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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**

**2022**

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

## LET WEL:

- 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, merk die doodgetrekte poging.
- Volgehoue akkuraatheid word in ALLE aspekte van die nasienriglyne toegepas. Hou op nasien by die tweede berekeningsfout.
- Aanvaar van antwoorde/waardes 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)
	'n Punt vir 'n korrekte bewering ( 'n Punt vir 'n bewering is onafhanklik van die rede)
R	A mark for the correct reason (A reason mark may only be awarded if the statement is correct)
	'n Punt vir 'n korrekte rede ( 'n Punt word slegs vir die rede toegeken as die bewering korrek is)
S/R	Award a mark if statement AND reason are both correct
	Ken 'n punt toe as die bewering EN rede beide korrek is

## QUESTION/VRAAG 1

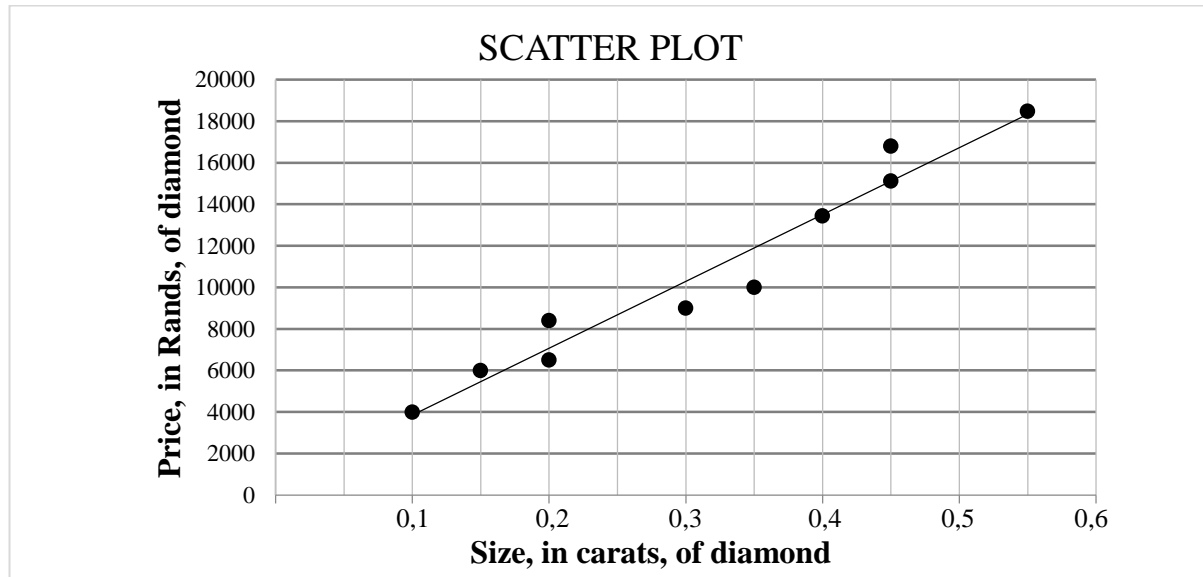
1.1	Modal class: $9 < m \leq 11$	✓ answer (1)																								
1.2	<table border="1"> <thead> <tr> <th>Mass (in kg)</th><th>Frequency</th><th>Cumulative frequency</th></tr> </thead> <tbody> <tr> <td><math>5 &lt; m \leq 7</math></td><td>6</td><td>6</td></tr> <tr> <td><math>7 &lt; m \leq 9</math></td><td>18</td><td>24</td></tr> <tr> <td><math>9 &lt; m \leq 11</math></td><td>21</td><td>45</td></tr> <tr> <td><math>11 &lt; m \leq 13</math></td><td>19</td><td>64</td></tr> <tr> <td><math>13 &lt; m \leq 15</math></td><td>11</td><td>75</td></tr> <tr> <td><math>15 &lt; m \leq 17</math></td><td>4</td><td>79</td></tr> <tr> <td><math>17 &lt; m \leq 19</math></td><td>1</td><td>80</td></tr> </tbody> </table>	Mass (in kg)	Frequency	Cumulative frequency	$5 < m \leq 7$	6	6	$7 < m \leq 9$	18	24	$9 < m \leq 11$	21	45	$11 < m \leq 13$	19	64	$13 < m \leq 15$	11	75	$15 < m \leq 17$	4	79	$17 < m \leq 19$	1	80	✓ adding  ✓ 80  (2)
Mass (in kg)	Frequency	Cumulative frequency																								
$5 < m \leq 7$	6	6																								
$7 < m \leq 9$	18	24																								
$9 < m \leq 11$	21	45																								
$11 < m \leq 13$	19	64																								
$13 < m \leq 15$	11	75																								
$15 < m \leq 17$	4	79																								
$17 < m \leq 19$	1	80																								
1.3		✓ grounding (5 ; 0)  ✓ points  ✓ shape  (3)																								
1.4	Median mass: 10,5 kg	✓✓ answer (2)																								
1.5.1	$\bar{x} = \frac{(6 \times 6 + 18 \times 8 + 21 \times 10 + 19 \times 12 + 11 \times 14 + 4 \times 16 + 1 \times 18)}{80}$ $= \frac{854}{80}$ $= 10,68$ <div style="border: 1px solid black; padding: 2px; display: inline-block;">Answer only 2/2</div>	✓ 854  ✓ answer  (2)																								
1.5.2	Learners' bags are heavier than the stipulated international guideline. Estimated mean = 10,68 kg 10% of 80 kg = 8 kg 10,68 kg > 8 kg	✓ answer    ✓ 8 kg  (2)																								

	<p><b>OR/ OF</b></p> <p>Learners' bags are heavier than the stipulated international guideline.</p> <p>Estimated mean <math>= \frac{10,68}{80} \times 100</math></p> <p><math>= 13,35\%</math></p> <p><math>13,35\% &gt; 10\%</math></p>	<p>✓ answer</p> <p>✓ 13,35%</p> <p>(2)</p>
<b>[12]</b>		



