



# Northern Cape Department of Education

AS WRITTEN 8 JUNE 2026 ERRATA AT 4.1 AND 11.3.5 NOT COMMUNICATED TO CANDIDATES

## CURRICULUM PROVINCIAL QUESTION PAPER

GRADE 12

MATHEMATICS

PAPER 2

JUNE 2026

**MARKS: 150**

**TIME: 3 hours**

**This question paper consists of 12 pages, 1 information sheet and  
an ANSWER BOOK of 23 pages.**

**INSTRUCTIONS AND INFORMATION**

Read the following instructions and information carefully before answering the questions.

1. This question paper consists of 11 questions.
2. Answer ALL the questions in the SPECIAL ANSWER BOOK provided.
3. Clearly show ALL calculations, diagrams, graphs, etc. that 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

The data set below has an average of 26,93.

|    |    |    |    |    |    |    |    |    |    |
|----|----|----|----|----|----|----|----|----|----|
| 8  | 10 | 17 | 19 | 22 | 24 | 27 | 28 | 29 | 30 |
| 32 | 35 | 37 | 41 | 45 |    |    |    |    |    |

- 1.1 Determine the standard deviation of the data set. (2)
  - 1.2 Determine what percentage of the data points are inside one standard deviation from the mean. (3)
  - 1.3 Calculate the interquartile range. (3)
  - 1.4 If each data point is reduced by 5, write down the new value of:
    - 1.4.1 The average (mean) (1)
    - 1.4.2 The standard deviation (1)
- [10]

## QUESTION 2

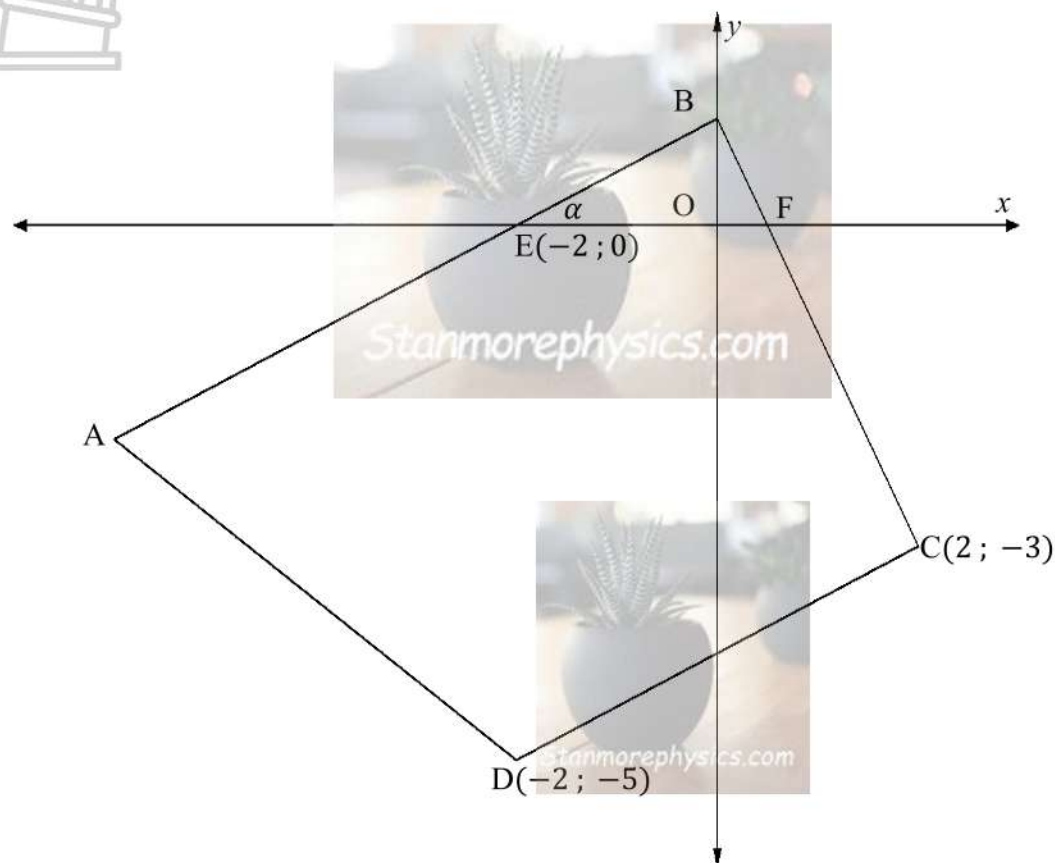
The cumulative frequency table below shows the distances, in kilometres, covered in an ultra-marathon by 51 participants who did not finish the race.

| DISTANCE<br>(in km) | FREQUENCY<br>$f$ | CUMULATIVE<br>FREQUENCY |
|---------------------|------------------|-------------------------|
| $0 < x \leq 10$     | 1                | 1                       |
| $10 < x \leq 20$    | 6                | 7                       |
| $20 < x \leq 30$    | A                | 19                      |
| $30 < x \leq 40$    | 16               | 35                      |
| $40 < x \leq 50$    | 10               | 45                      |
| $50 < x \leq 60$    | 4                | 49                      |
| $60 < x \leq 70$    | 2                | 51                      |

