basic education

Department:
Basic Education
REPUBLIC OF SOUTH AFRICA

SENIOR CERTIFICATE EXAMINATIONS/
SENIORSERTIFIKAAT-EKSAMEN
NATIONAL SENIOR CERTIFICATE EXAMINATIONS/
NASIONALE SENIORSERTIFIKAAT-EKSAMEN

MATHEMATICS P2/
WISKUNDE V2

MARKING GUIDELINES/*NASIENRIGLYNE*

2021

MARKS: 150
PUNTE: 150

These marking guidelines consist of 23 pages.
Hierdie nasienriglyne bestaan uit 23 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 memorandum. 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 memorandum 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 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

QUESTION/VRAAG 1

1.1

26	13	3	18	12	34	24	58	16	10	15	69	20	17	40

1.1.1(a)	$\bar{x} = \frac{375}{15}$ $\bar{x} = 25\text{MB}$ Answer only: Full marks	✓ 375 ✓ answer (2)
1.1.1(b)	$\sigma = 17{,}65$ MB	✓answer (1)
1.1.2	25 + 17,65 = 42,65 $\therefore$ 2 days	✓ 42,65 ✓ 2 (2)
1.1.3	Overall $\bar{x} = \frac{80}{100} \times 25$ = 20 MB $\frac{375 + x}{30} = 20$ $x = 600 - 375$ $= 225$ maximum total amount of data that Sam must use for the remainder of the month: **225** MB	✓ Overall $\bar{x} = 20$ ✓ $\frac{375 + x}{30} = 20$ ✓ answer (3)

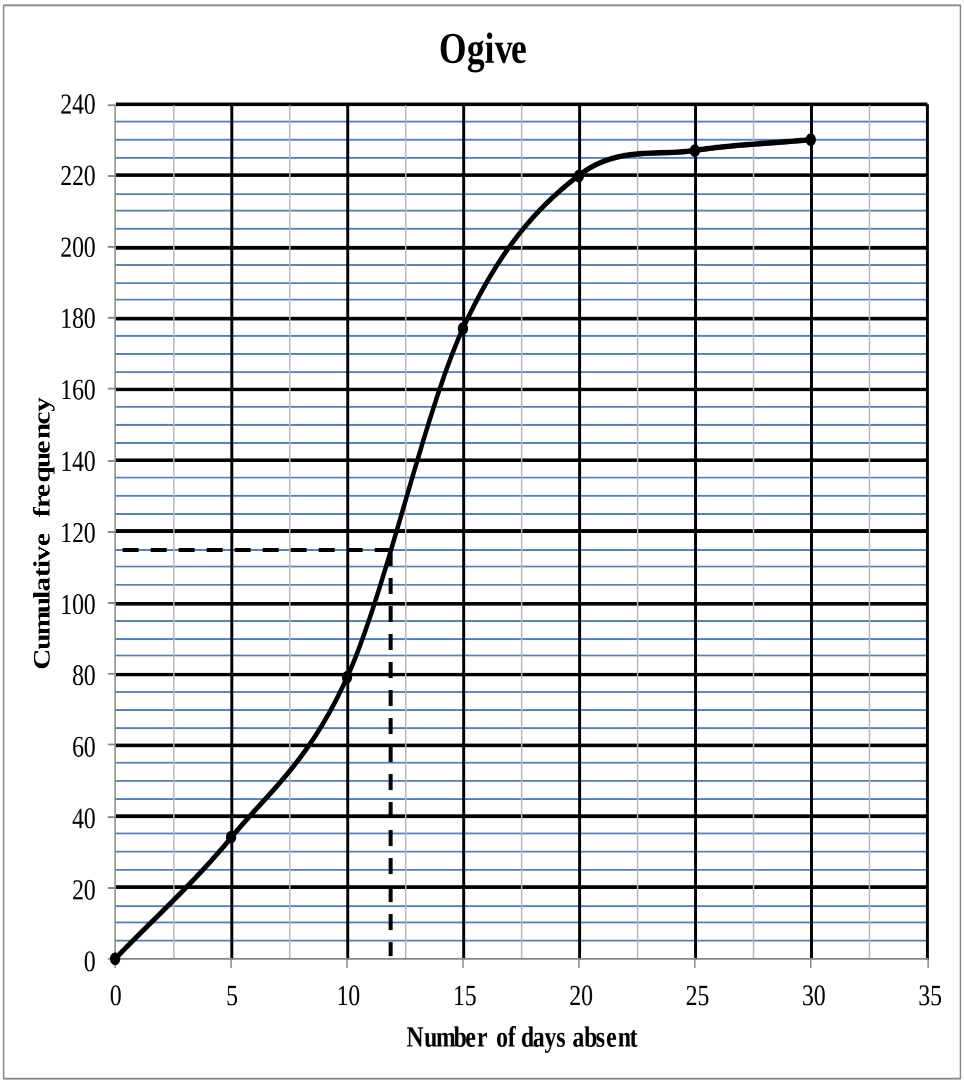
1.2

Wind speed in km/h (x)	2	6	15	20	25	17	11	24	13	22
Temperature in °C (y)	28	26	22	22	16	20	24	19	26	19

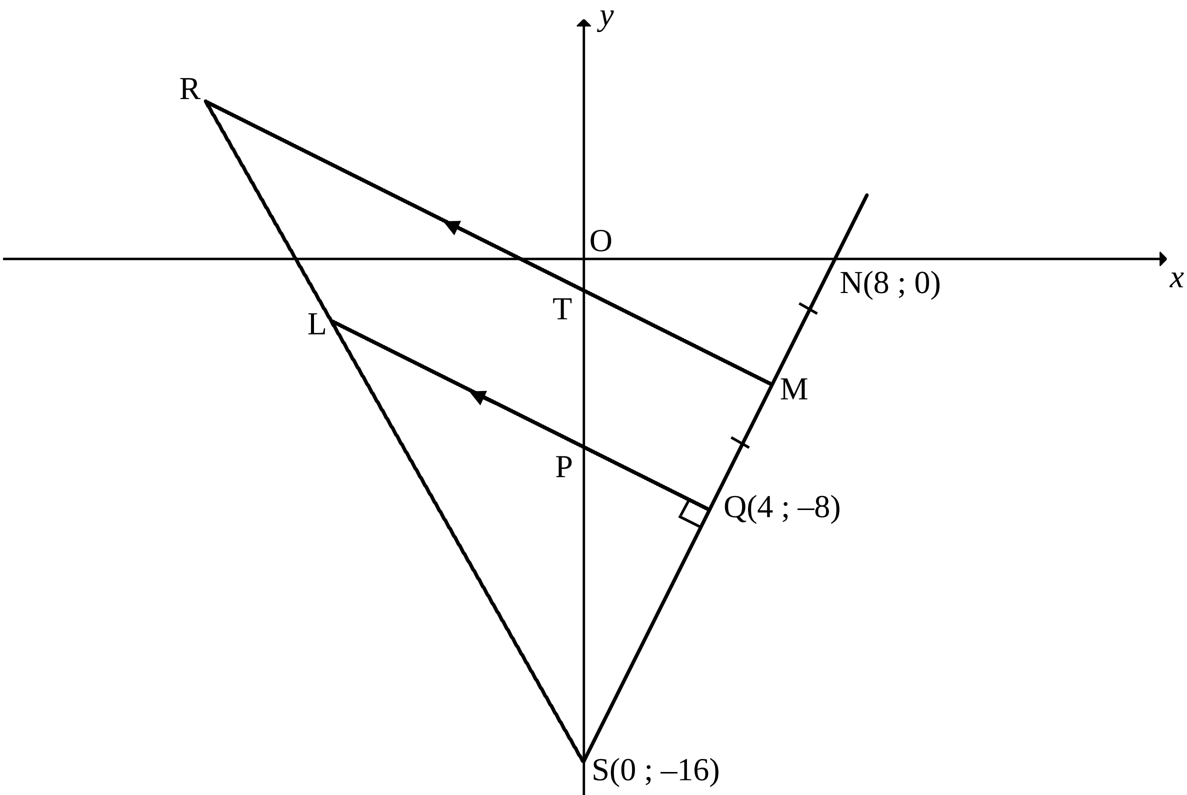
1.2.1	$a = 29{,}35$ $b = -0{,}46$ $\hat{y} = 29{,}35 - 0{,}46x$	✓ a ✓ b ✓ equation (3)
1.2.2	y = 25,20 °C (calculator) OR $\hat{y} = 29{,}35 - 0{,}46(9)$ y = 25,21 °C	✓✓ answer (2) ✓ substitution ✓ answer (2)
1.2.3	$b < 0$, indicating that as the wind speed increases the temperature decreases.	✓ interpretation (1)
		[14]