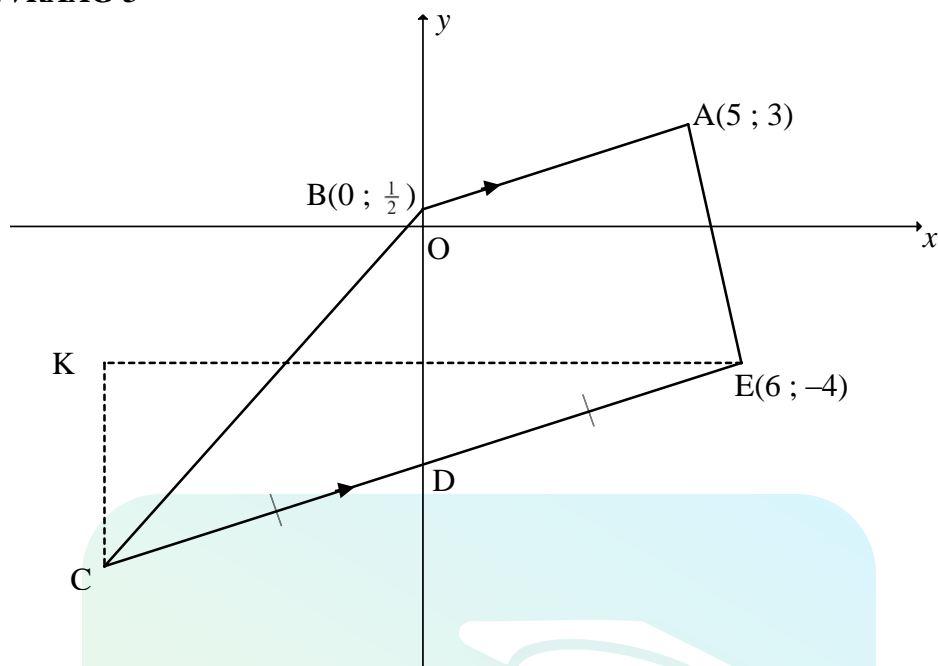
## QUESTION/VRAAG 2

Size, in carats, of diamond (x)	0,1	0,15	0,2	0,2	0,3	0,35	0,4	0,45	0,45	0,55
Price, in rands, of diamond (y)	4 000	6 000	6 500	8 400	9 000	10 000	13 440	15 120	16 800	18 480



2.1	$a = 634,382\dots$ $b = 32\,189,263\dots$ $\hat{y} = 634,38 + 32189,26x$	✓ $a$ ✓ $b$ ✓ equation Answer only 3/3	(3)
2.2	$\hat{y} = 634,38 + 32189,26(0,25)$ $= R8\,681,70$ <b>OR/OF</b> $\hat{y} = R8\,681,70$ (if using calculator)	✓ substitution ✓ answer ✓ ✓ answer	(2) (2)
2.3	Average price increase $= R \frac{32189,26}{20}$ per 0,05 carat $= R1\,609,46$ per 0,05 carat <b>OR/OF</b> Average price increase $= 0,05 \times 32\,189,26$ $= R1\,609,46$ per 0,05 carat <b>OR/OF</b> at 0,3: $\hat{y} = R10\,291,16$ $\therefore$ Average price increase $= 10\,291,16 - 8\,681,70$ $= R1\,609,46$ per 0,05 carat Answer only 2/2	✓ divide gradient by 20 ✓ answer ✓ multiply gradient by 0,05 ✓ answer ✓ Estimated price of a 0,3 carat diamond ✓ answer Answer only 2/2	(2) (2) (2)
2.4	The point (0,35 ; 11500) is closer to the least squares regression line.	✓ reason	(1)
<b>[8]</b>			

