

Soek jy 'n fantastiese tutor?

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basic education

Department:
Basic Education
REPUBLIC OF SOUTH AFRICA

**NATIONAL
SENIOR CERTIFICATE/
NASIONALE
SENIOR SERTIFIKAAT**

GRADE 12/GRAAD 12

MATHEMATICS P2/WISKUNDE V2

NOVEMBER 2024

MARKING GUIDELINES/NASIENRIGLYNE

MARKS/PUNTE: 150

**These marking guidelines consist of 25 pages./
*Hierdie nasienriglyne bestaan uit 25 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 Guidelines. Stop marking at the second calculation error.
- Assuming answers/values in order to solve a problem is NOT acceptable.

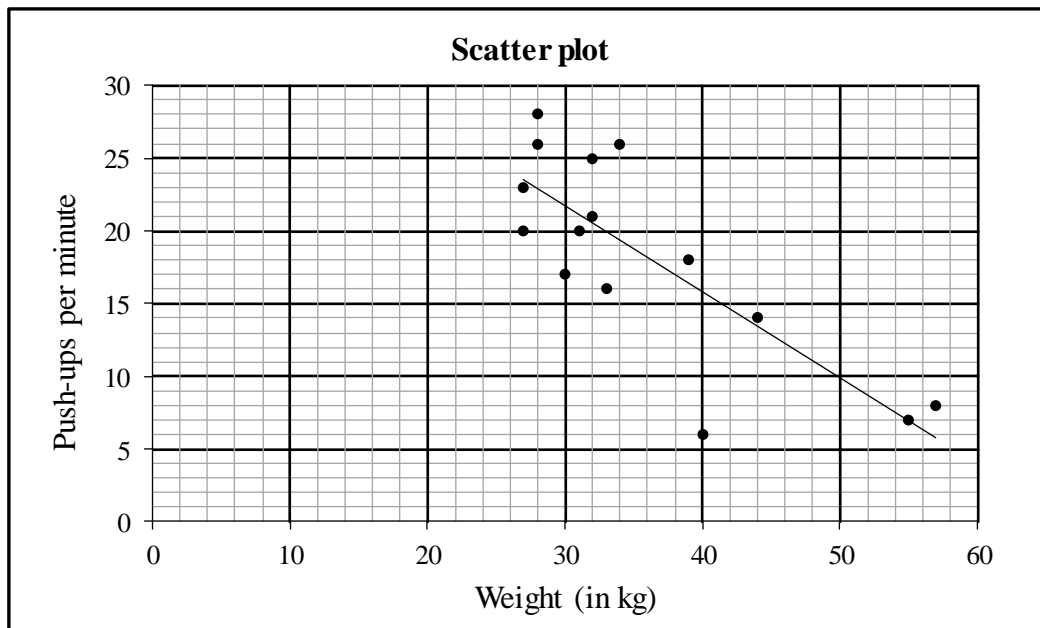
LET WEL:

- *As 'n kandidaat 'n vraag TWEE KEER beantwoord, sien slegs die EERSTE poging na.*
- *As 'n kandidaat 'n antwoord van 'n vraag doodtrek en nie oordoen nie, sien die doodgetrekte poging na.*
- *Volgehoue akkuraatheid word in ALLE aspekte van die Nasienriglyne toegepas. Hou op nasien by die tweede berekeningsfout.*
- *Aanvaar van antwoorde/waardes om 'n probleem op te los, word NIE toegelaat nie.*

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

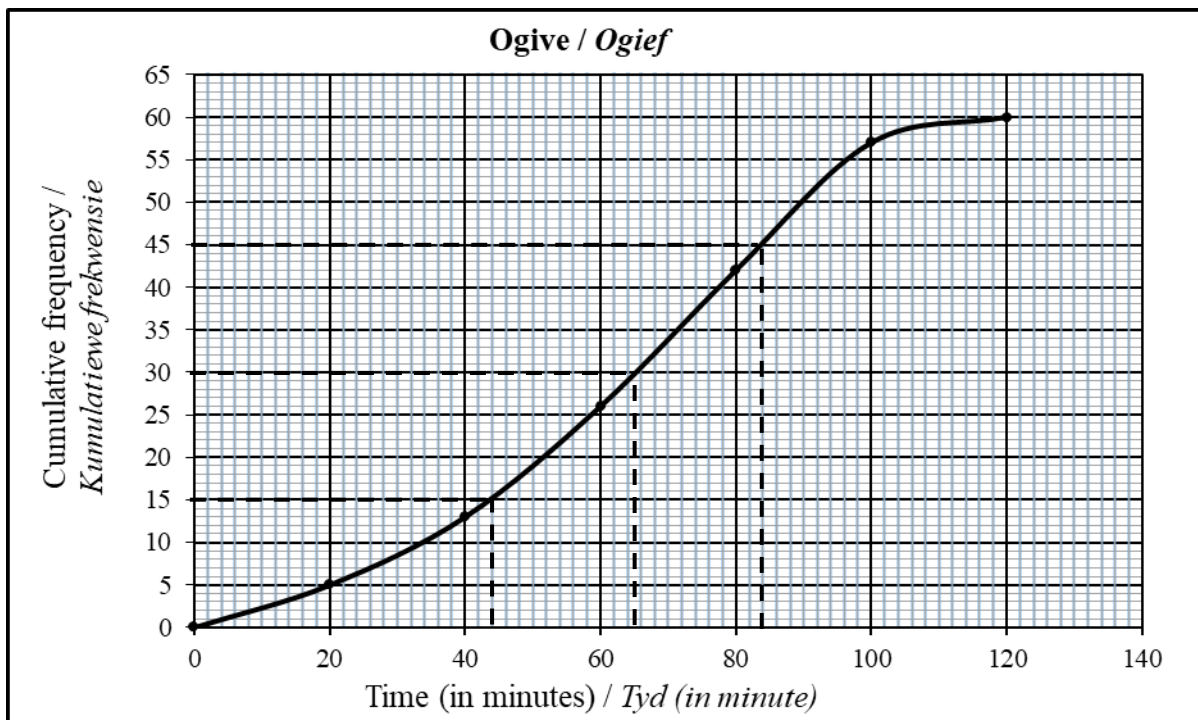
QUESTION/VRAAG 1

| Weight (in kg) (x) | 34 | 32 | 40 | 27 | 33 | 28 | 27 | 55 | 39 | 44 | 30 | 57 | 28 | 32 | 31 |
|--------------------------------------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| Number of push-ups per minute (y) | 26 | 21 | 6 | 20 | 16 | 26 | 23 | 7 | 18 | 14 | 17 | 8 | 28 | 25 | 20 |



