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Education and Sport Development

Department of Education and Sport Development
Departement van Onderwys en Sportontwikkeling
Lefapha la Thuto le Tlhabololo ya Metshameko

NORTH WEST PROVINCE

**NATIONAL
SENIOR CERTIFICATE/
NASIONALE
SENIOR SERTIFIKAAT**

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.

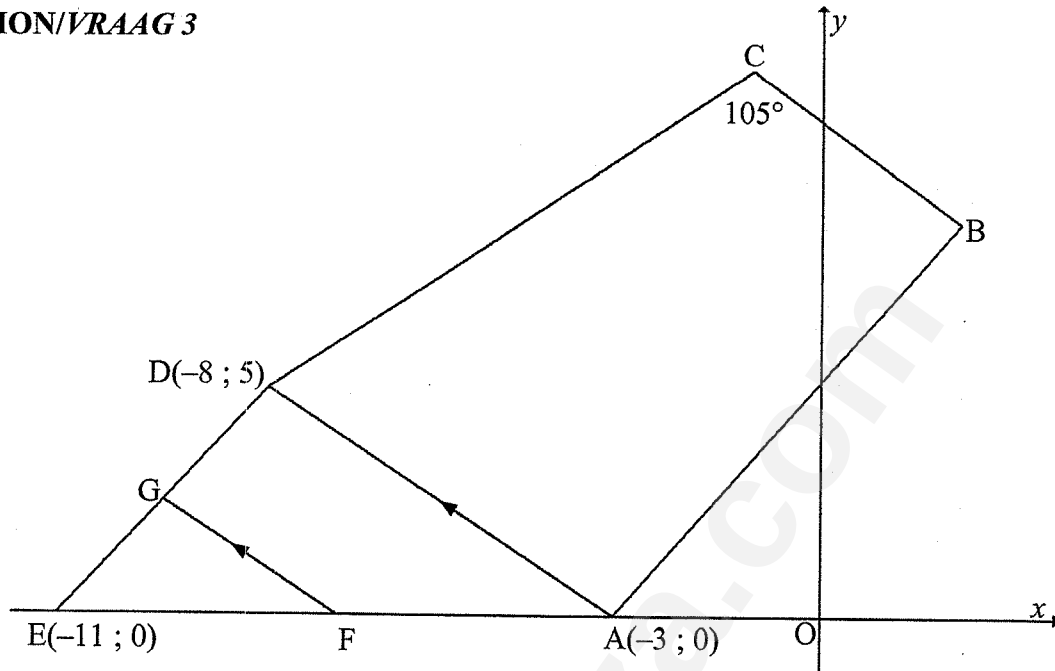
QUESTION/VRAAG 1

1.1	$\bar{x} = \frac{5478}{11}$ $\bar{x} = 498$ NOTE: ANSWER ONLY, FULL MARKS	$\checkmark \frac{5478}{11}$ $\checkmark 498$ (2)
1.2	$\sigma_x = 119,47$	$\checkmark \checkmark$ answer/antwoord (2)
1.3	$(\bar{x} - \sigma_x ; \bar{x} + \sigma_x)$ $(498 - 119,47 ; 498 + 119,47)$ $(378,53 ; 617,47)$ $\therefore$ 5 distances / afstande	$\checkmark 378,53$ $\checkmark 617,47$ $\checkmark 5$ (3)
1.4.1	new average / nuwe gemiddeld : $\bar{k} = \frac{5555}{11}$ $\bar{k} = 505$ the value of y / die waarde van y : $y = \bar{k} - \bar{x} = 505 - 498 = 7 \text{ cm}$ $11y = 5555 - 5478$ OR / OF $y = \frac{77}{11}$ $y = 7 \text{ cm}$	$\checkmark \bar{k} = 505$ $\checkmark y = 7$ OR / OF $\checkmark 11y = 5555 - 5478$ $\checkmark y = 7$ (2)
1.4.2	119,47	$\checkmark \checkmark$ correct answer / korrekte antwoord (2) [11]

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/ vergelyking (3)
2.2	$r = 0,93$	✓✓ 0,93 (2)
2.3	Strong positive correlation / Sterk positiewe korrelasie	✓ Strong / sterk ✓ Positive / positief (2)
2.4	$\hat{y} = 57,87 + 0,05(465)$ $\hat{y} = 81,12\%$ OR / OF $\hat{y} = 80,81\%$ (calculator / sakrekenaar) $\approx 81\%$	✓ substitute 465 into eq. / vervang 465 in vgl. ✓ 81,12 (2) ✓✓ 80,81% / 81% [9]

