SA-STUDENT

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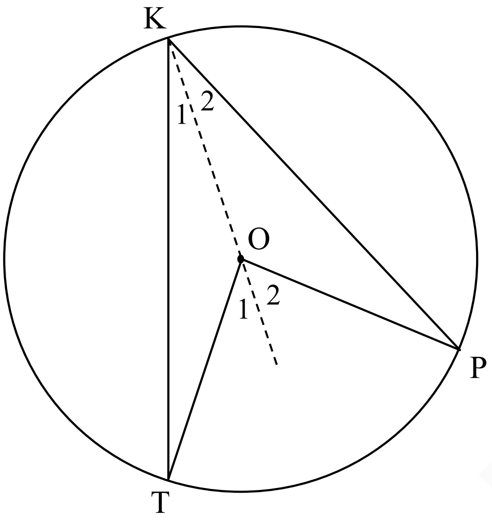
DO SOMETHING
TODAY
THAT YOUR
FUTURE SELF
WILL
THANK YOU FOR.

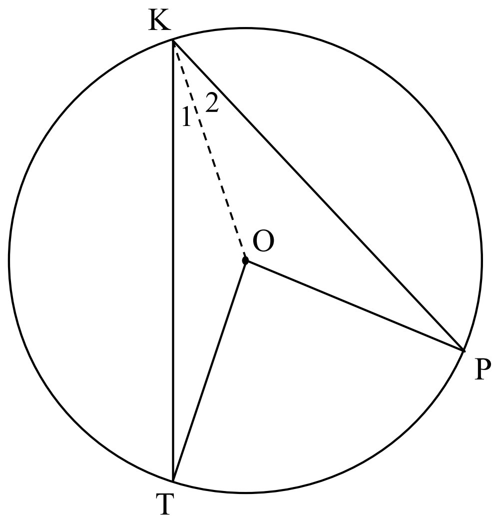
QUESTION/*VRAAG* 8

8.1



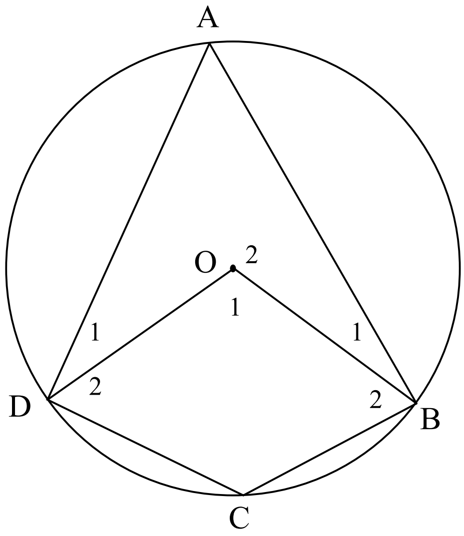
8.1	Construction: Draw KO produced $\hat{O}_1 = \hat{K}_1 + \hat{T}$ [ext $\angle$ of Δ] But $\hat{K}_1 = \hat{T}$ [$\angle$s opp equal sides] $\therefore \hat{O}_1 = 2\hat{K}_1$ $\hat{O}_2 = \hat{K}_2 + P$ [ext $\angle$ of Δ] But $\hat{K}_2 = P$ [$\angle$s opp equal sides] $\therefore \hat{O}_2 = 2\hat{K}_2$ $\therefore \hat{O}_1 + \hat{O}_2 = 2\hat{K}_1 + 2\hat{K}_2$ $= 2\left(\hat{K}_1 + \hat{K}_2\right)$ $\therefore T\hat{O}P = 2T\hat{K}P$ **OR**	✓ construction ✓ S / R ✓ S ✓ S ✓ S (5)

8.1



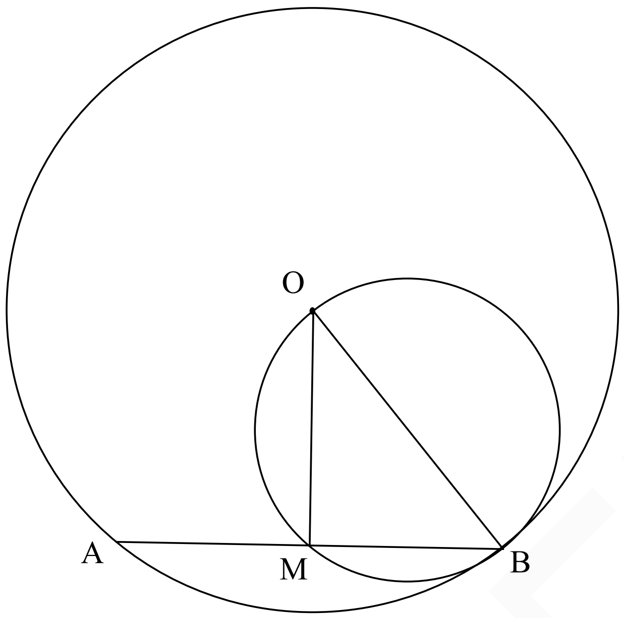
8.1	Construction: Draw KO $\hat{T} = \hat{K}_1$ [$\angle$s opp. equal sides] $\therefore K\hat{O}T = 180° - 2\hat{K}_1$ [sum of $\angle$s of ΔKOT] $\hat{P} = \hat{K}_2$ [$\angle$s opp. equal sides] $\therefore K\hat{O}P = 180° - 2\hat{K}_2$ [sum of $\angle$s of ΔKOP] $T\hat{O}P = 360° - \left(K\hat{O}T + K\hat{O}P\right)$ [$\angle$s around a point] $= 360° - \left(180° - 2\hat{K}_1 + 180° - 2\hat{K}_2\right)$ $= 2\hat{K}_1 + 2\hat{K}_2$ $= 2\left(\hat{K}_1 + \hat{K}_2\right)$ $\therefore T\hat{O}P = 2T\hat{K}P$	✓ construction ✓ S / R ✓ S ✓ S ✓ S (5)

8.2



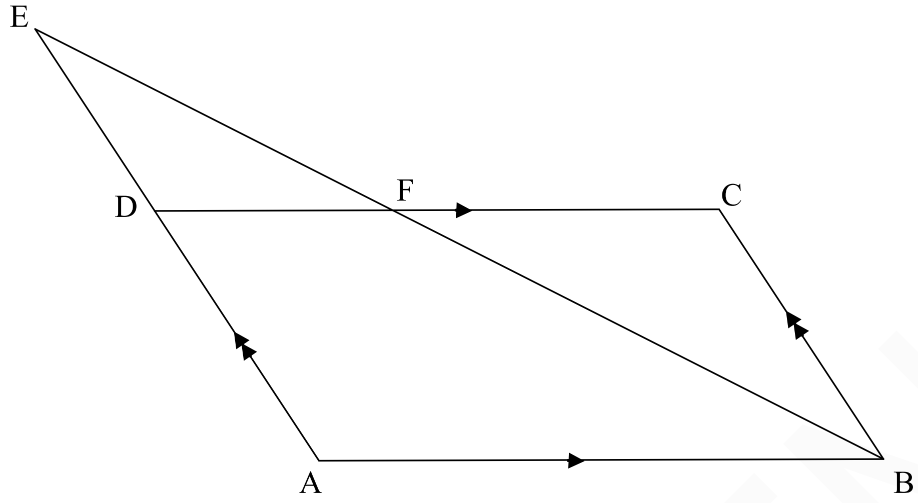
8.2	$\hat{O}_1 = 4x + 100°$ [given] $\therefore \hat{A} = 2x + 50°$ [∠ at centre = 2 ×∠ at circumference] $x + 34° + 2x + 50° = 180°$ [opp ∠s of cyclic quad] $3x = 96°$ $x = 32°$ **OR** $\hat{O}_2 = 2x + 68°$ [∠ at centre = 2 ×∠ at circumference] $4x + 100° + 2x + 68° = 360°$ [∠s round a pt] $6x = 192°$ $x = 32°$ **OR** $\hat{O}_2 = -4x + 260°$ [∠s round a pt] $2\hat{C} = -4x + 260°$ [∠ at centre = 2 ×∠ at circumference] $\hat{C} = -2x + 130°$ $x + 34° = -2x + 130°$ $3x = 96°$ $x = 32°$	✓ S ✓ R ✓ S ✓ R ✓ answer (5) ✓ S ✓ R ✓ S ✓ R ✓ answer (5) ✓ S ✓ R ✓ S ✓ R ✓ answer (5)

8.3



8.3.1	$O\hat{M}B = 90°$ [$\angle$ in semi circle]	✓ S ✓ R (2)
8.3.2	$AB = \sqrt{300} = 10\sqrt{3}$ $\therefore MB = 5\sqrt{3}$ [line from centre $\perp$ to chord] $OB^2 = OM^2 + MB^2$ [Pythagoras] $OB^2 = 5^2 + \left(5\sqrt{3}\right)^2$ OB = 10 units	✓ S ✓ R ✓ S ✓ answer (4)
		[16]

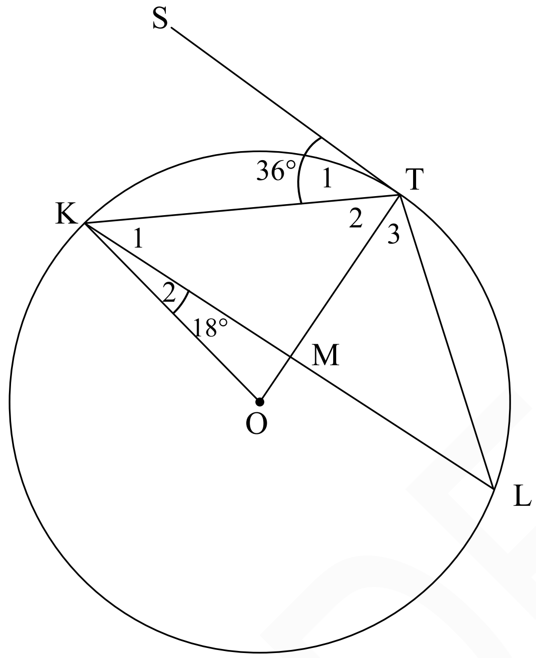
QUESTION/*VRAAG* 9



9.1	$\frac{FB}{EB}=\frac{DA}{EA}$ [prop theorem; DC ‖ AB] **OR** [line ‖ one side of Δ] $FB=\frac{4p\times 21}{7p}$ FB = 12 units	✓ S ✓ R ✓ answer (3)
9.2	In ΔEDF and ΔEAB: $\hat{E}$ is common $E\hat{D}F=\hat{A}$ [corresp ∠s; EA ‖ CB] $E\hat{F}D=E\hat{B}A$ [corresp ∠s; DC ‖ AB] ΔEDF ‖‖‖ ΔEAB [∠;∠;∠]	✓ S ✓ S/R ✓ S **OR** R (3)
9.3	$\frac{DF}{AB}=\frac{ED}{EA}$ [‖‖‖ Δs] $DF=\frac{3p\times 14}{7p}$ DF = 6 units FC = 8 units [DC = AB = 14 units; opp sides of $\|^m$] **OR** ΔEDF ‖‖‖ ΔBCF [∠;∠;∠] $\frac{ED}{BC}=\frac{DF}{CF}$ [‖‖‖ Δs] $\frac{3}{4}=\frac{14-FC}{FC}$ [BC = AD; opp sides of $\|^m$] $3FC=56-4FC$ $FC=8$	✓ S ✓ DF = 6 ✓ FC = 14 − DF (3) ✓ ΔEDF ‖‖‖ ΔBCF ✓ $\frac{3}{4}=\frac{14-FC}{FC}$ ✓ answer (3)
		[9]

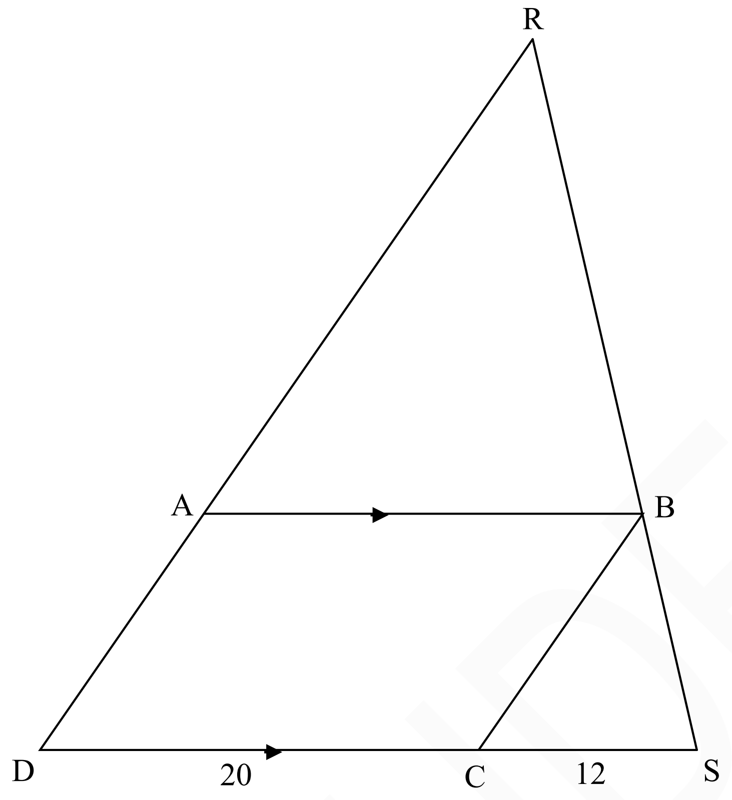
QUESTION/*VRAAG* 8

8.1



8.1.1(a)	$\hat{T}_2 = 54°$ [tan ⊥ rad]	✓ S ✓R (2)
8.1.1(b)	$\hat{L} = 36°$ [tan - chord theorem]	✓ S ✓R (2)
8.1.1(c)	$K\hat{O}T = 72°$ [∠ at centre = 2×∠ at circumference] **OR/*OF*** $O\hat{K}T = \hat{T}_2 = 54°$ [∠s opposite = radii] $K\hat{O}T = 180° - (54° + 54°)$ [sum of int ∠'s of Δ] $= 72°$	✓ S ✓R (2) ✓ S/R ✓ S (2)
8.1.2	$K\hat{M}O = 180° - (18° + 72°)$ $= 90°$ [sum of int ∠'s of Δ] $\therefore$ KM = ML [line from centre ⊥ to chord] **OR/*OF*** $O\hat{K}T = 54°$ [∠s opposite = radii] $\hat{K}_1 = 54° - 18° = 36°$ $T\hat{M}K = 90°$ [sum of int ∠'s of Δ] $\therefore$ KM = ML [line from centre ⊥ to chord]	✓ S ✓ S ✓ R (3) ✓ S ✓ S ✓ R (3)

8.2

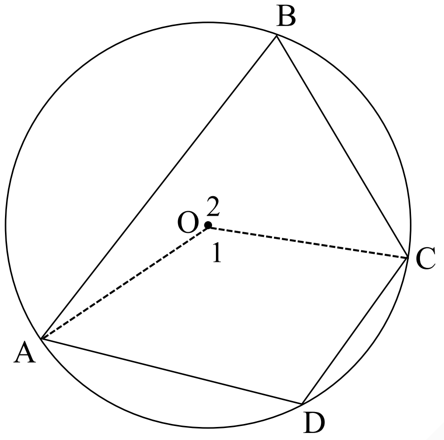


8.2.1	$\frac{DC}{CS}=\frac{20}{12}=\frac{5}{3}$ $\therefore \frac{DC}{CS}=\frac{RB}{BS}$ $\therefore$ BC || DR [converse line || one side of Δ OR sides in the $\therefore$ BC || AD same proportion]	✓ S ✓ S ✓ R (3)
8.2.2	$\frac{AR}{AD}=\frac{RB}{BS}$ [line || one side of Δ] **OR**[Prop Theorem AB || DS] $\frac{AR}{AD}=\frac{5}{3}$ $\frac{48-AD}{AD}=\frac{5}{3}$ $\therefore$ 5AD = 144 − 3AD AD = 18 AB = 20 [opp sides of parm] $\therefore$ AD : AB = 18 : 20 = 9 : 10	✓ $\frac{AR}{AD}=\frac{5}{3}$ ✓ AD = 18 ✓ ratio (3)

	OR/OF $\frac{AR}{RD}=\frac{5}{8}$.............prop thm $AB \parallel DS$ $\frac{AR}{48}=\frac{5}{8}$ $\therefore AR=30$ and $AD=18$ $\therefore \frac{AR}{RD}=\frac{AB}{DS}$........$\lVert\vert\ \Delta's$ $\therefore AB=20$ $\therefore AB:AD=18:20=9:10$	✓ $\frac{AR}{RD}=\frac{5}{8}$ ✓ AD = 18 ✓ ratio (3)
		[15]

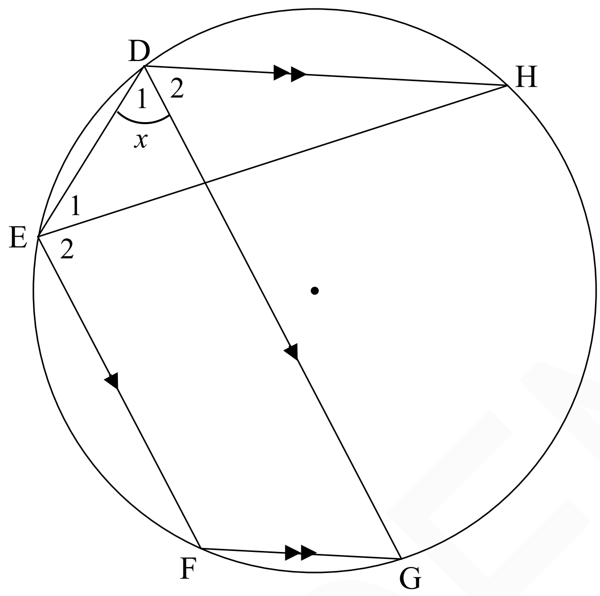
QUESTION/*VRAAG 9*

9.1



9.1	Constr: Draw radii OA and OC. Proof: $\hat{O}_1 = 2\hat{B}$ [$\angle$ at centre = 2×$\angle$ at circumference] $\hat{O}_2 = 2\hat{D}$ [$\angle$ at centre = 2×$\angle$ at circumference] $\hat{O}_1 + \hat{O}_2 = 360°$ [revolution] $2\hat{B} + 2\hat{D} = 360°$ [revolution] $\therefore \hat{B} + \hat{D} = 180°$	✓ Construction ✓ S ✓ R ✓ S/R ✓ S (5)

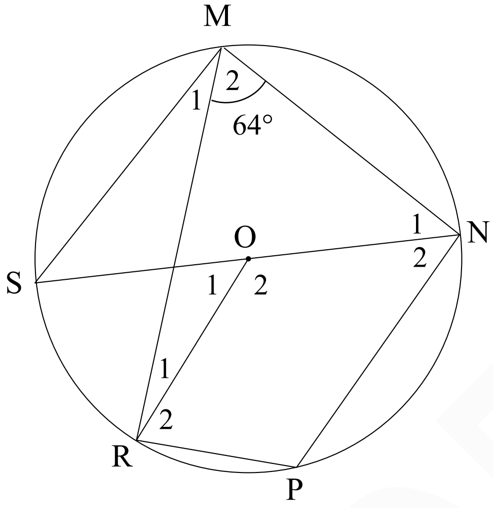
9.2



9.2	$\hat{EFG} = 180° - \hat{D}_1$ [opp ∠'s of cyclic quad] $\therefore \hat{EFG} = 180° - x$ $\hat{EFG} = 180° - \hat{G}$ [co-int ∠'s; EF ∥ DG] $\hat{G} = x$ But $\hat{G} = \hat{D}_2$ [alt ∠'s; DH ∥ FG] $\therefore \hat{D}_1 = \hat{D}_2 = x$	✓S ✓ R ✓S / R ✓ S / R (4)
		[9]

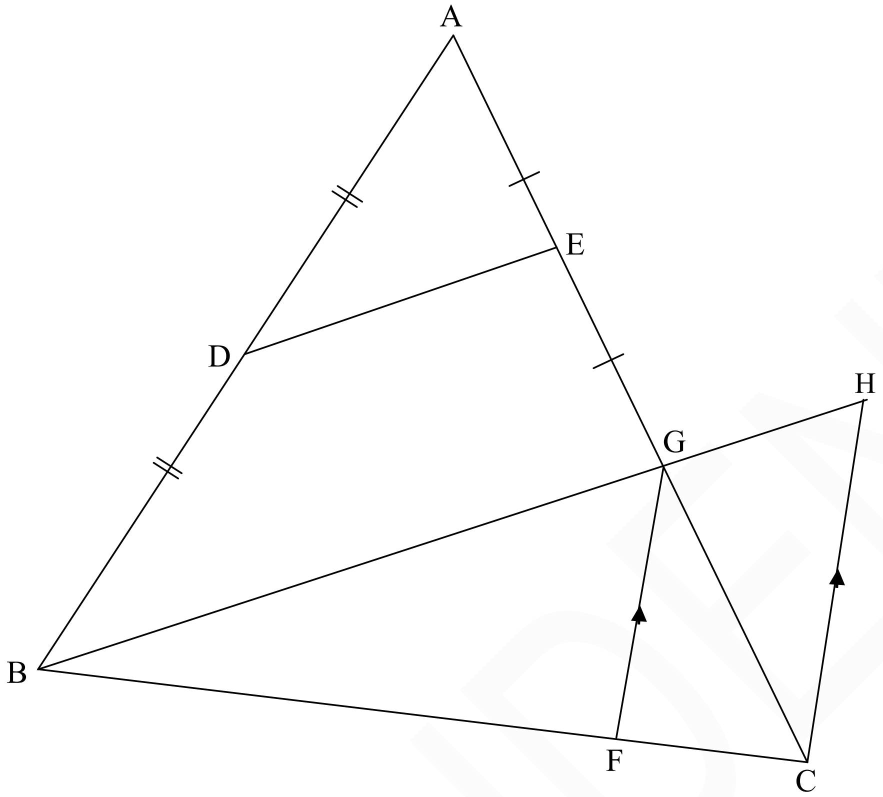
QUESTION/*VRAAG* 8

8.1



8.1.1	$\hat{P} = 116°$ [opp ∠s of cyclic quad/*teenoorst. ∠e van kvh*]	✓ S ✓ R (2)
8.1.2	$\hat{M}_1 + 64° = 90°$ [∠ in semi-circle/∠ *in halwe sirkel*] $\hat{M}_1 = 26°$	✓ R ✓ S (2)
8.1.3	$\hat{O}_1 = 52°$ [∠ at centre = 2 x ∠ at circumference/*midpts.* ∠ = 2 x *omtreks.* ∠]	✓ S ✓R (2)

8.2

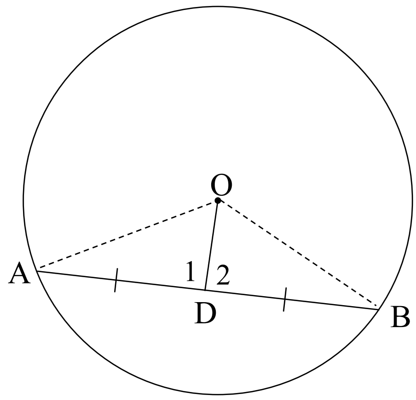


8.2.1	Midpt theorem/*Midpt. Stelling* **OR/*OF*** Converse prop intercept theorem	✓ R (1) ✓ R (1)
8.2.2	BG = 2DE or $6x-2$ [Midpt theorem/*Midpt. stelling*] BG = $6x-2$ $\frac{GH}{BG}=\frac{FC}{BF}$ [line ∥ one side of Δ **OR** prop theorem; FG ∥ CH / *lyn ∥ een sy v.* Δ] $\frac{x+1}{6x-2}=\frac{1}{4}$ $4x+4=6x-2$ $2x=6$ $x=3$ **OR/*OF***	✓ S ✓ R ✓ S ✓R ✓ equation into x ✓ answer (6)

	$\frac{BF}{FC}=\frac{BG}{GH}$	[line ∥ one side of Δ **OR** prop theorem; FG ∥ CH / *lyn ∥ een sy v.* Δ]	✓ S ✓ R
	$\frac{AE}{AG}=\frac{DE}{BG}$	[ΔADE ||| ΔABG]	✓ S ✓R
	BG = $4x + 4$		
	$\frac{1}{2}=\frac{3x-1}{4x+4}$		✓ equation into x
	$\therefore 4x + 4 = 6x - 2$		
	$\therefore x = 3$		✓ answer (6)
			[13]

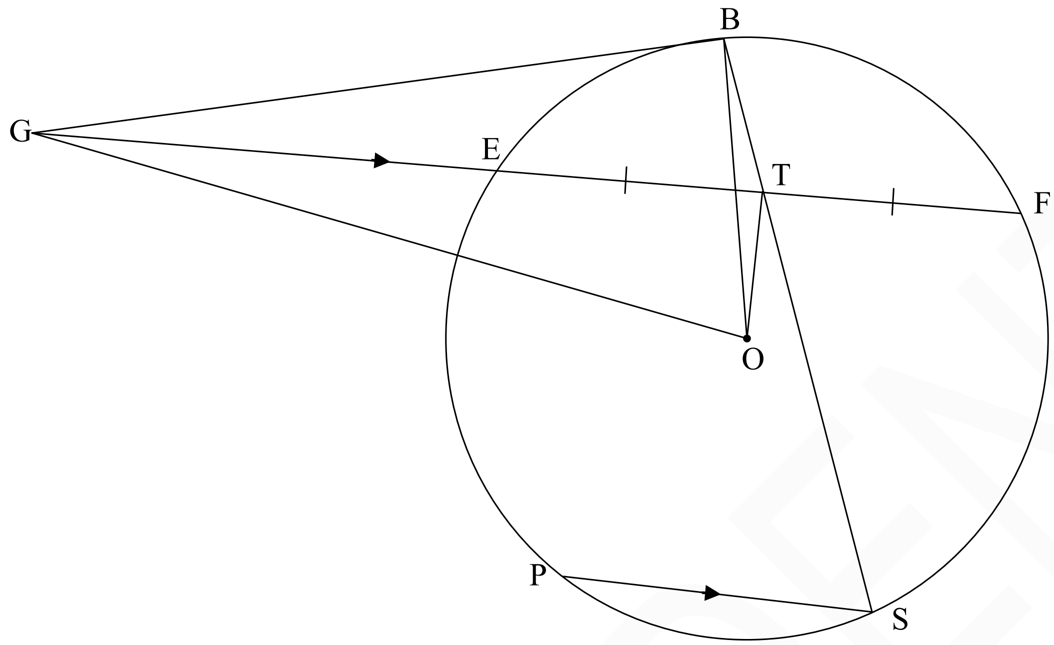
QUESTION/*VRAAG* 9

9.1



9.1.1	Construction: Draw OA and OB In ΔADO and ΔBDO OA = OB [radii/*radiusse*] OD = OD [common side/*gemeenskaplike sy*] AD = DB [given/*gegee*] $\therefore \Delta ADO \equiv \Delta BDO$ [S;S;S] ADB is a straight line $\therefore \hat{D}_1 = \hat{D}_2$ $\Delta ADO \equiv \Delta BDO$ $\therefore OD \perp AB$ [∠s on a str line/*∠e op 'n reguitlyn*]	✓ construction ✓ first pair of sides ✓ other 2 pairs ✓ R ✓ R (5)
	OR/*OF* Construction: Draw OA and OB In ΔADO and ΔBDO AD = DB [given/*gegee*] $\hat{A} = \hat{B}$ [∠s opp; ∠s sides /*∠e teenoor gelyke sye*] OA = OB [radii/*radiusse*] $\therefore \Delta ADO \equiv \Delta BDO$ [S;∠;S] ADB is a straight line $\therefore \hat{D}_1 = \hat{D}_2$ $\Delta ADO \equiv \Delta BDO$ $\therefore OD \perp AB$ [∠s on a str line/*∠e op 'n reguitlyn*]	✓ construction ✓ first pair of sides ✓ other 2 pairs ✓ R ✓ R (5)

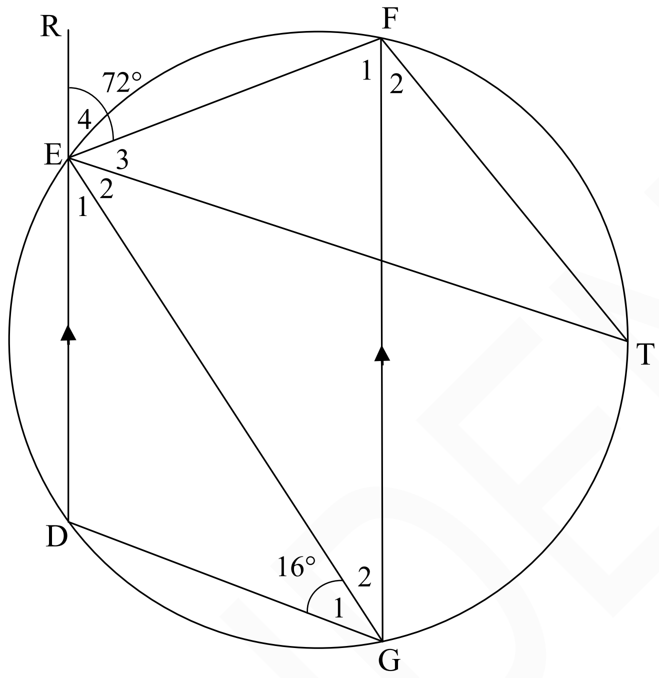
9.2



9.2.1	$O\hat{T}G = 90°$ [line from centre to midpt of chord/ *midpt. sirkel; midpt. koord*] $O\hat{B}G = 90°$ [tan ⊥ radius/*raaklyn ⊥ radius*] $\therefore O\hat{T}G = O\hat{B}G = 90°$ $\therefore$ OTBG is a cyclic quadrilateral [line subtends equal ∠s **OR** converse ∠s in the same segment/ *lyn onderspan gelyke ∠e*]	✓S ✓R ✓S ✓R ✓R (5)
9.2.2	$\hat{S} = B\hat{T}G$ [corresp ∠s; GF || PS / *ooreenk.* ∠s; GF || PS] But $B\hat{T}G = G\hat{O}B$ [∠s in the same segment/∠*e in dies. sirkelsegment*] $G\hat{O}B = \hat{S}$	✓S ✓R ✓S ✓R (4)
		[14]

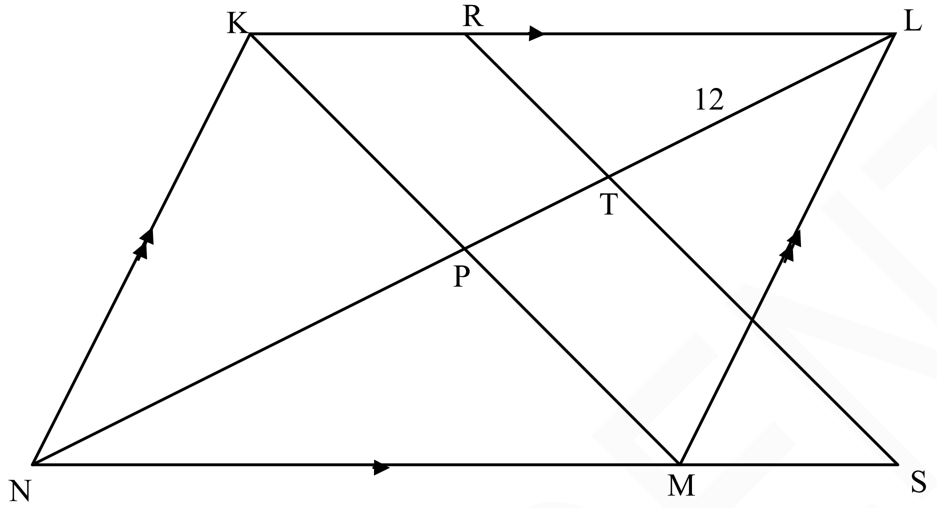
QUESTION/*VRAAG* 9

9.1



9.1.1	$D\hat{G}F = \hat{E}_4 = 72°$ [ext ∠ of cyclic quad/ *buite ∠ v kvh*]	✓ S ✓ R (2)
9.1.2	$\hat{G}_2 = 72° - 16° = 56°$ $\hat{T} = \hat{G}_2 = 56°$ [∠s in the same seg/ *∠e in dies. ⊙ segment*]	✓ S ✓ S / R (2)
9.1.3	$\hat{F}_1 = \hat{E}_4 = 72°$ [alt ∠s; DE ∥ GF / *verw. ∠e*; DE ∥ GF] $\therefore G\hat{E}F = 52°$ [sum of ∠s in Δ / *∠e van Δ*] **OR/*OF*** $\hat{E}_1 = 56°$ [alt ∠s; DE ∥ GF / *verw. ∠e*; DE ∥ GF] $\therefore G\hat{E}F = 52°$ [∠s on a str. line/ *∠e op 'n reguitlyn*]	✓ S / R ✓ S (2) ✓ S / R ✓ S (2)

9.2

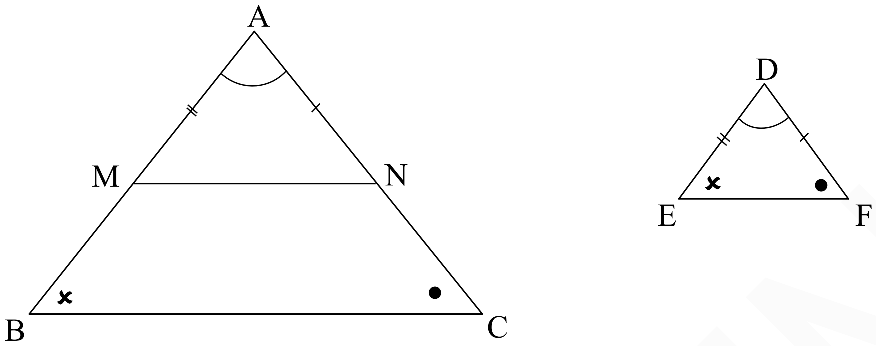


9.2.1	NP = PL = 16 [diag of ‖m / *hoeklyne van* ‖*m*] PT = 4 NP : PT = 16 : 4 = 4 : 1	✓ S ✓ R ✓ S ✓ answer (4)
9.2.2	NM : MS = 4 : 1 NP : PT = NM : MS KM ‖ RS [line divides two sides of Δ in prop / *Lyn verdeel 2 sye v* Δ *eweredig*] **OR/*OF*** [converse prop theorem / *omgekeerde lyn* ‖ *een sy v* Δ]	✓ S ✓ R (2)
9.2.3	$\frac{RL}{KL} = \frac{TL}{LP}$ [prop theorem; KM ‖ RS **OR** line ‖ one side of Δ / *Lyn* ‖ *een sy v* Δ] $RL = \frac{12 \times 21}{16}$ $= 15{,}75$	✓ S ✓ R ✓ S ✓ answer (4)