## QUESTION/VRAAG 3

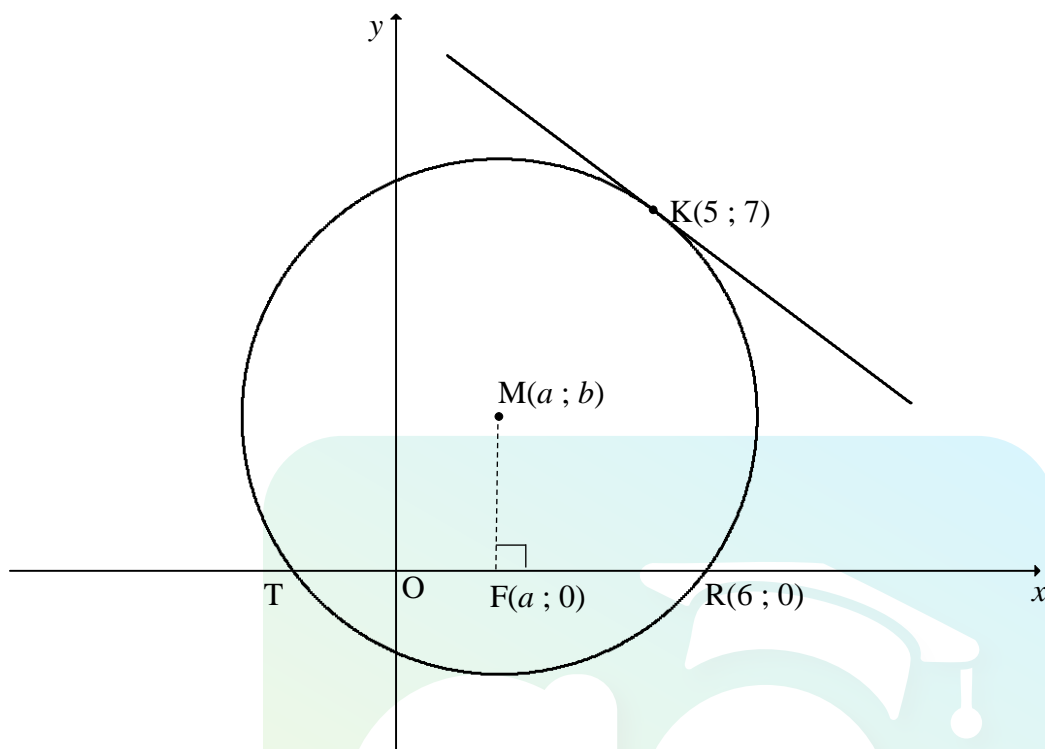


3.1	$m_{AB} = \frac{3 - \frac{1}{2}}{5 - 0}$ $m_{AB} = \frac{1}{2}$ <div style="border: 1px solid black; padding: 2px; display: inline-block;">Answer only 2/2</div>	✓ substitution ✓ answer (2)
3.2	$m_{CE} = m_{BA} = \frac{1}{2}$ $-4 = \frac{1}{2}(6) + c \quad \text{OR/OF} \quad y - (-4) = \frac{1}{2}(x - 6)$ $c = -7$ $y = \frac{1}{2}x - 7$	✓ gradient ✓ substitution of E ✓ answer (3)
3.3.1	$\frac{x_C + 6}{2} = 0 \qquad \frac{y_C + (-4)}{2} = -7$ $x_C = -6 \qquad y_C = -10$ $C(-6 ; -10)$ <div style="border: 1px solid black; padding: 2px; display: inline-block;">Answer only 3/3</div>	✓ D(0 ; -7) ✓ $x_C = -6$ ✓ $y_C = -10$ (3)
3.3.2	$\text{Area } \triangle BCD = \frac{1}{2}(7,5)(6)$ $= 22,5$ $\text{Area } \triangle ABD = \frac{1}{2}(7,5)(5)$ $= 18,75$ $\text{Area } ABCD = 22,5 + 18,75 = 41,25 \text{ units}^2$	✓ subst of correct base and height into the area formula ✓ area $\triangle BCD = 22,5$ ✓ area $\triangle ABD = 18,75$ ✓ answer (4)

3.4.1	$K(-6; -4)$	$\checkmark x_K = -6$ $\checkmark y_K = -4$ (2)
3.4.2a	$KC = 6$ units; $KE = 12$ units; $CE = \sqrt{(6)^2 + (12)^2}$ [Pythagoras] $CE = \sqrt{180} = 6\sqrt{5} = 13,42$ Perimeter $\Delta KEC = 6 + 12 + \sqrt{180}$ $= 31,42$ units	$\checkmark KC = 6$ units $\checkmark KE = 12$ units  $\checkmark CE$  $\checkmark$ answer (4)
3.4.2b	$\tan \hat{KCE} = \frac{KE}{KC} = \frac{12}{6} = 2$ $\hat{KCE} = 63,43^\circ$  <b>OR/OF</b> $\sin \hat{KCE} = \frac{KE}{CE} = \frac{12}{\sqrt{180}} = \frac{2\sqrt{5}}{5}$ $\hat{KCE} = 63,43^\circ$  <b>OR/OF</b> $m_{CE} = \frac{1}{2}$ $\tan \theta = \frac{1}{2}$ $\theta = 26,57^\circ$ $\hat{KCE} = 90^\circ - 26,57^\circ$ $\hat{KCE} = 63,43^\circ$  <b>OR/OF</b> $KE^2 = KC^2 + CE^2 - 2(KC)(CE)\cos \hat{KCE}$ $(12)^2 = (6)^2 + (\sqrt{180})^2 - 2(6)(\sqrt{180})(\cos \hat{KCE})$ $\cos \hat{KCE} = \frac{\sqrt{5}}{5}$ $\hat{KCE} = 63,43^\circ$	$\checkmark$ trig ratio $\checkmark \tan \hat{KCE} = 2$ $\checkmark$ answer (3)  $\checkmark$ trig ratio $\checkmark \sin \hat{KCE} = \frac{12}{\sqrt{180}}$ $\checkmark$ answer (3)  $\checkmark \tan \theta = \frac{1}{2}$ $\checkmark \theta = 26,57^\circ$  $\checkmark$ answer (3)  $\checkmark$ substitution into cosine rule $\checkmark$ trig ratio $\checkmark$ answer (3)
		<b>[21]</b>



## QUESTION/VRAAG 4

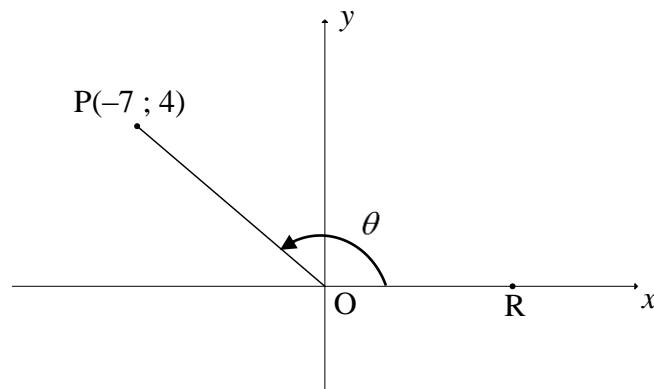


4.1.1	$y = x + 1$ $b = a + 1$	$\checkmark b = a + 1$ (1)
4.1.2	$MR^2 = MK^2$ $(a - 6)^2 + (b - 0)^2 = (a - 5)^2 + (b - 7)^2$ $(a - 6)^2 + (a + 1)^2 = (a - 5)^2 + (a + 1 - 7)^2$ $a^2 + 2a + 1 = a^2 - 10a + 25$ $12a = 24$ $a = 2$ $b = 3$ $\therefore M(2; 3)$	$\checkmark$ equating radii / solving simultaneously $\checkmark$ substitution $b = a + 1$  $\checkmark 12a = 24$ $\checkmark a = 2$ $\checkmark b = 3$ (5)
4.2.1	$(6 - 2)^2 + (0 - 3)^2 = r^2$ $r = 5$  <b>OR/OF</b>  $(2 - 5)^2 + (3 - 7)^2 = r^2$ $r = 5$	$\checkmark$ substitution R and M $\checkmark r = 5$ (2)  $\checkmark$ substitution K and M $\checkmark r = 5$ (2)

