SA-STUDENT

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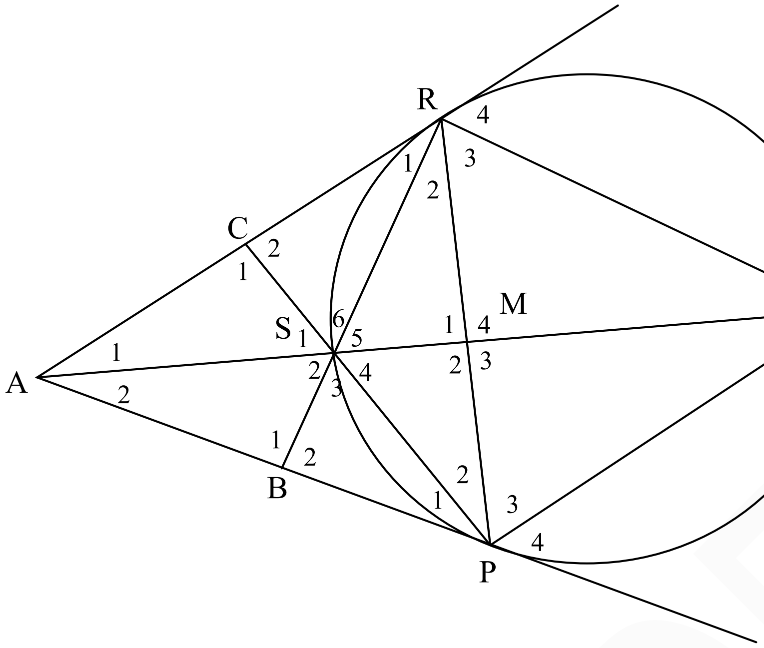
QUESTION/*VRAAG* 10



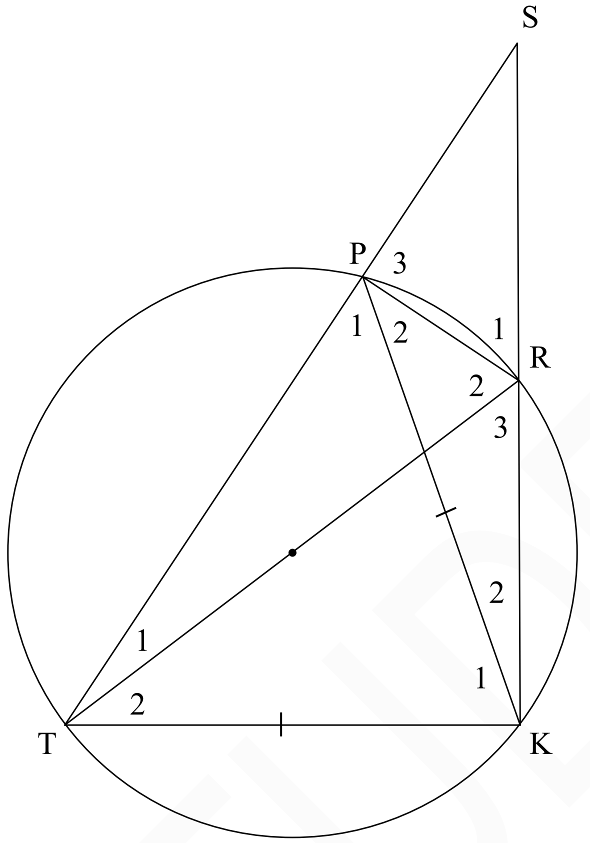
10.1	$\hat{S}_3 = P\hat{Q}R$ $\hat{R}_3 = P\hat{Q}R$ $\therefore \hat{S}_3 = \hat{R}_3$ But $\hat{S}_4 = \hat{R}_3$ $\therefore \hat{S}_3 = \hat{S}_4$	[ext $\angle$ of cyclic quad] [$\angle$s opp equal sides] [$\angle$s in the same seg]	✓ S ✓ R ✓ S / R ✓ S ✓ R (5)
10.2	$\hat{R}_1 + \hat{R}_2 = P\hat{Q}R$ $\hat{S}_4 = P\hat{Q}R$ $\therefore \hat{S}_4 = \hat{R}_1 + \hat{R}_2$ SMRC is a cyclic quad	[tan chord theorem] [proved in 10.1] [converse ext $\angle$ of cyclic quad]	✓ S ✓ R ✓ S ✓ R (4)
10.3	$\hat{S}_3 = \hat{R}_2 + \hat{P}_2$ $\hat{S}_4 = \hat{P}_1 + \hat{A}_2$ $\therefore \hat{R}_2 + \hat{P}_2 = \hat{A}_2 + \hat{P}_1$ But $\hat{P}_1 = \hat{R}_2$ $\therefore \hat{P}_2 = \hat{A}_2$ RP is a tangent to the circle **OR**	[ext $\angle$ of Δ] [ext $\angle$ of Δ] [tan chord theorem] [converse tan chord theorem] **OR** [$\angle$ between line and chord] **OR** [converse alt seg theorem]	✓ S ✓ R ✓ S ✓ S ✓ R ✓ R (6)

	In ΔMSP and ΔMPA		
	$\hat{M}_2$ is common		✓ S
	AR = AP	[tans from same point]	✓ S / R
	$\hat{R}_1 + \hat{R}_2 = \hat{P}_1 + \hat{P}_2$	[$\angle$s opp equal sides]	✓ S
	$\hat{S}_4 = \hat{R}_1 + \hat{R}_2$	[proved in 10.2]	
	$\therefore \hat{S}_4 = \hat{P}_1 + \hat{P}_2$		✓ S
	$\therefore \hat{P}_2 = \hat{A}_2$	[sum of $\angle$s in Δ]	✓ S
	RP is a tangent to the circle	[converse tan chord theorem]	✓ R (6)
			[15]

TOTAL/TOTAAL: 150

QUESTION/VRAAG 10

10.1



10.1.1	$\hat{TPR} = 90°$	[$\angle$ in semi-circle]	✓S ✓R
	$\hat{SPR} = 90°$	[$\angle$'s on a straight line]	✓S
	$\therefore$ SR is a diameter	[converse $\angle$ in semi-circle]	✓R
			(4)
	OR		
	$\hat{TKR} = 90°$	[$\angle$ in semi-circle]	✓S ✓R
	$\hat{SPR} = 90°$	[ext $\angle$ of cyclic quad]	✓S
	$\therefore$ SR is a diameter	[converse $\angle$ in semi-circle] **OR** [chord subtends a right angle]	✓R
			(4)

10.1.2	$\hat{R}_1 = P\hat{T}K$ [ext $\angle$ of cyclic quad] $\hat{P}_1 = P\hat{T}K = \hat{R}_1$ [$\angle$s opp equal sides] $\hat{S} + \hat{R}_1 = \hat{P}_1 + P_2$ [ext $\angle$ of Δ] $\therefore \hat{S} = \hat{P}_2$ [$\hat{R}_1 = \hat{P}_1$]	✓S ✓R ✓S /R ✓S ✓R (5)
10.1.3	In ΔSPK and ΔPRK $\hat{S} = \hat{P}_2$ [proved] $\hat{K}_2 = \hat{K}_2$ [common] $\Delta SPK \parallel\!\mid \Delta PRK$ [$\angle, \angle, \angle$] **OR/*OF*** In ΔSPK and ΔPRK $\hat{S} = \hat{P}_2$ [proved] $\hat{K}_2 = \hat{K}_2$ [common] $S\hat{P}K = P\hat{R}K$ [sum of $\angle$s in Δ] $\Delta SPK \parallel\!\mid \Delta PRK$	✓S ✓S ✓S/R (3) ✓S ✓S ✓S/R (3)
10.2	$\frac{PK}{RK} = \frac{SK}{PK}$ $[\Delta SPK \parallel\!\mid \Delta PRK]$ $PK^2 = SK.RK$ $ST^2 = SK^2 + TK^2$ [Pythagoras] $TK = PK$ [Given] $ST^2 = SK^2 + PK^2$ $ST^2 = SK^2 + SK.RK$ $ST^2 = (2RK)^2 + 2RK.RK$ $ST^2 = 6RK^2$ $ST = \sqrt{6}RK$	✓S ✓S ✓ $PK^2 = SK.RK$ ✓$SK = 2RK$ ✓ $ST^2 = 6RK^2$ (5)
		[17]

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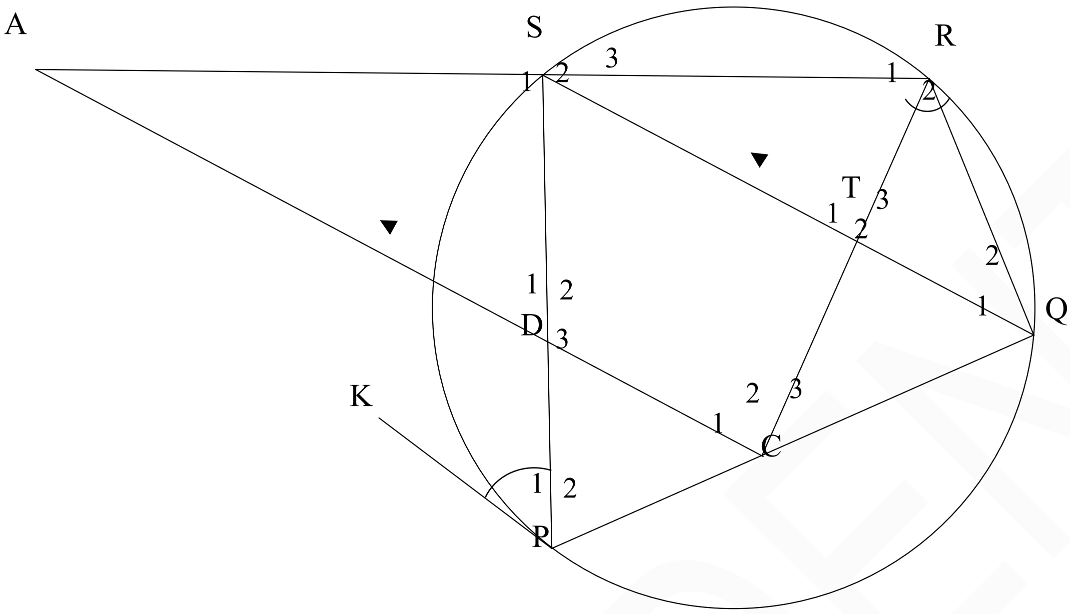
QUESTION/*VRAAG* 10



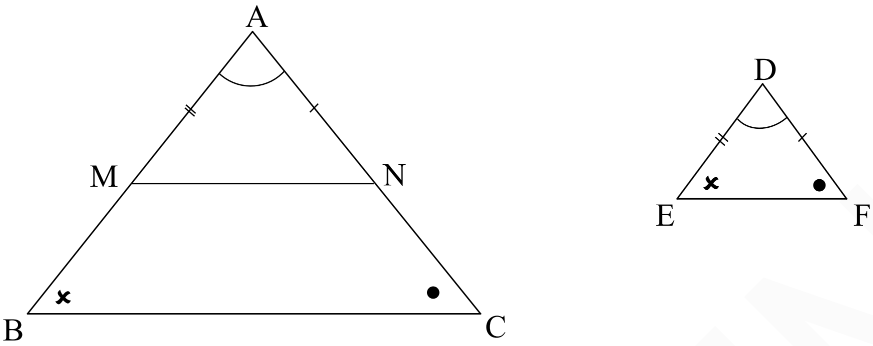
10.1	$\hat{P}_1 = \hat{Q}_1$ [tan-chord theorem/$\angle$ *tussen raaklyn en koord*] $\hat{S}_1 = \hat{Q}_1 + \hat{Q}_2$ [ext $\angle$ of cyclic quad/*buite* $\angle$ *v. kvh*] $\therefore \hat{S}_1 = \hat{P}_1 + \hat{Q}_2$ $\hat{T}_2 = \hat{R}_2 + \hat{Q}_2$ [ext $\angle$ of Δ/*buite* $\angle$ *v.* Δ] but $\hat{P}_1 = \hat{R}_2$ [given/*gegee*] $\hat{T}_2 = \hat{P}_1 + \hat{Q}_2$ $\therefore \hat{S}_1 = \hat{T}_2 = \hat{P}_1 + \hat{Q}_2$	✓ S ✓ S / R ✓ S ✓ S (4)
10.2	In Δ ASD and ΔACR $\hat{A} = \hat{A}$ [common $\angle$/*gemeenskaplike* $\angle$] $\hat{S}_1 = \hat{T}_2$ [proven/*reeds bewys*] $\hat{T}_2 = \hat{C}_2$ [alt $\angle$s; QS || CA/verw. $\angle e$; QS || CA] $\therefore \hat{S}_1 = \hat{C}_2$ $\hat{D}_1 = \hat{R}_1$ [sum of $\angle$s in Δ/$\angle e$ *v.* Δ] ΔASD ||| ΔACR $\therefore \frac{AD}{AR} = \frac{AS}{AC}$ [corresponding sides in proportion/ *ooreenstemmende sy in dies. verhouding*] **OR/*OF***	✓ identifying Δ's ✓ S ✓ S / R ✓ S ✓ S (5)

	In Δ ASD and ΔACR $\hat{A} = \hat{A}$ [common $\angle$/*gemeenskaplike* $\angle$] $\hat{S}_1 = \hat{T}_2$ [proven/*gegee*] $\hat{T}_2 = \hat{C}_2$ [alt $\angle$s; QS $\parallel$ CA/verw. $\angle e$; QS $\parallel$ CA] $\therefore \hat{S}_1 = \hat{C}_2$ $\Delta ASD \parallel\mid \Delta ACR$ [$\angle;\angle;\angle$] $\therefore \frac{AD}{AR} = \frac{AS}{AC}$ [corresponding sides in proportion/ *ooreenstemmende sy in dies. verhouding*]	✓ identifying Δ's ✓ S ✓ S/R ✓ S ✓ R (5)
10.3	$\frac{AS}{AC} = \frac{SD}{CR}$ [$\Delta ASD \parallel\mid \Delta ACR$] $\therefore AS = \frac{AC \times SD}{CR}$ $\frac{AS}{AR} = \frac{CT}{CR}$ [line $\parallel$ one side of Δ OR prop theorem; TS $\parallel$ CA/*lyn* $\parallel$ *een sy v.* Δ] $\therefore AS = \frac{AR \times CT}{CR}$ $\therefore \frac{AC \times SD}{CR} = \frac{AR \times CT}{CR}$ $\therefore AC \times SD = AR \times CT$	✓ S ✓ S ✓ R ✓ equating (4)
		[13]

TOTAL/*TOTAAL*: 150

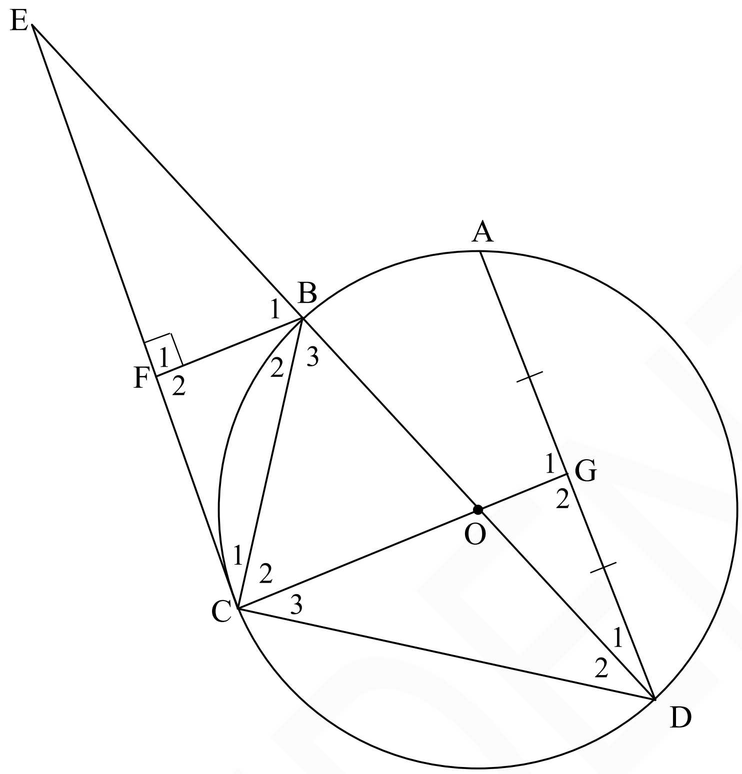
QUESTION/*VRAAG* 10

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 $\angle$'s are equal/ *ooreenk.* $\angle$ *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)