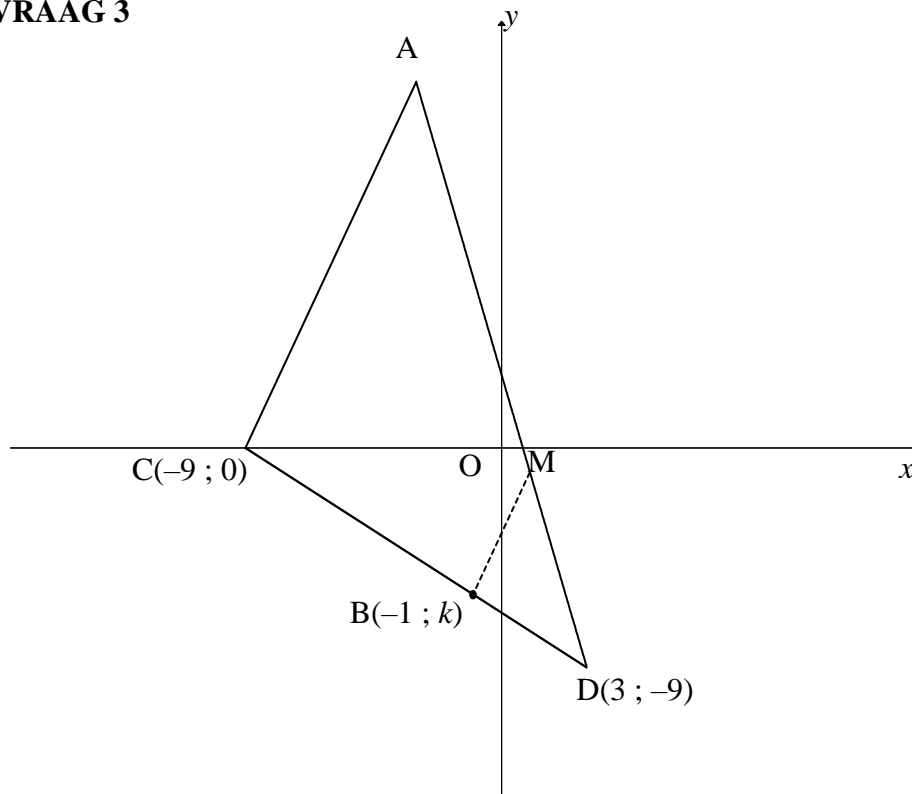
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|-----|--|--|
| 1.1 | $a = 39,456001\dots$ $b = -0,590018\dots$ $\hat{y} = 39,46 - 0,59x$ <div style="border: 1px solid black; padding: 2px; display: inline-block;">CORRECT ANSWER ONLY: FULL MARKS</div> | ✓ $a = 39,46$ ✓ $b = -0,59$ ✓ equation (3) |
| 1.2 | $r = -0,8$ | ✓(A) $-0,8$ (1) |
| 1.3 | $y = 39,46 - 0,59(29)$ $y = 22,35$ OR/OF $y = 22,35$ (calculator) | ✓ substitution ✓ answer (2) ✓✓ answer (2) |
| 1.4 | $\bar{y} = 18,33$ | ✓(A) $18,33$ (1) |
| 1.5 | The increase in the number of push-ups will have no influence . The standard deviation stays the same . | ✓ no influence OR standard deviation remains the same <i>geen verandering /</i> <i>bly dieselfde</i> (1) |
| 1.6 | 6 is furthest y-value below the least squares regression line. An increase of 10 push-ups will get the team member to (40 ; 16), the minimum number of push-ups for a player weighing 40kg. | ✓ 6 ✓ difference is 10 (2) |
| | | [10] |

QUESTION/VRAAG 2



| | | |
|-------------|--|---|
| 2.1 | Median = 65 | ✓ 65 (1) |
| 2.2 | $Q_1 = 44$ | ✓ 44 (1) |
| 2.3 | $IQR = 84 - 44$ $= 40$ | ✓ 84 ✓ IQR (2) |
| 2.4 | | ✓ box ✓ (A) whiskers ending at 5 & 120 (2) |
| 2.5 | Number of employees who qualify = 34 $\% \text{ of employees who qualify} = \frac{34}{60} \times 100$ $= 56,67\% \text{ of the employees}$ OR/OF Number of employees who qualify = 35 $\% \text{ of employees who qualify} = \frac{35}{60} \times 100$ $= 58,33\% \text{ of the employees}$ | ✓ 34 ✓ answer ✓ 35 ✓ answer (2) |
| 2.6 | Number of intervals = 3 Time allowed to work from home = 3(30 minutes) $= 90 \text{ minutes}$ OR/OF 1,5 hours | ✓ 3 ✓ answer (2) |
| [10] | | |