Answer only 2/2

4.2.2	<p><math>T(-2 ; 0)</math>  <math>TR = 8</math> units [line from centre <math>\perp</math> to chord]</p> <p><b>OR/OF</b></p> <p><math>M(2 ; 3)</math>  <math>F(a ; 0)</math>  <math>FR = 4</math> units  <math>TR = 8</math> units [line from centre <math>\perp</math> to chord]</p> <p><b>OR/OF</b></p> <p><math>(x-2)^2 + (0-3)^2 = 25</math>  <math>x^2 - 4x + 4 + 9 = 25</math>  <math>x^2 - 4x - 12 = 0</math>  <math>(x-6)(x+2) = 0</math>  <math>x = 6</math> or <math>x = -2</math>  <math>TR = 8</math> units</p> <p style="border: 1px solid black; padding: 2px; display: inline-block;">Answer only 2/2</p>	<p>✓ <math>T(-2 ; 0)</math>          ✓ answer (2)</p> <p>✓ 4 units          ✓ answer (2)</p> <p>✓ <math>x</math> values          ✓ answer (2)</p>
4.3	<p><math>m_{\text{radius}} = \frac{7-3}{5-2}</math>  <math>m_{\text{radius}} = \frac{4}{3}</math>  <math>m_{\text{tangent}} = -\frac{3}{4}</math></p> <p><math>7 = -\frac{3}{4}(5) + c</math> <b>OR/OF</b> <math>y - 7 = -\frac{3}{4}(x - 5)</math>  <math>c = \frac{43}{4}</math>  <math>y = -\frac{3}{4}x + \frac{43}{4}</math> <math>y = -\frac{3}{4}x + \frac{43}{4}</math></p>	<p>✓ substitution          ✓ <math>m_{\text{radius}} = \frac{4}{3}</math>          ✓ <math>m_{\text{tangent}} = -\frac{3}{4}</math>          ✓ substitution          ✓ answer (5)</p>
4.4.1	$N(2 ; -2)$	<p>✓ <math>x_N = 2</math> ✓ <math>y_N = -2</math>          (2)</p>
4.4.2	<p><math>(-2-2)^2 + (0+2)^2 = r^2</math>  <math>r^2 = 20</math>  <math>(x-2)^2 + (y+2)^2 = 20</math></p>	<p>✓ substitution          ✓ <math>r^2 = 20</math>          ✓ answer (3)</p>
		<b>[20]</b>

## QUESTION/VRAAG 5



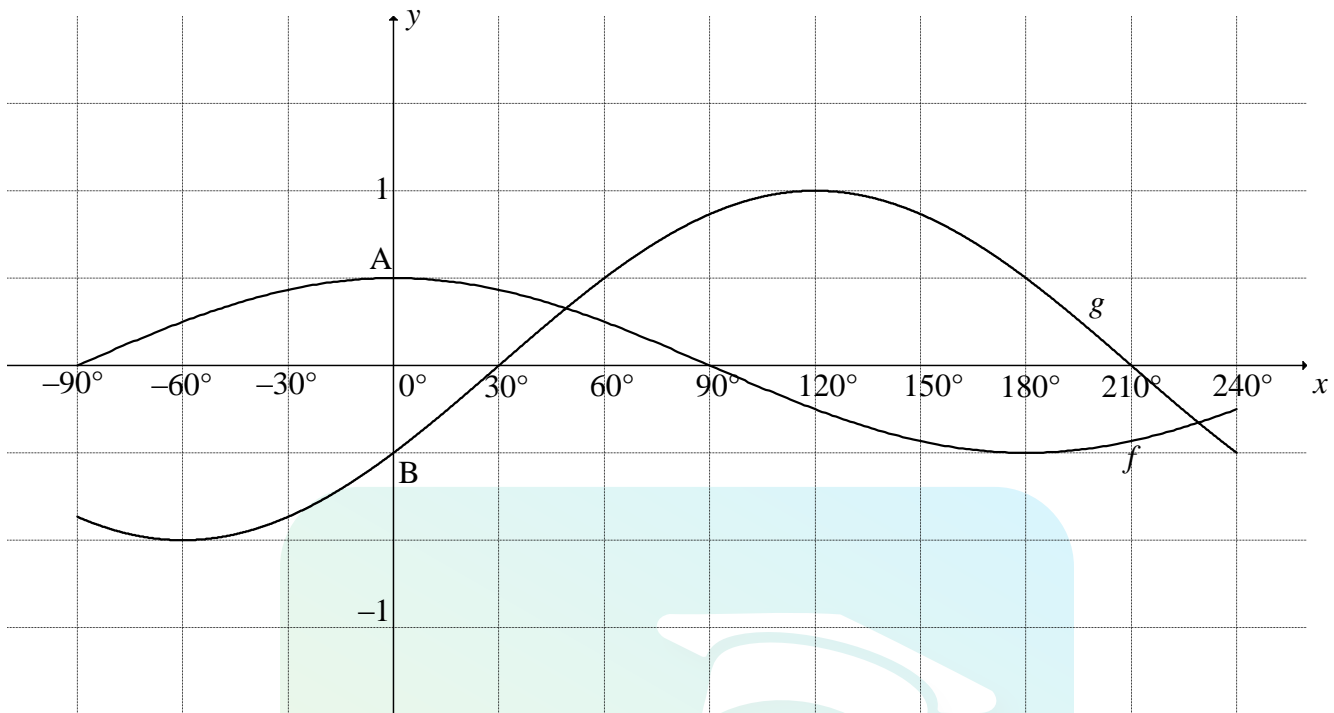
5.1.1	$OP = \sqrt{(-7)^2 + (4)^2}$ $= \sqrt{65}$	✓ substitution ✓ answer (2)
5.1.2(a)	$\tan \theta = \frac{4}{-7}$	✓ answer (1)
5.1.2(b)	$\cos(\theta - 180^\circ) = -\cos \theta$ $= \frac{7}{\sqrt{65}}$	✓ reduction ✓ answer (2)
5.2	$\sin x \cos x + \sin x = 3 \cos^2 x + 3 \cos x$ $\sin x \cos x + \sin x - 3 \cos^2 x - 3 \cos x = 0$ $\sin x(\cos x + 1) - 3 \cos x(\cos x + 1) = 0$ $(\cos x + 1)(\sin x - 3 \cos x) = 0$ $\cos x = -1 \quad \text{or} \quad \sin x = 3 \cos x$ $\tan x = 3$ $x = 180^\circ + k.360^\circ \quad \text{or} \quad x = 71,57^\circ + k.180^\circ ; k \in \mathbb{Z}$ <p><b>OR/OF</b></p> $\sin x \cos x + \sin x = 3 \cos^2 x + 3 \cos x$ $\sin x \cos x + \sin x - 3 \cos^2 x - 3 \cos x = 0$ $\sin x(\cos x + 1) - 3 \cos x(\cos x + 1) = 0$ $(\cos x + 1)(\sin x - 3 \cos x) = 0$ $\cos x = -1 \quad \text{or} \quad \sin x = 3 \cos x$ $\tan x = 3$ $x = 180^\circ + k.360^\circ \quad \text{or} \quad x = 71,57^\circ + k.360^\circ \quad \text{or}$ $x = 251,57^\circ + k.360^\circ ; k \in \mathbb{Z}$	✓ RHS = 0 ✓ grouping ✓ factors ✓ both equations  ✓ $x = 180^\circ$ ✓ $x = 71,57^\circ$ ✓ $+ k.180^\circ ; k \in \mathbb{Z}$ (7)

