



# basic education

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

**NATIONAL  
SENIOR CERTIFICATE  
NASIONALE  
SENIOR SERTIFIKAAT**

**GRADE/GRAAD 11**

**MATHEMATICS P2/WISKUNDE V2**

**NOVEMBER 2019**

**MARKING GUIDELINES/NASIENRIGLYNE**

**MARKS/PUNTE: 150**

**These marking guidelines consist of 21 pages./  
Hierdie nasienriglyne bestaan uit 21 bladsye.**

**NOTE:**

- If a candidate answered a question TWICE, mark only the FIRST attempt.
- If a candidate crossed out an answer and did not redo it, mark the crossed-out answer.
- Consistent accuracy applies to ALL aspects of the marking memorandum.
- Assuming values/answers in order to solve a problem is unacceptable.

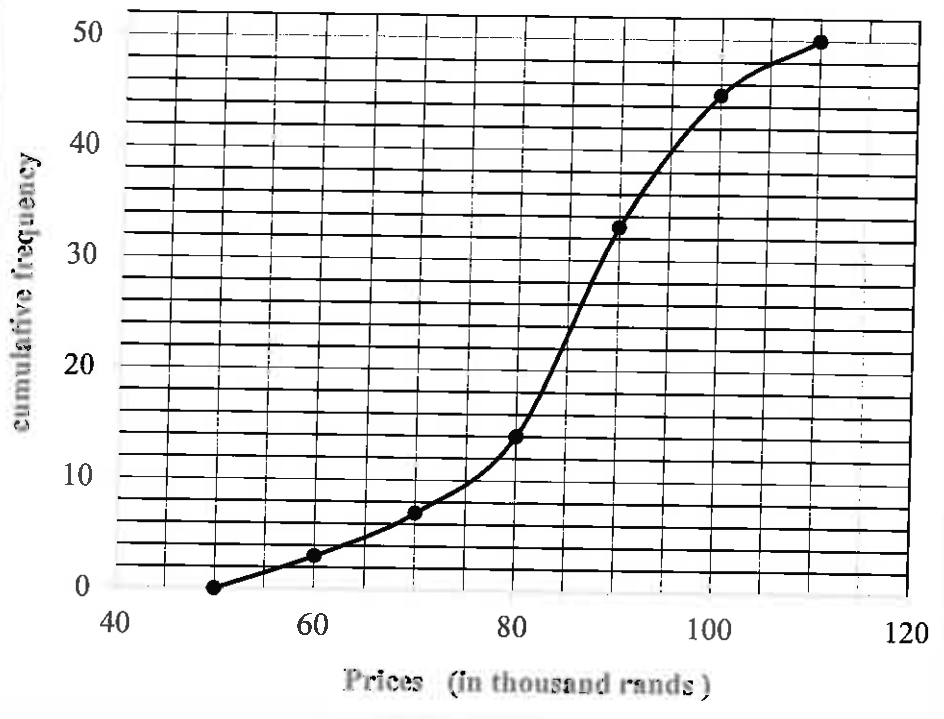
**LET WEL:**

- As 'n kandidaat 'n vraag TWEE keer beantwoord het, sien slegs die EERSTE poging na.
- As 'n kandidaat 'n antwoord deurgehaal en nie oorgedoen het nie, sien die deurgehaalde antwoord na.
- Volgehoue akkuraatheid is op ALLE aspekte van die memorandum van toepassing.
- Dit is onaanvaarbaar om waardes/antwoorde te veronderstel om 'n probleem op te los.

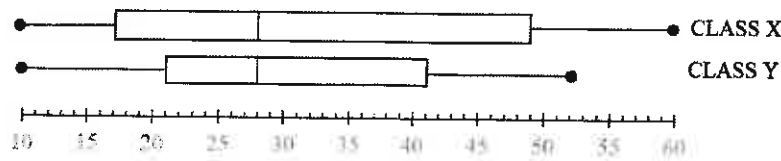
**QUESTION/VRAAG 1**

1.1	SELLING PRICE/ VERKOOPSPRYS (IN THOUSANDS OF RANDS/ IN DUISENDE RAND)	FREQUENCY/ FREKWENSIE	CUMULATIVE FREQUENCY/ KUMULATIEWE FREKWENSIE	
	$50 \leq x < 60$	3	3	
	$60 \leq x < 70$	4	7	$\checkmark a = 7$
	$70 \leq x < 80$	7	14	
	$80 \leq x < 90$	19	33	
	$90 \leq x < 100$	12	45	$\checkmark b = 45$
	$100 \leq x < 110$	5	50	

(2)

