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# basic education

Department:  
Basic Education  
**REPUBLIC OF SOUTH AFRICA**

**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:**

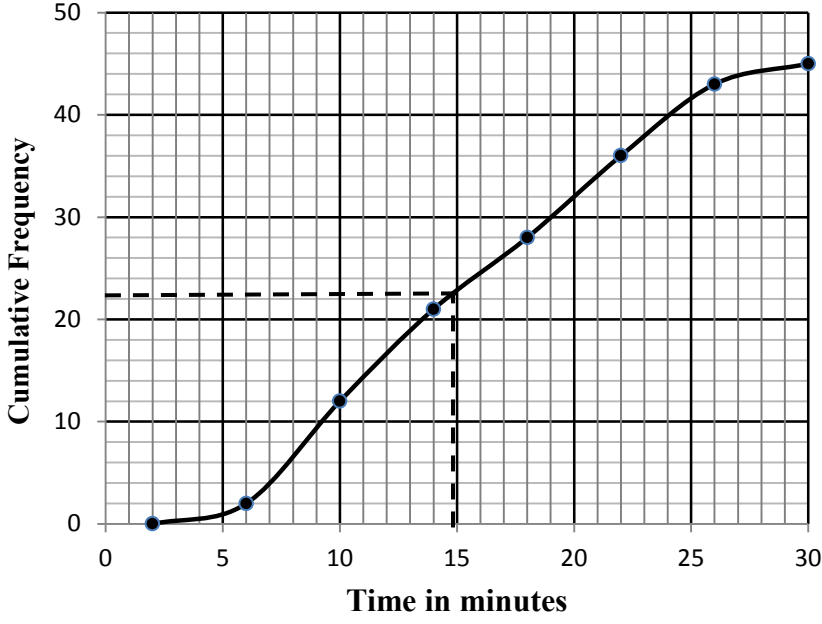
- If a candidate answers a question TWICE, only mark the FIRST attempt.
- If a candidate has crossed out an attempt of a question and not redone the question, mark the crossed out version.
- Consistent accuracy applies in ALL aspects of the marking memorandum. Stop marking at the second calculation error.
- 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.

