

basic education

Department:
Basic Education
REPUBLIC OF SOUTH AFRICA

NATIONAL
SENIOR CERTIFICATE
NATIONALE SENIOR
SERTIFIKAAT

GRADE 12/GRAAD 12

MATHEMATICS P2/WISKUNDE V2
NOVEMBER 2017
MARKING GUIDELINES/NASIENRIGLYNE

MARKS/PUNTE: 150

DEPARTMENT OF BASIC
EDUCATION
PRIVATE BAG X858, PRETORIA 008
2017 -11- 19
APPROVED MARKING GUIDELINE
PUBLIC EXAMINATION

These marking guidelines consist of 28 pages.
Hierdie nasienriglyne bestaan uit 28 bladsye.

Approved
Prof. R. Govender
13/11/2017

Approved
13/11/2017

Approved
2017-11-19

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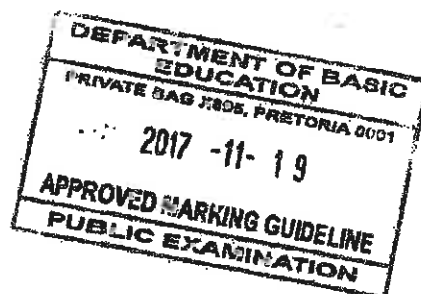
NOTE:

- 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.

NGTA:

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

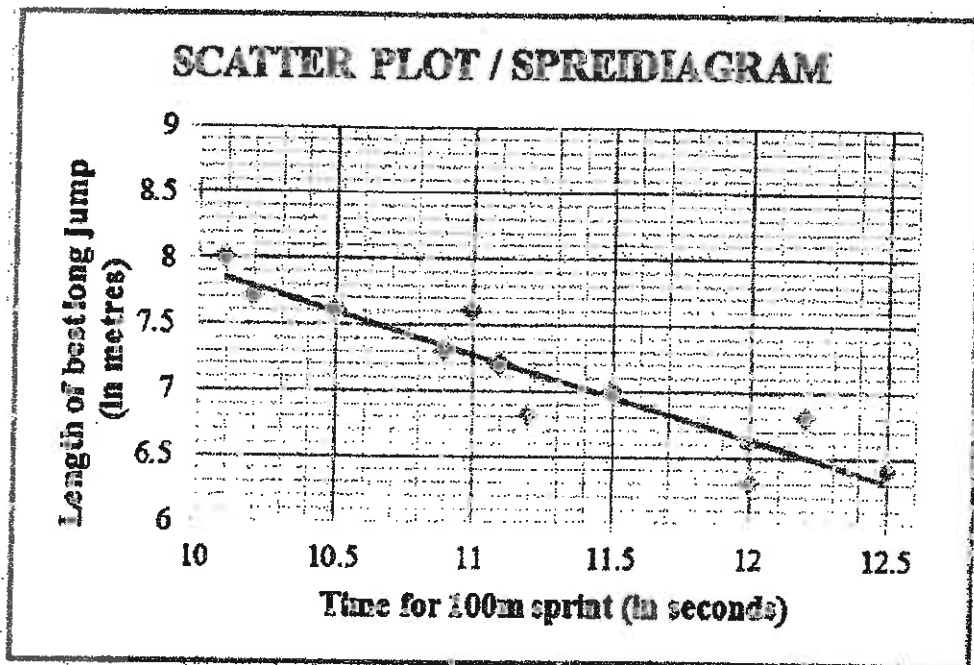
GEOMETRY	
S	A mark for a correct statement (A statement mark is independent of a reason.)
	'n Punt vir 'n korrekte bewering ('n Punt vir 'n bewering is onafhanklik van die rede.)
R	A mark for a correct reason (A reason mark may only be awarded if the statement is correct.)
	'n Punt vir 'n korrekte rede ('n Punt word slegs vir die rede toegeken as die bewering korrek is.)
S/R	Award a mark if the statement AND reason are both correct.
	Ken 'n punt toe as beide die bewering EN rede korrek is.



QUESTION/VRAAG 1

Time for 100 m sprint (in seconds) <i>Tyd vir 100 m-naelloop (in sekondes)</i>	10,1	10,2	10,5	10,9	11	11,1	11,2	11,5	12	12	12,2	12,5
Distance of best long jump (in metres) <i>Afstand van beste sprong in verspring (in meter)</i>	8	7,7	7,6	7,3	7,6	7,2	6,8	7	6,6	6,3	6,8	6,4

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1.1	$a = 14,343... = 14,34$ / $14,3$ / $14,35$ / $14,4$ <i>swapped</i> $b = -0,642... = -0,64$ / $-0,65$ <i>2de</i> $y = 14,34 - 0,64x$	✓ value of a ✓ value of b (3)
1.2	$y = 14,34 - 0,64(11,7)$ $= 6,85$ ✓ OR/OF <i>or wrong from 1.1, not swapped</i> $y = 6,83$ (calculator / sakrekenaar)	✓ substitution correctly ✓ answer (2)
1.3	The gradient increases / <i>Die gradient neem toe</i> ✓ The point (12,3 ; 7,6) lies some distance above the current data. <i>Die punt (12,3 ; 7,6) lê bokant die huidige data.</i>	✓ increases/ <i>neem toe</i> ✓ reasoning in words/ <i>redenasie in woorde</i> (2)
		[7]

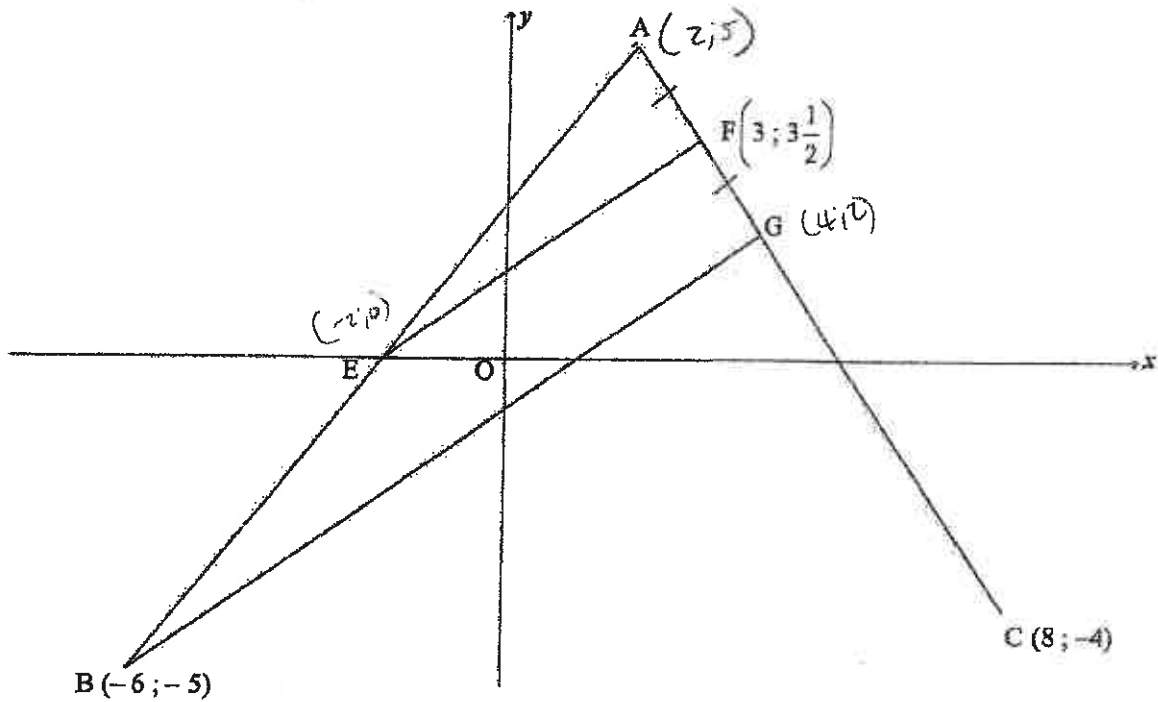
QUESTION/VRAAG 2

12	13	13	14	14	16	17	18	18	18	19	20
21	21	22	22	23	24	25	27	29	30	36	

2.1.1	$\bar{x} = \frac{472}{23}$ ✓ CA solank. bo of onder korrek is. $\bar{x} = 20,52$ seconds / sekonde (R)!! Answer only $\frac{2}{2}$	✓ $\frac{472}{23}$ ✓ answer	(2)
2.1.2	$Q_1 = 16$ ✓ $Q_3 = 24$ ✓ $IQR/IKO = Q_3 - Q_1 = 24 - 16 = 8$ ✓ CA If $Q_3 < Q_1$, no CA!! for dist mark. Answer only $\frac{2}{2}$	✓ Q_1 ✓ Q_3 ✓ answer	(3)
2.2	$20,52 + 5,94 = 26,46$ ✓ also if in interval $\therefore > 26,46$ $\therefore 4$ girls/dogters ✓ Answer only $\frac{2}{2}$	✓ 26,46 ✓ answer	(2)
2.3		✓ whiskers ending at 12 & 36 ✓ $Q_1 = 16$ & $Q_3 = 24$ (box) ✓ $Q_2 = 20$	(3)
2.4.1	Girls / Meisies ✓	✓ answer	(1)
2.4.2	Five-number summary of boys: (15 ; 21 ; 23,5 ; 26 ; 38) ✓ None of the boys / Nie een van die seuns nie 5 girls completed in less than 15 seconds which was the minimum time taken by the boys. 5 meisies voltooi in minder as 15 sekondes, wat die minimumtyd is wat die seuns geneem het. only girls took less than 15 s. only 3 girls were winners.	✓ answer ✓ reason/rede	(2)

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QUESTION/VRAG 3



<p>3.1.1</p> <p>$m_{AC} = \frac{y_2 - y_1}{x_2 - x_1}$</p> <p>$\frac{\frac{3}{2} - (-4)}{3 - 8}$ ✓ ← must show for first 2 marks</p> <p>$= -\frac{3}{2}$ ✓</p> <p>$y = mx + c$</p> <p>$y = -\frac{3}{2}x + c$ ✓ Ca. even if positive</p> <p>$-4 = -\frac{3}{2}(8) + c$ ✓ OR/OR $(y - (-4)) = -\frac{3}{2}(x - 8)$</p> <p>$c = 8$ ✓ $y + 4 = -\frac{3}{2}x + 12$</p> <p>$y = -\frac{3}{2}x + 8$ (nie nodig) $y = -\frac{3}{2}x + 8$</p> <p>OR/OR</p>	<p>Gradient wrong max $\frac{2}{4}$</p> <p>If use (2;5) in grad → lose first 2 marks</p> <p>✓ substitution of (8; -4) & $(3; 3\frac{1}{2})$</p> <p>✓ gradient</p> <p>✓ substitution of m and $(8; -4)$ of $(3; \frac{7}{2})$ IF subst (2;5) here, lose last 2 marks.</p> <p>✓ equation of AC (4)</p>
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Lyn AC

