SLT. file

Province of the EASTERN CAPE EDUCATION

# NATIONAL/*NASIONALE* SENIOR CERTIFICATE/*SERTIFIKAAT*

## GRADE/*GRAAD* 12

## JUNE/*JUNIE* 2026

## MATHEMATICS P2/*WISKUNDE V2* MARKING GUIDELINE/*NASIENRIGLYN*

**MARKS/*PUNTE*: 150**

This marking guideline consists of 17 pages.
*Hierdie nasienriglyn bestaan uit 17 bladsye.*

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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 a question, mark the crossed-out version.
- Consistency accuracy applies in ALL aspects of the marking guideline. Stop marking at the second calculation error.
- Assuming answers/values in order to solve a problem is NOT acceptable.

| **GEOMETRY** | |
|---|---|
| **S** | A mark for a correct statement.<br>(A statement mark is independent of a reason). |
| **R** | A mark for the correct reason.<br>(A reason mark may be awarded if the statement is correct). |
| **S/R** | Award a mark if a statement and a reason are both correct. |

***NOTA***

- *As 'n kandidaat 'n vraag TWEE keer beantwoord, merk slegs die EERSTE poging.*
- *As 'n kandidaat 'n poging van 'n vraag doodgetrek het en dit nie oorgedoen nie, merk die doodgetrekte poging.*
- *Volgehoue akkuraatheid word in ALLE aspekte van die nasienriglyn toegepas. Hou op nasien by die tweede berekeningsfout.*
- *Om antwoorde/waardes te aanvaar om 'n probleem op te los, word NIE aanvaar NIE.*

| ***MEETKUNDE*** | |
|---|---|
| **S** | *'n Punt vir korrekte stelling.*<br>*('n Stelling punt is onafhanklik van die rede.)* |
| **R** | *'n Punt vir 'n korrekte rede.*<br>*('n Punt word slegs vir die rede toegeken as die bewering korrek is.)* |
| **S/R** | *'n Punt word toegeken as die bewering en rede beide korrek is.* |

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**QUESTION/VRAAG 1**

| | | | |
|---|---|---|---|
| 1.1 | Median / *Mediaan* = 34 | ✓ answer / *antwoord* | (1) |
| 1.2 | $Q_1 = 60$ in both classes / *in albei klasse* | ✓ answer / *antwoord* | (1) |
| 1.3 | $90 - 6 = 84$ | ✓ 84 | (1) |
| 1.4 | **CLASS A** performed better than **CLASS B**. Range for **CLASS A** is less than range for **CLASS B**.<br>***KLAS A** het beter as **KLAS B** presteer. Omvang vir **KLAS A** is kleiner as die omvang van **KLAS B**.* | ✓ **CLASS A / *KLAS A***<br>✓ Reason / *Rede* | (2) |
| 1.5 | **CLASS B / *KLAS B*** | ✓ answer / *antwoord* | (1) |
| 1.6 | Positively skewed **OR** skewed to the right<br>*Positief skeef **OF** Skeef na regs* | ✓ answer / *antwoord* | (1) |
| 1.7 | $\frac{80}{100} \times 20 = 16$<br>$\therefore$ 4 learners qualified for awards<br>4 *leerders het vir toekennings gekwalifiseer*<br>**OR/*OF***<br>$\frac{20}{100} \times 20 = 4$<br>$\therefore$ 4 learners qualified for the awards<br>4 *leerders het vir toekennings gekwalifiseer* | ✓ method / *metode*<br>✓ answer / *antwoord*<br>**OR/*OF***<br>✓ method / *metode*<br>✓ answer / *antwoord* | (2) |
| | | | **[9]** |

1.6. $Q_3 - M$ $M - Q_1$

$= 60 - 46$ $= 46 - 34$

$= 14$ $= 12$

$Q_3 - M > M - Q_1$

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**QUESTION/VRAAG 2**

2.1

| **Ages in years** *Ouderdom in jare* | **Frequency** *Frekwensie* | **Cummulative Frequency** *Kummulatiewe Frekwensie* |
|---|---|---|
| $10 < x \leq 19$ | 1 | 1 |
| $20 < x \leq 29$ | 2 | 3 |
| $30 < x \leq 39$ | 3 | 6 |
| $40 < x \leq 49$ | 4 | 10 |
| $50 < x \leq 59$ | 6 | 16 |
| $60 < x \leq 69$ | 7 | 23 |
| $70 < x \leq 79$ | 4 | 27 |
| $80 < x \leq 89$ | 1 | 28 |

✓ first 3 correct *eerste 3 korrek* (2, 3, 4)
✓ second 3 correct *tweede 3 korrek* (6 ,7,4) (2)

2.2 Mean / *Gemiddelde*

$= \frac{14,5 \times 1 + 24,5 \times 2 + 34,5 \times 3 + 44,5 \times 4 + 54,5 \times 6 + 64,5 \times 7 + 74,5 \times 4 + 84,5 \times 1}{28}$

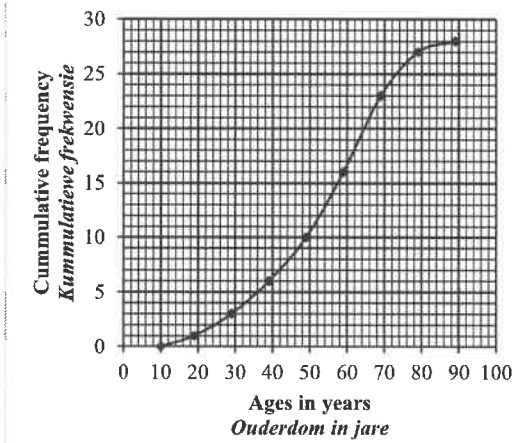
$= \frac{1506}{28}$

$= 53,79$

✓ method / *metode*
✓ 1506
✓answer/*antwoord* (3)

2.3 $60 < x \leq 69$ ✓answer/*antwoord* (1)

2.4




✓ grounding *anker*
✓ plot against the upper limit *afsteek teen boonste limiet*
✓ shape / *vorm* (3)

2.5 18 people / *persone* (1)

**[10]**

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## QUESTION/*VRAAG* 2

**2.1**

| Ages in years / *Ouderdom in jare* | Frequency / *Frekwensie* | Cummulative Frequency / *Kummulatiewe Frekwensie* |
|---|---|---|
| $10 < x \leq 19$ | 1 | 1 |
| $20 < x \leq 29$ | 2 | 3 |
| $30 < x \leq 39$ | 3 ✓ | 6 |
| $40 < x \leq 49$ | 4 | 10 |
| $50 < x \leq 59$ | 6 | 16 |
| $60 < x \leq 69$ | 7 ✓ | 23 |
| $70 < x \leq 79$ | 4 | 27 |
| $80 < x \leq 89$ | 1 | 28 |

