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**SENIOR CERTIFICATE EXAMINATIONS/
SENIORSERTIFIKAAT-EKSAMEN
NATIONAL SENIOR CERTIFICATE EXAMINATIONS/
NASIONALE SENIORSERTIFIKAAT-EKSAMEN**

**MATHEMATICS P2/
WISKUNDE V2**

MARKING GUIDELINES/NASIENRIGLYNE

2019

**MARKS: 150
PUNTE: 150**

**These marking guidelines consist of 20 pages.
Hierdie nasienriglyne bestaan uit 20 bladsye..**

NOTE:

- If a candidate answers a question TWICE, only mark the FIRST attempt.
- If a candidate has crossed out an attempt of a question and not redone the question, mark the crossed out version.
- Consistent accuracy applies in ALL aspects of the marking memorandum. Stop marking at the second calculation error.
- Assuming answers/values in order to solve a problem is NOT acceptable.

NOTA:

- As 'n kandidaat 'n vraag TWEE KEER beantwoord, sien slegs die EERSTE poging na.
- As 'n kandidaat 'n antwoord van 'n vraag doodtrek en nie oordoen nie, sien die doodgetrekte poging na.
- Volgehoue akkuraatheid word in ALLE aspekte van die nasienriglyne toegepas. Hou op nasien by die tweede berekeningsfout.
- Om antwoorde/waardes te aanvaar om 'n probleem op te los, word NIE toegelaat NIE.

GEOMETRY • MEETKUNDE	
S	A mark for a correct statement (A statement mark is independent of a reason)
	<i>'n Punt vir 'n korrekte bewering ('n Punt vir 'n bewering is onafhanklik van die rede)</i>
R	A mark for the correct reason (A reason mark may only be awarded if the statement is correct)
	<i>'n Punt vir 'n korrekte rede ('n Punt word slegs vir die rede toegeken as die bewering korrek is)</i>
S/R	Award a mark if statement AND reason are both correct
	<i>Ken 'n punt toe as die bewering EN rede beide korrek is</i>

