basic education

Department:
Basic Education
REPUBLIC OF SOUTH AFRICA

NATIONAL SENIOR CERTIFICATE
NASIONALE SENIOR SERTIFIKAAT

GRADE/*GRAAD* 11

MATHEMATICS P2/*WISKUNDE V2*

NOVEMBER 2018

MARKING GUIDELINES/ *NASIENRIGLYNE*

MARKS/*PUNTE*: 150

This marking guideline consists of 28 pages.
Hierdie nasienriglyne bestaan uit 28 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:

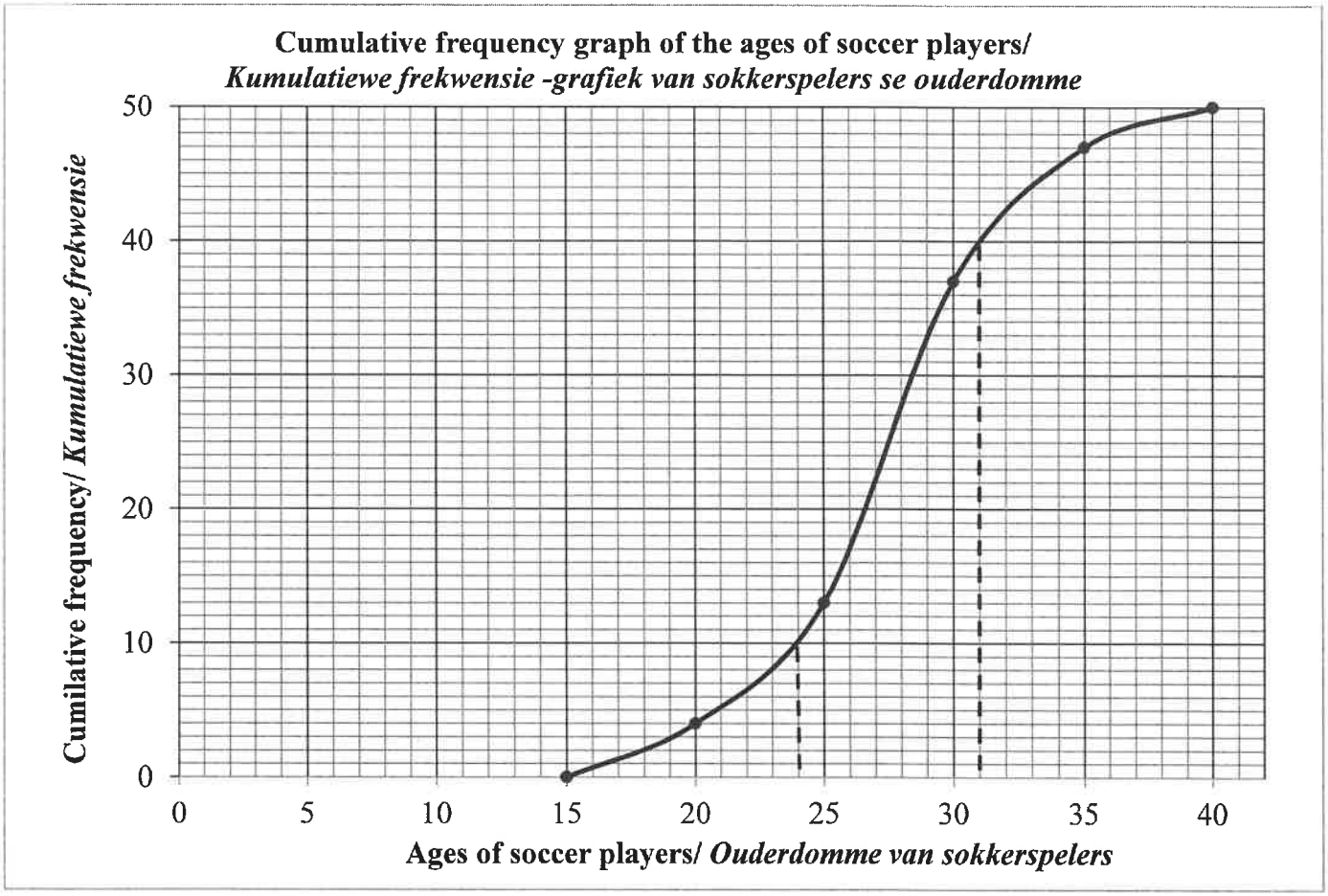
- *As 'n kandidaat 'n vraag TWEE keer beantwoord het, sien slegs die EERSTE poging na.*
- *As 'n kandidaat 'n antwoord deurgehaal en nie oorgedoen het nie, sien die deurgehaalde antwoord na.*
- *Volgehoue akkuraatheid is op ALLE aspekte van die memorandum van toepassing.*
- *Dit is onaanvaarbaar om waardes/antwoorde te veronderstel om 'n probleem op te los.*

QUESTION/*VRAAG* 1

4	12	13	16	17	18	20	22	22	25

1.1	4 minutes/ *minute*	✓ answer/ *antwoord* (1)
1.2	Mean/ *gemiddeld* $=\frac{169}{10}=16,9$	✓169 ✓ answer/ *antwoord* (2)
1.3	Standard deviation/ *Standardafwyking* = 5,79	✓answer/ *antwoord* (1)
1.4	$(16,9-2\times5,79;16,9+2\times5,79)$ (5,32 ; 28,48) ∴ 1 member of the team completed the obstacle race outside of 2 standard deviations of the mean./ 1 *lid van die span het die hundernisbaan buite twee standardafwykings van die gemiddeld voltooi.*	✓ $\bar{x}-2\sigma$ ✓ $\bar{x}+2\sigma$ ✓ answer/ *antwoord* (3)
1.5	$\frac{169+x+5}{20}=18$ $x=18\times20-174$ $x=186$	✓$169+x+5$ ✓dividing by 20/ *deel deur 20* ✓answer/ *antwoord* (3) **[10]**

QUESTION/*VRAAG* 2



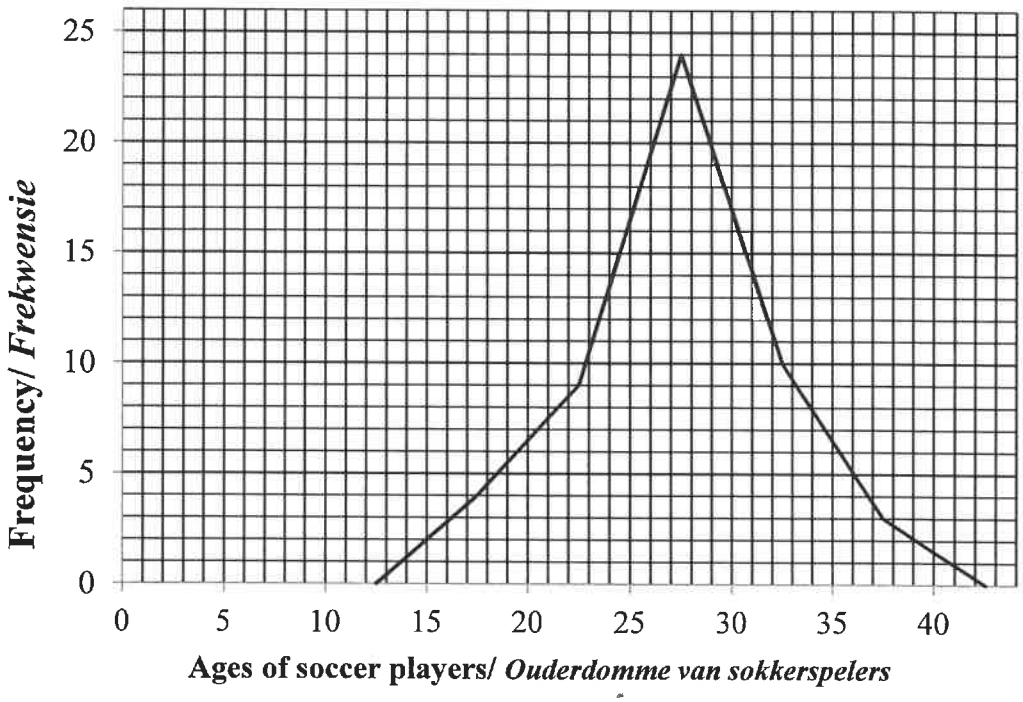
2.1.1	50 players/ *spelers*	✓ answer/ *antwoord* (1)
2.1.2	40 – 10 = 30 players/ *spelers*	✓40 and/ *en* 10 ✓answer/ *antwoord* (2)
2.1.3		✓ two correct values/ *twee korrekte waardes* ✓ three correct values/ *drie korrekte waardes* ✓ all correct values/ *al die waardes korrek* (3)