	OR / *OF*	
	NM : MS = 4 : 1	
	KR = MS = 5,25 [opp side of $\|\|^{m}$ / *teenoorst. sye van* $\|\|^{m}$]	✓ S ✓ R
	KL = NM = 21	
	RL + 5,25 = 21	✓ S
	RL = 15,75	✓ answer (4)
		[16]

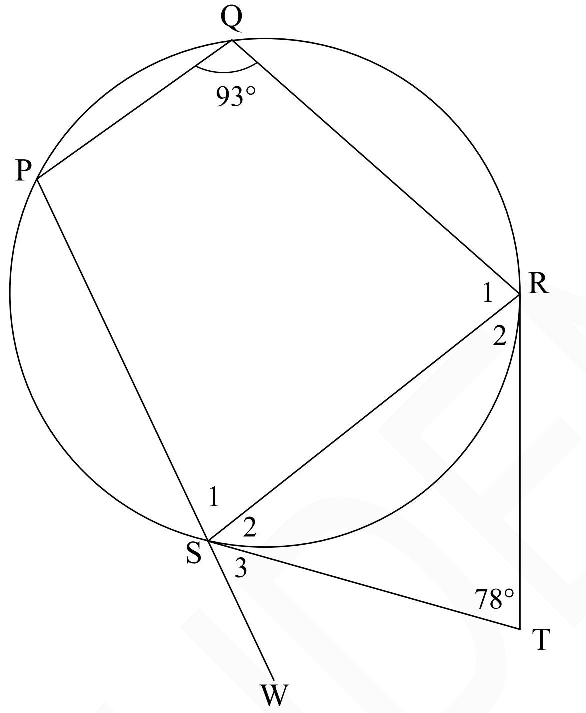
QUESTION/*VRAAG* 10

10.1



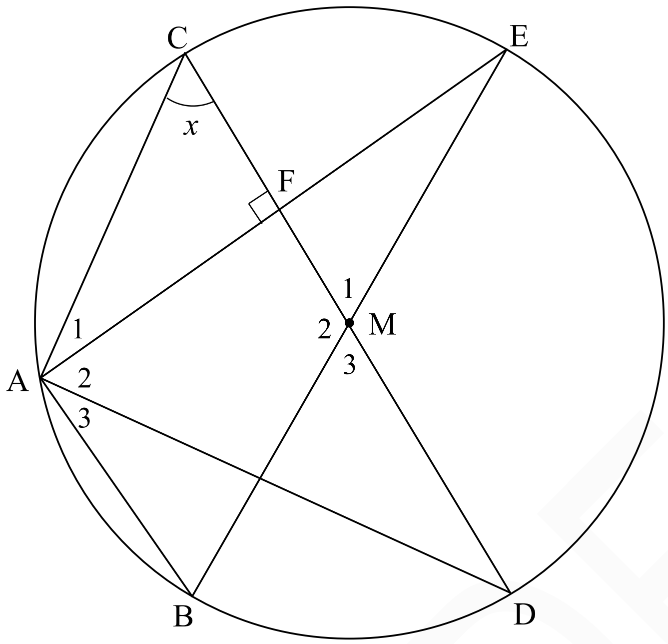
10.1	Constr: Let M and N lie on AB and AC respectively such that AM = DE and AN = DF. Draw MN. Proof: In Δ AMN and Δ DEF AM = DE [Constr / *Konstruksie*] AN = DF [Constr / *Konstruksie*] $\hat{A} = \hat{D}$ [Given /*Gegee*] $\therefore \ \Delta AMN \equiv \Delta DEF$ $[s, \angle, s]$ $\therefore A\hat{M}N = \hat{E} = \hat{B}$ MN || BC [corresp ∠'s are equal/ *ooreenk. ∠ e gelyk*] $\frac{AB}{AM} = \frac{AC}{AN}$ [line || one side of Δ **OR/*OF*** prop theorem; MN ||BC / *Lyn || een sy v* Δ] $\therefore \ \frac{AB}{DE} = \frac{AC}{DF}$ [AM = DE and AN = DF]	✓Constr ✓S ✓R ✓S /R ✓S ✓R (6)

QUESTION/VRAAG 9



9.1	tangents from same(common) point/*raaklyne vanaf dieselfde punt*	✓ R (1)
9.2.1	$\hat{S}_2 = S\hat{R}T$ [$\angle$s opp equal sides/$\angle$*e teenoor gelyke sye*] $\therefore \hat{S}_2 = 51°$ [sum of $\angle$s in Δ/*som van* $\angle$*e in* Δ]	✓ R ✓ S (2)
9.2.2	$\hat{S}_2 + \hat{S}_3 = 93°$ [ext $\angle$ of cyclic quad/*buite*$\angle$ *van koordevh*] $\hat{S}_3 = 42°$ **OR/*OF*** $\hat{S}_1 = 87°$ [opp $\angle$s of cyclic quad/*teenoorst* $\angle$*e v kdvh*] $\hat{S}_3 = 180° - (87° + 51°)$ $\hat{S}_3 = 42°$ [$\angle$s on a str line/$\angle$*e op reguitlyn*]	✓ R ✓ answer (2) ✓ R ✓ answer (2)
		[5]

QUESTION/*VRAAG* 10

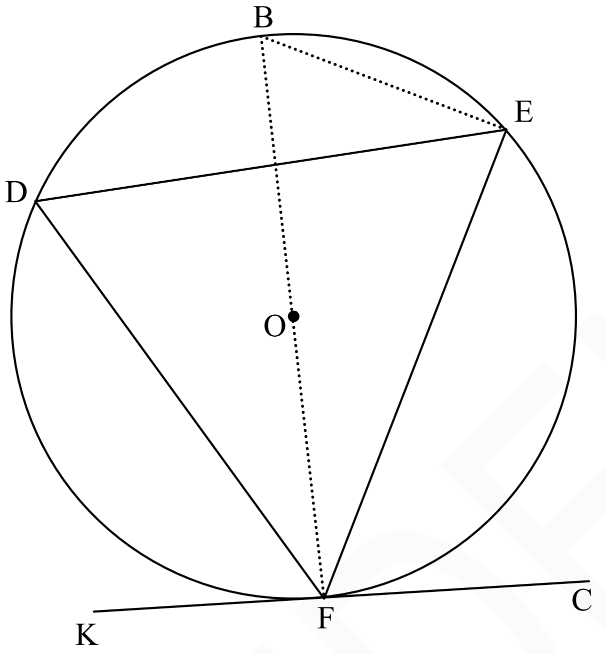


10.1	line from centre ⊥ to chord/*lyn vanaf middelpunt ⊥ op koord*	✓ R (1)
10.2	$\therefore \hat{A}_1 = 90° - x$ [sum of ∠s in Δ/*som van ∠e in Δ*] $\therefore \hat{M}_1 = 180° - 2x$ [∠at centre=2× at circumf/*midpts∠*= 2×omtreks∠]	✓ S ✓ S ✓ R (3)
10.3	$C\hat{A}D = 90°$ [∠ in semi circle/∠ *in halfsirkel*] $\hat{A}_2 = 90° - (90° - x)$ $\hat{A}_2 = x$ $\therefore \hat{A}_2 = \hat{C} = x$ ∴ AD is a tangent [converse tan-chord theorem/*omgek rkl-kd st.*] **OR/*OF*** $E\hat{M}D = 2x$ [adj suppl ∠s/*aanligg suppl ∠e*] $\therefore\ \hat{A}_2 = x$ [∠at centre= 2×∠ at circumf/*midpts∠*= 2 ×omtreks∠] $\therefore\ \hat{A}_2 = C = x$ ∴ AD is a tangent [converse tan-chord theorem/*omgek rkl-kd st.*] **OR/*OF*** $\hat{M}_3 = 180° - 2x$ [vert. opp/ *regoorstaande ∠e*] $\therefore \hat{A}_3 = 90° - x$ [∠at centre= 2×∠ at circumf/*midpts∠*= 2 ×omtreks∠] $B\hat{A}E = 90°$ [∠ in semi-circle/∠ *in halfsirkel*] $\therefore\ \hat{A}_2 = C = x$ ∴ AD is a tangent [converse tan-chord theorem/*omgek rkl-kd st.*] **OR/*OF***	✓ S ✓ R ✓ S ✓ R (4) ✓ S ✓ S ✓ R ✓ R (4) ✓ S ✓ R ✓ S ✓ R (4)

	CD ‖ AB [midpt. Thm/ *middelpuntst.*] $B\hat{A}E = 90^\circ$ [$\angle$ in semi-circle/$\angle$ *in halfsirkel*] $\therefore \hat{A}_3 = \hat{D} = 90^\circ - x$ [alt.$\angle$s; CD‖AB/*verwiss* $\angle$*e*] $\therefore \hat{A}_2 = x =$ C $\therefore$ AD is a tangent [converse tan-chord theorem/*omgek rkl-kd st.*] **OR/*OF*** $C\hat{A}D = 90^\circ$ [$\angle$ in semi circle/$\angle$ *in halfsirkel*] AC = diameter [converse $\angle$ in semi circle/*omgek* $\angle$ *in halfsirkel*] $\therefore$ AD is a tangent [converse radius $\perp$ tangent/*omgek radius*$\perp$*rkl*]	✓ S ✓ R ✓ S ✓ R (4) ✓ S ✓ R ✓ S ✓ R (4)
10.4	AF = FE and BM = ME [given & radii] $\therefore$ FM = $\frac{1}{2}$AB = 12 units [Midpt Theorem/*middelptstelling*] EM = MB = CM = 18 units [radii] $\therefore$ EB = 36 units [diameter = 2 radius] $\therefore AE^2 = (36)^2 - (24)^2$ [Pythagoras] AE = $12\sqrt{5}$ or 26,83 units **OR/*OF*** AF = FE and BM = ME [given & radii] $\therefore$ FM = $\frac{1}{2}$AB = 12 units [Midpt Theorem/*middelpuntstelling*] EM = MB = CM = 18 units [radii] $\therefore FE^2 = (18)^2 - (12)^2$ [Pythagoras] FE = $6\sqrt{5}$ AE = $12\sqrt{5}$ or 26,83 units	✓ FM = 12 ✓ R ✓ EB = 36 ✓ using Pyth correctly ✓ answer (5) ✓ FM = 12 ✓ R ✓ EM = 18 ✓ using Pyth correctly ✓ answer (5)
		[13]

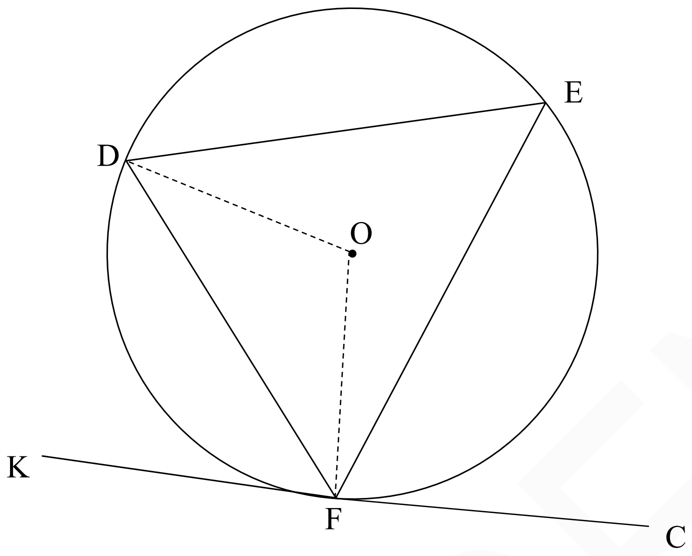
QUESTION/*VRAAG* 11

11.1



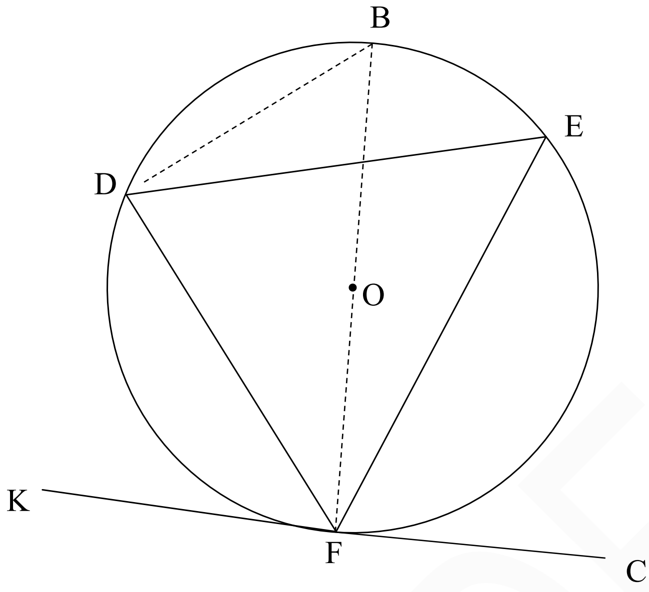
	Construction: Draw diameter BF and draw BE *Konstruksie: Trek middellyn* BF *en verbind* BE	✓Constr
	$B\hat{F}K = 90°$ or $D\hat{F}K = 90° - B\hat{F}D$ [radius ⊥ tangent/*raaklyn*]	✓ S ✓ R
	$B\hat{E}F = 90°$ [∠ in semi-circle/*semi-sirkel*]	✓ S
	$\therefore D\hat{E}F = 90° - B\hat{E}D$	
	$= 90° - B\hat{F}D$ [∠s same segment/∠*e dieselfde segment*]	✓ S/R
	$\therefore D\hat{F}K = D\hat{E}F$	(5)

OR/*OF*



	Construction: Draw radii DO and OF *Konstruksie: Trek radii DO en OF* $O\hat{F}K = 90°$ or $D\hat{F}K = 90° - O\hat{F}D$ radius⊥ tangent/*raaklyn*] $O\hat{D}F = O\hat{F}D$ [∠s opp = sides/*∠e teenoor = sye*] $\therefore D\hat{O}F = 180° - 2O\hat{F}D$ [∠s of Δ/*∠e van Δ*] $D\hat{E}F = 90° - O\hat{F}D$ [∠ at centre = 2×∠ circumf/ *midpts∠ = 2× omtreks∠*] $\therefore D\hat{F}K = D\hat{E}F$	✓ construction ✓ S ✓R ✓ S ✓ S/R (5)

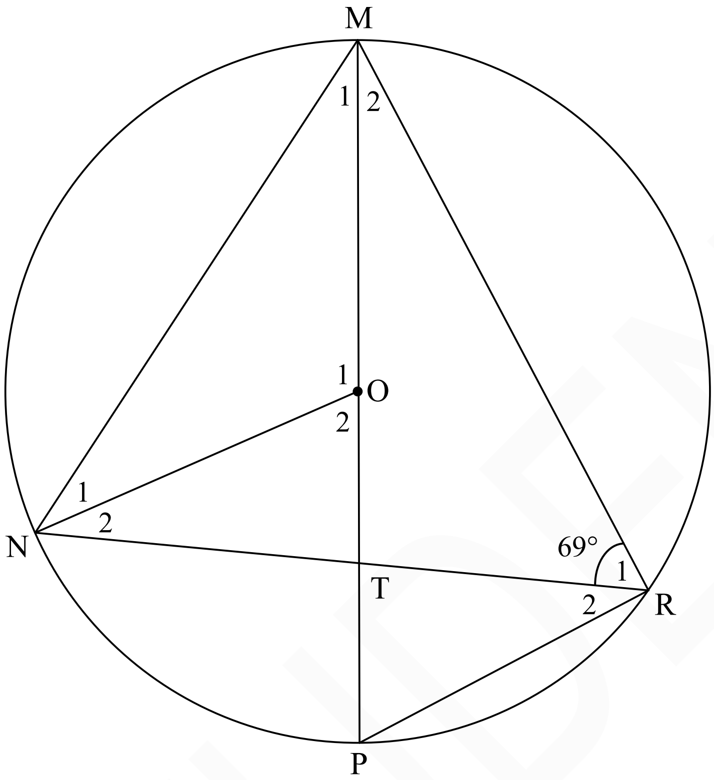
OR/OF



	Construction: Draw diameter BF and join BD. *Konstruksie: Trek middellyn BF en verbind BD.* $\text{B}\hat{\text{F}}\text{K} = 90°$ or $\text{D}\hat{\text{F}}\text{K} = 90° - \text{B}\hat{\text{F}}\text{D}$ [radius⊥ tangent/*raaklyn*] $\text{F}\hat{\text{D}}\text{B} = 90°$ [∠ in half circle/*semi-sirkel*] $\hat{\text{B}} = 90° - \text{B}\hat{\text{F}}\text{D}$ $\therefore \text{D}\hat{\text{F}}\text{K} = \hat{\text{B}}$ but $\hat{\text{B}} = \hat{\text{E}}$ [∠s same segment/∠*e dieselfde segment*] $\therefore \text{D}\hat{\text{F}}\text{K} = \hat{\text{E}}$	✓ construction ✓ S ✓/R ✓ S ✓ S/R (5)

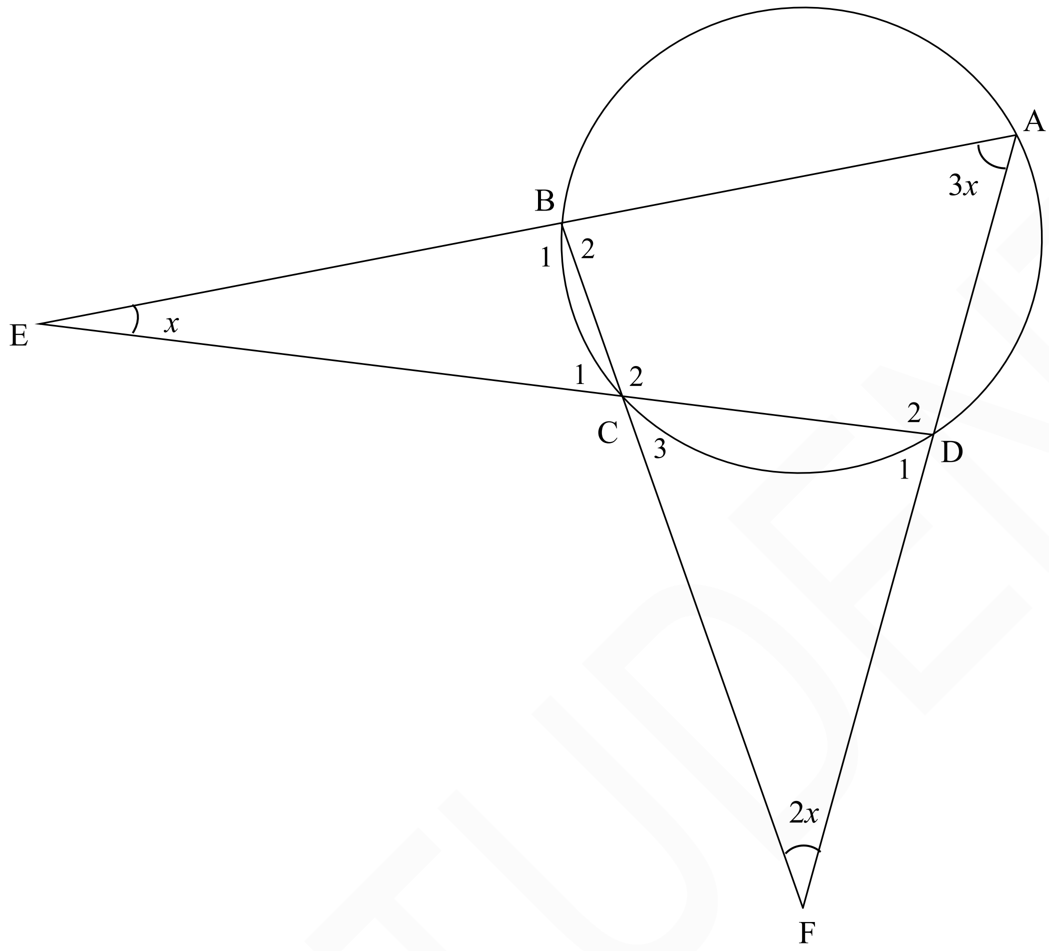
QUESTION/VRAAG 8

8.1



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

8.2

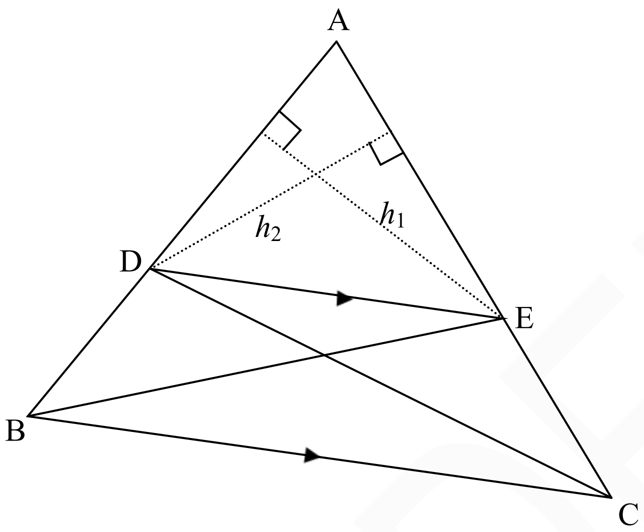


8.2	$\hat{D}_1 = 4x$ [ext ∠ of Δ/*buite ∠ v Δ*] $\hat{D}_2 = 180° - 4x$ [∠s on a str line/∠*e op ′n reguitlyn*] $\hat{B}_1 = 5x$ [ext ∠ of Δ/*buite ∠ v Δ*] $\hat{B}_1 = \hat{D}_2$ [ext ∠ of cyclic quad/*buite ∠ v kvh*] $180° - 4x = 5x$ $9x = 180°$ $x = 20°$ **OR** $\hat{C}_1 = 3x$ [ext ∠ of cyclic quad/*buite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

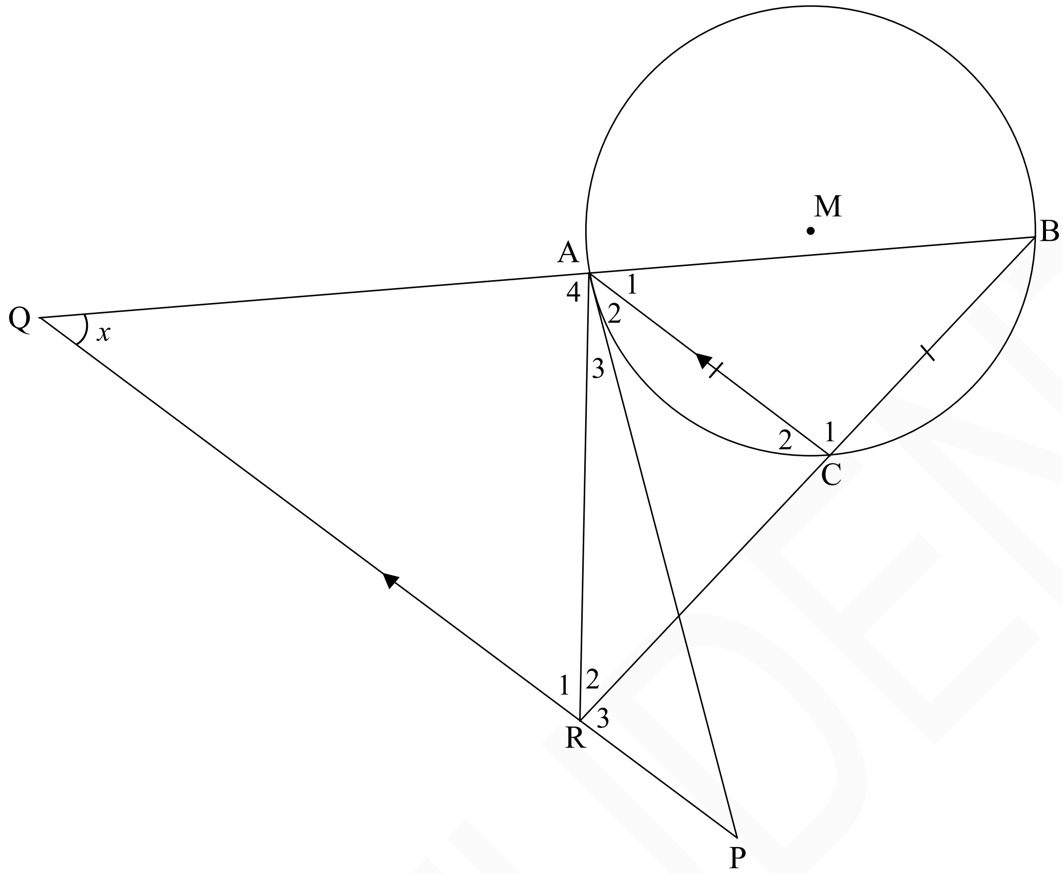
QUESTION/VRAAG 9

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*: $\dfrac{\text{area }\Delta\text{ADE}}{\text{area }\Delta\text{BDE}} = \dfrac{\frac{1}{2}\text{AD}\times h_1}{\frac{1}{2}\text{BD}\times h_1} = \dfrac{\text{AD}}{\text{BD}}$ $\dfrac{\text{area }\Delta\text{ADE}}{\text{area }\Delta\text{DEC}} = \dfrac{\frac{1}{2}\text{AE}\times h_2}{\frac{1}{2}\text{EC}\times h_2} = \dfrac{\text{AE}}{\text{EC}}$ area ΔADE = area ΔADE [common/*gemeenskaplik*] But area ΔBDE = area ΔDEC [same base & height ; DE || BC/ *dies basis & hoogte ;* DE || BC] $\therefore \dfrac{\text{area }\Delta\text{ADE}}{\text{area }\Delta\text{BDE}} = \dfrac{\text{area }\Delta\text{ADE}}{\text{area }\Delta\text{DEC}}$ $\therefore \dfrac{\text{AD}}{\text{BD}} = \dfrac{\text{AE}}{\text{EC}}$	✓ constr/*konstr* ✓ $\dfrac{\text{area }\Delta\text{ADE}}{\text{area }\Delta\text{BDE}}$ ✓ $\dfrac{\frac{1}{2}\text{AD}\times h_1}{\frac{1}{2}\text{BD}\times h_1}$ **or R** ✓ $\dfrac{\text{area }\Delta\text{ADE}}{\text{area }\Delta\text{DEC}} = \dfrac{\text{AE}}{\text{EC}}$ ✓ S ✓R (6)

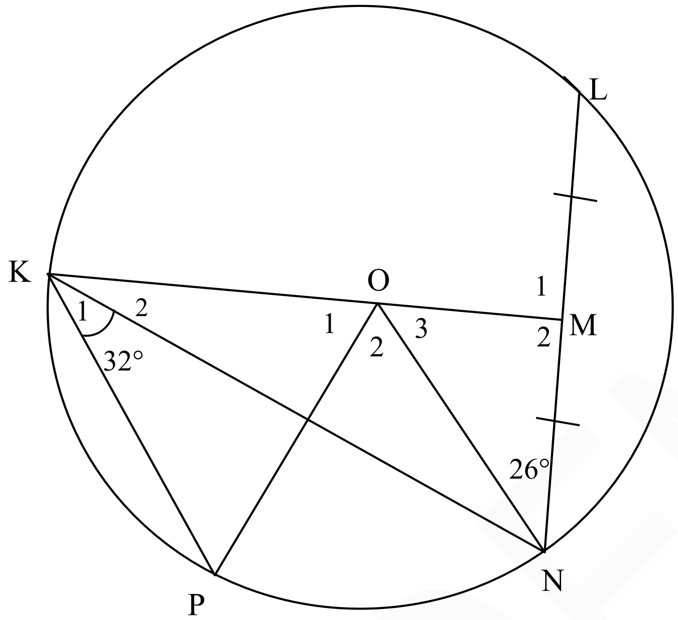
9.2



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)

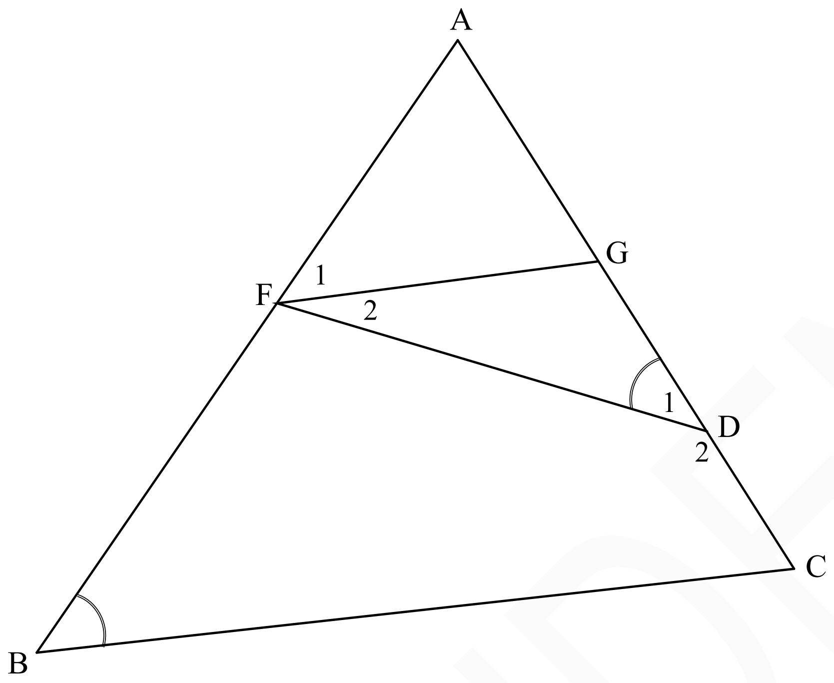
	OR	
	In Δ ABC and Δ BQR:	
	$\hat{A}_1 = \hat{B} = x$ [proved in 9.2.1]	✓ S
	$\hat{B} = \hat{Q} = x$ [proved in 9.2.1]	✓ S
	$\hat{C}_1 = B\hat{R}Q = 180° - 2x$ [sum of $\angle$s of Δ]	✓ S
	$\therefore \Delta ABC \parallel\!\mid \Delta BQR$	
	$\therefore \frac{BA}{BQ} = \frac{BC}{QR}$	(3)
	OR	
	In Δ ABC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

QUESTION/*VRAAG* 8



8.1.1(a)	$\hat{O}_2 = 64°$ [∠ at centre = 2 ×∠ at circumference/ *Middelpts ∠ = 2 ×∠ omtreks∠*]	✓ S ✓ R (2)
8.1.1(b)	$\hat{M}_2 = 90°$ [Line from centre to midpt of chord/*lyn v midpt na midpt v koord*] $K\hat{O}N = 90° + 26° = 116°$ [ext ∠ of Δ/*buite ∠ van* Δ] $\hat{O}_1 = 116° - 64° = 52°$ **OR** $\hat{M}_2 = 90°$ [Line from centre to midpt of chord/*lyn v midpt na midpt v koord*] $\hat{O}_3 = 64°$ [sum of ∠s in Δ] $\hat{O}_1 = 52°$ [∠s on straight line/*op 'n reguitlyn*]	✓ S ✓ R ✓ S ✓ answer (4) ✓ S ✓ R ✓ S ✓ answer (4)
8.1.2	$P\hat{K}O + \hat{P} = 128°$ [sum of ∠s in Δ/*som ∠e van* Δ] $P\hat{K}O = \hat{P}$ [∠s opp = sides/*∠e teenoor = sye*] $= 64°$ $\therefore \hat{K}_2 = 32°$ *or* $\hat{K}_2 = \hat{K}_1$ ∴ KN bisects/*halveer* $O\hat{K}P$ **OR** $\hat{K}_2 = K\hat{N}O$ [∠s opp = sides/*∠e teenoor = sye*] $\hat{K}_2 + K\hat{N}O = 64°$ [sum of ∠s in Δ/*som ∠e van* Δ] $\therefore \hat{K}_2 = 32°$ *or* $\hat{K}_2 = \hat{K}_1$ ∴ KN bisects/*halveer* $O\hat{K}P$	✓ S ✓ S ✓ S (3) ✓ S ✓ S ✓ S (3)

