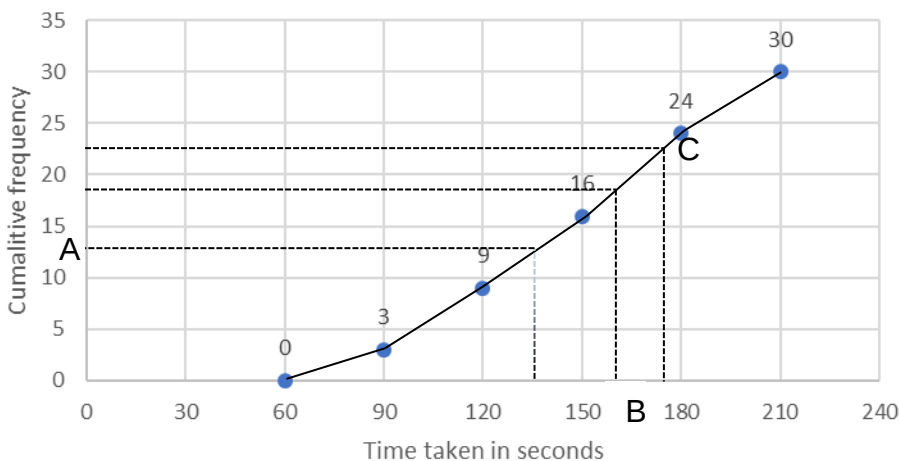


NATIONAL
SENIOR CERTIFICATE

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. Dit bly dieselfde. Geen verandering in standaardafwyking	✓ reason/rede	(1)
1.5	$\text{Semi - IQR: IKV} = \frac{75 - 30}{2}$ $\text{Semi - IQR: IKV} = 22,5$	✓ answer/antwoord	(1)
			[5]

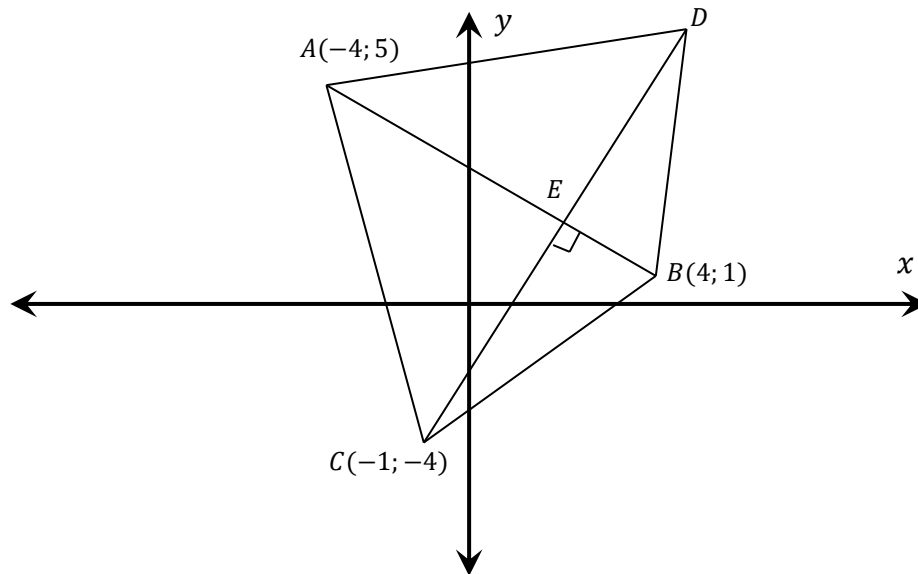
QUESTION/VRAAG 2

2.1	<table><thead><tr><th>Time taken Tyd geneem</th><th>No. of pupils Aantal leerlinge</th><th>Cumulative frequency Kummulatiewe frekwensie</th></tr></thead><tbody><tr><td>$60 \leq t \leq 90$</td><td>3</td><td>3</td></tr><tr><td>$90 \leq t \leq 120$</td><td>6</td><td>9</td></tr><tr><td>$120 \leq t \leq 150$</td><td>7</td><td>16</td></tr><tr><td>$150 \leq t \leq 180$</td><td>8</td><td>24</td></tr><tr><td>$180 \leq t \leq 210$</td><td>6</td><td>30</td></tr></tbody></table>	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)
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																			
2.2	Time taken to complete course. 	✓ 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]																		

