



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.

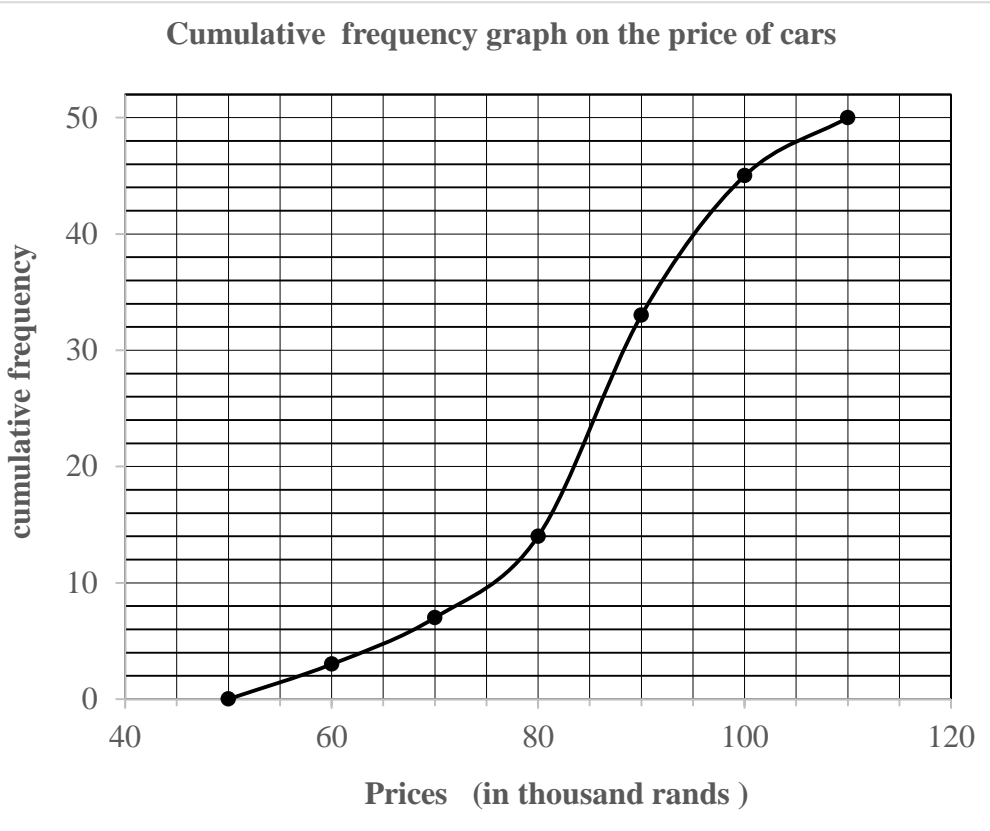
LET WEL:

- *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.*

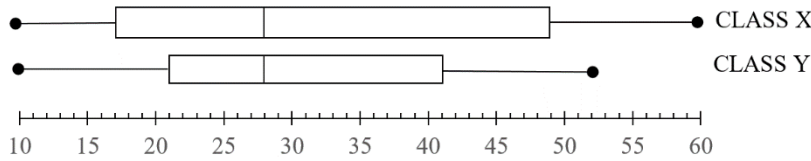
QUESTION/VRAAG 1

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)

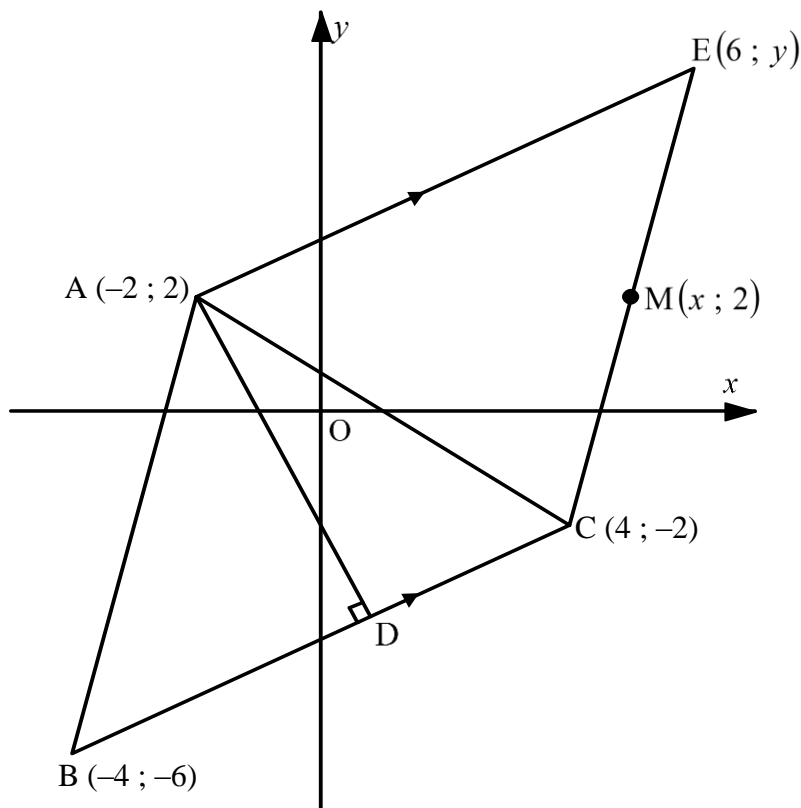
<p>1.2</p>	<p style="text-align: center;">Cumulative frequency graph on the price of cars</p>  <p style="text-align: center;">Prices (in thousand rands)</p>	<p>✓ grounding/ geanker (50:0) ✓ upper boundry/ boonste grens ✓ smooth curve/ gladde kurwe</p> <p style="text-align: right;">(3)</p>
<p>1.3</p>	<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>[6]</p>