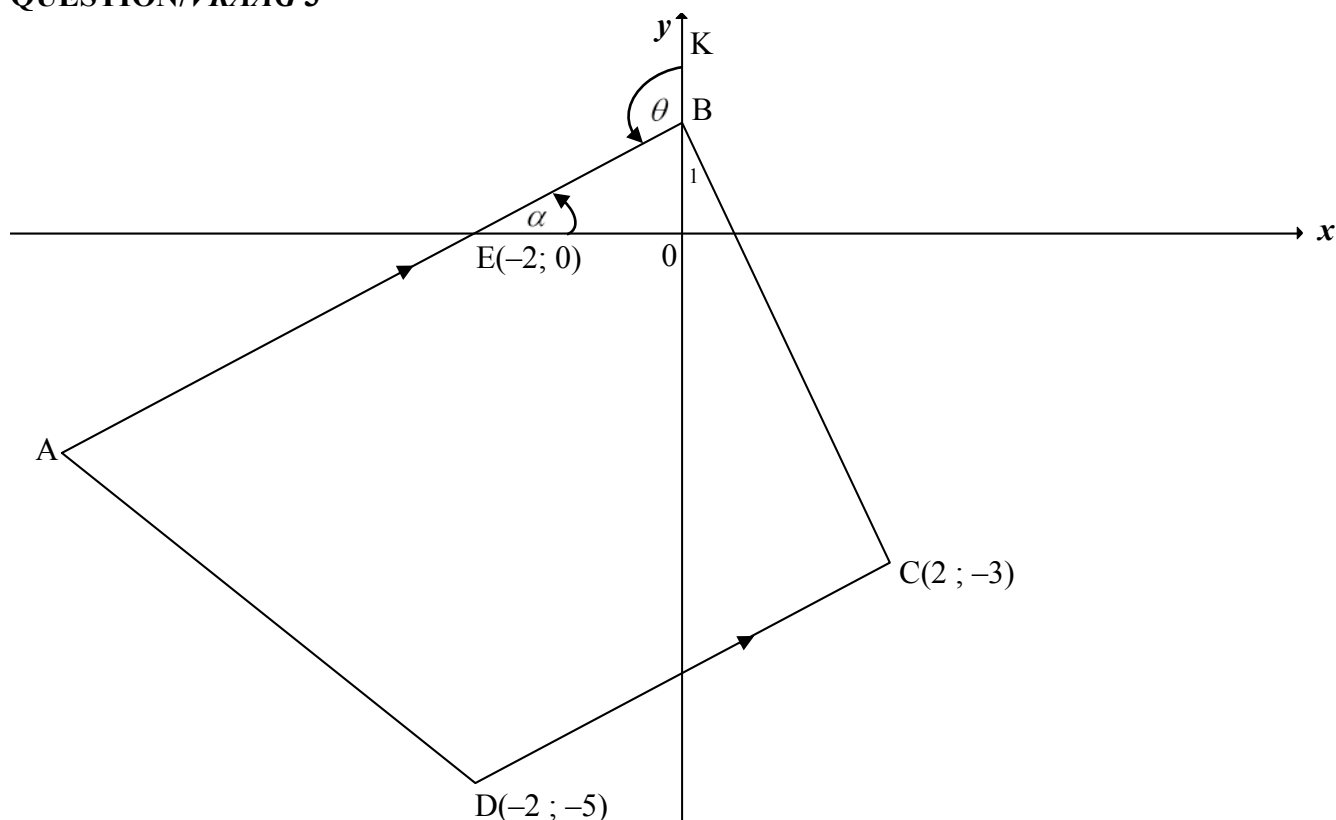
QUESTION/VRAAG 1

1.1	45 children	✓ answer (1)																								
1.2	$\bar{x} = \frac{\sum fx}{n} = \frac{(4 \times 2) + (8 \times 10) + (12 \times 9) + (16 \times 7) + (20 \times 8) + (24 \times 7) + (28 \times 2)}{45}$ $\bar{x} = \frac{692}{45} \text{ OR } \bar{x} = 15,38 \text{ minutes}$ Answer only: full marks	✓ 692 ✓ answer (2)																								
1.3	<table border="1" style="width: 100%; border-collapse: collapse; text-align: center;"> <thead> <tr> <th>Time taken (<i>t</i>) (in minutes)</th><th>Number of children</th><th>Cumulative frequency</th></tr> </thead> <tbody> <tr> <td>$2 < t \leq 6$</td><td>2</td><td>2</td></tr> <tr> <td>$6 < t \leq 10$</td><td>10</td><td>12</td></tr> <tr> <td>$10 < t \leq 14$</td><td>9</td><td>21</td></tr> <tr> <td>$14 < t \leq 18$</td><td>7</td><td>28</td></tr> <tr> <td>$18 < t \leq 22$</td><td>8</td><td>36</td></tr> <tr> <td>$22 < t \leq 26$</td><td>7</td><td>43</td></tr> <tr> <td>$26 < t \leq 30$</td><td>2</td><td>45</td></tr> </tbody> </table>	Time taken (<i>t</i>) (in minutes)	Number of children	Cumulative frequency	$2 < t \leq 6$	2	2	$6 < t \leq 10$	10	12	$10 < t \leq 14$	9	21	$14 < t \leq 18$	7	28	$18 < t \leq 22$	8	36	$22 < t \leq 26$	7	43	$26 < t \leq 30$	2	45	✓ first 4 cum freq correct ✓ last 3 cum freq correct (2)
Time taken (<i>t</i>) (in minutes)	Number of children	Cumulative frequency																								
$2 < t \leq 6$	2	2																								
$6 < t \leq 10$	10	12																								
$10 < t \leq 14$	9	21																								
$14 < t \leq 18$	7	28																								
$18 < t \leq 22$	8	36																								
$22 < t \leq 26$	7	43																								
$26 < t \leq 30$	2	45																								
1.4	CUMULATIVE FREQUENCY GRAPH (OGIVE)	✓ plotting cum freq at upper limits correctly (all points) ✓ shape (smooth) ✓ grounding (2;0) (3)																								
1.5	On graph at the y-value of 22,5 or 23 Median = ± 15 minutes. Answer only: full marks	✓ graph ✓ answer (2)																								
		[10]																								

QUESTION/VRAAG 2

2.1	$a = 12,44$ $b = 0,98$ $y = 12,44 + 0,98x$ Answer only: full marks	✓ value of a ✓ value of b ✓ equation (3)
2.2.1	Percentage = $\frac{15}{50} \times 100$ = 30%	✓ answer (1)
2.2.2	$\hat{y} = 12,44 + 0,98x$ $\hat{y} = 12,44 + 0,98(30)$ $\hat{y} = 41,84$ = 42 OR $\hat{y} = 41,87$ (if using calculator) $\hat{y} = 42$ OR $\hat{y} = \frac{21}{50}$ Answer only: full marks	✓ substitution of 30 ✓ answer as integer (2) ✓ value of y ✓ answer as integer (2) ✓ ✓ answer (2)
2.3.1	standard deviation = 13,88	✓ ✓ answer (2)
2.3.2	$x = 50,67 - 45,67$ = 5% Answer only: full marks	✓ $50,67 - 45,67$ ✓ answer (2)
		[10]

