



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

**DEPARTMENT OF BASIC
EDUCATION
PRIVATE BAG X895, PRETORIA 0001
2018 -11- 21
APPROVED MARKING GUIDELINE
PUBLIC EXAMINATION**

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

Approved

2018-11-21

CAPS/KABV – Grade/Graad 11 – Memorandum

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.

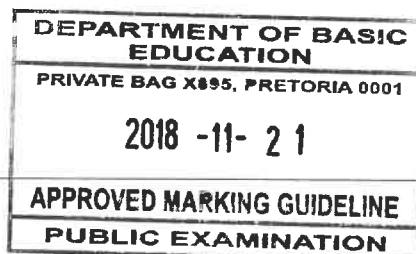
LET WEL:

- 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

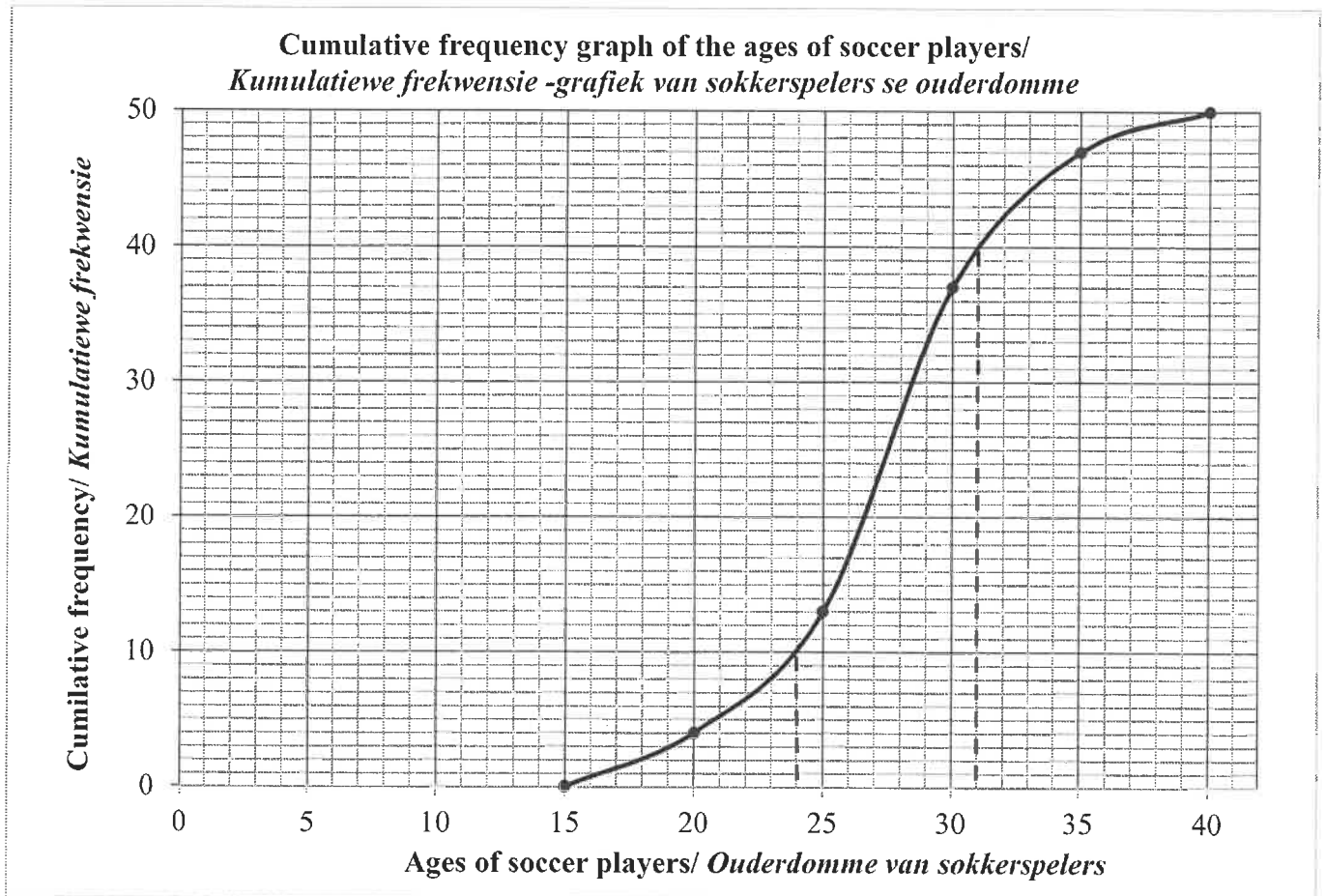
4	12	13	16	17	18	20	22	22	25
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1.1	4 minutes/ minute	✓ answer/ antwoord (1)
1.2	Mean/ gemiddeld = $\frac{169}{10} = 16,9$	✓ 169 ✓ answer/ antwoord (2)
1.3	Standard deviation/ Standardafwyking = 5,79	✓ answer/ antwoord (1)
1.4	$(16,9 - 2 \times 5,79; 16,9 + 2 \times 5,79)$ $(5,32 ; 28,48)$ ∴ 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	$\frac{169 + x + 5}{20} = 18$ $x = 18 \times 20 - 174$ $x = 186$	✓ $169 + x + 5$ ✓ dividing by 20/ deel deur 20 ✓ answer/ antwoord (3)



[10]

QUESTION/VRAAG 2



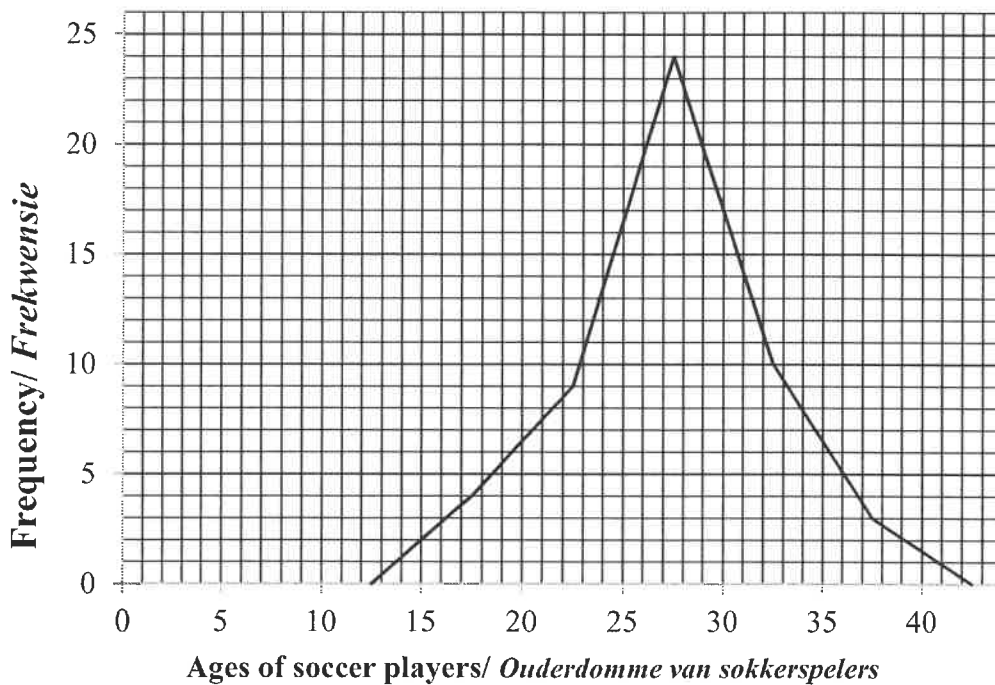
2.1.1	50 players/ <i>spelers</i>	DEPARTMENT OF BASIC EDUCATION PRIVATE BAG X195, PRETORIA 0001 2018 -11- 2 1 APPROVED MARKING GUIDELINE PUBLIC EXAMINATION	✓ answer/ <i>antwoord</i> (1)																	
2.1.2	$40 - 10 = 30$ players/ <i>spelers</i>		✓ 40 and/ <i>en</i> 10 ✓ answer/ <i>antwoord</i> (2)																	
2.1.3	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: center;">Class interval/ <i>Klas interval</i></th> <th style="text-align: center;">Frequency/ <i>Frekwensie</i></th> <th style="text-align: center;">Cumulative frequency <i>Kumulatiewe frekwensie</i></th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">$15 \leq x < 20$</td> <td style="text-align: center;">4</td> <td style="text-align: center;">4</td> </tr> <tr> <td style="text-align: center;">$20 \leq x < 25$</td> <td style="text-align: center;">9</td> <td style="text-align: center;">13</td> </tr> <tr> <td style="text-align: center;">$25 \leq x < 30$</td> <td style="text-align: center;">24</td> <td style="text-align: center;">37</td> </tr> <tr> <td style="text-align: center;">$30 \leq x < 35$</td> <td style="text-align: center;">10</td> <td style="text-align: center;">47</td> </tr> <tr> <td style="text-align: center;">$35 \leq x < 40$</td> <td style="text-align: center;">3</td> <td style="text-align: center;">50</td> </tr> </tbody> </table>	Class interval/ <i>Klas interval</i>	Frequency/ <i>Frekwensie</i>	Cumulative frequency <i>Kumulatiewe frekwensie</i>	$15 \leq x < 20$	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	✓ two correct values/ <i>twee korrekte waardes</i> ✓ three correct values/ <i>drie korrekte waardes</i> ✓ all correct values/ <i>al die waardes korrek</i> (3)
Class interval/ <i>Klas interval</i>	Frequency/ <i>Frekwensie</i>	Cumulative frequency <i>Kumulatiewe frekwensie</i>																		
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2.1.4