QUESTION/VRAAG 2



2.1.1	Positively skewed/ <i>Positief skeef</i> or/of skewed to the right/ <i>skeef na regs</i>	✓ answer/ <i>antwoord</i> (1)
2.1.2	Class/ <i>Klas</i> X	✓ answer/ <i>antwoord</i> (1)
2.1.3	The average performance is the same./ <i>Die gemiddelde prestasie is dieselfde.</i> Both classes have the same median mark./ <i>Albei klasse het dieselfde mediaanpunt.</i>	✓ average performance is the same/ <i>gemiddelde prestasie dieselfde</i> ✓ same median mark/ <i>dieselfde mediaanpunt</i> (2)
2.2.1	$a = 5$ $g = 5 + 48$ $= 53$ $d = 22$ $b = 5 + 7$ $= 12$ $f = 12 + 28$ $= 40$ $\frac{c + 2c + 132}{7} = 27$ $3c = 57$ $c = 19$ $e = 38$	$\checkmark a = 5$ $\checkmark b = 12$ $\checkmark \frac{c + 2c + 132}{7} = 27$ $\checkmark c = 19$ $\checkmark d = 22$ $\checkmark e = 38$ $\checkmark f = 40$ $\checkmark g = 53$ (8)
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/ <i>5 doele is binne een standaardafwyking van die gemiddeld aangeteken</i>	$\checkmark \checkmark (11,13; 42,87)$ \checkmark answer/ <i>antwoord</i> (3) [15]