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

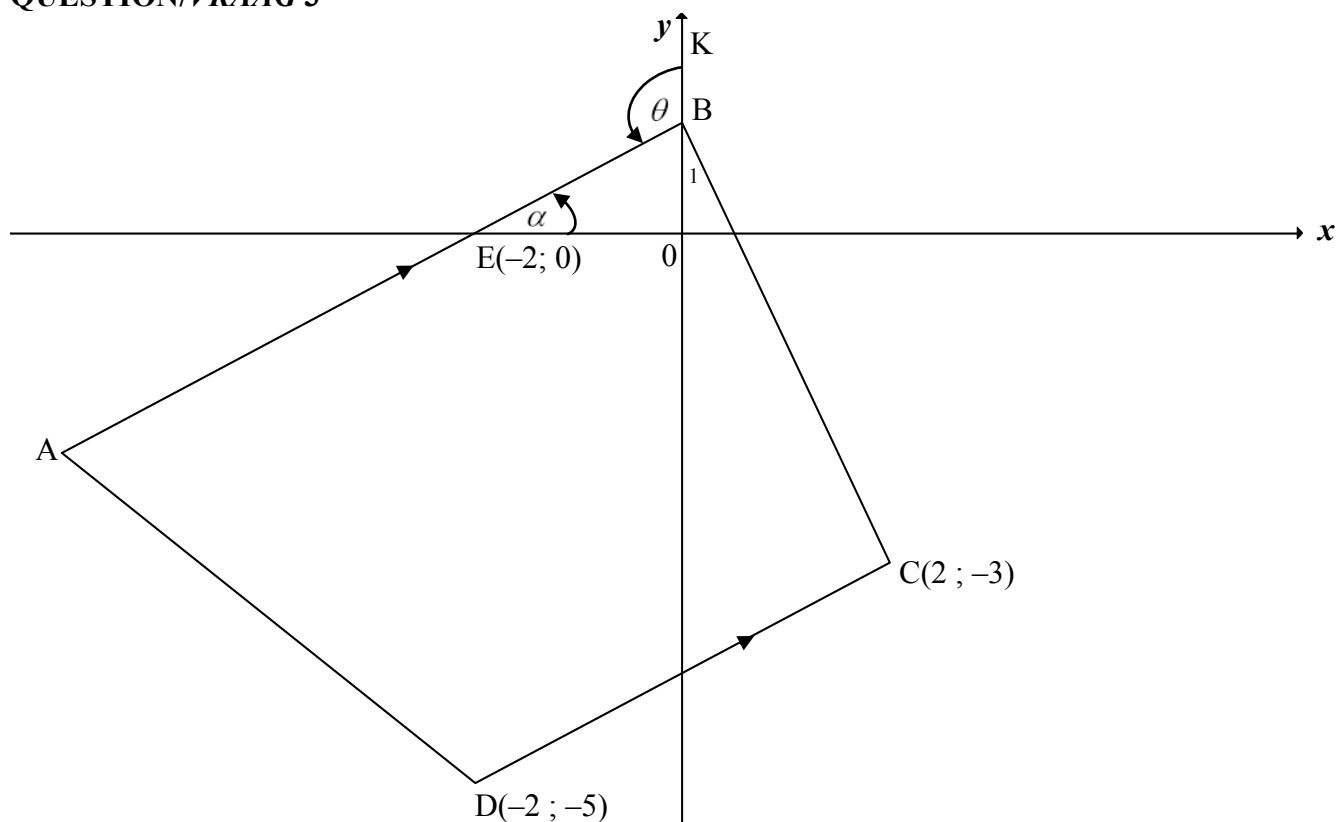
**QUESTION/VRAAG 1**

1.1	45 children	✓ answer (1)																								
1.2	$\bar{x} = \frac{\sum fx}{n} = \frac{(4 \times 2) + (8 \times 10) + (12 \times 9) + (16 \times 7) + (20 \times 8) + (24 \times 7) + (28 \times 2)}{45}$ $\bar{x} = \frac{692}{45} \text{ OR } \bar{x} = 15,38 \text{ minutes}$ <div style="border: 1px solid black; padding: 2px; display: inline-block;">Answer only: full marks</div>	✓ 692 ✓ answer (2)																								
1.3	<table border="1" style="margin-left: auto; margin-right: auto;"> <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><math>2 &lt; t \leq 6</math></td><td>2</td><td>2</td></tr> <tr> <td><math>6 &lt; t \leq 10</math></td><td>10</td><td>12</td></tr> <tr> <td><math>10 &lt; t \leq 14</math></td><td>9</td><td>21</td></tr> <tr> <td><math>14 &lt; t \leq 18</math></td><td>7</td><td>28</td></tr> <tr> <td><math>18 &lt; t \leq 22</math></td><td>8</td><td>36</td></tr> <tr> <td><math>22 &lt; t \leq 26</math></td><td>7</td><td>43</td></tr> <tr> <td><math>26 &lt; t \leq 30</math></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																								
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$18 < t \leq 22$	8	36																								
$22 < t \leq 26$	7	43																								
$26 < t \leq 30$	2	45																								
1.4	<p style="text-align: center;"><b>CUMULATIVE FREQUENCY GRAPH (OGIVE)</b></p> 	✓ 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. <div style="border: 1px solid black; padding: 2px; display: inline-block;">Answer only: full marks</div>	✓ graph ✓ answer (2)																								
		<b>[10]</b>																								

**QUESTION/VRAAG 2**

2.1	$a = 12,44$ $b = 0,98$ $y = 12,44 + 0,98x$ <div>Answer only: full marks</div>	✓ 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 <b>OR</b> $\hat{y} = 41,87$ (if using calculator) $\hat{y} = 42$  <b>OR</b> $\hat{y} = \frac{21}{50}$ <div>Answer only: full marks</div>	✓ 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% <div>Answer only: full marks</div>	✓ $50,67 - 45,67$ ✓ answer (2)
		<b>[10]</b>