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 as follows: Gebruik van 'n sakrekenaar waar die vier waardes soos volg is: 8 ; 10 ; 4 and 6 $sd(\sigma) = \sqrt{5}$	✓ four values/vier waardes ✓ answer/antwoord	(2)
			[6]

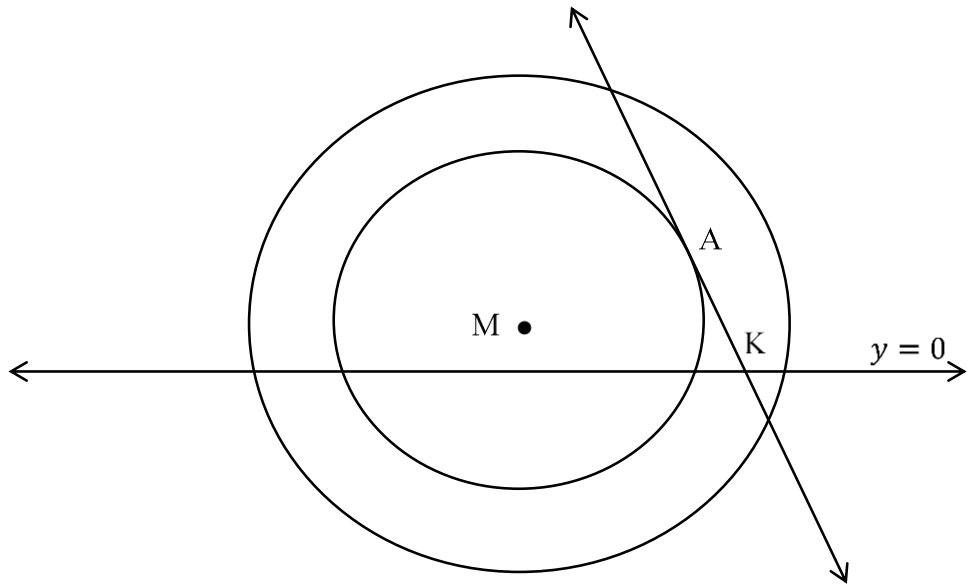
QUESTION/VRAAG 4



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. ingradiënt formule ✓ $m_{AB} = -\frac{1}{2}$	(2)
4.2	$\therefore m_{CD} = 2$ $\overline{CD}: y = 2x + c$ $-4 = 2(-1) + c$ $-2 = c$ $\overline{CD}: y = 2x - 2$	✓ $m_{CD} = 2$ ✓ sub of point / verv. van punt $(-1; -4)$ ✓ $-2 = c$ ✓ equation of CD / vergelyking van CD	(4)
4.3	$\overline{AB}: y = -\frac{1}{2}x + c$ $1 = -\frac{1}{2}(4) + c$ $3 = c$ $y = -\frac{1}{2}x + 3$ $-\frac{1}{2}x + 3 = 2x - 2$ $-x + 6 = 4x - 4$ $5x = 10$ $x = 2$ $y = 2(2) - 2$ $y = 2$ $E(2; 2)$	✓ 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)

4.4	$D(x; y)$ $\frac{x-1}{2} = 2$ $x - 1 = 4$ $x = 5$ $D(5; 8)$	$\frac{y-4}{2} = 2$ $y - 4 = 4$ $y = 8$	$\checkmark x = 5$ $\checkmark y = 8$	(2)
4.5	$m_{AC} = \frac{5+4}{-4+1}$ $m_{AC} = -3$ Line parallel to AC has same gradient. Lyn ewewydig aan AC heteselfdegradient $y = -3x + c$ $8 = -3(5) + c$ $c = 23$ $y = -3x + 23$	$\checkmark$ substitution into gradient formula/ $\checkmark$ vervanging in gradiënt formule $\checkmark m_{AC} = -3$ $\checkmark c = 23$ $\checkmark$ equation of line/ $\checkmark$ 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	$\checkmark x = 1$ $\checkmark m_{BC} = 1$ $\checkmark$ gradient of altitude -1 $\checkmark$ gradiënt van hoogtelyn -1 $\checkmark$ substitution of point $\checkmark$ vervanging van punt $\checkmark$ equation of altitude $\checkmark$ vergelyking van hoogtelyn $\checkmark x = 1$		(6)
				[24]

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 vandie 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)