QUESTION/VRAAG 2

Number of days absent	**Number of learners**	**Cumulative frequency**
$0 \leq x < 5$	34	34
$5 \leq x < 10$	45	79
$10 \leq x < 15$	98	177
$15 \leq x < 20$	43	220
$20 \leq x < 25$	7	227
$25 \leq x < 30$	3	230

2.1	Modal class: $10 \leq x < 15$	✓ answer (1)
2.2	177 learners	✓ answer (1)
2.3	230 learners	✓ answer (1)
2.4		✓ grounding at (0; 0) ✓ shape ✓ upper limits ✓ All other points correct (4)
2.5	The median is at position 115. □value of median is 12 days (accept 11 – 14) Answer only: Full marks	✓ reading off at 115 ✓ answer (2)
		[9]

QUESTION/VRAAG 3

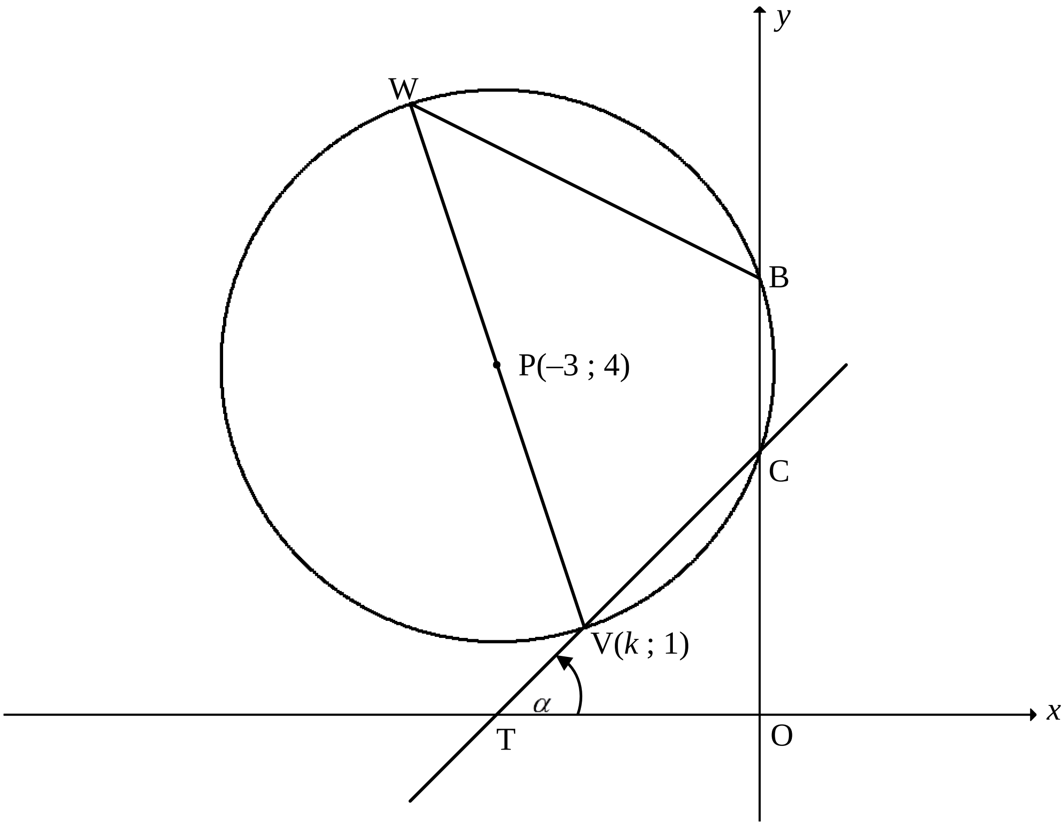


3.1	$M\left(\frac{4+8}{2};\frac{-8+0}{2}\right)$ $M(6;-4)$	✓ x_M ✓ y_M (2)
3.2	$m_{NS} = \frac{0-(-16)}{8-0}$ or $m_{NQ} = \frac{0-(-8)}{8-4}$ or $m_{QS} = \frac{-8-(-16)}{4-0}$ $= 2$	✓ subst N and Q or N and Q or Q and S into gradient formula ✓ answer (2)
3.3	$m_{LQ} \times 2 = -1$ [LQ$\perp$ NS] $\therefore m_{LQ} = -\frac{1}{2}$ $-8 = -\frac{1}{2}(4) + c$ **OR** $y+8 = -\frac{1}{2}(x-4)$ $c = -6$ $y+8 = -\frac{1}{2}x + 2$ $\therefore y = -\frac{1}{2}x - 6$	✓ m_{LQ} ✓ substitution of Q ✓ calculation of *c* or simplification (3)
3.4	OS is the radius of circle passing through S $(x-0)^2 + (y-0)^2 = (16)^2$ $x^2 + y^2 = 256$ Answer only: Full marks	✓ identifying radius = 16 ✓ Equation of circle (2)

