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**NATIONAL SENIOR  
CERTIFICATE/*NASIONALE  
SENIORSERTIFIKAAT***

**GRADE/*GRAAD* 12**

**SEPTEMBER 2024**

**TECHNICAL MATHEMATICS P2/*TEGNIJSE WISKUNDE V2*  
MARKING GUIDELINE/*NASIENRIGLYN***

**MARKS/*PUNTE*: 150**

This marking guideline consists of 21 pages./  
*Hierdie nasienriglyn bestaan uit 21 bladsye.*



**NOTE:**

- Continuous accuracy (CA) applies only where indicated in this marking guideline.
- Assuming values/answers in order to solve a problem is unacceptable.

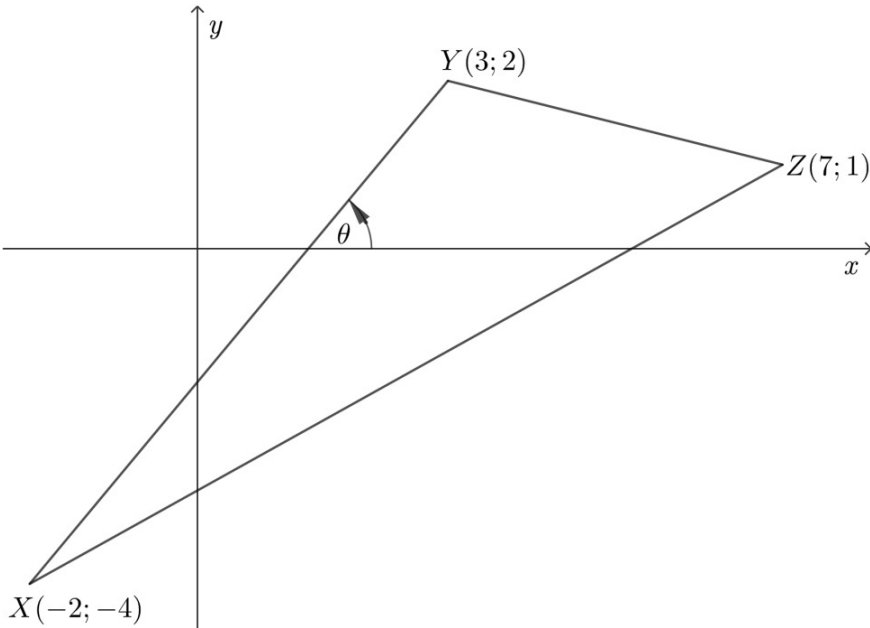
**LET WEL:**

- *Volgehoue akkuraatheid (CA) is slegs van toepassing soos aangedui in hierdie nasienriglyn.*
- *Aanvaarding van waardes/antwoorde om 'n problem op te los, is onaanvaarbaar.*

| MARKING CODES / NASIENKODES |                                                                                                |
|-----------------------------|------------------------------------------------------------------------------------------------|
| <b>M</b>                    | Method / <i>Metode</i>                                                                         |
| <b>A</b>                    | Accuracy / <i>Akkuraatheid</i>                                                                 |
| <b>AO</b>                   | Answer only / <i>Slegs antwoord</i>                                                            |
| <b>CA</b>                   | Consistent accuracy / <i>Deurlopende akkuraatheid</i>                                          |
| <b>F</b>                    | Formula / <i>Formule</i>                                                                       |
| <b>I</b>                    | Identity / <i>Identiteit</i>                                                                   |
| <b>R</b>                    | Rounding / <i>Afronding</i>                                                                    |
| <b>S</b>                    | Simplification / <i>Vereenvoudiging</i>                                                        |
| <b>ST</b>                   | Statement / <i>Bewering</i>                                                                    |
| <b>RE</b>                   | Reason / <i>Rede</i>                                                                           |
| <b>ST RE</b>                | Statement and correct reason / <i>Bewering en korrekte rede</i>                                |
| <b>SF</b>                   | Substitution correctly in correct formula / <i>Korrekte vervanging in die korrekte formule</i> |
| <b>NPU</b>                  | No penalty for omitting units / <i>Geen penalisering vir eenhede uitgelaat</i>                 |



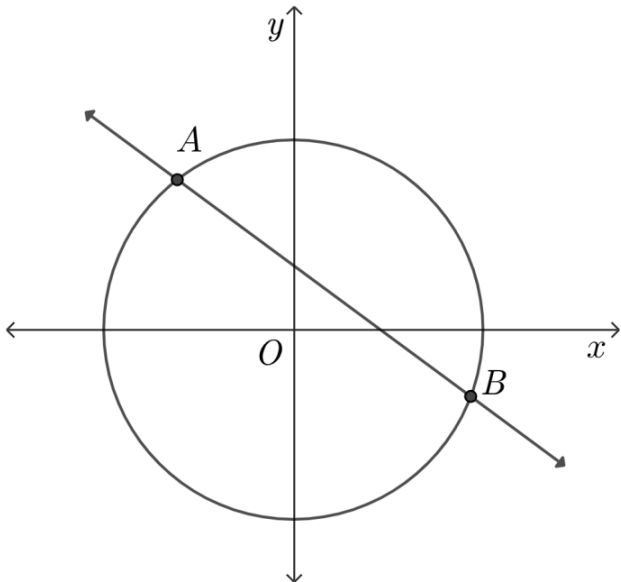
## QUESTION/VRAAG 1

|     |                                                                                                                                                |                                                                  |     |
|-----|------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------|-----|
|     |                                                              |                                                                  |     |
| 1.1 | $m = \frac{y_2 - y_1}{x_2 - x_1}$ $m_{XY} = \frac{2 + 4}{3 + 2}$ $= \frac{6}{5}$                                                               | ✓Subst. <b>A</b><br><br>✓Ans/Antw. <b>CA</b>                     | (2) |
| 1.2 | $XY = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$ $= \sqrt{(3 + 2)^2 + (2 + 4)^2}$ $= \sqrt{5^2 + 6^2}$ $= \sqrt{61}$ $= 7,81 \text{ units/eenhede}$ | ✓F <b>A</b><br><br>✓Subst. <b>A</b><br><br>✓Ans/Antw. <b>CA</b>  | (3) |
| 1.3 | $\tan \theta = m_{XY}$ $\tan \theta = \frac{6}{5}$ $\theta = \tan^{-1}\left(\frac{6}{5}\right)$ $\theta = 50,19^\circ$                         | ✓M <b>A</b><br><br>✓Subst. <b>CA</b><br><br>✓Ans/Antw. <b>CA</b> | (3) |





