



basic education

Department:
Basic Education
REPUBLIC OF SOUTH AFRICA

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

GRADE 12/*GRAAD 12*

MATHEMATICS P2/*WISKUNDE V2*

NOVEMBER 2017

MARKING GUIDELINES/*NASIENRIGLYNE*

MARKS/*PUNTE*: 150

**These marking guidelines consist of 22 pages.
*Hierdie nasienriglyne bestaan uit 22 bladsye.***

NOTE:

- If a candidate answers a question TWICE, only mark the FIRST attempt.
- If a candidate has crossed out an attempt of a question and not redone the question, mark the crossed out version.
- Consistent accuracy applies in ALL aspects of the marking guidelines. Stop marking at the second calculation error.
- Assuming answers/values in order to solve a problem is NOT acceptable.

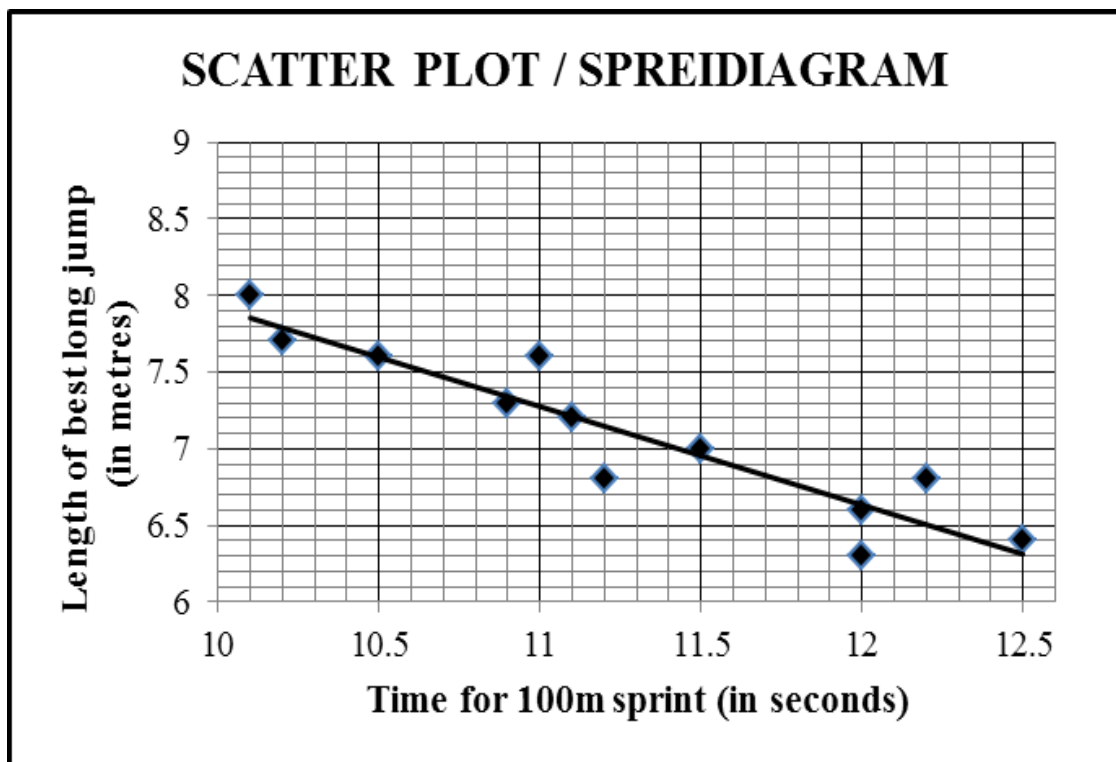
NOTA:

- *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 nasienriglyne 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

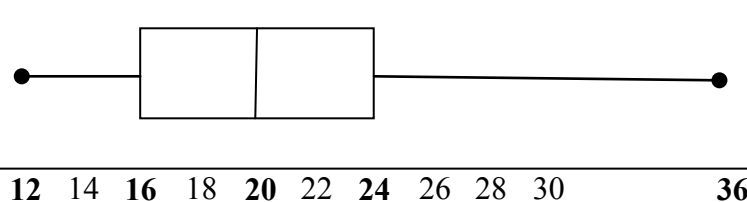
Time for 100 m sprint (in seconds) <i>Tyd vir 100 m-naelloop (in sekondes)</i>	10,1	10,2	10,5	10,9	11	11,1	11,2	11,5	12	12	12,2	12,5
Distance of best long jump (in metres) <i>Afstand van beste sprong in verspring (in meter)</i>	8	7,7	7,6	7,3	7,6	7,2	6,8	7	6,6	6,3	6,8	6,4