	$m_{FC} = \frac{y_2 - y_1}{x_2 - x_1} = \frac{(-4) - \left(3\frac{1}{2}\right)}{8 - 3}$ $= -\frac{3}{2}$ $y = mx + c$ $3\frac{1}{2} = -\frac{3}{2}(3) + c$ $c = 8$ $y = -\frac{3}{2}x + 8$	<ul style="list-style-type: none"> ✓ substitution of (8; -4) & $\left(3; 3\frac{1}{2}\right)$ ✓ gradient ✓ substitution of m and $\left(3; 3\frac{1}{2}\right)$ ✓ equation of AC <p style="text-align: right;">(4)</p>
<p>3.1.2</p> <p style="font-size: 2em; transform: rotate(-45deg); position: absolute; left: -100px; top: 50px;">Point G?</p>	<p>AC: $3x + 2y = 16$ and BG: $7x - 10y = 8$</p> $15x + 10y = 80$ $7x - 10y = 8$ $22x = 88$ $x = 4$ $3(4) + 2y = 16$ $y = 2$ <p>∴ G(4; 2)</p> <p>OR/OF</p> <p>BG: $7x - 10y = 8$ ∴ $y = \frac{7}{10}x - \frac{8}{10}$</p> $\therefore \frac{7}{10}x - \frac{8}{10} = -\frac{3}{2}x + 8$ [CA from 3.1.1] $\frac{11}{5}x = \frac{44}{5}$ $x = 4$ $3(4) + 2y = 16$ $y = 2$ <p>∴ G(4; 2)</p>	<ul style="list-style-type: none"> ✓ method / metode: solving simultaneously / los gelyktydig op ✓ x coordinate (x > 0) ✓ y coordinate <p style="text-align: right;">(3)</p> <ul style="list-style-type: none"> ✓ method: equating metode: stel vgl's gelyk ✓ x coordinate (x > 0) ✓ y coordinate <p style="text-align: right;">(3)</p>
<p>3.2</p> <p style="font-size: 2em; transform: rotate(-45deg); position: absolute; left: -100px; top: 50px;">Toon A(2;5)</p>	$\frac{x_A + 4}{2} = 3$ and $\frac{y_A + 2}{2} = 3\frac{1}{2}$ <p>∴ A(2; 5)</p> <p>OR/OF by translation/deur translasie:</p> $x_A = 3 - (4 - 3) = 2$ $y_A = 3\frac{1}{2} + (3\frac{1}{2} - 2) = 5$ <p>∴ A(2; 5)</p>	<p>If use (2;5) $\frac{0}{2}$</p> <p>If G wrong and A is not (2;5) $\frac{0}{2}$</p> <ul style="list-style-type: none"> ✓ equation ito x ✓ equation ito y ✓ equation ito x ✓ equation ito y <p style="text-align: right;">(2)</p>

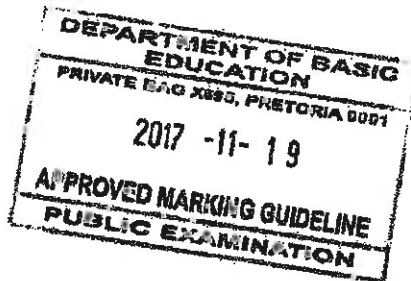
<p>3.3</p> <p><i>Prove EF // BG</i></p> <p><i>Assume E is midpt</i></p> <p><i>E = (-2, 0)</i> <i>EF = 6, 10</i> <i>BF = -13, 20</i> <i>How // lines</i></p>	<p>The coordinates of the midpt of AB / Die koördinaat van midpt van AB is:</p> $\left(\frac{2+(-6)}{2}; \frac{5+(-5)}{2}\right) = (-2; 0)$ <p>But the y-coordinate of E is 0 $\therefore E(-2; 0)$ is the midpoint of AB ✓ $\therefore EF \parallel BG$ [midpoint theorem/middelpuntst] OR/OF line divides 2 sides of Δ in prop/lyn verdeel 2 sye van Δ in dies verh]</p> <p>OR/OF The coordinates of the midpt of AB / Die koördinaat van midpt van AB is:</p> $\left(\frac{2+(-6)}{2}; \frac{5+(-5)}{2}\right) = (-2; 0)$ $AE = \sqrt{(-2-2)^2 + (0-5)^2} = \sqrt{41}$ $EB = \sqrt{(-2-(-6))^2 + (0-(-5))^2} = \sqrt{41}$ <p>\therefore In ΔABG: $AE = EB$ and $AF = FG$ ✓ $\therefore EF \parallel BG$ [midpoint theorem/middelpuntst] ✓</p> <p>OR/OF Equation of AB:</p> $y - (-5) = \frac{5 - (-5)}{2 - (-6)}(x - (-6))$ $y + 5 = \frac{10}{8}x + \frac{15}{2} \quad \therefore y = \frac{5}{4}x + \frac{5}{2}$ <p>x-intercept of AB:</p> $0 = \frac{5}{4}x + \frac{5}{2} \quad \therefore x = -2$ <p>$\therefore E(-2; 0)$ ✓</p> $m_{EF} = \frac{3 - 0}{-2 - (-2)} = \frac{7}{10}$ $m_{BG} = \frac{7}{10}$ <p>$\therefore m_{EF} = m_{BG} = \frac{7}{10}$ ✓ <i>Must conclude.</i></p> <div style="border: 1px solid black; padding: 5px; width: fit-content;"> <p>BG: $7x - 10y = 8$ $\therefore y = \frac{7}{10}x - \frac{8}{10}$ $\therefore m_{BG} = \frac{7}{10}$</p> </div>	<p>✓ subst A & B into midpt formula ✓ y coordinate = 0 ✓ E = midpt ✓ Reason (4)</p> <p>✓ subst A & B into midpt formula ✓ lengths of AE & EB ✓ AE = EB or E = midpt ✓ Reason (4)</p> <p>✓ equation of AB ✓ coordinates of E ✓ gradient of EF ✓ gradient EF = gradient BG (4)</p>
<p>3.4</p> <p><i>Prove D</i></p>	<p>Midpoint of AC = $\left(5; \frac{1}{2}\right)$ ✓ ✓ <i>D in (Kall)!!</i></p> $\frac{x_D + (-6)}{2} = 5 \quad \text{and} \quad \frac{y_D + (-5)}{2} = \frac{1}{2}$ <p>$\therefore D(16; 6)$ ✓</p> <p><i>Consider only wrong method</i></p> <p><i>OF</i></p>	<p>✓ $\left(5; \frac{1}{2}\right)$ ✓ x value ✓ y value (4)</p>

<p>OR/OF by translation/dmv translasië: D(16; 6)</p> <p>OR/OF $m_{BC} = \frac{-5 - (-4)}{-6 - 8} = \frac{1}{14}$ and $m_{AB} = \frac{5 - (-5)}{2 - (-6)} = \frac{5}{4}$</p> <p>AD: $y - 5 = \frac{1}{14}(x - 2) \Rightarrow y = \frac{1}{14}x + \frac{34}{7}$</p> <p>CD: $y + 4 = \frac{5}{4}(x - 8) \Rightarrow y = \frac{5}{4}x - 14$</p> <p>$\frac{5}{4}x - 14 = \frac{1}{14}x + \frac{34}{7}$ ✓</p> <p>∴ $x = 16$ ✓ $y = 6$ ✓</p>	<p>✓ method finding x ✓ method finding y ✓ x value ✓ y value</p> <p>(4)</p> <p>✓ equating</p> <p>✓ x value ✓ y value</p> <p>(4) [17]</p>
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OR

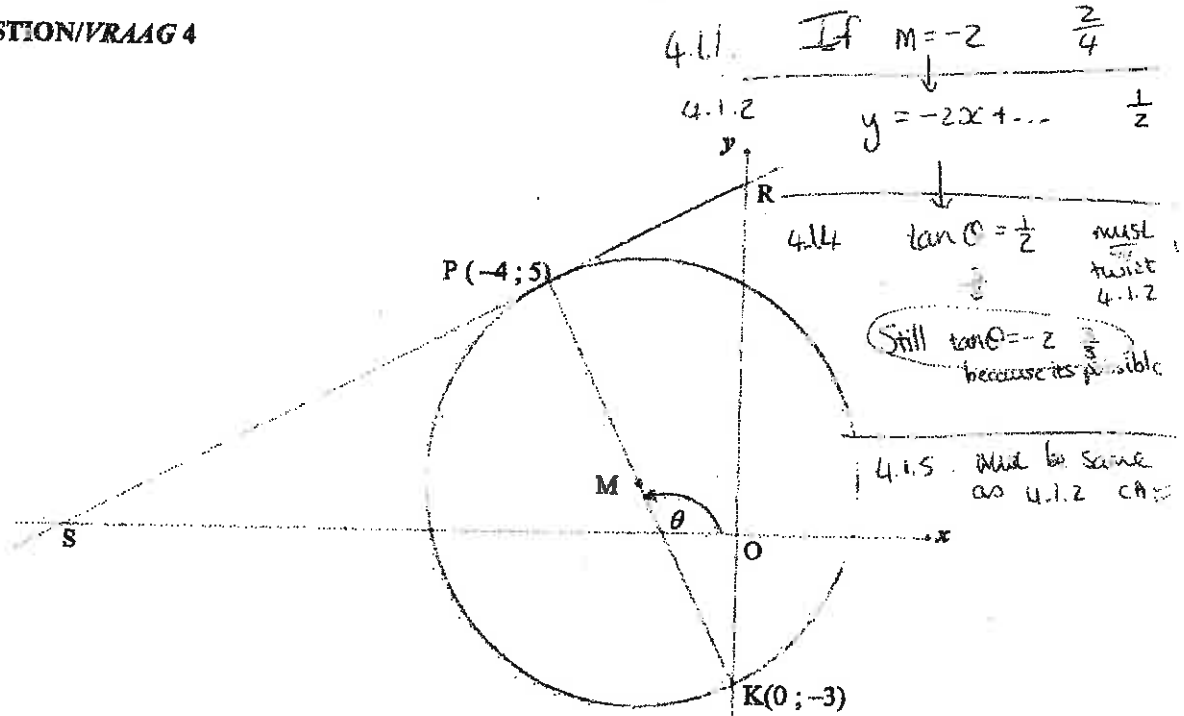
Subst a point into distance

$AD^2 = 197$
 $BC^2 = 197$
 $AB^2 = 166$
 $CD^2 = (-2 - 0)^2 + (4 - 4)^2 = 166$
 ↓
 subst line
 ↓
 $x = 16$ $y = 6$



