



basic education

Department:
Basic Education
REPUBLIC OF SOUTH AFRICA

**NATIONAL
SENIOR CERTIFICATE
*NASIONALE
SENIOR SERTIFIKAAT***

GRADE/*GRAAD* 11

MATHEMATICS P2/*WISKUNDE V2*

NOVEMBER 2017

MARKING GUIDELINES/*NASIENRIGLYNE*

MARKS/*PUNTE*: 150

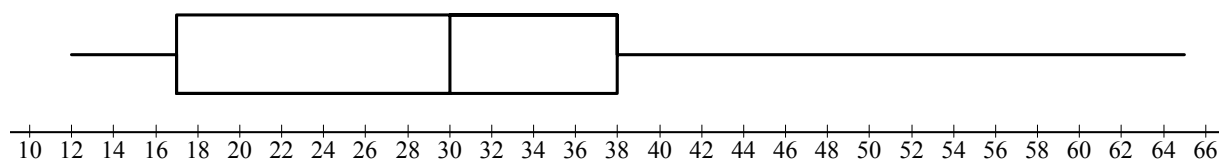
**These marking guidelines consist of 19 pages.
*Hierdie nasienriglyne bestaan uit 19 bladsye.***

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 guidelines.
- 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 nasienriglyne van toepassing.
- Dit is onaanvaarbaar om waardes/antwoorde te veronderstel om 'n probleem op te los.

QUESTION/VRAAG 1

1.1.1	$\min = 12$ $Q_1 = 17$ $\text{median} / \text{mediaan} = 30$ $Q_3 = 38$ $\max = 65$	$\checkmark$ $\min + \max$ $\checkmark$ median, Q_1 and/en Q_3 (2)
1.1.2	$IQR = Q_3 - Q_1$ $= 38 - 17$ $= 21$	$\checkmark$ answer/antw (1)
1.1.3	Skewed to the right OR positively skewed <i>Skeef na regs OF positief skeef</i>	$\checkmark$ answer/antw (1)

5	8	10	17	20	29	32	48	50	50	63	y	107
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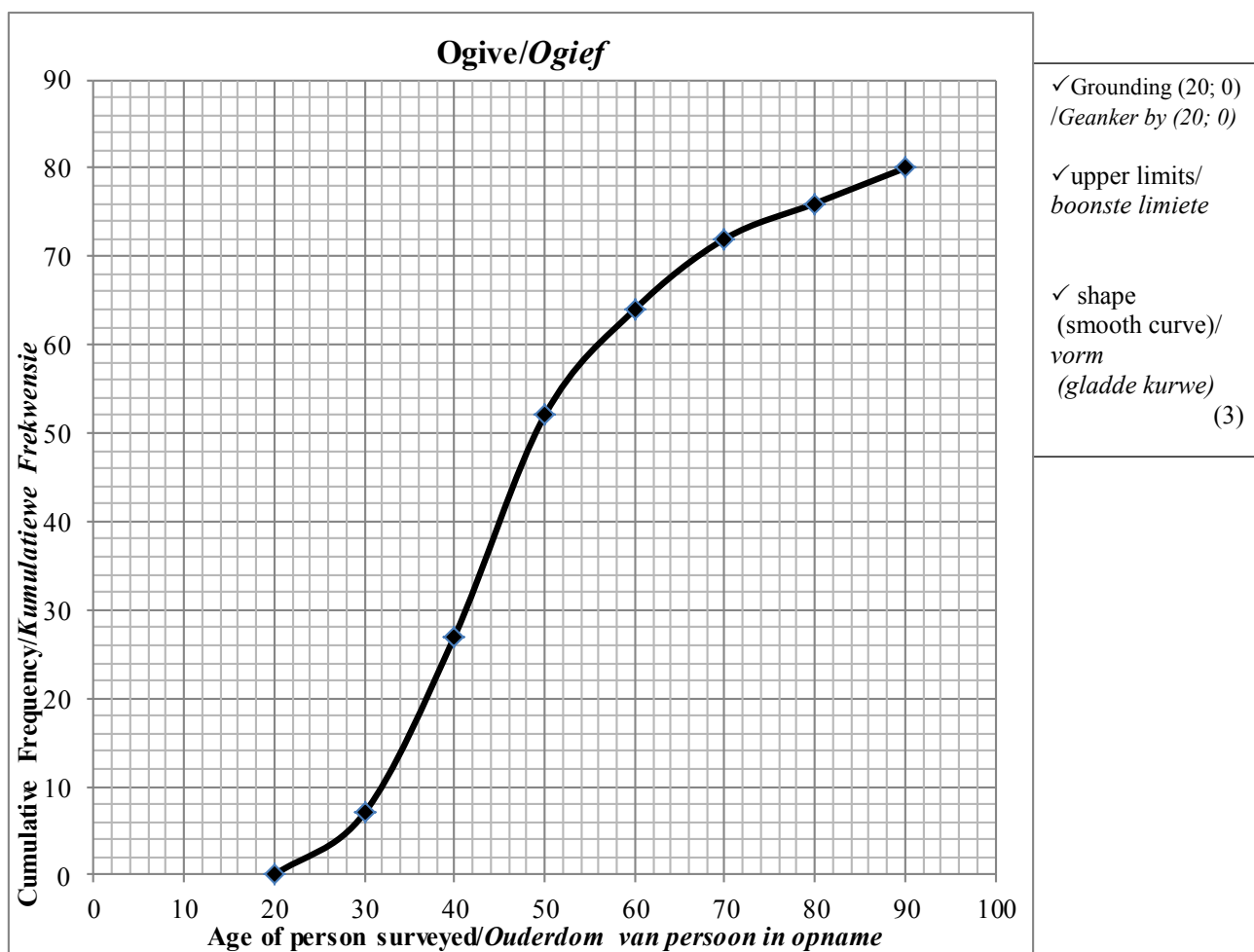
1.2.1	$\text{Mean/Gemiddeld} = \frac{439 + y}{13}$ $41 = \frac{439 + y}{13}$ $439 + y = 533$ $y = 94$	$\checkmark$ $41 = \frac{439 + y}{13}$ $\checkmark$ answer/antw (2)
1.2.2	$\sigma = 30,94$	$\checkmark$ answer/antw (1)

