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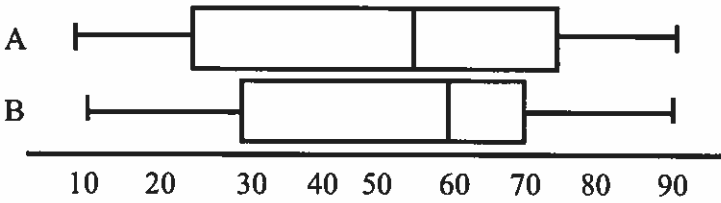
GRADE/GRAAD 12

**MATHEMATICS PAPER 2/ WISKUNDE V2
SEPTEMBER 2020
MEMORANDUM**

MARKS/PUNTE: 150

This memorandum consists of 15 pages / Hierdie memo bestaan uit 15 bladsye.

QUESTION /VRAAG 1

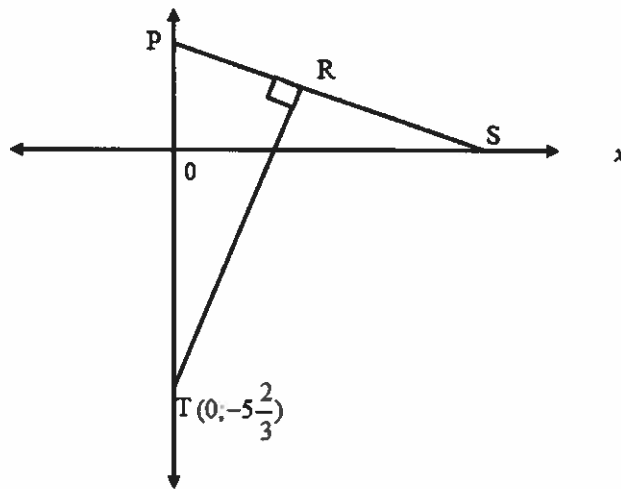
<p>1.1.1</p>		<p>✓box /mond ✓whiskers, on scale/ stert, en op skaal</p> <p>(2)</p>
<p>1.1.2</p>	<p>School B/skool B: In B 50% of learners got above 60% whilst 50% of learners of A above 55% / 50% van B het meer as 60% ; by A het 50% meer as 55% median of B > median of A/ mediaan van B > mediaan van A 75% of B above 30% and at A 75% above 23,5% / 75% van B bo 30% ; By A 75% bo 23,5%</p> <p>OR/OF Skewed to the right/ skeef na Regs</p>	<p>✓School /skool B</p> <p>✓✓any two reasons enige twee redes</p> <p>✓✓</p> <p>OR/ OF ✓✓</p> <p>(3)</p>
<p>1.2</p>	$\frac{135 \times 24 + 225 \times 32 + 200 \times x}{560} = x$ $3240 + 7200 + 200x = 560x$ $360x = 10440$ $x = 29$	<p>✓numerator/ teller</p> <p>✓560</p> <p>✓360x = 10440</p> <p>✓</p> <p>answer/antwoord</p> <p>(4)</p>
		<p>[9]</p>

QUESTION/VRAAG 2

<p>2.1</p>	<p>$a = 23,19$ $b = 0,768..$ $y = 23,19 + 0,77x$</p>	<p>✓a ✓b</p> <p>✓ $y = 23,19 + 0,77x$</p> <p>(3)</p>
<p>2.2</p>	<p>$y = 23,19 + 0,77(30)$ $= 46,29$ $\approx 46\%$</p>	<p>✓</p> <p>substitution/vervanging</p> <p>✓answer/antwoord</p> <p>(2)</p>

2.3.1	$\delta = 10,99$	✓✓ answer /antwoord (2)
2.3.2	$57,4\% - 49,4\% = 8\%$ $\frac{x}{50} = \frac{8}{100}$ $x = 4$ marks	✓8% ✓4 marks/ punte (2)
		[9]