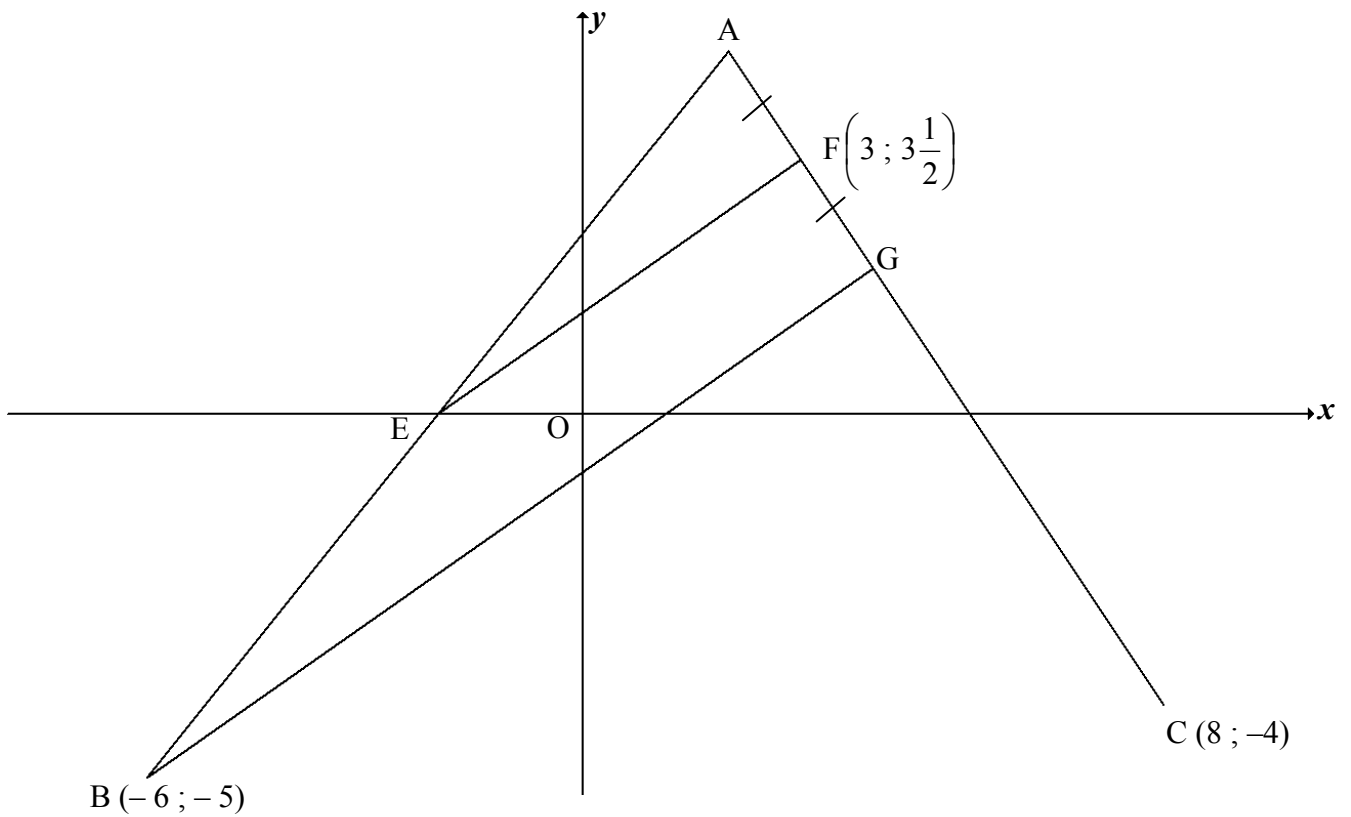
1.1	$a = 14,34$ $b = -0,64$	✓✓ value of a ✓ value of b (3)
1.2	$y = 14,34 - 0,64(11,7)$ $= 6,85 \approx 6,9$ OR/OF $y = 6,83 \approx 6,8$ (calculator / sakrekenaar)	✓ substitution ✓ answer ✓✓ answer (2) (2)
1.3	The gradient increases / <i>Die gradiënt neem toe</i> The point (12,3 ; 7,6) lies some distance above the current data. Thus this will force the trendline upwards on the RHS, resulting in the gradient increasing . <i>Die punt (12,3 ; 7,6) lê 'n ent bokant die huidige data. Dit sal dus die regressielyn aan die RK opwaarts trek, wat meebring dat die gradiënt verhoog.</i>	✓ increases/ <i>neem toe</i> ✓ reasoning/ <i>rede</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	$\bar{x} = \frac{472}{23}$ $\bar{x} = 20,52 \text{ seconds / sekonde}$	✓ $\frac{452}{22}$ ✓ answer (2)
2.1.2	$Q_1 = 16$ $Q_3 = 24$ $IQR/IKO = Q_3 - Q_1$ $= 24 - 16 = 8$	✓ Q_1 ✓ Q_3 ✓ answer (3)
2.2	$20,52 + 5,94 = 26,46$ $\therefore > 26,46$ $\therefore 4 \text{ girls/dogters}$	✓ 26,46 ✓ answer (2)
2.3	 <p>12 14 16 18 20 22 24 26 28 30 36</p>	✓ min & max/ 12 & 36 ✓ $Q_1 = 16$ & $Q_3 = 24$ ✓ $Q_2 = 20$ (3)
2.4.1	Girls / Meisies	✓ answer (1)
2.4.2	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.	✓ answer ✓ reason/rede (2) [13]