QUESTION/VRAAG 3



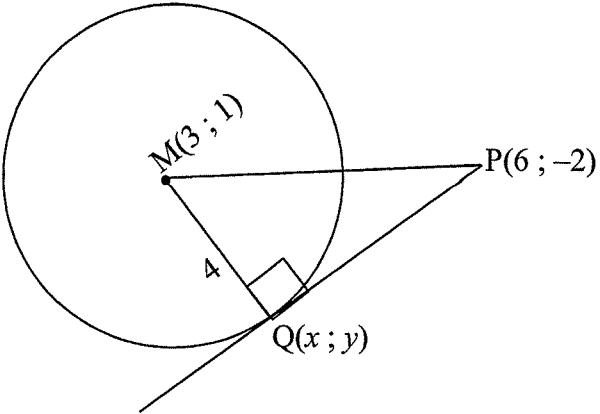
3.1	Length of AD / Lengte van AD : $d_{AD} = \sqrt{(-3+8)^2 + (0-5)^2}$ $d_{AD} = \sqrt{50}$ $d_{AD} = 5\sqrt{2} \text{ or / of } 7,07 \text{ units / eenhede}$ Length of DE / Lengte van DE : $d_{DE} = \sqrt{(-8+11)^2 + (5-0)^2}$ $d_{DE} = \sqrt{34} \text{ or / of } 5,83 \text{ units / eenhede}$ Length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

3.2.4	$m_{AD} = \frac{0-5}{-3-(-8)}$ $= \frac{-5}{5}$ $= -1$ $m_{FG} = m_{AD} \quad [AD \parallel FG]$ Through the point / Deur die punt $\left(-\frac{19}{2}; \frac{5}{2}\right)$ $y - \frac{5}{2} = -1 \left(x + \frac{19}{2}\right)$ $y = -x - \frac{19}{2} + \frac{5}{2}$ $\therefore y = -x - 7$	$\checkmark m_{FG} = m_{AD} \quad [AD \parallel FG]$ $\checkmark m_{FG} = -1$ $\checkmark \text{Subst./Vervang}$ $\left(-\frac{19}{2}; \frac{5}{2}\right)$ $\checkmark y = -x - 7$ (4)
3.3	$\tan \hat{DAO} = m_{AD}$ $\tan \hat{DAO} = -1$ $\therefore \hat{DAO} = -45^\circ + 180^\circ$ $\hat{DAO} = 135^\circ$	$\checkmark \tan \hat{DAO} = -1$ $\checkmark \hat{DAO} = 135^\circ$ (2)