Class interval/ <i>Klas- interval</i>	Class midpoint/ <i>Klas- middelpunt</i>	Frequency/ <i>Frekwensie</i>
$15 \leq x < 20$	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 ouderomme***



- ✓ 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. /

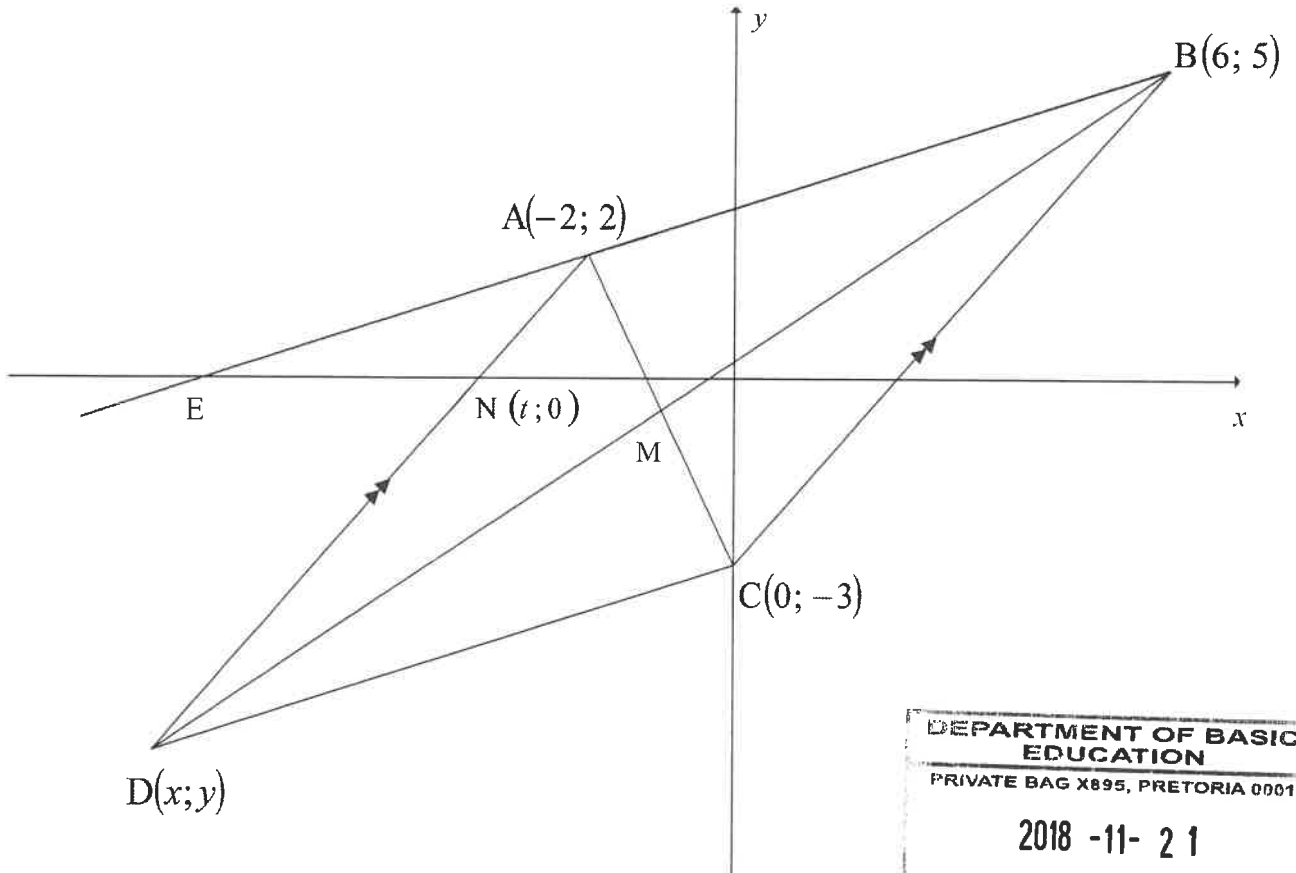
Klas A het slegter gevorder aan die onderste groep

- ✓ 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

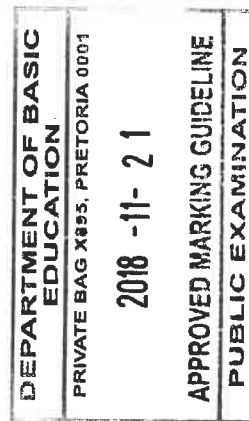


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<p>3.1</p>	<p>B(6;5) C(0;-3)</p> $m_{BC} = \frac{y_2 - y_1}{x_2 - x_1}$ $= \frac{-3 - 5}{0 - 6}$ $= \frac{-8}{-6}$ $= \frac{4}{3}$	<p>OR/ OF</p> $m_{BC} = \frac{y_2 - y_1}{x_2 - x_1}$ $= \frac{5 - (-3)}{6 - 0}$ $= \frac{8}{6}$ $= \frac{4}{3}$	<p>✓ subst into correct grad.form / <i>verv in grad form.</i></p> <p>✓ answer/ <i>antwoord</i> (2)</p>
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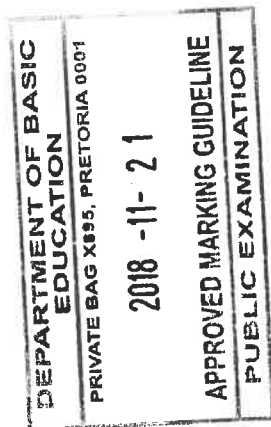
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3.2	$m_{AD} = m_{BC} = \frac{4}{3} \text{ (AD} \parallel \text{BC)}$ $y = \frac{4}{3}x + c$ $2 = \frac{4}{3}(-2) + c$ $\frac{14}{3} = c$ $\therefore y = \frac{4}{3}x + \frac{14}{3}$ <p>OR/OF</p> $m_{AD} = \frac{4}{3} \text{ (AD} \parallel \text{BC)}$ $y - 2 = \frac{4}{3}(x - (-2))$ $y = \frac{4}{3}x + \frac{14}{3}$ $\therefore y = \frac{4}{3}x + \frac{14}{3}$	$\checkmark m_{AD} = \frac{4}{3}$ <p>\checkmark subst of m and point $(-2;2)$ / <i>verv. m en punt $(-2;2)$</i></p> <p>\checkmark answer/ <i>antwoord</i></p> <p style="text-align: right;">(3)</p>
3.3	$y = \frac{4}{3}x + \frac{14}{3}$ $0 = \frac{4}{3}t + \frac{14}{3}$ $\frac{-14}{3} = \frac{4}{3}t$ $t = \frac{-14}{4} = \frac{-7}{2}$	<p>\checkmark subst/ <i>verv. $y=0$</i></p> <p>\checkmark answer/ <i>antwoord</i></p> <p style="text-align: right;">(2)</p>
3.4	$AN = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$ $= \sqrt{\left((-2) - \left(-\frac{7}{2}\right)\right)^2 + (2 - 0)^2}$ $= \sqrt{\frac{25}{4}}$ $= \frac{5}{2}$	<p>\checkmark subst. in distance formula/ <i>verv. in afstand formule</i></p> <p>\checkmark answer/ <i>antwoord</i></p> <p style="text-align: right;">(2)</p>