QUESTION/VRAAG 3

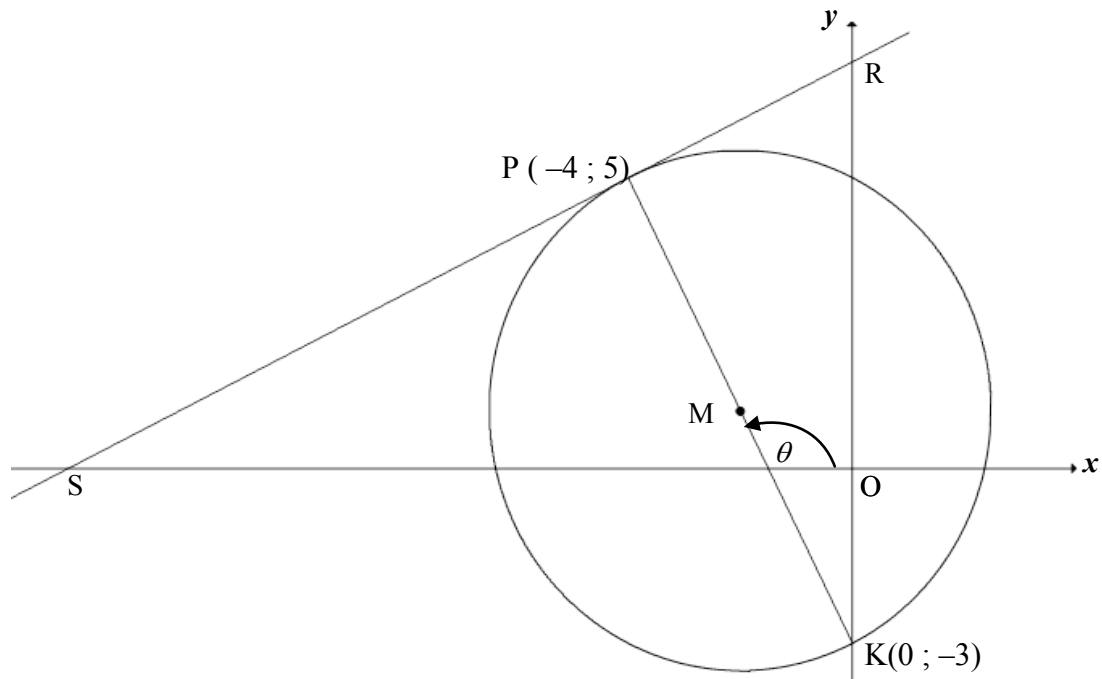


<p>3.1.1</p>	$m_{FC} = \frac{y_2 - y_1}{x_2 - x_1}$ $= \frac{3\frac{1}{2} - (-4)}{3 - 8}$ $= -\frac{3}{2}$ $y = mx + c$ $y = -\frac{3}{2}x + c$ $-4 = -\frac{3}{2}(8) + c \quad \text{OR/OR} \quad (y - (-4)) = -\frac{3}{2}(x - 8)$ $c = 8$ $y = -\frac{3}{2}x + 8$ <p>OR/OR</p> $y - y_1 = m(x - x_1)$ $y + 4 = -\frac{3}{2}x + 12$ $y = -\frac{3}{2}x + 8$	<p>✓ substitution</p> <p>✓ answer</p> <p>✓ substitution of m and $(8; -4)$</p> <p>✓ equation of AC</p> <p>(4)</p>
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	$m_{FC} = \frac{y_2 - y_1}{x_2 - x_1} = \frac{(-4) - \left(3\frac{1}{2}\right)}{8 - 3}$ $= -\frac{3}{2}$ $y = mx + c \qquad y - y_1 = m(x - x_1)$ $y = -\frac{3}{2}x + c$ $3\frac{1}{2} = -\frac{3}{2}(3) + c \quad \text{OR/OF} \quad \left(y - 3\frac{1}{2}\right) = -\frac{3}{2}(x - 3)$ $c = 8 \qquad \left(y - 3\frac{1}{2}\right) = -\frac{3}{2}x + \frac{9}{2}$ $y = -\frac{3}{2}x + 8 \qquad y = -\frac{3}{2}x + 8$	<p>✓ substitution</p> <p>✓ answer</p> <p>✓ substitution of m and $\left(3; 3\frac{1}{2}\right)$</p> <p>✓ equation of AC</p> <p>(4)</p>
<p>3.1.2</p>	<p>AC: $3x + 2y = 16$ and BG: $7x - 10y = 8$</p> <p>$15x + 10y = 80$</p> <p>$7x - 10y = 8$</p> <p>$22x = 88$</p> <p>$x = 4$</p> <p>$3(4) + 2y = 16$</p> <p>$y = 2$</p> <p>G(4 ; 2)</p> <p>OR/OF</p> <p>$y = -\frac{3}{2}x + 8$ [AC from 3.1.2]</p> <p>BG: $7x - 10y = 8$</p> <p>$\therefore y = \frac{7}{10}x - \frac{8}{10}$</p> <p>$\therefore \frac{7}{10}x - \frac{8}{10} = -\frac{3}{2}x + 8$</p> <p>$\frac{11}{5}x = \frac{44}{5}$</p> <p>$x = 4$</p> <p>$3(4) + 2y = 16$</p> <p>$y = 2$</p> <p>G(4 ; 2)</p>	<p>✓ method /metode: solving simultaneously / los gelyktydig op</p> <p>✓ x coordinate</p> <p>✓ y coordinate</p> <p>(3)</p> <p>✓ method: equating</p> <p>metode: stel vgl's gelyk</p> <p>✓ x coordinate</p> <p>✓ y coordinate</p> <p>(3)</p>
<p>3.2</p>	<p>$\frac{x_A + 4}{2} = 3$ and $\frac{y_A + 2}{2} = 3\frac{1}{2}$</p> <p>$\therefore A(2 ; 5)$</p> <p>OR/OF by translation/deur translasië:</p> <p>$x_A = 3 - (4 - 3) = 2$</p> <p>$y_A = 3\frac{1}{2} + (3\frac{1}{2} - 2) = 5$</p> <p>$\therefore A(2 ; 5)$</p>	<p>✓ equation ito x</p> <p>✓ equation ito y</p> <p>(2)</p> <p>✓ equation ito x</p> <p>✓ equation ito y</p> <p>(2)</p>

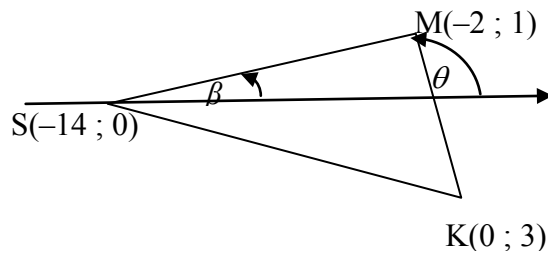
<p>3.3</p>	<p>The midpoint of AB is / <i>die middelpnt van AB is:</i> $\left(\frac{2+(-6)}{2}, \frac{5+(-5)}{2}\right)$ $= (-2 ; 0)$ <p>But the <i>y</i>-coordinate of E is 0 $\therefore E(-2 ; 0)$ is the midpoint of AB \therefore In $\triangle ABG$: $AE = EB$ and $AF = FG$ $\therefore EF \parallel BG$ [midpoint theorem/<i>middelpuntst</i>]</p> <p>OR/OF Equation of AB: $y - (-5) = \left(\frac{5 - (-5)}{2 - (-6)}\right)(x - (-6))$ $y + 5 = \frac{10}{8}x + \frac{15}{2}$ $y = \frac{5}{4}x + \frac{5}{2}$ <p>x-intercept of AB: $0 = \frac{5}{4}x + \frac{5}{2}$ $x = -2$ $\therefore E(-2 ; 0)$ $m_{EF} = \frac{3\frac{1}{2} - 0}{3 - (-2)} = \frac{7}{10}$ $m_{EF} = m_{BG} = \frac{7}{10}$ $\therefore EF \parallel BG$</p> <div style="border: 1px solid black; padding: 5px; width: fit-content; margin: 10px auto;"> <p>BG: $7x - 10y = 8$ $\therefore y = \frac{7}{10}x - \frac{8}{10}$ $\therefore m_{BG} = \frac{7}{10}$</p> </div> </p></p>	<p>✓ subst A & B into midpt formula ✓ coordinates of midpt</p> <p>✓ E = midpt OR AE = EB ✓ Reason (4)</p> <p>✓ equation of AB</p> <p>✓ coordinates of E</p> <p>✓ gradient of EF</p> <p>✓ gradient EF = gradient BG (4)</p>
<p>3.4</p>	<p>Midpoint of AC = $\left(5 ; \frac{1}{2}\right)$ $\frac{x_D + (-6)}{2} = 5 \text{ and } \frac{y_D + (-5)}{2} = \frac{1}{2}$ $\therefore D(16 ; 6)$</p> <p>OR/OF by translation/<i>dmv translasie</i>: D(16 ; 6)</p>	<p>✓✓ $\left(5 ; \frac{1}{2}\right)$</p> <p>✓ <i>x</i> value ✓ <i>y</i> value (4)</p> <p>✓✓ method</p> <p>✓ <i>x</i> value ✓ <i>y</i> value (4)</p> <p>[17]</p>

QUESTION/VRAAG 4



<p>4.1.1</p>	$m_{PK} = \frac{5 - (-3)}{-4 - 0}$ $= -2$ <p>PK \perp SR [radius \perp tangent/raaklyn] $\therefore m_{PK} \times m_{RS} = -1$ $\therefore m_{RS} = \frac{1}{2}$</p>	<ul style="list-style-type: none"> ✓ substitution P & K into gradient formula ✓ gradient of PK ✓ PK \perp SR ✓ answer <p style="text-align: right;">(4)</p>
<p>4.1.2</p>	$y = \frac{1}{2}x + c$ $5 = \frac{1}{2}(-4) + c \quad \text{OR/OF} \quad (y - 5) = \frac{1}{2}(x - (-4))$ $c = 7 \quad (y - 5) = \frac{1}{2}x + 2$ $y = \frac{1}{2}x + 7 \quad y = \frac{1}{2}x + 7$	<ul style="list-style-type: none"> ✓ substitution of m and P ✓ equation <p style="text-align: right;">(2)</p>
<p>4.1.3</p>	$M\left(\frac{-4 + 0}{2}; \frac{5 + (-3)}{2}\right)$ $\therefore M(-2; 1)$ $r^2 = (x_2 - x_1)^2 + (y_2 - y_1)^2$ $r^2 = (-2 + 4)^2 + (1 - 5)^2$ $\therefore r^2 = 20$ $\therefore (x + 2)^2 + (y - 1)^2 = 20$ <p>OR/OF</p>	<ul style="list-style-type: none"> ✓ M (-2 ; 1) ✓ substitute M & P ✓ 20 ✓ equation <p style="text-align: right;">(4)</p>