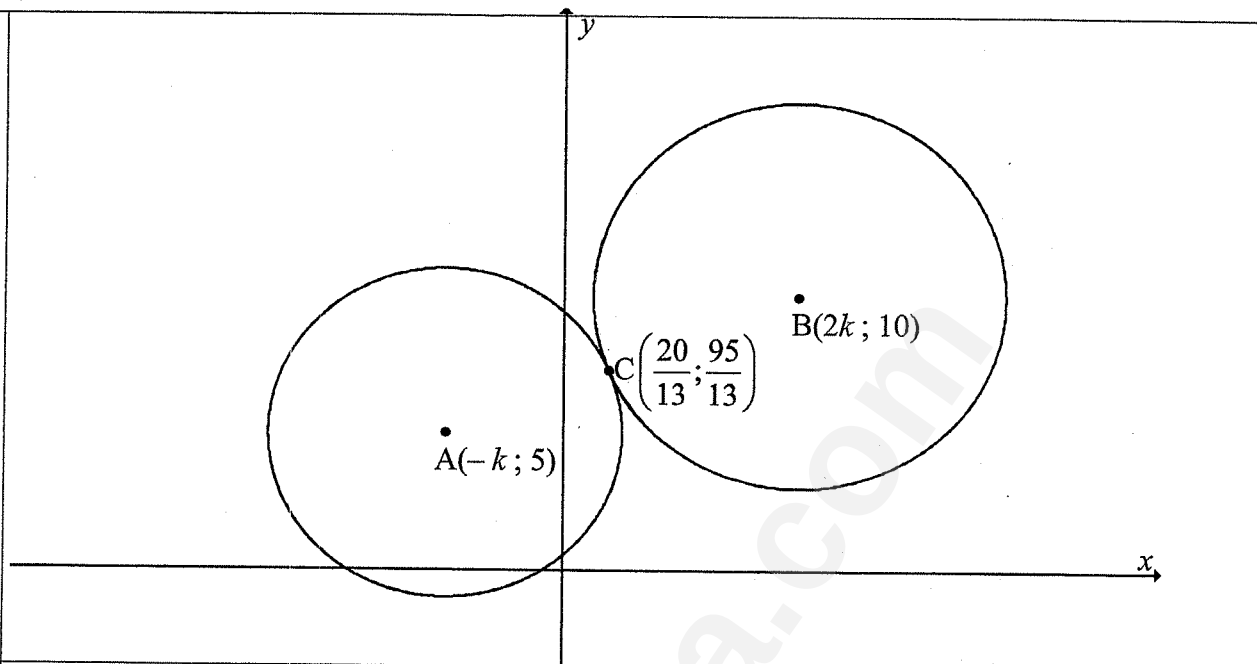
3.4	$\hat{DAB} = 75^\circ$ [opp. $\angle$ s cyclic quad. / teenoorst. $\angle$ ekvh] $\hat{OAB} = 135^\circ - 75^\circ$ $= 60^\circ$ $\tan \hat{OAB} = m_{AB}$ $\tan 60^\circ = m_{AB} = \sqrt{3}$ equation / vergelyking AB through / deur $(-3; 0)$: $y - 0 = \sqrt{3}(x + 3)$ $y = \sqrt{3}x + 3\sqrt{3}$ at / by 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/en $\therefore y = \sqrt{3}(2) + 3\sqrt{3}$ OR / OF $y = \frac{-12 + 5\sqrt{3}}{3}(2) + \frac{24 + 5\sqrt{3}}{3}$ $\therefore y = 5\sqrt{3}$ $\therefore B(2; 5\sqrt{3})$	$\checkmark \hat{DAB} = 75^\circ$ $\checkmark \hat{OAB} = 60^\circ$ $\checkmark m_{AB} = \sqrt{3}$ $\checkmark y = \sqrt{3}x + 3\sqrt{3}$ $\checkmark \frac{-12 + 5\sqrt{3}}{3}x + \frac{24 + 5\sqrt{3}}{3} = \sqrt{3}x + 3\sqrt{3}$ $\checkmark x = 2$ $\checkmark y = 5\sqrt{3}$ (7) [23]
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QUESTION/VRAAG 4

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

4.2.4	 $d_{MP} = \sqrt{(6-3)^2 + (-2-1)^2}$ $d_{MP} = \sqrt{18}$ $d_{MP} = 3\sqrt{2}$ Pythagoras : $PQ^2 = (3\sqrt{2})^2 - 4^2$ $PQ^2 = 18 - 16$ $\therefore PQ = \sqrt{2}$ units / eenhede	✓ $MQ \perp PQ$ ✓ $d_{MP} = \sqrt{18}$ or / of $3\sqrt{2}$ ✓ $PQ^2 = (3\sqrt{2})^2 - 4^2$ ✓ $PQ = \sqrt{2}$ (4)
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4.3



4.3.1

$$AB = 6 + 7 = 13$$

$$d_{AB} = \sqrt{(2k - (-k))^2 + (10 - 5)^2}$$

$$13^2 = (3k)^2 + (5)^2$$

$$169 = 9k^2 + 25$$

$$144 = 9k^2$$

$$16 = k^2$$

$$k = \pm 4$$

$\therefore k = 4$ (see diagram / sien diagram)

