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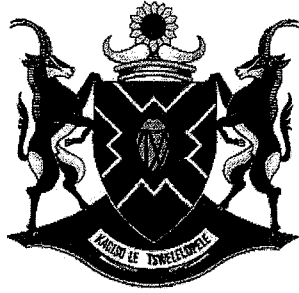
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**NATIONAL
SENIOR CERTIFICATE/
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GRADE/GRAAD 12

MATHEMATICS P2/WISKUNDE V2

SEPTEMBER 2018

MEMORANDUM

MARKS/PUNTE: 150

**This memorandum consists of 22 pages./
Hierdie memorandum bestaan uit 22 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, merk slegs die EERSTE poging.
- 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 nasienmemorandum toegepas. Hou op nasien by die tweede berekeningsfout.
- Aanvaar van antwoorde of waardes om 'n probleem op te los, word NIE toegelaat nie.

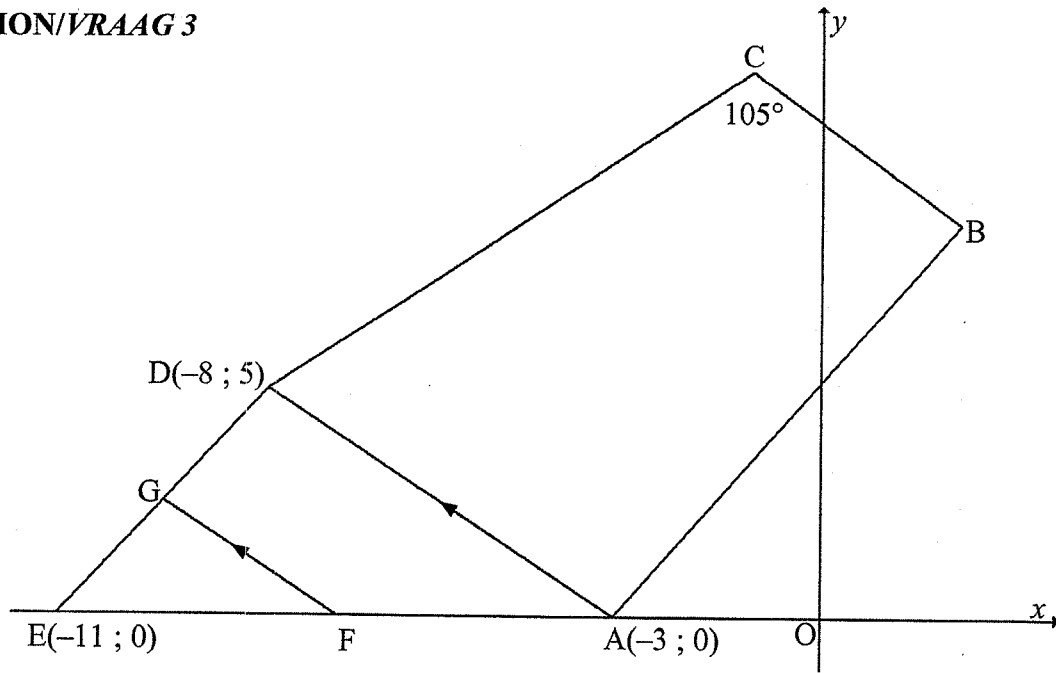
QUESTION/VRAAG 1

1.1	$\bar{x} = \frac{5478}{11}$ $\bar{x} = 498$ <div style="border: 1px solid black; padding: 5px; display: inline-block; margin: 10px 0;">NOTE: ANSWER ONLY, FULL MARKS</div>	$\checkmark \frac{5478}{11}$ $\checkmark 498$ <p style="text-align: right;">(2)</p>
1.2	$\sigma_x = 119,47$	$\checkmark \checkmark \text{answer/antwoord}$ <p style="text-align: right;">(2)</p>
1.3	$(\bar{x} - \sigma_x ; \bar{x} + \sigma_x)$ $(498 - 119,47 ; 498 + 119,47)$ $(378,53 ; 617,47)$ <p>\therefore 5 distances / afstande</p>	$\checkmark 378,53$ $\checkmark 617,47$ $\checkmark 5$ <p style="text-align: right;">(3)</p>
1.4.1	<p>new average / nuwe gemiddeld :</p> $\bar{k} = \frac{5555}{11}$ $\bar{k} = 505$ <p>the value of y / die waarde van y :</p> $y = \bar{k} - \bar{x} = 505 - 498 = 7 \text{ cm}$	$\checkmark \bar{k} = 505$ $\checkmark y = 7$ <p>OR/OF</p> $y = \frac{77}{11}$ <p>OR/OF</p> $\checkmark 11y = 5555 - 5478$ $\checkmark y = 7$ <p style="text-align: right;">(2)</p>
1.4.2	119,47	$\checkmark \checkmark \text{correct answer / korrekte antwoord}$ <p style="text-align: right;">(2)</p> <p style="text-align: right;">[11]</p>

