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GAUTENG PROVINCE
EDUCATION
REPUBLIC OF SOUTH AFRICA

GAUTENG DEPARTMENT OF EDUCATION/
GAUTENGSE DEPARTEMENT VAN ONDERWYS

JUNE EXAMINATION/
JUNIE EKSAMEN 2022

MARKING GUIDELINES/
NASIENRIGLIYNE

MATHEMATICS/*WISKUNDE*
(PAPER/*VRAESTEL* 2) (10612)

BILINGUAL/*TWEETALIG*

15 pages/ *bladsye*

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QUESTION/*VRAAG* 1

1.1	B	✓ answer/*antwoord*	(1)
1.2	B	✓ answer/*antwoord*	(1)
1.3	75%	✓ answer/*antwoord*	(1)
1.4	Nothing. It remains the same. No change in standard deviation. *Niks. Dit bly dieselfde. Geen verandering in standaardafwyking*	✓reason/*rede*	(1)
1.5	$\text{Semi} - \text{IQR: IKV} = \frac{75 - 30}{2}$ $\text{Semi} - \text{IQR: IKV} = 22.5$	✓ answer/*antwoord*	(1)
			[5]

QUESTION 2/*VRAAG 2*

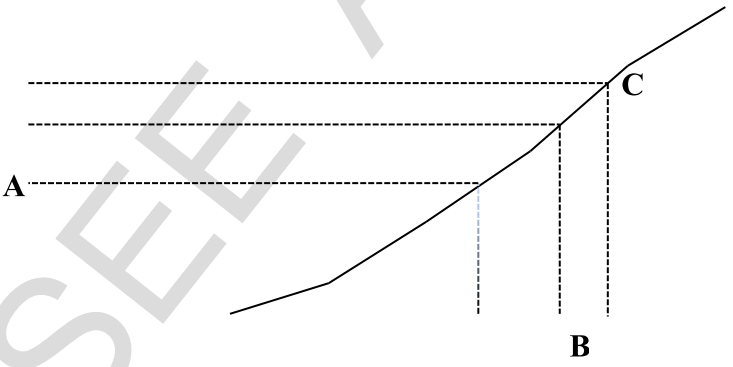
2.1

Time taken *Tyd geneem*	No. of pupils *Aantal leerlinge*	Cumulative frequency *Kummulatiewe frekwensie*
$60 \leq t \leq 90$	3	3
$90 \leq t \leq 120$	6	9
$120 \leq t \leq 150$	7	16
$150 \leq t \leq 180$	8	24
$180 \leq t \leq 210$	6	30

✓ for values
vir waardes

(1)

2.2



✓ anchor point/ *ankerpunt* (60;0)

✓ (120; 9)
✓ (150; 16)
✓ (210; 30)

(4)

2.3

2.3.1	See diagram above / *Sien diagram hierbo*	✓ A	(1)
2.3.2	See diagram above / *Sien diagram hierbo*	✓ B	(1)
2.3.3	See diagram above / *Sien diagram hierbo*	✓ C	(1)
			[8]

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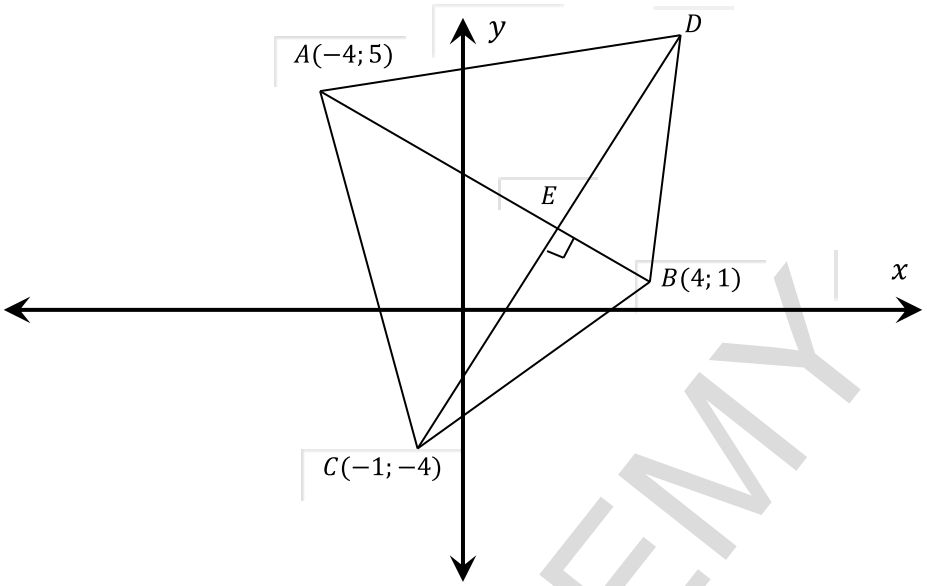
QUESTION/*VRAAG* 3

