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**SA EXAM
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Proudly South African



basic education

Department:
Basic Education
REPUBLIC OF SOUTH AFRICA

NATIONAL SENIOR CERTIFICATE *NASIONALE* *SENIOR SERTIFIKAAT*

GRADE 12/*GRAAD 12*

TECHNICAL MATHEMATICS P2/*TEGNIесе WISKUNDE V2*

NOVEMBER 2025

MARKING GUIDELINES/*FINALE NASIENRIGLYNE*

MARKS/*PUNTE*: 150

| CODE/ <i>KODE</i> | EXPLANATION/ <i>VERDUIDELIKING</i> |
|----------------------|---|
| A | Accuracy/ <i>Akkuraatheid</i> |
| AO | Answer only/ <i>Slegs antwoord</i> |
| CA | Consistent accuracy/ <i>Volgehoue akkuraatheid</i> |
| I | Identity/ <i>Identiteit</i> |
| M | Method/ <i>Metode</i> |
| NPR | No penalty for rounding/ <i>Geen penalisering vir afronding nie</i> |
| NPU | No penalty for omitting units/ <i>Geen penalisering vir eenhede weggelaat nie</i> |
| R | Rounding/ <i>Afronding</i> |
| RE | Reason/ <i>Rede</i> |
| S | Simplification/ <i>Vereenvoudiging</i> |
| F | Formula/ <i>Formule</i> |
| SF | Substitution in correct formula/ <i>Vervanging in korrekte formule</i> |
| ST | Statement/ <i>Bewering</i> |
| ST/RE | Statement with reason/ <i>Bewering met rede</i> |

These marking guidelines consist of 32 pages.

Hierdie nasienriglyne bestaan uit 32 bladsye.

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NOTE:

- If a candidate answers a question TWICE, only mark the FIRST attempt.
- The method of consistent accuracy marking must be applied in all aspects of the marking guidelines where applicable as indicated by the marking code CA.
- # Shows questions where a Tolerance Range will be applied:
Q 2.1.3 ; Q 3.3 ; Q 6.5 & Q 10.2.3

LET WEL:

- *Indien 'n kandidaat 'n vraag TWEE keer beantwoord, sien slegs die EERSTE poging na.*
- *Die metode van volgehoue akkuraatheid-nasien moet waar moontlik op alle aspekte van die nasienriglyne toegepas word, soos aangedui deur die nasien kode CA.*
- *# Toon vrae waar Toleransiewydte (Verdraagsaamheidsomvang) toegepas word:
 V 2.1.3 ; V 3.3 ; V 6.5 & V 10.2.3*

QUESTION/VRAAG 1

| | | | |
|-----|--|--|-----------------------------|
| | | | |
| 1.1 | OA = 4 units/eenhede | ✓ length of /lengte van OA | A (1) |
| 1.2 | $M = \left(\frac{x_A + x_B}{2}, \frac{y_A + y_B}{2} \right)$ $= \left(\frac{0 + (-2)}{2}, \frac{-4 + (-3)}{2} \right)$ $= \left(-1; -\frac{7}{2} \right) \text{ OR / OF } (-1; -3,5)$ | ✓ x - coordinate/koördinaat ✓ y - coordinate/koördinaat | A A (2) |



| | | |
|-----|--|--|
| 1.3 | $m_{AC} = \frac{y_A - y_C}{x_A - x_C}$ $= \frac{(-4) - (2)}{(0) - (3)} \text{ OR / OF } = \frac{(2) - (-4)}{(3) - (0)}$ $= 2$ <p style="text-align: center;">OR / OF</p> $y - y_1 = m (x - x_1)$ $(-4) - (2) = m ((0) - (3))$ $-6 = m (-3)$ $m = \frac{-6}{-3} = 2$ <p style="text-align: center;">OR / OF</p> $y = mx + c$ $y = mx - 4$ $2 = m(3) - 4$ $3m = 6$ $m = 2$ | <p>✓ SF A</p> <p>✓ value of/waarde van m CA</p> <p style="text-align: center;">OR / OF</p> <p>✓ SF A</p> <p>✓ value of/waarde van m CA</p> <p style="text-align: center;">OR / OF</p> <p>✓ SF A</p> <p>✓ value of/waarde van m CA</p> <p>AO: Full marks/Volpunte</p> <p style="text-align: right;">(2)</p> |
| 1.4 | $\tan \theta = m_{AC}$ $\theta = \tan^{-1}(2)$ $\theta \approx 63,43^\circ$ | <p>✓ SF CA</p> <p>✓ value of/waarde van θ CA</p> <p>AO: Full marks/Volpunte</p> <p>NPR</p> <p style="text-align: right;">(2)</p> |
| 1.5 | equal / gelyk OR / OF the same / dieselfde | <p>✓ equal/gelyk A</p> <p style="text-align: right;">(1)</p> |
| 1.6 | $y - (-3) = 2 (x - (-2))$ $y + 3 = 2x + 4$ $y = 2x + 1$ <p style="text-align: center;">OR / OF</p> $-3 = 2(-2) + c$ $c = 4 - 3$ $c = 1$ | <p>✓ gradient/helling CA</p> <p>✓ Subst./Vervang B A</p> <p>✓ equation in form $y = \dots$ / vergelyking in vorm $y = \dots$ CA</p> <p style="text-align: right;">(3)</p> |



| | | |
|-----|---|---|
| 1.7 | $\cos \alpha = -\frac{\sqrt{2}}{2}$ <p>ref. / verw. $\angle = 45^\circ$ $\therefore \alpha = 180^\circ - 45^\circ = 135^\circ$ $\therefore m = \tan(135^\circ) = -1$</p> <p style="text-align: center;">OR / OF</p> $\cos \alpha = -\frac{\sqrt{2}}{2}$ $x^2 + y^2 = r^2$ $(-\sqrt{2})^2 + y^2 = (2)^2$ $y^2 = 4 - 2$ $y^2 = \pm\sqrt{2}$ $\therefore y = \sqrt{2}$ $\tan \alpha = \frac{\sqrt{2}}{-\sqrt{2}}$ $\tan \alpha = -1$ $\therefore m = -1$ | <p>✓ Ref. \angle / Verwys. \angle A ✓ value of/waarde van α CA ✓ value of/waarde van m A</p> <p style="text-align: center;">OR / OF</p> <p>✓ Value of/Waarde van y A ✓ tan ratio/verhouding CA ✓ value of/waarde van m CA</p> <p style="text-align: right;">(3)</p> |
| | | [14] |



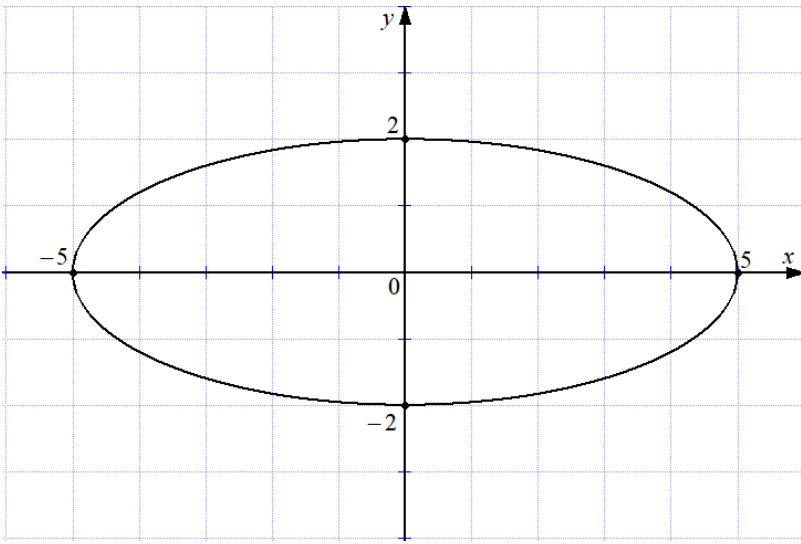
QUESTION/VRAAG 2

| | | |
|-------|---|---|
| 2.1 | | |
| 2.1.1 | $x^2 + y^2 = (13)^2$ OR / OF $x^2 + y^2 = 169$ OR / OF $x = \pm \sqrt{169 - y^2}$ OR / OF $y = \pm \sqrt{169 - x^2}$ OR / OF $(13)^2 + (0)^2 = r^2$ $169 = r^2$ $x^2 + y^2 = 169$ | ✓✓ equation/vergeljking A OR / OF ✓✓ equation/vergeljking A OR / OF ✓✓ equation/vergeljking A OR / OF ✓✓ equation/vergeljking A OR / OF ✓ substitution/vervangings A ✓ equation/vergeljking A AO: Full marks/Volpunte (2) |
| 2.1.2 | $(-5)^2 + (k)^2 = 169$ $\therefore k^2 = 144$ $\therefore k = -12$ | ✓ substitution/vervangings CA ✓ value of/waarde van k CA AO: Full marks/Volpunte (2) |