QUESTION/VRAAG 2

2.1	$\hat{y} = a + bx$ $a = 57,87$ and / en $b = 0,05$ $\therefore \hat{y} = 57,87 + 0,05x$	✓ $a = 57,87$ ✓ $b = 0,05$ ✓ equation/ vergeljking (3)
2.2	$r = 0,93$	✓✓ 0,93 (2)
2.3	Strong positive correlation / <i>Sterk positiewe korrelasie</i>	✓ Strong / <i>sterk</i> ✓ Positive / <i>positief</i> (2)
2.4	$\hat{y} = 57,87 + 0,05(465)$ $\hat{y} = 81,12\%$ OR / OF $\hat{y} = 80,81\%$ (calculator / <i>sakrekenaar</i>) $\approx 81\%$	✓ substitute 465 into eq. / <i>vervang 465</i> <i>in vgl.</i> ✓ 81,12 (2) ✓✓ 80,81% / 81% [9]

QUESTION/VRAAG 3



<p>3.1</p>	<p>Length of AD / <i>Lengte van AD</i> :</p> $d_{AD} = \sqrt{(-3+8)^2 + (0-5)^2}$ $d_{AD} = \sqrt{50}$ $d_{AD} = 5\sqrt{2} \text{ or / of } 7,07 \text{ units / eenhede}$ <p>Length of DE / <i>Lengte van DE</i> :</p> $d_{DE} = \sqrt{(-8+11)^2 + (5-0)^2}$ $d_{DE} = \sqrt{34} \text{ or / of } 5,83 \text{ units / eenhede}$ <p>Length of AE / <i>Lengte van AE</i> = 8 units / eenhede Perimeter / <i>Omtrek Δ ADE</i> $= 5\sqrt{2} + \sqrt{34} + 8 = 20,9 \text{ units / eenhede}$ or / of $7,07 + 5,83 + 8 = 20,90$</p>	<p>✓</p> $d_{AD} = \sqrt{(-3+8)^2 + (0-5)^2}$ <p>✓ $d_{AD} = 5\sqrt{2}$ or / of 7,07</p> <p>✓ $d_{DE} = \sqrt{34}$ or / of 5,83</p> <p>✓ AE = 8</p> <p>✓ $5\sqrt{2} + \sqrt{34} + 8$ or / of $7,07 + 5,83 + 8$</p> <p>(5)</p>
<p>3.2.1</p>	<p>Line from mdpt 1st side of Δ, parallel to 2nd side, bisects 3rd side / <i>Lyn uit midpt van een sy van Δ, ewewydig aan 2^{de} sy, halveer 3^{de} sy.</i></p>	<p>✓ reason/rede</p> <p>(1)</p>
<p>3.2.2</p>	$x_G = \frac{-11+(-8)}{2} \quad \text{and/en} \quad y_G = \frac{0+5}{2}$ $\therefore x_G = -\frac{19}{2} \quad \therefore y_G = \frac{5}{2}$ $\therefore G\left(-\frac{19}{2}; \frac{5}{2}\right)$	<p>✓ method/metode</p> <p>✓ $x_G = -\frac{19}{2}$</p> <p>✓ $y_G = \frac{5}{2}$</p> <p>(3)</p>
<p>3.2.3</p>	$FG = \frac{1}{2} AD = \frac{5\sqrt{2}}{2} \text{ or / of } 3,54 \text{ units / eenhede}$	<p>✓ answer/antwoord</p> <p>(1)</p>

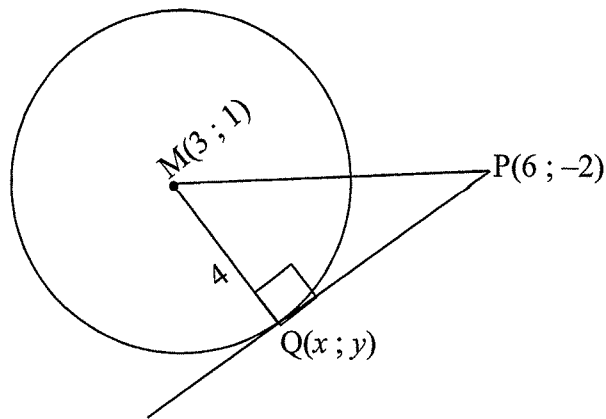
3.2.4	$m_{AD} = \frac{0-5}{-3-(-8)}$ $= \frac{-5}{5}$ $= -1$ $m_{FG} = m_{AD} \quad [AD \parallel FG]$ <p>Through the point / Deur die punt $\left(-\frac{19}{2}; \frac{5}{2}\right)$</p> $y - \frac{5}{2} = -1 \left(x + \frac{19}{2}\right)$ $y = -x - \frac{19}{2} + \frac{5}{2}$ $\therefore y = -x - 7$	$\checkmark m_{FG} = m_{AD} \quad [AD \parallel FG]$ $\checkmark m_{FG} = -1$ $\checkmark \text{Subst./Vervang}$ $\left(-\frac{19}{2}; \frac{5}{2}\right)$ $\checkmark y = -x - 7$
3.3	$\tan \hat{D\hat{A}O} = m_{AD}$ $\tan \hat{D\hat{A}O} = -1$ $\therefore \hat{D\hat{A}O} = -45^\circ + 180^\circ$ $\hat{D\hat{A}O} = 135^\circ$	$\checkmark \tan \hat{D\hat{A}O} = -1$ $\checkmark \hat{D\hat{A}O} = 135^\circ$