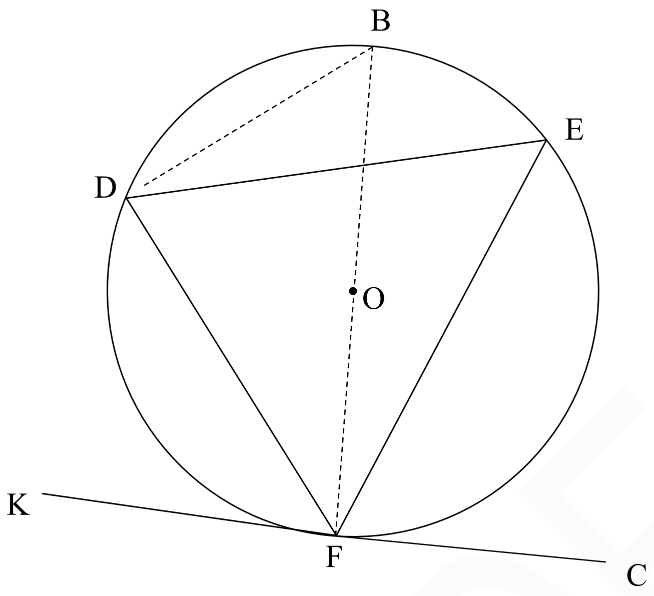
10.2



10.2.1(a)	$\hat{FCO} = 90°$ [tan ⊥ radius / *raaklyn ⊥ radius*] $\hat{F}_1 = 90°$ [BF ⊥ EC] $\therefore \hat{FCO} = \hat{F}_1 = 90°$ FB ∥ CG [corresp ∠s = / *ooreenk. ∠ gelyk*]	✓ S / R ✓ S ✓ R (3)
10.2.1(b)	In ΔFCB and ΔCDB $\hat{BCD} = 90°$ [∠ in semi-circle / ∠ $\frac{1}{2}$ ⊙] $\hat{F}_2 = 90°$ [BF ⊥ EC] $\therefore \hat{F}_2 = \hat{BCD} = 90°$ $\hat{C}_1 = \hat{D}_2$ [tan chord theorem / ∠ *tussen rkl en koord*] $\hat{B}_2 = \hat{B}_3$ [sum of ∠s in Δ / ∠*e van* Δ] ∴ ΔFCB ∣∣∣ ΔCDB **OR/*OF*** In ΔFCB and ΔCDB $\hat{BCD} = 90°$ [∠ in semi-circle / ∠ $\frac{1}{2}$ ⊙] $\hat{F}_2 = 90°$ [BF ⊥ EC] $\therefore \hat{F}_2 = \hat{BCD} = 90°$ $\hat{C}_1 = \hat{D}_2$ [tan chord theorem / ∠ *tussen rkl en koord*] ∴ ΔFCB ∣∣∣ ΔCDB [∠,∠,∠]	✓ S /R ✓ S ✓ S ✓ R ✓ S ✓ S / R ✓ S ✓ S ✓ R ✓ R (5)

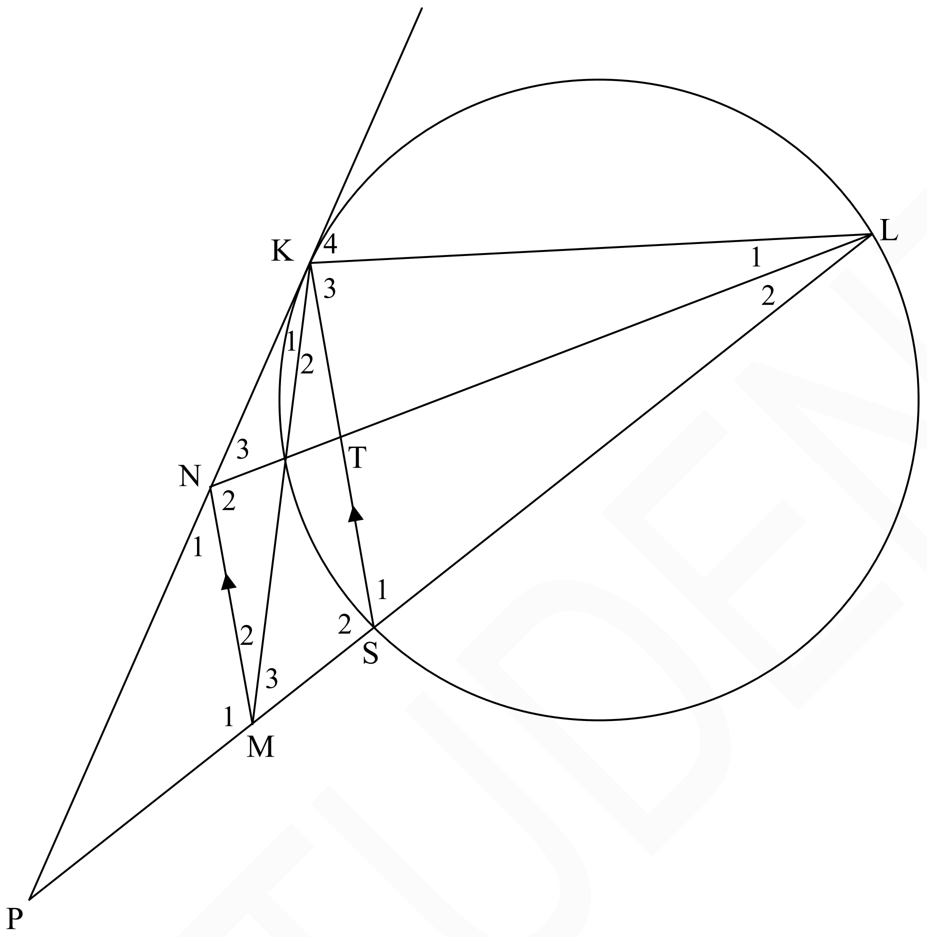
10.2.2	$\hat{G}_1 = 90°$ [line from centre to midpt of chord / *midpt.* ⊙; *midpt. koord*]	✓ R (1)
10.2.3	In ΔGCD and ΔCDB $\hat{G}_2 = B\hat{C}D = 90°$ $\hat{C}_3 = \hat{D}_2$ [$\angle$s opp equal sides /$\angle$*e teenoor gelyke sye*] $G\hat{D}C = \hat{B}_3$ [sum of $\angle$s in Δ /$\angle$*e van* Δ] $\therefore \Delta GCD \parallel\!\mid \Delta CDB$ [$\angle,\angle,\angle$] $\therefore \frac{CD}{DB} = \frac{CG}{CD}$ [$\parallel\!\mid$ Δs] $\therefore CD^2 = CG.DB$	✓ identifying Δs ✓ S ✓ S / R ✓ S **OR** ✓ R ✓ S (5)
10.2.4	$\frac{BC}{DB} = \frac{FB}{BC}$ [$\Delta FCB \parallel\!\mid \Delta CDB$] $\therefore BC^2 = DB.FB$ $CD^2 + BC^2 = CG.DB + DB.FB$ $DB^2 = DB(CG + FB)$ $DB = CG + FB$	✓ S ✓ R ✓ S ✓ sum ✓ $DB^2 = CD^2 + BC^2$ (5)
		[25]

TOTAL/*TOTAAL*: 150



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

11.2



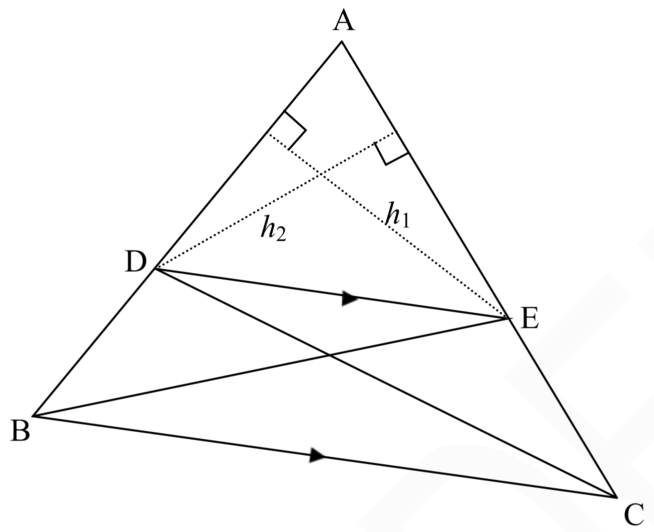
11.2.1(a)	$\hat{K}_4 = \hat{S}_1$ [tan chord theorem/*raaklynkoordstelling*] $\hat{M}_2 + \hat{M}_3 = \hat{S}_1$ [corresp ∠s; / *ooreenk ∠s;* MN || KS] $\therefore \hat{K}_4 = \hat{M}_2 + \hat{M}_3 = N\hat{M}L$	✓ S ✓ R ✓ S ✓ R (4)
11.2.1(b)	$\therefore \hat{K}_4 = \hat{M}_2 + \hat{M}_3 = N\hat{M}L$ $\therefore$ KLMN is a cyclic quad [ext ∠ of quad = opp int ∠ / *buite ∠ van vh = teenoorst binne ∠*] **OR/OF** $N_1 = \hat{K}_1 + \hat{K}_2 = N\hat{K}S$ [corresp ∠s; / *ooreenk ∠s;* MN || KS] $N\hat{K}S = K\hat{L}S$ [tan chord theorem / *raaklynkoordstelling*] $\hat{N}_1 = K\hat{L}S$ $\therefore$ KLMN is a cyclic quad [ext ∠ of quad = opp int ∠ / *buite ∠ van vh = teenoorst binne ∠*] **OR/OF**	✓ R (1) ✓ R (1)

	$NKL = 180^\circ - K_4$ [adj. suppl.] $\therefore NKL = 180^\circ - NML$ [proved] $\therefore$ KLMN is a cyclic quad [opp.$\angle$s supplementary]	✓ R (1)
11.2.2	In $\Delta LKN \,\vert\vert\vert\, \Delta KSM$: $\hat{N}_3 = \hat{M}_3$ [$\angle$s in the same seg / $\angle$*e in dieselfde sirkel segm*] $\hat{L}_1 = \hat{M}_2$ [$\angle$s in the same seg / $\angle$*e in dieselfde sirkel segm*] $= \hat{K}_2$ [alt $\angle$s; / *verw*$\angle$*e;* MN$\vert\vert$KS] $N\hat{K}L = M\hat{S}K$ [$\angle$s of Δ / $\angle$*e van* Δ] $\Delta LKN \,\vert\vert\vert\, \Delta KSM$	✓ S ✓ R ✓ S ✓ S/R ✓ S (5)
	OR/OF In $\Delta LKN \,\vert\vert\vert\, \Delta KSM$: $\hat{N}_3 = \hat{M}_3$ [$\angle$s in the same seg / $\angle$*e in dieselfde sirkel segm*] $N\hat{K}L = \hat{M}_1$ [ext $\angle$ of cyclic quad/*buite*$\angle$ *van koordevh*] $= \hat{S}_2$ [corresp $\angle$s/*ooreenk* $\angle$*e*; KS $\vert\vert$ NM] $\Delta LKN \,\vert\vert\vert\, \Delta KSM$ [$\angle,\angle,\angle$]	✓ S ✓ R ✓ S/R ✓ S ✓ R (5)
	OR/OF In $\Delta LKN \,\vert\vert\vert\, \Delta KSM$: $\hat{N}_3 = \hat{M}_3$ [$\angle$s in the same seg / $\angle$*e in dieselfde sirkel segm*] $\hat{K}_4 + N\hat{K}L = \hat{S}_1 + \hat{S}_2$ [$\angle$s on straight line/$\angle$*e op reguitlyn*] $\therefore N\hat{K}L = \hat{S}_2$ [$\hat{K}_4 = \hat{S}_1$] $\Delta LKN \,\vert\vert\vert\, \Delta KSM$ [$\angle,\angle,\angle$]	✓ S ✓ R ✓ S/R ✓ S ✓ R (5)
11.2.3	$\frac{LK}{KS} = \frac{KN}{SM}$ [$\Delta LKN \,\vert\vert\vert\, \Delta KSM$] $\therefore \frac{12}{KS} = \frac{4}{3}$ $KS = 9$ units	✓ S ✓ R ✓ substitution ✓ answer (4)
11.2.4	4SM = 3KN $SM = \frac{3(8)}{4}$ SM = 6 $\frac{LT}{NL} = \frac{LS}{ML}$ [line $\vert\vert$ one side of Δ / *lyn* $\vert\vert$ *een sy v* Δ] $\frac{LT}{16} = \frac{13}{19}$ $LT = \frac{208}{19} = 10,95$	✓ SM = 6 ✓ S ✓ R ✓ answer (4)
		[23]

TOTAL/*TOTAAL*: 150

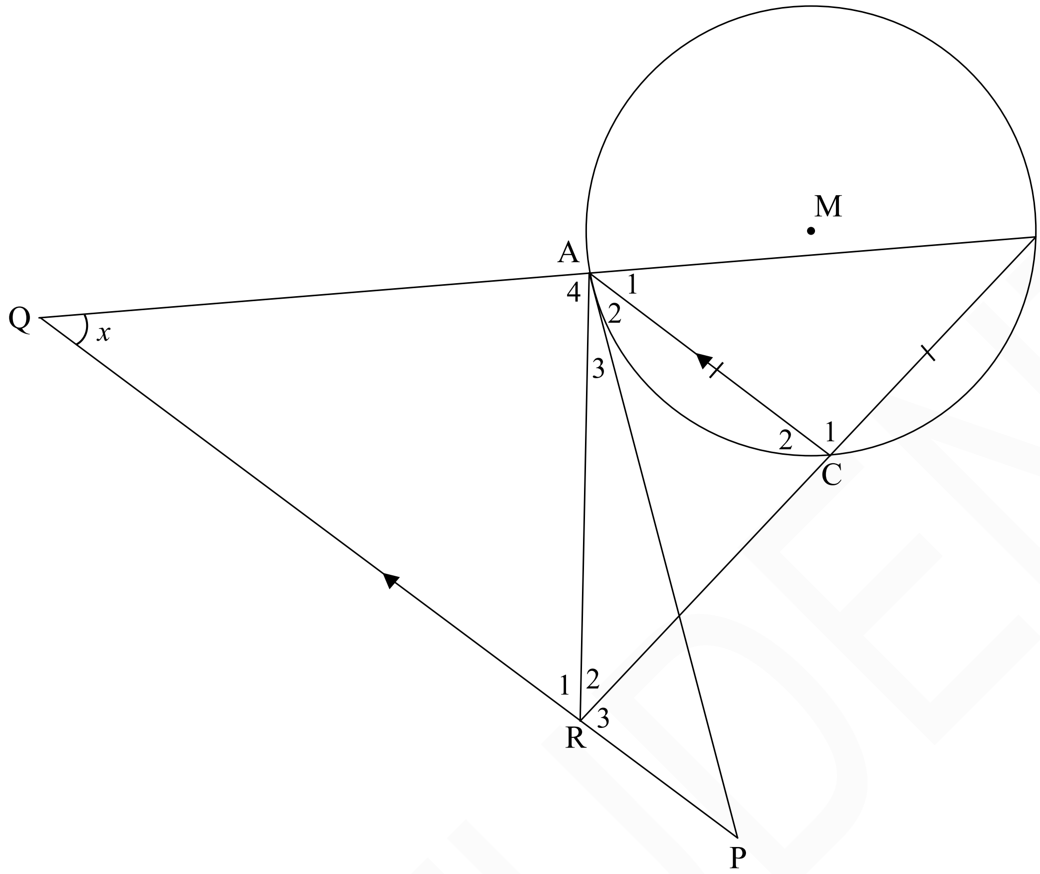
QUESTION/VRAAG 9

9.1



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

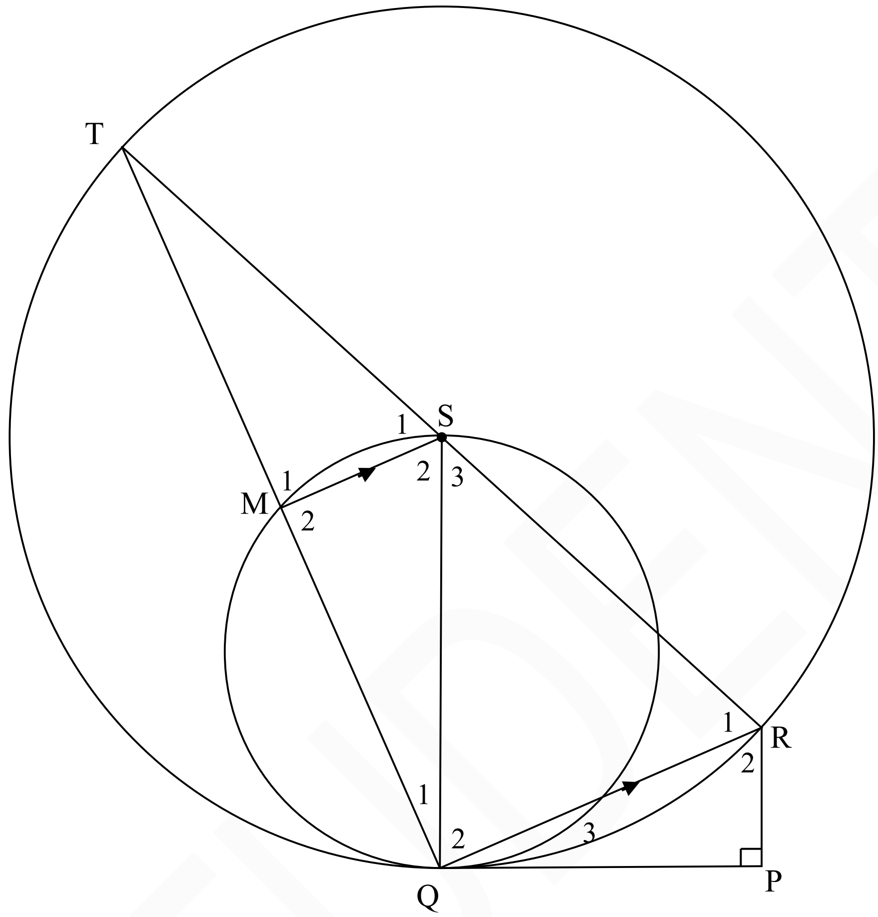
9.2



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*] $\therefore$ A, B, P and R are concyclic $\therefore$ ABPR is a cyclic quadrilateral [conv ∠s in the same segment/ *koord onderspan gelyke omtreks ∠e*]	✓ S ✓ R (2)
9.2.3	$\frac{BA}{BQ} = \frac{BC}{BR}$ [prop th; AC ‖ QP] **OR** [line ‖ one side Δ/*lyn ‖ een syn v Δ*] But QR = BR [sides opp = ∠s/*sye teenoor = ∠e*] $\therefore \frac{BA}{BQ} = \frac{BC}{QR}$	✓ S ✓ R ✓ S (3)