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QUESTION/VRAAG 4



<p>4.1.1</p> <p><i>Grad SR</i></p>	<p>$m_{PK} = \frac{5 - (-3)}{-4 - 0}$ <i>Subst P(-4; 5) K(0; -3)</i> $= -2$ ✓ <i>Incorrect if swapped</i></p> <p>PK ⊥ SR [radius ⊥ tangent/raaklyn] ✓ $\therefore m_{PK} \times m_{RS} = -1$ $\therefore m_{RS} = \frac{1}{2}$ ✓ <i>Miss = -1/m_{PK} = -(-2) = 2</i></p>	<p>✓ substitution P & K into gradient formula ✓ gradient of PK ✓ PK ⊥ SR OR r ⊥ tangent ✓ answer (4)</p>
<p>4.1.2</p> <p><i>CA what answer is found in 4.1.1</i> <i>Very SR</i></p>	<p>$y = \frac{1}{2}x + c$ 4.1.1 $5 = \frac{1}{2}(-4) + c$ OR/OF $(y-5) = \frac{1}{2}(x-(-4))$ $c = 7$ <i>Add out of blue</i> $y = \frac{1}{2}x + 7$ ✓ <i>Answer only</i> $y = \frac{1}{2}x + 7$</p>	<p>✓ substitution of m and P ✓ equation (2)</p>
<p>4.1.3</p> <p><i>Very stuck</i></p>	<p>$M\left(\frac{-4+0}{2}; \frac{5+(-3)}{2}\right)$ $\therefore M(-2; 1)$ $r^2 = (x_2 - x_1)^2 + (y_2 - y_1)^2$ $r^2 = (-2 - 4)^2 + (1 - 5)^2 \rightarrow d_{PM}$ $\therefore r^2 = 20$ ✓ $\therefore (x+2)^2 + (y-1)^2 = 20$ or $(\sqrt{20})^2$</p> <p>OR/OF</p>	<p>• Assume M max $\frac{3}{4}$ ✓ x value of M ✓ y value of M ✓ $r^2 = 20$ ✓ equation (4)</p>

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$M\left(\frac{-4+0}{2}; \frac{5+(-3)}{2}\right) \therefore M(-2; 1)$

$(x+2)^2 + (y-1)^2 = r^2$
 $(-4+2)^2 + (5-1)^2 = r^2 \rightarrow d Pa$

$\therefore r^2 = 20$

$\therefore (x+2)^2 + (y-1)^2 = 20 \text{ or } (\sqrt{20})^2$

OR/OF

$M\left(\frac{-4+0}{2}; \frac{5+(-3)}{2}\right) \therefore M(-2; 1)$

$PK = \sqrt{(-4-0)^2 + (5-(-3))^2} = \sqrt{80}$

$r = \frac{\sqrt{80}}{2} = \sqrt{20}$

$\therefore (x+2)^2 + (y-1)^2 = 20 \text{ or } (\sqrt{20})^2$

✓✓ M(-2; 1)

$r^2 = 20$

✓ equation

(4)

✓✓ M(-2; 1)

$r^2 = 20$

✓ equation

(4)

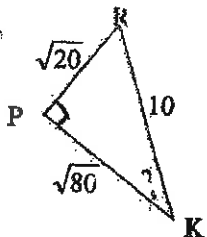
4.1.4

$\tan \theta = m_{PK} = -2$ ← Must twist
 $\therefore \theta = 180^\circ - 63,43^\circ$ find answer of 4.1.2
 $= 116,57^\circ$

$\tan PKR = \frac{1}{2}$
 $PKR = 26,57^\circ$

$PKR = 116,57^\circ - 90^\circ$ [ext \angle of ΔMOK]
 $= 26,57^\circ$

OR/OF



In ΔRPK :

$PK = \sqrt{(0-(-4))^2 + (-3-5)^2} = \sqrt{80}$

$PR = \sqrt{(-4-0)^2 + (5-7)^2} = \sqrt{20}$

$RK = 10$

$\cos PKR = \frac{PK^2 + KR^2 - PR^2}{2 \cdot PK \cdot KR} = \frac{(\sqrt{80})^2 + (10)^2 - (\sqrt{20})^2}{2(\sqrt{80})(10)}$
 $= \frac{2\sqrt{5}}{5}$

$PKR = 26,57^\circ$

OR/OF

$\sin PKR = \frac{\sqrt{20}}{10}$ lengths ratio

$\cos PKR = \frac{\sqrt{80}}{10}$

$PKR = 26,57^\circ$

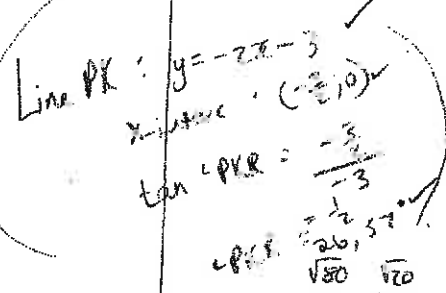
$PKR = 26,57^\circ$

✓ $\tan \theta = -2$

✓ size of θ

✓ answer

(3)



✓ lengths of PK, PR & RK

✓ correct values into cos rule

✓ answer

(3)

✓ lengths of sides

✓ ratio

✓ answer

(3)

Size PKR

$PK^2 = PK^2 + KR^2 - 2 \cdot PK \cdot KR \cdot \cos PKR$

	<p>OR/OF</p> $\tan \hat{P}KR = \frac{\sqrt{20}}{\sqrt{80}} \checkmark \text{ lengths } \checkmark \text{ ratios}$ $\hat{P}KR = 26,57^\circ \checkmark$	<ul style="list-style-type: none"> ✓ lengths of sides ✓ ratio ✓ answer <p>(3)</p>
<p>4.1.5</p>	<p>RS tangent at K(0; -3)</p> <p>4.1.1. $\therefore m_{RS} = m_{\text{tangent}} = \frac{1}{2} \checkmark$</p> <p>$\therefore y = \frac{1}{2}x - 3 \checkmark$</p> <p>OR/OF</p> $m_{PK} = \frac{1-5}{-2+4} = -2$ $m_{PK} \times m_{\text{tangent}} = -1 \quad [\text{radius } \perp \text{ tangent/raaklyn}]$ $\therefore m_{\text{tangent}} = \frac{1}{2} \checkmark$ <p>$\therefore y = \frac{1}{2}x - 3 \checkmark$</p> <p><i>Graph grad out of blue</i> $\frac{0}{2}$</p> <p><i>Answer only</i> $\frac{3}{2}$</p> <p><i>Same grad as in 4.1.2</i></p> <p><i>If $y = -2x - 3$</i></p>	<ul style="list-style-type: none"> ✓ gradient ✓ equation <p>(2)</p>
<p>4.2</p>	<p>$t \in (-3; 7)$</p> <p>OR/OF</p> $-3 < t < 7$ <p><i>notation</i></p> <p><i>If critical values wrong, no action mark</i></p> <p>$t = -3$ $t = 7$ <i>inequality</i> ✓</p>	<ul style="list-style-type: none"> ✓ -3 (A) ✓ 7 (CA from 4.1.2) ✓ correct inequality <p>(3)</p>
<p>4.3</p>	<p>RS: $y = \frac{1}{2}x + 7 \quad \therefore S(-14; 0) \checkmark$</p> <p>$SP = \sqrt{(-14 - (-4))^2 + (0 - 5)^2} = \sqrt{100 + 25} = \sqrt{125} \checkmark$</p> <p>Area $\Delta SMK = \frac{1}{2} \cdot MK \cdot SP \checkmark$</p> $= \frac{1}{2} (\sqrt{20})(\sqrt{125}) \checkmark$ $= 25 \text{ square units} \checkmark$	<ul style="list-style-type: none"> ✓ coordinates of S ✓ length of SP ✓ correct base & height into Area rule ✓ correct substitution ✓ answer <p>(5)</p>

by K raaklyn

values of t --- 2 diff points of intersection

opp ΔSMK


Look for $\frac{SP}{\sqrt{125}} \quad \frac{SM}{\sqrt{125}} \quad \frac{SK}{\sqrt{125}}$

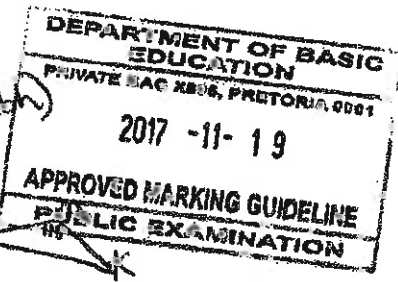
Eindig met

$\rightarrow \frac{1}{2} \sqrt{20} \cdot \sqrt{125} = 25 \quad (\frac{1}{2} \cdot 20)$

$\rightarrow \frac{1}{2} \sqrt{145} \cdot \sqrt{20} \cdot \sin 11,81^\circ = 25$

$\rightarrow \frac{1}{2} \sqrt{145} \cdot \sqrt{205} \cdot \sin 16,85^\circ = 25$

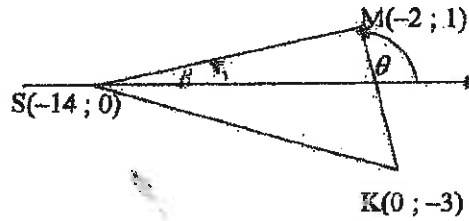




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OR/OF



Let β = inclination of SM / *inclinasië van SM*

RS: $y = \frac{1}{2}x + 7 \quad \therefore S(-14; 0)$

$SM = \sqrt{(-14 - (-2))^2 + (0 - 1)^2} = \sqrt{145}$ ✓

$\tan \beta = \frac{1 - 0}{-2 - (-14)} = \frac{1}{12} \quad \therefore \beta = 4,76^\circ$

$\therefore \hat{SMK} = 116,57^\circ - 4,76^\circ \quad [\text{ext } \angle \text{ of } \Delta]$
 $= 111,81^\circ$ ✓