3.4	$\hat{D}AB = 75^\circ$ [<i>opp. \angles cyclic quad. / teenoorst. \anglee kvh</i>] $\hat{O}AB = 135^\circ - 75^\circ$ $= 60^\circ$ $\tan \hat{O}AB = m_{AB}$ $\tan 60^\circ = m_{AB} = \sqrt{3}$ equation / <i>vergelyking</i> AB through / <i>deur</i> $(-3; 0)$: $y - 0 = \sqrt{3}(x + 3)$ $y = \sqrt{3}x + 3\sqrt{3}$ at / <i>by</i> B: $\frac{-12 + 5\sqrt{3}}{3}x + \frac{24 + 5\sqrt{3}}{3} = \sqrt{3}x + 3\sqrt{3}$ $\frac{-12 + 5\sqrt{3}}{3}x - \sqrt{3}x = 3\sqrt{3} - \frac{24 + 5\sqrt{3}}{3}$ $x \left(\frac{-12 + 5\sqrt{3}}{3} - \sqrt{3} \right) = 3\sqrt{3} - \frac{24 + 5\sqrt{3}}{3}$ $x = 2$ and/ <i>en</i> $\therefore y = \sqrt{3}(2) + 3\sqrt{3}$ OR / OF $y = \frac{-12 + 5\sqrt{3}}{3}(2) + \frac{24 + 5\sqrt{3}}{3}$ $\therefore y = 5\sqrt{3}$ $\therefore B(2; 5\sqrt{3})$	✓ $\hat{D}AB = 75^\circ$ ✓ $\hat{O}AB = 60^\circ$ ✓ $m_{AB} = \sqrt{3}$ ✓ $y = \sqrt{3}x + 3\sqrt{3}$ ✓ $\frac{-12 + 5\sqrt{3}}{3}x + \frac{24 + 5\sqrt{3}}{3} = \sqrt{3}x + 3\sqrt{3}$ ✓ $x = 2$ ✓ $y = 5\sqrt{3}$
		(7) [23]

QUESTION/VRAAG 4

4.1	$x^2 + y^2 = r^2$ $x^2 + y^2 = (2\sqrt{3})^2$ $x^2 + y^2 = 12$	✓ subst. into eq./ <i>vervang in vgl.</i> ✓ answer/ <i>antwoord</i> (2)
4.2.1	$x^2 - 6x + (-3)^2 + y^2 - 2y + (-1)^2 = 6 + (-3)^2 + (-1)^2$ $\therefore (x - 3)^2 + (y - 1)^2 = 16$	✓ $(x - 3)^2 + (y - 1)^2$ ✓ 16 (2)
4.2.2	M(3 ; 1)	✓ $x = 3$ ✓ $y = 1$ (2)
4.2.3	4	✓ answer/ <i>antwoord</i> (1)

4.2.4



$$d_{MP} = \sqrt{(6-3)^2 + (-2-1)^2}$$

$$d_{MP} = \sqrt{18}$$

$$d_{MP} = 3\sqrt{2}$$

Pythagoras :

$$PQ^2 = (3\sqrt{2})^2 - 4^2$$

$$PQ^2 = 18 - 16$$

$$\therefore PQ = \sqrt{2} \text{ units / eenhede}$$

$$\checkmark MQ \perp PQ$$

✓

$$d_{MP} = \sqrt{18} \text{ or / of } 3\sqrt{2}$$

$$\checkmark PQ^2 = (3\sqrt{2})^2 - 4^2$$

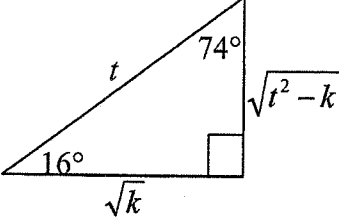
$$\checkmark PQ = \sqrt{2}$$

(4)

<p>4.3</p>		
<p>4.3.1</p>	<p>$AB = 6 + 7 = 13$</p> $d_{AB} = \sqrt{(2k - (-k))^2 + (10 - 5)^2}$ $13^2 = (3k)^2 + (5)^2$ $169 = 9k^2 + 25$ $144 = 9k^2$ $16 = k^2$ $k = \pm 4$ <p>$\therefore k = 4$ (see diagram / sien diagram)</p> <p>$\therefore A(-4; 5)$ and / en $B(8; 10)$</p> <p>Gradient of AB / Gradiënt van AB</p> $m_{AB} = \frac{\frac{95}{13} - 5}{\frac{20}{13} - (-4)} \text{ or / of } m_{AB} = \frac{\frac{95}{13} - 10}{\frac{20}{13} - 8} \text{ or / of } m_{AB} = \frac{10 - 5}{8 + 4} = \frac{5}{12}$ $m_{AB} = \frac{5}{12}$ <p>OR/OF</p>	<p>✓ $AB = 6 + 7 = 13$</p> <p>✓ $13^2 = (3k)^2 + (5)^2$</p> <p>✓ $k^2 = 16$</p> <p>✓ $k = 4$</p> <p>✓ Correct subst. into gradient / vervang korrek in gradiënt</p> <p>(5)</p>