8.2

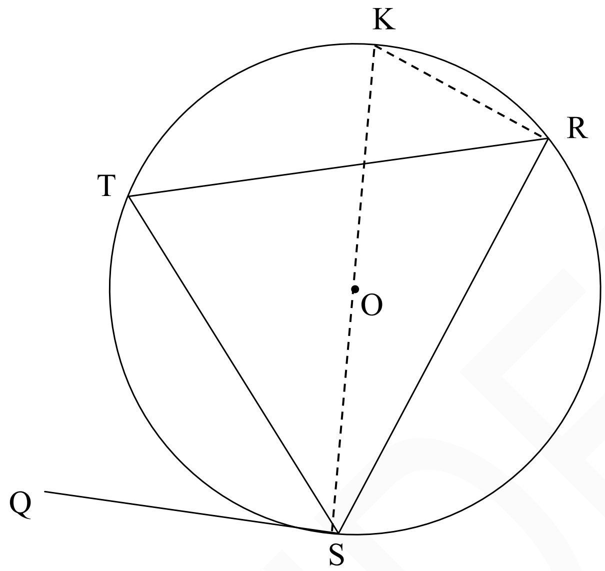


8.2.1	$\hat{F}_1 = \hat{D}_1$ [tan chord theorem/*raaklyn koordst*] $\hat{D}_1 = \hat{B}$ [Given/*Gegee*] $\therefore \hat{F}_1 = \hat{B}$ $\therefore FG \parallel BC$ [corresp $\angle$s =/*Ooreenkomstige* $\angle$*e* =]	✓ S ✓ R ✓ $\hat{F}_1 = \hat{B}$ ✓ R (4)
8.2.2	$\frac{GC}{AC} = \frac{FB}{AB}$ [line || one side of Δ/*lyn* || *een sy v Δ*] $\frac{x+9}{2x-6} = \frac{5}{7}$ $7x + 63 = 10x - 30$ $3x = 93$ $x = 31$ **OR** $AG = 2x - 6 - (x+9) = x - 15$ $\frac{AG}{GC} = \frac{AF}{FB}$ [line || one side of Δ/*lyn* || *een sy v Δ*] $\frac{x-15}{x+9} = \frac{2}{5}$ $5x - 75 = 2x + 18$ $3x = 93$ $x = 31$ **OR**	✓ S ✓ R ✓ substitution ✓ answer (4) ✓ S ✓ R ✓ substitution ✓ answer (4)

	$\frac{AF}{AB}=\frac{AG}{AC}$ [line ∥ one side of Δ /lyn ∥ een sy v Δ] $\frac{2}{7}=\frac{x-15}{2x-6}$ $7x-105=4x-12$ $3x=93$ $x=31$	✓ S ✓ R ✓ substitution ✓ answer (4)
		[17]

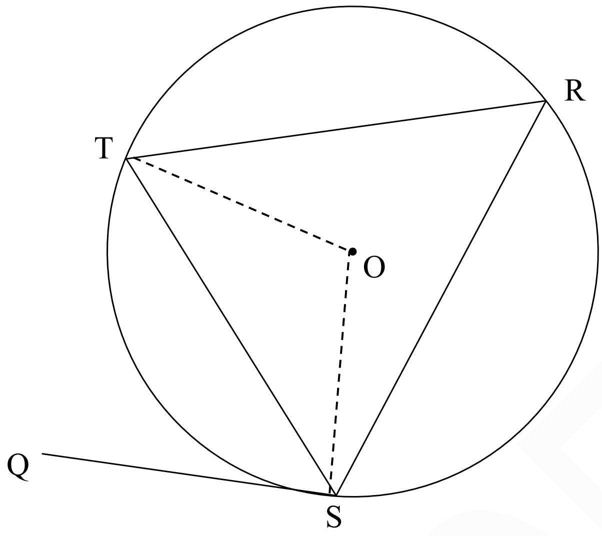
QUESTION/*VRAAG* 9

9.1



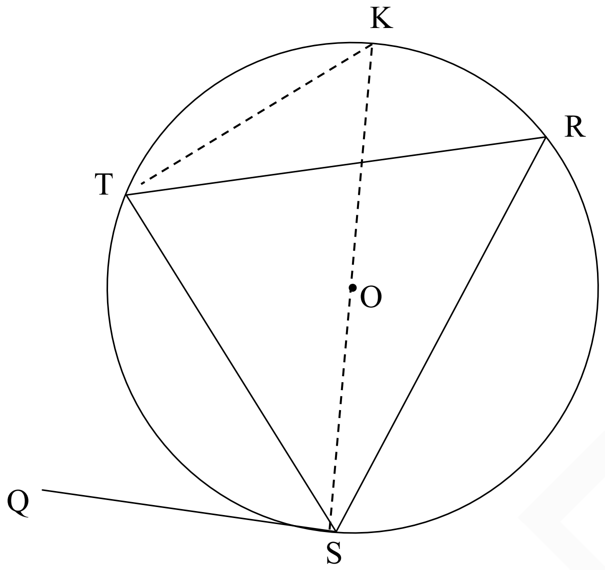
9.1	Construction: Draw diameter KS and draw KR *Konstruksie: Trek middellyn KS en verbind KR* $\hat{QST} = 90° - \hat{TSK}$ [radius ⊥ tangent/*raaklyn*] $\hat{SRK} = 90°$ [∠ in semi circle/*halfsirkel*] $\therefore \hat{SRT} = 90° - \hat{KRT}$ $\hat{TSK} = \hat{TRK}$ [∠s same segment/∠*e dieselfde segment*] $\therefore \hat{QST} = \hat{R}$	✓ construction ✓ S/R ✓ S/R ✓ S ✓ S/R (5)

OR



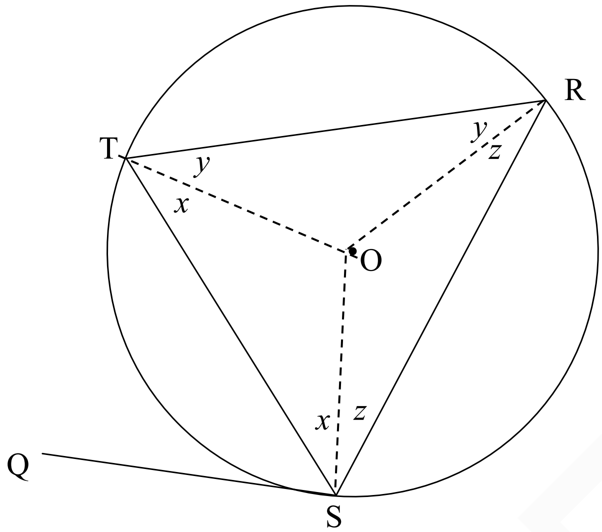
9.1	Construction: Draw radii OS and OT *Konstruksie: Trek radii OS en OT* $Q\hat{S}T = 90° - O\hat{S}T$ [radius ⊥ tangent/*raaklyn*] $O\hat{S}T = S\hat{T}O$ [∠s opp = sides/*∠e teenoor = sye*] $\therefore S\hat{O}T = 180° - 2O\hat{S}T$ [∠s of Δ/*∠e van Δ*] $\hat{R} = 90° - O\hat{S}T$ [∠ at centre = 2×∠ circumf/ *midpts∠ = 2× omtreks∠*] $\therefore Q\hat{S}T = \hat{R}$	✓ construction ✓ S/R ✓ S/R ✓ S ✓ S/R (5)

OR



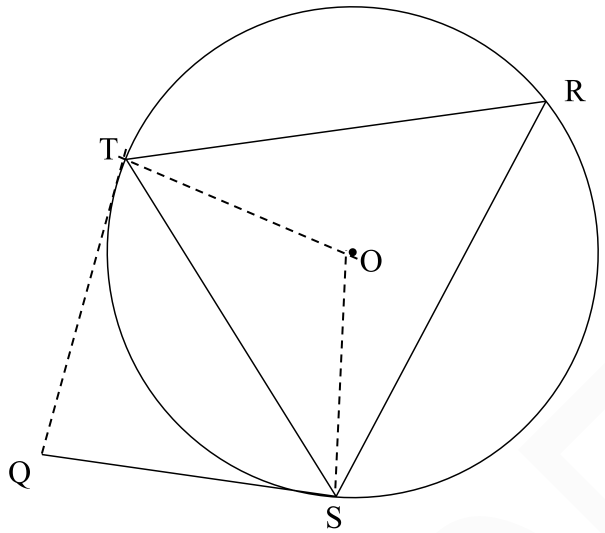
9.1	Construction: Draw diameter KS and join K to T. *Konstruksie: Trek middellyn KS en verbind K tot T* K $Q\hat{S}T = 90° - T\hat{S}K$ [radius ⊥ tangent/*raaklyn*] $S\hat{T}K = 90°$ [∠ in semi circle/*halfsirkel*] $\therefore \hat{K} = 90° - T\hat{S}K$ $\therefore Q\hat{S}T = \hat{K}$ but $\hat{R} = \hat{K}$ [∠s same segment/*∠e dieselfde segment*] $\therefore Q\hat{S}T = \hat{R}$	✓ construction ✓ S/R ✓ S/R ✓ S ✓ S/R (5)

OR



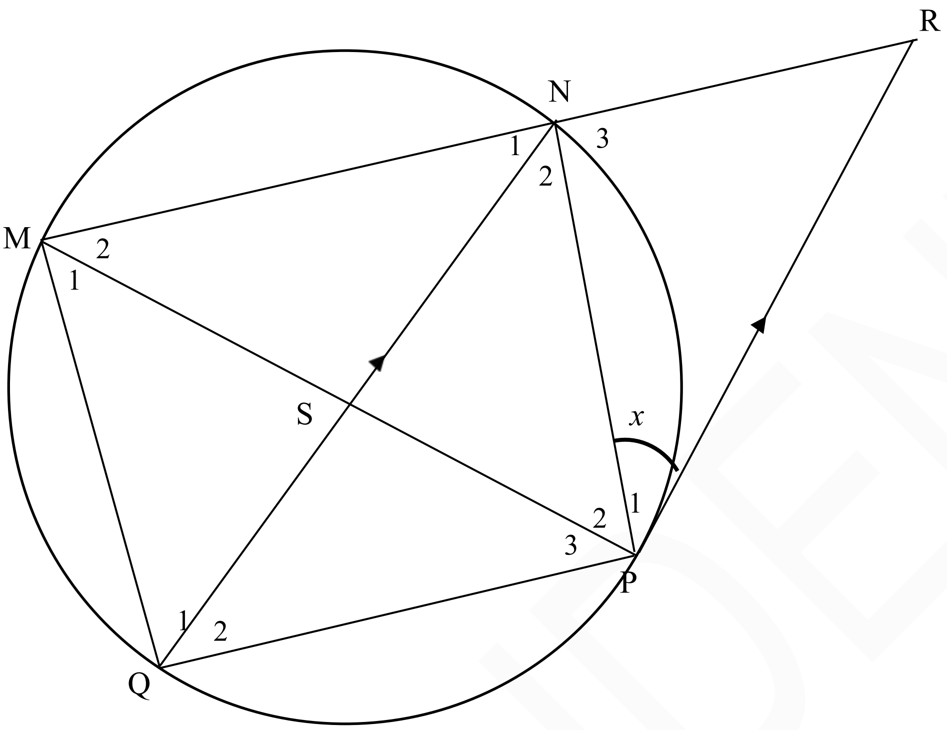
9.1	Construction: Draw radii OT, OR and OS *Konstruksie: Trek radiuse OT, OR en OS* $\hat{OST} = \hat{OTS}$ [∠s opp = radii/∠*e teenoor* = *radiuse*] Also: $\hat{OTR} = \hat{ORT}$ and $\hat{ORS} = \hat{OSR}$ $2x + 2y + 2z = 180°$ [∠s of Δ] $x + y + z = 90°$ $y + z = 90° - x$ $\hat{OSQ} = 90°$ [radius ⊥ tangent/*raaklyn*] $\therefore\ \hat{TSQ} = 90° - x$ $\therefore\ \hat{TSQ} = y + z = \hat{R}$	✓ construction ✓ S/R ✓ S ✓ S/R ✓ S (5)

OR



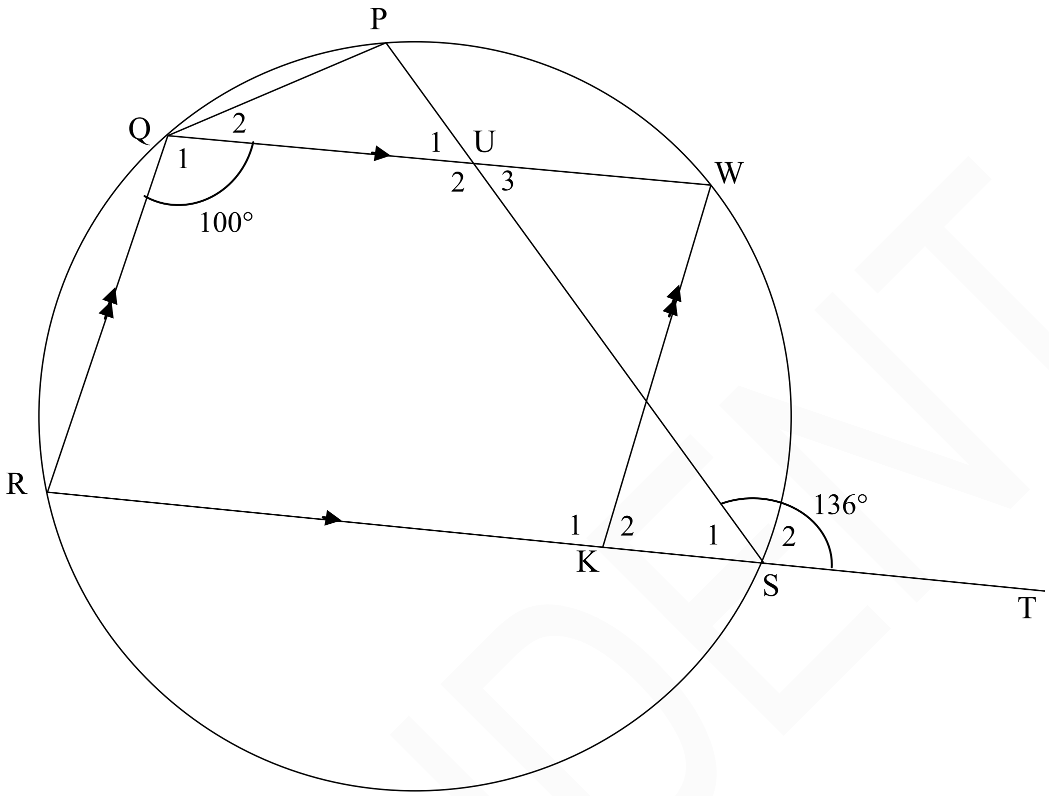
9.1	Construction: Draw radii OT and OS, tangent QT *Konstruksie: Trek radiuse OT en OS, raaklyn QT* $O\hat{S}Q = 90°$ [radius ⊥ tangent/*raaklyn*] $\therefore\ T\hat{S}Q = 90° - T\hat{S}O$ $\therefore\ T\hat{S}O = S\hat{T}O$ [∠s opp = radii/*∠e teenoor = radiuse*] $T\hat{O}S = 180° - 2T\hat{S}O$ [∠s of Δ] $\hat{R} = 90° - T\hat{S}O$ [∠ at centre = 2×∠ circumf/ *midpts∠ = 2× omtreks∠*] $\therefore\ T\hat{S}Q = \hat{R}$	✓ construction ✓ S/R ✓ S ✓ S ✓ S/R (5)

9.2



9.2.1(a)	$\hat{N}_2 = x$ [alt ∠s; PR ‖ NQ/*verw. ∠e;* PR ‖ NQ]	✓ S ✓ R (2)
9.2.1(b)	$\hat{Q}_2 = x$ [tan chord theorem/*raaklyn koordstelling*] OR $M_2 = x$ [tan chord theorem/*raaklyn koordstelling*] $\hat{Q}_2 = x$ [∠s in same segment/*∠e in dieselfde segm*]	✓ S ✓ R (2) ✓ S/R ✓ S/R (2)
9.2.2	$\frac{MN}{NR} = \frac{MS}{SP}$ [QN ‖ PR; Prop Th] $\hat{N}_1 = \hat{N}_2 = x$ [given] $\hat{P}_3 = x$ [∠s in same segment/*∠e in dieselfde segm*] $\hat{P}_3 = \hat{Q}_2$ [= x] SQ = PS [sides opp = ∠/*sye teenoor = ∠e*] $\frac{MN}{NR} = \frac{MS}{SQ}$	✓ S ✓ R ✓ S ✓ S ✓ R ✓ R (6)
		[15]

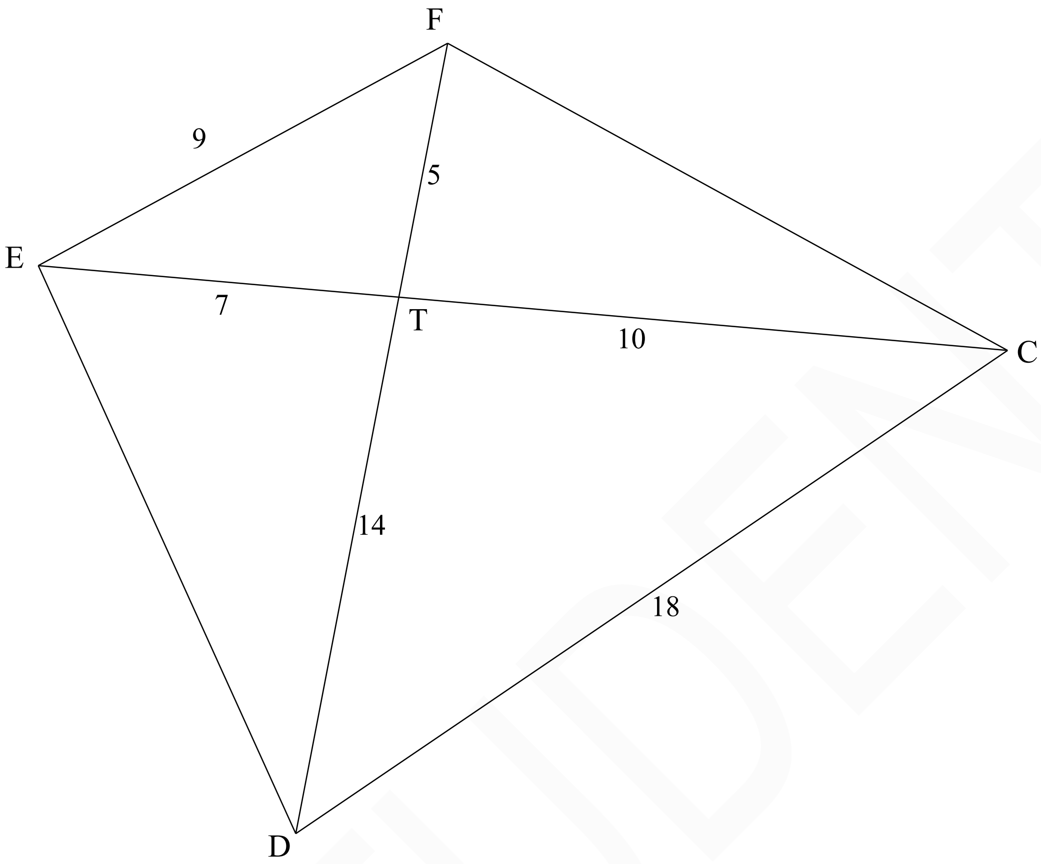
QUESTION/*VRAAG* 8



8.1.1	$\hat{R} = 80°$ [co-int ∠s/*ko-binne ∠e*; QW ‖ RK]	✓S ✓R (2)
8.1.2	$\hat{P} = 100°$ [opp ∠s of cyclic quad/*teenoorst ∠e v koordevh*]	✓S ✓R (2)
8.1.3	$P\hat{Q}R = 136°$ [ext ∠ of cyclic quad/*buite ∠ v koordevh*] $\hat{Q}_2 = 36°$ **OR** $P\hat{U}W = \hat{S}_2 = 136°$ [corresp ∠s/*ooreenkomstige ∠e*; QW ‖ RK] $P\hat{Q}W + \hat{P} = P\hat{U}W$ [ext ∠s of/*buite ∠ van* Δ QPU] $P\hat{Q}W + 100° = 136°$ $P\hat{Q}W = 36°$ **OR** $\hat{U}_3 = 180° - 136° = 44°$ [co-int ∠s/*ko-binne ∠e*; QW ‖ RK] $\hat{U}_1 = \hat{U}_3 = 44°$ [vert opp ∠s/*regoorstaande ∠e*] $P\hat{Q}W = 180° - (100 + 44°)$ [sum of ∠s in Δ/*som ∠e van* Δ] $P\hat{Q}W = 36°$	✓S ✓R ✓S (3) ✓S ✓R ✓S (3) ✓S ✓R ✓S (3)

8.1.4	$\hat{U}_2 = \hat{S}_2 = 136°$ [alt ∠s/*verwiss ∠e* ; QW || RK] **OR** $\hat{U}_2 = 100° + 36°$ [ext ∠s of/*buite ∠ van* ΔQPU] $= 136°$ **OR** $\hat{U}_2 = P\hat{U}W = 136°$ [vert opp ∠s/*regoorstaande ∠e*] **OR** $\hat{U}_2 = 180° - \hat{U}_3$ [∠s on a str line/*∠e op reguitlyn*] $= 180° - 44°$ $= 136°$	✓S ✓R (2) ✓S ✓R (2) ✓S ✓R (2) ✓S ✓R (2)

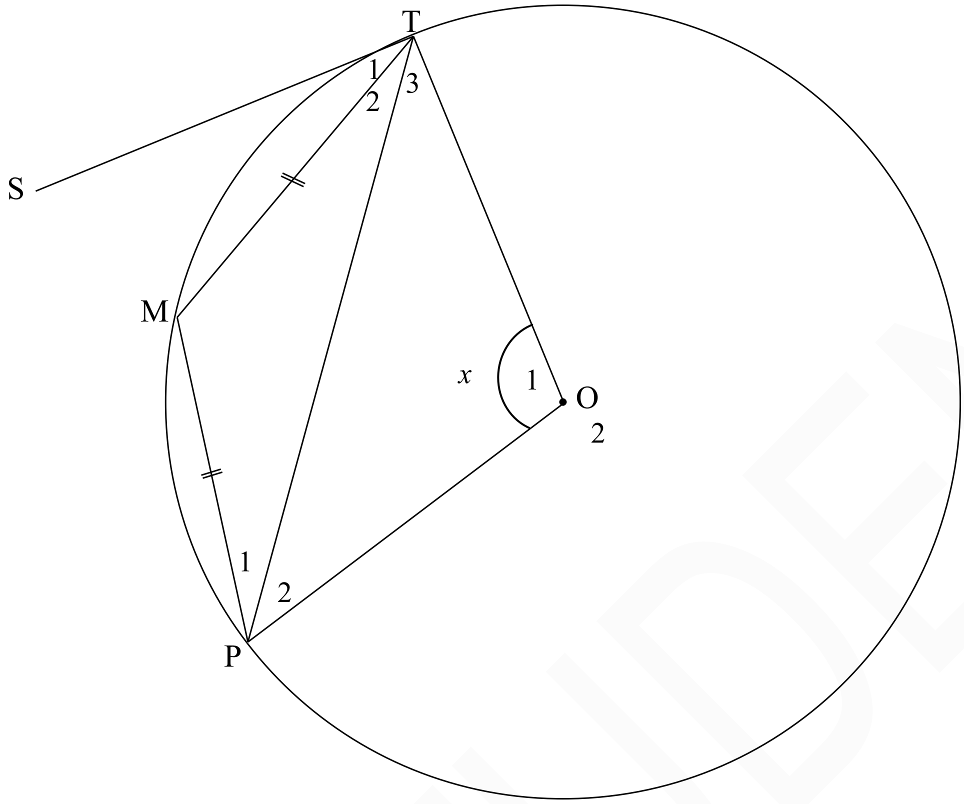
8.2



8.2.1	In ΔEFT and ΔDCT: $\frac{EF}{CD}=\frac{9}{18}=\frac{1}{2}$ $\frac{FT}{TC}=\frac{5}{10}=\frac{1}{2}$ $\frac{ET}{TD}=\frac{7}{14}=\frac{1}{2}$ $\therefore \Delta EFT \,\|\|\|\, \Delta DCT$ [Sides of Δ in prop/ *sye van Δ in dieselfde verh*] $\therefore E\hat{F}D = E\hat{C}D$	✓✓ all 3 ratios = $\frac{1}{2}$ ✓ $\Delta EFT \,\|\|\|\, \Delta DCT$ ✓ R (4)
	OR In ΔFET: $49 = 25+81-2(5)(9)\cos\hat{F}$ $\cos\hat{F}=\frac{19}{30}$ $\hat{F}=50{,}7°$ In ΔTDC: $196=100+256-2(10)(18)\cos\hat{C}$ $\cos\hat{C}=\frac{19}{30}$ $\hat{C}=50{,}7°$	✓✓ $\hat{F}=50{,}7°$ ✓✓ $\hat{C}=50{,}7°$ (4)

8.2.2	$E\hat{F}D = E\hat{C}D$ [proved in 8.2.1] E, F, C and D are concyclic EFCD is a cyclic quad [converse ∠s in the same segment/ *omgekeerde ∠e in dies segment*] $\therefore D\hat{F}C = D\hat{E}C$ [∠s in the same segment/∠*e in dies segment*]	✓S ✓R ✓ R (3)
		[16]

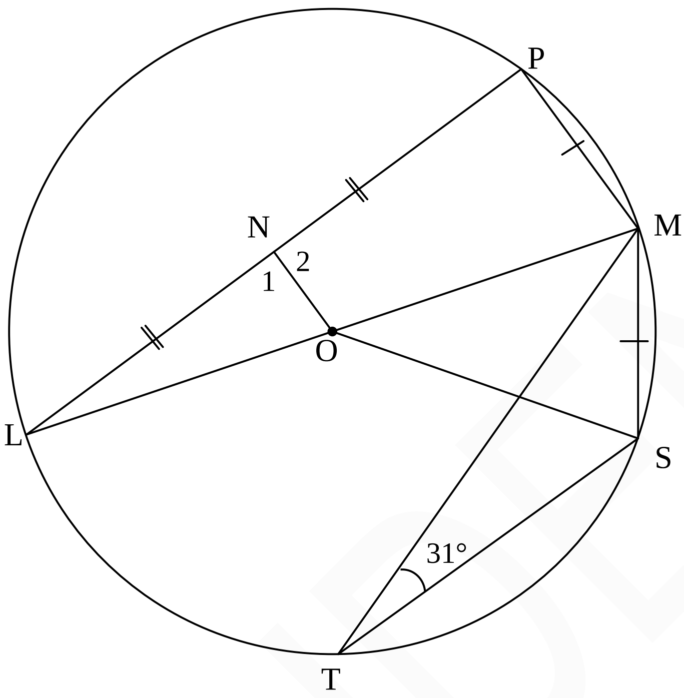
QUESTION/*VRAAG* 9



	$\hat{O}_2 = 360° - x$ [∠s round a pt/*∠e om 'n punt*] $\therefore \hat{M} = 180° - \frac{1}{2}x$ [∠ at centre = 2 ×∠ at circumference/ *middelpunts∠ = 2 × omtreks∠*] $\therefore \hat{T}_2 + \hat{P}_1 = \frac{1}{2}x$ [sum of ∠s in Δ/*som ∠e van Δ*] $\therefore \hat{T}_2 = \hat{P}_1 = \frac{1}{4}x$ [∠s opp equal sides/*∠e teenoor gelyke sye*] $\therefore S\hat{T}M = \hat{P}_1 = \frac{1}{4}x$ [tan chord theorem/*raaklyn koordstelling*]	✓ $\hat{O}_2 = 360° - x$ ✓ $\hat{M} = 180° - \frac{1}{2}x$ ✓R ✓ $\hat{T}_2 + \hat{P}_1 = \frac{1}{2}x$ ✓ $\hat{P}_1 = \frac{1}{4}x$ ✓R ✓R (7)
	OR/*OF* $\hat{O}_2 = 360° - x$ [∠s round a pt/*∠e om 'n punt*] $\therefore \hat{M} = \frac{1}{2}\hat{O}_2$ [∠ at centre = 2 ×∠ at circumference] $\therefore \hat{T}_2 + \hat{P}_1 = 180° - \hat{M}$ [sum of ∠s in Δ/*som ∠e van Δ*] $\therefore \hat{T}_2 = \hat{P}_1$ [∠s opp equal sides/*∠e teenoor gelyke sye*] $= \frac{180° - \hat{M}}{2} = \frac{180° - \frac{1}{2}\hat{O}_2}{2} = \frac{180° - \frac{1}{2}(360° - x)}{2} = \frac{1}{4}x$ $\therefore S\hat{T}M = \frac{1}{4}x$ [tan chord theorem/*raaklyn koordstelling*]	✓ $\hat{O}_2 = 360° - x$ ✓ S ✓R ✓S ✓R ✓ S ✓R (7)
		[7]

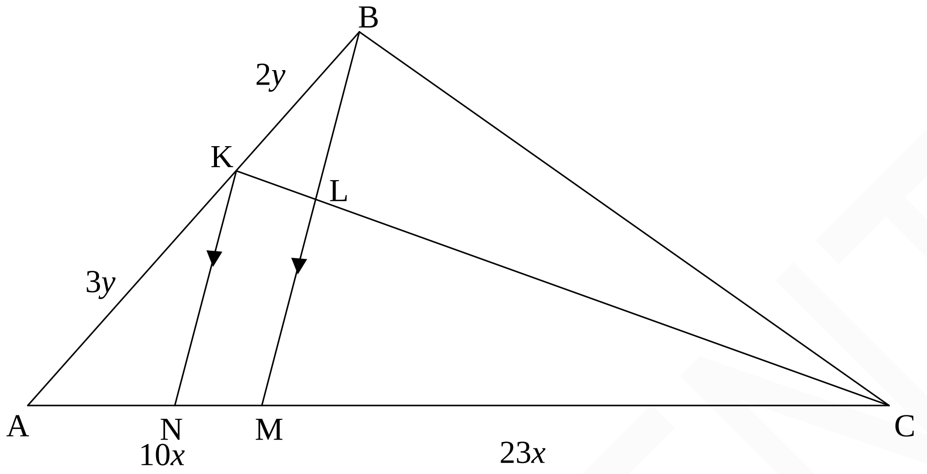
QUESTION/*VRAAG* 8

8.1



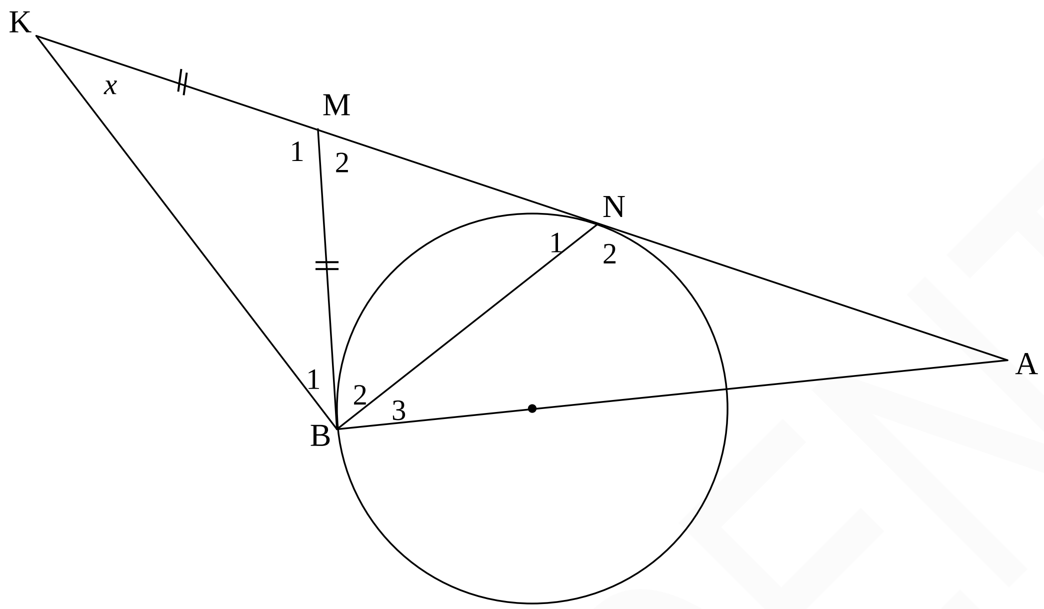
8.1.1(a)	$\hat{MOS} = 62°$ [∠ at centre = 2× ∠ at circumf/*middelpts∠ =2omtreks∠*]	✓ S ✓ R (2)
8.1.1(b)	$\hat{L} = 31°$ [equal chords; equal ∠s /= *koorde; = ∠e*]	✓ S ✓ R (2)
8.1.2	LN = NP and LO = OM $\therefore$ ON = $\frac{1}{2}$PM [midpoint theorem/*middelpuntstelling*] $\therefore$ ON = $\frac{1}{2}$MS [PM = MS] **OR** $\hat{N}_1 = 90°$ [line from centre to midpt chord/*lyn v midpt na midpt kd*] $\hat{P} = 90°$ [∠ in semi-circle/∠ *in halfsirkel*] $\hat{L}$ is common/*gemeen* $\therefore$ ΔNLO ‖‖ Δ PLM (∠∠∠) $\frac{NL}{PL} = \frac{NO}{PM} = \frac{1}{2}$ $\therefore$ ON = $\frac{1}{2}$PM $\therefore$ ON = $\frac{1}{2}$MS [PM = MS]	✓ LO = OM ✓ S ✓ R ✓ S (4) ✓ S R ✓ S/R ✓ S ✓ S (4)

8.2



8.2.1	$\frac{AN}{AM}=\frac{AK}{AB}$ [line || one side of Δ **OR** prop theorem; KN ||BM/ *lyn || sy van Δ **OR** eweredigheidst; KN||BM*] $\frac{AN}{AM}=\frac{3y}{5y}=\frac{3}{5}$	✓ R ✓ S (2)
8.2.2	$\frac{AM}{MC}=\frac{10x}{23x}$ [given] $AM = 5y = 10x \quad \therefore \quad y=2x$ $\frac{LC}{KL}=\frac{MC}{NM}$ [line || one side of Δ **OR** prop theorem; KN ||LM/ *lyn || sy van Δ **OR** eweredigheidst; KN||BM*] $=\frac{23x}{2y}=\frac{23x}{4x}=\frac{23}{4}$ **OR** $\frac{AM}{MC}=\frac{10x}{23x}$ [given] $\frac{AN}{MN}=\frac{3y}{2y}=\frac{6x}{4x}$ $\frac{LC}{KL}=\frac{MC}{NM}$ [line || one side of Δ **OR** prop theorem; KN ||LM/ *lyn || sy van Δ **OR** eweredigheidst; KN||BM*] $=\frac{23x}{2y}=\frac{23x}{4x}=\frac{23}{4}$	✓ S ✓ R ✓ S (3) ✓ S ✓ R ✓ S (3)
		[13]