$\therefore A(-4; 5)$ and / en $B(8; 10)$

Gradient of AB /

Gradiënt van AB

$$m_{AB} = \frac{\frac{95}{13} - 5}{\frac{20}{13} - (-4)} \text{ or / of } m_{AB} = \frac{\frac{95}{13} - 10}{\frac{20}{13} - 8} \text{ or / of } m_{AB} = \frac{10 - 5}{8 + 4} = \frac{5}{12}$$

$$m_{AB} = \frac{5}{12}$$

OR/OF

$$\checkmark AB = 6 + 7 = 13$$

$$\checkmark 13^2 = (3k)^2 + (5)^2$$

$$\checkmark k^2 = 16$$

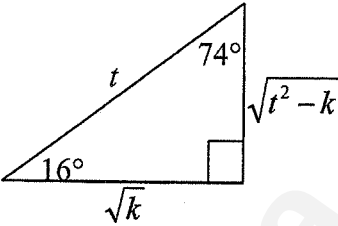
$$\checkmark k = 4$$

$\checkmark$ Correct subst. into gradient /
vervang korrek in gradiënt

(5)

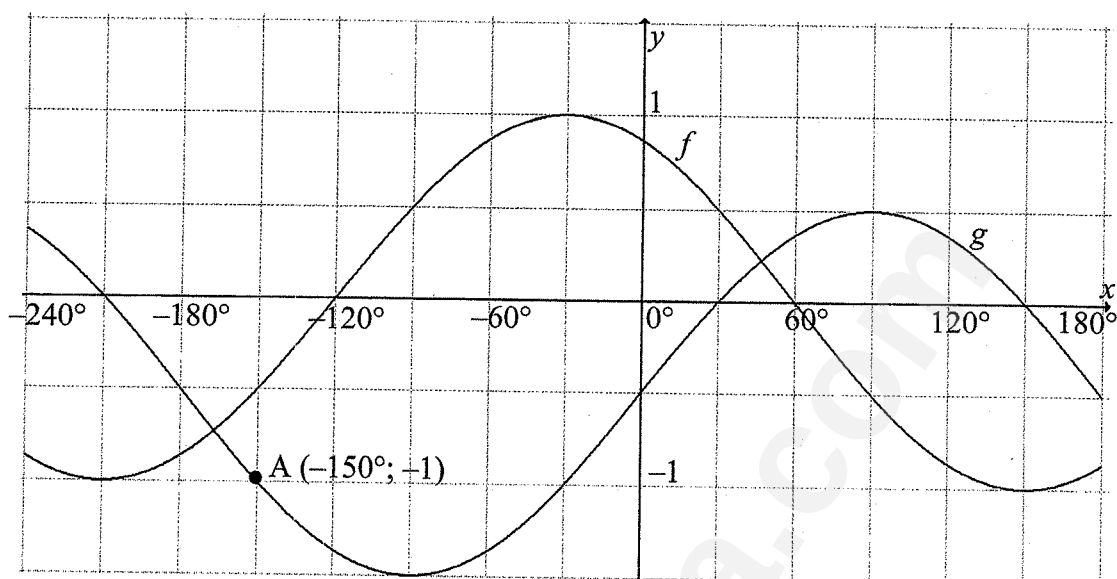
	$M_{AB} = \frac{5}{3k}$ $M_{AC} = \frac{\frac{95}{13} - 5}{\frac{20}{13} + k}$ $= \frac{95 - 65}{20 + 13k}$ $\frac{5}{3k} = \frac{30}{20 + 13k}$ $100 + 65k = 90k$ $100 = 25k$ $k = 4$ $\therefore M_{AB} = \frac{5}{3(4)} = \frac{5}{12}$	$\checkmark M_{AB} = \frac{5}{3k}$ $\checkmark M_{AB} = \frac{\frac{95}{13}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