1.2.3	$41 \times 13 = 533$ $6 \times 18 = 108$ $\frac{533 + 108}{19} = \frac{641}{19} = 33,74$	✓ 108 ✓ $533 + 108 = 641$ ✓ answer/antw (3) [10]
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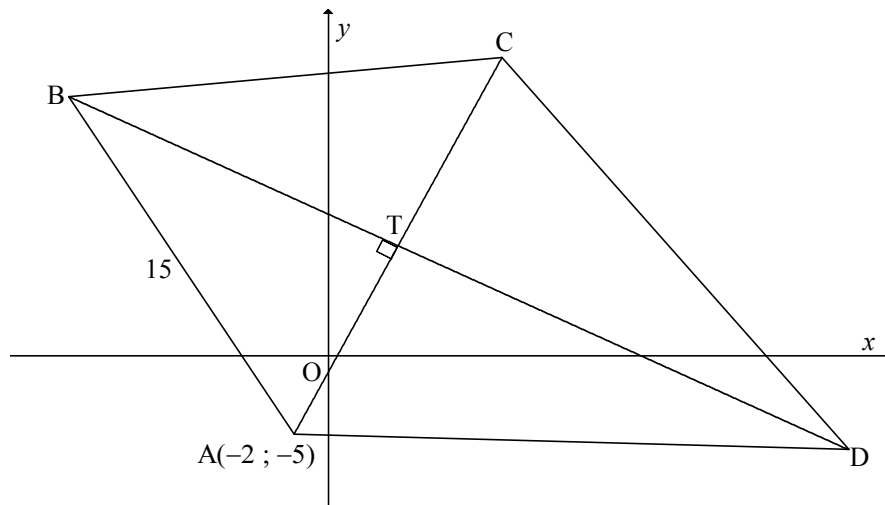
QUESTION/VRAAG 2

2.1	<table> <tr> <th>AGE OF PERSON SURVEYED/OUDERDOM VAN PERSOON IN OPNAME</th><th>FREQUENCY/FREKWENSIE</th><th>CUMULATIVE FREQUENCY/ KUMULATIEWE FREKWENSIE</th></tr> <tr> <td>$20 < x \leq 30$</td><td>7</td><td>7</td></tr> <tr> <td>$30 < x \leq 40$</td><td>20</td><td>27</td></tr> <tr> <td>$40 < x \leq 50$</td><td>25</td><td>52</td></tr> <tr> <td>$50 < x \leq 60$</td><td>12</td><td>64</td></tr> <tr> <td>$60 < x \leq 70$</td><td>8</td><td>72</td></tr> <tr> <td>$70 < x \leq 80$</td><td>4</td><td>76</td></tr> <tr> <td>$80 < x \leq 90$</td><td>4</td><td>80</td></tr> </table>	AGE OF PERSON SURVEYED/OUDERDOM VAN PERSOON IN OPNAME	FREQUENCY/FREKWENSIE	CUMULATIVE FREQUENCY/ KUMULATIEWE FREKWENSIE	$20 < x \leq 30$	7	7	$30 < x \leq 40$	20	27	$40 < x \leq 50$	25	52	$50 < x \leq 60$	12	64	$60 < x \leq 70$	8	72	$70 < x \leq 80$	4	76	$80 < x \leq 90$	4	80	✓ 20, 12 ✓ 8, 4 ✓ 52 ✓ 76 (4)
AGE OF PERSON SURVEYED/OUDERDOM VAN PERSOON IN OPNAME	FREQUENCY/FREKWENSIE	CUMULATIVE FREQUENCY/ KUMULATIEWE FREKWENSIE																								
$20 < x \leq 30$	7	7																								
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$50 < x \leq 60$	12	64																								
$60 < x \leq 70$	8	72																								
$70 < x \leq 80$	4	76																								
$80 < x \leq 90$	4	80																								
2.2	$n = 80$	✓ answ/antw (1)																								
2.3	$40 < x \leq 50$	✓ answ/antw (1)																								