	$M\left(\frac{-4+0}{2}; \frac{5+(-3)}{2}\right)$ $\therefore M(-2; 1)$ $(x+2)^2 + (y-1)^2 = r^2$ $(-4+2)^2 + (5-1)^2 = r^2$ $\therefore r^2 = 20$ $\therefore (x+2)^2 + (y-1)^2 = 20$	<ul style="list-style-type: none"> ✓ M (-2 ; 1) ✓ substitute M & P ✓ 20 ✓ equation 	(4)
4.1.4	$\tan \theta = m_{PK} = -2$ $\therefore \theta = 180^\circ - 63,43^\circ$ $= 116,57^\circ$ $PKR = 116,57^\circ - 90^\circ \quad [\text{ext } \angle \text{ of } \Delta MOK]$ $= 26,57^\circ$	<ul style="list-style-type: none"> ✓ $\tan \theta = m_{PK}$ ✓ size of θ ✓ answer 	(3)
4.1.5	<p>RS tangent at K(0 ; 3)</p> $\therefore m_{PS} = m_{\text{tang}} = \frac{1}{2}$ $\therefore y = \frac{1}{2}x - 3$ <p>OR/OF</p> $m_{PK} = \frac{1-5}{-2+4} = -2$ $m_{PK} \times m_{\text{tang}} = -1 \quad [\text{radius } \perp \text{ tangent/raaklyn}]$ $\therefore m_{\text{tang}} = \frac{1}{2}$ $y = \frac{1}{2}x - 3$	<ul style="list-style-type: none"> ✓ gradient ✓ equation ✓ gradient ✓ equation 	(2)
4.2	$t \in (-3 ; 7) \quad \mathbf{OR/OF} \quad -3 < t < 7$	<ul style="list-style-type: none"> ✓ ✓ critical values ✓ notation 	(3)
4.3	<p>RS: $y = \frac{1}{2}x + 7 \quad \therefore S(-14 ; 0)$</p> $SP = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$ $= \sqrt{(-14 - (-4))^2 + (0 - 5)^2}$ $= \sqrt{100 + 25} = \sqrt{125}$ <p>Area $\Delta SMK = \frac{1}{2} \cdot MK \cdot SP$</p> $= \frac{1}{2}(\sqrt{20})(\sqrt{125})$ $= 25 \text{ square units}$ <p>OR/OF</p>	<ul style="list-style-type: none"> ✓ coordinates of S ✓ length of SP ✓ correct base & height into Area formula ✓ correct substitution ✓ answer 	(5)



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

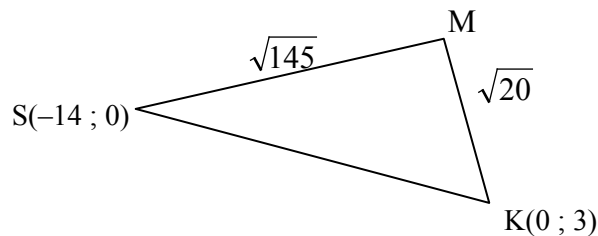
RS: $y = \frac{1}{2}x + 7 \quad \therefore S(-14 ; 0)$

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

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

Area $\Delta SMK = \frac{1}{2}(\text{SM})(\text{MK}) \cdot \sin \hat{SMK}$
 $= \frac{1}{2}(\sqrt{145})(\sqrt{20}) \cdot \sin 111,81^\circ$
 $= 24,9985 = 25 \text{ square units}$

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 $\Delta SMK = \frac{1}{2}(\text{SM})(\text{MK}) \cdot \sin \hat{SMK}$
 $= \frac{1}{2}(\sqrt{145})(\sqrt{20}) \cdot \sin 111,81^\circ$
 $= 24,9985 = 25 \text{ square units}$

✓ coordinates of S

✓ size of β

✓ size of/grootte van \hat{SMK}

✓ correct substitution into area rule

✓ answer

(5)

✓ coordinates of S

✓ length of SK

✓ correct substitution into cosine rule

✓ size of/grootte van \hat{SMK}

✓ correct substitution into area rule

✓ answer

(5)

[23]

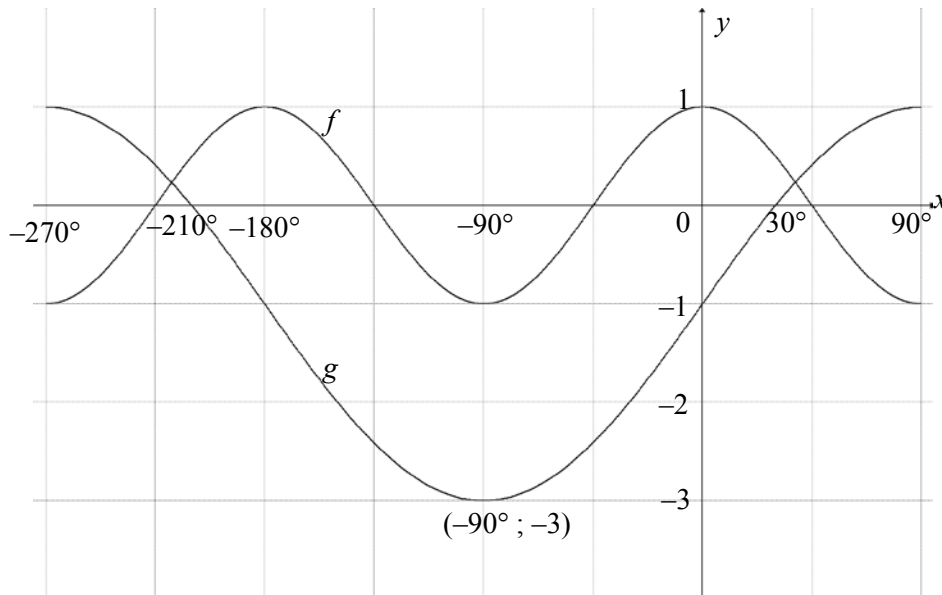
QUESTION/VRAAG 5

5.1	$\frac{\sin(A - 360^\circ) \cdot \cos(90^\circ + A)}{\cos(90^\circ - A) \cdot \tan(-A)}$ $= \frac{\sin A(-\sin A)}{\sin A(-\tan A)}$ $= \frac{-\sin A}{\left(-\frac{\sin A}{\cos A}\right)}$ $= \cos A$	<ul style="list-style-type: none"> ✓ sin A ✓ -sin A ✓ sin A ✓ -tan A ✓ $\tan A = \frac{\sin A}{\cos A}$ ✓ answer 	(6)
5.2.1	$t^2 = (\sqrt{34})^2 - (3)^2$ $\therefore t = -5$	<ul style="list-style-type: none"> ✓ substitution ✓ answer 	(2)
5.2.2	$\tan \beta = \frac{-5}{3}$	<ul style="list-style-type: none"> ✓ correct ratio 	(1)
5.2.3	$\cos 2\beta = 2 \cos^2 \beta - 1$ $2 \left(\frac{3}{\sqrt{34}} \right)^2 - 1$ $= 2 \left(\frac{9}{34} \right) - 1$ $= -\frac{16}{34} \text{ OR } -\frac{8}{17}$ <p>OR/OF</p> $\cos 2\beta = 1 - 2 \sin^2 \beta$ $= 1 - 2 \left(-\frac{5}{\sqrt{34}} \right)^2$ $= 1 - 2 \left(\frac{25}{34} \right)$ $= -\frac{16}{34} \text{ OR } -\frac{8}{17}$	<ul style="list-style-type: none"> ✓ compound formula ✓ substitution ✓ simplification ✓ answer 	(4)
5.3.1	$\text{LHS} = \sin(A + B) - \sin(A - B)$ $= \sin A \cdot \cos B + \cos A \cdot \sin B - (\sin A \cdot \cos B - \cos A \cdot \sin B)$ $= \sin A \cdot \cos B + \cos A \cdot \sin B - \sin A \cdot \cos B + \cos A \cdot \sin B$ $= 2 \cos A \cdot \sin B$	<ul style="list-style-type: none"> ✓ both compound formulae ✓ simplification 	(2)
5.3.2	$\sin 77^\circ - \sin 43^\circ = \sin(60^\circ + 17^\circ) - \sin(60^\circ - 17^\circ)$ $= 2 \cos 60^\circ \cdot \sin 17^\circ$ $= 2 \times \frac{1}{2} \times \sin 17^\circ$ $= \sin 17^\circ$	<ul style="list-style-type: none"> ✓✓ write i.t.o 60° and 17° ✓ simplify ✓ $\frac{1}{2}$ 	(4)