QUESTION/VRAAG 5

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

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

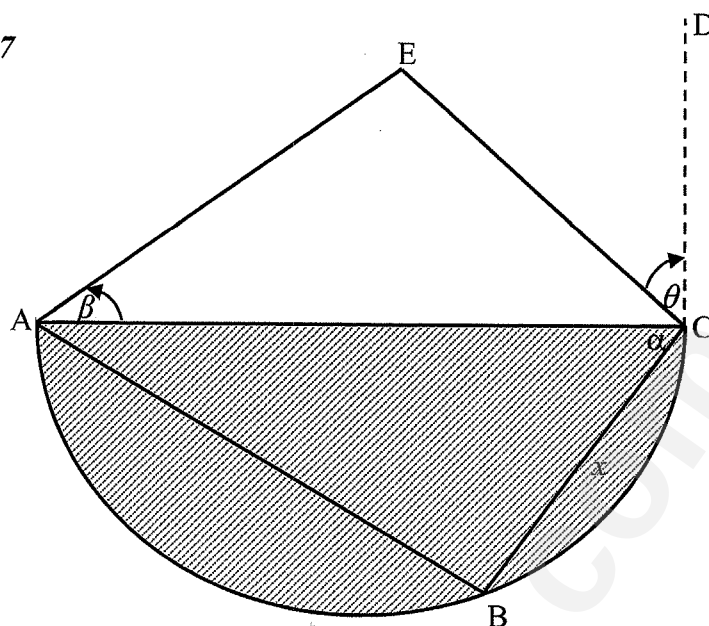
QUESTION/VRAAG 6



6.1	$p = 30^\circ$ and / en $q = -\frac{1}{2}$	$\checkmark\checkmark p = 30^\circ$ $\checkmark\checkmark q = -\frac{1}{2}$	(4)
6.2	$x = -150^\circ$ or / of $x = 30^\circ$	$\checkmark -150^\circ$ $\checkmark 30^\circ$	(2)
6.3	The graph of f must be translated 60° to the left / Die grafiek van f moet 60° na links getransleer word. OR/OF 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.	$\checkmark\checkmark 60^\circ$ to the left/na links $\checkmark 120^\circ$ right/regs $\checkmark$ reflect about x -axis/reflekteer in die x -as.	(2)

[8]

QUESTION/VRAAG 7

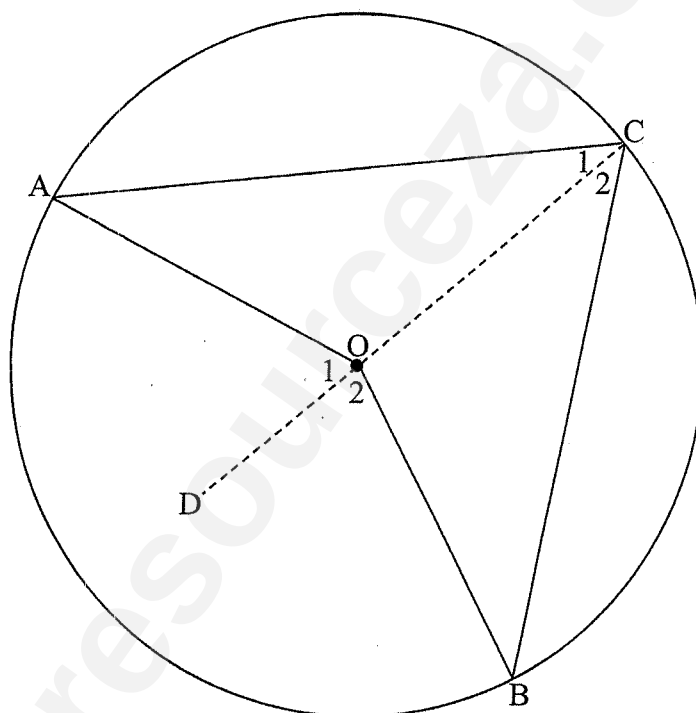


7.1	$\hat{B} = 90^\circ$ $\cos \alpha = \frac{BC}{AC} = \frac{x}{AC}$ $\therefore AC = \frac{x}{\cos \alpha}$	$\checkmark \hat{B} = 90^\circ$ $\checkmark \cos \alpha = \frac{BC}{AC} = \frac{x}{AC}$ (2)
7.2	$\hat{E}CA = 90^\circ - \theta$ $\hat{A}EC = 180^\circ - \beta - (90^\circ - \theta)$ $\hat{A}EC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

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 a 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 the statement AND reason are both correct.
	Ken 'n punt toe as beide die bewering EN rede korrek is.