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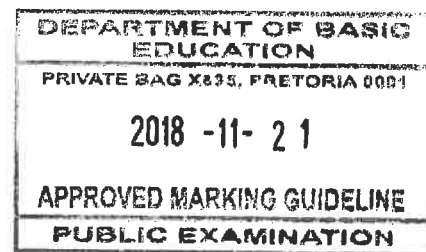
<p>3.5</p>	$\frac{3}{8}x - 3 = \frac{4}{3}x + \frac{14}{3}$ $\frac{23}{24}x = -\frac{23}{3}$ $x = -8$ $y = \frac{4}{3}(-8) + \frac{14}{3}$ $= -6$ $D(-8; -6)$	<p>✓ equating/ <i>vergelyk</i></p> <p>✓ simplification/ <i>vereenv.</i></p> <p>✓ x- value/ <i>waarde</i></p> <p>✓ y- value/ <i>waarde</i></p> <p>(4)</p>
<p>3.6</p>	<p>$m_{AB} = \frac{5-2}{6-(-2)} = \frac{3}{8}$</p> <p>$m_{AB} = m_{DC}$ $\therefore AB \parallel DC$ but/<i>maar</i> $AD \parallel BC$ $\therefore ABCD$ is a parallelogram [opp sides are \parallel/<i>teenoorst sye is</i> \parallel]</p> <p>OR/OF</p> $AD = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$ $= \sqrt{((-2) - (-8))^2 + (2 - 6)^2}$ $= \sqrt{100}$ $= 10$ $BC = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$ $= \sqrt{(6 - 0)^2 + (5 - (-3))^2}$ $= \sqrt{100}$ $= 10$ $\therefore AD = BC$ <p>but/<i>maar</i> $AD \parallel BC$ $\therefore ABCD$ is a parallelogram [2 opp sides are = <i>and</i> \parallel/ <i>teenoorst sye is = en</i> \parallel]</p> <p>OR/OF</p>	<p>✓ $m_{AB} = \frac{3}{8}$</p> <p>✓ $AB \parallel DC$</p> <p>✓ reason/ <i>rede</i></p> <p>(3)</p> <p>✓ length of AD/ <i>lengte van AD</i></p> <p>✓ length of BC/ <i>lengte van BC</i></p> <p>✓ reason/ <i>rede</i></p> <p>(3)</p>



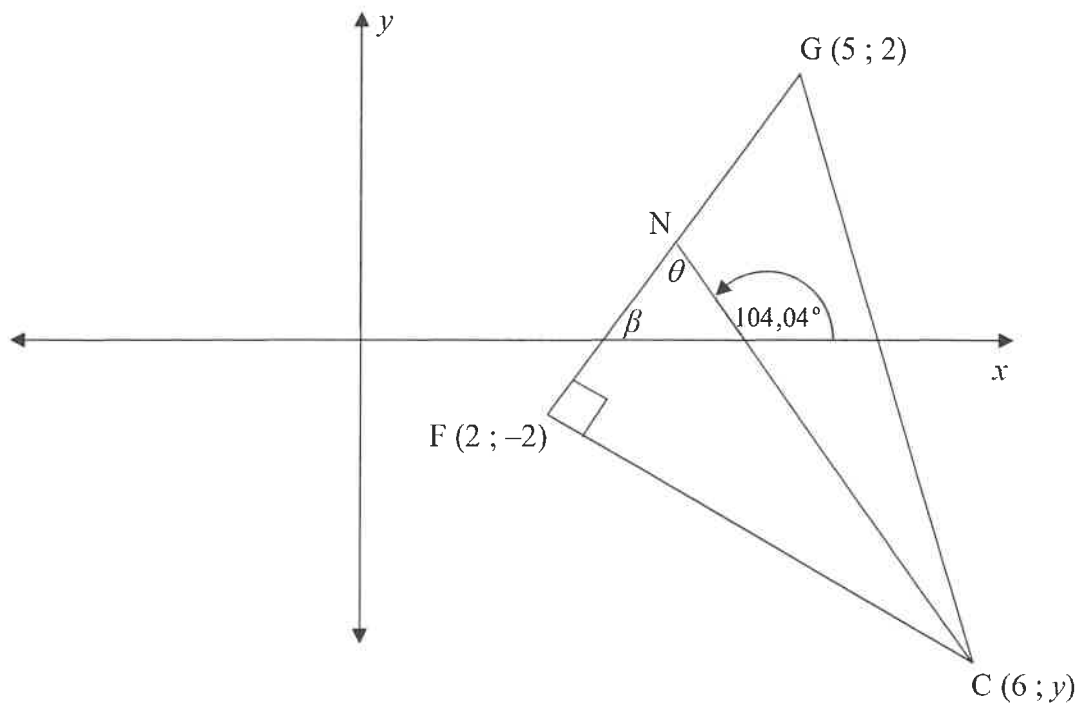
Q

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



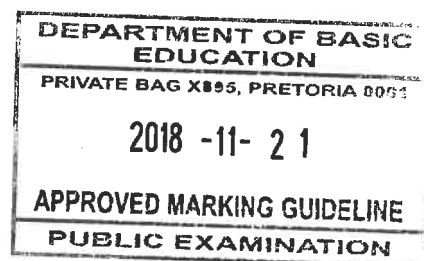
QUESTION/VRAAG 4



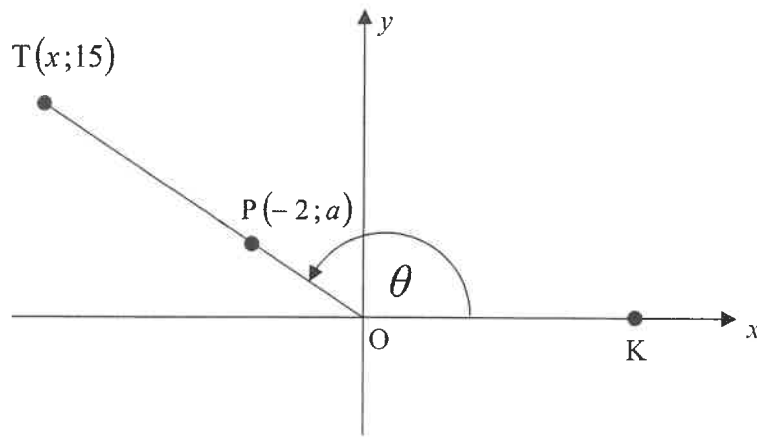
<p>4.1</p>	$m_{FG} = \frac{2 - (-2)}{5 - 2}$ $= \frac{4}{3}$	<p>✓ subst. into correct gradient form./ vervang in gradiënt formule ✓ answer (2)</p>
<p>4.2</p>	$m_{FC} = \frac{-3}{4} \quad (FC \perp FG)$ $\frac{y + 2}{6 - 2} = \frac{-3}{4}$ $y = -5$ <p>OR/OF</p> <div style="border: 1px solid black; padding: 5px; width: fit-content; margin: 10px auto;"> <p style="text-align: center; margin: 0;">DEPARTMENT OF BASIC EDUCATION</p> <p style="text-align: center; margin: 0;">PRIVATE BAG X895, PRETORIA 0001</p> <p style="text-align: center; margin: 0;">2018 -11- 2 1</p> <p style="text-align: center; margin: 0;">APPROVED MARKING GUIDELINE</p> <p style="text-align: center; margin: 0;">PUBLIC EXAMINATION</p> </div>	<p>✓ $m_{FC} = \frac{-3}{4}$ ✓ equating gradients/ stel gradiënte gelyk ✓ answer/ antwoord (3)</p>