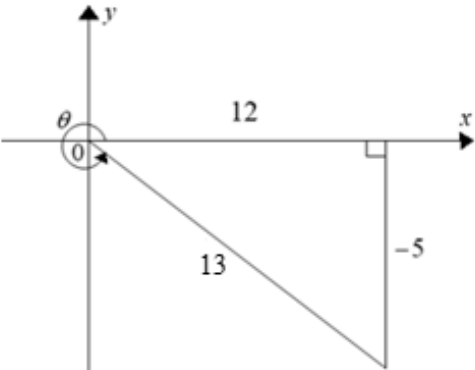
| | | |
|------------|---|---|
| 2.1.3 # | <p>Since / Omdat M(13 ; y)</p> $m_{ON} = \frac{12}{5}$ $m_{MN} = -\frac{5}{12}$ $y - (-12) = -\frac{5}{12}(x - (-5)) \text{ OR / OF } -12 = -\frac{5}{12}(-5) + c$ $y = -\frac{5}{12}x - \frac{25}{12} - 12 \qquad c = -\frac{25}{12} - 12 = -\frac{169}{12}$ $\therefore y = -\frac{5}{12}x - \frac{169}{12}$ $\therefore y = -\frac{5}{12}(13) - \frac{169}{12}$ $\therefore y = -\frac{39}{2} = -19,5$ $\therefore M(13; -19,5)$ | <p>✓ value of/waarde van x A</p> <p>✓ gradient/gradjënt of/van ON CA</p> <p>✓ gradient/gradjënt of/van MN CA</p> <p>✓ equation/vergelyking CA</p> <p>✓ value of/waarde van y CA</p> |
| | <p style="text-align: center;">OR / OF</p> <p>Since / Omdat M(13 ; y)</p> $x \cdot x_1 + y \cdot y_1 = r^2$ $-5x - 12y = 169$ $-12y = 5x + 169$ $\therefore y = -\frac{5}{12}x - \frac{169}{12}$ $\therefore y = -\frac{5}{12}(13) - \frac{169}{12}$ $\therefore y = -\frac{39}{2} = -19,5$ $\therefore M(13; -19,5)$ | <p style="text-align: center;">OR / OF</p> <p>✓ value of/waarde van x A</p> <p>✓ F A</p> <p>✓ subst/vervang CA</p> <p>✓ equation/vergelyking CA</p> <p>✓ value of/waarde van y CA</p> |
| | <p style="text-align: center;">OR / OF</p> <p>Since / Omdat M(13 ; y)</p> <p>and/en $d_{LM} = d_{NM}$ (tangents from same pt. / Raaklyne vanuit dies pt)</p> $\sqrt{(13 - (-5))^2 + (y - (-12))^2} = y$ $(13 - (-5))^2 + (y - (-12))^2 = y^2$ $324 + y^2 + 24y + 144 = y^2$ $24y = -468$ $y = -\frac{39}{2} = -19,5$ $M(13; -19,5)$ | <p style="text-align: center;">OR / OF</p> <p>✓ value of/waarde van x A</p> <p>✓ statement/bewering A</p> <p>✓ subst/vervang CA</p> <p>✓ squaring both sides / kwadreer beide kante CA</p> <p>✓ value of/waarde van y CA</p> |



| | | |
|--------------------|--|--|
| <p>2.2</p> |  | <ul style="list-style-type: none"> ✓ x-intercept/afsnit A ✓ y-intercept/afsnit A ✓ elliptical shape/ elliptiese vorm A <p style="text-align: right;">(3)</p> <p>ACCEPT/AANVAAR: $\sqrt{25}$ and / en $-\sqrt{25}$ $\sqrt{4}$ and / en $-\sqrt{4}$</p> |
| <p>[12]</p> | | |



QUESTION/VRAAG 3

| | | |
|-------|---|--|
| 3.1 | $\sqrt{\sin B + \sec A}$ $= \sqrt{\sin 30,5^\circ + \sec 72^\circ}$ $= \sqrt{\sin 30,5^\circ + \frac{1}{\cos 72^\circ}}$ $\approx 1,93$ | ✓ substitution/ <i>vervanging</i> A ✓ I A ✓ S CA NPR AO: Full marks/Volpunte (3) |
| 3.2.1 |  $\sin \theta = -\frac{5}{13}$ $x^2 + (-5)^2 = (13)^2$ $x = 12$ $\cos \theta = \frac{12}{13}$ <p style="text-align: center;">OR / OF</p> $\cos \theta = \sqrt{1 - \sin^2 \theta}$ $= \sqrt{1 - \left(\frac{-5}{13}\right)^2}$ $= \frac{12}{13}$ | ✓ Pyth. Theorem/ <i>Stelling</i> A ✓ value of/ <i>waarde van x</i> CA ✓ ratio/ <i>verhouding</i> CA <p style="text-align: center;">OR / OF</p> ✓ I A ✓ ratio of/ <i>verhouding van sin</i> A ✓ ratio/ <i>verhouding</i> CA (3) |
| 3.2.2 | $\cot \theta - \operatorname{cosec} \theta$ $= \left(-\frac{12}{5}\right) - \left(-\frac{13}{5}\right)$ $= \frac{1}{5}$ | ✓ cot ratio/ <i>verhouding</i> CA ✓ cosec ratio/ <i>verhouding</i> A ✓ S CA ACCEPT/AANVAAR: Correct decimal values./ <i>Korrekte desimale waardes.</i> (3) |



| | | |
|----------|--|--|
| 3.3 # | $\cot x = -0,587$ $\tan x = -\frac{1}{0,587}$ OR / OF $\tan x = -1,704$ Ref. $\angle \approx 59,59^\circ$ $x \approx 180^\circ - 59,59^\circ$ or/of $x \approx 360^\circ - 59,59^\circ$ $x \approx 120,41^\circ$ or/of $x \approx 300,41^\circ$ | \checkmark tan ratio/ <i>verhouding</i> A \checkmark ref. angle/ <i>verw. hoek</i> CA \checkmark value of/ <i>waarde van</i> x CA \checkmark value of <i>waarde van</i> x CA (4) |
| | | [13] |