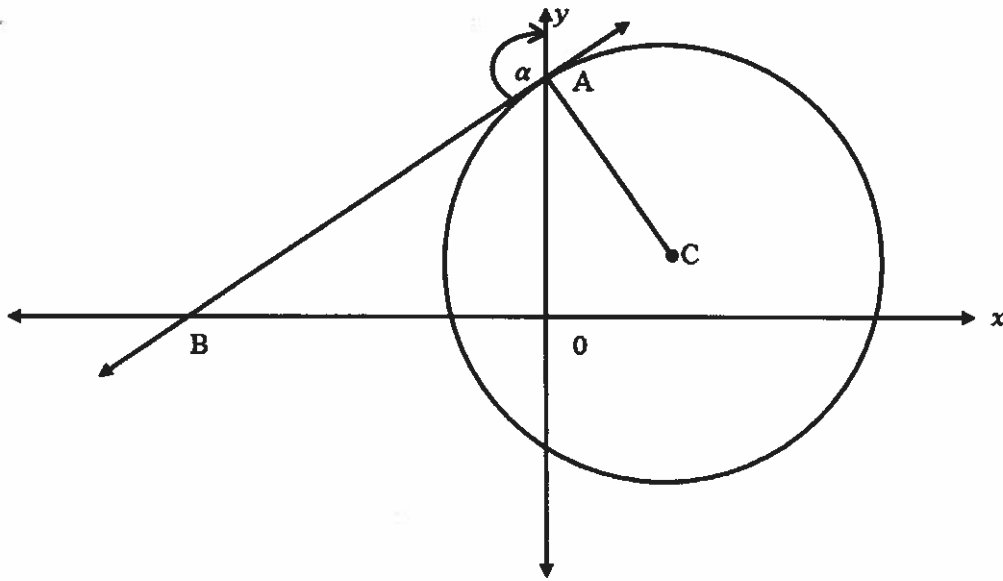
QUESTION /VRAAG 3



3.1	$x + ay = a$ $0 + ay = a$ $y = 1$ $\therefore P(0;1)$	✓ $x=0$ ✓ $y=1$ ✓ $P(0;1)$ (3)
3.2	$OS : OP = 3 : 1$ $S(3;0) : x + ay = a$ $3 + a(0) = a$ $a = 3$	✓ $S(3;0)$ ✓substitution/vervang ✓ $a = 3$ (3)
3.3	$m_{PS} = -\frac{1}{3}$ $m_{TR} = 3$ RT: $y = 3x - 5\frac{2}{3}$	✓ $m_{PS} = -\frac{1}{3}$ ✓ $m_{TR} = 3$ ✓equation/ vergelyking (3)
3.4	$x + 3y = 3 \Rightarrow y = -\frac{1}{3}x + 1$ $\therefore -\frac{1}{3}x + 1 = 3x - \frac{17}{3}$ $-x + 3 = 9x - 17$ $20 = 10x$	✓equating /stel gelyk

	Substitute: $y = -\frac{1}{3}(2) + 1$ $y = \frac{1}{3}$ $R(2; \frac{1}{3})$	\checkmark <i>simplification/vereenvoudig</i> $\checkmark x = 2$ $\checkmark y = \frac{1}{3}$ (4)
3.5	$area\Delta PRT = \frac{1}{2} \times PT \times h$ $= \frac{1}{2} \times 6 \frac{2}{3} \times 2$ $= \frac{20}{3}$ sqd units/ <i>vierkante eenhede</i>	$\checkmark PT = 6 \frac{2}{3}$ $\checkmark h = 2$ \checkmark answer/ <i>antwoord</i> (3)
3.6	PT is the diameter (converse: \angle in semi \odot) / $\odot PT$ is die middellyn (omgekeerde: \angle in semi \odot) $radius = \frac{10}{3}$ units.	\checkmark S/R \checkmark answer / <i>antwoord</i> (2)
		[18]

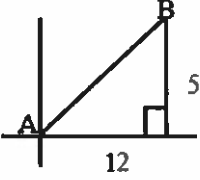
QUESTION/VRAAG 4



4.1.1	$x^2 - 6x + 9 + y^2 - 4y + 4 = 12 + 9 + 4$ $(x - 3)^2 + (y - 2)^2 = 25$ $C(3;2)$ $r = 5$	Completing the square <i>vierkantsvoltooiing</i> ✓LHS/ LK ✓RHS/RK ✓ C(3;2) ✓ r = 5 (4)
4.1.2	Y-intercept: /Y as: $x = 0$ $y^2 - 4y - 12 = 0$ $(y - 6)(y + 2) = 0$ $y = -2 \text{ or } y = 6 \therefore A(0;6)$ $m_{AC} = \frac{6 - 2}{0 - 3} = -\frac{4}{3}$ $m_{AB} = \frac{3}{4} \text{ (tan } \perp \text{ radius)}$ $y = \frac{3}{4}x + 6$	✓ $x = 0$ ✓ standardform/ <i>standaardvorm</i> ✓ factors/faktore ✓ A(0;6) ✓ $m_{AC} = -\frac{4}{3}$ ✓ $m_{AB} = \frac{3}{4}$ ✓ R ✓ equation/ <i>vergelyking</i> (8)
4.1.3	Let $A = \theta$: $\tan \theta = \frac{3}{4}$ $\theta = 36,87^\circ$ $\alpha = 90^\circ + 36,87^\circ$ $\alpha = 126,87^\circ$	✓ $\tan \theta = \frac{3}{4}$ ✓ $\theta = 36,87^\circ$ ✓ $\alpha = 90^\circ + 36,87^\circ$ ✓ answer / <i>antwoord</i> (1)