QUESTION/*VRAAG* 9

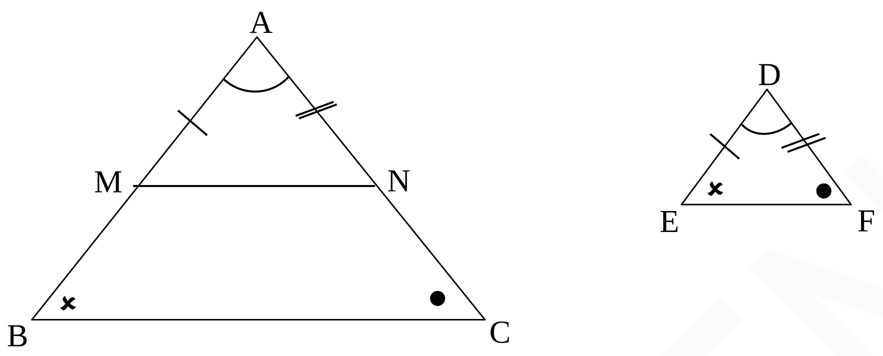


9.1	$\hat{B}_1 = x$ [$\angle$'s opp = sides/$\angle$*e teenoor = sye*] $\hat{M}_2 = 2x$ [ext $\angle$ of Δ] **OR** $\hat{M}_1 = 180° - 2x$ [$\angle$s of Δ] BM = MN [2 tans from a common point/*raaklyne vanuit dieselfde punt*] $\hat{N}_1 = \frac{180° - 2x}{2} = 90° - x$ [$\angle$'s opp = sides/$\angle$*e teenoor = sye*] **OR** NM = BM [2 tans from a common point/*raaklyne vanuit dieselfde punt*] $\hat{B}_2 = \hat{N}_1$ [$\angle$'s opp = sides/$\angle$*e teenoor = sye*] $\hat{B}_1 = x$ [$\angle$'s opp = sides/$\angle$*e teenoor = sye*] In Δ KBN: $x + x + \hat{B}_2 + \hat{N}_1 = 180°$ [sum of $\angle$'s of Δ] $2x + 2\hat{N}_1 = 180°$ $x + \hat{N}_1 = 90°$ $\hat{N}_1 = 90° - x$	✓S ✓S ✓R ✓S ✓R ✓answer (6) ✓S ✓R ✓S ✓R ✓S ✓answer (6)
9.2	$M\hat{B}A = \hat{B}_2 + \hat{B}_3 = 90°$ [tangent$\perp$diameter/*raaklyn$\perp$middellyn*] $\hat{B}_3 = 90° - \hat{B}_2$ $= 90° - (90° - x) = x$ $\hat{B}_3 = \hat{K} = x$ $\therefore$ AB is a tangent/*raaklyn* converse tan-chord theorem/ *omgekeerde raakl koordst*]]	✓S ✓ R ✓ S ✓ S ✓ R (5)

	OR $\hat{B}_2 = \hat{N}_1$ $\hat{B}_1 + \hat{B}_2 = x + (90° - x) = 90°$ $\therefore$ KN is diameter/*middellyn* [converse $\angle$ in semi-circle/ *omgekeerde* $\angle$ *in halfsirkel*] $M\hat{B}A = \hat{B}_2 + \hat{B}_3 = 90°$ [tangent $\perp$ diameter] $\therefore$ AB is a tangent/*raaklyn* converse tan-chord theorem/ *omgekeerde raakl koordst*]]	✓S ✓ R ✓ S ✓ R ✓ R (5)
		[11]

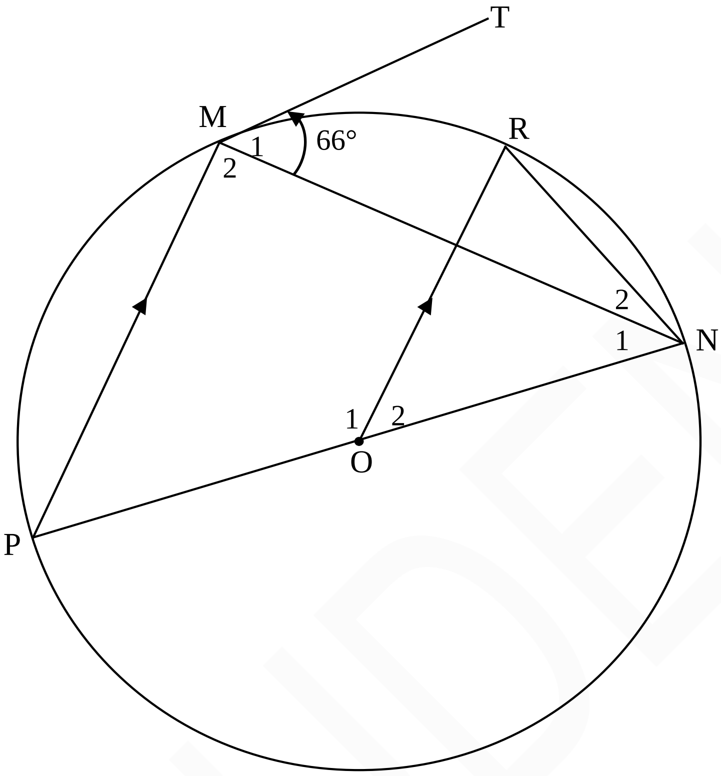
QUESTION/*VRAAG* 10

10.1



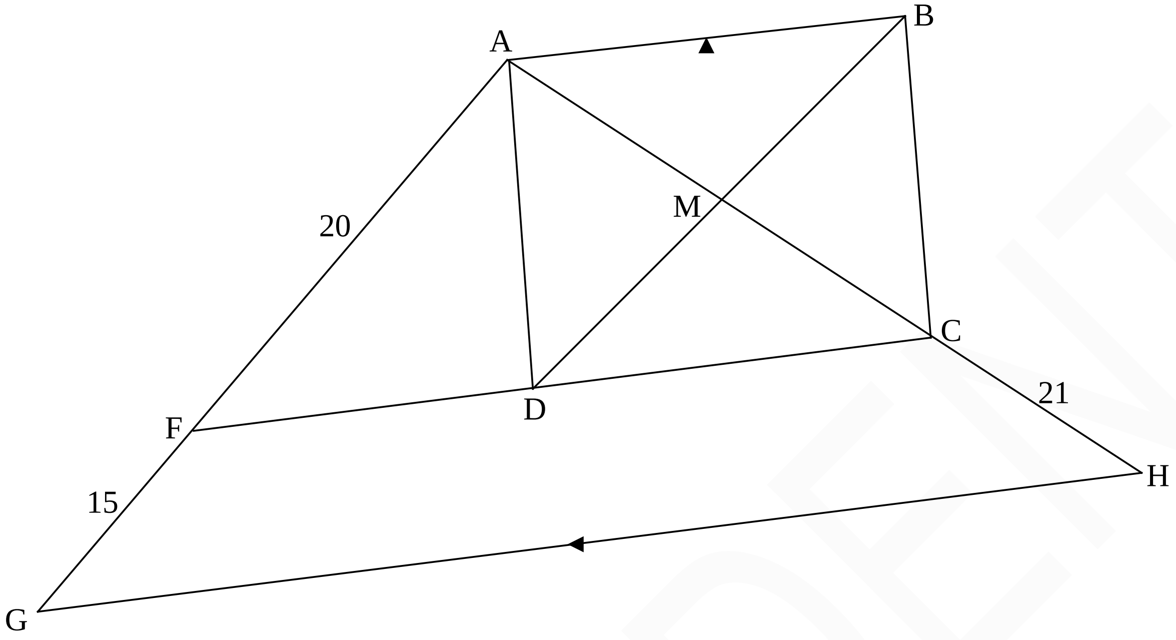
10.1	Constr: Let M and N lie on AB and AC respectively such that AM = DE and AN = DF. Draw MN. *Konst: Merk M en N op AB en AC onderskeidelik af sodanig dat AM = DE en AN = DF. Verbind MN.* Proof: In Δ AMN and Δ DEF AM = DE [Constr] AN = DF [Constr] $\hat{A} = \hat{D}$ [Given] $\therefore\ \Delta AMN \equiv \Delta DEF (SAS)$ $\therefore A\hat{M}N = \hat{E} = \hat{B}$ MN ∥ BC [corresp ∠'s are equal/*ooreenkomstige ∠e =*] $\frac{AB}{AM} = \frac{AC}{AN}$ [line ∥ one side of Δ **OR** prop theorem; MN ∥BC] $\therefore\ \frac{AB}{DE} = \frac{AC}{DF}$ [AM = DE and AN = DF]	✓Constr / *Konstr* ✓ $\Delta AMN \equiv \Delta DEF$ ✓SAS ✓MN ∥ BC and R ✓ $\frac{AB}{AM} = \frac{AC}{AN}$ ✓R (6)

QUESTION/*VRAAG* 8



8.1.1	$\hat{P} = \hat{M}_1 = 66°$ [tan chord theorem/*raaklyn koordst*]	✓S ✓R (2)
8.1.2	$\hat{M}_2 = 90°$ [$\angle$ in semi circle/$\angle$ *in halfsirkel*]	✓S ✓R (2)
8.1.3	$\hat{N}_1 = 180° - (90° + 66°)$ [sum of $\angle$s of /*som van* $\angle$*e* ΔMNP] $= 24°$	✓S (1)
8.1.4	$\hat{O}_2 = \hat{P} = 66°$ [corres. $\angle$s;/*ooreenk* $\angle$*e*, PM ǁ OR]	✓S ✓R (2)
8.1.5	$\hat{R} + \hat{N}_1 + \hat{N}_2 = 180° - 66°$ [sum of $\angle$s of/*som van* $\angle$*e* ΔRNO] $= 114°$ $\hat{R} = \hat{N}_1 + \hat{N}_2 = 57°$ [$\angle$s opposite = radii/$\angle$*e teenoor = radii*] $\therefore \hat{N}_2 = 33°$ **OR/*OF*** $P\hat{O}R = 114°$ [$\angle$s on straight line/$\angle$*e op reguitlyn*] $P\hat{N}R = 57°$ [$\angle$ at centre = twice $\angle$ at circumference/ *midpts*$\angle$ *= 2 × omtreks*$\angle$] $\therefore \hat{N}_2 = 33°$	✓S ✓S/R ✓S (3) ✓S ✓S/R ✓S (3)

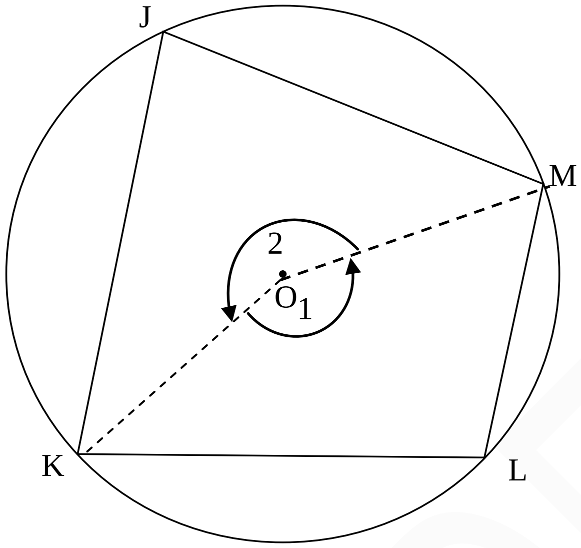
8.2



8.2.1	FC ∥ AB ∥ GH [opp sides of **rectangle**/*teenoorst sye v reghoek*]	✓ R (1)
8.2.2	$\frac{AC}{CH} = \frac{AF}{FG}$ [line ∥ one side of Δ] **OR** [prop theorem; FC ∥ GH] *[lyn ∥ een sy van Δ]* ***OF*** *[eweredighst; FC ∥ GH]* $\frac{AC}{21} = \frac{20}{15}$ $AC = \frac{20 \times 21}{15}$ $= 28$ DB = AC = 28 [diags of rectangle =/*hoeklyne v reghoek* =] $DM = \frac{1}{2}DB = 14$ [diags of rectangle bisect/*hoekl v reghoek halveer*]	✓S ✓R ✓ AC ✓ S ✓ S (5)
		[16]

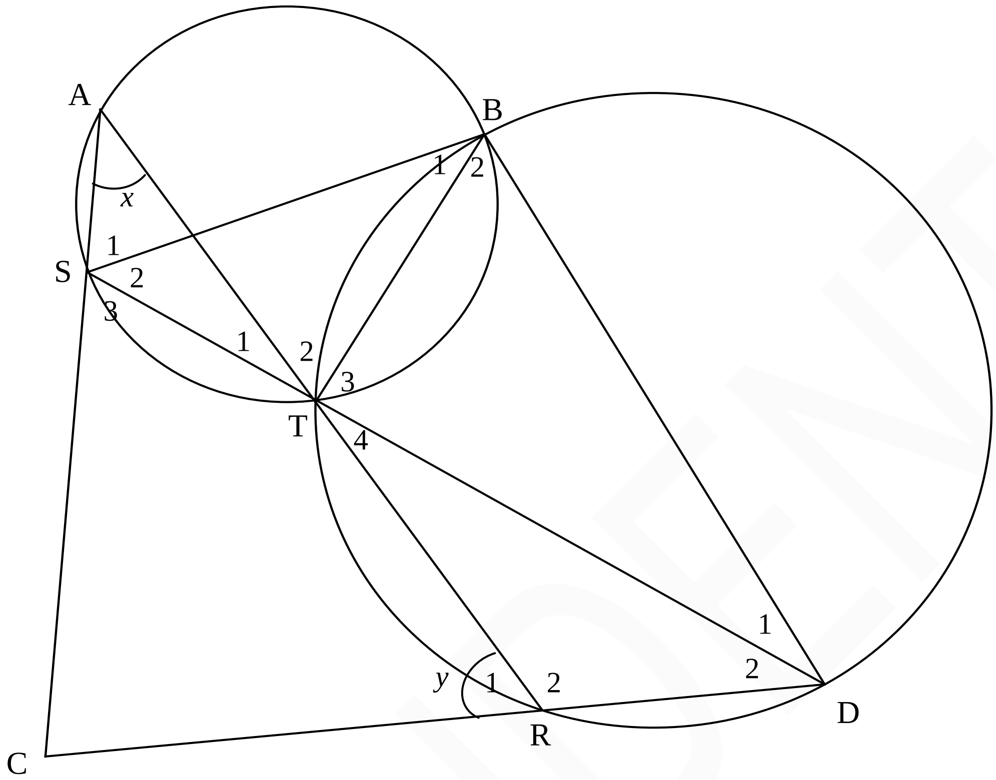
QUESTION/*VRAAG* 9

9.1



9.1	Constr/*Konstr*.: Draw KO and MO/*Trek KO en MO*	✓ construction
	Proof:	
	$\hat{O}_1 = 2\hat{J}$ [$\angle$ at centre = twice $\angle$ at circumference] *[midpts$\angle$ = 2 × omtreks$\angle$]*	✓ S/R
	$\hat{O}_2 = 2\hat{L}$ [$\angle$ at centre = twice $\angle$ at circumference]	✓ S
	$\hat{O}_1 + \hat{O}_2 = 360°$ [$\angle$s around a point /$\angle$*e om 'n punt*]	✓ S/R
	$\therefore 2\hat{J} + 2\hat{L} = 360°$	✓ S
	$\therefore 2(\hat{J} + \hat{L}) = 360°$	
	$\therefore \hat{J} + \hat{L} = 180°$	(5)
	OR/*OF*	
	Constr/*Konstr*.: Draw KO and MO/*Trek KO en MO*	✓ construction
	Proof:	
	Let $\hat{J} = x$	
	$\hat{O}_1 = 2x$ [$\angle$ at centre = twice $\angle$ at circumference] *[midpts$\angle$ = 2 × omtreks$\angle$]*	✓ S ✓ R
	$\hat{O}_2 = 360° - 2x$ [$\angle$s around a point /$\angle$*e om 'n punt*]	✓ S/R
	$\therefore \hat{L} = 180° - x$ [$\angle$ at centre = twice $\angle$ at circumference]	✓ S
	$\therefore \hat{J} + \hat{L} = 180°$	
		(5)

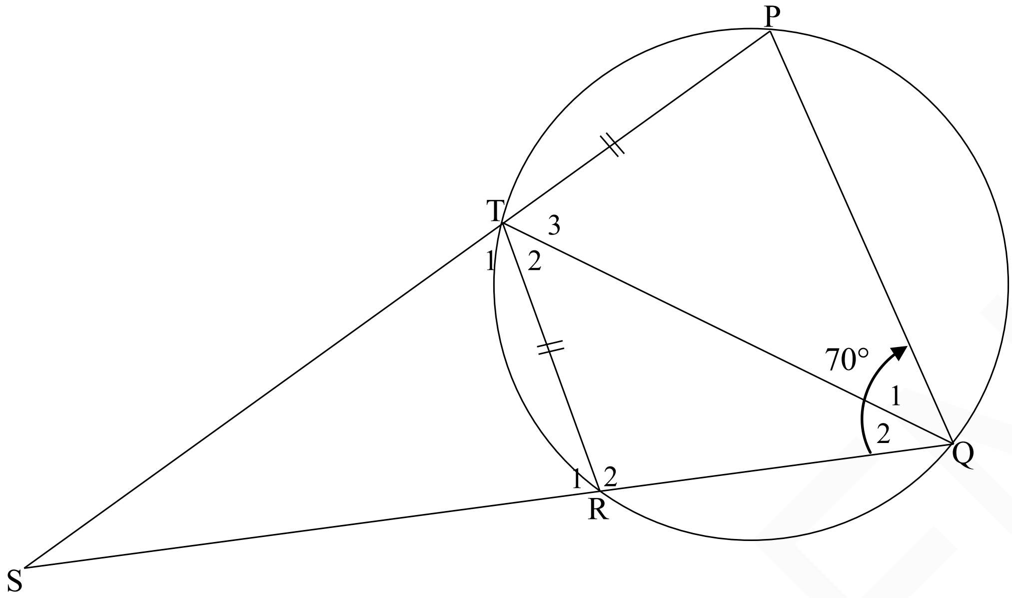
9.2



9.2.1(a)	$\hat{B}_1 = x$ [∠s in same seg/*∠e in dieselfde segm*]	✓S ✓R (2)
9.2.1(b)	$\hat{B}_2 = y$ [ext ∠ of cyclic quad/*buite∠ koordevh*]	✓S ✓R (2)
9.2.2	$\hat{C} = 180° - (x+y)$ [sum of ∠s of/*som v ∠e*, ΔACR] $S\hat{B}D + \hat{C} = x + y + 180° - (x+y)$ $S\hat{B}D + \hat{C} = 180°$ SCDB is a cyclic quad [converse opp angles of cyclic quad] [*omgekeerde teenoorst ∠e koordevh*] **OR/*OF*** $\hat{S}_1 = \hat{T}_2$ [∠s in same segment/*∠e in dies. segment*] $\hat{T}_2 = \hat{D}_1 + \hat{D}_2 = B\hat{D}R$ [ext ∠ of cyc quad/*buite∠ koordevh*] $\therefore\ \hat{S}_1 = B\hat{D}R$ $\therefore$ SCDB is cyc quad [ext ∠ of quad = opp ∠/*buite∠ = tos ∠*]	✓S ✓S ✓R (3) ✓S ✓S ✓R (3)

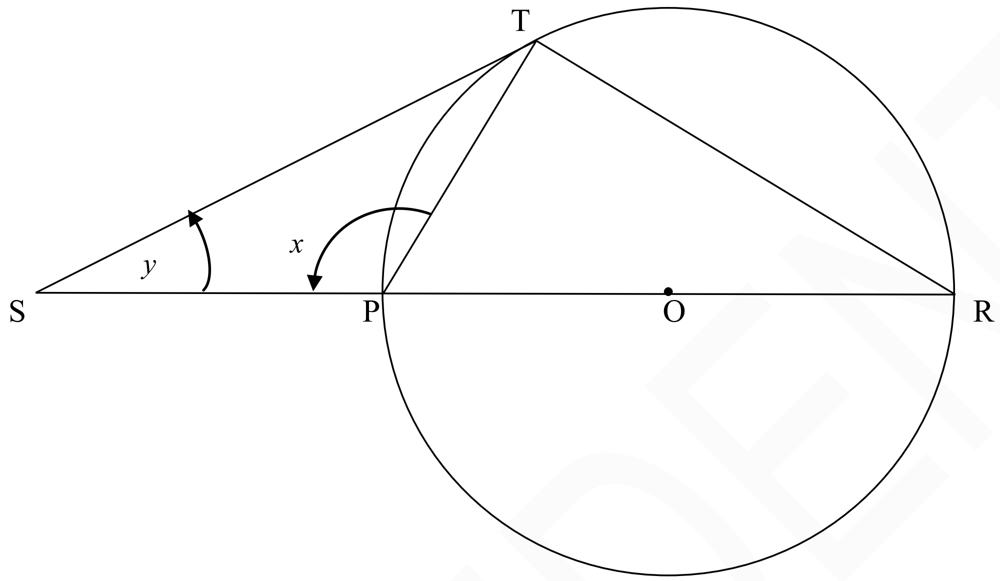
9.2.3	$\hat{T}_4 = y - 30°$ [ext ∠ of/*buite* ∠ Δ TDR] $\hat{T}_1 = y - 30°$ [vert opp ∠s =/*regoorst* ∠*e* =] $y - 30° + x + 100° = 180°$ [sum of ∠s of/*som v* ∠*e*, Δ AST] $\therefore x + y = 110°$ $S\hat{B}D = 110°$ ∴ SD not diameter [line does not subtend 90° ∠] *SD nie 'n middellyn [lyn onderspan nie 90°∠]* **OR/*OF*** $A\hat{S}T = \hat{C} + \hat{D}_2$ [ext ∠ of/*buite* ∠ Δ SCD] $\hat{C} = 100° - 30° = 70°$ $S\hat{B}D = 180° - 70°$ [opp ∠s cyclic quad/ teenoorst ∠e kdvh] $= 110°$ ∴ SD not diameter [line does not subtend 90° ∠] *SD nie 'n middellyn [lyn onderspan nie 90°∠]*	✓ S ✓ S ✓ S ✓ R (4) ✓ S ✓ S ✓ S ✓ R (4)
		[16]

QUESTION/*VRAAG* 7



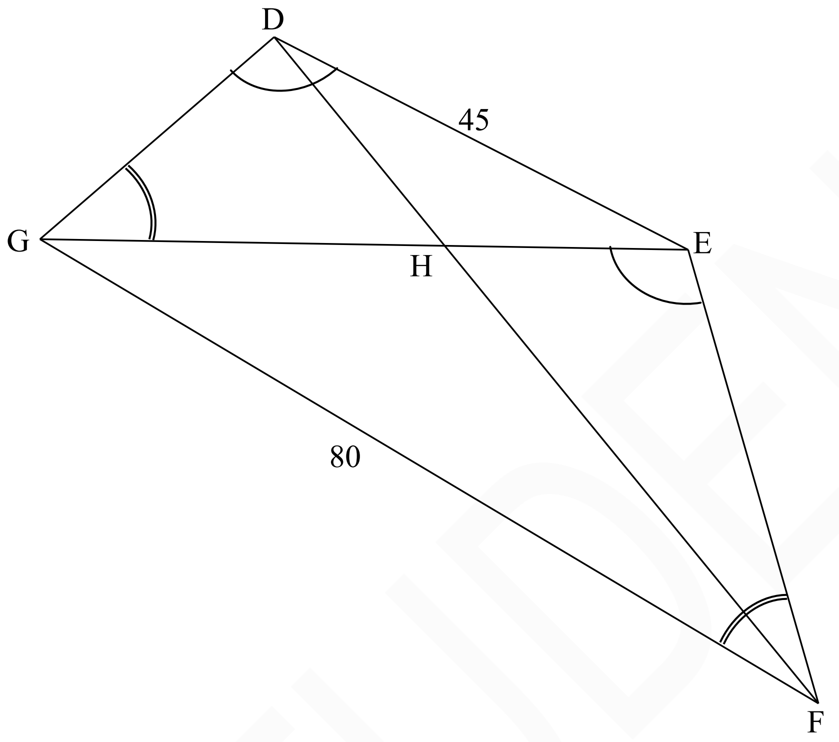
7.1.1	$\hat{T}_1 = 70°$ [ext ∠ of cyclic quad/*buite ∠ van koordevh*]	✓ S ✓ R (2)
7.1.2	$\hat{Q}_1 = \hat{Q}_2 = 35°$ [equal chords;equal∠s/*gelyke koorde; gelyke∠e*]	✓ S ✓ R (2)
7.2.1	$\hat{T}_2 = \hat{Q}_1 = 35°$ [alt ∠s/*verwiss ∠e*; PQ ‖ TR]	✓ S ✓ R (2)
7.2.2	$\frac{PT}{TS} = \frac{QR}{RS}$ [prop theorem/*eweredighst*; PQ ‖ TR] $\therefore \frac{TR}{TS} = \frac{QR}{RS}$ [PT = TR]	✓ S ✓ R (2) **[8]**

QUESTION/*VRAAG* 8



	$P\hat{T}R = 90°$ [∠ in semi-circle/*halfsirkel*] $x = 90° + \hat{R}$ [ext/*buite* ∠ of/*van* Δ] $\therefore \hat{R} = x - 90°$ $S\hat{T}P = x - 90°$ [tan chord theorem/*raakl koordstelling*] $x + x - 90° + y = 180°$ [sum of/*som van* ∠s/*e* in Δ] $\therefore y = 270° - 2x$	✓ S/R ✓ S/R ✓ S ✓R ✓ S ✓ answer **[6]**

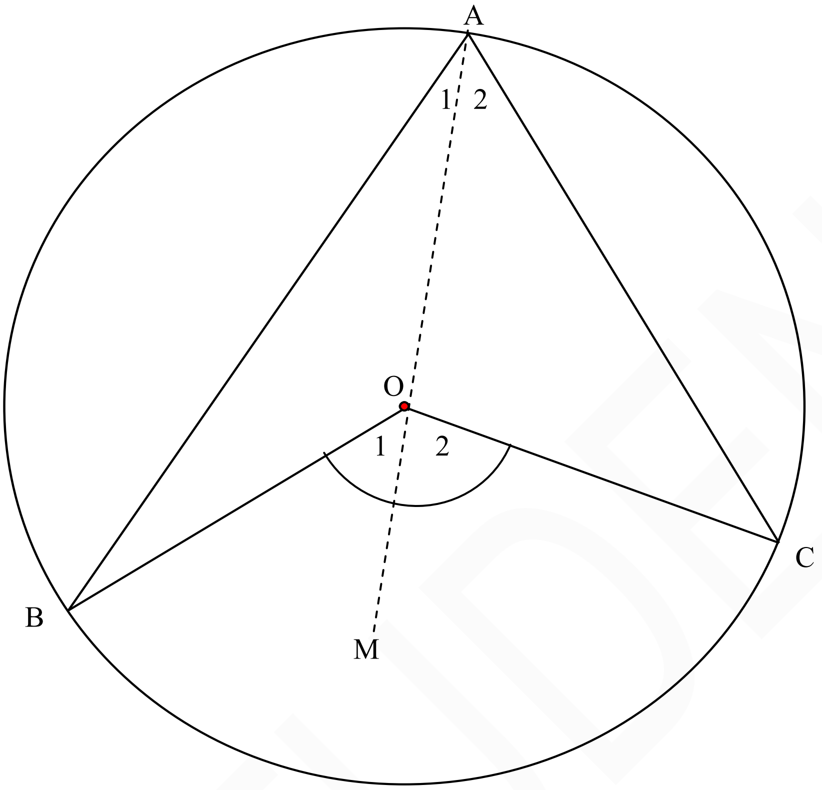
QUESTION/*VRAAG* 9



9.1	equiangular Δs/*gelykhoekige Δe* **OR/*OF*** (∠∠∠)		✓ answer (1)
9.2	$\therefore \frac{GE}{GF} = \frac{DE}{GE}$ $GE^2 = 45 \times 80$ $GE = 60$	[$\vert\vert\vert$ Δs]	✓ proportion ✓ substitution ✓ answer (3)
9.3	In ΔDEH and ΔFGH: $D\hat{H}E = F\hat{H}G$ $D\hat{E}H = F\hat{G}H$ $E\hat{D}H = G\hat{F}H$ $\therefore \Delta DEH \vert\vert\vert \Delta FGH$ **OR/*OF*** In ΔDEH and ΔFGH: $D\hat{H}E = F\hat{H}G$ $D\hat{E}H = F\hat{G}H$ $\therefore \Delta DEH \vert\vert\vert \Delta FGH$	[vert opp ∠s =/*regoorst ∠e* =] [$\vert\vert\vert$ Δs] [sum of/*som van* ∠s/*e* in Δ] [vert opp ∠s =/*regoorst ∠e* =] [$\vert\vert\vert$ Δs] [∠∠∠]	✓ S/R ✓ S/R ✓ S (3) ✓ S/R ✓ S/R ✓ R (3)

9.4	$\frac{GH}{EH}=\frac{FG}{DE}$ [||| Δs] $\frac{GH}{60-GH}=\frac{80}{45}$ [EH = 60 – GH] 45 GH = 80(60 – GH) 45 GH = 4800 – 80 GH 125 GH = 4800 GH = 38,4	✓S ✓ substitution ✓ answer (3) **[10]**

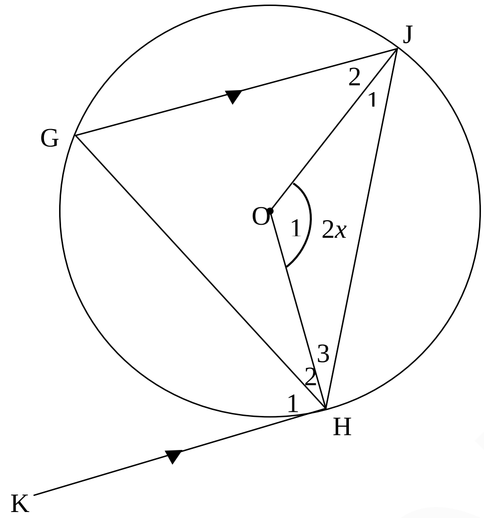
QUESTION/*VRAAG* 10



10.1	Construction: AO is drawn and produced to M $\hat{O}_1 = \hat{A}_1 + \hat{B}$ [ext ∠ of Δ/*buite ∠ van Δ*] But $\hat{A}_1 = \hat{B}$ [∠s opp = radii/*∠e teenoor =radii*] $\therefore \hat{O}_1 = 2\hat{A}_1$ Similarly/*Netso*: $\hat{O}_2 = 2\hat{A}_2$ $\therefore \hat{O}_1 + \hat{O}_2 = 2\hat{A}_1 + 2\hat{A}_2$ $= 2(\hat{A}_1 + \hat{A}_2)$ $B\hat{O}C = 2B\hat{A}C$	✓ Constr ✓ S/R ✓ S/R ✓ S ✓ S (5)

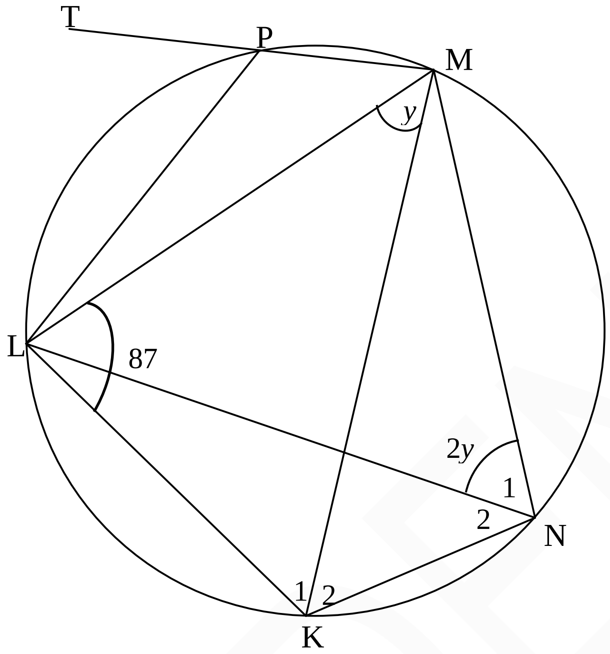
QUESTION/*VRAAG* 8

8.1



8.1.1	$\hat{G} = x$ [$\angle$ centre $= 2\times$ circumference / *midpts*$\angle = 2\times$*omtreks*$\angle$] $\hat{H}_1 = x$ [alt $\angle$s / *verwiss* $\angle$*e*; KH || GJ] $G\hat{J}H = x$ [tan chord theorem / *raaklyn koordstelling*]	✓S ✓R ✓S ✓S ✓R (5)
8.1.2	$\hat{J}_1 + \hat{H}_3 = 180° - 2x$ [sum of $\angle$s in Δ / *som van* $\angle$*e in* Δ] $\therefore \hat{J}_1 = \hat{H}_3 = 90° - x$ [$\angle$s opp equal sides / $\angle$*e teenoor gelyke sye*] $\therefore x + \hat{H}_2 = 90°$ **OR** [tan $\perp$ radius / *raaklyn* $\perp$ *radius*] $\hat{H}_2 = 90° - x$ $\therefore \hat{H}_2 = \hat{H}_3$	 ✓S ✓S ✓R (3)

