ✓ first interval ✓ second interval (4)
	[22,5 ; 45) (45; 112,5] AO: 2	[10]

QUESTION/*VRAAG* 8



8.1	Area of ABCD = BC × AB $648 = 2AB \times AB$ $AB^2 = 324$ $AB = 18$ cm	✓ BC = 2AB ✓ substitution into area of rectangle (2)
8.2	$AC^2 = AB^2 + BC^2$ [Pythagoras] $= 18^2 + 36^2$ $AC = \sqrt{1620} = 18\sqrt{5} = 40,25$ cm	✓ $AC^2 = 18^2 + 36^2$ ✓ answer (2)
8.3	$\frac{KC}{\sin K\hat{B}C} = \frac{BC}{\sin B\hat{K}C}$ $\frac{KC}{\sin 104°} = \frac{36}{\sin 52,6°}$ $KC = \frac{36\sin 104°}{\sin 52,6°}$ $KC = 43,97$ cm	✓ substitution into sine rule ✓ answer (2)
8.4	$AK^2 = AB^2 + BK^2$ [Pythagoras] $= 18^2 + 18^2$ $AK = \sqrt{648} = 18\sqrt{2}$ cm $= 25,46$ cm $KC^2 = AK^2 + AC^2 - 2AK.AC\cos K\hat{A}C$ $(43,97)^2 = (18\sqrt{2})^2 + (18\sqrt{5})^2 - 2(18\sqrt{2})(18\sqrt{5})(\cos K\hat{A}C)$ $\cos K\hat{A}C = 0,16...$ $K\hat{A}C = 80,60°$	✓ length of AK ✓ substitution into cosine rule ✓ simplification ✓ answer (4)
		[10]

QUESTION/VRAAG 9

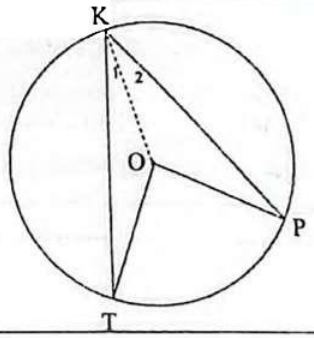


No constr: BD.

9.1	Construction: Draw KO produced	✓ construction
	$\hat{O}_1 = \hat{K}_1 + \hat{T}$ [ext ∠ of Δ/*buite ∠ van Δ*]	
	But $\hat{K}_1 = \hat{T}$ [∠s opp equal sides/*∠e teenoor gelyke sye*]	✓ S / R
	$\therefore \hat{O}_1 = 2\hat{K}_1$	✓ S
	$\hat{O}_2 = \hat{K}_2 + P$ [ext ∠ of Δ/*buite ∠ van Δ*]	
	But $\hat{K}_2 = P$ [∠s opp equal sides/*∠e teenoor gelyke sye*]	
	$\therefore \hat{O}_2 = 2\hat{K}_2$	✓ S
	$\therefore \hat{O}_1 + \hat{O}_2 = 2\hat{K}_1 + 2\hat{K}_2$	✓ S
	$= 2(\hat{K}_1 + \hat{K}_2)$	
	$\therefore T\hat{O}P = 2\,T\hat{K}P$	(5)