5.3.1	$\begin{aligned} \text{LHS} &= \frac{\sin 3x}{1 - \cos 3x} \times \frac{1 + \cos 3x}{1 + \cos 3x} \\ &= \frac{(\sin 3x)(1 + \cos 3x)}{(1 - \cos 3x)(1 + \cos 3x)} \\ &= \frac{(\sin 3x)(1 + \cos 3x)}{1 - \cos^2 3x} \\ &= \frac{(\sin 3x)(1 + \cos 3x)}{\sin^2 3x} \\ &= \frac{1 + \cos 3x}{\sin 3x} \\ &= \text{RHS} \end{aligned}$ <p><b>OR/OF</b></p> $\begin{aligned} \text{LHS} &= \frac{\sin 3x}{1 - \cos 3x} \times \frac{\sin 3x}{\sin 3x} \\ &= \frac{\sin^2 3x}{\sin 3x(1 - \cos 3x)} \\ &= \frac{1 - \cos^2 3x}{\sin 3x(1 - \cos 3x)} \\ &= \frac{(1 - \cos 3x)(1 + \cos 3x)}{\sin 3x(1 - \cos 3x)} \\ &= \frac{1 + \cos 3x}{\sin 3x} \\ &= \text{RHS} \end{aligned}$	<p>✓ multiply by “1”</p> <p>✓ <math>1 - \cos^2 3x</math></p> <p>✓ square identity</p> <p>(3)</p> <p>✓ multiply by “1”</p> <p>✓ square identity</p> <p>✓ factors</p> <p>(3)</p>
5.3.2	<p>undefined when <math>\sin 3x = 0</math> and <math>1 - \cos 3x = 0</math>  <math>3x = 0^\circ</math> or <math>3x = 180^\circ</math> and <math>3x = 0^\circ</math> or <math>3x = 360^\circ</math>  <math>x = 0^\circ</math> or <math>x = 60^\circ</math></p>	<p>✓ <math>\sin 3x = 0</math> and <math>1 - \cos 3x = 0</math>          ✓ <math>0^\circ</math> ✓ <math>60^\circ</math></p> <p>(3)</p>
[18]		

## QUESTION/VRAAG 6

6.1	$\frac{\sin 10^\circ}{\cos 440^\circ} + \tan(360^\circ - \theta) \cdot \sin 2\theta$ $= \frac{\cos 80^\circ}{\cos 80^\circ} - \tan \theta (2 \sin \theta \cos \theta)$ $= 1 - \frac{\sin \theta}{\cos \theta} (2 \sin \theta \cos \theta)$ $= 1 - 2 \sin^2 \theta$ $= \cos 2\theta$	<p>✓ <math>-\tan \theta</math>                  ✓ <math>\cos 80^\circ</math>                  ✓ co-ratio                  ✓ double angle</p> <p>✓ quotient identity</p> <p>✓ answer</p> <p>(6)</p>
6.2.1	$\sin(60^\circ + 2x) + \sin(60^\circ - 2x) = k \cos 2x$ $(\sin 60^\circ \cos 2x + \cos 60^\circ \sin 2x) + (\sin 60^\circ \cos 2x - \cos 60^\circ \sin 2x) = k \cos 2x$ $2 \sin 60^\circ \cos 2x = k \cos 2x$ $2 \left( \frac{\sqrt{3}}{2} \right) \cos 2x = k \cos 2x$ $\therefore k = \sqrt{3}$	<p>✓ both expansions correct</p> <p>✓ special <math>\angle</math>s</p> <p>✓ answer</p> <p>(3)</p>
6.2.2	$\tan 60^\circ [\sin(60^\circ + 2x) + \sin(60^\circ - 2x)]$ $= \tan 60^\circ [k \cos 2x]$ $= \sqrt{3} (\sqrt{3} \cos 2x)$ $= 3(2 \cos^2 x - 1)$ $= 3(2(\sqrt{t})^2 - 1)$ $= 6(\sqrt{t})^2 - 3$ $= 6t - 3$	<p>✓ special <math>\angle</math></p> <p>✓ double <math>\angle</math>s</p> <p>✓ answer i.t.o <math>t</math></p> <p>(3)</p>
<b>[12]</b>		

## QUESTION/VRAAG 7



7.1	$A\left(0; \frac{1}{2}\right) \quad B\left(0; -\frac{1}{2}\right)$ $AB = \frac{1}{2} - \left(-\frac{1}{2}\right)$ $= 1 \text{ unit}$	✓ y-values ✓ answer Answer only 2/2 (2)
7.2	Range of $f: y \in \left[-\frac{1}{2}; \frac{1}{2}\right]$ Range of $3f(x) + 2: y \in \left[\frac{1}{2}; 3\frac{1}{2}\right]$ <b>OR/OF</b> $\frac{1}{2} \leq y \leq 3\frac{1}{2}$	✓ critical values ✓ answer (2)
7.3	$x = 90^\circ$	✓✓ $x = 90^\circ$ (2)
7.4.1	$x \in (30^\circ; 90^\circ) \cup (210^\circ; 240^\circ]$ <b>OR/OF</b> $30^\circ < x < 90^\circ \text{ or } 210^\circ < x \leq 240^\circ$	✓ $x \in (30^\circ; 90^\circ)$ ✓ $(210^\circ; 240^\circ]$ (2) ✓ $30^\circ < x < 90^\circ$ ✓ $210^\circ < x \leq 240^\circ$ (2)
7.4.2	$x \in (-55^\circ; 125^\circ)$ <b>OR/OF</b> $-55^\circ < x < 125^\circ$	✓ critical values ✓ answer (2) ✓ critical values ✓ answer (2)