QUESTION/VRAAG 3

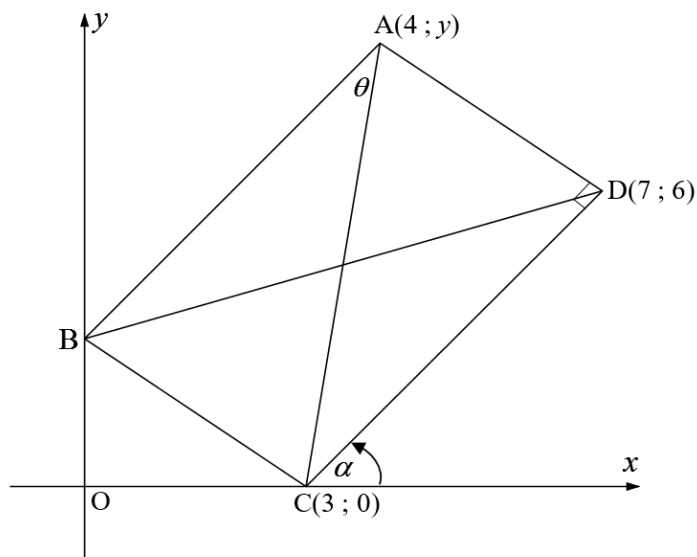


<p>3.1</p>	<p>B(-4;-6) C(4;-2)</p> $m_{BC} = \frac{y_2 - y_1}{x_2 - x_1}$ $= \frac{-2 - (-6)}{4 - (-4)}$ $= \frac{4}{8}$ $= \frac{1}{2}$ <p style="text-align: center;">OR/OF</p> $m_{BC} = \frac{y_2 - y_1}{x_2 - x_1}$ $= \frac{-6 - (-2)}{-4 - 4}$ $= \frac{-4}{-8}$ $= \frac{1}{2}$	<p>✓ gradient formula/ gradiëntformule ✓ subst into/ vervanging in gradient form./ gradiëntform.</p> <p>✓ answer/antwoord (3)</p>
<p>3.2</p>	$x = \frac{6+4}{2}$ $x = 5$ $\frac{y+(-2)}{2} = 2$ $y = 6$	<p>✓ $x = 5$ ✓ $\frac{y+(-2)}{2} = 2$ ✓ $y = 6$ (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	$m_{AD} = -2 \text{ (AD } \perp \text{ BC)}$ $y = \frac{4}{3}x + c$ $2 = -2(-2) + c$ $-2 = c$ $\therefore y = -2x - 2$ <p>OR/OF</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> $y = \frac{1}{2}x + c$ $-2 = \frac{1}{2}(4) + c$ $-4 = c$ $\therefore y = \frac{1}{2}x - 4$ $-2x - 2 = \frac{1}{2}x - 4$ $-4x - 4 = x - 8$ $4 = 5x$ $x = \frac{4}{5}$ $y = (-2)\frac{4}{5} - 2$ $= \frac{-18}{5}$ $D\left(\frac{4}{5}; \frac{-18}{5}\right)$ <p style="text-align: center;">OR/OF</p> $y - (-2) = \frac{1}{2}(x - 4)$ $y + 2 = \frac{1}{2}x - 2$ $\therefore y = \frac{1}{2}x - 4$ <p style="text-align: center;">OR/OF</p> $y = \frac{1}{2}\left(\frac{4}{5}\right) - 4$ $= \frac{-18}{5}$	<p>✓ subst. of/verv. <i>m</i> and point/en punt (4; -2)/</p> <p>✓ $y = \frac{1}{2}x - 4$</p> <p>✓ equating both equations/vergeliking van beide vergelykings</p> <p>✓ <i>x</i>-value/-waarde</p> <p>✓ <i>y</i>-value/-waarde</p> <p style="text-align: right;">(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 $\Delta AEC = \frac{1}{2}AE \times AD$</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 style="text-align: right;">(3)</p>
[20]		

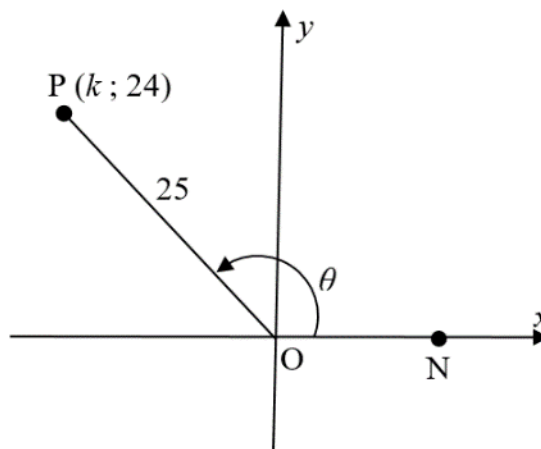
QUESTION/VRAAG 4



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	$\tan \alpha = m_{CD}$ $\tan \alpha = \frac{3}{2}$ $\alpha = 56,31^\circ$	✓ $\tan \alpha = \frac{3}{2}$ ✓ $\alpha = 56,31^\circ$ (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	$m_{AC} = \frac{8-0}{4-3} = 8$ $\therefore \text{Inclination of AC} = \tan^{-1}(8)$ $= 82,87^\circ$ $\hat{A}CD = 82,87^\circ - 56,31^\circ$ $= 26,56^\circ$ $\therefore \theta = 26,56^\circ$	$\checkmark m_{AC} = 8$ $\checkmark 82,87^\circ$ $\checkmark \hat{A}CD = 82,87^\circ - 56,31^\circ$ $\checkmark \hat{A}CD = 26,56^\circ$ $\checkmark \theta = 26,56^\circ$ <p style="text-align: right;">(5)</p>
		[13]

