

EUKLIDIESE MEETKUNDE

Oplossings

Die DBE se eie nasienriglyne, in boekvolgorde

Elke oplossing hier is 'n uitknipsel van die amptelike DBE-nasienriglyn wat saam met die vraestel gepubliseer is waaruit die vraag kom. Die bewerking, die punt-merke en die aanvaarde alternatiewe is die DBE se eie. Niks is oorgeskryf of oor afgelei nie.

Die nommers pas by die vraeboek: oplossing 34 antwoord vraag 34, en die hoofstukke is in dieselfde volgorde.

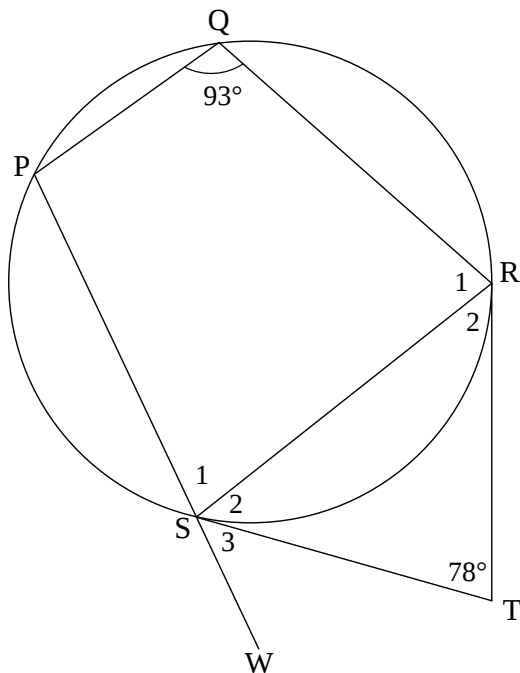
Die DBE skryf een riglyn vir albei tale, so hierdie bladsye is tweetalig en hul nasienaantekeninge is grootliks in Engels. Dit is die DBE se eie bladsy, presies soos gedruk weergegee.

'n Nasienriglyn word vir nasieners geskryf, nie vir leerders nie. Dit wys die kortste pad na die punte, so waar 'n stap saamgepers lyk, is dit die riglyn wat bondig is eerder as 'n stap wat ontbreek.

1. Hoekom $ST = TR$, dan twee hoeke in 'n koordevierhoek

Amptelike DBE-nasienriglyn · November 2021 · V9 · 5 punte

QUESTION/VRAAG 9

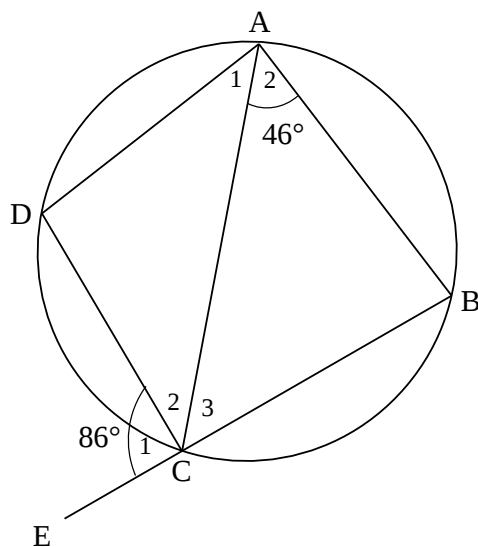


9.1	tangents from same(common) point/raaklyne vanaf dieselfde punt	✓ R	(1)
9.2.1	$\hat{S}_2 = \hat{S}_1$ [∠s opp equal sides/∠e teenoor gelyke sye] $\therefore \hat{S}_2 = 51^\circ$ [sum of ∠s in Δ/som van ∠e in Δ]	✓ R ✓ S	(2)
9.2.2	$\hat{S}_2 + \hat{S}_3 = 93^\circ$ [ext ∠ of cyclic quad/buite ∠ van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

2. 'n Buitehoek van 'n koordevierhoek, dan $AD = DC$

Amptelike DBE-nasienriglyn · November 2024 · V9 · 6 punte

QUESTION/VRAAG 9

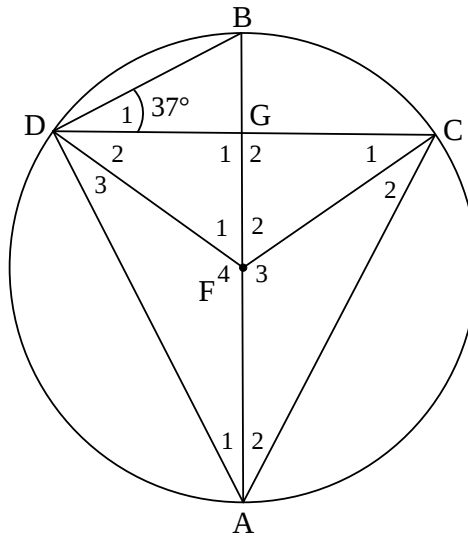


9.1	$\hat{A}_1 = 40^\circ$ [ext. $\angle$ of a cyclic quad / buite $\angle$ van kvh]	✓ S ✓ R (2)
9.2	$\hat{B} = 80^\circ$ $\left[\hat{A}_1 = \frac{1}{2} \hat{B} \right]$ $\hat{D} = 100^\circ$ [opp $\angle$ s of cyclic quad / teenoorst. $\angle$ e van kvh] $\therefore \hat{C}_2 = 40^\circ$ [sum of $\angle$ s in Δ / binne $\angle$ e van Δ] $\therefore \hat{C}_2 = \hat{A}_1 = 40^\circ$ $\therefore AD = DC$ [sides opp = $\angle$ s / sye teenoor gelyke $\angle$] OR/OF $\hat{B} = 80^\circ$ $\left[\hat{A}_1 = \frac{1}{2} \hat{B} \right]$ $\angle ACE = \hat{A}_2 + \hat{B}$ [ext $\angle$ of Δ / buite $\angle$ van Δ] $\therefore \hat{C}_2 = 40^\circ$ $\therefore \hat{C}_2 = \hat{A}_1 = 40^\circ$ $\therefore AD = DC$ [sides opp = $\angle$ s / sye teenoor gelyke $\angle$] OR/OF $\hat{B} = 80^\circ$ $\left[\hat{A}_1 = \frac{1}{2} \hat{B} \right]$ $\therefore \hat{C}_3 = 180^\circ - 46^\circ - 80^\circ$ [sum of $\angle$ s in Δ / binne $\angle$ e van Δ] $\therefore \hat{C}_3 = 54^\circ$ $\therefore \hat{C}_2 = 180^\circ - 86^\circ - 54^\circ$ [$\angle$ s on a str. line / $\angle$ e op 'n reguitlyn] $\therefore \hat{C}_2 = 40^\circ$ $\therefore \hat{C}_2 = \hat{A}_1 = 40^\circ$ $\therefore AD = DC$ [sides opp = $\angle$ s / sye teenoor gelyke $\angle$] 	✓ S ✓ S/R ✓ S ✓ R ✓ S ✓ S/R ✓ S ✓ R (4) (4)

3. 'n Middellyn en 'n gehalveerde hoek: vind nog drie

Amptelike DBE-nasienriglyn · Mei/Junie 2024 · V9 · 12 punte

QUESTION/VRAAG 9



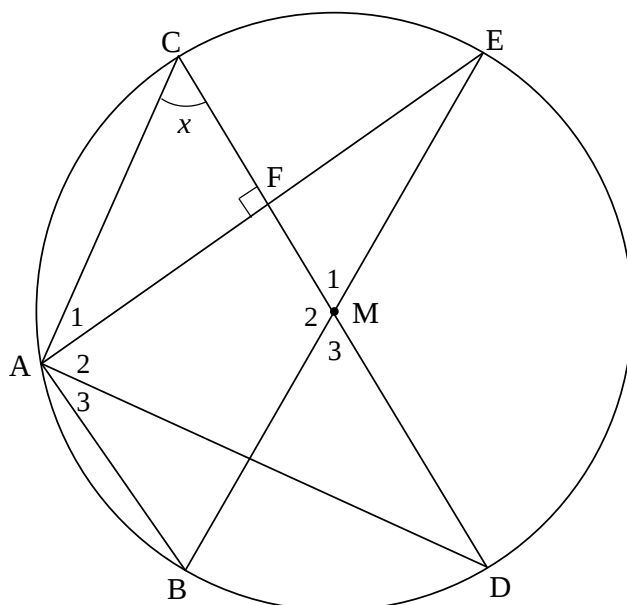
9.1	$\hat{A}_2 = \hat{D}_1 = 37^\circ$ $\hat{A}_1 = \hat{A}_2 = 37^\circ$ $\hat{D}_3 = \hat{A}_1 = 37^\circ$ $\hat{C}_2 = \hat{A}_2 = 37^\circ$	$[\angle s \text{ in the same seg/} \angle e \text{ in dies segment}]$ $[BA \text{ bisects } \hat{C}\hat{A}\hat{D} / BA \text{ halveer } \hat{C}\hat{A}\hat{D}]$ $[\angle s \text{ opp equal sides/} \angle e \text{ teenoor gelyke sye}]$ $[\angle s \text{ opp equal sides/} \angle e \text{ teenoor gelyke sye}]$	$\checkmark$ S $\checkmark$ R $\checkmark\checkmark$ any other two statements (4)
9.2	$\hat{A}\hat{D}\hat{G} = 53^\circ$ $\hat{A}_1 = 37^\circ$ $\therefore \hat{G}_1 = 90^\circ$ $\therefore CG = DG$ OR $\hat{F}_2 = 2\hat{D}_1 = 74^\circ$ $\hat{D}_3 = 37^\circ$ $\therefore \hat{D}_2 = 16^\circ$ $\hat{C}_1 = \hat{D}_2 = 16^\circ$ $\therefore \hat{G}_2 = 90^\circ$ $\therefore CG = DG$	$[\angle \text{ in semi circle/} \angle \text{ in halwe sirkel}]$ $[\text{proved in 9.1/reeds bewys in 9.1}]$ $[\text{sum of } \angle s \text{ in } \Delta / \text{binne } \angle e \text{ van } \Delta]$ $[\text{line from centre } \perp \text{ to chord/} \text{lyn uit midpt. } \perp \text{ op koord}]$ $[\angle \text{ at centre} = 2 \times \angle \text{ at circumference/} \text{midpt. } \angle s = 2 \times \text{omtreks } \angle]$ $[\text{proved in 9.1/reeds bewys in 9.1}]$ $[\angle \text{ in semi circle/} \angle \text{ in halwe sirkel}]$ $[\angle s \text{ opp equal sides/} \angle e \text{ teenoor gelyke sye}]$ $[\text{sum of } \angle s \text{ in } \Delta / \text{binne } \angle e \text{ van } \Delta]$ $[\text{line from centre } \perp \text{ to chord/} \text{lyn uit midpt. } \perp \text{ op koord}]$	$\checkmark$ S $\checkmark$ R $\checkmark$ S $\checkmark$ R (4) $\checkmark$ S $\checkmark$ R $\checkmark$ S $\checkmark$ R (4)

9.3	$\hat{F}_2 = 2\hat{D}_1 = 74^\circ$ OR $\hat{F}_2 = 2\hat{A}_2 = 74^\circ$ [$\angle$ at centre = $2 \times \angle$ at circum./ midpt. $\angle s = 2 \times \text{omtreks} \angle$] $\frac{FG}{20} = \cos 74^\circ$ $FG = 5,51$ $\therefore BG = 14,49$ units OR $\hat{F}_2 = 2\hat{D}_1 = 74^\circ$ [$\angle$ at centre = $2 \times \angle$ at circumference midpt. $\angle = 2 \times \text{omtreks} \angle$] $\frac{FG}{20} = \sin 16^\circ$ $FG = 5,51$ $\therefore BG = 14,49$ units OR $\frac{DG}{20} = \cos 16^\circ$ $DG = 19,23$ $\frac{BG}{19,23} = \tan 37^\circ$ $BG = 14,49$ units OR $\frac{DG}{20} = \cos 16^\circ$ $DG = 19,23$ $FG^2 = FD^2 - DG^2$ [Pythagoras] $FG^2 = 20^2 - (19,23)^2$ $FG = 5,51$ $BG = 20 - 5,51$ $= 14,49$ units	✓ S ✓ trig ratio ✓ FG ✓ answer (4) ✓ S ✓ trig ratio ✓ FG ✓ answer (4) ✓ trig ratio ✓ length of DG ✓ trig ratio ✓ answer (4) ✓ trig ratio ✓ length of DG ✓ correct use of Pythagoras ✓ answer (4)
		[12]