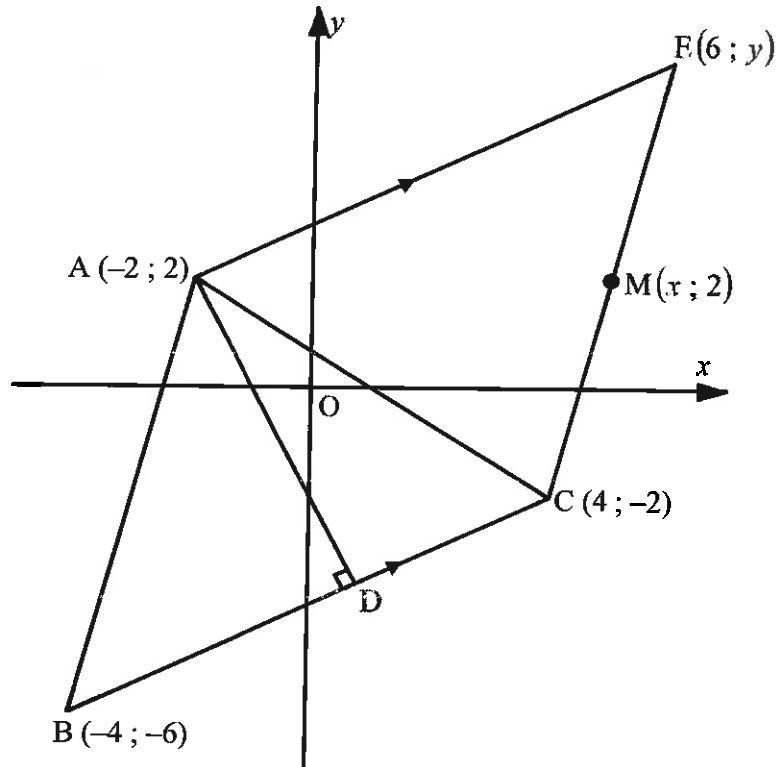
<p>1.2</p>	<p style="text-align: center;"><b>Cumulative frequency graph on the price of cars</b></p>  <table border="1" style="display: none;"> <caption>Data points for the cumulative frequency graph</caption> <thead> <tr> <th>Price (thousand rands)</th> <th>Cumulative Frequency</th> </tr> </thead> <tbody> <tr><td>50</td><td>0</td></tr> <tr><td>60</td><td>3</td></tr> <tr><td>70</td><td>7</td></tr> <tr><td>80</td><td>14</td></tr> <tr><td>90</td><td>33</td></tr> <tr><td>100</td><td>44</td></tr> <tr><td>110</td><td>50</td></tr> </tbody> </table>	Price (thousand rands)	Cumulative Frequency	50	0	60	3	70	7	80	14	90	33	100	44	110	50	<ul style="list-style-type: none"> <li>✓ grounding/ geanker (50:0)</li> <li>✓ upper boundry/ boonste grens</li> <li>✓ smooth curve/ gladde kurwe</li> </ul> <p style="text-align: right;">(3)</p>
Price (thousand rands)	Cumulative Frequency																	
50	0																	
60	3																	
70	7																	
80	14																	
90	33																	
100	44																	
110	50																	
<p>1.3</p>	<p>(95 000 ; 40) 40 cars to choose from/40 motors om vanuit te kies (Accept any answer between 37 and 43/ Aanvaar enige antwoord tussen 37 en 43)</p>	<p style="text-align: right;">(1)</p>																
		<p><b>[6]</b></p>																

## QUESTION/VRAAG 2



2.1.1	Positively skewed/Positief skeef or/of skewed to the right/skeef na regs	✓ answer/antwoord (1)														
2.1.2	Class/Klas X	✓ answer/antwoord (1)														
2.1.3	Answer with appropriate justification	✓  ✓  (2)														
2.2.1	$a = 5$ $g = 5 + 48$ $= 53$ $d = 22$ $b = 5 + 7$ $= 12$ $f = 12 + 28$ $= 40$ $\frac{c + 2c + 132}{7} = 27$ $3c = 57$ $c = 19$ $e = 38$	<table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th>a</th> <th>b</th> <th>c</th> <th>d</th> <th>e</th> <th>f</th> <th>g</th> </tr> </thead> <tbody> <tr> <td>5</td> <td>12</td> <td>19</td> <td>22</td> <td>38</td> <td>40</td> <td>53</td> </tr> </tbody> </table> $\frac{1}{1,13}$ $\frac{1}{42,87}$ ✓ $a = 5$ ✓ $b = 12$ ✓ $\frac{c + 2c + 132}{7} = 27$ ✓ $c = 19$ ✓ $d = 22$ ✓ $e = 38$ ✓ $f = 40$ ✓ $g = 53$ (8)	a	b	c	d	e	f	g	5	12	19	22	38	40	53
a	b	c	d	e	f	g										
5	12	19	22	38	40	53										
2.2.2	$(\bar{x} - \sigma; \bar{x} + \sigma)$ $(27 - 15,87; 27 + 15,87)$ $(11,13; 42,87)$ 5 goals were scored within one standard deviation of the mean/ 5 doele is binne een standaardafwyking van die gemiddeld aangeteken	✓✓ (11,13; 42,87) ✓ answer/antwoord (3) [15]														

**QUESTION/VRAAG 3**

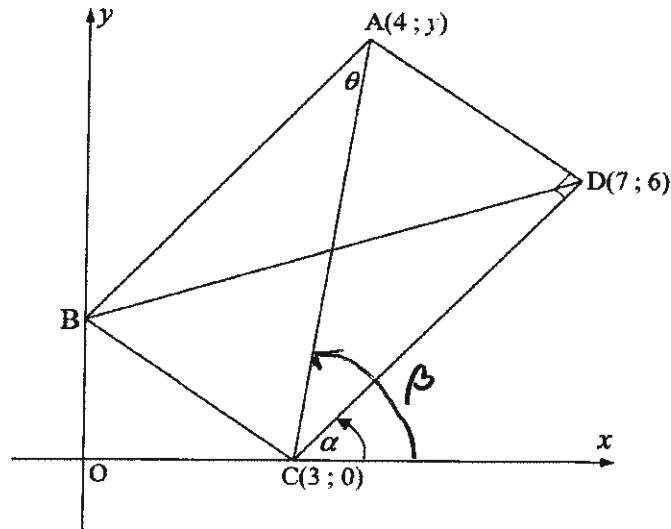


<p>3.1</p>	<p>B(-4;-6) C(4;-2)</p> $m_{BC} = \frac{y_2 - y_1}{x_2 - x_1}$ $= \frac{-2 - (-6)}{4 - (-4)}$ $= \frac{4}{8}$ $= \frac{1}{2}$ <p style="text-align: center;">OR OR</p> $m_{BC} = \frac{y_2 - y_1}{x_2 - x_1}$ $= \frac{-6 - (-2)}{-4 - 4}$ $= \frac{-4}{-8}$ $= \frac{1}{2}$	<p>✓ gradient formula/ gradiëntformule</p> <p>✓ subst into/ vervanging in gradient form./ gradiëntform.</p> <p>✓ answer/antwoord</p> <p style="text-align: right;">(3)</p>
<p>3.2</p>	$x = \frac{6+4}{2}$ $x = 5$ $\frac{y+(-2)}{2} = 2$ $y = 6$	<p>✓ <math>x = 5</math></p> <p>✓ <math>\frac{y+(-2)}{2} = 2</math></p> <p>✓ <math>y = 6</math></p> <p style="text-align: right;">(3)</p>