- 2.1 Write down the value of A. (1)
  - 2.2 Calculate the estimated mean of the data. (2)
  - 2.3 Draw an ogive (cumulative frequency graph) of the data. (4)
  - 2.4 Read the median from the drawn ogive. (1)
  - 2.5 Determine, from your ogive, how many of the athletes who did not finish, ran further than 55 km. (2)
- [10]

### QUESTION 3

The diagram below shows a trapezium with vertices  $A$ ,  $B$ ,  $C(2; -3)$  and  $D(-2; -5)$ .  $AB$  and  $CD$  are parallel.  $E(-2; 0)$  is the  $x$ -intercept of  $AB$  and  $\alpha$  is the angle of inclination of  $AB$ . The gradient of  $BC = -2$ .

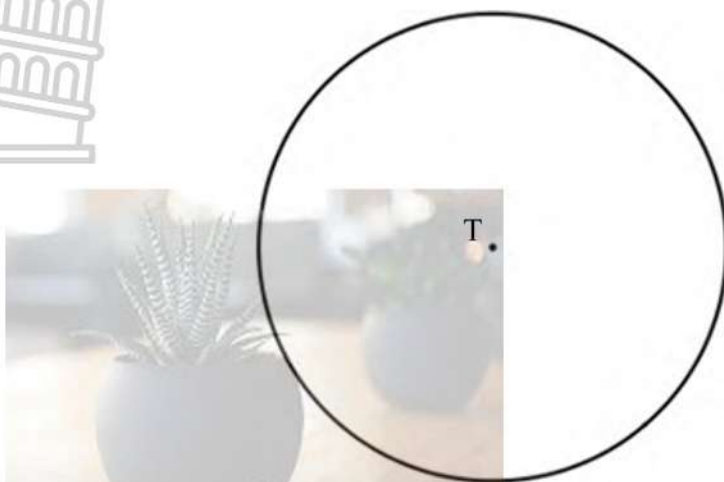
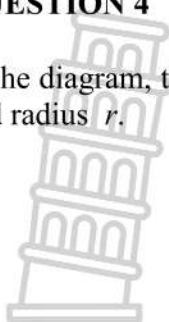


- 3.1 Determine the gradient of  $DC$ . (2)
  - 3.2 Determine the equation of  $AB$  in the form  $y = mx + c$ . (3)
  - 3.3 Determine the size of  $\alpha$ , the angle of inclination of  $AB$ . (2)
  - 3.4 Calculate the length of  $BE$ . (2)
  - 3.5 Show that  $\widehat{ABC} = 90^\circ$ . (2)
  - 3.6 Describe the transformation that must be applied from  $D$  to  $D'$  so that  $ABCD'$  will be a parallelogram. The coordinates of  $A$  is given as  $(-6; -2)$ . (4)
  - 3.7 Hence, or otherwise, determine the point of intersection of the diagonals of the newly formed parallelogram. (3)
  - 3.8 Determine the area of  $\triangle BEF$ . (3)
- [21]**

NB: +4 OMITTED FROM LHS OF EQUATION. NOT COMMUNICATED AS ERRATA TO CANDIDATES

**QUESTION 4**

In the diagram, the equation  $x^2 + y^2 + 4x - 12y = 0$  describes the circle with centre T and radius  $r$ .



- 4.1 Write  $x^2 + y^2 + 4x - 12y = 0$  in the form  $(x - a)^2 + (y - b)^2 = r^2$  to show that the coordinates of the centre T is  $(-2; 6)$  and the length of the radius  $r$  is equal to 6. (3)
- 4.2 Hence, write down the coordinate(s) of the  $x$ -intercept(s). (1)
- 4.3 Calculate the coordinates of the  $y$ -intercepts. Leave your answer in simplified surd form. (4)
- 4.4 Calculate the equation of the tangent to the circle at  $(0; 6 + 4\sqrt{2})$ . (4)
- 4.5 For which values of  $k$ ,  $k \in R$ , will a circle with centre  $(-2; 6 + k)$  and radius 6, not touch or intersect the  $x$ -axis? (4)