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 $\Delta AMK = 8 \text{ units}^2/\text{eenhede}^2$	✓ $AK = \sqrt{32}$ ✓ $AM = \sqrt{8}$ ✓ $8 \text{ units}^2/\text{eenhede}^2$	(3)
			[16]

QUESTION/VRAAG 6

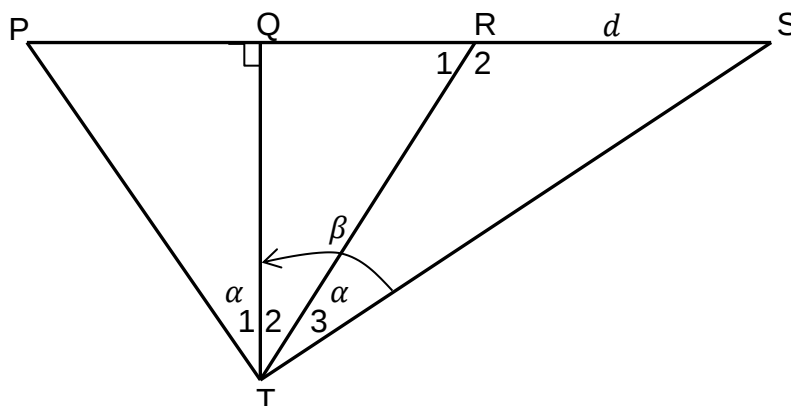
6.1			
6.1.1	$\sin 26^\circ = \frac{\sqrt{p^2 - 1}}{p}$	✓ sketch in Quadrant 1 skets in kwadrant 1 ✓ $\sqrt{p^2 - 1}$ ✓ answer/antwoord	(3)
6.1.2	$\cos 52^\circ = \cos 2(26^\circ)$ $= 2 \cos^2 26^\circ - 1$ $= 2 \left(\frac{1}{p}\right)^2 - 1$ $= \frac{2}{p^2} - 1$	✓ $\cos 2(26^\circ)$ ✓ $2 \cos^2 26^\circ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

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

QUESTION/VRAAG 7

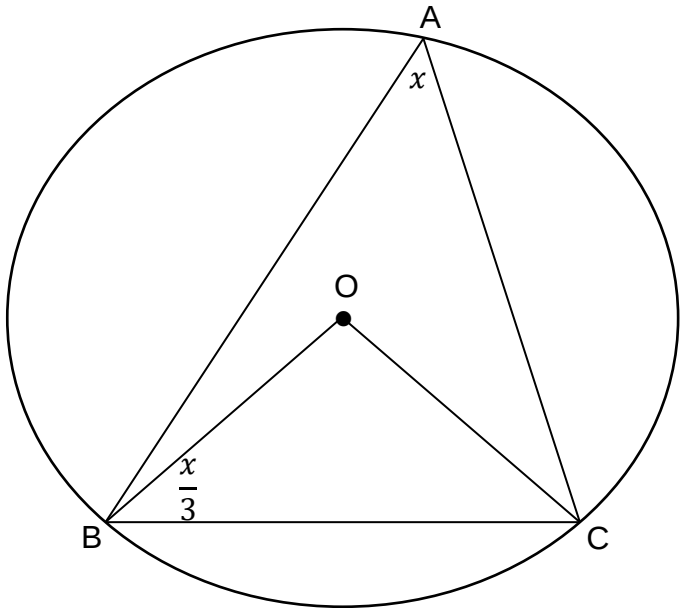
7.1	$\cos 3x = \sin(x - 30^\circ)$ $\cos 3x = \cos[90^\circ - (x - 30^\circ)]$ $\cos 3x = \cos[120^\circ - x]$ $3x = 120^\circ - x \text{ (ref angle)}$ $3x = 120^\circ - x + k \cdot 360^\circ \text{ OR/OF } 3x = 360^\circ - [120^\circ - x] + k \cdot 360^\circ$ $4x = 120^\circ + k \cdot 360^\circ$ $x = 30^\circ + k \cdot 90^\circ$ $x = 30^\circ; -60^\circ; 120^\circ$	✓ Co-ratio Ko-verhoud ✓ ref angle verwys $\angle$ ✓ quadrant 1 kwadrant1 ✓ quadrant 4 kwadrant4 ✓ 30° ✓ -60° ✓ 120°	(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	$-30^\circ < x < 30^\circ$ OR/OF $30^\circ < x < 90^\circ$ OR/OF $150^\circ < x < 180^\circ$	✓✓ $-30^\circ < x < 30^\circ$ ✓ $30^\circ < x < 90^\circ$ ✓ $150^\circ < x < 180^\circ$	(4)
			[17]