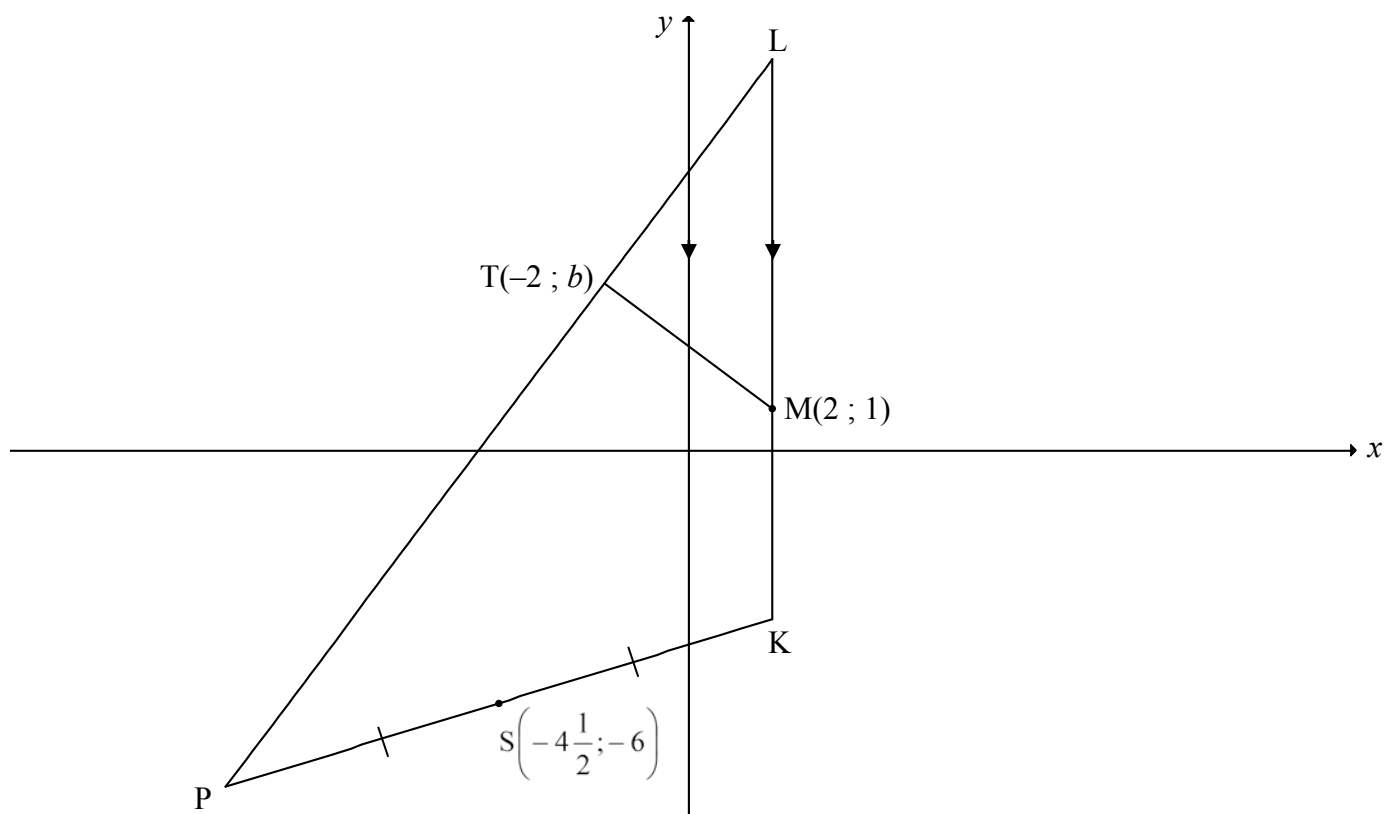
## QUESTION/VRAAG 3



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	$m_{DC} = \frac{-3-(-5)}{2-(-2)} \text{ OR } \frac{-5-(-3)}{-2-2}$ $= \frac{2}{4} = \frac{1}{2}$ <div style="border: 1px solid black; padding: 2px; display: inline-block;">Answer only: full marks</div>	✓ 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 $\alpha$ ✓ value of $\theta$ (3)