QUESTION/VRAAG 4

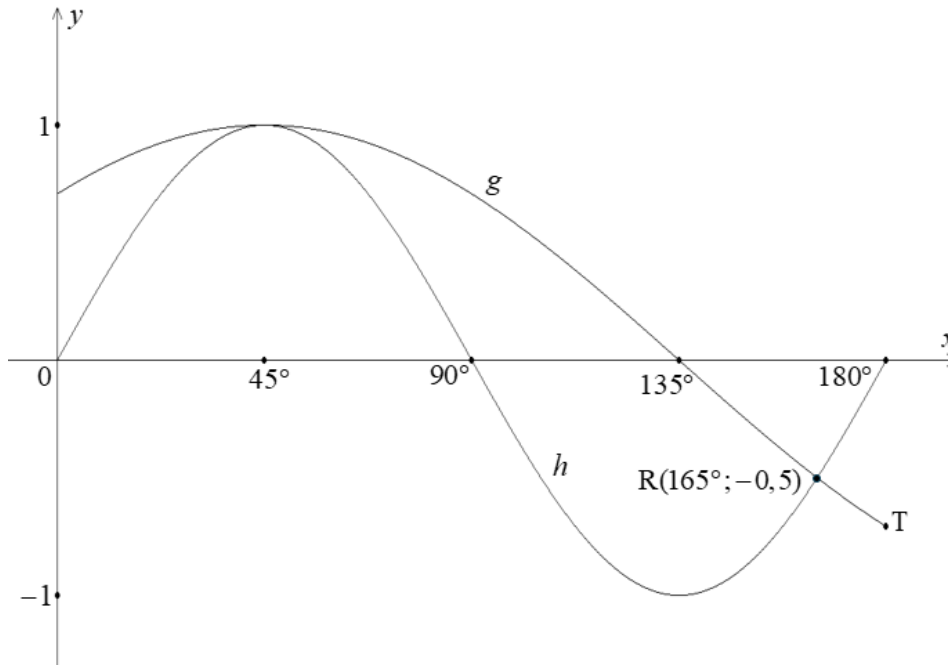
| | | | |
|-------|---|---|-----------------|
| 4.1.1 | $\tan x$ | ✓ reduction/ <i>reduksie</i> | A (1) |
| 4.1.2 | $\frac{\cos x}{\sin x}$ | ✓ I | A (1) |
| 4.1.3 | $\{ 0^\circ ; 90^\circ ; 180^\circ ; 270^\circ ; 360^\circ \}$ | ✓✓ any two values/ <i>enige twee</i> waardes | A (2) |
| 4.1.4 | $\frac{\sin(180^\circ + x) \cdot \sin(360^\circ - x) + \cos(2\pi - x) \cdot \cos x}{\sin x} + \frac{1}{\tan(180^\circ + x)}$ $= \frac{-\sin x \cdot -\sin x + \cos x \cdot \cos x}{\sin x} + \frac{1}{\tan x}$ $= \frac{\sin^2 x + \cos^2 x}{\sin x} + \frac{\cos x}{\sin x}$ $= \frac{1}{\sin x} + \frac{\cos x}{\sin x}$ $= \frac{1 + \cos x}{\sin x} \text{ OR / OF } = \operatorname{cosec} x + \cot x$ | ✓ $-\sin x$ A ✓ $-\sin x$ A ✓ $\cos x$ A ✓ I (1) A ✓ S CA (5) | |
| 4.2.1 | $\sin \theta (1 - \cos \theta)$ | ✓ factors/ <i>faktore</i> | A (1) |



| | | |
|-------|---|---|
| 4.2.2 | $\begin{aligned} \text{LHS} &= \frac{\sin \theta - \cos \theta \cdot \sin \theta}{\cos \theta - (1 - \sin^2 \theta)} \\ &= \frac{\sin \theta(1 - \cos \theta)}{\cos \theta - \cos^2 \theta} \\ &= \frac{\sin \theta(1 - \cos \theta)}{\cos \theta(1 - \cos \theta)} \\ &= \frac{\sin \theta}{\cos \theta} \\ &= \tan \theta = \text{RHS} \end{aligned}$ <p style="text-align: center;">OR / OF</p> $\begin{aligned} \text{LHS} &= \frac{\sin \theta - \cos \theta \cdot \sin \theta}{\cos \theta - (1 - \sin^2 \theta)} \\ &= \frac{\sin \theta - \cos \theta \cdot \sin \theta}{\cos \theta - 1 + \sin^2 \theta} \\ &= \frac{\sin \theta(1 - \cos \theta)}{\cos \theta - 1 + 1 - \cos^2 \theta} \\ &= \frac{\sin \theta(1 - \cos \theta)}{\cos \theta(1 - \cos \theta)} \\ &= \frac{\sin \theta}{\cos \theta} \\ &= \tan \theta = \text{RHS} \end{aligned}$ | $\checkmark \mathbf{I}(\cos^2 \theta) \quad \mathbf{A}$ \checkmark common fact/ gemeensk. fakt \mathbf{A} $\checkmark \mathbf{S} \quad \mathbf{A}$ <p style="text-align: center;">OR / OF</p> $\checkmark \mathbf{I}(1 - \cos^2 \theta) \quad \mathbf{A}$ \checkmark common fact/ gemeensk. fakt \mathbf{A} $\checkmark \mathbf{S} \quad \mathbf{A}$ (3) |
| | | [13] |



QUESTION/VRAAG 5



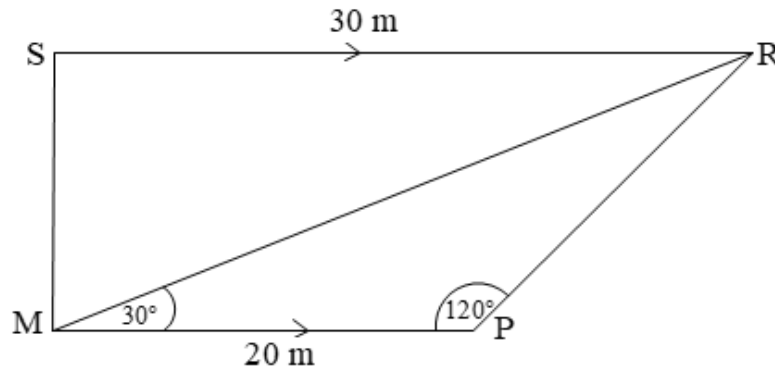
| | | |
|-------|---|---|
| 5.1 | $m = 2$ and / en $p = 45^\circ$ | ✓ value of/waarde van p A ✓ value of/waarde van m A (2) |
| 5.2 | 180° | ✓ period/periode A (1) |
| 5.3 | 1 | ✓ value/waarde A (1) |
| 5.4.1 | $165^\circ < x \leq 180^\circ$ OR / OF $x \in (165^\circ ; 180^\circ]$ OR / OF $x > 165^\circ$ and / en $x \leq 180^\circ$ OR / OF Greater than 165° and smaller or equal to 180° . / Groter as 165° en kleiner of gelyk aan 180° . | ✓ endpoints/eindpunte A ✓ notation/notasie A OR / OF ✓ endpoints/eindpunte A ✓ notation/notasie A OR / OF ✓ endpoints/eindpunte A ✓ notation/notasie A OR / OF ✓ endpoints/eindpunte A ✓ Correct interval/Korrekte interval A (2) |



| | | |
|-------|--|---|
| 5.4.2 | $0^\circ \leq x \leq 90^\circ$ $135^\circ \leq x \leq 180^\circ$ <p style="text-align: center;">OR / OF</p> $x \in [0^\circ ; 90^\circ]$ or / of $x \in [135^\circ ; 180^\circ]$ <p style="text-align: center;">OR / OF</p> $x \geq 0^\circ$ and / en $x \leq 90^\circ$ or / of $x \geq 135^\circ$ and / en $x \leq 180^\circ$ <p style="text-align: center;">OR / OF</p> From 0° to 90° / Vanaf 0° tot by 90° or / of From 135° to 180° / Vanaf 135° tot by 180° | ✓ critical values/ kritiese waardes A ✓ notation/ notasie A ✓ critical values/ kritiese waardes A ✓ notation/ notasie A <p style="text-align: center;">OR / OF</p> ✓ critical values/ kritiese waardes A ✓ notation/ notasie A ✓ critical values/ kritiese waardes A ✓ notation/ notasie A <p style="text-align: center;">OR / OF</p> ✓ critical values/ kritiese waardes A ✓ notation/ notasie A ✓ critical values/ kritiese waardes A ✓ notation/ notasie A <p style="text-align: center;">OR / OF</p> ✓ endpoints/ eindpunte A ✓ Correct interval/ Regte interval A ✓ endpoints/ eindpunte A ✓ Correct interval/ Regte interval A (4) |
| 5.5 | $h(x) = \sin 2x - 1$ <p style="text-align: center;">OR / OF</p> $h(x) = \sin mx - 1$ | ✓ $\sin 2x - 1$ CA <p style="text-align: center;">OR / OF</p> ✓ $\sin mx - 1$ A (1) |
| | | [11] |



QUESTION/VRAAG 6

**NOTE:**

If an angle of 90° is assumed – **BREAKDOWN**, hence no marks may be awarded.