3.1	Median score / *Mediaan telling* = $2x$	✓ answer/*antwoord*	(1)
3.2	$\text{Mean}/Gemiddelde = \frac{\sum x}{n}$ $= \frac{4(x+3)+3(2x)+2(x-1)+2(6)}{11}$ $= \frac{12x+22}{11}$	✓ substitution/*vervanging* ✓ simplification/*vereenvoudiging* ✓ answer/*antwoord*	(3)
3.3	Use of a calculator where the four values are as follows: *Gebruik van 'n sakrekenaar waar die vier waardes soos volg is:* 8 ; 10 ; 4 and/*en* 6 $sd(\sigma) = \sqrt{5}$	✓ four values/*vier waardes* ✓ answer/*antwoord*	(2)
			[6]

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QUESTION/*VRAAG* 4



4.1	$m_{AB} = \frac{5-1}{-4-4}$ $= \frac{4}{-8}$ $m_{AB} = -\frac{1}{2}$ $\therefore\ m_{CD} = 2$	✓ subst into gradient formula. *verv. in gradiënt formule* ✓ $m_{AB} = -\frac{1}{2}$	(2)
4.2	$\therefore\ m_{CD} = 2$ $\overline{CD}: \quad y = 2x + c$ $-4 = 2(-1) + c$ $-2 = c$ $\overline{CD}: \quad y = 2x - 2$	✓ $m_{CD} = 2$ ✓ sub of point/*verv. van punt* $(-1; -4)$ ✓ $-2 = c$ ✓ equation of CD / *vergelyking van* CD	(4)
4.3	$\overline{AB}: \quad y = -\frac{1}{2}x + c$ $1 = -\frac{1}{2}(4) + c$ $3 = c$ $y = -\frac{1}{2}x + 3$ $-\frac{1}{2}x + 3 = 2x - 2$ $-x + 6 = 4x - 4$ $5x = 10$ $x = 2$ $y = 2(2) - 2$ $y = 2$ $E(2; 2)$	✓ substitution of point $(4; 1)$ *vervanging van punt* $(4;1)$ ✓ equation of $\overline{AB}$ *vergelyking van* $\overline{AB}$ ✓ equating of AB and CD *gelykstel van* AB en CD ✓ x –value/*waarde* ✓ substitution of / *vervanging van* x – value/*waarde* ✓ y – value/*waarde*	(6)

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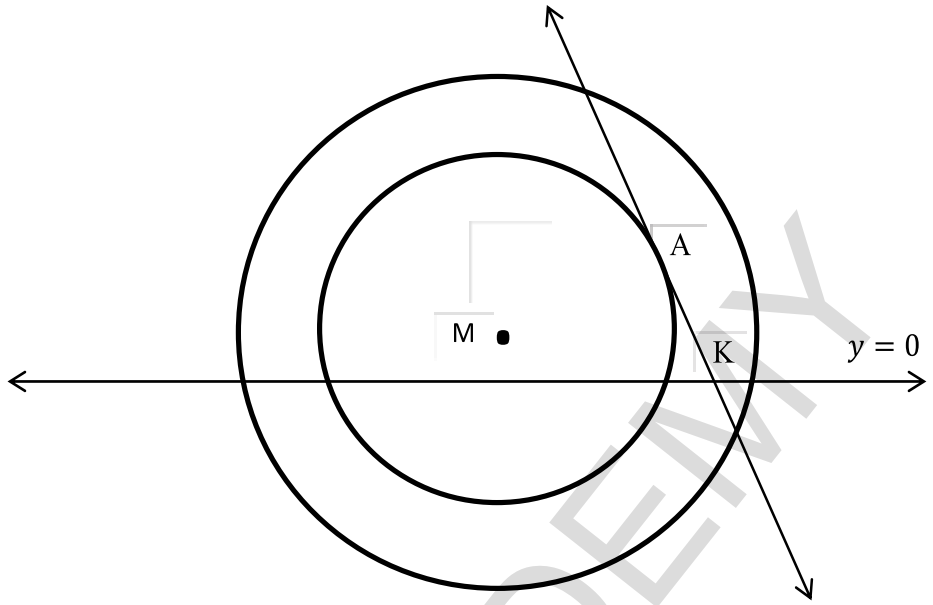
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4.4	$D(x;y)$ $\frac{x-1}{2}=2$ $\qquad$ $\frac{y-4}{2}=2$ $x-1=4$ $\qquad$ $y-4=4$ $x=5$ $\qquad$ $y=8$ $D(5;8)$	✓ $x=5$ ✓ $y=8$	(2)
4.5	$m_{AC}=\frac{5+4}{-4+1}$ $m_{AC}=-3$ Line parallel to AC has same gradient. *Lyn ewewydig aan AC het dieselfde gradiënt* $y=-3x+c$ $8=-3(5)+c$ $c=23$ $y=-3x+23$	✓ substitution into gradient formula. *vervanging in gradiënt formule* ✓ $m_{AC}=-3$ ✓ $c=23$ ✓ equation of line. *vergelyking van lyn*	(4)
4.6	$x-$ intercept of CD : $x-afsnit\ van$ CD $2x-2=0$ $x=1$ $m_{BC}=1$ Equation of Altitude/*Vergelyking van Hoogtelyn* $y=-x+c$ $5=-(-4)+c$ $c=1$ $\therefore y=-x+1$ x–intercept of Altitude / *x-afsnit van hoogtelyn* $x=1$ x–intercept of CD = x–intercept of Altitude *x-afsnit van* CD = *x-afsnit van hoogtelyn*	✓ $x=1$ ✓ $m_{BC}=1$ ✓ gradient of Altitude -1 *gradiënt van hoogtelyn* -1 ✓ substitution of point *vervanging van punt* ✓equation of altitude *vergelyking van hoogtelyn* ✓ $x=1$	(6)