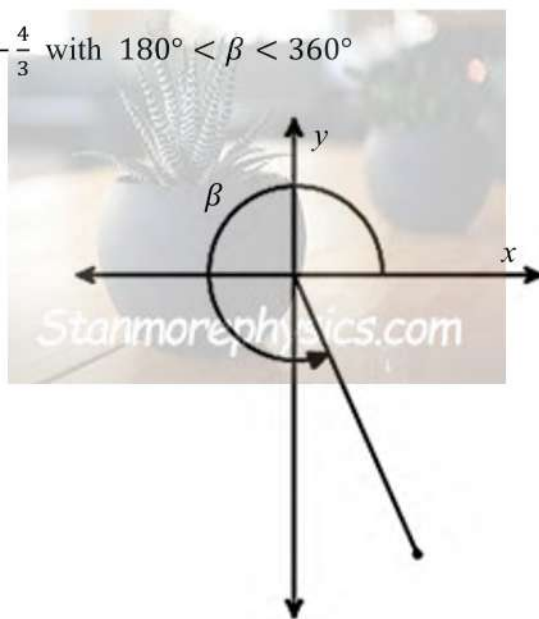
**[16]****QUESTION 5**

- 5.1 Prove that:  $\frac{-1 + \cos(180^\circ - \theta) \cdot -\cos \theta}{\cos(-\theta) \cdot \cos \theta \cdot \tan^2(540^\circ + \theta)} = -1$  (6)
- 5.2 If  $\sin 40^\circ = k$ , express the following in terms of  $k$ :
- 5.2.1  $\frac{1}{\sin 140^\circ}$  (2)
- 5.2.2  $\sin 20^\circ \cos 20^\circ$  (2)
- 5.2.3  $\sin 20^\circ$  (Leave your answer in simplified surd form) (4)
- 5.3 If  $\sin 76^\circ = a$  and  $\cos 76^\circ = b$ , show, without the use of a calculator, that  $a^2 - b^2 = \cos 28^\circ$ . (3)

**[17]**

### QUESTION 6

6.1 Given:  $\tan \beta = -\frac{4}{3}$  with  $180^\circ < \beta < 360^\circ$



Determine, without the use of a calculator and with the aid of diagrams, the value of:

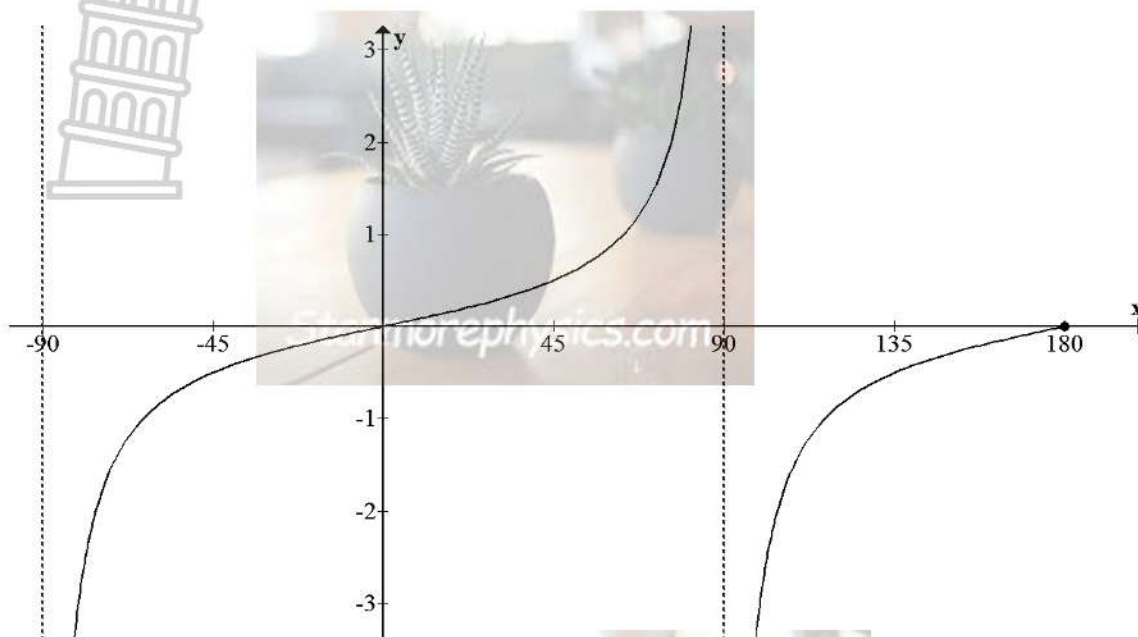
6.1.1  $\sin \beta$  (2)

6.1.2  $\sin(\beta + \alpha)$  if  $\sin \alpha = -\frac{4}{5}$  with  $0^\circ < \alpha < 270^\circ$  (3)

6.2 Determine the general solution of  $\sin x (3 \sin x + 1) = 0$ . (5)  
[10]

### QUESTION 7

In the diagram, the graph of  $f(x) = \frac{1}{2} \tan x$  is drawn for  $x \in [-90^\circ; 180^\circ]$ .



- 7.1 For which value(s) of  $x$  is  $f(x) = 0$  in the interval  $x \in [-90^\circ; 180^\circ]$ ? (1)
- 7.2 On the set of axes provided in the ANSWER BOOK, draw the graph of  $g(x) = \sin 2x$  for  $x \in [-90^\circ; 180^\circ]$ . Clearly indicate all turning points and intercepts with the axes. (3)
- 7.3 Determine the value(s) of  $x$  for which  $\frac{1}{2} \tan x = \sin 2x$  in the interval  $x \in [-90^\circ; 180^\circ]$ . Show ALL calculations. (7)
- 7.4 Hence, or otherwise, determine the value(s) of  $x$  in the interval  $x \in [0^\circ; 90^\circ]$  for which  $\frac{1}{2} \tan x - 2 \sin x \cos x \geq 0$  (3)