4. Twee middellyne, 'n loodregte koord, alles in terme van x

Amptelike DBE-nasienriglyn · November 2021 · V10 · 13 punte

QUESTION/VRAAG 10



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

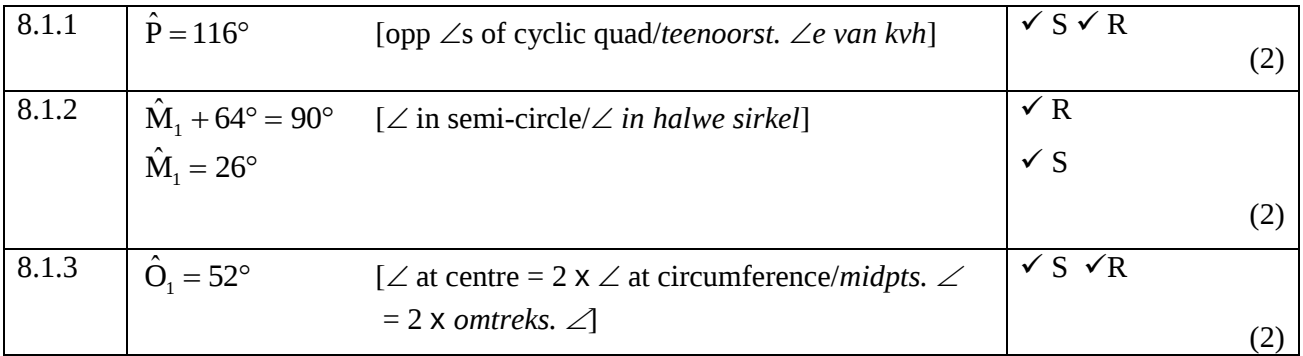
	$CD \parallel AB$ [midpt. Thm/ <i>middelpuntst.</i>] $\hat{BAE} = 90^\circ$ [$\angle$ in semi-circle/$\angle$ in <i>halfsirkel</i>] $\therefore \hat{A}_3 = \hat{D} = 90^\circ - x$ [alt.$\angle$s; $CD \parallel AB$/verwiss $\angle$e] $\therefore \hat{A}_2 = x = C$ $\therefore AD$ is a tangent [converse tan-chord theorem/<i>omgek rkl-kd st.</i>] OR/OF $\hat{CAD} = 90^\circ$ [$\angle$ in semi circle/$\angle$ in <i>halfsirkel</i>] AC = diameter [converse $\angle$ in semi circle/<i>omgek $\angle$ in halfsirkel</i>] $\therefore AD$ is a tangent [converse radius $\perp$ tangent/<i>omgek radius $\perp$ rkl</i>]	✓ 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/<i>middelpuntstelling</i>] $EM = MB = CM = 18$ 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/<i>middelpuntstelling</i>] $EM = MB = CM = 18$ 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]

5. 'n Middellyn deur 'n koordevierhoek getrek

Amptelike DBE-nasienriglyn · November 2022 · V8 · 13 punte

QUESTION/VRAAG 8

8.1



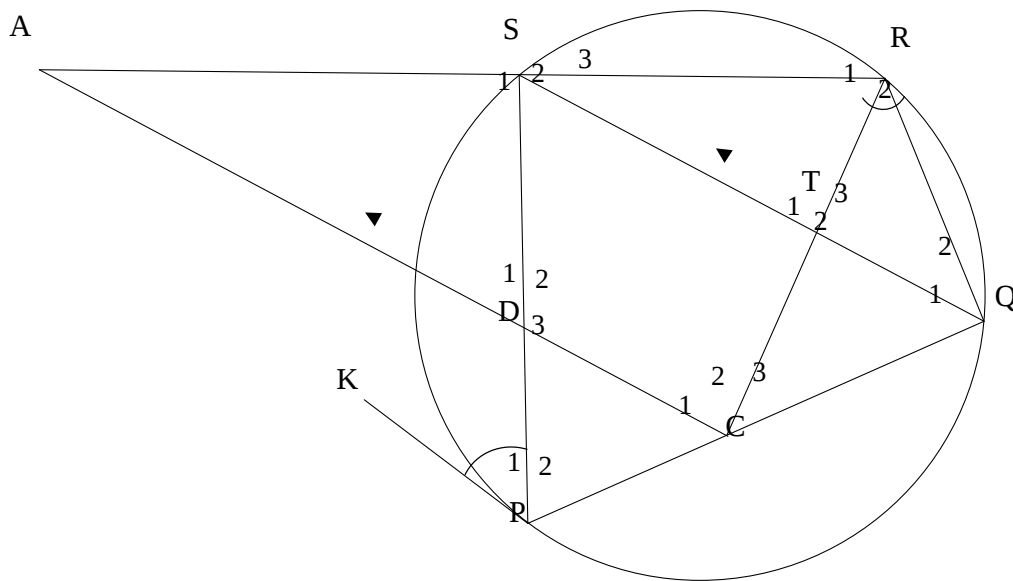
8.2.1	Midpt theorem/ <i>Midpt. Stelling</i> OR/OF Converse prop intercept theorem	✓ R ✓ R (1)
8.2.2	$BG = 2DE$ or $6x - 2$ [Midpt theorem/ <i>Midpt. stelling</i>] $BG = 6x - 2$ $\frac{GH}{BG} = \frac{FC}{BF}$ [line $\parallel$ one side of Δ OR prop theorem; $FG \parallel CH$ / <i>lyn $\parallel$ een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

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

6. 'n Raaklyn, 'n ewewydige lyn, en 'n koordevierhoek om te bewys

Amptelike DBE-nasienriglyn · November 2022 · V10 · 13 punte

QUESTION/VRAAG 10



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

(4)

(5)

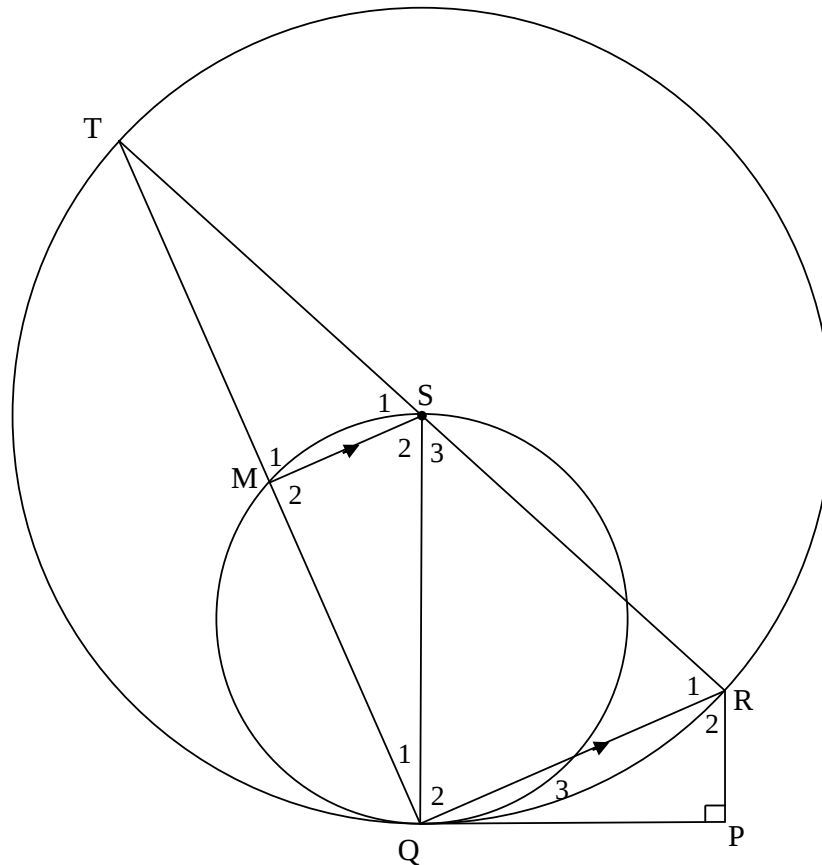
	In ΔASD and ΔACR $\hat{A} = \hat{A}$ [common $\angle$/gemeenskaplike $\angle$] $\hat{S}_1 = \hat{T}_2$ [proven/gegee] $\hat{T}_2 = \hat{C}_2$ [alt $\angle$s; $QS \parallel CA$/verw. $\angle$e; $QS \parallel CA$] $\therefore \hat{S}_1 = \hat{C}_2$ $\Delta ASD \parallel \Delta ACR$ [$\angle$; $\angle$;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

TOTAL/TOTAAL: 150

7. Twee sirkels met 'n raaklyn gemeenskaplik aan albei by Q

Amptelike DBE-nasienriglyn · Mei/Junie 2021 · V10 · 15 punte

QUESTION/VRAAG 10



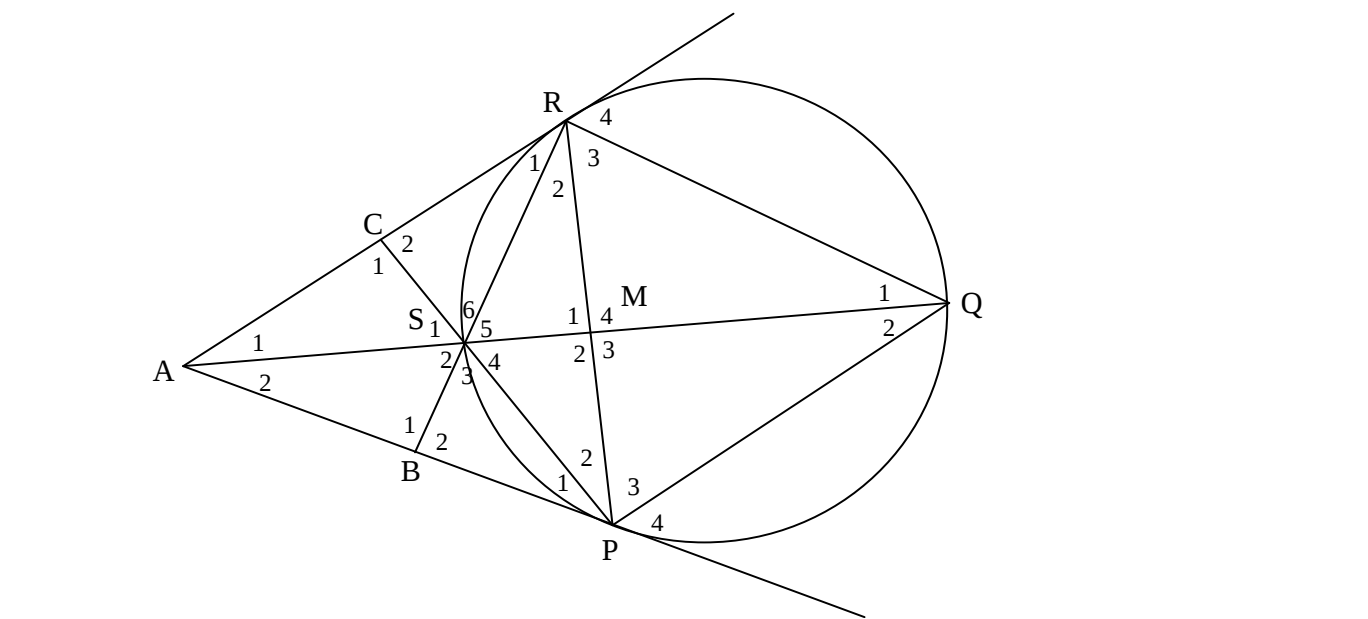
10.1.1	$\hat{Q}_1 + \hat{Q}_2 = 90^\circ$ $\therefore \hat{M}_2 = 90^\circ$ $\therefore SQ$ is a diameter	$[\angle \text{ in semi circle } / \angle \text{ in halwe sirkel }]$ $[\text{co-interior } \angle, MS \parallel QR / \text{ko-binne } \angle e,$ $MS \parallel QR]$ $[\text{converse: } \angle \text{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

10.1.2	In $\triangle RTQ$ and $\triangle RQP$ $\hat{T} = \hat{Q}_3$ [tan-chord theorem/$\angle$ tussen raaklyn en koord] $\hat{Q}_1 + \hat{Q}_2 = 90^\circ$ [co-interior $\angle$s, $MS \parallel QR$/ko-binne $\angle$e, $MS \parallel QR$] or [$\angle$ in semi circle/$\angle$ in halwe sirkel] $\therefore \hat{Q}_1 + \hat{Q}_2 = \hat{P} = 90^\circ$ $\hat{R}_1 = \hat{R}_2$ [$\angle$s of $\triangle$/$\angle$e van $\triangle$] $\triangle RTQ \parallel \triangle RQP$ $\frac{RT}{RQ} = \frac{RQ}{RP}$ $RT = \frac{RQ^2}{RP}$ OR In $\triangle RTQ$ and $\triangle RQP$ $\hat{T} = \hat{Q}_3$ [tan-chord theorem $\angle$ tussen raaklyn en koord] $\hat{Q}_1 + \hat{Q}_2 = 90^\circ$ [co-interior $\angle$s, $MS \parallel QR$/ko-binne $\angle$e, $MS \parallel QR$] or [$\angle$ in semi circle/$\angle$ in halwe sirkel] $\therefore \hat{Q}_1 + \hat{Q}_2 = \hat{P} = 90^\circ$ $\triangle RTQ \parallel \triangle RQP$ [$\angle, \angle, \angle$] $\frac{RT}{RQ} = \frac{RQ}{RP}$ $RT = \frac{RQ^2}{RP}$	✓ S ✓ R ✓ S ✓ S ✓ S ✓ ratio (6) ✓ S ✓ R ✓ S ✓ S ✓ R ✓ ratio (6)
10.2	$QR = 28$ units [midpoint theorem/midpt. stelling] $RP^2 = 28^2 - (\sqrt{640})^2$ [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