3.3	$BC = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$ $= \sqrt{((-4) - 4)^2 + ((-6) - (-2))^2}$ $= \sqrt{80}$	✓ subst. in distance formula/verv. in afstandformule  ✓ answer/antwoord (2)
3.4	Parallelogram	✓ answer/antwoord (1)
3.5	$m_{AD} = -2 \text{ (AD} \perp \text{BC)}$ $y = -2x + c$ $2 = -2(-2) + c \quad \text{sub } A(-2; 2)$ $-2 = c$ $\therefore y = -2x - 2$ <p><b>OR/OF</b></p> $m_{AD} = -2 \text{ (AD} \perp \text{BC)}$ $y - 2 = -2(x - (-2))$ $y - 2 = -2x - 4$ $\therefore y = -2x - 2$	✓ $m_{AD} = -2$  ✓ subst. of/verv. m and point/en punt $(-2; 2)$ / ✓ answer/antwoord  ✓ $m_{AD} = -2$ ✓ subst. of/verv. m and point/en punt $(-2; 2)$ ✓ answer/antwoord (3)

<p>3.6</p>	$m_{BC} = \frac{1}{2}$ <p>Equation of/Verg. van BC:</p> $y = \frac{1}{2}x + c$ $-2 = \frac{1}{2}(4) + c$ $-4 = c$ $\therefore y = \frac{1}{2}x - 4$ $-2x - 2 = \frac{1}{2}x - 4$ $-4x - 4 = x - 8$ $4 = 5x$ $x = \frac{4}{5}$ $y = (-2)\frac{4}{5} - 2$ $= \frac{-18}{5}$ <p>D(<math>\frac{4}{5}; \frac{-18}{5}</math>)</p> $y - (-2) = \frac{1}{2}(x - 4)$ $y + 2 = \frac{1}{2}x - 2$ $\therefore y = \frac{1}{2}x - 4$ $y = \frac{1}{2}\left(\frac{4}{5}\right) - 4$ $= \frac{-18}{5}$ <p>OR/OR</p>	<p>✓ subst. of/verv. m and point/en punt (4;-2)/</p> <p>✓ <math>y = \frac{1}{2}x - 4</math></p> <p>✓ equating both equations/vergelyking van beide vergelykings</p> <p>✓ x-value/-waarde</p> <p>✓ y-value/-waarde</p> <p>(5)</p>
<p>3.7</p>	$AD = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$ $= \sqrt{\left(\left(\frac{4}{5}\right) - (-2)\right)^2 + \left(\left(\frac{-18}{5}\right) - 2\right)^2}$ $= \frac{14\sqrt{5}}{5}$ <p>Area of/Oppervlakte van <math>\Delta AEC = \frac{1}{2}AE \times AD</math></p> $= \frac{1}{2} \times \sqrt{80} \times \frac{14\sqrt{5}}{5}$ $= 28 \text{ units}^2 / \text{eenhede}^2$	<p>✓ length of AD/ lengte van AD</p> <p>✓ subst into area formula</p> <p>✓ answer/antwoord</p> <p>(3)</p> <p>[20]</p>

**QUESTION/VRAAG 4**

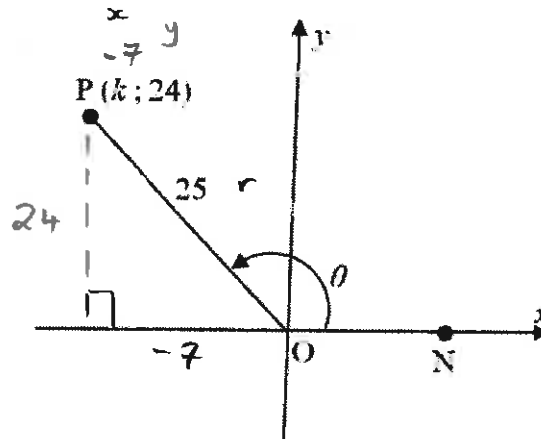


4.1	$m_{DC} = \frac{y_2 - y_1}{x_2 - x_1}$ $= \frac{6 - 0}{7 - 3}$ $= \frac{3}{2}$	✓ substitution in gradient formula/ vervanging in gradiëntformule ✓ $m_{DC} = \frac{3}{2}$ (2)
4.2	$\tan \alpha = m_{CD}$ $\tan \alpha = \frac{3}{2}$ I : $\alpha = 56,31^\circ$ <i>mf = 56,30...° tan + m</i>	✓ $\tan \alpha = \frac{3}{2}$ ✓ $\alpha = 56,31^\circ$ (2)
4.3	$m_{CD} \times m_{AD} = -1$ $\frac{3}{2} \times \frac{y-6}{4-7} = -1$ $\frac{y-6}{-3} = -\frac{2}{3}$ $3y-18=6$ $y-6=2$ $y=8$	✓ $\frac{y-6}{-3} = -\frac{2}{3}$ ✓ $3y-18=6$ ✓ $y=8$ (4)

