



# education

Department:  
Education  
North West Provincial Government  
**REPUBLIC OF SOUTH AFRICA**

## NATIONAL SENIOR CERTIFICATE

**GRADE 12**

**MATHEMATICS P2**

**SEPTEMBER 2025**

**MARKS: 150**

**TIME: 3 hours**

**This question paper consists 12 pages, 1 information sheet  
and an answer book of 22 pages.**

**INSTRUCTIONS AND INFORMATION**

Read the following instructions carefully before answering the questions.

1. This paper consists of 10 questions.
2. Answer ALL the questions in the SPECIAL ANSWER BOOK provided.
3. Clearly show ALL calculations, diagrams, graphs etc. which you have used in determining your answers.
4. Answers only will NOT necessarily be awarded full marks.
5. You may use an approved scientific calculator (non-programmable and non-graphical), unless stated otherwise.
6. If necessary, round off answers to TWO decimal places, unless stated otherwise.
7. Diagrams are NOT necessarily drawn to scale.
8. An information sheet with formulae is included at the end of the question paper.
9. Write neatly and legibly.



**QUESTION 1**

A survey was done under 100 members of a gymnasium about the cost of their annual membership contract.

Results showed an average annual payment of R3 240.

| AMOUNT (R)               | FREQUENCY |
|--------------------------|-----------|
| $0 \leq x < 1\,000$      | 8         |
| $1\,000 \leq x < 2\,000$ | 12        |
| $2\,000 \leq x < 3\,000$ | P         |
| $3\,000 \leq x < 4\,000$ | 30        |
| $4\,000 \leq x < 5\,000$ | Q         |
| $5\,000 \leq x < 6\,000$ | 12        |

- 1.1 How many members paid less than R2 000 for their annual contract? (1)
  - 1.2 Proof by calculation that  $P = 20$  and  $Q = 18$ . (5)
  - 1.3 Hence, complete the cumulative frequency table in the ANSWER BOOK. (2)
  - 1.4 Use the cumulative frequency table to draw an ogive to illustrate the information above. (3)
  - 1.5 Use the ogive to determine how many members spent more than R4 200 annually on their contracts. (1)
- [12]**

**QUESTION 2**

Eight couples entered a dance competition. Two judges gave marks for their performances. The marks (out of 20) are shown in the table below.

| COUPLE  | 1  | 2 | 3 | 4 | 5 | 6  | 7  | 8  |
|---------|----|---|---|---|---|----|----|----|
| JUDGE 1 | 18 | 4 | 6 | 8 | 5 | 12 | 10 | 14 |
| JUDGE 2 | 15 | 6 | 3 | 5 | 5 | 14 | 8  | 15 |

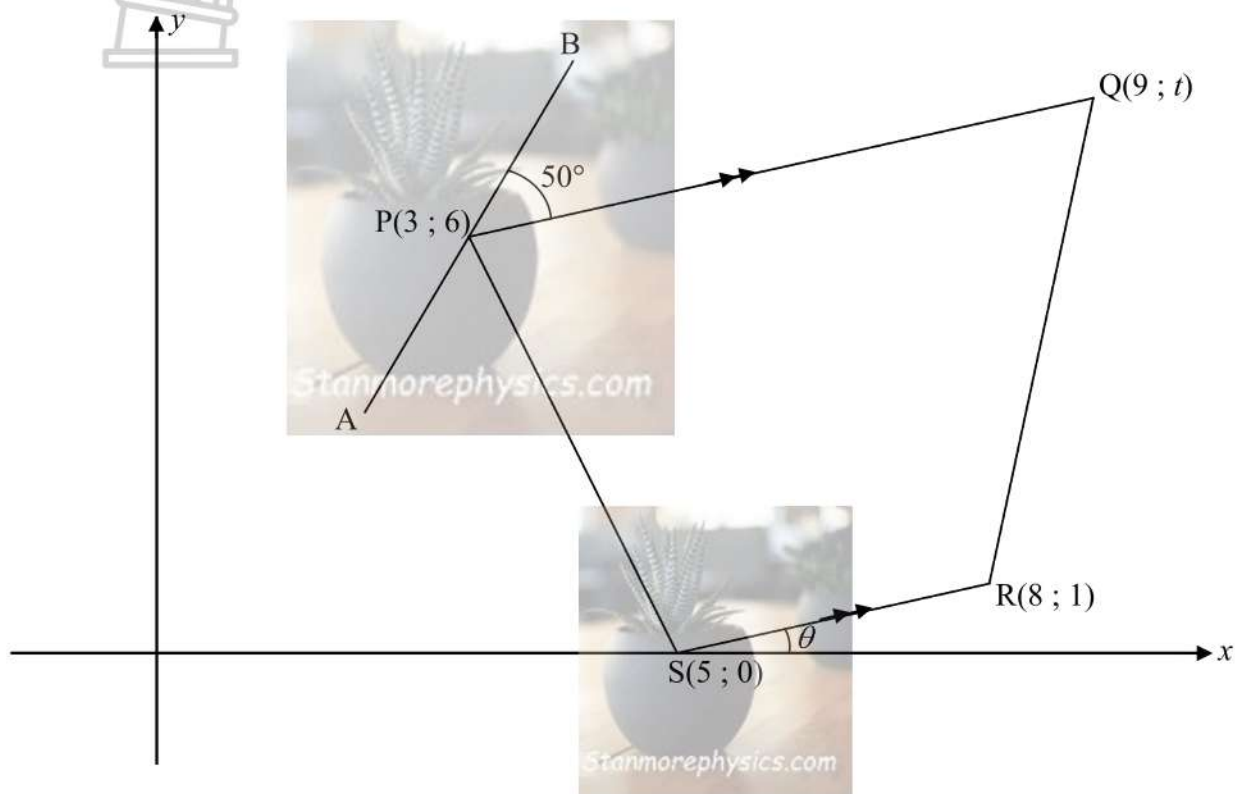
- 2.1 Determine the equation of the least squares regression line of the marks given by the two judges. (3)
- 2.2 A ninth couple had a late entry in the competition and received a mark of 15 by JUDGE 1. Calculate to the nearest integer, the mark they possibly would have received from JUDGE 2. (2)
- 2.3 Are the judges consistent when allocating marks?  
Motive your answer with appropriate calculations. (3)

**[8]**

**QUESTION 3**

In the diagram below PQRS is a quadrilateral with vertices  $P(3 ; 6)$ ,  $Q(9 ; t)$ ,  $R(8 ; 1)$  and  $S(5 ; 0)$ .  $PQ \parallel SR$ .

AB is a straight line that touches the quadrilateral at P.  $\hat{QPB} = 50^\circ$



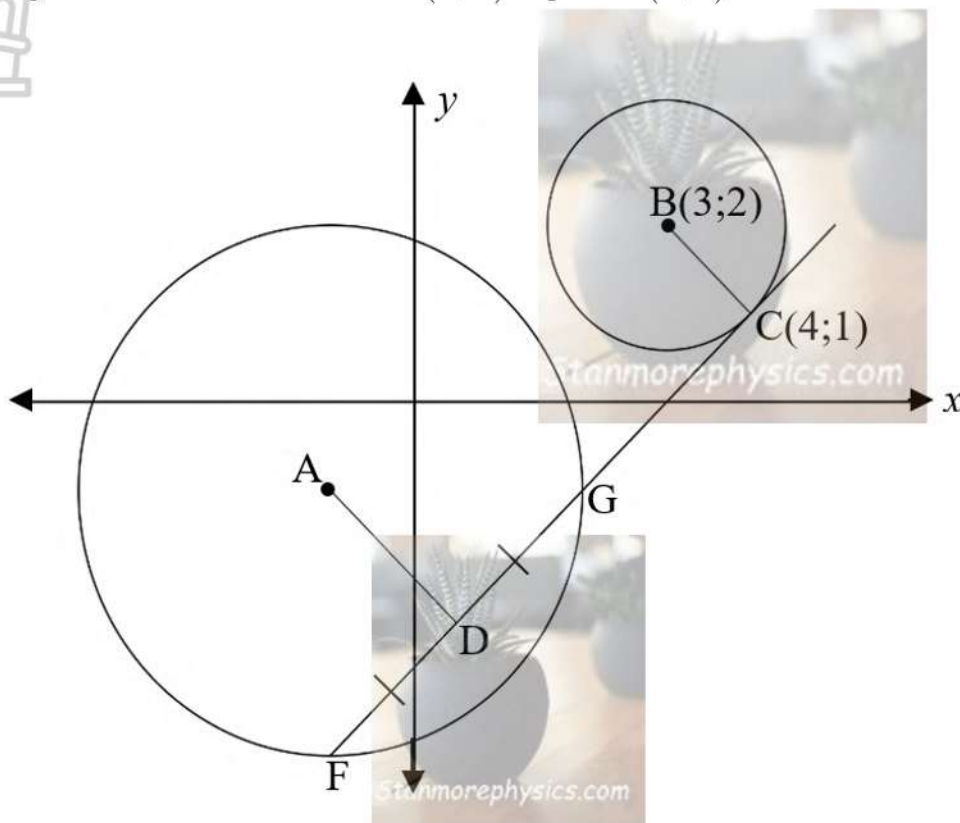
- 3.1 Calculate the gradient of SR. (2)
  - 3.2 Determine the equation of PQ in the form  $y = mx + c$ . (3)
  - 3.3 Calculate the value of  $t$ . (2)
  - 3.4 Calculate the length of PQ if  $t = 8$ . (2)
  - 3.5 Proof that PS is perpendicular to SR. (3)
  - 3.6 If  $PQ = PS$ , calculate the area of PQRS. (6)
  - 3.7 Calculate the value of  $\theta$ , the angle of inclination of SR. (2)
  - 3.8 Calculate the equation of AB. Show ALL working. (6)
- [26]**

**QUESTION 4**

In the diagram below the circle with centre A has the equation  $(x+1)^2 + (y+1)^2 = 9$ .

FG is a chord of circle A. AD bisects chord FG.

FGC is a tangent to the circle with centre B(3; 2) at point C(4; 1).