Amptelike DBE-hasiénriglyn · November 2023 · V10 · 15 punte

QUESTION/VRAAG 10



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

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

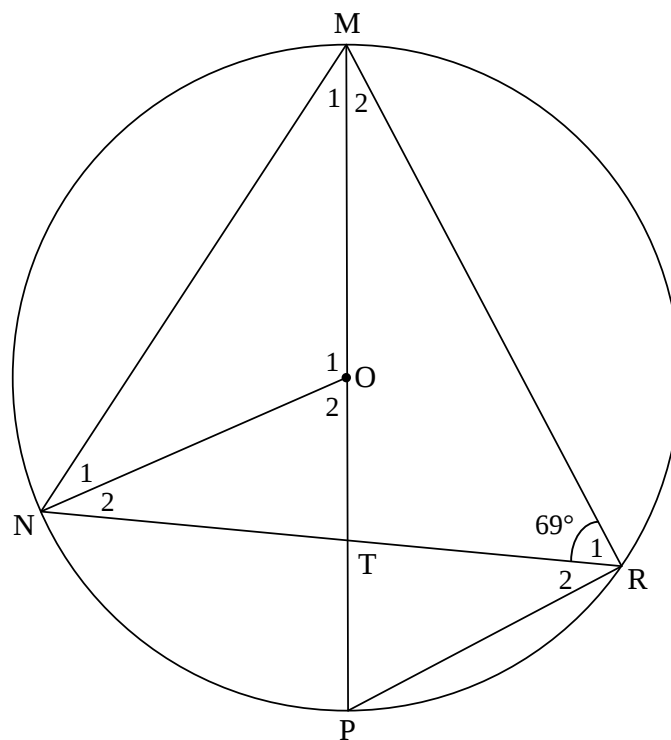
TOTAL/TOTAAL: 150

9. 'n Middellyn wat 'n koord sny, en die hoeke daaromheen

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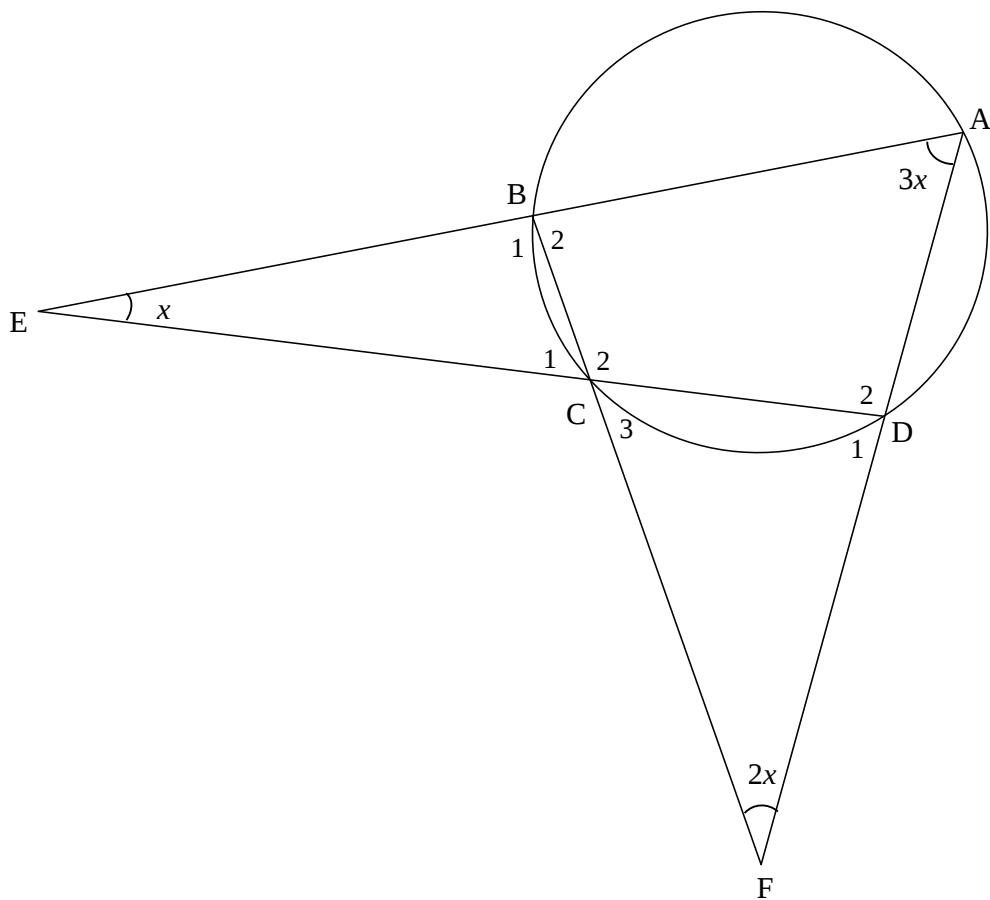
QUESTION/VRAAG 8

8.1



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

8.2



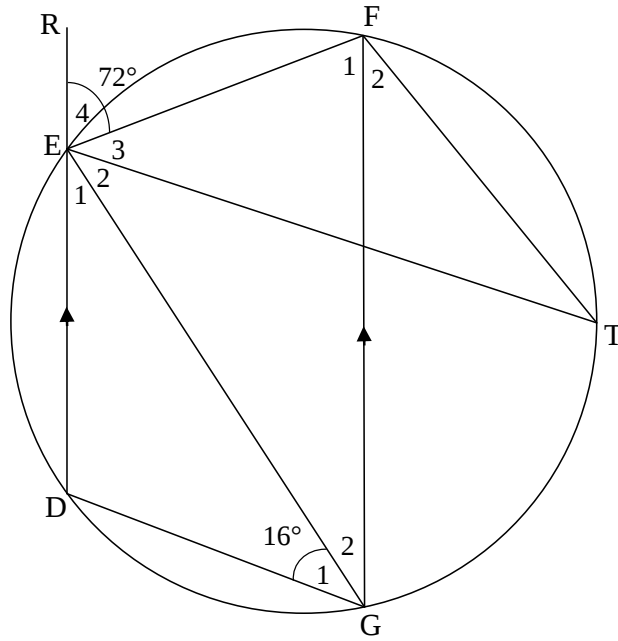
8.2	$\hat{D}_1 = 4x$ [ext $\angle$ of Δ /buite $\angle$ v Δ] $\hat{D}_2 = 180^\circ - 4x$ [$\angle$ s on a str line/ $\angle$ e op 'n reguitlyn] $\hat{B}_1 = 5x$ [ext $\angle$ of Δ /buite $\angle$ v Δ] $\hat{B}_1 = \hat{D}_2$ [ext $\angle$ of cyclic quad/buite $\angle$ v kvh] $180^\circ - 4x = 5x$ $9x = 180^\circ$ $x = 20^\circ$ OR $\hat{C}_1 = 3x$ [ext $\angle$ of cyclic quad/buite $\angle$ v kvh] $\hat{B}_2 = 4x$ [ext $\angle$ of Δ /buite $\angle$ v Δ] $\hat{C}_1 = \hat{C}_3 = 3x$ [vert opp $\angle$ s] $\hat{D}_2 = 5x$ [ext $\angle$ of Δ /buite $\angle$ v Δ] $4x + 5x = 180^\circ$ [opp $\angle$ of cyclic quad/teenoorst. $\angle$ e v kvh] $x = 20^\circ$	✓ S/R ✓ S ✓ S ✓ S ✓ R ✓ answer (6) ✓ S ✓ R ✓ S ✓ S ✓ S/R ✓ answer (6)
	OR $\hat{C}_3 = 3x$ [ext $\angle$ of cyclic quad/buite $\angle$ v kvh] $\hat{D}_1 = 4x$ [ext $\angle$ of Δ /buite $\angle$ v Δ] $2x + 3x + 4x = 180^\circ$ [sum of $\angle$ s in Δ / $\angle$ e v Δ] $9x = 180^\circ$ $x = 20^\circ$	✓ S ✓ R ✓ S ✓ S ✓ R ✓ answer (6)
[16]		

10. 'n Koordevierhoek met een paar ewewydige sye

Amptelike DBE-nasienriglyn · Mei/Junie 2022 · V9 · 16 punte

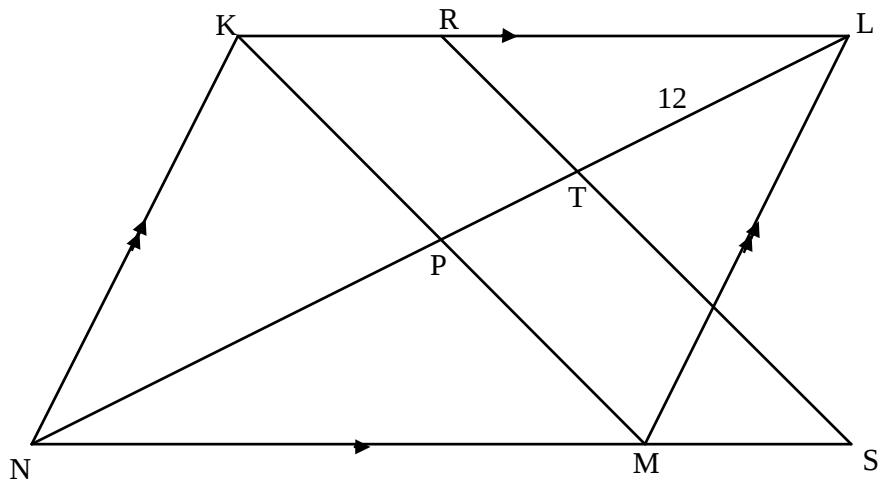
QUESTION/VRAAG 9

9.1



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

9.2



9.2.1	$NP = PL = 16$ [diag of $\parallel^m$ / <i>hoeklyne van $\parallel^m$</i>] $PT = 4$ $NP : PT = 16 : 4$ $= 4 : 1$	$\checkmark$ S $\checkmark$ R $\checkmark$ S $\checkmark$ answer (4)
9.2.2	$NM : MS = 4 : 1$ $NP : PT = NM : MS$ $KM \parallel RS$ [line divides two sides of Δ in prop / <i>Lyn verdeel 2 sye v Δ eweredig</i>] OR/OF [converse prop theorem / <i>omgekeerde lyn $\parallel$ een sy v Δ</i>]	$\checkmark$ S $\checkmark$ R (2)
9.2.3	$\frac{RL}{KL} = \frac{TL}{LP}$ [prop theorem; $KM \parallel RS$ OR line $\parallel$ one side of Δ / <i>Lyn $\parallel$ een sy v Δ</i>] $RL = \frac{12 \times 21}{16}$ $= 15,75$	$\checkmark$ S $\checkmark$ R $\checkmark$ S $\checkmark$ answer (4)
	OR / OF $NM : MS = 4 : 1$ $KR = MS = 5,25$ [opp side of $\parallel^m$ / <i>teenoorst. sye van $\parallel^m$</i>] $KL = NM = 21$ $RL + 5,25 = 21$ $RL = 15,75$	$\checkmark$ S $\checkmark$ R $\checkmark$ S $\checkmark$ answer (4)
[16]		

Amptelike DBE-nasienriglyn · Mei/Junie 2024 · V10 · 19 punte

The diagram shows a circle with center O . Points C, B, D, F are on the circumference. Lines connect O to C, B, D, F . Lines connect C to B, D, F . Lines connect B to D, F . Lines connect D to F . A point T is on line segment CB . A point E is on line segment DF . A line segment AE is drawn. Angles are labeled with numbers 1, 2, 3, 4. A right angle is marked at O between OC and OB .

10.1	$\hat{O}_1 = 90^\circ$ $\hat{F}_2 + \hat{F}_3 = 90^\circ$ $\hat{O}_1 = \hat{F}_2 + \hat{F}_3 = 90^\circ$ $\therefore$ TODF is a cyclic quad	[given/gegee] [$\angle$ in semi circle/ <i>$\angle$ in halwe sirkel</i>] [ext $\angle$ = int opp $\angle$ / <i>buite $\angle$ = teenoorst. binne $\angle$</i>] OR [converse ext $\angle$ of cyclic quad/ <i>omgekeerde buite $\angle$ v kvh</i>]	✓ S ✓ R ✓ S ✓ R	(4)
10.2	$\hat{T}_1 = \hat{T}_3$ But $\hat{D}_3 = \hat{T}_3$ $\therefore \hat{T}_1 = \hat{D}_3$	[vert opp $\angle$ s =/ <i>regoorstaande $\angle$e</i>] [ext $\angle$ of cyclic quad/ <i>buite $\angle$ v kvh</i>]	✓ S / R ✓ S ✓ R	(3)
10.3	In $\triangle DFE$ and $\triangle TFO$ 1) $\hat{D}_3 = \hat{T}_3$ 2) $\hat{F}_4 = \hat{C}_2$ but $\hat{C}_2 = \hat{F}_2$ $\therefore \hat{F}_4 = \hat{F}_2$ 3) $\hat{E} = \hat{O}_2$ $\triangle TFO \parallel \triangle DFE$	[ext $\angle$ of cyclic quad/ <i>buite $\angle$ v kvh</i>] [tan-chord theorem/ <i>$\angle$ tussen rkl en koord</i>] [$\angle$ s opp equal sides/ <i>$\angle$e teenoor gelyke sye</i>] [3 rd $\angle$ of $\triangle$ / <i>$\angle$e van $\triangle$</i>] [$\angle\angle\angle$]	✓ S ✓ S / R ✓ S ✓ S ✓ S OR R	(5)