## QUESTION/VRAAG 2

|       |                                                                                                                                                                                                                                                                                                      |                                                                                 |     |
|-------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------|-----|
| 2.1   |                                                                                                                                                                                                                    |                                                                                 |     |
| 2.1.1 | Secant/sekant                                                                                                                                                                                                                                                                                        | ✓Ans/Antw. A                                                                    | (1) |
| 2.1.2 | $y = -x + 4, \quad x^2 + y^2 = 40$<br><br>$x^2 + (-x + 4)^2 = 40$<br>$x^2 + x^2 - 8x + 16 = 40$<br>$2x^2 - 8x - 24 = 0$<br>$x^2 - 4x - 12 = 0$<br>$(x - 6)(x + 2) = 0$<br>$x = 6 \text{ or } x = -2$<br>$y = -6 + 4 \quad y = -(-2) + 4$<br>$y = -2 \quad y = 6$<br><br>$A(-2 ; 6), \quad B(6 ; -2)$ | ✓Subst. A<br><br>✓Standard Form/Vorm CA<br><br>✓A (-2 ; 6) CA<br>✓B (6 ; -2) CA | (4) |
| 2.1.3 | $x \cdot x_2 + y \cdot y_2 = r^2$<br>$x(-2) + y(6) = 40$<br>$-2x + 6y = 40$<br>$6y = 2x + 40$<br>$y = \frac{2}{6}x + \frac{40}{6}$<br>$y = \frac{1}{3}x + \frac{20}{3}$                                                                                                                              | ✓F A<br><br>✓SF A<br><br>✓S CA<br><br>✓Equation/Vgl. CA                         | (4) |

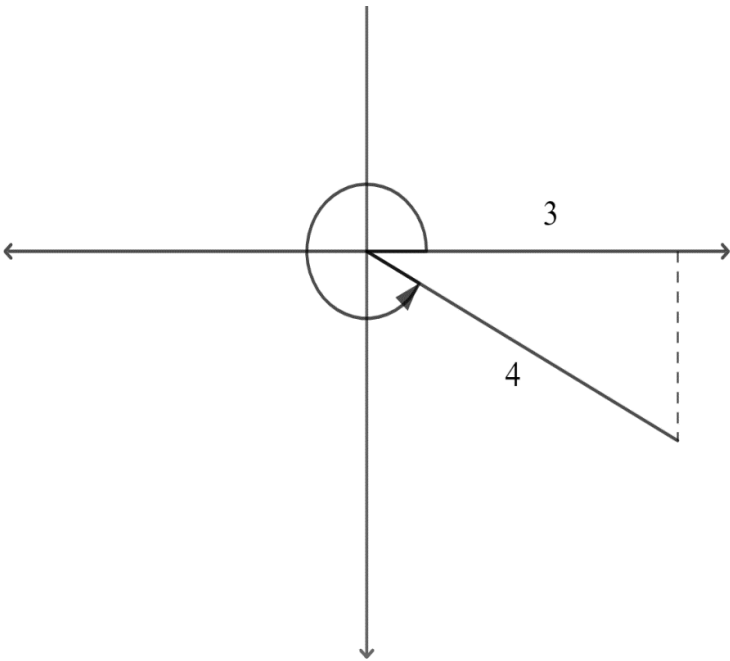
OR/OF



|       |                                                                                                                                                                                                                                                               |                                                                                                                                                               |             |
|-------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|
|       | $m_{OA} = \frac{y_2 - y_1}{x_2 - x_1}$ $= \frac{6 - 0}{-2 - 0}$ $= -3$ $m_{\text{tangent}} = -1 \times -\frac{1}{3} = \frac{1}{3}$ $y - y_1 = m(x - x_1)$ $y - 6 = \frac{1}{3}(x + 2)$ $y = \frac{1}{3}x + \frac{2}{3} + 6$ $y = \frac{1}{3}x + \frac{20}{3}$ | <p>✓ <math>m_{OA}</math>      <b>A</b></p> <p>✓ <math>m_{\text{tangent}}</math>      <b>CA</b></p> <p>✓ S      <b>CA</b></p> <p>✓ Equation/Vgl. <b>CA</b></p> | (4)         |
| 2.2.1 | Ellipse/Ellips or/of Oval/Ovaal                                                                                                                                                                                                                               | ✓ Ans/Antw. <b>A</b>                                                                                                                                          | (1)         |
| 2.2.2 | $16x^2 + 64y^2 = 1024$ $\frac{16x^2}{1024} + \frac{64y^2}{1024} = \frac{1024}{1024}$ $\frac{x^2}{64} + \frac{y^2}{16} = 1$ $\frac{x^2}{8^2} + \frac{y^2}{4^2} = 1$                                                                                            | <p>✓ M      <b>A</b></p> <p>✓ Equation/Vgl. <b>CA</b></p>                                                                                                     | (2)         |
| 2.2.3 |                                                                                                                                                                                                                                                               | <p>✓ elliptical shape /elliptiese vorm      <b>A</b></p> <p>✓ x-int/as      <b>A</b></p> <p>✓ y-int/as      <b>A</b></p>                                      | (3)         |
|       |                                                                                                                                                                                                                                                               |                                                                                                                                                               | <b>[15]</b> |