4.1 Write down the coordinates of A. (1)

4.2 Determine the equation of tangent FC, in the form  $y = mx + c$ . (4)

4.3 Given:  $AD = \frac{\sqrt{10}}{2}$  units. Calculate the length of FG. (4)

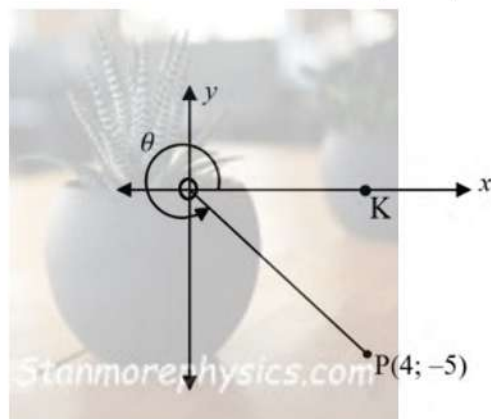
4.4 Determine the length of AB. (2)

4.5 Another circle with centre B, touches the circle with centre A at K. Determine the equation of the new circle. (3)

**[14]**

## QUESTION 5

- 5.1 In the diagram below, line OP is given with  $P(4; -5)$ .  $\widehat{KOP} = \theta$



Calculate, **without using a calculator**, the numerical value of the following:

5.1.1  $\sin^2(180^\circ + \theta)$  (4)

5.1.2  $\tan(-\theta)$  (2)

- 5.2 Calculate, **without using a calculator**, the value of the following:

5.2.1  $\cos 15^\circ$  (6)

5.2.2 
$$\frac{\cos(90^\circ + x) \cdot \cos(180^\circ - x)}{\cos^2(180^\circ + x) \cdot \tan(180^\circ - x)}$$
 (5)

5.3 Given: 
$$\frac{\sin 2\theta + 2 \cos \theta - 2 \cos^3 \theta}{1 + \sin \theta} = \sin 2\theta$$

5.3.1 Proof the identity. (5)

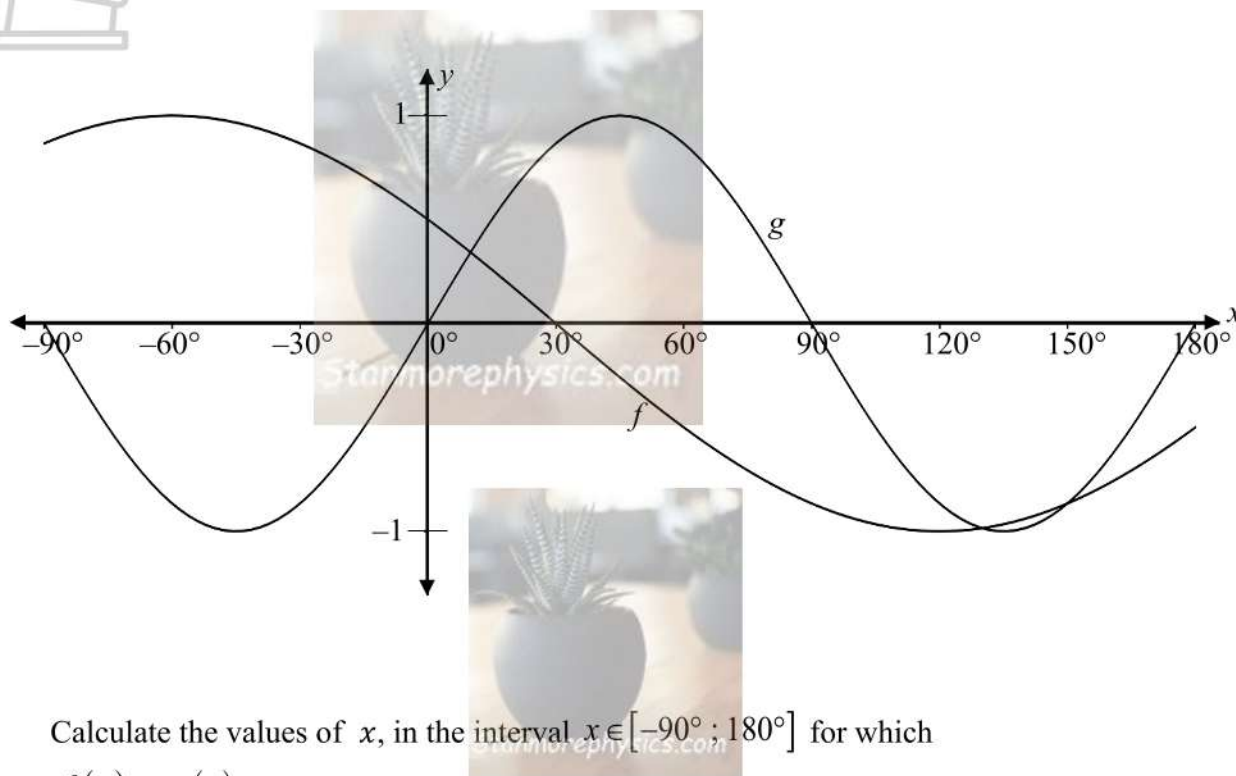
5.3.2 For which values of  $\theta$  in the interval  $[-360^\circ; 360^\circ]$  is the identity in QUESTION 5.3.1 undefined? (2)

5.4 Calculate the maximum value of  $\frac{4}{2 + \cos x}$  (2)

**[26]**

**QUESTION 6**

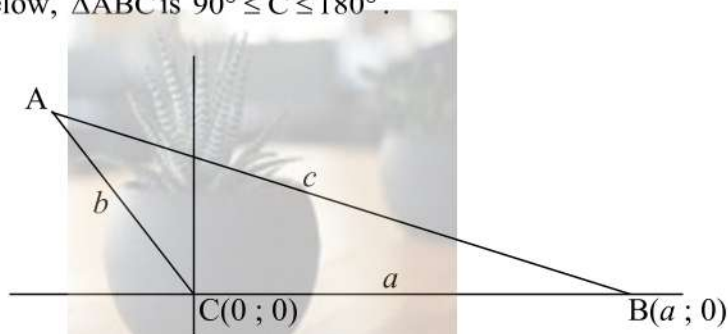
In the diagram below, the graphs of  $f(x) = \cos(x + 60^\circ)$  and  $g(x) = \sin 2x$  are drawn for the interval  $x \in [-90^\circ; 180^\circ]$ .



- 6.1 Calculate the values of  $x$ , in the interval  $x \in [-90^\circ; 180^\circ]$  for which  $f(x) = g(x)$ . (7)
- 6.2 Write down the period of  $g(x)$ . (1)
- 6.3 Use your answer in question 6.1 to determine the value(s) of  $x$  where  $g(x) \geq f(x)$ . (2)
- 6.4 Describe the transformation from  $h$  to  $p$  if  $h(x) = \sin x$  and  $p(x) = \sin(x - 30^\circ)$ . (3)
- [13]**

## QUESTION 7

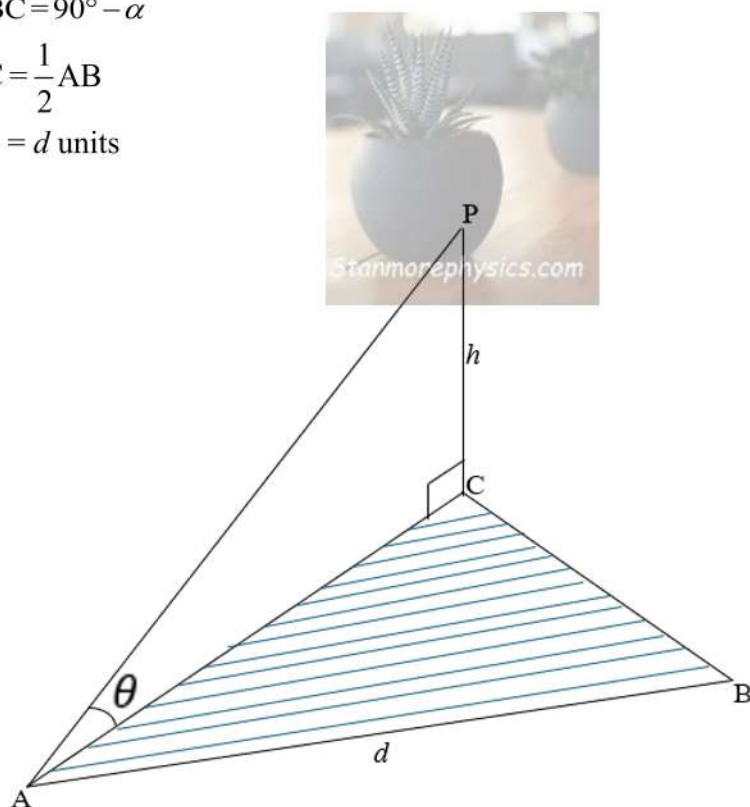
7.1 In the diagram below,  $\triangle ABC$  is  $90^\circ \leq C \leq 180^\circ$ .



Proof:  $c^2 = a^2 + b^2 - 2ab \cos C$ . (4)

7.2 In the diagram below, A, B and C are three points in the same horizontal plane.

- P is the image of a balloon vertically above C
- The angle of elevation to P from A is  $\theta$
- $\angle ABC = 90^\circ - \alpha$
- $BC = \frac{1}{2} AB$
- $AB = d$  units



7.2.1 Prove that  $h = \frac{d \cdot \tan \theta \cdot \sqrt{5 - 4 \sin \alpha}}{2}$ , where  $h$  is the height of the balloon above the ground. (4)

7.2.2 Determine the value of  $h$  if  $d = 300 \text{ m}$ ,  $\alpha = 32^\circ$  and  $\theta = 63^\circ$ . (3)

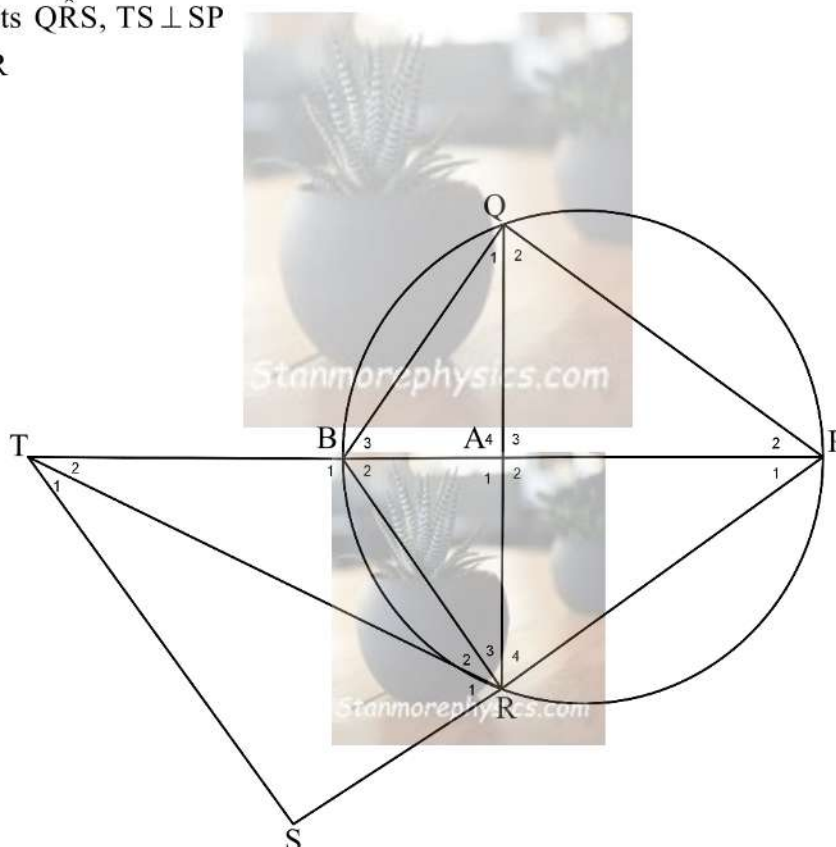
[11]

Provide reasons for your statements in QUESTION 8, 9 and 10.