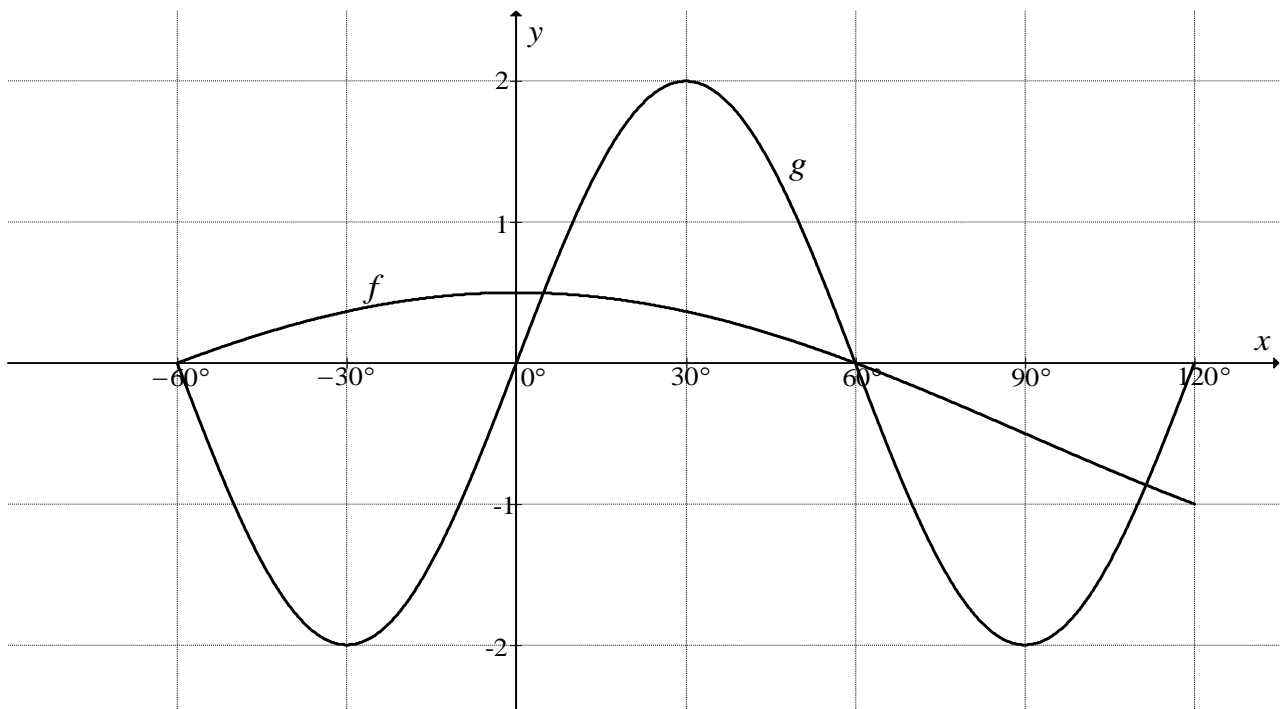
QUESTION/VRAAG 5



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

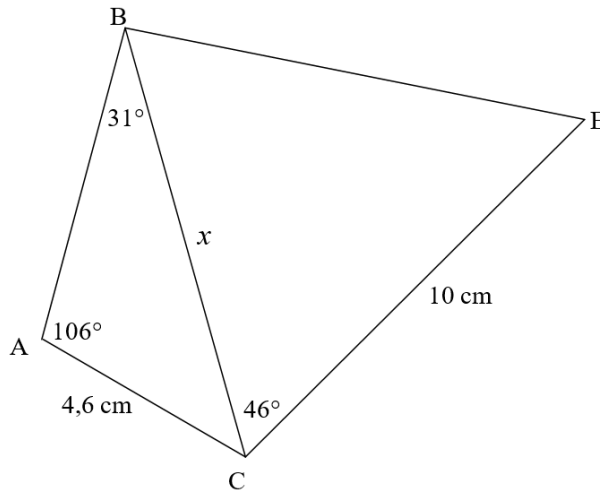
<p>5.2</p>	$\frac{\cos 210^\circ \cdot \tan 135^\circ}{\sin(-60^\circ) \cdot \cos 420^\circ}$ $= \frac{-\cos 30^\circ \cdot -\tan 45^\circ}{-\sin 60^\circ \cdot \cos 60^\circ}$ $= \frac{\left(-\frac{\sqrt{3}}{2}\right)(-1)}{\left(-\frac{\sqrt{3}}{2}\right) \cdot \frac{1}{2}}$ $= -2$	<p>✓ $-\cos 30^\circ \cdot -\tan 45^\circ$ ✓ $-\sin 60^\circ \cdot \cos 60^\circ$</p> <p>✓ $\left(-\frac{\sqrt{3}}{2}\right)(-1)$</p> <p>✓ $\left(-\frac{\sqrt{3}}{2}\right) \cdot \frac{1}{2}$</p> <p>✓ answer/antwoord (5)</p>
<p>5.3</p>	<p>LHS = $\frac{1}{\tan^2 x} - \cos^2 x$</p> $= \frac{1}{\frac{\sin^2 x}{\cos^2 x}} - \cos^2 x$ $= \frac{\cos^2 x}{\sin^2 x} - \cos^2 x$ $= \frac{\cos^2 x - \cos^2 x \sin^2 x}{\sin^2 x}$ $= \frac{\cos^2 x(1 - \sin^2 x)}{\sin^2 x}$ $= \frac{\cos^2 x(\cos^2 x)}{\sin^2 x}$ $= \frac{\cos^4 x}{\sin^2 x}$ <p>= RHS</p>	<p>✓ $\frac{\sin^2 x}{\cos^2 x}$</p> <p>✓ common denominator/ gemene noemer</p> <p>✓ factors/faktore</p> <p>✓ $1 - \sin^2 x = \cos^2 x$</p> <p>(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>$\cos x = 0$</p> <p>$x = 90^\circ + 360^\circ k, k \in Z$</p> <p>or</p> <p>$x = 270^\circ + 360^\circ k, k \in Z$</p> <p>or/of</p> $\sin x = \frac{1}{\sqrt{2}}$ <p>or</p> $x = 45^\circ + 360^\circ \cdot k, k \in Z$ <p>OR</p> $x = 135^\circ + 360^\circ \cdot k, k \in Z$ <p>or</p> $x = 90^\circ + 180^\circ k, k \in Z$	<p>✓ standard form/stand.vorm</p> <p>✓ factors/faktore</p> <p>✓ both equations/beide vergelykings</p> <p>✓ $x = 90^\circ + 360^\circ k, k \in Z$</p> <p>✓ $x = 45^\circ + 360^\circ \cdot k, k \in Z$</p> <p>✓ $x = 135^\circ + 360^\circ \cdot k, k \in Z$</p> <p>(6)</p> <p>[24]</p>