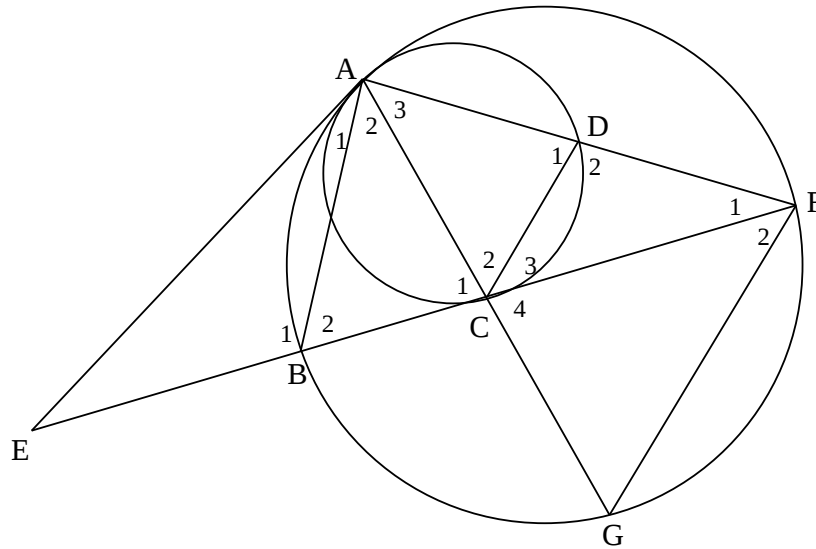
	OR In $\triangle DFE$ and $\triangle TFO$ 1) $\hat{D}_3 = \hat{T}_3$ [ext $\angle$ of cyclic quad/buite $\angle$ van $\triangle$] 2) $\hat{F}_4 = \hat{C}_2$ [tan-chord theorem/ $\angle$ tussen rkl en koord] $\hat{F}_2 + \hat{F}_3 = 90^\circ$ [$\angle$ in semi circle/ $\angle$ in halwe sirkel] $\hat{D}_1 + \hat{D}_2 = 90^\circ - \hat{C}_2$ [sum of $\angle$ s in $\triangle$ / binne $\angle$ e van $\triangle$] $\hat{E} = 90^\circ - 2\hat{F}_4$ [ext $\angle$ of $\triangle$ / buite $\angle$ van $\triangle$] $\hat{O}_3 = 2\hat{C}_2$ [$\angle$ at centre = $2 \times \angle$ at circumference/ midpt. $\angle$ s = $2 \times$ omtreks $\angle$] $\hat{O}_2 = 90^\circ - 2\hat{F}_4$ [$\angle$ s on a str line/ $\angle$ e op 'n reguitlyn] $\hat{O}_2 = \hat{E}$ 3) $\therefore \hat{F}_4 = \hat{F}_2$ [3^{rd} $\angle$ of $\triangle$ / $\angle$ e van $\triangle$] $\triangle TFO \parallel \triangle DFE$ [$\angle \angle \angle$] 	✓ S ✓ S / R ✓ S ✓ S ✓ S OR R (5)
10.4	$\hat{B}_2 = \hat{D}_1$ [$\angle$ s opp equal sides/ $\angle$ e teenoor gelyke sye] $\hat{B}_2 = \hat{E}$ [given/gegee] $\therefore \hat{D}_1 = \hat{E}$ $\therefore DB \parallel EA$ [corresp $\angle$ s =/ooreenkomstige $\angle$ e gelyk] 	✓ S / R ✓ R (2)
10.5	In $\triangle OEA$ $DB \parallel EA$ [proven/reeds bewys] $\frac{OD}{DE} = \frac{OB}{BA}$ [line $\parallel$ one side of $\triangle$ /lyn $\parallel$ een sy van $\triangle$] OR [prop theorem; $DB \parallel EA$ / eweredigheid stelling; $DB \parallel EA$] $\therefore DE = \frac{DO \cdot AB}{OB}$ $\frac{FO}{FE} = \frac{TO}{DE}$ [$\triangle TFO \parallel \triangle DFE$] $DE = \frac{TO \cdot FE}{FO}$ $\therefore \frac{DO \cdot AB}{OB} = \frac{TO \cdot FE}{FO}$ $\therefore \frac{DO \cdot AB}{DO} = \frac{TO \cdot FE}{DO}$ [$DO = OB = FO$] $\therefore DO = \frac{TO \cdot FE}{AB}$ 	✓ R ✓ S ✓ S / R ✓ S ✓ S (5)
		[19]

TOTAL/TOTAAL: 150

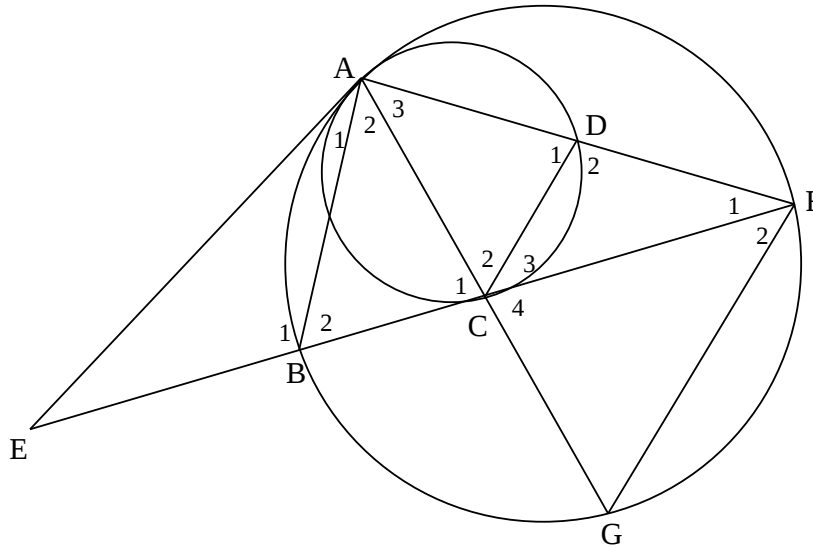
12. Twee sirkels wat binne raak, en 'n raaklyn aan albei

Amptelike DBE-nasienriglyn · November 2024 · V11 · 20 punte

QUESTION/VRAAG 11



11.1	$\hat{D}_1 = E\hat{A}G = x$	[tan-chord theorem/ $\angle$ tussen raaklyn en koord]	✓ S ✓ R	(6)
	$\hat{C}_1 = \hat{D}_1 = x$	[tan-chord theorem/ $\angle$ tussen raaklyn en koord]	✓ S ✓ R	
	$\hat{C}_4 = \hat{C}_1 = x$	[vert opp $\angle s = /$ regoorst. $\angle e$]	✓ S/R	
	$A\hat{F}G = E\hat{A}G = x$	[tan-chord theorem/ $\angle$ tussen raaklyn en koord]	✓ S	
	OR/OF			
	$EA = EC$	[tans from common pt/ raaklyne vanuit dies. punt]	✓ S/R	(6)
	$\hat{C}_1 = E\hat{A}G = x$	[$\angle s$ opp equal sides/ $\angle e$ teenoor gelyke sye]	✓ S	
	$\hat{C}_4 = \hat{C}_1 = x$	[vert opp $\angle s = /$ regoorst. $\angle e$]	✓ S/R	
	$\hat{D}_1 = E\hat{A}G = x$	[tan-chord theorem/ $\angle$ tussen raaklyn en koord]	✓ S ✓ R	
	$A\hat{F}G = E\hat{A}G = x$	[tan-chord theorem $\angle$ tussen raaklyn en koord]	✓ S	



11.2	$\hat{D}_1 = \hat{A}FG = x$ $\therefore DC \parallel FG$ [corresp $\angle s = /$ ooreenk $\angle e =$] $\frac{AG}{AC} = \frac{AF}{AD}$ [prop theorem; $DC \parallel FG /$ lyn $\parallel$ een sy van Δ] $\therefore AG \cdot AD = AC \cdot AF$ OR/OF In ΔACD and ΔAGF $\hat{A}_3$ is common $\hat{A}FG = \hat{D}_1 = x$ [proved in 11.1 / reeds bewys] $\hat{C}_2 = \hat{A}GF = x$ [sum $\angle \Delta s$ /binne $\angle e \Delta$] $\Delta ACD \parallel \Delta AGF$ [$\angle \angle \angle$] $\frac{AC}{AG} = \frac{AD}{AF}$ [$\parallel \Delta s \therefore$ sides in proportion / $\parallel \Delta e \therefore$ sye in dieselfde verhouding] $\therefore AG \cdot AD = AC \cdot AF$	✓ S ✓ S/R ✓ S ✓ R (4) ✓ S ✓ S ✓ S/R ✓ S (4)
11.3	In ΔAGF and ΔABC $\hat{G} = \hat{B}_2$ [$\angle s$ in the same seg / $\angle e$ in dies. segment] $\hat{A}FG = \hat{C}_1 = x$ [proved in 11.1 / reeds bewys] $\hat{A}_3 = \hat{A}_2$ [sum of $\angle s$ in Δ /binne $\angle e$ van Δ] $\Delta AGF \parallel \Delta ABC$ [$\angle \angle \angle$]	✓ S ✓ R ✓ S ✓ S OR/OF R (4)

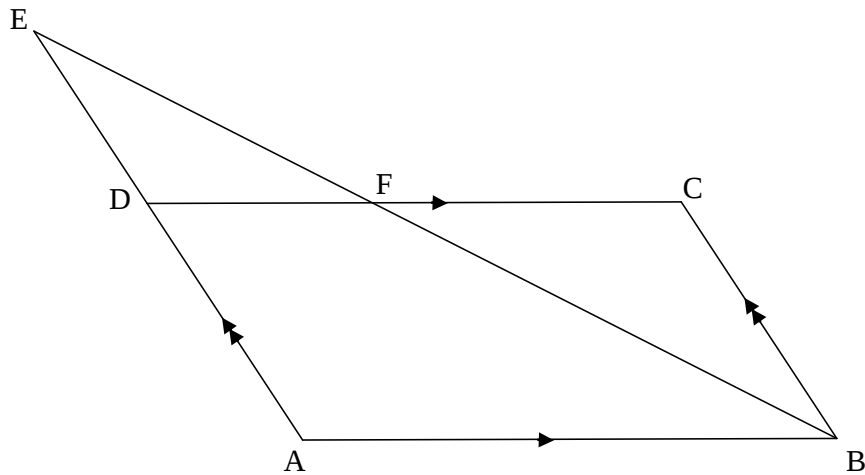
11.4	$\frac{GF}{BC} = \frac{AF}{AC} \quad [\triangle AGF \parallel \triangle ABC]$ $\therefore GF = \frac{BC \cdot AF}{AC}$ $\triangle ACD \parallel \triangle FGC \quad [\angle \angle \angle]$ $\therefore \frac{AC}{GF} = \frac{AD}{FC}$ $\therefore AC = \frac{AD \cdot FG}{FC}$ $\therefore GF = BC \cdot AF \div \frac{AD \cdot FG}{FC}$ $GF = BC \cdot AF \times \frac{FC}{AD \cdot FG}$ $\therefore GF^2 = \frac{BC \cdot FC \cdot AF}{AD}$ OR/OF $\triangle AGF \parallel \triangle ABC \quad [\angle \angle \angle]$ $\frac{GF}{BC} = \frac{AF}{AC}$ $GF = \frac{AF \cdot BC}{AC}$ $\triangle ACD \parallel \triangle AGF \quad [\angle \angle \angle]$ $\frac{AD}{AF} = \frac{CD}{GF}$ $GF = \frac{AF \cdot CD}{AD}$ $GF \times GF = \frac{AF \cdot BC}{AC} \cdot \frac{AF \cdot CD}{AD}$ $\triangle FCD \parallel \triangle FAC \quad [\angle \angle \angle]$ $\frac{FC}{FA} = \frac{CD}{AC} \quad \text{from } \parallel \Delta \text{'s}$ $FC = \frac{CD \cdot AF}{AC}$ $GF^2 = \frac{AF \cdot FC \cdot BC}{AD}$	✓ S / R ✓ S ✓ S ✓ S ✓ S ✓ S (6) OR/OF ✓ S ✓ S ✓ S ✓ S ✓ S ✓ S ✓ S (6)
		[20]

TOTAL/TOTAAL: 150

13. 'n Parallelogram deur 'n lyn gesny, en die lengte van FB

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QUESTION/VRAAG 9



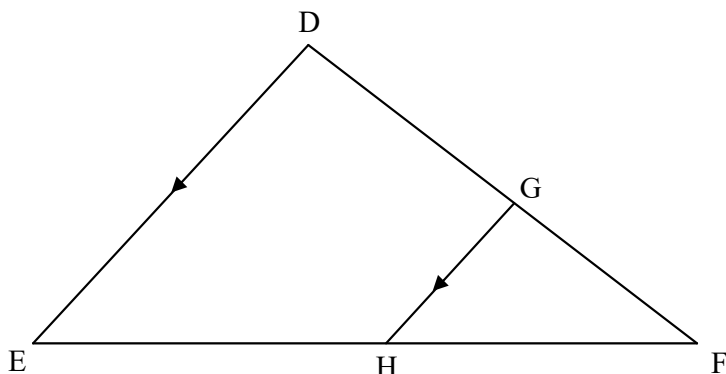
9.1	$\frac{FB}{EB} = \frac{DA}{EA}$ [prop theorem; $DC \parallel AB$] OR [line $\parallel$ one side of Δ] $FB = \frac{4p \times 21}{7p}$ $FB = 12 \text{ units}$	✓ S ✓ R ✓ answer (3)
9.2	In ΔEDF and ΔEAB: $\hat{E}$ is common $\hat{EDF} = \hat{A}$ [corresp $\angle$s; $EA \parallel CB$] $\hat{EFD} = \hat{EBA}$ [corresp $\angle$s; $DC \parallel AB$] $\Delta EDF \parallel \Delta EAB$ [$\angle$; $\angle$; $\angle$]	✓ S ✓ S/R ✓ S OR R (3)
9.3	$\frac{DF}{AB} = \frac{ED}{EA}$ [$\parallel \Delta$s] $DF = \frac{3p \times 14}{7p}$ $DF = 6 \text{ units}$ $FC = 8 \text{ units}$ [$DC = AB = 14 \text{ units}$; opp sides of $\parallel^m$] OR $\Delta EDF \parallel \Delta BCF$ [$\angle$; $\angle$; $\angle$] $\frac{ED}{BC} = \frac{DF}{CF}$ [$\parallel \Delta$s] $\frac{3}{4} = \frac{14 - FC}{FC}$ [$BC = AD$; opp sides of $\parallel^m$] $3FC = 56 - 4FC$ $FC = 8$	✓ S ✓ $DF = 6$ ✓ $FC = 14 - DF$ (3) ✓ $\Delta EDF \parallel \Delta BCF$ ✓ $\frac{3}{4} = \frac{14 - FC}{FC}$ ✓ answer (3)
		[9]