### QUESTION 8

In the diagram below PQBR is a cyclic quadrilateral.

- BP is a diameter of the circle. PR is produced to S, and PB to T
- PBT intersects QR at A and the circle at B
- RT bisects  $\hat{Q}RS$ ,  $TS \perp SP$
- $PQ = PR$



8.1 If  $\hat{Q}_2 = 55^\circ$ , calculate with reasons the size of:

8.1.1  $\hat{R}_4$  (2)

8.1.2  $\hat{B}_3$  (2)

8.1.3  $\hat{B}RP$  (2)

8.1.4  $\hat{A}_1$  (3)

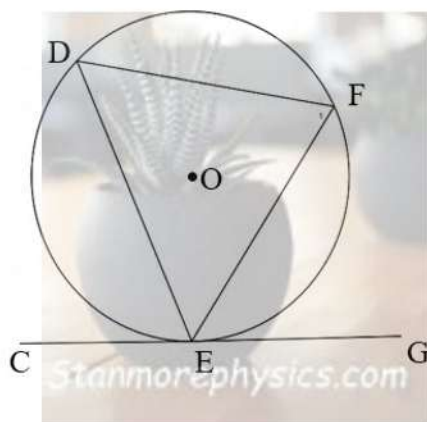
8.2 Give a reason why  $AQ = AR$ . (1)

8.3 Prove that  $AT = TS$ . (4)

[14]

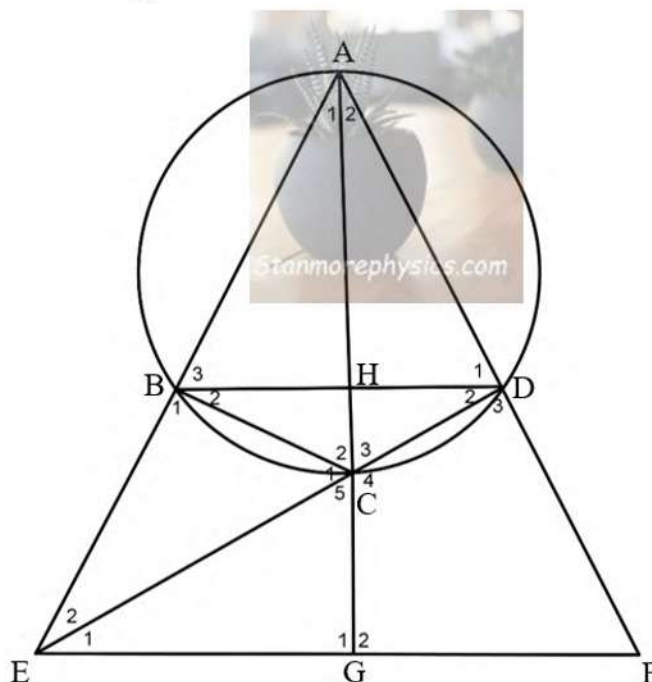
## QUESTION 9

In the diagram O is the centre of the circle, with CEG a tangent to the circle.



9.1 Prove the theorem that states that  $\hat{CED} = \hat{F}$ . (5)

9.2 In the diagram below, ABCD is a cyclic quadrilateral.  $EF \parallel BD$ . ACG and DCE are straight lines.



Prove that:

9.2.1  $\hat{E}_1 = \hat{A}_1$  (3)

9.2.2 EF is a tangent to the circle EAC (1)

9.2.3  $\triangle ABC \parallel \triangle EDF$  (4)

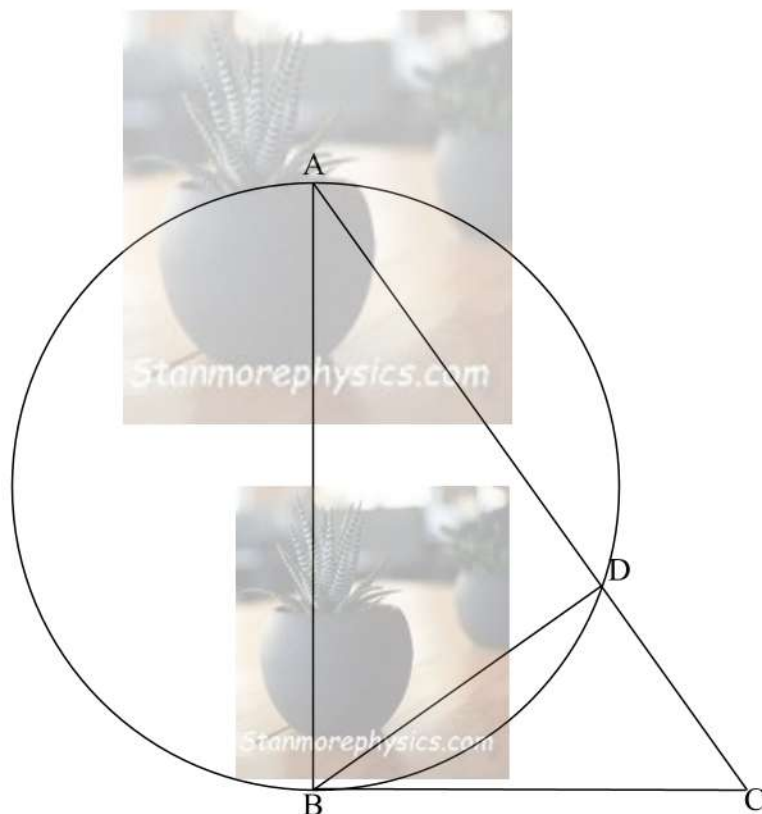
9.2.4  $\frac{BE \cdot AH}{GH} = \frac{ED \cdot BC}{DF}$  (6)

[19]

**QUESTION 10**

In the diagram below, AB is a diameter of the circle. CB is a tangent to the circle at B. AC intersect the circle at D.

- $DC = x$
- $DC = \frac{1}{2}AD$



10.1 Prove that  $\frac{BD}{DC} = \sqrt{2}$

(4)

10.2 Calculate the perimeter of  $\triangle ABC$  if  $AD = 10$  mm.

(3)

[7]

**TOTAL: 150**

## INFORMATION SHEET

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$A = P(1 + ni)$$

$$T_n = a + (n - 1)d$$

$$T_n = ar^{n-1}$$

$$A = P(1 - ni)$$

$$S_n = \frac{n}{2} [2a + (n - 1)d]$$

$$S_n = \frac{a(r^n - 1)}{r - 1}; r \neq 1$$

$$A = P(1 - i)^n$$

$$A = P(1 + i)^n$$

$$S_\infty = \frac{a}{1 - r}; -1 < r < 1$$

$$F = \frac{x[(1 + i)^n - 1]}{n}$$

$$P = \frac{x[1 - (1 + i)^{-n}]}{i}$$

$$f'(x) = \lim_{h \rightarrow 0} \frac{f(x + h) - f(x)}{h} \quad x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2} \quad M\left(\frac{x_1 + x_2}{2}; \frac{y_1 + y_2}{2}\right)$$

$$y = mx + c$$

$$y - y_1 = m(x - x_1)$$

$$m = \frac{y_2 - y_1}{x_2 - x_1}$$

$$m = \tan \theta$$

$$(x - a)^2 + (y - b)^2 = r^2$$

$$\text{In } \triangle ABC: \frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

$$a^2 = b^2 + c^2 - 2bc \cos A$$

$$\text{area } \triangle ABC = \frac{1}{2} ab \sin C$$

$$\sin(\alpha + \beta) = \sin \alpha \cos \beta + \cos \alpha \sin \beta$$

$$\sin(\alpha - \beta) = \sin \alpha \cos \beta - \cos \alpha \sin \beta$$

$$\cos(\alpha + \beta) = \cos \alpha \cos \beta - \sin \alpha \sin \beta$$

$$\cos(\alpha - \beta) = \cos \alpha \cos \beta + \sin \alpha \sin \beta$$

$$\cos 2\alpha = \begin{cases} \cos^2 \alpha - \sin^2 \alpha \\ 1 - 2\sin^2 \alpha \\ 2\cos^2 \alpha - 1 \end{cases}$$

$$\sin 2\alpha = 2\sin \alpha \cos \alpha$$

$$\bar{x} = \frac{\sum x}{n}$$

$$\sigma^2 = \frac{\sum_{i=1}^n (x_i - \bar{x})^2}{n}$$

$$P(A) = \frac{n(A)}{n(S)}$$

$$P(A \text{ or } B) = P(A) + P(B) - P(A \text{ and } B)$$

$$\hat{y} = a + bx$$

$$b = \frac{\sum (x - \bar{x})(y - \bar{y})}{\sum (x - \bar{x})^2}$$



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**NATIONAL SENIOR CERTIFICATE/  
NASIONALE SENIOR SERTIFIKAAT**

**GRADE/GRAAD 12**

**MATHEMATICS P2/WISKUNDE V2**

**SEPTEMBER 2025**

**MARKING GUIDELINES/NASIENRIGLYNE**

**MARKS/PUNTE: 150**

**These marking guidelines consist of 18 pages./  
Hierdie nasienriglyne bestaan uit 18 bladsye.**

**NOTE:**

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

**LET WEL:**

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

## QUESTION/VRAAG 1



| AMOUNT/<br>BEDRAG (R)    | FREQUENCY/<br>FREKWENSIE |
|--------------------------|--------------------------|
| $0 \leq x < 1\,000$      | 8                        |
| $1\,000 \leq x < 2\,000$ | 12                       |
| $2\,000 \leq x < 3\,000$ | P                        |
| $3\,000 \leq x < 4\,000$ | 30                       |
| $4\,000 \leq x < 5\,000$ | Q                        |
| $5\,000 \leq x < 6\,000$ | 12                       |