QUESTION / VRAAG 3

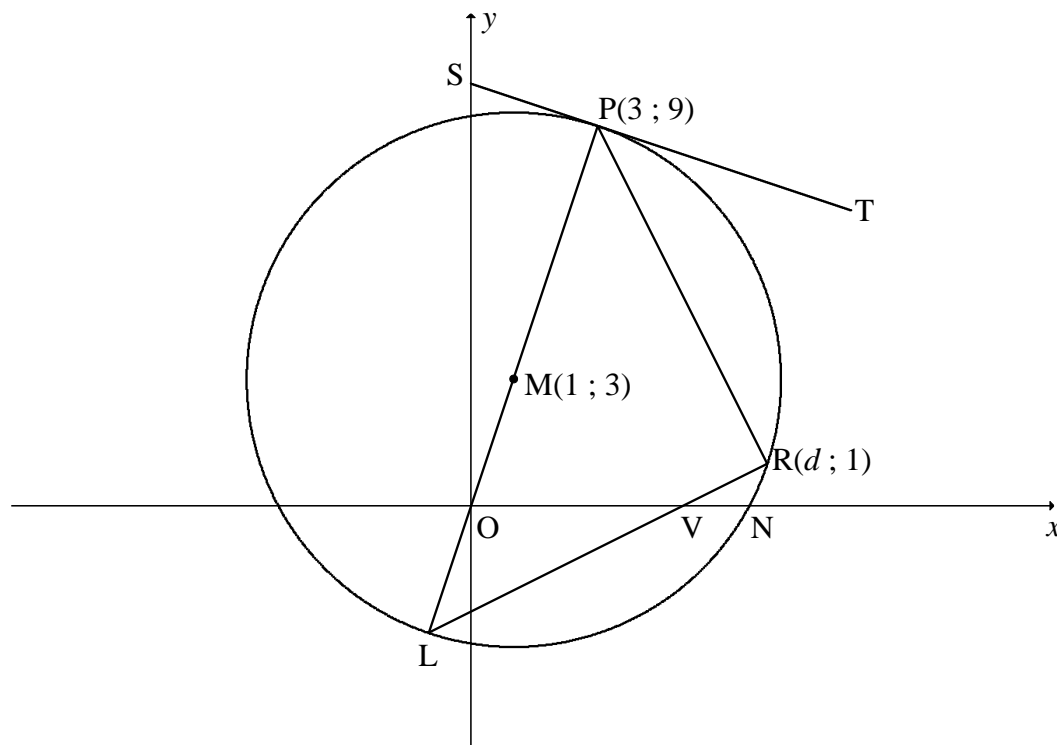


| | | |
|-----|---|---|
| 3.1 | $m_{DC} = \frac{-9-0}{3-(-9)} \quad \text{OR/OF} \quad m_{DC} = \frac{0-(-9)}{-9-3}$ $m_{DC} = -\frac{3}{4} \quad m_{DC} = -\frac{3}{4}$ | ✓ correct substitution of D(3; -9) & C(-9; 0) into gradient formula ✓ answer (2) |
| 3.2 | Equation of DC: $0 = -\frac{3}{4}(-9) + c \quad \text{OR/OF} \quad y - 0 = -\frac{3}{4}(x - (-9))$ $c = \frac{-27}{4} \text{ or } -6\frac{3}{4} \quad y = -\frac{3}{4}(x + 9)$ $y = -\frac{3}{4}x - \frac{27}{4} \quad y = -\frac{3}{4}x - \frac{27}{4}$ | ✓ correct substitution of C(-9; 0) or D(3; -9) into equation of line ✓ answer (2) |
| 3.3 | $k = -\frac{3}{4}(-1) - \frac{27}{4} \quad \text{OR/OF} \quad \frac{k - (-9)}{-1 - 3} = \frac{-3}{4} \quad \text{OR/OF} \quad \frac{k - 0}{-1 - (-9)} = \frac{-3}{4}$ $k = \frac{3}{4} - \frac{27}{4} \quad \text{OR/OF} \quad k + 9 = 3 \quad \text{OR/OF} \quad k = -\frac{3}{4}(8)$ $k = -6 \quad k = -6 \quad k = -6$ | ✓ substitution of B(-1; k) (1) |
| 3.4 | $DC = \sqrt{(3+9)^2 + (-9-0)^2}$ $DC = 15 \text{ units}$ | ✓ correct substitution of D(3; -9) & C(-9; 0) into distance formula ✓ answer (2) |

| | | |
|-----|---|---|
| 3.5 | $DB = \sqrt{(3 - (-1))^2 + (-9 - (-6))^2}$ $DB = 5$ $\therefore \frac{DB}{DC} = \frac{5}{15} = \frac{1}{3}$ | ✓ $DB = 5$ ✓ answer (2) |
| 3.6 | $\frac{DM}{DA} = \frac{DB}{DC} = \frac{1}{3}$ $\frac{\text{Area } \triangle MBD}{\text{Area } \triangle ACD} = \frac{\frac{1}{2}(DM)(DB)(\sin \hat{D})}{\frac{1}{2}(DA)(DC)(\sin \hat{D})}$ $= \frac{1}{3} \times \frac{1}{3}$ $= \frac{1}{9}$ | ✓ $\frac{DM}{DA} = \frac{DB}{DC}$ ✓ correct use of area rule ✓ subst. for $\frac{BD}{DC}$ and $\frac{DM}{DA}$ into correct formula ✓ answer (4) |
| 3.7 | $y = -4x + c$ $m_{AD} = -4$ $-9 = -4(3) + c$ $c = 3$ $y = -4x + 3$ $(x-3)^2 + (y+9)^2 = 612$ $(x-3)^2 + (-4x+3+9)^2 = (\sqrt{612})^2$ $(x-3)^2 + (-4x+12)^2 = 612$ $x^2 - 6x + 9 + 16x^2 - 96x + 144 = 612$ $17x^2 - 102x - 459 = 0$ $x^2 - 6x - 27 = 0$ $(x-9)(x+3) = 0$ $x = 9 \text{ or } x = -3$ N/A $y = -4(-3) + 3$ $y = 15$ $A(-3; 15)$ | ✓ correct substitution of $m_{AD} = -4$ and $D(3; -9)$ ✓ $(x-3)^2 + (y+9)^2 = 612$ ✓ substitution of equation AD into distance formula ✓ standard form ✓ x values with rejection ✓ y coordinate (6) |

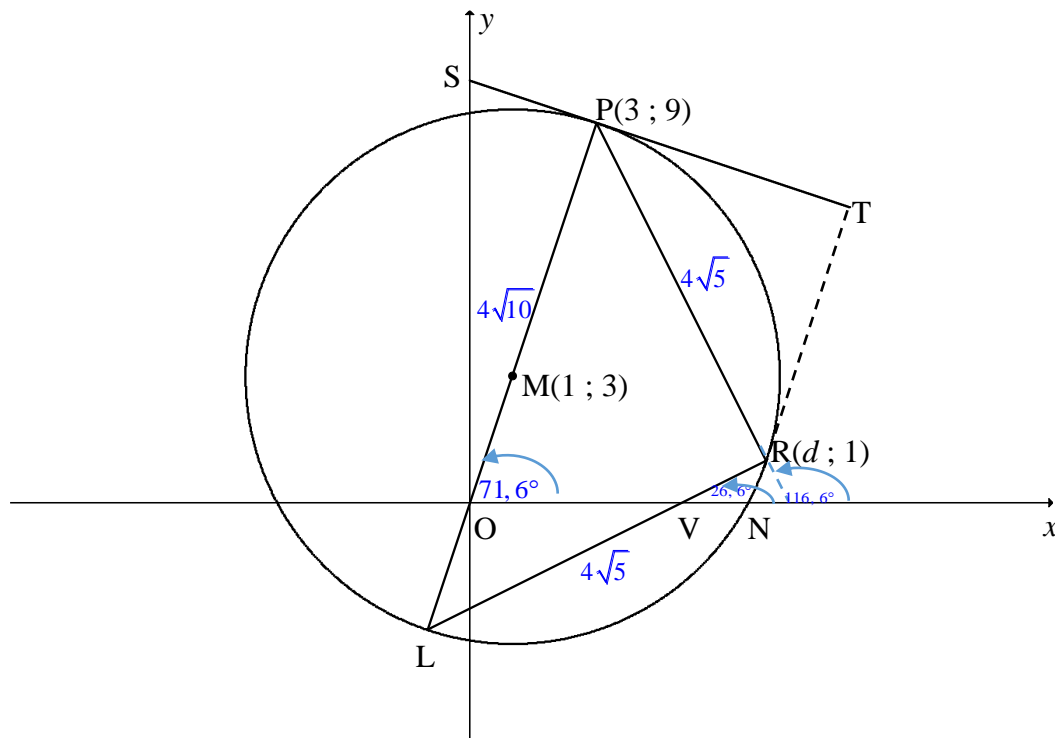
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| | <p>OR/OF</p> $-9 = -4(3) + c$ $c = 3$ $y = -4x + 3$ $N(0 ; 3)$ $ND = \sqrt{(3-0)^2 + (-9-3)^2}$ $= 3\sqrt{17}$ $AD = 6\sqrt{17}$ $ND = \frac{1}{2}AD$ <p>N is the midpoint of AD</p> $A(-3 ; 15)$ | <p>OR/OF</p> <p>✓ correct substitution of $m_{AD} = -4$ and $D(3 ; -9)$</p> <p>✓ $N(0 ; 3)$</p> <p>✓ substitution into distance formula to calculate ND</p> <p>✓ $ND = \frac{1}{2}AD$</p> <p>✓ x – value ✓ y – value</p> <p>(6)</p> |
| | | [19] |