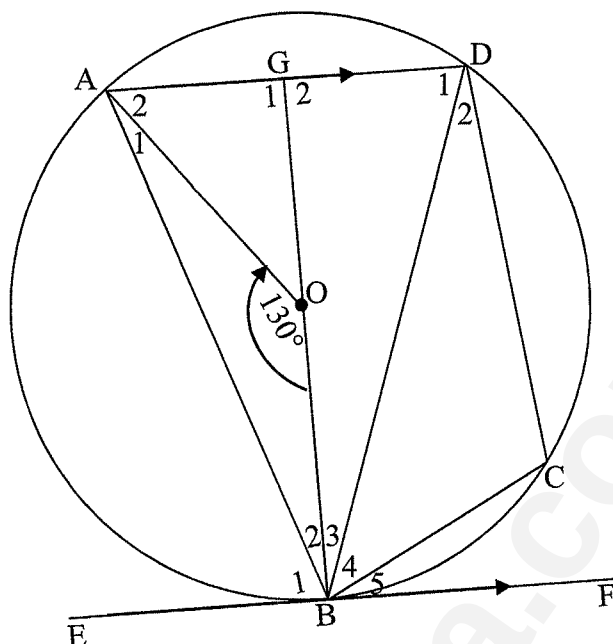
QUESTION/VRAAG 8

8.1



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

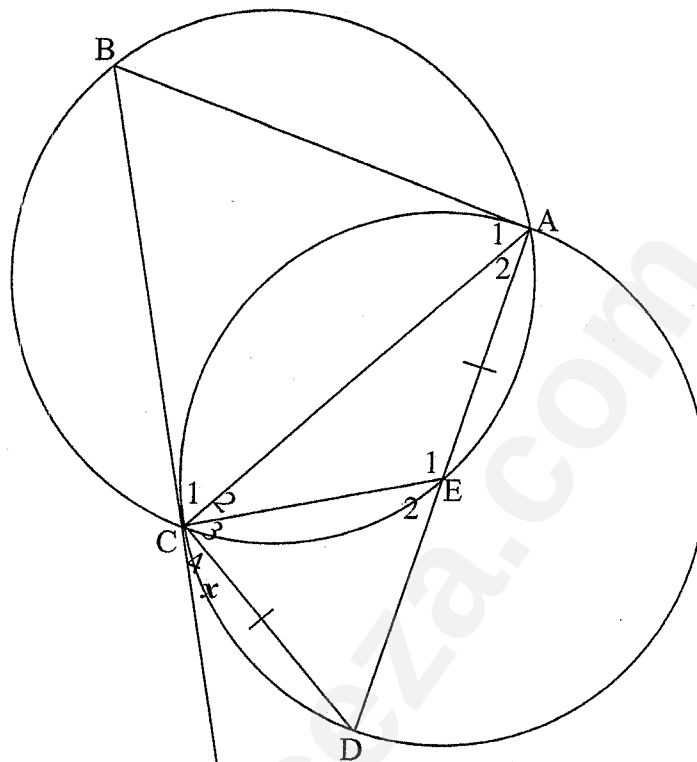
8.2



8.2.1	$\hat{D}_1 = 65^\circ$ [$\angle$ at centre = $2 \times \angle$ at circumference / <i>midpt. $\angle = 2 \times$ omtreks $\angle$</i>]	✓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 $\angle$e; $AD \parallel EF$</i>]	✓S/R (1)
8.2.4	$\hat{C} = 115^\circ$ [opp $\angle$ s of cyclic quad / <i>teenoorst. $\angle$e van kvh</i>]	✓S✓R (2)
8.2.5	$\hat{G}\hat{B}F = 90^\circ$ [rad $\perp$ tangent / <i>rad $\perp$ raaklyn</i>] $\hat{D}\hat{B}F = 65^\circ$ [alt $\angle$ s / <i>verwiss $\angle$e; $AD \parallel EF$</i>] $\hat{B}_3 = 90^\circ - 65^\circ = 25^\circ$ OR/OF $\hat{B}_1 + \hat{B}_2 = 90^\circ$ [rad $\perp$ tangent / <i>rad $\perp$ raaklyn</i>] $\hat{G}_2 = 90^\circ$ [alt $\angle$ s / <i>verwiss $\angle$e; $AD \parallel EF$</i>] $\hat{B}_3 = 180^\circ - 65^\circ - 90^\circ = 25^\circ$ [$\angle$ s of Δ / <i>binne $\angle$e van Δ</i>]	✓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 $\angle$e; $AD \parallel EF$</i>] / [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 ✓ $\frac{\sqrt{7}}{4}$ (3)

[18]