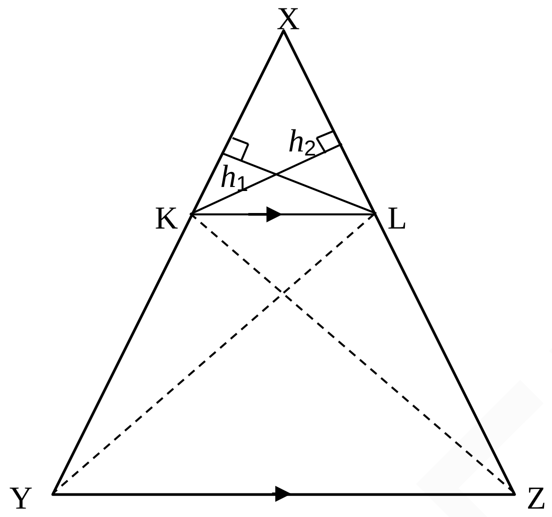
8.2



8.2.1	$\hat{N}_2 = y$ [∠s in the same seg / *∠e in dieselfde segment*]	✓S ✓R (2)
8.2.2(a)	$2y + y + 87° = 180°$ [opp ∠s of cyclic quad / *teenoorst ∠e v kvh*] $3y = 93°$ $y = 31°$	✓S ✓R ✓S (3)
8.2.2(b)	$T\hat{P}L = 62°$ [ext. ∠ of cyclic quad / *buite ∠ v kvh*]	✓S ✓R (2)
		[15]

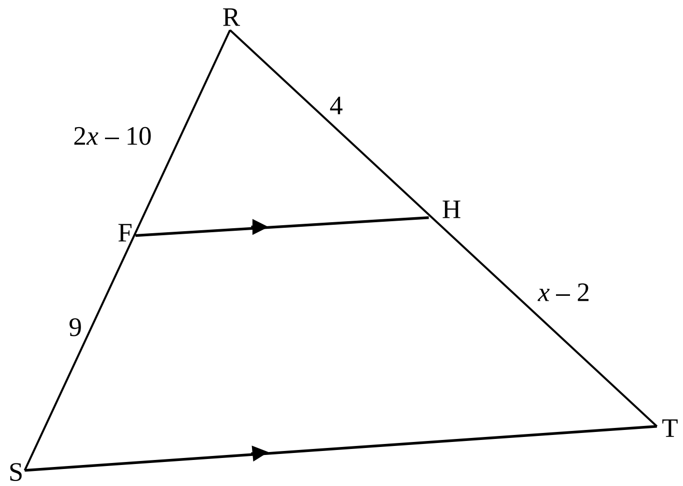
QUESTION/*VRAAG* 9

9.1



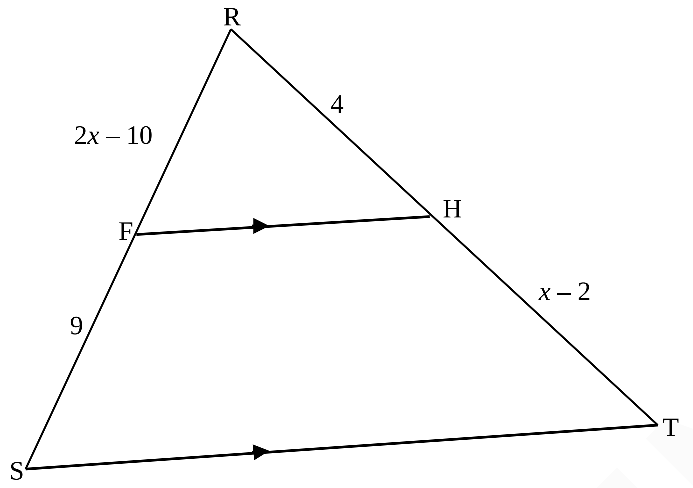
9.1	Constr: Join KZ and LY and draw h_1 from K $\perp$ XL and h_2 from L $\perp$ XK *Konstr: Verbind KZ en LY en trek* h_1 *vanaf* K $\perp$ XL *en* h_2 *vanaf* L $\perp$ XK . Proof / *Bewys*: $\frac{\text{area } \Delta XKL}{\text{area } \Delta LYK} = \frac{\frac{1}{2} XK \times h_1}{\frac{1}{2} KY \times h_1} = \frac{XK}{KY}$ $\frac{\text{area } \Delta XKL}{\text{area } \Delta KLZ} = \frac{\frac{1}{2} XL \times h_2}{\frac{1}{2} LZ \times h_2} = \frac{XL}{LZ}$ area ΔXKL = area ΔXKL [common / *gemeenskaplik*] But area ΔLYK = area ΔKLZ [same base & height ; LK || YZ / *dies basis & hoogte ;* LK || YZ] $\therefore \frac{\text{area } \Delta XKL}{\text{area } \Delta LYK} = \frac{\text{area } \Delta XKL}{\text{area } \Delta KLZ}$ $\therefore \frac{XK}{KY} = \frac{XL}{LZ}$	✓ constr / *konstr* ✓ $\frac{\text{area } \Delta XKL}{\text{area } \Delta LYK} = \frac{\frac{1}{2} XK \times h_1}{\frac{1}{2} KY \times h_1}$ ✓ S ✓R ✓ S (5)

9.2



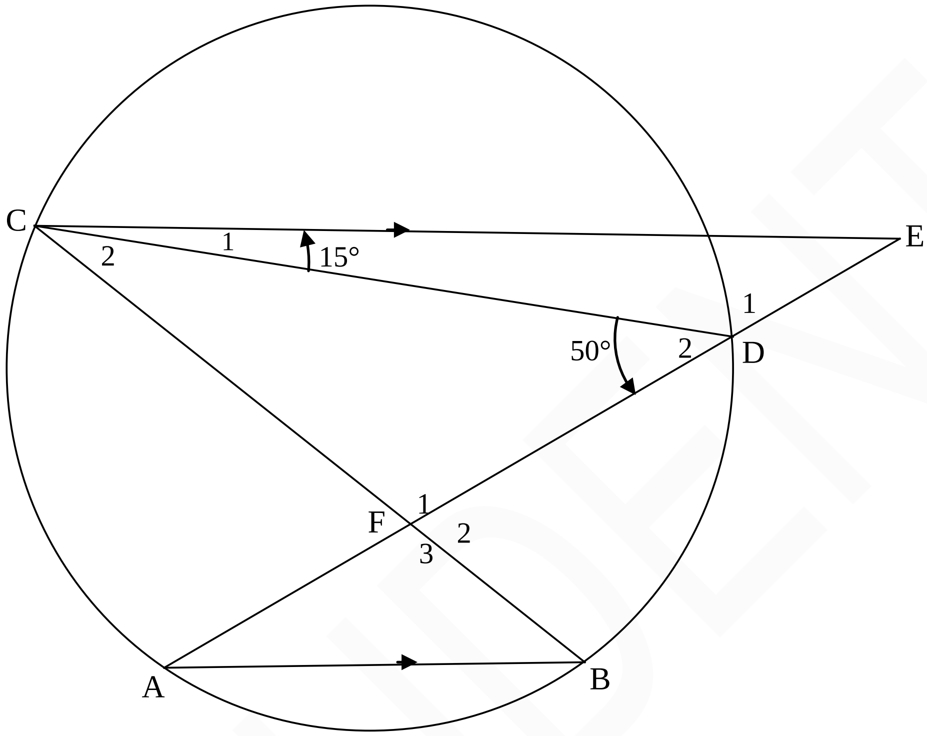
9.2.1	$\frac{RF}{FS}=\frac{RH}{HT}$ [line || one side of Δ **OR** prop theorem; FH || ST] [*Lyn || een sy van Δ* ***OF*** *eweredigh. st;* FH|| ST] $\frac{2x-10}{9}=\frac{4}{x-2}$ $(2x-10)(x-2)=4\times 9$ $2x^2-14x-16=0$ $x^2-7x-8=0$ $(x-8)(x+1)=0$ $\therefore x=8\ \ (x\neq -1)$ **OR/OF** $\frac{RF}{RS}=\frac{RH}{RT}$ [line || one side of Δ **OR** prop theorem; FH || ST] [*Lyn || een sy van Δ* ***OF*** *eweredigh. st;* FH|| ST] $\frac{2x-10}{2x-1}=\frac{4}{x+2}$ $(2x-10)(x+2)=4(2x-1)$ $2x^2-14x-16=0$ $x^2-7x-8=0$ $(x-8)(x+1)=0$ $\therefore x=8\ \ (x\neq -1)$	✓S/R ✓ substitution ✓ standard form ✓ factors ✓answer with rejection (5) ✓S/R ✓ substitution ✓ standard form ✓ factors ✓answer with rejection (5)
9.2.2	$\frac{\text{area }\Delta RFH}{\text{area }\Delta RST}=\frac{\frac{1}{2}RF\times RH\sin\hat{R}}{\frac{1}{2}RS\times RT\sin\hat{R}}$ $=\frac{\frac{1}{2}\times 6\times 4\times\sin\hat{R}}{\frac{1}{2}\times 15\times 10\times\sin\hat{R}}$ $=\frac{24}{150}=\frac{4}{25}$	✓ numerator/*teller* ✓ denominator/*noemer* ✓ substitution ✓answer (4)
		[14]

QUESTION 9



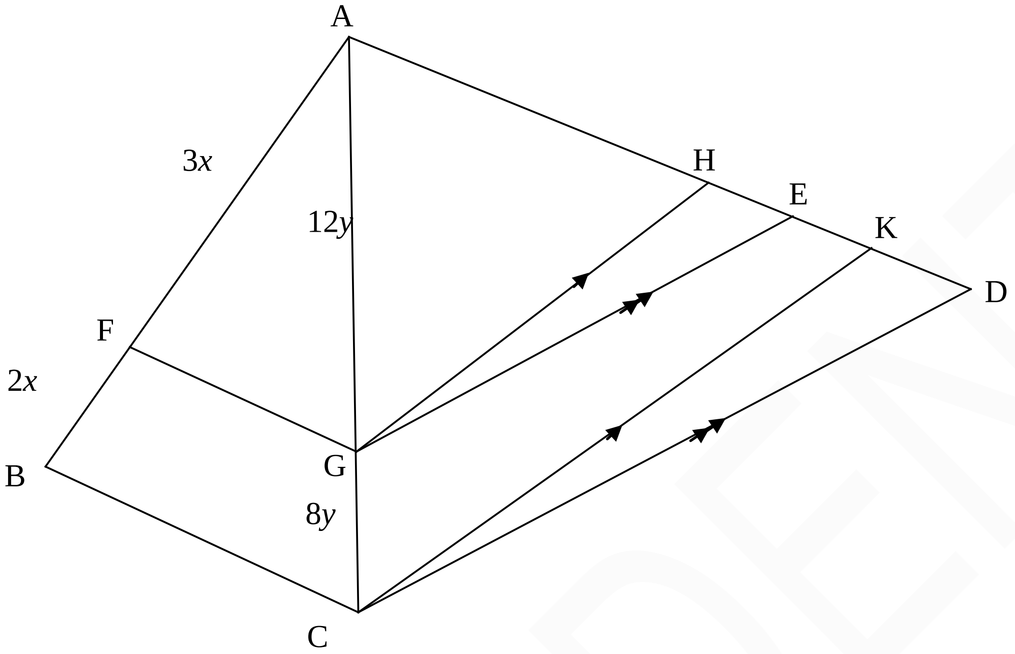
9.2.2	Join FT. area $\Delta RFH = \frac{4}{10} \times$ (area ΔRFT) But area $\Delta RFT = \frac{6}{15} \times$ (area ΔRST) (common vertex; = heights) area $\Delta RFH = \frac{4}{10} \times \frac{6}{15} \times$(area ΔRST) $\frac{\text{area}\Delta RFH}{\text{area}\Delta RST} = \frac{4}{25}$

QUESTION/*VRAAG* 8



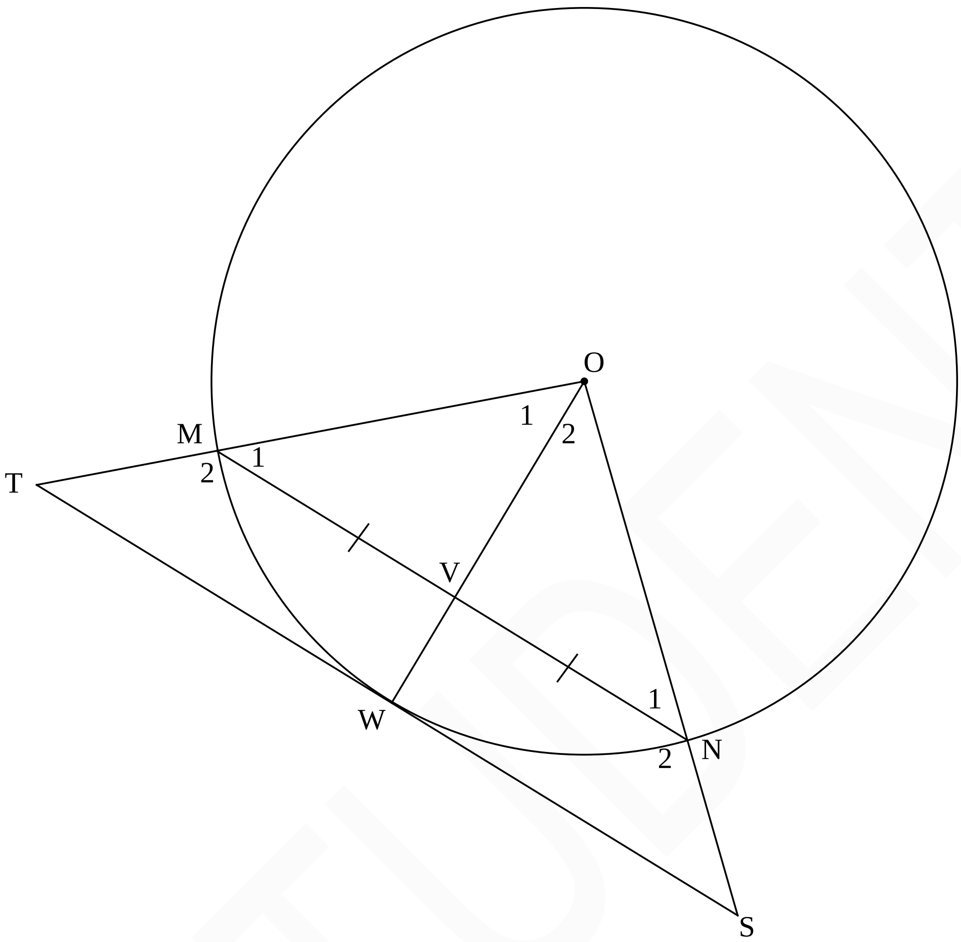
8.1.1	$\hat{E} = 50° - 15° = 35°$ [ext ∠ of Δ/*buite ∠ van Δ*] $\hat{A} = 35°$ [alt ∠s / *verwiss ∠e*; CE ‖ AB] **OR/*OF*** $\hat{E} = 180° - (130° + 15°) = 35°$ [str line; ∠s of Δ/*rt lyn;∠e van Δ*] $\hat{A} = 35°$ [alt ∠s / *verwiss ∠e*; CE ‖ AB] **OR/*OF*** $\hat{B} = 50°$ [∠s in same segment/*∠e in dieselfde segment*] $\hat{C}_2 + 15° = 50°$ [alt ∠s / *verwiss ∠e*; CE ‖ AB] $\therefore \hat{C}_2 = 35°$ $\hat{A} = 35°$ [∠s in same segment/*∠e in dieselfde segment*]	✓ S ✓S ✓ R (3) ✓ S ✓S ✓ R (3) ✓ S ✓S ✓ R (3)
8.1.2	$\hat{C}_2 = 35°$ [∠s in same segment/*∠e in dieselfde segment*]	✓ S ✓ R (2)
8.2	$\hat{C}_2 = \hat{E}$ [from 8.1.1 and 8.1.2] ∴ CF is a tangent to the circle [converse tan chord theorem] ∴ *CF is 'n raaklyn aan die sirkel [omgekeerde raakl koordst]*	✓ S ✓ R (2) **[7]**

QUESTION/*VRAAG* 9



9.1.1	$\frac{AF}{BF} = \frac{3x}{2x} = \frac{3}{2}$ & $\frac{AG}{CG} = \frac{12y}{8y} = \frac{3}{2}$ $\therefore \frac{AF}{BF} = \frac{AG}{CG}$ $\therefore$ FG ∥ BC [conv prop th/*omg eweredigh st.* **OR** line divides 2 sides of Δ in prop/*lyn verdeel 2 sye v Δ in dies verh*]	✓ $\frac{AF}{BF} = \frac{AG}{CG}$ ✓R (2)
9.1.2	$\frac{AG}{GC} = \frac{AH}{HK}$ [prop theorem/*eweredigh st*; GH ∥ CK **OR** line ∥ to 1 side of Δ/*lyn ∥ 1 sy van Δ*] $\frac{AG}{GC} = \frac{AE}{ED}$ [prop theorem/*eweredigh st*; GE ∥ CD] $\therefore \frac{AH}{HK} = \frac{AE}{ED}$	✓S ✓ R ✓ S (3)
9.2	$\frac{AE}{ED} = \frac{3}{2}$ and $\frac{AH}{HK} = \frac{3}{2}$ $\frac{AE}{12} = \frac{3}{2}$ and $\frac{15}{HK} = \frac{3}{2}$ $\therefore$ AE = 18 and HK = 10 $\therefore$ HE = AE – AH = 18 – 15 = 3 $\therefore$ EK = HK – HE = 10 – 3 = 7 **OR/*OF*** AD = 30 KD = AD – AH – HK = 30 – 15 – 10 = 5 EK = ED – KD = 12 – 5 = 7	✓ use of ratios ✓ AE = 18 ✓ HK = 10 ✓ HE = 3 **or** KD = 5 ✓ EK = 7 (5) **[10]**

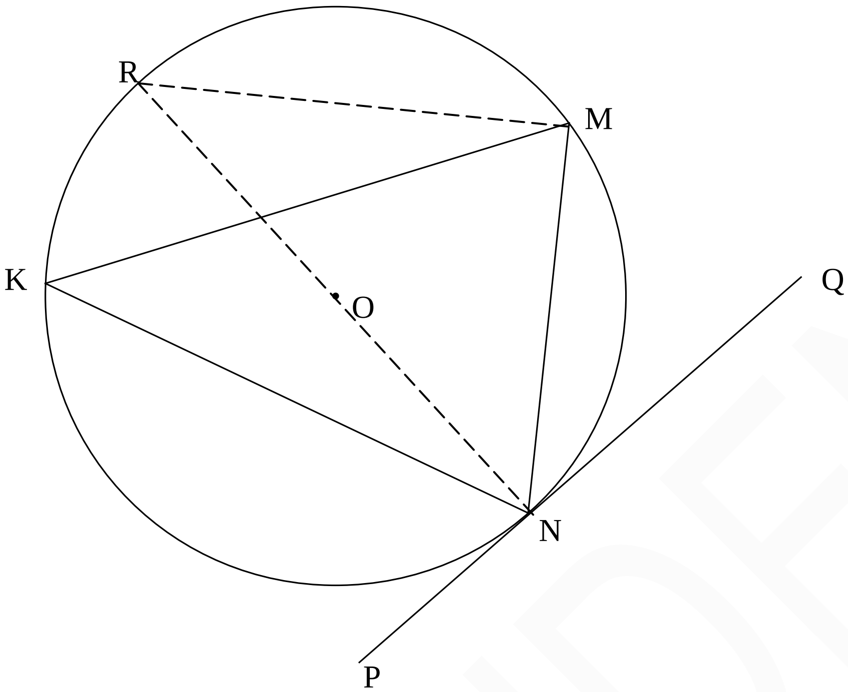
QUESTION/*VRAAG* 10



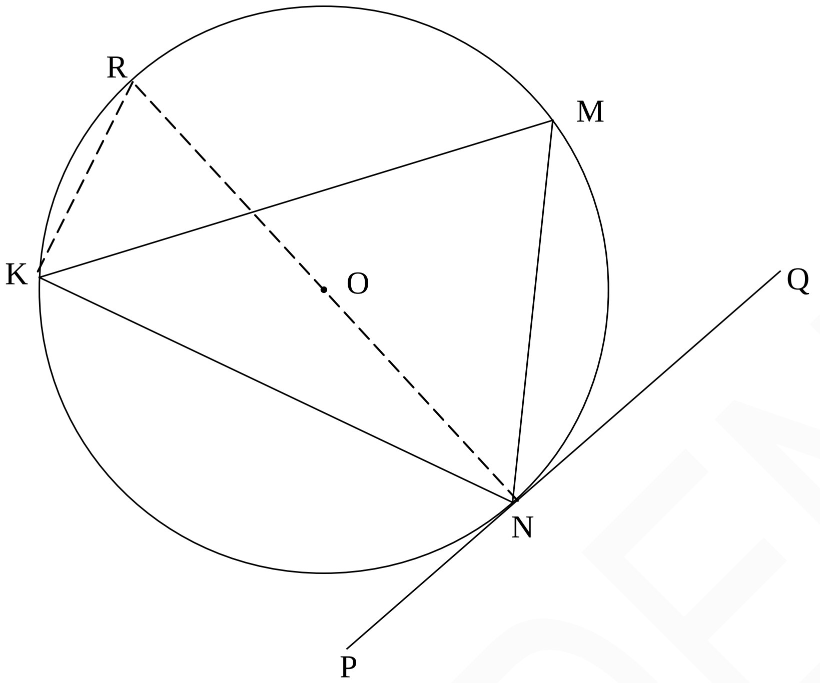
10.1	Line from centre to midpoint of chord/ *lyn vanaf midpt na midpt van koord*	✓ R (1)
10.2.1	$\hat{OWT} = \hat{OWS} = 90°$ [radius ⊥ tangent/*raaklyn*] $\therefore$ MN ‖ TS [corresp ∠s =/*ooreenkomstige ∠e* = **OR** co-int ∠s 180°/*ko-binne∠e 180°* **OR** alternate ∠s/*verwiss ∠e*]	✓ R ✓ R (2)
10.2.2	$\hat{M}_1 = \hat{N}_1$ [∠s opp = sides/ *∠e teenoor = sye*] $\hat{M}_1 = \hat{T}$ [corresp ∠s/*ooreenk ∠e*; MN ‖ TS] $\therefore \hat{N}_1 = \hat{T}$ $\therefore$ TMNS is a cyclic quadrilateral [conv: ext∠ cyclic quad] TMNS *is 'n koordevierhoek* [*omgek: buite∠ kdvh*] **OR/*OF*** $\hat{M}_1 = \hat{N}_1$ [∠s opp = sides/*∠e teenoor = sye*] $\hat{N}_1 = \hat{S}$ [corresp ∠s/*ooreenk ∠e*; MN ‖ TS] $\therefore \hat{S} = \hat{M}_1$ $\therefore$ TMNS is a cyclic quadrilateral [conv: ext∠ cyclic quad] TMNS *is 'n koordevierhoek* [*omgek: buite∠ kdvh*]	✓ S ✓ S ✓ S ✓ R (4) ✓ S ✓ S ✓ S ✓ R (4)

10.2.3	In ΔOVN and ΔOWS $\hat{O}_2 = \hat{O}_2$ [common/*gemeenskaplik*] $O\hat{V}N = O\hat{W}S = 90°$ [from 10.1] $O\hat{N}V = O\hat{S}W$ [sum $\angle$s Δ/*som* $\angle$*e* Δ] $\therefore \Delta OVN \mid\mid\mid \Delta OWS$ [$\angle, \angle, \angle$] $\therefore \frac{VN}{WS} = \frac{ON}{OS}$ But VN = $\frac{1}{2}$MN [given] $\therefore \frac{\frac{1}{2}MN}{WS} = \frac{ON}{OS}$ $\therefore$OS.MN = 2ON. WS	✓ S; S; S **OR** S; S; R ✓$\Delta OVN \mid\mid\mid \Delta OWS$ ✓ $\frac{VN}{WS} = \frac{ON}{OS}$ ✓ VN = $\frac{1}{2}$MN ✓ substitution (5)
	OR/*OF* In ΔOVM and ΔOWS $O\hat{V}M = O\hat{W}S = 90°$ [from 10.1] $O\hat{M}V = O\hat{S}W$ [sum $\angle$s Δ/*som* $\angle$*e* Δ] $\therefore \Delta OVM \mid\mid\mid \Delta OWS$ [$\angle, \angle, \angle$] $\therefore \frac{OM}{OS} = \frac{VM}{WS}$ But VN = $\frac{1}{2}$MN [given] $\therefore \frac{\frac{1}{2}MN}{WS} = \frac{OM}{OS}$ $\therefore$OS.MN = 2ON. WS [VM = VN]	✓ S; S; S **OR** S; S; R ✓$\Delta OVM \mid\mid\mid \Delta OWS$ ✓ $\frac{OM}{OS} = \frac{VM}{WS}$ ✓ VN = $\frac{1}{2}$MN ✓ substitution (5)
	OR/*OF* If any other 2 Δs are used, first need to prove that TW = WS by proving $\Delta OWT \equiv \Delta OWS$ In ΔOVM and ΔOWT $\hat{O}_1 = \hat{O}_1$ [common/*gemeenskaplik*] $O\hat{V}M = O\hat{W}T = 90°$ [from 10.1] $O\hat{M}V = O\hat{T}W$ [sum $\angle$s Δ/*som* $\angle$*e* Δ] $\therefore \Delta OVM \mid\mid\mid \Delta OWT$ [$\angle, \angle, \angle$] $\therefore \frac{VM}{WT} = \frac{OM}{OT}$ But VN = VM = $\frac{1}{2}$MN [given] and WT = WS and OT = OS [$\Delta OWT \equiv \Delta OWS$] $\therefore \frac{\frac{1}{2}MN}{WS} = \frac{ON}{OS}$ $\therefore$OS.MN = 2ON. WS	✓✓ similarity ✓✓ congruency ✓ VN = VM = $\frac{1}{2}$MN (5) **[12]**

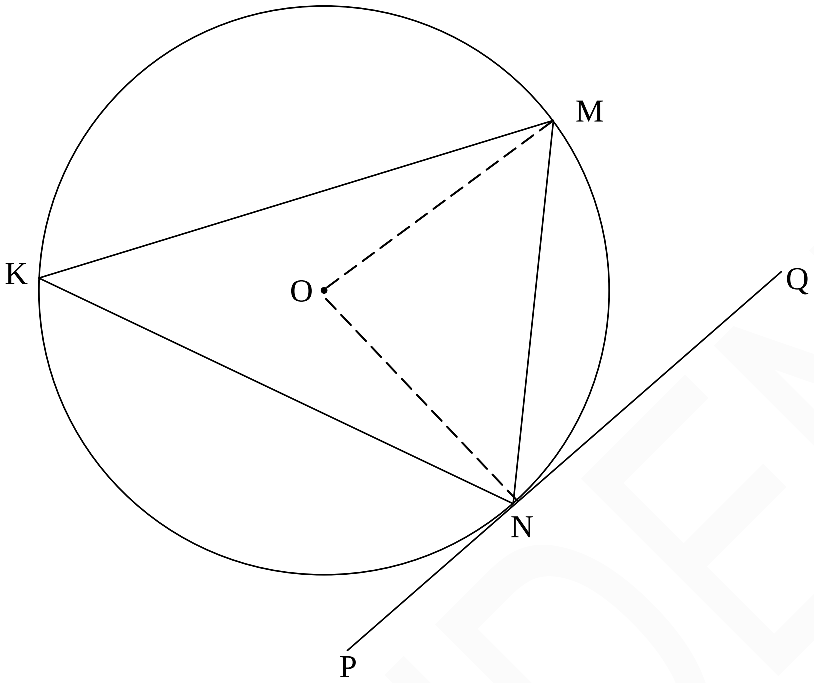
QUESTION/*VRAAG* 11



11.1	Construction: Draw diameter NR and draw RM *Konstruksie: Trek middellyn NR en verbind RM* $O\hat{N}M + M\hat{N}Q = 90°$ [radius ⊥ tangent/*raaklyn*] $N\hat{M}R = 90°$ [∠ in semi circle/*semi-sirkel*] $\therefore M\hat{R}N = 180° - (90° + 90° - M\hat{N}Q)$ [sum ∠s Δ] $= M\hat{N}Q$ but $M\hat{R}N = M\hat{K}N$ [∠s same segment/∠*e dieselfde segment*] $\therefore M\hat{N}Q = \hat{K}$ **OR/*OF***	✓ construction ✓ S /R ✓ S/ R ✓ S ✓ S / R (5)

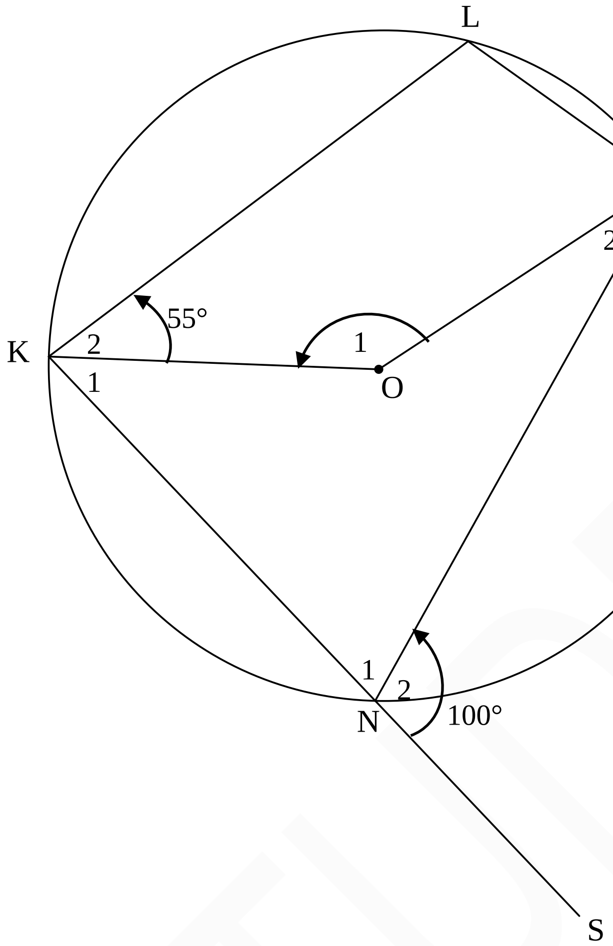


11.1	Construction: Draw diameter NR and draw RK *Konstruksie: Trek middellyn NR en verbind RK* $\text{M}\hat{\text{N}}\text{Q} + \text{R}\hat{\text{N}}\text{M} = 90°$ [radius ⊥ tangent/*raaklyn*] $\text{N}\hat{\text{K}}\text{R} = 90°$ [∠ in semicircle/*semi-sirkel*] $\therefore \text{M}\hat{\text{K}}\text{N} = 90° - \text{R}\hat{\text{K}}\text{M}$ $= 90° - \text{R}\hat{\text{N}}\text{M}$ [∠s same segment/*∠e dieselfde segment*] $\therefore \text{M}\hat{\text{N}}\text{Q} = \hat{\text{K}}$	✓ construction ✓ S /R ✓ S/ R ✓ S ✓ S / R (5)



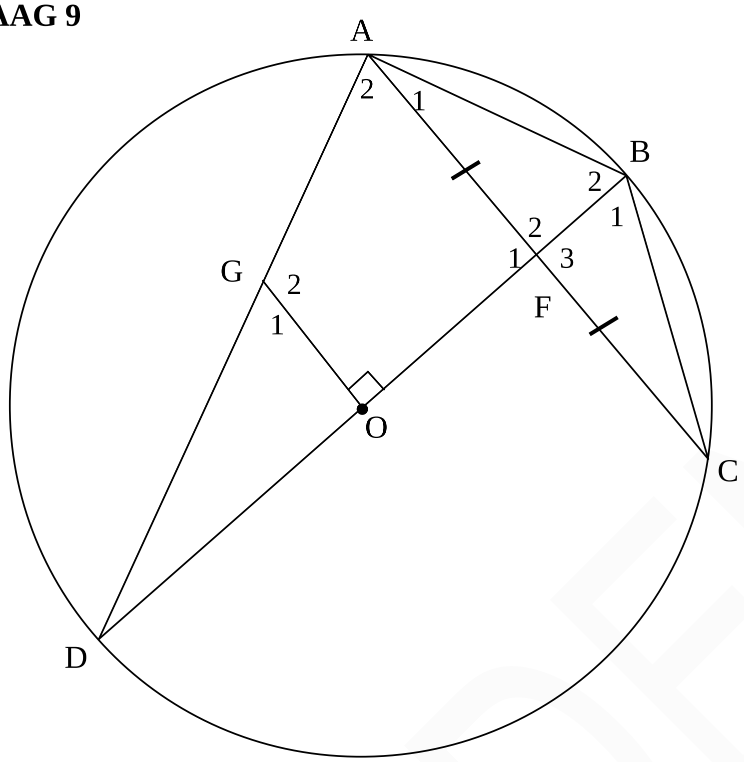
11.1	Construction: Draw radii ON and OM *Konstruksie: Trek radiusse ON en OM* $\hat{MON} = 2\hat{K}$ [∠ at centre = 2∠ at circumf/*midpts∠ = 2 omtreks∠*] $\hat{ONM} + \hat{OMN} = 180° - 2\hat{K}$ [∠s of Δ/*∠e van Δ*] $\hat{ONM} = \hat{OMN} = \frac{180° - 2\hat{K}}{2} = 90° - \hat{K}$ [∠s opp = sides/*∠e teenoor = sye*] $\hat{ONQ} = 90°$ [radius⊥tangent/*radius⊥raaklyn*] $\therefore \hat{MNQ} = \hat{K}$	✓ construction ✓ S /R ✓ S ✓ S/ R ✓ S / R (5)