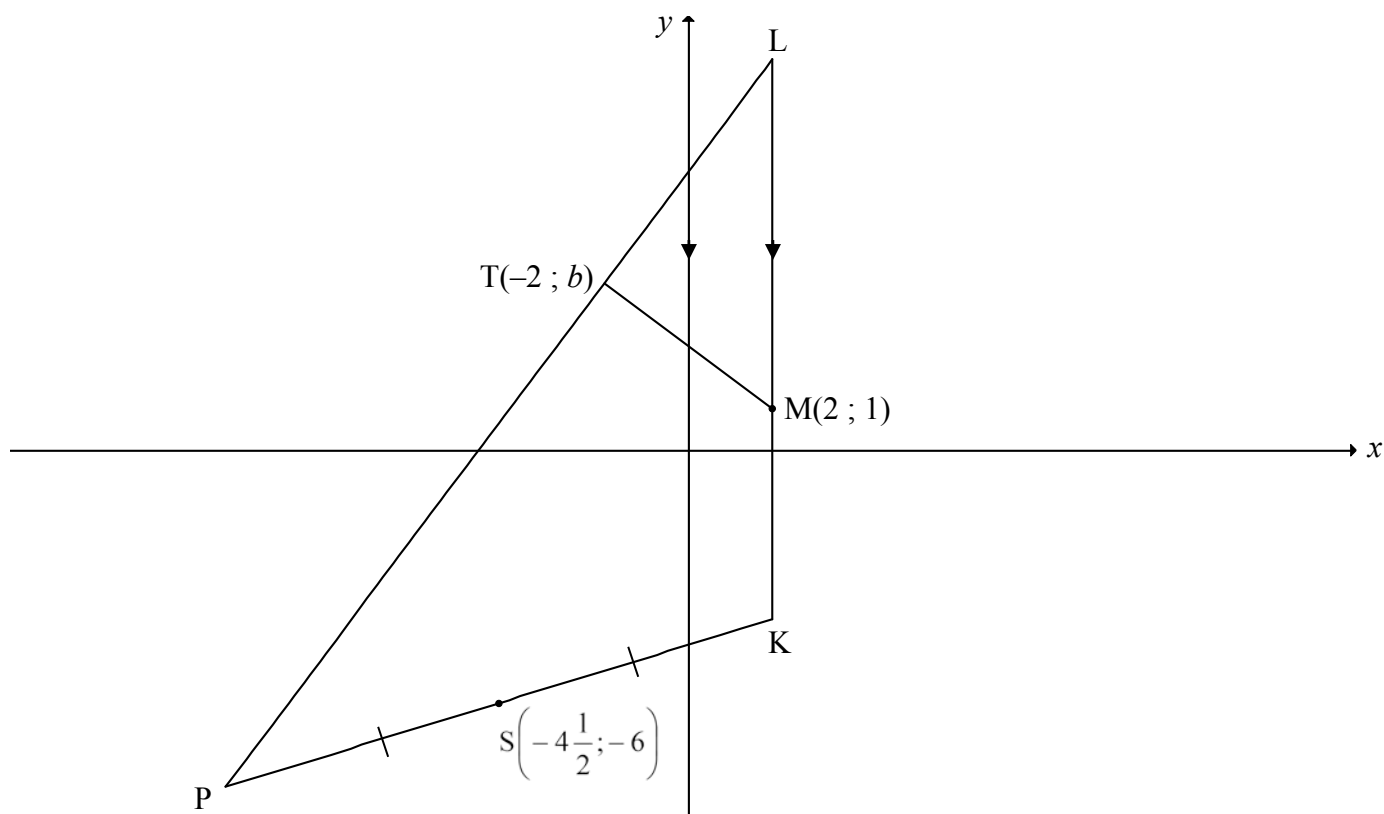
QUESTION/VRAAG 3



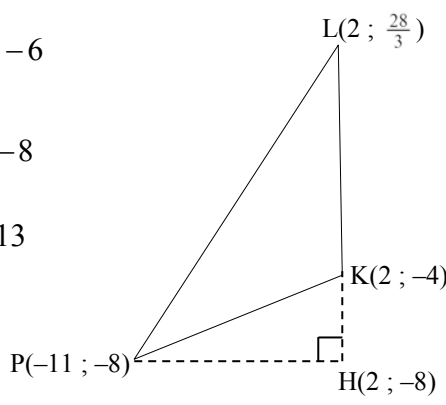
3.1.1	Midpoint of EC: $= \left(\frac{-2+2}{2} ; \frac{0+(-3)}{2} \right) = \left(0 ; \frac{-3}{2} \right)$	✓ x value ✓ y value (2)
3.1.2	$m_{DC} = \frac{-3-(-5)}{2-(-2)} \text{ OR } \frac{-5-(-3)}{-2-2}$ $= \frac{2}{4} = \frac{1}{2}$ Answer only: full marks	✓ substitution ✓ answer (2)
3.1.3	$m_{AB} = \frac{1}{2} \quad [AB \parallel DC]$ $y = \frac{1}{2}x + c$ $0 = \frac{1}{2}(-2) + c \quad \text{OR} \quad y - y_1 = \frac{1}{2}(x - x_1)$ $c = 1$ $\therefore y = \frac{1}{2}x + 1$	✓ $m_{AB} = \frac{1}{2}$ ✓ substitution of $(-2; 0)$ ✓ equation (3)
3.1.4	$\tan \alpha = m_{AB} = \frac{1}{2}$ $\alpha = 26,57^\circ$ $\theta = 90^\circ + 26,57^\circ \quad [\text{ext } \angle \text{ of } \Delta]$ $= 116,57^\circ$	✓ $\tan \alpha = \frac{1}{2}$ ✓ value of α ✓ value of θ (3)

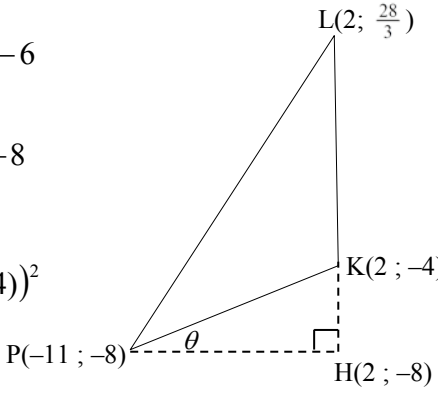
3.2	$B(0 ; 1)$ $m_{BC} = \frac{1 - (-3)}{0 - 2}$ OR $m_{BC} = \frac{(-3) - 1}{2 - 0}$ $= -2$ $= -2$ $m_{AB} \times m_{BC} = \frac{1}{2} \times -2$ $= -1$ $\therefore AB \perp BC$	✓ coordinates of B ✓ $m_{BC} = -2$ ✓ product of gradients = -1 (3)
3.3.1	$\hat{ABC} = 90^\circ$ $\therefore EC$ is diameter [converse: $\angle$ in semi circle] $\therefore$ centre of circle = $\left(0 ; -\frac{3}{2}\right)$	✓ answer (1)
3.3.2	$(x-0)^2 + \left(y + \frac{3}{2}\right)^2 = r^2$ $(-2-0)^2 + \left(0 + \frac{3}{2}\right)^2 = r^2$ OR $(2-0)^2 + \left(-3 - \left(-\frac{3}{2}\right)\right)^2 = r^2$ OR $(0-0)^2 + \left(1 - \left(-\frac{3}{2}\right)\right)^2 = r^2$ OR $r = \frac{EC}{2} = \frac{\sqrt{(-2-2)^2 + (0-(-3))^2}}{2}$ OR $r = 1 - \left(-\frac{3}{2}\right)$ $\therefore r^2 = \frac{25}{4}$ or $r = \frac{5}{2}$ $x^2 + \left(y + \frac{3}{2}\right)^2 = \frac{25}{4}$	✓ substitution of centre ✓ correct substitution of $E(-1 ; 0)$, $B(0 ; 1)$ or $C(2 ; -3)$ to calculate r^2 or r ✓ value of r^2 or r ✓ equation (4)
		[18]