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QUESTION/*VRAAG* 5



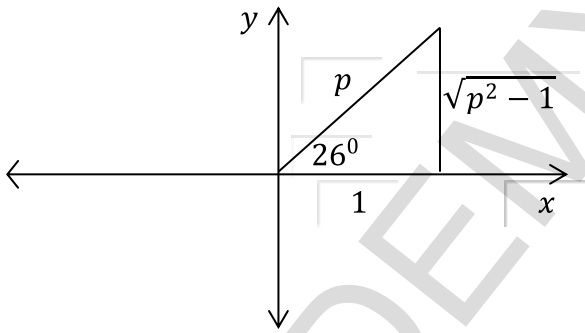
5.1	$x^2 + y^2 = 4y - 2x + 44$ $x^2 + 2x + 1 + y^2 - 4y + 4 = 44 + 1 + 4$ $(x + 1)^2 + (y - 2)^2 = 49$ $\therefore M(-1; 2)$	✓✓ completing the square *voltooiing van die vierkant* ✓ factorizing / *faktorisering* ✓ $M(-1; 2)$	(4)
5.2	$m_{MA} = \frac{y - 2}{x + 1}$ $\frac{y - 2}{x + 1} = 1$ $y - 2 = x + 1$ $y = x + 3$ $x + 3 = -x + 5$ $2x = 2$ $x = 1$ $\therefore \ y = 4$ $A(1; 4)$	✓ gradient of MA/*gradiënt van* MA ✓ equating it to 1/*stel dit gelyk aan* 1 ✓ making y or x the subject. *maak y* of *x die onderwerp* ✓ equating the two linear functions. *gelykstel van twee lineêre funksies* ✓ coordinates of $A(1; 4)$ *koördinate van* $A(1; 4)$	(5)
5.3	$(x + 1)^2 + (y - 2)^2 = r^2$ $(1 + 1)^2 + (4 - 2)^2 = r^2$ $8 = r^2$ $(x + 1)^2 + (y - 2)^2 = 8$	✓ substitution of A/*vervanging van* A ✓ $8 = r^2$ ✓ equation of the circle/*vergelyking van die sirkel*	(3)

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5.4	$K(5;0)$	✓ $K(5;0)$	(1)
5.5	$AK = \sqrt{32}$ Area of/*van* $\Delta\, AMK = \frac{1}{2}\, AK \times AM$ Area of/*van* $\Delta\, AMK = \frac{1}{2}\sqrt{32} \times \sqrt{8}$ Area of/*van* $\Delta\, AMK =$ 8 units^2/*eenhede*^{2}	✓ $AK = \sqrt{32}$ ✓ $AM = \sqrt{8}$ ✓ 8 units^2/*eenhede*^{2}	(3)
			[16]