QUESTION/VRAAG 3

|       |                                                                                                                                                                                                                                   |                                                                                                                                                            |     |
|-------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|
| 3.1   | $\theta = 22,51^\circ \quad \beta = 231,21^\circ$<br>$\cos(\theta + 20^\circ) - \tan(3\beta)$<br>$= \cos(22,51^\circ + 20^\circ) - \tan(3 \times 231,21^\circ)$<br>$= 1,23$                                                       | ✓ Subst.                      A<br>✓ Ans/Antw.                A                                                                                            | (2) |
| 3.2.1 | <br><br>$x^2 + y^2 = r^2$<br>$3^2 + y^2 = 4^2$<br>$y^2 = 16 - 9$<br>$y = \pm\sqrt{7}$<br>$y = -\sqrt{7}$<br>$\sin \alpha = \frac{-\sqrt{7}}{4}$ | ✓ Diagram                      A<br><br>✓ Subst.                      CA<br><br>✓ y-value/waarde        CA<br><br>✓ $\sin \alpha = \frac{-\sqrt{7}}{4}$ CA | (4) |



|       |                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                         |             |
|-------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|
| 3.2.2 | $\tan \alpha + \frac{\operatorname{cosec}^2 \alpha}{3}$ $= \frac{-\sqrt{7}}{3} + \frac{\left(\frac{4}{-\sqrt{7}}\right)^2}{3}$ $= \frac{16 - 7\sqrt{7}}{21}$ $= -0,12$                                                                                                                                              | $\checkmark \tan \alpha = \frac{-\sqrt{7}}{3} \quad \text{CA}$ $\checkmark \operatorname{cosec} \alpha = \frac{4}{-\sqrt{7}} \quad \text{CA}$ $\checkmark \text{Ans/Antw.} \quad \text{CA}$ <p><b>NPR</b></p>                                                                                                                                                           | (3)         |
| 3.3   | $3 \sin x = -2$ $\sin x = \frac{-2}{3}$ $x = \sin^{-1}\left(\frac{2}{3}\right)$ $\text{Ref} \angle = 41,81^\circ$ <p>3<sup>rd</sup> Quad/3<sup>de</sup> kwadrant</p> $x = 180 + 41,81^\circ$ $x = 221,81^\circ$ <p>4<sup>th</sup> Quad/4<sup>de</sup> kwadrant</p> $x = 360^\circ - 41,81^\circ$ $x = 318,18^\circ$ | $\checkmark \sin x = \frac{-2}{3} \quad \text{A}$ $\checkmark \sin^{-1}\left(\frac{2}{3}\right) \quad \text{CA}$ $\checkmark \text{Ref} \angle \quad \text{CA}$ $\checkmark x \text{ in 3}^{\text{rd}} \text{ quad/3}^{\text{de}} \text{ kwadrant} \quad \text{CA}$ $\checkmark x \text{ in 4}^{\text{th}} \text{ Quad/4}^{\text{de}} \text{ kwadrant} \quad \text{CA}$ | (5)         |
|       |                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                         | <b>[14]</b> |



## QUESTION/VRAAG 4

|       |                                                                                                                                                                                                                                                                                                                      |                                                                                                                                                                                                                  |             |
|-------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|
| 4.1.1 | $\cot(2\pi - \theta) = -\cot \theta$<br><b>OR / OF</b><br>$\cot(2\pi - \theta) = -\frac{\cos \theta}{\sin \theta}$                                                                                                                                                                                                   | ✓Ans/Antw. <b>A</b>                                                                                                                                                                                              | (1)         |
| 4.1.2 | $= \frac{-\tan \theta \cdot \cos \theta \cdot \sin \theta}{\sin \theta \cdot -\frac{\cos \theta}{\sin \theta} \cdot \cos \theta}$ $= \frac{\frac{\sin \theta}{\cos \theta} \cdot \cos \theta}{\frac{1}{\sin \theta}}$ $= \frac{\sin \theta}{\cos \theta} \cdot \cos \theta \cdot \sin \theta$ $= \sin^2 \theta$      | ✓ $-\tan \theta$ <b>A</b><br>✓ $\cos \theta$ <b>A</b><br>✓ $\sin \theta$ <b>A</b><br>✓ $\frac{1}{\cos \theta}$ <b>A</b><br>✓ $\frac{\sin \theta}{\cos \theta}$ <b>A</b><br>✓ S <b>CA</b><br>✓Ans/Antw. <b>CA</b> | (7)         |
| 4.2   | $\text{LHS} / \text{LK} = \frac{\sin x}{\cos x} \cdot \sin^2 x + \sin x \cdot \cos x$ $= \frac{\sin^3 x}{\cos x} + \sin x \cdot \cos x$ $= \frac{\sin^3 x + \sin x \cdot \cos^2 x}{\cos x}$ $= \frac{\sin x(\sin^2 x + \cos^2 x)}{\cos x}$ $= \frac{\sin x \cdot (1)}{\cos x}$ $= \tan x$ $= \text{RHS} / \text{RK}$ | ✓ $\frac{\sin x}{\cos x}$ <b>A</b><br>✓ S <b>A</b><br>✓ Factors/Faktore <b>A</b><br>✓ $\sin^2 x + \cos^2 x = 1$ <b>A</b><br>✓ $\frac{\sin \theta}{\cos \theta}$ <b>A</b>                                         | (5)         |
|       |                                                                                                                                                                                                                                                                                                                      |                                                                                                                                                                                                                  | <b>[13]</b> |