3.5	$m_{RM} = m_{LQ} = -\frac{1}{2}$ [RM ∥ LQ] $-4 = -\frac{1}{2}(6) + c$ **OR** $y + 4 = -\frac{1}{2}(x - 6)$ $c = -1$ $y + 4 = -\frac{1}{2}x + 3$ $\therefore y = -\frac{1}{2}x - 1$ $T(0;-1)$	✓ m_{RM} ✓ substitution of $M(6;-4)$ ✓ coordinates of T (3)
3.6	$T(0;-1)$, $P(0;-6)$ and $S(0;-16)$ $\therefore$ PS = 10 units and TS = 15 units $\frac{LS}{RS} = \frac{PS}{TS} = \frac{2}{3}$ [prop theorem; RM ∥ LP] **OR** [line ∥ one side of Δ/*lyn* ∥ *een sy v Δ*] Answer only: Full marks **OR** M(6 ; –4), Q(4 ; –8) and S(0 ; –16) MS = $\sqrt{180} = 6\sqrt{5}$ and QS = $\sqrt{80} = 4\sqrt{5}$ $\frac{LS}{RS} = \frac{QS}{MS} = \frac{2}{3}$ [prop theorem; RM ∥ LQ] **OR** [line ∥ one side of Δ/*lyn* ∥ *een sy v Δ*] Answer only: Full marks	✓ PS = 10 units ✓ TS = 15 units ✓ answer (3) ✓ MS $= 6\sqrt{5}$ units ✓ QS $= 4\sqrt{5}$ units ✓ answer (3)
3.7	area of PTMQ = area of ΔTSM – area of ΔPSQ $= \frac{1}{2}.ST.\perp h_M - \frac{1}{2}.PS.\perp h_Q$ $= \frac{1}{2}(15)(6) - \frac{1}{2}(10)(4)$ = 45 – 20 = 25 square units **OR** $TM = \sqrt{45} = 3\sqrt{5} = 6{,}71$ $MQ = \sqrt{20} = 2\sqrt{5} = 4{,}47$ $PQ = \sqrt{20} = 2\sqrt{5} = 4{,}47$ area of trapezium PTMQ = $\frac{1}{2}(3\sqrt{5} + 2\sqrt{5})(2\sqrt{5})$ $= \frac{1}{2}(5\sqrt{5})(2\sqrt{5})$ = 25 square units	✓ area of ΔTSM – area of ΔPSQ ✓ area ΔTSM = 45 ✓ area ΔPSQ = 20 ✓ answer (4) ✓ $TM = 3\sqrt{5}$ $MQ = 2\sqrt{5}$ $PQ = 2\sqrt{5}$ ✓ area of trapezium = $\frac{1}{2}$ (sum of ∥sides)(height) ✓ substitute into formula ✓ answer (4)

	OR $\mathrm{MQ}=\sqrt{20}=2\sqrt{5}$ $\mathrm{PQ}=\sqrt{20}=2\sqrt{5}$ $\mathrm{TP}=5$ area of PTMQ= area of ΔMTP+ area of ΔPQM $\boxed{\text{area of PTMQ}=\frac{1}{2}\mathrm{TP}\times\perp h_M+\frac{1}{2}\mathrm{MQ}\times\mathrm{PQ}}$ area of PTMQ$=\frac{1}{2}(5)\times 6+\frac{1}{2}(2\sqrt{5})(2\sqrt{5})$ area of PTMQ$=10+15=25$	✓ area of ΔMTP + area of ΔPQM ✓ area ΔMTP = 10 ✓ area ΔPQM = 15 ✓ answer (4)
		[19]

QUESTION 4



4.1	$PV = r = \sqrt{10}$ $PV = \sqrt{(k-(-3))^2 + (1-4)^2} = \sqrt{10}$ $(PV)^2 = (k-(-3))^2 + (1-4)^2 = 10$ $k^2 + 6k + 9 + 9 = 10$ **OR** $(k+3)^2 + 9 = 10$ $k^2 + 6k + 8 = 0$ $(k+3)^2 = 1$ $(k+4)(k+2) = 0$ $k + 3 = 1$ or $k + 3 = -1$ $k = -4$ or $k = -2$ $\therefore k = -2$	✓ $PV = r = \sqrt{10}$ ✓ substitution into distance formula ✓ standard form ✓ factors ✓ answer (5)
4.2	$x^2 + 6x + y^2 - 8y + 15 = 0$ y-intercepts: $(0)^2 + 6(0) + y^2 - 8y + 15 = 0$ $(y-3)(y-5) = 0$ $y_C = 3$ or $y_B = 5$ $\therefore BC = 2$ units	✓ $x = 0$ ✓ factors ✓ both values ✓ answer (4)

4.3.1	$m_{TC}=\dfrac{3-1}{0-(-2)}$ $=1$ $\tan\alpha=1$ $\therefore\alpha=45°$ **OR** $y=mx+3$ $1=m(-2)+3$ $m_{TC}=1$ $\tan\alpha=1$ $\therefore\alpha=45°$	✓ substitution into gradient formula ✓ $\tan\alpha=1$ ✓ answer (3) ✓ substitution into equation of a line ✓ $\tan\alpha=1$ ✓ answer (3)
4.3.2	$B\hat{C}V=135°$ [ext ∠ of Δ/*buite* ∠ v Δ] $\therefore V\hat{W}B=45°$ [opp ∠s of cyclic quad/*teenoorst. ∠e v kvh*] Answer only: Full marks **OR** $T\hat{C}O=45°$ [∠s of Δ/∠*e v* Δ] $\therefore V\hat{W}B=45°$ [ext ∠s of cyclic quad/*buite* ∠ *v kvh*] Answer only: Full marks	✓ $B\hat{C}V=135°$ ✓ answer (2) ✓ $T\hat{C}O=45°$ ✓ answer (2)
4.4.1	$Q(-3;-2)$	✓ x_Q ✓ y_Q (2)
4.4.2	$(x+3)^2+(y+2)^2=10$	✓ LHS ✓ RHS (2)
4.4.3	$x=-2$ or $x=-4$	✓ $x=-2$ ✓ $x=-4$ (2)
		[20]