QUESTION/*VRAAG* 6

6.1				
	6.1.1	$\sin 26^0 = \frac{\sqrt{p^2-1}}{p}$	✓ sketch in Quadrant 1 *skets in kwadrant* 1 ✓ $\sqrt{p^2-1}$ ✓ answer/*antwoord*	(3)
	6.1.2	$\cos 52^0 = \cos 2(26^0)$ $= 2\cos^2 26^0 - 1$ $= 2\left(\frac{1}{p}\right)^2 - 1$ $= \frac{2}{p^2} - 1$	✓$\cos 2(26^0)$ ✓$2\cos^2 26^0 - 1$ ✓ answer/*antwoord*	(3)
	6.1.3	$\tan^2 64^0 \times (p+1)^2$ $= \left(\frac{1}{\sqrt{p^2-1}}\right) \times (p+1)$ $= \frac{1}{p^2-1} \times (p+1)$ $= \frac{1}{(p-1)(p+1)} \times (p+1)$ $= \frac{1}{p-1}$	✓ $\left(\frac{1}{\sqrt{p^2-1}}\right)^2$ ✓ $\frac{1}{p^2-1}$ ✓ $(p-1)(p+1)$ ✓ answer/*antwoord*	(4)

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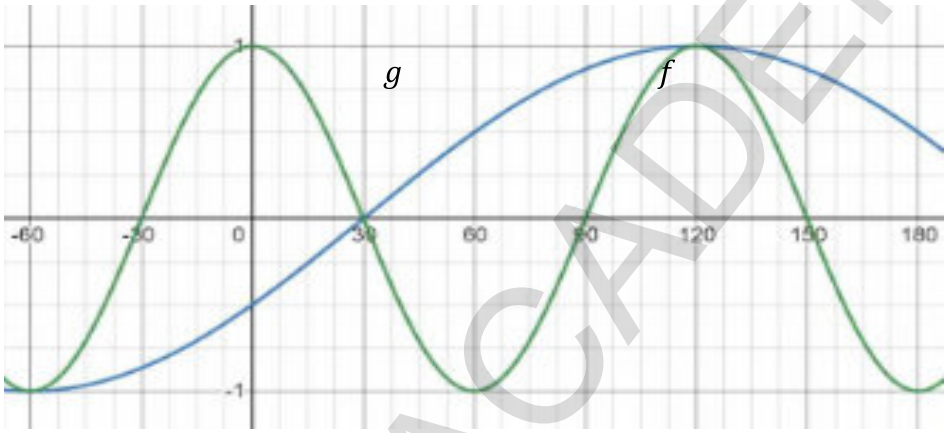
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6.2	$\frac{\sin(-\beta)+\sin(360^o-\beta)}{\sin(180^o-\beta)+\sin 180^o}$ $=\frac{-\sin\beta+(-\sin\beta)}{\sin\beta+0}$ $=\frac{-2\sin\beta}{\sin\beta}$ $=-2$	✓ $-\sin\beta$ ✓ $-\sin\beta$ ✓ $\sin\beta$ ✓ simplification *vereenvoudiging* ✓ answer/*antwoord*	(5)
6.3	$2p\tan(\frac{\theta}{2})=\sin(2\theta)$ $2p\tan(\frac{82^o}{2})=\sin(2\times 82^o)$ $p=\frac{\sin 162^o}{2\tan 41^o}$ $p=0{,}16$	✓ substitution/*vervanging* ✓ simplification/*vereenvoudiging* ✓ answer/*antwoord*	(3)
6.4	$4\sin\theta.\cos^3\theta-4\cos\theta.\sin^3\theta$ $=\sin 4\theta$ $LHS/LK=4\sin\theta.\cos^3\theta$ $-4\cos\theta.\sin^3\theta$ $=4\sin\theta.\cos\theta(\cos^2\theta-\sin^2\theta)$ $=2\times 2\sin\theta\cos\theta(\cos 2\theta)$ $=2.\sin 2\theta.\cos 2\theta$ $=\sin 4\theta$ $=RHS/RK$	✓ common factor/*gemene faktor* ✓ $2\times 2\sin\theta\cos\theta$ ✓ $(\cos 2\theta)$ ✓$\sin 2\theta.$ ✓ $2.\sin 2\theta.\cos 2\theta$ ✓ answer/*antwoord*	(6)
			[24]

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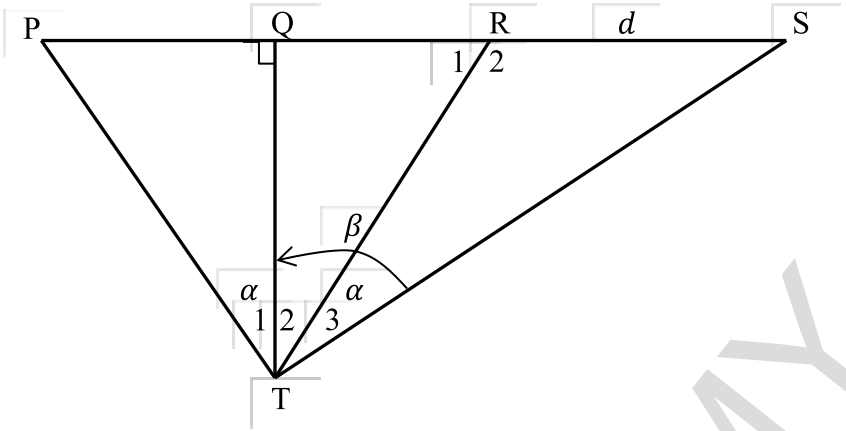
QUESTION/*VRAAG* 7