## QUESTION/VRAAG 5

|       |                                                                                               |                                                                                                                            |             |
|-------|-----------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------|-------------|
| 5.1   | $f(x) = \tan(x)$ and/en $g(x) = 2 \sin(x + 30^\circ)$<br>for/vir $x \in (0^\circ; 360^\circ)$ |                                                                                                                            |             |
|       |                                                                                               | $g$ :<br>✓y-intercept/as <b>A</b><br>✓x-intercept/as <b>A</b><br>✓TP/DP <b>A</b>                                           | (3)         |
| 5.2.1 | $180^\circ$                                                                                   | ✓ $180^\circ$ <b>A</b>                                                                                                     | (1)         |
| 5.2.2 | $x = 90^\circ$ and/en $x = 270^\circ$                                                         | ✓ $x = 90^\circ$ <b>A</b><br>✓ $x = 270^\circ$ <b>A</b>                                                                    | (2)         |
| 5.2.3 | $y \in [-2; 2]$                                                                               | ✓values/waardes <b>A</b><br>✓notation/notasie <b>A</b>                                                                     | (2)         |
| 5.2.4 | Amplitude of/van $g = 2$                                                                      | ✓Answer/Antwoord <b>A</b>                                                                                                  | (1)         |
| 5.3   | $0^\circ < x < 90^\circ$ , $150^\circ < x < 180^\circ$ , $270^\circ < x < 330^\circ$          | ✓ $0^\circ < x < 90^\circ$ <b>CA</b><br>✓ $150^\circ < x < 180^\circ$ <b>CA</b><br>✓ $270^\circ < x < 330^\circ$ <b>CA</b> | (3)         |
|       |                                                                                               |                                                                                                                            | <b>[12]</b> |



## QUESTION/VRAAG 6

|     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                  |     |
|-----|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------|-----|
|     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                  |     |
| 6.1 | $\tan \theta = \frac{\text{opposite/teenoorstaande}}{\text{adjacent/aangrensend}}$                                                                                                                                                                                                                                                                                                                                                                                                | ✓ Ans/antw. <b>A</b>                                                                                                                             | (1) |
| 6.2 | $\tan 16^\circ = \frac{MQ}{PQ}$ $MQ = PQ \tan 16^\circ$ $= 230 \times \tan 16^\circ$ $= 65,95 \text{ cm}$ $MN = 65,95 \times 2$ $= 131,9 \text{ cm}$ $= 132 \text{ cm}$                                                                                                                                                                                                                                                                                                           | ✓ $\tan 16^\circ = \frac{MQ}{PQ}$ <b>A</b><br>✓ $MQ$ <b>CA</b><br><br>✓ $MN$ <b>CA</b><br><b>NPR</b>                                             | (3) |
| 6.3 | $\text{Area of/Oppervlakte van } \triangle MNP = \left(\frac{1}{2} \times PQ \times MQ\right)$ $= \left(\frac{1}{2} \times 230 \times 65,95\right) \times 2$ $= 15\,168,5 \text{ cm}^2$ <p style="text-align: center;"><b>OR/OF</b></p> $\text{Area} = \frac{1}{2} a \cdot b \sin \hat{C}$ $= \frac{1}{2} PM \times PN \times \sin \hat{P}$ $= \frac{1}{2} \left(\frac{230}{\cos 16^\circ}\right) \left(\frac{230}{\cos 16^\circ}\right) \sin 32^\circ$ $= 15168,83 \text{ cm}^2$ | ✓ F <b>A</b><br>✓ SF <b>CA</b><br>✓ Area/Oppervl. <b>CA</b><br><br>✓ F <b>A</b><br>✓ SF <b>CA</b><br><br>✓ Area/Oppervl. <b>CA</b><br><b>NRP</b> | (3) |



|       |                                                                                                                                                                                                                                                                     |                                                                                                                                               |             |
|-------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------|-------------|
| 6.4.1 | $125 \times 15 = 1\,875 \text{ min.}$<br><br>$1 \frac{\text{hr}}{\text{uur}} = 60 \text{ min}$<br><br>$\frac{1\,875}{60} = 31,25 \frac{\text{hrs}}{\text{ure}}$<br><br>$1 \text{ day/dag} = 8 \text{ hrs/ure}$<br><br>$\frac{31,25}{8} = 3,90 = 4 \text{ days/dae}$ | $\checkmark 1\,875 \text{ min}$ <b>A</b><br><br>$\checkmark 31,25 \text{ hrs/ure}$ <b>CA</b><br><br>$\checkmark 4 \text{ days/dae}$ <b>CA</b> | (3)         |
| 6.4.2 | $\text{Payment/Betaling} = R350,00 \times 8 \times 4$<br>$= R11\,200,00$                                                                                                                                                                                            | $\checkmark \text{Payment/Betaling}$ <b>CA</b>                                                                                                | (1)         |
|       |                                                                                                                                                                                                                                                                     |                                                                                                                                               | <b>[11]</b> |