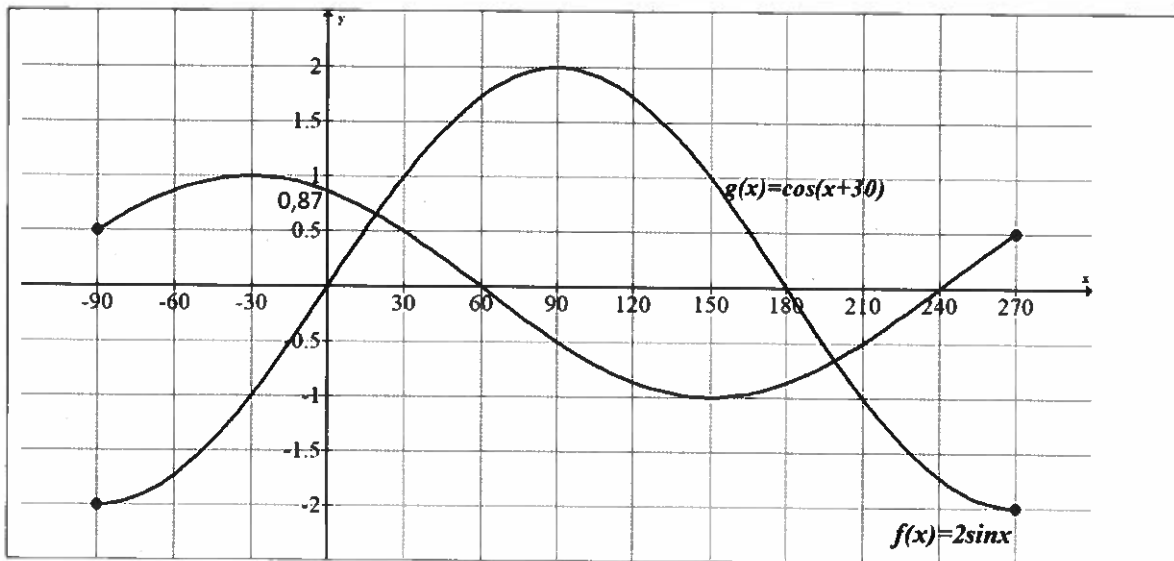
4.2	$x^2 + 2x + 1 + y^2 - 4y + 4 = 44 + 1 + 4$ $(x+1)^2 + (y-2)^2 = 49$ <p>Centre / <i>middelpunt</i> D(-1;2) ; radius = 7</p> $CD = 3 - (-1) = 4$ $r_C + r_D = 5 + 7 = 12 > 4$ <p>∴ the two circles intercept internally/ <i>twee sirkels sny inwendig</i></p>	<p>✓ Centre D(-1;2)</p> <p>✓ r = 7</p> <p>✓ CD = 4</p> <p>✓ $r_C + r_D = 12$</p> <p>✓ > 4</p> <p>✓ conclusion / <i>gevolgtrekking</i> (6)</p>
[22]		