2.4



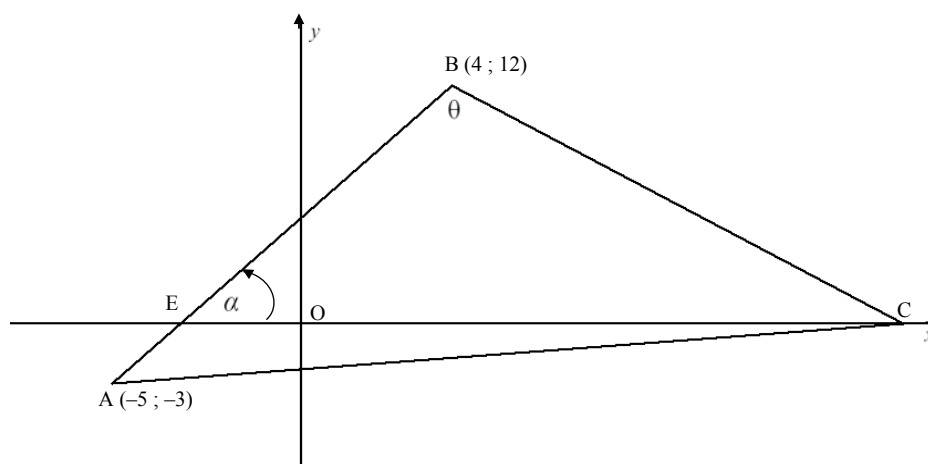
2.5	$80 - 58 = 22$ $\frac{22}{80} \times 100 = 27,5\%$	Accept/aanvaar: 56 – 59 calls/oproepe	✓ 58 calls/oproepe ✓ 22 ✓ 27,5% (3)
			[12]

QUESTION/VRAAG 3

3.1	$BD \quad y = -\frac{1}{2}x + 9$ $\therefore m_{BD} = -\frac{1}{2}$ $\therefore m_{AC} = 2$	✓ Standard form/vorm ✓ answ/antw (2)
3.2	$y - y_1 = m(x - x_1)$ $y - (-5) = 2(x - (-2))$ $y = 2x - 1$	✓ subst $(-2 ; -5)$ ✓ answ/antw (2)
3.3	$2x - 1 = -\frac{1}{2}x + 9$ $\frac{5}{2}x = 10$ $x = 4$ $y = 2(4) - 1$ $y = 7$ $T(4 ; 7)$	✓ $2x - 1 = -\frac{1}{2}x + 9$ ✓ $x = 4$ ✓ $y = 7$ (3)

3.4.1	$4 = \frac{-2+x}{2}$ $8 = -2+x$ $x = 10$ $7 = \frac{-5+y}{2}$ $14 = -5+y$ $y = 19$ $C(10; 19)$	$\checkmark \quad x = 10$ $\checkmark \quad y = 19$ (2)
3.4.2	$AT = \sqrt{(4 - (-2))^2 + (7 - (-5))^2}$ $= \sqrt{180}$ $= 6\sqrt{5}$ $BT^2 + AT^2 = AB^2 \quad (\text{Pythagoras})$ $BT = \sqrt{15^2 - (\sqrt{180})^2}$ $= 3\sqrt{5}$	$\checkmark$ subst. in distance/afstand form. $\checkmark$ answer/antw $\checkmark$ subst. in pyth $\checkmark$ answer/antw (4)
3.4.3	BC is the diameter/ <i>middel lyn</i> [subt. right / <i>ondersp. reg $\angle$</i>] or/d [conv. $\angle^s$ in semi - circle/ <i>omgk. $\angle^s$ in halfsirkel</i>] Radius = $\frac{15}{2} = 7,5$ units/ <i>eenh.</i>	$\checkmark$ S $\checkmark$ answ/antw (2) [15]