QUESTION/VRAAG 7

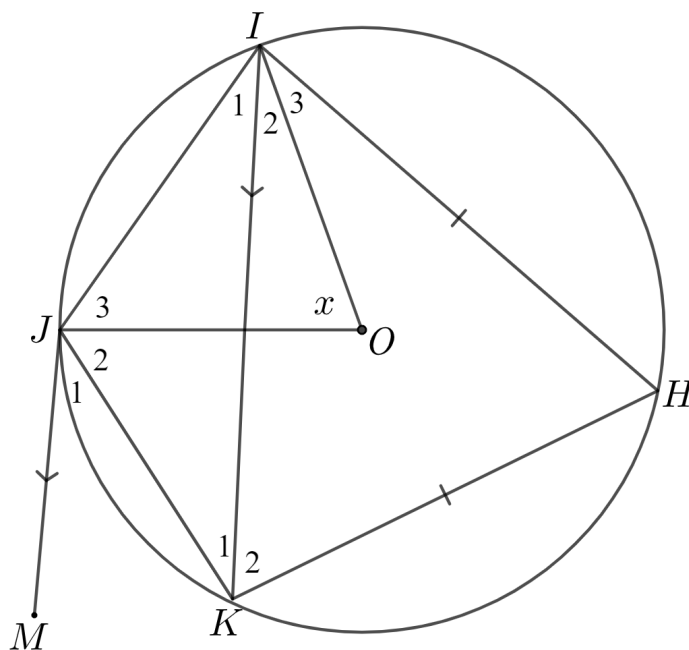
|                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                        |                                                            |           |     |                        |                                |                                                                |                |   |                                |                                                            |           |   |                                |                                                       |  |  |                                |                           |  |  |
|----------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------|------------------------------------------------------------|-----------|-----|------------------------|--------------------------------|----------------------------------------------------------------|----------------|---|--------------------------------|------------------------------------------------------------|-----------|---|--------------------------------|-------------------------------------------------------|--|--|--------------------------------|---------------------------|--|--|
|                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                        |                                                            |           |     |                        |                                |                                                                |                |   |                                |                                                            |           |   |                                |                                                       |  |  |                                |                           |  |  |
| 7.1                                    | <table><tr><td>1. <math>\hat{D}_3 = \hat{B}_1 = x</math>,</td><td>(alt. <math>\angle</math>'s / verw. <math>\angle</math>'e; <math>BA \parallel FD</math>)</td><td>✓ ST ✓ RE</td><td>A</td><td rowspan="5">(6)</td></tr><tr><td>2. <math>\hat{E}_1 = \hat{D}_3 = x</math></td><td>(<math>\angle</math>'s in the same seg./ <math>\angle</math>'e in dieselfde seg.)</td><td>✓ ST ✓ RE</td><td>A</td></tr><tr><td>3. <math>\hat{F}_2 = \hat{E}_1 = x</math></td><td>(alt. <math>\angle</math>'s / verw. <math>\angle</math>'e; <math>BA \parallel FD</math>)</td><td>✓ ST ✓ RE</td><td>A</td></tr><tr><td>4. <math>\hat{F}_1 = \hat{E}_1 = x</math></td><td>(<math>\angle</math>'s opp = sides/ <math>\angle</math>'e teenoor = sye)</td><td></td><td></td></tr><tr><td>5. <math>\hat{F}_1 = \hat{D}_1 = x</math></td><td>(tan chord/raaklyn koord)</td><td></td><td></td></tr></table> | 1. $\hat{D}_3 = \hat{B}_1 = x$ ,       | (alt. $\angle$ 's / verw. $\angle$ 'e; $BA \parallel FD$ ) | ✓ ST ✓ RE | A   | (6)                    | 2. $\hat{E}_1 = \hat{D}_3 = x$ | ( $\angle$ 's in the same seg./ $\angle$ 'e in dieselfde seg.) | ✓ ST ✓ RE      | A | 3. $\hat{F}_2 = \hat{E}_1 = x$ | (alt. $\angle$ 's / verw. $\angle$ 'e; $BA \parallel FD$ ) | ✓ ST ✓ RE | A | 4. $\hat{F}_1 = \hat{E}_1 = x$ | ( $\angle$ 's opp = sides/ $\angle$ 'e teenoor = sye) |  |  | 5. $\hat{F}_1 = \hat{D}_1 = x$ | (tan chord/raaklyn koord) |  |  |
| 1. $\hat{D}_3 = \hat{B}_1 = x$ ,       | (alt. $\angle$ 's / verw. $\angle$ 'e; $BA \parallel FD$ )                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | ✓ ST ✓ RE                              | A                                                          | (6)       |     |                        |                                |                                                                |                |   |                                |                                                            |           |   |                                |                                                       |  |  |                                |                           |  |  |
| 2. $\hat{E}_1 = \hat{D}_3 = x$         | ( $\angle$ 's in the same seg./ $\angle$ 'e in dieselfde seg.)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | ✓ ST ✓ RE                              | A                                                          |           |     |                        |                                |                                                                |                |   |                                |                                                            |           |   |                                |                                                       |  |  |                                |                           |  |  |
| 3. $\hat{F}_2 = \hat{E}_1 = x$         | (alt. $\angle$ 's / verw. $\angle$ 'e; $BA \parallel FD$ )                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | ✓ ST ✓ RE                              | A                                                          |           |     |                        |                                |                                                                |                |   |                                |                                                            |           |   |                                |                                                       |  |  |                                |                           |  |  |
| 4. $\hat{F}_1 = \hat{E}_1 = x$         | ( $\angle$ 's opp = sides/ $\angle$ 'e teenoor = sye)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                        |                                                            |           |     |                        |                                |                                                                |                |   |                                |                                                            |           |   |                                |                                                       |  |  |                                |                           |  |  |
| 5. $\hat{F}_1 = \hat{D}_1 = x$         | (tan chord/raaklyn koord)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                        |                                                            |           |     |                        |                                |                                                                |                |   |                                |                                                            |           |   |                                |                                                       |  |  |                                |                           |  |  |
| 7.2                                    | <table><tr><td><math>\hat{O}BC = 90^\circ</math> tan <math>\perp</math> rad</td><td>✓ RE</td><td>A</td><td rowspan="4">(2)</td></tr><tr><td><math>\hat{B}FE = 90^\circ</math></td><td>✓ <math>\hat{B}FE</math></td><td>A</td></tr><tr><td><b>OR / OF</b></td><td></td><td></td></tr><tr><td><math>\hat{B}DE = 90^\circ</math></td><td></td><td></td></tr></table>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | $\hat{O}BC = 90^\circ$ tan $\perp$ rad | ✓ RE                                                       | A         | (2) | $\hat{B}FE = 90^\circ$ | ✓ $\hat{B}FE$                  | A                                                              | <b>OR / OF</b> |   |                                | $\hat{B}DE = 90^\circ$                                     |           |   |                                |                                                       |  |  |                                |                           |  |  |
| $\hat{O}BC = 90^\circ$ tan $\perp$ rad | ✓ RE                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | A                                      | (2)                                                        |           |     |                        |                                |                                                                |                |   |                                |                                                            |           |   |                                |                                                       |  |  |                                |                           |  |  |
| $\hat{B}FE = 90^\circ$                 | ✓ $\hat{B}FE$                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | A                                      |                                                            |           |     |                        |                                |                                                                |                |   |                                |                                                            |           |   |                                |                                                       |  |  |                                |                           |  |  |
| <b>OR / OF</b>                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                        |                                                            |           |     |                        |                                |                                                                |                |   |                                |                                                            |           |   |                                |                                                       |  |  |                                |                           |  |  |
| $\hat{B}DE = 90^\circ$                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                        |                                                            |           |     |                        |                                |                                                                |                |   |                                |                                                            |           |   |                                |                                                       |  |  |                                |                           |  |  |