QUESTION/VRAAG 5

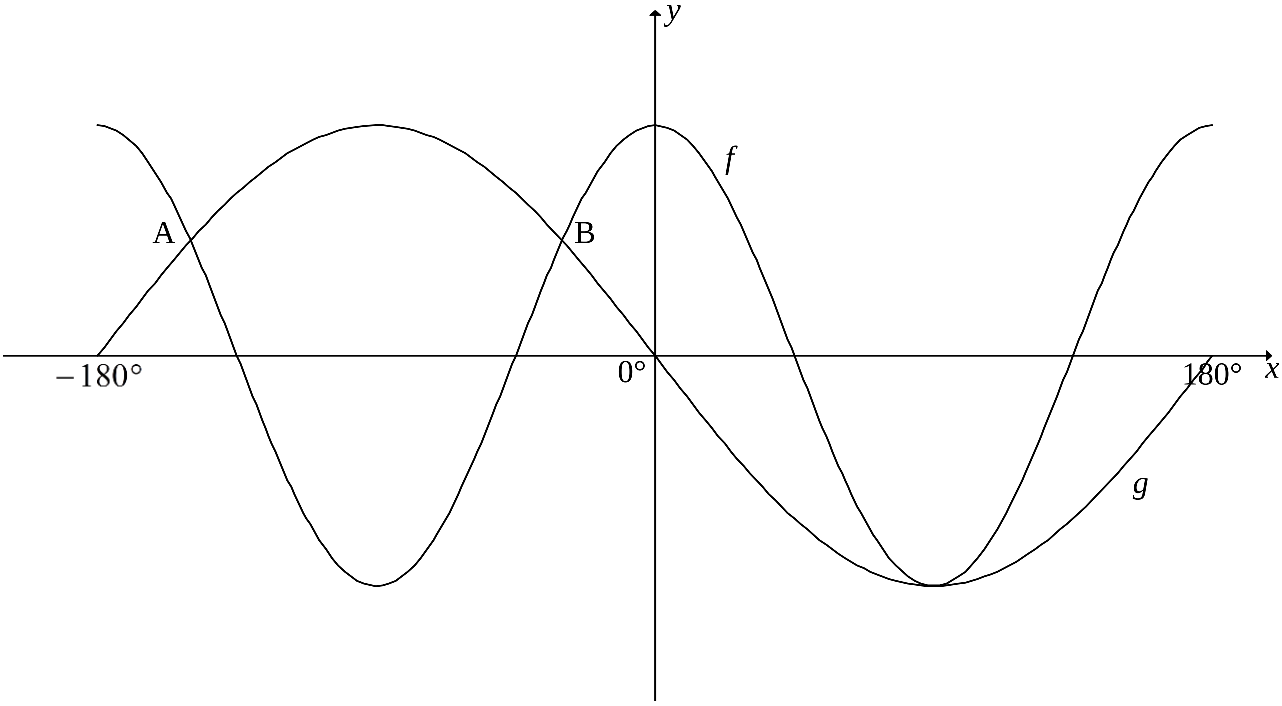
5.1	$\tan(-x).\cos x.\sin(x-180°)-1$ $=-\tan x.\cos x.\sin(-(180°-x))-1$ $=\dfrac{-\sin x}{\cos x}.\cos x.(-\sin x)-1$ $=\sin^2 x-1$ $=-\cos^2 x$	✓ $-\tan x$ ✓ $-\sin x$ ✓ $\dfrac{-\sin x}{\cos x}$ ✓ $\sin^2 x-1$ ✓ answer (5)
5.2.1	$\cos 215°$ $=-\cos 35°$ $=-m$	✓ reduction ✓ answer (2)
5.2.2	$\sin 20°$ $=\cos 70°$ $=\cos 2(35°)$ $=2\cos^2 35°-1$ $=2m^2-1$ OR $=\sin(55°-35°)$ $=\sin 55°\cos 35°-\cos 55°\sin 35°$ $=m.m-\sqrt{1-m^2}.\sqrt{1-m^2}$ $=m^2-(1-m^2)$ $=2m^2-1$	✓ co-function ✓ double angle expansion ✓ answer in terms of m (3) ✓ compound angle expansion ✓ $\cos 55°=\sqrt{1-m^2}$ or $\sin 35°=\sqrt{1-m^2}$ ✓ answer in terms of m (3)
5.3	$\cos 4x.\cos x+\sin 4x.\sin x=-0{,}7$ $\cos(4x-x)=-0{,}7$ ref $\angle$ = 45,57…° $3x=180°-45{,}57...°+k.360°$ or $3x=180°+45{,}57...°+k.360°$ $3x=134{,}43°+k.360°$ or $3x=225{,}57°+k.360°$ $x=44{,}81°+k.120°$; $k\in Z$ $x=75{,}19°+k.120°$; $k\in Z$	✓ compound angle ✓ $3x$ = 134,43° or 225,57° ✓ x = 44,81° or 75,19° ✓ + k.120°; $k\in Z$ (4)

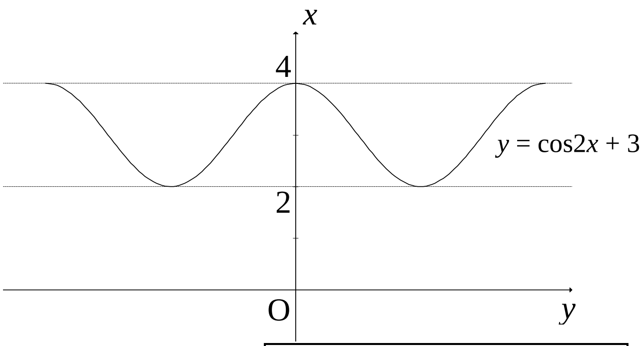
5.4	$\text{RHS} = \cos^2 x - \sin^2 x$ $\text{LHS} = \dfrac{\sin 4x.\cos 2x - 2\cos 4x.\sin x.\cos x}{\tan 2x}$ $= \dfrac{\sin 4x.\cos 2x - \cos 4x.\sin 2x}{\frac{\sin 2x}{\cos 2x}}$ $= \sin(4x - 2x)\left(\dfrac{\cos 2x}{\sin 2x}\right)$ $= \cos 2x$ $= \cos^2 x - \sin^2 x$ LHS = RHS	✓ $\sin 2x$ ✓ $\dfrac{\sin 2x}{\cos 2x}$ ✓ $\sin(4x-2x)$ ✓ $\cos 2x$ (4)
		[18]

QUESTION/VRAAG 6

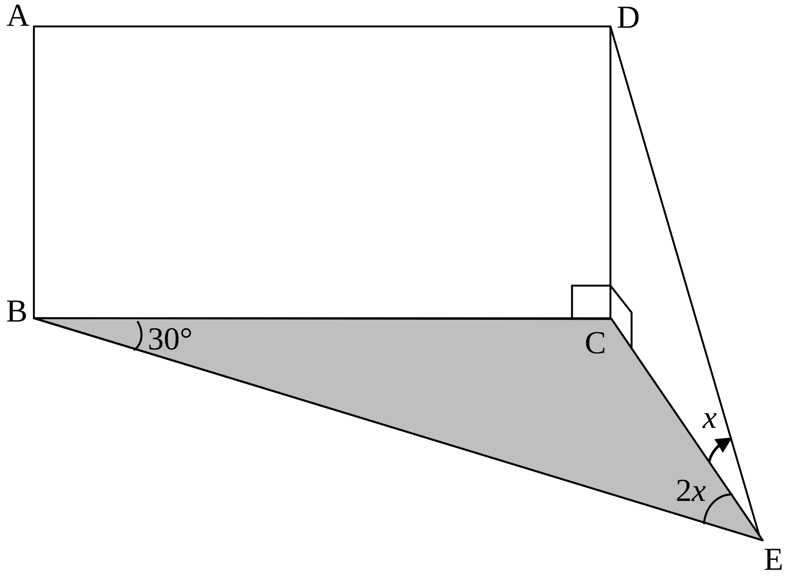
6.1	$1-2\sin^2 x=-\sin x$ $2\sin^2 x-\sin x-1=0$ $(2\sin x+1)(\sin x-1)=0$ $\sin x=-\frac{1}{2}$ or $\sin x=1$ ref $\angle$ = 30° ref $\angle$ = 90° $x=210°+k.360°$ or $x=330°+k.360°$; $x=90°+k.360°$ $x=-150°$ or $x=-30°$ or $x=90°$	✓ identity ✓ factors ✓ $\sin x=-\frac{1}{2}$ ✓ $\sin x=1$ ✓ –150° and –30° ✓ 90° (A) (6)
	OR	
	$\cos 2x=-\sin x$ $\cos 2x=-\cos(90°-x)$ $2x=180°-(90°-x)+k.360°$ or $2x=180°+(90°-x)+k.360°$ $2x=90°+x+k.360°$ or $2x=270°-x+k.360°$ $x=90°+k.360°$; $x=90°+k.120°$ $x=-150°$ or $x=-30°$ or $x=90°$	✓ co-functions ✓ $2x$ in quadrant 2 ✓ $2x$ in quadrant 3 ✓ both general solutions ✓ –150° and –30° ✓ 90° (A) (6)
	OR	
	$\cos 2x=-\sin x$ $\cos 2x=\cos(90°+x)$ $2x=90°+x+k.360°$ or $2x=360°-(90°+x)+k.360°$ $x=90°+k.360°$ or $3x=270°+k.360°$ $x=90°+k.120°$ $x=-150°$ or $x=-30°$ or $x=90°$	✓ co-functions ✓ $2x$ in quadrant 1 ✓ $2x$ in quadrant 4 ✓ both general solutions ✓ –150° and –30° ✓ 90° (A) (6)
	OR	
	$\cos 2x=-\sin x$ $\sin(90°-2x)=-\sin x$ $90°-2x=180+x+k.360°$ or $90°-2x=360°-x+k.360°$ $x=-30°+k.120°$; $x=-270°+k.360°$ $x=-150°$ or $x=-30°$ or $x=90°$	✓ co-functions ✓ 90°–2x in quadrant 3 ✓ 90°–2x in quadrant 4 ✓ both general solutions ✓ –150° and –30° ✓ 90° (A) (6)