QUESTION/VRAAG 4

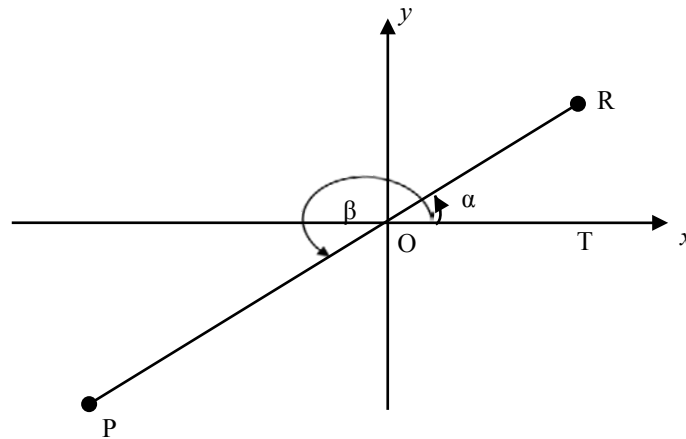


4.1	$m_{AB} = \frac{12 - (-3)}{4 - (-5)} = \frac{5}{3}$ OR/OF $m_{AB} = \frac{-3 - 12}{-5 - 4} = \frac{5}{3}$	✓ subst. in gradient form. ✓ answ/antw (2)
4.2	$y - 12 = \frac{5}{3}(x - 4)$ $0 - 12 = \frac{5}{3}(x - 4)$ $x = -\frac{16}{5}$ $E\left(-\frac{16}{5}; 0\right)$ OR/OF $\frac{0 - 12}{x - 4} = \frac{5}{3}$ $-36 = 5x - 20$ $-16 = 5x$ $x = \frac{-16}{5}$ $E\left(-\frac{16}{5}; 0\right)$ $\frac{0 + 3}{x + 5} = \frac{5}{3}$ $9 = 5x + 25$ $-16 = 5x$ $x = \frac{-16}{5}$	✓ equation/verg. ✓ $y = 0$ ✓ answ/antw (3) ✓ equating/verg. ✓ $y = 0$ ✓ answ/antw (3)

4.3	$\tan \alpha = m_{AB}$ $\tan \alpha = \frac{5}{3}$ $\alpha = 59^\circ$	$\checkmark \tan \alpha = \frac{5}{3}$ $\checkmark \alpha = 59^\circ$ (2)
4.4	$76^\circ + 59^\circ = 135^\circ$ [ext $\angle$ of Δ] $\hat{B}CX = 135^\circ$ $\tan 135^\circ = m_{BC}$ $m_{BC} = -1 = m_{//}$ $y - (-3) = -1(x - (-5))$ $y = -x - 8$	$\checkmark 135^\circ$ $\checkmark \tan 135^\circ = m_{BC}$ $\checkmark$ answer/antw $\checkmark$ subst $(-3; -5)$ $\checkmark$ answer/antw (5) [12]

QUESTION/VRAAG 5

5.1	$\sin(90^\circ - x) \cdot \cos(180^\circ + x) + \tan x \cdot \cos x \cdot \sin(x - 180^\circ)$ $= \cos x \cdot (-\cos x) + \frac{\sin x}{\cos x} \cdot \cos x \cdot (-\sin x)$ $= -\cos^2 x - \sin^2 x$ $= -(\cos^2 x + \sin^2 x)$ $= -1$	$\checkmark \cos x$ $\checkmark -\sin x$ $\checkmark -\cos x$ $\checkmark \frac{\sin x}{\cos x}$ $\checkmark$ common factor/gemene fakt. $\checkmark$ identity/identiteit (6)
5.2	$\text{LHS} = \frac{\sin 315^\circ \cdot \tan 210^\circ \cdot \sin 190^\circ}{\cos 100^\circ \cdot \sin 120^\circ}$ $= \frac{(-\sin 45^\circ) \cdot (\tan 30^\circ) \cdot (-\sin 10^\circ)}{(-\sin 10^\circ) \cdot (\sin 60^\circ)}$ $= \frac{-\frac{1}{\sqrt{2}} \cdot \frac{1}{\sqrt{3}}}{\frac{\sqrt{3}}{2}}$ $= -\frac{\sqrt{2}}{3}$	$\checkmark -\sin 45^\circ$ $\checkmark \tan 30^\circ$ $\checkmark -\sin 10^\circ$ $\checkmark -\sin 10^\circ$ $\checkmark \sin 60^\circ$ $\checkmark$ subst. of special angles/inverv. van sp hoeke (6)



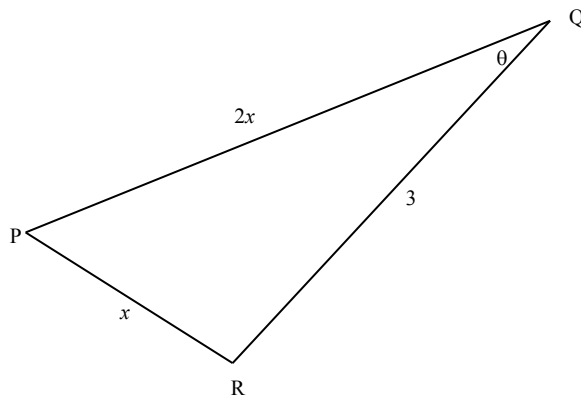
5.3.1	$x^2 + y^2 = r^2$ [Pythagoras] $(x)^2 + (3)^2 = 5^2$ $x^2 = 16$ $x = 4$ $R(4 ; 3)$ $\tan \alpha = \frac{3}{4}$	✓ subst in pyth ✓ $x = 4$ ✓ answer/antw (3)
5.3.2	$\sin \beta$ $= \sin (180^\circ + \alpha)$ $= -\sin \alpha$ $= \frac{-3}{5}$	✓ $\beta = 180^\circ + \alpha$ ✓ $-\sin \alpha$ ✓ answer/antw (3)