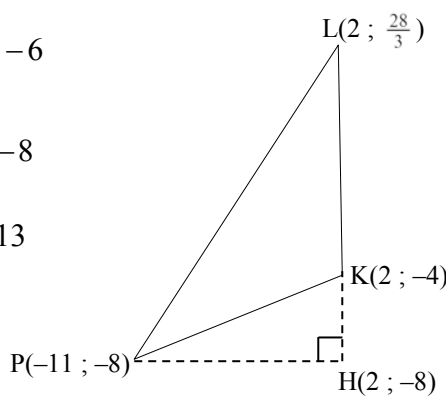
3.2	$B(0 ; 1)$ $m_{BC} = \frac{1 - (-3)}{0 - 2}$ <b>OR</b> $m_{BC} = \frac{(-3) - 1}{2 - 0}$ $= -2$ $= -2$ $m_{AB} \times m_{BC} = \frac{1}{2} \times -2$ $= -1$ $\therefore AB \perp BC$	✓ coordinates of B  ✓ $m_{BC} = -2$  ✓ product of gradients = -1  (3)
3.3.1	$\hat{ABC} = 90^\circ$ $\therefore EC$ is diameter [converse: $\angle$ in semi circle] $\therefore$ centre of circle = $\left(0 ; -\frac{3}{2}\right)$	✓ answer  (1)
3.3.2	$(x-0)^2 + \left(y + \frac{3}{2}\right)^2 = r^2$ $(-2-0)^2 + \left(0 + \frac{3}{2}\right)^2 = r^2$ <b>OR</b> $(2-0)^2 + \left(-3 - \left(-\frac{3}{2}\right)\right)^2 = r^2$ <b>OR</b> $(0-0)^2 + \left(1 - \left(-\frac{3}{2}\right)\right)^2 = r^2$ <b>OR</b> $r = \frac{EC}{2} = \frac{\sqrt{(-2-2)^2 + (0-(-3))^2}}{2}$ <b>OR</b> $r = 1 - \left(-\frac{3}{2}\right)$ $\therefore r^2 = \frac{25}{4}$ 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	$(x-2)^2 + (y-1)^2 = 25$ $(-2-2)^2 + (b-1)^2 = 25$ $(b-1)^2 = 9$ <b>OF</b> $16 + b^2 - 2b + 1 = 25$ $b-1 = \pm 3$ $\therefore b=4$ or $b \neq -2$	$(x-2)^2 + (y-1)^2 = 25$ $(-2-2)^2 + (b-1)^2 = 25$ $b^2 - 2b - 8 = 0$ $\therefore b=4$ or $b \neq -2$	✓ equation of the circle ✓ substitution of point T ✓ simplification ✓ answer (4)
4.2.1	$K(2; 1-5)$ $\therefore K(2; -4)$	<div style="border: 1px solid black; padding: 5px; display: inline-block;">Answer only: full marks</div>	✓ 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)