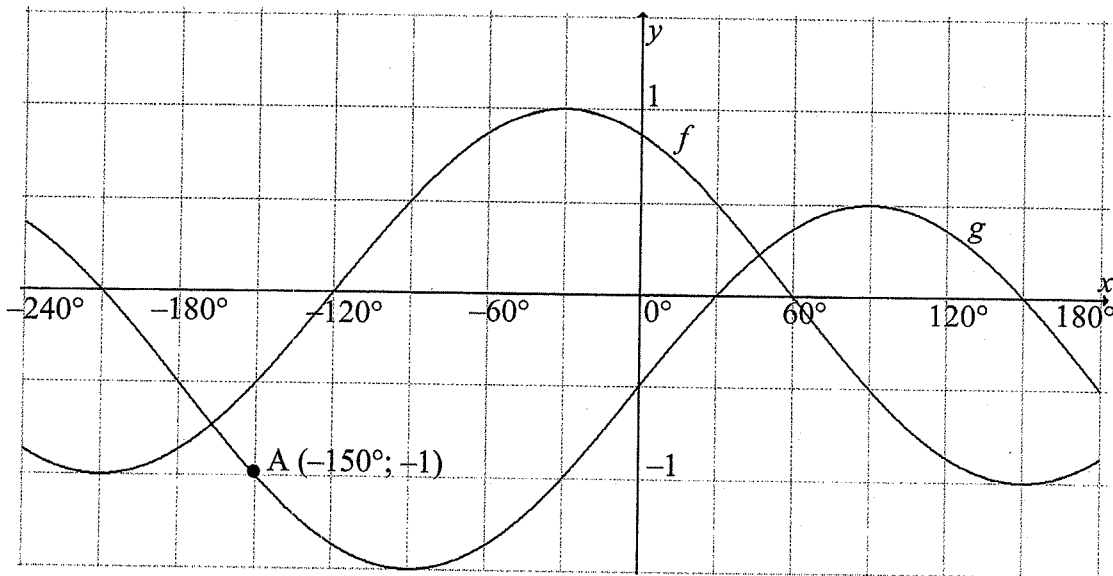
	$M_{AB} = \frac{5}{3k}$ $M_{AC} = \frac{\frac{95}{13} - 5}{\frac{20}{13} + k}$ $= \frac{95 - 65}{20 + 13k}$ $\frac{5}{3k} = \frac{30}{20 + 13k}$ $100 + 65k = 90k$ $100 = 25k$ $k = 4$ $\therefore M_{AB} = \frac{5}{3(4)} = \frac{5}{12}$	$\checkmark M_{AB} = \frac{5}{3k}$ $\checkmark M_{AB} = \frac{\frac{95}{13} - 5}{\frac{20}{13} + k}$ $\checkmark \frac{5}{3k} = \frac{95 - 65}{20 + 13k}$ $\checkmark k = 4$ <p>✓ Correct subst. into gradient / vervang korrek in gradiënt (5)</p>
4.3.2	<p>radius \perp tangent / radius \perp raaklyn</p> $\therefore m_{\text{tangent/raaklyn}} = -\frac{12}{5}$ <p>Equation of common tangent / Vergelyking van gemeenskaplike raaklyn</p> $y - \frac{95}{13} = -\frac{12}{5} \left(x - \frac{20}{13} \right)$ $\therefore y = -\frac{12}{5}x + 11$	$\checkmark m_{\text{tangent/raaklyn}} = -\frac{12}{5}$ $\checkmark \text{Subst. / vervang} \left(\frac{20}{13}; \frac{95}{13} \right)$ $\checkmark y = -\frac{12}{5}x + 11$ <p>(3) [19]</p>

QUESTION/VRAAG 5

<p>5.1.1</p>	$\begin{aligned} \sin 106^\circ &= \sin(180^\circ - 74^\circ) \\ &= \sin 74^\circ \\ &= \cos 16^\circ \\ &= \frac{\sqrt{k}}{t} \end{aligned}$	$\begin{aligned} &\checkmark \cos 16^\circ \\ &\checkmark \frac{\sqrt{k}}{t} \end{aligned} \quad (2)$
<p>5.1.2</p>	$\sin 16^\circ = \frac{\sqrt{t^2 - k}}{t}$ <p>OR/OF</p> $\begin{aligned} \sin^2 16^\circ + \cos^2 16^\circ &= 1 \\ \sin^2 16^\circ + \left(\frac{\sqrt{k}}{t}\right)^2 &= 1 \\ \sin^2 16^\circ &= 1 - \frac{k}{t^2} \\ \sin^2 16^\circ &= \frac{t^2 - k}{t^2} \\ \sin 16^\circ &= \frac{\sqrt{t^2 - k}}{t} \end{aligned}$ 	<p>make use of diagram/ maak van diagram gebruik</p> $\begin{aligned} &\checkmark \checkmark \frac{\sqrt{t^2 - k}}{t} \\ &\checkmark \frac{\sqrt{t^2 - k}}{t} \end{aligned}$ <p>OR/OF</p> $\begin{aligned} &\checkmark \sin^2 16^\circ + \cos^2 16^\circ = 1 \\ &\checkmark 1 - \frac{k}{t^2} \\ &\checkmark \frac{\sqrt{t^2 - k}}{t} \end{aligned} \quad (3)$
<p>5.1.3</p>	$\begin{aligned} \cos 16^\circ &= \cos 2(8^\circ) = 2 \cos^2(8^\circ) - 1 \\ \frac{\sqrt{k}}{t} &= 2 \cos^2(8^\circ) - 1 \\ \frac{\sqrt{k}}{t} + 1 &= 2 \cos^2(8^\circ) \\ \frac{\sqrt{k}}{2t} + \frac{1}{2} &= \cos^2(8^\circ) \\ \therefore \cos 8^\circ &= \sqrt{\frac{\sqrt{k}}{2t} + \frac{1}{2}} = \sqrt{\frac{\sqrt{k} + t}{2t}} \end{aligned}$	$\begin{aligned} &\checkmark \cos 2(8^\circ) \\ &\checkmark \\ &\checkmark \cos 16^\circ = 2 \cos^2(8^\circ) - 1 \\ &\checkmark \frac{\sqrt{k}}{t} = 2 \cos^2(8^\circ) - 1 \\ &\checkmark \sqrt{\frac{\sqrt{k} + 1}{2t} + \frac{1}{2}} \text{ or / of} \\ &\checkmark \sqrt{\frac{\sqrt{k} + t}{2t}} \end{aligned} \quad (4)$