QUESTION/VRAAG 4



| | | |
|-----|--|--|
| 4.1 | $L(-1 ; -3)$ | $\checkmark \ x = -1 \ \checkmark \ y = -3$ (2) |
| 4.2 | $m_{MP} = \frac{9-3}{3-1}$ $m_{MP} = 3$ $m_{ST} = -\frac{1}{3}$ $9 = -\frac{1}{3}(3) + c$ $c = 10$ $y = -\frac{1}{3}x + 10$ $y - 9 = -\frac{1}{3}(x - 3)$ $y - 9 = -\frac{1}{3}x + 1$ $y = -\frac{1}{3}x + 10$ <p style="text-align: center;">OR/OF</p> | $\checkmark \ m_{MP} = 3$ $\checkmark \ m_{ST} = -\frac{1}{m_{MP}}$ $\checkmark \ \text{substitution of } m_{ST} \text{ \& P(3; 9) into equation of a line}$ $\checkmark \ \text{equation of tangent ST}$ (4) |
| 4.3 | $(x-1)^2 + (y-3)^2 = r^2$ $(3-1)^2 + (9-3)^2 = r^2$ $r^2 = 40$ $(x-1)^2 + (y-3)^2 = 40$ $x^2 - 2x + 1 + y^2 - 6y + 9 = 40$ $x^2 + y^2 - 2x - 6y - 30 = 0$ | $\checkmark \ (3-1)^2 + (9-3)^2 = r^2$ $\checkmark \ \text{value of } r^2$ $\checkmark \ \text{LHS of equation of circle}$ $\checkmark \ \text{expanding LHS}$ (4) |

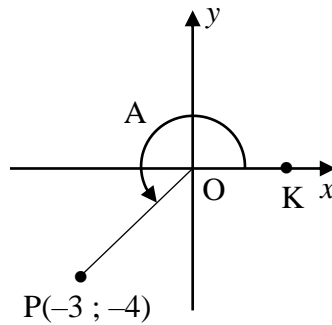
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| 4.4 | $d^2 + (1)^2 - 2d - 6(1) - 30 = 0$ $d^2 - 2d - 35 = 0$ $(d - 7)(d + 5) = 0$ $d = 7 \text{ or } d = -5$ $\therefore d = 7$ <p>OR/OF</p> $(x - 1)^2 + (y - 3)^2 = 40$ $(d - 1)^2 + (1 - 3)^2 = 40$ $(d - 1)^2 = 36$ $d - 1 = 6 \text{ or } d - 1 = -6$ $d = 7 \text{ or } d = -5$ $\therefore d = 7$ <p>OR/OF</p> $\hat{PRL} = 90^\circ \quad (\angle \text{ in semi-circle})$ $\frac{9 - 1}{3 - d} \times \frac{1 - (-3)}{d - (-1)} = -1$ $d^2 - 2d - 35 = 0$ $(d - 7)(d + 5) = 0$ $d = 7 \text{ or } d = -5$ $\therefore d = 7$ | $\checkmark d^2 + (1)^2 - 2d - 6(1) - 30 = 0$ $\checkmark \text{ standard form}$ <p style="text-align: right;">(2)</p> <p>OR/OF</p> $\checkmark (d - 1)^2 + (1 - 3)^2 = 40$ $\checkmark \text{ standard form}$ <p style="text-align: right;">(2)</p> <p>OR/OF</p> $\checkmark m_{PR} \times m_{RL} = -1$ $\checkmark \text{ standard form}$ <p style="text-align: right;">(2)</p> |
|-----|---|---|



| | | |
|------------|---|--|
| <p>4.5</p> | <p> $m_{PO} = 3$ $\therefore \tan \hat{POV} = 3$ $\hat{POV} = 71,565\dots^\circ$ $m_{RL} = \frac{1 - (-3)}{7 - (-1)}$ $= \frac{1}{2}$ $\therefore \tan \hat{RVN} = \frac{1}{2}$ $\hat{RVN} = 26,565\dots^\circ$ $\hat{L} = 71,565\dots^\circ - 26,565\dots^\circ$ [ext. \angle of Δ / buite \angle van Δ] $\hat{L} = 45^\circ$ OR/OF $\hat{R} = 90^\circ$ [\angle in semi-circle / \angle in 'n halwe sirkel] $PR^2 = (3-7)^2 + (9-1)^2$ $PR = \sqrt{80} = 4\sqrt{5}$ units $PL^2 = (3-(-1))^2 + (9-(-3))^2$ OR $RL^2 = (7+1)^2 + (1+3)^2$ $PL = \sqrt{160} = 4\sqrt{10}$ $RL = \sqrt{80} = 4\sqrt{5}$ $\sin \hat{L} = \frac{4\sqrt{5}}{4\sqrt{10}}$ OR $\cos \hat{L} = \frac{4\sqrt{5}}{4\sqrt{10}}$ OR $\tan \hat{L} = \frac{4\sqrt{5}}{4\sqrt{5}}$ $\hat{L} = 45^\circ$ </p> | <p> $\checkmark \tan \hat{POV} = m_{PO}$ $\checkmark \hat{POV}$ $\checkmark m_{RL}$ using R(7 ; 1) & L $\checkmark \hat{RVN}$ \checkmark answer (5) OR/OF $\checkmark \hat{R} = 90^\circ$ $\checkmark PR = \sqrt{80} = 4\sqrt{5}$ \checkmark length of PL OR RL \checkmark trig ratio of \hat{L} \checkmark answer (5) </p> |
|------------|---|--|

| | | |
|-----|--|---|
| | <p>OR/OF</p> $PL = \sqrt{(3+1)^2 + (9+3)^2} = \sqrt{160} = 4\sqrt{10}$ $PR = \sqrt{(7-3)^2 + (1-9)^2} = \sqrt{80} = 4\sqrt{5}$ $LR = \sqrt{(7+1)^2 + (1+3)^2} = \sqrt{80} = 4\sqrt{5}$ $\cos L = \frac{80+160-80}{2\sqrt{80} \times \sqrt{160}}$ $\cos L = \frac{\sqrt{2}}{2}$ $\hat{L} = 45^\circ$ | <p>OR/OF</p> <p>✓ length of PL</p> <p>✓ $PR = \sqrt{80} = 4\sqrt{5}$</p> <p>✓ length of LR</p> <p>✓ substitution into the cos rule</p> <p>✓ answer</p> <p>(5)</p> |
| 4.6 | $m_{RM} = \frac{1-3}{7-1}$ $= -\frac{1}{3}$ $m_{RT} = 3 \quad (\tan \perp \text{ rad})$ $m_{PT} = -\frac{1}{3}$ $m_{RT} \times m_{PT} = -1$ <p>PT \perp RT</p> <p>OR/OF</p> $m_{MR} = \frac{3-1}{1-7}$ $= -\frac{1}{3}$ $m_{PT} = -\frac{1}{3} \quad [\text{proved in Q4.2}]$ $m_{PT} = m_{MR}$ <p>\therefore PT \parallel MR</p> <p>$\hat{MRT} = 90^\circ$ [radius \perp tangent / raaklyn \perp radius]</p> <p>$\hat{PTR} = 90^\circ$ [co-int \angles; PT \parallel MR/ooreenkomst. \anglee; PT \parallel MR]</p> <p>PT \perp RT</p> <p>OR/OF</p> <p>$\hat{TPR} = \hat{L} = 45^\circ$ [tan-chord theorem/ \angle tussen raaklyn en koord]</p> <p>TP = TR [tans from common pt]</p> <p>$\therefore \hat{TPR} = \hat{TRP} = 45^\circ$ [\angles opp equal sides/ \anglee teenoor gelyke sye]</p> <p>$\therefore \hat{PTR} = 90^\circ$ [sum of \angles in Δ / binne \anglee van Δ]</p> <p>PT \perp RT</p> | <p>✓ m_{RM}</p> <p>✓ m_{RT}</p> <p>✓ $m_{RT} \times m_{PT} = -1$</p> <p>(3)</p> <p>OR/OF</p> <p>✓ PT \parallel MR</p> <p>✓ $\hat{MRT} = 90^\circ$</p> <p>✓ $\hat{PTR} = 90^\circ$</p> <p>(3)</p> <p>OR/OF</p> <p>✓ $\hat{TPR} = \hat{L}$</p> <p>✓ $\hat{TPR} = \hat{TRP}$</p> <p>✓ $\hat{PTR} = 90^\circ$</p> <p>(3)</p> |
| | | [20] |