QUESTION/VRAAG 5

5.1	$\tan A = \frac{5}{12}$  $r^2 = 12^2 + 5^2$ $= 169$ $r = 13$ $13 \sin A - 3 \tan B$ $= 13 \left(\frac{5}{13} \right) - 3 \left(\frac{12}{5} \right)$ $= 5 - \frac{36}{5}$ $= -\frac{11}{5}$	<p>✓ diagram</p> <p>✓ r = 13</p> <p>✓ $\sin A = \frac{5}{13}$</p> <p>✓ $\tan B = \frac{12}{5}$</p> <p>✓ answer / <i>antwoord</i> (5)</p>
5.2	$\frac{-\tan 60^\circ - \sin x}{\sin x + 2 \cos 30^\circ}$ $= \frac{-\sqrt{3} - \sin x}{\sin x + 2 \left(\frac{\sqrt{3}}{2} \right)}$ $= \frac{-(\sin x + \sqrt{3})}{(\sin x + \sqrt{3})}$ $= -1$	<p>✓ $-\tan 60^\circ$</p> <p>✓ $-\sin x$</p> <p>✓ $2 \cos 30^\circ$</p> <p>✓ special angles/ <i>bekende hoeke</i></p> <p>✓ factorisation/ <i>faktoriseer</i></p> <p>✓ answer/</p>

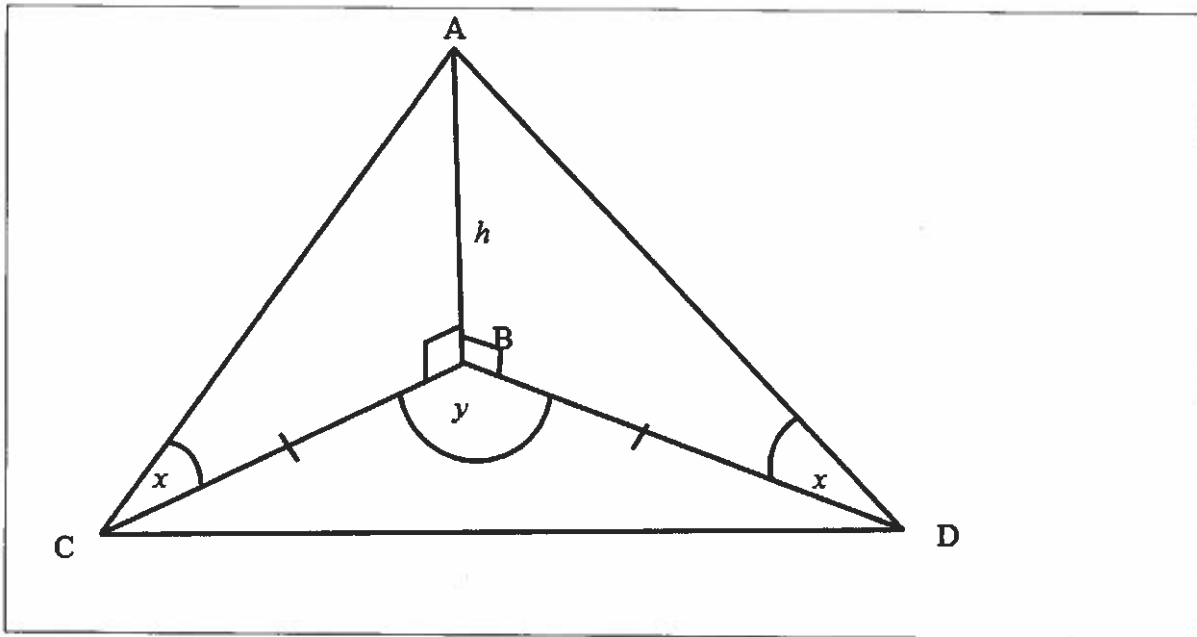
5.3.1	$\begin{aligned}\cos(x+y) &= \sin(90^\circ - (x+y)) \\ &= \sin((90^\circ - x) + (-y)) \\ &= \sin(90^\circ - x)\cos(-y) + \cos(90^\circ - x)\sin(-y) \\ &= \cos x \cos y - \sin x \sin y\end{aligned}$	<p>✓ Correct co-fn/ korrekte ko – funksie</p> <p>✓ regrouping/ herrangskik</p> <p>✓ Correct expansion/ uitbreiding</p> <p>✓ simplification/ vereenvoudig</p> <p>(4)</p>
5.3.2	$\begin{aligned}\cos(x-y) - \cos(x+y) &= \cos x \cos y + \sin x \sin y - (\cos x \cos y - \sin x \sin y) \\ &= \cos x \cos y + \sin x \sin y - \cos x \cos y + \sin x \sin y \\ &= 2 \sin x \sin y\end{aligned}$	<p>✓ Expansion/ brei uit</p> <p>✓ simplification / vereenvoudig</p> <p>(2)</p>
5.3.3	$\begin{aligned}2 \sin 195^\circ \sin 45^\circ &= \cos(195^\circ - 45^\circ) - \cos(195^\circ + 45^\circ) \\ &= \cos 150^\circ - \cos 240^\circ \\ &= -\cos 30^\circ - (-\cos 60^\circ) \\ &= -\frac{\sqrt{3}}{2} + \frac{1}{2} \\ &= \frac{-\sqrt{3} + 1}{2}\end{aligned}$	<p>✓ Substitution/ vervang</p> <p>✓ $-\cos 30^\circ$</p> <p>✓ $-\cos 60^\circ$</p> <p>✓ Special angles/ bekende hoeke</p> <p>✓ answer/antwoord</p> <p>(5)</p>
		[22]