**[14]**

### QUESTION 8

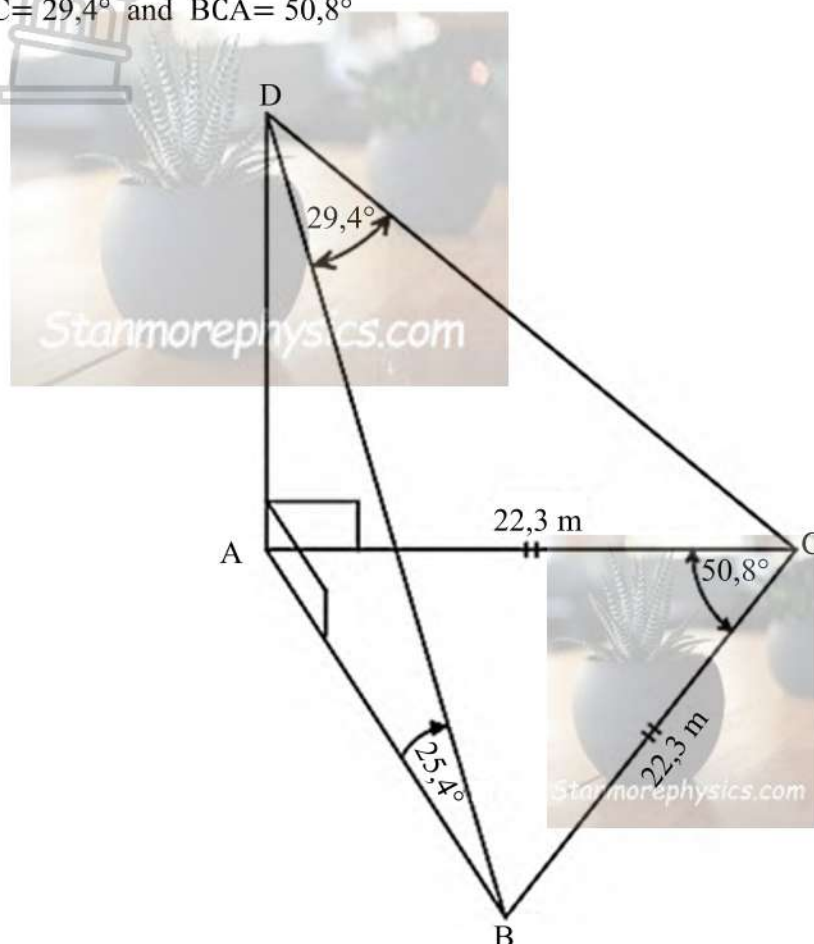
In the diagram, A, B and C are three points in the same horizontal plane.

$$AC = BC = 22,3 \text{ m}$$

AD is a vertical tower anchored by cables at B and C.

The angle of elevation from B to D is  $25,4^\circ$

$$\widehat{BDC} = 29,4^\circ \text{ and } \widehat{BCA} = 50,8^\circ$$



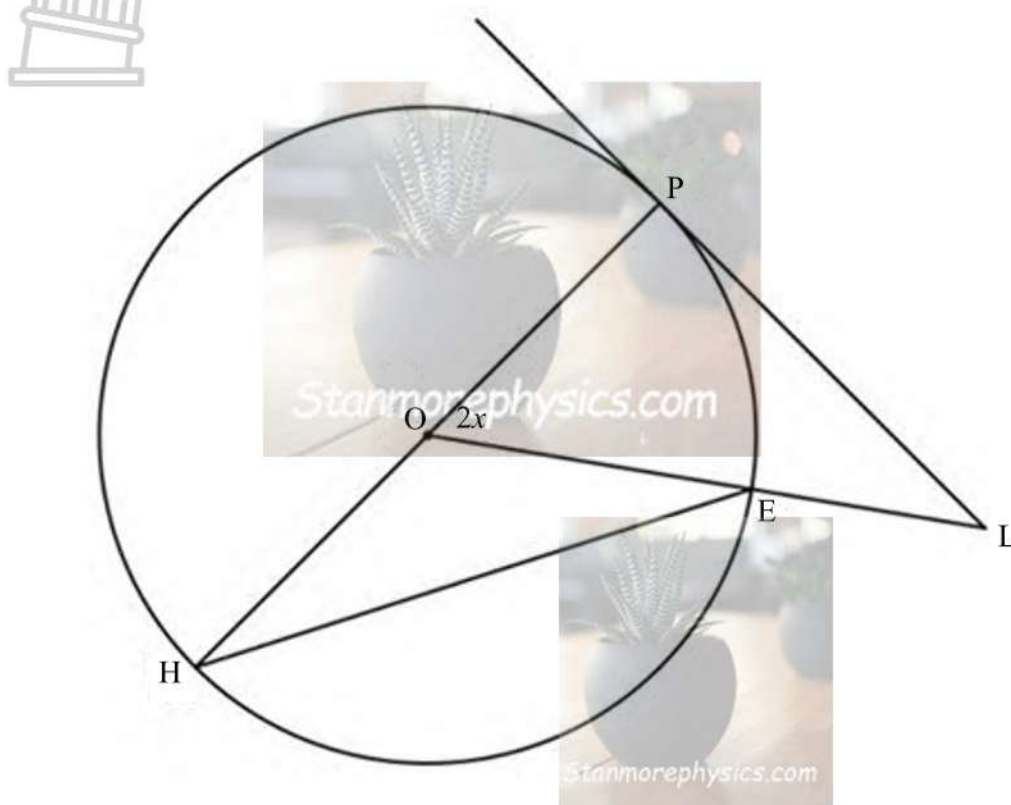
Calculate, correct to TWO decimal places:

- 8.1 The area of  $\triangle ABC$  (2)
  - 8.2 The length of AB (3)
  - 8.3 The length of DC if  $\widehat{DBC} = 43,6^\circ$  (2)
- [7]

Provide reasons for your statements in QUESTIONS 9, 10 AND 11.