QUESTION/VRAAG 6

6.1	$\sin(x - 30^\circ) = \cos 2x$ $\sin(x - 30^\circ) = \sin(90^\circ - 2x)$ $x - 30^\circ = 90^\circ - 2x + 360^\circ k$ or $x - 30^\circ = 180^\circ - (90^\circ - 2x) + 360^\circ k$ $3x = 120^\circ + 360^\circ k$ $-x = 120^\circ + 360^\circ k$ $x = 40^\circ + 120^\circ k$ $x = -120^\circ + 360^\circ k, k \in \mathbb{Z}$ OR/OF $\cos(90^\circ - (x - 30^\circ)) = \cos 2x$ $\cos(120^\circ - x) = \cos 2x$ $120^\circ - x = 2x + 360^\circ k$ or $120^\circ - x = -2x + 360^\circ k$ $-3x = -120^\circ + 360^\circ k$ $x = -120^\circ + 360^\circ k$ $x = 40^\circ + 120^\circ k, k \in \mathbb{Z}$ NOTE/LET WEL: $x = -120^\circ + k \cdot 360^\circ$ is equivalent to/ekwivalent aan $x = 240^\circ + k \cdot 360^\circ$	$\checkmark \sin(90^\circ - 2x)$ $\checkmark x - 30^\circ = 90^\circ - 2x + 360^\circ k$ $\checkmark x = 40^\circ + 120^\circ k$ $\checkmark$ $x - 30^\circ = 180^\circ - (90^\circ - 2x) + 360^\circ k$ $\checkmark x = -120^\circ + 360^\circ k$ (5) $\checkmark \cos(90^\circ - (x - 30^\circ))$ $\checkmark$ $120^\circ - x = 2x + 360^\circ k$ $\checkmark x = 40^\circ + 120^\circ k$ $\checkmark$ $120^\circ - x = -2x + 360^\circ k$ $\checkmark x = 240^\circ + 360^\circ k$ (5)
6.2.1	180°	$\checkmark$ answer/antw (1)
6.2.2	$-1 \leq y \leq 1$ OR/OF $y \in [-1; 1]$	$\checkmark$ values/waardes $\checkmark$ notation/notasie (2) $\checkmark$ values/waardes $\checkmark$ notation/notasie (2)

6.2.3		✓ f x -intercept at/afsnit by 30° ✓ shape of/vorm van f ✓ g x -intercepts at/afsnitte by 45° and/ en 135° ✓ shape of/vorm van g ✓ TP at/DP by $(90^\circ; -1)$ (5)
6.2.4	$x = -80^\circ$; $x = 40^\circ$; $x = 160^\circ$	✓✓✓ one mark per answer/een punt per antw.(3)
		[16]