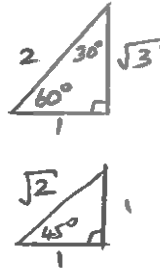


4.4	$m_{AC} = \frac{8-0}{4-3} = 8$ $\therefore \text{Inclination of AC} = \tan^{-1}(8)$ $\hat{\angle} \beta = 82,87^\circ$ $\hat{A}CD = 82,87^\circ - 56,31^\circ$ $= 26,56^\circ$ $\therefore \theta = 26,56^\circ \quad \text{alt}'s =, AB \parallel CD$	$\checkmark m_{AC} = 8$ $\checkmark 82,87^\circ$ $\checkmark \hat{A}CD = 82,87^\circ - 56,31^\circ$ $\checkmark \hat{A}CD = 26,56^\circ$ $\checkmark \theta = 26,56^\circ$ <p style="text-align: right;">(5)</p>
		[13]

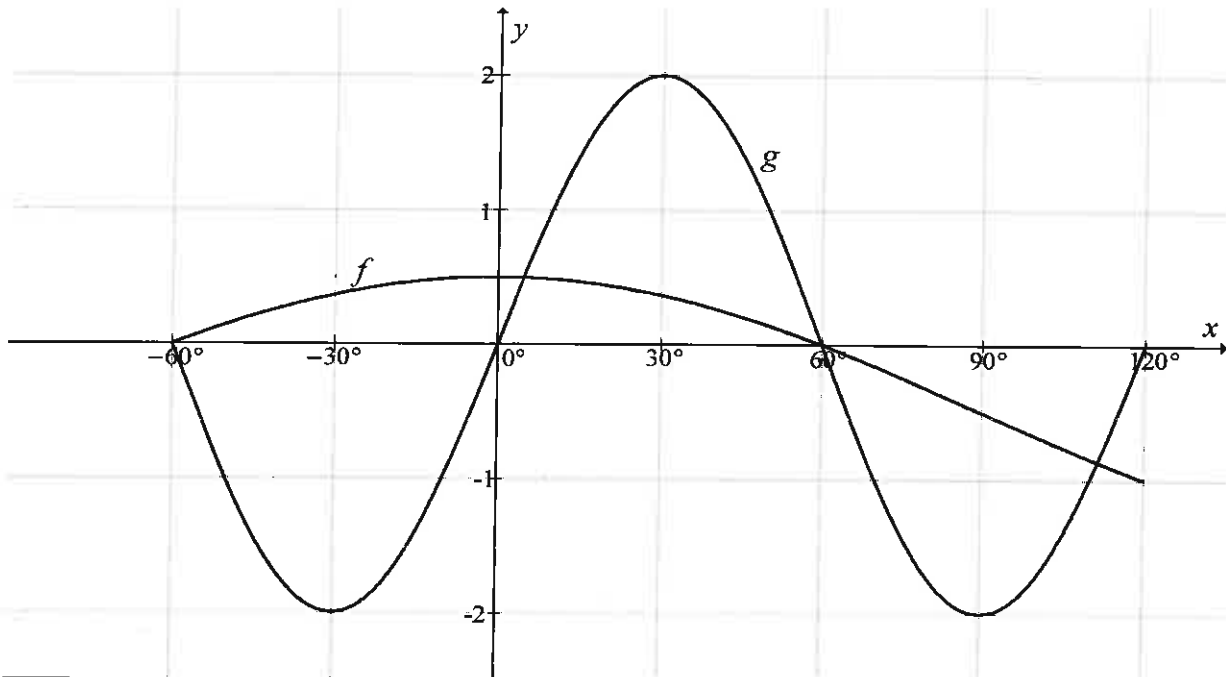
**QUESTION/VRAAG 5**



5.1.1	$x^2 + y^2 = r^2$ $(k)^2 + (24)^2 = 25^2$ $k^2 = 49$ $k = -7$ <i>Pythag</i>	✓ subst./ vervanging ✓ answer/antwoord (2)
5.1.2	$\tan \theta = -\frac{24}{7}$ <i>x/y</i>	✓ answer/antwoord (1)
5.1.3	$\theta + \alpha = 360^\circ$ $\alpha = 360^\circ - \theta$ $\sin \alpha = \sin(360^\circ - \theta)$ $= -\sin \theta$ $= -\frac{24}{25}$ <i>T/y</i>	✓ $\sin \alpha = \sin(360^\circ - \theta)$ ✓ $-\sin \theta$ ✓ answer/antwoord (3)
5.1.4	$\cos^2 \theta - \sin^2 \alpha$ $= \left(\frac{-7}{25}\right)^2 - \left(-\frac{24}{25}\right)^2$ $= \frac{-527}{625}$ $\left(\frac{x}{r}\right)^2$ $\left(\frac{y}{r}\right)^2$	✓✓ substitution/ vervanging ✓ answer/antwoord (3)