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

QUESTION/VRAAG 10

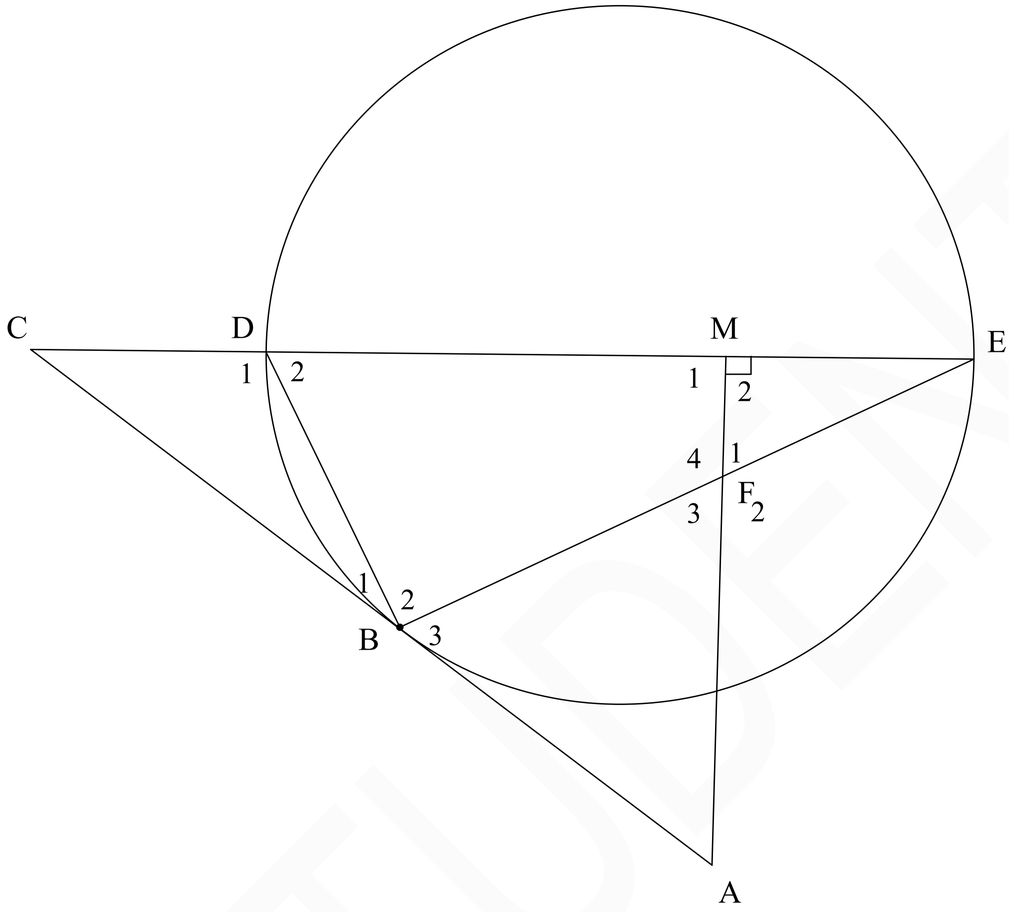


10.1.1	$\hat{Q}_1 + \hat{Q}_2 = 90°$	[∠ in semi circle/∠ *in halwe sirkel*]	✓ S/R
	$\therefore \hat{M}_2 = 90°$	[co-interior ∠, MS ǁ QR/*ko-binne ∠e,* MS ǁ QR]	✓ S/R
	$\therefore$ SQ is a diameter	[converse: ∠ in semi circle/ *Omgekeerde: ∠ in halwe sirkel*]	✓ R (3)
	OR		
	MS ǁ QR		
	$\frac{TS}{SR} =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

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

TOTAL/TOTAAL: 150

QUESTION/*VRAAG* 10



10.1.1	$\hat{DBE} = 90°$ [∠ in semi-circle/∠ *in halfsirkel*] $\therefore D\hat{M}A = 90°$ [$AM \perp DE$] ∴ FBDM is a cyclic quadrilateral/*koordevh* [converse opp ∠s cyclic quad/*omgek teenoorst ∠e kvh*] **OR** $\hat{DBE} = 90°$ [∠ in semi-circle/∠ *in halfsirkel*] $\hat{M}_2 = D\hat{B}E = 90°$ ∴ FBDM is a cyclic quadrilateral/*koordevh* [converse ext∠ of cyclic quad/*omgek buite∠ van kvh*]	✓S ✓R ✓R (3) ✓S ✓R ✓R (3)

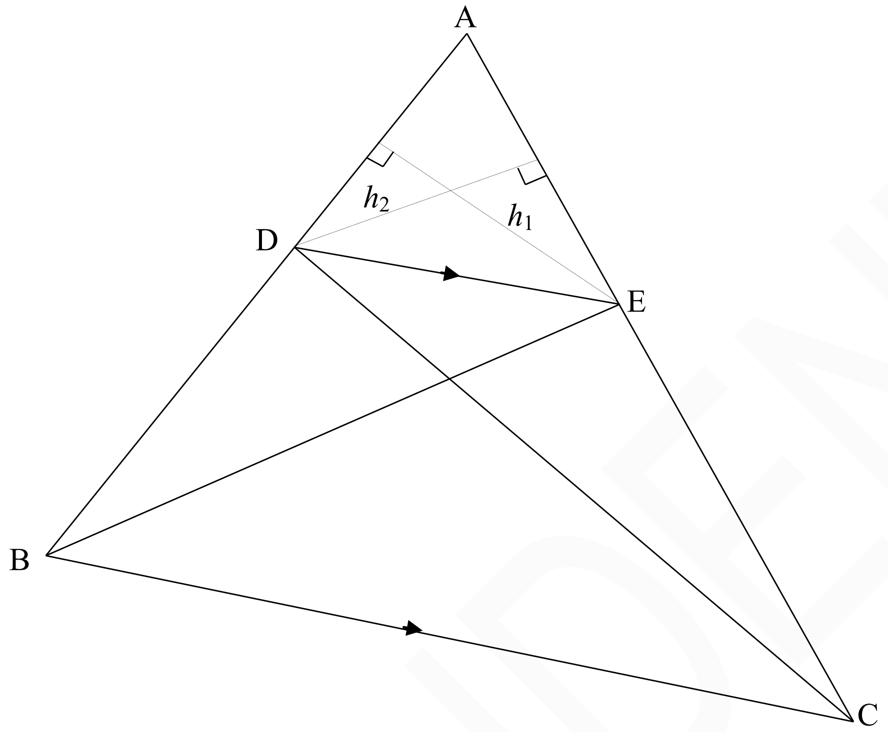
10.1.2	$\hat{B}_3 = \hat{D}_2$ [tangent chord th/*raaklyn koordst*] $\hat{F}_1 = \hat{D}_2$ [ext ∠ cyc quad/*buite ∠ koordevh*] $\therefore \hat{B}_3 = \hat{F}_1$	✓ S ✓ R ✓ S ✓ R (4)
	OR $\hat{B}_1 = \hat{E} = x$ [tangent chord th/*raaklyn koordst*] $\hat{F}_1 = 90° - x$ [∠ sum in Δ/∠ *van* Δ] $\hat{D}_2 = 90° - x$ [∠ sum in Δ/∠ *van* Δ] $\therefore \hat{F}_1 = D_2$ $\hat{B}_3 = \hat{D}_2$ [tangent chord th/*raaklyn koordst*] $\therefore \hat{B}_3 = \hat{F}_1$	✓ S ✓ R ✓ $\hat{F}_1 = 90° - x = \hat{D}_2$ ✓ R (4)
	OR $\hat{B}_1 = \hat{E} = x$ [tangent chord th/*raaklyn koordst*] $\hat{B}_3 = 90° - x$ [straight line/*reguitlyn*] $\hat{F}_1 = 90° - x$ [sum of ∠s Δ/ *som van ∠e van* Δ] $\therefore \hat{B}_3 = \hat{F}_1$	✓ S ✓ R ✓ S ✓ S (4)
10.1.3	In ΔCDB and ΔCBE $\hat{C} = \hat{C}$ [common ∠/*gemeenskaplike* ∠] $C\hat{B}D = C\hat{E}B$ [tangent chord th/*raaklyn koordst*] $C\hat{D}B = C\hat{B}E$ [∠ sum in Δ/∠ *van* Δ] ΔCDB ||| ΔCBE	✓ S ✓ S/R ✓ R (3)
	OR In ΔCDB and ΔCBE $C\hat{B}D = C\hat{E}B$ [tangent chord th/*raaklyn koordst*] $\hat{C} = \hat{C}$ [common ∠/*gemeenskaplike* ∠] ΔCDB ||| ΔCBE [∠, ∠, ∠]	✓ S/R ✓ S ✓ R (3)
10.2.1	$\frac{BC}{EC} = \frac{DC}{BC}$ [||| Δs] $BC^2 = EC \times DC$ $= 8 \times 2$ $= 16$ $BC = 4$	✓ ratio ✓ substitution ✓answer (3)

10.2.2	$\frac{BC}{EC}=\frac{DB}{BE}$ [$\parallel\!\mid$ Δs] $\frac{DB}{BE}=\frac{4}{8}=\frac{1}{2}$ $BE=2DB$ $DB^2+BE^2=DE^2$ [Pyth theorem] $DB^2+(2DB)^2=36$ $5DB^2=36$ $DB^2=\frac{36}{5}$ $DB=\frac{6}{\sqrt{5}}=2{,}68$ units	✓ BE = 2DB ✓ substitution into Pyth theorem ✓ $DB^2=\frac{36}{5}$ ✓answer (4)
		[17]

TOTAL/*TOTAAL*: 150

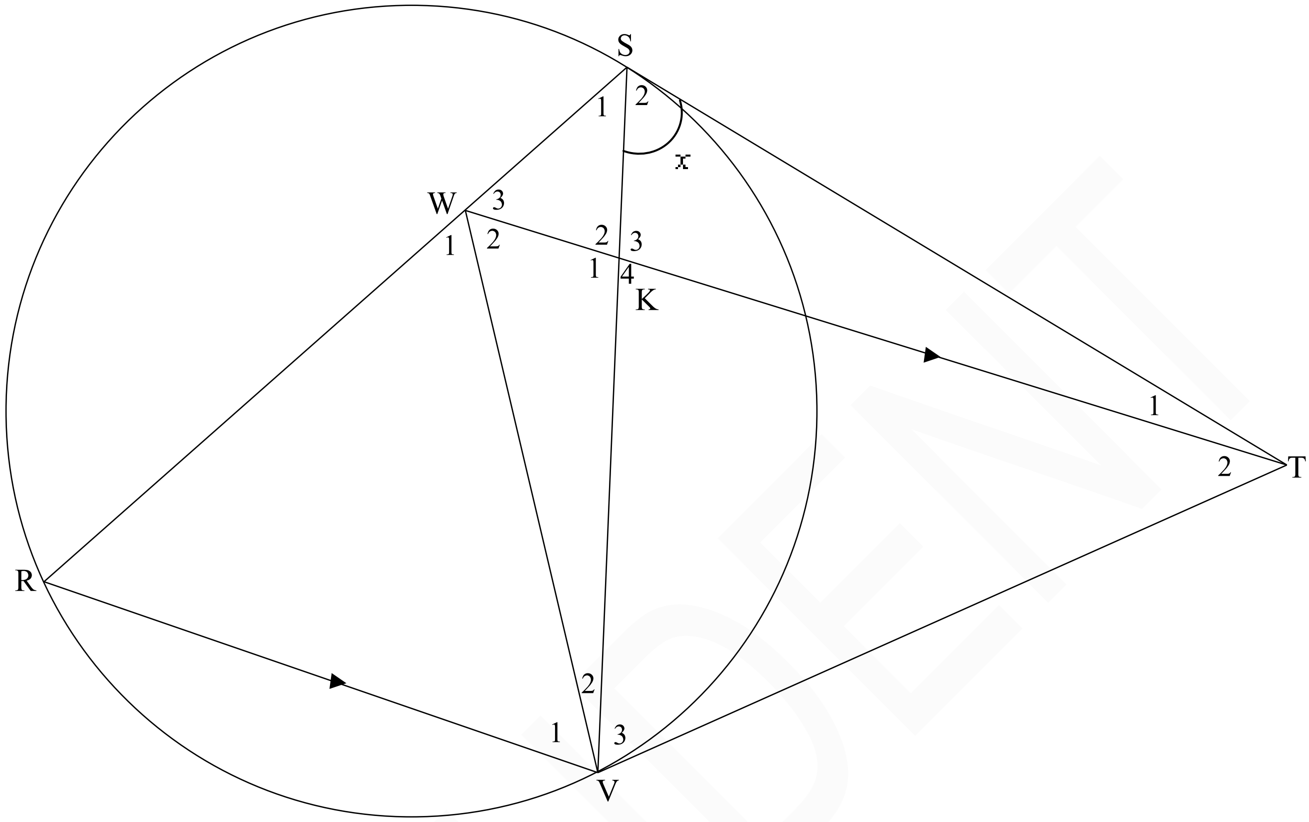
QUESTION/*VRAAG* 10

10.1



10.1	Constr: Draw h_1 from E $\perp$ AD and h_2 from D $\perp$ AE *Konstr: Trek* h_1 *vanaf* E $\perp$ AD *en* h_2 *vanaf* D $\perp$ AE Proof/*Bewys*: $\dfrac{\text{area }\Delta\text{ADE}}{\text{area }\Delta\text{BDE}} = \dfrac{\frac{1}{2}\text{AD}\times h_1}{\frac{1}{2}\text{DB}\times h_1} = \dfrac{\text{AD}}{\text{DB}}$ $\dfrac{\text{area }\Delta\text{ADE}}{\text{area }\Delta\text{DEC}} = \dfrac{\frac{1}{2}\text{AE}\times h_2}{\frac{1}{2}\text{EC}\times h_2} = \dfrac{\text{AE}}{\text{EC}}$ But area ΔBDE = area ΔDEC [same base & height or DE || BC/ *dies basis & hoogte*; of DE || BC] $\therefore \dfrac{\text{area }\Delta\text{ADE}}{\text{area }\Delta\text{BDE}} = \dfrac{\text{area }\Delta\text{ADE}}{\text{area }\Delta\text{DEC}}$ $\therefore \dfrac{\text{AD}}{\text{DB}} = \dfrac{\text{AE}}{\text{EC}}$	✓ constr/*konstr* **OR reason: common vertex or same height** ✓ $\dfrac{\text{area }\Delta\text{ADE}}{\text{area }\Delta\text{BDE}} = \dfrac{\frac{1}{2}\text{AD}\times h_1}{\frac{1}{2}\text{DB}\times h_1}$ ✓ $\dfrac{\text{area }\Delta\text{ADE}}{\text{area }\Delta\text{DEC}} = \dfrac{\text{AE}}{\text{EC}}$ ✓ S ✓R ✓ S (6)

10.2



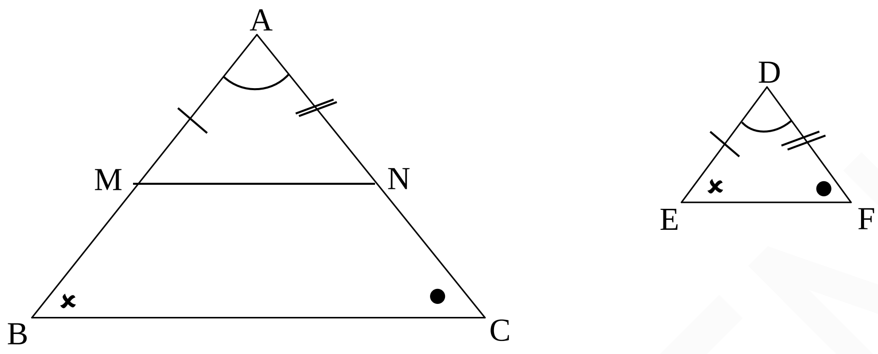
10.2.1	$\hat{V}_3 = x$ [Tans from same point/*raaklyne vanaf dieselfde pt*] $\hat{R} = x$ [tan chord theorem/*raaklyn koordstelling*] $\hat{W}_3 = x$ [corresp ∠s/*ooreenkomstige ∠e*; WT ‖ RV]	✓ S ✓ R ✓ S ✓ R ✓ S ✓ R (6)
10.2.2(a)	$\hat{V}_3 = \hat{W}_3 = x$ [proved in 10.2.1] W, S, T and V are concyclic/*is konsiklies* WSTV is a cyclic quad [converse ∠s in the same segment/ *Omgekeerde ∠e in dieselfde segment*]	✓ S ✓ R (2)
10.2.2(b)	$\hat{W}_2 = \hat{S}_2 = x$ [∠s in the same segment/∠e *in dies segment*] $\hat{V}_1 = \hat{W}_2 = x$ [alt ∠s/*verwiss* ∠e ; WT ‖ RV] But $\hat{R} = x$ [proved in 10.2.1] $\therefore \hat{R} = \hat{V}_1 = x$ ∴ WR = WV [sides opp equal ∠s/*sye teenoor gelyke ∠e*] ΔWRV is isosceles/*is gelykbenig* **OR/*OF***	✓ S ✓R ✓ S/ R ✓ S (4)