NOTA:

Indien 'n hoek van 90° aangeneem word = **AFBREEK**, vervolgens mag geen punte toegeken word nie.

| | | |
|-----|--|---|
| 6.1 | $\hat{M}R P = 180^\circ - 120^\circ - 30^\circ$ $= 30^\circ$ | ✓ size of/grootte van $\hat{M}R P$ A (1) |
| 6.2 | Isosceles triangle/Gelykbenige driehoek OR / OF Obtuse angled triangle/Stomphoekige driehoek | ✓ isosceles/gelykbenig A OR / OF ✓ obtuse angled/Stomphoekig A (1) |
| 6.3 | $\frac{MR}{\sin P} = \frac{MP}{\sin \hat{M}R P}$ $\frac{MR}{\sin 120^\circ} = \frac{20}{\sin 30^\circ}$ $MR = \frac{20 \sin 120^\circ}{\sin 30^\circ}$ $MR = 20\sqrt{3} \text{ units} \approx 34,64 \text{ units}$ <p style="text-align: center;">OR / OF</p> $MP = PR = 20\text{m}$ $MR = \sqrt{(20)^2 + (20)^2 - 2(20)(20)\cos 120^\circ}$ $= 20\sqrt{3} \text{ units} \approx 34,64 \text{ units}$ | ✓ sine rule/sinusreël A ✓ Subst. / Vervang. CA ✓ length of/lengte van MR CA OR / OF ✓ length / lengte PR A ✓ Subst. into / Vervang. in cosine rule/cosinusreël CA ✓ length / lengte MR CA (3) |



| | | |
|----------|--|---|
| 6.4 | $\hat{MRS} = 30^\circ$ (alt. \angle s/verw. \angle e; $SR \parallel MP$) | ✓ ST A ✓ RE A (2) |
| 6.5 # | $SM^2 = SR^2 + MR^2 - 2SR \cdot MR \cos \hat{MRS}$ $SM^2 = (30)^2 + (20\sqrt{3})^2 - 2(30)(20\sqrt{3})\cos 30^\circ$ $= 300$ $SM = 10\sqrt{3} \approx 17,32$ $SM^2 + SR^2 = (10\sqrt{3})^2 + (30)^2$ $= 1200$ $MR^2 = (20\sqrt{3})^2$ $= 1200$ $\therefore SM^2 + SR^2 = MR^2$ $\therefore \Delta MRS \text{ is a right-angled triangle}$ $\therefore \Delta MRS \text{ is 'n reghoekige driehoek}$ <p style="text-align: center;">OR / OF</p> $SM^2 = SR^2 + MR^2 - 2SR \cdot MR \cos \hat{MRS}$ $SM^2 = (30)^2 + (20\sqrt{3})^2 - 2(30)(20\sqrt{3})\cos 30^\circ$ $= 300$ $SM = 10\sqrt{3} \approx 17,32$ $\cos \hat{S} = \frac{(10\sqrt{3})^2 + (30)^2 - (20\sqrt{3})^2}{2(10\sqrt{3})(30)}$ $\hat{S} = \cos^{-1}\left(\frac{0}{600\sqrt{3}}\right)$ $\hat{S} = 90^\circ$ $\therefore \Delta MRS \text{ is a right-angled triangle}$ $\therefore \Delta MRS \text{ is 'n reghoekige driehoek}$ <p style="text-align: center;">OR / OF</p> | ✓ SF cosine rule/ <i>cosinusreël</i> CA ✓ length of/lengte van SM CA ✓ value of/waarde van $SM^2 + SR^2$ CA ✓ value of/ waarde van MR^2 CA ✓ $SM^2 + SR^2 = MR^2$ CA <p style="text-align: center;">OR / OF</p> ✓ SF cosine rule/ <i>cosinusreël</i> CA ✓ length of/lengte van SM CA ✓ SF cosine rule/ <i>cosinusreël</i> CA ✓ $\cos^{-1}\left(\frac{0}{600\sqrt{3}}\right)$ CA ✓ Size of/ grootte van \hat{S} CA <p style="text-align: center;">OR / OF</p> |

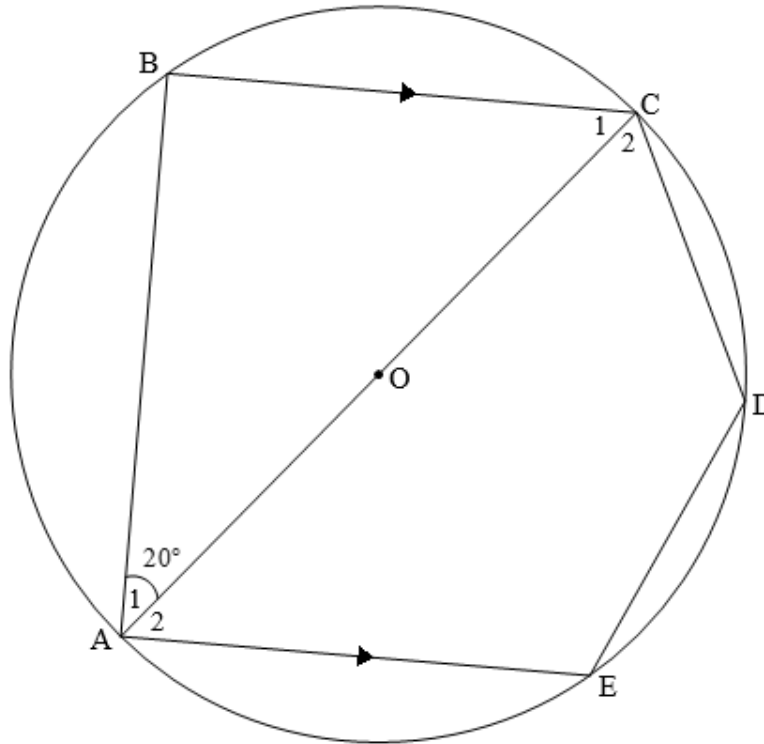


| | |
|---|---|
| $SM^2 = SR^2 + MR^2 - 2SR \cdot MR \cos \hat{M}RS$ $SM^2 = (30)^2 + (20\sqrt{3})^2 - 2(30)(20\sqrt{3})\cos 30^\circ$ $= 300$ $SM = 10\sqrt{3} \approx 17,32$ $\frac{\sin \hat{S}}{s} = \frac{\sin \hat{R}}{r}$ $\frac{\sin \hat{S}}{20\sqrt{3}} = \frac{\sin 30^\circ}{10\sqrt{3}}$ $\sin \hat{S} = 1$ $\hat{S} = \sin^{-1}(1)$ $\hat{S} = 90^\circ$ <p>$\therefore \Delta MRS$ is a right-angled triangle $\therefore \Delta MRS$ is 'n reghoekige driehoek</p> <p style="text-align: center;">OR / OF</p> $\sin 30^\circ = \frac{h}{20\sqrt{3}}$ $h = 20\sqrt{3} \cdot \sin 30^\circ$ $h = 10\sqrt{3} \approx 17,32$ $SM = \sqrt{(30)^2 + (20\sqrt{3})^2 - 2(30)(20\sqrt{3}) \cdot \cos 30^\circ}$ $SM = 10\sqrt{3} \approx 17,32$ <p>$\therefore SM =$ Perp. height/<i>loodregte hoogte</i> Therefor SMR is a right-angled triangle. / <i>Daarom is SMR 'n reghoekige driehoek.</i></p> | <p>✓ SF cosine rule/ <i>cosinusreël</i> CA</p> <p>✓ length of/<i>lengte van</i> SM CA</p> <p>✓ SF sine rule/<i>sinusreël</i> CA</p> <p>✓ $\sin^{-1}(1)$ CA</p> <p>✓ Size of/<i>grootte</i> van \hat{S} CA</p> <p style="text-align: center;">OR / OF</p> <p>✓ sine ratio/<i>verh.</i> CA</p> <p>✓ h CA</p> <p>✓ SF cosine rule/ <i>cosinusreël</i> CA</p> <p>✓ length of/<i>lengte van</i> SM CA</p> <p>✓ Conclusion/ <i>Gevolgtrekking</i> CA (5)</p> |
| | [12] |