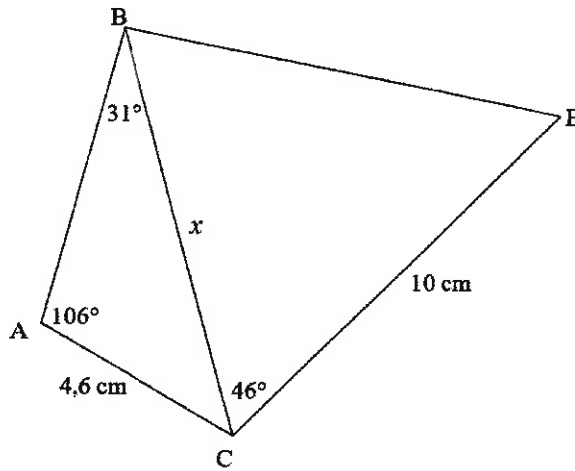
<p>5.2</p>	$\frac{\cos 210^\circ \cdot \tan 135^\circ}{\sin(-60^\circ) \cdot \cos 420^\circ}$ $= \frac{-\cos 30^\circ \cdot -\tan 45^\circ}{-\sin 60^\circ \cdot \cos 60^\circ}$ $= \frac{\left(-\frac{\sqrt{3}}{2}\right)(-1)}{\left(-\frac{\sqrt{3}}{2}\right) \cdot \frac{1}{2}}$ $= -2$  <p>• no Δ or incorrect Δ, no marks • max 2/5</p>	<p>✓ <math>-\cos 30^\circ \cdot -\tan 45^\circ</math> ✓ <math>-\sin 60^\circ \cdot \cos 60^\circ</math> ✓ <math>\left(-\frac{\sqrt{3}}{2}\right)(-1)</math> ✓ <math>\left(-\frac{\sqrt{3}}{2}\right) \cdot \frac{1}{2}</math> ✓ answer/antwoord (5)</p>
<p>5.3</p>	$\text{LHS} = \frac{1}{\tan^2 x} - \cos^2 x$ $= \frac{1}{\frac{\sin^2 x}{\cos^2 x}} - \cos^2 x$ $= \frac{\cos^2 x}{\sin^2 x} - \cos^2 x$ $= \frac{\cos^2 x - \cos^2 x \sin^2 x}{\sin^2 x}$ $= \frac{\cos^2 x(1 - \sin^2 x)}{\sin^2 x}$ $= \frac{\cos^2 x(\cos^2 x)}{\sin^2 x}$ $= \frac{\cos^4 x}{\sin^2 x}$ <p>= RHS</p>	<p>✓ <math>\frac{\sin^2 x}{\cos^2 x}</math> ✓ common denominator/gemene noemer ✓ factors/faktore ✓ <math>1 - \sin^2 x = \cos^2 x</math> (4)</p>
<p>5.4</p>	$\sqrt{2} \sin x \cos x = \cos x$ $\sqrt{2} \sin x \cos x - \cos x = 0$ $\cos x(\sqrt{2} \sin x - 1) = 0$ <p><math>\cos x = 0</math> <math>x = 90^\circ + 360^\circ k, k \in \mathbb{Z}</math> or <math>x = 270^\circ + 360^\circ k, k \in \mathbb{Z}</math></p> <p>OR <math>x = 90^\circ + 180^\circ k, k \in \mathbb{Z}</math></p> <p>both <math>\sin x = \frac{1}{\sqrt{2}}</math> ref <math>\angle = 45^\circ</math> sin + in I: <math>x = 45^\circ + 360^\circ k, k \in \mathbb{Z}</math> or II: <math>x = 135^\circ + 360^\circ k, k \in \mathbb{Z}</math></p> <p>• no <math>k \in \mathbb{Z}, -1</math></p>	<p>✓ standard form/stand.vorm ✓ factors/faktore ✓ both equations/beide vergelykings ✓ <math>x = 90^\circ + 360^\circ k, k \in \mathbb{Z}</math> ✓ <math>x = 45^\circ + 360^\circ k, k \in \mathbb{Z}</math> ✓ <math>x = 135^\circ + 360^\circ k, k \in \mathbb{Z}</math> (6) [24]</p>

**QUESTION/VRAAG 6**

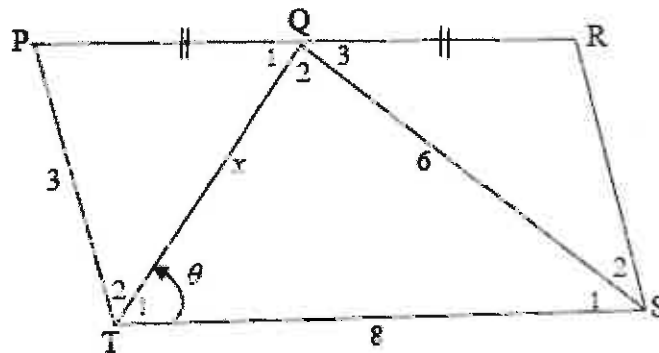


6.1	(30°:2)	✓ answer/antwoord (1)
6.2	$-60^\circ < x < 0^\circ$ $x \in (-60^\circ; 0^\circ)$ int ✓ not ✓ • only award not mark if int correct	✓ endpoints/eindpunte ✓ notation/notasie (2)
6.3	$q = -\frac{1}{2}$ $b = 3$	✓ $q = -\frac{1}{2}$ ✓ $b = 3$ (2)
6.4	$2 \cos x \sin 3x - \sin 3x \geq 0$ $2 \sin 3x \left( \cos x - \frac{1}{2} \right) \geq 0$ $g(x).f(x) \geq 0$ $0^\circ \leq x \leq 120^\circ$ or $x = -60^\circ$	✓✓ $2 \sin 3x \left( \cos x - \frac{1}{2} \right) \geq 0$ ✓ ✓ (4)
		[9]

**QUESTION/VRAAG 7**

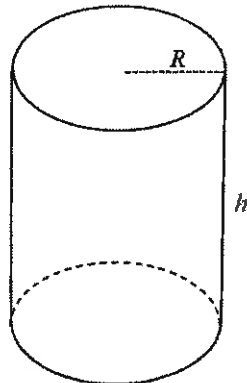


7.1.1	$\frac{BC}{\sin \hat{A}} = \frac{AC}{\sin \hat{B}}$ $\frac{x}{\sin 106^\circ} = \frac{4,6}{\sin 31^\circ}$ $x = \frac{4,6 \sin 106^\circ}{\sin 31^\circ}$ $x = 8,59 \text{ cm}$	✓ substitution into sine rule/vervang in sinusreël ✓ $x = \frac{4,6 \sin 106^\circ}{\sin 31^\circ}$ ✓ answer/antwoord (3)
7.1.2	$\hat{A}CB = 43^\circ$ <i>Sum <math>\hat{A}</math>s in <math>\Delta = 180^\circ</math></i> $\text{Area ACEB} = \left( \frac{1}{2} \times AC \times BC \times \sin \hat{A}CB \right) + \left( \frac{1}{2} \times BC \times CE \times \sin \hat{B}CE \right)$ $= \left( \frac{1}{2} \times 4,6 \times 8,59 \times \sin 43^\circ \right) + \left( \frac{1}{2} \times 8,59 \times 10 \times \sin 46^\circ \right)$ $= 44,37 \text{ cm}^2$	✓ $\hat{A}CB = 43^\circ$  ✓ ✓ substitution/vervang ✓ answer/antwoord (4)