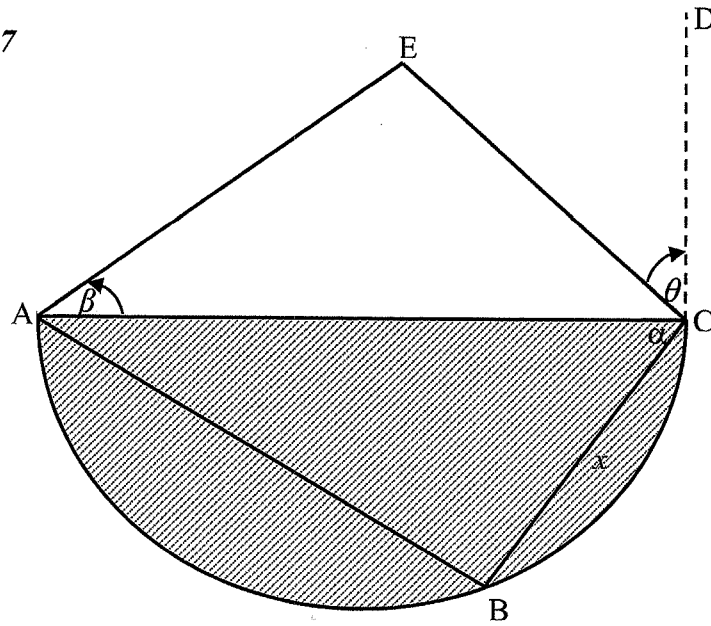
<p>5.2</p>	<p>LHS / LK</p> $\frac{\sqrt{4(1 - \cos \theta)(1 + \cos \theta)}}{\sin 2\theta}$ $= \frac{\sqrt{4(1 - \cos^2 \theta)}}{2 \sin \theta \cos \theta}$ $= \frac{2\sqrt{\sin^2 \theta}}{2 \sin \theta \cos \theta}$ $= \frac{2 \sin \theta}{2 \sin \theta \cos \theta}$ $= \frac{1}{\cos \theta} = \text{RHS / RK}$	<p>✓ $(1 - \cos \theta)(1 + \cos \theta)$ $= 1 - \cos^2 \theta$</p> <p>✓ $1 - \cos^2 \theta = \sin^2 \theta$</p> <p>✓ $\sin 2\theta = 2 \sin \theta \cos \theta$</p> <p>✓ $\frac{2 \sin \theta}{2 \sin \theta \cos \theta}$</p> <p>(4)</p>
<p>5.3.1</p>	<p>$\sin p + \sqrt{3} \cos p = 1$</p> $\frac{1}{2} \sin p + \frac{\sqrt{3}}{2} \cos p = \frac{1}{2} \quad (\div 2)$ <p>$\cos 60^\circ \sin p + \sin 60^\circ \cos p = \frac{1}{2}$ (special angles / spesiale hoeke)</p> <p>$\sin(60^\circ + p) = \frac{1}{2}$ (compound angles / saamgestelde hoeke)</p>	<p>✓ $\frac{1}{2} \sin p + \frac{\sqrt{3}}{2} \cos p = \frac{1}{2}$</p> <p>✓ $\cos 60^\circ \sin p$</p> <p>✓ $\sin 60^\circ \cos p$</p> <p>(3)</p>
<p>5.3.2</p>	<p>$\sin(60^\circ + p) = \frac{1}{2}$</p> <p>ref. \angle / verw. $\angle = 30^\circ$</p> <p>$60^\circ + p = 30^\circ + n.360^\circ$ or / of $60^\circ + p = (180^\circ - 30^\circ) + n.360^\circ$</p> <p>$p = -30^\circ + n.360^\circ$ or / of $p = 90^\circ + n.360^\circ$ ($n \in \mathbb{Z}$)</p>	<p>✓</p> <p>ref. \angle / verw. $\angle = 30^\circ$</p> <p>✓</p> <p>$p = -30^\circ + n.360^\circ /$ $p = 330^\circ + n.360^\circ$</p> <p>✓ $p = 90^\circ + n.360^\circ$</p> <p>✓ ($n \in \mathbb{Z}$) if used in correct context / as dit in korrekte konteks gebruik is</p> <p>(4)</p>
<p>5.4</p>	<p>$\cos 0^\circ + \cos 1^\circ + \cos 2^\circ + \dots + \cos(180 - 2)^\circ + \cos(180 - 1)^\circ + \cos 180^\circ + 2$</p> <p>$1 + \cos 1^\circ + \cos 2^\circ \dots + (-\cos 2^\circ) + (-\cos 1^\circ) + (-1) + 2$</p> <p>$1 + (-1) + 2$</p> <p>$= 2$</p>	<p>✓ $\cos(180 - 2)^\circ + \cos(180 - 1)^\circ$</p> <p>✓</p> <p>$\dots(-\cos 2^\circ) + (-\cos 1^\circ)$</p> <p>✓ 2</p> <p>(3)</p> <p>[23]</p>