Area $\Delta SMK = \frac{1}{2}(SM)(MK) \cdot \sin \hat{SMK}$

$= \frac{1}{2}(\sqrt{145})(\sqrt{20}) \cdot \sin 111,81^\circ$ ✓ *area rule subst*

$= 24,9985 = 25 \text{ square units}$ ✓

opp Δ SMK

✓ coordinates of S

✓ length of SM

✓ size of /grootte v \hat{SMK}

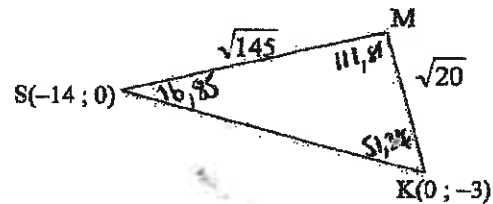
✓ correct substitution into area rule

✓ answer

(5)

No marks for (MK) PM

OR/OF



RS: $y = \frac{1}{2}x + 7 \quad \therefore S(-14; 0)$ ✓

$SK = \sqrt{(-14 - 0)^2 + (0 + 3)^2} = \sqrt{205}$ ✓

$\cos \hat{SMK} = \frac{(\sqrt{145})^2 + (\sqrt{20})^2 - (\sqrt{205})^2}{2(\sqrt{145})(\sqrt{20})} = \frac{2\sqrt{29}}{29}$

$\hat{SMK} = 111,80^\circ$ ✓

Area $\Delta SMK = \frac{1}{2}(SM)(MK) \cdot \sin \hat{SMK}$

$= \frac{1}{2}(\sqrt{145})(\sqrt{20}) \cdot \sin 111,81^\circ$ ✓

$= 24,9985 = 25 \text{ square units}$ ✓

✓ coordinates of S

✓ length of SK

✓ size of /grootte v \hat{SMK}

✓ correct substitution into area rule

✓ answer

(5)

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<p>OR/OF</p> <p>Produce KS to T</p> <p>RS: $y = \frac{1}{2}x + 7 \quad \therefore S(-14; 0)$ ✓</p> <p>$SK = \sqrt{(-14 - 0)^2 + (0 + 3)^2} = \sqrt{205}$ ✓</p> <p>$SM = \sqrt{(-14 - (-2))^2 + (0 - 1)^2} = \sqrt{145}$ ✓</p> <p>$m_{SK} = -\frac{3}{14} \Rightarrow T\hat{S}O = 167,91^\circ$</p> <p>$m_{SM} = \frac{1}{12} \Rightarrow M\hat{S}O = 4,76^\circ$</p> <p>$M\hat{S}K = 180^\circ - 167,91^\circ + 4,76^\circ = 16,85^\circ$ ✓</p> <p>Area $\Delta SMK = \frac{1}{2}(SM)(SK) \cdot \sin M\hat{S}K$</p> <p>$= \frac{1}{2}(\sqrt{145})(\sqrt{205}) \cdot \sin 16,85^\circ$ ✓</p> <p>$= 24,9985 = 25$ square units ✓</p> <p style="text-align: center;">(OR)</p>	<p>✓ coordinates of S</p> <p>✓ length of SK & SM</p> <p>✓ size of /grootte v $M\hat{S}K$</p> <p>✓ correct substitution into area rule</p> <p>✓ answer</p> <p style="text-align: right;">(5)</p>
--	--

Area $\Delta SPK \rightarrow M$

SP $\sqrt{125}$

PK $\sqrt{80}$

$$\begin{aligned} \text{Area } \Delta SPK &= \frac{1}{2} PS \cdot PK \\ &= \frac{1}{2} (\sqrt{125}) (\sqrt{80}) \\ &= 49,9 \dots \end{aligned}$$

Area $\Delta SMK = 25$

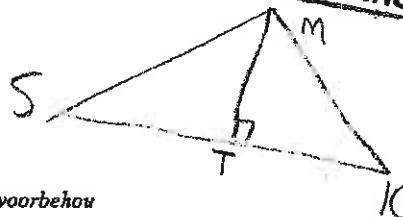
(OR)

Line SK: $y = -\frac{3}{14}x - 3$

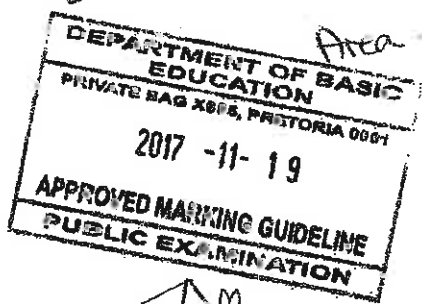
T $(-\frac{112}{41}; -\frac{97}{41})$

d_{NT} (height) = $\frac{10\sqrt{205}}{41}$

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$$\begin{aligned} \text{Area} &= \frac{1}{2}bh \\ &= \frac{1}{2}(5h)h \\ &= \frac{1}{2}(\sqrt{205})(\dots) \\ &= 25 \end{aligned}$$



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QUESTION/VRAAG 5

<p>5.1</p>	$\frac{\sin(A - 360^\circ) \cdot \cos(90^\circ + A)}{\cos(90^\circ - A) \cdot \tan(-A)}$ $= \frac{\sin A(-\sin A)}{\sin A(-\tan A)}$ $= \frac{\sin A}{\cos A}$ $= \cos A$	<p>whole numerator</p> <p>$\frac{-\sin A \sin A}{-\sin A \tan A} \frac{5}{6}$ ← perhaps indicate signs</p> <p>$\frac{(-\sin A)(\sin A)}{(-\sin A)(\cos A)} \frac{2}{6}$ ← show strong signs</p> <p>$\frac{\sin A \sin A}{\sin A \cdot \tan A} \frac{4}{6}$ ← sign mistake</p> <p>sin A -sin A sin A -tan A tan A = sin A / cos A answer</p>
<p>5.2.1</p>	$t^2 = (\sqrt{34})^2 - (3)^2$ $\therefore t = -5$	<p>substitution answer on Diagram !!!</p>
<p>5.2.2</p>	$\tan \beta = \frac{-5}{3}$	<p>correct ratio</p>
<p>5.2.3</p>	$\cos 2\beta = 2\cos^2 \beta - 1$ $= 2\left(\frac{3}{\sqrt{34}}\right)^2 - 1$ $= 2\left(\frac{9}{34}\right) - 1$ $= -\frac{16}{34} \text{ OR } -\frac{8}{17}$	<p>Wrong formula 6/10 Incorrect ratio 3/4 No Calc!</p> <p>compound formula substitution simplification or implied answer</p>
	<p>OR/OF</p> $\cos 2\beta = 1 - 2\sin^2 \beta$ $= 1 - 2\left(-\frac{5}{\sqrt{34}}\right)^2$ $= 1 - 2\left(\frac{25}{34}\right)$ $= -\frac{16}{34} \text{ OR } -\frac{8}{17}$ <p>(No decimals)</p>	<p>compound formula substitution simplification answer</p>
	<p>OR/OF</p> $\cos 2\beta = \cos^2 \beta - \sin^2 \beta$ $= \left(\frac{3}{\sqrt{34}}\right)^2 - \left(\frac{5}{\sqrt{34}}\right)^2$ $= \frac{9}{34} - \frac{25}{34}$ $= -\frac{16}{34} \text{ OR } -\frac{8}{17}$	<p>compound formula substitution simplification answer</p>

Simply to single trig ratio

Value t

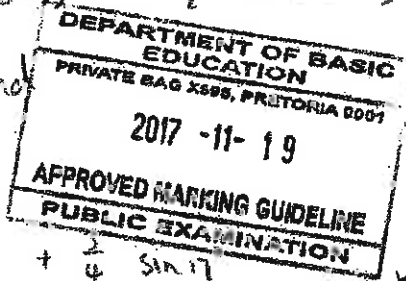
Value tan β

Value cos 2β

5.3.1	$\begin{aligned} \text{LHS} &= \sin(A+B) - \sin(A-B) \\ &= \sin A \cos B + \cos A \sin B - (\sin A \cos B - \cos A \sin B) \\ &= \sin A \cos B + \cos A \sin B - \sin A \cos B + \cos A \sin B \\ &= 2 \cos A \sin B \\ &= \text{RHS} \rightarrow \text{not needed} \end{aligned}$	<p style="text-align: right;">must have brackets here</p> <ul style="list-style-type: none"> ✓ compound formula ✓ compound formula <p style="text-align: right;">(2)</p>
5.3.2	$\begin{aligned} \sin 77^\circ - \sin 43^\circ &= \sin(60^\circ + 17^\circ) - \sin(60^\circ - 17^\circ) \\ &= 2 \cos 60^\circ \sin 17^\circ \\ &= 2 \times \frac{1}{2} \times \sin 17^\circ \\ &= \sin 17^\circ \end{aligned}$ <p style="text-align: center;">OR/OR</p> $\begin{aligned} \sin 77^\circ - \sin 43^\circ &= \sin(60^\circ + 17^\circ) - \sin(60^\circ - 17^\circ) \\ &= (\sin 60^\circ \cos 17^\circ + \cos 60^\circ \sin 17^\circ) - \\ &\quad (\sin 60^\circ \cos 17^\circ - \cos 60^\circ \sin 17^\circ) \\ &= \frac{\sqrt{3}}{2} \cos 17^\circ + \frac{1}{2} \sin 17^\circ - \frac{\sqrt{3}}{2} \cos 17^\circ + \frac{1}{2} \sin 17^\circ \\ &= \sin 17^\circ \end{aligned}$	<ul style="list-style-type: none"> ✓ $60^\circ + 17^\circ$ ✓ $60^\circ - 17^\circ$ ✓ simplify ✓ $\frac{1}{2}$ <p style="text-align: right;">(4)</p> <ul style="list-style-type: none"> ✓ $60^\circ + 17^\circ$ ✓ $60^\circ - 17^\circ$ ✓ expansion ✓ $\frac{1}{2}$ both <p style="text-align: right;">(4) [19]</p>