QUESTION/VRAAG 9



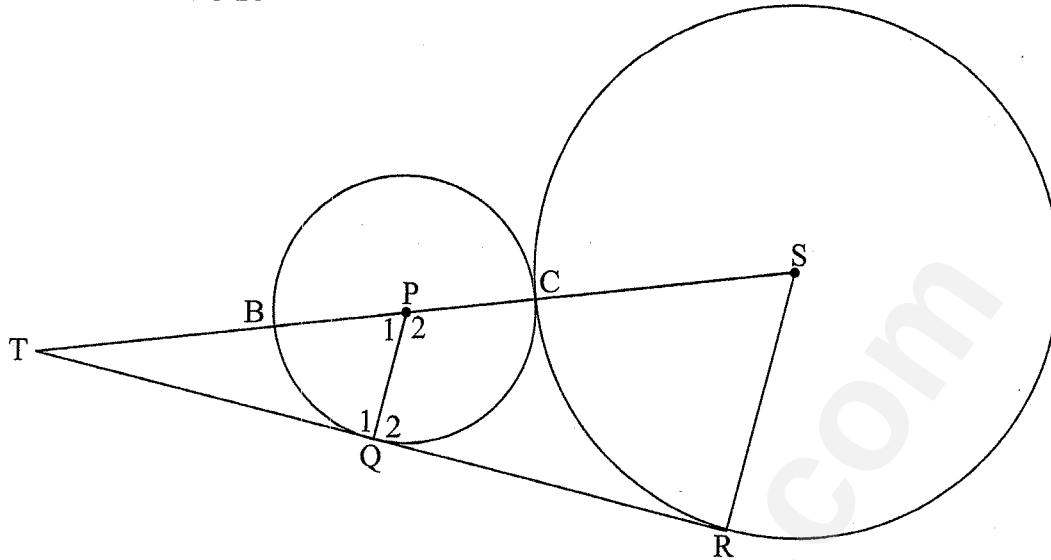
Let/Laat $\hat{C}_4 = x$.

9.1	$\hat{C}_4 = \hat{A}_2 = x$ [tangent chord theorem / raaklyn – koordstelling] $\hat{C}_2 = \hat{A}_2 = x$ [equal circles, equal chords, equal $\angle$ s / gelyke sirkels, gelyke koorde, gelyke $\angle$ e] $\therefore \hat{C}_2 = \hat{C}_4$	$\checkmark$ S $\checkmark$ R $\checkmark$ S $\checkmark$ R
9.2	$\hat{C}_4 + \hat{C}_3 = \hat{A}_1 + \hat{A}_2$ [ext. $\angle$ s of cyclic quad / buite $\angle$ e van kvh] But / Maar $\hat{C}_4 = \hat{A}_2 = x$ [in 9.1] $\therefore \hat{C}_3 = \hat{A}_1$ OR / OF $\hat{E}_1 = 180^\circ - 2x$ [sum of $\angle$ s of Δ / som van binne $\angle$ e van Δ] $\hat{B} = 180^\circ - (180^\circ - 2x) = 2x$ [opp $\angle$ s of cyclic quad / teenoorst. $\angle$ e van kvh] $\hat{C}_2 + \hat{C}_3 + \hat{C}_4 = \hat{B} + \hat{A}_1$ [ext. $\angle$ of Δ / buite $\angle$ van Δ] But / Maar $\hat{C}_2 + \hat{C}_4 = x + x = 2x = \hat{B}$ $\therefore \hat{C}_3 = \hat{A}_1$	$\checkmark$ S $\checkmark$ R $\checkmark$ S $\checkmark$ S/R $\checkmark$ S/R $\checkmark$ S

(3)

9.3	$\hat{C}_2 = \hat{A}_2$ [see / sien 9.1] $\therefore CE = AE$ [sides opp. = $\angle$ s / sye teenoor = $\angle$ e] $\hat{A}_1 = \hat{D}$ [tan-chord theorem / raaklyn – koord – stelling] $\hat{A}_1 = \hat{C}_3$ [from / van 9.2] $\therefore \hat{D} = \hat{C}_3$ $\therefore CE = DE$ [sides opp. = $\angle$ s / sye teenoor = $\angle$ e] $CE = AE = DE$ $\therefore E$ is the centre of the circle / is die middelpunt van die sirkel	 ✓S/R ✓S/R ✓S/R ✓S (4)
9.4	$AE = EC = ED$ [radii / radiusse] But / Maar $CD = AE$ [Given / gegee] $\therefore CD = DE = CE$ $\therefore \triangle ECD$ is equilateral / gelyksydig	 ✓S ✓S (2) [13]

QUESTION/VRAAG 10



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

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

TOTAL/TOTAAL: 150