(2) 2

**2.2**

$\bar{x} = \frac{14,5 \times 1 + 24,5 \times 2 + \ldots + 84,5 \times 1}{28}$ ✓

$= \frac{1506}{28}$ ✓

$= 53,79$ ✓ a o 3/3

(3) 3

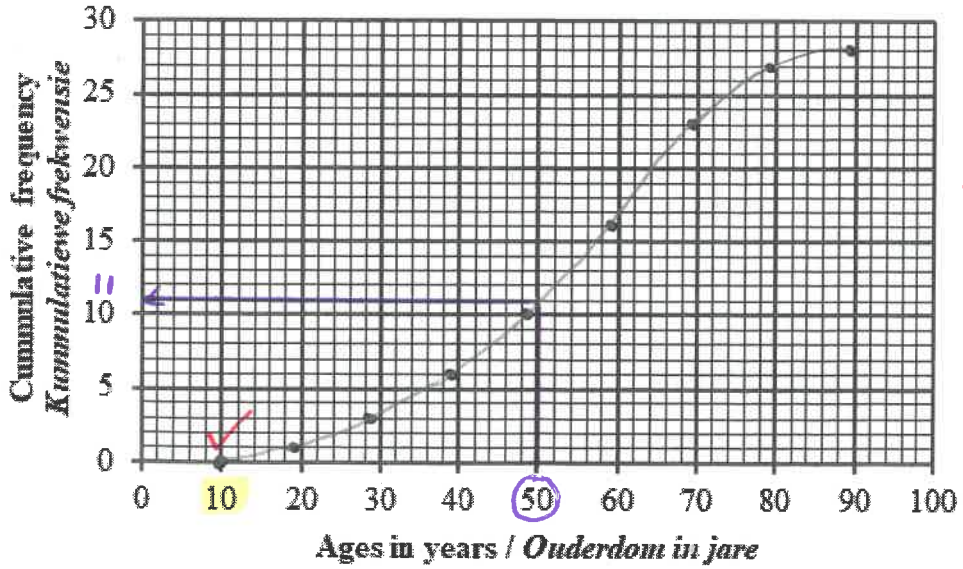
**2.3**

Modal class : $60 < x \leq 69$ ✓

(1) 1

**2.4**

**Cummulative Frequency graph/ Ogive**
***Kummulatiewefrekwensie-grafiek / Ogief***




✓ plotting
✓ shape

(3) 3

**2.5**

$\leq 50$ yrs $= 11$

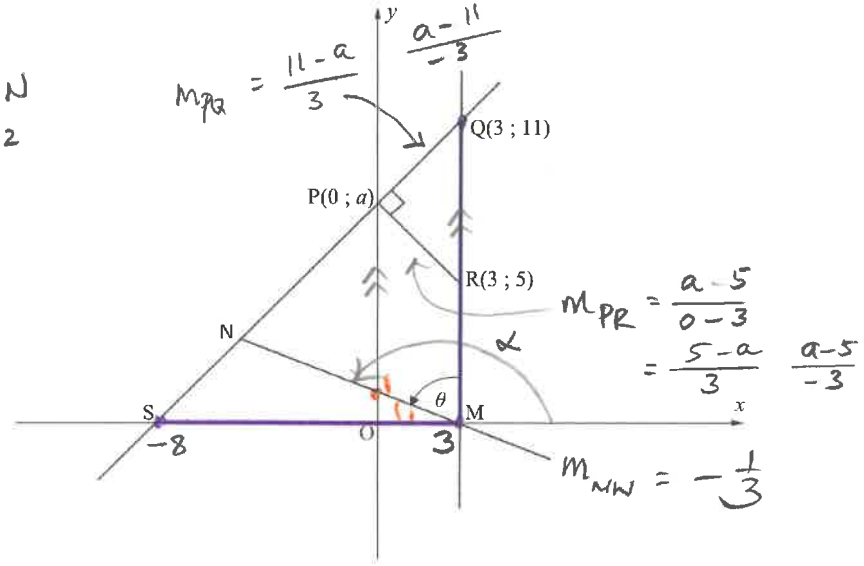
$\therefore > 50$ yrs $= 28 - 11$

$= 17$ ✓ 17 – 19

(1) 1

**[10]**

**QUESTION/*VRAAG 3***




| | | | |
|---|---|---|---|
| 3.1 | M(3;0) ✓ | ✓ answer / *antwoord* | (1) |
| 3.2 | QM = 11 units / *eenhede* ✓ | ✓ answer / *antwoord* | (1) |
| 3.3 | $m_{PQ}=\frac{11-a}{3-0}=\frac{11-a}{3}$ ✓ ✓ | ✓ correct substitution *korrekte vervanging* ✓ answer / *antwoord* | (2) |
| 3.4 | $m_{PQ}\times m_{PR}=-1$ [product of gradients of $\perp$ *lines*] [*produk van gradiënte van* $\perp$ *lyne*] ✓<br>$\frac{11-a}{3}\times\frac{5-a}{3}=-1$ ✓<br>$55-11a-5a+a^2=-9$ ✓<br>$a^2-16a+64=0$ ✓<br>$(a-8)^2=0$ ✓<br>$\therefore a=8$ | ✓ $m_{PQ}\times m_{PR}=-1$<br>✓ correct substitution *korrekte vervanging*<br>✓ simplification / *vereenvoudiging*<br>✓ standard form / *standaardvorm*<br>✓ factors / *faktore* | (5) |



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| | | | |
|---|---|---|---|
| 3.5 | $m_{SQ}=\frac{11-8}{3}=1$ ✓<br>$11=1(3)+c$ ✓<br>$8=c$<br>$y=x+8$ ✓ | ✓ $m_{SQ}$<br>✓ substituting $m_{SQ}$ and P(0 ; 8) or Q(3; 11) *vervanging* $m_{SQ}$ en P(0 ; 8) of Q(3 ; 11)<br>✓ answer / *antwoord* | (3) |
| 3.6 | $x+8=0$ ✓<br>$x=-8$ ✓<br>S(−8; 0)<br>SM = 11 units / *eenhede* ✓<br>$\therefore \Delta SMQ$ is isosceles (SM = MQ)<br>$\Delta SMQ$ *is gelykbenig* (SM = MQ) | ✓ $y=0$<br>✓ correct $x$-value / *korrekte x-waarde*<br>✓ SM = 11 | (3) |
| 3.7 | $y=mx+1$<br>$0=m(3)+1$ ✓<br>$m=-\frac{1}{3}$ ✓<br>$\tan\alpha=-\frac{1}{3}$<br>$\alpha=161{,}57^0$ ✓<br>$\theta=161{,}57^0-90^0$ [$QM \parallel y-axis$ / *as*]<br>$=71{,}57^0$ ✓ | ✓ substitute / *vervang* M(3;0)<br>✓ $m_{MN}$<br>✓ inclination of MN / *inklinasie van MN*<br>✓ answer / *antwoord* | (4) |
| 3.8 | Area of $\Delta MQN=\frac{1}{2}\times MN\times MQ\times\sin\theta$<br>$45{,}38=\frac{1}{2}\times MN\times 11\times\sin 71{,}57^0$ ✓<br>MN = 8,70 ✓ | ✓ correct formula of ΔMQN *korrekte formule van* ΔMQN<br>✓ correct substitution / *korrekte vervanging*<br>✓ answer / *antwoord* | (3) |
| | | | [22] |



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3.8. MN: $y = -\frac{1}{3}x + 1$ SQ: $y = x + 8$