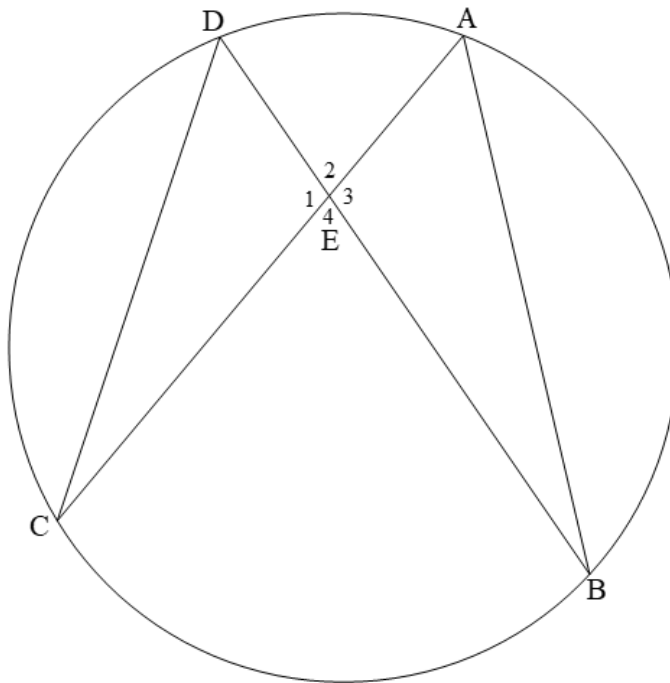
QUESTION/VRAAG 7

7.1



| | | |
|-------|--|---|
| 7.1.1 | <p>The angle subtended by the diameter at the circumference of the circle is 90°. (\angle in semi-circle) / <i>Die omtrekshoek wat deur die middellyn onderspan word, is 90°. (\angle in halwe sirkel)</i></p> <p style="text-align: center;">OR / OF</p> <p>Diameter subtends right angle. / <i>Diameter onderspan regtehoek.</i></p> | <p>✓ RE A</p> <p style="text-align: center;">OR / OF</p> <p>✓ RE A (1)</p> |
| 7.1.2 | <p>$\hat{A}_2 = 70^\circ$ (co-int \angles / ko-binne \anglee; $BC \parallel AE$)</p> <p>$\therefore \hat{D} = 110^\circ$ (opp \angles of cyclic quad / teenoorst \anglee van kdvk)</p> <p style="text-align: center;">OR / OF</p> <p>$\hat{C}_1 = 70^\circ$ (Int. \angles Δ / Binne \anglee Δ; $BC \parallel AE$)</p> <p>$\hat{A}_2 = 70^\circ$ (alt. \angles / verw. \anglee; $BC \parallel AE$)</p> <p>$\therefore \hat{D} = 110^\circ$ (opp \angles of cyclic quad / teenoorst \anglee van kdvk)</p> | <p>✓ ST A</p> <p>✓ ST CA</p> <p>✓ RE A</p> <p style="text-align: center;">OR / OF</p> <p>✓ ST A</p> <p>✓ ST CA</p> <p>✓ RE A (3)</p> |

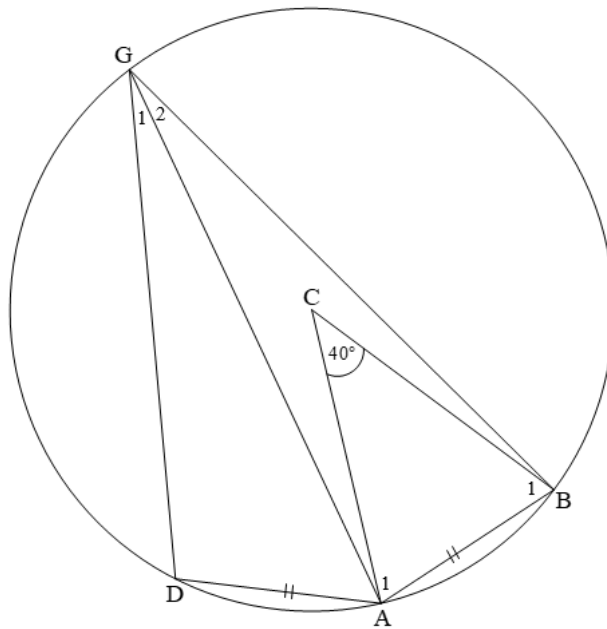
7.2



| | | | |
|-----------|--|--|---|
| 7.2.1 | equal./gelyk. OR / OF the same./dieselfde. | ✓ ST | A (1) |
| 7.2.2 (a) | ∠s in the same segment/ ∠e in dieselfde segment OR / OF ∠s subt. by same arc/chord./ ∠e onderspan deur dieselfde boog/koord. | ✓ RE OR / OF ✓ RE | A A A (1) |
| 7.2.2 (b) | Vertical opposite ∠s / regoorstaande ∠e | ✓ ST | A (1) |
| 7.2.2 (c) | ∠, ∠, ∠ OR / OF A, A, A / H, H, H OR / OF Equiangular triangles/Gelykhoekige driehoeke | ✓ RE OR / OF ✓ RE | A A A (1) |
| | | | [8] |

QUESTION/VRAAG 8

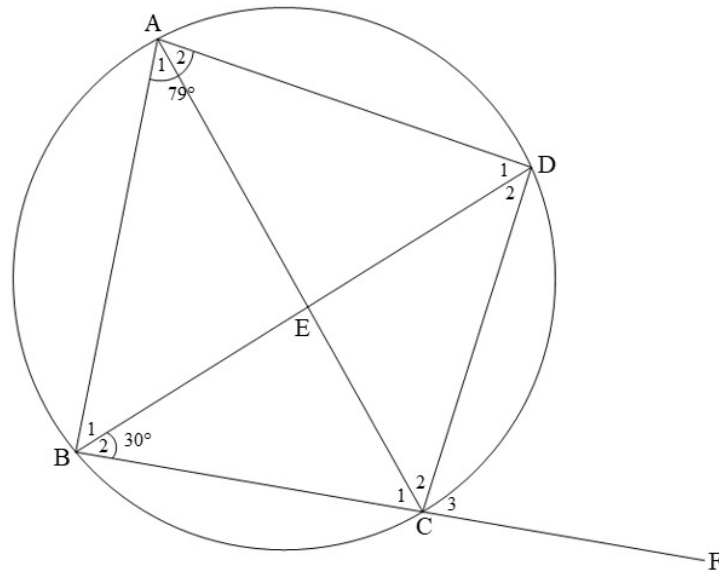
8.1



| | | | |
|-------|--|--|---|
| 8.1.1 | $\hat{G}_1 = \hat{G}_2$ | ✓ ST | A (1) |
| 8.1.2 | $\hat{G}_2 = 20^\circ$ $\left(\begin{array}{l} \angle \text{ at centre} = 2 \times \angle \text{ at circ. } / \\ \text{Mdpt. } \angle = 2 \times \text{omtreks } \angle \end{array} \right)$ | ✓ ST ✓ RE | A A (2) |
| 8.1.3 | $\angle s \text{ opp} = \text{sides} / \angle e \text{ teenoor gelyke sye}$ | ✓ RE | A (1) |
| 8.1.4 | $\hat{A}_1 + \hat{B}_1 + \hat{A}CB = 180^\circ$ (Int. $\angle s \Delta / \text{Binne } \angle e \Delta$) $\hat{A}_1 = \frac{180^\circ - 40^\circ}{2}$ OR / OF $\hat{A}_1 = 70^\circ$ ($\angle s \text{ opp.} = \text{sides} / \angle e \text{ teenoor} = \text{sy e}$) | ✓ RE ✓ 70° | A A (2) |
| 8.1.5 | $\hat{D}AC + 70^\circ + 40^\circ = 180^\circ$ $\left(\begin{array}{l} \text{opp. } \angle s \text{ cyclic quad} / \\ \text{teenoorst. } \angle e \text{ kdvh} \end{array} \right)$ $\therefore \hat{D}AC = 70^\circ$ | ✓ ST ✓ RE ✓ ST | CA A CA (3) |
| 8.2.1 | exterior / buite | ✓ ST ACCEPT/AANVAAR: outside/buitekant | A (1) |
| 8.2.2 | interior / binne | ✓ ST ACCEPT/AANVAAR: inside/binnekant | A (1) |