If no labels then mark up to $\hat{O}_1 = 2K$ ∴ 3/5

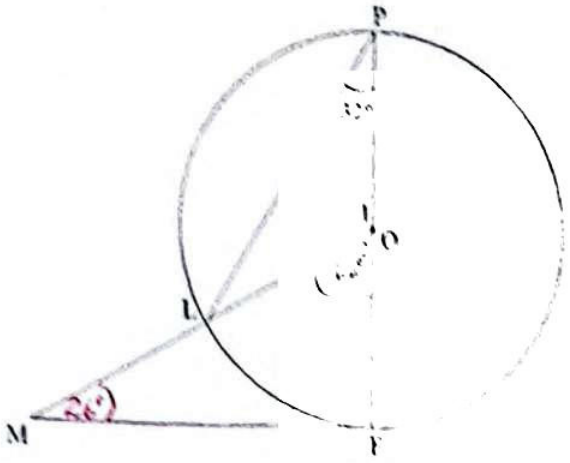
OR



9.1	Construction: Draw KO	✓ construction
	$\hat{T} = \hat{K}_1$ [∠ s opp. equal sides/*∠e teenoor gelyke sye*]	✓ S / R
	$\therefore K\hat{O}T = 180° - 2\hat{K}_1$ [sum of ∠ s of Δ /*binne ∠e van Δ*]	✓ S
	$\hat{P} = \hat{K}_2$ [∠ s opp. equal sides/*∠e teenoor gelyke sye*]	
	$\therefore K\hat{O}P = 180° - 2\hat{K}_2$ [sum of ∠ s of Δ / *binne ∠e van Δ*]	✓ S
	$T\hat{O}P = 360° - (K\hat{O}T + K\hat{O}P)$ [∠ s around a point/*∠e om 'n punt*]	✓ S
	$= 360° - (180° - 2\hat{K}_1 + 180° - 2\hat{K}_2)$	
	$= 2\hat{K}_1 + 2\hat{K}_2$	
	$= 2(\hat{K}_1 + \hat{K}_2)$	
	$\therefore T\hat{O}P = 2\,T\hat{K}P$	(5)

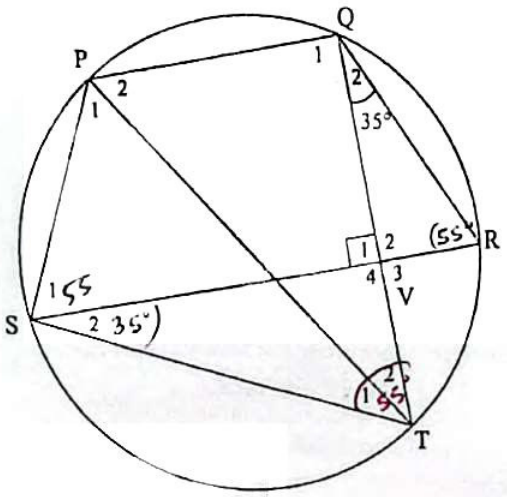
If both options are combined: 2/5

9.2



9.2.1	$\hat{O}_2 = 64°$ ✓	[∠ at centre = 2 × ∠ at circumference/ ✓ *Middelpunt ∠ = 2 × (omtrek ∠)*]	✓ S ✓ R (2)
	OR		
	$P\hat{L}O = \hat{P} = 32°$	[∠s opp equal radii *∠e teenoor gelyke radiusse*]	✓ S / R
	$\hat{O}_2 = 64°$	[ext ∠ of Δ / *buite ∠ van Δ*]	✓ S (2)
9.2.2	$P\hat{F}M = 90°$ ✓ $\hat{M} = 26°$ ✓	[tan ⊥ diameter/*raaklyn ⊥ middellyn*] ✓ [sum of ∠s of Δ/*binne ∠e van Δ*]	✓ S ✓ R ✓ S (3)
			[10]