N:

$$-\frac{1}{3}x + 1 = x + 8$$

$$-7 = \frac{4}{3}x$$

$$-\frac{21}{4} = x$$

$$y = -\frac{21}{4} + 8$$

$$= \frac{11}{4}$$

✓ $N\left(-\frac{21}{4}; \frac{11}{4}\right)$ $M(3; 0)$

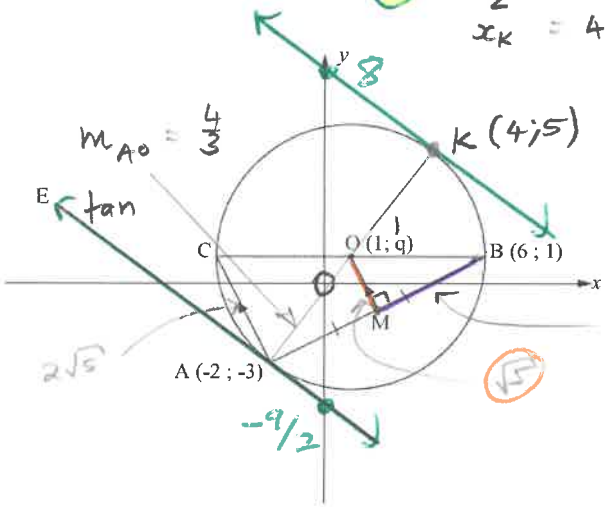
$$MN = \sqrt{\left(0 - \frac{11}{4}\right)^2 + \left(3 - \left(-\frac{21}{4}\right)\right)^2}$$ ✓

$$= \sqrt{\frac{605}{8}}$$

$$= 8,70$$ ✓

(3)

**QUESTION/VRAAG 4**




| | | | |
|---|---|---|---|
| 4.1 | $AB = \sqrt{(-2-6)^2+(-3-1)^2}$ $= \sqrt{80} = 4\sqrt{5}$ | ✓ correct substitution *korrekte vervanging* ✓ answer / *antwoord* | (2) |
| 4.2 | $OM = \sqrt{5}$ [Midpoint Thm / *Middelpunt Stelling*] | ✓ answer / *antwoord* | (1) |
| 4.3 | $O\hat{M}B = 90^0$ [line from centre to the midpoint] [*lyn vanaf middelpunt*] | ✓ answer / *antwoord* | (1) |
| 4.4 | $OB^2 = OM^2 + MB^2$ [Pyth Thm / *Pyth Stelling*] $r^2 = (\sqrt{5})^2 + (2\sqrt{5})^2$ $= 25$ $(q-1)^2 + (1-6)^2 = 25$ $(q-1)^2 = 0$ $q = 1$ | ✓ correct subst. into Pyth *korrekte verv. in Pyth* ✓ simplification *vereenvoudiging* ✓ answer / *antwoord* | (3) |
| 4.5 | $m_{AO} = \frac{1+3}{1+2}$ $= \frac{4}{3}$ | ✓ correct substitution *korrekte vervanging* ✓ answer / *antwoord* | (2) |
| 4.6 | $(x-1)^2 + (y-1)^2 = 25$ | ✓ LHS / *LK* ✓ RHS / *RK* | (2) |

see pg 8.1./2 for alternatives

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| | | | |
|---|---|---|---|
| 4.7 | $m_{AE} = -\frac{3}{4}$ [tan ⊥ rad] / [*raaklyn ⊥ radius*] $y = -\frac{3}{4}x + c$ $y = -\frac{3}{4}x - \frac{9}{2}$ | ✓ $m_{AE}$ ✓ substituting / *vervanging* $m_{AE}$ and / *en* A(−2;−3) ✓ answer / *antwoord* | (3) |
| 4.8 | $-\frac{9}{2} < t < 8$ | ✓ correct c.v's. *korrekte k/w's* ✓ correct notation *korrekte notasie* | (2) |
| 4.9 | $\left(-\frac{22}{3};1\right)$ $r^2_{new/nuwe} = \left(-\frac{22}{3}-1\right)^2 + (1-1)^2$ $r_{new/nuwe} = \frac{25}{3}$ $r_{old/oud} = 5$ $r_{old/oud} < r_{new/nuwe}$ $\therefore \left(-\frac{22}{3}-1\right)$ lies outside the circle / *lê buite die sirkel* | ✓ $r_{new/nuwe}$ ✓ $r_{old/oud} < r_{new/nuwe}$ ✓ conclusion / *gevolgtrekking* | (3) |
| | | | [19] |

$y = -\frac{3}{4}x + t$
sub $K(4;5)$
$5 = -\frac{3}{4}(4) + t$
$8 = t$
$y = -\frac{3}{4}x + 8$

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44. $A(-2;-3)$ $B(6;1)$

$x_M = \frac{-2+6}{2}$ $y_M = \frac{-3+1}{2}$

$= 2$ $= -1$

$M(2;-1)$ ✓ $O(1;q)$

$OM = \sqrt{(q-(-1))^2 + (1-2)^2}$

$\sqrt{5} = \sqrt{(q+1)^2 + 1}$

sbs $5 = (q+1)^2 + 1$

$4 = (q+1)^2$

$\pm 2 = q+1$ ✓ $\pm\sqrt{}$

$\therefore -2 = q+1$ or $2 = q+1$

$-3 \neq q$ $1 = q$ ✓

reject

Quad 1

3

OR

$4 = (q+1)^2$

$4 = q^2 + 2q + 1$

$0 = q^2 + 2q - 3$

$0 = (q-1)(q+3)$ ✓

$\therefore q = 1$ or $-3$

✓ reject

OR

4.4. $M(2;-1)$ ✓

$M_{OM} = \frac{q-(-1)}{1-2}$ $\quad M_{BM} = \frac{1-(-1)}{6-2}$

$= \frac{q+1}{-1}$ $\quad = \frac{1}{2}$

$\frac{q+1}{-1} \times \frac{1}{2} = -1$ ✓ $\quad$ 1

$-(q+1) = -2$

$q+1 = 2$

$q = 1$ ✓

3

## QUESTION/VRAAG 5

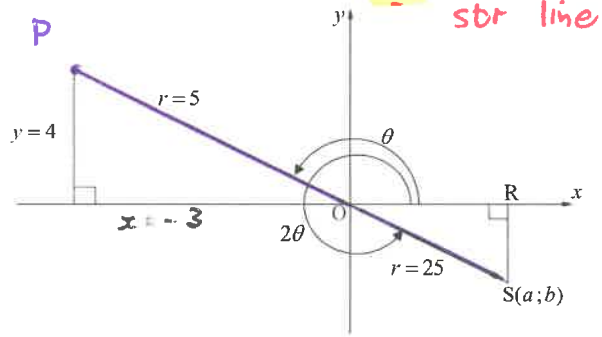
NB POS is not a str line!