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	$m_{FC} \times m_{FG} = -1$ (FC \perp FG) $\frac{y+2}{6-2} \times \frac{4}{3} = -1$ $4(y+2) = -12$ $y+2 = -3$ $y = -5$	$\checkmark m_{FC} \times m_{FG} = -1$ \checkmark substitution/ <i>verv.</i> \checkmark answer/ <i>antwoord</i> (3)
4.3	$\tan \beta = \frac{4}{3}$ $\beta = 53,13^\circ$ $\theta = 104,04^\circ - 53,13^\circ$ [ext \angle of Δ / <i>buite \angle van Δ] $\theta = 50,91^\circ$ </i>	$\checkmark \tan \beta = \frac{4}{3}$ $\checkmark \beta = 53,13^\circ$ \checkmark answer/ <i>antwoord</i> (3)
4.4	$FC = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$ $= \sqrt{(6-2)^2 + (-5-(-2))^2}$ $= \sqrt{16+9}$ $= 5$ $\sin \theta = \frac{FC}{NC}$ $\sin 50,91^\circ = \frac{5}{NC}$ $NC = \frac{5}{\sin 50,91^\circ}$ $= 6,44$ unit	\checkmark subst. into distance formula/ <i>verv. in afst. form.</i> \checkmark length of FC / <i>lengte van FC</i> $\checkmark \sin 50,91^\circ = \frac{5}{NC}$ \checkmark answer/ <i>antwoord</i> (4) [12]



QUESTION/VRAAG 5

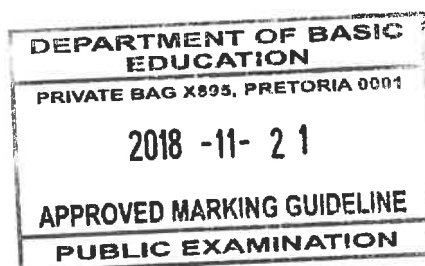


5.1.1	$x^2 + y^2 = r^2 \quad [\textit{Pythagoras}]$ $(x)^2 + (15)^2 = 17^2$ $x^2 = 64$ $x = -8 \quad (\textit{P is in quadrant 2/ is in kwadrant 2})$	✓ subst in pyth/ verv in pyth ✓ answer/ antwoord (2)
5.1.2	$\tan \theta = \frac{15}{-8}$	✓ answer/ antwoord (1)
5.1.3	$\cos(180^\circ - \theta)$ $= -\cos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

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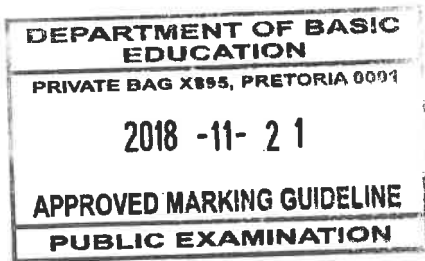
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<p>5.1.5</p>	$\tan \theta = \frac{a}{-2} = \frac{15}{-8}$ $\frac{a}{-2} = \frac{15}{-8}$ $a = \frac{15}{4}$ <p>OR/OF</p> $m = \frac{15}{-8}$ $y = \frac{15}{-8}x$ $a = \frac{15}{-8}(-2)$ $a = \frac{15}{4}$	<p>✓ $\tan \theta = \frac{a}{-2}$</p> <p>✓ equating/ <i>stel gelyk</i></p> <p>✓ answer/ <i>antwoord</i> (3)</p> <p>✓ $y = \frac{15}{-8}x$</p> <p>✓ substitution of $P(-2; a)$/ <i>vervanging van</i> $P(-2; a)$</p> <p>✓ answer/ <i>antwoord</i> (3)</p>
<p>5.2</p>	$\text{LHS} = \frac{\sin 120^\circ \cdot \cos 210^\circ \cdot \tan 315^\circ \cdot \cos 27^\circ}{\cos 540^\circ \cdot \sin 63^\circ}$ $= \frac{\sin 60^\circ \cdot (-\cos 30^\circ) \cdot (-\tan 45^\circ) \cdot \sin 63^\circ}{\cos 180^\circ \cdot \sin 63^\circ}$ $= \frac{\frac{\sqrt{3}}{2} \cdot \frac{-\sqrt{3}}{2} \cdot (-1)}{-1}$ $= -\frac{3}{4}$	<p>✓ $\sin 60^\circ / \cos 30^\circ$</p> <p>✓ $-\cos 30^\circ$</p> <p>✓ $-\tan 45^\circ$</p> <p>✓ $\sin 63^\circ / \cos 27^\circ$</p> <p>✓ $\cos 180^\circ$</p> <p>✓ special angle ratios/ <i>spesiale hoeke verhoudings</i></p> <p>✓ answer/ <i>antwoord</i> (7)</p>



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<p>5.3</p>	$\begin{aligned} \text{LHS} &= \frac{1}{\cos \theta} - \frac{\cos \theta}{1 + \sin \theta} \\ &= \frac{1 + \sin \theta - \cos^2 \theta}{\cos \theta(1 + \sin \theta)} \\ &= \frac{1 + \sin \theta - (1 - \sin^2 \theta)}{\cos \theta(1 + \sin \theta)} \\ &= \frac{\sin \theta(1 + \sin \theta)}{\cos \theta(1 + \sin \theta)} \\ &= \frac{\sin \theta}{\cos \theta} \\ &= \tan \theta \\ &= \text{RHS} \end{aligned}$ <p>OR/OF</p> $\begin{aligned} \text{LHS} &= \frac{1}{\cos \theta} - \frac{\cos \theta}{1 + \sin \theta} \\ &= \frac{1 + \sin \theta - \cos^2 \theta}{\cos \theta(1 + \sin \theta)} \\ &= \frac{(1 - \cos^2 \theta) + \sin \theta}{\cos \theta(1 + \sin \theta)} \\ &= \frac{\sin^2 \theta + \sin \theta}{\cos \theta(1 + \sin \theta)} \\ &= \frac{\sin \theta(1 + \sin \theta)}{\cos \theta(1 + \sin \theta)} \\ &= \frac{\sin \theta}{\cos \theta} \\ &= \tan \theta \\ &= \text{RHS} \end{aligned}$ <p>OR/OF</p>	<p>✓ common denominator/ <i>gemene noemer</i></p> <p>✓ $1 - \sin^2 \theta$</p> <p>✓ simplification/ <i>vereenv.</i></p> <p>✓ factors/ <i>faktore</i></p> <p>✓ $\frac{\sin \theta}{\cos \theta}$</p> <p>(5)</p> <p>✓ common denominator/ <i>gemene noemer</i></p> <p>✓ $1 - \cos^2 \theta$</p> <p>✓ simplification/ <i>vereenv.</i></p> <p>✓ factors/ <i>faktore</i></p> <p>✓ $\frac{\sin \theta}{\cos \theta}$</p> <p>(5)</p>
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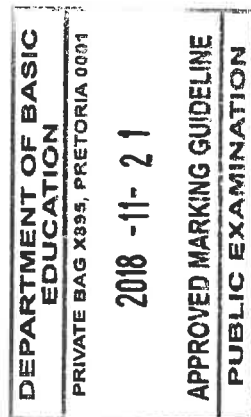