QUESTION/VRAAG 6

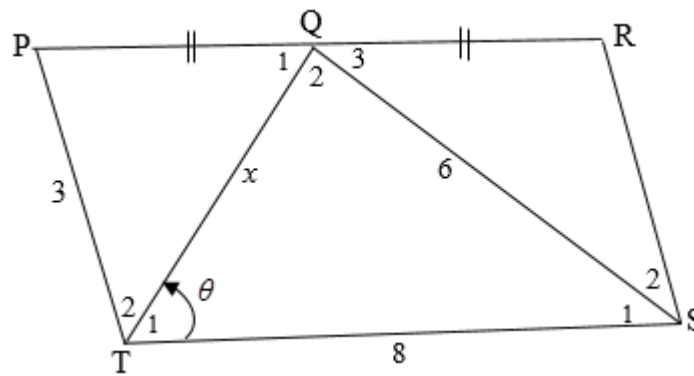


6.1	$(30^\circ; 2)$	✓✓ answer/antwoord (1)
6.2	$-60^\circ < x < 0^\circ$	✓ endpoints/eindpunte ✓ notation/notasie (2)
6.3	$q = -\frac{1}{2}$ $b = 3$	✓ $q = -\frac{1}{2}$ ✓ $b = 3$ (2)
6.4	$2 \cos x \sin 3x - \sin 3x \geq 0$ $2 \sin 3x \left(\cos x - \frac{1}{2} \right) \geq 0$ $g(x) \cdot f(x) \geq 0$ $0^\circ \leq x \leq 120^\circ$	✓✓ $2 \sin 3x \left(\cos x - \frac{1}{2} \right) \geq 0$ ✓ endpoints/eindpunte ✓ notation/notasie (4)
		[9]

QUESTION/VRAAG 7




<p>7.1.1</p>	$\frac{BC}{\sin \hat{A}} = \frac{AC}{\sin \hat{B}}$ $\frac{x}{\sin 106^\circ} = \frac{4,6}{\sin 31^\circ}$ $x = \frac{4,6 \sin 106^\circ}{\sin 31^\circ}$ $x = 8,59 \text{ cm}$	<p>✓ substitution into sine rule/<i>vervang</i>ing in <i>sinusreël</i></p> <p>✓ $x = \frac{4,6 \sin 106^\circ}{\sin 31^\circ}$</p> <p>✓ answer/<i>antwoord</i> (3)</p>
<p>7.1.2</p>	<p>$\hat{A}CB = 43^\circ$</p> <p>Area ACEB = $\left(\frac{1}{2} \times AC \times BC \times \sin \hat{A}CB \right) + \left(\frac{1}{2} \times BC \times CE \times \sin \hat{B}CE \right)$</p> <p>= $\left(\frac{1}{2} \times 4,6 \times 8,59 \times \sin 43^\circ \right) + \left(\frac{1}{2} \times 8,59 \times 10 \times \sin 46^\circ \right)$</p> <p>= 44,37 cm²</p>	<p>✓ $\hat{A}CB = 43^\circ$</p> <p>✓ substitution/<i>vervang</i>ing</p> <p>✓ answer/<i>antwoord</i> (4)</p>