$\theta = 126, \ldots^\circ$

$2\theta = 253, \ldots^\circ$

in Q III

NOT Q IV




| | | | | |
|---|---|---|---|---|
| 5.1 | 5.1.1 | $x = -\sqrt{5^2 - 4^2} = -3$<br>$\cos\theta = -\frac{3}{5}$ | ✓ correct $x$-value *korrekte x-waarde*<br>✓ answer / *antwoord* | (2) |
| | 5.1.2 | $\cos(90^\circ - \theta) = \sin\theta$<br>$= \frac{4}{5}$ | ✓ $\sin\theta$<br>✓ answer / *antwoord* | (2) |
| | 5.1.3 | $\sin 2\theta = \frac{b}{25}$<br>$2\sin\theta\cos\theta = \frac{b}{25}$<br>$2\left(\frac{4}{5}\right)\left(-\frac{3}{5}\right) = \frac{b}{25}$<br>$b = -24$ ✓b<br>$a = \sqrt{(25)^2 - (-24)^2} = 7$ ✓a<br>$\therefore S(7;-24)$ | ✓ correct ratio *korrekte verhouding*<br>✓ identity / *identiteit*<br>✓ correct substitution *korrekte vervanging*<br>✓ value of $b$ / *waarde van b*<br>✓ value of $a$ / *waarde van a* | (5) |
| 5.2 | | $\frac{\cos(\theta - 360^\circ).\sin(180^\circ + \theta)}{\cos^2\theta + \sin\theta\cos(90^\circ + \theta) + \sin^2\theta}$<br>$= \frac{(\cos\theta)(-\sin\theta)}{1 + \sin\theta(-\sin\theta)}$<br>$= -\frac{\sin\theta\cos\theta}{1 - \sin^2\theta}$<br>$= -\frac{\sin\theta\cos\theta}{\cos^2\theta}$<br>$= -\tan\theta$ | ✓ $\cos\theta$<br>✓ $-\sin\theta$<br>✓ $\sin^2\theta + \cos^2\theta = 1$<br>✓ $-\sin\theta$<br>✓ $\cos^2\theta$<br>✓ answer / *antwoord* | (6) |
| | | | | [15] |

$a = -7$

* see pg 10.1.



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## QUESTION/VRAAG 6

| | | | |
|---|---|---|---|
| 6.1.1 | LHS/$LK$ $= \frac{16\sin^2 A.\cos A}{2\sin^3 A - \sin 2A\cos A}$<br>$= \frac{8.2\sin A.\sin A.\cos A}{2\sin^3 A - 2\sin A.\cos A.\cos A}$<br>$= \frac{8\sin A.\sin 2A}{2\sin A(\sin^2 A - \cos^2 A)}$<br>$= \frac{4\sin 2A}{-\cos 2A}$<br>$= -4\tan 2A$ = RHS | ✓ $2\sin A\cos A$<br>✓ $\sin 2A$<br>✓ common factor *gemene faktor*<br>✓ $-\cos 2A$ | (4) |
| * 6.1.2 | $A \in [-90^\circ; 90^\circ]$; $A \neq \pm 45^\circ$; $0^\circ$ | any two | (2) |
| 6.2 | $\sin(30^\circ - 2x) = -\sin^2 x + \cos^2 x$<br>$\sin(30^\circ - 2x) = \cos 2x$<br>$\sin 30^\circ\cos 2x - \sin 2x\cos 30^\circ = \cos 2x$<br>$\frac{1}{2}\cos 2x - \frac{\sqrt{3}}{2}\sin 2x - \cos 2x = 0$<br>$-\frac{1}{2}\cos 2x - \frac{\sqrt{3}}{2}\sin 2x = 0$<br>$\frac{\sqrt{3}}{2}\sin 2x = -\frac{1}{2}\cos 2x$<br>$\tan 2x = -\frac{1}{\sqrt{3}}$<br>$2x = 150^\circ + 180^\circ.k$<br>$x = 75^\circ + 90^\circ k$ ; $k \in Z$ | ✓ $\cos 2x$<br>✓ expansion / *uitbreiding*<br>✓ simplification *vereenvoudiging*<br>✓ equating / *gelykstel*<br>✓ $\tan 2x = -\frac{1}{\sqrt{3}}$<br>✓ $2x = 150^\circ + 180^\circ.k,\ k \in Z$<br>✓ $x = 75^\circ + 90^\circ k$ | (7) |
| | | | [13] |

$c^2 - 5^2$

* see pg 10.2.

* see pg 10.3.



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OR

5.2. $$\frac{\cos(\theta - 360^\circ).\sin(180^\circ + \theta)}{\cos^2\theta + \sin\theta\cos(90^\circ + \theta) + \sin^2\theta}$$

$$= \frac{(\cos\theta)(-\sin\theta)}{\cos^2\theta + \sin\theta(-\sin\theta) + \sin^2\theta}$$

$$= \frac{-\sin\theta\cos\theta}{\cos^2\theta - \sin^2\theta + \sin^2\theta}$$

$$= \frac{-\sin\theta\cos\theta}{\cos^2\theta}$$

$$= -\frac{\sin\theta}{\cos\theta}$$

$$= -\tan\theta$$

6

6.1 2. ID is undefined when :

- $\tan 2A = UD$
  $2A = M$
  $\tan M = UD$
  $\frac{\sin M}{\cos M} = UD$
  $\cos M = 0$
  $M = 90° + k180°$
  $2A =$
  $A = 45° + k90°; k \in \mathbb{Z}$

$\therefore x = -45°; 45°$

or $2\sin^3 A - \sin 2A \cos A = 0$
$2\sin A(-\cos 2A) = 0$
$\sin A . \cos 2A = 0$

- $\sin A = 0$
  $A = k.180°; k \in \mathbb{Z}$
  $\therefore x = 0°$

- $\cos 2A = 0$
  done

$\therefore A \in [-90°; 90°]; A \neq \pm 45°; 0°$ →

OR

6.2. $\sin(30° - 2x) = -\sin^2 x + \cos^2 x$

$= \cos 2x$ ✓

$A = 30° - 2x \quad B = 2x$

$\sin A = \cos B$

can "split as coeff of sin & cos are $\pm 1$

$\sin(90° - B)$ $\quad$ $\sin(90° + B)$

I $\quad$ II

$\sin A = \sin(90° - B)$ or $\sin A = \sin(90° + B)$

$A = 90° - B + k.360°$ $\quad$ $A = 90° + B + k.360°$

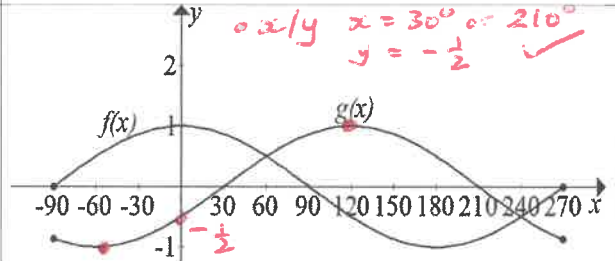
$30° - 2x = 90° - 2x + k.360°$ $\quad$ $30° - 2x = 90° + 2x + k360°$

$0 = 60° + k.360°$ $\quad$ $-4x = 60° + k.360°$

✓ no soln $\quad$ $x = -15° - k.90°; k \in \mathbb{Z}$

(7)

**QUESTION/*VRAAG 7***

| | | | |
|---|---|---|---|
| 7.1 | $-3 \le y \le -1$ | ✓ correct critical values *korrekte kritieke waardes*<br>✓ correct notation *korrekte notasie* | (2) |
| 7.2 |  • x/y $x = 30^0$ or $210^0$ $y = -\frac{1}{2}$ • tp $(-60^0; -1)$ $(120^0; 1)$ • shape | ✓ intercepts with the axes *afsnitte met die asse*<br>✓ turning points *draaipunte*<br>✓ shape / *vorm* | (3) |
| 7.3.1 | $x = -60^0$ and/*en* $x = 0^0$ | ✓✓ each $x$-value *elke x-waarde* | (2) |
| 7.3.2 | $2 - 4\cos^2\frac{1}{2}x = \sqrt{3}\sin x - \cos x$<br>$-2\left(2\cos^2\frac{1}{2}x - 1\right) = \sqrt{3}\sin x - \cos x$<br>$\cos x = -\frac{\sqrt{3}}{2}\sin x + \frac{1}{2}\cos x$<br>$\frac{\sqrt{3}}{2}\sin x = \frac{1}{2}\cos x - \cos x$<br>$\frac{\sqrt{3}}{2}\sin x = -\frac{1}{2}\cos x$<br>$\tan x = \frac{-1}{\sqrt{3}}$ Ref $= 30^0$ tan − in<br>II: $x = 150^0 + k180^0$; $k \in \mathbb{Z}$<br>$\therefore x = -30^0$ or $150^0$ | | (4) |
| 7.3.3 | $-10^0 < x < 170^0$ A | ✓✓ answer / *antwoord* | (2) |
| | | | [13] |

* See pgs 11.1 and 11.2.