7.1	$\cos 3x = \sin(x - 30^0)$ $\cos 3x = \cos[90^0 - (x - 30^0)]$ $\cos 3x = \cos[120 - x]$ $3x = 120 - x$ (ref angle) $3x = 120^0 - x + k.360^0$ **OR/*OF*** $3x = 360^0 - [120^0 - x]k.360^0$ $4x = 120^0 + k.360^0$ $\quad 2x = 240^0 + k.360^0$ $x = 30^0 + k.90^0$ $\quad x = 120^0 + k.180^0$ $x = 30^0 ; -60^0 ; 120^0$	✓ Co- ratio *Ko-verhoud.* ✓ ref angle *verwys.* ∠ ✓ quadrant 1 *kwadrant* 1 ✓ quadrant 4 *kwadrant* 4 ✓ 30^0 ✓ -60^0 ✓ 120^0	(7)
7.2	 ✓ Shape of f. ✓ x–intercepts ✓ start and end points *Vorm van* ***f*** *x-afsnitte* *begin en eindpunte* ✓ Shape of g. ✓ x–intercepts ✓ start and end points *Vorm van* g *x-afsnitte* *begin en eindpunte*		(6)
7.3	$-30^0 < x < 30^0$ ***OR/OF*** $30^0 < x < 90^0$ ***OR/OF*** $150^0 < x < 180^0$	✓✓ $-30^0 < x < 30^0$ ✓ $30^0 < x < 90^0$ ✓ $150^0 < x < 180^0$	(4)
			[17]

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QUESTION/*VRAAG* 8

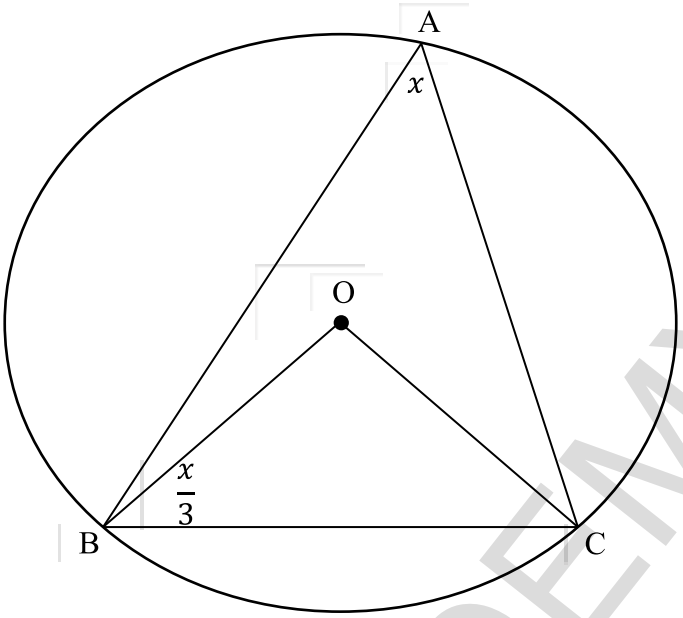


8.1	$\hat{QTR} = \beta - \alpha$	✓ answer/*antwoord*	(1)
8.2	$\hat{S} = 90^0 - \beta$	✓ answer/*antwoord*	(1)
8.3	$\hat{S} = 90^0 - \alpha$	✓ answer/*antwoord*	(1)
8.4	In ΔRST $\frac{d}{\sin\alpha} = \frac{RT}{\sin(90^0 - \beta)}$ $RT = \frac{d\cos\beta}{\sin\alpha}$	✓ use of sine rule *gebruik van sinusreël* ✓ use of co- function *gebruik van ko-funksie* ✓ answer/*antwoord*	(3)
8.5	$\frac{PR}{\sin\beta} = \frac{RT}{\sin(90^0 - \alpha)}$ $PR = \frac{RT\sin\beta}{\cos\alpha}$ $PR = \frac{d\cos\beta\sin\beta}{\sin\alpha\cos\alpha}$	✓ use of sine rule *gebruik van sinusreël* ✓ sub of RT *vervanging van* RT ✓ answer/*antwoord*	(3)
			[9]