### QUESTION 9

In the diagram,  $O$  is the centre of the circle.  $HOP$  is a diameter and  $LP$  is a tangent to the circle at  $P$ .  $OL$  intersects the circle at  $E$ .



Calculate, with reasons, the size of the following in terms of  $x$ :

9.1  $\hat{H}EO$  (4)

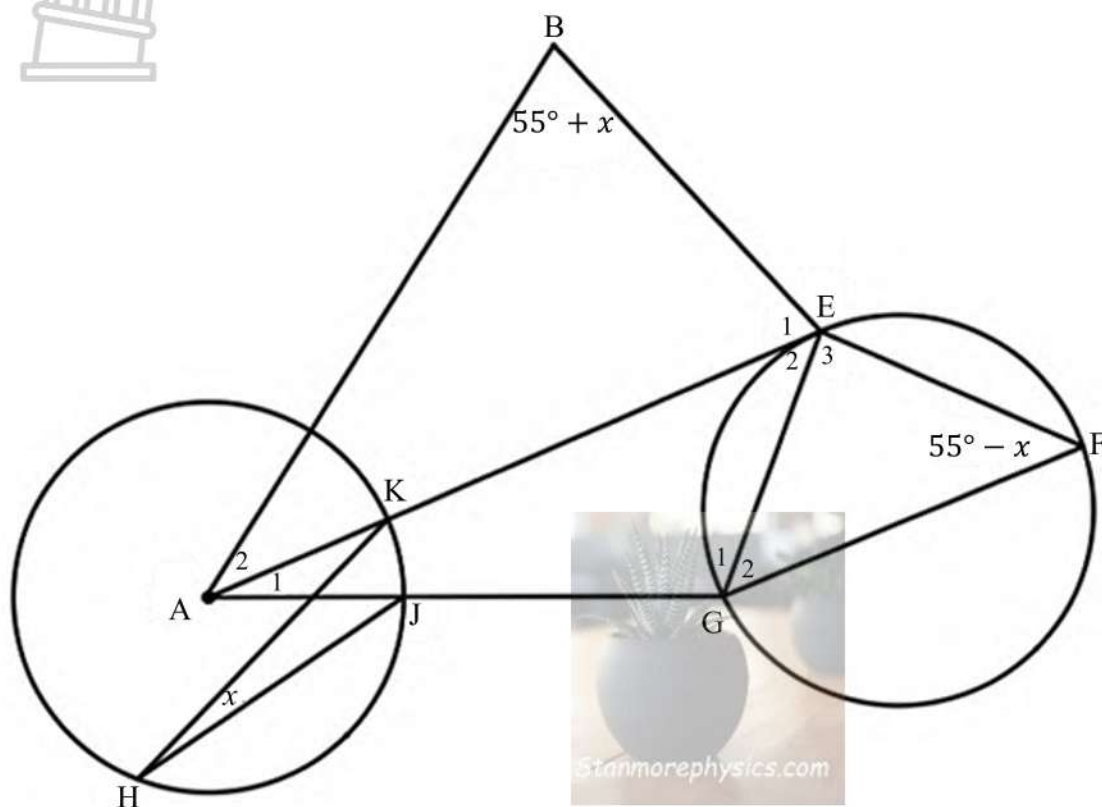
9.2  $\hat{L}$  (3)

[7]

### QUESTION 10

In the circle with centre  $A$ , the points  $H$ ,  $J$  and  $K$  are on the circumference of the circle. Another circle passes through the coordinates of  $G$ ,  $E$  and  $F$ .  $AE$  is a tangent at  $E$  and intersects the first circle at  $K$ .

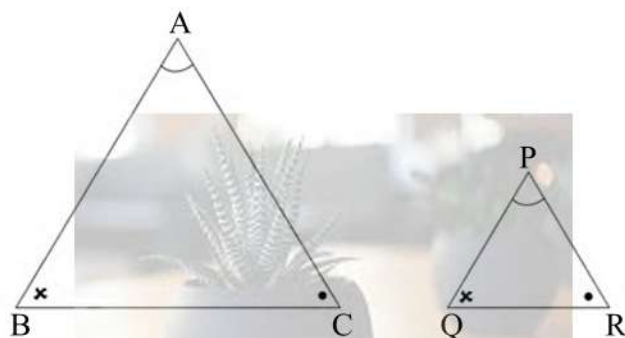
$$\hat{H} = x, \hat{F} = 55^\circ - x \text{ and } \hat{B} = 55^\circ + x$$



- 10.1 Calculate, with reasons, the size of  $\widehat{E}_2$  in terms of  $x$ . (2)
  - 10.2 Prove that ABEG is a cyclic quadrilateral. (5)
- [7]**