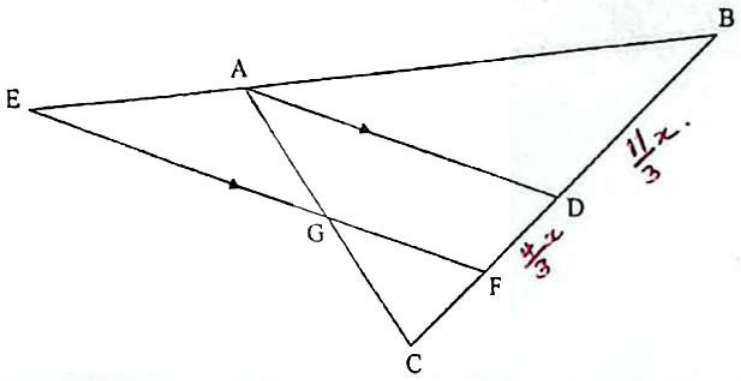
QUESTION/VRAAG 10



10.1	$\hat{R}=55°$ ✓ [sum of ∠s in Δ/*binne ∠e van Δ*] $\therefore Q\hat{T}S=55°$ ✓ [∠s in the same seg/*∠e in dieselfde segment*] **OR** $\hat{S}_2=35°$ [∠s in the same seg/*∠e in dieselfde segment*] $\therefore Q\hat{T}S=55°$ [sum of ∠s in Δ/*binne ∠e van Δ*]	✓S ✓S ✓R (3) ✓S ✓R ✓S (3)
10.2	$S\hat{P}Q=125°$ ✓ [opp ∠s of cyclic quad/teenoorst. *∠e van kvh*] $\hat{S}_1=\hat{R}=55°$ [given/*gegee*] $S\hat{P}Q+\hat{S}_1=180°$ $\therefore PQ \parallel SR$ [co-int ∠s supp/*ko-binne ∠e suppl*] ✓ **OR** $\hat{S}_1=\hat{R}=55°$ [given/*gegee*] $P\hat{Q}R=125°$ ✓ [opp ∠s of cyclic quad/teenoorst. *∠e van kvh*] $\therefore \hat{Q}_1=125°-35°=90°$ $\therefore \hat{Q}_1+\hat{V}_1=180°$ $\therefore PQ \parallel SR$ [co-int ∠s supp/*ko-binne ∠e suppl*] ✓	✓S ✓R ✓R (3) ✓S ✓R ✓R (3)

10.3	$\hat{Q}_1 = 90°$ ✓	[co-int ∠s; PQ|| SR/ *ko-binne ∠e; PQ ||SR*]	✓ S
	∴ PT is a diameter	[converse ∠ in semi-circle/ chord subtends 90°∠ *omgekeerde ∠ in halwe sirkel / koord onderspan* 90° ∠]	✓ R (2)
	OR		
	$\hat{S}_2 = 35°$ ✓	[ext ∠ of ΔSVT or sum of ∠s in Δ *buite ∠ v Δ of binne ∠e van Δ*]	✓ S
	$P\hat{S}T = 90°$		
	∴ PT is a diameter	[converse ∠ in semi-circle/ chord subtends 90°∠ *omgekeerde ∠ in halwe sirkel / koord onderspan* 90° ∠]	✓ R (2)
			[8]

QUESTION/*VRAAG* 11



11.1.1	$\frac{FD}{CF}=\frac{GA}{CG}$ ✓[prop theorem; AD ‖ EF/line ‖ one side of Δ/ *eweredigheidst.; AD ‖ EF / lyn ‖ een sy v Δ*] $\frac{FD}{CF}=\frac{2}{3}$ ✓	✓ S ✓ answer (2)
11.1.2	$FD=\frac{2}{3}CF$ $FD=\frac{2}{3}(2x)=\frac{4}{3}x$ ✓ $\frac{BA}{EA}=\frac{BD}{FD}$ ✓[prop theorem; AD ‖ EF/line ‖ one side of Δ/ *eweredigheidst.; AD ‖ EF / lyn ‖ een sy v Δ*] $\frac{BA}{EA}=\frac{5x-\frac{4}{3}x}{\frac{4}{3}x}$ ✓ $=\frac{11}{3}\times\frac{3}{4}$ $=\frac{11}{4}$ ✓	✓ $\frac{4}{3}x$ ✓ S ✓ substitution ✓ answer (4)