QUESTION/VRAAG 8



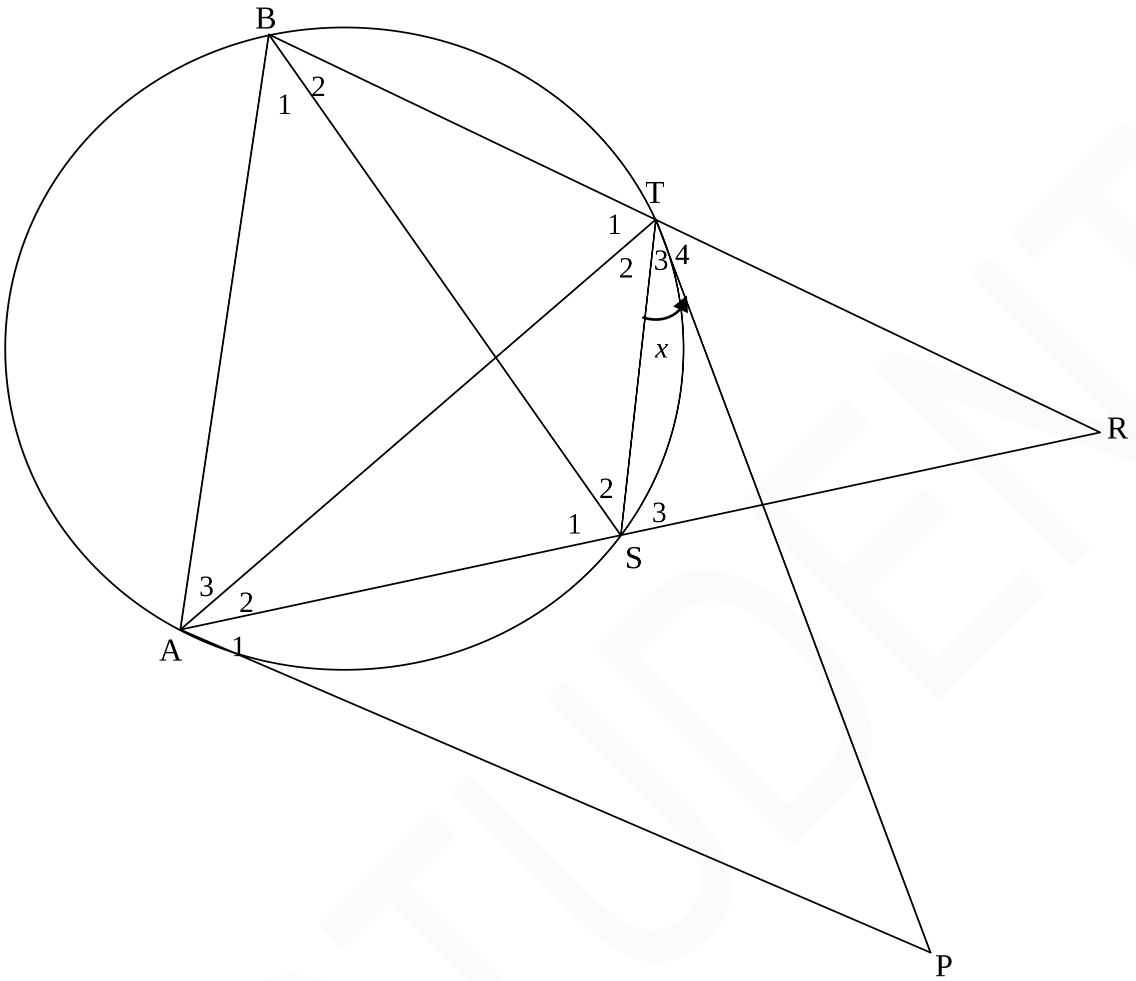
8.1	$\hat{L} = 100°$ [ext ∠ cyclic quad = int opp ∠ / *buite ∠ kdvh = tos ∠*] **OR/*OF*** $\hat{N}_1 = 80°$ [∠s on straight line] $\hat{L} = 100°$ [opp ∠s of cyclic quad]	✓S ✓R (2) ✓S ✓R (2)
8.2	$\hat{N}_1 = 80°$ [∠s on straight line/∠e *op reguitlyn*] $\therefore \hat{O}_1 = 160°$ [∠ at centre = 2×∠ at circumference/midpts∠ = 2 omtreks∠] **OR/*OF*** reflex $K\hat{O}M = 200°$ [∠ at centre=2 × ∠ at circumference/*midpts∠ = 2×omtreks∠*] $\therefore \hat{O}_1 = 160°$ [∠s around a pt/ ∠e om 'n pt]	✓S ✓S ✓R (3) ✓S ✓R ✓S (3)
8.3	$\hat{M}_1 = 360° - (100° + 55° + 160°)$ [sum ∠s of quad/*som ∠e v vierhoek*] $\therefore \hat{M}_1 = 45°$	✓S ✓S (2) **[7]**

QUESTION/VRAAG 9



9.1.1	$\angle$ in semi-circle/$\angle$ *in halfsirkel*	✓answer (1)
9.1.2	**Opp $\angle$s** of quad **= 180°**/*Teenoorst $\angle$e v vierhoek=180°*	✓answer (1)
9.2.1	OF $\perp$ AC [line from centre bisects chord/*lyn v midpt halv kd*] $\therefore$ AC ∥ GO [co-interior/*ko-binne* $\angle$s = 180° **OR/*OF*** corresp/*ooreenkomstige* $\angle$s =]	✓ S ✓ R ✓ R (3)
9.2.2	$\hat{G}_1 = \hat{A}_2$ [corresp/*ooreenk* $\angle$s; AC ∥ GO] $\hat{A}_2 = \hat{B}_1$ [$\angle$s in same segment/$\angle$e *in dies segment*] $\therefore \hat{G}_1 = \hat{B}_1$ **OR/*OF*** $\hat{G}_1 = \hat{B}_2$ [ext $\angle$ cyclic quad/*buite* $\angle$ *koordevh*] but $\Delta ABF \equiv \Delta CBF$ [s, $\angle$, s] $\therefore \hat{B}_2 = \hat{B}_1$ $\therefore \hat{G}_1 = \hat{B}_1$	✓ S ✓ R ✓ S ✓ R (4) ✓ S ✓ R ✓ R ✓ S (4)
9.3	OF : FB = 3 : 2 DB = 2r $\therefore$ DO = 5k and DF = 8k **OR/*OF*** DF = $2r - \frac{2}{5}r = \frac{8}{5}r$ $\therefore \frac{DG}{DA} = \frac{DO}{DF} = \frac{r}{\frac{8}{5}r}$ [line ∥ side of Δ/*lyn* ∥ *sy v* Δ] $\therefore \frac{DG}{DA} = \frac{5}{8}$	 ✓ S ✓ R ✓ S (3)
		[12]

QUESTION/VRAAG 10

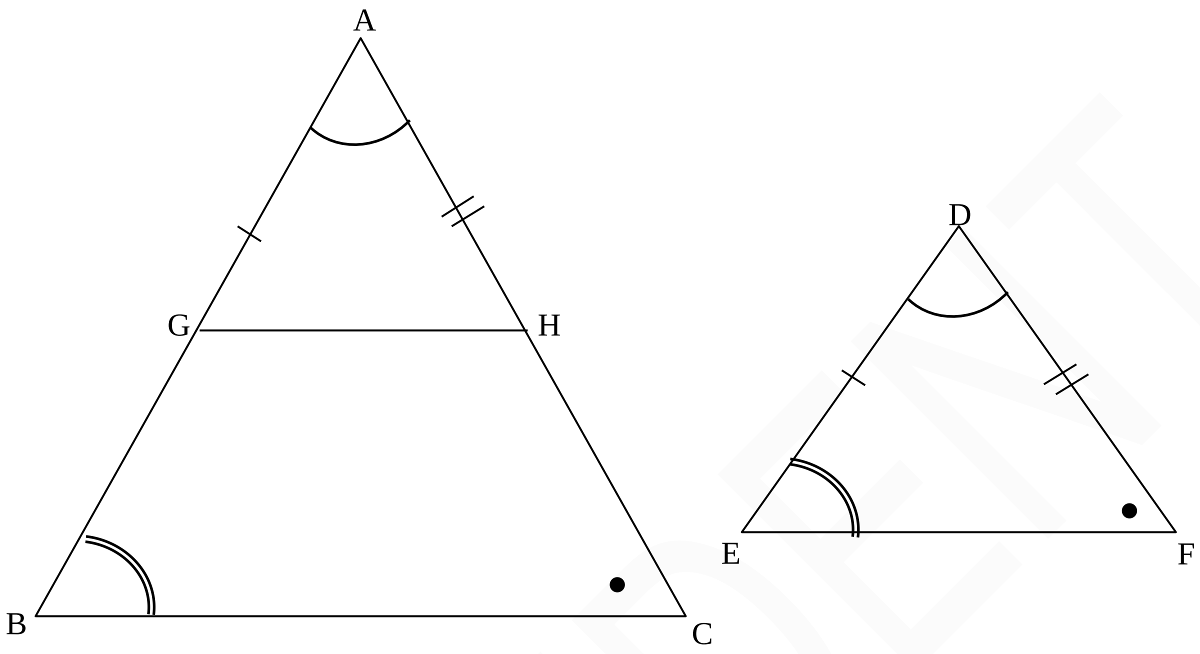


10.1	Tangent-chord theorem	✓ R (1)
10.2.1	$\hat{A}_2 + \hat{A}_3 = \hat{B}_1 + \hat{B}_2$ [$\angle^s$ opp = sides/$\angle$*e teenoor* = *sye*] $\hat{S}_3 = \hat{B}_1 + \hat{B}_2$ [ext $\angle$ cyclic quad/*buite* $\angle$ *koordevh*] $\therefore \hat{S}_3 = \hat{A}_2 + \hat{A}_3$ $\therefore AB \parallel ST$ [corresp/*ooreenk* $\angle^s$ =] **OR/*OF*** $R\hat{T}S = B\hat{A}S$ [ext $\angle$ cyclic quad/*buite* $\angle$ *koordevh*] $B\hat{A}S = A\hat{B}T$ [$\angle^s$ opp = sides/$\angle$*e teenoor* = *sye*] $\therefore R\hat{T}S = A\hat{B}T$ $\therefore AB \parallel ST$ [corresp/*ooreenk* $\angle^s$ =]	✓ S ✓ R ✓ S ✓ R ✓ R (5) ✓ S ✓ R ✓ S ✓ R ✓ R (5)

10.2.2	$\hat{B}_2 = x$ [tan chord theorem/*raakl – koordst*] $x + \hat{T}_4 = \hat{B}_1 + \hat{B}_2$ [corresp/*ooreenk* $\angle^s$; AB // ST] $\therefore \hat{T}_4 = \hat{B}_1$ $\hat{B}_1 = \hat{A}_1$ [tan chord theorem/*raakl – koordst*] $\therefore \hat{T}_4 = \hat{A}_1$	✓ S ✓ R ✓ S ✓ R ✓ R (5)
10.2.3	$\hat{T}_4 = \hat{A}_1$ [proven/*bewys in* 10.2.2] $\therefore$ RTAP is a cyclic quadrilateral [line subtends = $\angle^s$] *Is 'n koordevierhoek* [*lyn onderspan* = $\angle e$]	✓ S ✓ R (2)
		[13]

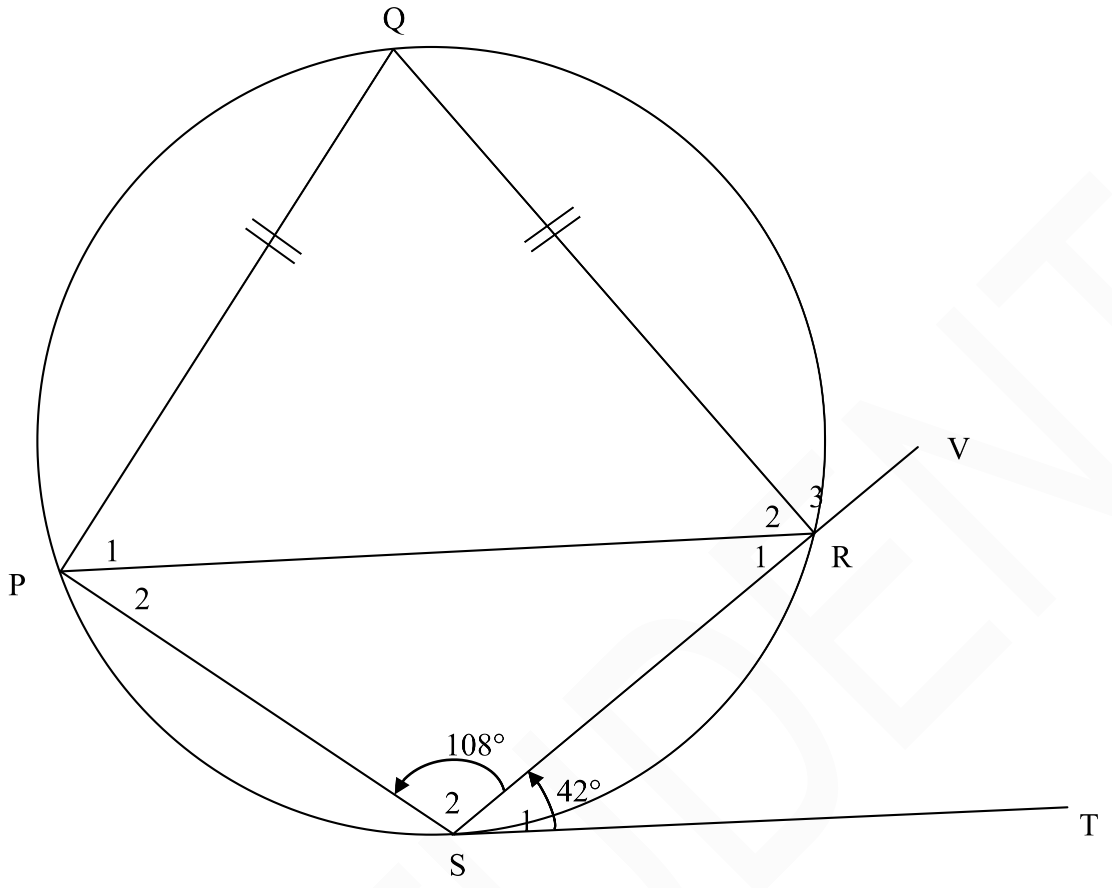
QUESTION/VRAAG 11

11.1



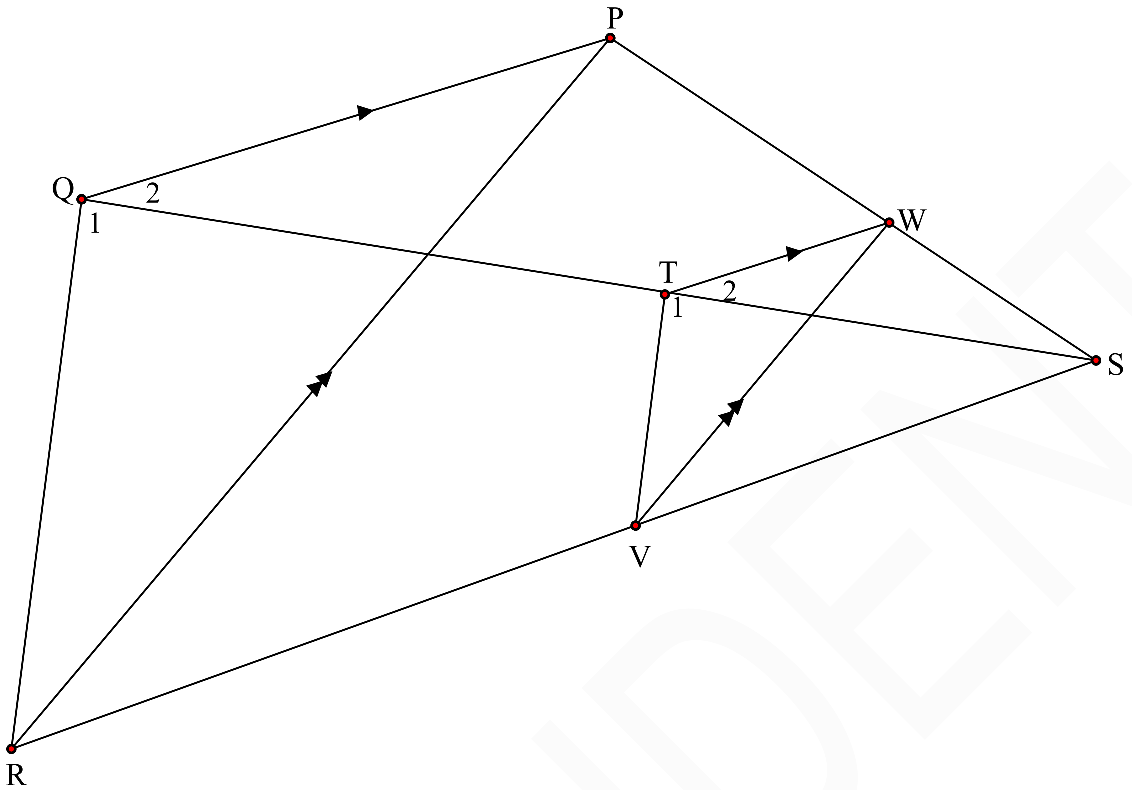
11.1	Constr: On sides AB and AC of ΔABC, mark points G and H respectively such that AG = DE and AH = DF. Draw GH/*Merk punt G en H op sy AB en AC van ΔABC onderskeidelik af sodanig dat AG = DE en AH = DF. Trek GH.* Proof/*Bewys*: $\Delta AGH \equiv \Delta DEF$ [s, ∠, s] $\therefore A\hat{G}H = \hat{E}$ $= \hat{B}$ [$\hat{B} = \hat{E}$, given/*gegee*] $\therefore GH \parallel BC$ [corresp/*ooreenk* $\angle^s =$] $\therefore \frac{AG}{AB} = \frac{AH}{AC}$ [line ‖ side of Δ / *lyn* ‖ *sye v* Δ] $\therefore \frac{DE}{AB} = \frac{DF}{AC}$ [constr/*konstruksie*]	✓ construction/ *konstruksie* ✓ S/R ✓ S ✓ S /R ✓ S ✓ R (6)

QUESTION/*VRAAG* 8



8.1	$\hat{Q} = 72°$ [opp ∠s of cyclic quad/*teenoorst ∠e koordevh*]	✓ S ✓ R (2)
8.2	$\hat{R}_2 = \hat{P}_1$ [∠s opp equal sides/*∠e teenoor gelyke sye*] $\hat{R}_2 = \dfrac{180° - 72°}{2}$ [sum of ∠s in Δ/*som v ∠e in Δ*] $= 54°$	✓ S/R ✓ answer (2)
8.3	$\hat{P}_2 = 42°$ [tan chord theorem/*raakl-koordst*]	✓ S ✓ R (2)
8.4	$\hat{R}_3 = \hat{P}_1 + \hat{P}_2$ [ext ∠ of cyclic quad/*buite∠ van koordevh*] $= 54° + 42°$ $= 96°$ **OR/*OF*** $\hat{R}_1 = 180° - 108° - 42° = 30°$ [sum of/*som van*∠s/e in Δ] $\hat{R}_3 = 180° - \hat{R}_1 - \hat{R}_2$ [∠s on str line/*∠e op reguitlyn*] $= 180° - 30° - 54°$ [sum of/*som van*∠s/e in Δ] $= 96°$	✓ R ✓ S (2) ✓ $\hat{R}_1 = 30°$ ✓ S (2) **[8]**

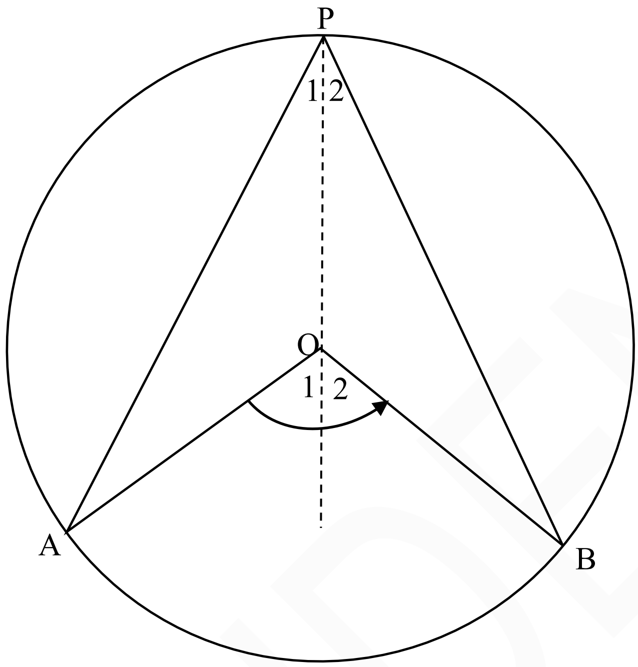
QUESTION/*VRAAG* 9



9.1.1	$\frac{ST}{TQ}=\frac{SW}{WP}$ [prop theorem/*eweredighst*; TW ∥ QP] $=\frac{2}{3}$	✓ S ✓ S (2)
9.1.2	$\frac{SV}{VR}=\frac{SW}{WP}$ [prop theorem/*eweredighst*; VW ∥ RP] $=\frac{2}{3}$	✓ answer (1)
9.2	$\frac{ST}{TQ}=\frac{SV}{VR}$ [both equal/*beide gelyk* $\frac{WS}{PW}$] ∴ TV ∥ QR [line divides 2 sides of Δ in prop/*lyn verdeel 2 sye van Δ in dies verh*] $\therefore \hat{T}_1=\hat{Q}_1$ [corresp/*ooreenkomst* ∠s/e; TV ∥ QR]	✓ S ✓ S ✓ R ✓ R (4)
9.3	ΔVWS ||| <u>ΔRPS</u>	✓ ΔRPS (any order) (1)
9.4	$\frac{WV}{PR}=\frac{SW}{SP}$ [ΔVWS ||| ΔRPS] $=\frac{2}{5}$ **OR/*OF*** $\frac{WV}{PR}=\frac{SV}{SR}$ [ΔVWS ||| Δ RPS] $=\frac{2}{5}$	✓ ratio ✓ answer (2) **[10]**

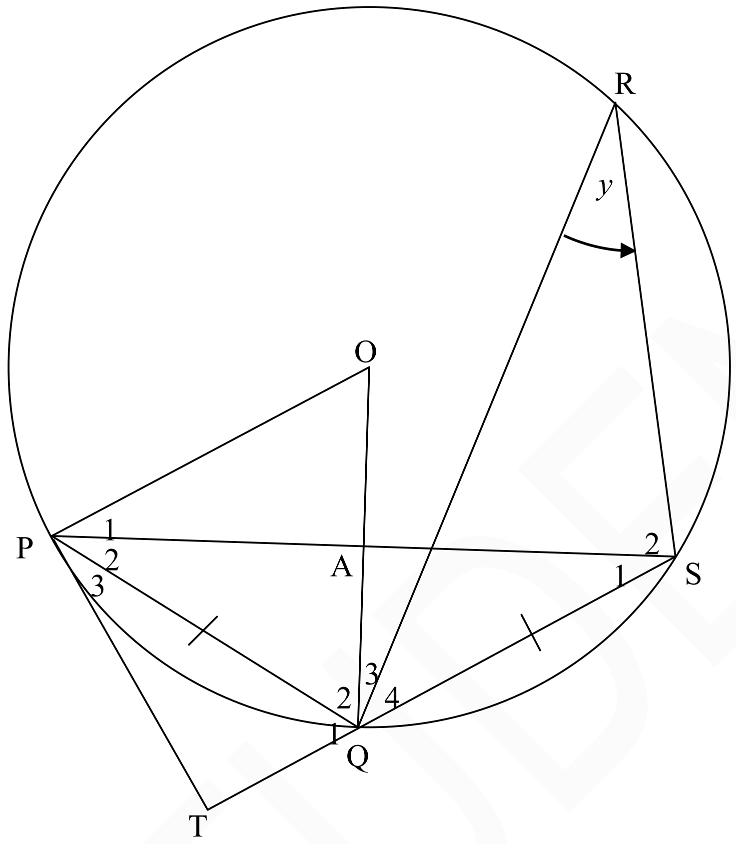
QUESTION/*VRAAG* 10

10.1



	Constr/*Konst* : Draw line PO and extend /*Trek lyn PO en verleng* Proof/*Bewys* : $OP = OA$ [radii] $\therefore \hat{P}_1 = \hat{A}$ [$\angle$s opp/*teenoor* = sides/*sye*] but $\hat{O}_1 = \hat{P}_1 + \hat{A}$ [ext $\angle$ of Δ] $\therefore \hat{O}_1 = 2\hat{P}_1$ Similarly/*Netso*, $\hat{O}_2 = 2\hat{P}_2$ $\therefore \hat{O}_1 + \hat{O}_2 = 2(\hat{P}_1 + \hat{P}_2)$ i.e. $A\hat{O}B = 2A\hat{P}B$	✓ construction ✓ S/R ✓ S/R ✓ S ✓ S (5)

10.2

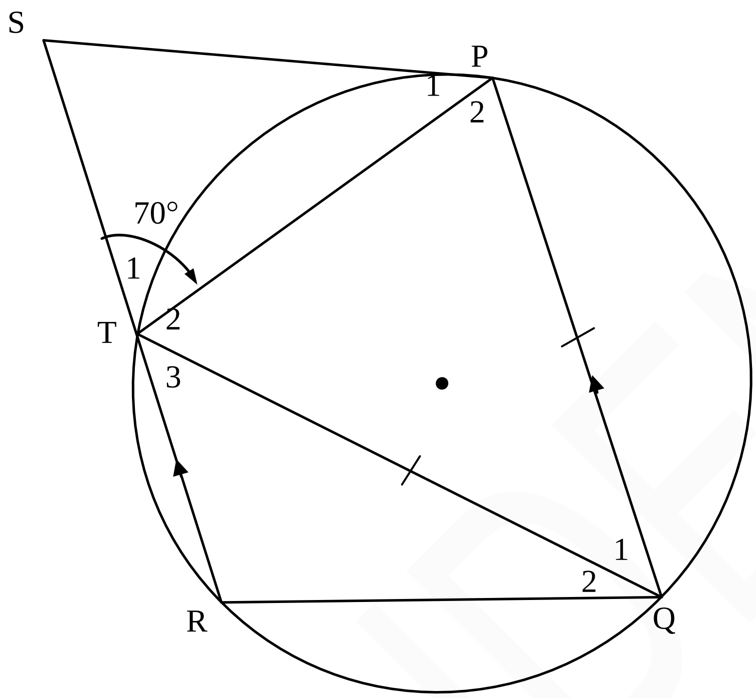


10.2.1	∠s in the same segment/ ∠*e in dieselfde sirkelsegment*	✓ R (1)
10.2.2	$\hat{P}_2 = \hat{S}_1 = y$ [∠s opp equal sides/∠*e teenoor = sye*] $\hat{S}_1 = \hat{P}_3 = y$ [tan chord theorem/*raakl-koordst*] $\therefore\ \hat{P}_2 = \hat{P}_3$ $\therefore$ PQ bisects $T\hat{P}S$	✓ S ✓ R ✓ S ✓ R (4)
10.2.3	$P\hat{O}Q = 2\hat{S}_1 = 2y$ [∠at centre =2×∠at circ/*midpts∠= 2×omtreks∠*]	✓ S ✓ R (2)
10.2.4	$T\hat{P}A = \hat{P}_2 + \hat{P}_3 = 2y$ [proved/*bewys* in 11.2.2] $\therefore\ T\hat{P}A = P\hat{O}Q$ [proved/*bewys* in 11.2.3] $\therefore$ PT = tangent [converse tan chord theorem/*omgek raakl-koordst*]	✓ $T\hat{P}A = P\hat{O}Q$ ✓ R (2)

10.2.5	$\hat{OPQ} + \hat{OQP} = 180° - 2y$ [sum of/*sum v* ∠s/*e* in Δ] $\therefore\ \hat{OQP} = 90° - y$ [∠s opp equal sides/∠*e to = sye;* OP = OQ] In ΔPAQ: $\hat{OQP} + \hat{P}_2 + \hat{QAP} = 180°$ $90° - y + y + \hat{QAP} = 180°$ [sum of/*sum v* ∠s/*e* in Δ] $\hat{QAP} = 90°$ $\therefore\ \hat{OAP} = 90°$ [∠s/*e* on straight line/*op reguitlyn*]	✓ S ✓ S ✓ R ✓ S ✓ S (5)
	OR/*OF*	
	$\hat{OPT} = 90°$ [radius ⊥ tangent/*raaklyn*] $\therefore\ \hat{P}_1 = 90° - 2y$ $\hat{P}_1 + \hat{O} + \hat{OAP} = 180°$ [sum of/*sum v* ∠s/*e* in Δ] $(90° - 2y) + 2y + \hat{OAP} = 180°$ $\therefore\ \hat{OAP} = 90°$	✓ S ✓ R ✓ S ✓ S ✓ S (5)
	OR/*OF*	
	POSQ is a kite/'*n vlieër* ∴ OQ ⊥ PS [diag of a kite/*hoeklyne v vlieër*] $\therefore\ \hat{OAP} = 90°$	✓✓✓ S ✓✓ R (5)
	OR/*OF*	
	In ΔOAP and ΔOAS OP = OS (radii) OA is common $\hat{POA} = 2y$ $= 2\hat{P}_2$ $= \hat{QOS}$ ΔOAP ≡ ΔOAS (SAS) $\hat{OAP} = \hat{OAS}$ (≡Δs) $\hat{OAP} = \hat{OAS} = 90°$ (∠s on str line)	✓ S ✓ S ✓ S ✓ R ✓ S (5) **[19]**

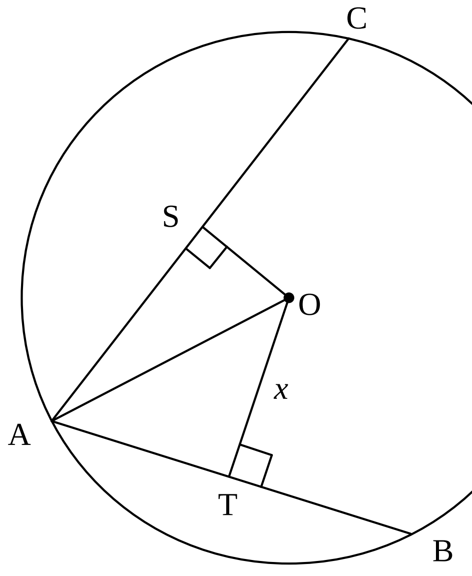
QUESTION/*VRAAG* 8

8.1



8.1.1	Alternate angles / *verwiss hoeke*, PQ ǁ SR		✓ R (1)
8.1.2(a)	$\hat{T}_2 = 70°$ $\therefore \hat{Q}_1 = 180° - 2(70°)$ $= 40°$	[∠s opp = sides/∠*e teenoor = sye*] [∠s/*e* Δ = 180°]	✓ S ✓R ✓ answer (3)
8.1.2(b)	$\hat{P}_1 = 40°$	[tangent chord th/*raakl-koordst*]	✓ S ✓R (2)

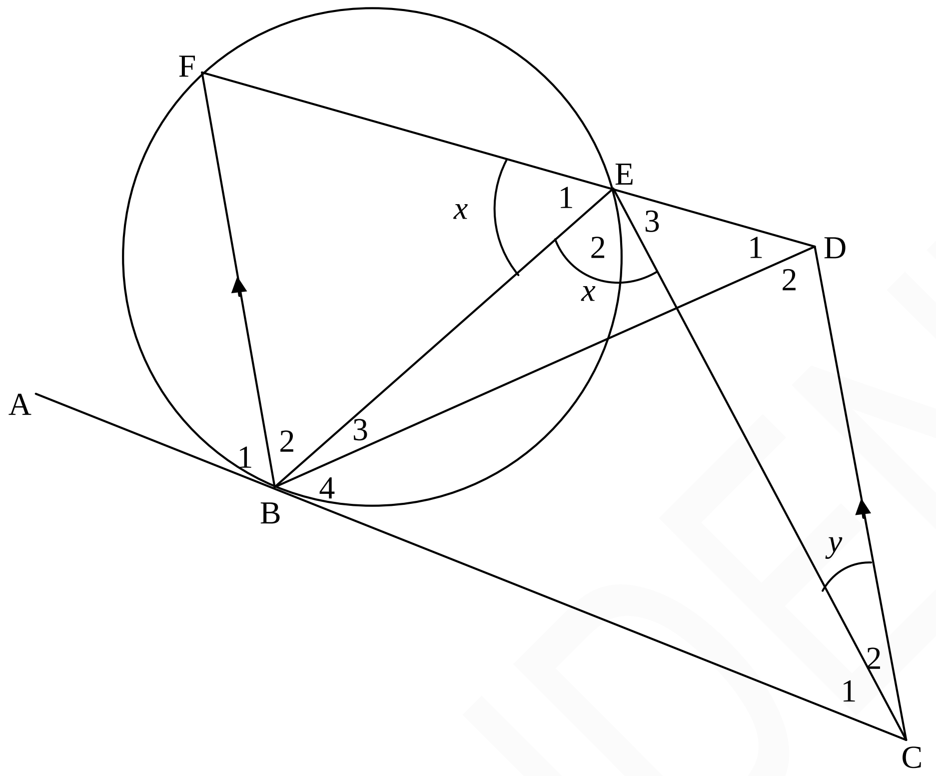
8.2



8.2.1	AT = 20 [line from centre ⊥ to chord/*lyn vanaf midpt ⊥ koord*]	✓S (1)
8.2.2	$AO^2 = OS^2 + AS^2$ [Pyth : ΔAOS] $OT^2 + AT^2 = OS^2 + AS^2$ [Pyth : ΔAOT] But AS = 24 [line from centre ⊥ to chord/*lyn vanaf midpt ⊥ koord*] $OT^2 + 400 = \left(\frac{7}{15}OT\right)^2 + 576$ $176 = \frac{176}{225}OT^2$ $OT^2 = 225$ $OT = 15$ $\therefore AO = \sqrt{225+400}$ $= 25$ **OR/OF** Let OS = 7, then OT = 15 In ΔAOT: $AO^2 = 20^2 + 15^2$ $= 625$ $AO = 25$ In ΔAOS: $AO^2 = 24^2 + 7^2$ $= 625$ $AO = 25$ $\therefore$ OA = 25 **OR/OF**	✓ equating ✓ AS = 24 ✓ substitution $OS = \frac{7}{15}OT$ ✓ OT ✓ radius (5) ✓✓ testing in ΔAOT ✓✓ testing in ΔAOS ✓conclusion (5)