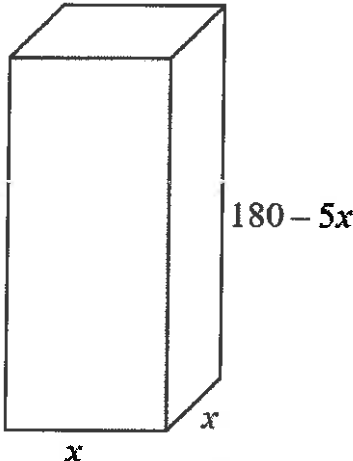
7.2.1	<p>In <math>\Delta QTS</math></p> $6^2 = 8^2 + x^2 - 2(8)(x)\cos\theta$ $16x\cos\theta = 8^2 + x^2 - 6^2$ $16x\cos\theta = x^2 + 28$ $\cos\theta = \frac{28 + x^2}{16x}$	<p>✓✓ substitution into cosine rule/                  vervanging in cosinusreël                  ✓ <math>16x\cos\theta = x^2 + 28</math></p> <p>(3)</p>
7.2.2	<p><math>\hat{Q}_1 = \theta</math> and <math>PQ = 4</math></p> <p>In <math>\Delta QTP</math></p> $3^2 = 4^2 + x^2 - 2(4)(x)\cos\theta$ $8x\cos\theta = 4^2 + x^2 - 3^2$ $8x\cos\theta = x^2 + 7$ $\cos\theta = \frac{7 + x^2}{8x}$ $\frac{7 + x^2}{8x} = \frac{28 + x^2}{16x}$ $112x + 16x^3 = 224x + 8x^3$ $8x^3 = 112x$ $8x^3 - 112x = 0$ $8x(x^2 - 14) = 0$ $x \neq 0 \quad x = \sqrt{14}$ <p><i>alt "S =, PR IITS opp sides    fm =</i></p>	<p>✓</p> <p><math>\hat{Q}_1 = \theta</math> and <math>PQ = 4</math></p> <p>✓</p> $3^2 = 4^2 + x^2 - 2(4)(x)\cos\theta$ $\checkmark \cos\theta = \frac{7 + x^2}{8x}$ <p>✓ equating/                  vergelyking</p> <p>✓ factors/faktore</p> <p>✓ <math>x \neq 0 \quad x = \sqrt{14}</math></p> <p>(6)</p>
		[16]

**QUESTION/VRAAG 8**



Volume of sphere =  $\frac{4}{3}\pi r^3$   
 Surface area of a sphere =  $4\pi r^2$

Volume of sfeer =  $\frac{4}{3}\pi r^3$   
 Oppervlakte van 'n sfeer =  $4\pi r^2$

8.1.1	$V = \pi r^2 h$ $300 = \pi R^2 h$ $h = \frac{300}{\pi R^2}$	✓ substitution/ vervanging ✓ isolating h/ isoleer h (2)
8.1.2	$\text{Volume of marbles} = 100 \left( \frac{4}{3} \pi r^3 \right)$ $= 100 \times \frac{4}{3} \pi (0.75)^3$ $= \frac{225\pi}{4}$ $= 176,71 \text{ cm}^3$ <p>amount of water = <math>300 - 176,71</math></p> $= 123,29 \text{ cm}^3$ 	✓ subst. into formula/vervanging in formule  ✓ 176,71  ✓ 123,29 cm <sup>3</sup> (3)

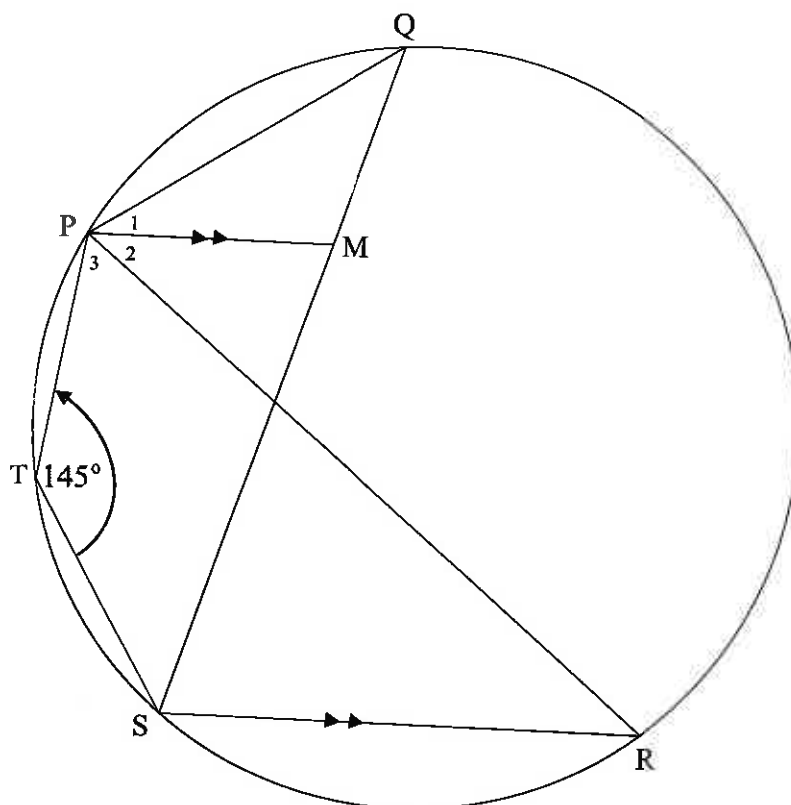
8.2	<p>TSA = <math>2 \times</math> area of the base + (perimeter <math>\times</math> height)</p> <p>TSA = <math>2 \times</math> oppervlakte van basis <math>\pm</math> (omtrek <math>\times</math> hoogte)</p> <p><math>= 2(x^2) + 4x(180 - 5x)</math></p> <p><math>= 2x^2 + 720x - 20x^2</math></p> <p><math>= -18x^2 + 720x</math></p> <p>Surface area will be maximum when</p> <p>Oppervlakte sal op maksimum wees wanneer</p> <p><math>x = \frac{-b}{2a} = \frac{-720}{2(-18)} = 20</math></p> <p>max. surface area/maks. oppervlakte = <math>-18(20)^2 + 720(20)</math></p> <p style="text-align: center;"><math>= 7200 \text{ cm}^2</math></p>	<p>✓ subst. into formula/vervanging in formule</p> <p>✓ simplification/vereenvoudiging</p> <p>✓ value of/waarde van <math>x</math></p> <p>✓ subst./verv <math>x = 20</math></p> <p>✓ answer/antwoord (5)</p> <p style="text-align: right;">[10]</p>
-----	--	---