QUESTION/VRAAG 8

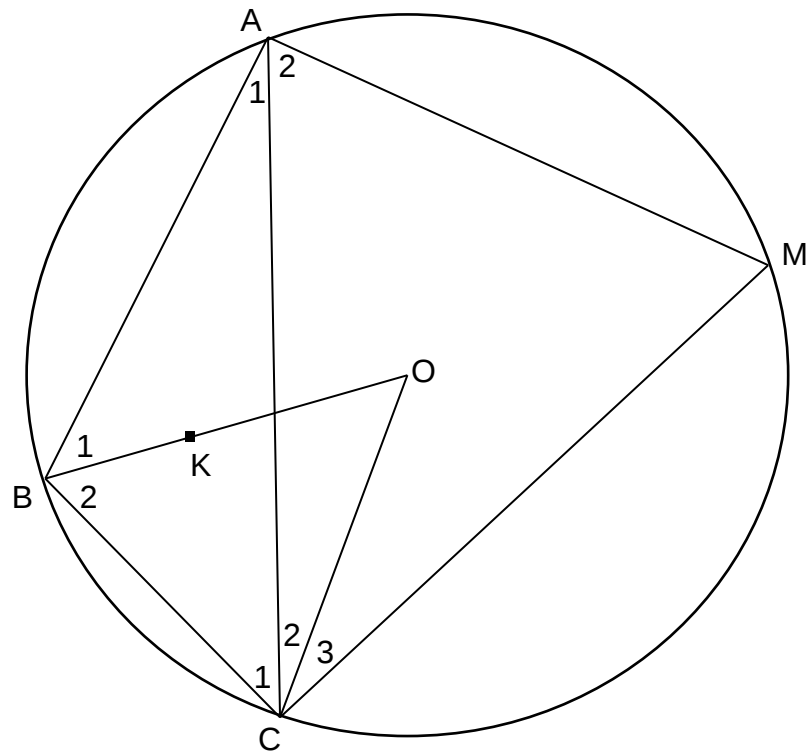


8.1	$\widehat{QTR} = \beta - \alpha$	✓ answer/antwoord	(1)
8.2	$\widehat{S} = 90^\circ - \beta$	✓ answer/antwoord	(1)
8.3	$\widehat{S} = 90^\circ - \alpha$	✓ answer/antwoord	(1)
8.4	In ΔRST $\frac{d}{\sin \alpha} = \frac{RT}{\sin(90^\circ - \beta)}$ $RT = \frac{d \cos \beta}{\sin \alpha}$	✓ use of sine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

QUESTION/VRAAG 9

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

9.3



9.3.1

$$\hat{A}_1 = 30^\circ$$

$$\hat{BOC} = 60^\circ$$

[angle at centre = $2 \times$ angle at circum]
[middelpuntshoek = $2 \times$ omtrekshoek]

$$\hat{B}_2 = \hat{C}_1 + \hat{C}_2$$

[angles opp = sides ; $OB = OC$]
[hoeke teenoor = sye $OB = OC$]

$$\therefore 2\hat{B}_2 = 180^\circ - 60^\circ$$

[sum of angles of Δ]
[som van hoeke van Δ]

$$\hat{B}_2 = 60^\circ$$

$$\hat{B}_1 = 60^\circ$$

[BO bisects $\hat{ABC}$] / [BO halveer $\hat{ABC}$]

✓ S/R
✓ S/R
✓ S/R
✓ S

✓ S/R

(5)

9.3.2

$$\hat{A}_1 = 30^\circ$$

$$\hat{B}_1 + \hat{B}_2 + \hat{M} = 180^\circ$$

[opp angles of cyclic quad]