8.3



| | | | |
|----------|---|--|---|
| 8.3.1(a) | $\hat{C}_3 = 79^\circ$ (Ext. \angle cyclic. quad / <i>Buite \angle kdvh.</i>) | ✓ ST ✓ RE | A A (2) |
| 8.3.1(b) | $\hat{D}_2 = 49^\circ$ (Ext. $\angle \Delta$ / <i>Buite $\angle \Delta$</i>) OR / OF $\hat{BCD} = 101^\circ$ (\angle s on str. line / <i>Leopreguitlyn</i>) $\hat{D}_2 = 49^\circ$ (Int. \angle s Δ / <i>Binne \anglee Δ</i>) OR / OF $\hat{B}_2 = \hat{A}_2 = 30^\circ$ (\angle s in same segm./ <i>\anglee in dies. segm.</i>) $\therefore \hat{A}_1 = 49^\circ$ $\hat{A}_1 = \hat{D}_2 = 49^\circ$ (\angle s in same segm./ <i>\anglee in dies. segm.</i>) | ✓ ST ✓ RE ✓ ST ✓ ST ✓ ST | CA A CA CA CA (2) |
| 8.3.1(c) | $\hat{D}_1 = 180^\circ - 79^\circ - 49^\circ$ (Co - int. \angle s suppl. ; $AB \parallel CD$) $\hat{D}_1 = 52^\circ$ (<i>Ko - Binne \angleesup pl.; $AB \parallel CD$</i>) OR / OF $\hat{B}_1 = 49^\circ$ (alt. \angle 's =; <i>verw. \angle'e =;</i> $AB \parallel CD$) $\therefore \hat{D}_1 = 52^\circ$ (Int. \angle 's Δ / <i>Binne \angle'e Δ</i>) | ✓ ST ✓ RE ✓ ST ✓ ST ✓ RE ✓ ST | CA A CA CA A CA (3) |

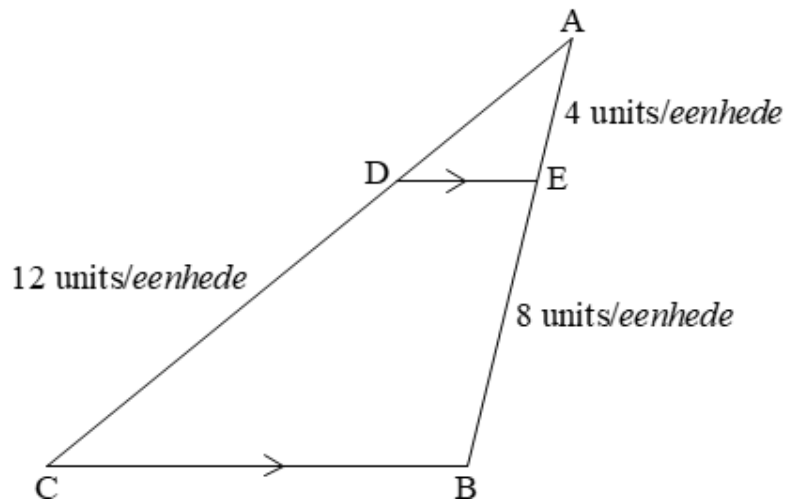


| | | | |
|-------|---|---|--------------------|
| 8.3.2 | $\hat{C}_1 = \hat{D}_1 = 52^\circ$ $\left(\begin{array}{l} \text{∠s in same segment /} \\ \text{∠e in dies. segment} \end{array} \right)$ $\hat{C}_2 = 49^\circ$ $\left(\begin{array}{l} \text{∠s on str. line /} \\ \text{∠e op reguitlyn} \end{array} \right)$ $\hat{D}_2 = \hat{C}_2 = 49^\circ$ $\left(\begin{array}{l} \text{sides opp. = ∠s /} \\ \text{sy teenoor = ∠e} \end{array} \right)$ CE = DE <p style="text-align: center;">OR / OF</p> $\hat{C}_2 = \hat{B}_1 = 49^\circ$ $\left(\begin{array}{l} \text{∠s in same segment /} \\ \text{∠e in dies. segment} \end{array} \right)$ $\hat{D}_2 = \hat{C}_2 = 49^\circ$ $\left(\begin{array}{l} \text{sides opp. = ∠s /} \\ \text{sy teenoor = ∠e} \end{array} \right)$ CE = DE | \checkmark ST CA \checkmark RE A \checkmark ST CA \checkmark RE A \checkmark ST CA \checkmark RE A | (4) [22] |
|-------|---|---|--------------------|



QUESTION/VRAAG 9

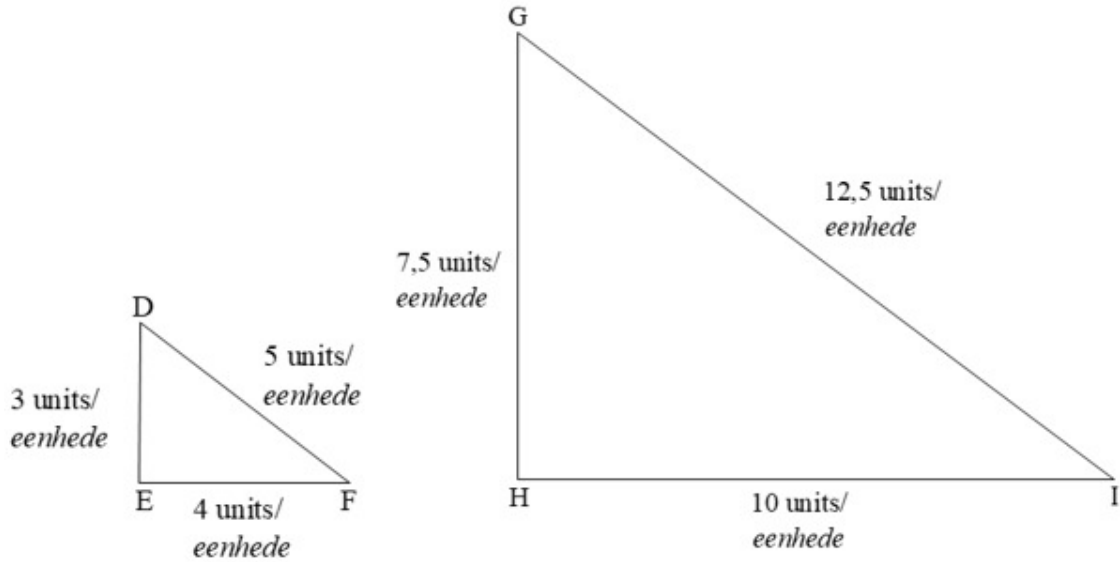
9.1



| | | | |
|-------|---|---|---------------------|
| 9.1.1 | $\frac{AD}{CD} = \frac{AE}{BE}$ (Prop. Theorem / <i>Eweredigheid</i> ; $DE \parallel BC$) | ✓ ST ✓ RE | A A (2) |
| 9.1.2 | $\frac{AD}{CD} = \frac{AE}{BE}$ $\frac{AD}{12} = \frac{4}{8}$ $AD = \frac{4}{8} \times 12$ $= 6 \text{ units/ eenhede}$ | ✓ SF ✓ 6 AO: Full marks/ <i>Volpunte</i> | CA CA (2) |