|     |                                                                                                                                                                                                                                                                           |                                                                             |      |
|-----|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------|------|
| 7.3 | $D\hat{B}O + B\hat{D}A + \hat{A} = 180^\circ$ (int. <'s of $\Delta$ /binne <'e van $\Delta$ )<br>$x + (90^\circ + x) + \hat{A} = 180^\circ$<br>$\hat{A} = 180^\circ - (90^\circ + 2x)$<br>$\hat{A} = 90^\circ - 2x$<br>$\hat{A} = 90^\circ - 2(23^\circ)$<br>$= 44^\circ$ | ✓ ST   ✓ RE   A<br><br>✓ S   CA<br><br>✓ Subst.   A<br><br>✓ Ans/Antw.   CA | (5)  |
|     |                                                                                                                                                                                                                                                                           |                                                                             | [13] |



## QUESTION/VRAAG 8



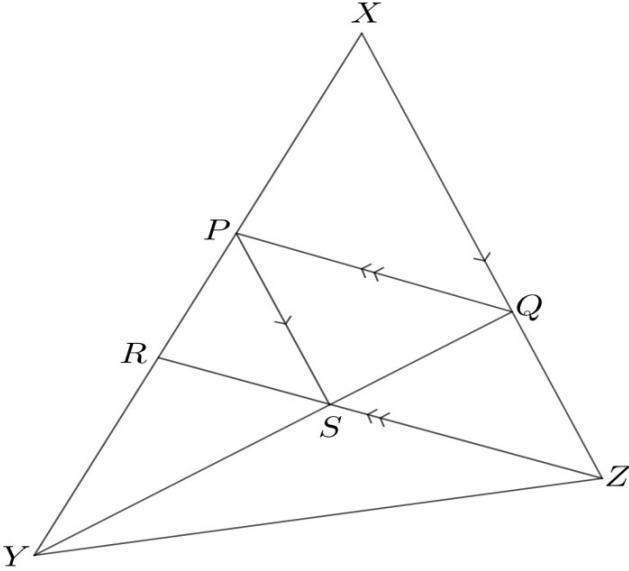
|       |                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                   |    |     |
|-------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------|----|-----|
| 8.1   | $\hat{O} = 2\hat{K}_1$ ( $\angle$ at centre = $2 \times \angle$ at circumf / midpts $\angle = 2 \times$ omtreks $\angle$ )<br>$\hat{K}_1 = \frac{x}{2}$                                                                                                                                                                                                                                                                                           | ✓ RE              | A  |     |
|       |                                                                                                                                                                                                                                                                                                                                                                                                                                                   | ✓ ST              | A  |     |
|       |                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                   |    | (2) |
| 8.2.1 | $\hat{K}_1 = \hat{J}_1$ (alt. $\angle$ 's / verw. $\angle$ 'e; $JM \parallel IM$ )<br>$\hat{J}_1 = \hat{I}_1$ (tan - chord/raaklyn koord)<br>$\therefore JK = JI$ (sides opp = $\angle$ 's/sye teenoor = $\angle$ 'e)                                                                                                                                                                                                                             | ✓ ST              | A  |     |
|       |                                                                                                                                                                                                                                                                                                                                                                                                                                                   | ✓ RE              | A  |     |
|       |                                                                                                                                                                                                                                                                                                                                                                                                                                                   | ✓ RE              | A  | (4) |
| 8.2.2 | $\hat{K}_1 = \hat{J}_1 = \frac{x}{2}$ (alt. $\angle$ 's/verw. $\angle$ 'e; $JM \parallel IM$ )<br>$\hat{I}_1 = \hat{J}_1$ (proved/bewys)<br>$\hat{J}_{2+3} = 180^\circ - (\hat{K}_1 + \hat{I}_1)$ (int $\angle$ 's of $\Delta$ / binne $\angle$ 'e van $\Delta$ )<br>$= 180^\circ - x$<br>$\therefore \hat{H} + J = 180^\circ$ (opp $\angle$ 's of cq/teenoorst. $\angle$ 'e van kvh)<br>$\hat{H} = 180^\circ - (180^\circ - x)$<br>$\hat{H} = x$ | ✓ RE              | A  |     |
|       |                                                                                                                                                                                                                                                                                                                                                                                                                                                   | ✓ $180^\circ - x$ | CA |     |
|       |                                                                                                                                                                                                                                                                                                                                                                                                                                                   | ✓ RE              | A  |     |
|       |                                                                                                                                                                                                                                                                                                                                                                                                                                                   | ✓ H               | CA | (3) |