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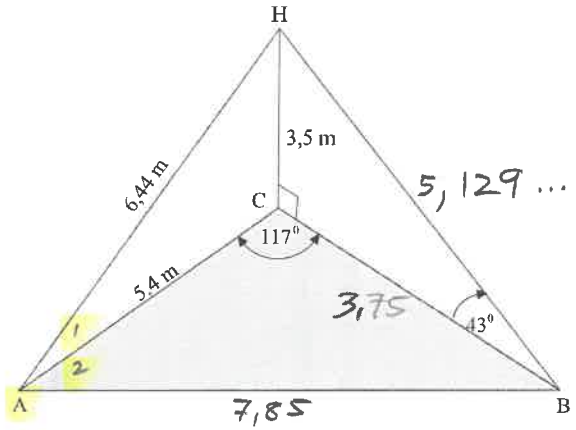
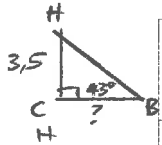
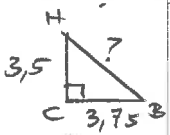
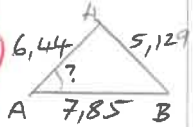
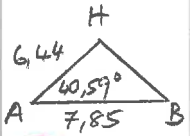
**QUESTION/*VRAAG 8***




| | | | |
|---|---|---|---|
| 8.1 | $\tan 43^0 = \frac{3,5}{BC}$<br>$BC = 3.75$ | ✓ correct substitution *korrekte vervanging*<br>✓ BC | (2) |
| 8.2 | $HB = \sqrt{(3,75)^2 + (3,5)^2}$ [*Pyth Thm / Stelling*]<br>$= 5,129\ldots$ 5,13...<br>$HB^2 = AH^2 + AB^2 - 2.AH.AB.\cos H\hat{A}B$<br>$(5,12\ldots)^2 = (6,44)^2 + (7,85)^2 - 2(6,44)(7,85)\cos A$<br>$\cos A = 0,759$ 0,751 ...<br>$H\hat{A}B = 40,59^0$ $40,61^0$<br>$H\hat{A}B \neq \hat{A}_1 + \hat{A}_2$ !!! 58,...° xxx | ✓ HB<br>✓ correct application of cosine rule *korrekte toepassing van kosinusreël*<br>✓ correct substitution *korrekte vervanging*<br>✓ correct ratio of cos A *korrekte verhouding van* cos A<br>✓ answer / *antwoord* | (5) |
| 8.3 | Area $\Delta HAB = \frac{1}{2} \times AH \times AB \times \sin 40,59^0$<br>$= \frac{1}{2} \times 6,44 \times 7,85 \times \sin(40,59^0)$<br>$= 16,45\ cm^2$ | ✓ correct application in area rule in $\Delta HAB$ *korrekte toepassing van oppervlakte-reël*<br>✓ correct substitution *korrekte vervanging*<br>✓ answer / *antwoord* | (3) |
| | | | [10] |



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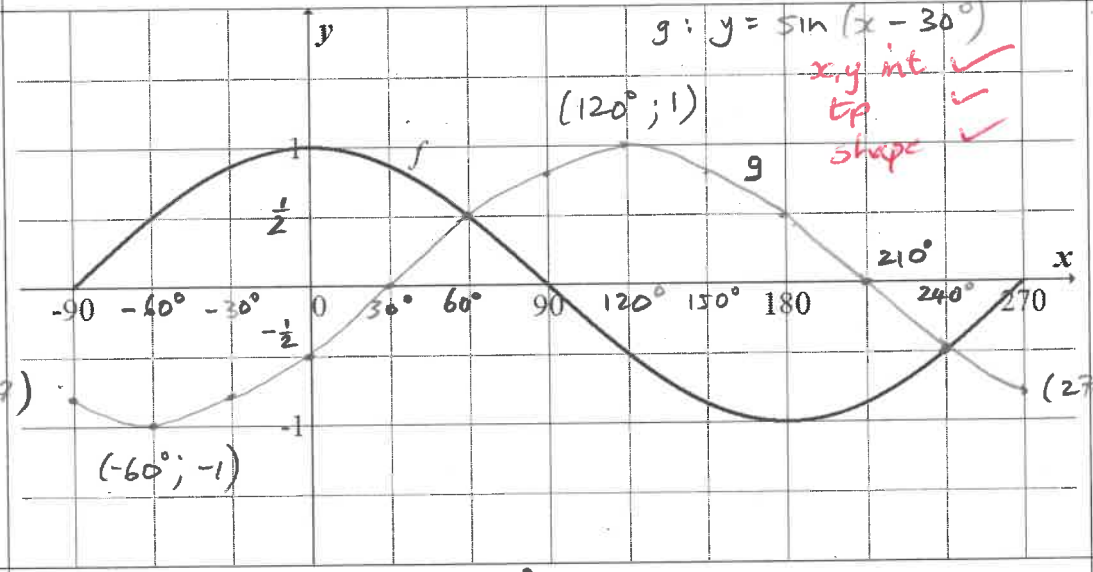
**QUESTON/*VRAAG* 7**

| | Solution/*Oplossing* | Marks/ *Punte* |
|---|---|---|
| 7.1 | $f: \quad y \in [-1; 1]$<br>$f-2: \quad y \in [-3; -1]$ ✓ ✓ int not$^n$ | 2<br>(2) |
| 7.2 |  | 3<br>(3) |
| 7.3.1 | $f(x) - g(x) = \frac{3}{2}$ ; f − g = 1,5<br>$y_f - y_g = \frac{3}{2}$ ; f − g<br>$x = -60°$ or $0°$ ✓ ✓ | 2<br>(2) |
| 7.3.2 | $2.(1 - 2\cos^2 \frac{1}{2}x) = \sqrt{3}\sin x - \cos x$<br>$-\cos x = \sin x \frac{\sqrt{3}}{2} - \cos x \frac{1}{2}$ ✓<br>$= \sin x \cos 30° - \cos x \sin 30°$<br>$= \sin(x - 30°)$ ✓<br>$\therefore \quad -y_f = y_g$ refl $y_f$ x axis<br>$\therefore x = -30°$ or $150°$ ✓ ✓ | 4<br>(4) |
| 7.3.3 | $f'(x) < 0 \quad x \in (0°; 180°)$<br>$f'(x + 10°)$ f 10 ← $\therefore x \in (-10°; 170°)$ ✓✓ | 2<br>(2) |
| | | [13] |