9.2

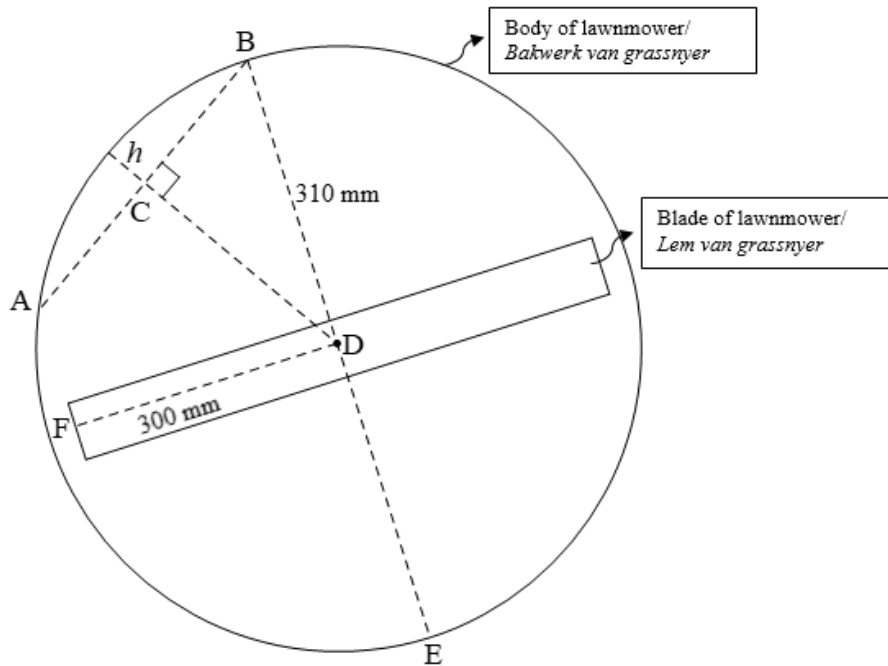


| | |
|--|---|
| $\frac{DE}{GH} = \frac{3}{7,5} = \frac{2}{5} = 0,4 \text{ OR / OF } \frac{GH}{DE} = \frac{7,5}{3} = \frac{5}{2} = 2,5$ | ✓ Ratio/verhouding A |
| $\frac{EF}{HI} = \frac{4}{10} = \frac{2}{5} = 0,4 \text{ OR / OF } \frac{HI}{EF} = \frac{10}{4} = \frac{5}{2} = 2,5$ | ✓ Ratio/verhouding A |
| $\frac{DF}{GI} = \frac{5}{12,5} = \frac{2}{5} = 0,4 \text{ OR / OF } \frac{GI}{DF} = \frac{12,5}{5} = \frac{5}{2} = 2,5$ | ✓ Ratio/verhouding A |
| $\therefore \triangle DEF \parallel \triangle GHI \quad (\text{Sides in prop. / Sye in verhouding})$ | ✓ RE A |
| OR / OF | OR / OF |
| $\hat{E} = 90^\circ$ Conv. Pyth./ Omg. Pyth. | ✓ Conv. Pyth./ Omg. Pyth. A |
| $\hat{H} = 90^\circ$ Conv. Pyth./ Omg. Pyth. | |
| $\tan \hat{F} = \frac{3}{4}$ $\tan \hat{I} = \frac{3}{4}$ | ✓ Any trig ratio/ Enige trig verhouding A |
| $\hat{F} = 36,87^\circ$ $\hat{I} = 36,87^\circ$ | |
| $\hat{E} = \hat{H}$ (Proven / Bewys) | ✓ ST A |
| $\hat{F} = \hat{I}$ (Proven / Bewys) | |
| $\triangle DEF \parallel \triangle GHI \quad (\angle; \angle; \angle)$ | ✓ RE A (4) |
| | [8] |



QUESTION/VRAAG 10

10.1

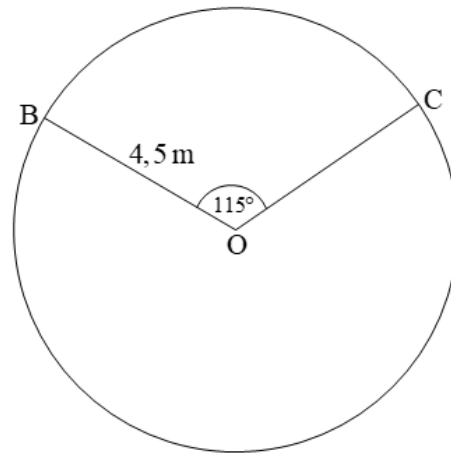


| | | |
|---------------|---|---|
| <p>10.1.1</p> | $\omega = 2\pi n$ $377 = 2\pi n$ $n = \frac{377}{2\pi} \text{ or / of } 60 \text{ rev/s}$ | <p>✓ F A</p> <p>✓ SF A</p> <p>✓ $\frac{377}{2\pi}$ or / of 60 CA</p> <p>NPU</p> <p>NPR</p> <p>(3)</p> |
| <p>10.1.2</p> | $v = \omega r$ $= (377)(300)$ $= 113100 \text{ mm/s}$ <p style="text-align: center;">OR / OF</p> $v = \pi Dn$ $= \pi (600) \left(\frac{377}{2\pi} \right) \text{ OR / OF } \approx \pi (600)(60)$ $= 113100 \text{ mm/s} \qquad \approx 113097,34 \text{ mm/s}$ | <p>✓ F A</p> <p>✓ SF A</p> <p>✓ value of/waarde van v CA</p> <p style="text-align: center;">OR / OF</p> <p>✓ F A</p> <p>✓ SF CA</p> <p>✓ value of/waarde van v CA</p> <p>NPU</p> <p>NPR</p> <p>(3)</p> |

| | | |
|--------|--|--|
| 10.1.3 | $4h^2 - 4dh + x^2 = 0$ $4h^2 - 4(620)h + (130)^2 = 0$ $4h^2 - 2480h + 16900 = 0$ $h = \frac{2480 \pm \sqrt{5880000}}{8}$ $h \approx 613,11 \text{ mm or / of } h \approx 6,89 \text{ mm}$ $\therefore \text{ minor / klein } h \approx 6,89 \text{ mm}$ | \checkmark F A \checkmark SF A \checkmark S CA \checkmark both vertical heights/beide vertikale hoogtes CA \checkmark minor height / klein hoogte CA |
| | OR / OF | OR / OF |
| | $AC = BC = 65$ $\left(\begin{array}{l} \text{Line from centre of circle, perp. to chord} \\ \text{Lyn mdpt. sirkel, loodreg op koord} \end{array} \right)$ $CD^2 = 310^2 - 65^2$ $CD = 303,11 \text{ mm}$ $h = 310 - 303,11$ $h = 6,89 \text{ mm}$ | \checkmark BC = 65 A \checkmark M A \checkmark Length/lengte CD CA \checkmark M A \checkmark minor height / klein hoogte CA NPU NPR |
| | | (5) |



10.2



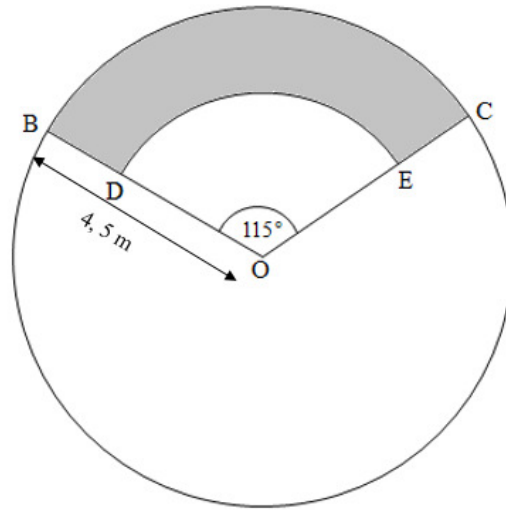
| | | |
|--------|---|---|
| 10.2.1 | $\hat{BOC} = 115^\circ \times \frac{\pi}{180^\circ}$ $= \frac{23}{36} \pi \approx 2,01 \text{ rad}$ | $\checkmark \frac{23}{36} \pi \text{ or/of } 2,01 \text{ A}$ (1) NPU NPR |
|--------|---|---|



| | | |
|--------|---|--|
| 10.2.2 | $\text{Area} = \frac{r^2 \theta}{2}$ $= \frac{(4,5)^2 \left(\frac{23}{36} \pi \right)}{2} \quad \text{OR / OF} \quad \frac{(4,5)^2 (2,01)}{2}$ $= \frac{207}{32} \pi \approx 20,32 \text{ m}^2 \quad \approx 20,35 \text{ m}^2$ <p style="text-align: center;">OR/OF</p> $\text{Area} = \frac{115^\circ}{360^\circ} \times \pi r^2$ $= \frac{115^\circ}{360^\circ} \times \pi (4,5)^2$ $= \frac{207}{32} \pi \approx 20,32 \text{ m}^2$ <p style="text-align: center;">OR/OF</p> $s = r \theta$ $= 4,5 \left(\frac{23}{36} \pi \right) \quad \text{OR / OF} \quad = 4,5 (2,01)$ $= \frac{23}{8} \pi \approx 9,03 \text{ m} \quad \approx 9,05 \text{ m}$ $\text{Area} = \frac{r s}{2}$ $= \frac{4,5 \left(\frac{23}{8} \pi \right)}{2} \quad \text{OR / OF} \quad \frac{4,5 (9,05)}{2}$ $= \frac{207}{32} \pi \approx 20,32 \text{ m}^2 \quad \approx 20,36 \text{ m}^2$ | <p>✓ F A</p> <p>✓ SF CA</p> <p>✓ area/oppervlak CA</p> <p style="text-align: center;">OR/OF</p> <p>✓ F A</p> <p>✓ SF A</p> <p>✓ area/oppervlak CA</p> <p style="text-align: center;">OR/OF</p> <p>✓ arc length/booglengte CA</p> <p>✓ F A</p> <p>✓ area/oppervlak CA</p> <p>NPR NPU</p> <p style="text-align: right;">(3)</p> |
|--------|---|--|