	$AO^2 = OS^2 + AS^2$ [Pyth : ΔAOS] $OT^2 + AT^2 = OS^2 + AS^2$ [Pyth : ΔAOT] Let OT = $15x$. Then OS = $7x$ But AS = 24 [line from centre ⊥ to chord/*lyn vanaf midpt ⊥ koord*] $(15x)^2 + 400 = (7x)^2 + 576$ $225x^2 + 400 = 49x^2 + 576$ $176x^2 = 176$ $x = 1$ $\therefore AO = \sqrt{225+400}$ $= 25$	✓ equating ✓ AS = 24 ✓ substitution ✓ $x = 1$ ✓ radius (5)
	OR/OF AS = 24 [line from centre ⊥ to chord/*lyn vanaf midpt ⊥ koord*] $AO^2 = OS^2 + AS^2$ [Pyth : ΔAOS] $= \left(\frac{7}{15}OT\right)^2 + AS^2$ $AO^2 = \frac{49}{225}(AO^2 - 20^2) + 24^2$ [Pyth : ΔAOT] $\frac{176}{225}AO^2 = \frac{4400}{9}$ $AO^2 = 625$ $AO = 25$	✓ AS = 24 ✓ substitution $OS = \frac{7}{15}OT$ ✓ equating ✓ subst Pyth ✓ radius (5) **[12]**

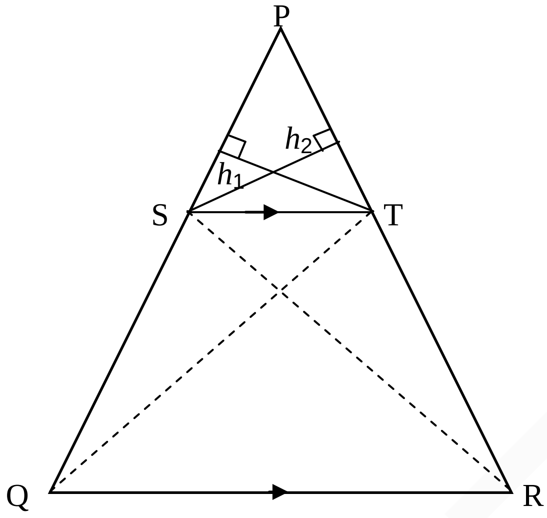
QUESTION/*VRAAG* 9



9.1.1	tangent chord theorem/*raaklyn-koordstelling*	✓ R (1)
9.1.2	corresponding/*ooreenkomstige* ∠s/*e*; FB ∥ DC	✓ R (1)
9.2	$\hat{E}_1 = B\hat{C}D$ $\therefore$ BCDE = cyclic quad [converse ext ∠ cyc quad/*omgek: buite∠kdvh*]	✓ S ✓ R (2)
9.3	$\hat{D}_2 = \hat{E}_2$ [∠*s* in the same segment/∠*e in dies segment*] $\hat{D}_2 = F\hat{B}D$ [alt ∠*s*, BF∥CD/*verwiss* ∠*e*,*BF*∥*CD*]	✓ S ✓ S (2)
9.4	$\hat{B}_3 = y$ *OR* $\hat{B}_3 = \hat{C}_2$ [∠s in the same segment/∠*e in dies segment*] $\hat{B}_2 = x - y$ *OR* $\hat{B}_3 + \hat{B}_2 = x$ [from 9.3 and 9.4] $\hat{C}_1 = x - y$ [from 9.2 and 9.3] $\therefore \hat{B}_2 = \hat{C}_1$ **OR/*OF*** In ΔBFE and ΔBEC $\hat{E}_1 = \hat{E}_2$ [$= x$] $\hat{F} = \hat{B}_3 + \hat{B}_4$ [tan - chord theorem] $\therefore \Delta BFE /// \Delta CBE$ [∠, ∠, ∠] $\therefore \hat{B}_2 = \hat{C}_1$	✓ S ✓ S ✓ S (3) ✓ identifying Δ's ✓ S ✓ S (3) **[9]**

QUESTION/*VRAAG* 10

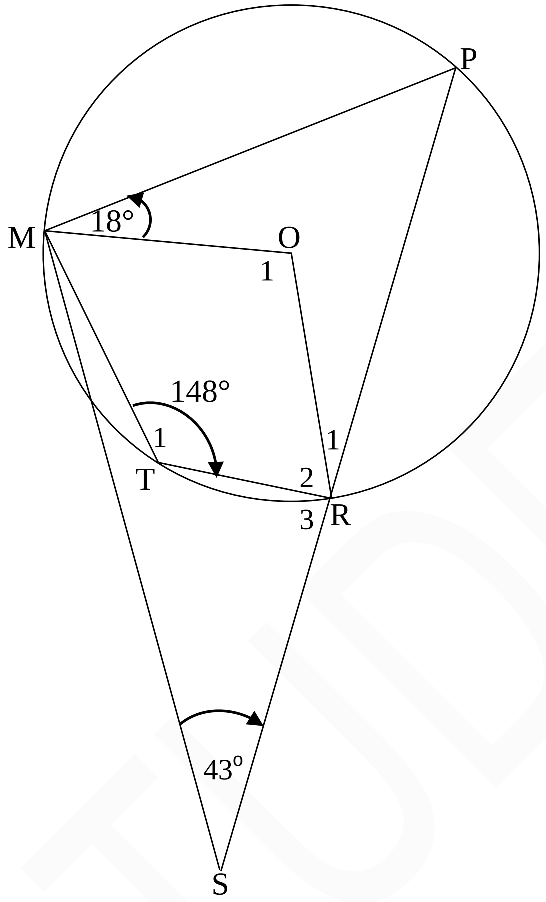
10.1



10.1	Constr : Join S to R and T to Q and draw h_1 from S $\perp$ PT and h_2 from T $\perp$ PS/ *Verbind SR en TQ en trek h_1 van S $\perp$ PT en h_2 van T $\perp$ PS*]	✓ constr/*konstruksie*
	Proof :	
	$\frac{\text{area } \Delta PST}{\text{area } \Delta QST} = \frac{\frac{1}{2} PS \times h_2}{\frac{1}{2} SQ \times h_2} = \frac{PS}{SQ}$ equal altitudes	✓ $\frac{\text{area } \Delta PST}{\text{area } \Delta QST} = \frac{\frac{1}{2} PS \times h_2}{\frac{1}{2} SQ \times h_2}$
	$\frac{\text{area } \Delta PST}{\text{area } \Delta STR} = \frac{\frac{1}{2} PT \times h_1}{\frac{1}{2} TR \times h_1} = \frac{PT}{TR}$ equal altitudes	✓ $\frac{\text{area } \Delta PST}{\text{area } \Delta STR} = \frac{PT}{TR}$
	area ΔPST = area ΔPST [common]	
	But area ΔQST = area ΔSTR [same base, height; ST || QR]	
	$\therefore \frac{\text{area } \Delta PST}{\text{area } \Delta QST} = \frac{\text{area } \Delta PST}{\text{area } \Delta STR}$	✓ S ✓ R
	$\therefore \frac{PS}{SQ} = \frac{PT}{TR}$	✓ S
		(6)

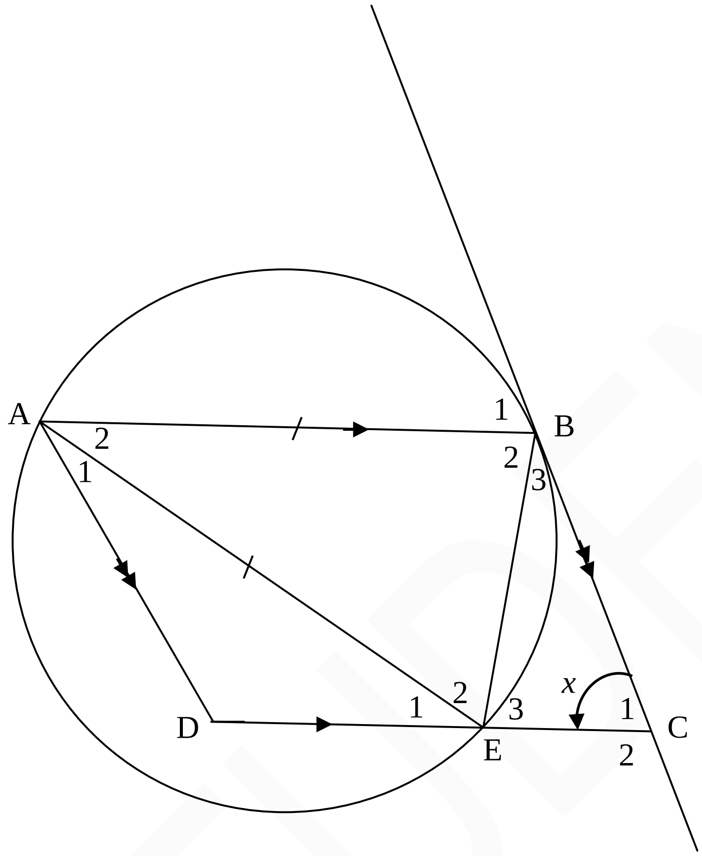
QUESTION/*VRAAG* 8

8.1



8.1.1	$\hat{P} = 32°$ [opp ∠s of cyclic quad/*teenoorst∠e v koordevh*]	✓ S ✓ R (2)
8.1.2	$\hat{O}_1 = 2(32°) = 64°$ [∠ centre = 2 ∠ at circum/*midpts∠ = 2 omtreks∠*] **OR/*OF*** reflex $\hat{O} = 296°$ [∠ centre = 2 ∠ at circum/*midpts∠ = 2 omtreks∠*] $\hat{O}_1 = 64°$ [∠s around a point/*∠e om 'n punt*]	✓ S ✓R (2) ✓ S and R ✓ S (2)
8.1.3	$O\hat{M}S = 180° - (32° + 18° + 43°)$ [sum ∠s Δ / *som ∠e Δ*] $= 87°$	✓ S ✓ S (2)
8.1.4	$\hat{R}_3 = T\hat{M}P$ [ext ∠ cyclic quad/*buite ∠ koordevh*] $= 87° + 18° - 6°$ $= 99°$	✓ R ✓ S (2)

8.2

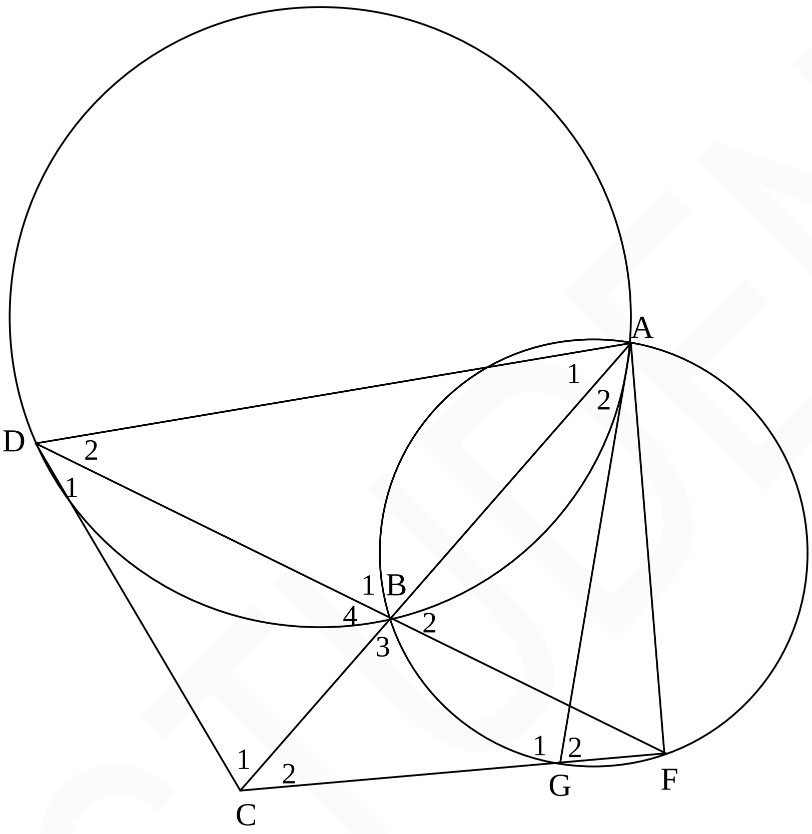


8.2.1	corres $\angle$s/*ooreenk* $\angle e$; AB || DC	✓ R (1)
8.2.2	$\hat{E}_2 = x$ [tan - chord theorem/*raakl – koordst*] $\hat{B}_2 = x$ [$\angle$s opp = sides/$\angle e$ *teenoor = sye*] $\hat{E}_3 = x$ [alt $\angle$s/*verwiss* $\angle e$; AB || DC] $D\hat{A}B = x$ [opp $\angle$s $\|\|^m$ /*teenoor* $\angle e$ $\|\|^m$ **OR/*OF*** alternate/*verwiss* $\angle$s/*e*; BC ||AD] Any 3 $\angle$s correct	✓S ✓R ✓ S ✓ R ✓ S ✓ R (6)
8.2.3	$\hat{D} = 180° - x$ [co - int $\angle$s suppl/*ko – binne$\angle e$* suppl; AD || BC] $\therefore \hat{B}_2 + \hat{D} = 180°$ $\therefore$ ABED a cyc quad/*kdvh* [converse opp $\angle$s of cyclic quad/ *omgek teenoorst $\angle e$ koordevh*] **OR/*OF*** $D\hat{A}B = x$ [opp $\angle$s/*teenoor* $\angle e$ $\|\|^m$] OR/*OF* [alt$\angle$s/*verwiss* $\angle e$; BC || AD] $\hat{E}_3 = D\hat{A}B = x$ $\therefore$ ABED a cyc quad/*kdvh* [converse ext $\angle$ of cyc quad/*omgek buite$\angle$ v koordevh*]	✓S ✓ R ✓ R (3) ✓S ✓ R ✓ R (3) **[18]**

QUESTION/*VRAAG* 9

9.1	… in the alternate segment/…*in die(teen)oorstaande segment*	✓ answer (1)

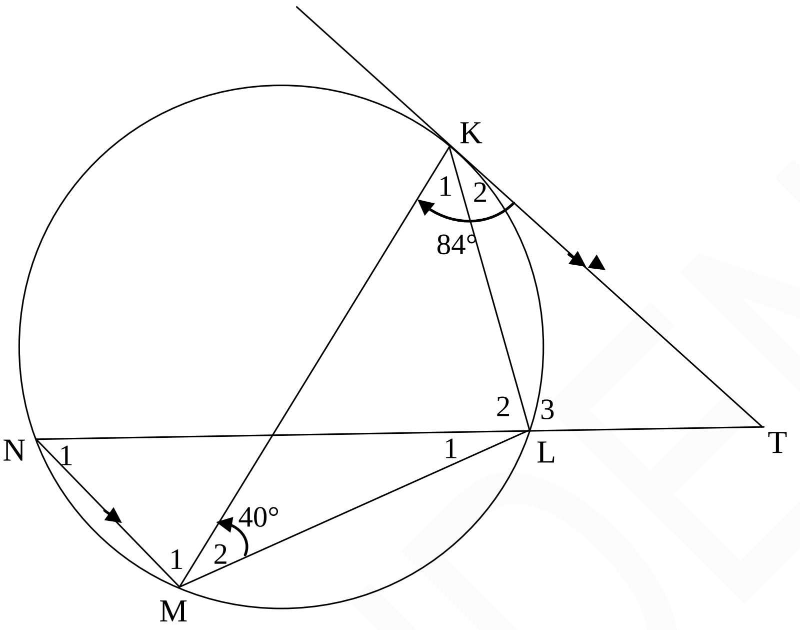
9.2



9.2.1	$\hat{A}_1 = \hat{D}_1$ [tan chord theorem/*raakl – koordst*] $\hat{B}_4 = \hat{A}_1 + \hat{D}_2$ [ext ∠ Δ/*buite∠ Δ*] $= \hat{D}_1 + \hat{D}_2$	✓S ✓ R ✓ S ✓ R (4)
9.2.2	$\hat{B}_4 = \hat{B}_2$ [vert opp ∠s/*regoorst ∠e*] $\hat{D}_1 + \hat{D}_2 = \hat{B}_2$ [proven/*bewys*] $= \hat{G}_2$ [∠s in same segment/∠e *in dies segment*] ∴ AGCD is cyc quad/*kvh* [converse ext∠ cyc quad/*omgek buite∠ kvh*]	✓ S ✓ S ✓ R ✓ R (4)
9.2.3	$\hat{D}_1 = \hat{A}_2$ [∠s in same segment/∠*e in dies segment*] $\hat{A}_2 = \hat{F}$ [∠s in same segment/∠*e in dies segment*] $\therefore \hat{D}_1 = \hat{F}$ ∴ DC = CF [sides opp = ∠s/*sye teenoor = ∠e*]	✓ S ✓ R ✓ S ✓ R (4) **[13]**

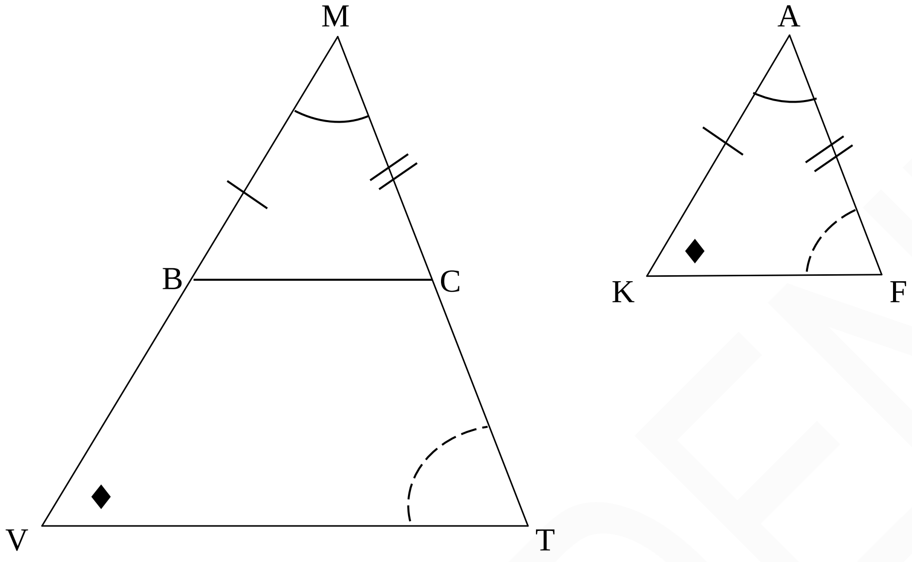
QUESTION/*VRAAG* 8

8.1



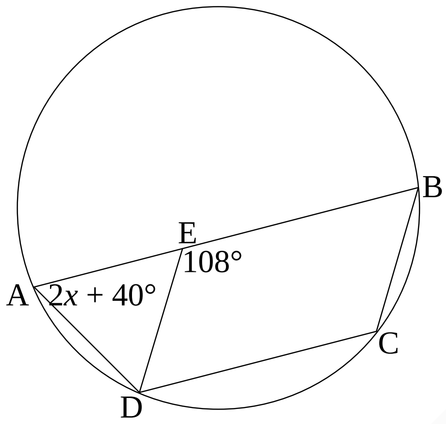
8.1.1	$\hat{K}_2 = \hat{M}_2 = 40°$ [tan chord theorem/*raakl-kdst*]	✓S ✓R (2)
8.1.2	$\hat{N}_1 = \hat{K}_1$ [∠s in the same seg/∠*e in dies segm*] $\hat{K}_1 = 84° - 40° = 44°$ $\therefore \hat{N}_1 = 44°$	✓S ✓R ✓S (3)
8.1.3	$\hat{T} = \hat{N}_1 = 44°$ [alt/*verw* ∠s/*e*; KT | | NM]	✓S ✓R (2)
8.1.4	$\hat{L}_2 = \hat{K}_2 + \hat{T}$ [ext ∠ of Δ/*buite* ∠ *v* Δ] $= 40° + 44°$ $= 84°$	✓R ✓S (2)
8.1.5	In ΔKLM: $44° + 84° + 40° + \hat{L}_1 = 180°$ [∠s sum in Δ/∠*e som in* Δ] $\therefore \hat{L}_1 = 12°$	✓S (1)

QUESTION/*VRAAG* 10



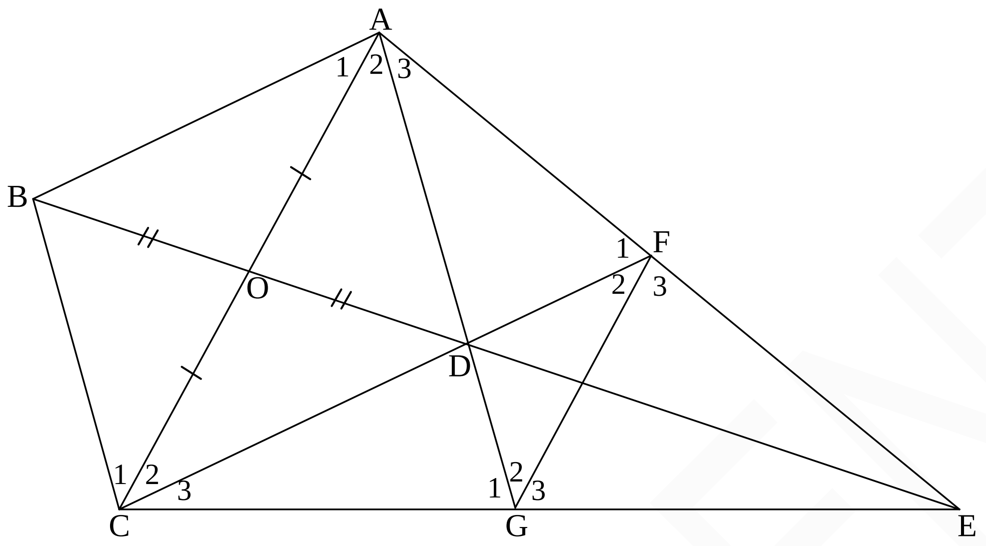
10.1	Constr/*Konstr* : Draw line BC such that MB = AK and MC = AF *Trek lyn BC sodat MB = AK en MC = AF* Proof/*Bewys* : In ΔBMC and/*en* ΔKAF MB = AK [constr/*konstr*] $\hat{M} = \hat{A}$ [given/*gegee*] MC = AF [constr/*konstr*] ΔBMC ≡ ΔKAF [s ∠ s] $\therefore M\hat{B}C = A\hat{K}F$ or $M\hat{C}B = A\hat{F}K$ [≡ Δ] but /*maar* $\hat{V} = \hat{K}$ or $\hat{T} = \hat{F}$ [given/*gegee*] $\therefore M\hat{B}C = \hat{V}$ or $M\hat{C}B = \hat{T}$ But these are corresponding ∠s/*maar hulle is ooreenk ∠e* ∴ BC || VT [corr ∠s = /*ooreenk∠e* =] $\therefore \frac{MV}{MB} = \frac{MT}{MC}$ [prop theorem/*eweredighst*; BC || VT] but /*maar* MB = AK and MC = AF [constr/*konstr*] $\therefore \frac{MV}{AK} = \frac{MT}{AF}$	✓ constr/*konstr* ✓ S / R ✓ S ✓ S ✓ S / R ✓S ✓R (7)

8.2



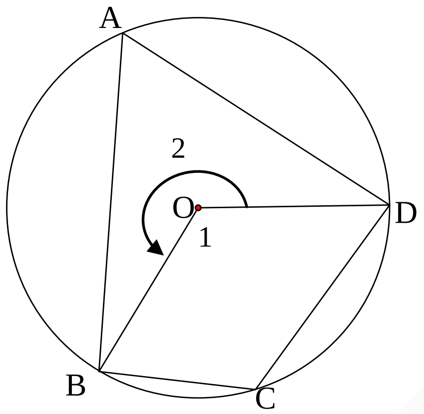
8.2	$\hat{C} = 108°$ [opp∠s of ‖m/*tos ∠e v* ‖*m*] $2x + 40° + 108° = 180°$ [opp∠s of cyc quad/*tos∠e v kdvh*] $2x = 32°$ $x = 16°$ **OR/*OF*** $\hat{C} = 180° - (2x + 40°)$ [opp∠s of cyc quad/*tos∠e v kdvh*] $180° - (2x + 40°) = 108°$ [opp∠s of ‖m/*tos ∠e v* ‖*m*] $2x = 32°$ $x = 16°$	✓S ✓R ✓S ✓R ✓answ/*antw* (5) ✓S ✓R ✓S ✓R ✓answ/*antw* (5) **[15]**

QUESTION/*VRAAG* 9



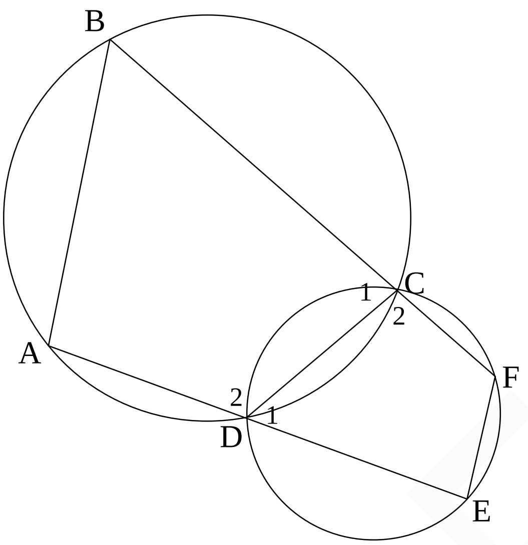
9.1	ABCD is a ‖m [diags of quad bisect each other/ *hoekl v vh halveer mekaar*]	✓ R (1)
9.2	$\frac{ED}{DB}=\frac{FE}{AF}$ [Prop Th/*Eweredigh st*; DF || BA] $\frac{ED}{DB}=\frac{GE}{CG}$ [Prop Th/*Eweredigh st*; DG || BC]	✓S ✓ R ✓S ✓ R (4)
9.3	$\frac{FE}{AF}=\frac{GE}{CG}$ [proved/*bewys*] $\therefore$ AC || FG [line divides two sides of Δ in prop/ *lyn verdeel 2 sye van Δ eweredig*] $\hat{C}_2=\hat{F}_2$ [alt/*verw* ∠s/*e*; AC || FG] $\hat{A}_1=\hat{C}_2$ [alt/*verw* ∠s/*e*; AB || CD] $\therefore\ \hat{A}_1=\hat{F}_2$	✓S ✓ S ✓R ✓S ✓ S (5)
9.4	$\hat{A}_1=\hat{A}_2$ [diags of rhombus/*hoekl v ruit*] $\hat{A}_2=\hat{F}_2$ [$\hat{A}_1=\hat{F}_2$] $\therefore$ ACGF = cyc quad/*kdvh* [∠s in the same seg =/ *∠e in dies segm* =] **OR/*OF*** $\hat{C}_2=\hat{A}_2$ [∠s opp equal sides of rhombus/ *∠e to gelyke sye v ruit*] $\hat{A}_2=\hat{G}_2$ [alt/*verw*-∠s/*e*; AC || FG] $\therefore\ \hat{C}_2=\hat{G}_2$ $\therefore$ ACGF is a cyc quad/*kdvh* [∠s in the same seg =/ *∠e in dies segm* =]	✓S ✓ S ✓R (3) ✓S ✓ S ✓R (3) **[13]**

QUESTION/*VRAAG* 8



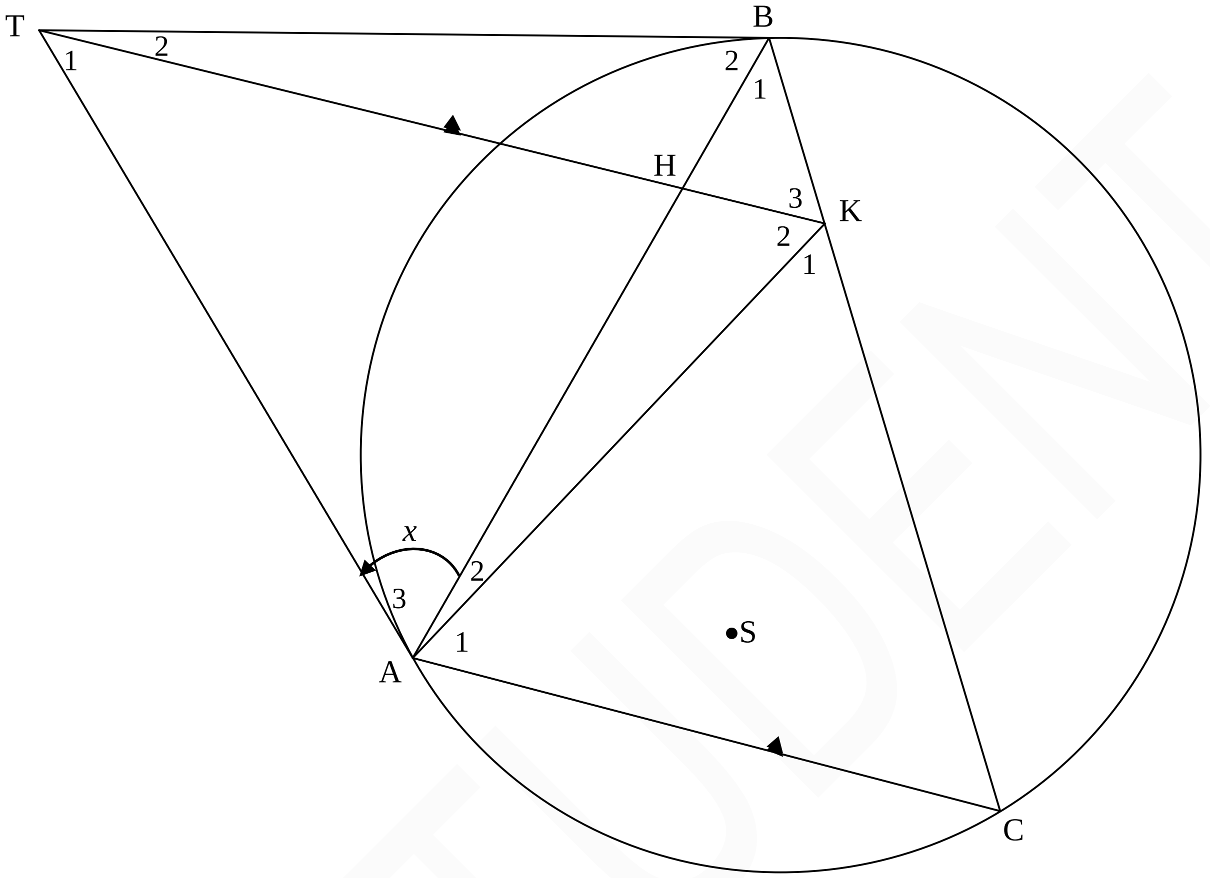
8.1.1	twice or double /*twee keer of dubbel*	✓ R (1)
8.1.2	$\hat{O}_1 = 2\hat{A}$ [∠ at centre = 2×∠ at circ/*midpts∠ =2×omtreks∠*] $\hat{O}_2 = 2\hat{C}$ [∠ at centre = 2×∠ at circ/*midpts∠ =2×omtreks∠*] $\hat{O}_1 + \hat{O}_2 = 360°$ [∠s in a rev/*∠e in omw of om 'n pt*] $2\hat{A} + 2\hat{C} = 360°$ $\therefore \hat{A} + \hat{C} = 180°$ **OR/OF** Let/*Gestel* $\hat{O}_1 = 2x$ $\hat{A} = x$ [∠ at centre = 2×∠ at circ/*midpts∠ =2×omtreks∠*] $\hat{O}_2 = 360° - 2x$ [∠s in a rev/*∠e in omw of om 'n pt*] $\hat{C} = 180° - x$ [∠ at centre = 2×∠ at circ/*midpts∠ =2×omtreks∠*] $\therefore \hat{A} + \hat{C} = 180°$	✓ S ✓ S ✓ S (3) ✓ S ✓ S ✓ S (3)

8.2



8.2	$\hat{A} = \hat{C}_2$ [ext ∠ of cyclic quad/*buite∠ v kdvh*] $\hat{E} = 180° - \hat{C}_2$ [opp ∠s of cyclic quad/*tos∠e v kdvh*] $\therefore\ \hat{E} = 180° - \hat{A}$ $\therefore$ EF || AB [co-interior ∠s 180°/*ko-binne∠e 180°*] **OR/*OF*** $\hat{B} = \hat{D}_1$ [ext ∠ of cyclic quad/*buite∠ v kdvh*] $\hat{F} = 180° - \hat{D}_1$ [opp ∠s of cyclic quad/*tos∠e v kdvh*] $\therefore\ \hat{F} = 180° - \hat{B}$ $\therefore$ EF || AB [co-interior ∠s 180°/*ko-binne∠e 180°*]	✓ S ✓ R ✓ S ✓ R ✓ R (5) ✓ S ✓ R ✓ S ✓ R ✓ R (5) **[9]**