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

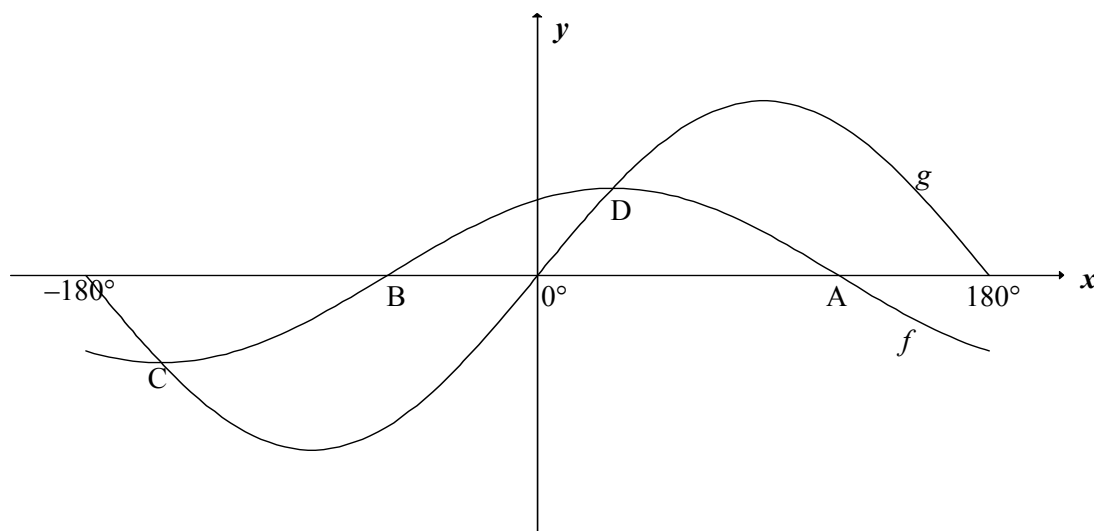


**QUESTION/VRAAG 5**

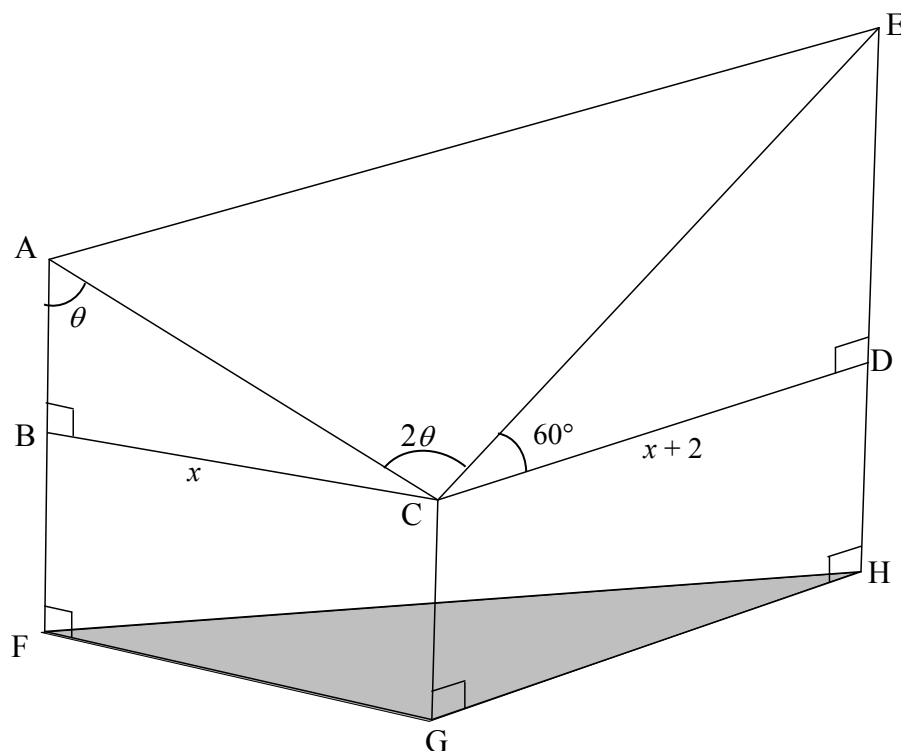
5.1.1	$\sin 191^\circ$ $= -\sin 11^\circ$	$\checkmark -\sin 11^\circ$ (1)
5.1.2	$\cos 22^\circ$ $= \cos(2 \times 11^\circ)$ $= 1 - 2\sin^2 11^\circ$	$\checkmark$ answer (1)
5.2	$\cos(x - 180^\circ) + \sqrt{2} \sin(x + 45^\circ)$ $= -\cos x + \sqrt{2}(\sin x \cos 45^\circ + \cos x \sin 45^\circ)$ $= -\cos x + \sqrt{2}\left(\sin x \left(\frac{1}{\sqrt{2}}\right) + \cos x \left(\frac{1}{\sqrt{2}}\right)\right)$ $= -\cos x + \sin x + \cos x$ $= \sin x$ <b>OR</b> $\cos(x - 180^\circ) + \sqrt{2} \sin(x + 45^\circ)$ $= -\cos x + \sqrt{2}(\sin x \cos 45^\circ + \cos x \sin 45^\circ)$ $= -\cos x + \sqrt{2}\left(\sin x \left(\frac{\sqrt{2}}{2}\right) + \cos x \left(\frac{\sqrt{2}}{2}\right)\right)$ $= -\cos x + \sin x + \cos x$ $= \sin x$	$\checkmark -\cos x$ $\checkmark$ 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)
		<b>[12]</b>