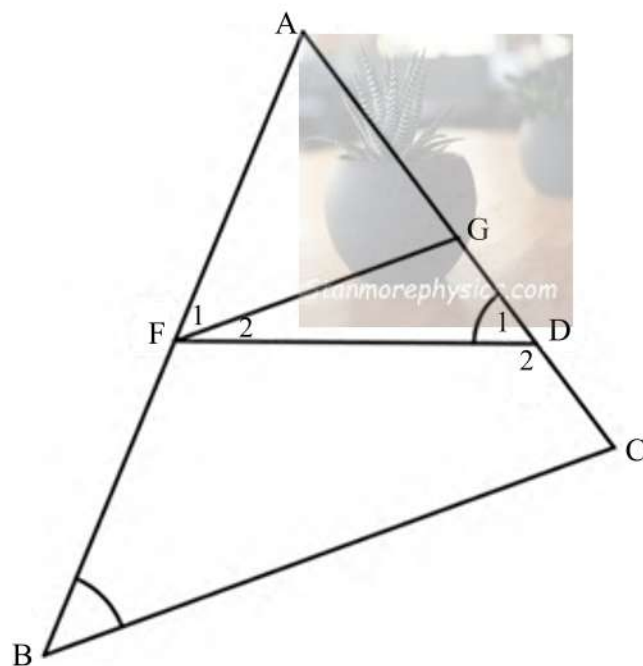
# QUESTION 11

11.1 Use the diagram provided in the ANSWER BOOK to answer the following question.



Prove the theorem which states that if two triangles are equiangular, then the corresponding sides are in proportion, i.e.  $\frac{AB}{PQ} = \frac{AC}{PR}$  (6)

11.2 In  $\triangle ABC$ , F and G are points on sides AB and AC respectively. D is a point on GC such that  $\widehat{D}_1 = \widehat{B}$ .



11.2.1 AF is a tangent to the circle through points F, G and D. Prove, with reasons, that  $FG \parallel BC$ . (3)

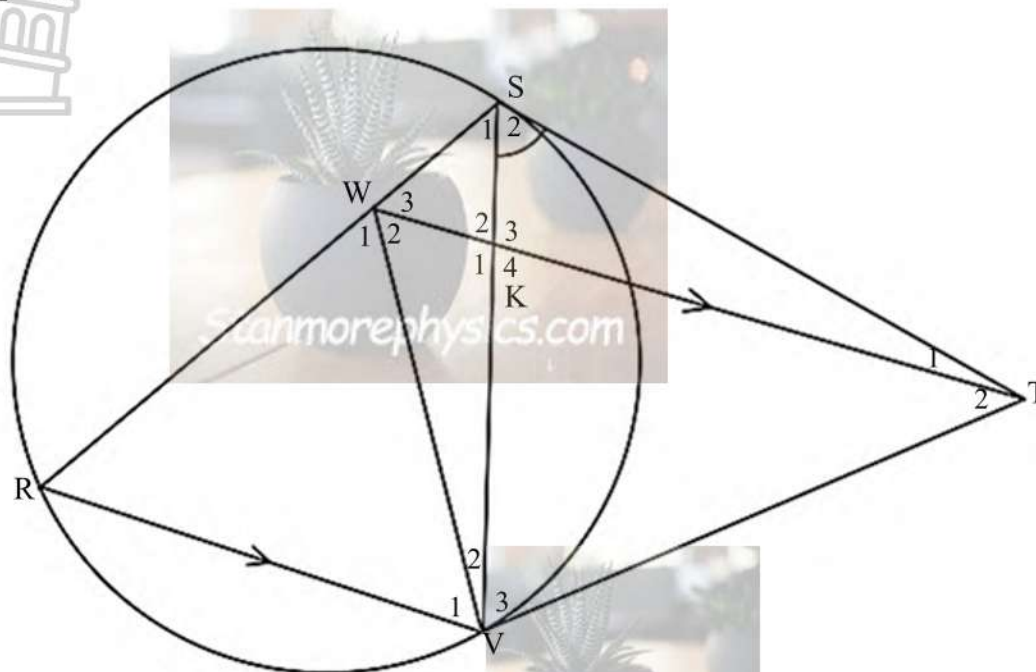
11.2.2 If  $\frac{AF}{AB} = \frac{2}{5}$ ,  $AC = 2k - 6$  and  $GC = k + 9$ , calculate the value of  $k$ . (5)

11.2.3 Calculate:

$$\frac{\text{Area of } \triangle AFG}{\text{Area of } \triangle ABC} \quad (3)$$

- 11.3 In the diagram, ST and TV are tangents to the circle at S and V respectively. R is a point on the circle and W is a point on chord RS such that TW is parallel to RV. SV and VW are drawn. TW intersects SV at K.

$$\hat{S}_2 = x$$



- 11.3.1 Write down, without reasons, 3 other angles that are equal to  $x$ . (3)
- 11.3.2 Prove, with reasons, that WSTV is a cyclic quadrilateral. (2)
- 11.3.3 Show that  $\triangle RVW$  is an isosceles triangle. (4)
- 11.3.4 Prove that  $\triangle RVW \sim \triangle SVT$ . (3)
- 11.3.5 Hence, show that  $\frac{RV}{ST} = \frac{WR}{TS}$  (2)