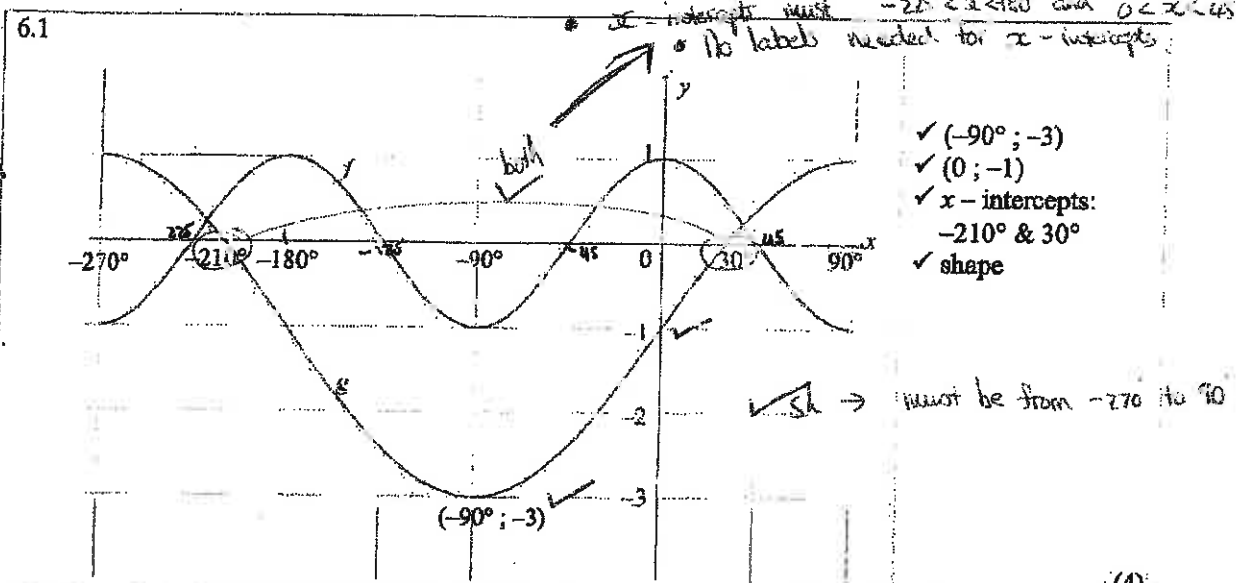
(OR)

$$\begin{aligned} &\sin(90-13) - \sin(30+13) \\ &= \sin 90 \cos 13 - \cos 90 \sin 13 - (\sin 30 \cos 13 + \cos 30 \sin 13) \\ &= 1 \cdot \cos 13^\circ - 0 \cdot \sin 13^\circ - \left(\frac{1}{2} \cos 13^\circ + \frac{\sqrt{3}}{2} \sin 13^\circ \right) \\ &= \frac{1}{2} \cos 13^\circ - \frac{\sqrt{3}}{2} \sin 13^\circ \\ &= \frac{1}{2} (\cos 30-13) - \frac{\sqrt{3}}{2} \sin(30-13) \\ &= \frac{1}{2} \sin 17^\circ + \frac{1}{2} \sin 17^\circ \\ &= \sin 17^\circ \end{aligned}$$



(Handwritten signatures)

QUESTION/VRAAG 6



- ✓ $(-90^\circ; -3)$
- ✓ $(0; -1)$
- ✓ x -intercepts: -210° & 30°
- ✓ shape

Sketch $g(x) = 2 \sin(x - 90)$
Incomplete graph

6.2

$\cos 2x = 2 \sin x - 1$
 $1 - 2 \sin^2 x = 2 \sin x - 1$
 $2 \sin^2 x + 2 \sin x - 2 = 0$
 $\sin^2 x + \sin x - 1 = 0$

$\sin x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$ formula or implied.
 • If stop here $\frac{1}{2}$
 • If formula and then $\sin x = \frac{-1 \pm \sqrt{5}}{2}$

$\sin x = \frac{-1 + \sqrt{5}}{2}$, since $\sin x = \frac{-1 - \sqrt{5}}{2} < -1$ has no solution

✓ $\cos 2x = 1 - 2 \sin^2 x$ anywhere
 ✓ standard form
 ✓ using quadratic formula
 ✓ substitution into quadratic formula

Important see x is $\sin x = \frac{-1 + \sqrt{5}}{2}$

6.3

$\sin x = \frac{-1 + \sqrt{5}}{2} = 0,618...$ accept 0,62
 Reference $\angle = 38,17^\circ$ or $38,32^\circ$ or implied
 $\therefore x = 38,17^\circ + k \cdot 360^\circ$ or $x = 141,83^\circ + k \cdot 360^\circ; k \in \mathbb{Z}$
 $\therefore x = 38,17^\circ$ or $-218,17^\circ$
 $y = 0,24$
 \therefore Points of intersection/snympunte:
 $(38,17^\circ; 0,24)$ and $(-218,17^\circ; 0,24)$

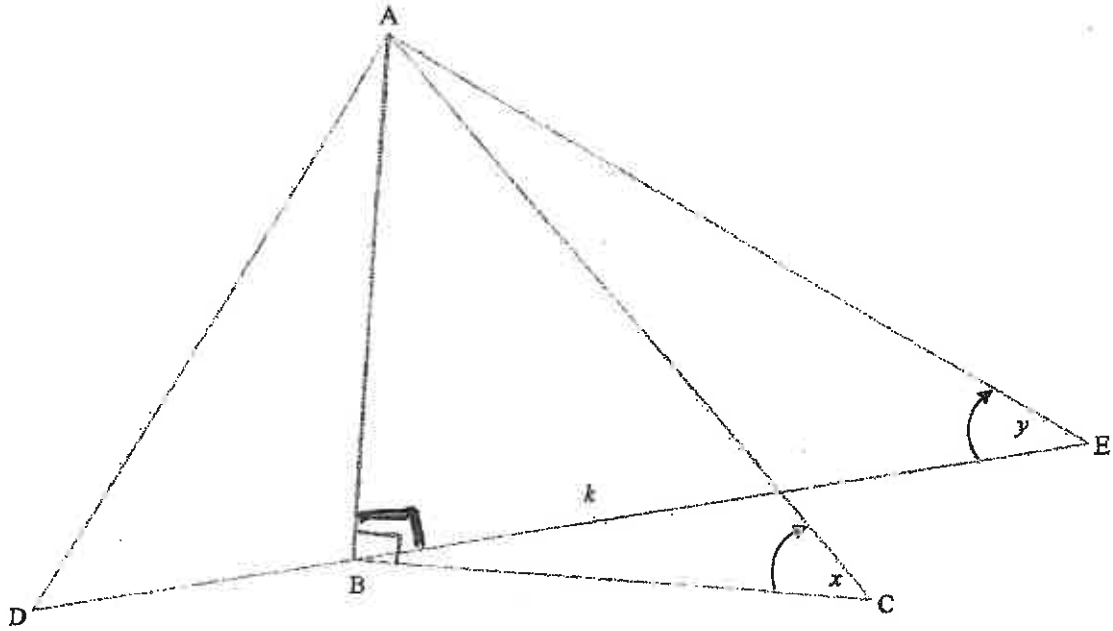
• Answer only
 $y = 0,24$
 $x = 38,17^\circ$
 $x = -218,17^\circ$

✓ $38,17^\circ$
 ✓ $141,83^\circ \rightarrow$ can be implied
 ✓ $-218,17^\circ$
 ✓ $0,24$

Points of intersection $x \in [-270^\circ; 90^\circ]$

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QUESTION/VRAAG 7



7.1	$\hat{A}BC = 90^\circ$ ✓	✓ answer (1)
7.2	<p>In ΔABE:</p> $\frac{AB}{BE} = \tan y$ ✓ $\textcircled{AB} = k \tan y$ ✓ <p>In ΔABC:</p> $\frac{AB}{AC} = \sin x$ ✓ ratio $\textcircled{AC} = \frac{AB}{\sin x}$ ✓ $= \frac{k \tan y}{\sin x}$	<p>✓ correct ratio ✓ value AB</p> <p>✓ correct ratio ✓ AC as subject and substitution</p> <p>(4)</p>

Show
 $AC = \frac{k \cdot \tan y}{\sin x}$

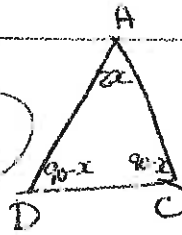
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7.3

$$\widehat{ADC} = \widehat{ACD} = \frac{180^\circ - 2x}{2} = 90^\circ - x$$

$$\frac{DC}{\sin 2x} = \frac{AC}{\sin(90^\circ - x)}$$

$$\begin{aligned} DC &= \frac{AC \sin 2x}{\cos x} \\ &= \frac{AC(2 \sin x \cos x)}{\cos x} \\ &= \frac{k \tan y \cdot 2 \sin x \cos x}{\sin x \cos x} \\ &= 2k \tan y \end{aligned}$$



- ✓ $90^\circ - x$
- ✓ subst into sine rule
- ✓ $2 \sin x \cos x$
- ✓ $\cos x$
- ✓ substitution

Wrong formula
↓
Still 1 mark for subst.
↓
Mark for 1-25%

OR/OF

$$\begin{aligned} DC^2 &= AD^2 + AC^2 - 2AD \cdot AC \cos 2x \\ &= AC^2 + AC^2 - 2AC^2 \cos 2x \\ &= 2AC^2(1 - \cos 2x) \\ &= 2AC^2(1 - 1 + 2\sin^2 x) \\ &= 4AC^2 \sin^2 x \\ DC &= 2AC \sin x \\ &= 2 \left(\frac{k \tan y}{\sin x} \right) \sin x \\ &= 2k \tan y \end{aligned}$$

- ✓ substitution into cos rule
- ✓ factorisation
- ✓ $1 - 2\sin^2 x$
- ✓ DC to AC and sin x
- ✓ substitution

(5)

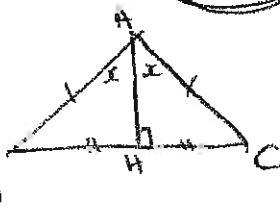
OR/OF

$$\begin{aligned} DC^2 &= AD^2 + AC^2 - 2AD \cdot AC \cos 2x \\ &= 2 \left(\frac{k \tan y}{\sin x} \right)^2 - 2 \left(\frac{k \tan y}{\sin x} \right)^2 \cos 2x \\ &= \frac{2k^2 \tan^2 y}{\sin^2 x} - \frac{2k^2 \tan^2 y}{\sin^2 x} (1 - 2\sin^2 x) \\ &= \frac{2k^2 \tan^2 y}{\sin^2 x} - \frac{2k^2 \tan^2 y}{\sin^2 x} + 4k^2 \tan^2 y \\ DC &= \sqrt{4k^2 \tan^2 y} \\ &= 2k \tan y \end{aligned}$$