Class interval/ *Klas interval*	**Frequency/ *Frekwensie***	**Cumulative frequency *Kumulatiewe frekwensie***
$15 \leq x < 20$	4	4
$20 \leq x < 25$	9	13
$25 \leq x < 30$	24	37
$30 \leq x < 35$	10	47
$35 \leq x < 40$	3	50

2.1.4

Class interval/ ***Klas- interval***	**Class midpoint/** ***Klas- middelpunt***	**Frequency/** ***Frekwensie***
$15 \leq x < 20$	17,5	4
$20 \leq x < 25$	22,5	9
$25 \leq x < 30$	27,5	24
$30 \leq x < 35$	32,5	10
$35 \leq x < 40$	37,5	3

Frequency polygon of the ages of soccer players/
Frekwensie- veelhoek van sokkerspelers se oudermme



✓ using midpoints / *gebruik middelpunte*

✓plotting the points correctly/ *korrekte punte geplot*

✓points joined by straight line/ *punte verbind met 'n reguitlyn*

✓ grounding at/ *geanker by* (12,5;0) and/ *en* (42,5 ; 0)

(4)

2.2

The claim is not valid. / *Die bewering is nie geldig nie*

Range of class/ *Omvang van klas* A = 60
Range of class/ *Omvang van klas* B = 40

The range of class A is bigger than the range of class B. Therefore the marks of class A are more spread out than the class B./
Die omvang van klas A is groter as die omvang van klas B. Dus is die punte in klas A meer verspreid as klas B

At least 25% of class A have lower marks than any learner in class B./
ten minste 25% van klas A het laer punte as enige leerder in klas B.

Class A performed worse at the bottom end. /
Klas A het slegter gevorder aan die onderste groep

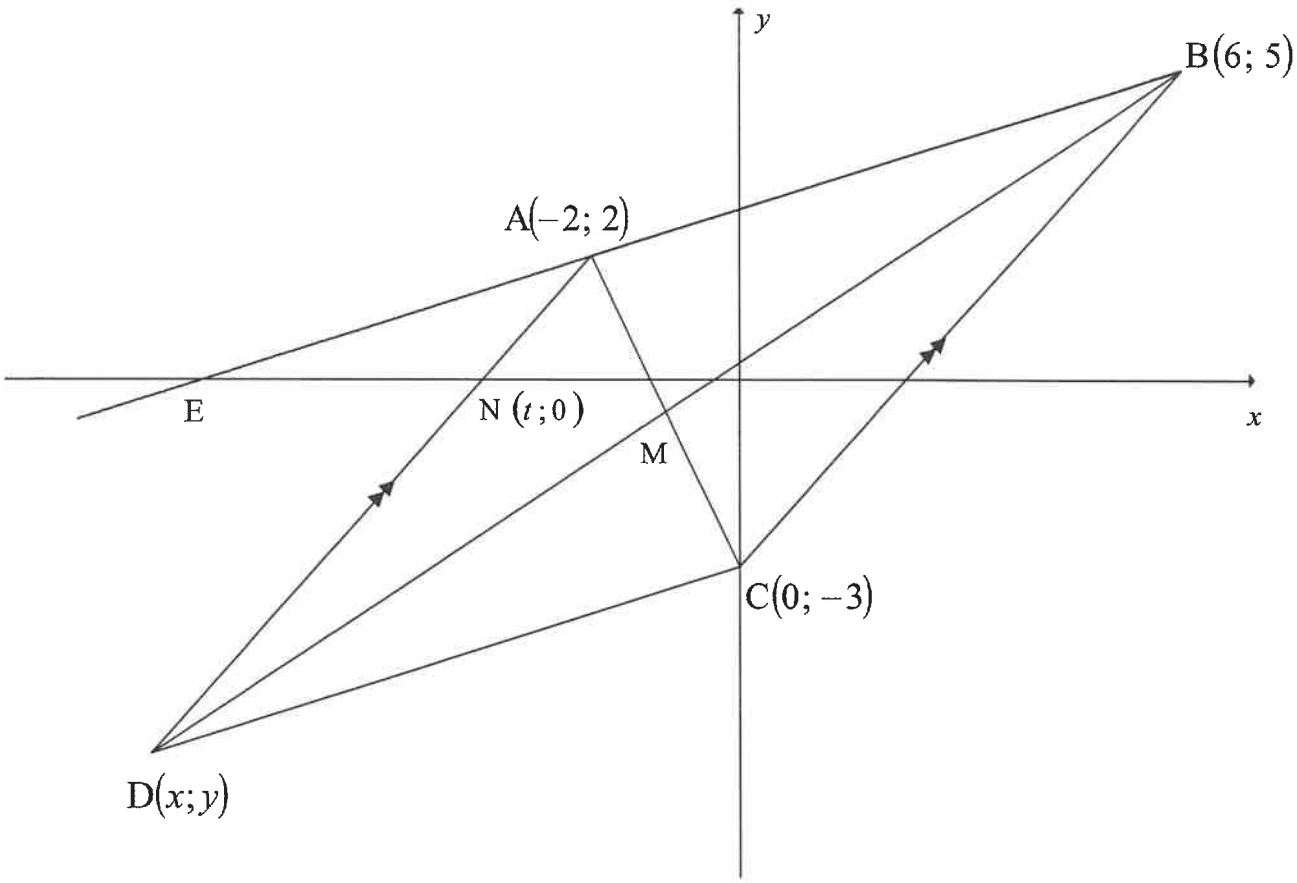
✓ claim not valid/ *bewering nie geldig nie*

✓ comment on the overall spread/ *kommentaar oor die algehele verspreiding*

✓ comparison of the lower marks/ *vergelyk laer punte*

(3)
[13]