QUESTION/VRAAG 6



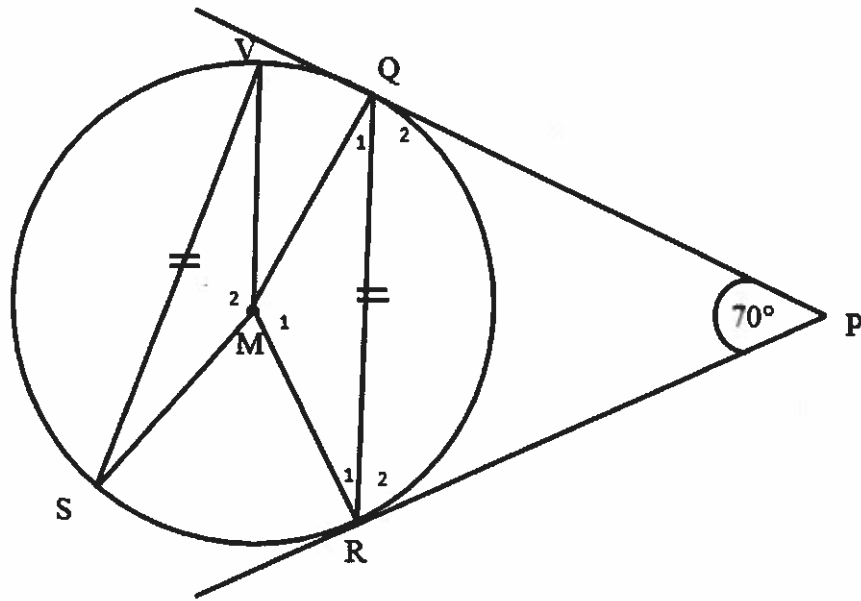
6.1	g : \checkmark x-intercepts/ x – asse \checkmark y-intercepts/ y – as \checkmark turningpoints / draaipunte	(3)	
6.2	$2\sin x = \cos x \cos 30^\circ - \sin x \sin 30^\circ$ $2\sin x = \frac{\sqrt{3}}{2} \cos x - \frac{1}{2} \sin x$ $\frac{5}{2} \sin x = \frac{\sqrt{3}}{2} \cos x$ $\frac{\sin x}{\cos x} = \frac{\sqrt{3}}{5}$ $\tan x = \frac{\sqrt{3}}{5}$	\checkmark Expansion of g / <i>brei uit</i> \checkmark Special angles/ <i>bekende hoeke</i> $\checkmark \frac{5}{2} \sin x = \frac{\sqrt{3}}{2} \cos x$ $\checkmark \frac{\sin x}{\cos x}$	(4)
6.3	$\tan x = \frac{\sqrt{3}}{5}$ $x = 19,1^\circ \text{ or } x = 180^\circ + 19,1^\circ = 199,1^\circ$	$\checkmark 19,1^\circ$ $\checkmark 199,1^\circ$	(2)
6.4.1	$x \in [60^\circ; 180^\circ] \cup [240^\circ; 270^\circ]$	$\checkmark 60^\circ$ and / en 180° $\checkmark 240^\circ$ and / en 270° \checkmark notation / <i>notasie</i>	(3)
6.4.2	$x \in [19,1^\circ; 199,1^\circ]$	\checkmark critical values / <i>kritieke waardes</i> \checkmark notation / <i>notasie</i>	(2)