[10]

## QUESTION/VRAAG 8

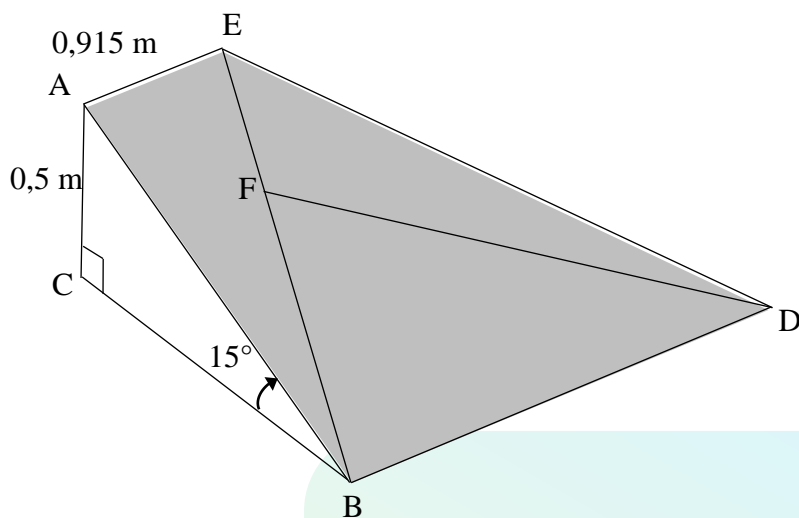


FIGURE I

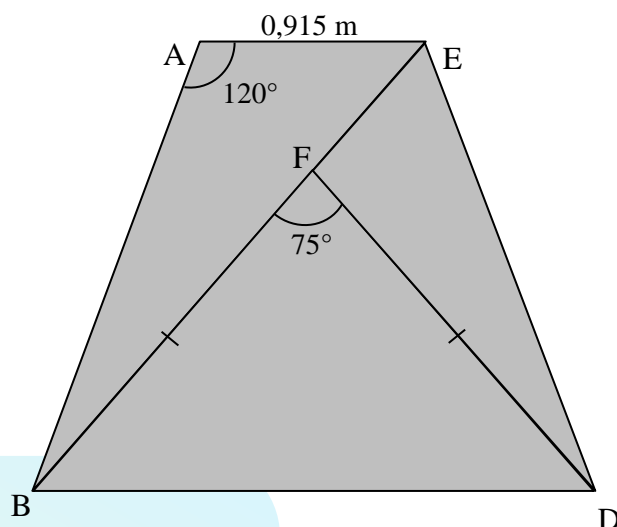
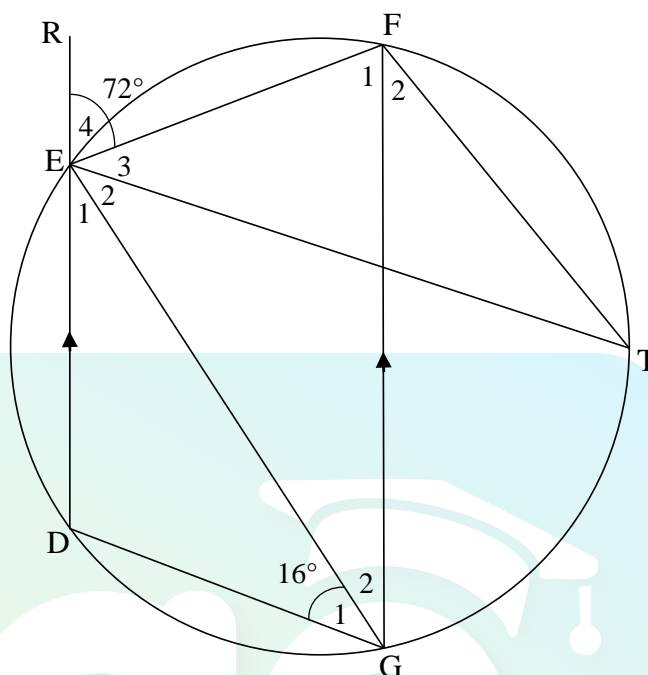


FIGURE II (top view)

8.1	$\frac{0,5}{AB} = \sin 15^\circ$ $AB = \frac{0,5}{\sin 15^\circ}$ $AB = 1,93 \text{ m}$	✓ trig ratio  ✓ answer  <div style="border: 1px solid black; padding: 2px; display: inline-block;">Answer only 2/2</div>
8.2	$BE^2 = AB^2 + AE^2 - 2(AB)(AE)\cos \hat{BAE}$ $BE^2 = (1,93)^2 + (0,915)^2 - 2(1,93)(0,915)(\cos 120^\circ)$ $BE = 2,52 \text{ m}$	✓ correct use of cosine rule  ✓ substitution  ✓ answer
8.3	$BF = FD = \frac{5}{7}(2,52) = 1,80 \text{ m}$ $\text{Area } \triangle BFD = \frac{1}{2}(BF)(FD)\sin \hat{BFD}$ $= \frac{1}{2}(1,8)(1,8)(\sin 75^\circ)$ $= 1,56 \text{ m}^2$	✓ BF      ✓ correct substitution into the area rule  ✓ answer
		(3)
		<b>[8]</b>