**QUESTION/VRAAG 6**

6.1	$\cos(x - 30^\circ) = 2 \sin x$ $\cos x \cos 30^\circ + \sin x \sin 30^\circ = 2 \sin x$ $\frac{\sqrt{3}}{2} \cos x + \frac{1}{2} \sin x = 2 \sin x$ $\frac{\sqrt{3}}{2} \cos x = \frac{3}{2} \sin x$ $\tan x = \frac{\sqrt{3}}{3}$ $x = 30^\circ + k \cdot 180^\circ; \quad k \in \mathbb{Z}$  <b>OR</b> $x = 30^\circ + k \cdot 360^\circ$ or $x = 210^\circ + k \cdot 360^\circ; \quad k \in \mathbb{Z}$	✓ expansion  ✓ special $\angle$ s  ✓ simplification  ✓ equation in tan ✓ $30^\circ$ ✓ $k \cdot 180^\circ; k \in \mathbb{Z}$ <b>OR</b> ✓ $30^\circ$ and $210^\circ$ ✓ $k \cdot 360^\circ; \quad k \in \mathbb{Z}$ (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 $y = 2 \sin x$ : $y \in [-2 ; 2]$ <b>OR</b> $-2 \leq y \leq 2$ Range of $y = 2 \sin x + 3$ : $y \in [1 ; 5]$ <b>OR</b> $1 \leq y \leq 5$ Range: $y = 2^{2 \sin x + 3}$ : $y \in [2 ; 32]$ <b>OR</b> $2 \leq y \leq 32$ <div style="border: 1px solid black; padding: 2px; display: inline-block;">Answer only: full marks</div>	✓ 1 ✓ 5 ✓ 2 ✓ 32 ✓ correct interval (5)
		<b>[18]</b>

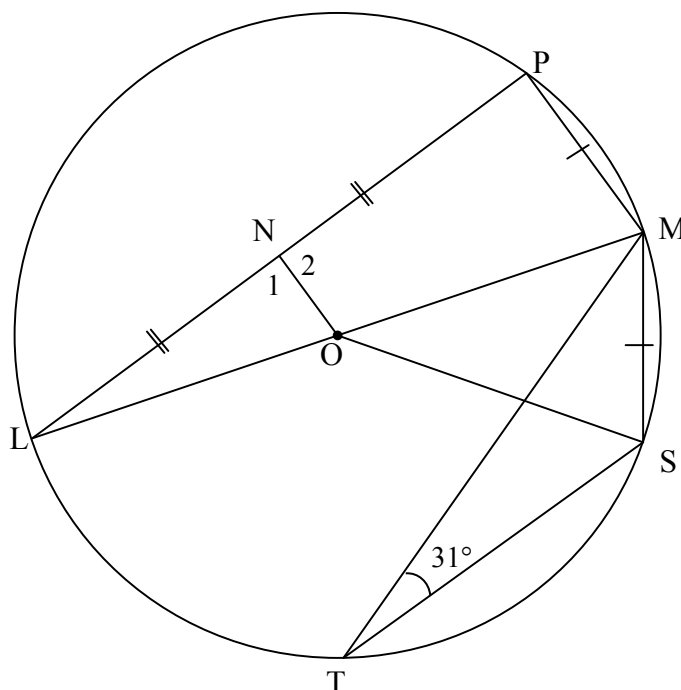
**QUESTION/VRAAG 7**

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]