| 1.1                     | 20                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | ✓ answer/antwoord<br>(1)                                                                                                                                   |                          |                                                       |                      |   |   |                         |    |    |                         |    |    |                         |    |    |                         |    |    |                         |    |     |                                         |
|-------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------|-------------------------------------------------------|----------------------|---|---|-------------------------|----|----|-------------------------|----|----|-------------------------|----|----|-------------------------|----|----|-------------------------|----|-----|-----------------------------------------|
| 1.2                     | $8 + 12 + P + 30 + Q + 12 = 100$<br>$P + Q = 38 \dots\dots\dots \textcircled{1}$<br><br>$\bar{x} = 3240 = \frac{8(500) + 12(1\,500) + P(2\,500) + 30(3\,500) + Q(4\,500) + 12(5\,500)}{100}$<br><br>$\therefore 1310 = 25P + 45Q$<br>$\therefore 262 = 5P + 9Q$<br><br>$5(38 - Q) + 9P = 262$<br>$190 - 5Q + 9Q = 262$<br>$4Q = 72$<br>$Q = 18$<br>$P = 20$                                                                                                                                                                                                                                                                                                                    | ✓ $P + Q = 38$<br><br>✓ eq of $\bar{x} = 3240$<br><br>✓ $262 = 5P + 9Q$<br><br>✓ subst/vervang $\textcircled{1}$<br><br>✓ subst/vervang<br>$Q = 18$<br>(5) |                          |                                                       |                      |   |   |                         |    |    |                         |    |    |                         |    |    |                         |    |    |                         |    |     |                                         |
| 1.3                     | <table border="1"> <thead> <tr> <th>AMOUNT/<br/>BEDRAG (R)</th><th>FREQUENCY/<br/>FREKWENSIE</th><th>CUMULATIVE<br/>FREQUENCY/<br/>KUMULATIEWE<br/>FREKWENSIE</th></tr> </thead> <tbody> <tr> <td><math>0 \leq x \leq 1000</math></td><td>8</td><td>8</td></tr> <tr> <td><math>1000 \leq x \leq 2000</math></td><td>12</td><td>20</td></tr> <tr> <td><math>2000 \leq x \leq 3000</math></td><td>20</td><td>40</td></tr> <tr> <td><math>3000 \leq x \leq 4000</math></td><td>30</td><td>70</td></tr> <tr> <td><math>4000 \leq x \leq 5000</math></td><td>18</td><td>88</td></tr> <tr> <td><math>5000 \leq x \leq 6000</math></td><td>12</td><td>100</td></tr> </tbody> </table> | AMOUNT/<br>BEDRAG (R)                                                                                                                                      | FREQUENCY/<br>FREKWENSIE | CUMULATIVE<br>FREQUENCY/<br>KUMULATIEWE<br>FREKWENSIE | $0 \leq x \leq 1000$ | 8 | 8 | $1000 \leq x \leq 2000$ | 12 | 20 | $2000 \leq x \leq 3000$ | 20 | 40 | $3000 \leq x \leq 4000$ | 30 | 70 | $4000 \leq x \leq 5000$ | 18 | 88 | $5000 \leq x \leq 6000$ | 12 | 100 | ✓ 8, 20, 40<br><br>✓ 70, 88, 100<br>(2) |
| AMOUNT/<br>BEDRAG (R)   | FREQUENCY/<br>FREKWENSIE                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | CUMULATIVE<br>FREQUENCY/<br>KUMULATIEWE<br>FREKWENSIE                                                                                                      |                          |                                                       |                      |   |   |                         |    |    |                         |    |    |                         |    |    |                         |    |    |                         |    |     |                                         |
| $0 \leq x \leq 1000$    | 8                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 8                                                                                                                                                          |                          |                                                       |                      |   |   |                         |    |    |                         |    |    |                         |    |    |                         |    |    |                         |    |     |                                         |
| $1000 \leq x \leq 2000$ | 12                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 20                                                                                                                                                         |                          |                                                       |                      |   |   |                         |    |    |                         |    |    |                         |    |    |                         |    |    |                         |    |     |                                         |
| $2000 \leq x \leq 3000$ | 20                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 40                                                                                                                                                         |                          |                                                       |                      |   |   |                         |    |    |                         |    |    |                         |    |    |                         |    |    |                         |    |     |                                         |
| $3000 \leq x \leq 4000$ | 30                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 70                                                                                                                                                         |                          |                                                       |                      |   |   |                         |    |    |                         |    |    |                         |    |    |                         |    |    |                         |    |     |                                         |
| $4000 \leq x \leq 5000$ | 18                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 88                                                                                                                                                         |                          |                                                       |                      |   |   |                         |    |    |                         |    |    |                         |    |    |                         |    |    |                         |    |     |                                         |
| $5000 \leq x \leq 6000$ | 12                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 100                                                                                                                                                        |                          |                                                       |                      |   |   |                         |    |    |                         |    |    |                         |    |    |                         |    |    |                         |    |     |                                         |

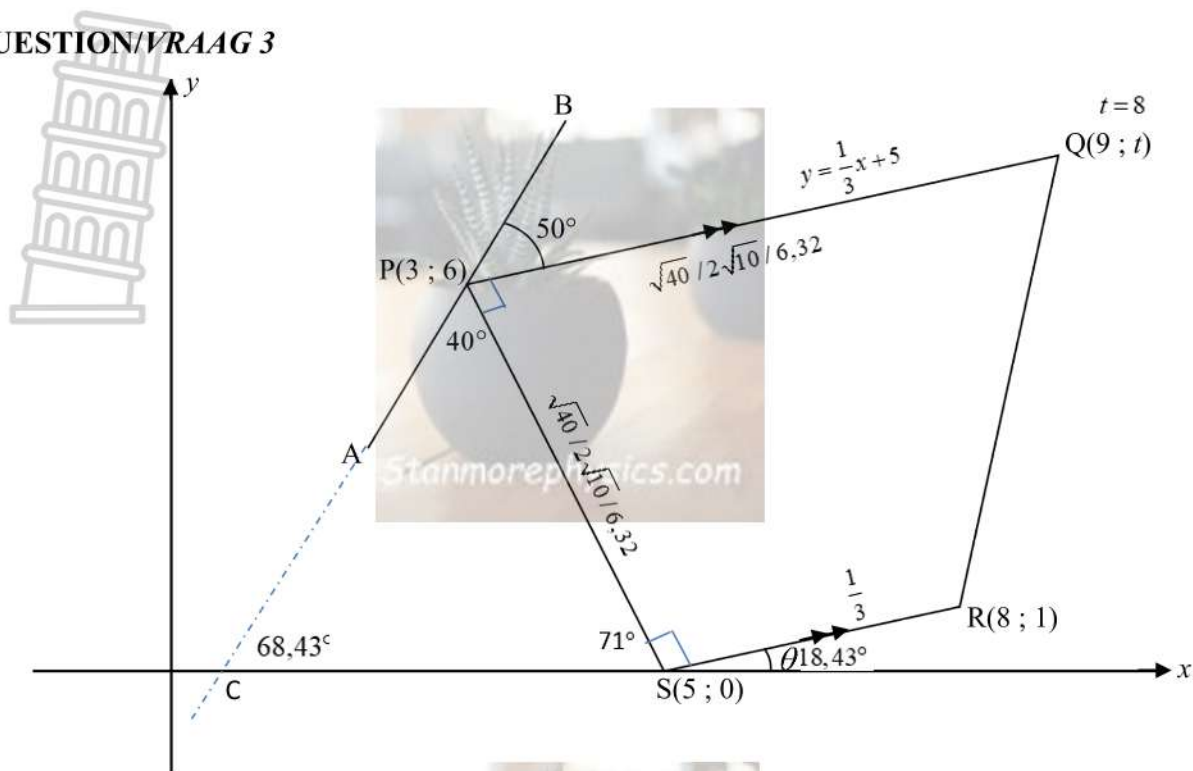
|     |                                                       |                                                                                                                                                                                                                   |
|-----|-------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1.4 | <p style="text-align: center;"><b>Ogive/Ogief</b></p> | <ul style="list-style-type: none"> <li>✓ min/max values</li> <li>✓ all coordinates (penalise without grouping/penaliseer sonder beginpunt)</li> <li>✓ shape/vorm</li> </ul> <p style="text-align: right;">(3)</p> |
| 1.5 | $100 - 74 = 26$ members/lede                          | <ul style="list-style-type: none"> <li>✓ answer/antwoord</li> </ul> <p style="text-align: right;">(1)</p>                                                                                                         |
|     |                                                       | <b>[12]</b>                                                                                                                                                                                                       |

**QUESTION/VRAAG 2**

| COUPLE/PAAR         | 1  | 2 | 3 | 4 | 5 | 6  | 7  | 8  |
|---------------------|----|---|---|---|---|----|----|----|
| JUDGE/BEOORDELAAR 1 | 18 | 4 | 6 | 8 | 5 | 12 | 10 | 14 |
| JUDGE/BEOORDELAAR 2 | 15 | 6 | 3 | 5 | 5 | 14 | 8  | 15 |

|     |                                                                                                                                                         |                                                                                                                                                                                                                         |                                                                                                 |     |
|-----|---------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------|-----|
| 2.1 | $a = -0.03$<br>$b = 0,93$<br>$\hat{y} = -0.03 + 0,93x$                                                                                                  | <div> Answer only: full marks, but if <math>a</math> and <math>b</math> are swopped only 1/3 marks/<br/> <i>Slegs antwoord: vol punte maar as <math>a</math> en <math>b</math> omgeruil is, slegs 1/3 punte.</i> </div> | <div> ✓ <math>a</math><br/> ✓ <math>b</math><br/> ✓ equation/<br/> vergeliking </div>           | (3) |
| 2.2 | $\hat{y} = -0.03 + 0,93(15)$<br>$= 13,92$ OR / OF $13,85$<br>$\approx 14$                                                                               | <div> Answer only: full marks<br/> <i>Slegs antwoord: vol punte</i> </div>                                                                                                                                              | <div> ✓ substitute 15 into<br/> eq/ vervang 15 in<br/> vgl.<br/> <br/> ✓ answer/antwoord </div> | (2) |
| 2.3 | Yes, they are consistent. $r = 0,9$ – positive strong correlation /<br><i>Ja, hulle is konsekwent. <math>r = 0,9</math> – positief sterk korrelasie</i> |                                                                                                                                                                                                                         | <div> ✓ yes/ja<br/> ✓ <math>r = 0,9</math><br/> ✓ positive strong/<br/> positief sterk </div>   | (3) |
| [8] |                                                                                                                                                         |                                                                                                                                                                                                                         |                                                                                                 |     |