QUESTION/VRAAG 7

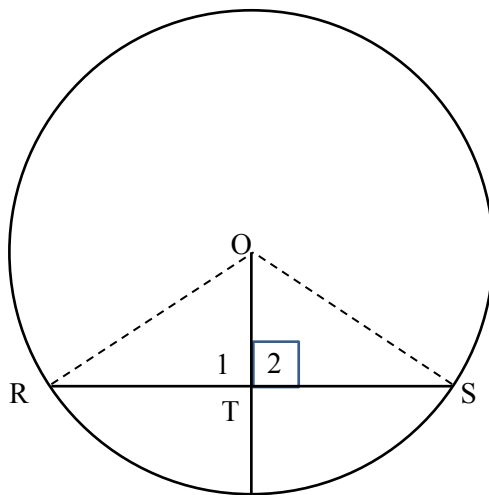


7.1	$x^2 = (2x)^2 + (3)^2 - 2(2x)(3)\cos\theta$ $12x\cos\theta = 3x^2 + 9$ $\cos\theta = \frac{3x^2 + 9}{12x}$ $\cos\theta = \frac{3(x^2 + 3)}{12x}$ $\cos\theta = \frac{x^2 + 3}{4x}$	✓ cos rule ✓ subst ✓ simplify/vereenv (3)
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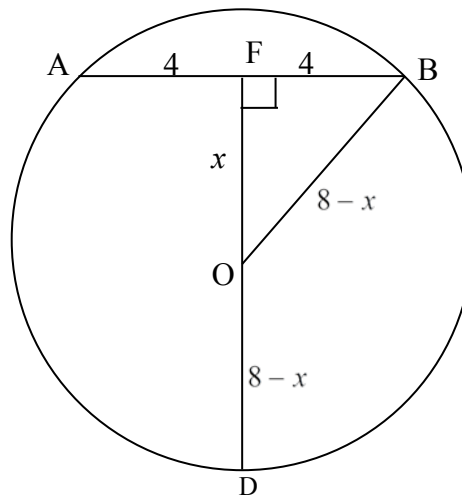
7.2.1	$\cos \theta = \frac{(2,4)^2 + 3}{4(2,4)}$ $\cos \theta = 0,9125$ $\theta = 24,15^\circ$	✓ subst ✓ $\cos \theta = 0,9125$ ✓ answer/antw. (3)
7.2.2	$\text{Area of/van } \Delta PQR = \frac{1}{2} \times PQ \times QR \times \sin \hat{Q}$ $= \frac{1}{2} \times 4,8 \times 3 \times \sin 24,15$ $= 2,95 \text{ units/eenh}^2$	✓ subst ✓ answer/antw. (2)
7.3	For/vir $x > 0$, $\cos \theta > 0$ $0^\circ < \theta < 90^\circ$ $0 < \frac{x^2 + 3}{4x} < 1$ $x^2 + 3x < 4x$ $x^2 - 4x + 3 < 0$ $(x-1)(x-3) < 0$ $1 < x < 3$	$\checkmark \checkmark 0 < \frac{x^2 + 3}{4x} < 1$ $\checkmark \checkmark 1 < x < 3$ (4)
		[12]

QUESTION 8/VRAAG 8

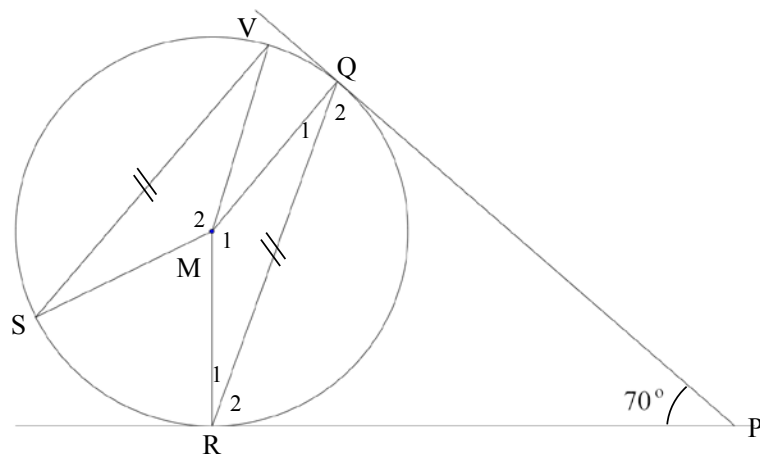
8.1	$V = \frac{1}{3} Ah$ $640 = \frac{1}{3} \times (16 \times 16) \times h$ $h = 7,5 \text{ cm}$	✓ Area of square/van $= (16 \times 16)$ vierk. ✓ Subst in volume form (2)
8.2	slant height / skuinshoogte $= \sqrt{7,5^2 + 8^2} = 10,9658\dots$ Total surface / Totale buite area $= (side \times side) + 4 \left(\frac{1}{2} b \times \perp h \right)$ $= (16 \times 16) + 4 \left(\frac{1}{2} \times 16 \times 10,9658\dots \right)$ $= 606,91 \text{ cm}^2$	✓ Subst in pyth ✓ answer/antw ✓ Subst in SA/ BO form. ✓ answer/antw (4) [6]

QUESTION 9/VRAAG 9

9.1	Construction/Konstr: Draw/trek radii OR and/en OS In $\triangle OTR$ and/ en $\triangle OTS$ $OR = OS$ (radii) $OT = OT$ (common side/ gemene sy) $\hat{T}_1 = \hat{T}_2 = 90^\circ$ ($\angle^s$ on straight line/ op 'n reguit lyn) $\triangle OTR \equiv \triangle OTS$ (90° HS) $\therefore RT = TS$ ($\equiv \Delta^s$)	✓ Constr/Konstr ✓ S (OT is common/gemeen) ✓ S/R ✓ R ✓ S (5)
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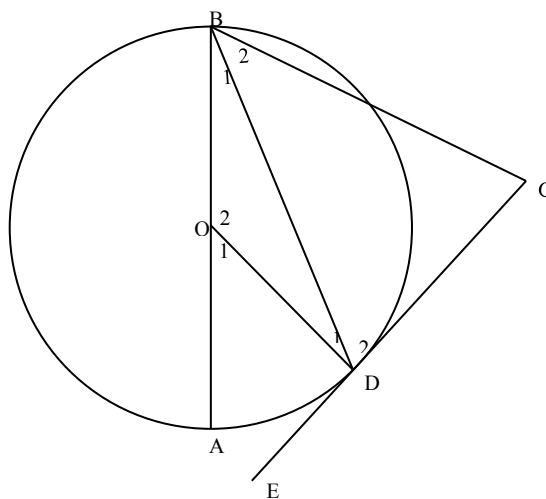