QUESTION/VRAAG 5



| | | |
|-------|---|--|
| 5.1.1 | $r = 5$ $\cos A = -\frac{3}{5}$ | ✓ $r = 5$ ✓ answer (2) |
| 5.1.2 | $\cos 2A = 2\cos^2 A - 1$ $= 2\left(-\frac{3}{5}\right)^2 - 1$ $= -\frac{7}{25}$ OR/OF $\cos 2A = \cos^2 A - \sin^2 A$ $= \left(-\frac{3}{5}\right)^2 - \left(-\frac{4}{5}\right)^2$ $= -\frac{7}{25}$ OR/OF $\cos 2A = 1 - 2\sin^2 A$ $= 1 - 2\left(-\frac{4}{5}\right)^2$ $= -\frac{7}{25}$ | ✓ substitution of $\cos A$ into double angle formula ✓ answer (2) ✓ substitution of $\cos A$ & $\sin A$ into double angle formula ✓ answer (2) ✓ substitution of $\sin A$ into double angle formula ✓ answer (2) |
| 5.1.3 | $x = -3$ $\sin(A - B) = \sin A \cos B - \cos A \sin B$ $= \left(-\frac{4}{5}\right)\left(-\frac{3}{5}\right) - \left(-\frac{3}{5}\right)\left(\frac{4}{5}\right)$ $= \frac{12}{25} + \frac{12}{25}$ $= \frac{24}{25}$ | ✓ $x = -3$ ✓✓ substitution into the compound angle formula ✓ answer (4) |

| | | |
|-----|---|---|
| 5.2 | $\frac{\cos\left(\frac{\alpha}{2} - 45^\circ\right) \sin\left(\frac{\alpha}{2} - 45^\circ\right)}{2}$ $= \frac{2\cos\left(\frac{\alpha}{2} - 45^\circ\right) \sin\left(\frac{\alpha}{2} - 45^\circ\right)}{2.2}$ $= \frac{\sin(\alpha - 90^\circ)}{4}$ $= \frac{-\cos \alpha}{4}$ $= \frac{-p}{4} \quad \text{OR/OF} \quad = -\frac{1}{4} p$ <p>OR/OF</p> $\frac{\cos\left(\frac{\alpha}{2} - 45^\circ\right) \sin\left(\frac{\alpha}{2} - 45^\circ\right)}{2}$ $= \frac{\left[\cos \frac{\alpha}{2} \cos 45^\circ + \sin \frac{\alpha}{2} \sin 45^\circ\right] \left[\sin \frac{\alpha}{2} \cos 45^\circ - \cos \frac{\alpha}{2} \sin 45^\circ\right]}{2}$ $= \frac{\left[\frac{\sqrt{2}}{2} \cos \frac{\alpha}{2} + \frac{\sqrt{2}}{2} \sin \frac{\alpha}{2}\right] \left[\frac{\sqrt{2}}{2} \sin \frac{\alpha}{2} - \frac{\sqrt{2}}{2} \cos \frac{\alpha}{2}\right]}{2}$ $= \frac{\frac{1}{2} \sin^2 \frac{\alpha}{2} - \frac{1}{2} \cos^2 \frac{\alpha}{2}}{2}$ $= \frac{-\frac{1}{2} \left(\cos^2 \frac{\alpha}{2} - \sin^2 \frac{\alpha}{2}\right)}{2}$ $= -\frac{\cos 2\left(\frac{\alpha}{2}\right)}{4}$ $= -\frac{\cos \alpha}{4}$ $= -\frac{1}{4} p$ | <p>✓ multiply by $\frac{2}{2}$</p> <p>✓ double angle</p> <p>✓ co function</p> <p>✓ answer</p> <p>(4)</p> <p>OR/OF</p> <p>✓ expansion</p> <p>✓ special angles</p> <p>✓ double angle</p> <p>✓ answer</p> <p>(4)</p> |
| | | [12] |

QUESTION/VRAAG 6

| | | |
|-------|---|---|
| 6.1.1 | $\cos(x + y) = \cos(x - (-y))$ $= \cos x \cos(-y) + \sin x \sin(-y)$ $= \cos x \cos y - \sin x \sin y$ | ✓ $(x + y) = (x - (-y))$ ✓ correct expansion (2) |
| 6.1.2 | $\text{LHS} = \frac{\cos(90^\circ - x)\cos y + \sin(-y)\cos(180^\circ + x)}{\cos x \cos(360^\circ + y) + \sin(360^\circ - x)\sin y}$ $= \frac{(\sin x)\cos y + (-\sin y)(-\cos x)}{\cos x(\cos y) + (-\sin x)\sin y}$ $= \frac{\sin x \cos y + \cos x \sin y}{\cos x \cos y - \sin x \sin y}$ $= \frac{\sin(x + y)}{\cos(x + y)}$ $= \tan(x + y)$ $= \text{RHS}$ | ✓ $\cos(90^\circ - x) = \sin x$ ✓ $\sin(-y) = -\sin y$ ✓ $\cos(180^\circ + x) = -\cos x$ ✓ $\cos(360^\circ + y) = \cos y$ ✓ $\sin(360^\circ - x) = -\sin x$ ✓ compound angle formulae (6) |
| 6.2 | $\sqrt{6\sin^2 x - 11\cos(90^\circ + x) + 7} = 2$ $6\sin^2 x - 11\cos(90^\circ + x) + 7 = 4$ $6\sin^2 x - 11(-\sin x) + 7 = 4$ $6\sin^2 x + 11\sin x + 3 = 0$ $(3\sin x + 1)(2\sin x + 3) = 0$ $\sin x = -\frac{1}{3} \quad \text{OR/OF} \quad \sin x = -\frac{3}{2}$ $\text{ref } \angle = 19,47^\circ \quad \text{no solution}$ $x = 199,47^\circ \text{ or } x = 340,53^\circ$ | ✓ squaring both sides ✓ $\cos(90^\circ + x) = -\sin x$ ✓ factors ✓ both equations ✓ ✓ answers (6) |
| 6.3.1 | $g(x) = \frac{4 - 8\sin^2 x}{3}$ $= \frac{4(1 - 2\sin^2 x)}{3}$ $= \frac{4\cos 2x}{3}$ <p>Maximum value of $\cos 2x$ is 1</p> <p>\therefore maximum value of $g(x) = \frac{4}{3}$</p> | ✓ factors ✓ $\frac{4\cos 2x}{3}$ ✓ answer (3) |