|     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                     |                                                                                                                                                                         |      |
|-----|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|
| 8.3 | $\hat{O} = \hat{H} = x$ (proved/bewys)<br><br><i>in <math>\triangle IHK</math></i><br>$\hat{I}KH = \hat{K}IH$ ( $\angle$ 's opp = sides/ $\angle$ 'e teenoor = sye)<br>$\hat{K}_2 = \frac{180^\circ - x}{2}$ (int. $\angle$ 's of $\triangle$ / binne $\angle$ 'e van $\triangle$ )<br><br><i>in <math>\triangle IOJ</math></i><br>$\hat{I}JO = \hat{J}IO$ ( $\angle$ 's opp = sides/ $\angle$ 'e teenoor = sye)<br>$\hat{J}_3 = \frac{180^\circ - x}{2}$ (int. $\angle$ 's of $\triangle$ / binne $\angle$ 'e van $\triangle$ )<br>$\therefore \hat{J}_3 = \hat{K}_2$<br>$\hat{I}_{1+2} = \hat{I}_{2+3}$ (third $\angle$ of $\triangle$ /derde $\angle$ van $\triangle$ )<br><br>$\triangle IOJ \parallel \triangle IHK$ ( $\angle\angle\angle$ ) | $\checkmark$ ST<br><br><br><br><br><br><br><br><br><br><br>$\checkmark$ ST<br><br><br><br><br><br><br><br><br><br><br>$\checkmark$ ST<br><br><br><br><br><br><br><br><br><br><br>$\checkmark$ RE                    | <b>A</b><br><br><br><br><br><br><br><br><br><br><br><b>A</b><br><br><br><br><br><br><br><br><br><br><br><b>A</b><br><br><br><br><br><br><br><br><br><br><br><b>A</b>    | (4)  |
| 8.4 | $\frac{HK}{OJ} = \frac{IK}{IJ}$ $\triangle IOJ \parallel \triangle IHK$ $\angle\angle\angle$<br>$\frac{10}{5} = \frac{8}{IJ}$<br><br>$IJ = \frac{8 \times 5}{10}$<br><br>$IJ = 4cm$                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | $\checkmark$ ST $\checkmark$ RE<br><br><br><br><br><br><br><br><br><br><br>$\checkmark$ Subst.<br><br><br><br><br><br><br><br><br><br><br>$\checkmark$ S<br><br><br><br><br><br><br><br><br><br><br>$\checkmark$ IJ | <b>A</b><br><br><br><br><br><br><br><br><br><br><br><b>CA</b><br><br><br><br><br><br><br><br><br><br><br><b>CA</b><br><br><br><br><br><br><br><br><br><br><br><b>CA</b> | (5)  |
|     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                     |                                                                                                                                                                         | [18] |



## QUESTION/VRAAG 9

|       |                                                                                                                                                                                                                                                           |                                         |                             |     |
|-------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------|-----------------------------|-----|
| 9.1   | Parallel/eweredig                                                                                                                                                                                                                                         | ✓ ST                                    | A                           | (1) |
| 9.2   |                                                                                                                                                                         |                                         |                             |     |
| 9.2.1 | <p>In <math>\triangle YPQ</math></p> $\frac{YR}{RP} = \frac{YS}{SQ} \quad (SR \parallel QP)$ <p>In <math>\triangle YXQ</math></p> $\frac{YP}{PX} = \frac{YS}{SQ} \quad (PS \parallel XQ)$ $\therefore \frac{YR}{RP} = \frac{YP}{PX}$                      | <p>✓ ST ✓ RE</p> <p>✓ ST</p>            | <p>A</p> <p>A</p>           | (3) |
| 9.2.2 | <p>In <math>\triangle YXQ</math></p> $\frac{XY}{PY} = \frac{QY}{SY} \quad (XQ \parallel PS)$ <p>In <math>\triangle YPQ</math></p> $\frac{PY}{RY} = \frac{QY}{SY} \quad (SR \parallel QP)$ $\therefore \frac{XY}{PY} = \frac{PY}{RY}$ $XY \cdot RY = PY^2$ | <p>✓ ST ✓ RE</p> <p>✓ ST</p> <p>✓ S</p> | <p>A</p> <p>A</p> <p>CA</p> | (4) |
|       |                                                                                                                                                                                                                                                           |                                         |                             | [8] |