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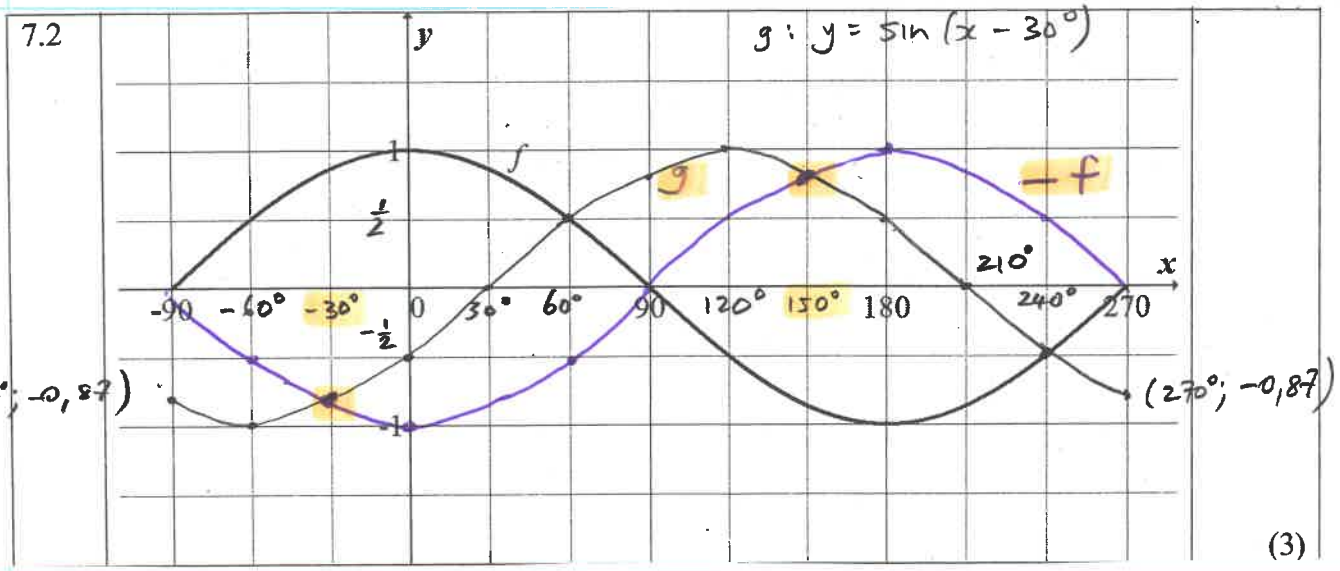
7.2




(3)

7.3.2

$2.(1-2\cos^2\frac{1}{2}x) = \sqrt{3}\sin x - \cos x$

$-\cos x = \sin x \frac{\sqrt{3}}{2} - \cos x \frac{1}{2}$

$= \sin x \cos 30° - \cos x \sin 30°$

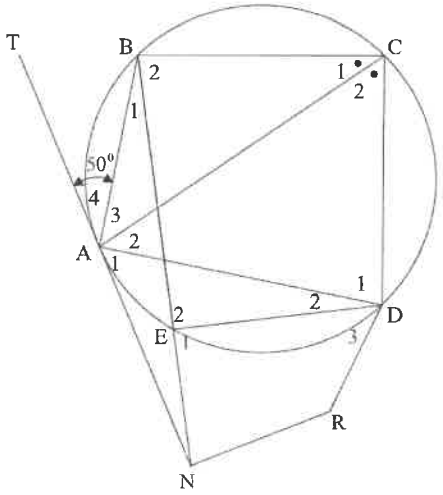
$= \sin(x - 30°)$

$\therefore -y_f = y_g$ refl $y_f$ x axis

$\therefore x = -30°$ or $150°$

(4)

**QUESTION/*VRAAG 9***




| | | | |
|---|---|---|---|
| 9.1 | $\hat{C}_1 = \hat{A}_4 = 50^0$ [tan chord theo] / [*raaklyn – koord stelling*]<br>$\hat{C}_2 = \hat{C}_1 = 50^0$ [given] / [*gegee*]<br>$\hat{A}_1 = \hat{C}_2 = 50^0$ [tan chord theo] / [*raaklyn – koord stelling*] | ✓ S ✓ R<br>✓ S<br>✓ S/R | (4) |
| 9.2 | $\hat{E}_1 = \hat{C} = 100^0$ [ext ∠ of a cyclic quad]/[*buite ∠ van koordevh*]<br>$A_1 = 50^0$ [9.1.]<br>$\therefore \hat{E}_1 = 2\hat{A}_1 = 100^0$<br>∴E is the centre of the *circle* passing through A, N, R and D<br>possibly, not definitely! | ✓ S ✓ R<br>✓S<br>✓ S<br>$\hat{E}_1 = 2\hat{A}_1 = 100^0$ | (4) |
| 9.3 | $\hat{R} = 130^0$ [opp ∠s of a cyclic quad] / [*teenoorst. ∠e van koordevh*] | ✓ S R ✓ | (2) |
| 9.4 | Chords subt. = ∠s / *Koorde onderspan = ∠e* | ✓ R | (1) |
| | | | [11] |

• see pgs 13.1./2

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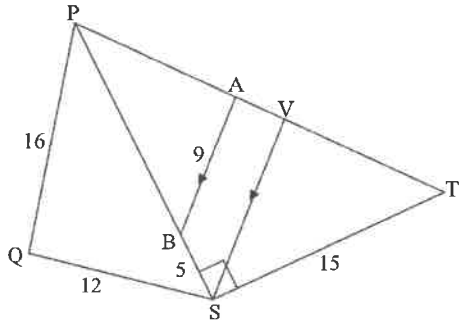
**QUESTION/*VRAAG 10***




| | | | |
|---|---|---|---|
| 10.1 | $\frac{PB}{BS} = \frac{PA}{AV}$ [*line ‖ to one side of a Δ*]/[*lyn ‖ aan een sy van Δ*]<br>$\frac{PB}{5} = \frac{3}{1}$<br>$PB = 15$<br>**OR/*OF***<br>$\frac{PS}{BS} = \frac{PV}{AV}$ [*line ‖ to one side of a Δ*]/[*lyn ‖ aan een sy van Δ*]<br>$\frac{PS}{5} = \frac{4}{1}$<br>$PS = 20$<br>$\therefore PB = 15$<br>**OR/*OF***<br>$\frac{PB}{PS} = \frac{PA}{PV}$ [line ‖ to one side of a Δ]/[*lyn ‖ aan een sy van Δ*]<br>$\frac{PB}{PB+5} = \frac{3}{4}$<br>$4PB = 3PB + 15$<br>$PB = 15$ | ✓ S ✓ R<br>✓ PB<br>**OR/*OF***<br>✓ S ✓ R<br>✓ PB<br>**OR/*OF***<br>✓ S ✓ R<br>✓ PB | (3) |