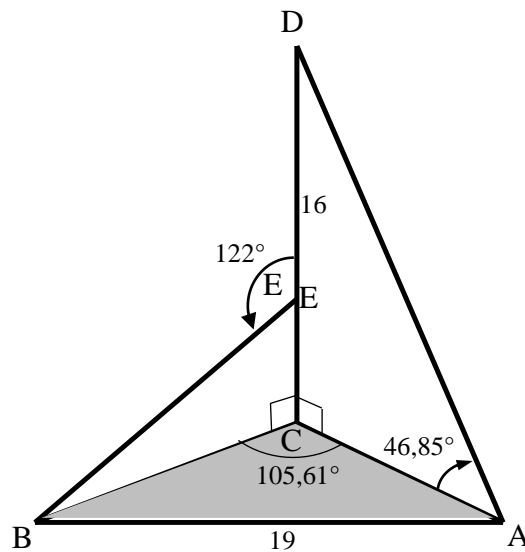
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| | <p>OR/OF</p> <p>$4 - 8\sin^2 x$ is a maximum when $\sin^2 x$ is a minimum</p> <p>Minimum value of $\sin^2 x$ is 0</p> <p>\therefore max. value of $g(x) = \frac{4 - 8(0)}{3}$</p> $g(x) = \frac{4}{3}$ <p>OR/OF</p> $\sin x = \frac{-(0)}{2\left(-\frac{8}{3}\right)}$ <p>$\sin x = 0$</p> <p>\therefore max. value of $g(x) = \frac{4 - 8(0)}{3}$</p> $g(x) = \frac{4}{3}$ | <p>OR/OF</p> <p>✓ min of $\sin^2 x = 0$</p> <p>✓ $g(x) = \frac{4 - 8(0)}{3}$</p> <p>✓ answer</p> <p>(3)</p> <p>OR/OF</p> <p>✓ $\sin x = \frac{-(0)}{2\left(-\frac{8}{3}\right)}$</p> <p>✓ $\sin x = 0$</p> <p>✓ answer</p> <p>(3)</p> |
| 6.3.2 | $x = 180^\circ$ | <p>✓ 180°</p> <p>(1)</p> |
| [18] | | |

QUESTION/VRAAG 7

| | | |
|-------|--|--|
| 7.1 | $x = 90^\circ$ | ✓ $x = 90^\circ$ (1) |
| 7.2 | $x = -180^\circ$ or $x \in (-90^\circ ; 0^\circ]$ OR/OF $x = -180^\circ$ or $-90^\circ < x \leq 0^\circ$ | ✓✓ answer (2) ✓✓ answer (2) |
| 7.3.1 | 180° | ✓ answer (1) |
| 7.3.2 | | ✓ turning points on x-axis: $x = -90^\circ ; 90^\circ$ ✓ shape ✓ turning point on y-axis at $(0 ; 2)$ (3) |
| 7.4 | $2\cos^3 x - \sin x = 0$ $2\cos^3 x = \sin x$ $2\cos^2 x = \frac{\sin x}{\cos x}$ $2\cos^2 x = \tan x$ $2\cos^2 x - 1 = \tan x - 1$ $\cos 2x + 1 = \tan x$ $x = 45^\circ + k \cdot 180^\circ ; k \in \mathbb{Z}$ OR/OF $2\cos^3 x - \sin x = 0$ $\cos x (2\cos^2 x - \tan x) = 0$ $\cos x = 0$ or $2\cos^2 x = \tan x$ not valid $2\cos^2 x - 1 + 1 = \tan x$ $\cos 2x + 1 = \tan x$ $x = 45^\circ + k \cdot 180^\circ ; k \in \mathbb{Z}$ | ✓ $2\cos^2 x = \tan x$ ✓ $2\cos^2 x - 1 = \tan x - 1$ ✓ $\cos 2x + 1 = \tan x$ ✓ answer (4) OR/OF ✓ $2\cos^2 x = \tan x$ ✓ $2\cos^2 x - 1 + 1 = \tan x$ ✓ $\cos 2x + 1 = \tan x$ ✓ answer (4) |

[11]

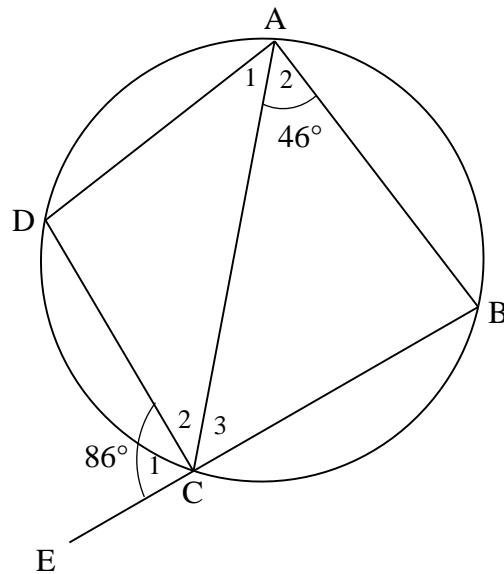
QUESTION/VRAAG 8



| | | |
|-----|---|--|
| 8.1 | $\tan \hat{D}AC = \frac{DC}{AC}$ $AC = \frac{16}{\tan 46,85^\circ}$ $AC = 15 \text{ m}$ | ✓ correct subs into trig ratio ✓ answer (2) |
| 8.2 | $(AB)^2 = (BC)^2 + (AC)^2 - 2(BC)(AC)\cos \hat{B}CA$ $(19)^2 = x^2 + (15)^2 - 2x(15)\cos 105,61^\circ$ $x^2 + 8,07x - 136 = 0$ $x = \frac{-8,07 \pm \sqrt{(8,07)^2 - 4(1)(-136)}}{2(1)}$ $x = 8,30 \text{ m or } x \neq -16,38 \text{ m}$ $\hat{B}EC = 58^\circ \quad \text{OR/OF} \quad \hat{E}BC = 32^\circ$ $\tan \hat{B}EC = \frac{BC}{EC} \quad \tan \hat{E}BC = \frac{EC}{BC}$ $EC = \frac{8,3}{\tan 58^\circ} \quad EC = 8,3 \tan 32^\circ$ $EC = 5,19 \text{ m} \quad EC = 5,19 \text{ m}$ $DE = 10,81 \text{ m} \quad DE = 10,81 \text{ m}$ | ✓ correct subst. into cosine rule ✓ quadratic equation in std form ✓ correct subst. into quadratic formula ✓ length of BC ✓ size of $\hat{B}EC$ OR/OF $\hat{E}BC$ ✓ length of EC ✓ answer (7) |