6.2



6.2.1	A(–150°; 0,5) B(–30°; 0,5) AB = –30° – (–150°) AB = 120° Answer only: Full marks	✓ AB = –30° – (–150°) ✓ answer (2)
6.2.2	$x \in (0°; 90°)$ or $x \in (90°; 180°)$ **OR** $0° < x < 90°$ or $90° < x < 180°$	✓ $x \in (0°; 90°)$ ✓ $x \in (90°; 180°)$ (2) ✓ $0° < x < 90°$ ✓ $90° < x < 180°$ (2)
6.2.3	$\cos 2x = k - 3$ $k - 3 < -1$ or $k - 3 > 1$ $k < 2$ or $k > 4$ Answer only: Full marks **OR**  $k < 2$ or $k > 4$ Answer only: Full marks	✓ $k - 3 < -1$ or $k - 3 > 1$ ✓ $k < 2$ ✓ $k > 4$ (3) ✓ graph of $y = \cos 2x + 3$ ✓ $k < 2$ ✓ $k > 4$ (3)
		[13]

QUESTION/VRAAG 7

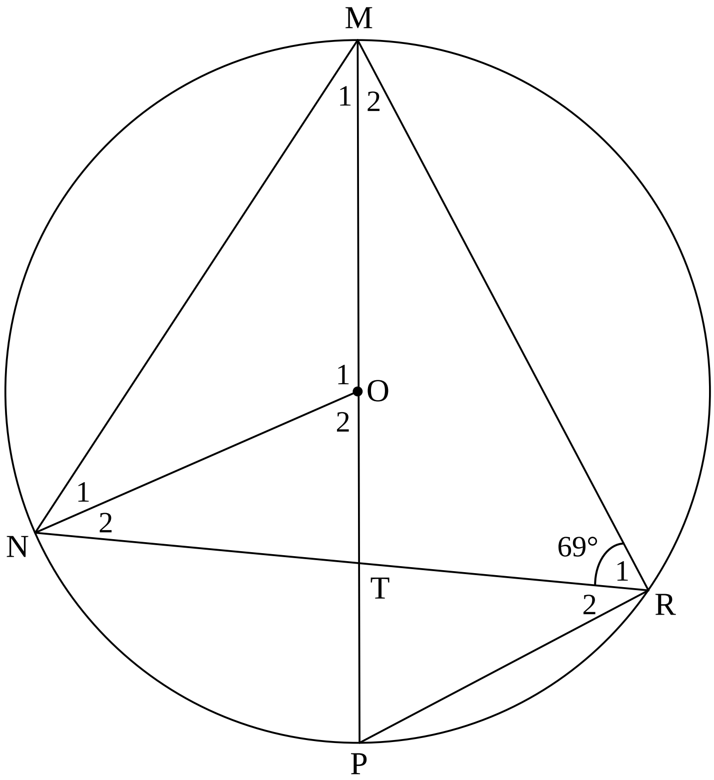


7.1	In ΔBCE: $\frac{\text{CE}}{\sin\hat{\text{B}}} = \frac{\text{BC}}{\sin \text{B}\hat{\text{E}}\text{C}}$ $\frac{\text{CE}}{\sin 30°} = \frac{\text{BC}}{\sin 2x}$ $\text{CE} = \frac{\text{BC}\sin 30°}{\sin 2x}$ In ΔCDE: $\frac{\text{DC}}{\text{CE}} = \tan \text{D}\hat{\text{E}}\text{C}$ $\text{DC} = \frac{\text{BC}.\sin 30°}{\sin 2x}(\tan x)$ $\text{DC} = \frac{\text{BC}}{4\sin x \cos x}\left(\frac{\sin x}{\cos x}\right)$ $\text{DC} = \frac{\text{BC}}{4\cos^2 x}$	✓ correct use of sine rule ✓ $\text{CE} = \frac{\text{BC}\sin 30°}{\sin 2x}$ ✓ correct trig ratio ✓ Subst CE ✓ $2\sin x \cos x$ ✓ $\frac{\sin x}{\cos x}$ (6)

7.2	$\text{DC}=\frac{\text{BC}}{4\cos^2 30°}$ $=\frac{\text{BC}}{4\left(\frac{\sqrt{3}}{2}\right)^2}$ $=\frac{\text{BC}}{3}$ $\therefore \text{BC}=3\text{DC}$ But AB = DC [opp sides of rectangle/*teenoorst. sye v reghoek*] $\therefore \text{BC}=3\text{AB}$ Area of rectangle = (AB)(BC) = (AB)(3AB) $=3\text{AB}^2$	 ✓ $\text{DC}==\frac{\text{BC}}{3}$ ✓ $\text{BC}=3\text{AB}$ ✓ substitution into area formula (3)
		[9]