## QUESTION/VRAAG 9

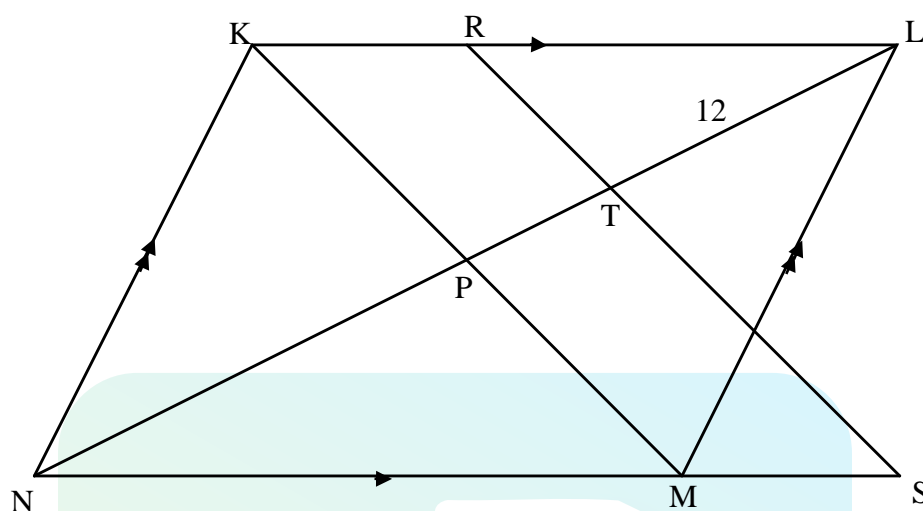
9.1



9.1.1	$\hat{DGF} = \hat{E}_4 = 72^\circ$ [ext $\angle$ of cyclic quad/ <i>buite <math>\angle</math> v kvh</i> ]	✓ S ✓ R (2)
9.1.2	$\hat{G}_2 = 72^\circ - 16^\circ = 56^\circ$ $\hat{T} = \hat{G}_2 = 56^\circ$ [ $\angle$ s in the same seg/ <i><math>\angle</math>e in dies. <math>\odot</math> segment</i> ]	✓ S ✓ S / R (2)
9.1.3	$\hat{F}_1 = \hat{E}_4 = 72^\circ$ [alt $\angle$ s; $DE \parallel GF$ / <i>verw. <math>\angle</math>e; <math>DE \parallel GF</math> ] <math>\therefore \hat{GEF} = 52^\circ</math> [sum of <math>\angle</math>s in <math>\Delta</math> / <i><math>\angle</math>e van <math>\Delta</math> ] <b>OR/OF</b> <math>\hat{E}_1 = 56^\circ</math> [alt <math>\angle</math>s; <math>DE \parallel GF</math> / <i>verw. <math>\angle</math>e; <math>DE \parallel GF</math> ] <math>\therefore \hat{GEF} = 52^\circ</math> [<math>\angle</math>s on a str. line/ <i><math>\angle</math>e op 'n reguitlyn</i>]</i></i></i>	✓ S / R ✓ S (2) ✓ S / R ✓ S (2)



9.2



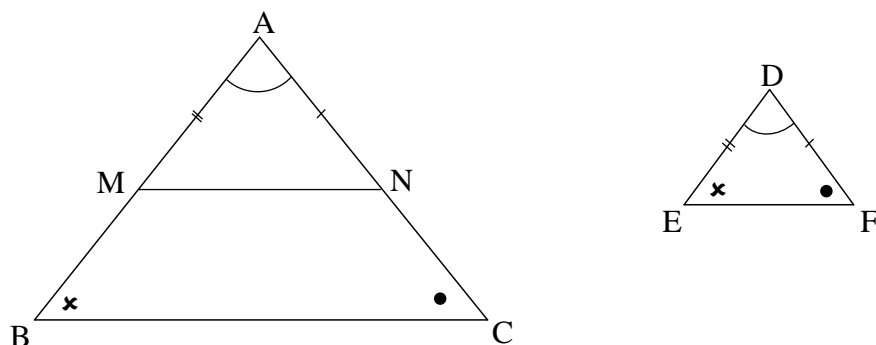
9.2.1	$NP = PL = 16$ $PT = 4$ $NP : PT = 16 : 4$ $= 4 : 1$	[diag of $\parallel m$ / hoeklyne van $\parallel m$ ]  ✓ S   ✓ R ✓ S ✓ answer  (4)
9.2.2	$NM : MS = 4 : 1$ $NP : PT = NM : MS$ $KM \parallel RS$ [line divides two sides of $\Delta$ in prop / <i>Lyn verdeel 2 sye v <math>\Delta</math> eweredig</i> ]  <b>OR/OF</b> [converse prop theorem / <i>omgekeerde lyn <math>\parallel</math> een sy v <math>\Delta</math></i> ]	✓ S ✓ R  (2)
9.2.3	$\frac{RL}{KL} = \frac{TL}{LP}$ [prop theorem; $KM \parallel RS$ <b>OR</b> line $\parallel$ one side of $\Delta$ / <i>Lyn <math>\parallel</math> een sy v <math>\Delta</math></i> ]  $RL = \frac{12 \times 21}{16}$ $= 15,75$	✓ S   ✓ R  ✓ S ✓ answer  (4)

	<p><b>OR / OF</b></p> <p>NM : MS = 4 : 1</p> <p>KR = MS = 5,25                      [opp side of <math>\parallel^m</math> / teenoorst. sye van <math>\parallel^m</math>]</p> <p>KL = NM = 21</p> <p>RL + 5,25 = 21</p> <p>RL = 15,75</p>	<p>✓ S   ✓ R</p> <p>✓ S</p> <p>✓ answer</p> <p>(4)</p>
<b>[16]</b>		