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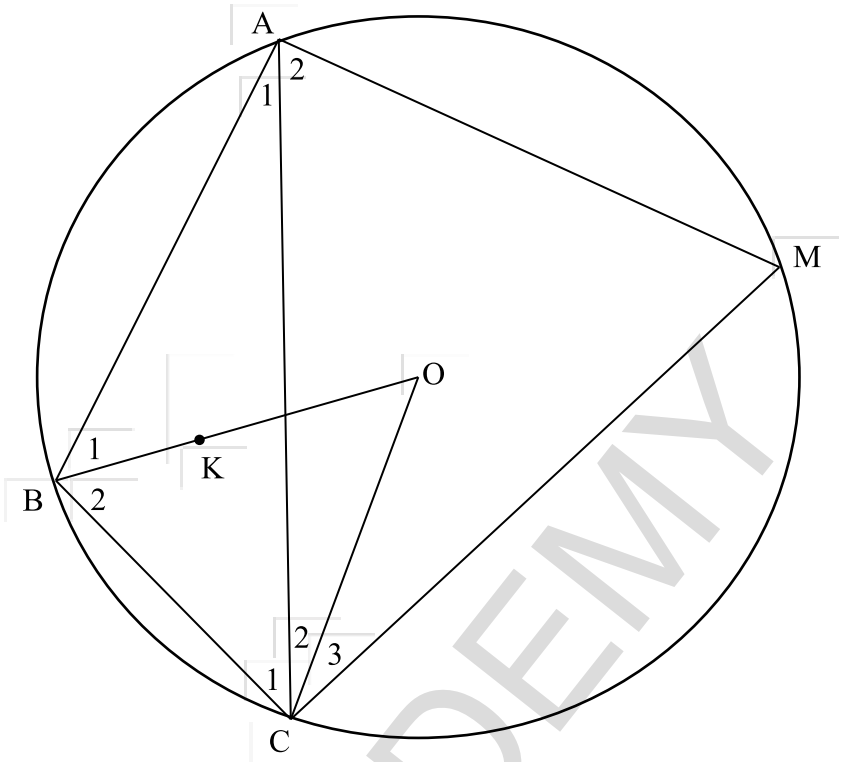
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QUESTION/*VRAAG* 9

9.1	centre / *middelpuntshoek*	✓ answer/*antwoord*	(1)
			
9.2	$\hat{BOC} = 2x$ [angle at centre = 2 × angle at circum] [*Middelpuntshoek* = 2 ×*Omtrekshoek*] $\hat{BCO} = \frac{x}{3}$ [angles opp = sides ; OB = OC] [*hoeke teenoor* = *sye* ; OB = OC] $\therefore \frac{x}{3} + \frac{x}{3} + 2x = 180^0$ [sum of angles of Δ] [*som van hoeke van* Δ] $8x = 540^0$ $x = 67{,}5^0$	✓ statement / *stelling* (**S**) ✓ reason/*rede* (**R**) ✓statement / *stelling* (**S**) ✓reason/*rede* (**R**) ✓ **S/R** ✓ answer/*antwoord*	(6)