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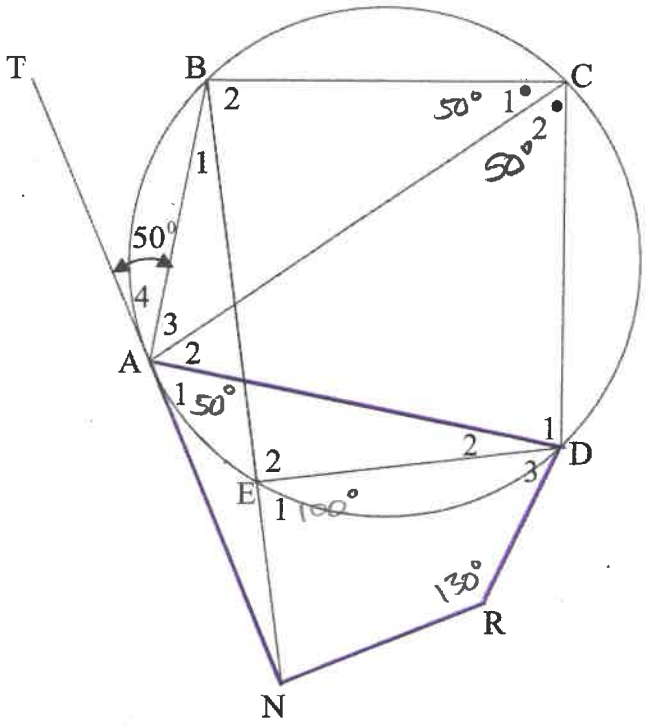
**QUESTION/*VRAAG* 9**




| | Solution/*Oplossing* | Marks/ *Punte* |
|---|---|---|
| 9.1 | $\hat{C}_1 = 50°$ ✓S ✓R tan chord thm<br>$\hat{E}_2 = 50$ ✓S given<br>$\hat{A}_1 = 50°$ ✓SR tan chord thm | 4<br>(4) |
| 9.2 | $\hat{E}_1 = 100°$ ✓S ✓R ext ∠ cyclic quad<br>$\hat{A}_1 = 50°$ ✓S (9.1)<br>$\therefore \hat{E}_1 = 2.\hat{A}_1$ ✓S<br>NB It is actually not possible to conclude that $\hat{E}$ is definitely the centre of ⊙ADRN! | 4<br>(4) |

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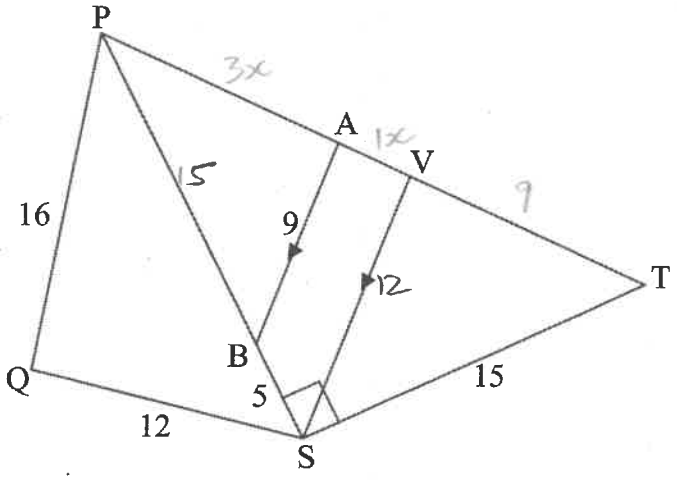
| | | |
|---|---|---|
| 9.3 | $\hat{R} = 130°$ ✓S ✓R opp ^'s cyclic quad<br>$= 180°$ | (2) |
| 9.4 | AB = AD ✓R = ^'s = chords | (1) |
| | NB This reason is not in the exam guidelines, but is always true! | [11] |

**QUESTION/*VRAAG* 10**




| | Solution/*Oplossing* | Marks/ *Punte* |
|---|---|---|
| 10.1 | $\frac{PB}{BS} = \frac{PA}{AV}$ ✓S ✓R line ∥ one side of Δ | 3 |
| | $\frac{PB}{5} = \frac{3x}{1x}$ | |
| | $PB = 15$ ✓ | |
| | | (3) |
| 10.2 | $\frac{PA}{PV} = \frac{AB}{VS} = \frac{BP}{SP}$ ✓R ΔPAB ||| ΔPVS | 6 |
| | $\frac{PA}{PV} = \frac{AB}{VS}$ ✓S | |
| | $\frac{3x}{4x} = \frac{9}{VS}$ ✓sub | |
| | $\therefore 3VS = 36$ | |
| | $VS = 12$ ✓ | |
| | In Δ's PQS, SVT | |
| | 1. $\frac{PQ}{SV} = \frac{16}{12} = \frac{4}{3}$ | |
| | 2. $\frac{QS}{VT} = \frac{12}{9} = \frac{4}{3}$ ✓ | |
| | 3. $\frac{SP}{TS} = \frac{20}{15} = \frac{4}{3}$ | |
| | $\therefore \frac{PQ}{SV} = \frac{QS}{VT} = \frac{SP}{TS}$ all $= \frac{4}{3}$ | (6) |
| | $\therefore$ ΔPQS ||| ΔSVT sides of Δ in prop$^n$ ✓R | [9] |

| | | | |
|---|---|---|---|
| 10.2 | $\Delta PAB \mid\mid\mid \Delta PVS$<br>$\frac{PB}{PS}=\frac{AB}{VS}$ ΔPAB III ΔPVS<br>$\frac{15}{20}=\frac{9}{VS}$<br>$VS=12$<br>In $\Delta PQS$ *and* $\Delta SVT$ /<br>In $\Delta PQS$ *en* $\Delta SVT$<br>$\frac{PQ}{SV}=\frac{16}{12}=\frac{4}{3}$<br>$\frac{QS}{VT}=\frac{12}{9}=\frac{4}{3}$<br>$\frac{PS}{ST}=\frac{20}{15}=\frac{4}{3}$<br>$\therefore \Delta PQS \mid\mid\mid \Delta SVT$ sides of Δ in propn | ✓ S ✓ R<br>✓ substitution / *vervanging*<br>✓ VS<br>✓ all 3 equal ratios *al 3 gelyke verhoudings*<br>✓ R | (6) |
| | | | [9] |

• see pg 15.1.



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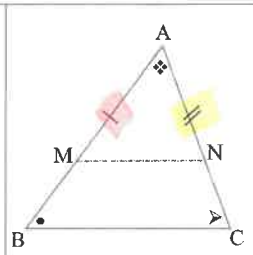
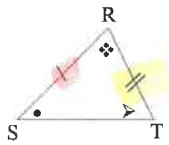
**QUESTION/*VRAAG 11***

| | | | |
|---|---|---|---|
| 11.1 |   ✓ Constr NB ≅<br>Constructions. Put point M on AB and N on AC such that AM = RS and AN = RT<br>Proof: In ΔAMN & Δ RST<br>1. AM = RS [constructions]<br>2. AN = RT [constructions]<br>3. BÂC = SR̂T [given]<br>∴ ΔAMN ≡ ΔRST [S∠S]<br>∴ AM̂N = RŜT [≡ Δs] both = RŜT<br>∴ AM̂N = B̂<br>∴ MN ‖ BC [corresp.∠s=]<br>∴ $\frac{AB}{AM}=\frac{AC}{AN}$ [line ‖ to one side of a Δ]<br>$\frac{AB}{RS}=\frac{AC}{RT}$ AM = RS, AN = RT constr<br>*Konstruksies. Plaas punt M op AB en N op AC sodat AM = RS en AN = RT*<br>*Bewys: In Δ AMN & Δ RST*<br>*1. AM = RS [konstruksie]*<br>*2. AN = RT [konstruksie]*<br>3. BÂC = SR̂T [gegee]<br>∴ ΔAMN ≡ ΔRST [S∠S]<br>∴ AM̂N = RŜT [≡ Δe]<br>∴ AM̂N = B̂<br>∴ MN ‖ BC [*ooreenk.∠s=*]<br>∴ $\frac{AB}{AM}=\frac{AC}{AN}$ [*lyn ‖ aan een sy van 'n Δ*]<br>$\frac{AB}{RS}=\frac{AC}{RT}$ | ✓ complete constructions<br>✓ all 3 statements<br>✓ R for congruency<br>✓ R for MN‖ BC<br>✓ S ✓ R<br>✓ *volledige konstruksies*<br>✓ *al 3 stellings*<br>✓ R *vir kongruensie*<br>✓R vir MN ‖ BC<br>✓ S ✓ R | (6) |