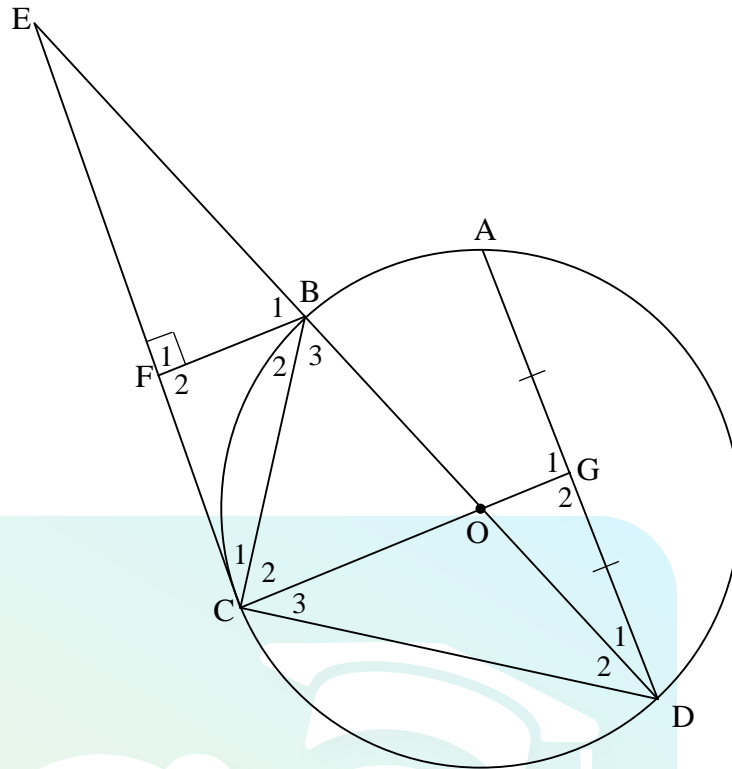
## QUESTION/VRAAG 10

10.1



10.1	<p>Constr: Let M and N lie on AB and AC respectively such that <math>AM = DE</math> and <math>AN = DF</math>. Draw MN.</p> <p>Proof: In <math>\triangle AMN</math> and <math>\triangle DEF</math></p> <p><math>AM = DE</math> [Constr / Konstruksie]  <math>AN = DF</math> [Constr / Konstruksie]  <math>\hat{A} = \hat{D}</math> [Given / Gegee]  <math>\therefore \triangle AMN \cong \triangle DEF</math> [<math>s, \angle, s</math>]  <math>\therefore \hat{A}MN = \hat{E} = \hat{B}</math>  <math>MN \parallel BC</math> [corresp <math>\angle</math>'s are equal/ ooreenk. <math>\angle</math> e gelyk]  <math>\frac{AB}{AM} = \frac{AC}{AN}</math> [line <math>\parallel</math> one side of <math>\triangle</math> <b>OR/OF</b> prop theorem; <math>MN \parallel BC</math>  / Lyn <math>\parallel</math> een sy v <math>\triangle</math>]  <math>\therefore \frac{AB}{DE} = \frac{AC}{DF}</math> [<math>AM = DE</math> and <math>AN = DF</math>]</p>	<p>✓Constr</p> <p>✓S ✓R</p> <p>✓S /R</p> <p>✓S ✓R</p> <p>(6)</p>
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10.2



10.2.1(a)	$\hat{F}\hat{C}O = 90^\circ$ [tan $\perp$ radius / raaklyn $\perp$ radius] $\hat{F}_1 = 90^\circ$ [BF $\perp$ EC] $\therefore \hat{F}\hat{C}O = \hat{F}_1 = 90^\circ$ FB $\parallel$ CG [corresp $\angle$ s = / ooreenk. $\angle$ gelyk]	$\checkmark$ S / R  $\checkmark$ S  $\checkmark$ R
10.2.1(b)	In $\triangle FCB$ and $\triangle CDB$ $\hat{B}\hat{C}D = 90^\circ$ [ $\angle$ in semi-circle / $\angle \frac{1}{2} \odot$ ] $\hat{F}_2 = 90^\circ$ [BF $\perp$ EC] $\therefore \hat{F}_2 = \hat{B}\hat{C}D = 90^\circ$ $\hat{C}_1 = \hat{D}_2$ [tan chord theorem / $\angle$ tussen rkl en koord] $\hat{B}_2 = \hat{B}_3$ [sum of $\angle$ s in $\triangle$ / $\angle$ e van $\triangle$ ] $\therefore \triangle FCB \parallel \triangle CDB$  <b>OR/OF</b> In $\triangle FCB$ and $\triangle CDB$ $\hat{B}\hat{C}D = 90^\circ$ [ $\angle$ in semi-circle / $\angle \frac{1}{2} \odot$ ] $\hat{F}_2 = 90^\circ$ [BF $\perp$ EC] $\therefore \hat{F}_2 = \hat{B}\hat{C}D = 90^\circ$ $\hat{C}_1 = \hat{D}_2$ [tan chord theorem / $\angle$ tussen rkl en koord] $\therefore \triangle FCB \parallel \triangle CDB$ [ $\angle, \angle, \angle$ ]	$\checkmark$ S / R  $\checkmark$ S  $\checkmark$ S $\checkmark$ R  $\checkmark$ S  $\checkmark$ S / R  $\checkmark$ S  $\checkmark$ S $\checkmark$ R  $\checkmark$ R

(3)

(5)

10.2.2	$\hat{G}_1 = 90^\circ$ [line from centre to midpt of chord / <i>midpt. <math>\odot</math>; midpt. koord</i> ]	✓ R (1)
10.2.3	In $\triangle GCD$ and $\triangle CDB$ $\hat{G}_2 = \hat{B}\hat{C}\hat{D} = 90^\circ$ $\hat{C}_3 = \hat{D}_2$ [∠s opp equal sides / <i>∠e teenoor gelyke sye</i> ] $\hat{G}\hat{D}\hat{C} = \hat{B}_3$ [sum of ∠s in $\triangle$ / <i>∠e van <math>\triangle</math></i> ] $\therefore \triangle GCD \parallel \triangle CDB$ [∠, ∠, ∠] $\therefore \frac{CD}{DB} = \frac{CG}{CD}$ [    $\triangle$ s] $\therefore CD^2 = CG \cdot DB$	✓ identifying $\triangle$ s ✓ S ✓ S / R ✓ S <b>OR</b> ✓ R ✓ S (5)
10.2.4	$\frac{BC}{DB} = \frac{FB}{BC}$ [ $\triangle FCB \parallel \triangle CDB$ ] $\therefore BC^2 = DB \cdot FB$ $CD^2 + BC^2 = CG \cdot DB + DB \cdot FB$ $DB^2 = DB(CG + FB)$ $DB = CG + FB$	✓ S ✓ R ✓ S ✓ sum ✓ $DB^2 = CD^2 + BC^2$ (5)
		[25]

**TOTAL/TOTAAL: 150**