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| | <p>OR/OF</p> $\frac{\sin 105,61^\circ}{19} = \frac{\sin \hat{C}BA}{15}$ $\hat{C}BA = 49,5^\circ$ $\hat{B}AC = 24,89^\circ$ $\frac{BC}{\sin 24,89^\circ} = \frac{19}{\sin 105,61^\circ}$ $BC = 8,3 \text{ m}$ $\hat{B}EC = 58^\circ$ $\tan \hat{B}EC = \frac{BC}{EC}$ $EC = \frac{8,3}{\tan 58^\circ}$ $EC = 5,19 \text{ m}$ $DE = 10,81 \text{ m}$ | <p>OR/OF</p> <p>✓ correct subst. into sine rule</p> <p>✓ $\hat{B}AC$</p> <p>✓ correct subst. into sine formula</p> <p>✓ length of BC</p> <p>✓ size of $\hat{B}EC$ OR/OF $\hat{E}BC$</p> <p>✓ length of EC</p> <p>✓ answer</p> <p>(7)</p> |
| [9] | | |

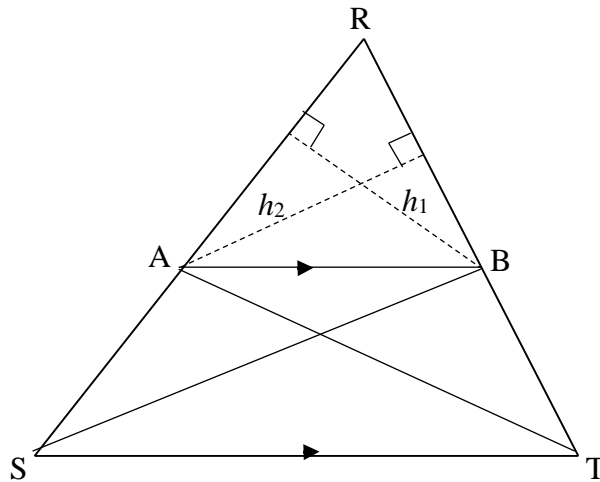
QUESTION/VRAAG 9



| | | |
|------------|---|---|
| 9.1 | $\hat{A}_1 = 40^\circ$ [ext. \angle of a cyclic quad / buite \angle van kvh] | ✓ S ✓ R (2) |
| 9.2 | $\hat{B} = 80^\circ$ $\left[\hat{A}_1 = \frac{1}{2} \hat{B} \right]$ $\hat{D} = 100^\circ$ [opp \angle s of cyclic quad / teenoorst. \angle e van kvh] $\therefore \hat{C}_2 = 40^\circ$ [sum of \angle s in Δ / binne \angle e van Δ] $\therefore \hat{C}_2 = \hat{A}_1 = 40^\circ$ $\therefore AD = DC$ [sides opp = \angle s / sye teenoor gelyke \angle] OR/OF $\hat{B} = 80^\circ$ $\left[\hat{A}_1 = \frac{1}{2} \hat{B} \right]$ $\angle ACE = \hat{A}_2 + \hat{B}$ [ext \angle of Δ / buite \angle van Δ] $\therefore \hat{C}_2 = 40^\circ$ $\therefore \hat{C}_2 = \hat{A}_1 = 40^\circ$ $\therefore AD = DC$ [sides opp = \angle s / sye teenoor gelyke \angle] OR/OF $\hat{B} = 80^\circ$ $\left[\hat{A}_1 = \frac{1}{2} \hat{B} \right]$ $\therefore \hat{C}_3 = 180^\circ - 46^\circ - 80^\circ$ [sum of \angle s in Δ / binne \angle e van Δ] $\therefore \hat{C}_3 = 54^\circ$ $\therefore \hat{C}_2 = 180^\circ - 86^\circ - 54^\circ$ [\angle s on a str. line / \angle e op 'n reguitlyn] $\therefore \hat{C}_2 = 40^\circ$ $\therefore \hat{C}_2 = \hat{A}_1 = 40^\circ$ $\therefore AD = DC$ [sides opp = \angle s / sye teenoor gelyke \angle] | ✓ S ✓ S/R ✓ S ✓ R (4) ✓ S ✓ S/R ✓ S ✓ R (4) ✓ S ✓ S/R ✓ S ✓ R (4) |
| [6] | | |

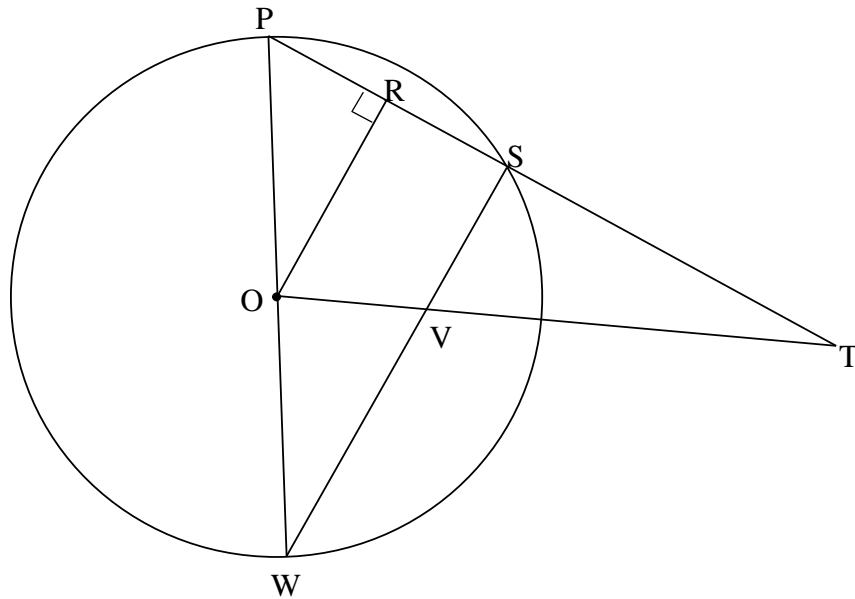
QUESTION/VRAAG 10

10.1



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| <p>10.1</p> | <p>Construction: Join SB and TA and draw h_1 from B \perp AR and h_2 from A \perp RB</p> <p><i>Konstruksie: Verbind SB en TA en trek h_1 vanaf B \perp AR en h_2 vanaf A \perp RB</i></p> <p>Proof/Bewys:</p> $\frac{\text{area } \triangle RAB}{\text{area } \triangle ASB} = \frac{\frac{1}{2} RA \times h_1}{\frac{1}{2} AS \times h_1} = \frac{RA}{AS}$ $\frac{\text{area } \triangle RAB}{\text{area } \triangle ABT} = \frac{\frac{1}{2} RB \times h_2}{\frac{1}{2} BT \times h_2} = \frac{RB}{BT}$ <p>area $\triangle RAB$ = area $\triangle RAB$ [common/gemeenskaplik] But area $\triangle ASB$ = area $\triangle ABT$ [same base & height; AB \parallel ST/ dies. basis & hoogte; AB \parallel ST]</p> $\therefore \frac{\text{area } \triangle RAB}{\text{area } \triangle ASB} = \frac{\text{area } \triangle RAB}{\text{area } \triangle ABT}$ $\therefore \frac{RA}{AS} = \frac{RB}{BT}$ | <p>✓ construction</p> $\checkmark \frac{\text{area } \triangle RAB}{\text{area } \triangle ASB} = \frac{\frac{1}{2} RA \times h_1}{\frac{1}{2} AS \times h_1}$ $\checkmark \frac{RA}{AS}$ $\checkmark \frac{\text{area } \triangle RAB}{\text{area } \triangle ABT} = \frac{RB}{BT}$ <p>✓ S ✓ R</p> <p>(6)</p> |
|-------------|--|--|