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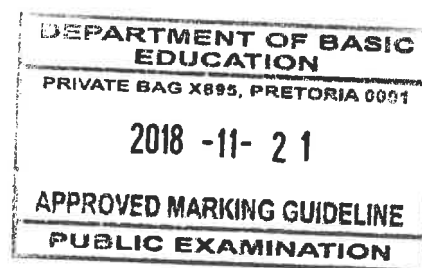
	$\begin{aligned} \text{LHS} &= \frac{1}{\cos \theta} - \frac{\cos \theta}{1 + \sin \theta} \\ &= \frac{1 + \sin \theta - \cos^2 \theta}{\cos \theta(1 + \sin \theta)} \\ &= \frac{\sin^2 \theta + \cos^2 \theta + \sin \theta - \cos^2 \theta}{\cos \theta(1 + \sin \theta)} \\ &= \frac{\sin^2 \theta + \sin \theta}{\cos \theta(1 + \sin \theta)} \\ &= \frac{\sin \theta(1 + \sin \theta)}{\cos \theta(1 + \sin \theta)} \\ &= \frac{\sin \theta}{\cos \theta} \\ &= \tan \theta \\ &= \text{RHS} \end{aligned}$	<p>✓ common denominator/ <i>gemene noemer</i></p> <p>✓ $\sin^2 \theta + \cos^2 \theta$</p> <p>✓ simplification/ <i>vereenv.</i></p> <p>✓ factors/ <i>faktore</i></p> <p>✓ $\frac{\sin \theta}{\cos \theta}$</p> <p style="text-align: right;">(5)</p>
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<p>5.4</p>	$3 \sin x = 2 \tan x.$ $3 \sin x = 2 \times \frac{\sin x}{\cos x}$ $3 \sin x \cos x = 2 \sin x$ $3 \sin x \cos x - 2 \sin x = 0$ $\sin x(3 \cos x - 2) = 0$ <p>$\sin x = 0$</p> <p>$x = 360^\circ k, k \in Z$</p> <p>or</p> <p>$x = 180^\circ + 360^\circ k, k \in Z$</p> <p>or</p> $\cos x = \frac{2}{3}$ <p>$x = 48,19^\circ + 360^\circ k, k \in Z$</p> <p>or</p> <p>$x = 311,81^\circ + 360^\circ k, k \in Z$</p> <p>OR/ OF</p>	<p>✓ $\frac{\sin x}{\cos x}$</p> <p>✓ factors/ <i>faktore</i></p> <p>✓ both equations/ <i>beide vergelykings</i></p> <p>✓ both general solutions/ <i>beide algemene oplossings</i></p> <p>✓ both general solutions/ <i>beide algemene oplossings</i></p> <p>✓ $k \in Z$</p> <p style="text-align: right;">(6)</p>
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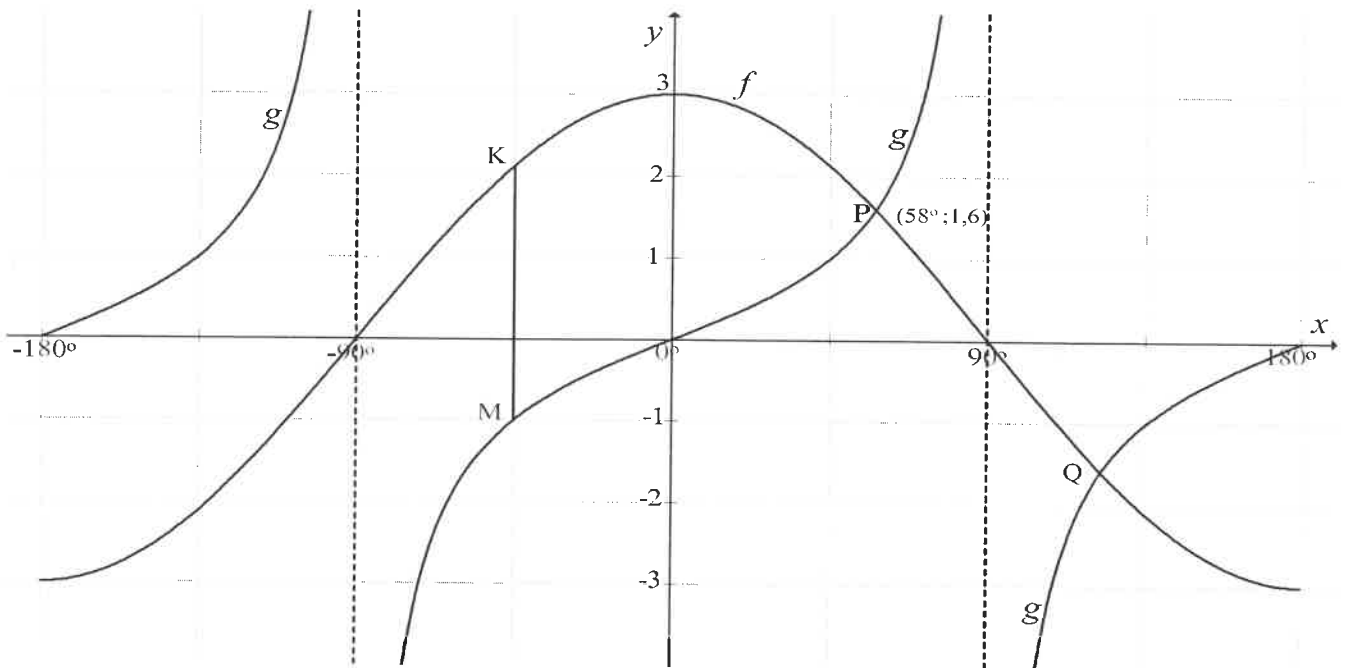
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	$3 \sin x = 2 \tan x.$ $3 \sin x = 2 \times \frac{\sin x}{\cos x}$ $3 \sin x \cos x = 2 \sin x$ $3 \sin x \cos x - 2 \sin x = 0$ $\sin x (3 \cos x - 2) = 0$ $\sin x = 0$ $x = 180^\circ \cdot k, k \in \mathbb{Z}$ $\cos x = \frac{2}{3}$ $x = \pm 48,19^\circ + 360^\circ \cdot k, k \in \mathbb{Z}$	<p>✓ $\frac{\sin x}{\cos x}$</p> <p>✓ factors/ faktore</p> <p>✓ both equations/ beide vergelykings</p> <p>✓ general solution/ algemene oplossing</p> <p>✓ both general solutions/ beide algemene oplossings</p> <p>✓ $k \in \mathbb{Z}$</p> <p style="text-align: right;">(6)</p> <p style="text-align: right;">[28]</p>
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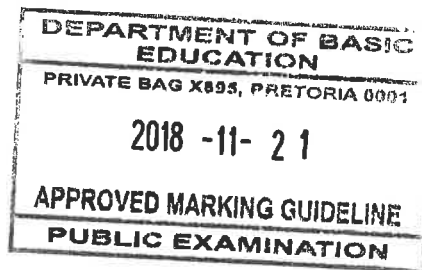


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QUESTION/VRAAG 6

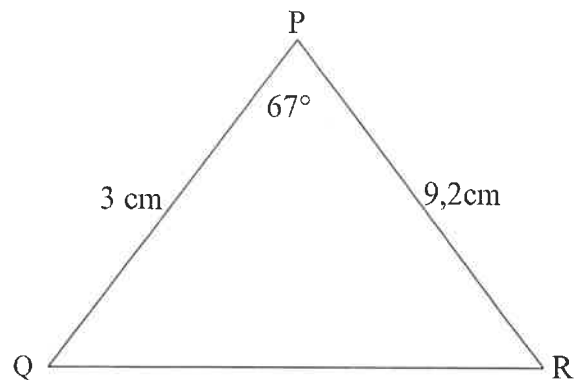


6.1	$-3 \leq y \leq 3$ or/ of $y \in [-3;3]$	✓ end points/ eindpunte ✓ notation/ notasie (2)
6.2	$c = 1$	✓ answer/ antwoord (1)
6.3	$a = 3, b = 1$	✓ $a = 3$ ✓ $b = 1$ (2)
6.4	$Q(122^\circ; -1,6)$	✓ x- value/ waarde ✓ y- value/ waarde (2)
6.5	$K(-45^\circ; \frac{3\sqrt{2}}{2})$ $M(-45^\circ; -1)$ $KM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