QUESTION/VRAAG 4



4.1	$(x-2)^2 + (y-1)^2 = 25$ $(-2-2)^2 + (b-1)^2 = 25$ $(b-1)^2 = 9$ OF $16 + b^2 - 2b + 1 = 25$ $b-1 = \pm 3$ $\therefore b=4 \text{ or } b \neq -2$	$(x-2)^2 + (y-1)^2 = 25$ $(-2-2)^2 + (b-1)^2 = 25$ $b^2 - 2b - 8 = 0$ $\therefore b=4 \text{ or } b \neq -2$	✓ equation of the circle ✓ substitution of point T ✓ simplification ✓ answer (4)
4.2.1	$K(2; 1-5)$ $\therefore K(2; -4)$	Answer only: full marks	✓ x value ✓ y value (2)
4.2.2	$m_{MT} = \frac{4-1}{-2-2} = -\frac{3}{4}$ $m_{PL} = \frac{4}{3}$ [radius $\perp$ tangent] $y = \frac{4}{3}x + c$ $4 = \frac{4}{3}(-2) + c$ $c = \frac{20}{3}$ $y = \frac{4}{3}x + \frac{20}{3}$		✓ m_{MT} ✓ $m_{PL} = \frac{4}{3}$ ✓ substitution of m_{PL} and the point T ✓ equation (4)

	OR $m_{MT} = \frac{4-1}{-2-2} = -\frac{3}{4}$ $m_{PL} = \frac{4}{3} \quad [\text{radius} \perp \text{tangent}]$ $y - y_1 = \frac{4}{3}(x - x_1)$ $y - 4 = \frac{4}{3}(x + 2)$ $y = \frac{4}{3}x + \frac{20}{3}$ OR P(-11 ; -8) $m_{PL} = \frac{4 - (-8)}{-2 - (-11)}$ $= \frac{4}{3}$ $y = \frac{4}{3}x + c$ $-8 = \frac{4}{3}(-11) + c$ $c = \frac{20}{3}$ $y = \frac{4}{3}x + \frac{20}{3}$	✓ m_{MT} ✓ $m_{PL} = \frac{4}{3}$ ✓ substitution of m_{PL} and the point T ✓ equation (4) ✓ coordinates of P ✓ $m_{PL} = \frac{4}{3}$ ✓ substitution of m_{PL} and the point P or T ✓ equation (4)
4.2.3	$y_L = \frac{4}{3}(2) + \frac{20}{3} = \frac{28}{3}$ $L\left(2; \frac{28}{3}\right) \text{ and } K(2; -4): \quad LK = \frac{28}{3} - (-4) = \frac{40}{3}$ <u>Coordinates of P:</u> $\frac{x+2}{2} = -4\frac{1}{2} \quad \text{and} \quad \frac{y-4}{2} = -6$ $\therefore x = -11 \quad y = -8$ $\therefore P(-11; -8)$ $\perp \text{ height (PH)} = 2 - (-11) = 13$ $\text{Area } \triangle PKL = \frac{1}{2}(LK)(PH)$ $= \frac{1}{2}\left(\frac{40}{3}\right)(13)$ $= \frac{260}{3} \quad \text{OR} \quad 86,67 \text{ square units}$ 	✓ $y_L = \frac{28}{3}$ ✓ length of LK ✓ x_p ✓ y_p ✓ length of $\perp$ height ✓ substitution into the area formula ✓ answer (7)