QUESTION/*VRAAG* 3



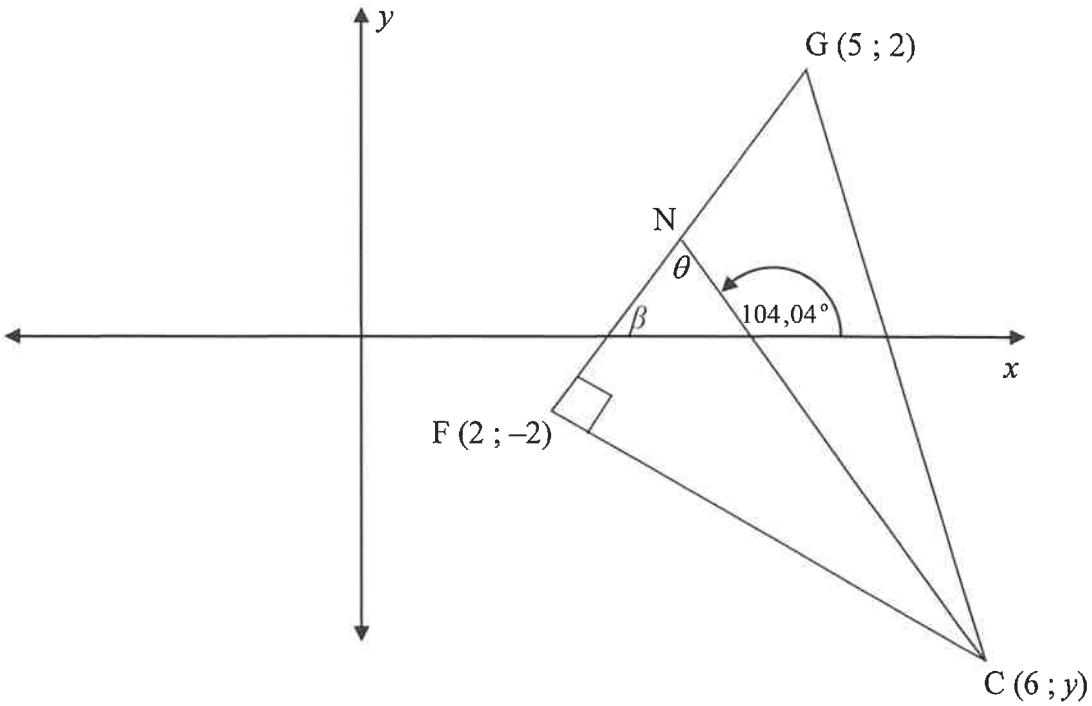
3.1	B(6;5) C(0;–3) $m_{BC}=\frac{y_2-y_1}{x_2-x_1}$ $=\frac{-3-5}{0-6}$ $=\frac{-8}{-6}$ $=\frac{4}{3}$ OR/ OF $m_{BC}=\frac{y_2-y_1}{x_2-x_1}$ $=\frac{5-(-3)}{6-0}$ $=\frac{8}{6}$ $=\frac{4}{3}$	✓subst into correct grad.form / *verv in grad form.* ✓ answer/ *antwoord* (2)

3.2	$m_{AD} = m_{BC} = \frac{4}{3}$ (AD $\parallel$ BC) $y = \frac{4}{3}x + c$ $2 = \frac{4}{3}(-2) + c$ $\frac{14}{3} = c$ $\therefore y = \frac{4}{3}x + \frac{14}{3}$ **OR/OF** $m_{AD} = \frac{4}{3}$ (AD $\parallel$ BC) $y - 2 = \frac{4}{3}(x - (-2))$ $y = \frac{4}{3}x + \frac{14}{3}$ $\therefore y = \frac{4}{3}x + \frac{14}{3}$	✓ $m_{AD} = \frac{4}{3}$ ✓subst of m and point $(-2;2)$ / *verv. m en punt* $(-2;2)$ ✓ answer/ *antwoord* (3) ✓ $m_{AD} = \frac{4}{3}$ ✓subst of m and point $(-2;2)$ / *verv. m en punt* $(-2;2)$/ ✓ answer/ *antwoord* (3)
3.3	$y = \frac{4}{3}x + \frac{14}{3}$ $0 = \frac{4}{3}t + \frac{14}{3}$ $\frac{-14}{3} = \frac{4}{3}t$ $t = \frac{-14}{4} = \frac{-7}{2}$	✓ subst/ *verv.* $y = 0$ ✓ answer/ *antwoord* (2)
3.4	$AN = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$ $= \sqrt{\left((-2) - \left(-\frac{7}{2}\right)\right)^2 + (2 - 0)^2}$ $= \sqrt{\frac{25}{4}}$ $= \frac{5}{2}$	✓subst. in distance formula/ *verv. in afstand formule* ✓answer/ *antwoord* (2)

3.5	$\frac{3}{8}x-3=\frac{4}{3}x+\frac{14}{3}$ $\frac{23}{24}x=-\frac{23}{3}$ $x=-8$ $y=\frac{4}{3}(-8)+\frac{14}{3}$ $=-6$ $D(-8;-6)$	✓ equating/ *vergelyk* ✓simplifcation/ *vereenv.* ✓ *x*- value/ *waarde* ✓ *y*- value/ *waarde* (4)
3.6	$m_{AB}=\frac{5-2}{6-(-2)}=\frac{3}{8}$ $m_{AB}=m_{DC}$ $\therefore$ AB||DC but/*maar* AD||BC $\therefore$ ABCD is a parallelogram [opp sides are|| / *teenoorst sye is*||] **OR/OF** $AD=\sqrt{(x_{2-}-x_1)^2+(y_2-y_1)^2}$ $=\sqrt{((-2)-(-8))^2+(2-6)^2}$ $=\sqrt{100}$ $=10$ $BC=\sqrt{(x_{2-}-x_1)^2+(y_2-y_1)^2}$ $=\sqrt{(6-0)^2+(5-(-3))^2}$ $=\sqrt{100}$ $=10$ $\therefore$ AD = BC but/*maar* AD||BC $\therefore$ ABCD is a parallelogram [2 opp sides are = *and*|| *teenoorst sye is* = *en* ||] **OR/OF**	✓ $m_{AB}=\frac{3}{8}$ ✓ AB || DC ✓reason/ *rede* (3) ✓ length of AD/ *lengte van AD* ✓ length of BC/ *lengte van BC* ✓reason/ *rede* (3)

	M is the midpoint of AC *M is die middelpunt van AC* $M\left(\frac{(-2)+0}{2};\frac{2+(-3)}{2}\right)$ $M\left(-1;-\frac{1}{2}\right)$ M is the midpoint of BD *M is die middelpunt van BD* $M\left(\frac{(-8)+6}{2};\frac{(-6)+5}{2}\right)$ $M\left(-1;-\frac{1}{2}\right)$ $\therefore$ ABCD is a parallelogram [diagonals bisect each other / *hoeklyne halveer mekaar*]	✓ midpoint of AC/ *middelpunt van AC* ✓ midpoint of BD/ *middelpunt van AC* ✓reason/ *rede* (3)
3.7	M is the midpoint of AC [diagonals bisect] *M is die middelpunt van AC* [*hoelyne halveer*] $M\left(\frac{(-2)+0}{2};\frac{2+(-3)}{2}\right)$ $M\left(-1;-\frac{1}{2}\right)$	✓ Substitution into the correct formula/ *Verv. in korrekte form.* ✓x- value / *waarde* ✓y- value / *waarde* (3) **[19]**

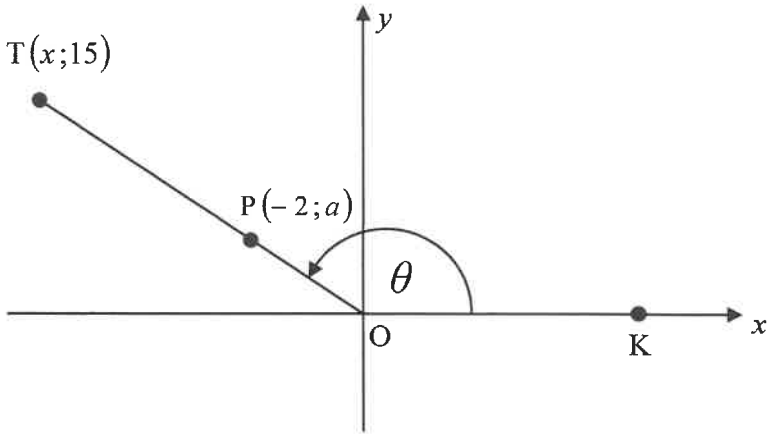
QUESTION/*VRAAG* 4



4.1	$m_{FG} = \frac{2-(-2)}{5-2}$ $= \frac{4}{3}$	✓ subst. into correct gradient form./ *vervang in gradiënt formule* ✓ answer (2)
4.2	$m_{FC} = \frac{-3}{4}$ (FC⊥FG) $\frac{y+2}{6-2} = \frac{-3}{4}$ $y = -5$ **OR/OF**	✓ $m_{FC} = \frac{-3}{4}$ ✓equating gradients/ *stel gradiënte gelyk* ✓answer/ *antwoord* (3)