14. 'n Lyn oor 'n driehoek getrek, en die verhoudings wat dit maak

Amptelike DBE-nasienriglyn · Mei/Junie 2025 · V9 · 20 punte

QUESTION/VRAAG 9

9.1



9.1.1	$\frac{HF}{EH} = \frac{GF}{GD} = \frac{2}{5}$ [line to one side of Δ /lyn een sy van Δ] OR [prop theorem; $GH \parallel DE$ /eweredigheidst.; $GH \parallel DE$]	✓ S ✓ R (2)
9.1.2	$\frac{EH}{EF} = \frac{DG}{DF} = \frac{5}{7}$ [line to one side of Δ /lyn een sy van Δ] OR [prop theorem; $GH \parallel DE$ /eweredigheidst.; $GH \parallel DE$] $\frac{EH}{21} = \frac{5}{7}$ $EH = 15\text{cm}$ OR/OF $\frac{HF}{EF} = \frac{2}{7}$ [line to one side of Δ /lyn een sy van Δ] OR [prop theorem; $GH \parallel DE$ /eweredigheidst.; $GH \parallel DE$] $\frac{HF}{21} = \frac{2}{7}$ $HF = 6\text{cm}$ $EH = 21 - 6$ $EH = 15\text{cm}$	✓ S ✓ answer (2) ✓ S ✓ answer (2)
9.1.3	$\triangle FGH \parallel \triangle FDE$ [$\angle\angle\angle$]	✓ S (1)
9.1.4	$\frac{GH}{DE} = \frac{FH}{FE}$ [Δ 's] OR/OF $\frac{GH}{DE} = \frac{FG}{FD}$ [Δ 's]	✓ S ✓ S (2)

9.2.1	$\hat{L}_2 = 90^\circ$ [$\angle$ in semi-circle/ OR $\hat{L}_1 = \hat{R}_1$ [tan chord theorem/ $\angle$ in halwe sirkel] $\hat{R}_2 = 90^\circ$ [$\angle$ in semi-circle] $\hat{R}_1 = \hat{P}$ [tan chord theorem] $\angle$ in halwe sirkel] $\therefore \hat{L}_2 = \hat{R}_2$ $\therefore \hat{L}_1 = \hat{P}$ $\therefore LT \parallel PR$ [alt $\angle$ s =/verw. $\angle$ e =] $\therefore LT \parallel PR$ [corresp. $\angle$ s =/ ooreenk. $\angle$ e =]	$\checkmark$ S $\checkmark$ R $\checkmark$ S/R $\checkmark$ R	(4)
9.2.2	$\hat{L}_1 = \hat{R}_1$ [tan chord theorem/raaklyn-koordst.] $\hat{L}_1 = \hat{O}_1$ [corresp. $\angle$ s; $LT \parallel OM$ /ooreenk. $\angle$ e; $LT \parallel OM$] $\therefore \hat{R}_1 = \hat{O}_1$ $\therefore$ L, O, R and M are concyclic. $\therefore$ LORM is a cyclic quadrilateral [converse $\angle$ s in the same seg/ omgekeerde $\angle$ e in dies. sirkel segm]	$\checkmark$ S $\checkmark$ R $\checkmark$ S/R $\checkmark$ S $\checkmark$ R	(5)
9.2.3	$O\hat{L}R = \hat{M}_1$ [$\angle$ s in the same seg/ $\angle$ e in dieselfde segment] $2\hat{L}_3 = \hat{M}_1$ [$\angle$ at centre = $2 \times \angle$ at circumference/ midpt. $\angle$ = $2 \times$ omtreks $\angle$] $\therefore O\hat{L}R = 2\hat{L}_3$ $\therefore \hat{L}_4 = \hat{L}_3$ $\therefore$ LN bisects $O\hat{L}R$	$\checkmark$ S/R $\checkmark$ S $\checkmark$ R $\checkmark$ S	(4)

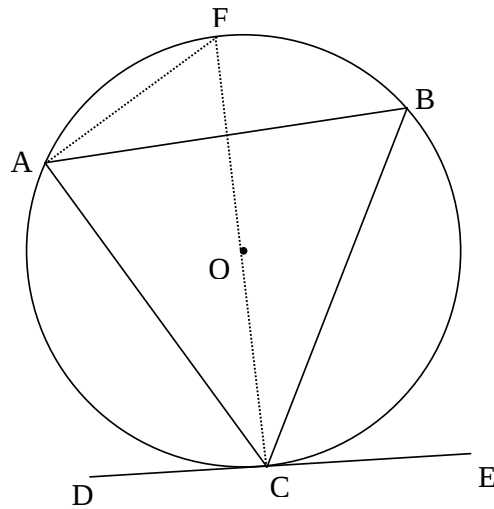
[20]

15. Die raaklyn-koordstelling, bewys en dan gebruik

Amptelike DBE-nasienriglyn · Mei/Junie 2024 · V8 · 11 punte

QUESTION/VRAAG 8

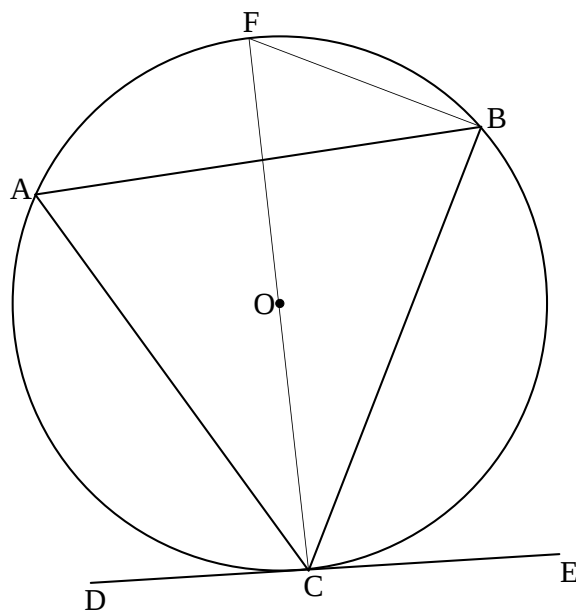
8.1



	Construction: Draw diameter CF and draw AF Konstruksie: Trek middellyn CF en verbind AF	✓ Constr
	$\widehat{FCE} = 90^\circ$ [tan $\perp$ radius/raaklyn $\perp$ radius]	✓ S ✓ R
	$\widehat{FAC} = 90^\circ$ [$\angle$ in semi circle/ $\angle$ in halwe sirkel]	✓ S/R
	$\widehat{FAB} = \widehat{FCB}$ [$\angle$ s same segment/ $\angle$ e dieselfde segm]	✓ S/R
	$\therefore \widehat{BAC} = \widehat{BCE}$	
	$\therefore \widehat{BCE} = \widehat{A}$	(5)

OR

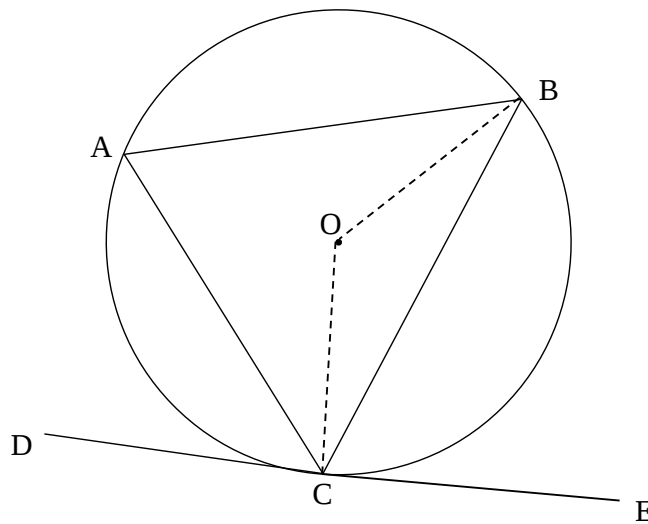
8.1



	Construction: Draw diameter CF and draw FB <i>Konstruksie: Trek middellyn CF en verbind FB</i>	✓ construction
	$\hat{FBC} = 90^\circ$ [∠ in semi circle/∠ in halwe sirkel] $\hat{BFC} + \hat{FCB} = 90^\circ$ [sum of ∠s in Δ/binne ∠e v Δ]	✓ S / R
	$\hat{OCE} = 90^\circ$ [tan ⊥ radius/ raaklyn ⊥ radius] $\therefore \hat{BCE} = \hat{F}$ but $\hat{A} = \hat{F}$ [∠s in same seg/∠ in dies. segment]	✓ S ✓ R
	$\therefore \hat{BCE} = \hat{A}$	✓ S / R
		(5)

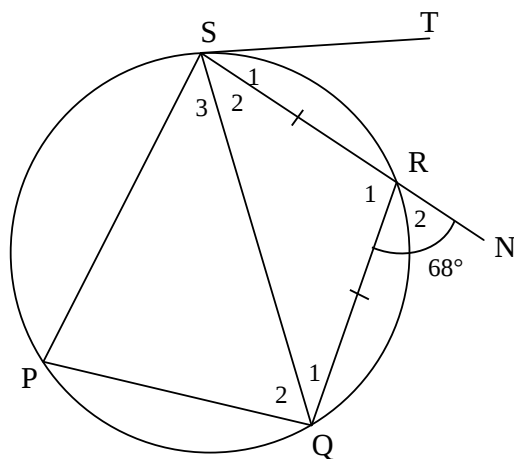
OR

8.1



	Construction: Draw radii BO and OC <i>Konstruksie: Trek radiusse BO en OC</i>	✓ construction
	$\hat{OCE} = 90^\circ$ or $\hat{BCE} = 90^\circ - \hat{OCB}$ [tan ⊥ radius / raaklyn ⊥ radius]	✓ S ✓ R
	$\hat{OCB} = \hat{OBC}$ [∠s opp equal sides/ ∠e teenoor gelyke sye] $\therefore \hat{COB} = 180^\circ - 2\hat{OCB}$ [∠s of Δ/∠e van Δ]	✓ S
	$\hat{CAB} = 90^\circ - \hat{OCB}$ [∠ at centre = 2 × ∠ circumf/ midpts ∠ = 2 × omtreks ∠] $\therefore \hat{BCE} = \hat{CAB}$	✓ S/R
		(5)

8.2



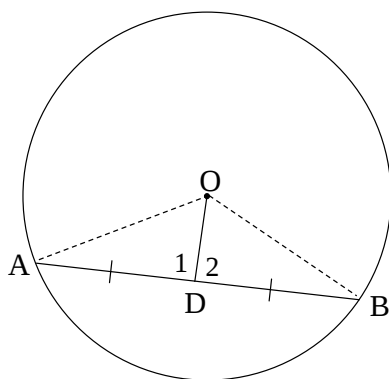
8.2.1	$\hat{P} = \hat{R}_2 = 68^\circ$	[ext $\angle$ of cyclic quad /buite $\angle$ van kvh]	✓ S ✓ R	(2)
8.2.2	$\hat{Q}_1 = \hat{S}_2$ $\hat{Q}_1 + \hat{S}_2 = 68^\circ$ $\therefore \hat{Q}_1 = 34^\circ$	[$\angle$ s opp equal sides / $\angle$ e teenoor gelyke sye] [ext $\angle$ of Δ / buite $\angle$ van Δ]	✓ S ✓ S	(2)
8.2.3	$\hat{S}_1 = \hat{Q}_1 = 34^\circ$	[tan-chord theorem/ $\angle$ tussen rkl en koord]	✓ S ✓ R	(2)
				[11]

16. Die lyn vanaf die middelpunt wat 'n koord halveer

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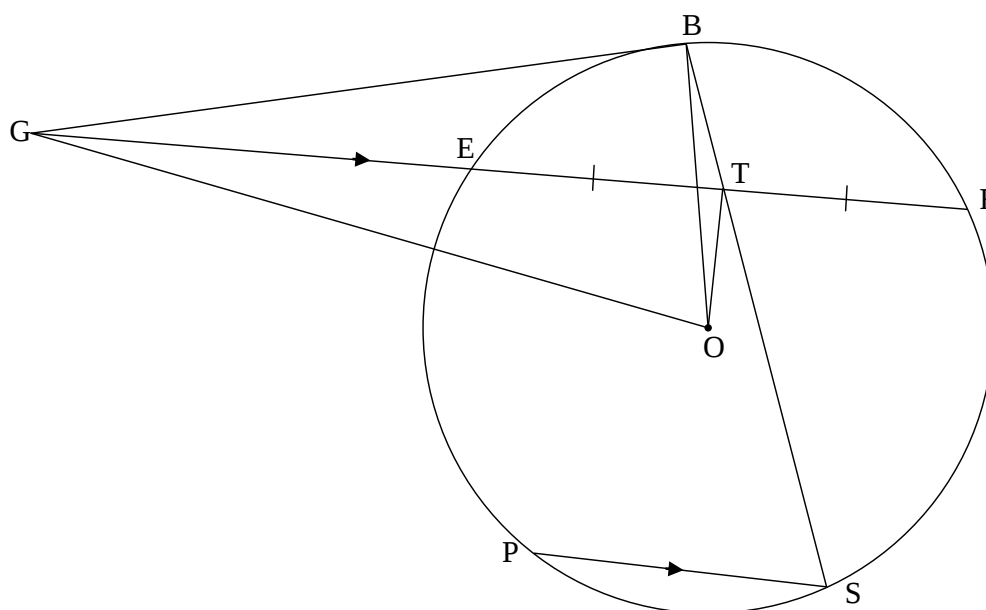
QUESTION/VRAAG 9