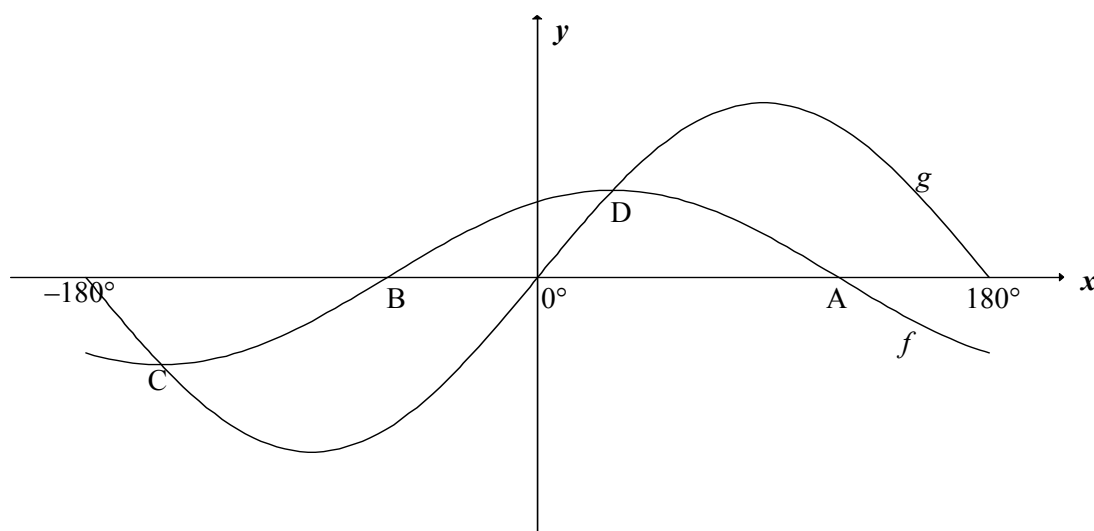
4.2.3	OR $y_L = \frac{4}{3}(2) + \frac{20}{3} = \frac{28}{3}$ $L\left(2; \frac{28}{3}\right) \text{ and } K(2; -4): LK = \frac{28}{3} - (-4) = \frac{40}{3}$ <u>Coordinates of P:</u> $\frac{x+2}{2} = -4\frac{1}{2} \text{ and } \frac{y-4}{2} = -6$ $\therefore x = -11 \qquad y = -8$ $\therefore P(-11; -8)$ $PK^2 = (-11-2)^2 + (-8-(-4))^2$ $PK = \sqrt{185} \text{ units}$ $m_{PK} = \frac{-8-(-4)}{-11-2} = \frac{4}{13}$ $\tan \theta = \frac{4}{13} \therefore \theta = 17,1027\dots^\circ$ $\therefore \hat{PKL} = 90^\circ + 17,1027\dots^\circ = 107,1^\circ$ $\text{Area } \triangle PKL = \frac{1}{2}(PK)(LK).\sin \hat{PKL}$ $= \frac{1}{2}(\sqrt{185})\left(\frac{40}{3}\right)\sin 107,10^\circ$ $= 86,67 \text{ square units}$ 	✓ $y_L = \frac{28}{3}$ ✓ length of LK ✓ x_p ✓ y_p ✓ $\hat{PKL}$ ✓ substitution into the area rule ✓ answer (7)
4.3	The centres of the two circles lie on the same vertical line $x = 2$. and the sum of the radii = 10 $n-1 = 10$ or $1-n = 10$ $n=11$ or $n = -9$ Answer only: full marks	✓ correct method ✓ sum of radii = 10 ✓ $n=11$ ✓ $n = -9$ (4)
	[21]	

QUESTION/VRAAG 5

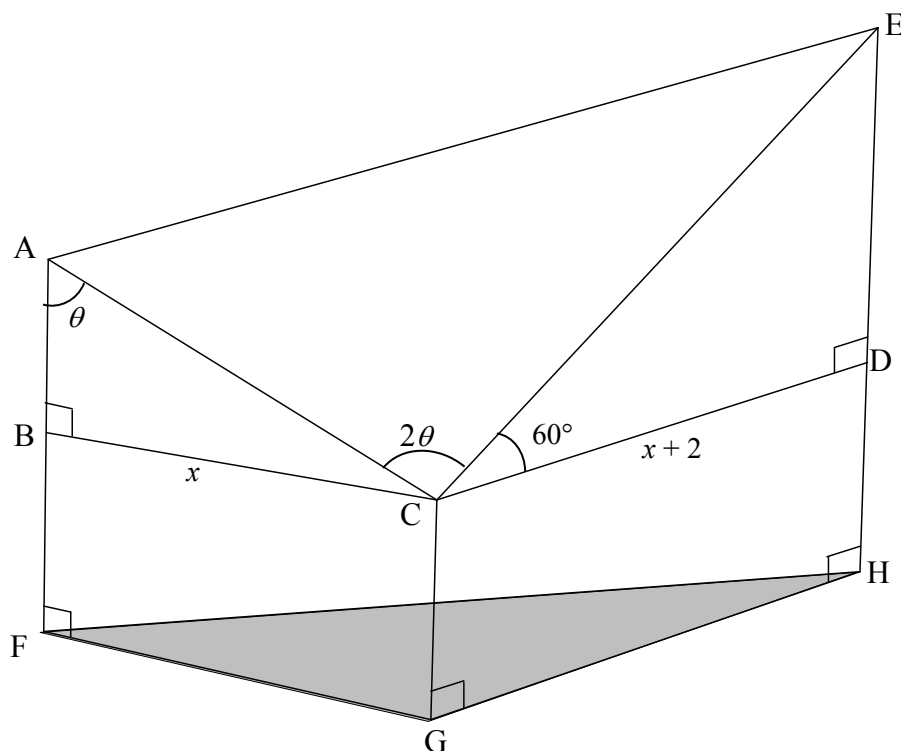
5.1.1	$\sin 191^\circ$ $= -\sin 11^\circ$	$\checkmark -\sin 11^\circ$ (1)
5.1.2	$\cos 22^\circ$ $= \cos(2 \times 11^\circ)$ $= 1 - 2\sin^2 11^\circ$	$\checkmark$ answer (1)
5.2	$\cos(x - 180^\circ) + \sqrt{2} \sin(x + 45^\circ)$ $= -\cos x + \sqrt{2}(\sin x \cos 45^\circ + \cos x \sin 45^\circ)$ $= -\cos x + \sqrt{2}\left(\sin x \left(\frac{1}{\sqrt{2}}\right) + \cos x \left(\frac{1}{\sqrt{2}}\right)\right)$ $= -\cos x + \sin x + \cos x$ $= \sin x$ OR $\cos(x - 180^\circ) + \sqrt{2} \sin(x + 45^\circ)$ $= -\cos x + \sqrt{2}(\sin x \cos 45^\circ + \cos x \sin 45^\circ)$ $= -\cos x + \sqrt{2}\left(\sin x \left(\frac{\sqrt{2}}{2}\right) + \cos x \left(\frac{\sqrt{2}}{2}\right)\right)$ $= -\cos x + \sin x + \cos x$ $= \sin x$	$\checkmark -\cos x$ $\checkmark$ expansion $\checkmark$ special angle ratios $\checkmark$ simplification of last 2 terms $\checkmark$ answer (5) $\checkmark -\cos x$ $\checkmark$ expansion $\checkmark$ special angle ratios $\checkmark$ simplification of last 2 terms $\checkmark$ answer (5)
5.3	$\sin P + \sin Q = \sin P + \cos P$ $(\sin P + \cos P)^2 = \left(\frac{7}{5}\right)^2$ $\sin^2 P + 2 \sin P \cos P + \cos^2 P = \frac{49}{25}$ $2 \sin P \cos P = \frac{49}{25} - 1$ $\sin 2P = \left(\frac{49}{25} - \frac{25}{25}\right)$ $= \frac{24}{25}$	$\checkmark \sin Q = \cos P$ $\checkmark$ squaring $\checkmark$ expansion $\checkmark \sin^2 P + \cos^2 P = 1$ $\checkmark$ answer (5)
		[12]