	$\hat{S}_2 = \hat{W}_2 = x$ [∠s in the same segment] $\hat{W}_2 = \hat{W}_3 = x$ $\hat{W}_2 + \hat{W}_3 = \hat{R} + \hat{V}_1$ [ext ∠ of Δ] $\therefore\ \hat{V}_1 = x = \hat{R}$ ∴ WR = WV [sides opp equal ∠s/*sye teenoor gelyke ∠e*] ΔWRV is isosceles/*is gelykbenig*	✓ S ✓R ✓ S/ R ✓ S (4)
10.2.2(c)	In ΔWRV and/*en* ΔTSV $\hat{R} = \hat{S}_2 = x$ [proved **OR** tan chord theorem] $\hat{V}_1 = \hat{V}_3 = x$ [proved] ∴ ΔWRV ||| ΔTSV [∠, ∠, ∠] **OR/*OF*** In ΔWRV and/*en* ΔTSV $\hat{R} = \hat{S}_2 = x$ [proved **OR** tan chord theorem] $\hat{V}_1 = \hat{V}_3 = x$ [proved] $\hat{W}_1 = S\hat{T}V = x$ [sum of ∠s in Δ/*∠e van* Δ] ∴ ΔWRV ||| ΔTSV	✓ S ✓ S ✓ R (3) ✓ S ✓ S ✓ S (3)
10.2.2(d)	$\frac{RV}{SV} = \frac{WR}{TS}$ [ΔWRV ||| ΔTSV] $\therefore WR \times SV = RV \times TS$ $\frac{WR}{SR} = \frac{KV}{SV}$ [prop theorem/*eweredighst*; WT || RV] $\therefore WR \times SV = KV \times SR$ $\therefore RV \times TS = KV \times SR$ $\therefore \frac{RV}{SR} = \frac{KV}{TS}$ **OR/*OF*** In ΔRVS and/*en* ΔVKT $S\hat{V}R = \hat{K}_4$ [alt ∠s, WT || RV] $S\hat{R}V = \hat{V}_3$ [proven] ΔRVS ||| ΔVKT [∠, ∠, ∠] $\therefore \frac{RV}{SR} = \frac{KV}{VT}$ but VT = ST [tans from same point] $\therefore \frac{RV}{SR} = \frac{KV}{TS}$	✓ correct ratios ✓ $\frac{WR}{SR} = \frac{KV}{SV}$ ✓ R ✓ equating WR × SV (4) ✓ identifying correct Δs ✓ proving ||| ✓ correct ratio ✓ S (4)
		[25]

TOTAL/*TOTAAL*: 150

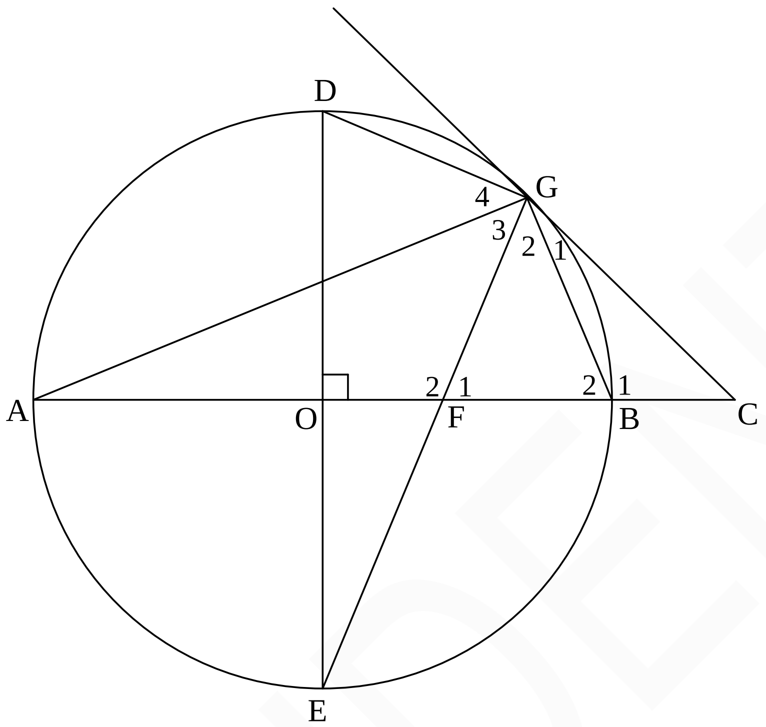
QUESTION/*VRAAG* 10

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)

10.2

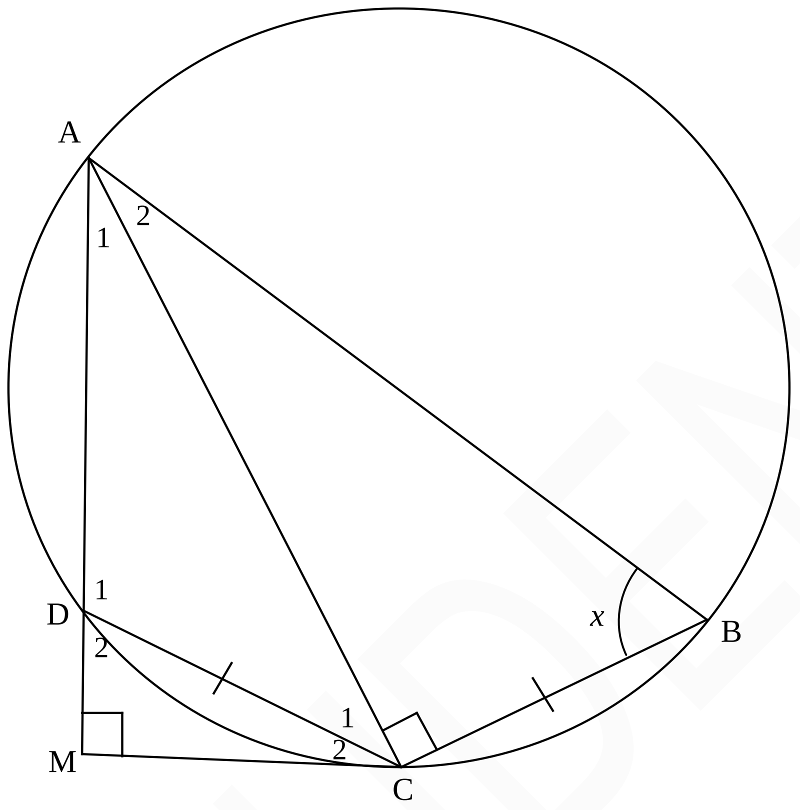


10.2.1(a)	$D\hat{O}B = 90°$ $D\hat{G}F = \hat{G}_3 + \hat{G}_4 = 90°$ [∠ in semi-circle/∠ *in halfsirkel*] $D\hat{O}B + D\hat{G}F = 180°$ ∴ DGFO is a cyclic quad. [converse: opp ∠s of cyclic quad/ *omgekeerde teenoorst ∠e v koordevh*] OR ∠s of quad = 180°/*∠e van koordevh = 180°*]	✓ S ✓R ✓ R (3)
	OR $E\hat{O}B = 90°$ $D\hat{G}F = \hat{G}_3 + \hat{G}_4 = 90°$ [∠ in semi-circle/∠ *in halfsirkel*] $E\hat{O}B = D\hat{G}F$ ∴ DGFO is a cyclic quad. . [converse: ext ∠ = opp int ∠/ *omgekeerde buite∠ = teenoorst ∠*] OR ext∠ of quad = opp int ∠/*buite∠ v vh = teenoorst ∠*]	✓ S ✓R ✓ R (3)
10.2.1(b)	$\hat{F}_1 = \hat{D}$ [ext ∠of cyclic quad/buite∠ v koordevh] $\hat{G}_1 + \hat{G}_2 = \hat{D}$ [tan-chord theorem/raakl koordst] $\therefore \hat{F}_1 = \hat{G}_1 + \hat{G}_2$ ∴ GC = CF [sides opp equal ∠s/sye teenoor = ∠e]	✓ S ✓ R ✓ S ✓ R ✓ R (5)

10.2.2(a)	AB = DE = 14 [diameters/*middellyne*] $\therefore$ OB = 7 units $\therefore$ BC = OC – OB = 11 – 7 = 4 units Answer only: full marks	✓ S ✓ S ✓ S (3)
10.2.2(b)	In ΔCGB and ΔCAG $\hat{G}_1 = \hat{A} = x$ [tan-chord theorem/*raakl koordst*] $\hat{C} = \hat{C}$ [common] ΔCGB ||| ΔCAG [$\angle, \angle, \angle$] $\frac{CG}{CA} = \frac{CB}{CG}$ $\frac{CG}{18} = \frac{4}{CG}$ $CG^2 = 72$ $CG = \sqrt{72}$ or $6\sqrt{2}$ *or* 8,49 units	✓ S/R ✓ S ✓ S ✓ CA = 18 ✓answer (5)
10.2.2(c)	OF = OC – FC $= 11 - \sqrt{72}$ $\tan E = \frac{OF}{OE}$ $= \frac{11 - \sqrt{72}}{7} = 0{,}36$ $\hat{E} = 19{,}76°$ **OR** OF = OC – FC $= 11 - \sqrt{72}$ $FE^2 = OE^2 + OF^2$ $= 7^2 + (11 - \sqrt{72})^2$ FE = 7,437.. = 7,44 $\cos E = \frac{OE}{FE}$ *OR* $\sin E = \frac{OF}{FE}$ $= \frac{7}{7{,}44} = 0{,}94$ $= \frac{11 - \sqrt{72}}{7{,}44} = 0{,}338$ $\hat{E} = 19{,}76°$ $\hat{E} = 19{,}76°$	✓ OF ✓ trig ratio ✓ substitution ✓ answer (4) ✓ OF ✓ trig ratio ✓ substitution ✓ answer (4)
		[26]

	TOTAL/*TOTAAL*:	**150**

QUESTION/*VRAAG* 10



10.1.1	$\hat{A}_2 = \hat{A}_1 = 90° - x$ [= chords subtend = ∠s = *kde onderspan* =∠*e*] $\hat{D}_2 = x$ [exterior angle of cyclic quad/*buite∠ koordevh.*] $\therefore \hat{C}_2 = 90° - x$ [sum of ∠s of/*som v ∠e*, ΔDCM] $\therefore \hat{C}_2 = \hat{A}_1 = 90° - x$ ∴ MC is a tangent to the circle at C [converse: tan chord th] *MC is 'n raaklyn by C [omgekeerde raakl koordst]*	✓ S ✓R ✓ S/R ✓ $\hat{C}_2 = 90° - x$ ✓ R (5)
	OR/*OF* $\hat{A}_2 = \hat{A}_1 = 90° - x$ [= chords subtend = ∠s/ = *kde onderspan* =∠*e*] $\hat{C}_1 + \hat{C}_2 = x$ [sum of ∠s of/*som v ∠e*, ΔACM] $\therefore \hat{C}_1 + \hat{C}_2 = \hat{B} = x$ ∴ MC is a tangent to the circle at C [converse : tan chord th] *MC is 'n raaklyn by C [omgekeerde raakl koordst]*	✓ S ✓ R ✓✓ $\hat{C}_1 + \hat{C}_2 = x$ ✓ R (5)
	OR/*OF* In ΔAMC and ΔACB: $\hat{A}_2 = \hat{A}_1 = 90° - x$ [= chords subtend = ∠s/ = *kde onderspan* =∠*e*] $A\hat{M}C = A\hat{C}B = 90°$ [given] $\therefore \hat{C}_1 + \hat{C}_2 = \hat{B} = x$	✓ S ✓ R ✓✓ $\hat{C}_1 + \hat{C}_2 = x$

	$\therefore$ MC is a tangent to the circle at C [converse : tan chord th] *MC is 'n raaklyn by C [omgekeerde raakl koordst]*	✓ R (5)
	In ΔACB and/*en* ΔCMD $\hat{B} = \hat{D}_2 = x$ [proved **OR** exterior $\angle$ of cyclic quad.] *[bewys **OF** buite $\angle$v koordevh]* $\hat{A}_2 = \hat{C}_2 = 90° - x$ [proved **OR** sum of $\angle$s in Δ] [*Bewys **OF** som v $\angle$e in Δ*] $\Delta ACB \parallel\mid \Delta CMD$ [$\angle, \angle, \angle$] **OR/*OF*** In ΔACB and/*en* ΔCMD $\hat{B} = \hat{D}_2 = x$ [proved **OR** exterior $\angle$ of cyclic quad.] *[bewys **OF** buite $\angle$v koordevh]* $A\hat{C}B = A\hat{M}C = 90°$ [given/*gegee*] $\Delta ACB \parallel\mid \Delta CMD$ [$\angle, \angle, \angle$] **OR/*OF*** In ΔACB and/*en* ΔCMD $\hat{B} = \hat{D}_2 = x$ [proved **OR** exterior $\angle$ of cyclic quad] *[bewys **OF** buite $\angle$v koordevh]* $\hat{A}_2 = \hat{C}_2 = 90° - x$ [proved **OR** sum of $\angle$s in Δ] *[Bewys **OF** som v $\angle$e in Δ]* $A\hat{C}B = A\hat{M}C = 90°$ [given **OR** sum of $\angle$s in Δ] *[gegee **OF** som v $\angle$e in Δ]* $\Delta ACB \parallel\mid \Delta CMD$	✓ S ✓ S ✓ R (3) ✓ S ✓ S ✓ R (3) ✓ S ✓ S ✓ S (3)
10.2.1	$\frac{BC}{MD} = \frac{AB}{DC}$ [$\Delta ACB \parallel\mid \Delta CMD$] $\frac{DC}{MD} = \frac{AB}{DC}$ [BC = DC] $\therefore DC^2 = AB \times MD$ In ΔAMC and/*en* ΔCMD $\hat{M}$ is common/*gemeen* $\hat{A}_1 = \hat{C}_2$ [tan chord th /*raaklyn koordst*] **OR/*OF*** $\hat{C}_1 + \hat{C}_2 = \hat{B} = \hat{D} = x$ [tan chord th /*raaklyn koordst* **OR/*OF*** exterior $\angle$ of cyclic quad/ *buite $\angle$v kdvh*] $\Delta AMC \parallel\mid \Delta CMD$ [$\angle, \angle, \angle$] $\frac{AM}{CM} = \frac{CM}{MD}$ $\therefore CM^2 = AM \times MD$ $\therefore \frac{CM^2}{DC^2} = \frac{AM \times MD}{AB \times MD}$ $= \frac{AM}{AB}$	✓ $\frac{BC}{MD} = \frac{AB}{DC}$ ✓ $DC^2 = AB \times MD$ ✓ S ✓ S ✓ $CM^2 = AM \times MD$ ✓ $\frac{AM \times MD}{AB \times MD}$ (6)

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OR/*OF*

$\frac{AC}{MC} = \frac{AB}{DC}$ [$\Delta ACB \parallel\!| \Delta CMD$]

$\therefore CM \times AB = AC \times DC$

In ΔAMC and/*en* ΔACB

$\hat{C} = \hat{M} = 90°$ [given]

$\hat{A}_1 = \hat{A}_2$ [proven]

OR/*OF*

$A\hat{C}M = \hat{B} = x$ [proven]

$\Delta AMC \parallel\!| \Delta ACB$ [$\angle, \angle, \angle$]

$\frac{AC}{AM} = \frac{BC}{MC}$

$\therefore AC \times MC = AM \times BC$

$\therefore AC = \frac{BC.AM}{MC}$

$CM \times AB = \frac{BC.AM}{MC} \times DC$

$CM^2 = \frac{DC.AM}{AB} \times DC$ [$BC = DC$]

$\frac{CM^2}{DC^2} = \frac{AM}{AB}$

</td><td>

✓ $\frac{AC}{MC} = \frac{AB}{DC}$

✓ S

✓ S

✓ $AC.MC = AM.BC$

✓ equating

✓ S

(6)

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<tr><td>10.2.2</td><td>

In ΔDMC:

$\frac{CM}{DC} = \sin x$

$\frac{CM^2}{DC^2} = \sin^2 x$ $\frac{AC}{AB} = \frac{CM}{DC}$

$\therefore \frac{AM}{AB} = \sin^2 x$

OR/*OF*

In ΔABC:

$\sin x = \frac{AC}{AB}$

In ΔAMC:

$\sin x = \frac{AM}{AC}$

$\sin x . \sin x = \frac{AC}{AB} \times \frac{AM}{AC} = \frac{AM}{AB}$

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✓ trig ratio

✓ square both sides

(2)

✓ 2 equations for $\sin x$

✓ product

(2)

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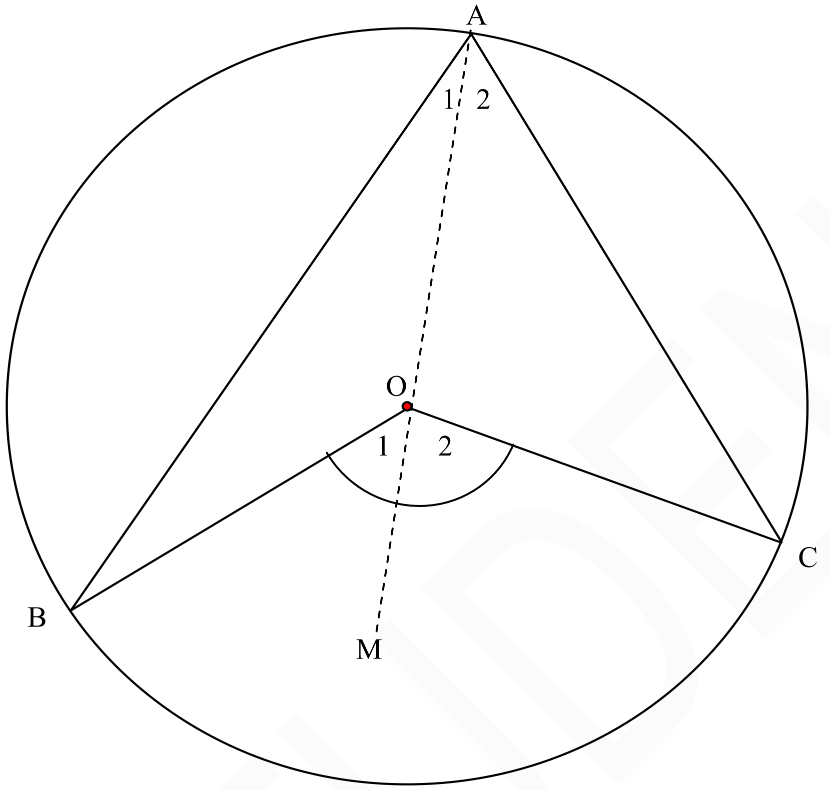
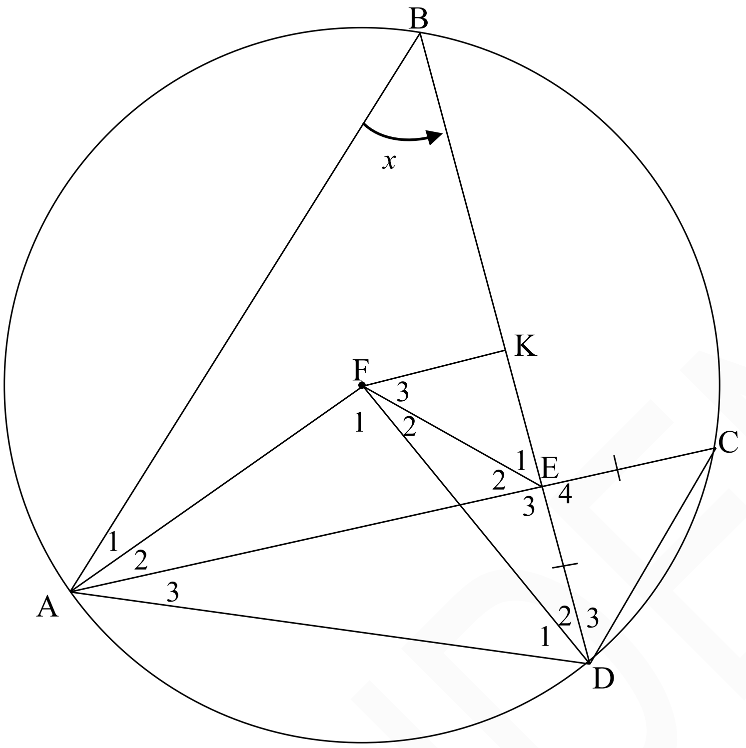
TOTAL/*TOTAAL*: 150