[31]

**TOTAL: 150**

## INFORMATION SHEET

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

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

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

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

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

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

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

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

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

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

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

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

$$f'(x) = \lim_{h \rightarrow 0} \frac{f(x+h) - f(x)}{h}$$

$$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$

$$M\left(\frac{x_1 + x_2}{2}; \frac{y_1 + y_2}{2}\right)$$

$$y = mx + c$$

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

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

$$m = \tan \theta$$

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

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

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

$$area \Delta ABC = \frac{1}{2} ab \cdot \sin C$$

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

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

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

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

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

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

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

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

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

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

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

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



NORTHERN CAPE  
DEPARTMENT OF EDUCATION

NOORD KAAP

DEPARTEMENT VAN ONDERWYS

LEFAPHA LA THUTO

LEARNER NAME/LEERDER NAAM:

SCHOOL NAME/NAAM VAN SKOOL:

**MATHEMATICS P2 / WISKUNDE V2**

**GRADE 12 / GRAAD 12**

**JUNE 2026/ JUNIE 2026**

**SPECIAL ANSWER BOOK/SPESIALE ANTWOORDBOEK**

| QUESTION /VRAAG     | MARK / PUNT | I.M | E.M |
|---------------------|-------------|-----|-----|
| 1                   | 10          |     |     |
| 2                   | 10          |     |     |
| 3                   | 21          |     |     |
| 4                   | 16          |     |     |
| 5                   | 17          |     |     |
| 6                   | 10          |     |     |
| 7                   | 14          |     |     |
| 8                   | 7           |     |     |
| 9                   | 7           |     |     |
| 10                  | 7           |     |     |
| 11                  | 31          |     |     |
| <b>TOTAL/TOTAAL</b> | 150         |     |     |
| INITIAL / PARAFEER  |             |     |     |

**This answer book consists of 22- pages. / Hierdie antwoordboek bestaan uit 22-bladsye.**

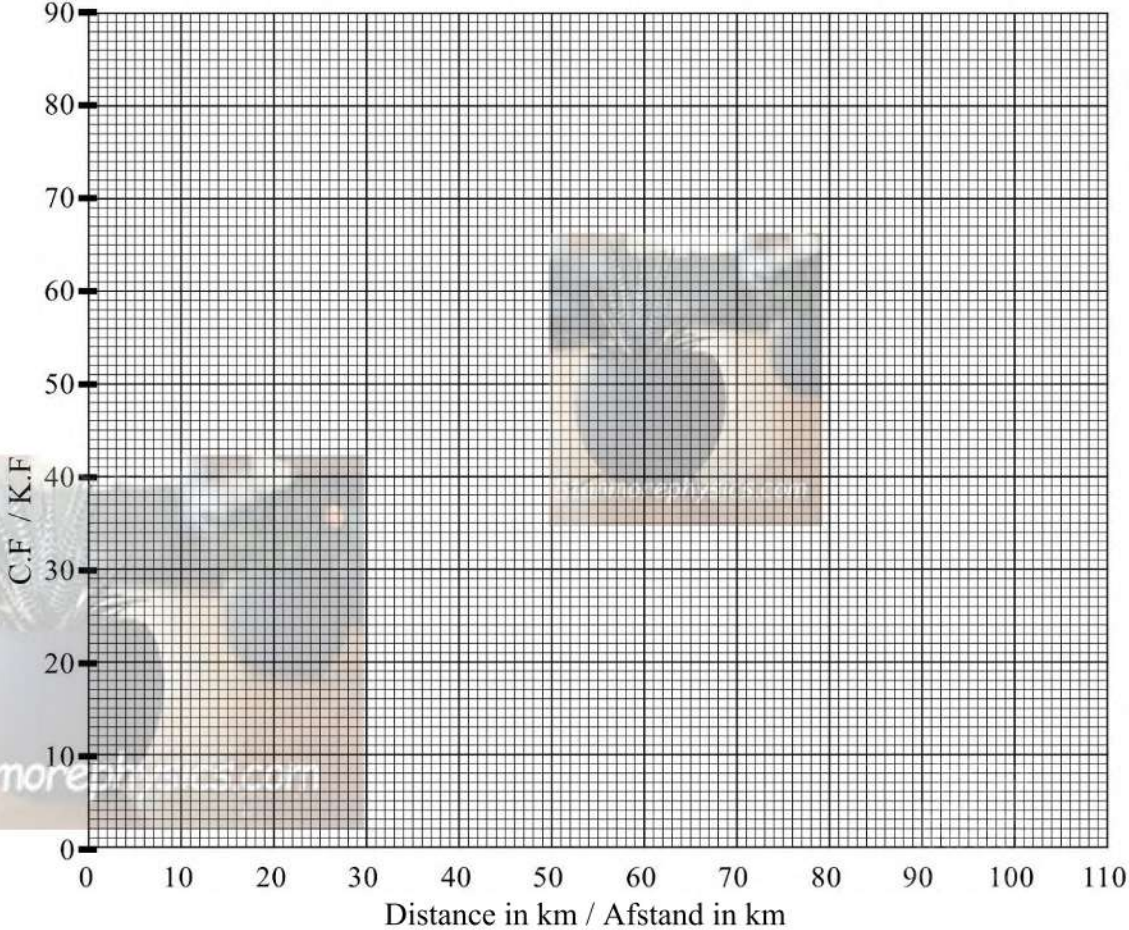
**QUESTION 1/VRAAG 1**

8      10      17      19      22      24      27      28      29      30  
 32      35      37      41      45