**QUESTION/VRAAG 3**

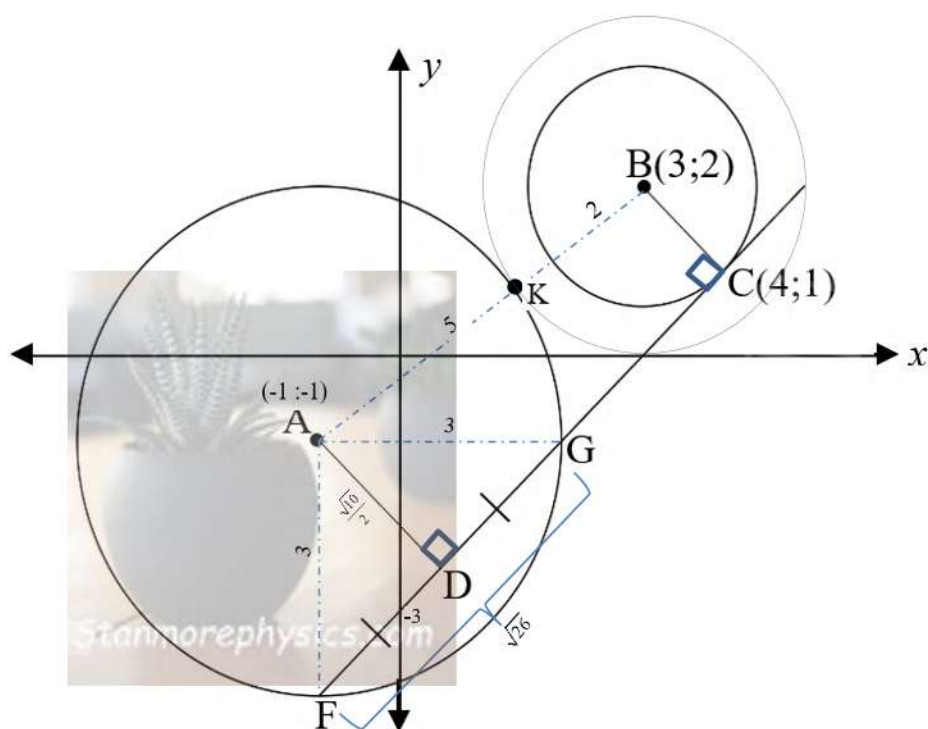


|     |                                                                                                                                                                                                                |                                                                                                                                                                                             |
|-----|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 3.1 | $m_{SR} = \frac{1-0}{8-5}$ $= \frac{1}{3}$                                                                                                                                                                     | <div>✓ subst./vervang</div> <div>✓ answer/antwoord</div> <div>(2)</div>                                                                                                                     |
| 3.2 | <p>Equation/Vergelyking: PQ</p> $m_{PQ} = m_{SR} = \frac{1}{3}$ <p><math>P(3; 6)</math>:</p> $6 = \left(\frac{1}{3}\right)(3) + c$ $\therefore c = 5$ $\therefore y = \frac{1}{3}x + 5$ <div>CA from 3.1</div> | <div>✓ <math>m_{PQ} = m_{SR} = \frac{1}{3}</math></div> <div>✓ subst. coordinates of/<br/>vervang koördinate van P</div> <div>✓ equation of PQ/<br/>vergelyking van PQ</div> <div>(3)</div> |
| 3.3 | <p><math>Q(9; t)</math> in <math>y = \frac{1}{3}x + 5</math></p> $t = \frac{1}{3}(9) + 5$ $t = 8$ <div>CA from 3.2</div>                                                                                       | <div>✓ subst. coordinates of/<br/>vervang koördinate van P</div> <div>✓ value of/<br/>waarde van t</div> <div>(2)</div>                                                                     |
| 3.4 | $PQ = \sqrt{(3-9)^2 + (6-8)^2}$ $PQ = \sqrt{36+4}$ $PQ = \sqrt{40} / 2\sqrt{10} / 6,32$                                                                                                                        | <div>✓ subst. coordinates in<br/>correct formula/ vervang<br/>koördinate in korrekte<br/>formule</div> <div>✓ answer/antwoord</div> <div>(2)</div>                                          |

|     |                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                      |
|-----|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 3.5 | $m_{PS} = \frac{6-0}{3-5} = \frac{6}{-2} = -3$ $m_{SR} = \frac{1}{3}$ $m_{PS} \times m_{SR}$ $= -3 \times \frac{1}{3}$ $= -1$ $\therefore PS \perp SR$                                                                                                                                                                                                        | $\checkmark m_{PS} = -3$<br>$m_{PS} \times m_{SR}$ $\checkmark = -3 \times \frac{1}{3}$ $= -1$<br>$\checkmark$ <p>conclusion/gevolgtrekking</p> <p>(3)</p>                                           |
| 3.6 | $SR = \sqrt{(8-5)^2 + (1-0)^2}$ $SR = \sqrt{9+1}$ $SR = \sqrt{10} / 3,16$<br>$PS = \sqrt{(5-3)^2 + (0-6)^2}$ $PS = \sqrt{4+36}$ $PS = \sqrt{40} / 2\sqrt{10} / 6,32$<br>$\text{area of trapezium/oppv van trapesium} = \frac{1}{2}(PQ + RS) \cdot PS$ $= \frac{1}{2}(\sqrt{40} + \sqrt{10}) \times \sqrt{40}$ $= 30 \text{ square units / vierkante eenhede}$ | $\checkmark SR$ $\checkmark PS$<br>$\checkmark \text{ area of trapezium/}$ $\text{oppv van trapezium}$ $\checkmark \sqrt{40}$ $\checkmark \sqrt{10}$ $\checkmark \text{ answer/antwoord}$ <p>(6)</p> |
| 3.7 | $\tan \theta = \frac{1}{3}$ $\therefore \theta = 18,43^\circ$ <div style="border: 1px solid black; padding: 5px; display: inline-block;">                     Answer only: full marks                 </div>                                                                                                                                                  | $\checkmark \tan \alpha = m_{SR}$ $\checkmark \text{ answer/antwoord}$ <p>(2)</p>                                                                                                                    |

|            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>3.8</p> | <p> <math>\hat{QPS} = 90^\circ</math> [co-int <math>\angle</math>'s / ko-binne <math>\angle^e PQ \parallel SR</math>]<br/> <math>\hat{P}_1 = 40^\circ</math> [straight line / reguitlyn]<br/> <math>\hat{C} = 68,43^\circ</math> [ext <math>\angle</math> of <math>\Delta</math> / buite <math>\angle</math> v <math>\Delta</math>]<br/> <math>\tan 68,43^\circ = 2,53</math><br/>                     OR/OF<br/> <math>\hat{PSC} = 71,57^\circ</math><br/> <math>\hat{CPS} = 40^\circ</math><br/> <math>\therefore \hat{PCS} = 68,43^\circ</math><br/> <math>P(3:6):</math><br/> <math>6 = (2,53)(3) + c</math><br/> <math>\therefore c = -1,59</math><br/> <math>\therefore y = 2,53x - 1,59</math> </p> | <p> <math>\checkmark \hat{QPS} = 90^\circ</math><br/> <math>\checkmark \hat{P}_1 = 40^\circ</math><br/> <math>\checkmark \hat{PCS} = 68,43^\circ</math><br/> <math>\checkmark m = 2,53</math><br/> <br/> <math>\checkmark \hat{PSC} = 71,57^\circ</math><br/> <math>\checkmark \hat{CPS} = 40^\circ</math><br/> <math>\checkmark \hat{PCS} = 68,43^\circ</math><br/> <br/> <math>\checkmark</math> subst. coordinates of/<br/>                     vervang koördinate<br/>                     van P<br/> <br/> <math>\checkmark</math> equation/ vergelyking                 </p> |
|            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | <p>(6)<br/>[26]</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |

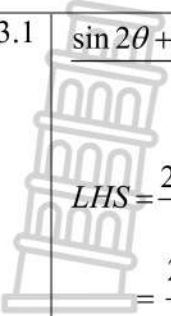
#### QUESTION/VRAAG 4



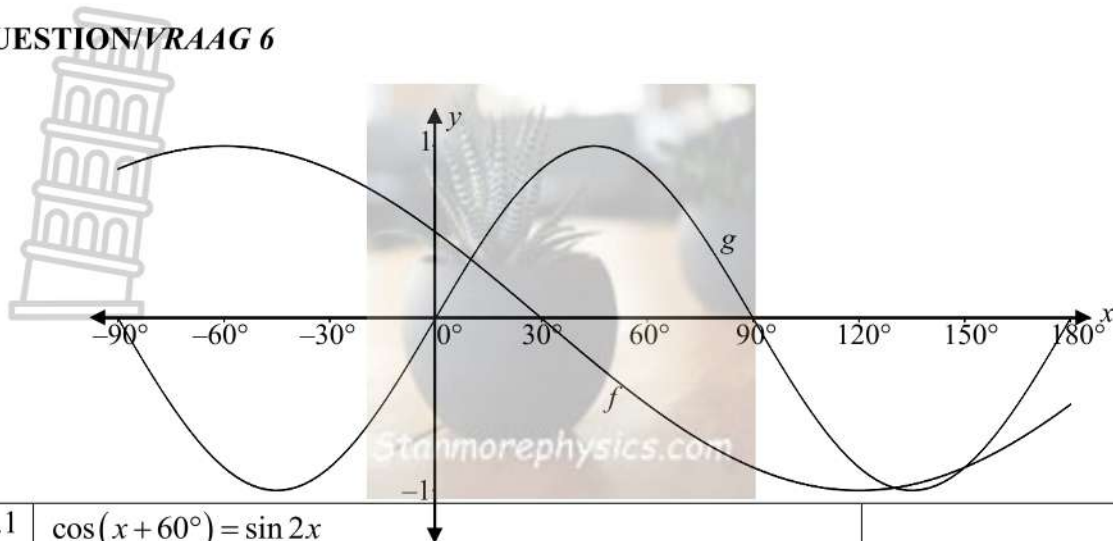
|     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                             |
|-----|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 4.1 | A(-1; -1)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | ✓ answer/antwoord<br>(1)                                                                                                                                                                                                                                    |
| 4.2 | <p><math>\hat{ADC} = 90^\circ</math> (line from centre bisect cord / <i>mdpt</i> <math>\odot</math> ; <i>mdpt koord</i>)<br/>                     FGC is a tangent to circle B / 'n raaklyn aan sirkel B<br/> <math>\therefore \hat{BCG} = 90^\circ</math> (tan <math>\perp</math> chord / <i>rklyn</i> <math>\perp</math> rad)<br/> <math>m_{BC} = \frac{2-1}{3-4}</math><br/> <math>= -1</math><br/> <math>\therefore m_{AD} = -1</math><br/> <math>\perp m_{FC} = 1</math><br/> <math>1 = 1(4) + c</math><br/>                     C (4;1): <math>c = -3</math><br/> <math>\therefore y = x - 3</math></p> | <p>✓ <math>\hat{ADC} = 90^\circ</math><br/> <math>\hat{BCG} = 90^\circ</math></p> <p>✓ <math>m_{AD} = -1</math><br/>                     ✓ <math>m_{FC} = 1</math></p> <p>✓ equation of FC/<br/> <i>vergelyking van FC</i><br/>                     (4)</p> |
| 4.3 | <p><math>\hat{ADF} = 90^\circ</math></p> <p><math>FD^2 = 3^2 - \left(\frac{\sqrt{10}}{2}\right)^2</math> (pyth)</p> <p><math>FD^2 = 9 - \frac{10}{4}</math></p> <p><math>FD = \sqrt{6\frac{1}{2}} = \frac{\sqrt{26}}{2} / 2,55</math></p> <p>FD = DG</p> <p><math>\therefore FG = 2 \times \frac{\sqrt{26}}{2}</math></p> <p><math>\therefore FG = \sqrt{26} / 5,10</math></p>                                                                                                                                              | <p>✓ subst. in pyth<br/>                     formula/ <i>vervang in pyth formule</i></p> <p>✓ radii</p> <p>✓ <math>FD = \frac{\sqrt{26}}{2} / 2,55</math></p> <p>✓ <math>FG = \sqrt{26} / 5,10</math><br/>                     (4)</p>                      |
| 4.4 | <p><math>AB = \sqrt{(-1-3)^2 + (-1-2)^2}</math></p> <p><math>AB = \sqrt{16+9}</math></p> <p>AB = 5</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | <p>✓ subst. coordinates/<br/>                     in correct formula/<br/> <i>vervang koördinate in korrekte formule</i></p> <p>✓ answer/antwoord<br/>                     (2)</p>                                                                          |
| 4.5 | <p>BK = AB - AK<br/>                     BK = 5 - 3<br/>                     BK = 2</p> <p><math>(x-3)^2 + (y-2)^2 = 4</math></p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | <p>✓ BK = 2</p> <p>✓ subst. coordinates<br/>                     in correct formula/<br/> <i>vervang koördinate in korrekte formule</i></p> <p>✓ <math>r^2 = 4</math><br/>                     (3)</p>                                                      |
|     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | [14]                                                                                                                                                                                                                                                        |