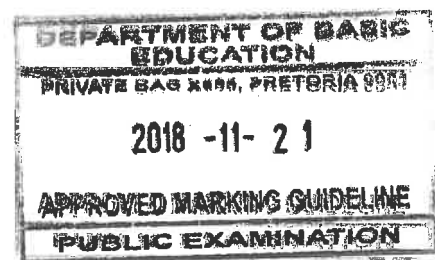


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QUESTION/VRAAG 7

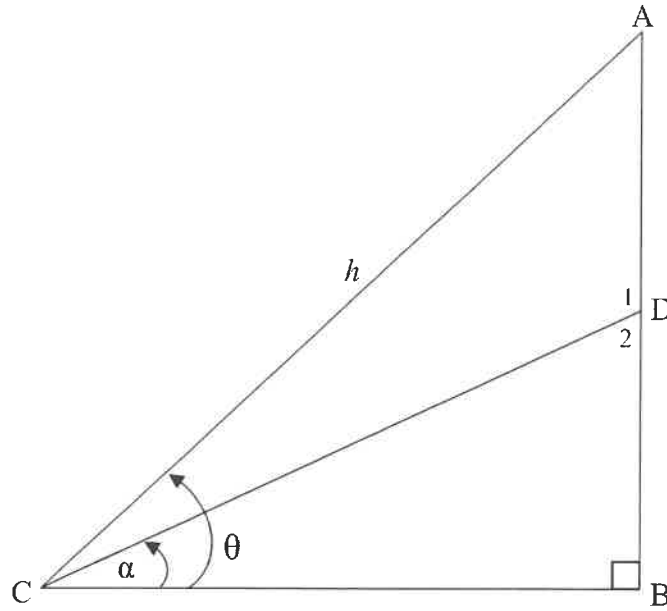


7.1	$QR^2 = PR^2 + PQ^2 - 2PR \cdot PQ \cos \hat{P}$ $QR^2 = (3)^2 + (9,2)^2 - 2(3)(9,2)\cos 67^\circ$ $QR = \sqrt{(3)^2 + (9,2)^2 - 2(3)(9,2)\cos 67^\circ}$ $QR = 8,49\text{cm}$	<p>✓ using cos rule/ gebruik cos reël</p> <p>✓ substitution/ vervanging</p> <p>✓ answer/ antwoord</p> <p style="text-align: right;">(3)</p>
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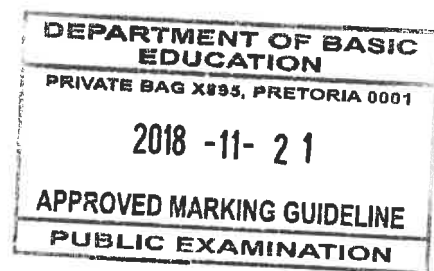
7.2.1	$\hat{A}CD = \theta - \alpha$	✓ answer/antw. (1)
7.2.2	$\hat{D}_1 = 90^\circ + \alpha$ $\frac{\sin(90^\circ + \alpha)}{h} = \frac{\sin(\theta - \alpha)}{AD}$ $\frac{\cos \alpha}{h} = \frac{\sin(\theta - \alpha)}{AD}$ $AD = \frac{h \sin(\theta - \alpha)}{\cos \alpha}$	✓ $\hat{D}_1 = 90^\circ + \alpha$ ✓ $\frac{\sin(90^\circ + \alpha)}{h}$ ✓ $\frac{\sin(\theta - \alpha)}{AD}$ ✓ $\sin(90^\circ + \alpha) = \cos \alpha$ (4)
7.2.3	$AD = \frac{17 \sin(58^\circ - 23^\circ)}{\cos 23^\circ}$ $AD = 10,59 \text{ units}$	✓ subst/verv. ✓ answer/antw. (2)
7.2.4	$\text{Area of } \triangle ADC = \frac{1}{2} \times AD \times AC \times \sin \hat{A}$ $= \frac{1}{2} \times 10,59 \times 17 \times \sin 32^\circ$ $= 47,70 \text{ unit}^2$ <p>OR/ OF</p>	✓ correct area rule/ korrekte area reël ✓ 32° ✓ answer/antw. (3)

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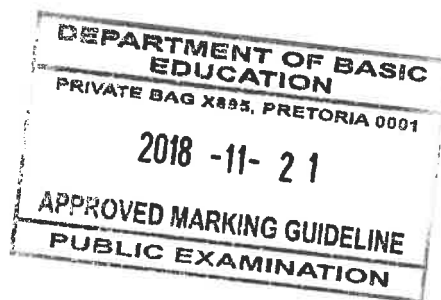
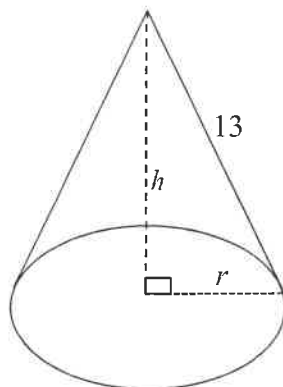


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$\sin 58^\circ = \frac{AB}{17}$ $AB = 17 \sin 58^\circ$ $= 14,41682\dots$ $BD = 14,41682\dots - 10,59289\dots = 3,82393\dots$ $\sin 23^\circ = \frac{3,82393\dots}{CD}$ $CD = \frac{3,82393\dots}{\sin 23^\circ}$ $= 9,78660\dots$ $\text{Area of } \triangle ADC = \frac{1}{2} \times CD \times AC \times \sin 35^\circ$ $= \frac{1}{2} \times 9,78660\dots \times 17 \times \sin 35^\circ$ $= 47,71 \text{ unit}^2$	<p>✓ length of BD / lengte van BD</p> <p>✓ length of CD / lengte van CD</p> <p>✓ answer/antw. (3)</p> <p style="text-align: right;">[28]</p>
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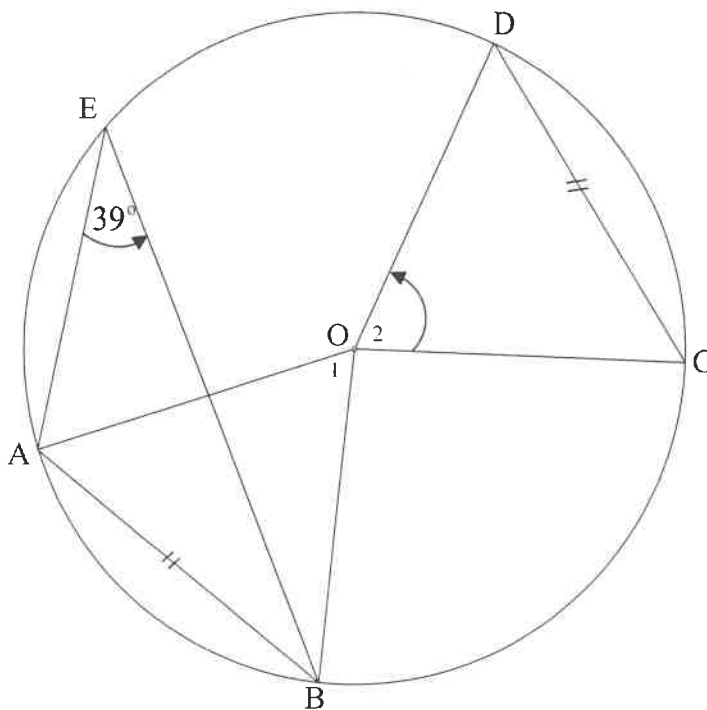