QUESTION /VRAAG 7



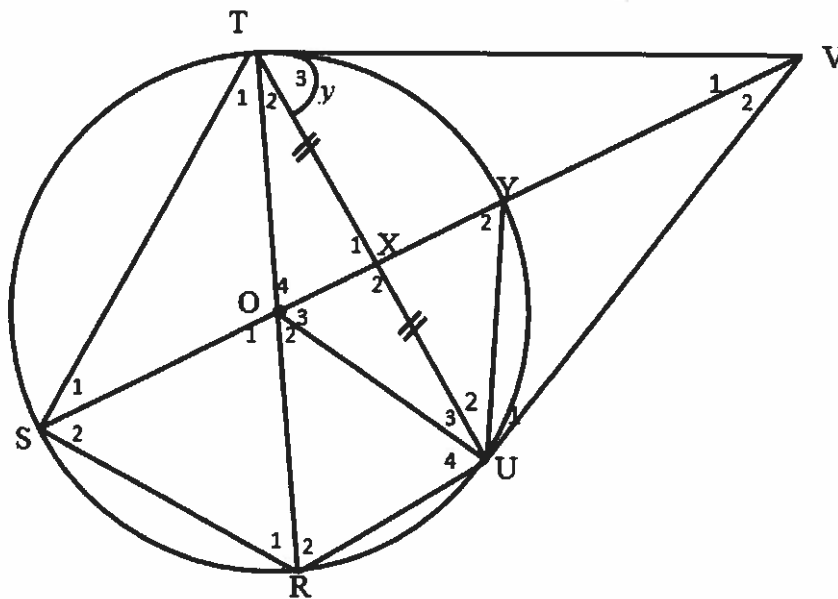
$\text{In } \triangle ABC : \tan x = \frac{h}{CB}$ $CB = \frac{h}{\tan x}$ $\text{In } \triangle BCD : CB = BD$ $CD^2 = BC^2 + BD^2 - 2BC \times BD \times \cos y$ $=$ $\left(\frac{h}{\tan x}\right)^2 + \left(\frac{h}{\tan x}\right)^2 - 2 \frac{h}{\tan x} \times \frac{h}{\tan x} \times \cos y$ $= \frac{2h^2}{\tan^2 x} - \frac{2h^2 \cos y}{\tan^2 x}$ $= \frac{2h^2}{\tan^2 x} (1 - \cos y)$ $CD = \frac{h}{\tan x} \sqrt{2(1 - \cos y)}$ $CD = \frac{h}{\tan x} \sqrt{2 - 2 \cos y}$	$\checkmark \tan x = \frac{h}{CB}$ $\checkmark CB = \frac{h}{\tan x}$ <p>\checkmark Correct application of cos rule/ korrekte gebruik van cosreël</p> <p>\checkmark substitution</p> <p>\checkmark simplify/ vereenvoudig</p> <p>\checkmark factorising/ faktoriseer</p>
	[6]

QUESTION/VRAAG 8



8.1.1	$\hat{Q}_2 = \hat{R}_2$ (tangents from same point)/ raaklyne uit dsde punt $2\hat{R}_2 + 70^\circ = 180^\circ$ (\angle 'sof ΔPQR / \angle 'e van ΔPQR) $2\hat{R}_2 = 110^\circ$ $\hat{R}_2 = 55^\circ$	$\checkmark S \checkmark R$ $\checkmark S$ \checkmark answer/ antwoord (4)
8.1.2	$\hat{Q}_1 + \hat{Q}_2 = 90^\circ$ (tangent \perp radius)/(raaklyn \perp op radius) $\hat{Q}_1 + 55^\circ = 90^\circ$ $\hat{Q}_1 = 35^\circ$	$\checkmark S \checkmark R$ \checkmark answer / antwoord (3)
8.1.3	$\hat{Q}_1 = \hat{R}_1 = 35^\circ$ (r=) $\hat{M}_1 = 110$ (\angle 'sof ΔMQR) $\hat{M}_2 = \hat{M}_1 = 110$ (= chords subtend = \angle 's at centre)/ (= koorde = middelpunts \angle 'e)	$\checkmark S/R$ $\checkmark \hat{M}_2 = 110$ $\checkmark R$ (3)