QUESTION/VRAAG 5

|       |                                                                                                                                                                                                                                                                                               |                                                                    |                                                                                                                                 |
|-------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------|
| 5.1.1 | $\sin^2(180^\circ + \theta)$<br>$= \sin^2 \theta$<br>$= \left( \frac{-5}{\sqrt{41}} \right)^2$<br>$= \frac{25}{41}$                                                                                                                                                                           | $OP^2 = OK^2 + KP^2$<br>$OP^2 = 4^2 + (-5)^2$<br>$OP = \sqrt{41}$  | ✓ $r = \sqrt{41}$<br>✓ $\sin^2 \theta$<br>✓ subst./vervang<br>✓ answer/antwoord (4)                                             |
| 5.1.2 | $\tan(-\theta)$<br>$= -\tan \theta$<br>$= -\left( \frac{-5}{4} \right)$<br>$= \frac{5}{4}$                                                                                                                                                                                                    |                                                                    | ✓ $-\tan \theta$<br>✓ answer/antwoord (2)                                                                                       |
| 5.2.1 | $\cos 15^\circ$<br>$= \cos(60^\circ - 45^\circ)$<br>$= \cos 60^\circ \cdot \cos 45^\circ + \sin 60^\circ \cdot \sin 45^\circ$<br>$= \frac{1}{2} \cdot \frac{1}{\sqrt{2}} + \frac{\sqrt{3}}{2} \cdot \frac{1}{\sqrt{2}}$<br>$= \frac{1 + \sqrt{3}}{2\sqrt{2}} / \frac{\sqrt{6} + \sqrt{2}}{4}$ | <b>ANSWER ONLY – NO MARKS</b><br><b>DECIMAL ANSWERS – NO MARKS</b> | ✓ expansion<br>✓ $\frac{1}{2}$ ✓ $\frac{1}{\sqrt{2}}$<br>✓ $\frac{\sqrt{3}}{2}$ ✓ $\frac{1}{\sqrt{2}}$<br>✓ answer/antwoord (6) |
| 5.2.2 | $\frac{\cos(90^\circ + x) \cdot \cos(180^\circ - x)}{\cos^2(180^\circ + x) \cdot \tan(180^\circ - x)}$<br>$= \frac{(-\sin x)(-\cos x)}{(\cos^2 x)(-\tan x)}$<br>$= -\frac{\tan x}{\tan x}$<br>$= -1$                                                                                          |                                                                    | ✓ $-\sin x$<br>✓ $-\cos x$<br>✓ $\cos^2 x$<br>✓ $\tan x$<br>✓ -1<br>(5)                                                         |

|       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                                                                                                                                        |
|-------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 5.3.1 |  $\frac{\sin 2\theta + 2 \cos \theta - 2 \cos^3 \theta}{1 + \sin \theta} = \sin 2\theta$ $LHS = \frac{2 \sin \theta \cos \theta + 2 \cos \theta - 2 \cos^3 \theta}{1 + \sin \theta}$ $= \frac{2 \sin \theta \cos \theta + 2 \cos \theta (1 - \cos^2 \theta)}{1 + \sin \theta}$ $= \frac{2 \sin \theta \cos \theta + 2 \cos \theta (\sin^2 \theta)}{1 + \sin \theta}$ $= \frac{2 \sin \theta \cos \theta (1 + \sin \theta)}{1 + \sin \theta}$ $= 2 \sin \theta \cos \theta$ $= \sin 2\theta$ $= RHS$  | <ul style="list-style-type: none"> <li>✓ <math>2 \sin \theta \cos \theta</math></li> <li>✓ <math>2 \cos \theta</math> (common factor/gem faktor)</li> <li>✓ <math>\sin^2 \theta</math></li> <li>✓ <math>2 \sin \theta \cos \theta</math> (common factor/gem faktor)</li> <li>✓ <math>2 \sin \theta \cos \theta</math></li> </ul> <p style="text-align: right;">(5)</p> |
| 5.3.2 | $1 + \sin \theta = 0$<br>$\therefore \sin \theta = -1$<br>$\theta = -90^\circ \text{ or } \theta = 270^\circ$                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | <ul style="list-style-type: none"> <li>✓ <math>1 + \sin \theta = 0</math></li> <li>✓ <math>-90^\circ, 270^\circ</math> (both/beide)</li> </ul> <p style="text-align: right;">(2)</p>                                                                                                                                                                                   |
| 5.4   | $\frac{4}{2 + \cos x}$ $= \frac{4}{2 + (-1)}$ $= \frac{4}{1}$ $= 4$ <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>For max value, <math>\cos x</math> should be a min/<br/> <i>Vir maks waarde, moet <math>\cos x</math> 'n min wees</i></p> </div>                                                                                                                                                                                                                                                                                                                                                                                         | <ul style="list-style-type: none"> <li>✓ -1</li> <li>✓ answer/antwoord</li> </ul> <p style="text-align: right;">(2)</p>                                                                                                                                                                                                                                                |
|       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | <b>[26]</b>                                                                                                                                                                                                                                                                                                                                                            |

QUESTION/VRAAG 6



6.1

$$\cos(x + 60^\circ) = \sin 2x$$

$$\therefore \cos(x + 60^\circ) = \cos[90^\circ - 2x]$$

reference/verwysings  $\angle$  :  $x + 60^\circ = 90^\circ - 2x$

$$1: x + 60^\circ = 90^\circ - 2x + k.360^\circ \quad k \in \mathbb{Z}$$

$$3x = 30^\circ + k.360^\circ$$

$$\therefore x = 10^\circ + k.120^\circ$$

$$x + 60^\circ = 360^\circ - (90^\circ - 2x) + k.360^\circ \quad k \in \mathbb{Z}$$

$$\therefore x + 60^\circ = 360^\circ - 90^\circ + 2x + k.360^\circ$$

$$4: -x = 210^\circ + k.360^\circ$$

$$\therefore x = -210^\circ + k.360^\circ$$

But/maar  $x \in [-90^\circ; 180^\circ]$

$$\therefore x = 10^\circ; 130^\circ; 150^\circ$$

OR/OF

$$\sin[90^\circ \pm (x + 60^\circ)] = \sin 2x$$

$$1: 90^\circ - x - 60^\circ = 2x + k.360^\circ \quad k \in \mathbb{Z}$$

$$-3x = -30^\circ + k.360^\circ$$

$$x = 10^\circ + k.120^\circ$$

or / of

$$2: 90^\circ + x + 60^\circ = 2x + k.360^\circ \quad k \in \mathbb{Z}$$

$$-x = -150^\circ + k.360^\circ$$

$$x = 150^\circ - k.360^\circ$$

But/maar  $x \in [-90^\circ; 180^\circ]$

$$\therefore x = 10^\circ; 130^\circ; 150^\circ$$

$$\checkmark \cos(x + 60^\circ) = \cos[90^\circ - 2x]$$

$$\checkmark x + 60^\circ = 90^\circ - 2x + k.360^\circ$$

$$\checkmark x = 10^\circ + k.120^\circ$$

$\checkmark$

$$x + 60^\circ = 360^\circ - (90^\circ - 2x) + k.360^\circ$$

$$\checkmark x = -210^\circ + k.360^\circ$$

$\checkmark k \in \mathbb{Z}$  (provided  $k.360^\circ$  is stated /slegs as  $k.360^\circ$  gegee word)

$\checkmark$  all three answers/al drie antwoorde

$$\checkmark \sin[90^\circ \pm (x + 60^\circ)] = \sin 2x$$

$$\checkmark 90^\circ - x - 60^\circ = 2x + k.360^\circ$$

$$\checkmark -3x = -30^\circ + k.360^\circ$$

$$\checkmark 90^\circ + x + 60^\circ = 2x + k.360^\circ$$

$$\checkmark -x = -150^\circ + k.360^\circ$$

$$\checkmark k \in \mathbb{Z}$$

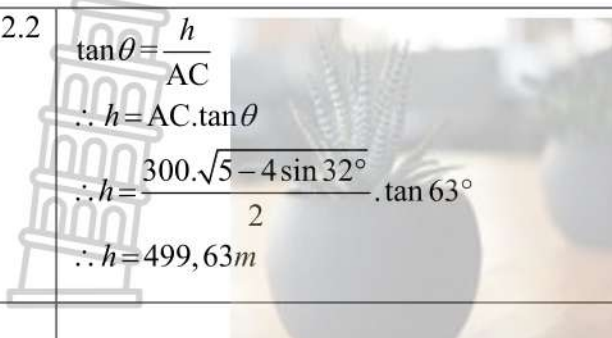
$\checkmark$  all three answers/al drie antwoorde