QUESTION/VRAAG 6



6.1	$p = 30^\circ$ and / en $q = -\frac{1}{2}$	✓✓ $p = 30^\circ$ ✓✓ $q = -\frac{1}{2}$ (4)
6.2	$x = -150^\circ$ or / of $x = 30^\circ$	✓ -150° ✓ 30° (2)
6.3	The graph of f must be translated 60° to the left / Die grafiek van f moet 60° na links getransleer word. <p style="text-align: center;">OR/OF</p> The graph of f must be translated 120° to the right and then be reflected about the x -axis/ Die grafiek van f moet 120° na regs getransleer word en dan in die x -as gereflekteer word.	✓✓ 60° to the left/na links (2) ✓ 120° right/regs ✓ reflect about x -axis/reflekteer in die x -as. [8]

QUESTION/VRAAG 7

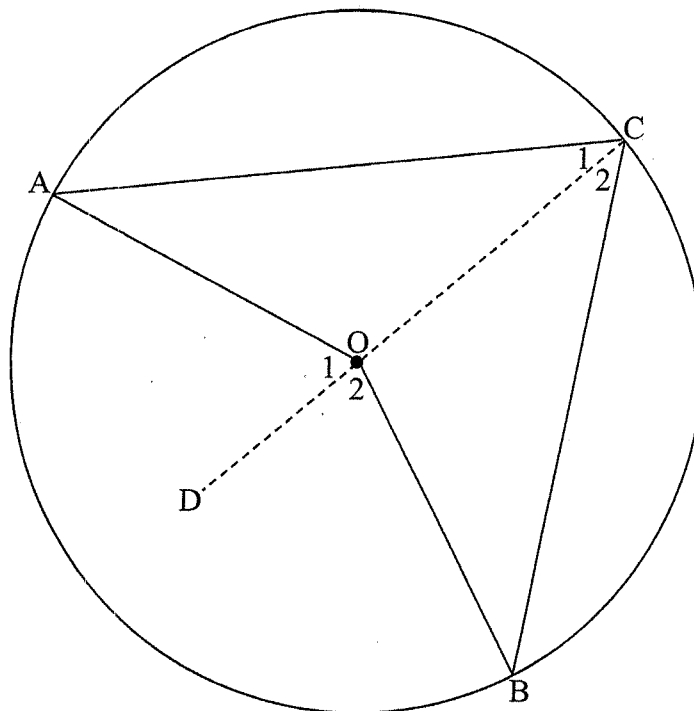


7.1	$\hat{B} = 90^\circ$ $\cos \alpha = \frac{BC}{AC} = \frac{x}{AC}$ $\therefore AC = \frac{x}{\cos \alpha}$	$\checkmark \hat{B} = 90^\circ$ $\checkmark \cos \alpha = \frac{BC}{AC} = \frac{x}{AC}$ <p style="text-align: right;">(2)</p>
7.2	$\hat{ECA} = 90^\circ - \theta$ $\hat{AEC} = 180^\circ - \beta - (90^\circ - \theta)$ $\hat{AEC} = 90^\circ - \beta + \theta$ or / of $90^\circ - (\beta - \theta)$ or / of $90^\circ + (\theta - \beta)$	$\checkmark \hat{ECA} = 90^\circ - \theta$ $\checkmark \hat{AEC} = 180^\circ - \beta - (90^\circ - \theta)$ $\checkmark \hat{AEC} = 90^\circ - \beta + \theta$ or / of $90^\circ - (\beta - \theta)$ or / of $90^\circ + (\theta - \beta)$ <p style="text-align: right;">(3)</p>
7.3	In $\triangle ABC$ $AC = \frac{x}{\cos \theta}$ (see / sien 7.1) In $\triangle ACE$ $\frac{\sin \beta}{EC} = \frac{\sin \hat{AEC}}{x}$ $\frac{\sin \beta}{EC} = \frac{\sin \alpha}{\cos \alpha}$ $EC = \frac{\frac{x}{\cos \alpha} \times \sin \beta}{\sin[90^\circ - (\beta - \theta)]}$ $EC = \frac{\frac{x \sin \beta}{\cos \alpha}}{\cos(\beta - \theta)}$ $= \frac{x \sin \beta}{\cos \alpha \cdot \cos(\beta - \theta)}$	\checkmark Correct application of sine-rule/ <i>korrekte toepassing van sinus-reël</i> $\checkmark EC = \frac{\frac{x}{\cos \alpha} \times \sin \beta}{\sin[90^\circ - (\beta - \theta)]}$ $\checkmark \sin[90^\circ - (\beta - \theta)] = \cos(\beta - \theta)$ <p style="text-align: right;">(3) [8]</p>