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)

10.2

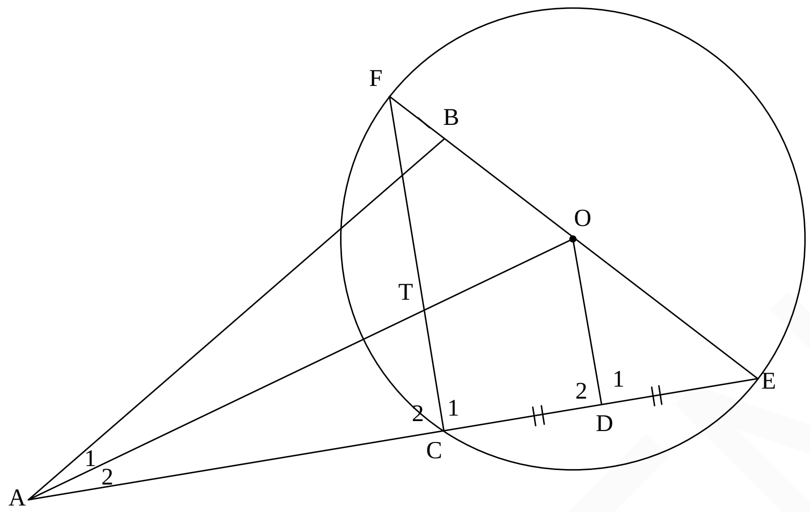


10.2.1(a)	$\hat{F}_1 = 2x$ [$\angle$ centre = 2$\angle$ at circum/*midpts$\angle$ =2omtreks$\angle$*]	✓ S ✓ R (2)
10.2.1(b)	$\hat{C} = x$ [$\angle$s in the same seg/*$\angle$e in dieselfde segment*] **OR/*OF*** $\hat{C} = x$ [$\angle$ centre = 2$\angle$ at circum/*midpts$\angle$ =2omtreks$\angle$*]	✓ S ✓ R (2) ✓ S ✓ R (2)
10.2.2	$\hat{D}_3 = x$ [$\angle$s opp equal sides/*$\angle$e teenoor = sye*] $\hat{E}_3 = 2x$ [ext $\angle$ of Δ/*buite $\angle$ van Δ*] $\therefore \hat{F}_1 = \hat{E}_3 = 2x$ $\therefore$ AFED is a cyclic quadrilateral [converse $\angle$s in the same seg]/ *Is 'n koordevierhoek* [*omgekeerde $\angle$e in dieselfde segm*]	✓ S/R ✓ S/R ✓ S ✓ R (4)

10.2.3	$\hat{A}_2+\hat{A}_3+\hat{D}_1+\hat{F}_1=180°$ [sum of ∠s in Δ/*som van ∠e in Δ*] $\hat{A}_2+\hat{A}_3=D_1$ [∠s opp = sides/*∠e teenoor = sye*] $\therefore\ \hat{A}_2+\hat{A}_3=90°-x$ $\hat{E}_1=\hat{A}_2+\hat{A}_3$ [ext∠of cyclic quad/*buite∠ v koordevh*] $=90°-x$ $F\hat{K}E=90°$ [line from centre bisects chord]/ [*lyn van midpt halveer koord*] $\hat{F}_3=x$ [sum of ∠s in Δ/*som van ∠e in Δ*]	✓ S ✓ S ✓ R ✓ S ✓ S ✓ R (6)
10.2.4	$B\hat{A}C=\hat{D}_3$ [∠s in the same seg/*∠e in dieselfde segm*] $AE=BE$ [sides opp equal ∠s/*sye teenoor =∠e*] $\dfrac{\text{area }\Delta AEB}{\text{area }\Delta DEC}=\dfrac{\frac{1}{2}(BE)(AE).\sin A\hat{E}B}{\frac{1}{2}(EC)(ED).\sin D\hat{E}C}$ $6{,}25=\dfrac{AE^2}{ED^2}$ $\therefore\ \dfrac{AE}{ED}=2{,}5$	✓ S ✓ S ✓ substitution into area rule ✓ simplification of RHS ✓ answer (5) **[24]**

TOTAL/*TOTAAL*: 150

QUESTION/*VRAAG* 10



10.1.1	$\hat{C}_1 = 90°$ [$\angle$ in semi circle / $\angle$ *in halfsirkel*] $\hat{D}_1 = 90°$ [line from centre to midpt of chord / *lyn vanaf midpt na midpt van koord*] $\therefore \hat{C}_1 = \hat{D}_1$ $\therefore$ FC ‖ OD [corresp $\angle$s = / *ooreenkomstige* $\angle$*e* =] **OR/OF** FO = OE [radii] CD = DE [given / *gegee*] $\therefore$ FC ‖ OD [midpoint theorem / *middelpuntstelling*]	✓ S ✓ R ✓ S ✓ R ✓ R (5) ✓ S ✓ R ✓ S ✓✓ R (5)
10.1.2	$D\hat{O}E = \hat{F}$ [corresp $\angle$s =; FC ‖ OD] $B\hat{A}E = \hat{F}$ [$\angle$s in the same seg] $\therefore D\hat{O}E = B\hat{A}E$	✓ S ✓ R ✓ S ✓ R (4)
10.1.3	In ΔABE and ΔFCE: $\hat{E}$ is common $B\hat{A}E = \hat{F}$ [proved in 10.1.2] $\therefore A\hat{B}E = \hat{C}_1$ [sum of $\angle$s in Δ] $\therefore$ ΔABE ‖‖ ΔFCE [$\angle\angle\angle$] $\frac{AB}{FC} = \frac{AE}{FE}$ [‖‖ Δs] $AB \times FE = AE \times FC$ But FE = 2 OF [$d = 2r$] And FC =2 OD [midpoint theorem] $AB \times 2OF = AE \times 2OD$ $\therefore AB \times OF = AE \times OD$	 ✓ S ✓ S ✓ R ✓ S ✓ S ✓ S/R ✓ S (7)

	OR/*OF* In ΔODE and ΔABE 1. $\hat{E}$ is common 2. $D\hat{O}E = E\hat{A}B$ (proved in 10.1.2) 3. $\hat{D}_1 = A\hat{B}E$ ($\angle$ sum Δ) $\Delta ODE \parallel\!\mid \Delta ABE$ ($\angle\angle\angle$) $\frac{EO}{EA} = \frac{OD}{AB} = \frac{ED}{EB}$ ($\parallel\!\mid \Delta$s) $\therefore AB.EO = OD.EA$ but OE = FO (radii) $\therefore AB \times OF = OD \times EA$	✓ S ✓ S ✓ R ✓ S ✓ S ✓ S ✓ R (7)
10.2	$\frac{AT}{TO} = \frac{AC}{CD} = \frac{3}{1}$ [line ∥ one side of Δ **OR** prop theorem; FC ∥ OD] But CD = DE $\frac{AE}{CE} = \frac{5}{2}$ $\therefore$ $AE = \frac{5}{2}CE$ $\frac{BE}{CE} = \frac{AE}{FE}$ [$\parallel\!\mid \Delta$s] $\frac{BE}{CE} = \frac{\frac{5}{2}CE}{FE}$ $BE \times FE = \frac{5}{2}CE^2$ $\therefore 5CE^2 = 2BE.FE$	✓ S ✓ R ✓ S ✓ S ✓substitute $AE = \frac{5}{2}CE$ (5)
		[21]

TOTAL/TOTAAL: 150

MATHEMATICS P2: JUNE 2018
MARKING GUIDELINES NOTES

QUESTION 1

1.1.1	If left as 190, 25 then penalise 1 mark.
1.1.2	If the position is used: $\left[\frac{1}{4}(n+1)+\frac{3}{4}(n+1)\right]\div 2$ $=\frac{158+219}{2}$ $=\frac{377}{2}$ $=188,5$

QUESTION 2

2.4	Do not accept estimation from the table.

QUESTION 3

3.1	No ca if $\frac{x_2-x_1}{y_2-y_1}$	
3.3	MD^2+AM^2 $=\left[(3-8)^2+(-1+11)^2\right]+\left[(3-7)^2+(-1-1)^2\right]$ $=125+20$ $=145$ AD^2 $=(7-8)^2+(1+11)^2$ $=145$ $MD^2+AM^2=AD^2$	✓ AM^2+MD^2 ✓ AD^2 ✓ $MD^2+AM^2=AD^2$ (3)

QUESTION 4

4.3	Candidates can use the rotation of P through $90°$ to get to R(6 ; 4) If the candidate assumes that R(4 ; 6) : 1/4 marks

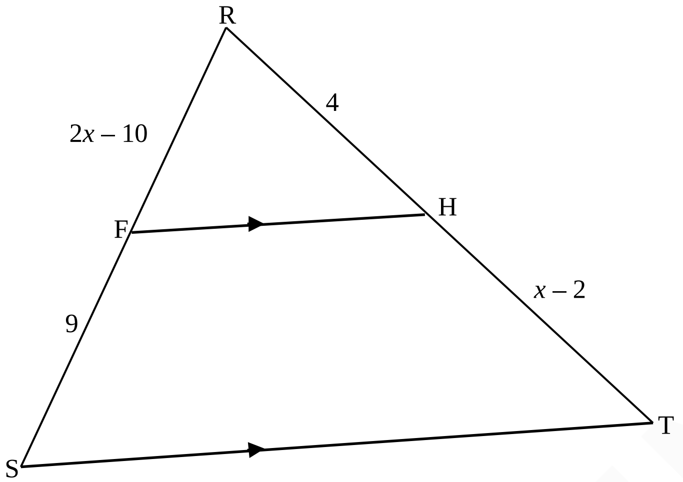
QUESTION 6

6.2	$y\in(-2\ ;\ 2)$	1/2 marks
	$-2<y<2$	1/2 marks

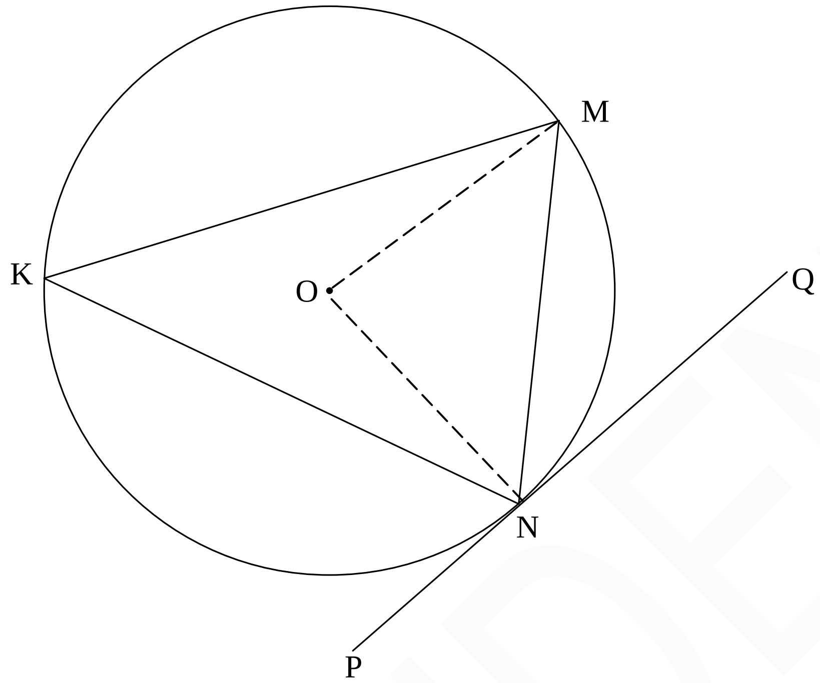
QUESTION 7

7.3	There is NO penalty for incorrect rounding.

QUESTION 9

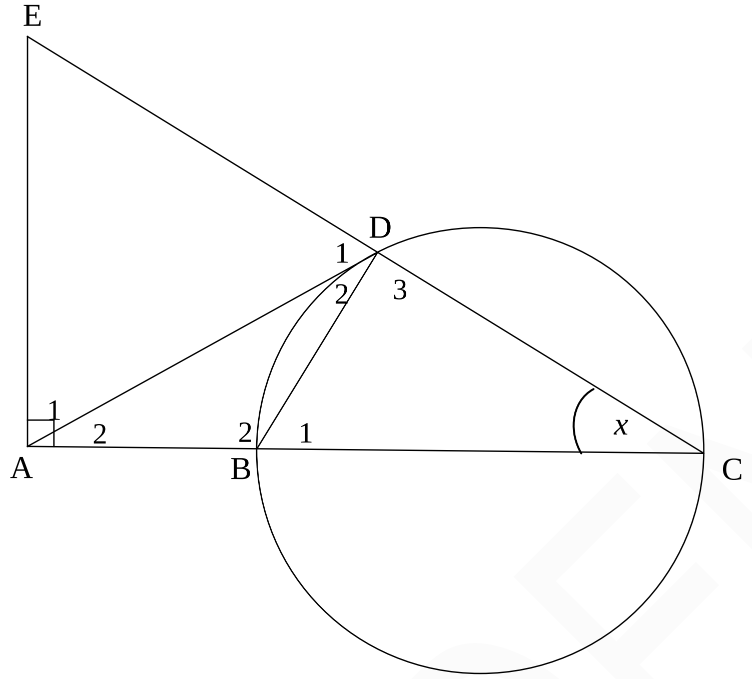


9.2.2	Join FT. area $\Delta RFH = \frac{4}{10} \times$ (area ΔRFT) But area $\Delta RFT = \frac{6}{15} \times$ (area ΔRST) (common vertex; = heights) area $\Delta RFH = \frac{4}{10} \times \frac{6}{15} \times$(area ΔRST) $\frac{\text{area}\Delta RFH}{\text{area}\Delta RST} = \frac{4}{25}$



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)

11.2



11.2.1(a)	Angle in a semi circle/ *Hoek in halfsirkel*	✓ R (1)
11.2.1(b)	Exterior ∠of quad = opp interior ∠/ *Buite ∠ van vierh = teenoorst binne ∠* **OR/*OF*** Opp ∠s of quad supplementary/ *Teenoorst ∠e van vierh is supplementêr*	✓ R (1)
11.2.1(c)	tangent chord theorem/ *raaklyn koord stelling*	✓ R (1)
11.2.2(a)	In ΔAEC $\hat{E} = 180° - (90° + x)$ [sum ∠s Δ] $= 90° - x$ $\hat{D}_1 = 180° - (90° + x)$ [∠s on a straight line] $= \hat{E} = 90° - x$ $\therefore$ AD = AE [sides opp = ∠s/ *sye teenoor = ∠e*]	✓ S ✓ S ✓ R (3)
11.2.2(b)	In ΔADB and ΔACD $\hat{A}_2 = \hat{A}_2$ [common] $\hat{D}_2 = \hat{C}$ [proven] $\hat{B}_2 = \hat{D}_2 + \hat{D}_3$ [sum ∠^{e} Δ] $\therefore \Delta ADB \parallel\!\mid \Delta ACD$ **OR/*OF*** In ΔADB and ΔACD $\hat{A}_2 = \hat{A}_2$ [common] $\hat{D}_2 = \hat{C}$ [proven] $\therefore \Delta ADB \parallel\!\mid \Delta ACD$ [∠, ∠, ∠]	✓ S ✓ S ✓ S (3) ✓ S ✓ S ✓ R (3)