10.2.3
#



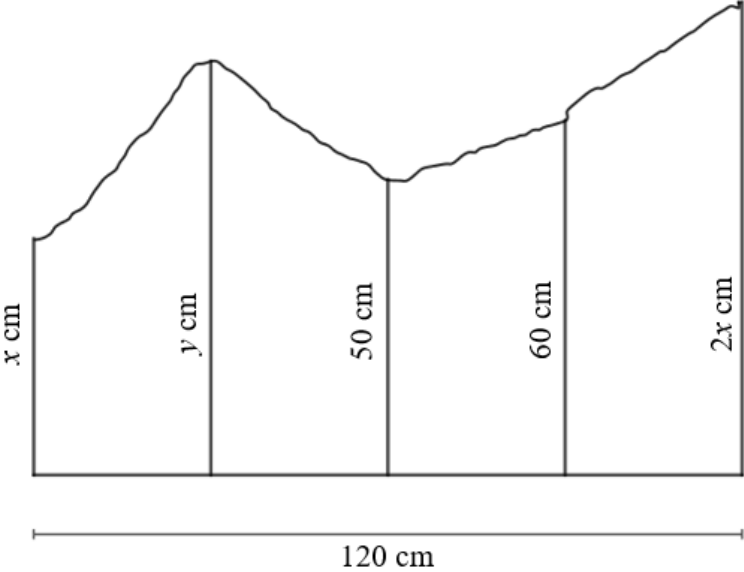
| | |
|--|--|
| $DO = \frac{3}{5} \times 4,5 = 2,7 \text{ m}$ $A_{DOE} = \frac{(2,7)^2 \left(\frac{23}{36} \pi \right)}{2} \quad \text{OR / OF} \quad A_{DOE} = \frac{115^\circ}{360^\circ} \times \pi (2,7)^2$ $= \frac{1863}{800} \pi \approx 7,32 \text{ m}^2$ $A_{\text{shaded/geskakeer}} = \frac{207}{32} \pi - \frac{1863}{800} \pi$ $= \frac{207}{50} \pi \approx 13,01 \text{ m}^2$ <p>\therefore Seedlings needed / Saailinge benodig $= 13 \times 4$ $= 52$</p> | <p>✓ ratio/verhouding A</p> <p>✓ length of/lengte van DO CA</p> <p>✓ Area of/Oppv. van DOE CA</p> <p>✓ Area of the shaded part/Oppv. van geskakeerde gedeelte CA</p> <p>✓ Number of seedlings/Aantal saailinge CA</p> |
| OR/OF | OR/OF |



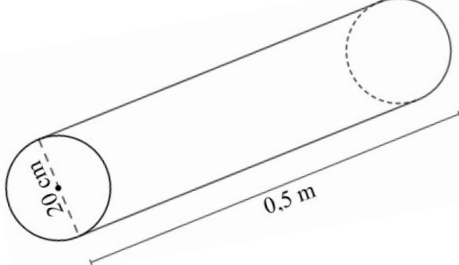
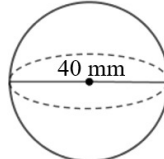
| | |
|--|---|
| $DO = \frac{3}{5} \times 4,5 = 2,7 \text{ m}$ $s_{DE} = r\theta$ $= 2,7 \left(\frac{23}{36} \pi \right)$ $= \frac{69}{40} \pi \approx 5,42 \text{ m}$ $\text{Area}_{DOE} = \frac{rs}{2}$ $= \frac{2,7 \left(\frac{69}{40} \pi \right)}{2}$ $= \frac{1863}{800} \pi \approx 7,32 \text{ m}^2$ $A_{\text{shaded/geskakeer}} = \frac{207}{32} \pi - \frac{1863}{800} \pi$ $= \frac{207}{50} \pi \approx 13,01 \text{ m}^2$ <p>\therefore Seedlings needed / Saailinge benodig</p> $= 13 \times 4$ $= 52$ | <p>✓ ratio/verhouding A</p> <p>✓ length of/lengte van DO CA</p> <p>✓ Area of/Oppv. van DOE CA</p> <p>✓ Area of the shaded part/Oppv. van geskakeerde gedeelte CA</p> <p>✓ Number of seedlings/Aantal saailinge CA</p> <p>NPU NPR</p> <p style="text-align: right;">(5)</p> |
| | [20] |



QUESTION/VRAAG 11

| | | |
|--------|---|---|
| 11.1 |  | |
| 11.1.1 | 30 cm | ✓ 30 cm A (1) |
| 11.1.2 | $y = 50 + 20 = 70$ cm | ✓ value of/waarde van y A (1) |
| 11.1.3 | $A_T = a \left(\frac{o_1 + o_n}{2} + o_2 + o_3 + \dots + o_{n-1} \right)$ $7200 = 30 \left(\frac{x+2x}{2} + 70 + 50 + 60 \right)$ $240 = 1,5x + 180$ $\therefore x = 40 \text{ cm}$ <p style="text-align: center;">OR / OF</p> $A_T = a (m_1 + m_2 + m_3 + \dots + m_n)$ $7200 = 30 \left(\frac{x+70}{2} + \frac{70+50}{2} + \frac{50+60}{2} + \frac{60+2x}{2} \right)$ $240 = 1,5x + 180$ $\therefore x = 40 \text{ cm}$ | ✓ F A ✓ SF CA ✓ S CA ✓ value of/waarde van x CA <p style="text-align: center;">OR / OF</p> ✓ F A ✓ SF CA ✓ S CA ✓ value of/waarde van x CA (4) |



| | | |
|--------|--|--|
| 11.2 |  |  |
| 11.2.1 | $0,5 \text{ m} \times 100 = 50 \text{ cm}$ | ✓ 50 cm A (1) |
| 11.2.2 | $r = 40 \div 2 = 20 \text{ mm}$ $\therefore r = 20 \div 10 = 2 \text{ cm}$ OR / OF $d = 40 \div 10 = 4 \text{ cm}$ $\therefore r = 4 \div 2 = 2 \text{ cm}$ | ✓ M $40 \div 2$ A ✓ r value in/waarde in cm CA OR / OF ✓ M A ✓ r value/waarde in cm CA AO: Full marks/Volpunte (2) |
| 11.2.3 | TSA of Cylindrical rod / <i>Buite-oppervlakte van silindriese staaf</i> : $= 2\pi r^2 + 2\pi r h$ $= 2\pi(10)^2 + 2\pi(10)(50)$ $= 1200\pi \approx 3769,91 \text{ cm}^2$ | ✓ SF CA ✓ total surface area/totale buite-oppervlakte CA (2) |



| | | |
|--------|---|--|
| 11.2.4 | <p>Volume of one steel ball bearing/<i>van een staal bal</i></p> $= \frac{4}{3} \pi (2)^3$ $= \frac{32}{3} \pi \approx 33,51 \text{ cm}^3$ <p>Volume of Cylindrical rod/<i>van silindriese staaf</i></p> $= \pi (10)^2 (50)$ $= 5000 \pi \approx 15707,96 \text{ cm}^3$ <p>Volume Recovered / <i>Herwin</i></p> $= 5000\pi - 18\% \times 5000\pi \quad \text{OR / OF}$ $= 82\% \times 5000\pi$ $= 4100 \pi$ $\approx 12880,53 \text{ cm}^3$ $\therefore \frac{4100 \pi}{\frac{32}{3} \pi} \qquad \qquad \qquad \therefore \frac{32}{3} \pi \times 400$ $= 384,375 \quad \text{OR / OF} \qquad \qquad \qquad = \frac{12800}{3} \pi$ $\approx 384 \qquad \qquad \qquad = 13404,13 \text{ cm}^3$ <p>\therefore More than 400 balls can NOT be made / <i>Meer as 400 balle kan NIE gemaak word NIE.</i></p> | <p>✓ SF CA</p> <p>✓ Vol. of ball bearing/<i>Vol. van staal koellaër</i> CA</p> <p>✓ Vol. of cyl. rod/<i>Vol. van sil.staaf</i> CA</p> <p>✓ M A</p> <p>✓ Vol. recovered/<i>herwin</i> CA</p> <p>✓ conclusion/<i>gevolgtrekking</i> CA (6)</p> |
| | | [17] |

TOTAL/TOTAAL: 150