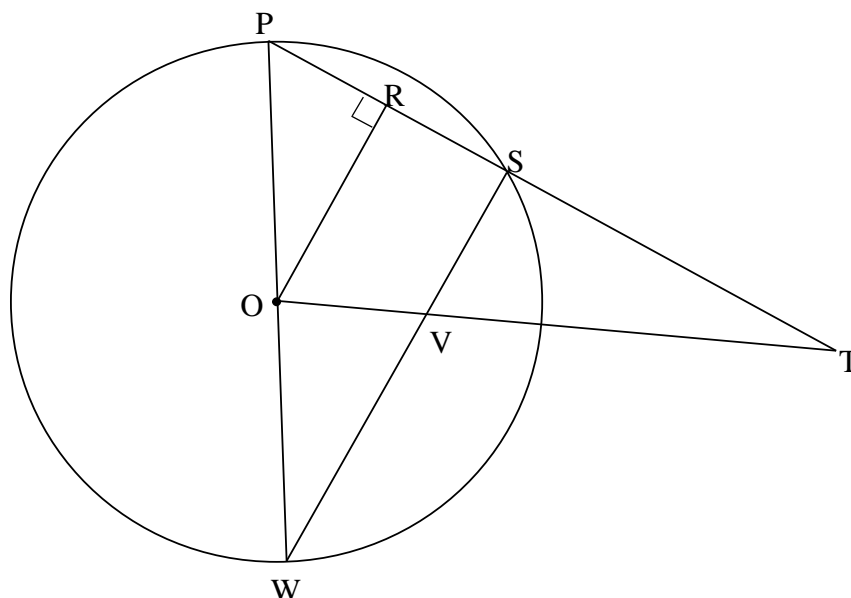
10.2



| | | | |
|--------|--|--|---|
| 10.2.1 | <p>PR = RS PO = OW $\therefore OR = \frac{1}{2} WS$ $\therefore OR : WS = 1 : 2$</p> <p>OR/OF</p> <p>$\hat{P}SW = 90^\circ$ $\hat{P}RO = 90^\circ$ $\therefore \hat{P}RO = \hat{P}SW$ $\therefore RO \parallel SW$</p> <p>$\frac{PO}{OW} = \frac{PR}{RS}$</p> <p>PO = OW $\therefore PR = RS$ $\therefore OR : WS = 1 : 2$</p> | <p>[line from centre \perp to chord/ lyn vanuit midpt. sirkel \perp op koord] [radii / radiusse] [midpt theorem/midpt. stelling]</p> <p>[\angle in semi circle/\angle in halwe sirkel] [given] [corresp \angles = / ooreenk. \anglee =] OR/OF [co-int. \angles suppl / ko-binne \anglee suppl] [prop theorem; $RO \parallel SW$/ lyn // een sy van Δ] [radii / radiusse] [midpt theorem/ midpt. stelling]</p> | <p>✓ S ✓ R ✓ S ✓ S ✓ R (5)</p> <p>✓ S ✓ S ✓ S ✓ R (5)</p> |
|--------|--|--|---|

| | | |
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| | <p>OR/OF</p> <p>$\triangle PRO$ and $\triangle PSW$</p> <p>$\hat{P}\hat{S}W = 90^\circ$ [∠ in semi circle/∠ in halwe sirkel]</p> <p>$\hat{P}\hat{R}O = 90^\circ$ [given]</p> <p>$\therefore \hat{P}\hat{R}O = \hat{P}\hat{S}W$</p> <p>$\hat{P}$ is common</p> <p>$\hat{P}\hat{O}R = \hat{P}\hat{W}S$ [sum of ∠s in Δ/ som van ∠e in Δ]</p> <p>$\therefore \triangle PRO \parallel \triangle PSW$ [∠∠∠]</p> <p>$\therefore \frac{PO}{PW} = \frac{RO}{SW}$ [Δs / Δe]</p> <p>but $PW = 2 PO$ [diameter = 2 radius/middellyn = 2 radius]</p> <p>$\therefore \frac{RO}{SW} = \frac{PO}{2PO}$</p> <p>$= \frac{1}{2}$</p> <p>$\therefore OR : WS = 1 : 2$</p> | <p>✓ S ✓ R</p> <p>✓ S</p> <p>✓ S</p> <p>✓ S</p> <p>(5)</p> |
| 10.2.2 | <p>$\frac{OV}{VT} = \frac{RS}{ST} = \frac{1}{3}$ [prop theorem; $RO \parallel SW$/ lyn een sy van Δ]</p> <p>$\frac{RS}{15} = \frac{1}{3}$</p> <p>$RS = 5$ units</p> <p>$PR = RS = 5$ units [line from centre ⊥ to chord / lyn vanuit midpt. sirkel ⊥ op koord]</p> <p>$\therefore PT = 25$ units</p> | <p>✓ S / R</p> <p>✓ S</p> <p>✓ S</p> <p>✓ answer</p> <p>(4)</p> |
| [15] | | |

10.2



| | | |
|------|---|---|
| 11.4 | $\frac{GF}{BC} = \frac{AF}{AC} \quad [\Delta AGF \parallel \Delta ABC]$ $\therefore GF = \frac{BC \cdot AF}{AC}$ $\Delta ACD \parallel \Delta FGC \quad [\angle \angle \angle]$ $\therefore \frac{AC}{GF} = \frac{AD}{FC}$ $\therefore AC = \frac{AD \cdot FG}{FC}$ $\therefore GF = BC \cdot AF \div \frac{AD \cdot FG}{FC}$ $GF = BC \cdot AF \times \frac{FC}{AD \cdot FG}$ $\therefore GF^2 = \frac{BC \cdot FC \cdot AF}{AD}$ <p>OR/OF</p> $\Delta AGF \parallel \Delta ABC \quad [\angle \angle \angle]$ $\frac{GF}{BC} = \frac{AF}{AC}$ $GF = \frac{AF \cdot BC}{AC}$ $\Delta ACD \parallel \Delta AGF \quad [\angle \angle \angle]$ $\frac{AD}{AF} = \frac{CD}{GF}$ $GF = \frac{AF \cdot CD}{AD}$ $GF \times GF = \frac{AF \cdot BC}{AC} \cdot \frac{AF \cdot CD}{AD}$ $\Delta FCD \parallel \Delta FAC \quad [\angle \angle \angle]$ $\frac{FC}{FA} = \frac{CD}{AC} \quad \text{from } \parallel \Delta \text{'s}$ $FC = \frac{CD \cdot AF}{AC}$ $GF^2 = \frac{AF \cdot FC \cdot BC}{AD}$ | <p>✓ S / R</p> <p>✓ S</p> <p>✓ S</p> <p>✓ S</p> <p>✓ S</p> <p>✓ S</p> <p>✓ S</p> <p>(6)</p> <p>OR/OF</p> <p>✓ S</p> <p>✓ S</p> <p>✓ S</p> <p>✓ S</p> <p>✓ S</p> <p>✓ S</p> <p>✓ S</p> <p>(6)</p> <p>[20]</p> |
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TOTAL/TOTAAL: 150