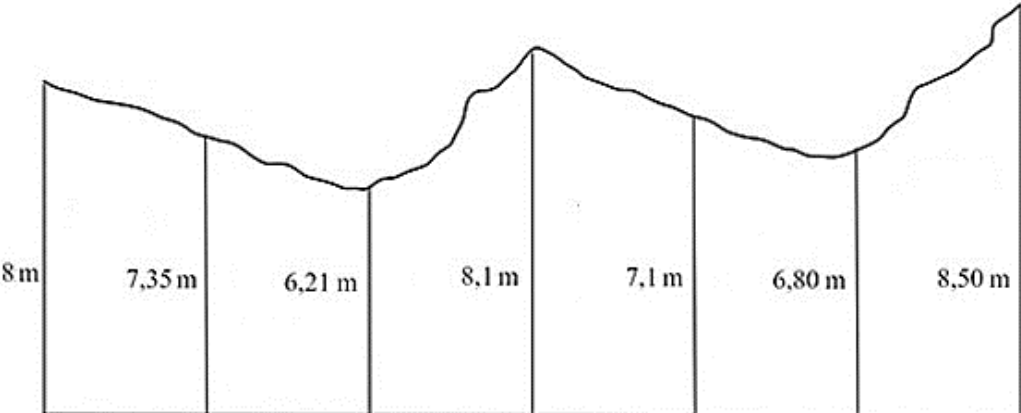


| QUESTION/VRAAG 10 |                                                                                                                                                                              |                                                                      |     |
|-------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------|-----|
| 10.1.1            | $50 \text{ mm} = \frac{50 \text{ mm}}{1} \times \frac{1 \text{ m}}{1\,000 \text{ mm}} = \frac{1}{20} \text{ m} = 0,05 \text{ m}$                                             | ✓conv/herleid A<br>✓ans/antw CA<br>NPU, NPR                          | (2) |
| 10.1.2            | $\frac{8000}{1 \text{ min}} \times \frac{1}{60 \text{ sec}} = \frac{400}{3} \text{ rev/s} \approx 133,33 \text{ rev/s}$                                                      | ✓conv/herleid A<br>✓ans/antw CA<br>NPU, NPR                          | (2) |
| 10.1.3            | $\omega = 2\pi n$<br>$\omega = 2\pi(133,33)$<br>$\omega \approx 266,67\pi \text{ rad/s}$<br><br><b>OR/OF</b><br>$\omega \approx 837,75 \text{ rad/s}$                        | ✓F A<br>✓SF CA<br>✓Ans/antw CA                                       | (3) |
| 10.1.4            | $v = \pi D n$<br>$v = \pi(0,05)(133,33)$<br>$v = 6,67\pi \text{ m/s}$<br>$v = 20,94 \text{ m/s}$                                                                             | ✓F A<br>✓SF CA<br>✓Ans/antw. CA<br><br>✓unit/eenhede A               | (4) |
| 10.2.1            | $38^\circ \times \frac{\pi}{180^\circ} = \frac{19\pi}{90} \text{ rad}$<br>$\approx 0,66 \text{ rad}$                                                                         | ✓Ans/antw. A<br>NPU, NPR                                             | (1) |
| 10.2.2            | $s = r\theta$<br>$r = \frac{s}{\theta} = \frac{15}{\left(\frac{19\pi}{90}\right)}$<br>$OP = 22,62 \text{ m}$                                                                 | ✓F A<br>✓SF CA<br>✓Ans/antw. CA                                      | (3) |
| 10.2.3            | $\text{Area of sector } OPQ = \frac{1}{2} r^2 \theta$<br>$= \frac{1}{2} \times (22,62)^2 \times \left(\frac{19\pi}{90}\right)$<br>$= 169,67 \text{ m}^2$<br><br><b>OR/OF</b> | ✓F A<br>✓SF CA<br>✓Area/Oppervl. CA<br><br>NPU, NPR<br>AO Full marks |     |



|      |                                                                                                                                                                                 |                                                                                                                         |      |
|------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------|------|
|      | $\text{Area of sector/van sektor } OPQ = \frac{rs}{2}$ $= \frac{22,62 \times 15}{2}$ $= 169,65 \text{ m}^2$                                                                     | ✓F                      A<br>✓SF                    CA<br>✓Area/Oppervl. CA<br><b>NPU, NPR</b><br><b>AO Full marks</b>  | (3)  |
| 10.3 | $4h^2 - 4dh + x^2 = 0$<br>$h = 5\text{cm}, d = 23\text{cm}$<br>$4(5)^2 - 4(23)(5) + x^2 = 0$<br>$x^2 = 460 - 100$<br>$x^2 = 360$<br>$x = \pm\sqrt{360}$<br>$x = 18,97\text{cm}$ | ✓F                      A<br><br>✓SF                    CA<br><br>✓S                      CA<br>✓Ans/Antw.            A | (4)  |
|      |                                                                                                                                                                                 |                                                                                                                         | [22] |



| QUESTION/VRAAG 11 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                  |  |
|-------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
| 11.1              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                                                                                                                                                                                                  |  |
|                   | $A_T = a \left( \frac{o_1 + o_7}{2} + o_2 + o_3 + o_4 + o_5 + o_6 \right)$ $= \frac{36}{6} \left( \frac{8 + 8,5}{2} + 7,35 + 6,21 + 8,1 + 7,5 + 6,8 \right)$ $= 6 \left( \frac{4\,421}{100} \right)$ $= 265,26 \text{ m}^2$ <p style="text-align: center;"><b>OR/OF</b></p> $A_T = a(m_1 + m_2 + m_3 + m_4 + \dots + m_n)$ $= \frac{36}{6} \left( \frac{8+7,35}{2} + \frac{7,35+6,21}{2} + \frac{6,21+8,1}{2} + \frac{8,1+7,5}{2} + \frac{7,5+6,8}{2} + \frac{6,8+8,5}{2} \right)$ $= 6 \left( \frac{4\,421}{100} \right)$ $= 265,26 \text{ m}^2$ | ✓F                      A<br>✓SF                    A<br>✓ $a = \frac{36}{6}$ A<br>✓S<br>CA<br>✓Area/Oppervl.<br>CA<br>✓F                      A<br>✓SF                    A<br>✓ $a = \frac{36}{6}$ A<br>✓S                      CA<br>✓Area/Oppervl. CA    (5) |  |
| 11.2.1            | Area of rectangular prism/<br>oppervlakte van reghoekige prisma = $2lh + 2lw + 2wh$<br>$1\,790 = (50 \times x) + 2(8 \times x) + 2(8 \times 50)$ (one side is open/een kant is oop)<br>$1\,790 = 50x + 16x + 800$<br>$66x = 1\,790 - 800$<br>$66x = 990$<br>$x = \frac{990}{66}$<br>$x = 15 \text{ cm}$                                                                                                                                                                                                                                           | ✓SF                    A<br><br>✓S                      CA<br>✓value of/waarde<br>van x                      CA    (3)                                                                                                                                           |  |



|        |                                                                                                                                                                                                                                                                     |                                                                                           |            |
|--------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------|------------|
| 11.2.2 | <p>Volume of cylinder = <math>\pi r^2 h</math></p> <p>Vol. of/van <math>\frac{1}{4}</math> circle/sirkel = <math>\frac{1}{4} \pi r^2 h</math></p> <p><math>= \frac{1}{4} \times \pi \times (15)^2 \times 50</math></p> <p><math>= 8\,835,72 \text{ cm}^3</math></p> | <p>✓F                      A</p> <p>✓Subst.              CA</p> <p>✓Ans/Antw.      CA</p> | (3)        |
|        |                                                                                                                                                                                                                                                                     |                                                                                           | [11]       |
|        |                                                                                                                                                                                                                                                                     |                                                                                           |            |
|        |                                                                                                                                                                                                                                                                     | <b>TOTAL /TOTAAL:</b>                                                                     | <b>150</b> |