[19]

QUESTION/VRAAG 6

6.1



- ✓ turning points/
draaipunte
- ✓ y – intercept/*afsnit*
- ✓ x – intercepts:
- ✓ 30° &
- ✓ - 210°

(4)

6.2

$$\begin{aligned} \cos 2x &= 2 \sin x - 1 \\ 1 - 2 \sin^2 x &= 2 \sin x - 1 \\ 2 \sin^2 x + 2 \sin x - 2 &= 0 \\ \sin^2 x + \sin x - 1 &= 0 \\ \sin x &= \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} \\ &= \frac{-1 \pm \sqrt{1^2 - 4(1)(-1)}}{2(1)} \\ \sin x &= \frac{-1 + \sqrt{5}}{2}, \text{ since } \sin x = \frac{-1 - \sqrt{5}}{2} < -1 \text{ has no solution} \end{aligned}$$

- ✓ $\cos 2x = 1 - 2 \sin^2 x$
- ✓ standard form

- ✓ substitution into quadratic formula

- ✓ rejecting invalid solution with reason/*gooi ongeldige oplossing weg met rede*

(4)

6.3

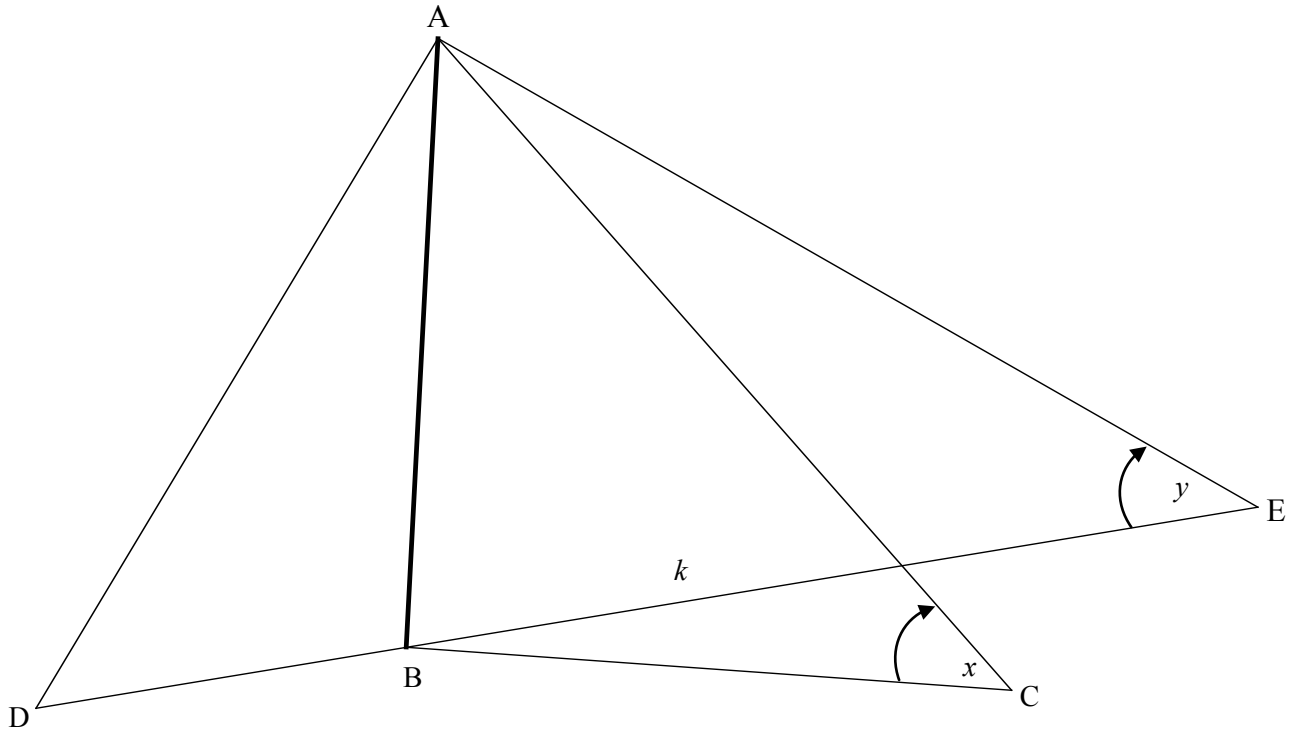
$$\begin{aligned} \sin x &= \frac{-1 + \sqrt{5}}{2} \\ \sin x &= 0,618... \\ \text{Reference } \angle &= 38,17^\circ \\ \therefore x &= 38,17^\circ + k \cdot 360^\circ \text{ or } x = 141,83^\circ + k \cdot 360^\circ; k \in \mathbb{Z} \\ x &= -321,83^\circ \text{ or } -218,17^\circ \\ y &= 0,24 \\ \therefore \text{Points of intersection/} &\textit{snytpunte:} \\ &(38,17^\circ; 0,24) \text{ and } (-218,17^\circ; 0,24) \end{aligned}$$

- ✓ 38,17° & 141,83°
- ✓ - 321,83°
- ✓ -218,17°
- ✓ 0,24

(4)

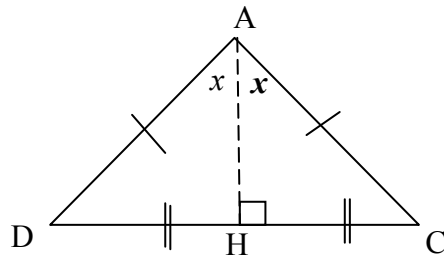
[12]

QUESTION/VRAAG 7



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

7.3



Draw median/Trek swaartelyn AH of $\triangle ADC$.