(7)

|     |                                                                                                                                           |                                                             |
|-----|-------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------|
| 6.2 | $180^\circ$                                                                                                                               | ✓ answer/antwoord (1)                                       |
| 6.3 | $10^\circ \leq x \leq 130^\circ \cup 150^\circ \leq x < 180^\circ$<br>of<br>$[10^\circ; 130^\circ] \cup [150^\circ; 180)$                 | ✓ values/waardes<br>✓ notation/notasie (2)                  |
| 6.4 | $p(x) = \sin(x - 30^\circ)$<br>The graph of $h$ is shifted/moved $30^\circ$ to the right./<br>Die grafiek het $30^\circ$ na regs geskuif. | ✓ shifted/moved/geskuif<br>✓ $30^\circ$<br>✓ right/regs (3) |
|     |                                                                                                                                           | <b>[13]</b>                                                 |

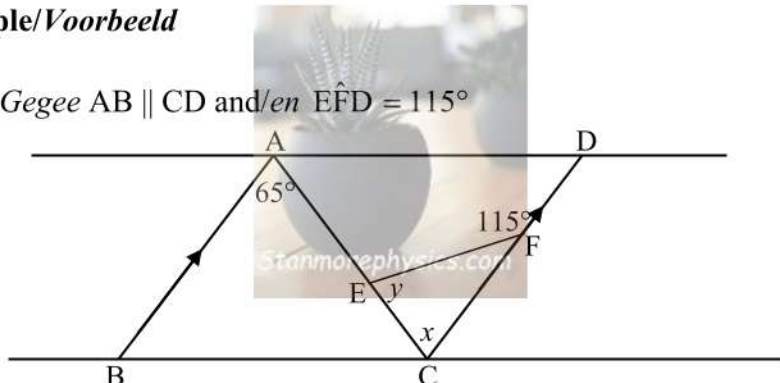
### QUESTION/VRAAG 7

|       |                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                                                                                   |
|-------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 7.1   | $A(b \cos A; b \sin A)$<br>$c^2 = AB^2 = (x_A - x_B)^2 + (y_A - y_B)^2$<br>$c^2 = (b \cos C - a)^2 + (b \sin C - 0)^2$<br>$c^2 = b^2 \cos^2 C - 2ab \cos C + a^2 + b^2 \sin^2 C$<br>$c^2 = b^2 (\cos^2 C + \sin^2 C) + a^2 - 2ab \cos C$<br>$c^2 = b^2 (1) + a^2 - 2ab \cos C$<br>$c^2 = a^2 + b^2 - 2ab \cos C$                                                                                                                            | ✓ coordinates of/coördinate van A<br>✓ correct subst into distance/korrekte invervanging in afstands formulae<br>✓ simplification/vereenvoudig<br>✓ $\sin^2 x + \cos^2 x = 1$ (4) |
| 7.2.1 | $AC^2 = d^2 + \left(\frac{d}{2}\right)^2 - 2.d.\frac{d}{2}.\cos(90^\circ - \alpha)$<br>$AC^2 = d^2 + \frac{d^2}{4} - d^2 \sin \alpha$<br>$AC^2 = \frac{5d^2}{4} - \frac{4d^2 \sin \alpha}{4}$<br>$AC^2 = \frac{d^2(5 - 4 \sin \alpha)}{4}$<br>$AC = \frac{d\sqrt{5 - 4 \sin \alpha}}{2}$<br>$\tan \theta = \frac{h}{AC}$<br>$\therefore h = AC \cdot \tan \theta$<br>$\therefore h = \frac{d\sqrt{5 - 4 \sin \alpha}}{2} \cdot \tan \theta$ | ✓ correct subst into cosine rule/korrekte vervanging in kosinus formule<br>✓ $BC = \frac{d}{2}$ ✓ $\sin \alpha$<br>✓ factorise/faktoriseer (4)                                    |

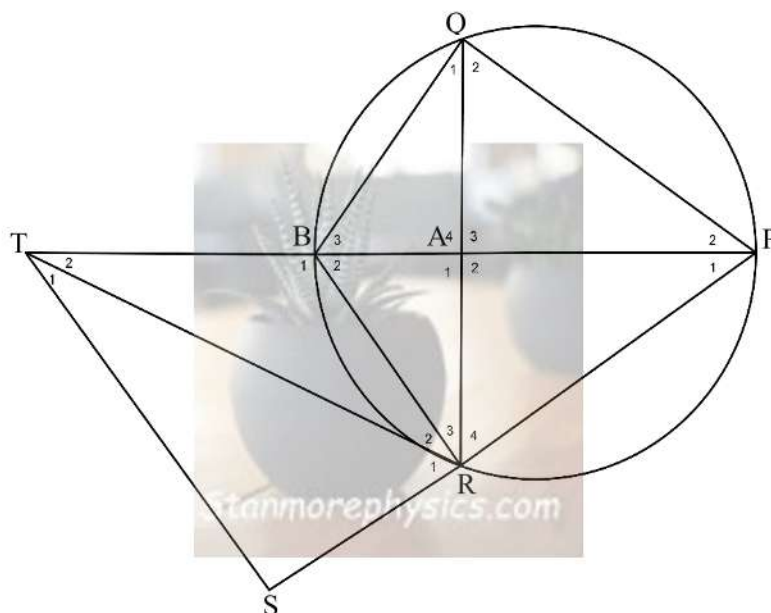
|       |                                                                                                                                                                                                                                                                 |                                                                                                           |
|-------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------|
| 7.2.2 |  $\tan \theta = \frac{h}{AC}$ $\therefore h = AC \cdot \tan \theta$ $\therefore h = \frac{300 \cdot \sqrt{5-4 \sin 32^\circ}}{2} \cdot \tan 63^\circ$ $\therefore h = 499,63m$ | ✓ trig ratio<br>✓ correct subst into tan ratio/korrekte vervanging in tan verhouding<br>✓ answer/antwoord |
|       |                                                                                                                                                                                                                                                                 | (3)                                                                                                       |
|       |                                                                                                                                                                                                                                                                 | [11]                                                                                                      |

### GEOMETRY/MEETKUNDE

Please read carefully through the following table before marking **QUESTION 8–10**/  
 Lees asseblief sorgvuldig deur die volgende tabel alvorens **VRAE 8–10** nagesien word.

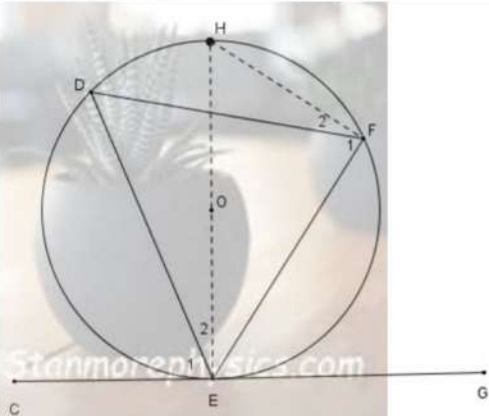
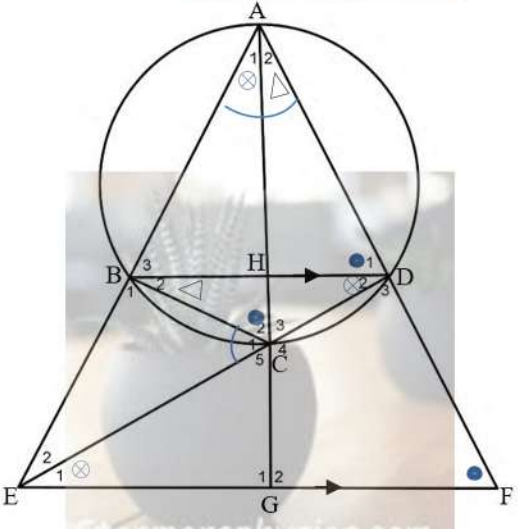
|     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|-----|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|     | <p>The order in which the candidate answers a geometry question must follow logically/ Die volgorde waarin 'n kandidaat 'n meetkundevraag beantwoord moet logies volg.</p> <p><b>Example/Voorbeeld</b></p> <p>Given/Gegee <math>AB \parallel CD</math> and/en <math>\hat{EFD} = 115^\circ</math></p>  <p>The candidate first needs to calculate <math>x</math> BEFORE he/she can calculate <math>y</math>/Die kandidaat moet eerste vir <math>x</math> bereken VOORDAT hy/sy vir <math>y</math> kan bereken.</p> |
| S   | <p>A mark for a correct statement<br/>                     (A statement mark is independent of a reason)<br/>                     'n Punt vir 'n korrekte bewering<br/>                     ('n Punt vir 'n bewering is onafhanklik van die rede)</p>                                                                                                                                                                                                                                                                                                                                               |
| R   | <p>A mark for the correct reason<br/>                     (A reason mark may only be awarded if the statement is correct)<br/>                     'n Punt vir 'n korrekte rede<br/>                     ('n Punt word slegs vir die rede toegeken as die bewering korrek is)</p>                                                                                                                                                                                                                                                                                                                   |
| S/R | <p>Award a mark if the statement AND reason are both correct<br/>                     (Both MUST be correct to get one mark)<br/>                     Ken 'n punt toe as die bewering EN rede beide korrek is<br/>                     (Beide MOET korrek wees om een punt te kry)</p>                                                                                                                                                                                                                                                                                                              |