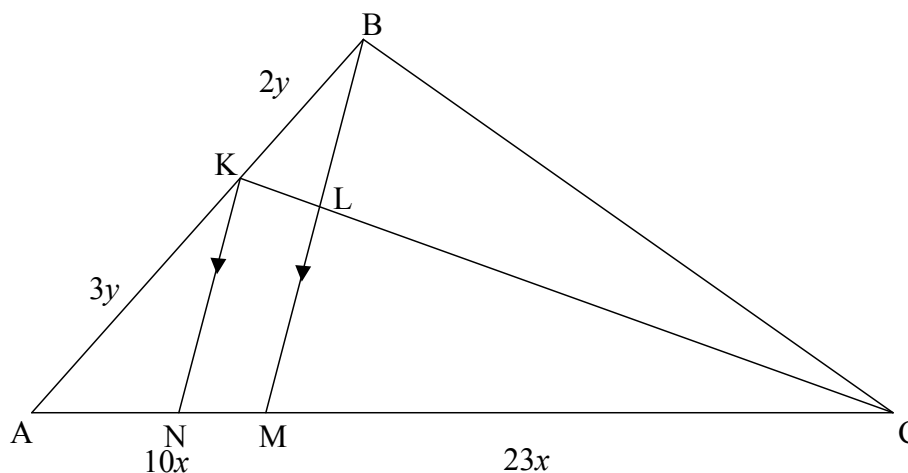
## QUESTION/VRAAG 8

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	<p>LN = NP and LO = OM</p> <p><math>\therefore ON = \frac{1}{2} PM</math> [midpoint theorem/middelpuntstelling]</p> <p><math>\therefore ON = \frac{1}{2} MS</math> [PM = MS]</p> <p><b>OR</b></p> <p><math>\hat{N}_1 = 90^\circ</math> [line from centre to midpt chord/lyn v midpt na midpt kd]</p> <p><math>\hat{P} = 90^\circ</math> [<math>\angle</math> in semi-circle/<math>\angle</math> in halfsirkel]</p> <p><math>\hat{L}</math> is common/gemeen</p> <p><math>\therefore \triangle NLO \parallel \triangle PLM</math> (<math>\angle \angle \angle</math>)</p> <p><math>\frac{NL}{PL} = \frac{NO}{PM} = \frac{1}{2}</math></p> <p><math>\therefore ON = \frac{1}{2} PM</math></p> <p><math>\therefore ON = \frac{1}{2} MS</math> [PM = MS]</p>	<p>✓ LO = OM</p> <p>✓ S ✓ R</p> <p>✓ S</p> <p>(4)</p> <p>✓ S R</p> <p>✓ S/R</p> <p>✓ S</p> <p>✓ S</p> <p>(4)</p>