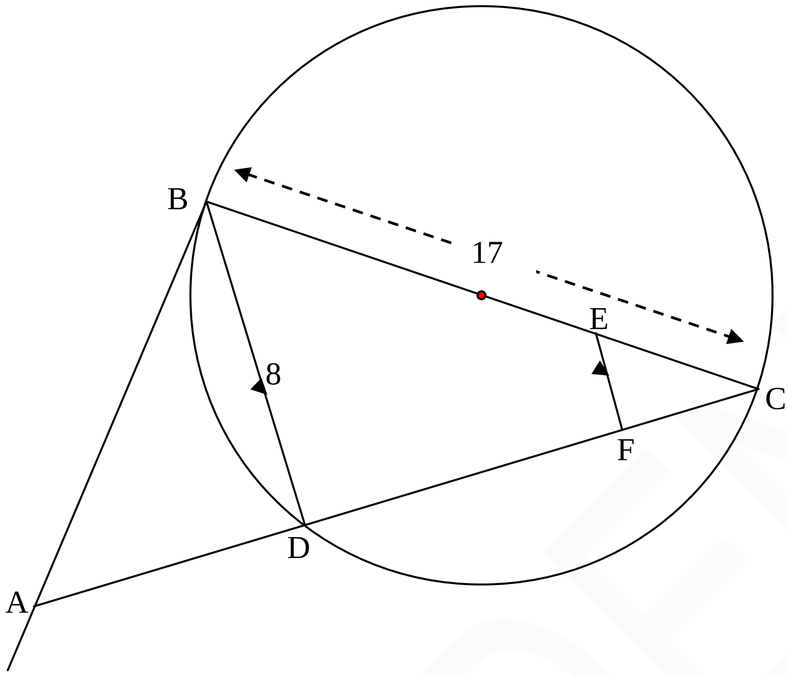
QUESTION/*VRAAG* 9



9.1	$\hat{K}_3 = \hat{C}$ $= \hat{A}_3$ $= x$	[corresp ∠s/*ooreenk ∠e* ; CA||KT] [tan-chord th/*raakl-koordst*]	✓ S ✓ R ✓ S ✓ R (4)
9.2	$\hat{K}_3 = x = \hat{A}_3$ ∴ AKBT is cyc quad	[proved/*bewys* in 9.1] [line (BT) subtends equal ∠s/ *lyn (BT) onderspan gelyke ∠e*] **OR/OF** [converse ∠s in same segment/ *omgek ∠e in dies segment*]	✓ S ✓ R (2)
9.3	$\hat{K}_3 = \hat{C}$ $= \hat{B}_2$ $= \hat{K}_2$ ∴ TK bisects/*halveer* $A\hat{K}B$ **OR/*OF*** $\hat{K}_2 = \hat{B}_2$ $= \hat{A}_3$	[proven in 9.1] [tan-chord th/*raakl-koordst*] [∠s in the same segm/*∠e in dies segm*] [∠s in the same seg/*∠e in dies segm*] [tans from same pt; ∠s opp equal sides/ *rkle v dies pt; ∠e to gelyke sye*]	 ✓ S ✓ R ✓ S ✓ R (4) ✓ S ✓ R ✓ S ✓ R

	$\therefore \quad = \hat{K}_3$ [proven in 9.1] $\therefore$ TK bisects/*halveer* $A\hat{K}B$	(4)
9.4	$\hat{A}_3 = \hat{K}_2 = x$ [proven/*bewys*] $\therefore$ TA tangent [converse tan chord theorem OR $\angle$ between line and chord/ *omgekeerde raakl-kdst* ***OF*** $\angle$ *tussen lyn en koord*]	✓ S ✓ R (2)
9.5	$B\hat{S}A = B\hat{K}A = 2x$ [A,S,K & B concyclic/*konsiklies*] $A\hat{T}B = 180° - 2x$ [A,T,B & K concyclic/*konsiklies*] $\therefore$ points A, S, B and T are also concyclic/*punte A, S, B en T is ook konsiklies* [opp $\angle$s of quad = 180°/*tos* $\angle$*e van vierhoek=180°*]	✓ S (both/*beide* statements/ *bewerings*) ✓ R (2)
	OR/*OF*	
	A, S K and B are concyclic. A, K, B and T are concyclic. $\therefore$ A, S, B and T are concyclic.	✓ S ✓ S (2)
	OR/*OF*	
	The circle passing through points A, K and B contains the point S on the circumference (A, ,S, K and B concyclic)./*Die sirkel deur punt A, K en B bevat die punt S op die omtrek (A, S, K en B konsiklies).*	✓ S
	The circle passing through A, K and B contains the point T on the circumference (proven in 9.2)./*Die sirkel deur punt A, K en B bevat die punt T op die omtrek (bewys in 9.2).* $\therefore$ points A, S, B and T are also concyclic/*punte A, S, B en T is konsiklies*	✓ S (2) **[14]**

QUESTION/*VRAAG* 10

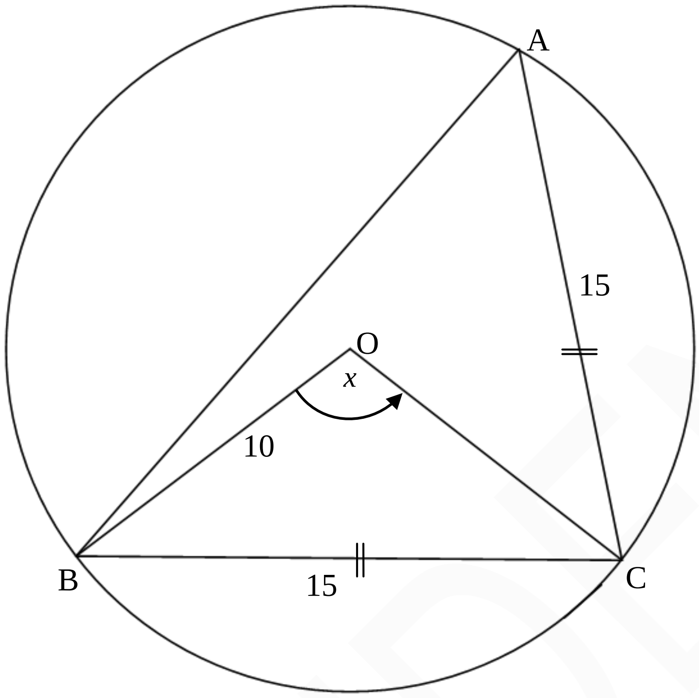


10.1	$B\hat{D}C = 90°$ $DC^2 = 17^2 - 8^2$ $= 225$ $\therefore$ DC = 15	[∠ in semi circle/∠ *in halfsirkel*] [Th of/*stelling v* Pythagoras]	✓ S ✓ using/*gebruik* Pyth *korrek/* correctly ✓ answ/*antw* (3)
10.2.1	$\frac{CF}{CD} = \frac{CE}{CB}$ $\therefore \frac{CF}{15} = \frac{1}{4}$ $\therefore$ CF = 3,75	[line | | one side of Δ/*lyn* | | *een sy van* Δ] **OR/OF** ΔCEF | | | ΔCBD	✓ S/R ✓ subst correctly/ *korrek* ✓ answ/*antw* (3)
10.2.2	$B\hat{D}C = 90°$ $E\hat{F}C = B\hat{D}C$ $A\hat{B}C = 90°$ In ΔBAC and/*en* Δ FEC: $A\hat{B}C = E\hat{F}C$ $\hat{C} = \hat{C}$ $\therefore$ ΔBAC | | | Δ FEC **OR/*OF*** $B\hat{D}C = 90°$ $E\hat{F}C = B\hat{D}C$ $A\hat{B}C = 90°$ In ΔBAC and/*en* Δ FEC: $A\hat{B}C = E\hat{F}C$ $\hat{C} = \hat{C}$	[∠ in semi circle/∠ *in halfsirkel*] [corresp ∠s/*ooreenk* ∠*e*; EF| |BD] [tan ⊥ diameter/*raakl* ⊥ *middellyn*] [proven/bewys] [common/*gemeen*] [∠∠∠] [∠ in semi circle/∠ *in halfsirkel*] [corresp ∠s/*ooreenk* ∠*e*; EF| |BD] [tan ⊥ diameter/*raakl* ⊥ *middellyn*] [proven/bewys] [common/*gemeen*]	 ✓ S/R ✓ S ✓ R ✓ S ✓ R (5) ✓ S/R ✓ S ✓ R ✓ S

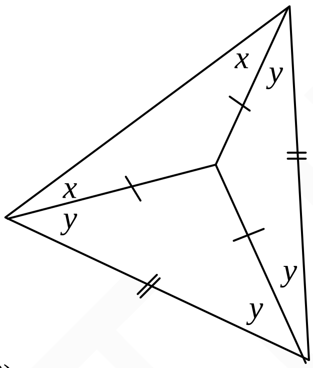
	$B\hat{A}C = F\hat{E}C$ [∠ sum in Δ/∠ *som van* Δ] $\therefore \Delta BAC \,\vert\vert\vert\, \Delta FEC$	✓ S (5)
10.2.3	$EC = \frac{1}{4} \times 17 = 4{,}25$ $\frac{AC}{EC} = \frac{BC}{FC}$ [ΔBAC ||| Δ FEC] $\frac{AC}{4{,}25} = \frac{17}{3{,}75}$ $\therefore AC = 19{,}27$ or/*of* $19\frac{4}{15}$	✓ length of/*lengte v* EC ✓ S ✓ subst correctly/ *korrek* ✓ answ/*antw* (4)
	OR/*OF* $\cos \hat{C} = \frac{CF}{CE} = \frac{BC}{AC}$ $\therefore \frac{3{,}75}{4{,}25} = \frac{17}{AC}$ $\therefore AC = 19{,}27$ or/*of* $19\frac{4}{15}$	✓✓ correct ratios/ *korrekte verh's* ✓ subst correctly/ *korrek* ✓ answ/*antw* (4)
	OR/*OF* $\Delta BCA \,\vert\vert\vert\, \Delta DBC$ $CB^2 = CD \,.\, AC$ $AC = \frac{BC^2}{DC}$ $= \frac{17^2}{15}$ $= 19{,}27$ or/*of* $19\frac{4}{15}$	✓ S **OR** Pyth th ✓ correct ratio ✓ subst ✓ answ/*antw* (4)
	OR/*OF* $\hat{C} = A\hat{B}D$ [tan-chord theorem/*rkl-kdstelling*] $\frac{AD}{8} = \tan A\hat{B}D$ $= \tan\hat{C}$ $= \frac{8}{15}$ $\therefore AD = \frac{64}{15}$ $\therefore AC = 19{,}27$ or/*of* $19\frac{4}{15}$	✓ S ✓ correct ratio ✓ subst ✓ answ/*antw* (4)

10.2.4	AC is diameter of the circle passing through A, B and C [chord subtends 90° **OR** converse $\angle$ in semi circle] *AC is middellyn van die sirkel wat deur die punte A, B en C gaan* [*koord onderspan 90°* ***OF*** *omgek* $\angle$ *in halfsirkel*] $\therefore$ radius = $\frac{1}{2}\times 19{,}27 = 9{,}63$ or/*of* $9\frac{19}{30}$ or/*of* $\frac{1}{2}$AC	✓ S/R ✓ answ/*antw* (2) **[17]**

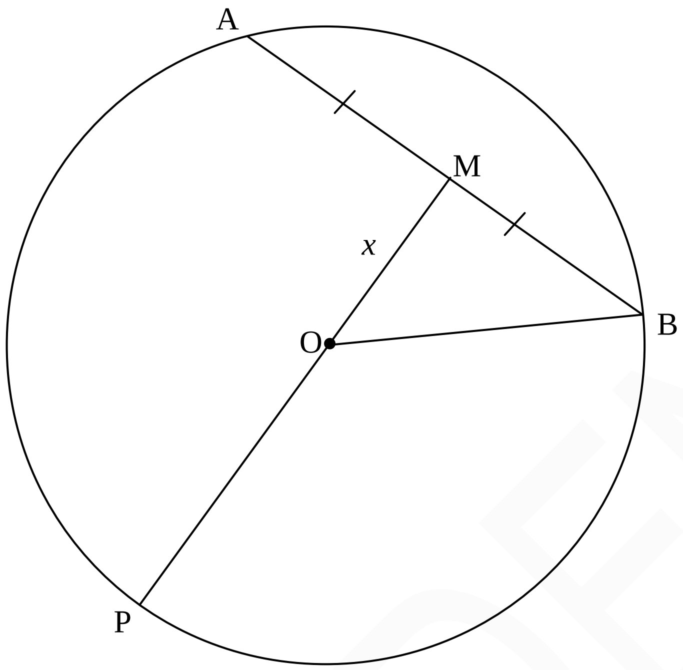
6.2



6.2.1	In ΔBOC: $BC^2 = BO^2 + CO^2 - 2.BO.\ CO\ .\cos x$ $15^2 = 10^2 + 10^2 - 2(10)(10).\ \cos x$ $200 \cos x = -25$ $\cos x = -0{,}125$ $x = 180° - 82{,}82°$ $= 97{,}18°$ **OR/*OF*** Draw a line OD$\perp$ BC: BD = DC (line from centre $\perp$ on chord) ΔOBD $\equiv$ ΔOCD (90°; h; s) $\sin \frac{x}{2} = \frac{7{,}5}{10}$ $\frac{x}{2} = 48{,}59°$ $\therefore\ x = 97{,}18°$	✓ using cosine rule/ *gebruik cos-reël* ✓correct subst/ *korrekte subst* ✓ $\cos x = -0{,}125$ ✓97,18° (4) ✓ S/R ✓correct ratio/ *korrekte verh* ✓ value of/*waarde van* $\frac{x}{2}$ ✓97,18° (4)

6.2.2	$B\hat{A}C = 48{,}59°$ ($\angle$ at centre=2×$\angle$at circ/$\angle$ *by midpt=2×$\angle$omt*) $A\hat{B}C = B\hat{A}C = 48{,}59°$ ($\angle$'s opp equal sides/$\angle$*e teenoor = sye*) $\therefore A\hat{C}B = 82{,}82°$ (sum of $\angle$s of Δ/*som van $\angle$e van Δ*) **OR/*OF*** $A\hat{C}B = \frac{1}{2}A\hat{O}B$ ($\angle$at centre = 2× $\angle$at circle) ($\angle$ *by midpt=2×$\angle$omt*) $= \frac{1}{2}[360° - 2(97{,}18°)]$ $= 82{,}82°$ **OR/*OF*** $O\hat{C}B = \frac{1}{2}(180° - 97{,}18°)$ ($\angle$'s opp equal sides; sum of $\angle$s of Δ) (*$\angle$e teenoor = sye; som van $\angle$e van Δ*) $= 41{,}41°$  $A\hat{C}B = 2(41{,}41°)$ $= 82{,}82°$	✓ S ✓ S ✓82,82° (3) ✓ S ✓ S ✓82,82° (3) ✓ S ✓ S ✓82,82° (3)
6.2.3	Area/*Oppervlakte* ΔABC $= \frac{1}{2}(BC)(AC)\sin A\hat{C}B$ $= \frac{1}{2}(15)(15)(\sin 82{,}82°)$ $= 111{,}62\ \text{cm}^2$	✓correct subst into area rule/*korrekte subst in opp-reël* ✓ $111{,}62\ \text{cm}^2$ (2) **[16]**

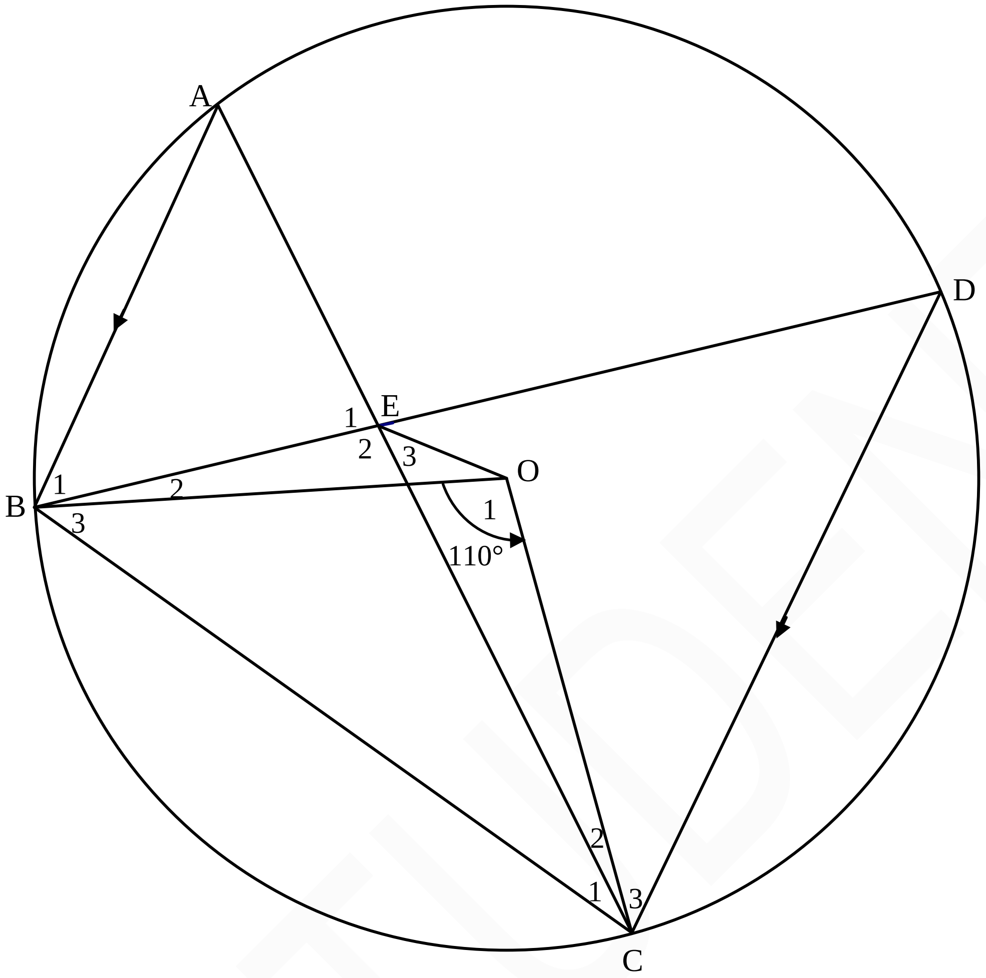
QUESTION/VRAAG 7



7.1	MB = 10 cm	✓ answer/*antw* (1)
7.2	line from centre to midpoint of chord is perpendicular to chord/*lyn vanaf midpt na midpt van koord is loodreg op koord* **OR/*OF*** line from centre bisects chord/*lyn vanaf midpt halveer koord*	✓ answer/*antw* (1) ✓ answer/*antw* (1)
7.3	$\frac{\text{MP}}{\text{OM}} = \frac{5}{2}$ $\frac{x + \text{OP}}{x} = \frac{5}{2}$ $2x + 2\text{OP} = 5x$ $\text{OP} = \frac{3x}{2}$ **OR/*OF*** $\frac{\text{OP}}{\text{OM}} = \frac{3}{2}$ $\text{OP} = \frac{3x}{2}$	✓ $\frac{x + \text{OP}}{x} = \frac{5}{2}$ ✓ $\text{OP} = \frac{3x}{2}$ (2) ✓ $\frac{\text{OP}}{\text{OM}} = \frac{3}{2}$ ✓ $\text{OP} = \frac{3x}{2}$ (2)

7.4	$OM^2 + MB^2 = OB^2$ $x^2 + 10^2 = \left(\frac{3x}{2}\right)^2$ $4x^2 + 400 = 9x^2$ $5x^2 = 400$ $x^2 = 80$ $x = 8{,}94$ or $4\sqrt{5}$ or $\sqrt{80}$	✓ subst into/*subst* Pythagoras ✓ $4x^2 + 400 = 9x^2$ ✓ answer/*antw* (3) **[7]**

QUESTION/VRAAG 8

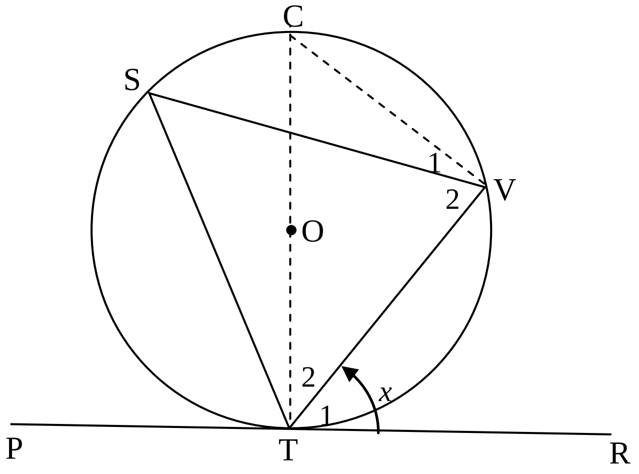


8.1.1	$\hat{D} = \frac{1}{2}\hat{O}_1 = 55°$ ($\angle$ at centre=2×$\angle$at circ/$\angle$ *by midpt=2×$\angle$by omt*)	✓S ✓R (2)
8.1.2	$\hat{A} = \frac{1}{2}\hat{O}_1 = 55°$ ($\angle$ at centre=2×$\angle$at circ/$\angle$ *by midpt=2×$\angle$by omt*) **OR/*OF*** $\hat{A} = \hat{D} = 55°$ ($\angle$s in same segment/$\angle$*e in dieselfde segment*)	✓S ✓R (2) ✓S ✓R (2)
8.1.3	$\hat{B}_1 = \hat{D} = 55°$ (alternate $\angle$s/*verwiss$\angle$e*; AB | | DC) $\hat{E}_2 = \hat{B}_1 + \hat{A}$ (ext$\angle$ ofΔ = sum of opp$\angle^s$/*buite$\angle$ vΔ=som v tos$\angle$e*) $= 55° + 55°$ $\hat{E}_2 = 110°$	✓S ✓R ✓R ✓ answer/*antw* (4)
8.2	$\hat{E}_2 = \hat{O}_1 = 110°$ (proven in/*bewys in* 8.1.3) BEOC is a cyclic quadrilateral (equal $\angle$s subtended by line/ *gelyke $\angle$e onderspan deur lyn*)	✓S ✓R (2) **[10]**

QUESTION/VRAAG 9

9.1	the interior opposite angle/*die teenoorstaande binnehoek.*	✓ answer/*antw* (1)

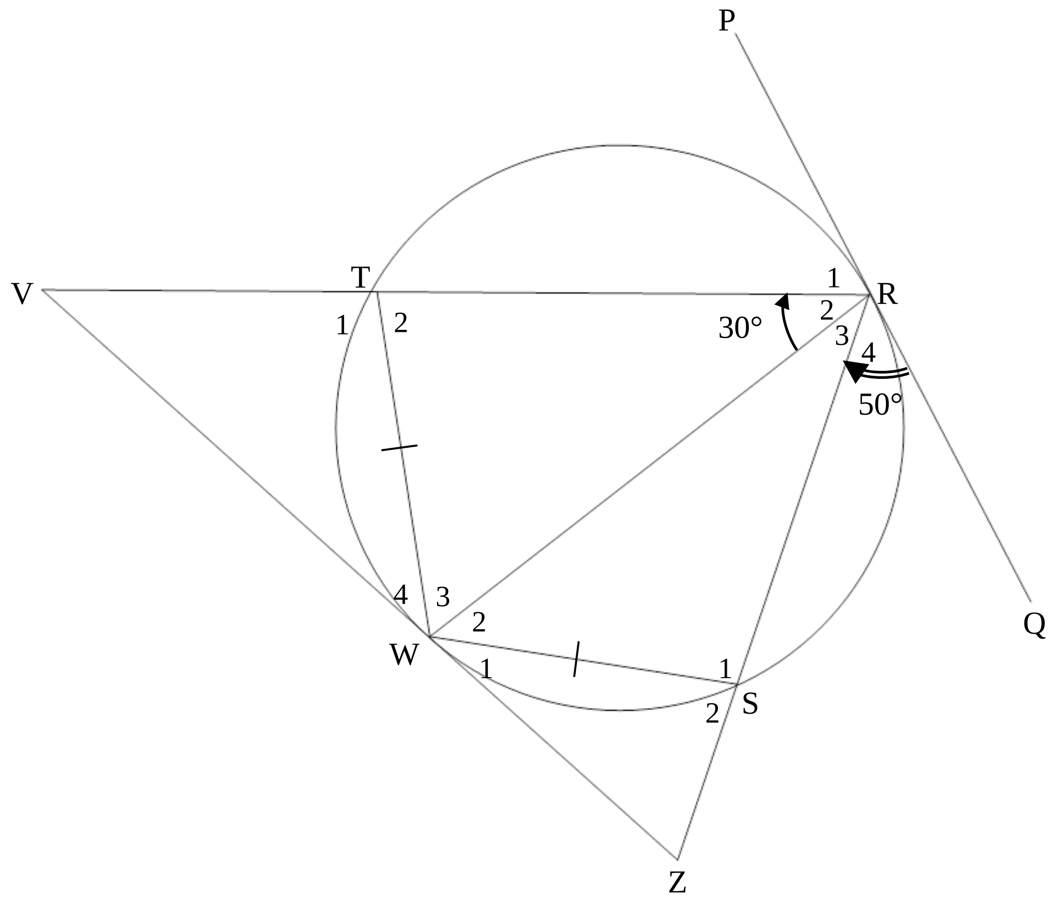
9.2



Construction: Draw diameter CT and join CV.
Konstruksie: Trek middellyn CT en verbind CV.

$\hat{V}_1 + \hat{V}_2 = \mathbf{90°}$	**∠ in semi-circle/∠*in halfsirkel***	✓ S ✓ R
$\hat{T}_2 = 90° - x$	**Tangent ⊥ diameter/radius/*raaklyn ⊥ middellyn/radius***	✓ R
$\therefore \hat{C} = \boldsymbol{x}$	Sum of the angles of triangle/*Som van die hoeke van 'n driehoek*	✓ S
$\therefore \hat{S} = x$	**∠'s same segment/∠*e in dieselfde segment***	✓ R
$\therefore V\hat{T}R = \hat{S}$		(5)

9.3

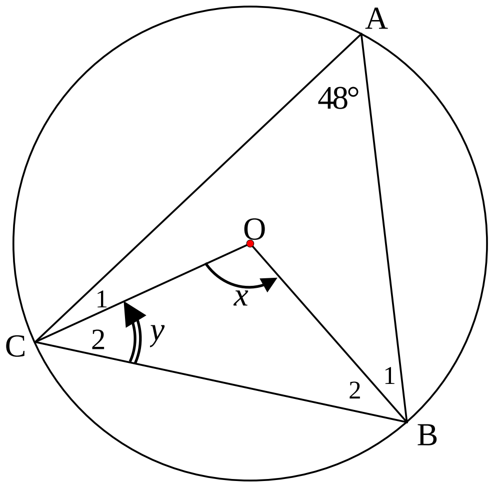


9.3.1	Equal chords subtend equal ∠s/*Gelyke koorde onderspan gelyke ∠e*	✓ R (1)
9.3.2	$\hat{W}_4 = 30°$ (tan chord theorem/*rkl-koordst*) $\hat{W}_1 = 30°$	✓ answer/*antw* ✓ reason/*rede* ✓ answer/*antw* (3)
9.3.3(a)	$\hat{R}_4 = \hat{W}_2 = 50°$ (tan chord theorem/*rkl-koordst*) $\hat{S}_2 = \hat{R}_3 + \hat{W}_2$ (ext∠ of Δ/*buite ∠ v Δ*) $\therefore \hat{S}_2 = 80°$ **OR/*OF*** $\hat{R}_2 = \hat{R}_3 = 30°$ (= chords subtend =∠s /= *kde onderspan=∠e*) $\hat{R}_4 = \hat{W}_2 = 50°$ (tan chord theorem/*rkl-koordst*) $\therefore \hat{S}_2 = 80°$	✓ S ✓R ✓ S (3) ✓ S ✓R ✓ S (3)

9.3.3(b)	$\hat{T}_2 = \hat{S}_2 = 80°$ (ext $\angle$ of cyclic quad/*buite$\angle$ van koordevh*) $V + \hat{W}_4 = \hat{T}_2$ (ext$\angle$ of Δ/*buite$\angle$ van Δ*) $\therefore\ \hat{V} = 50°$	✓ S ✓ R ✓ S ✓ S (4)
9.3.4	In ΔRVW and/*en* ΔRWS: $\hat{R}_2 = \hat{R}_3 = 30°$ (proven/*bewys* in 9.3.1) $\hat{V} = \hat{W}_2 = 50°$ (proven/*bewys* in 9.3.3) $V\hat{W}R = \hat{S}_1$ (3rd $\angle$ in Δ) $\therefore \Delta RVW \mid\mid\mid \Delta RWS$ ($\angle\angle\angle$) $\therefore \frac{WR}{RV} = \frac{RS}{WR}$ ($\Delta RVW \mid\mid\mid \Delta RWS$) $\therefore WR^2 = RV.RS$	✓ using the correct Δs/ *gebruik korrekte Δe* ✓ S ✓ S ✓ R (3rd $\angle$ in Δ) or ($\angle\angle\angle$) ✓ S (5) **[22]**

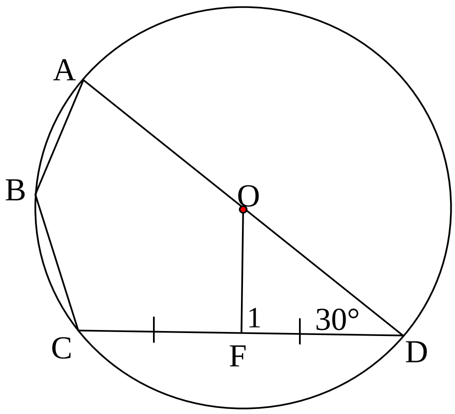
QUESTION/VRAAG 8

8.1



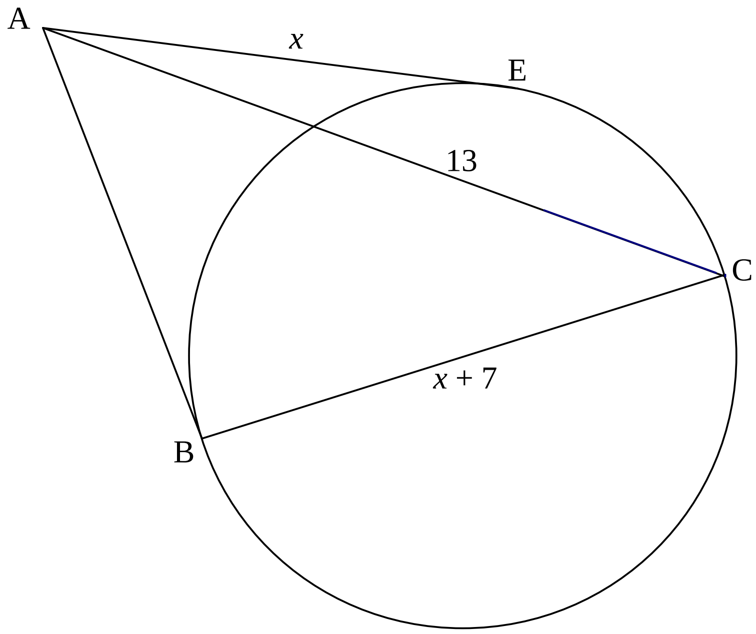
8.1.1	$x = 96°$ (∠ at centre = 2∠ at circumference/ ∠ *by midpt = 2∠ by omtrek*)	✓ S ✓ R (2)
8.1.2	$\hat{C}_2 + \hat{B}_2 = 180° - 96° = 84°$ (sum of ∠s in Δ/ *som v∠e in* Δ) $y = \hat{B}_2 = 42°$ (∠s opp = sides/∠*e teenoor = sye*)	✓ S ✓ S (2)

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)

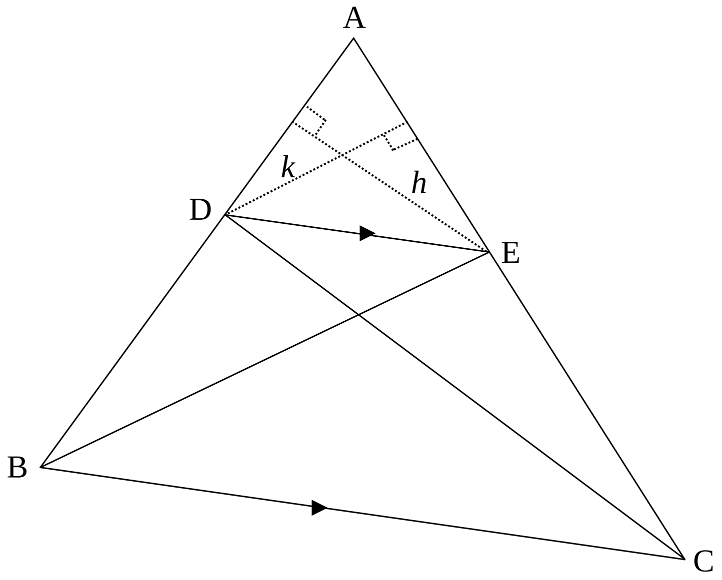
8.3



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]**

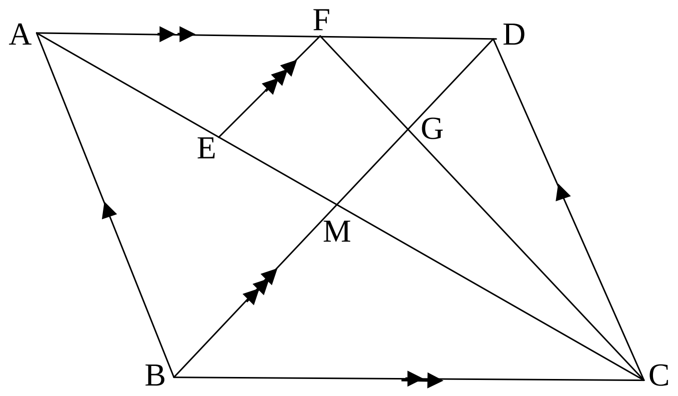
QUESTION/VRAAG 9

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	$\dfrac{\text{AD}}{\text{DB}}$ $\dfrac{\frac{1}{2}\text{AE}\times k}{\frac{1}{2}\text{EC}\times k}$ But/*Maar* area ΔDEB = area ΔDEC (Same base and same height/*dieselfde basis en dieselfde hoogte*) $\therefore \dfrac{\text{area } \Delta\text{ADE}}{\text{area } \Delta\text{DEB}} = \dfrac{\text{area } \Delta\text{ADE}}{\text{area } \Delta\text{DEC}}$ $\therefore \dfrac{\text{AD}}{\text{DB}} = \dfrac{\text{AE}}{\text{EC}}$	✓ 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]**