9.1



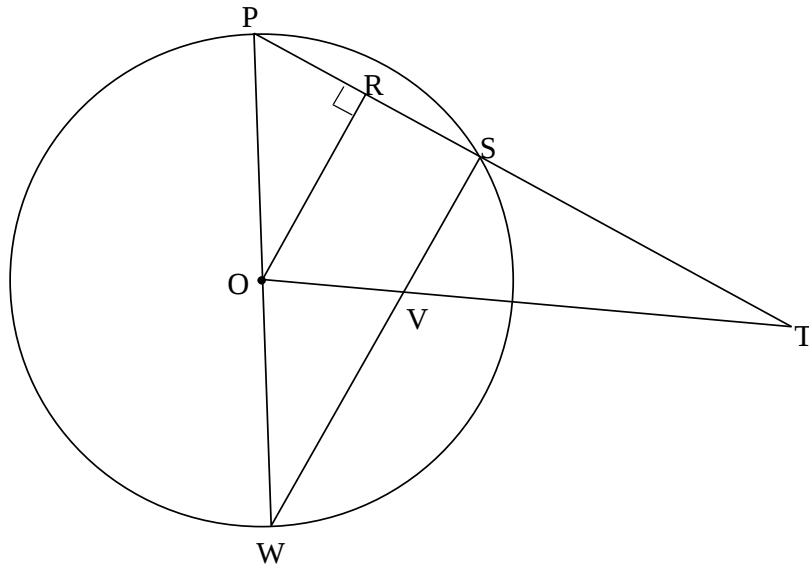
9.1.1	Construction: Draw OA and OB In $\triangle ADO$ and $\triangle BDO$ $OA = OB$ [radii/radiusse] $OD = OD$ [common side/gemeenskaplike sy] $AD = DB$ [given/gegee] $\therefore \triangle ADO \equiv \triangle BDO$ [S;S;S] ADB is a straight line $\therefore \hat{D}_1 = \hat{D}_2$ $\triangle ADO \equiv \triangle BDO$ $\therefore OD \perp AB$ [$\angle$s on a str line/$\angle$e op 'n reguitlyn] OR/OF Construction: Draw OA and OB In $\triangle ADO$ and $\triangle BDO$ $AD = DB$ [given/gegee] $\hat{A} = \hat{B}$ [$\angle$s opp; $\angle$s sides /$\angle$e teenoor gelyke sye] $OA = OB$ [radii/radiusse] $\therefore \triangle ADO \equiv \triangle BDO$ [S;$\angle$;S] ADB is a straight line $\therefore \hat{D}_1 = \hat{D}_2$ $\triangle ADO \equiv \triangle BDO$ $\therefore OD \perp AB$ [$\angle$s on a str line/$\angle$e op 'n reguitlyn]	✓ construction ✓ first pair of sides ✓ other 2 pairs ✓ R ✓ R (5) ✓ construction ✓ first pair of sides ✓ other 2 pairs ✓ R ✓ R (5)
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9.2



10.1	Construction: Join SB and TA and draw h_1 from B $\perp$ AR and h_2 from A $\perp$ RB Konstruksie: Verbind SB en TA en trek h_1 vanaf B $\perp$ AR en h_2 vanaf A $\perp$ RB Proof/Bewys: $\frac{\text{area } \triangle RAB}{\text{area } \triangle ASB} = \frac{\frac{1}{2} RA \times h_1}{\frac{1}{2} AS \times h_1} = \frac{RA}{AS}$ $\frac{\text{area } \triangle RAB}{\text{area } \triangle ABT} = \frac{\frac{1}{2} RB \times h_2}{\frac{1}{2} BT \times h_2} = \frac{RB}{BT}$ area $\triangle RAB$ = area $\triangle RAB$ [common/gemeenskaplik] But area $\triangle ASB$ = area $\triangle ABT$ [same base & height; AB $\parallel$ ST/ dies. basis & hoogte; AB $\parallel$ ST] $\therefore \frac{\text{area } \triangle RAB}{\text{area } \triangle ASB} = \frac{\text{area } \triangle RAB}{\text{area } \triangle ABT}$ $\therefore \frac{RA}{AS} = \frac{RB}{BT}$	✓ construction $\checkmark \frac{\text{area } \triangle RAB}{\text{area } \triangle ASB} = \frac{\frac{1}{2} RA \times h_1}{\frac{1}{2} AS \times h_1}$ $\checkmark \frac{RA}{AS}$ $\checkmark \frac{\text{area } \triangle RAB}{\text{area } \triangle ABT} = \frac{RB}{BT}$ ✓ S ✓ R (6)
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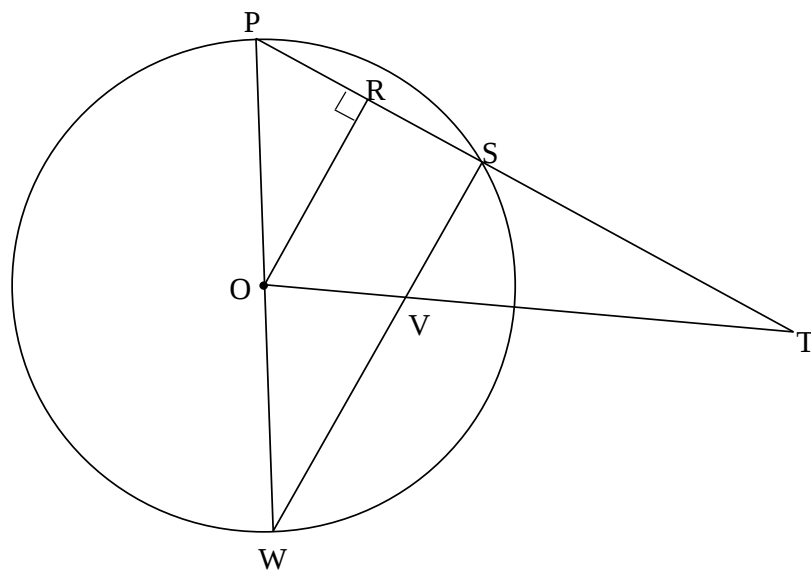
10.2



10.2.1	$PR = RS$ $PO = OW$ $\therefore OR = \frac{1}{2} WS$ $\therefore OR : WS = 1 : 2$ OR/OF $\hat{P}SW = 90^\circ$ $\hat{P}RO = 90^\circ$ $\therefore \hat{P}RO = \hat{P}SW$ $\therefore RO \parallel SW$ $\frac{PO}{OW} = \frac{PR}{RS}$ $PO = OW$ $\therefore PR = RS$ $\therefore OR : WS = 1 : 2$	[<i>line from centre $\perp$ to chord/ lyn vanuit midpt. sirkel $\perp$ op koord</i>] [<i>radii / radiusse</i>] [<i>midpt theorem/midpt. stelling</i>] [$\angle$ in semi circle/$\angle$ in halwe sirkel] [<i>given</i>] [<i>corresp $\angle$s = / ooreenk. $\angle$e =</i>] OR/OF [<i>co-int. $\angle$s suppl / ko-binne $\angle$e suppl</i>] [<i>prop theorem; $RO \parallel SW$/ lyn $\parallel$ een sy van Δ</i>] [<i>radii / radiusse</i>] [<i>midpt theorem/ midpt. stelling</i>] ✓ S ✓ R ✓ S ✓ S ✓ R ✓ S ✓ S ✓ S ✓ R ✓ R (5)
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	OR/OF $\triangle PRO$ and $\triangle PSW$ $\hat{P}\hat{S}W = 90^\circ$ [∠ in semi circle/∠ in halwe sirkel] $\hat{P}\hat{R}O = 90^\circ$ [given] $\therefore \hat{P}\hat{R}O = \hat{P}\hat{S}W$ $\hat{P}$ is common $\hat{P}\hat{O}R = \hat{P}\hat{W}S$ [sum of ∠s in Δ/ som van ∠e in Δ] $\therefore \triangle PRO \parallel \triangle PSW$ [∠∠∠] $\therefore \frac{PO}{PW} = \frac{RO}{SW}$ [∥ Δs / ∥ Δe] but $PW = 2 PO$ [diameter = 2 radius/middellyn = 2 radius] $\therefore \frac{RO}{SW} = \frac{PO}{2PO}$ $= \frac{1}{2}$ $\therefore OR : WS = 1 : 2$	✓ S ✓ R ✓ S ✓ S ✓ S
10.2.2	$\frac{OV}{VT} = \frac{RS}{ST} = \frac{1}{3}$ [prop theorem; $RO \parallel SW$/ lyn een sy van Δ] $\frac{RS}{15} = \frac{1}{3}$ $RS = 5$ units $PR = RS = 5$ units [line from centre $\perp$ to chord / lyn vanuit midpt. sirkel $\perp$ op koord] $\therefore PT = 25$ units	✓ S / R ✓ S ✓ S ✓ answer
(5)		
(4)		
[15]		

10.2

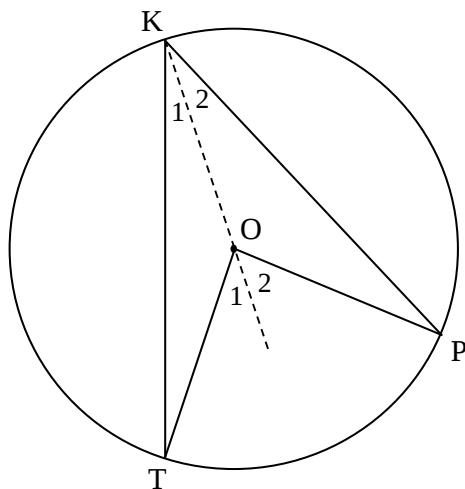


18. Die hoek by die middelpunt is twee keer die hoek by die omtrek

Amptelike DBE-nasienriglyn · November 2023 · V8 · 16 punte

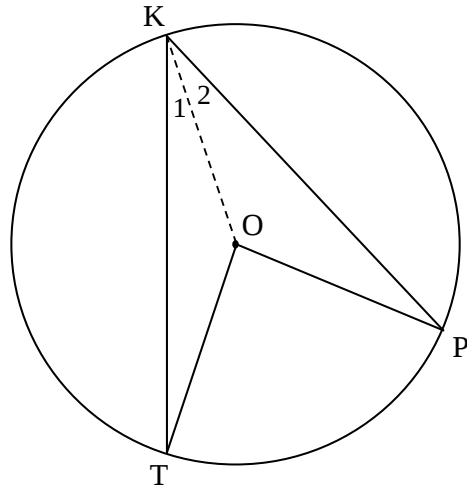
QUESTION/VRAAG 8

8.1



8.1	Construction: Draw KO produced $\hat{O}_1 = \hat{K}_1 + \hat{T} \quad [\text{ext } \angle \text{ of } \Delta]$ But $\hat{K}_1 = \hat{T}$ [$\angle$s opp equal sides] $\therefore \hat{O}_1 = 2\hat{K}_1$ $\hat{O}_2 = \hat{K}_2 + P \quad [\text{ext } \angle \text{ of } \Delta]$ But $\hat{K}_2 = P$ [$\angle$s opp equal sides] $\therefore \hat{O}_2 = 2\hat{K}_2$ $\therefore \hat{O}_1 + \hat{O}_2 = 2\hat{K}_1 + 2\hat{K}_2$ $= 2(\hat{K}_1 + \hat{K}_2)$ $\therefore \hat{TOP} = 2\hat{TKP}$ OR	✓ construction ✓ S / R ✓ S ✓ S ✓ S (5)
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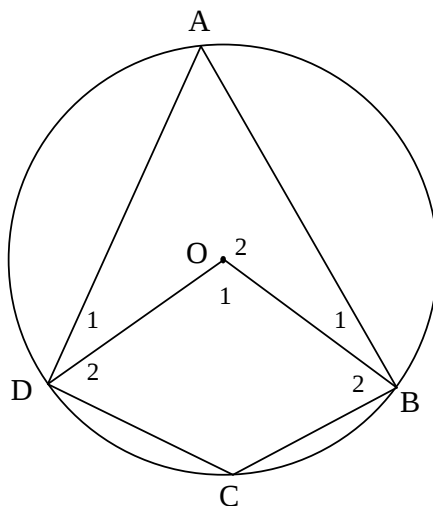
0.1



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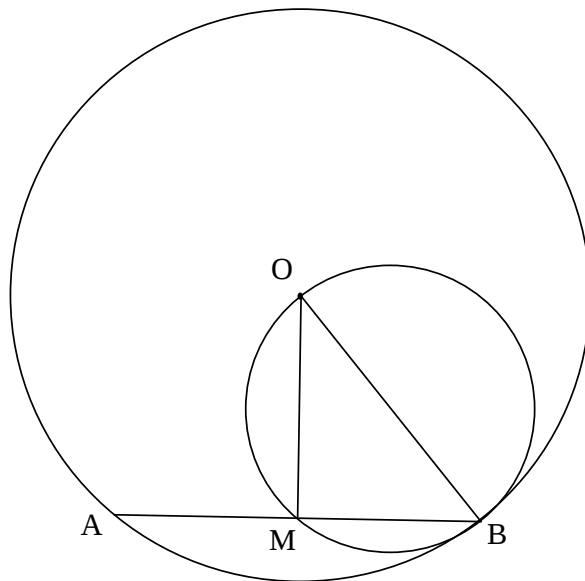
(5)