QUESTION/VRAAG 6

6.1	$\cos(x - 30^\circ) = 2 \sin x$ $\cos x \cos 30^\circ + \sin x \sin 30^\circ = 2 \sin x$ $\frac{\sqrt{3}}{2} \cos x + \frac{1}{2} \sin x = 2 \sin x$ $\frac{\sqrt{3}}{2} \cos x = \frac{3}{2} \sin x$ $\tan x = \frac{\sqrt{3}}{3}$ $x = 30^\circ + k \cdot 180^\circ; \quad k \in \mathbb{Z}$ OR $x = 30^\circ + k \cdot 360^\circ$ or $x = 210^\circ + k \cdot 360^\circ; \quad k \in \mathbb{Z}$	✓ expansion ✓ special $\angle$ s ✓ simplification ✓ equation in tan ✓ 30° ✓ $k \cdot 180^\circ; k \in \mathbb{Z}$ OR ✓ 30° and 210° ✓ $k \cdot 360^\circ; \quad k \in \mathbb{Z}$ (6)
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6.2.1(a)	A(120° ; 0)	✓ answer (1)
6.2.1(b)	C(-150° ; -1)	✓ x value ✓ y value (2)
6.2.2(a)	$x \in (-90^\circ ; 30^\circ)$ OR $-90^\circ < x < 30^\circ$	✓ endpoints ✓ correct interval (2)
6.2.2(b)	$x \in (-160^\circ ; 20^\circ)$ OR $-160^\circ < x < 20^\circ$	✓ endpoints ✓ correct interval (2)
6.2.3	$y = 2^{2 \sin x + 3}$ Range of $y = 2 \sin x$: $y \in [-2 ; 2]$ OR $-2 \leq y \leq 2$ Range of $y = 2 \sin x + 3$: $y \in [1 ; 5]$ OR $1 \leq y \leq 5$ Range: $y = 2^{2 \sin x + 3}$: $y \in [2 ; 32]$ OR $2 \leq y \leq 32$ Answer only: full marks	✓ 1 ✓ 5 ✓ 2 ✓ 32 ✓ correct interval (5)
		[18]

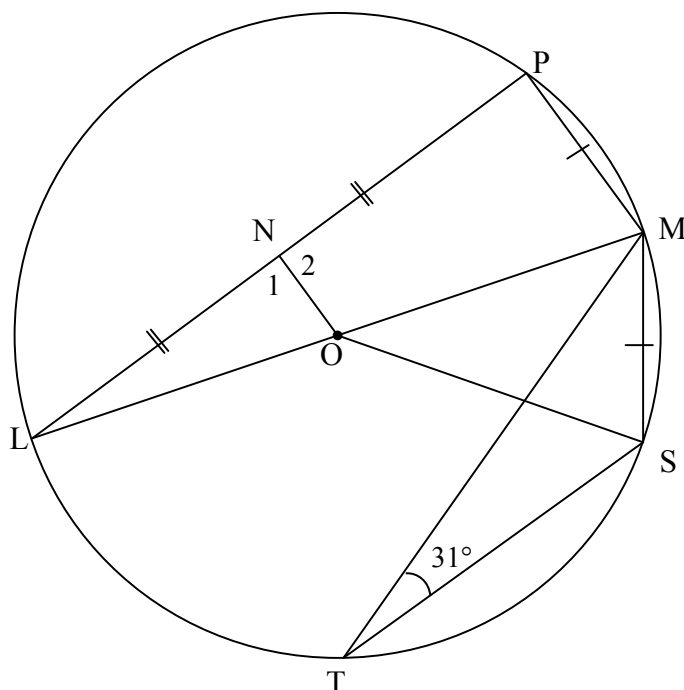
QUESTION/VRAAG 7

7.1.1	$\sin \theta = \frac{x}{AC} \quad \text{OR} \quad \frac{\sin \theta}{x} = \frac{\sin 90^\circ}{AC}$ $AC = \frac{x}{\sin \theta} \quad \text{OR} \quad AC = \frac{x}{\sin \theta}$	✓ trig ratio ✓ simplification (2)
7.1.2	$\cos 60^\circ = \frac{x+2}{CE} \quad \text{OR} \quad \frac{\sin 30^\circ}{x+2} = \frac{\sin 90^\circ}{CE}$ $CE = \frac{x+2}{\cos 60^\circ} \quad \text{OR} \quad CE = \frac{x+2}{\sin 30^\circ}$ $= \frac{x+2}{\frac{1}{2}} = 2(x+2) \quad \text{OR} \quad = 2(x+2)$	✓ trig ratio ✓ making CE the subject (2)
7.2	$\text{Area } \triangle ACE = \frac{1}{2} AC \cdot EC \cdot \sin \hat{ACE}$ $= \frac{1}{2} \left(\frac{x}{\sin \theta} \right) (2(x+2)) \sin 2\theta$ $= \frac{x(x+2) \times 2 \sin \theta \cos \theta}{\sin \theta}$ $= 2x(x+2) \cos \theta$	✓ use area rule correctly ✓ substitution of $\frac{x}{\sin \theta} (2(x+2))$ ✓ substitution of $\sin 2\theta$ (3)