- ✓ correct cos rule
- ✓ substitution
- ✓ $1 - 2\sin^2 x$
- ✓ squaring and multiplication
- ✓ $\sqrt{4k^2 \tan^2 y}$

(5)
[10]

Toon
 $DC = 2k \tan y$



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✓ median en steun

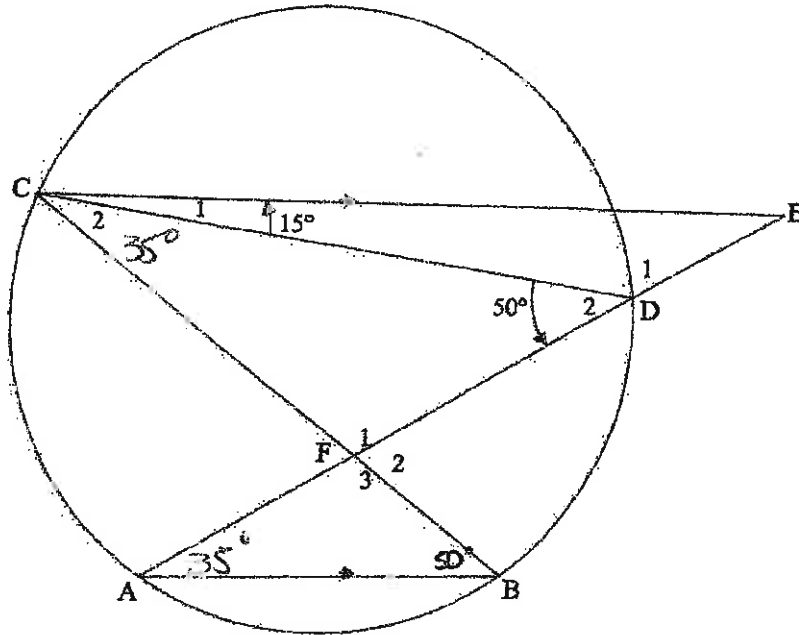
✓ $DC = 2HC$

✓ $\sin x = \frac{HC}{AC}$

$$DC = 2(HC) = 2 \left(\frac{k \tan y}{\sin x} \right) (\sin x)$$

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QUESTION/VRAAG 8



Check diagram !!!

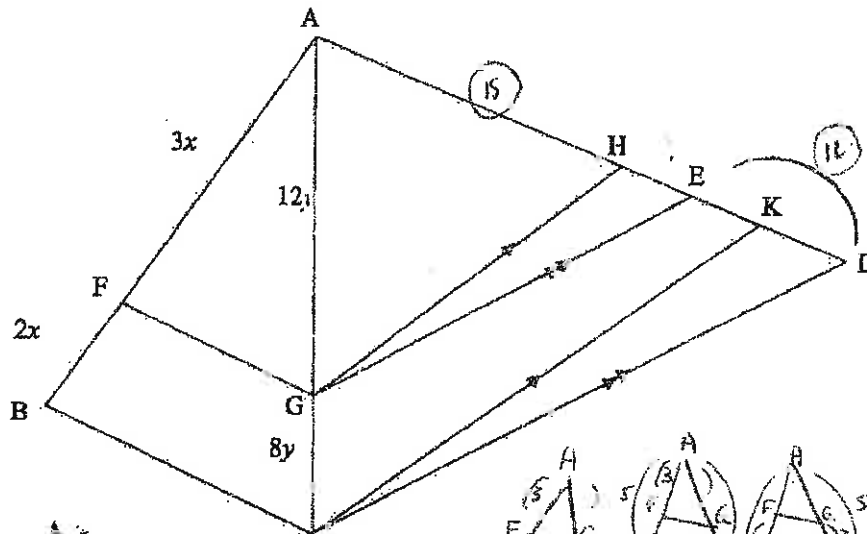
8.1.1	$\hat{E} = 50^\circ - 15^\circ = 35^\circ$ [ext \angle of Δ /buite \angle van Δ] $\hat{A} = 35^\circ$ [alt \angle s / verwiss \angle e; $CE \parallel AB$] <u>OR/OF</u> $\hat{E} = 180^\circ - (130^\circ + 15^\circ) = 35^\circ$ [str line; \angle s of Δ /rt lyn; \angle e van Δ] $\hat{A} = 35^\circ$ [alt \angle s / verwiss \angle e; $CE \parallel AB$] <u>OR/OF</u> $\hat{B} = 50^\circ$ [\angle s in same segment/ \angle e in dieselfde segment] $\hat{C}_2 + 15^\circ = 50^\circ$ [alt \angle s / verwiss \angle e; $CE \parallel AB$] $\therefore \hat{C}_2 = 35^\circ$ $\hat{A} = 35^\circ$ [\angle s in same segment/ \angle e in dieselfde segment]	✓ S ✓ S ✓ R (3) ✓ S ✓ S ✓ R (3) ✓ S ✓ S ✓ R (3)
8.1.2	$\hat{C}_2 = 35^\circ$ [\angle s in same segment/ \angle e in dieselfde segment] accept subtended by same arc	✓ S ✓ R (2)
8.2	$\hat{C}_2 = \hat{E}$ [from 8.1.1 and 8.1.2] $\therefore CF$ is a tangent to the circle [converse tan chord theorem] $\therefore CF$ is 'n raaklyn aan die sirkel [omgekeerde raakl koordst] accept \perp between line and chord	✓ S ✓ R (2) [7]

Bereken $\angle A$

Bereken $\angle C_2$

Bewys CF is raaklyn

QUESTION/VRAAG 9



9.1.1

$$\frac{AF}{BF} = \frac{3x}{2x} = \frac{3}{2} \quad \& \quad \frac{AG}{CG} = \frac{12y}{8y} = \frac{3}{2}$$

$$\therefore \frac{AF}{BF} = \frac{AG}{CG}$$

$\therefore FG \parallel BC$ [conv prop th/omg eweredigh st. (OR) line divides 2 sides of Δ in prop/lyn verdeel 2 sye v Δ in dies verk] accept sides same proportion/ sye eweredig

$$\checkmark \frac{AF}{BF} = \frac{AG}{CG}$$

$$\frac{AF}{BF} = \frac{AG}{CG} = \frac{3}{2}$$

or

$$\frac{AF}{BF} = \frac{AG}{CG} = \frac{2}{3}$$

Prove $FG \parallel BC$

9.1.2

$$\frac{AG}{GC} = \frac{AH}{HK}$$

[prop theorem/eweredigh st. $GH \parallel CK$ (OR)]

$\checkmark S \checkmark R$

line \parallel to 1 side of Δ / lyn \parallel 1 sye van Δ

\parallel lines must match the ratios

$$\frac{AG}{GC} = \frac{AE}{ED}$$

[prop theorem/eweredigh st. $GE \parallel CD$]

$\checkmark S$

$$\therefore \frac{AH}{HK} = \frac{AE}{ED}$$

(3)

Prove $\frac{AH}{HK} = \frac{AE}{ED}$

9.2

$$\frac{AE}{ED} = \frac{3}{2} \quad \text{and} \quad \frac{AH}{HK} = \frac{3}{2}$$

$$\frac{AE}{12} = \frac{3}{2} \quad \text{and} \quad \frac{15}{HK} = \frac{3}{2}$$

$$\therefore AE = 18 \quad \text{and} \quad HK = 10$$

$$\therefore HE = AE - AH$$

$$= 18 - 15$$

$$= 3$$

$$\therefore EK = HK - HE$$

$$= 10 - 3$$

$$= 7$$

$$AD = 30$$

$$KD = AD - AH - HK$$

$$= 30 - 15 - 10$$

$$= 5$$

$$EK = ED - KD$$

$$= 12 - 5$$

$$= 7$$

\checkmark use of ratios

\checkmark AE = 18

\checkmark HK = 10

\checkmark HE = 3 or KD = 5

\checkmark EK = 7

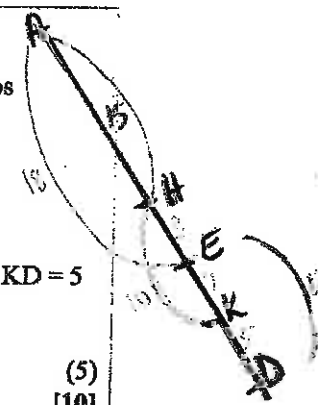
(5)

[10]

length Ek

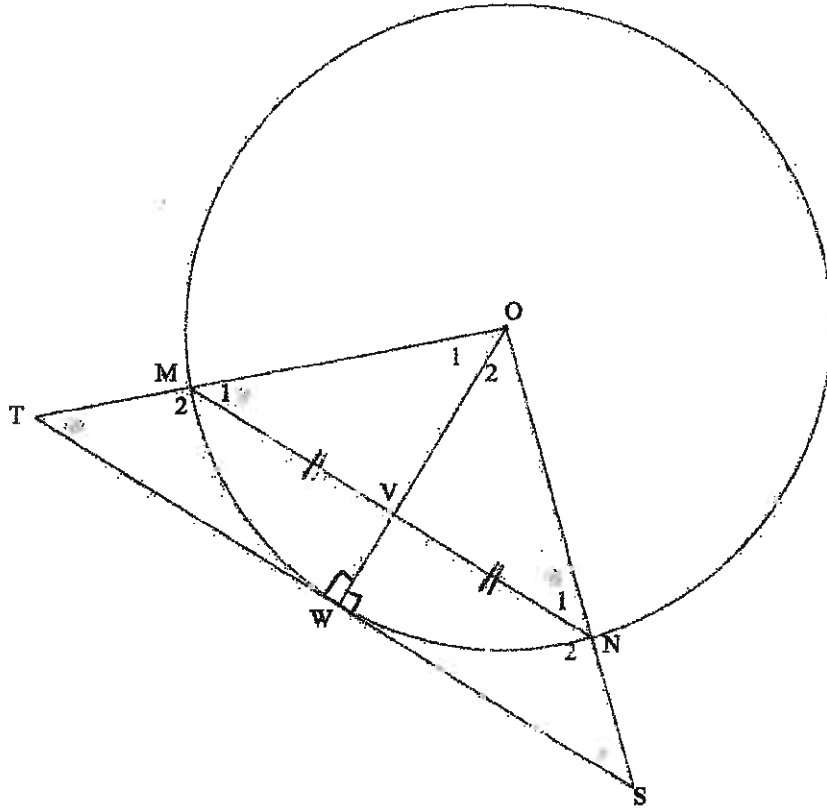
if AH = 15
ED = 12

(OR/OF)



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QUESTION/VRAAG 10



Rede OULMO

Prove MN || TS

Prove TMNS is cyclic quad.