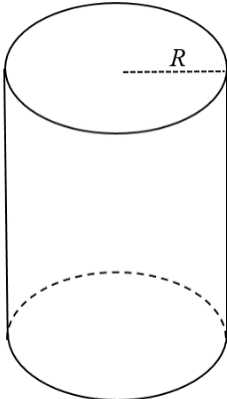


<p>7.2.1</p>	<p>In ΔQTS</p> $6^2 = 8^2 + x^2 - 2(8)(x)\cos \theta$ $16x \cos \theta = 8^2 + x^2 - 6^2$ $16x \cos \theta = x^2 + 28$ $\cos \theta = \frac{28 + x^2}{16x}$	<p>✓✓ substitution into cosine rule/ <i>vervang in cosinusreël</i></p> <p>✓ $16x \cos \theta = x^2 + 28$</p> <p>(3)</p>
<p>7.2.2</p>	<p>$\hat{Q}_1 = \theta$ and $PQ = 4$</p> <p>In ΔQTP</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>✓</p> <p>$\hat{Q}_1 = \theta$ and $PQ = 4$</p> <p>✓</p> $3^2 = 4^2 + x^2 - 2(4)(x)\cos \theta$ <p>✓ $\cos \theta = \frac{7 + x^2}{8x}$</p> <p>✓ equating/ <i>vergelyking</i></p> <p>✓ factors/<i>faktore</i></p> <p>✓ $x \neq 0 \quad x = \sqrt{14}$</p> <p>(6)</p>
		<p>[16]</p>

QUESTION/VRAAG 8

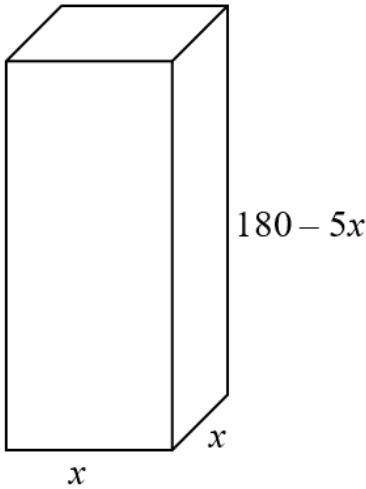


marble
albaster



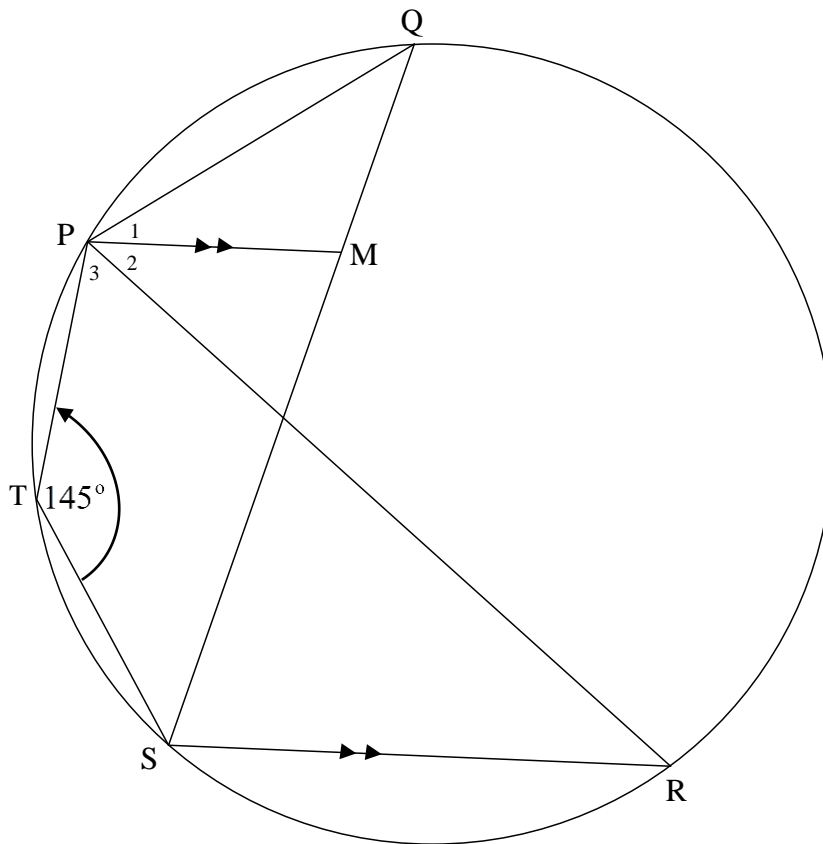
Volume of sphere = $\frac{4}{3} \pi r^3$
Surface area of a sphere = $4\pi r^2$

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

8.1.1	$V = \pi r^2 h$ $300 = \pi R^2 h$ $h = \frac{300}{\pi R^2}$	<p>✓ substitution/ <i>vervanging</i> ✓ isolating h/ <i>isoleer h</i></p> <p style="text-align: right;">(2)</p>
8.1.2	<p>Volume of marbles = $100 \left(\frac{4}{3} \pi r^3 \right)$</p> $= 100 \times \frac{4}{3} \pi (0.75)^3$ $= \frac{225\pi}{4}$ $= 176,71 \text{ cm}^3$ <p>amount of water = $300 - 176,71$</p> $= 123,29 \text{ cm}^3$ <div style="text-align: center; margin-top: 20px;">  </div>	<p>✓ subst. into formula/<i>vervanging</i> <i>in formule</i></p> <p>✓ 176,71</p> <p>✓ 123,29 cm³</p> <p style="text-align: right;">(3)</p>