7.3	$EC = 2(12 + 2) = 28$ $AE^2 = AC^2 + EC^2 - 2(AC)(EC)\cos\hat{A}CE$ $= \left(\frac{12}{\sin 55^\circ}\right)^2 + 28^2 - 2\left(\frac{12}{\sin 55^\circ}\right)(28)\cos 110^\circ$ $AE = 35,77m$	✓ EC ✓ use cosine rule correctly ✓ substitution ✓ answer (4)
		[11]

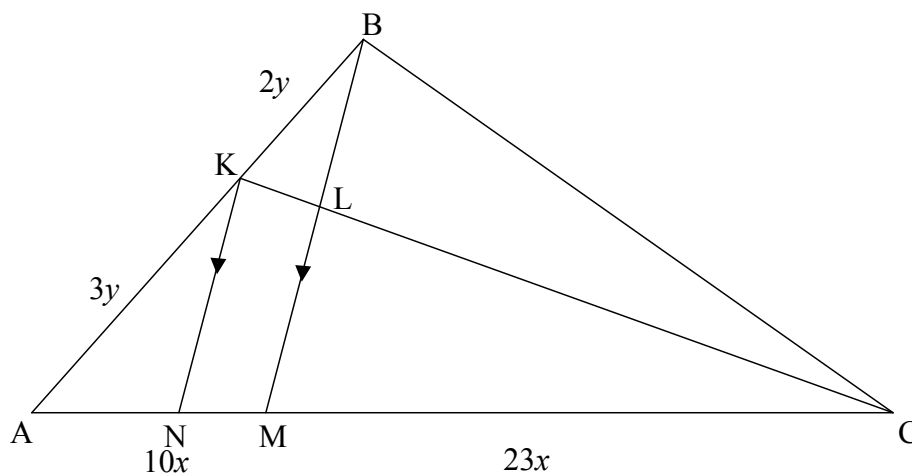
QUESTION/VRAAG 8

8.1



8.1.1(a)	$\hat{MOS} = 62^\circ$ [$\angle$ at centre = $2 \times \angle$ at circumf/middelpnts $\angle = 2 \text{omtreks} \angle$]	✓ S ✓ R (2)
8.1.1(b)	$\hat{L} = 31^\circ$ [equal chords; equal $\angle$ s / = koorde; = $\angle e$]	✓ S ✓ R (2)
8.1.2	LN = NP and LO = OM $\therefore ON = \frac{1}{2} PM$ [midpoint theorem/middelpuntstelling] $\therefore ON = \frac{1}{2} MS$ [PM = MS] OR $\hat{N}_1 = 90^\circ$ [line from centre to midpt chord/lyn v midpt na midpt kd] $\hat{P} = 90^\circ$ [$\angle$ in semi-circle/$\angle$ in halfsirkel] $\hat{L}$ is common/gemeen $\therefore \triangle NLO \parallel \triangle PLM$ ($\angle \angle \angle$) $\frac{NL}{PL} = \frac{NO}{PM} = \frac{1}{2}$ $\therefore ON = \frac{1}{2} PM$ $\therefore ON = \frac{1}{2} MS$ [PM = MS]	✓ LO = OM ✓ S ✓ R ✓ S (4) ✓ S R ✓ S/R ✓ S ✓ S (4)

8.2

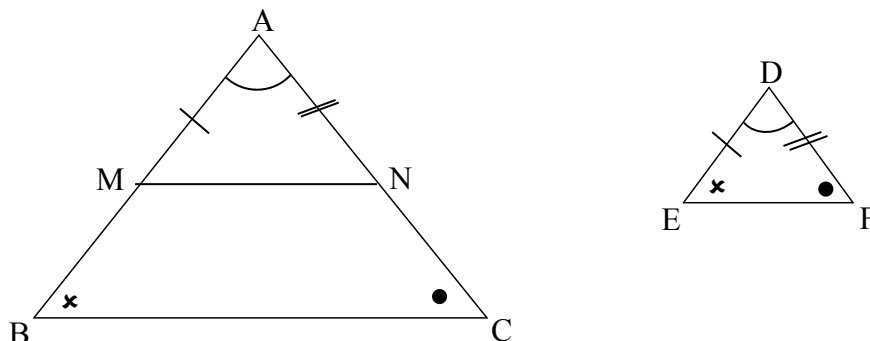


8.2.1	$\frac{AN}{AM} = \frac{AK}{AB}$ [line one side of Δ OR prop theorem; $KN \parallel BM$/ lyn sy van Δ OR eweredigheidst; $KN \parallel BM$] $\frac{AN}{AM} = \frac{3y}{5y} = \frac{3}{5}$	✓ R ✓ S (2)
8.2.2	$\frac{AM}{MC} = \frac{10x}{23x}$ [given] $AM = 5y = 10x \quad \therefore y = 2x$ $\frac{LC}{KL} = \frac{MC}{NM}$ [line one side of Δ OR prop theorem; $KN \parallel LM$/ lyn sy van Δ OR eweredigheidst; $KN \parallel BM$] $= \frac{23x}{2y} = \frac{23x}{4x} = \frac{23}{4}$ OR $\frac{AM}{MC} = \frac{10x}{23x}$ [given] $\frac{AN}{MN} = \frac{3y}{2y} = \frac{6x}{4x}$ $\frac{LC}{KL} = \frac{MC}{NM}$ [line one side of Δ OR prop theorem; $KN \parallel LM$/ lyn sy van Δ OR eweredigheidst; $KN \parallel BM$] $= \frac{23x}{2y} = \frac{23x}{4x} = \frac{23}{4}$	✓ S ✓ R ✓ S (3) ✓ S ✓ R ✓ S (3)
		[13]