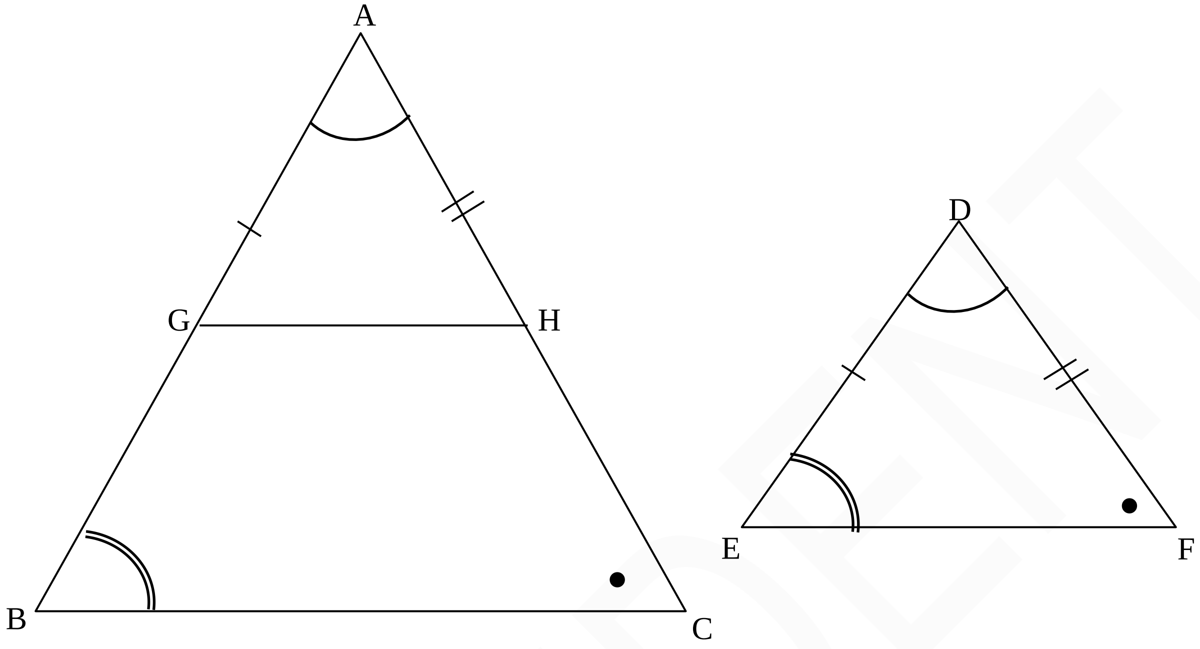
11.2.3(a)	$\frac{AD}{AC}=\frac{AB}{AD}$ [$\lvert\lvert\lvert$ Δs] $AD^2 = AC\ .\ AB$ $= 3r \times r$ $= 3r^2$	✓ ratio ✓ substitution (2)
11.2.3(b)	$AD = AE = \sqrt{3}r$ [from 11.2.2(a) &11.2.3(a)] $AB = r$ and $BC = 2r$ $\therefore AC = 3r$ <u>In ΔACE:</u> $\tan\hat{E}=\frac{AC}{AE}$ $=\frac{3r}{\sqrt{3}r}=\sqrt{3}$ $\therefore\ \hat{E}=60°$ $\therefore\ \hat{D}_1=60°$ [from 11.2.2(a)] $\therefore\ \hat{A}_1=60°$ [∠s of Δ = 180°] ∴ ΔADE is equilateral/*is gelyksydig* **OR/*OF*** $\frac{AD}{AC}=\frac{DB}{CD}$ [$\lvert\lvert\lvert$ Δs] $\frac{\sqrt{3}r}{3r}=\frac{DB}{CD}$ $\tan x=\frac{1}{\sqrt{3}}$ ∴ In ΔBDC: $x = 30°$ $\therefore\ \hat{E}=60°$ $\therefore\ \hat{D}_1=60°$ [from 11.2.2(a)] $\therefore\ \hat{A}_1=60°$ [∠s of Δ = 180°] ∴ ΔADE is equilateral/*is gelyksydig* **OR/*OF*** $\frac{AD}{AC}=\frac{DB}{CD}$ [$\lvert\lvert\lvert$ Δs] $\frac{\sqrt{3}r}{3r}=\frac{DB}{CD}$ $\therefore BD=\frac{CD}{\sqrt{3}}$ $DC^2 = BC^2 - DB^2$ $= 4r^2-\frac{CD^2}{3}$ $3DC^2 = 12r^2 - CD^2$ $4CD^2 = 12r^2$ $DC=\sqrt{3}r$	 ✓ AC ito r ✓ trig ratio ✓ simplification ✓ all 3 ∠s = 60° (4) ✓ $\frac{\sqrt{3}r}{3r}=\frac{DB}{CD}$ ✓ $\frac{1}{\sqrt{3}}=\tan x$ ✓ $x = 30°$ ✓ all 3 ∠s = 60° (4) ✓ $BD=\frac{CD}{\sqrt{3}}$ ✓ $DC=\sqrt{3}r$

	$EC^2 = EA^2 + AC^2$ $= 3r^2 + 9r^2$ $EC = 2\sqrt{3}r$ $\therefore$ ED = EC – DC $= \sqrt{3}r$ $\therefore$ ED = EA = AD $\therefore$ ΔADE is equilateral/*is gelyksydig*	✓ $EC = 2\sqrt{3}r$ ✓ ED = EA = AD (4) **[20]**

TOTAL/*TOTAAL*: 150

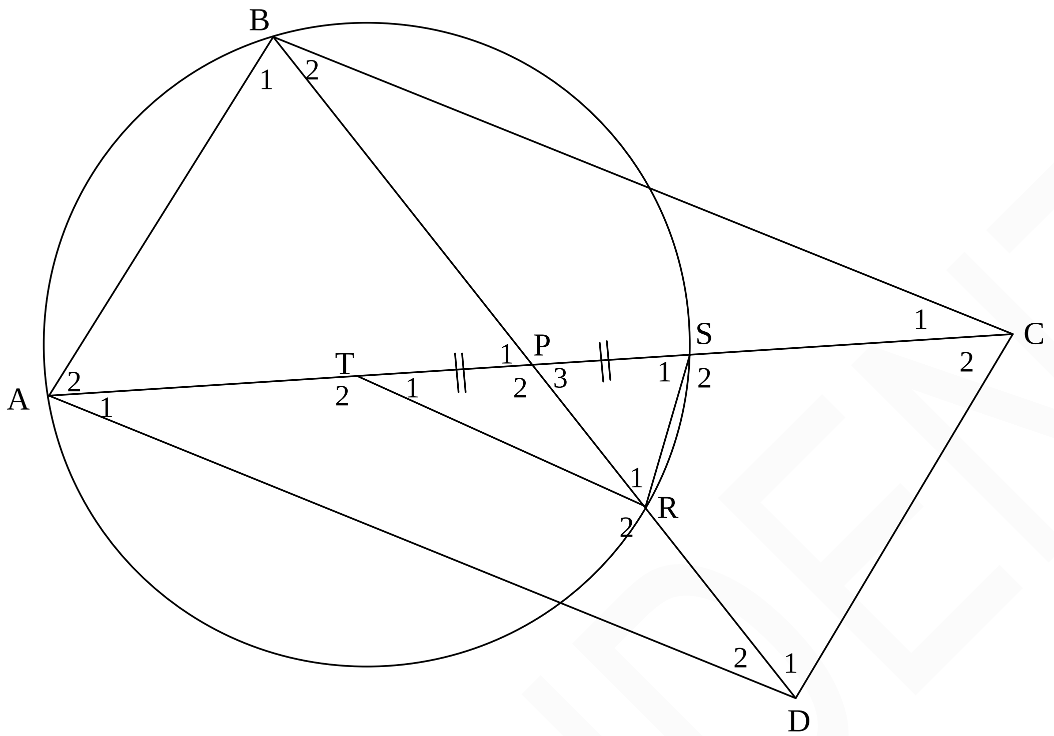
QUESTION/VRAAG 11

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.*	✓ construction/ *konstruksie*
	Proof/*Bewys*:	
	$\Delta AGH \equiv \Delta DEF$ [s, ∠, s]	✓ S/R
	$\therefore A\hat{G}H = \hat{E}$	
	$= \hat{B}$ [$\hat{B} = \hat{E}$, given/*gegee*]	✓ S
	$\therefore GH \parallel BC$ [corresp/*ooreenk* $\angle^s$ =]	✓ S /R
	$\therefore \frac{AG}{AB} = \frac{AH}{AC}$ [line ∥ side of Δ / *lyn* ∥ *sye v* Δ]	✓ S ✓ R
	$\therefore \frac{DE}{AB} = \frac{DF}{AC}$ [constr/*konstruksie*]	(6)

11.2

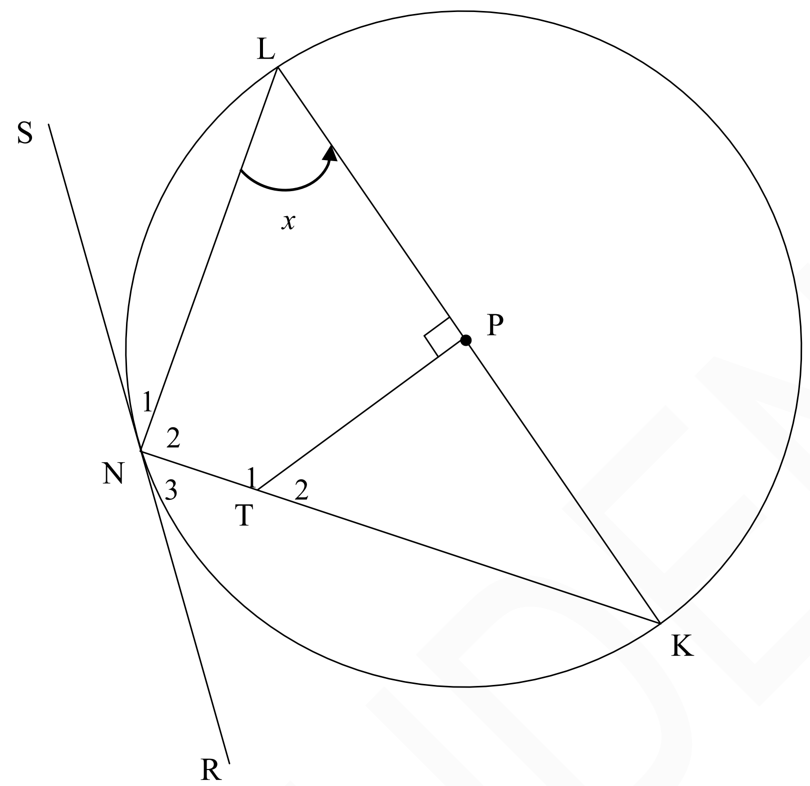


11.2.1(a)	$AP = PC$ [diag $\|\|^m$ bisect each other/*hoekl* $\|\|^m$ *halveer mekaar*] But $TP = PS$ [given/*gegee*] $AP - TP = PC - PS$ $\therefore AT = SC$	✓S ✓S OR S 2)
11.2.1(b)	In ΔPSR and ΔPBA : $\hat{P}_1 = \hat{P}_3$ [vertically opp $\angle^s$ / *regoorst* $\angle e$] $\hat{B}_1 = \hat{S}_1$ [$\angle^s$ in same segment/$\angle e$ *in dies segment*] $\therefore \Delta PSR \|\|\| \Delta PBA$ [$\angle, \angle, \angle$] **OR/*OF*** In ΔPSR and ΔPBA : $\hat{P}_1 = \hat{P}_3$ [vertically opp $\angle^s$ / *regoorst* $\angle e$] $\hat{B}_1 = \hat{S}_1$ [$\angle^s$ in same segment/$\angle e$ *in dies segment*] $\hat{A}_2 = \hat{R}_1$ [sum $\angle^s$ Δ / *som* $\angle e$ Δ] $\therefore \Delta PSR \|\|\| \Delta PBA$ [$\angle, \angle, \angle$]	✓S ✓R ✓S ✓R ✓R (5) ✓S ✓R ✓S ✓R ✓S (5)

11.2.2(a)	$\frac{PR}{PA}=\frac{PS}{PB}$ [$\|\|\|\Delta s$] $\therefore \frac{PR}{PA}=\frac{TR}{AD}=\frac{PS}{PB}$ [given $\frac{PR}{PA}=\frac{TR}{AD}$] $\therefore \frac{PR}{PA}=\frac{TR}{AD}=\frac{TP}{PD}$ [PS = TP; PB = PD] $\therefore \Delta RPT \|\|\| \Delta APD$ [sides of Δ in prop/*sye v Δ in dies verhouding*]	✓ S (all 3 ratios) ✓ S ✓ R (3)
11.2.2(b)	$\hat{T}_1 = \hat{D}_2$ [$\|\|\| \Delta s$] $\therefore$ ATRD is a cyclic quad [converse: ext $\angle$ of cyclic quad/ *Omgekeerde buite* $\angle$ v koordevh]	✓ S ✓ R (2)
		[18]

TOTAL/*TOTAAL*: 150

QUESTION/*VRAAG* 11



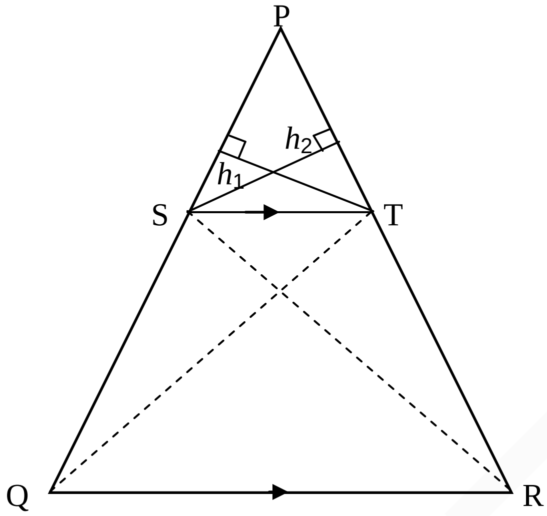
11.1	$\hat{N}_2 = 90°$ [∠ in semi-circle/*halfsirkel*] ∴ TPLN is a cyclic quad/ 'n *koordevh* [opp ∠s of quad is suppl/ *teenoor∠e v vh is suppl*] **OR** $\hat{N}_2 = 90°$ [∠ in semi-circle/*halfsirkel*] ∴ TPLN is a cyclic quad [ext ∠ = int opp ∠/*buite∠ = to binne ∠*]	✓ S ✓ R ✓ R (3) ✓ S ✓ R ✓ R (3)
11.2	$\hat{T}_2 = P\hat{L}N = x$ [ext ∠ of cyclic quad/*buite∠ van koordevh*] $\hat{K} = 90° - x$ [sum of/*som v* ∠s/e in Δ] $\hat{N}_1 = \hat{K} = 90° - x$ [tan chord theorem/*raakl-koordst*] **OR/*OF*** $\hat{K} = 90° - x$ [sum of/*som v* ∠s/e in Δ] $\hat{N}_1 = \hat{K} = 90° - x$ [tan chord theorem/*raakl-koordst*] **OR/*OF*** $\hat{N}_3 = x$ [tan chord theorem/*raakl-koordst*] $\hat{N}_2 = 90°$ [∠in semi circle/ *halfsirkel*] $\hat{N}_1 = 90° - x$ [straight line/*reguitlyn*]	✓ R ✓ S✓ R (3) ✓ R ✓ S✓ R (3) ✓ R ✓ S ✓ S (3)

11.3.1	In ΔKTP and ΔKLN: $P\hat{K}T = L\hat{K}N$ [common/*gemeen*] $K\hat{P}T = K\hat{N}L = 90°$ [given/*gegee*] $\therefore \Delta KTP \mid\mid\mid \Delta KLN$ [$\angle\angle\angle$] **OR/*OF*** In ΔKTP and ΔKLN: $P\hat{K}T = L\hat{K}N$ [common/*gemeen*] $K\hat{P}T = K\hat{N}L = 90°$ [given/*gegee*] $\hat{T}_2 = P\hat{L}N = x$ [proved in 11.2 **OR** sum of $\angle$s in Δ] $\therefore \Delta KTP \mid\mid\mid \Delta KLN$	✓ S ✓ S ✓ R (3) ✓ S ✓ S ✓ S (3)
11.3.2	$\frac{KT}{KL} = \frac{KP}{KN}$ [$\mid\mid\mid$ Δs] $\therefore KT . KN = KP . KL$ But $KL = 2KP$ [radii: PK = LP] $\therefore KT . KN = KP . 2KP$ $= 2KP^2$ $= 2(KT^2 - TP^2)$ [Theorem of Pythagoras] $= 2KT^2 - 2TP^2$	✓ S/R ✓ S ✓ S ✓ S ✓ S (5) **[14]**

TOTAL/*TOTAAL*: 150

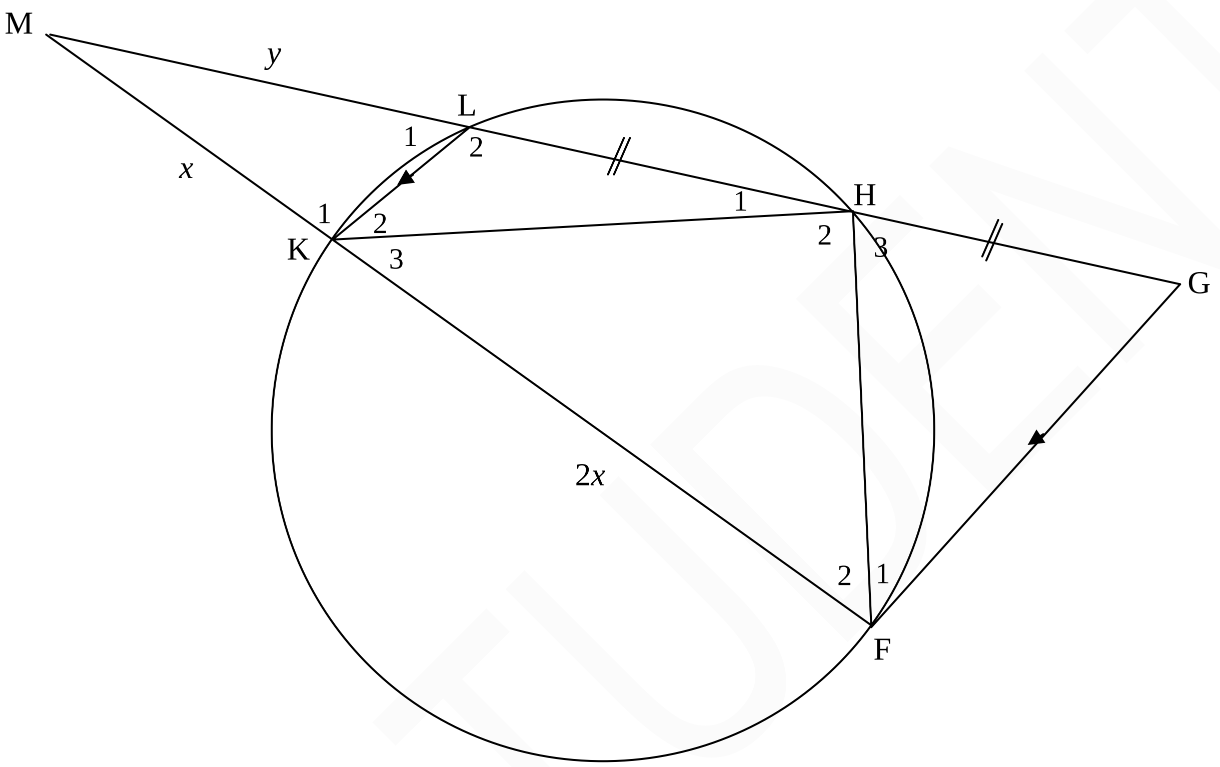
QUESTION/*VRAAG* 10

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 :	
	$\dfrac{\text{area } \Delta\text{PST}}{\text{area } \Delta\text{QST}} = \dfrac{\frac{1}{2}\text{PS} \times h_2}{\frac{1}{2}\text{SQ} \times h_2} = \dfrac{\text{PS}}{\text{SQ}}$ equal altitudes	✓ $\dfrac{\text{area } \Delta\text{PST}}{\text{area } \Delta\text{QST}} = \dfrac{\frac{1}{2}\text{PS} \times h_2}{\frac{1}{2}\text{SQ} \times h_2}$
	$\dfrac{\text{area } \Delta\text{PST}}{\text{area } \Delta\text{STR}} = \dfrac{\frac{1}{2}\text{PT} \times h_1}{\frac{1}{2}\text{TR} \times h_1} = \dfrac{\text{PT}}{\text{TR}}$ equal altitudes	✓ $\dfrac{\text{area } \Delta\text{PST}}{\text{area } \Delta\text{STR}} = \dfrac{\text{PT}}{\text{TR}}$
	area ΔPST = area ΔPST [common]	
	But area ΔQST = area ΔSTR [same base, height; ST || QR]	✓ S ✓ R
	$\therefore \dfrac{\text{area } \Delta\text{PST}}{\text{area } \Delta\text{QST}} = \dfrac{\text{area } \Delta\text{PST}}{\text{area } \Delta\text{STR}}$	
	$\therefore \dfrac{\text{PS}}{\text{SQ}} = \dfrac{\text{PT}}{\text{TR}}$	✓ S
		(6)