8.2



8.2	$\hat{O}_1 = 4x + 100^\circ$ [given] $\therefore \hat{A} = 2x + 50^\circ$ [$\angle$ at centre = $2 \times \angle$ at circumference] $x + 34^\circ + 2x + 50^\circ = 180^\circ$ [opp $\angle$ s of cyclic quad] $3x = 96^\circ$ $x = 32^\circ$ OR $\hat{O}_2 = 2x + 68^\circ$ [$\angle$ at centre = $2 \times \angle$ at circumference] $4x + 100^\circ + 2x + 68^\circ = 360^\circ$ [$\angle$ s round a pt] $6x = 192^\circ$ $x = 32^\circ$ OR $\hat{O}_2 = -4x + 260^\circ$ [$\angle$ s round a pt] $2\hat{C} = -4x + 260^\circ$ [$\angle$ at centre = $2 \times \angle$ at circumference] $\hat{C} = -2x + 130^\circ$ $x + 34^\circ = -2x + 130^\circ$ $3x = 96^\circ$ $x = 32^\circ$	✓ S ✓ R ✓ S ✓ R ✓ answer (5) ✓ S ✓ R ✓ S ✓ R ✓ answer (5) ✓ S ✓ R ✓ S ✓ R ✓ answer (5)
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8.3



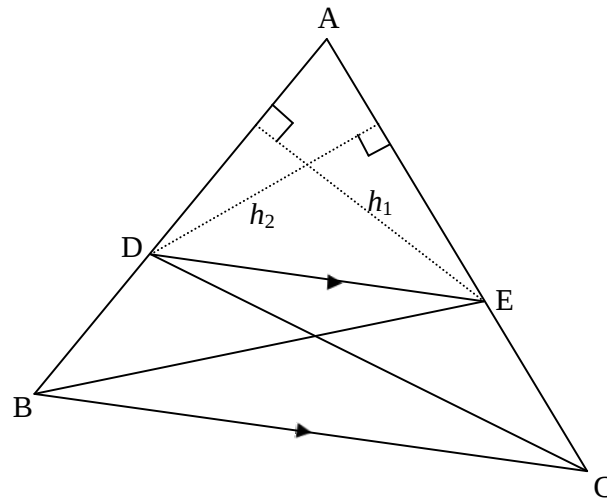
8.3.1	$\hat{O}MB = 90^\circ$ [∠ in semi circle]	✓ S ✓ R (2)
8.3.2	$AB = \sqrt{300} = 10\sqrt{3}$ $\therefore MB = 5\sqrt{3}$ [line from centre $\perp$ to chord] $OB^2 = OM^2 + MB^2$ [Pythagoras] $OB^2 = 5^2 + (5\sqrt{3})^2$ $OB = 10$ units	✓ S ✓ R ✓ S ✓ answer (4)
		[16]

19. Die Eweredigheidstelling, dan die toepassing wat daarop volg

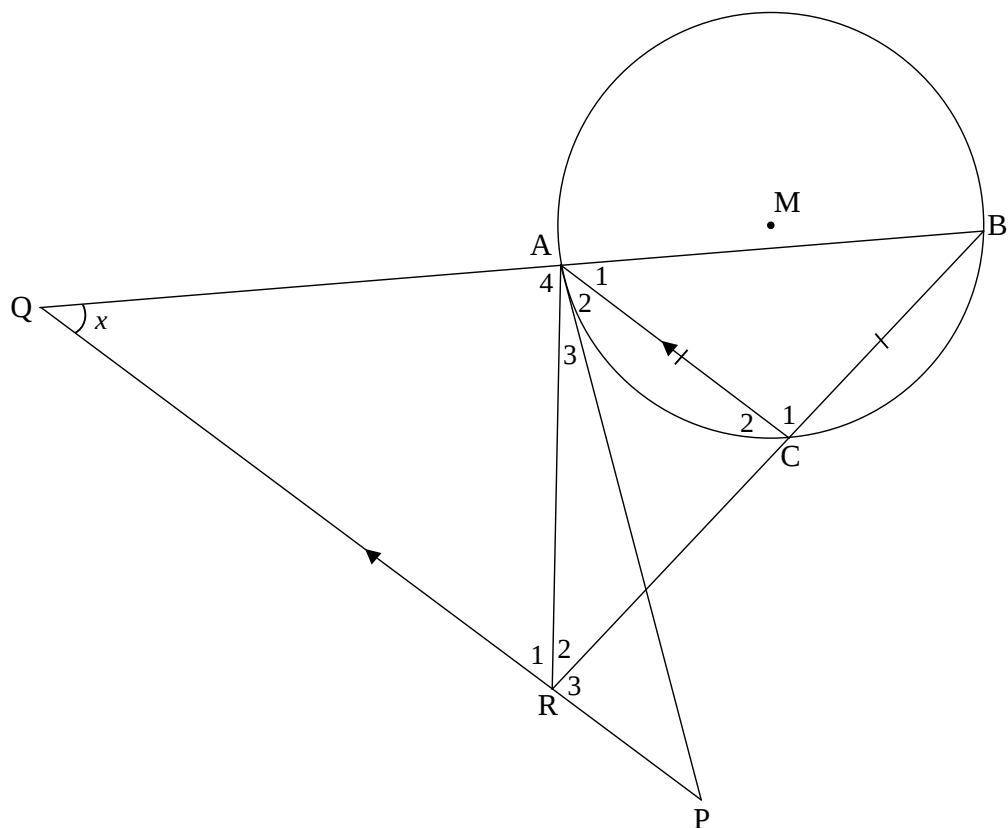
Amptelike DBE-nasienriglyn · Mei/Junie 2021 · V9 · 17 punte

QUESTION/VRAAG 9

9.1

[illegible]

9.2



9.2.1	$\hat{A}_1 = x$ [corresp $\angle$ s; $PQ \parallel CA$ /ooreenkomstige $\angle$ e, $PQ \parallel CA$] $\hat{B} = x$ [$\angle$ s opp equal sides/ $\angle$ e teenoor gelyke sye] $\hat{A}_2 = x$ [tan-chord theorem/ $\angle$ tussen raaklyn en koord] $\hat{P} = x$ [alt $\angle$ s; $PQ \parallel CA$ /verw. $\angle$ e, $PQ \parallel CA$]	$\checkmark$ S $\checkmark$ R $\checkmark$ S/R $\checkmark$ S $\checkmark$ R $\checkmark$ 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 $\angle$ s in the same segment/ koord onderspan gelyke omtreks $\angle$ e]	$\checkmark$ S $\checkmark$ R	(2)
9.2.3	$\frac{BA}{BQ} = \frac{BC}{BR}$ [prop th; $AC \parallel QP$] OR [line $\parallel$ one side Δ /lyn $\parallel$ een syn Δ] But $QR = BR$ [sides opp = $\angle$ s/sye teenoor = $\angle$ e] $\therefore \frac{BA}{BQ} = \frac{BC}{QR}$	$\checkmark$ S $\checkmark$ R $\checkmark$ S	(3)

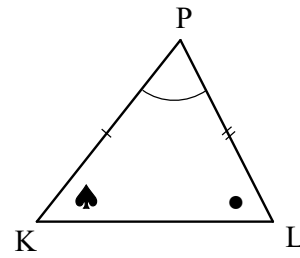
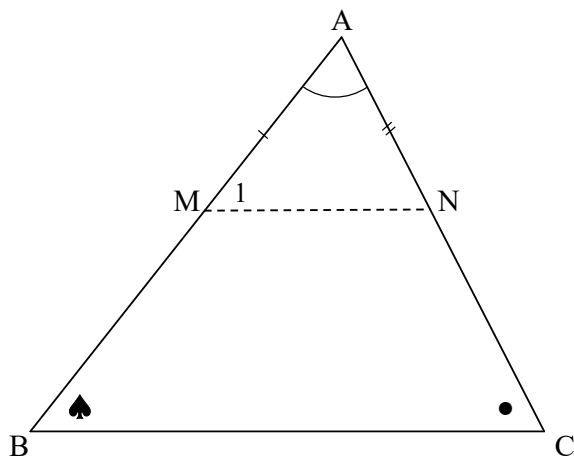
	OR In $\triangle ABC$ and $\triangle BQR$: $\hat{A}_1 = \hat{B} = x \quad [\text{proved in 9.2.1}]$ $\hat{B} = \hat{Q} = x \quad [\text{proved in 9.2.1}]$ $\hat{C}_1 = \hat{BRQ} = 180^\circ - 2x \quad [\text{sum of } \angle\text{s of } \triangle]$ $\therefore \triangle ABC \parallel \triangle BQR$ $\therefore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

20. Gelykhoekige driehoeke het hulle sye in eweredigheid

Amptelike DBE-nasienriglyn · Mei/Junie 2025 · V10 · 20 punte

QUESTION/VRAAG 10

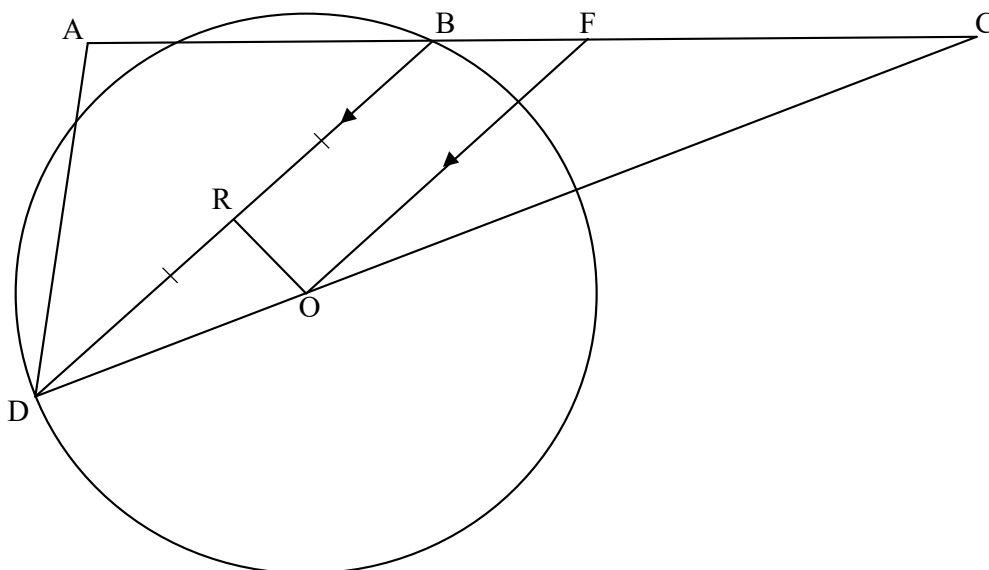
10.1



10.1	Construction: Draw line MN, where M and N are points on AB and AC respectively such that $AM = PK$ and $AN = PL$. In $\triangle AMN$ and $\triangle PKL$ $\hat{A} = \hat{P}$ [given] $AM = PK$ [construction] $AN = PL$ [construction] $\triangle AMN \equiv \triangle PKL$ [s.s.s.] $\therefore \hat{M}_1 = \hat{K}$ But $\hat{B} = \hat{K}$ [given] $\therefore \hat{M}_1 = \hat{B}$ $\therefore MN \parallel BC$ [corresp $\angle s = \text{oreenk. } \angle e =$] $\therefore \frac{AB}{AM} = \frac{AC}{AN}$ [line $\parallel$ one side of $\triangle$ / $lyn \parallel \text{een sy v } \triangle$] But $AM = PK$ and $AN = PL$ $\therefore \frac{AB}{PK} = \frac{AC}{PL}$	✓ construction ✓ S/R ✓ S ✓ S / R ✓ S ✓ R
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(6)

10.2

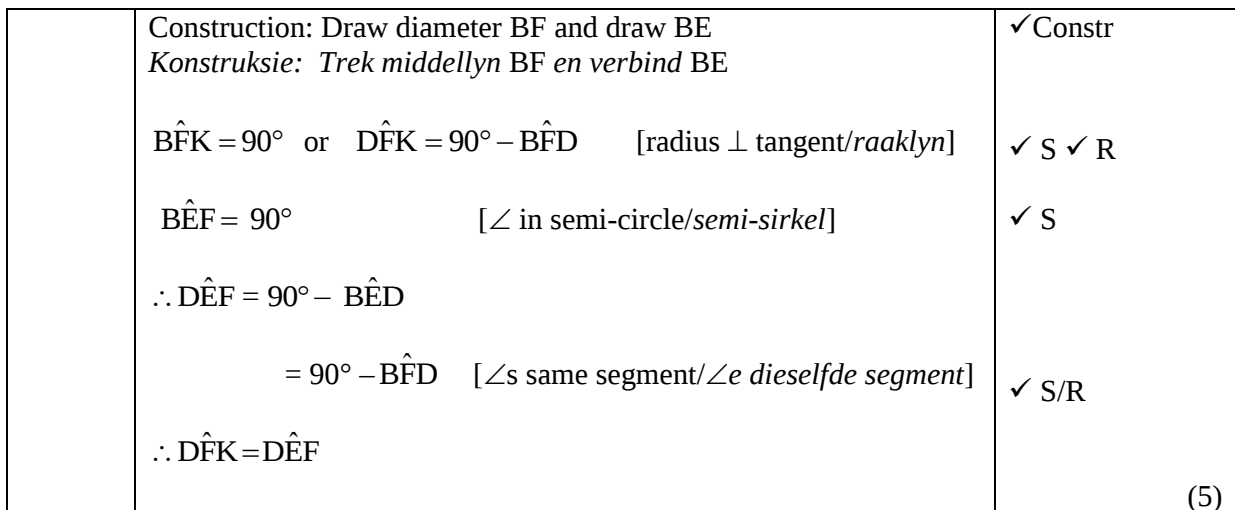


10.2.1	In $\triangle CFO$ and $\triangle CBD$ $\hat{C} = \hat{C}$ [common] $\hat{CFO} = \hat{CBD}$ [corresp $\angle$s; $BD \parallel FO$ / ooreenk. $\angle$e; $BD \parallel FO$] $\hat{COF} = \hat{CDB}$ [sum of $\angle$s in $\triangle$ / binne $\angle$e v $\triangle$] OR [corresp $\angle$s; $BD \parallel FO$ / ooreenk. $\angle$e; $BD \parallel FO$] $\triangle CFO \parallel \triangle CBD$ [$\angle \angle \angle$]	✓ S ✓ S/R ✓ S/R OR R (3)
10.2.2	$\frac{FO}{BD} = \frac{CO}{CD}$ [$\parallel \triangle$s] $FO \cdot CD = CO \cdot BD$ But $\hat{RDO} = \hat{FCO}$ [given] $\therefore BD = BC$ [sides opp equal $\angle$s / sye teenoor gelyke $\angle$e] $\therefore FO \cdot CD = CO \cdot BC$	✓ S/R ✓ S/R (2)