Then $AH \perp DC$ and $\hat{HAC} = x$

$$DC = 2HC$$

$$\sin x = \frac{HC}{AC}$$

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

$$DC = 2k \tan y$$

OR/OF

$$DC^2 = AD^2 + AC^2 - 2AD \cdot AC \cdot \cos 2x$$

$$= AC^2 + AC^2 - 2AC^2 \cos 2x$$

$$= 2AC^2(1 - \cos 2x)$$

$$= 2AC^2(1 - 1 + 2\sin^2 x)$$

$$= 4AC^2 \sin^2 x$$

$$DC = 2AC \sin x$$

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

$$= 2k \cdot \tan y$$

OR/OF

$$DC^2 = AD^2 + AC^2 - 2AD \cdot AC \cos 2x$$

$$= 2 \left(\frac{k \tan y}{\sin x} \right)^2 - 2 \left(\frac{k \tan y}{\sin x} \right)^2 \cos 2x$$

$$= \frac{2k^2 \tan^2 y}{\sin^2 x} - \frac{2k^2 \tan^2 y}{\sin^2 x} (1 - 2\sin^2 x)$$

$$= \frac{2k^2 \tan^2 y}{\sin^2 x} - \frac{2k^2 \tan^2 y}{\sin^2 x} + 4k^2 \tan^2 y$$

$$DC = \sqrt{4k^2 \tan^2 y}$$

$$= 2k \tan y$$

✓✓ sketch OR construction

✓ $DC = 2HC$

✓ ratio of $\sin x$

✓ DC subject & subst

(5)

✓ correct cos formula

✓ substitution

✓ $1 - 2\sin^2 x$

✓ squaring and multiplication

✓ $\sqrt{4k^2 \tan^2 y}$

(5)

✓ correct cos formula

✓ substitution

✓ $1 - 2\sin^2 x$

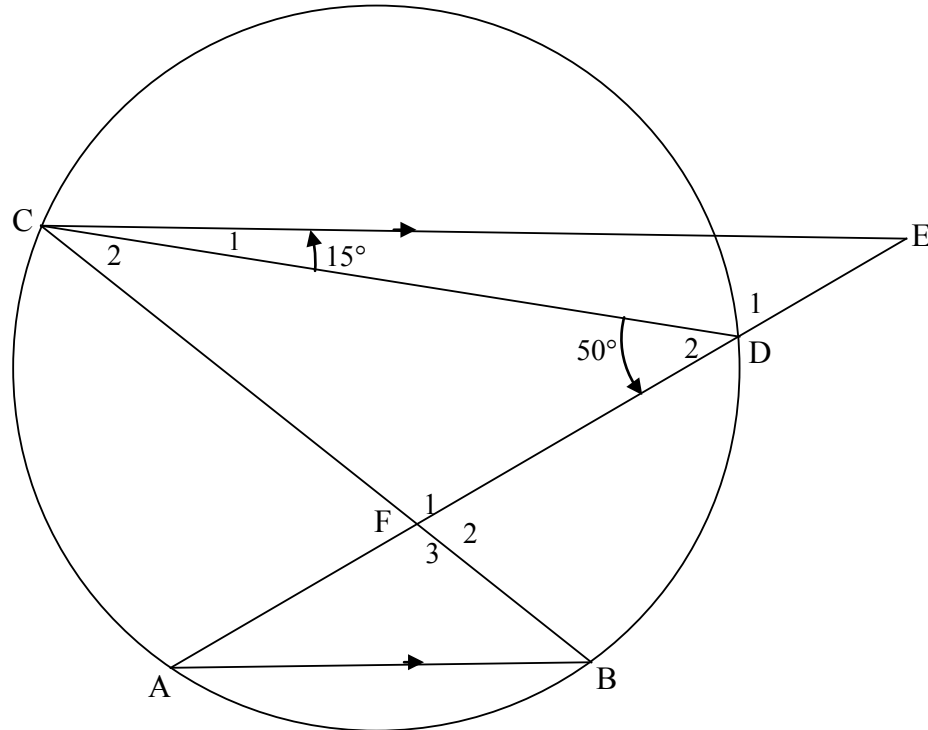
✓ squaring and multiplication

✓ $\sqrt{4k^2 \tan^2 y}$

(5)

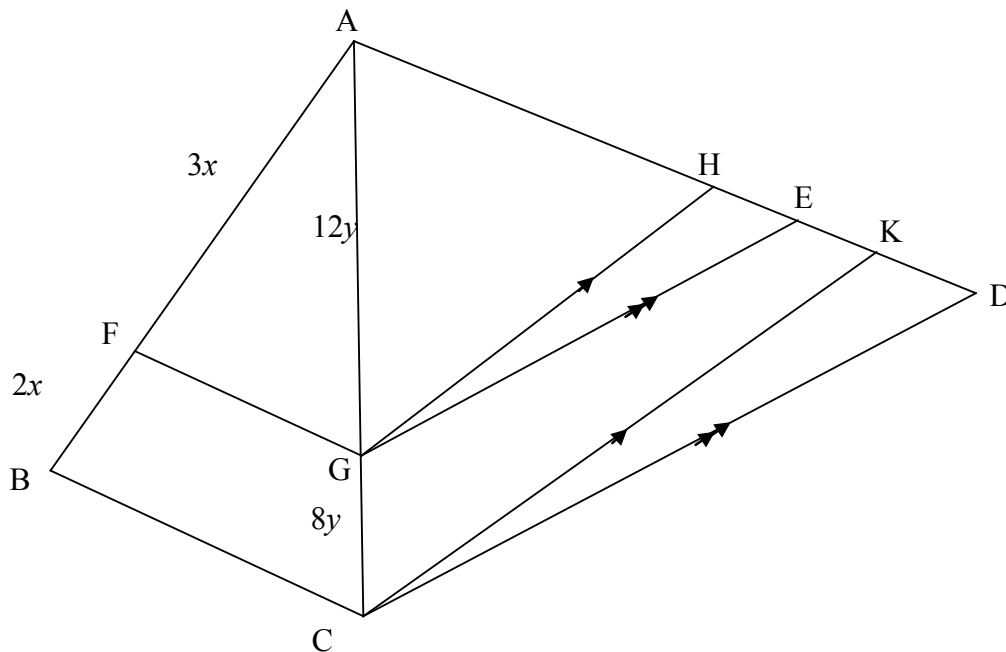
[10]