QUESTION/VRAAG 8



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

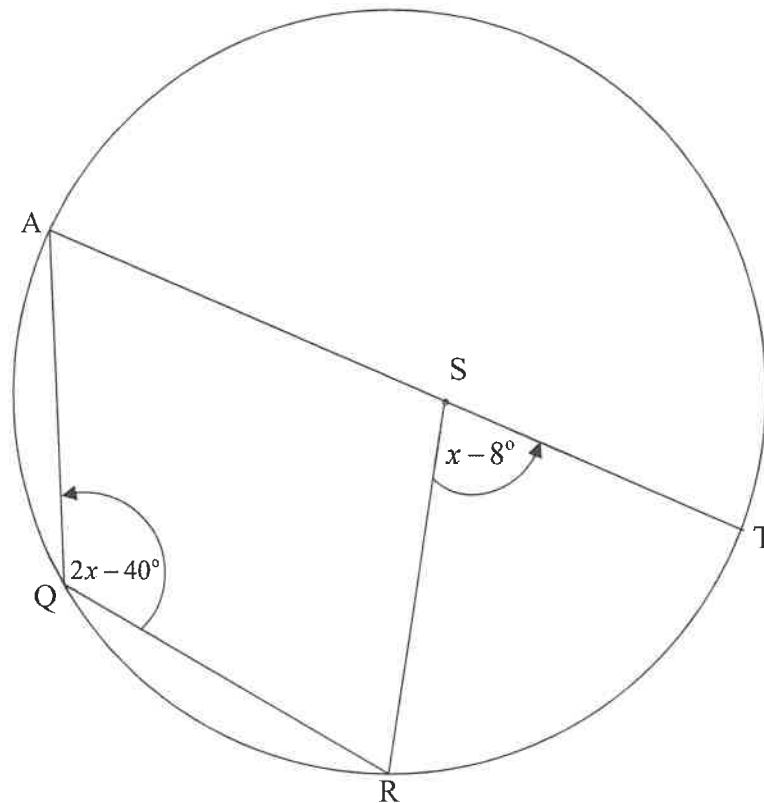
QUESTION/VRAAG 9



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

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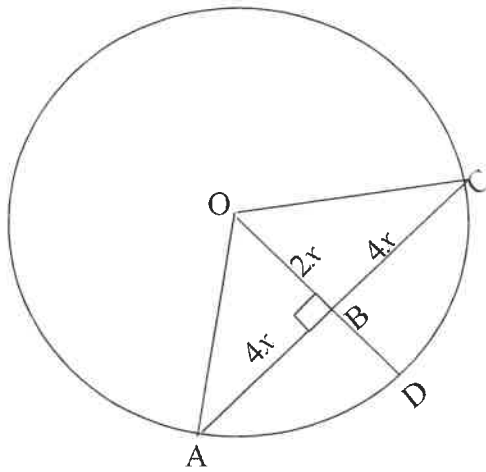
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<p>9.2</p>	$x - 8^\circ + 180^\circ = 2(2x - 40^\circ)$ <p>[angle at centre = $2 \times \angle$ at circumference/ middelpuntshoek = $2 \times$ omtrekshoek]</p> $4x - 80^\circ = 172^\circ + x$ $3x = 252^\circ$ $x = 84^\circ$ <p>OR/OF</p> <p>Join T and R/ verbind T en R</p> $\hat{T} = 180^\circ - (2x - 40^\circ)$ <p>[opp \angle's of cyclic quad/ teenoorst. \angle'e van koordevierhoek]</p> $\hat{R} = \hat{T} = 220^\circ - 2x$ <p>[\angle's opp. = sides / \angle's teoor gelyke sye]</p> $x - 8^\circ + 220^\circ - 2x + 220^\circ - 2x = 180^\circ$ <p>[sum of int \angle's of Δ som binne \angle'e van Δ]</p> $-3x = -252^\circ$ $x = 84^\circ$	<p>✓ S ✓ R</p> <p>✓ simplification/ vereenvoudiging</p> <p>✓ answer/ antwoord</p> <p>(4)</p> <p>✓ S ✓ R</p> <p>✓ S</p> <p>✓ answer/ antwoord</p> <p>(4)</p>
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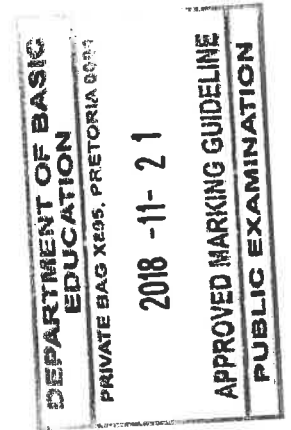
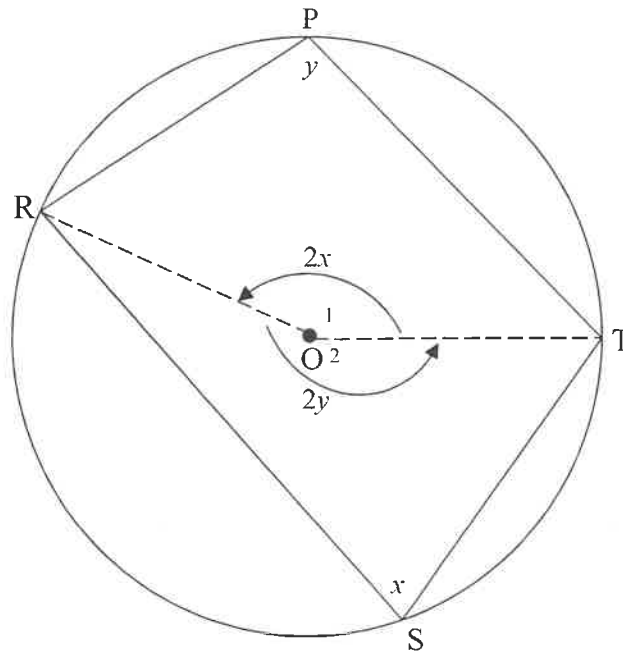
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<p>9.3</p>	$AB = BC = 4x \left[\begin{array}{l} \text{line from centre } \perp \text{ to chord /} \\ \text{lyn van middelpunt } \perp \text{ aan koord} \end{array} \right]$ $OA^2 = (4x)^2 + (2x)^2 \quad [\text{Pythagoras}]$ $OA = \sqrt{16x^2 + 4x^2}$ $= \sqrt{20x^2}$ $= 2\sqrt{5}x$ $OD = OA = 2\sqrt{5}x \quad [\text{radii}]$ $BD = 2\sqrt{5}x - 2x$ $= 2x(\sqrt{5} - 1)$	<p>✓ S ✓ R</p> <p>✓ Substitution/ vervanging</p> <p>✓ length of OA / lente van OA</p> <p>✓ $BD = 2\sqrt{5}x - 2x$</p> <p>(5) [13]</p>
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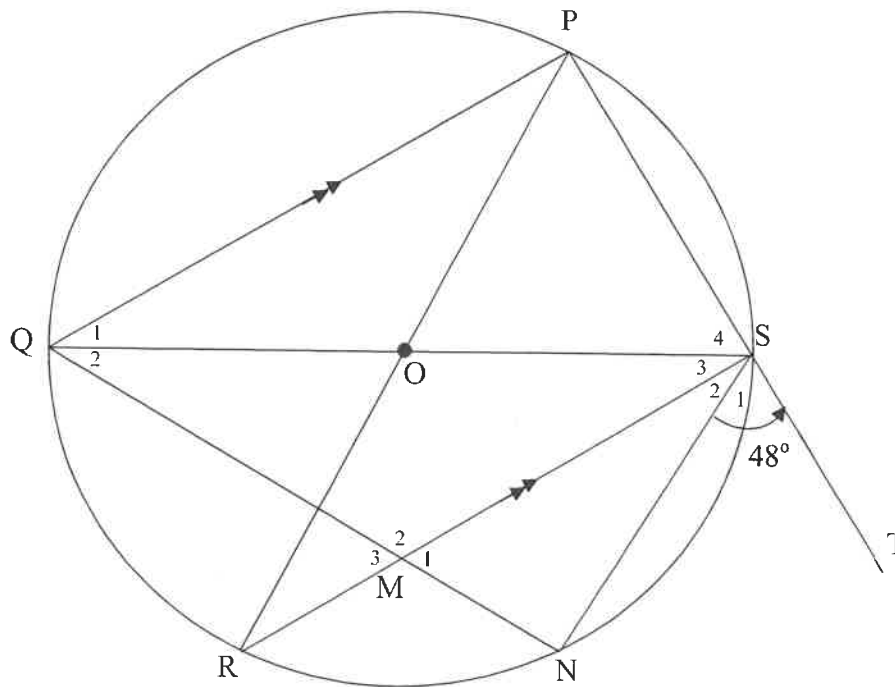
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QUESTION/VRAAG 10