10.2.3	RD = 6 units [DR = RB] $\frac{RO}{RD} = \frac{3}{4}$ $\therefore RO = \frac{3}{4}(6)$ RO = 4,5 units OR $\perp$ BD [line from centre to midpt of chord/ <i>midpt. sirkel; midpt koord</i>] $\therefore DO = \sqrt{6^2 + 4,5^2}$ [Pythagoras] DO = 7,5 units $\frac{BF}{BC} = \frac{DO}{DC}$ [line $\parallel$ to one side of Δ /lyn $\parallel$ een sy v Δ] OR/OF [prop theorem; BD $\parallel$ FO/<i>eweredigheidst.</i>; BD $\parallel$ FO] BC = BD = 12 units [sides opp equal $\angle$s/sye <i>teenoor gelyke $\angle$e</i>] $\therefore \frac{BF}{12} = \frac{7,5}{19,2}$ $BF = \frac{7,5 \times 12}{19,2}$ $BF = \frac{75}{16} \text{ units}$	✓ S ✓ S/R ✓ S ✓ S/R ✓ S ✓ S (6)
10.2.4	$\tan \hat{RDO} = \frac{RO}{RD} = \frac{4,5}{6} = \frac{3}{4}$ $\hat{RDO} = 36,87^\circ$ $\hat{FCO} = \hat{RDO} = 36,87^\circ$ [given] $\therefore \hat{ABD} = 73,74^\circ$ [ext $\angle$ of Δ/<i>buite $\angle$ v. Δ</i>] OR/OF $CD^2 = BC^2 + BD^2 - 2(BC)(BD)\cos \hat{DBC}$ $\cos \hat{DBC} = \frac{12^2 + 12^2 - 19,2^2}{2(12)(12)}$ $\cos \hat{DBC} = -\frac{7}{25}$ $\hat{DBC} = 106,26^\circ$ $\therefore \hat{ABD} = 73,74^\circ$ [$\angle$s on a straight line/$\angle$e op 'n reguitlyn]	✓ ratio ✓ $\hat{RDO}$ ✓ answer (3) ✓ substitution into cosine-rule ✓ $\hat{DBC}$ ✓ answer (3)
		[20]

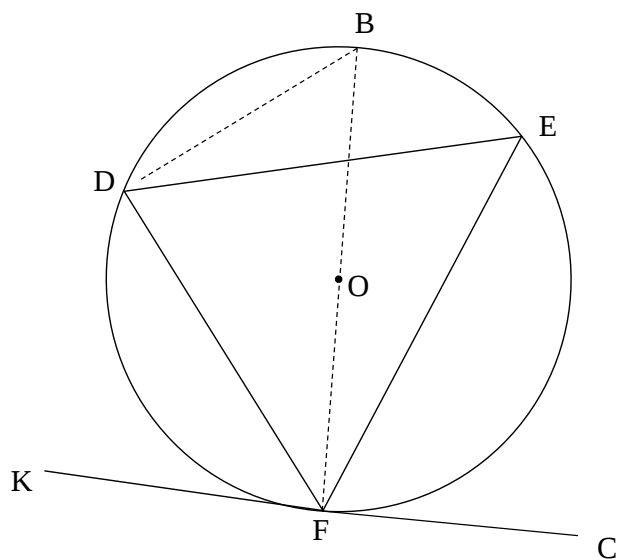
Amptelike DBE-nasienriglyn · November 2021 · V11 · 23 punte

11.1



	Construction: Draw radii DO and OF <i>Konstruksie: Trek radii DO en OF</i> $\hat{OFK} = 90^\circ$ or $\hat{DFK} = 90^\circ - \hat{OFD}$ radius $\perp$ tangent/raaklyn] $\hat{ODF} = \hat{OFD}$ [$\angle$s opp = sides/$\angle$e teenoor = sye] $\therefore \hat{DOF} = 180^\circ - 2\hat{OFD}$ [$\angle$s of Δ/$\angle$e van Δ] $\hat{DEF} = 90^\circ - \hat{OFD}$ [$\angle$ at centre = $2 \times \angle$ circumf/ midpts $\angle = 2 \times$ omtreks $\angle$] $\therefore \hat{DFK} = \hat{DEF}$	✓ construction ✓ S ✓ R ✓ S ✓ S/R (5)
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OR/OF



	Construction: Draw diameter BF and join BD. <i>Konstruksie: Trek middellyn BF en verbind BD.</i> $\hat{BFK} = 90^\circ$ or $\hat{DFK} = 90^\circ - \hat{BFD}$ [radius $\perp$ tangent/raaklyn] $\hat{FDB} = 90^\circ$ [$\angle$ in half circle/semi-sirkel] $\hat{B} = 90^\circ - \hat{BFD}$ $\therefore \hat{DFK} = \hat{B}$ but $\hat{B} = \hat{E}$ [$\angle$s same segment/$\angle$e dieselfde segment] $\therefore \hat{DFK} = \hat{E}$	✓ construction ✓ S ✓ R ✓ S ✓ S/R (5)
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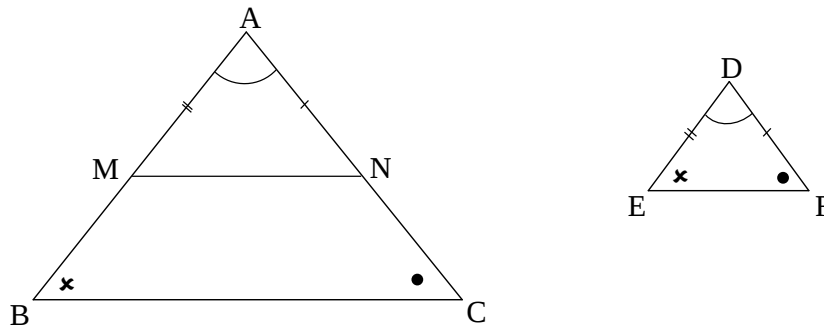
	$NKL = 180^\circ - K_4$ [adj. suppl.] $\therefore NKL = 180^\circ - NML$ [proved] $\therefore KLMN$ is a cyclic quad [opp. $\angle$ s supplementary]	$\checkmark$ R (1)
11.2.2	In $\triangle LKN \parallel \triangle KSM$: $\hat{N}_3 = \hat{M}_3$ [$\angle$ s in the same seg / $\angle$ e in dieselfde sirkel 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; $MN \parallel KS$] $N\hat{K}L = M\hat{S}K$ [$\angle$ s of $\triangle$ / $\angle$ e van $\triangle$] $\triangle LKN \parallel \triangle KSM$ OR/OF In $\triangle LKN \parallel \triangle KSM$: $\hat{N}_3 = \hat{M}_3$ [$\angle$ 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; $KS \parallel NM$] $\triangle LKN \parallel \triangle KSM$ [$\angle$, $\angle$, $\angle$] OR/OF In $\triangle LKN \parallel \triangle KSM$: $\hat{N}_3 = \hat{M}_3$ [$\angle$ 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] $\therefore N\hat{K}L = \hat{S}_2$ [$\hat{K}_4 = \hat{S}_1$] $\triangle LKN \parallel \triangle KSM$ [$\angle$, $\angle$, $\angle$]	$\checkmark$ S $\checkmark$ R $\checkmark$ S $\checkmark$ S/R $\checkmark$ S $\checkmark$ S $\checkmark$ R $\checkmark$ S/R $\checkmark$ S $\checkmark$ R (5)
11.2.3	$\frac{LK}{KS} = \frac{KN}{SM}$ [$\triangle LKN \parallel \triangle KSM$] $\therefore \frac{12}{KS} = \frac{4}{3}$ $KS = 9$ units	$\checkmark$ S $\checkmark$ R $\checkmark$ substitution $\checkmark$ answer (4)
11.2.4	$4SM = 3KN$ $SM = \frac{3(8)}{4}$ $SM = 6$ $\frac{LT}{NL} = \frac{LS}{ML}$ [line $\parallel$ one side of $\triangle$ / lyn $\parallel$ een sy v $\triangle$] $\frac{LT}{16} = \frac{13}{19}$ $LT = \frac{208}{19} = 10,95$	$\checkmark$ SM = 6 $\checkmark$ S $\checkmark$ R $\checkmark$ answer (4)
		[23]

22. Gelykhoekige driehoeke, dan die langste toepassing in die boek

Amptelike DBE-nasienriglyn · Mei/Junie 2022 · V10 · 25 punte

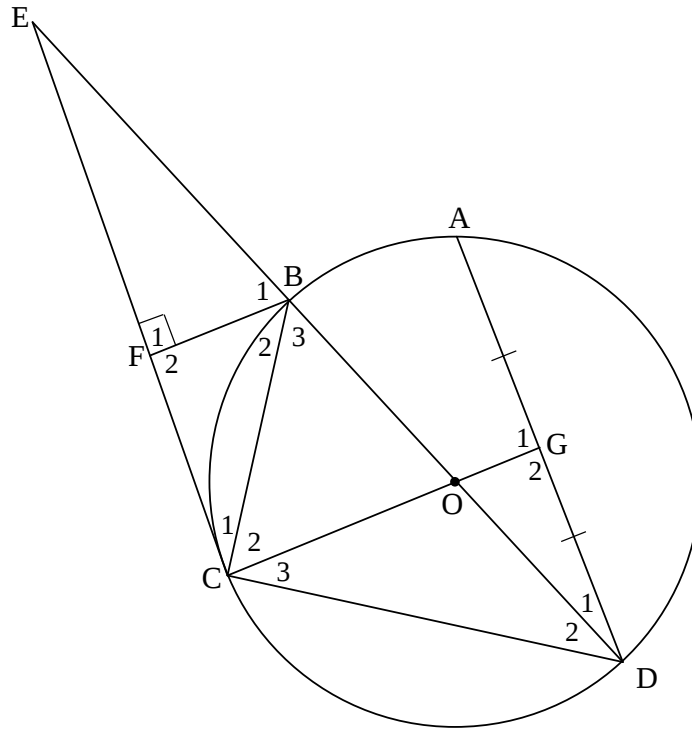
QUESTION/VRAAG 10

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 $\triangle AMN$ and $\triangle DEF$ $AM = DE$ [Constr / Konstruksie] $AN = DF$ [Constr / Konstruksie] $\hat{A} = \hat{D}$ [Given / Gegee] $\therefore \triangle AMN \cong \triangle DEF$ [s, $\angle$, s] $\therefore \hat{AMN} = \hat{E} = \hat{B}$ $MN \parallel BC$ [corresp $\angle$'s are equal/ ooreenk. $\angle$ e gelyk] $\frac{AB}{AM} = \frac{AC}{AN}$ [line $\parallel$ one side of $\triangle$ OR/OF prop theorem; $MN \parallel BC$ / Lyn $\parallel$ een sy v $\triangle$] $\therefore \frac{AB}{DE} = \frac{AC}{DF}$ [AM=DE and AN=DF]	✓ Constr ✓ S ✓ R ✓ S / R ✓ S ✓ R (6)
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10.2



10.2.1(a)	$\hat{F}\hat{C}O = 90^\circ$ [tan $\perp$ radius / raaklyn $\perp$ radius] $\hat{F}_1 = 90^\circ$ [BF $\perp$ EC] $\therefore \hat{F}\hat{C}O = \hat{F}_1 = 90^\circ$ FB $\parallel$ CG [corresp $\angle$ s = / ooreenk. $\angle$ gelyk]	$\checkmark$ S / R $\checkmark$ S $\checkmark$ R
10.2.1(b)	In $\triangle FCB$ and $\triangle CDB$ $\hat{B}\hat{C}D = 90^\circ$ [$\angle$ in semi-circle / $\angle \frac{1}{2} \odot$] $\hat{F}_2 = 90^\circ$ [BF $\perp$ EC] $\therefore \hat{F}_2 = \hat{B}\hat{C}D = 90^\circ$ $\hat{C}_1 = \hat{D}_2$ [tan chord theorem / $\angle$ tussen rkl en koord] $\hat{B}_2 = \hat{B}_3$ [sum of $\angle$ s in $\triangle$ / $\angle$ e van $\triangle$] $\therefore \triangle FCB \parallel \triangle CDB$ OR/OF In $\triangle FCB$ and $\triangle CDB$ $\hat{B}\hat{C}D = 90^\circ$ [$\angle$ in semi-circle / $\angle \frac{1}{2} \odot$] $\hat{F}_2 = 90^\circ$ [BF $\perp$ EC] $\therefore \hat{F}_2 = \hat{B}\hat{C}D = 90^\circ$ $\hat{C}_1 = \hat{D}_2$ [tan chord theorem / $\angle$ tussen rkl en koord] $\therefore \triangle FCB \parallel \triangle CDB$ [$\angle, \angle, \angle$]	$\checkmark$ S / R $\checkmark$ S $\checkmark$ S $\checkmark$ R $\checkmark$ S $\checkmark$ S / R $\checkmark$ S $\checkmark$ S $\checkmark$ R $\checkmark$ R

(3)

(5)

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

TOTAL/TOTAAL: 150