$$TSA = 2x \begin{array}{|c|} \hline x \\ \hline \end{array} x + 4x \begin{array}{|c|} \hline 180-x \\ \hline x \\ \hline \end{array}$$

$$= 2x^2 + 4x(180-x)$$

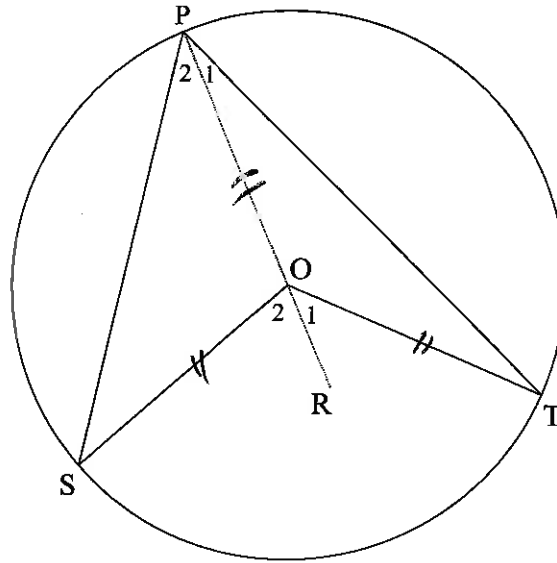


**QUESTION/VRAAG 9**

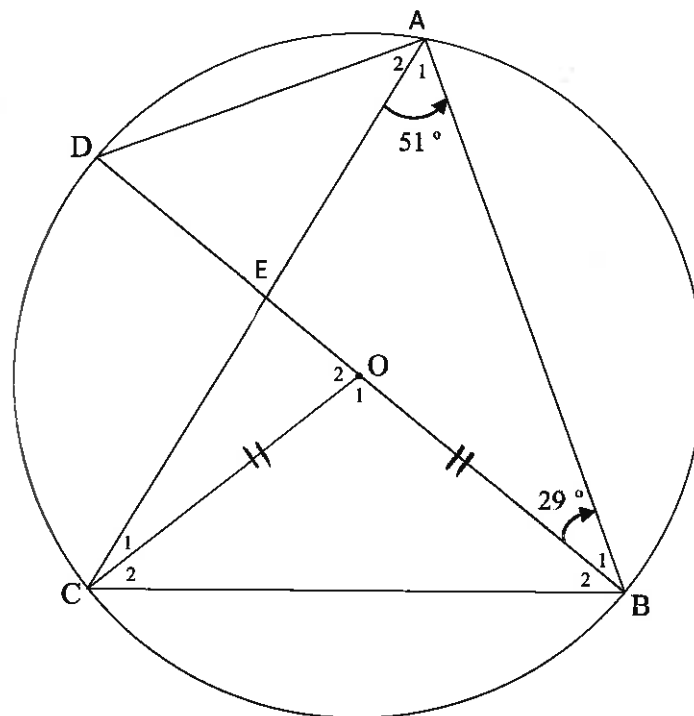


9.1.1	$\hat{Q} = 180^\circ - 145^\circ$ [opp $\angle^s$ of cyclic quad ] $= 35^\circ$	$\checkmark$ S $\checkmark$ R (2)
9.1.2	$\hat{R} = 180^\circ - 145^\circ$ [opp $\angle^s$ of cyclic quad ] or [ $\angle^s$ in the same segment ] $= 35^\circ$	$\checkmark$ S $\checkmark$ R (2)
9.1.3	$\hat{P}_2 = \hat{R} = 35^\circ$ [alt $\angle^s$ , PM $\parallel$ SR]	$\checkmark$ S / R (1)
9.2	$\therefore \hat{P}_2 = \hat{Q}$ $\therefore$ PR is a tangent to circle PMQ [ <u>converse tan-chord theorem</u> ]	$\checkmark$ R (1)
		[6]