9.2	$AF = FB = 4\text{cm}$ line from centre $\perp$ to chord/ lyn van mdpt $\perp$ aan koord $OD = OB = 8 - x$ (radii) $OB^2 = OF^2 + FB^2$ (Pythagoras) $(8 - x)^2 = x^2 + 4^2$ $64 - 16x + x^2 = x^2 + 4^2$ $48 = 16x$ $x = 3$ length of/ lengte van radius $= 8 - x$ $= 8 - 5$ $= 3\text{units} / \text{eenh}$	$\checkmark$ S/R $\checkmark 8 - x$ $\checkmark (8 - x)^2 = x^2 + 4^2$ $\checkmark x = 3$ $\checkmark$ Answer/antw (5) [10]
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QUESTION/VRAAG 10

10.1	$\hat{Q}_2 = \hat{R}_2$ [tangents from common point/ <i>rk ln e van selfde punt</i>] $\hat{Q}_2 + \hat{R}_2 + 70^\circ = 180^\circ$ [sum $\angle \Delta$] $2\hat{R}_2 = 110^\circ$ $\hat{R}_2 = 55^\circ$	$\checkmark$ S $\checkmark$ R $\checkmark$ S $\checkmark \hat{R}_2 = 55^\circ$ (4)
10.2	$\hat{Q}_2 + \hat{Q}_1 = 90^\circ$ [tan/rkl $\perp$ rad] $\hat{Q}_1 = 35^\circ$ OR/OF $\hat{R}_1 + \hat{R}_2 = 90^\circ$ [tan/rkl $\perp$ rad] $\hat{R}_1 = 35^\circ$ $\hat{Q}_1 = \hat{R}_1 = 35^\circ$ [OR = OQ]	$\checkmark$ R $\checkmark \hat{Q}_1 = 35^\circ$ (2) $\checkmark$ R $\checkmark \hat{Q}_1 = 35^\circ$ (2)
10.3	$\hat{O}_1 + \hat{R}_1 + \hat{Q}_1 = 180^\circ$ [sum $\angle \Delta$] $\hat{O}_1 = 180^\circ - 70^\circ = 110^\circ$ $\hat{O}_2 = 110^\circ$ [equal chords subtend = $\angle$ at the centre/ <i>gelyke koorde onrsp. = $\angle$ by mdpt</i>]	$\checkmark \hat{O}_1 = 110^\circ$ $\checkmark \hat{O}_2 = 110^\circ$ $\checkmark$ R (3) [9]