	$m_{FC} \times m_{FG} = -1$ (FC $\perp$ FG) $\frac{y+2}{6-2} \times \frac{4}{3} = -1$ $4(y+2) = -12$ $y+2 = -3$ $y = -5$	✓ $m_{FC} \times m_{FG} = -1$ ✓ substitution/ *verv.* ✓answer/ *antwoord* (3)
4.3	$\tan\beta = \frac{4}{3}$ $\beta = 53{,}13°$ $\theta = 104{,}04° - 53{,}13°$ [ext $\angle$ of Δ/ *buite* $\angle$ van Δ] $\theta = 50{,}91°$	✓ $\tan\beta = \frac{4}{3}$ ✓ $\beta = 53{,}13°$ ✓ answer/ *antwoord* (3)
4.4	$FC = \sqrt{(x_{2-} - x_1)^2 + (y_2 - y_1)^2}$ $= \sqrt{(6-2)^2 + (-5-(-2))^2}$ $= \sqrt{16+9}$ $= 5$ $\sin\theta = \frac{FC}{NC}$ $\sin 50{,}91° = \frac{5}{NC}$ $NC = \frac{5}{\sin 50{,}91°}$ $= 6{,}44$ unit	✓subst. into distance formula/ *verv. in afst. form.* ✓ length of FC / *lengte van* FC ✓ $\sin 50{,}91° = \frac{5}{NC}$ ✓ answer/ *antwoord* (4) **[12]**

QUESTION/*VRAAG* 5



5.1.1	$x^2 + y^2 = r^2$ [*Pythagoras*] $(x)^2 + (15)^2 = 17^2$ $x^2 = 64$ $x = -8$ (P is in quadrant 2/ *is in kwadrant* 2)	✓ subst in pyth/ *verv in pyth* ✓ answer/ *antwoord* (2)
5.1.2	$\tan\theta = \frac{15}{-8}$	✓ answer/ *antwoord* (1)
5.1.3	$\cos(180° - \theta)$ $= -\cos\theta$ $= -\left(\frac{-8}{17}\right)$ $= \frac{8}{17}$	✓ $-\cos\theta$ ✓ answer/ *antwoord* (2)
5.1.4	$\sin^2\theta$ $= \left(\frac{15}{17}\right)^2$ $= \frac{225}{289}$	✓substitution/ *vervanging* ✓ answer/ *antwoord* (2)

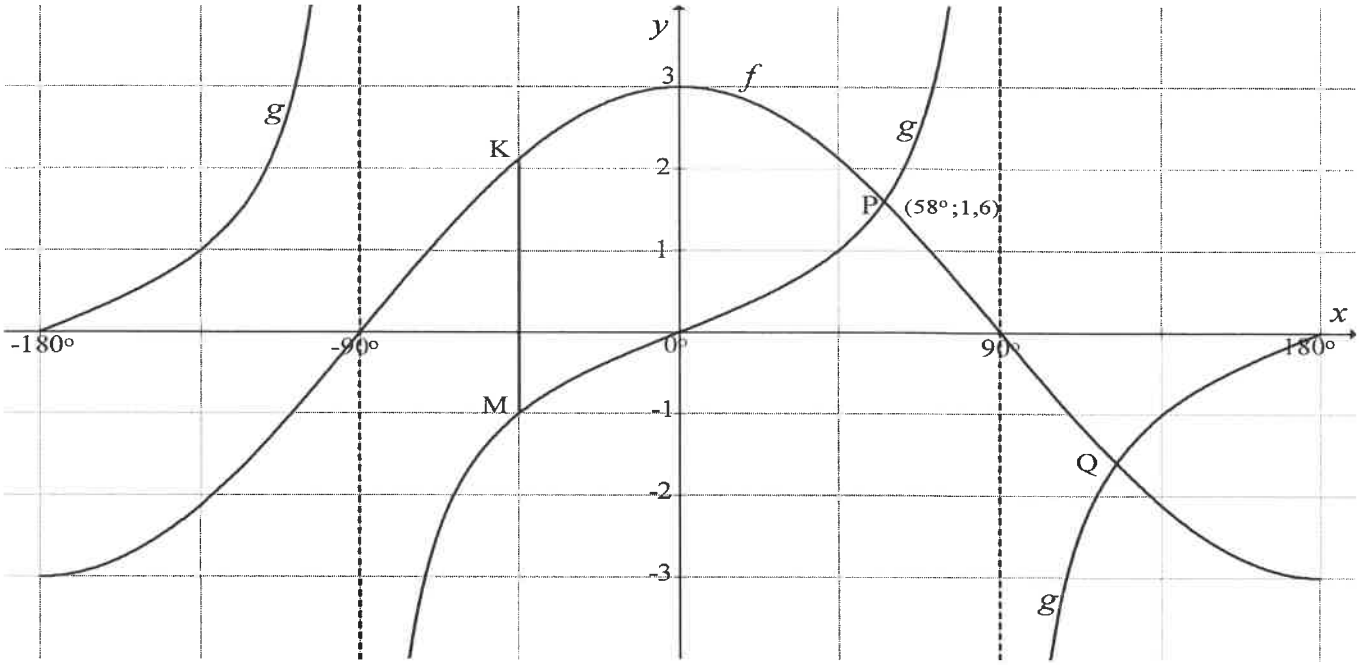
5.1.5	$\tan\theta=\frac{a}{-2}=\frac{15}{-8}$ $\frac{a}{-2}=\frac{15}{-8}$ $a=\frac{15}{4}$ **OR/OF** $m=\frac{15}{-8}$ $y=\frac{15}{-8}x$ $a=\frac{15}{-8}(-2)$ $a=\frac{15}{4}$	✓ $\tan\theta=\frac{a}{-2}$ ✓ equating/ *stel gelyk* ✓ answer/ *antwoord* (3) ✓ $y=\frac{15}{-8}x$ ✓ substitution of $P(-2;a)$/ *vervanging van* $P(-2;a)$ ✓ answer/ *antwoord* (3)
5.2	$\text{LHS}=\frac{\sin120°.\cos210°.\tan315°.\cos27°}{\cos540°.\sin63°}$ $=\frac{\sin60°.(-\cos30°)(-\tan45)°.\sin63°}{\cos180°.\sin63°}$ $=\frac{\frac{\sqrt{3}}{2}.\frac{-\sqrt{3}}{2}(-1)}{-1}$ $=-\frac{3}{4}$	✓ $\sin60°/\cos30°$ ✓ $-\cos30°$ ✓ $-\tan45°$ ✓ $\sin63°/\cos27°$ ✓ $\cos180°$ ✓ special angle ratios/ *spesiale hoeke verhoudings* ✓ answer/ *antwoord* (7)