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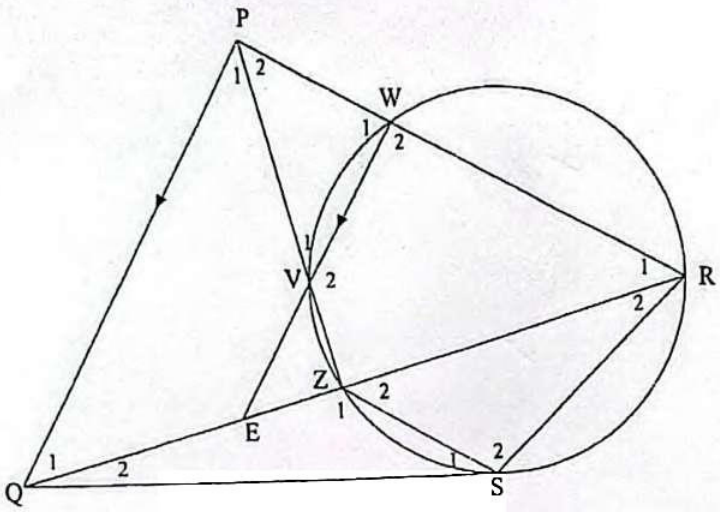
11.1.3	$\frac{\text{Area of } \Delta GCF}{\text{Area of GFDA}} = \frac{\text{Area } \Delta GCF}{\text{Area } \Delta CDA - \text{Area } \Delta GCF}$ ✓ $= \frac{\frac{1}{2}GC.CF\sin\hat{C}}{\frac{1}{2}AC.CD\sin\hat{C} - \frac{1}{2}GC.CF\sin\hat{C}}$ ✓ ✓ ✓ $= \frac{\frac{1}{2}(3k)(3p)(\sin\hat{C})}{\frac{1}{2}(5k)(5p)(\sin\hat{C}) - \frac{1}{2}(3k)(3p)(\sin\hat{C})}$ $= \frac{\frac{1}{2}(9kp)(\sin\hat{C})}{\frac{1}{2}\sin\hat{C}(25kp - 9kp)}$ $= \frac{9}{16}$ ✓	✓ GFDA = ΔCDA – ΔCGF ✓ $\frac{1}{2}(GC)(FC)\sin\hat{C}$ ✓ $\frac{1}{2}AC.CD\sin\hat{C} - \frac{1}{2}GC.CF\sin\hat{C}$ ✓ answer (4)

Assuming AGFA on is a trap, and using AG or DF as ⊥ height, then only 1/4

11.2



11.2.1	$\frac{QE}{QR}=\frac{PW}{PR}$ ✓ [prop theorem; PQ ‖ WE/line ‖ one side of Δ / *eweredigheidst.; PQ ‖ WE / lyn ‖ een sy v Δ*] ✓ Penalise for not indic ‖ lines. Accept ‖ lines without Prop theorem. $PR=\frac{PW.QR}{QE}$	✓ S ✓ R (2)
11.2.2	$\frac{PQ}{RQ}=\frac{QZ}{QP}$ ✓ [ΔPQZ ||| ΔRQP] $\therefore PQ^2 = RQ.QZ$	✓ $\frac{PQ}{RQ}=\frac{QZ}{QP}$ (1)
11.2.3	In ΔQSZ and ΔQRS $\hat{Q}_2=\hat{Q}_2$ ✓ [common ∠ / *gemeenskaplike∠*] $\hat{S}_1=\hat{R}_2$ ✓ [tan chord theorem/*raaklyn koord stelling*] $\hat{Z}_1=Q\hat{S}R$ [3rd ∠ of Δ] $\therefore$ ΔQSZ ||| ΔQRS [∠∠∠]	✓ S ✓ S/R ✓ S OR R (3)
11.2.4	$\frac{QS}{QR}=\frac{QZ}{QS}$ ✓ [ΔQSZ|||ΔQRS] $\therefore QS^2 = QZ.QR$ ✓ But $PQ^2 = RQ.QZ$ [proved in 11.2.2] must be shown in 11.2.2. $\therefore PQ = QS$	✓ S / R ✓ S ✓ S (3)

11.2.5	$\frac{PQ}{RQ}=\frac{PZ}{PR}$ [$\Delta PQZ \| \| \Delta RQP$] $PR=\frac{QR.PZ}{PQ}$ ✓ (1) $PR=\frac{PW.QR}{QE}$ [proved in 11.2.1] (2) $\therefore \frac{PW.QR}{QE}=\frac{QR.PZ}{PQ}$ ✓ (1)=(2) $PW=\frac{QE.PZ}{PQ}$ ✓ ← This steken must not just be given without calculation. But $PQ^2 = RQ.QZ$ [proved in 11.2.2] $\therefore PQ=\sqrt{RQ.QZ}$ ✓ $\therefore PW=\frac{QE.PZ}{\sqrt{QR.QZ}}$	✓ $PR=\frac{QR.PZ}{PQ}$ ✓ S ✓ $PW=\frac{QE.PZ}{PQ}$ ✓ $PQ=\sqrt{RQ.QZ}$ (4)
		[23]

TOTAL/*TOTAAL*: 150

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