<p>10.1</p>	<p>Construction: Draw radii OR and OT <i>Konstruksie: teken raduise OR en OT</i></p> <p>Let/ laat: $\hat{S} = x$ and/en $\hat{P} = y$</p> <p>$\hat{O}_1 = 2\hat{S}$ [angle at centre = 2 times angle at circumference/ <i>middelpuntshoek = 2 keer omtrekshoek</i>]</p> <p>$\hat{O}_1 = 2x$</p> <p>Similarly/ <i>in die selfde manier</i>: $\hat{O}_2 = 2y$</p> <p>$2x + 2y = 360^\circ$ [anlges around a pt / <i>hoeke om'n punt</i>] $x + y = 180^\circ$</p> <p>$\therefore \hat{S} + \hat{P} = 180^\circ$</p>	<p>✓ construction/ <i>konstruksie</i></p> <p>✓ S ✓ R</p> <p>✓ S</p> <p>✓ S/R</p> <p>(5)</p>
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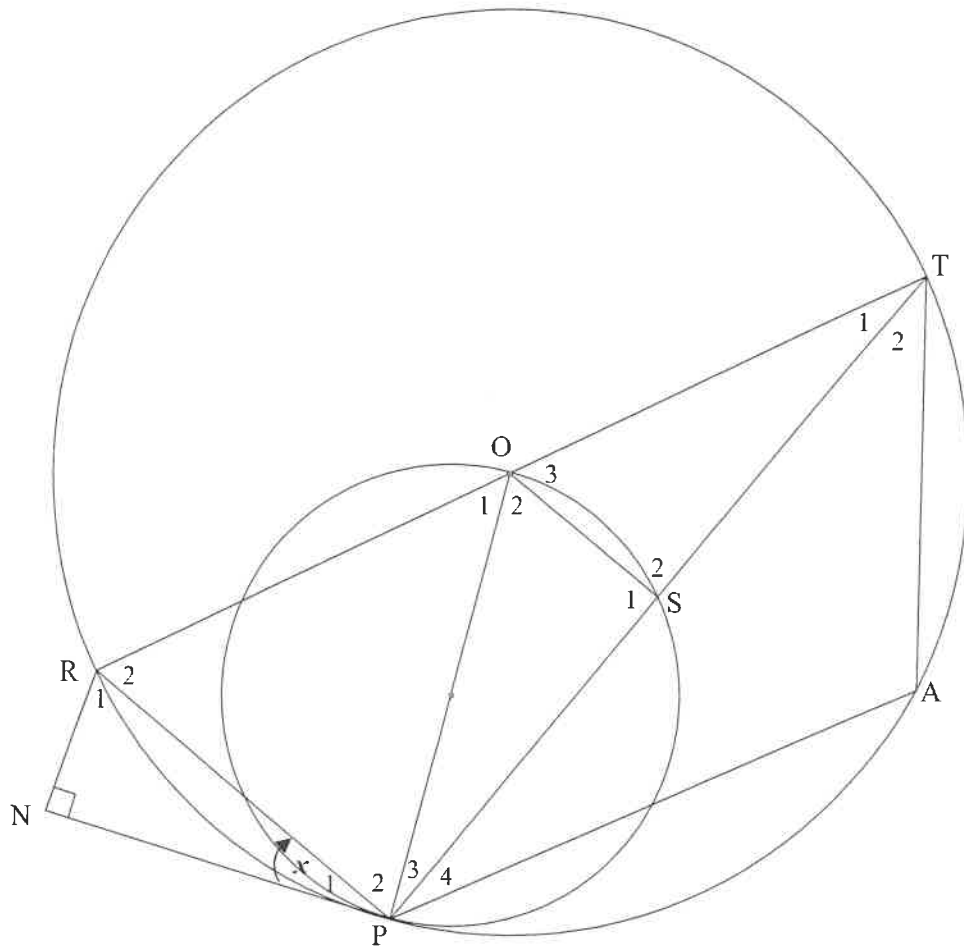
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10.2.1(a)	$\hat{Q} = \hat{S}_1 = 48^\circ$ [ext \angle of cyclic quad/ buite \angle van 'n koodervierhoek] $\hat{Q}_1 = \hat{Q}_2 = 24^\circ$ [QS bisects/ halveer $\hat{P}\hat{Q}\hat{N}$]	✓ S ✓ R ✓ S (3)
10.2.1(b)	$\hat{R} = \hat{Q}_1 = 24^\circ$ [\angle^s in the same segment/ in dieselfde segment]	✓ S ✓ R (2)
10.2.1(c)	$\hat{M}_1 = \hat{Q} = 48^\circ$ [corresp/ ooreenkomst \angle^s , $PQ \parallel SR$] OR/OF $\hat{S}_3 = \hat{Q}_1 = 24^\circ$ [alt \angle^s / ooreenkomst \angle^s , $PQ \parallel SR$] $\hat{M}_1 = 48^\circ$ [ext \angle of Δ / buite \angle van Δ]	✓ S ✓ R (2) ✓ S / R ✓ answer/ antwoord (2)
10.2.2	$\hat{M}_1 = \hat{S}_1 = 48^\circ$ $\therefore ST$ is a tangent to circle MNS. [converse tan – chord theorem] $\therefore ST$ is 'n raaklyn aan MNS [omgekrd raaklyn-koord st.]	✓ S ✓ R (2) [14]

QUESTION/VRAAG 11



<p>11.1</p>	<p>$\hat{T}_1 = x$ [tan – chord theorem / raaklyn-koord st]</p> <p>$\hat{O}_1 = 2x$ [\angle at centre = $2 \times \angle$ at circumference / middelpuntshoek = 2 keer omtrekshoek]</p> <p>$\hat{P}_2 = 90^\circ - x$ [tan \perp diameter/ raaklyn \perp middellyn]</p> <p>$\hat{R}_2 = 90^\circ - x$ [\angle^s opp. = sides / \angle^s teoor gelyke sye]</p> <p>$\therefore \hat{R}_1 = \hat{R}_2$</p> <p>PR bisects / halveer ORN</p>	<p>✓ S/R</p> <p>✓ S</p> <p>✓ S</p> <p>✓ $\hat{R}_2 = 90^\circ - x$</p> <p>✓ S</p>
<p>OR/ OF</p>	<div data-bbox="571 1839 992 2085" data-label="Image"> </div>	<p>(5)</p>

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	<p>$\hat{R}\hat{P}T = 90^\circ$ [\angle in the semi circle/ in dieselfde segment]</p> <p>$\hat{T}_1 = x$ [tan – chord theorem/ raaklyn-koord st]</p> <p>$\hat{R}_2 = 90^\circ - x$ [sum int \angle^s of Δ / som binne \angle^s van Δ]</p> <p>$\hat{R}_1 = 90^\circ - x$ [sum int \angle^s of Δ / som binne \angle^s van Δ]</p> <p>$\therefore \hat{R}_1 = \hat{R}_2$</p> <p>PR bisects/ halveer ORN</p> <p>OR/ OF</p> <p>$\hat{T}_1 = x$ [tan – chord theorem/ raaklyn-koord st]</p> <p>$\hat{P}_3 = x$ [\angle^s opp.=sides/ \angle^s teoor gelyke sye]</p> <p>$\hat{O}_1 = 2x$ [ext \angle of Δ / buite \angle van Δ]</p> <p>$\hat{R}_2 = \hat{P}_2 = \frac{180^\circ - 2x}{2}$ [\angle^s opp.=sides/ \angle^s teoor gelyke sye]</p> <p>$\hat{R}_2 = 90^\circ - x$</p> <p>$\hat{R}_1 = 90^\circ - x$ [sum int \angle^s of Δ / som binne \angle^s van Δ]</p> <p>$\therefore \hat{R}_1 = \hat{R}_2$</p> <p>PR bisects/ halveer ORN</p>	<p>✓ S</p> <p>✓ S/R</p> <p>✓ S</p> <p>✓ S</p> <p>✓ S</p> <p>✓ S</p> <p>✓ S/R</p> <p>✓ S</p> <p>✓ S</p> <p>✓ S</p> <p>✓ S</p> <p>(5)</p> <p>(5)</p>
<p>11.2</p>	<p>$\hat{P}\hat{A}T = 90^\circ + x$ [opp \angle^s of cyclicquad/ teenoorst. hoeke van koordevierhoek]</p> <p>$\hat{S}_2 = 90^\circ$ [Line from centre \perp to chord / lyn van mdpt \perp aan koord]</p> <p>$\hat{R}\hat{O}S = 90^\circ + x$ [ext \angle of Δ / buite \angle van Δ]</p> <p>$\therefore \hat{R}\hat{O}S = \hat{P}\hat{A}T$</p> <p>OR/ OF</p> <div style="text-align: center; border: 1px solid black; padding: 5px;"> <p>DEPARTMENT OF BASIC EDUCATION</p> <p>PRIVATE BAG X895, PRETORIA 0001</p> <p>2018 -11- 21</p> <p>APPROVED MARKING GUIDELINE</p> <p>PUBLIC EXAMINATION</p> </div>	<p>✓ S ✓ R</p> <p>✓ S ✓ R</p> <p>✓ S/R</p> <p>(5)</p>

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

TOTAL/TOTAAL: 150