	OR $\hat{B}_2 = \hat{N}_1$ $\hat{B}_1 + \hat{B}_2 = x + (90^\circ - x) = 90^\circ$ $\therefore$ KN is diameter/<i>middel lyn</i> [converse $\angle$ in semi-circle/ <i>omgekeerde $\angle$ in halfsirkel</i>] $\hat{MBA} = \hat{B}_2 + \hat{B}_3 = 90^\circ$ [tangent $\perp$ diameter] $\therefore$ AB is a tangent/<i>raaklyn</i> converse tan-chord theorem/ <i>omgekeerde raakl koordst</i>]]	✓ S ✓ R ✓ S ✓ R ✓ R (5)
		[11]

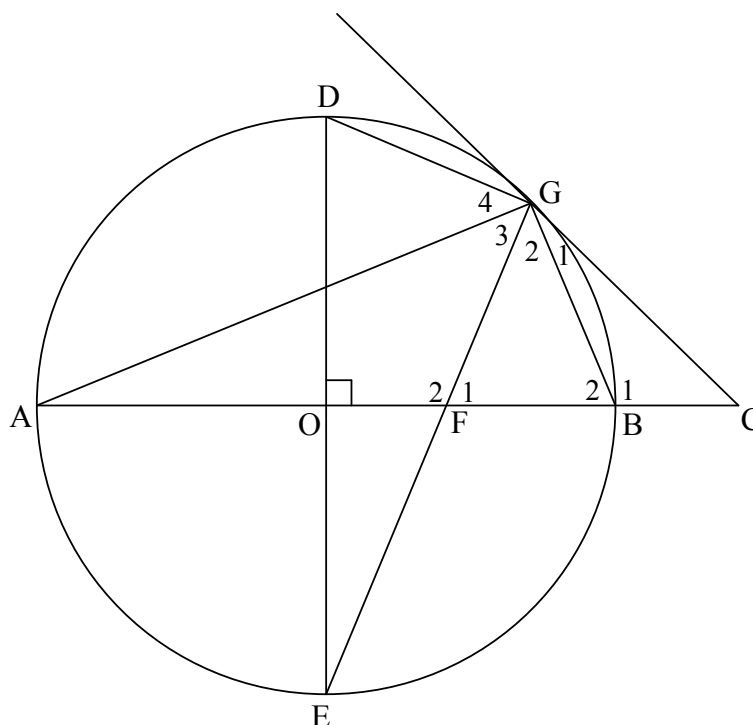
QUESTION/VRAAG 10

10.1



10.1	Constr: Let M and N lie on AB and AC respectively such that AM = DE and AN = DF. Draw MN. <i>Konstr: Merk M en N op AB en AC onderskeidelik af sodanig dat AM = DE en AN = DF. Verbind MN.</i> Proof: In $\triangle AMN$ and $\triangle DEF$ AM = DE [Constr] AN = DF [Constr] $\hat{A} = \hat{D}$ [Given] $\therefore \triangle AMN \equiv \triangle DEF$ (SAS) $\therefore \angle AMN = \angle E = \angle B$ MN $\parallel$ BC [corresp $\angle$'s are equal/ooreenkomstige $\angle$e =] $\frac{AB}{AM} = \frac{AC}{AN}$ [line $\parallel$ one side of $\triangle$ OR prop theorem; MN $\parallel$ BC] $\therefore \frac{AB}{DE} = \frac{AC}{DF}$ [AM = DE and AN = DF]	✓ Constr / <i>Konstr</i> ✓ $\triangle AMN \equiv \triangle DEF$ ✓ SAS ✓ MN $\parallel$ BC and R ✓ $\frac{AB}{AM} = \frac{AC}{AN}$ ✓ R (6)
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10.2



10.2.1(a)	DÔB=90° DĜF=Ĝ₃+Ĝ₄=90° [∠ in semi-circle/∠ in halfsirkel] DÔB+DĜF=180° ∴ DGFO is a cyclic quad. [converse: opp ∠s of cyclic quad/ <i>omgekeerde teenoorst ∠e v koordevh</i>] OR ∠s of quad = 180°/∠e van koordevh = 180°] OR EÔB=90° DĜF=Ĝ₃+Ĝ₄=90° [∠ in semi-circle/∠ in halfsirkel] EÔB = DĜF ∴ DGFO is a cyclic quad. . [converse: ext ∠ = opp int ∠/ <i>omgekeerde buite∠ = teenoorst ∠</i>] OR ext∠ of quad = opp int ∠/buite∠ v vh = teenoorst ∠]	✓ S ✓R ✓ R (3)
10.2.1(b)	F̂₁ = D̂ [ext ∠of cyclic quad/buite∠ v koordevh] Ĝ₁+Ĝ₂=D̂ [tan-chord theorem/raakl koordst] ∴ F̂₁=Ĝ₁+Ĝ₂ ∴ GC = CF [sides opp equal ∠s/sye teenoor = ∠e]	✓ S ✓R ✓ S ✓R ✓ R (5)

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

	TOTAL/TOTAAL:	150
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