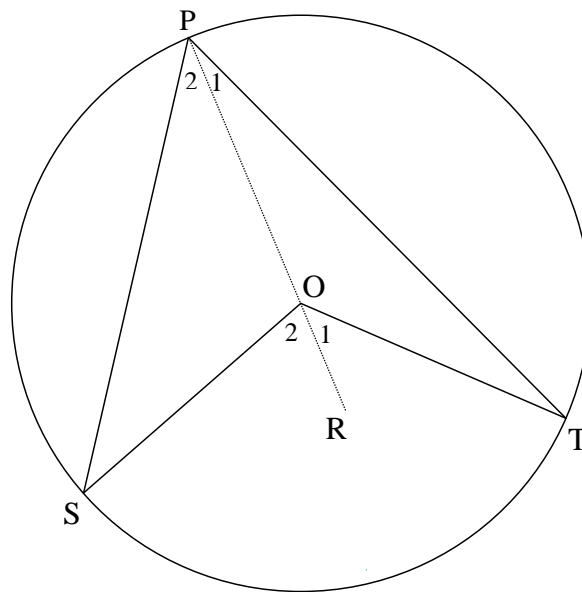
8.2	<p>TSA = $2 \times \text{area of the base} + (\text{perimeter} \times \text{height})$ <i>TSA = $2 \times \text{oppervlakte van basis} \pm (\text{omtrek} \times \text{hoogte})$</i> $= 2(x^2) + 4x(180 - 5x)$ $= 2x^2 + 720x - 20x^2$ $= -18x^2 + 720x$ Surface area will be maximum when <i>Oppervlakte sal op maksimum wees wanneer</i> $x = \frac{-b}{2a} = \frac{-720}{2(-18)} = 20$ max. surface area/maks. oppervlakte = $-18(20)^2 + 720(20)$ $= 7200 \text{ cm}^2$</p>	<p>✓ subst. into formula/<i>vervanging</i> <i>in formule</i> ✓ simplification/ <i>vereenvoudiging</i></p> <p>✓ value of/<i>waarde</i> <i>van x</i> ✓ subst./<i>verv</i> $x = 20$</p> <p>✓ answer/<i>antwoord</i> (5) [10]</p>
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QUESTION/VRAAG 9

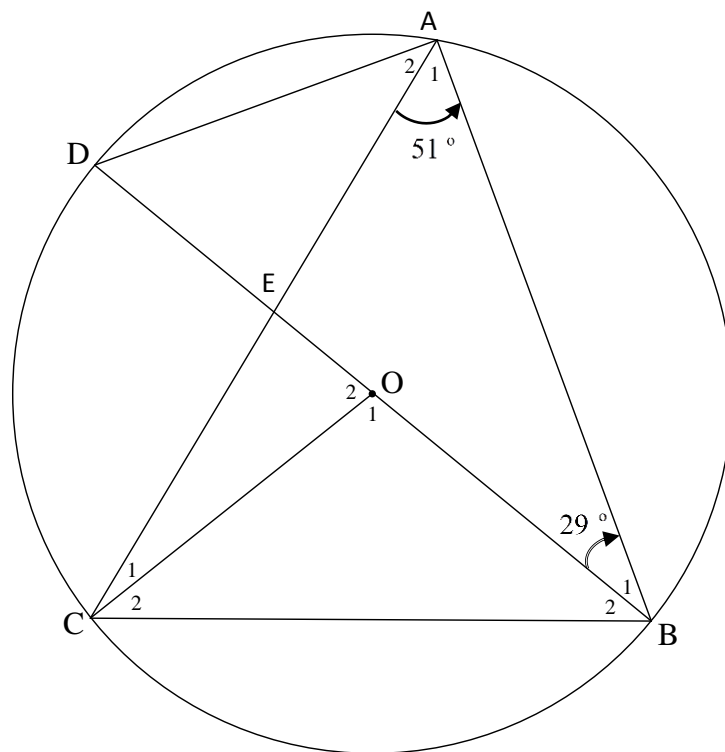


9.1.1	$\hat{Q} = 180^\circ - 145^\circ$ [opp \angle^s of cyclic quad] $= 35^\circ$	\checkmark S \checkmark R (2)
9.1.2	$\hat{R} = 180^\circ - 145^\circ$ [opp \angle^s of cyclic quad] or [\angle^s in the same segment] $= 35^\circ$	\checkmark S \checkmark R (2)
9.1.3	$\hat{P}_2 = \hat{R} = 35^\circ$ [alt \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 [converse tan - chord theorem]	\checkmark S / R (1)
		[6]