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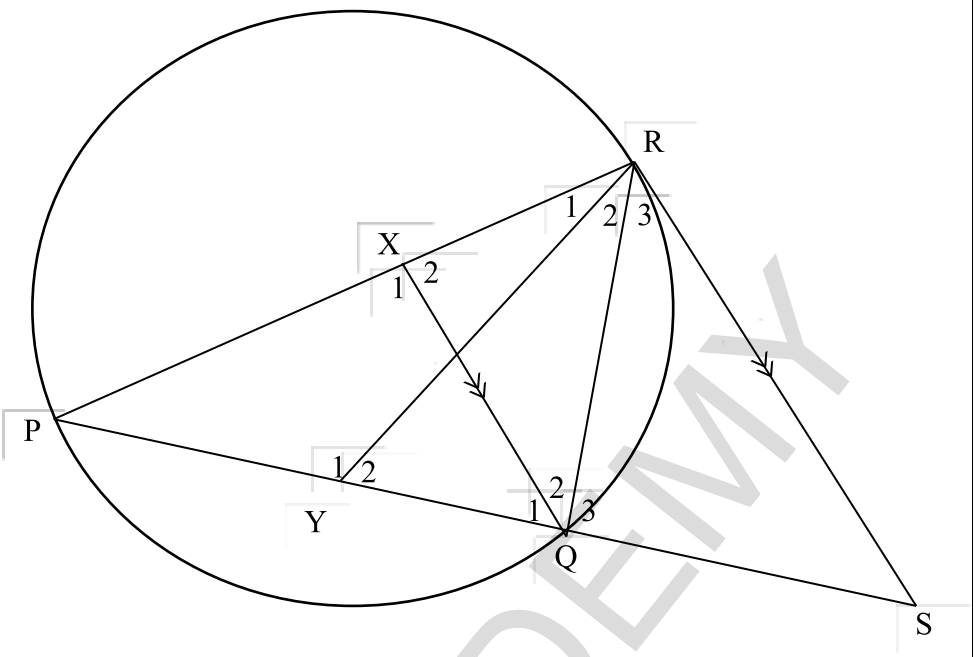
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9.3				
	9.3.1	$\hat{A}_1 = 30^o$ $B\hat{O}C = 60^o$ [angle at centre = 2 × angle at circum] [*middelpuntshoek* = 2 x *omtrekshoek*] $\hat{B}_2 = \hat{C}_1 + \hat{C}_2$ [angles opp = sides ; OB = OC] [*hoeke teenoor* = *sye* ; OB = OC] $\therefore 2\hat{B}_2 = 180^0 - 60^o$ [sum of angles of Δ] [*som van hoeke van* Δ] $\hat{B}_2 = 60^o$ $\hat{B}_1 = 60^o$ [BO bisects ABC] / [BO *halveer* ABC]	✓ S/R ✓ S/R ✓ S/R ✓ S ✓ S/R	(5)
	9.3.2	$\hat{A}_1 = 30^o$ $\hat{B}_1 + \hat{B}_2 + \hat{M} = 180^0$ [opp angles of cyclic quad] [*teenoorst. hoeke van koordevierhoek*] $\hat{M} = 180^o - 120^o$ $\hat{M} = 60^o$ $\therefore \hat{M} = 2 \times \hat{A}_1$	✓ S/R ✓ S ✓ answer/ *antwoord*	(3)
				[15]

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QUESTION/*VRAAG* 10

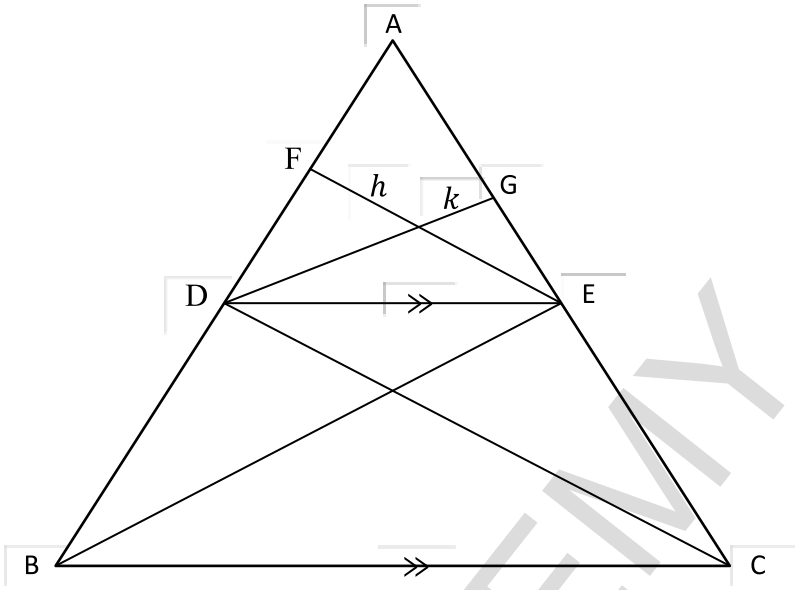


10.1	$\hat{R}_1 = \hat{R}_2$ [YR bisects $\hat{PRQ}$] / [YR *halveer* $\hat{PRQ}$] $\hat{R}_2 + \hat{R}_3 = \hat{Y}_2$ [angles opp = sides; RS = YS] [*hoeke teenoor = sye* ; RS = YS] $\hat{R}_1 + \hat{P} = \hat{Y}_2$ [ext angle of Δ]/[*buitehoek van* Δ] $\therefore \hat{R}_3 = \hat{P}$ $\therefore$ SR = tangent/*raaklyn* [converse tan – chord theorem] [*omgekeerde raaklyn-koord stelling*]	✓ S/R ✓ S ✓ R ✓ S ✓ R ✓ S	(6)
10.2	$\hat{Q}_2 = \hat{R}_3$ [alt angles = ; SR ‖ QX] [*verw. hoeke* = ; SR ‖ QX] $\hat{P} = \hat{R}_3$ [proven] / [*bewys*] $\hat{Q}_2 = \hat{P}$ $\therefore$ QR = tangent [converse tan – chord theorem] QR = *raaklyn* [*omgekeerde raaklyn-koord stelling*]	✓ S/R ✓ S ✓ S	(3)
			[9]