**QUESTION/VRAAG 10**

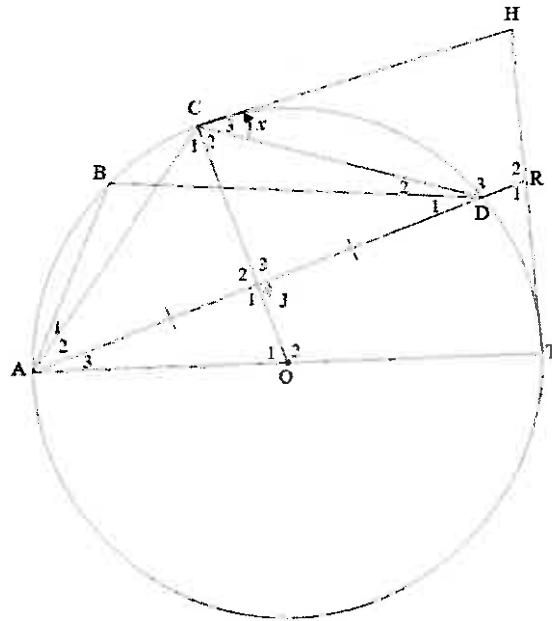


<p>10.1</p>	<p>Construction/Konstruksie: Draw/Trek POR                  Let <math>\hat{P}_2 = x</math>  <math>\hat{P}_2 = \hat{S}</math> [angles opp = sides, radii]  <math>\hat{O}_2 = 2x</math> [exterior <math>\angle</math> of <math>\Delta</math>]                  Let <math>\hat{P}_1 = y</math>  <math>\hat{P}_1 = \hat{T}</math> [angles opp = sides]  <math>\hat{O}_1 = 2y</math> [exterior <math>\angle</math> of <math>\Delta</math>]   <math>\hat{O}_1 + \hat{O}_2 = 2x + 2y = 2(x + y)</math>  <math>\hat{P}_1 + \hat{P}_2 = x + y</math>  <math>\therefore \hat{SOT} = 2 \times \hat{SPT}</math></p>	<p>✓ Construction/ Konstruksie                   ✓ S/R                  ✓ S/R                    ✓ S                   ✓ S                   (5)</p>
-------------	---	--



10.2.1	$\hat{O}_1 = 102^\circ$ [ angle at centre = 2 times angle at circumference / middelpuntshoek = 2 keer omtrekshoek ]	✓ S    ✓ R (2)
10.2.2	$\hat{A}_1 + \hat{A}_2 = 90^\circ$ $\hat{\text{in semi}} \hat{O} = 90^\circ$ $\hat{A}_2 = 39^\circ$	✓ S    ✓ R (2)
10.2.3.	$\hat{D} = 61^\circ$ [sum of int $\angle^s$ of $\Delta$ ]	✓ S (1)
10.2.4	$\hat{ACB} = \hat{D} = 61^\circ$ [ $\angle^s$ in the same segment] $\hat{C}_2 = \frac{180^\circ - 102^\circ}{2}$ [sum of int $\angle^s$ of $\Delta$ ] $= 39^\circ$ [als opp = sides, radius] $\hat{ACO} = 61^\circ - 39^\circ$ $= 22^\circ$	✓ S/R  ✓ S  ✓ S (3)
		[13]

**QUESTION/VRAAG 11**



11.1	$\hat{C}_3 = \hat{A}_2 = x$ [tan - chord]	✓ S ✓ R (2)
11.2	$\hat{J}_3 = 90^\circ$ [line from centre to midpt of chord] $\hat{O}CH = 90^\circ$ [tan $\perp$ rad] $CH \parallel JR$ [co - interior $\angle = 180^\circ$ ] $\therefore CHRJ$ is a trapezuim [one propp sides   ] <p style="text-align: center;"><b>OR/OF</b></p> $\hat{J}_4 = 90^\circ$ [line from centre to midpt of chord] $\hat{O}CH = 90^\circ$ [tan $\perp$ rad] $CH \parallel JR$ [corresp $\angle =$ ] $\therefore CHRJ$ is a trapezuim [one propp sides   ]	✓ S    ✓ R ✓ S    ✓ R ✓ S <p style="text-align: center;"><b>OR/OF</b></p> ✓ S    ✓ R ✓ S    ✓ R ✓ S (5)
11.3	In $\triangle CJA$ and $\triangle CJD$ $\hat{J}_2 = \hat{J}_3$ [line from centre to midpt of chord] $AJ = JD$ [given] $CJ = CJ$ [common side] $\therefore \triangle CJA \cong \triangle CJD$ [SAS] $\hat{C}_1 = \hat{C}_2$ [ $\triangle CJA \cong \triangle CJD$ ] $OC$ bisects $\hat{A}CD$	✓ S ✓ S ✓ S (3)

<p>11.4</p>	<p><math>\hat{C}_2 = 90^\circ - x</math> [tan <math>\perp</math> rad]  <math>\hat{B} = \hat{C}_1 + \hat{C}_2</math> [<math>\angle^s</math> in the same segment]  <math>= 90^\circ - x + 90^\circ - x</math> [<math>\hat{C}_1 = \hat{C}_2</math>]  <math>= 180^\circ - 2x</math></p> <p><b>OR/OF</b></p> <p><math>\hat{ADC} = x</math> [alt <math>\angle =</math>, CH <math>\parallel</math> JR ]  <math>\hat{C}_1 + \hat{C}_2 = 180^\circ - 2x</math> [sum of int <math>\angle^s</math> of <math>\Delta</math>]  <math>\hat{ABD} = 180^\circ - 2x</math> [<math>\angle^s</math> in the same segment]</p>	<p>✓ S                  ✓ S                  (2)</p> <p>✓ S                  ✓ S                  (2)</p>
<p>11.5</p>	<p><math>\hat{T} = 90^\circ</math> [tan <math>\perp</math> rad]  <math>\hat{CAO} = 90^\circ - x</math> [<math>\angle^s</math> opp = sides]  <math>x + \hat{A}_3 = 90^\circ - x</math>  <math>\hat{A}_3 = 90^\circ - 2x</math></p> <p><math>\therefore \hat{R}_2 = 90^\circ + 90^\circ - 2x</math> [ext <math>\angle^s</math> of <math>\Delta</math>]  <math>= 180^\circ - 2x</math></p>	<p>✓ S ✓ R                  ✓ S/R                  ✓ S                  ✓ S                  ✓ S                  (6)                  [18]</p>

TOTAAL: 150