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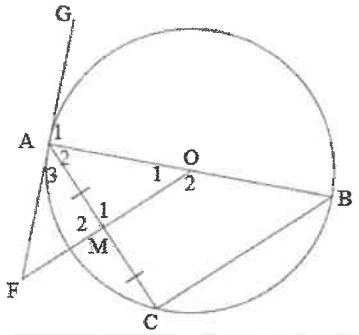
| | | | |
|---|---|---|---|
| 11.2 |  | | |
| 11.2.1 | $\hat{C} = 90^0$ [∠in semi – circle]/[∠*in semi – sirkel*]<br>$\hat{M}_1 = 90^0$ [line from centre to midpoint]<br>[*lyn vanaf die middelpunt van sirkel*]<br>FO\|\|CB [corresp. ∠s=]/[*ooreenk.* ∠*e*=] | ✓ S ✓ R<br>S / R ✓<br>✓ R | (4) |
| 11.2.2 | $\hat{M}_2 = \hat{M}_1$ [∠s on a straight line]/[∠*e op 'n reguitlyn*]<br>$\hat{M}_2 = \hat{C}$ [both / *beide* $= 90^0$]<br>$\hat{A}_3 = \hat{B}$ [tan chord theo]/[*raaklyn – koord – st*]<br>$\hat{F} = \hat{A}_2$ [3rd / 3*de* ∠]<br>ΔMAF ||| ΔCBA [∠∠∠]<br>**OR/*OF***<br>$\hat{M}_2 = \hat{M}_1$ [∠s on a straight line]/[∠*e op 'n reguitlyn*]<br>$\hat{M}_2 = \hat{C}$ [both / *beide* $= 90^0$]<br>$\hat{A}_3 = \hat{B}$ [tan chord theo]/[*raaklyn – koord – st*]<br>$\hat{F} = \hat{A}_2$ [3rd / 3*de* ∠]<br>ΔMAF ||| ΔCBA [∠∠∠] | ✓ S<br>✓ S ✓ R<br>✓ R<br>**OR/*OF***<br>✓ S<br>✓ S ✓ R<br>✓S for/*vir* 3rd/*de* ∠ | (4) |
| 11.2.3 | $\frac{MA}{CB} = \frac{MF}{AC}$ [||| Δ*s*]<br>$MA \times AC = MF \times BC$<br>$MA = \frac{1}{2}AC$ [given / *gegee*]<br>$\therefore AC \times \frac{1}{2}AC = MF \times BC$<br>$AC^2 = 2BC \times MF$<br>$AC^2 = AB^2 - BC^2$ [Pyth Thm / *Stelling*]<br>$AB^2 - BC^2 = 2BC \times MF$ | ✓ S ✓ R<br>$MA = \frac{1}{2}AC$<br>✓<br>$AC^2 = 2BC \times MF$ ✓<br>Pyth theo / stel ✓ | 5<br>(5) |
| | | | [19] |
| | | **TOTAL/*TOTAAL*:** | **150** |

• see pg 17.1./2

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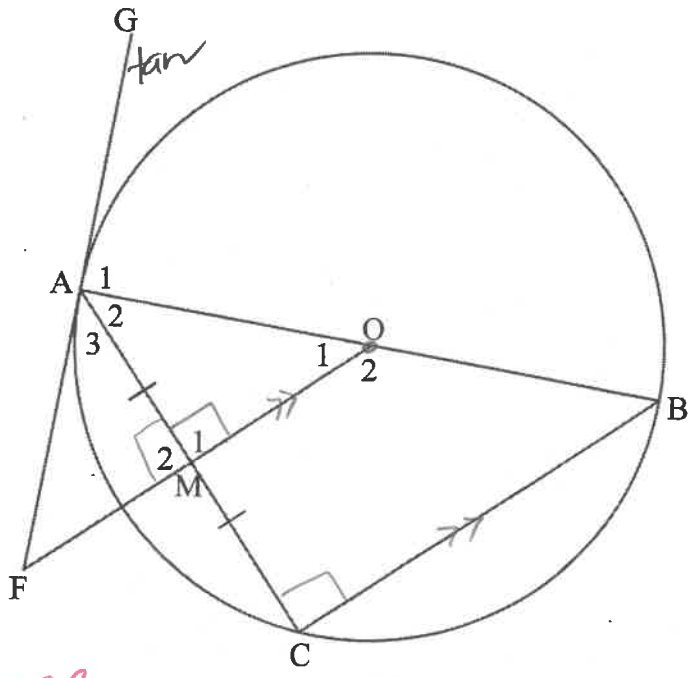


| | | | |
|---|---|---|---|
| 11.2.1 | $\hat{M}_1 = 90° = \hat{M}_2$ ✓SR | line from centre ⊙ to midpt chord | 4 |
| | $\hat{C} = 90°$ ✓S ✓R | ∠ in semi ⊙ = 90° | |
| | $\therefore \hat{M}_1 = \hat{C}$ | both = 90° | |
| | $\therefore$ FO ∥ CB ✓R | Corr ∠s = | |
| | OR | | (4) |

AM = MC — given

AO = OB — radii

$\therefore$ FMO ∥ CB — midpt thm

**11.2.2**

In $\Delta$'s $M_2A_3F$, C B $A_2$

1. $\hat{M}_2 = \hat{C}$ ✓S both $= 90°$
2. $\hat{A}_3 = \hat{B}$ ✓S ✓R tan chord thm
3. $\hat{F} = \hat{A}_2$ sum ^'s in $\Delta = 180°$

$\therefore \Delta MAF \;///\; \Delta CBA$ AAA ✓R

4 (4)

**11.2.3**

$\frac{MA}{CB} = \frac{AF}{BA} = \frac{FM}{AC}$ ✓R $\Delta MAF \;///\; \Delta CBA$

$\frac{MA}{CB} = \frac{FM}{AC}$ ✓S

$MA \cdot AC = CB \cdot FM$

$\frac{1}{2}AC \cdot AC = CB \cdot FM$ ✓S $MA = \frac{1}{2}AC$

x2: $AC^2 = 2\,CB \cdot FM$ ✓

$AB^2 - BC^2 = 2BC \cdot MF$ ✓SR Pythag

5 (5)

**[19]**

**TOTAL/*TOTAAL*: 150**