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

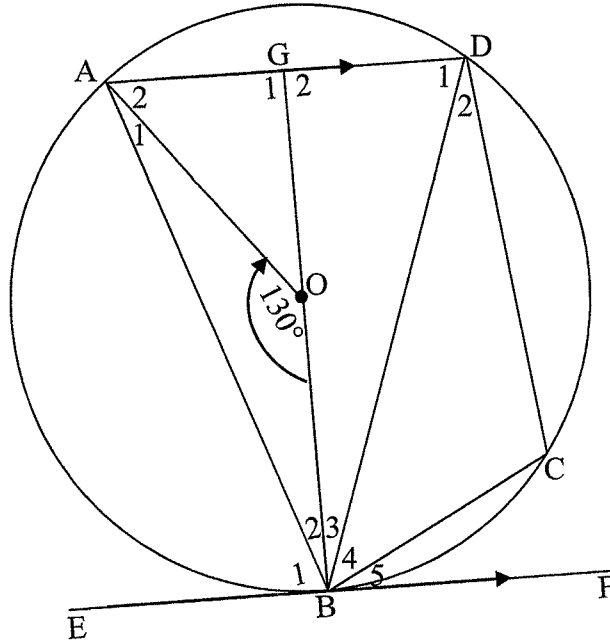
QUESTION/VRAAG 8

8.1



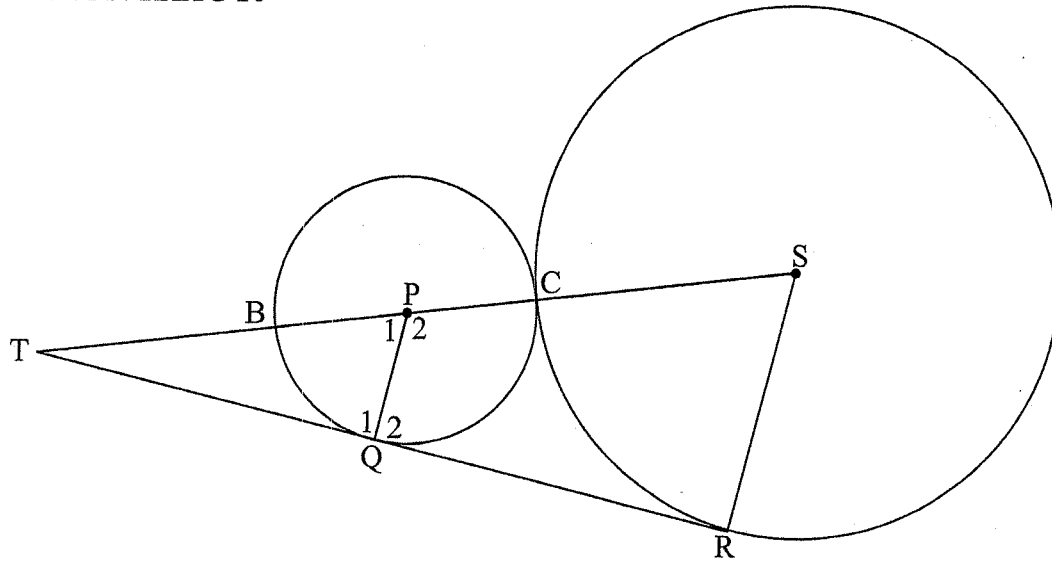
8.1	$\hat{O}_1 = \hat{C}_1 + \hat{A}$ [ext. \angle of Δ / buite \angle van Δ] But / maar $\hat{C}_1 = \hat{A}$ [\angle s opp. equal radii / \angle e teenoor gelyke radiusse] $\therefore \hat{O}_1 = 2\hat{C}_1$	✓S/R ✓S/R ✓S
	In the same manner / op dieselde wyse : $\hat{O}_2 = 2\hat{C}_2$ $\hat{O}_1 + \hat{O}_2 = 2\hat{C}_1 + 2\hat{C}_2$ $\therefore \hat{A}\hat{O}B = 2\hat{C}_1 + 2\hat{C}_2$ $= 2(\hat{C}_1 + \hat{C}_2)$ $= 2\hat{A}\hat{C}B$	✓S ✓S
		(5)

8.2



8.2.1	$\hat{D}_1 = 65^\circ$ [\angle at centre = $2 \times \angle$ at circumference / <i>midpt.</i> $\angle = 2 \times$ <i>omtreks</i> \angle]	✓S✓R (2)
8.2.2	$\hat{B}_1 = 65^\circ$ [tangent chord theorem / <i>raaklyn – koordstelling</i>]	✓S✓R (2)
8.2.3	$\hat{B}\hat{A}D = 65^\circ$ [alt \angle s / <i>verwiss</i> \angle e; $AD \parallel EF$]	✓S/R (1)
8.2.4	$\hat{C} = 115^\circ$ [opp \angle s of cyclic quad / <i>teenoorst.</i> \angle e van <i>kvh</i>]	✓S✓R (2)
8.2.5	$\hat{G}BF = 90^\circ$ [rad \perp tangent / <i>rad</i> \perp <i>raaklyn</i>] $\hat{D}BF = 65^\circ$ [alt \angle s / <i>verwiss</i> \angle e; $AD \parallel EF$] $\hat{B}_3 = 90^\circ - 65^\circ = 25^\circ$ OR/OF $\hat{B}_1 + \hat{B}_2 = 90^\circ$ [rad \perp tangent / <i>rad</i> \perp <i>raaklyn</i>] $\hat{G}_2 = 90^\circ$ [alt \angle s / <i>verwiss</i> \angle e; $AD \parallel EF$] $\hat{B}_3 = 180^\circ - 65^\circ - 90^\circ = 25^\circ$ [\angle s of Δ / <i>binne</i> \angle e van Δ]	✓S/R ✓S/R ✓S ✓S/R ✓S/R ✓S (3)
8.2.6	$\hat{G}_2 = 90^\circ$ [co-interior \angle s / <i>ko – binne</i> \angle e; $AD \parallel EF$] / [Proved in 8.2.5] $AG = GD$ [line from centre \perp chord; <i>Loodlyn vanuit midpt sirkel na koord</i>] $\therefore GD = \frac{\sqrt{7}}{4}$	✓S/R ✓S/R $\checkmark \frac{\sqrt{7}}{4}$ (3) [18]