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QUESTION/*VRAAG* 11



11.1 Proof / *Bewys*:

$$\frac{\text{Area of } \Delta ADE}{\text{Area of } \Delta BDE} = \frac{\frac{1}{2}\text{AD. h}}{\frac{1}{2}\text{BD. h}} = \frac{AD}{BD}$$ ✓ S/R

$$\frac{\text{Area of } \Delta ADE}{\text{Area of } \Delta CED} = \frac{\frac{1}{2}\text{AE. k}}{\frac{1}{2}\text{CE. k}} = \frac{AE}{CE}$$ ✓S ✓R

But/*Maar* Area ΔBDE = Area ΔCED (same base DE, same height)
(*dieselfde basis* DE, *dieselfde hoogte*)
DE ∥ BC ✓S ✓R

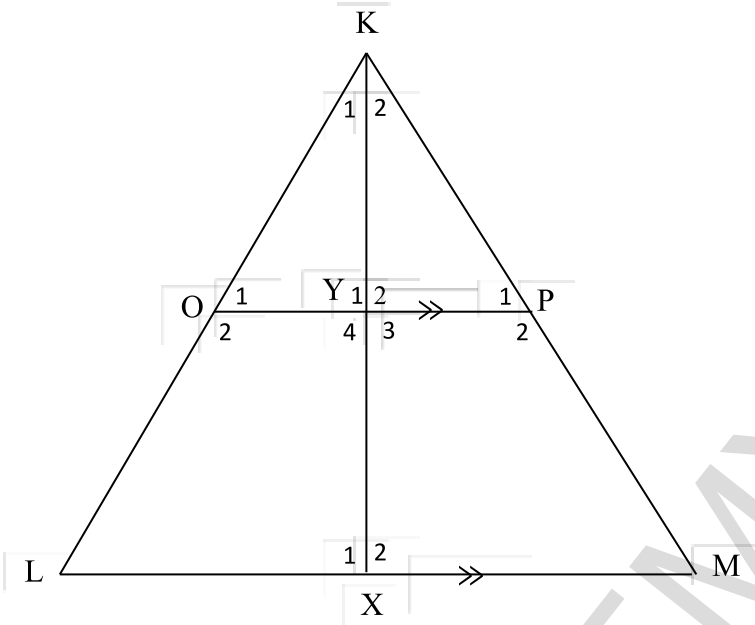
$$\frac{\text{Area of } \Delta ADE}{\text{Area of } \Delta BDE} = \frac{\text{Area of } \Delta ADE}{\text{Area of } \Delta CED}$$

$$\therefore \frac{AD}{BD} = \frac{AE}{CE}$$ ✓ S

(6)

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11.2				
	11.2.1	In ΔKOP and/*en* ΔKLM $\hat{K} = \hat{K}$ [common] / [*gemeen*] $\hat{O}_1 = \hat{L}$ [corresponding angles = ; OP ∥ LM] [*ooreenkomstige hoeke* = ; OP ∥ LM] $\hat{P}_1 = \hat{M}$ [corresponding angles =, OP ∥ LM] [*ooreenkomstige hoeke* = ; OP ∥ LM] ∴ Δ KOP ||| ΔKLM [A; A; A]	✓ S/R ✓S/R ✓ R	(3)
	11.2.2	$\frac{KO}{KL} = \frac{OP}{LM}$ [simirlarity : *gelykvormig*] $\frac{KO}{KL} = \frac{KY}{KX}$ [line parallel to one side of Δ] [*lyn ewewydig aan een sy van* Δ] ∴ $\frac{KY}{KX} = \frac{OP}{LM}$	✓ S/R ✓ S/R	(2)
	11.2.3	Area of Δ KOP = Area of Quad/*Vierhoek* OLMP ∴ Area of Δ KLM = 2 × Area of Δ KOP $\frac{1}{2} \times LM \times KX = 2 \times \frac{1}{2} \times OP \times KY$ $\frac{1}{2} = \frac{OP.KY}{LM.KX}$ but/*maar* $\frac{OP}{LM} = \frac{KY}{KX}$ $\frac{OP^2}{LM^2} = \frac{1}{2}$ $\frac{OP}{LM} = \frac{1}{\sqrt{2}}$ $\frac{OP}{LM} = \frac{KO}{KL}$ [Δ KOP |||ΔKLM] ∴ $\frac{KO}{KL} = \frac{1}{\sqrt{2}}$	✓ S ✓ S ✓S ✓S ✓S ✓ S/R	(6)
				[17]
		TOTAL/*TOTAAL:*		**150**