QUESTION/VRAAG 8



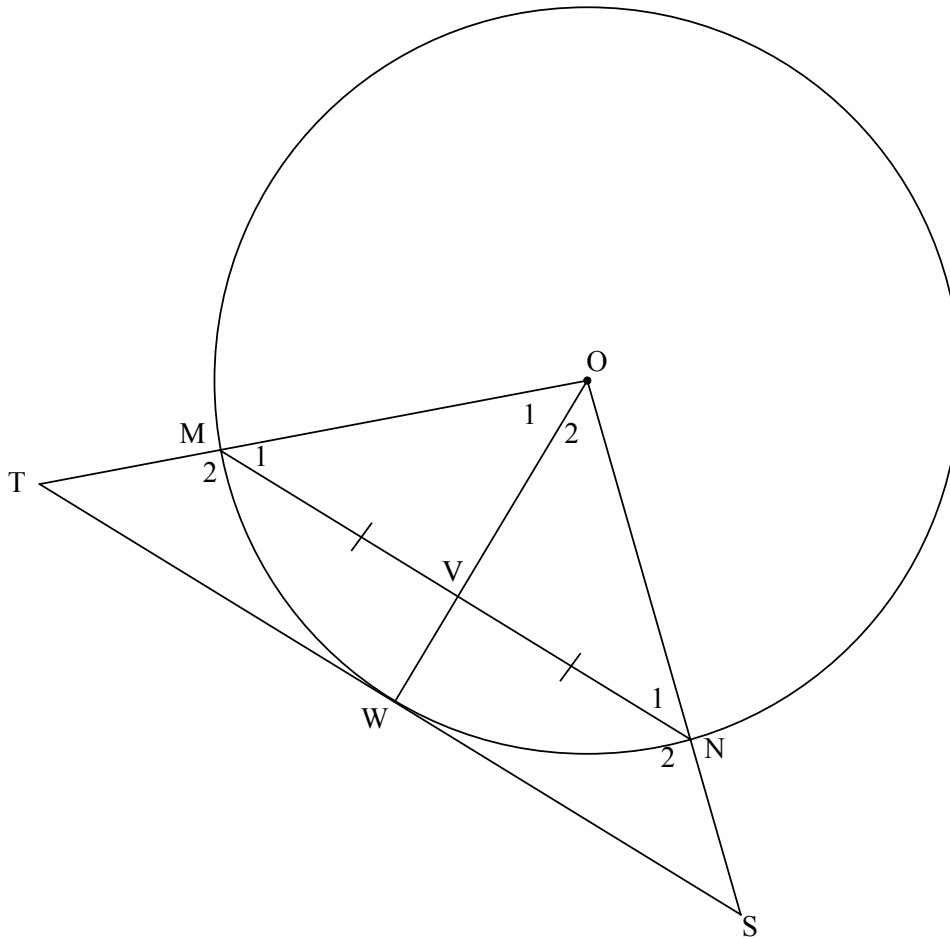
8.1.1	$\hat{E} = 50^\circ - 15^\circ = 35^\circ$ [ext \angle of Δ /buite \angle van Δ] $\hat{A} = 35^\circ$ [alt \angle s / verwiss \angle e; CE AB]	✓ S/R ✓ S ✓ R (3)
8.1.2	$\hat{C}_2 = 35^\circ$ [\angle s in same segment/ \angle e in dieselfde segment]	✓ S ✓ R (2)
8.2	$\hat{C}_2 = \hat{E} = 35^\circ$ [from 8.1.1 and 8.1.3] \therefore CF is a tangent to the circle [converse tan chord theorem] \therefore CF is 'n raaklyn aan die sirkel [omgekeerde raakl koordst]	✓ S ✓ R (2) [7]

QUESTION/VRAAG 9



9.1.1	$\frac{AF}{BF} = \frac{3}{2} = \frac{AG}{OG}$ $\therefore FG \parallel BC \text{ [conv prop th/conv. prop th]}$	✓S ✓R (2)
9.1.2	$\frac{AG}{GC} = \frac{AH}{HK} \quad \text{[prop theorem/eweredigh st; GH} \parallel \text{CK]}$ $\text{But } \frac{AG}{GC} = \frac{AE}{ED} \quad \text{[prop theorem/eweredigh st; GE} \parallel \text{ED]}$ $\therefore \frac{AH}{HK} = \frac{AE}{ED}$	✓S ✓R ✓S (3)
9.2	$\frac{AE}{ED} = \frac{AH}{HK} = \frac{3}{2}$ $\frac{AE}{12} = \frac{3}{2} \quad \text{and} \quad \frac{15}{HK} = \frac{3}{2}$ $\therefore AE = 18 \quad \text{and} \quad HK = 10$ $\therefore HE = AE - AH = 18 - 15 = 3$ $EK = HK - HE$ $= 10 - 3 = 7$	✓ ratio ✓ AE = 18 ✓ HK = 10 ✓ HE = 3 ✓ EK = 7 (5) [10]

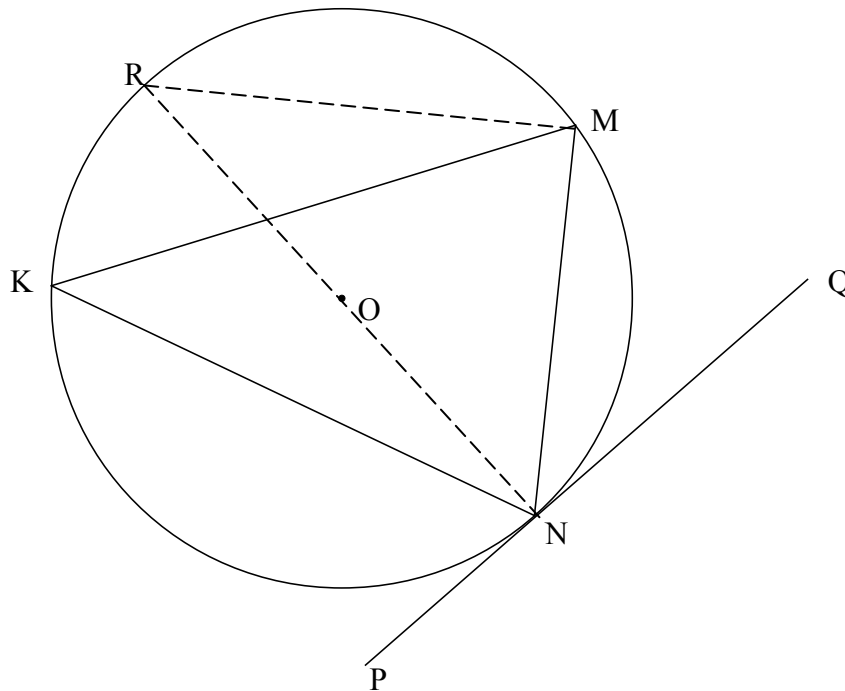
QUESTION/VRAAG 10



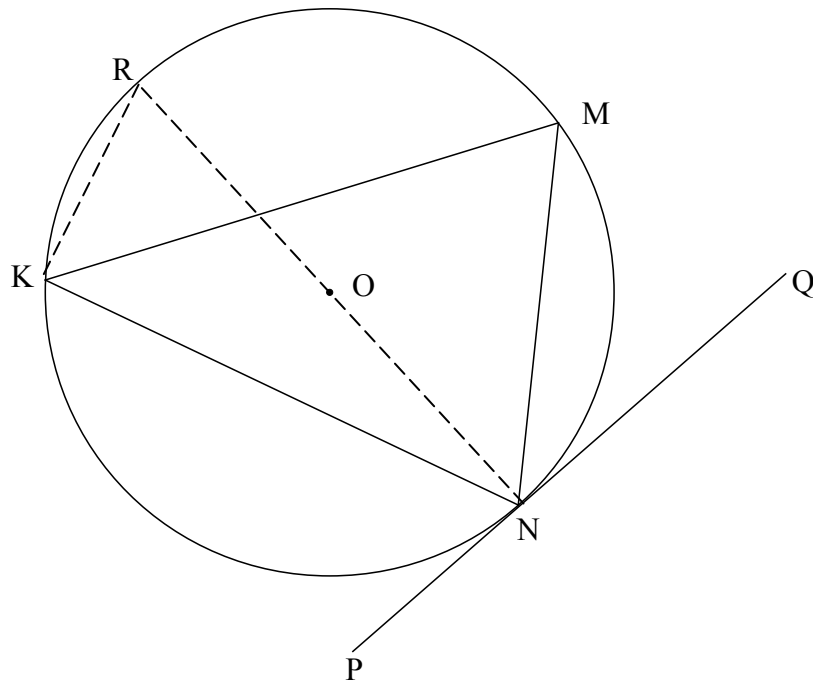
10.1	Line from centre bisects chord/ <i>lyn vanaf midpt halveer koord</i>	✓ R (1)
10.2.1	$\widehat{O\hat{W}T} = \widehat{O\hat{W}S} = 90^\circ$ [radius \perp tangent/raaklyn] $\therefore MN \parallel TS$ [corresp \angle s =/ooreenkomstige \angle e =]	✓ R ✓ R (2)
10.2.2	$\hat{M}_1 = \hat{N}_1$ [\angle s opp = sides/ \angle e teenoor = sye] $\hat{M}_1 = \hat{T}$ [corrsp \angle s/ooreenkomstige \angle e; $MN \parallel TS$] $\therefore \hat{N}_1 = \hat{T}$ $\therefore TMNS$ is a cyclic quadrilateral [conv: ext \angle cyclic quad] TMNS is 'n koordevierhoek [omgek: buite \angle kdvh] OR/OF $\hat{M}_1 = \hat{N}_1$ [\angle s opp = sides/ \angle e teenoor = sye] $\hat{N}_1 = \hat{S}$ [corrsp \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] TMNS is 'n koordevierhoek [omgek: buite \angle kdvh]	✓ S /R ✓ S/R ✓ S ✓ R (4) ✓ S /R ✓ S/R ✓ S ✓ R (4)