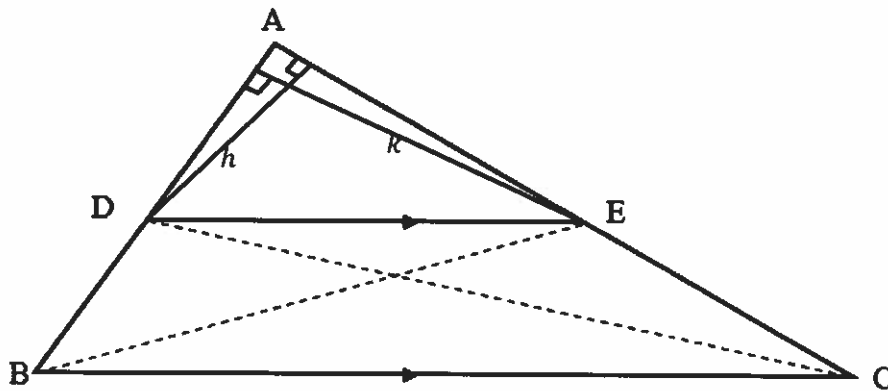
8.2



8.2.1	$\hat{X}_1 = 90^\circ$ (line from centre to midpoint of chord)/ (<i>van midpunt van \odot, mdpt van koord</i>) $\hat{U}_3 + \hat{U}_4 = 90^\circ$ (\angle in semi \odot) $\therefore \hat{X}_1 = \hat{U}_3 + \hat{U}_4 = 90^\circ$ $\Rightarrow RU \parallel SV$ (corresponding \angle 's =)/ (ooreenkomstige \angle 'e =)	$\checkmark S \checkmark R$ $\checkmark S$ $\checkmark S$ $\checkmark R$ (5)
8.2.2	$\hat{R}_2 = y$ (tan-chord theorem)/ (\angle tussen raaklyn en koord) $\hat{O}_1 = y$ (alternate \angle 's, $RU \parallel SV$)/ (verwisselende \angle 'e, $RU \parallel SV$) $\hat{O}_1 = 2\hat{T}_1$ (\angle at centre = $2\angle$ at circumference) (<i>middelpunts\angle = $2 \times$ omtreks\angle</i>) $\therefore \hat{T}_1 = \frac{1}{2}y$	$\checkmark S \checkmark R$ $\checkmark S$ $\checkmark S \checkmark R$ (5)
[20]		

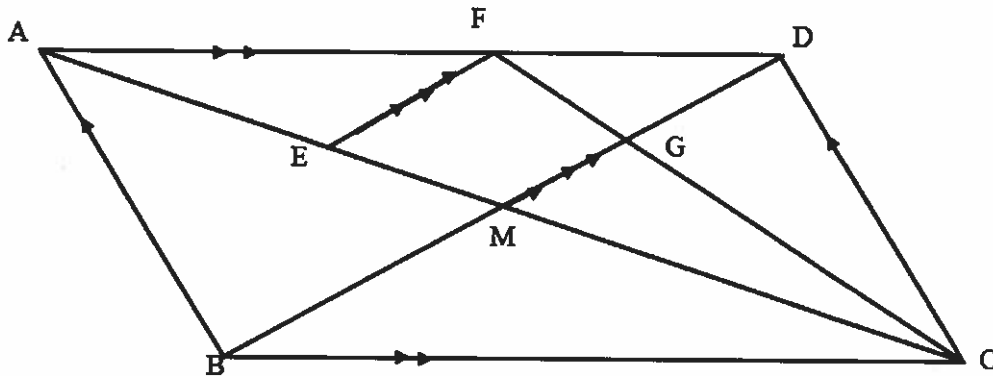
QUESTION/VRAAG 9

9.1



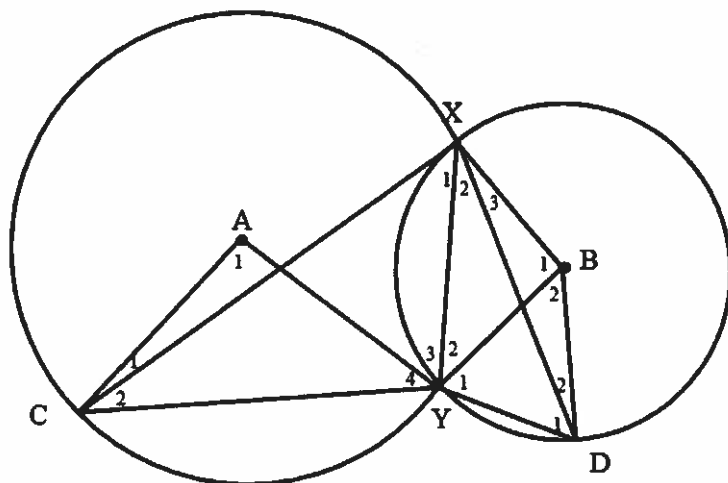
<p>9.1</p>	<p>Construction: Draw altitudes h and k. <i>Konstruksie: trek hoogtelyne h en k.</i></p> $\frac{\text{area}\triangle ADE}{\text{area}\triangle BDE} = \frac{\frac{1}{2} \times AD \times h}{\frac{1}{2} \times BD \times h} = \frac{AD}{DB}$ $\frac{\text{area}\triangle ADE}{\text{area}\triangle DEC} = \frac{\frac{1}{2} \times AE \times k}{\frac{1}{2} \times EC \times k} = \frac{AE}{EC}$ <p>But the $\text{area}\triangle BDE = \text{area}\triangle DEC$ (same base and same height/ <i>dsde basis en hoogte</i>)</p> $\therefore \frac{\text{area}\triangle ADE}{\text{area}\triangle BDE} = \frac{\text{area}\triangle ADE}{\text{area}\triangle DEC}$ $\therefore \frac{AD}{DB} = \frac{AE}{EC}$	<p>✓Construction/ <i>konstruksie</i></p> <p>✓S</p> <p>✓S</p> <p>✓S/R</p> <p>✓S</p> <p>(6)</p>
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9.2