5.3	$\text{LHS} = \frac{1}{\cos\theta} - \frac{\cos\theta}{1+\sin\theta}$ $= \frac{1+\sin\theta-\cos^2\theta}{\cos\theta(1+\sin\theta)}$ $= \frac{1+\sin\theta-(1-\sin^2\theta)}{\cos\theta(1+\sin\theta)}$ $= \frac{\sin\theta(1+\sin\theta)}{\cos\theta(1+\sin\theta)}$ $= \frac{\sin\theta}{\cos\theta}$ $= \tan\theta$ $= \text{RHS}$ **OR/OF** $\text{LHS} = \frac{1}{\cos\theta} - \frac{\cos\theta}{1+\sin\theta}$ $= \frac{1+\sin\theta-\cos^2\theta}{\cos\theta(1+\sin\theta)}$ $= \frac{(1-\cos^2\theta)+\sin\theta}{\cos\theta(1+\sin\theta)}$ $= \frac{\sin^2\theta+\sin\theta}{\cos\theta(1+\sin\theta)}$ $= \frac{\sin\theta(1+\sin\theta)}{\cos\theta(1+\sin\theta)}$ $= \frac{\sin\theta}{\cos\theta}$ $= \tan\theta$ $= \text{RHS}$ **OR/OF**	✓common denominator/ *gemene noemer* ✓$1-\sin^2\theta$ ✓simplification/ *vereenv.* ✓factors/ *faktore* ✓ $\frac{\sin\theta}{\cos\theta}$ (5) ✓common denominator/ *gemene noemer* ✓$1-\cos^2\theta$ ✓simplification/ *vereenv.* ✓factors/ *faktore* ✓ $\frac{\sin\theta}{\cos\theta}$ (5)

	$\text{LHS} = \frac{1}{\cos\theta} - \frac{\cos\theta}{1+\sin\theta}$ $= \frac{1+\sin\theta-\cos^2\theta}{\cos\theta(1+\sin\theta)}$ $= \frac{\sin^2\theta+\cos^2\theta+\sin\theta-\cos^2\theta}{\cos\theta(1+\sin\theta)}$ $= \frac{\sin^2\theta+\sin\theta}{\cos\theta(1+\sin\theta)}$ $= \frac{\sin\theta(1+\sin\theta)}{\cos\theta(1+\sin\theta)}$ $= \frac{\sin\theta}{\cos\theta}$ $= \tan\theta$ $= \text{RHS}$	✓common denominator/ *gemene noemer* ✓ $\sin^2\theta+\cos^2\theta$ ✓simplification/ *vereenv.* ✓factors/ *faktore* ✓ $\frac{\sin\theta}{\cos\theta}$ (5)
5.4	$3\sin x = 2\tan x.$ $3\sin x = 2\times\frac{\sin x}{\cos x}$ $3\sin x\cos x = 2\sin x$ $3\sin x\cos x - 2\sin x = 0$ $\sin x(3\cos x - 2) = 0$ $\sin x = 0$ $x = 360°k\ ,\ \ k\in Z$ or $x = 180° + 360°k,\ \ k\in Z$ or	✓ $\frac{\sin x}{\cos x}$ ✓ factors/ *faktore* ✓ both equations/ *beide vergelykings* ✓ both general solutions/ *beide algemene oplossings*

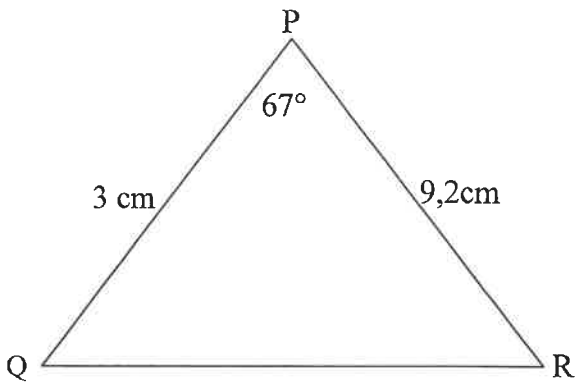
	$\cos x = \frac{2}{3}$ $x = 48{,}19° + 360°.k,\ k \in Z$ or $x = 311{,}81° + 360°.k,\ k \in Z$ **OR/ OF** $3\sin x = 2\tan x.$ $3\sin x = 2 \times \frac{\sin x}{\cos x}$ $3\sin x\cos x = 2\sin x$ $3\sin x\cos x - 2\sin x = 0$ $\sin x(3\cos x - 2) = 0$ $\sin x = 0$ $x = 180°.k,\ k \in Z$ $\cos x = \frac{2}{3}$ $x = \pm 48{,}19° + 360°.k,\ k \in Z$	✓ both general solutions/ *beide algemene oplossings* ✓ $k \in Z$ (6) ✓ $\frac{\sin x}{\cos x}$ ✓ factors/ *faktore* ✓ both equations/ *beide vergelykings* ✓ general solution/ *algemene oplossing* ✓ both general solutions/ *beide algemene oplossings* ✓ $k \in Z$ (6) **[28]**

QUESTION/*VRAAG* 6

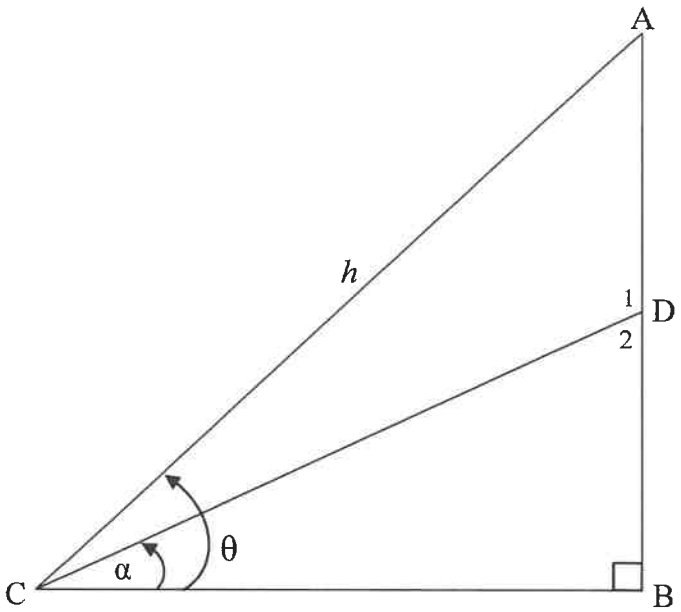


6.1	$-3 \le y \le 3$ or/ *of* $y \in [-3;3]$	✓ end points/ *eindpunte* ✓ notation/ *notasie* (2)
6.2	$c = 1$	✓ answer/ *antwoord* (1)
6.3	$a = 3,\ \ b = 1$	✓ $a = 3$ ✓ $b = 1$ (2)
6.4	$Q(122^\circ;-1,6)$	✓ *x*- value/ *waarde* ✓ *y*- value/ *waarde* (2)
6.5	$K(-45^\circ;\frac{3\sqrt{2}}{2})$ $M(-45^\circ;-1)$ $KM = \frac{3\sqrt{2}}{2}+1$ $= \frac{3\sqrt{2}+2}{2}$ $=3,12$	✓ coordinates of/ *koördinate van* K ✓ length of/ *lengte van* KM (2)
6.6	$f(x) = 3\cos(\theta - 45^\circ)$	✓ 3 ✓ -45° (2)
		[11]