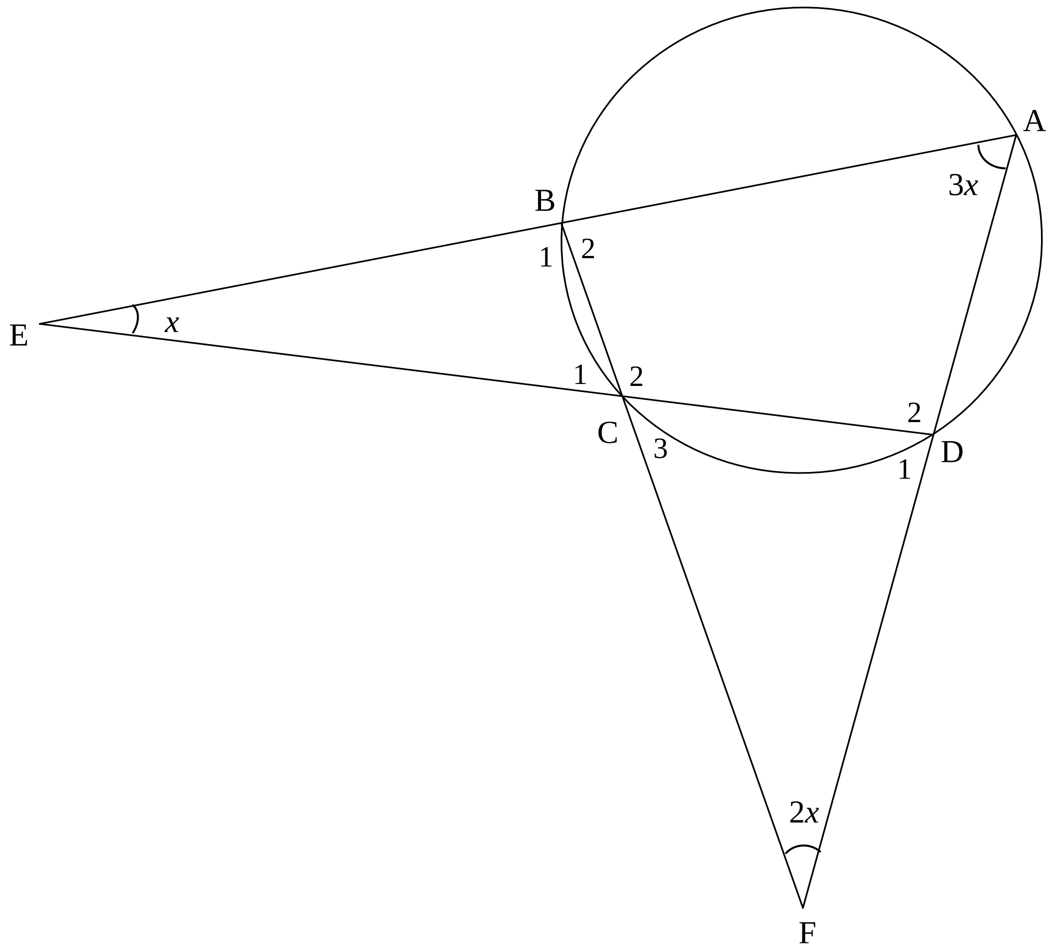
QUESTION/VRAAG 8

8.1



8.1.1	$M\hat{R}P = 90°$ [∠ in semi circle/∠ *in halwe sirkel*] $\hat{R}_2 = 21°$	✓ R ✓ S (2)
8.1.2	$\hat{O}_1 = 138°$ [∠ at centre = 2 ×∠ at circumference/ *midpts.* ∠ = 2× *omtreks* ∠]	✓ S ✓R (2)
8.1.3	$\hat{M}_1 = 21°$ [∠s in the same segment/∠*e in dieselfde sirkel segment*] **OR** $\hat{M}_1 + N_1 = 180° - 138°$ [sum of ∠s in Δ/∠*e v* Δ] $\therefore \hat{M}_1 = 21°$ [∠s opp equal sides/∠*e teenoor gelyke sye*]	✓ S ✓R (2) ✓ S ✓R (2)
8.1.4	$\hat{O}_2 = 42°$ [∠s on a str line/∠*e op 'n reguitlyn*] $\hat{P} = 42°$ [alt ∠s; NO || PR/*Verw.* ∠*e,* NO || PR] $\hat{M}_2 = 48°$ [sum of ∠s in Δ/∠*e v* Δ] **OR** $\hat{N}_2 = \hat{R}_2 = 21°$ [alt ∠s; NO || PR/*Verw.* ∠*e,* NO || PR] $\hat{N}_1 = \hat{M}_1 = 21°$ [∠s opposite equal sides/∠*e teenoor gelyke sye*] $\hat{M}_2 = 48°$ [sum of ∠s of Δ NMR//∠*e v* ΔNMR]	✓ S ✓ S ✓R ✓ S (4) ✓ S ✓R ✓ S ✓ S (4)

8.2

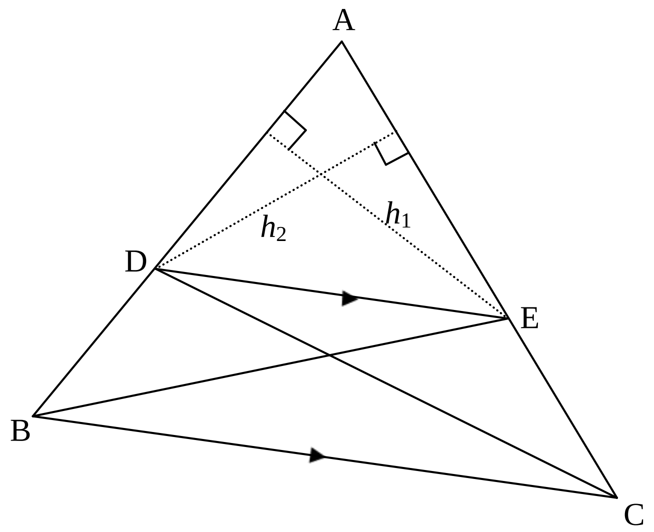


8.2	$\hat{D}_1 = 4x$ $\hat{D}_2 = 180° - 4x$ $\hat{B}_1 = 5x$ $\hat{B}_1 = \hat{D}_2$ $180° - 4x = 5x$ $9x = 180°$ $x = 20°$	[ext ∠ of Δ/*buite* ∠ *v* Δ] [∠s on a str line/∠*e op ´n reguitlyn*] [ext ∠ of Δ/*buite* ∠ *v* Δ] [ext ∠ of cyclic quad/*buite* ∠ *v kvh*]	✓ S/R ✓ S ✓ S ✓S ✓R ✓ answer (6)
	OR		
	$\hat{C}_1 = 3x$ $\hat{B}_2 = 4x$ $\hat{C}_1 = \hat{C}_3 = 3x$ $\hat{D}_2 = 5x$ $4x + 5x = 180°$ $x = 20°$	[ext ∠ of cyclic quad/*buite* ∠ *v kvh*] [ext ∠ of Δ/*buite* ∠ *v* Δ] [vert opp ∠s] [ext ∠ of Δ/*buite* ∠ *v* Δ] [opp ∠ of cyclic quad/*teenoorst.* ∠*e v kvh*]	✓ S ✓ R ✓ S ✓ S ✓S/R ✓ answer (6)

	OR $\hat{C}_3 = 3x$ [ext ∠ of cyclic quad/*buite* ∠ *v kvh*] $\hat{D}_1 = 4x$ [ext ∠ of Δ/*buite* ∠ *v* Δ] $2x + 3x + 4x = 180°$ [sum of ∠s in Δ/∠*e v* Δ] $9x = 180°$ $x = 20°$	✓ S ✓R ✓ S ✓ S ✓R ✓ answer (6)
		[16]