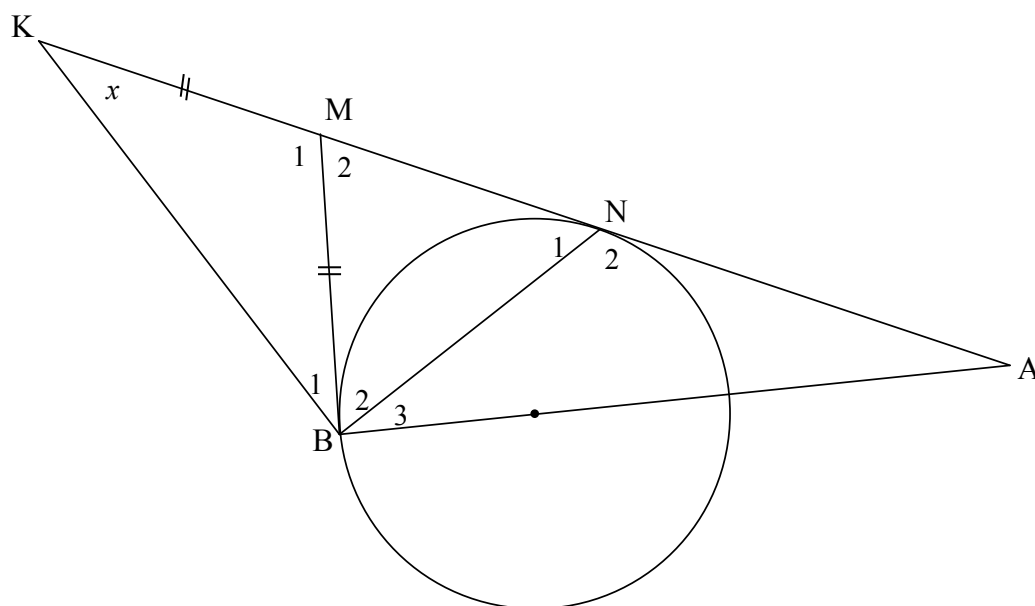
8.2



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



## QUESTION/VRAAG 9



9.1	$\hat{B}_1 = x$ [ $\angle$ 's opp = sides/ $\angle$ e teenoor = sye] $\hat{M}_2 = 2x$ [ext $\angle$ of $\Delta$ ] <b>OR</b> $\hat{M}_1 = 180^\circ - 2x$ [ $\angle$ s of $\Delta$ ] $BM = MN$ [ 2 tans from a common point/raaklyne vanuit dieselfde punt] $\hat{N}_1 = \frac{180^\circ - 2x}{2} = 90^\circ - x$ [ $\angle$ 's opp = sides/ $\angle$ e teenoor = sye] <b>OR</b> $NM = BM$ [ 2 tans from a common point/raaklyne vanuit dieselfde punt] $\hat{B}_2 = \hat{N}_1$ [ $\angle$ 's opp = sides/ $\angle$ e teenoor = sye] $\hat{B}_1 = x$ [ $\angle$ 's opp = sides/ $\angle$ e teenoor = sye] In $\Delta KBN$ : $x + x + \hat{B}_2 + \hat{N}_1 = 180^\circ$ [sum of $\angle$ 's of $\Delta$ ] $2x + 2\hat{N}_1 = 180^\circ$ $x + \hat{N}_1 = 90^\circ$ $\hat{N}_1 = 90^\circ - x$	$\checkmark$ S $\checkmark$ S $\checkmark$ R $\checkmark$ S $\checkmark$ R $\checkmark$ answer  $\checkmark$ S $\checkmark$ R $\checkmark$ S $\checkmark$ R $\checkmark$ S  $\checkmark$ answer	(6)
9.2	$\hat{MBA} = \hat{B}_2 + \hat{B}_3 = 90^\circ$ [tangent $\perp$ diameter/raaklyn $\perp$ middellyn] $\hat{B}_3 = 90^\circ - \hat{B}_2$ $= 90^\circ - (90^\circ - x) = x$ $\hat{B}_3 = \hat{K} = x$ $\therefore AB$ is a tangent/raaklyn converse tan-chord theorem/ omgekeerde raakl koordst]]	$\checkmark$ S $\checkmark$ R  $\checkmark$ S $\checkmark$ S $\checkmark$ R	(5)

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





10.2.2(a)	$AB = DE = 14$ [diameters/ <i>middel</i> lyne] $\therefore OB = 7$ units $\therefore BC = OC - OB = 11 - 7$ $= 4$ units <div style="border: 1px solid black; padding: 2px; display: inline-block;">Answer only: full marks</div>	✓ 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)	$OF = OC - FC$ $= 11 - \sqrt{72}$ $\tan E = \frac{OF}{OE}$ $= \frac{11 - \sqrt{72}}{7} = 0,36$ $\hat{E} = 19,76^\circ$ <b>OR</b> $OF = OC - FC$ $= 11 - \sqrt{72}$ $FE^2 = OE^2 + OF^2$ $= 7^2 + (11 - \sqrt{72})^2$ $FE = 7,437.. = 7,44$ $\cos E = \frac{OE}{FE}$ $= \frac{7}{7,44} = 0,94$ $\hat{E} = 19,76^\circ$ <div style="display: inline-block; vertical-align: middle; margin-left: 20px;"> OR  <math>\sin E = \frac{OF}{FE}</math>  <math>= \frac{11 - \sqrt{72}}{7,44} = 0,338</math>  <math>\hat{E} = 19,76^\circ</math> </div>	✓ OF ✓ trig ratio ✓ substitution ✓ answer (4)  ✓ OF  ✓ trig ratio ✓ substitution ✓ answer (4)
		[26]

	<b>TOTAL/TOTAAL:</b>	<b>150</b>
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