10.2.3	<p>In $\triangle OVN$ and $\triangle OWS$</p> $\hat{O}_2 = \hat{O}_2 \quad [\text{common/gemeenskaplik}]$ $O\hat{V}N = O\hat{W}S = 90^\circ \quad [\text{from 11.1}]$ $O\hat{N}V = O\hat{S}W \quad [\text{sum } \angle\text{s } \Delta/\text{som } \angle\text{e } \Delta]$ $\therefore \triangle OVN \parallel \triangle OWS \quad [\angle, \angle, \angle]$ $\therefore \frac{VN}{WS} = \frac{ON}{OS}$ <p>But $VN = \frac{1}{2}MN$ [given]</p> $\therefore \frac{\frac{1}{2}MN}{WS} = \frac{ON}{OS}$ $\therefore OS \cdot MN = 2ON \cdot WS$	<p>✓ identifying correct Δs</p> <p>✓✓ $\frac{VN}{WS} = \frac{ON}{OS}$</p> <p>✓ $VN = \frac{1}{2}MN$</p> <p>✓ substitution</p> <p>(5) [12]</p>
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QUESTION/VRAAG 11

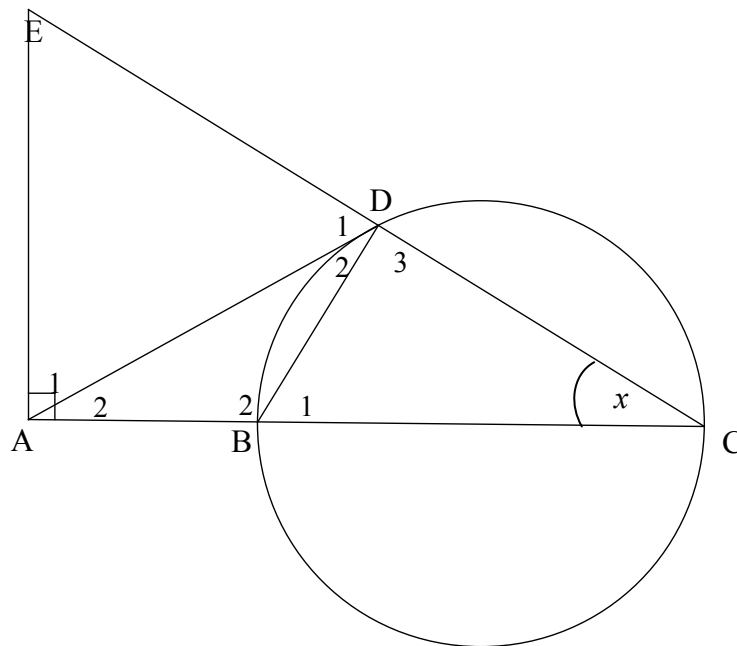


<p>11.1</p>	<p>Construction: Draw diameter NR and draw RM <i>Konstruksie: Trek middellyn NR en verbind RM</i> $\widehat{ONM} = 90^\circ - \widehat{MNQ}$ [radius \perp tangent/<i>raaklyn</i>] $\widehat{NMR} = 90^\circ$ [\angle in half circle/<i>semi-sirkel</i>] $\therefore \widehat{MRN} = 180^\circ - (90^\circ + 90^\circ - \widehat{MNQ})$ [sum \angles Δ] $= \widehat{MNQ}$ but $\widehat{MRN} = \widehat{MKN}$ [\angles same segment/<i>\angle e dieselfde segment</i>] $\therefore \widehat{MNQ} = \widehat{K}$ OR/OF</p>	<p>✓ construction ✓ S / R ✓ S / R ✓ S ✓ S / R (5)</p>
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<p>11.1</p>	<p>Construction: Draw diameter NR and draw RK <i>Konstruksie: Trek middellyn NR en verbind RK</i> $M\hat{N}Q = 90^\circ - R\hat{N}M$ [radius \perp tangent/raaklyn] $N\hat{K}R = 90^\circ$ [\angle in half circle/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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11.2



11.2.1(a)	Angle in a semi circle/ <i>Hoek in halfsirkel</i>	✓ R (1)
11.2.1(b)	Exterior \angle of a cyclic quadrilateral = opp interior \angle <i>Buite \angle van koordevierh = teenoorst binne \angle</i> OR/OF Opposite angles of cyclic quad supplementary	✓ R (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>]	✓ 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 $\angle^e \Delta$] $\therefore \triangle ADB \parallel \triangle ACD$ 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 ✓ S (3) ✓ S ✓ S ✓ R (3)

11.2.3(a)	$\frac{AD}{AC} = \frac{AB}{AD}$ $AD^2 = AC \cdot AB$ $= 3r \times r$ $= 3r^2$ <p style="text-align: right;">[Δs]</p>	✓ ratio ✓ substitution (2)
11.2.3(b)	$AD = \sqrt{3}r$ <p style="text-align: right;">[from 11.2.3(a)]</p> $AB = r \text{ and } BC = 2r$ $\therefore AC = 3r$ $\tan \hat{E} = \frac{AC}{AE}$ $= \frac{AC}{AD} \quad [AD = AE]$ $= \frac{3r}{\sqrt{3}r}$ $= \sqrt{3}$ $\therefore \hat{E} = 60^\circ$ $\therefore \hat{D}_1 = 60^\circ \quad [\angle s \text{ opp} = \text{sides} / \angle e \text{ teenoor} = \text{sy}]$ $\therefore \hat{A}_1 = 60^\circ \quad [\angle s \text{ of } \Delta = 180^\circ]$ $\therefore \Delta ADE \text{ is equilateral/is gelyksydig}$	✓ AC ito r ✓ trig ratio ✓ simplification ✓ all 3 \angle s = 60° (4) [20]

TOTAL/TOTAAL: 150