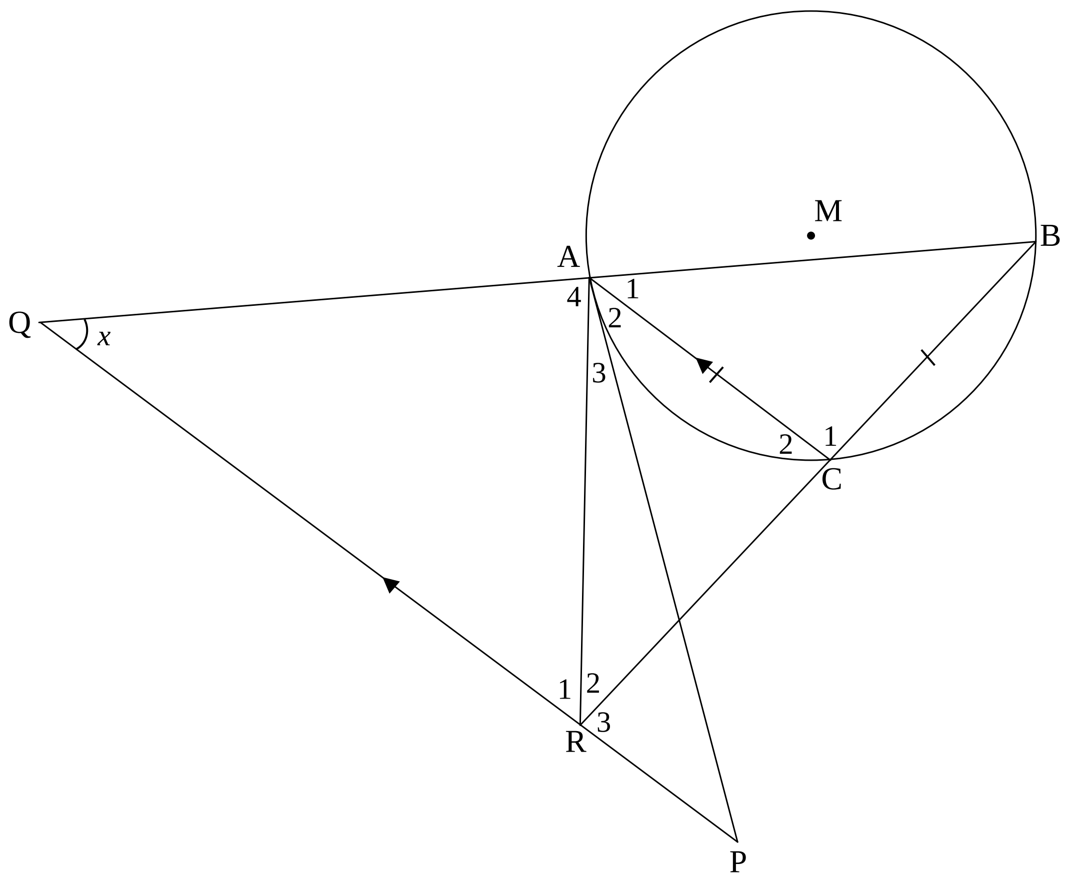
QUESTION/VRAAG 9

9.1



9.1	Constr: Join BE and CD and draw h_1 from E $\perp$ AD and h_2 from D $\perp$ AE *Konstr: Verbind BE en CD en trek* h_1 *vanaf* E $\perp$ AD *en* h_2 *vanaf* D $\perp$ AE Proof/*Bewys*: $\frac{\text{area } \Delta\text{ADE}}{\text{area } \Delta\text{BDE}} = \frac{\frac{1}{2}\text{AD}\times h_1}{\frac{1}{2}\text{BD}\times h_1} = \frac{\text{AD}}{\text{BD}}$ $\frac{\text{area } \Delta\text{ADE}}{\text{area } \Delta\text{DEC}} = \frac{\frac{1}{2}\text{AE}\times h_2}{\frac{1}{2}\text{EC}\times h_2} = \frac{\text{AE}}{\text{EC}}$ area ΔADE = area ΔADE [common/*gemeenskaplik*] But area ΔBDE = area ΔDEC [same base & height ; DE ∥ BC/ *dies basis & hoogte ;* DE ∥ BC] $\therefore \frac{\text{area } \Delta\text{ADE}}{\text{area } \Delta\text{BDE}} = \frac{\text{area } \Delta\text{ADE}}{\text{area } \Delta\text{DEC}}$ $\therefore \frac{\text{AD}}{\text{BD}} = \frac{\text{AE}}{\text{EC}}$	✓ constr/*konstr* ✓ $\frac{\text{area } \Delta\text{ADE}}{\text{area } \Delta\text{BDE}}$ ✓ $\frac{\frac{1}{2}\text{AD}\times h_1}{\frac{1}{2}\text{BD}\times h_1}$ **or R** ✓ $\frac{\text{area } \Delta\text{ADE}}{\text{area } \Delta\text{DEC}} = \frac{\text{AE}}{\text{EC}}$ ✓ S ✓R (6)