9.2.1	$\frac{AE}{EM} = \frac{AF}{FD} = \frac{4}{3}$ <p>(line to one side of ΔAMD)/ (lyn aan een sy van ΔAMD)</p> $\frac{EM}{AM} = \frac{3}{7}$	<p>✓S ✓R</p> <p>✓answer (3)</p>
9.2.2	$AM : MC = 7 : 7$ (diagonals of parm) $\frac{CM}{ME} = \frac{7}{3}$	<p>✓S ✓R</p> <p>✓answer (3)</p>
9.2.3	$area\Delta BDC = area\Delta ABD$ (diagonals of parm) $\frac{area\Delta FDC}{area\Delta BDC} = \frac{area\Delta FDC}{area\Delta ABD}$ $= \frac{\frac{1}{2} \times FD \times height}{\frac{1}{2} \times AD \times height}$ $= \frac{FD}{AD}$ (between same parallel lines)/ (tussen dieselfde lyne) $= \frac{3}{7}$	<p>✓S</p> <p>✓replacing/ vervang</p> <p>✓ area formula / oppervlak formule</p> <p>✓R</p> <p>(4)</p>
		[16]

QUESTION /VRAAG 10



<p>10.1</p>	<p><i>In $\triangle XYC$ and $\triangle DYX$:</i> $\hat{X}_1 = \hat{D}_1$ (tan-chord theorem/ \angle tussen raaklyn en koord) $\hat{C}_2 = \hat{X}_2$ (tan-chord theorem/ \angle tussen raaklyn en koord) $\hat{Y}_3 + \hat{Y}_4 = \hat{Y}_1 + \hat{Y}_2$ (\angle'sof Δ) $\therefore \triangle XYC \parallel \parallel \triangle DYX$ ($\angle\angle\angle$) $\Rightarrow \frac{XY}{DY} = \frac{YC}{YX}$ $\therefore XY^2 = YC \cdot DY$</p>	<p>✓S✓R ✓S ✓S ✓S</p>
<p>10.2</p>	<p>$\hat{A}_1 = 2\hat{X}_1$ (\angle at centre is twice \angle at circumference) (middelpunts$\angle = 2 \times$ omtreks\angle) Similarly/netso $\hat{B}_1 = 2\hat{D}_1$ But $\hat{X}_1 = \hat{D}_1$ (tan-chord theorem/ \angle tussen raaklyn en koord) $\therefore \hat{A}_1 = \hat{B}_1$</p>	<p>✓S✓R ✓ ✓S</p>
<p>10.3</p>	<p>$\frac{CA}{YB} = \frac{CY}{YX}$ ($\triangle CA Y \parallel \parallel \triangle Y B X$) $\frac{R}{r} = \frac{CY}{YX}$ $\therefore \frac{R^2}{r^2} = \frac{CY^2}{YX^2}$ $= \frac{CY \cdot CY}{CY \cdot DY}$ $= \frac{CY}{DY}$</p>	<p>✓S ✓Substitute/ vervang ✓Square both sides/ kwadreer albei kante</p>

(5)

(4)

	$\therefore \frac{r^2}{R^2} = \frac{DY}{CY}$	\checkmark Replace/vervang YX^2 \checkmark answer /antwoord (5)
		[14]