QUESTION/*VRAAG* 7



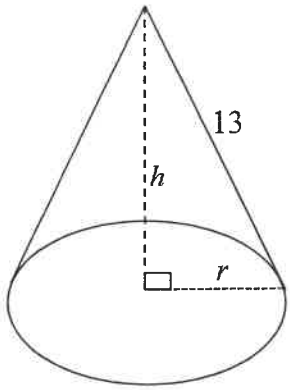
7.1	$QR^2 = PR^2 + PQ^2 - 2PR.PQ\cos\hat{P}$ $QR^2 = (3)^2 + (9,2)^2 - 2(3)(9,2)\cos 67°$ $QR = \sqrt{(3)^2 + (9,2)^2 - 2(3)(9,2)\cos 67°}$ $QR = 8,49\text{cm}$	✓using cos rule/ *gebruik cos reël* ✓substitution/ *vervanging* ✓ answer/ *antwoord* (3)



7.2.1	$A\hat{C}D = \theta - \alpha$	✓ answer/*antw.* (1)
7.2.2	$\hat{D}_1 = 90^\circ + \alpha$ $\frac{\sin(90^\circ+\alpha)}{h} = \frac{\sin(\theta-\alpha)}{AD}$ $\frac{\cos\alpha}{h} = \frac{\sin(\theta-\alpha)}{AD}$ $AD = \frac{h\sin(\theta-\alpha)}{\cos\alpha}$	✓ $\hat{D}_1 = 90^\circ + \alpha$ ✓ $\frac{\sin(90^\circ+\alpha)}{h}$ ✓ $\frac{\sin(\theta-\alpha)}{AD}$ ✓ $\sin(90^\circ+\alpha) = \cos\alpha$ (4)
7.2.3	$AD = \frac{17\sin(58^\circ-23^\circ)}{\cos 23^\circ}$ $AD = 10{,}59$ units	✓ subst/ *verv.* ✓ answer/*antw.* (2)
7.2.4	Area of $\Delta ADC = \frac{1}{2}\times AD\times AC\times \sin\hat{A}$ $= \frac{1}{2}\times 10{,}59\times 17\times \sin 32^\circ$ $= 47{,}70$ unit^2 **OR/ OF**	✓ correct area rule/ korrekte *area reël* ✓32° ✓ answer/*antw.* (3)

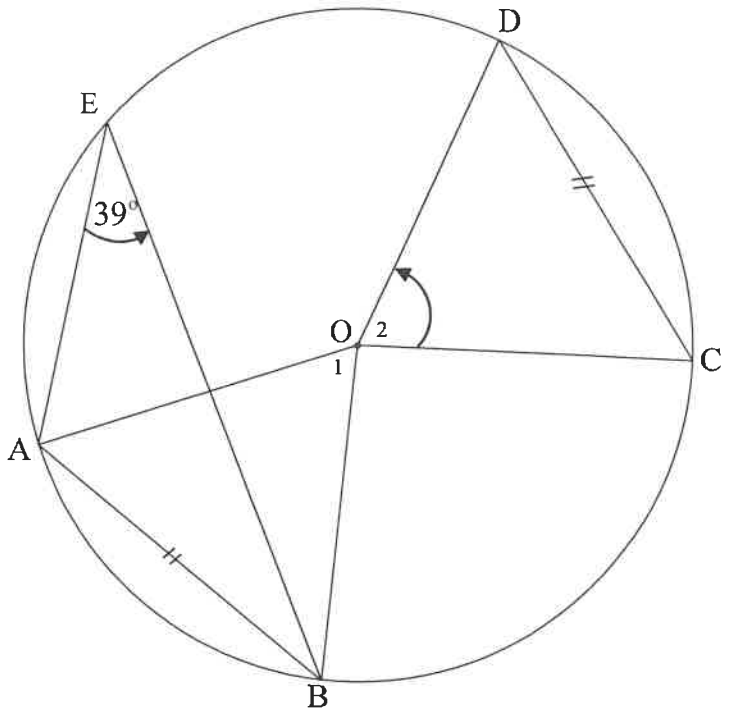
	$\sin 58° = \frac{AB}{17}$ $AB = 17\sin 58°$ $= 14{,}41682....$ $BD = 14{,}41682.... - 10{,}59289... = 3{,}82393...$ $\sin 23° = \frac{3{,}82393...}{CD}$ $CD = \frac{3{,}82393...}{\sin 23°}$ $= 9{,}78660...$ $\text{Area of } \Delta ADC = \frac{1}{2} \times CD \times AC \times \sin 35°$ $= \frac{1}{2} \times 9{,}78660... \times 17 \times \sin 35°$ $= 47{,}71 \text{ unit}^2$	✓length of BD / *lengte van BD* ✓length of CD/ *lengte van CD* ✓ answer/*antw.* (3) **[28]**

QUESTION/*VRAAG 8*

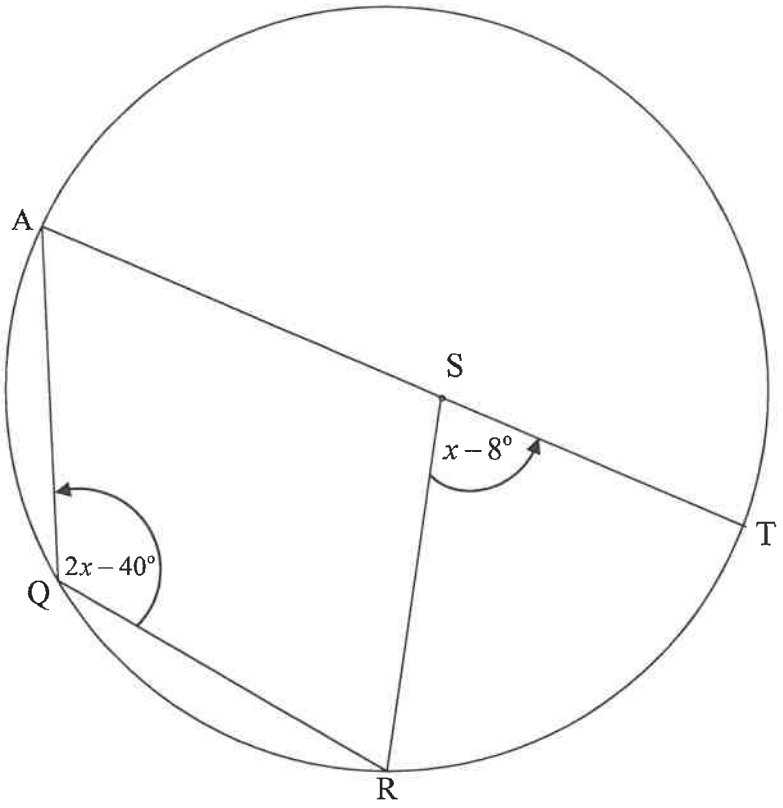


8.1	$r^2 = 13^2 - h^2$ (Pythagoras) $r^2 = 169 - h^2$ $V = \frac{1}{3}Ah$ $= \frac{1}{3}\pi r^2 h$ $= \frac{1}{3}\pi(169 - h^2)h$ $= \frac{169\pi h - \pi h^3}{3}$	✓using theorem of pythagoras/ *gebruik stelling van pythagoras* ✓ $r^2 = 169 - h^2$ ✓ substitution/ *vervanging* ✓simplification/ *vereenvoudig* (4)
8.2	$r = \sqrt{13^2 - 12^2}$ (Pythagoras) $= 5$ Total surface area/ *buite oppervlakte* $= \pi r^2 + \pi r s$ $= \pi(5^2) + \pi(5)(13)$ $= 90\pi$ $= 282{,}74\,\text{cm}^2$	✓ value of/ *waarde van r* ✓ subst. / *verv.* ✓ answer/ *antwoord* (3) [7]