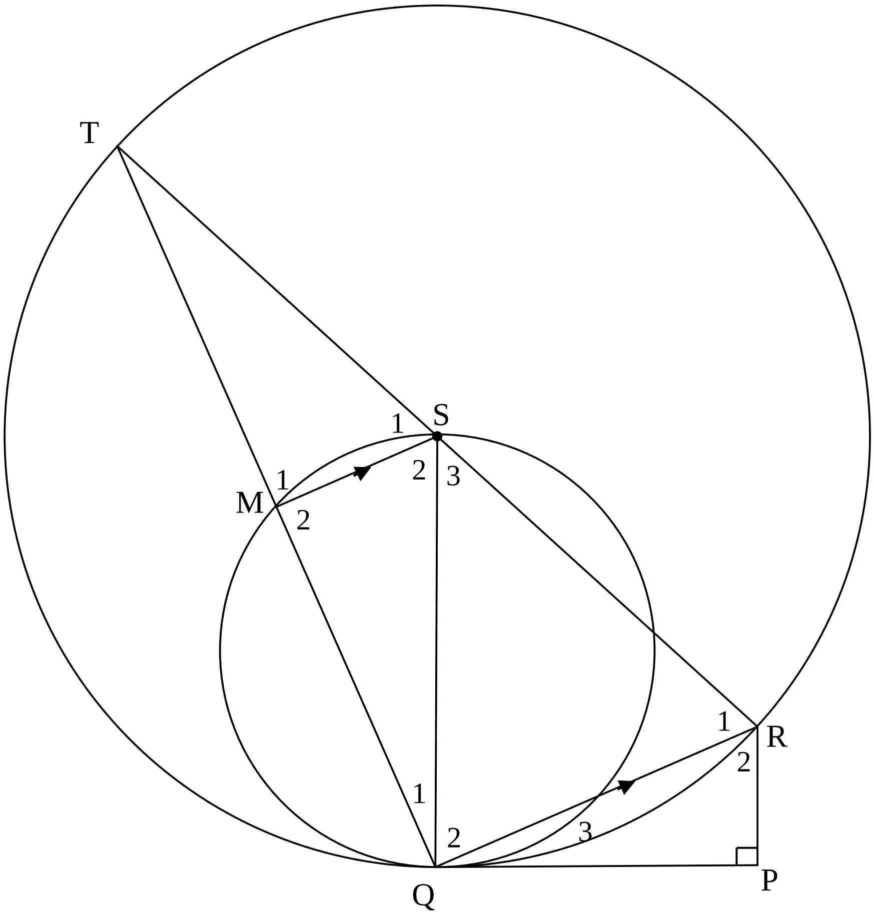
9.2



9.2.1	$\hat{A}_1 = x$ [corresp ∠s; PQ ‖ CA/*ooreenkomstige ∠e*, PQ ‖ CA] $\hat{B} = x$ [∠s opp equal sides/*∠e teenoor gelyke sye*] $\hat{A}_2 = x$ [tan-chord theorem/*∠ tussen raaklyn en koord*] $\hat{P} = x$ [alt ∠s; PQ ‖ CA/*verw. ∠e*, PQ ‖ CA]	✓ S ✓ R ✓ S/R ✓ S ✓ R ✓ S/R (6)
9.2.2	$\hat{B} = \hat{P}$ [proved in 9.2.1/*bewys in 9.2.1*] ∴ A, B, P and R are concyclic ∴ ABPR is a cyclic quadrilateral [conv ∠s in the same segment/ *koord onderspan gelyke omtreks ∠e*]	✓ S ✓ R (2)
9.2.3	$\frac{BA}{BQ} = \frac{BC}{BR}$ [prop th; AC ‖ QP] **OR** [line ‖ one side Δ/*lyn* ‖ *een syn v Δ*] But QR = BR [sides opp = ∠s/*sye teenoor* = *∠e*] $\therefore \frac{BA}{BQ} = \frac{BC}{QR}$	✓ S ✓ R ✓ S (3)

	OR In Δ ABC and Δ BQR: $\hat{A}_1 = \hat{B} = x$ [proved in 9.2.1] $\hat{B} = \hat{Q} = x$ [proved in 9.2.1] $\hat{C}_1 = B\hat{R}Q = 180° - 2x$ [sum of $\angle$s of Δ] $\therefore \Delta ABC \mathbin{\|\|\|} \Delta BQR$ $\therefore \frac{BA}{BQ} = \frac{BC}{QR}$	✓ S ✓ S ✓ S (3)
	OR In Δ ABC and Δ BQR: $\hat{A}_1 = \hat{B} = x$ [proved in 9.2.1] $\hat{B} = \hat{Q} = x$ [proved in 9.2.1] $\hat{C}_1 = B\hat{R}Q = 180° - 2x$ [sum of $\angle$s of Δ] $\therefore \Delta ABC \mathbin{\|\|\|} \Delta BQR$ [$\angle\angle\angle$] $\therefore \frac{BA}{BQ} = \frac{BC}{QR}$	✓ S ✓ S ✓ R (3)
	OR In Δ ABC and Δ QBR: $\hat{B}$ is common $\hat{A}_1 = \hat{Q} = x$ [corres $\angle$s; PQ || CA] $\hat{C}_1 = B\hat{R}Q = 180° - 2x$ [sum of $\angle$s of Δ] $\therefore \Delta ABC \mathbin{\|\|\|} \Delta QBR$ [$\angle\angle\angle$] But QR = BR [sides opp = $\angle$s/*sye teenoor* = $\angle$*e*] $\therefore \frac{BA}{BQ} = \frac{BC}{QR}$	✓ S ✓ S ✓ S (3)
		[17]

QUESTION/VRAAG 10



10.1.1	$\hat{Q}_1 + \hat{Q}_2 = 90°$ [∠ in semi circle/∠ *in halwe sirkel*] $\therefore \hat{M}_2 = 90°$ [co-interior ∠, MS ∥ QR/*ko-binne ∠e,* MS ∥ QR] $\therefore$ SQ is a diameter [converse: ∠ in semi circle/ *Omgekeerde: ∠ in halwe sirkel*] **OR** MS ∥ QR $\frac{TS}{SR} = \frac{TM}{MQ} = \frac{1}{1}$ [prop theorem; SM ∥ QR] **OR** [line ∥ one side of Δ]/*lyn ∥ een sy v*Δ $\therefore TM = MQ$ $\therefore \hat{M}_2 = 90°$ [Line from centre bisects chord/*midpt. sirkel; midpt koord*] $\therefore$ SQ is a diameter [converse: ∠ in semi circle/ *Omgekeerde: ∠ in halwe sirkel*] **OR** SQ ⊥ QP [tan ⊥ rad/*raaklyn ⊥ radius*] $\therefore$ SQ is a diameter [converse: tan ⊥ rad/*Omgekeerde: raaklyn ⊥ radius*]	✓ S/R ✓ S/R ✓ R (3) ✓ S/R ✓ S/R ✓ R (3) ✓ S ✓ R ✓ R (3)

10.1.2	In ΔRTQ and ΔRQP $\hat{T} = \hat{Q}_3$ [tan-chord theorem/$\angle$ *tussen raaklyn en koord*] $\hat{Q}_1 + \hat{Q}_2 = 90°$ [co-interior $\angle$s, MS || QR/*ko-binne $\angle$e,* MS || QR] **or** [$\angle$ in semi circle/$\angle$ *in halwe sirkel*] $\therefore \hat{Q}_1 + \hat{Q}_2 = \hat{P} = 90°$ $\hat{R}_1 = \hat{R}_2$ [$\angle$s of Δ/$\angle$*e van* Δ] $\Delta RTQ \parallel\!\mid \Delta RQP$ $\frac{RT}{RQ} = \frac{RQ}{RP}$ $RT = \frac{RQ^2}{RP}$ **OR** In ΔRTQ and ΔRQP $\hat{T} = \hat{Q}_3$ [tan-chord theorem $\angle$ *tussen raaklyn en koord*] $\hat{Q}_1 + \hat{Q}_2 = 90°$ [co-interior $\angle$s, MS || QR/*ko-binne* $\angle$*e*, MS || QR] **or** [$\angle$ in semi circle/$\angle$ *in halwe sirkel*] $\therefore \hat{Q}_1 + \hat{Q}_2 = \hat{P} = 90°$ $\Delta RTQ \parallel\!\mid \Delta RQP$ [$\angle,\angle,\angle$] $\frac{RT}{RQ} = \frac{RQ}{RP}$ $RT = \frac{RQ^2}{RP}$	✓ S ✓ R ✓ S ✓ S ✓ S ✓ ratio (6) ✓ S ✓ R ✓ S ✓ S ✓ R ✓ ratio (6)
10.2	QR = 28 units [midpoint theorem/*midpt. stelling*] $RP^2 = 28^2 - \left(\sqrt{640}\right)^2$ [Pythagoras/*Pythagoras*] RP = 12 units $RT = \frac{RQ^2}{RP}$ $RT = \frac{28^2}{12}$ $RT = \frac{196}{3}$ Radius = $\frac{98}{3}$ units	✓ S ✓ R ✓ S ✓ RP = 12 ✓ RT ✓ answer (6)
		[15]

TOTAL/TOTAAL: 150