10.1	Line from centre to midpoint of chord lyn vanaf midpt na midpt van koord	line from centre bisects chord lyn vanaf midpt na midpt van koord	✓ R	(1)
10.2.1	$\hat{O}WT = \hat{O}WS = 90^\circ$ [radius \perp tangent/raakhyn] ✓ R $\therefore MN \parallel TS$ [corresp \angle s = ooreenkomstige \angle e = ✓ R OR co-int \angle s 180° /ko-binne \angle e 180° OR alternate \angle s/verwiss \angle e]		✓ R ✓ R	(2)
10.2.2	$\hat{M}_1 = \hat{N}_1$ ✓ [\angle s opp = sides/ \angle e teenoor = sye] $\hat{M}_1 = \hat{T}$ ✓ [corresp \angle s/ooreenk \angle e; $MN \parallel TS$] $\therefore \hat{N}_1 = \hat{T}$ ✓ $\therefore TMNS$ is a cyclic quadrilateral [conv: ext \angle cyclic quad] ✓ R TMNS is 'n koordevierhoek [omgek: buite \angle kdvh] ✓ R		✓ S ✓ S ✓ S ✓ R	(4)
	OR/OF $\hat{M}_1 = \hat{N}_1$ ✓ [\angle s opp = sides/ \angle e teenoor = sye] $\hat{N}_1 = \hat{S}$ ✓ [corresp \angle s/ooreenk \angle e; $MN \parallel TS$] $\therefore \hat{S} = \hat{M}_1$ ✓ $\therefore TMNS$ is a cyclic quadrilateral [conv: ext \angle cyclic quad] ✓ R TMNS is 'n koordevierhoek [omgek: buite \angle kdvh]		✓ S ✓ S ✓ S ✓ R	(4)

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10.2.3

In $\triangle OVN$ and $\triangle OWS$

$\hat{O}_2 = \hat{O}_2$

[common/gemeenskaplik]

$\hat{O}VN = \hat{O}WS = 90^\circ$

[from 10.1]

$\hat{O}NV = \hat{O}SW$

[sum \angle s \triangle /som \angle e \triangle]

$\therefore \triangle OVN \parallel \triangle OWS$

[\angle, \angle, \angle]

$\therefore \frac{VN}{WS} = \frac{ON}{OS}$

But $VN = \frac{1}{2} MN$

[given]

$\therefore \frac{\frac{1}{2} MN}{WS} = \frac{ON}{OS}$

$\therefore OS \cdot MN = 2ON \cdot WS$

OR/OF

In $\triangle OVM$ and $\triangle OWS$

$\hat{O}VM = \hat{O}WS = 90^\circ$

[from 10.1]

$\hat{O}MV = \hat{O}SW$

[sum \angle s \triangle /som \angle e \triangle]

$\therefore \triangle OVM \parallel \triangle OWS$

[\angle, \angle, \angle]

$\therefore \frac{OM}{OS} = \frac{VM}{WS}$

But $VM = \frac{1}{2} MN$

[given]

$\therefore \frac{\frac{1}{2} MN}{WS} = \frac{OM}{OS}$

$\therefore OS \cdot MN = 2ON \cdot WS$

[$VM = VN$]

OR/OF

If any other 2 \triangle s are used, first need to prove that $TW = WS$ by proving $\triangle OWT \cong \triangle OWS$

In $\triangle OVM$ and $\triangle OWT$

$\hat{O}_1 = \hat{O}_1$

[common/gemeenskaplik]

$\hat{O}VM = \hat{O}WT = 90^\circ$

[from 10.1]

$\hat{O}MV = \hat{O}TW$

[sum \angle s \triangle /som \angle e \triangle]

$\therefore \triangle OVM \parallel \triangle OWT$

[\angle, \angle, \angle]

$\therefore \frac{VM}{WT} = \frac{OM}{OT}$

But $VN = VM = \frac{1}{2} MN$

[given]

and $WT = WS$ and $OT = OS$ [$\triangle OWT \cong \triangle OWS$]

$\therefore \frac{\frac{1}{2} MN}{WS} = \frac{ON}{OS}$

$\therefore OS \cdot MN = 2ON \cdot WS$

✓ S; S; S OR S; S; R

✓ $\triangle OVN \parallel \triangle OWS$

✓ $\frac{VN}{WS} = \frac{ON}{OS}$

✓ $VN = \frac{1}{2} MN$

✓ substitution

(5)

✓ S; S; R

✓ $\triangle OVM \parallel \triangle OWS$

✓ $\frac{OM}{OS} = \frac{VM}{WS}$

✓ $VM = \frac{1}{2} MN$

✓ substitution

(5)

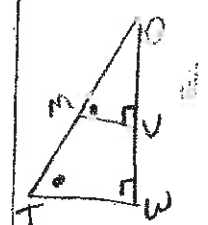
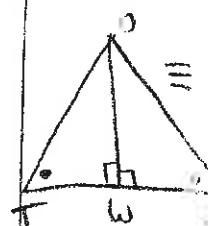
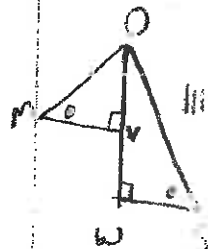
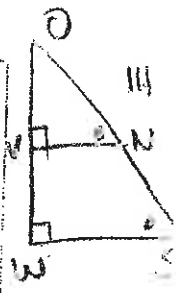
✓ ✓ similarity

✓ ✓ congruency

✓ $VN = VM = \frac{1}{2} MN$

(5)

[12]



Prove
OS.MN = 2ON.WS
Correct ratios without III

Correct ratios without III

3 statements

2 statements + 111

common

2nd \angle cyclic quad

s+s+r

OR

$\triangle OMN$ and $\triangle OTS$

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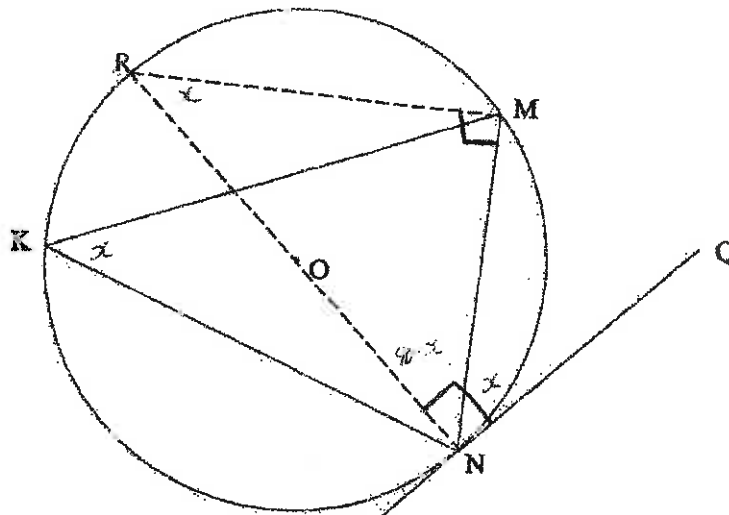
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✓ III
✓ III
✓ TS = 2WS

QUESTION/VRAAG 11



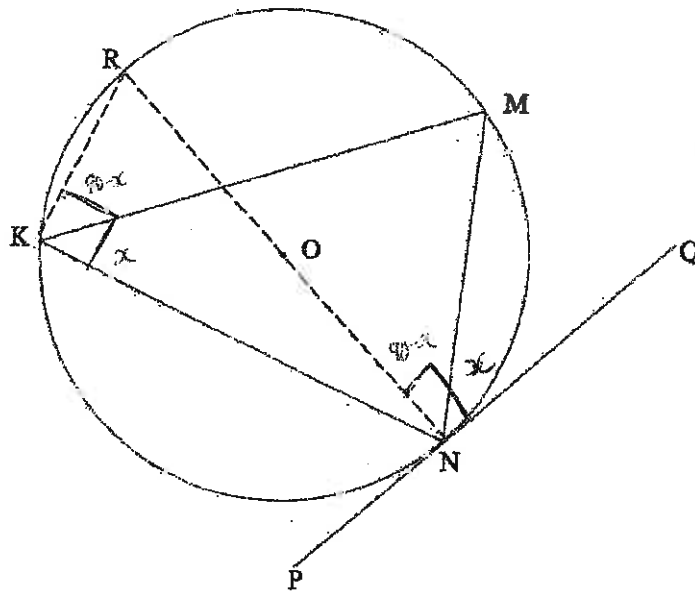
✓ Check Diagram

No construction 0 0

<p>11.1</p>	<p>Construction: Draw diameter NR and draw RM ✓ Konstruksie: Trek middellyn NR en verbind RM ✓ $\angle MNR + \angle MNQ = 90^\circ$ [radius \perp tangent/raaklyn] ✓ S/R $\angle MNR = 90^\circ$ [\angle in semi circle/semi-sirkel] ✓ S/R $\angle MRN = 180^\circ - (90^\circ + 90^\circ - \angle MNQ)$ [sum \angles Δ] $= \angle MNQ$ but $\angle MRN = \angle MKN$ [\angles same segment/\anglee dieselfde segment] ✓ $\therefore \angle MNQ = \angle K$</p> <p><u>OR/OF</u></p>	<p>✓ construction ✓ S/R ✓ S/R ✓ S ✓ S/R (5)</p>
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• If step is left out, 0/0 further
 • Visualize of act on diagram

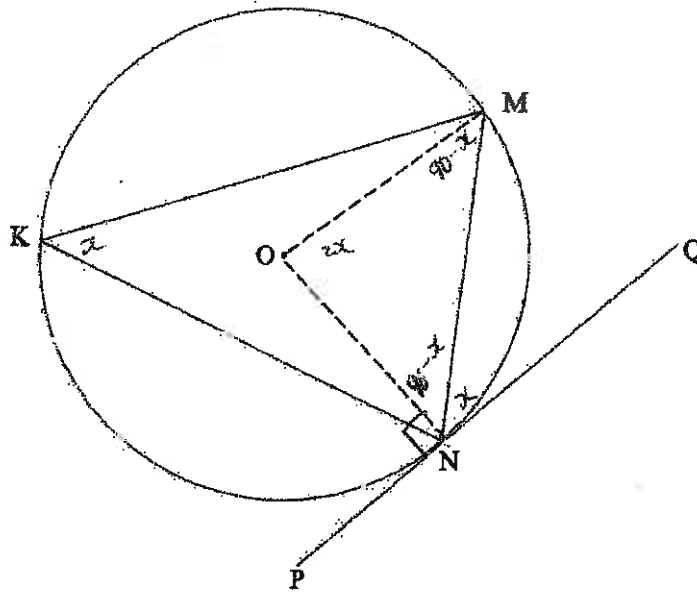
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 APPROVED MARKING GUIDELINE
 PUBLIC EXAMINATION