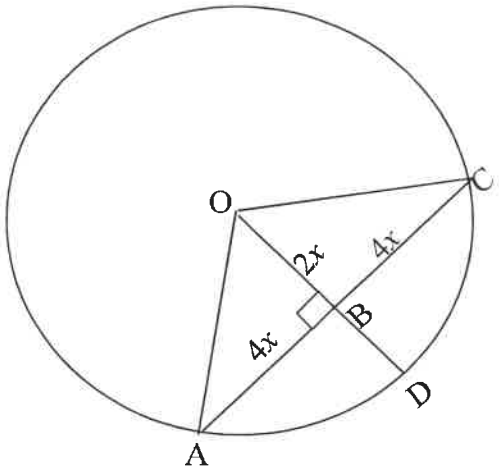
QUESTION/*VRAAG 9*



9.1.1	$\hat{O}_1 = 78°$ [angle at centre $= 2 \times \angle$ at circumference] $[middelpuntshoek = 2 \times omtrekshoek]$	✓ S ✓ R (2)
9.1.2	$\hat{O}_2 = 78°$ [equal chords; equal $\angle^s$ / *gelyke koorde; gelyke hoeke*]	✓ S ✓ R (2)

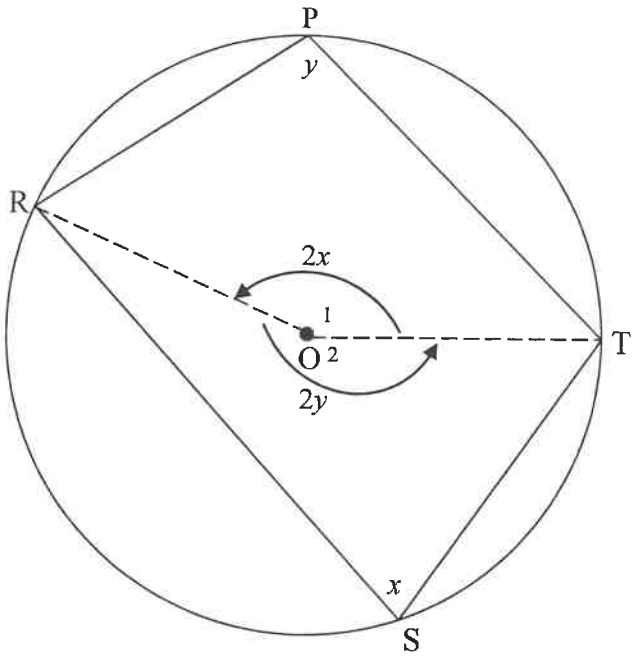


9.2	$x-8^\circ+180^\circ=2(2x-40^\circ)$ [angle at centre = 2 × ∠ at circumference / *middelpuntshoek = 2 × omtrekshoek*] $4x-80^\circ=172^\circ+x$ $3x=252^\circ$ $x=84^\circ$ OR/OF Join T and R/ *verbind* T *en* R $\hat{T}=180^\circ-(2x-40^\circ)$ [opp ∠'s of cyclic quad / *teenoorst.∠e van koordevierhoek*] $\hat{R}=\hat{T}=220^\circ-2x$ [∠s opp. = sides / ∠s *teeoor gelyke sye*] $x-8^\circ+220^\circ-2x+220^\circ-2x=180^\circ$ [*sum of* int ∠s *of* Δ / *som binne ∠e van* Δ] $-3x=-252^\circ$ $x=84^\circ$	✓ S ✓ R ✓ simplification/ *vereenvoudiging* ✓ answer/ *antwoord* (4) ✓ S ✓ R ✓ S ✓ answer/ *antwoord* (4)

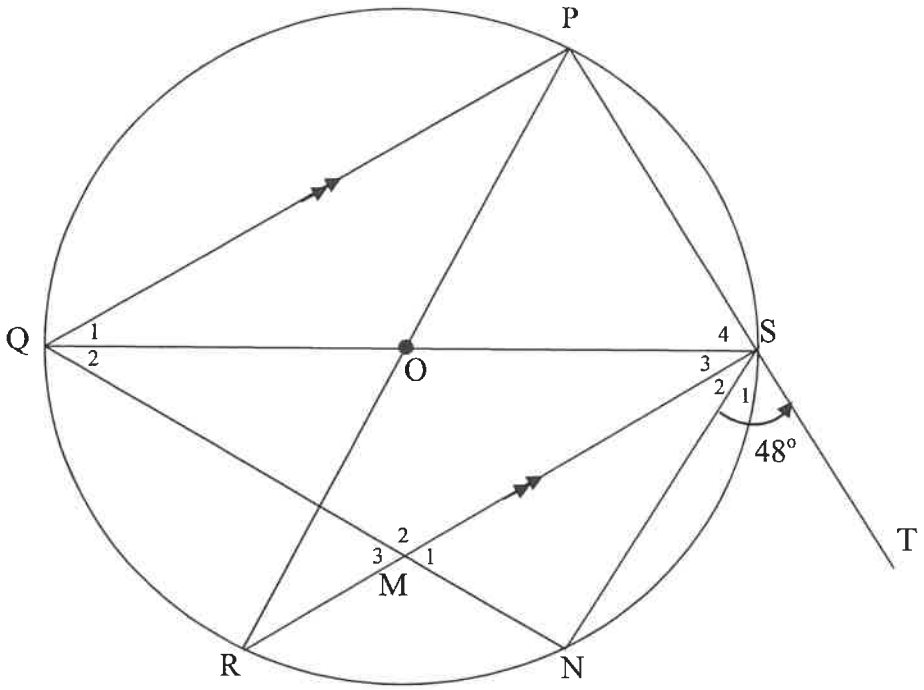


9.3	$AB = BC = 4x$ [line from centre ⊥ to chord/ *lyn van middelpunt ⊥ aan koord*] $OA^2 = (4x)^2 + (2x)^2$ [Pythagoras] $OA = \sqrt{16x^2 + 4x^2}$ $= \sqrt{20x^2}$ $= 2\sqrt{5}\,x$ $OD = OA = 2\sqrt{5}\,x$ [radii] $BD = 2\sqrt{5}\,x - 2x$ $= 2x(\sqrt{5} - 1)$	✓ S ✓ R ✓ Substitution/ *vervanging* ✓ length of OA / *lente van* OA ✓ $BD = 2\sqrt{5}\,x - 2x$ (5) **[13]**