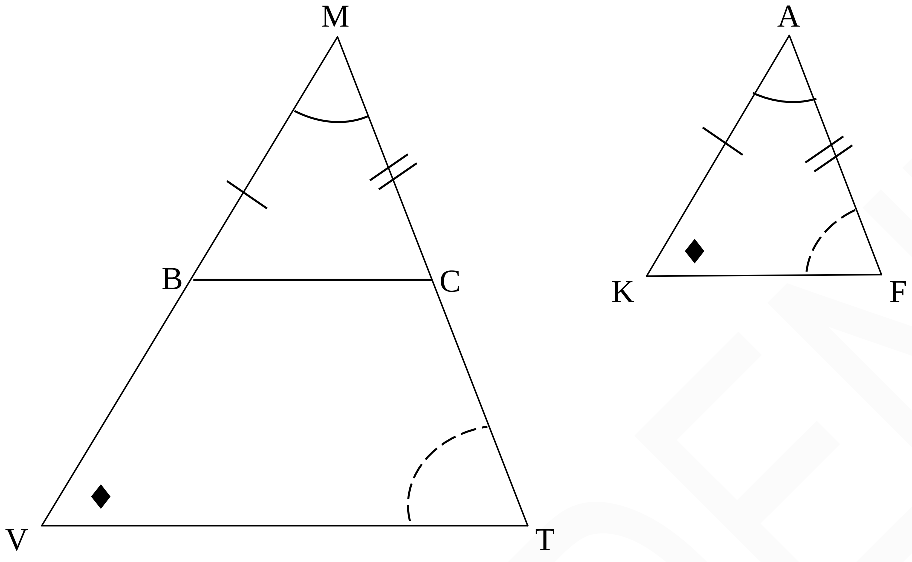
10.2



10.2.1	Corresponding/*Ooreenkomstige* ∠s/*e*; GF ‖ LK	✓ R (1)
10.2.2(a)	$\frac{GL}{LM}=\frac{FK}{KM}$ OR $\frac{GL}{y}=\frac{2x}{x}$ [prop theorem/*eweredighst*; GF ‖ LK] $\frac{2GH}{y}=\frac{2x}{x}$ [LH = HG] $\therefore GH = y$	✓S ✓ R ✓ GL = 2GH (3)

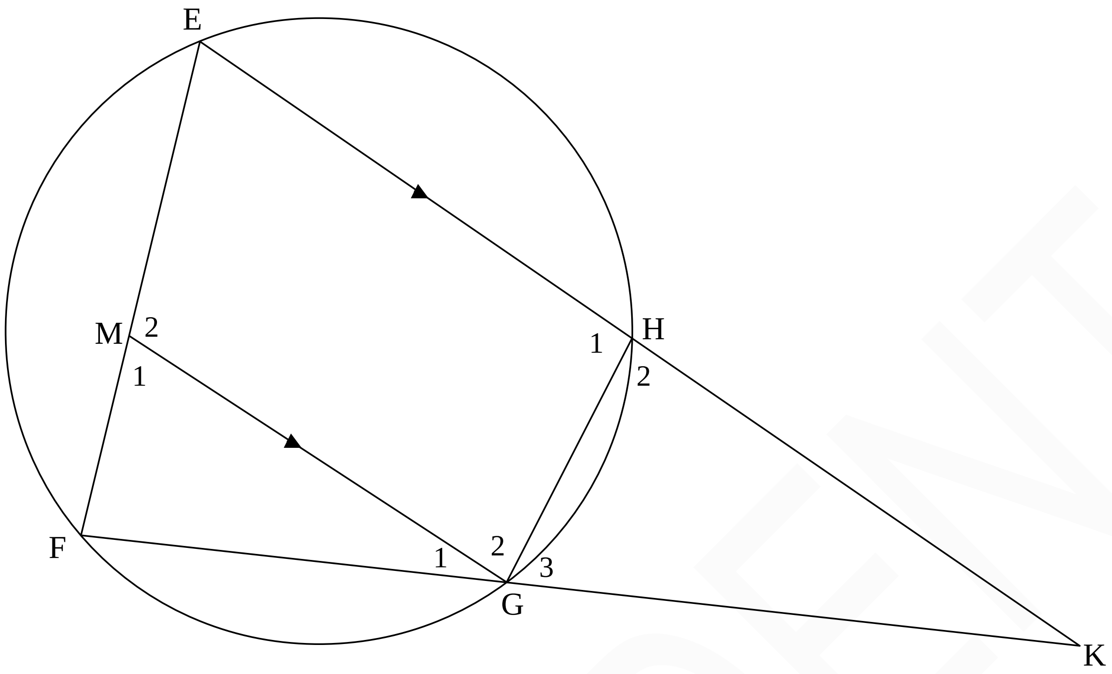
10.2.2(b)	$\overleftarrow{K}_1 = G\hat{F}M$ [corresponding/*ooreenkomst* $\angle$ s; GF ‖ LK] $L\hat{K}M$ or $\overleftarrow{K}_1 = M\hat{H}F$ [ext $\angle$ cyclic quad/*buite$\angle$koordevh*] $M\hat{H}F = G\hat{F}M$ In ΔMFH and ΔMGF: $\hat{M} = \hat{M}$ [common/*gemeen*] $M\hat{H}F = G\hat{F}M$ [proven/*bewys*] $\therefore$ ΔMFH ‖‖ ΔMGF [$\angle\angle\angle$] **OR/*OR*** $\overleftarrow{K}_1 = G\hat{F}M$ [corresponding/*ooreenkomst* $\angle$ s; GF ‖ LK] $L\hat{K}M$ or $\overleftarrow{K}_1 = M\hat{H}F$ [ext $\angle$ cyclic quad/*buite$\angle$koordevh*] $M\hat{H}F = G\hat{F}M$ In ΔMFH and ΔMGF: $\hat{M} = \hat{M}$ [common/*gemeen*] $M\hat{H}F = G\hat{F}M$ [proven/*bewys*] $\hat{F}_2 = \hat{G}$ [$\angle$s of Δ = 180°] $\therefore$ ΔMFH ‖‖ ΔMGF	✓S ✓ R ✓ S ✓ S ✓ R (5) ✓S ✓ R ✓ S ✓ S ✓ S (5)
10.2.2(c)	$\therefore \frac{GF}{FH} = \frac{MF}{MH}$ [‖‖ Δs] $= \frac{3x}{2y}$	✓S ✓R (2)
10.2.3	$\frac{MF}{MH} = \frac{MG}{MF}$ [‖‖ Δs] $\frac{3x}{2y} = \frac{3y}{3x}$ [from 10.2.2(*c*)] $\frac{y^2}{x^2} = \frac{9}{6} = \frac{3}{2}$ $\frac{y}{x} = \sqrt{\frac{3}{2}}$	✓ S ✓substitution ✓ simplification (3) **[20]**
	TOTAL MARKS	**150**

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*] $\Delta BMC \equiv \Delta KAF$ [s $\angle$ s] $\therefore M\hat{B}C = A\hat{K}F$ or $M\hat{C}B = A\hat{F}K$ [$\equiv \Delta$] 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 $\angle$s/*maar hulle is ooreenk* $\angle$*e* $\therefore BC \parallel VT$ [corr $\angle$s = /*ooreenk*$\angle$*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)

10.2

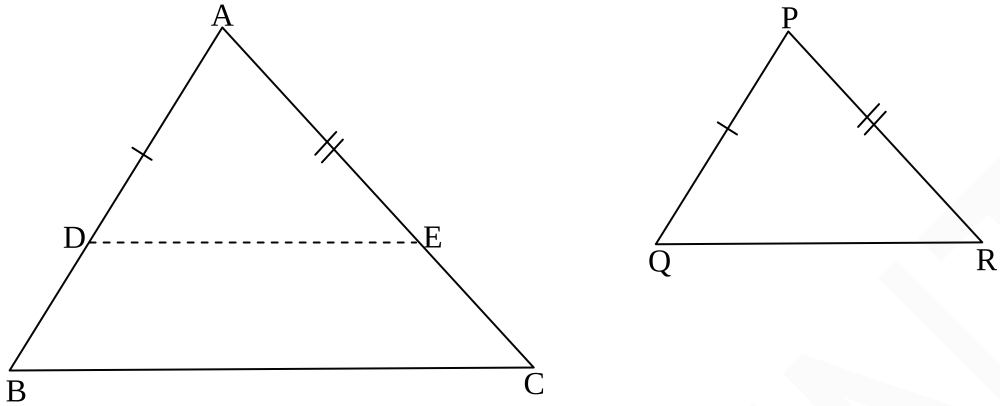


10.2.1(a)	In ΔKGH and ΔKEF $\hat{K}$ is common/*gemeen* $\hat{H}_2 = \hat{F}$ [ext $\angle$ cyclic quad/*buite* $\angle$ *koordevh*] $\hat{G}_3 = \hat{E}$ [sum$\angle$s Δ OR ext $\angle$ cyclic quad/*som*$\angle$*e*Δ *OR buite*$\angle$*koordevh*] $\therefore \Delta KGH \,\vert\vert\vert\, \Delta KEF$ [$\angle\angle\angle$]	✓ S ✓S ✓R ✓ naming third angle OR $\angle\angle\angle$ (4)
10.2.1(b)	$\frac{EF}{GH} = \frac{KE}{KG}$ [$\vert\vert\vert$ Δs] $\therefore \frac{EF}{GH} = \frac{KE}{EF}$ [KG = EF] $\therefore EF^2 = KE.GH$	✓ S ✓ S (2)
10.2.1(c)	$\frac{KG}{KF} = \frac{EM}{EF}$ [prop theorem/*eweredighst*; MG | | EK] but EF = KG [given/*gegee*] $\frac{KG}{KF} = \frac{EM}{KG}$ $KG^2 = EM.KF$	✓ S ✓ R ✓ S (3)
10.2.2	KE.GH = EM.KF $EM = \frac{20 \times 4}{16}$ = 5 units	✓ KE.GH = EM.KF ✓ substitution ✓ answer (3) **[19]**

TOTAL/*TOTAAL*: 150

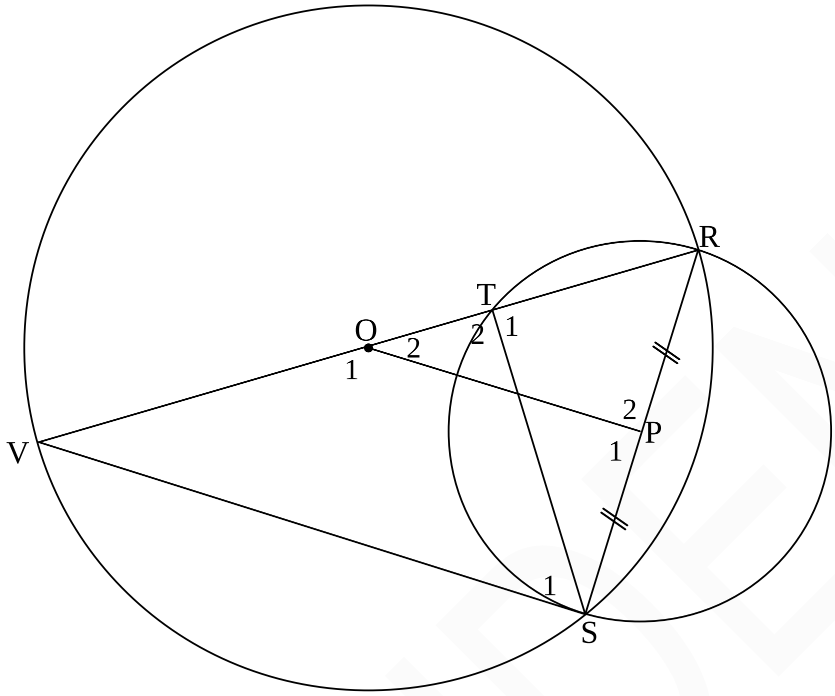
QUESTION/*VRAAG* 10

10.1



10.1.1	In ΔADE and/*en* ΔPQR: AD = PQ [construction/*konstr*] $\hat{A} = \hat{P}$ [given/*gegee*] AE = PR [construction/*konstr*] $\therefore \Delta ADE \equiv \Delta PQR$ [S∠S]	✓all/*al* 3 S's/*e* ✓reason/*rede* (2)
10.1.2	$A\hat{D}E = \hat{Q}$ [Δs ≡ ∴ corres/*ooreenk* ∠s/*e* =] But $\hat{B} = \hat{Q}$ [given/*gegee*] $\therefore A\hat{D}E = \hat{B}$ $\therefore$ DE | | BC [corres/*ooreenk* ∠s/*e* =]	✓ $A\hat{D}E = \hat{Q}$ ✓ $A\hat{D}E = \hat{B}$ ✓reason/*rede* (3)
10.1.3	$\frac{AB}{AD} = \frac{AC}{AE}$ [Prop Th/*Eweredigh st*; DE | | BC] But/*Maar* AD = PQ and/*en* AE = PR [construction/*konstr*] $\therefore \frac{AB}{PQ} = \frac{AC}{PR}$	✓S/R ✓S (2)

10.2

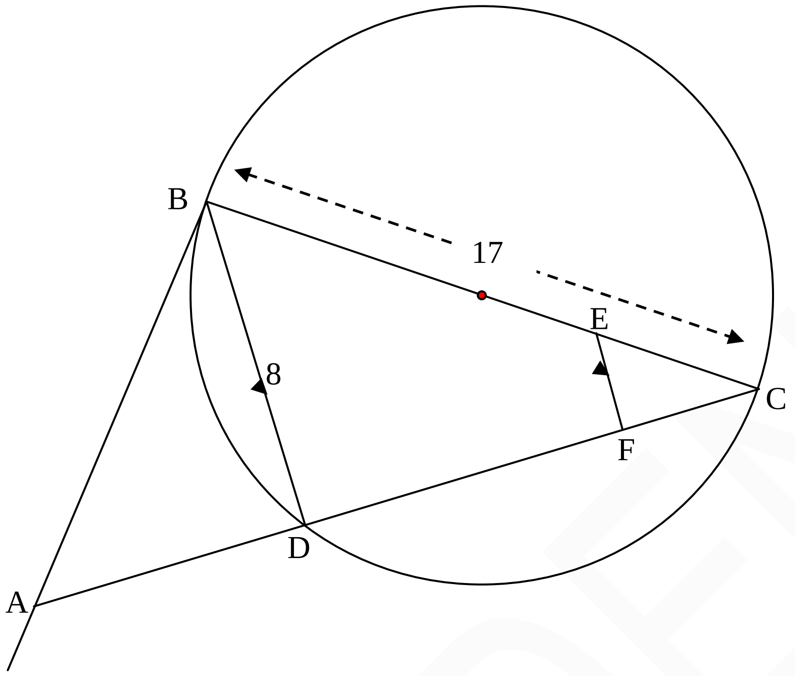


10.2.1	line from centre to midpt of chord/*lyn van midpt na midpt van koord*	✓answ/*antw* (1)
10.2.2	OP || VS [Midpt Theorem/*Midpt-stelling*] In ΔROP and/*en* ΔRVS: $\hat{R} = \hat{R}$ [common/*gemeen*] $\hat{O}_2 = \hat{V}$ [corresp/*ooreenk* ∠s/*e*; OP || VS] $\therefore \Delta ROP \ \|\|\| \ \Delta RVS$ [∠,∠,∠] **OR/*OF*** In ΔROP and/*en* ΔRVS: $\hat{P}_2 = V\hat{S}R$ [corresponding ∠s/ *ooreenkomstige* ∠'e] $\hat{R} = \hat{R}$ [common/*gemeen*] $\therefore \Delta ROP \ \|\|\| \ \Delta RVS$ [∠,∠,∠]	✓S ✓ R ✓S ✓S & ∠;∠;∠ **OR/*OF*** 3 angles/*hoeke* (4) ✓S ✓ R ✓S ✓S & ∠;∠;∠ **OR/*OF*** 3 angles/*hoeke* (4)