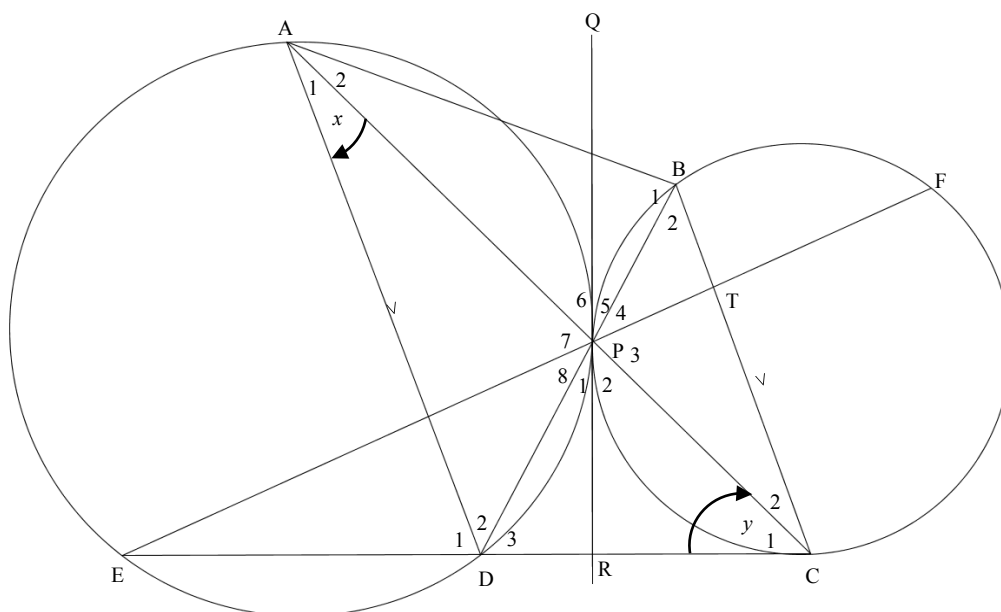
QUESTION/VRAAG 11



11.1	$\hat{B}_1 = \hat{B}_2 = x$ [BD bisect/halveer $\angle \hat{ABC}$] $\hat{ABC} = 2x$ $\hat{O}_1 = 2x$ [$\angle$ at centre = 2 times $\angle$ at circumference/] [midpts $\angle = 2 \times$ omtreks $\angle$] $\therefore BC \parallel OD$ [corresponding $\angle$ are equal/ooreenk. $\angle$ is gelyk] OR/OF $\hat{B}_1 = \hat{B}_2 = x$ [BD bisect/halveer $\angle \hat{ABC}$] $\hat{D}_1 = x$ [angle opp = sides/$\angle$ e to gelyke sye] $\hat{D}_1 = \hat{B}_2 = x$ $\therefore BC \parallel OD$ [alternate angles are equal/verw $\angle$ e gelyk] OR/OF $\hat{B}_1 = \hat{B}_2 = x$ [BD bisect/halveer $\angle \hat{ABC}$] $\hat{ABC} = 2x$ $\hat{O}_1 = 2x$ [angle at centre = 2 times angle at circumference] [midpts $\angle = 2 \times$ omtreks $\angle$] $\hat{O}_2 = 180^\circ - 2x$ [$\angle$ on a straight line/$\angle$ op reguit lyn] $\hat{O}_2 + \hat{ABC} = 180^\circ - 2x + 2x = 180^\circ$ $\therefore BC \parallel OD$ [co-int angles are suppl/ko-binne $\angle$ is suppl]	✓ S ✓ S ✓ R ✓ R (4) ✓ S ✓ S ✓ R ✓ R (4) ✓ S ✓ S ✓ R ✓ R (4)
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11.2	$O\hat{D}C = 90^\circ \text{ [tan/rkl } \perp \text{ rad]}$ $\hat{C} = 90^\circ \text{ [co – int / ko-binne } \angle\text{'s OD} \parallel \text{BC]}$ OR/OF $\hat{D}_1 = x$ $\hat{D}_2 = 90^\circ - x \text{ [tan/rkl } \perp \text{ rad]}$ $\hat{C} = 180^\circ - (90^\circ - x) - x \text{ [int } \angle\text{'s of / van } \Delta]$ $= 90^\circ$ OR/OF $E\hat{D}C = 90^\circ \text{ [tan/rkl } \perp \text{ rad]}$ $\hat{C} = 90^\circ \text{ [corresp. / ooreenk. } \angle\text{'s OD} \parallel \text{BC]}$	$\begin{array}{l} \checkmark \text{ S/R} \\ \checkmark \text{ S} \quad \checkmark \text{ R} \end{array} \quad (3)$ $\begin{array}{l} \checkmark \text{ S/R} \\ \checkmark \text{ S} \quad \checkmark \text{ R} \end{array} \quad (3)$ $\begin{array}{l} \checkmark \text{ S/R} \\ \checkmark \text{ S} \quad \checkmark \text{ R} \end{array} \quad (3)$ $[7]$
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QUESTION/VRAAG 12



12.1	$\hat{P}_1 = x$ [tan – ch th/ rkl-kdst] $\hat{C}_2 = x$ [alt/ verw. $\angle^s$ AD $\parallel$ BC] $\hat{E} = x$ [$\angle^s$ in the same segment/dieselfde segment] $\hat{P}_5 = x$ [vert opp/ reg oorst]	$\checkmark$ S $\checkmark$ R $\checkmark$ S $\checkmark$ R $\checkmark$ S $\checkmark$ R $\checkmark$ S/R (7)
12.2	$D\hat{C}B = x + y$ $E\hat{D}A = \hat{D}_1 = x + y$ [corresp/ ooreenk. $\angle^s =$, AD $\parallel$ BC] $\therefore E\hat{P}A = x + y$ [$\angle^s$ in the same segment/dieselfde segment]	$\checkmark$ S $\checkmark$ R $\checkmark$ S $\checkmark$ R (4)
12.3	$\hat{P}_2 = y$ [tan from a commom point/ rklyne v dieselfde pt] $D\hat{P}T = \hat{P}_1 + \hat{P}_2 + \hat{P}_3$ $= x + y + (x + y)$ $= 2x + 2y$ $\hat{C} = x + y$ $D\hat{P}T + \hat{C} = 180^\circ$ [opp $\angle^s$ of a cyclic quad/ teenoorst. $\angle^s$ van kvhk] $2x + 2y + x + y = 180^\circ$ $3x + 3y = 180^\circ$ $\therefore x + y = 60^\circ$	$\checkmark$ S/R $\checkmark$ $\hat{C} = x + y$ $\checkmark$ Subst $\checkmark$ Answ/antw (4) [15]

TOTAL/TOTAAL: 150