QUESTION/*VRAAG* 10

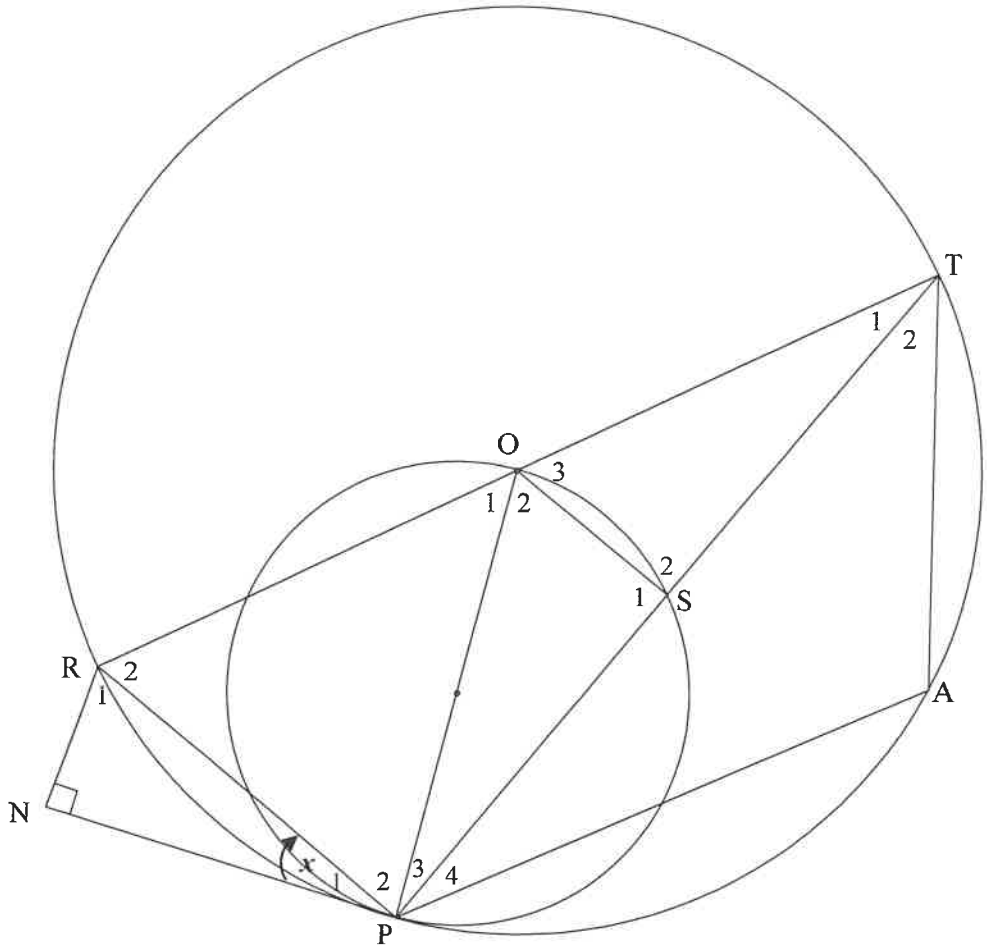


10.1	Construction: Draw radii OR and OT *Konstruksie: teken raduise OR en OT* Let/ *laat*: $\hat{S} = x$ and/*en* $\hat{P} = y$ $\hat{O}_1 = 2\hat{S}$ [angle at centre = 2 times angle at circumference/ *middelpuntshoek = 2 keer omtrekshoek*] $\hat{O}_1 = 2x$ Similarly/ *in die selfde manier*: $\hat{O}_2 = 2y$ $2x + 2y = 360°$ [anlges around a pt / *hoeke om 'n punt*] $x + y = 180°$ $\therefore \hat{S} + \hat{P} = 180°$	✓ construction/ *konstruksie* ✓ S ✓ R ✓ S ✓ S/R (5)



10.2.1(a)	$\hat{Q}=\hat{S}_1=48°$ [ext ∠ of cyclic quad/ *buite ∠ van 'n koodervierhoek*] $\hat{Q}_1=\hat{Q}_2=24°$ [QS bisects/ *halveer* PQN]	✓ S ✓R ✓ S (3)
10.2.1(b)	$\hat{R}=\hat{Q}_1=24°$ [∠ˢ in the same segment/ *in dieselfde segment*]	✓ S ✓R (2)
10.2.1(c)	$\hat{M}_1=\hat{Q}=48°$ [corresp/ *ooreenkomst* ∠ˢ, PQ || SR] **OR/OF** $\hat{S}_3=\hat{Q}_1=24°$ [alt ∠ˢ/ *ooreenkomst* ∠ˢ, PQ || SR] $\hat{M}_1=48°$ [ext ∠ of Δ / *buite ∠ van Δ*]	✓ S ✓R (2) ✓ S / R ✓answer/ *antwoord* (2)
10.2.2	$\hat{M}_1=\hat{S}_1=48°$ ∴ ST is a tangent to circle MNS. [converse tan – chord theorem] ∴ *ST is 'n raaklyn aan MNS* [*omgekrd raaklyn-koord st.*]	✓ S ✓R (2) **[14]**

QUESTION/*VRAAG* 11



11.1	$\hat{T}_1 = x$ [tan – chord theorem / *raaklyn-koord st*] $\hat{O}_1 = 2x$ [∠ at centre = 2 × ∠ at circumference / *middelpuntshoek = 2 keer omtrekshoek*] $\hat{P}_2 = 90° - x$ [tan ⊥ diameter / raaklyn ⊥ *middellyn*] $\hat{R}_2 = 90° - x$ [$\angle^s$ opp. = sides / $\angle^s$ *teeoor gelyke sye*] $\therefore \hat{R}_1 = \hat{R}_2$ PR bisects / *halveer* $O\hat{R}N$ **OR/ OF**	✓ S/R ✓ S ✓S ✓ $\hat{R}_2 = 90° - x$ ✓ S (5)

	$R\hat{P}T = 90°$ [∠in the semi circle/ *in dieselfde segment*] $\hat{T}_1 = x$ [tan – chord theorem/ *raaklyn-koord st*] $\hat{R}_2 = 90° - x$ [sum int ∠^{s} of Δ / *som binne* ∠^{s} *van* Δ] $\hat{R}_1 = 90° - x$ [sum int ∠^{s} of Δ / *som binne* ∠^{s} *van* Δ] $\therefore \hat{R}_1 = \hat{R}_2$ PR bisects/ *halveer* $O\hat{R}N$ OR/ OF $\hat{T}_1 = x$ [tan – chord theorem/ *raaklyn-koord st*] $\hat{P}_3 = x$ [∠^{s} opp.=sides/ ∠^{s} *teeoor gelyke sye*] $\hat{O}_1 = 2x$ [ext∠ of Δ / *buite*∠ *van* Δ] $\hat{R}_2 = \hat{P}_2 = \frac{180° - 2x}{2}$ [∠^{s} opp.=sides/ ∠^{s} *teeoor gelyke sye*] $\hat{R}_2 = 90° - x$ $\hat{R}_1 = 90° - x$ [sum int ∠^{s} of Δ / *som binne* ∠^{s} *van* Δ] $\therefore \hat{R}_1 = \hat{R}_2$ PR bisects/ *halveer* $O\hat{R}N$	✓ S ✓ S/R ✓S ✓S ✓ S (5) ✓ S/R ✓ S ✓S ✓S ✓ S (5)
11.2	$P\hat{A}T = 90° + x$ [opp ∠'*s* of cyclic quad/ *teenoorst. hoeke van koordevierhoek*] $\hat{S}_2 = 90°$ [Line from centre ⊥ to chord / *lyn van mdpt* ⊥ *aan koo* $R\hat{O}S = 90° + x$ [ext ∠of Δ / buite ∠ van Δ] $\therefore R\hat{O}S = P\hat{A}T$ OR/ OF	✓S ✓R ✓S ✓R ✓S/R (5)

	$\hat{RPT} = 90°$ [∠ in the semi circle/ *in dieselfde segment*] $\hat{NPT} = 90° + x$ $\hat{PAT} = \hat{NPT} = 90° + x$ [tan – chord theorem / *raaklyn-koord st* $\hat{P}_3 = x$ [$\angle^s$ opp. = sides / $\angle^s$ *teeoor gelyke sye*] $\hat{S}_1 = 90°$ [Line from centre ⊥ to chord / *lyn van mdpt ⊥ aan koord* $\therefore \hat{O}_2 = 90° - x$ [*sum of* int $\angle^s$ *of* Δ] $\hat{ROS} = \hat{O}_1 + \hat{O}_2$ $= 2x + 90° - x$ $= 90° + x$ $\therefore \hat{ROS} = \hat{PAT}$	✓S ✓S ✓R ✓S/R ✓S (5)
		[10]

TOTAL/*TOTAAL*: 150