[teenoorst. hoeke van koordevierhoek]

$$\hat{M} = 180^\circ - 120^\circ$$

$$\hat{M} = 60^\circ$$

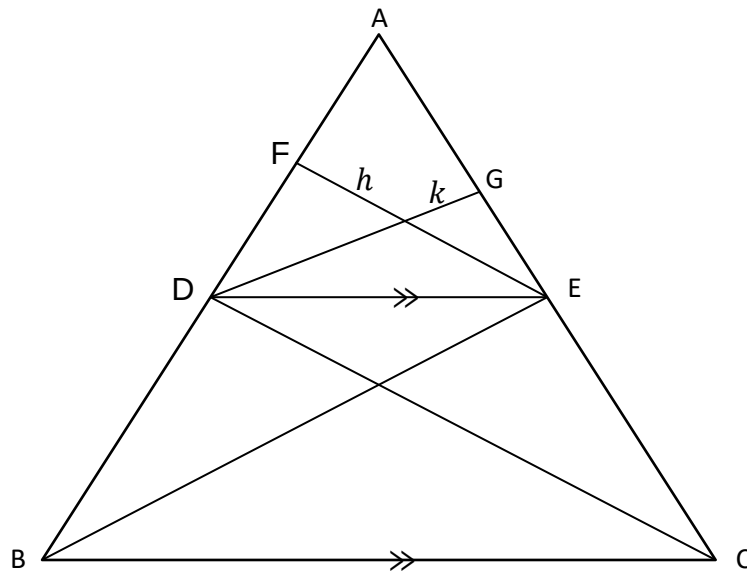
$$\therefore \hat{M} = 2 \times \hat{A}_1$$

✓ S/R
✓ S
✓ answer/
antwoord

(3)

[15]

QUESTION/VRAAG 11



11.1	Proof /Bewys Construct Perpendicular heights DG (k) and EF (h) in $\triangle ADE$. Join BE and DC. Teken loodregte hoogtes DG (k) en EF (h) in $\triangle ADE$ Verbind BE en DC $\frac{\text{Area of } \triangle ADE}{\text{Area of } \triangle BDE} = \frac{\frac{1}{2} AD \cdot h}{\frac{1}{2} BD \cdot h} = \frac{AD}{BD}$ $\frac{\text{Area of } \triangle ADE}{\text{Area of } \triangle CED} = \frac{\frac{1}{2} AE \cdot k}{\frac{1}{2} CE \cdot k} = \frac{AE}{CE}$ But/Maar Area $\triangle BDE$ = Area $\triangle CED$ (same base DE, same height) (dieselfde basis DE, dieselfde hoogte) DE $\parallel$ BC $\frac{\text{Area of } \triangle ADE}{\text{Area of } \triangle BDE} = \frac{\text{Area of } \triangle ADE}{\text{Area of } \triangle CED}$ $\therefore \frac{AD}{BD} = \frac{AE}{CE}$	✓ constr. konstrueer ✓ S/R ✓ S/R ✓ S ✓ R ✓ 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 =, $OP \parallel LM$] [ooreenkomstige hoekke, $OP \parallel LM$] $\hat{P}_1 = \hat{M}$ [corresponding angles =, $OP \parallel LM$] [ooreenkomstige hoekke, $OP \parallel LM$] $\therefore \Delta KOP \parallel \Delta KLM$ [A; A; A]	✓ S/R ✓ S/R ✓ R	(3)	
11.2.2	$\frac{KO}{KL} = \frac{OP}{LM}$ [similarity : <i>gelykvormig</i>] $\frac{KO}{KL} = \frac{KY}{KX}$ [line parallel to one side of Δ] [lyn ewewydig aan een sy van Δ] $\therefore \frac{KY}{KX} = \frac{OP}{LM}$	✓ S/R ✓ S/R	(2)	
11.2.3	Area of ΔKOP = Area of Quad/<i>Vierhoek</i> OLMP $\therefore$ Area of $\Delta KLM = 2 \times$ Area of ΔKOP $\frac{1}{2} \times LM \times KX = 2 \times \frac{1}{2} \times OP \times KY$ $\frac{1}{2} = \frac{OP \cdot KY}{LM \cdot KX}$ but/<i>maar</i> $\frac{OP}{LM} = \frac{KY}{KX}$ $\frac{OP^2}{LM^2} = \frac{1}{2}$ $\frac{OP}{LM} = \frac{1}{\sqrt{2}}$ $\frac{OP}{LM} = \frac{KO}{KL}$ [$\Delta KOP \parallel \Delta KLM$] $\therefore \frac{KO}{KL} = \frac{1}{\sqrt{2}}$	✓ S ✓ S ✓ S ✓ S ✓ S/R	(6)	
			[17]	
		TOTAL/ TOTAAL:	150	