### QUESTION/VRAAG 8



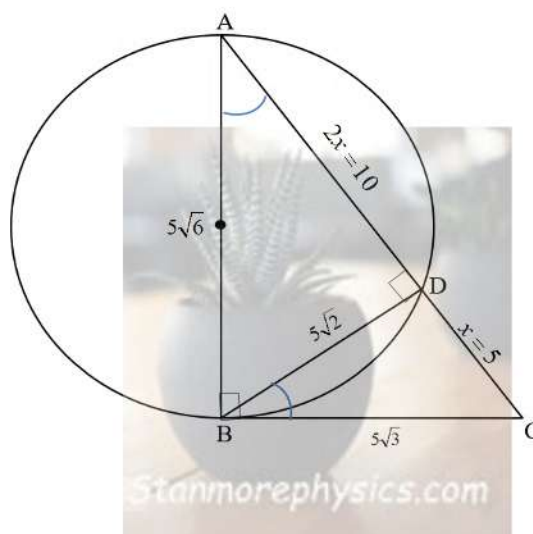
|       |                                                                                                                                                                                                                                                                                                                                                                                                           |                                 |
|-------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------|
| 8.1.1 | $\hat{R}_4 = 55^\circ$ [ $\angle$ s opp. = sides/ $\angle e$ teenoor = sye]                                                                                                                                                                                                                                                                                                                               | ✓ S ✓ R<br>(2)                  |
| 8.1.2 | $\hat{B}_3 = 55^\circ$ [ $\angle$ s in the same segment/ $\angle e$ in dieselfde sirkel segment]                                                                                                                                                                                                                                                                                                          | ✓ S ✓ R<br>(2)                  |
| 8.1.3 | $\hat{B}\hat{R}P = 90^\circ$ [ $\angle$ in semi circle./ $\angle$ in halfsirkel]                                                                                                                                                                                                                                                                                                                          | ✓ S ✓ R<br>(2)                  |
| 8.1.4 | $\hat{R}_4 = 55^\circ$ [proved / bewys in 8.1.1]<br>$\hat{B}\hat{R}P = 90^\circ$ [proved / bewys in 8.1.3]<br>$\therefore \hat{R}_3 = 35^\circ$<br>$\hat{B}_2 = \hat{Q}_2 = 55^\circ$ [ $\angle$ s in the same segment/ $\angle e$ in dieselfde sirkel segment]<br>$\hat{A}_1 = 90^\circ$                                                                                                                 | ✓ S<br>✓ S<br>✓ S<br>(3)        |
| 8.2   | [line from centre $\perp$ to chord/ $lyn$ vanuit midpt $\perp$ op koord]                                                                                                                                                                                                                                                                                                                                  | ✓ S<br>(1)                      |
| 8.3   | In $\triangle TAR$ and/en $\triangle TSR$ is:<br>$TR = TR$ [common / gemeenskaplik]<br>$\hat{R}_2 + \hat{R}_3 = \hat{R}_1$ [given / gegee]<br>$\hat{A}_1 = \hat{S} = 90^\circ$ [ $\hat{A}_1 = 90^\circ$ ,<br>line from centre $\perp$ to cord biseects the cord /<br>$lyn$ van uit midpt $\perp$ op koord halveer koord]<br>$\therefore \triangle TAR \equiv \triangle TSR$ [RHS]<br>$\therefore AT = TS$ | ✓ S<br>✓ S<br>✓ S<br>✓ R<br>(4) |
|       |                                                                                                                                                                                                                                                                                                                                                                                                           | [14]                            |

QUESTION/VRAAG 9

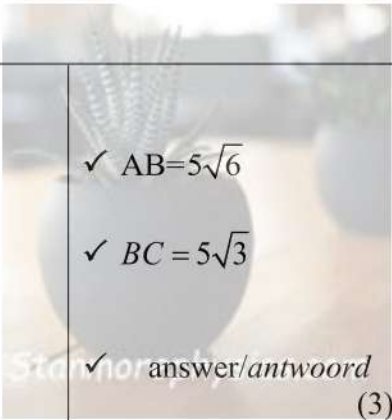
|              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                                                |
|--------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------|
| <p>9.1</p>   |  <p>Construction/konstruksie: Line EH through midpoint to circumference to F/Middel lyn EH en verbind met F</p> <p><math>\hat{E}_1 + \hat{E}_2 = 90^\circ</math> [rad <math>\perp</math> tan/ rklyn]</p> <p><math>\hat{F}_1 + \hat{F}_2 = 90^\circ</math> [<math>\angle</math> in semi circle./ <math>\angle</math> in halfsirkel]</p> <p><math>\hat{F}_1 + \hat{F}_2 = \hat{E}_1 + \hat{E}_2</math></p> <p>But/maar <math>\hat{E}_2 = \hat{F}_2</math> [<math>\angle</math> sin the same segment/ <math>\angle</math> e in dieselfde sirkelsegment]</p> <p><math>\therefore \hat{E}_1 = \hat{F}_1</math></p> <p><math>\hat{C}\hat{E}\hat{D} = \hat{F}_1</math></p> | <p>✓<br/>constr/konstr</p> <p>✓ S ✓ R</p> <p>✓ S/R</p> <p>✓ S/R</p> <p>(5)</p> |
|              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                |
| <p>9.2.1</p> | <p><math>\hat{E}_1 = \hat{D}_2</math> [alt <math>\angle</math>s / verw. <math>\angle</math>e; <math>BD \parallel EF</math>]</p> <p><math>\hat{D}_2 = \hat{A}_1</math> [<math>\angle</math>s in the same segment/ <math>\angle</math> e in dieselfde sirkel segment]</p> <p><math>\therefore \hat{E}_1 = \hat{A}_1</math></p>                                                                                                                                                                                                                                                                                                                                                                                                                         | <p>✓ S/R<br/>(with //)</p> <p>✓ S ✓ R</p> <p>(3)</p>                           |
| <p>9.2.2</p> | <p><math>\therefore EF</math> is a tangent/<math>EF</math> is 'n raaklyn</p> <p>[converse tan chord / omgekeerde rklyn koordstelling]</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | <p>✓ R</p> <p>(1)</p>                                                          |

|       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                            |
|-------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 9.2.3 | <p>In <math>\triangle ABC</math> and/en <math>\triangle EDF</math> is:</p> <p><math>\hat{A}_1 = \hat{E}_1</math> [proved/bewys in 10.2.1]</p> <p><math>\hat{B}_2 + \hat{B}_3 = \hat{D}_3</math> [ext <math>\angle</math> of cyclic quad / buite <math>\angle</math> v kvh]</p> <p><math>\hat{C}_2 = \hat{F}</math> [<math>3^{rd}</math> <math>\angle</math> sum of <math>\triangle</math> / <math>3^{de}</math> <math>\angle</math> som <math>\angle</math> v <math>\triangle</math>]</p> <p><math>\therefore \triangle ABC \parallel \triangle EDF</math> [<math>\angle, \angle, \angle</math>]</p> <p>OR/OF</p> <p>In <math>\triangle ABC</math> and <math>\triangle DEF</math> :</p> <p><math>\hat{A}_1 = \hat{E}_1</math> [proven/ bewys in 10.2.1]</p> <p><math>\hat{B}_2 + \hat{B}_3 = \hat{D}_3</math> [ext <math>\angle</math>'s of cyclic quad / buite <math>\angle</math> v vierhoek]</p> <p><math>\therefore \triangle ABC \parallel \triangle EDF</math> [<math>\angle, \angle, \angle</math>]</p> | <p>✓ S<br/>                 ✓ S ✓ R<br/>                 ✓ S/R</p> <p>✓ S<br/>                 ✓ S ✓ R<br/>                 ✓ R</p> <p>(4)</p>             |
| 9.2.4 | <p><math>\frac{AB}{ED} = \frac{BC}{DF}</math> [out of <math>\parallel</math> / uit <math>\parallel</math>]</p> <p><math>\therefore AB = \frac{BC \cdot ED}{DF}</math></p> <p>But/maar <math>\frac{AB}{BE} = \frac{AH}{HG}</math> [<math>BH \parallel EG</math>]</p> <p>[line <math>\parallel</math> to one side of a <math>\triangle</math> / lyn <math>\parallel</math> ander sy v <math>\triangle</math>]</p> <p>[prop theorem <math>BD \parallel EF</math> / <math>BD \parallel EF</math>]</p> <p><math>\therefore AB = \frac{AH \cdot BE}{HG}</math></p> <p><math>\therefore \frac{AH \cdot BE}{HG} = \frac{BC \cdot ED}{DF}</math></p> <div style="border: 1px solid black; padding: 5px; margin: 10px 0;"> <p>penalise once if // lines not shown/<br/>                     penaliseer 1x as // ontbreek</p> </div>                                                                                                                                                                                      | <p>✓ S ✓ R</p> <p>✓ S (making AB the subject/maak AB die onderwerp)</p> <p>✓ S ✓ R</p> <p>✓ S (making AB the subject/maak AB die onderwerp)</p> <p>(6)</p> |
|       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | [19]                                                                                                                                                       |

QUESTION/VRAAG 10



|      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                                                                                                                                                                                                                                                                   |
|------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 10.1 | $\hat{A}DB = 90^\circ$ [ $\angle$ in semi circle./ $\angle$ in halfsirkel]<br>$\hat{A}BC = 90^\circ$ [rad $\perp$ tan/ <i>rklyn</i> ]<br><br>$AB^2 = (2x)^2 + BD^2$ .....1<br>$BC^2 = (x)^2 + BD^2$ .....2<br><hr/> $AB^2 + BC^2 = 5x^2 + 2BD^2$<br>$9x^2 = 5x^2 + 2BD^2$<br>$\therefore 4x^2 = 2BD^2$<br>$\therefore BD = \sqrt{2}x$<br>$\therefore \frac{BD}{DC} = \sqrt{2}$<br><br>OR/OF<br><br>$\hat{A}DB = 90^\circ$ [ $\angle$ in semi circle./ $\angle$ in halfsirkel]<br>$\hat{A}BC = 90^\circ$ [rad $\perp$ tan/ <i>rklyn</i> ]<br><br>$BD^2 = AD \cdot CD$ [ $\text{right angled } \Delta \text{ with } BD \perp AC /$<br>$\text{loodlyn vanuit reghoekige hoekpunt}$ ]<br><br>$BD^2 = 2x \cdot x$<br>$\therefore BD = \sqrt{2}x$<br>$\frac{BD}{DC} = \frac{\sqrt{2}x}{x} = \sqrt{2}$ | $\checkmark$ both $90^\circ$<br>S/R<br><b>BD IF NOT SHOWN</b><br><br>$\checkmark$ both eq<br><br>$\checkmark 4x^2 = 2BD^2$<br><br>$\checkmark BD = \sqrt{2}x$<br><br><br><br><br>$\checkmark$ both $90^\circ$<br>S/R<br><b>BD IF NOT SHOWN</b><br><br>$\checkmark$ S $\checkmark$ R<br><br>$\checkmark BD = \sqrt{2}x$<br><br>(4) |
|------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

|      |                                                                                                                                          |                                                                                                                                                                                                 |
|------|------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 10.2 | $AB^2 = 10.15$<br>$AB = 5\sqrt{6}$<br>$BC^2 = 5.15$<br>$BC = 5\sqrt{3}$<br>$AB + BC + AC$<br>$= 5\sqrt{6} + 5\sqrt{3} + 15$<br>$= 35,91$ | <br>$\checkmark AB = 5\sqrt{6}$<br>$\checkmark BC = 5\sqrt{3}$<br>$\checkmark \text{answer/antwoord}$<br>(3) |
|      |                                                                                                                                          | [7]                                                                                                                                                                                             |

**TOTAL/TOTAAL: 150**