10.2.3	In ΔRVS and/*en* ΔRST: $V\hat{S}R = S\hat{T}R = 90°$ [$\angle$ in semi-circle/$\angle$ *in halfsirkel*] $\hat{R}$ is common/*gemeen* $\hat{V} = T\hat{S}R$ $\therefore \Delta RVS \mid\mid\mid \Delta RST$ [$\angle,\angle,\angle$]	✓S ✓ R ✓S & $\angle;\angle;\angle$ **OR/*OF*** 3 angles/*hoeke* (3)
10.2.4	In ΔRTS and/*en* ΔSTV: $R\hat{T}S = V\hat{T}S = 90°$ [$\angle$ s on straight line/$\angle$*e op rt lyn*] $\hat{R} = 90° - T\hat{S}R$ $= T\hat{S}V$ $T\hat{S}R = \hat{V}$ $\therefore \Delta RTS \mid\mid\mid \Delta STV$ [$\angle,\angle,\angle$] $\therefore \dfrac{RT}{ST} = \dfrac{TS}{VT}$ $\therefore ST^2 = VT.TR$	✓ΔRTS & ΔSTV ✓S ✓S ✓S (with justification/*met motivering*) ✓$\Delta RTS \mid\mid\mid \Delta STV$ ✓ratio/*verh* (6)
		[21]

TOTAL/*TOTAAL*: 150

QUESTION/*VRAAG* 10



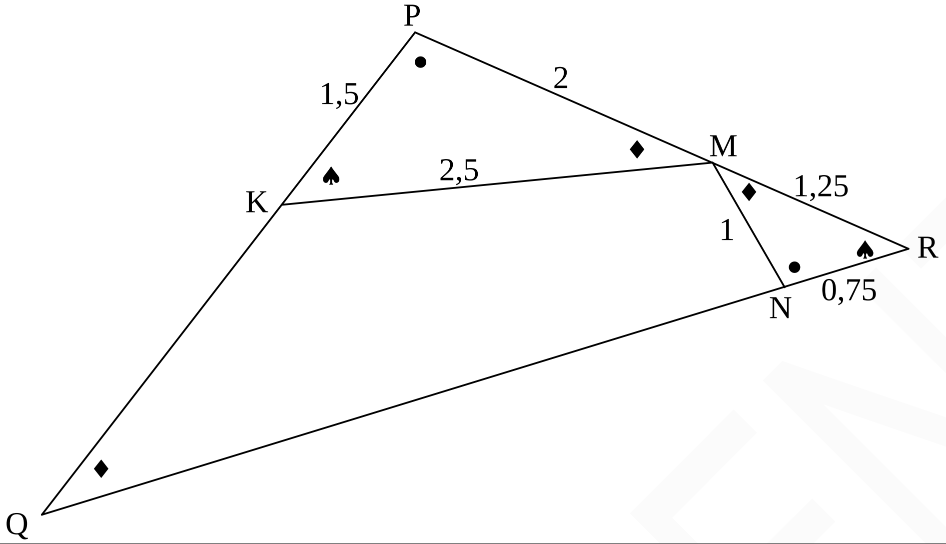
10.1	$B\hat{D}C = 90°$ $DC^2 = 17^2 - 8^2$ $= 225$ $\therefore\ DC = 15$	[∠ in semi circle/∠ *in halfsirkel*] [Th of/*stelling v* Pythagoras]	✓ S ✓ using/*gebruik* Pyth *korrek/* correctly ✓ answ/*antw* (3)
10.2.1	$\frac{CF}{CD} = \frac{CE}{CB}$ $\therefore \frac{CF}{15} = \frac{1}{4}$ $\therefore\ CF = 3{,}75$	[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

	$\hat{BAC} = \hat{FEC}$ [∠ sum in Δ/∠ *som van* Δ] $\therefore$ ΔBAC ||| Δ 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* ΔBCA ||| ΔDBC $CB^2 = CD . AC$ $AC = \frac{BC^2}{DC}$ $= \frac{17^2}{15}$ $= 19,27$ 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]**

QUESTION/*VRAAG* 11

11.1	equiangular or similar/*gelykhoekig of gelykvormig*	✓ answ/*antw* (1)

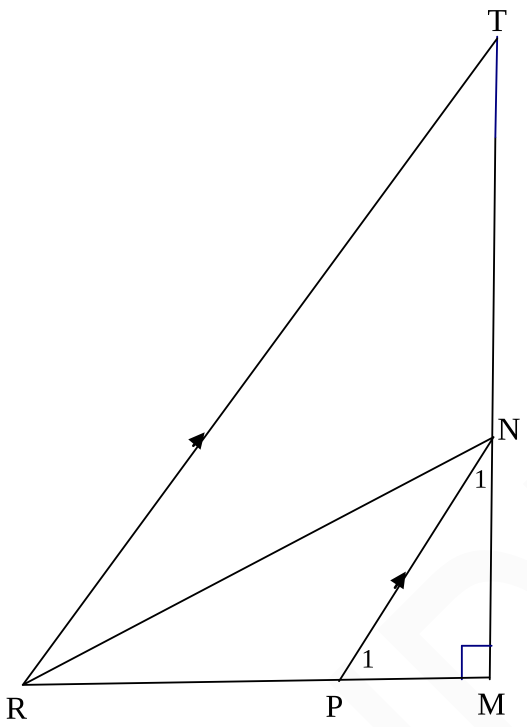


11.2.1	$\frac{KP}{RN}=\frac{1,5}{0,75}=2$; $\frac{PM}{NM}=\frac{2}{1}=2$; $\frac{KM}{RM}=\frac{2,5}{1.25}=2$ $\therefore\ \frac{KP}{RN}=\frac{PM}{NM}=\frac{KM}{RM}$ $\therefore\ \Delta KPM\ \vert\vert\vert\ \Delta RNM$ [Sides of Δ in prop/*sye v Δ eweredig*] **OR/*OF*** $\frac{RN}{KP}=\frac{0,75}{1,5}=\frac{1}{2}$; $\frac{NM}{PM}=\frac{1}{2}$; $\frac{RM}{KM}=\frac{1,25}{2,5}=\frac{1}{2}$ $\therefore\ \frac{RN}{KP}=\frac{NM}{PM}=\frac{RM}{KM}$ $\therefore\ \Delta KPM\ \vert\vert\vert\ \Delta RNM$ [Sides of Δ in prop/*sye v Δ eweredig*] **OR/*OF*** In ΔMNR: $1,25^2 = 1^2 + 0,75^2 = 1,5625$ $\therefore\ M\hat{N}R = 90°$ [converse Pyth theorem] In ΔPKM: $2,5^2 = 1,5^2 + 2^2 = 6,25$ $\therefore\ \hat{P} = 90°$ [converse Pyth theorem] $\cos\ P\hat{K}M=\frac{1,5}{2,5}=\frac{3}{5}$ and $\cos\ \hat{R}=\frac{0,75}{1,25}=\frac{3}{5}$ $\therefore\ P\hat{K}M=\hat{R}$ In ΔKPM and ΔRNM $P\hat{K}M=\hat{R}$ [proved] $\hat{P}=M\hat{N}R$ [proved] $\therefore \Delta KPM\vert\vert\vert\Delta RNM$ [∠;∠;∠ OR 3rd ∠]	✓✓✓ all 3 statements/ *al 3 bewerings* (3) ✓✓✓ all 3 statements/ *al 3 bewerings* (3) ✓ $\hat{P}=M\hat{N}R$ ✓ $P\hat{K}M=\hat{R}$ ✓[∠;∠;∠ OR 3rd ∠] (3)

11.2.2	$P\hat{K}M = \hat{R}$ [$\Delta KPM \,\|\|\|\, \Delta RNM$] $\therefore$ $\hat{P}$ is common/*gemeen* $\therefore \Delta RPQ \,\|\|\|\, \Delta KPM$ [$\angle\angle\angle$] $\frac{RP}{KP} = \frac{RQ}{KM}$ [$\Delta RPQ \,\|\|\|\, \Delta KPM$] $\therefore \frac{3{,}25}{1{,}5} = \frac{RQ}{2{,}5}$ $\therefore RQ = \frac{2{,}5 \times 3{,}25}{1{,}5} = 5{,}42$ or $5\frac{5}{12}$ $\therefore NQ = 5{,}42 - 0{,}75 = 4{,}67$ or $4\frac{2}{3}$	✓ S ✓ $\Delta RPQ \|\|\| \Delta KPM$ ✓ S ✓ subst correctly/ *korrek* ✓ $RQ = 5\frac{5}{12}$ ✓ NQ = answ/*antw* (6)
	OR/OF	
	$R\hat{N}M = \hat{P}$ [$\Delta KPM \,\|\|\|\, \Delta RNM$] $\therefore$ $\hat{R}$ is common/*gemeen* $\therefore \Delta RNM \,\|\|\|\, \Delta RPQ$ [$\angle\angle\angle$] $\frac{RP}{RN} = \frac{RQ}{RM}$ [$\Delta RNM \,\|\|\|\, \Delta RPQ$] $\therefore \frac{3{,}25}{0{,}75} = \frac{RQ}{1{,}25}$ $\therefore RQ = 5{,}42$ or $5\frac{5}{12}$ $\therefore NQ = 5{,}42 - 0{,}75 = 4{,}67$ or $4\frac{2}{3}$	✓ S ✓ $\Delta RNM \,\|\|\|\, \Delta RPQ$ ✓ S ✓ subst correctly/ *korrek* ✓ $RQ = 5\frac{5}{12}$ ✓ NQ = answ/*antw* (6)
	OR/*OF* In ΔMNR: $1{,}25^2 = 1^2 + 0{,}75^2 = 1{,}5625$ $\therefore M\hat{N}R = 90°$ [converse Pyth theorem] In ΔPKM: $2{,}5^2 = 1{,}5^2 + 2^2 = 6{,}25$ $\therefore \hat{P} = 90°$ [converse Pyth theorem] In ΔMNR and ΔQPR $\angle R$ is common $M\hat{N}R = \hat{P} = 90°$ $\therefore \Delta MNR \,\|\|\|\, \Delta QPR$ [$\angle\angle\angle$] $\frac{RP}{RN} = \frac{RQ}{RM}$ [$\Delta RNM \,\|\|\|\, \Delta RPQ$] $\therefore \frac{3{,}25}{0{,}75} = \frac{RQ}{1{,}25}$ $\therefore RQ = 5{,}42$ or $5\frac{5}{12}$ $\therefore NQ = 5{,}42 - 0{,}75 = 4{,}67$ or $4\frac{2}{3}$	✓ S ✓ $\Delta MNR \,\|\|\|\, \Delta QPR$ ✓ S ✓ subst correctly/ *korrek* ✓ $RQ = 5\frac{5}{12}$ ✓ NQ = answ/*antw* (6) **[10]**

TOTAL/*TOTAAL*: 149

QUESTION/VRAAG 10

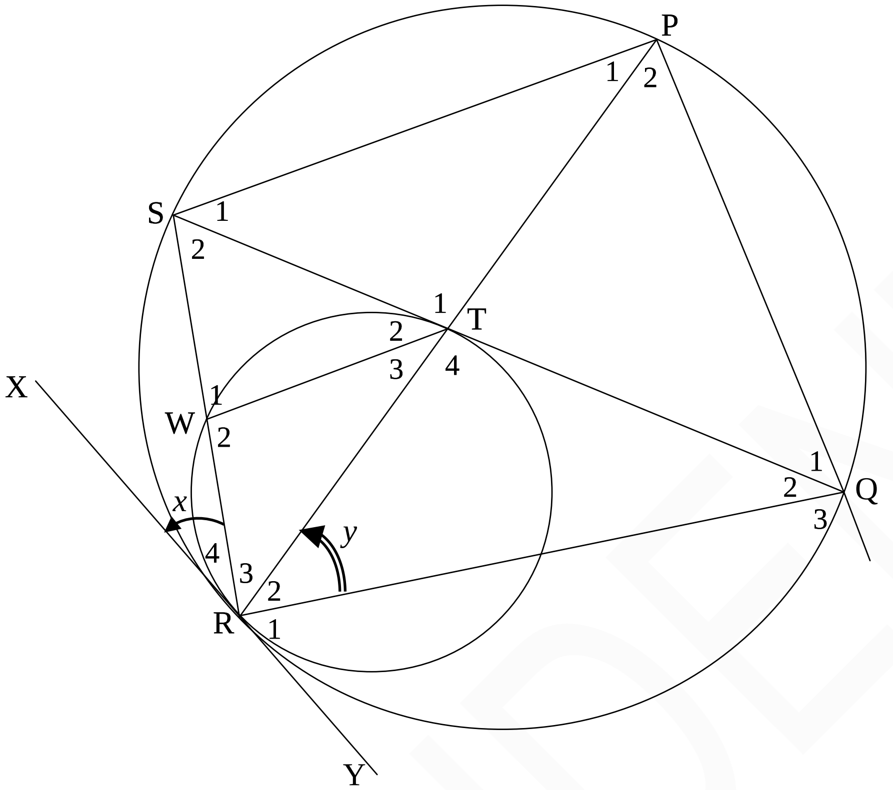


10.1.1	corresponding ∠s/*ooreenkomstige∠e*; PN | | RT	✓ answer/*antw* (1)
10.1.2	∠; ∠; ∠ **OR/*OF*** ∠; ∠	✓ answer/*antw* (1)
10.2	$\frac{PM}{RM}=\frac{PN}{RT}$ $(\Delta PNM \parallel\!\mid \Delta RTM)$ $=\frac{PN}{3PN}$ $=\frac{1}{3}$	✓ S ✓ S (2)
10.3	$\frac{PM}{RM}=\frac{1}{3}$ $\therefore \frac{RP}{RM}=\frac{2}{3}$ $RN^2 - PN^2 = (RM^2 + NM^2) - (PM^2 + NM^2)$ (Pyth) $= RM^2 - PM^2$ $=\left(\frac{3}{2}RP\right)^2-\left(\frac{1}{2}RP\right)^2$ $=\frac{9}{4}RP^2-\frac{1}{4}RP^2$ $= 2RP^2$ **OR/*OF***	✓ Use of Pyth. for RN^2 and PN^2 ✓ $RM = \frac{3}{2}RP$ ✓ $PM = \frac{1}{2}RP$ ✓ $\frac{9}{4}RP^2$ & $\frac{1}{4}RP^2$ (4)

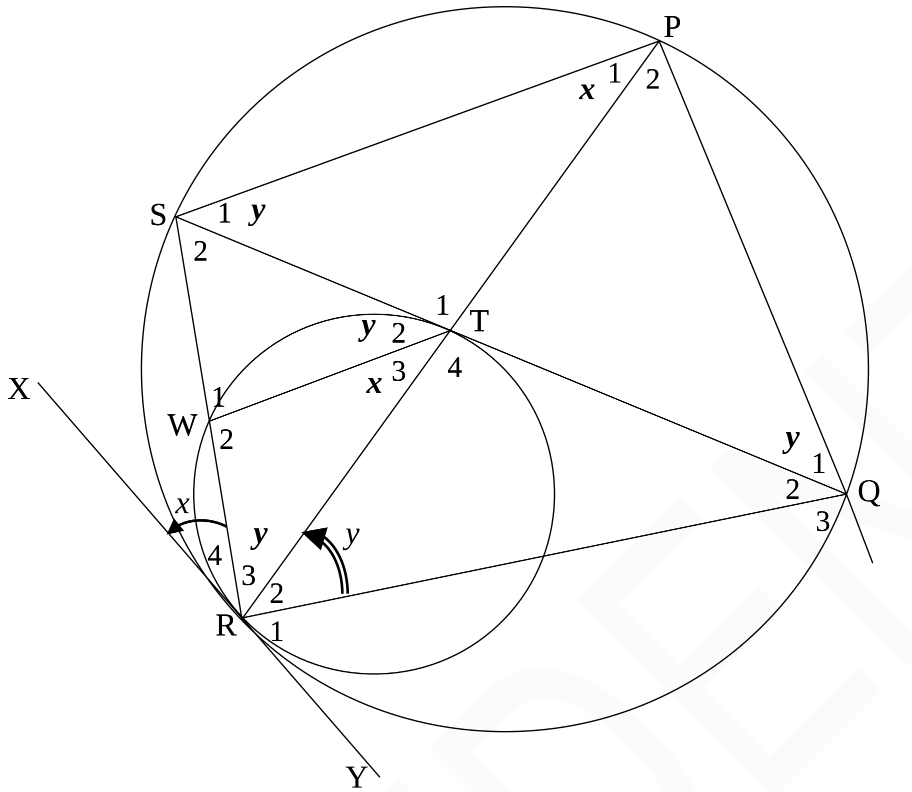
	$RN^2 - PN^2 = (RM^2 + NM^2) - (PM^2 + NM^2)$ (Pyth) $= RM^2 - PM^2$ $= (3PM)^2 - PM^2$ $= 8PM^2$ $= 2(2PM)^2$ $= 2RP^2$	✓ Use of Pyth. for RN^2 and PN^2 ✓ $RM = RP + PM$ ✓ $(3PM)^2 - PM^2$ ✓ $RP = 2PM$ (4)
	OR/*OF*	
	$RN^2 - PN^2 = (RM^2 + NM^2) - (PM^2 + NM^2)$ (Pyth) $= RM^2 - PM^2$ $= (RP + PM)^2 - PM^2$ $= RP^2 + 2RP.PM + PM^2 - PM^2$ $= RP^2 + 2RP.\frac{1}{2}RP$ $= 2RP^2$	✓ Use of Pyth. for RN^2 and PN^2 ✓ $RM = RP + PM$ ✓ expansion/ *uitbreiding* ✓ $PM = \frac{1}{2}RP$ (4) **[8]**

TOTAL/*TOTAAL*: 150

QUESTION/VRAAG 10



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



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

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

TOTAL/TOTAAL: 150