<p>11.1</p>	<p>Construction: Draw diameter NR and draw RK <i>Konstruksie: Trek middellyn NR en verbind RK</i> $M\hat{N}Q + R\hat{N}M = 90^\circ$ [radius \perp tangent/raaklyn] $N\hat{K}R = 90^\circ$ [\angle in semicircle/semi-sirkel] $\therefore M\hat{K}N = 90^\circ - R\hat{K}M$ $= 90^\circ - R\hat{N}M$ [\angles same segment/\anglee dieselfde segment] $\therefore M\hat{N}Q = \hat{K}$</p>	<p>✓ construction ✓ S/R ✓ S/R ✓ S ✓ S/R (5)</p>
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(OR)

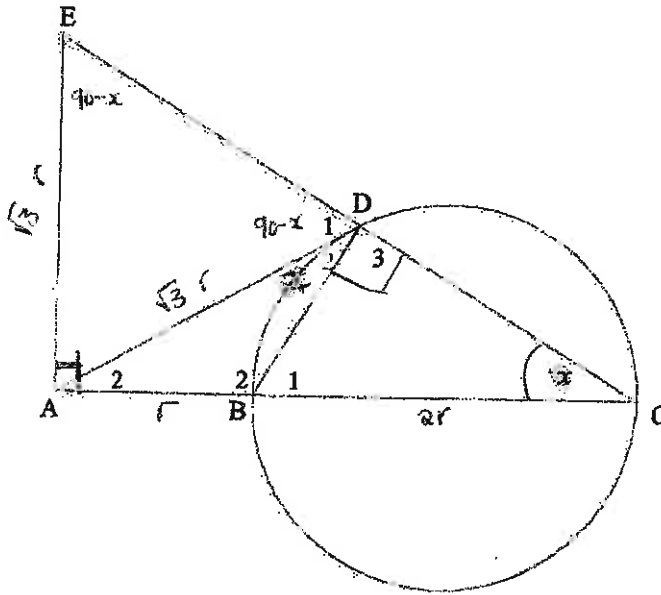
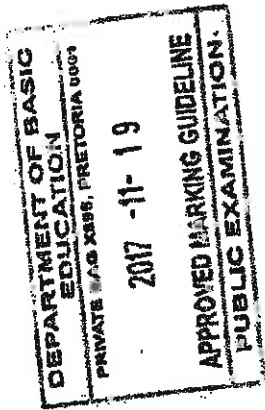
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11.1	<p>Construction: Draw radii ON and OM Konstruksie: Trek radiusse ON en OM</p> <p>$\hat{M}\hat{O}\hat{N} = 2\hat{K}$ [\angle at centre = $2\angle$ at circumf/midpts $\angle = 2$ omtreks \angle]</p> <p>$\hat{O}\hat{N}\hat{M} + \hat{O}\hat{M}\hat{N} = 180^\circ - 2\hat{K}$ [\angles of Δ/\anglee van Δ]</p> <p>$\hat{O}\hat{N}\hat{M} = \hat{O}\hat{M}\hat{N} = \frac{180^\circ - 2\hat{K}}{2} = 90^\circ - \hat{K}$ [\angles opp = sides/\anglee teenoor = sye]</p> <p>$\hat{O}\hat{N}\hat{Q} = 90^\circ$ [radius \perp tangent/radius \perp raaklyn]</p> <p>$\therefore \hat{M}\hat{N}\hat{Q} = \hat{K}$</p>	<p>✓ construction</p> <p>✓ S/R</p> <p>✓ S</p> <p>✓ S/R</p> <p>✓ S/R</p> <p>(5)</p> <p><i>accept base of isosceles Δ</i></p>
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11.2



<p>Rek^e ∠D₃ = 90</p>	11.2.1(a)	Angle in a semi circle/ <i>Hoek in halfsirkel</i> / \angle subtended by diameter / <i>BC is diameter</i> / \angle opposite diameter at centre = 90 \angle at ground.	✓ R	(1)
<p>Rek^e AD = AE</p>	11.2.1(b)	Exterior \angle of quad = opp interior \angle / <i>Buite \angle van vierh = teenoorst binne \angle</i>	✓ R	(1)
		OR/OF Opp \angle s of quad supplementary / <i>Teenoorst \anglee van vierh is supplementêr</i>		(1)
	11.2.1(c)	tangent chord theorem / <i>raaklyn koord stelling</i>	✓ R	(1)
	11.2.2(a)	In $\triangle AEC$ $\hat{E} = 180^\circ - (90^\circ + x)$ [sum \angle s Δ] $= 90^\circ - x$ ✓ $\hat{D}_1 = 180^\circ - (90^\circ + x)$ [\angle s on a straight line] $= \hat{E} = 90^\circ - x$ ✓ $\therefore AD = AE$ [sides opp = \angle s / <i>syte teenoor = \anglee</i>] <i>not dia !!</i>	✓ S ✓ S ✓ S ✓ R	(3)
	11.2.2(b)	In $\triangle ADB$ and $\triangle ACD$ $\hat{A}_2 = \hat{A}_2$ ✓ [common] $\hat{D}_2 = \hat{C}$ ✓ [proven] $\hat{B}_2 = \hat{D}_2 + \hat{D}_3$ ✓ [sum \angle o Δ] $\therefore \triangle ADB \parallel \triangle ACD$ <i>not D₂₊₃</i>	✓ S ✓ S ✓ S	(3)
		OR/OF In $\triangle ADB$ and $\triangle ACD$ $\hat{A}_2 = \hat{A}_2$ ✓ [common] $\hat{D}_2 = \hat{C}$ ✓ [proven] $\therefore \triangle ADB \parallel \triangle ACD$ [\angle, \angle, \angle]	✓ S ✓ S ✓ R	(3)

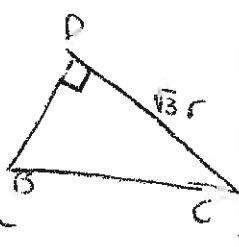
Bevys AD = 3r²

<p>11.2.3(a)</p>	$\frac{AD}{AC} = \frac{AB}{AD} \quad [\Delta s]$ $AD^2 = AC \cdot AB$ $= 3r \times r$ $= 3r^2$	<p>✓ ratio</p> <p>✓ substitution</p> <p>(2)</p>
<p>11.2.3(b)</p>	<p>$AD = AE = \sqrt{3}r$ [from 11.2.2(a) & 11.2.3(a)]</p> <p>$AB = r$ and $BC = 2r \therefore AC = 3r$ ✓</p> <p><u>In ΔACE:</u></p> $\tan \hat{E} = \frac{AC}{AE}$ $= \frac{3r}{\sqrt{3}r} = \sqrt{3}$ <p>$\therefore \hat{E} = 60^\circ$ } <i>Show all 3 w</i></p> <p>$\therefore \hat{D}_1 = 60^\circ$ } [from 11.2.2(a)]</p> <p>$\therefore \hat{A}_1 = 60^\circ$ } [$\angle s$ of $\Delta = 180^\circ$]</p> <p>$\therefore \Delta ADE$ is equilateral/is gelyksydig</p> <p><u>OR/OF</u></p> $\frac{AD}{AC} = \frac{DB}{CD} \quad [\Delta s] \quad \Delta ADB \parallel \Delta ACD \text{ uit vl. 2.2b}$ $\frac{\sqrt{3}r}{3r} = \frac{DB}{CD}$ <p>$\tan x = \frac{1}{\sqrt{3}}$</p> <p>$\therefore$ In ΔBDC; $x = 30^\circ$ ✓</p> <p>$\therefore \hat{E} = 60^\circ$ }</p> <p>$\therefore \hat{D}_1 = 60^\circ$ } [from 11.2.2(a)]</p> <p>$\therefore \hat{A}_1 = 60^\circ$ } [$\angle s$ of $\Delta = 180^\circ$]</p> <p>$\therefore \Delta ADE$ is equilateral/is gelyksydig</p> <p><u>OR/OF</u></p> $\frac{AD}{AC} = \frac{DB}{CD} \quad [\Delta s]$ $\frac{\sqrt{3}r}{3r} = \frac{DB}{CD} \therefore BD = \frac{CD}{\sqrt{3}}$ $DC^2 = BC^2 - DB^2$ $= 4r^2 - \frac{CD^2}{3}$ $3DC^2 = 12r^2 - CD^2$ $4CD^2 = 12r^2$ $DC = \sqrt{3}r$	<p>✓ AC ito r</p> <p>✓ trig ratio</p> <p>✓ simplification</p> <p>✓ all 3 $\angle s = 60^\circ$</p> <p>(4)</p> <p>✓ $\frac{\sqrt{3}r}{3r} = \frac{DB}{CD}$</p> <p>✓ $\frac{1}{\sqrt{3}} = \tan x$</p> <p>✓ $x = 30^\circ$</p> <p>✓ all 3 $\angle s = 60^\circ$</p> <p>(4)</p> <p>✓ $BD = \frac{CD}{\sqrt{3}}$</p> <p>✓ $DC = \sqrt{3}r$</p>

Bevys
 ΔADE is gelyksydig

tan E

tan x

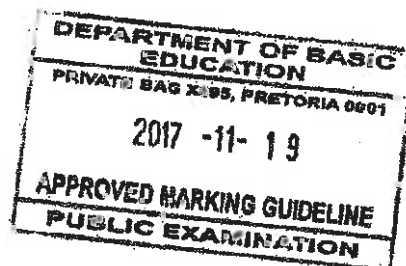


Pyth

[Handwritten signatures and initials]

	$EC^2 = EA^2 + AC^2$ $= 3r^2 + 9r^2$ $EC = 2\sqrt{3}r \quad \checkmark$ $\therefore ED = EC - DC$ $= \sqrt{3}r$ $\therefore ED = EA = AD$ $\therefore \triangle ADE \text{ is equilateral/is gelyksydig}$	$\checkmark EC = 2\sqrt{3}r$ $\checkmark ED = EA = AD$ (4) [20]
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TOTAL/TOTAAL: 150



[Handwritten signatures]