QUESTION/VRAAG 10

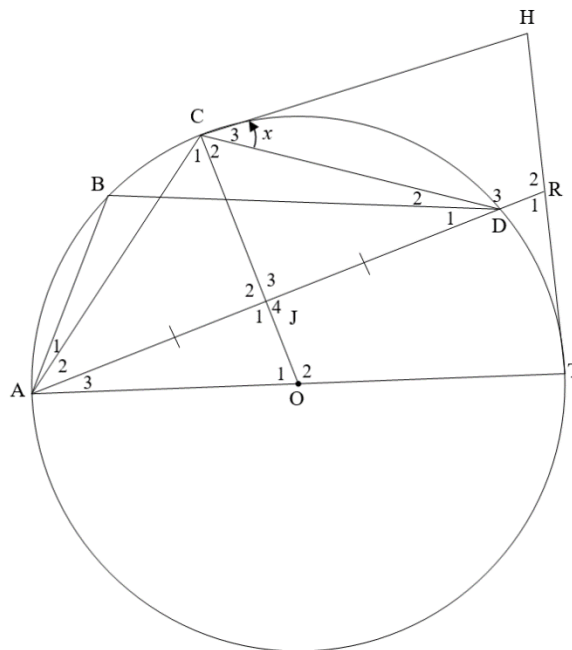


<p>10.1</p>	<p>Construction/<i>Konstruksie</i>: Draw/<i>Trek</i> POR Let $\hat{P}_2 = x$ $\hat{P}_2 = \hat{S}$ [<i>angles opp = sides</i>] $\hat{O}_2 = 2x$ [<i>exterior \angle of Δ</i>] Let $\hat{P}_1 = y$ $\hat{P}_1 = \hat{T}$ [<i>angles opp = sides</i>] $\hat{O}_1 = 2y$ [<i>exterior \angle of Δ</i>] $\hat{O}_1 + \hat{O}_2 = 2x + 2y = 2(x + y)$ $\hat{P}_1 + \hat{P}_2 = x + y$ $\therefore \hat{SOT} = 2 \times \hat{SPT}$</p>	<p>✓ Construction/ <i>Konstruksie</i> ✓ S/R ✓ S/R ✓ S ✓ S (5)</p>
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10.2.1	$\hat{O}_1 = 102^\circ$ [angle at centre = 2 times angle at circumference/ <i>middelpuntshoek = 2keer omtrekshoek</i>]	✓ S ✓ R (2)
10.2.2	$\hat{A} = 90^\circ$ [\angle in a semi – circle] $\hat{A}_2 = 39^\circ$	✓ S ✓ R (2)
10.2.3.	$\hat{D} = 61^\circ$ [sum of int \angle^s of Δ]	✓ 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 Δ] $= 39^\circ$ $\hat{ACO} = 61^\circ - 39^\circ$ $= 22^\circ$	✓ 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 \parallel] <p style="text-align: center;">OR/OF</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 \parallel]	✓ S ✓ R ✓ S ✓ R ✓ S <p style="text-align: center;">OR/OF</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>$\hat{C}_2 = 90^\circ - x$ [tan \perp rad] $\hat{B} = \hat{C}_1 + \hat{C}_2$ [\angle^s in the same segment] $= 90^\circ - x + 90^\circ - x$ [$\hat{C}_1 = \hat{C}_2$] $= 180^\circ - 2x$</p> <p>OR/OF</p> <p>$\hat{ADC} = x$ [alt $\angle =$, CH \parallel JR] $\hat{C}_1 + \hat{C}_2 = 180^\circ - 2x$ [sum of int \angle^s of Δ] $\hat{ABD} = 180^\circ - 2x$ [\angle^s in the same segment]</p>	<p>✓ S ✓ S (2) ✓ S ✓ S (2)</p>
<p>11.5</p>	<p>$\hat{T} = 90^\circ$ [tan \perp rad] $\hat{CAO} = 90^\circ - x$ [\angle^s opp = sides] $x + \hat{A}_3 = 90^\circ - x$ $\hat{A}_3 = 90^\circ - 2x$</p> <p>$\therefore \hat{R}_2 = 90^\circ + 90^\circ - 2x$ [ext \angle^s of Δ] $= 180^\circ - 2x$</p>	<p>✓ S ✓R ✓ S/R ✓ S ✓ S ✓ S (6) [18]</p>

TOTAAL: 150