QUESTION/VRAAG 10



10.1	Parallel to the third side of the Δ / <i>Ewewydig aan die derde sy van die Δ</i>	✓R	(1)
10.2.1	$\hat{R} = 90^\circ$ [tangent \perp radius / <i>raaklyn \perp radius</i>] $\hat{Q}_1 = 90^\circ$ [tangent \perp radius / <i>raaklyn \perp radius</i>] $\hat{Q}_1 = \hat{R} = 90^\circ$ $\therefore PQ \parallel SR$ [corresponding \angle s are equal / <i>ooreenk. \anglee is gelyk</i>] OR / OF $\hat{R} = 90^\circ$ [tangent \perp radius / <i>raaklyn \perp radius</i>] $\hat{Q}_2 = 90^\circ$ [tangent \perp radius / <i>raaklyn \perp radius</i>] $\therefore \hat{R} + \hat{Q}_2 = 180^\circ$ $\therefore PQ \parallel SR$ [co-interior \angle s = 180° ; <i>ko – binne \anglee saam 180°</i>]	✓S ✓R ✓S/R ✓R ✓S ✓R ✓S/R ✓R	(4)
10.2.2	$\frac{TP}{PS} = \frac{TQ}{QR}$ [prop.theorem; $PQ \parallel SR$ / <i>eweredigheidst.; $PQ \parallel SR$</i>] $\therefore TP = \frac{TQ \cdot PS}{QR}$ $PC = BP$ and / <i>en</i> $SC = SR$ [radii / <i>radiusse</i>] $PS = PC + CS = BP + SR$ $\therefore TP = \frac{TQ(BP + SR)}{QR}$	✓S ✓R ✓S/R ✓S	(4)

<p>10.2.3</p>	<p>In ΔTQP and / en ΔTRS $\hat{T} = \hat{T}$ [common / <i>gemeenskaplik</i>] $\hat{Q}_1 = \hat{R}$ [corresp. \angles / <i>ooreenk. \anglee</i>; $PQ \parallel SR$] $\hat{P}_1 = \hat{S}$ [sum of \angles Δ / <i>som van \anglee Δ</i>] $\therefore \Delta TQP \parallel \Delta TRS$</p> <p>OR / OF</p> <p>$\hat{T} = \hat{T}$ [common / <i>gemeenskaplik</i>] $\hat{Q}_1 = \hat{R}$ or / of $\hat{P}_1 = \hat{S}_1$ [corresp. \angles / <i>ooreenk. \anglee</i>; $PS \parallel QR$] $\therefore \Delta TQP \parallel \Delta TRS$ [\angle, \angle, \angle]</p>	<p>✓S ✓S ✓S ✓S ✓S ✓R (3)</p>
<p>10.2.4</p>	<p>$TS^2 - SR^2 = TR^2$ [Pythagoras] $CS = SR$ [radii / <i>radiusse</i>] $\therefore TS^2 - CS^2 = TR^2$ $\frac{TQ}{TR} = \frac{QP}{RS} = \frac{TP}{TS}$ [Δs] $TR = \frac{TQ \cdot RS}{QP}$ But / <i>Maar</i> $QP = BP$ and/en $RS = CS$ [radii / <i>radiusse</i>] $\therefore TR = \frac{TQ \cdot CS}{BP}$ $TQ^2 = TP^2 + PQ^2 - 2TP \cdot PQ \cdot \cos P_1$ But / <i>Maar</i> $PQ = BP$ and/en $\hat{S}_1 = \hat{P}_1$ $\therefore TQ^2 = (TP^2 + BP^2 - 2TP \cdot BP \cos S)$ $TR^2 = \frac{TQ^2 CS^2}{BP^2}$ $\therefore TS^2 - CS^2 = \frac{TQ^2 CS^2}{BP^2}$ $\therefore \sqrt{TS^2 - CS^2} = \frac{\sqrt{(TP^2 + BP^2 - 2TP \cdot BP \cos S)} \cdot CS}{BP}$</p>	<p>✓S ✓S/R ✓S ✓ use cosine-rule to find TQ/ <i>Gebruik cosinus-reël om TQ te vind</i> ✓ $\frac{TQ^2 CS^2}{BP^2}$ ✓ $TS^2 - CS^2 = \frac{TQ^2 CS^2}{BP^2}$ (6) [18]</p>

TOTAL/TOTAAL: 150