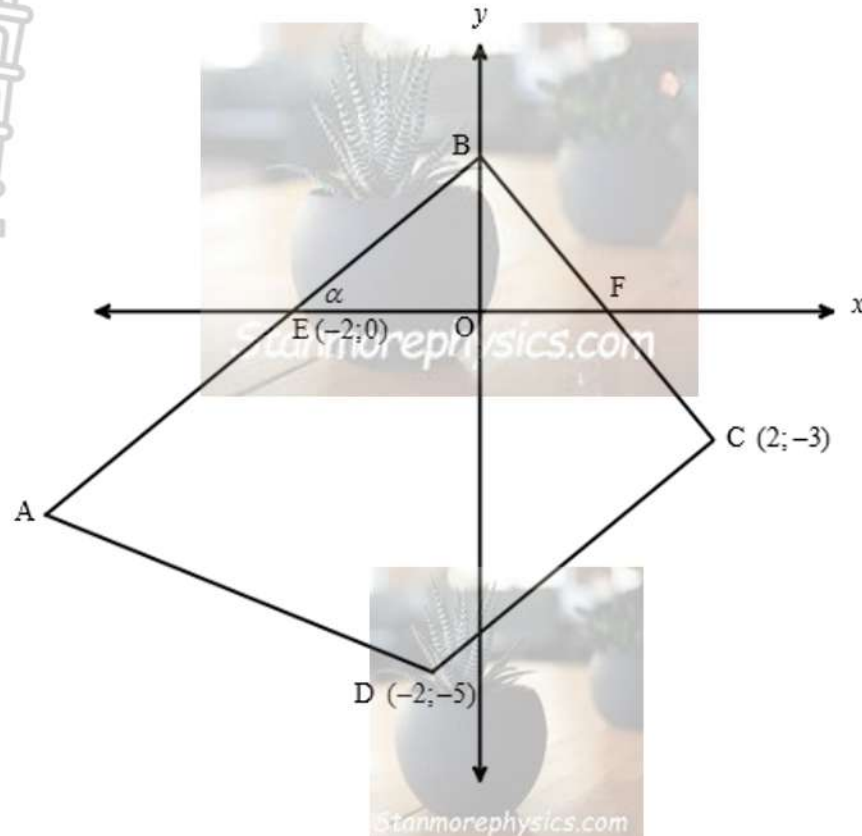
Average / Gemiddeld: 26,93

|       | <b>SOLUTION / OPLOSSING</b> | <b>Mark/Punt</b> |
|-------|-----------------------------|------------------|
| 1.1   |                             | (2)              |
|       |                             |                  |
| 1.2   |                             | (3)              |
|       |                             |                  |
|       |                             |                  |
|       |                             |                  |
| 1.3   |                             | (3)              |
|       |                             |                  |
|       |                             |                  |
|       |                             |                  |
|       |                             |                  |
|       |                             |                  |
| 1.4.1 |                             | (1)              |
|       |                             |                  |
| 1.4.2 |                             | (1)              |
|       |                             |                  |
|       |                             | <b>[10]</b>      |

## QUESTION 2/VRAAG 2

|     | SOLUTION / OPLOSSING                                                                | Mark/<br>Punt |
|-----|-------------------------------------------------------------------------------------|---------------|
| 2.1 |                                                                                     | (1)           |
| 2.2 |                                                                                     | (2)           |
| 2.3 |  |               |
|     |                                                                                     | (4)           |
| 2.4 |                                                                                     | (1)           |
| 2.5 |                                                                                     | (2)           |
|     |                                                                                     | [10]          |

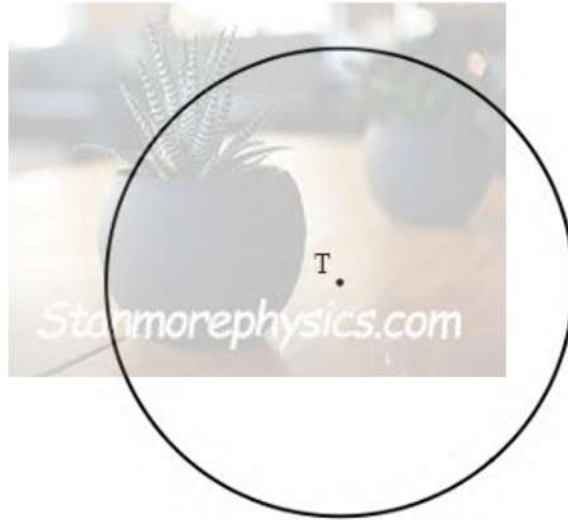
**QUESTION 3/VRAAG 3**



|     | <b>SOLUTION / OPLOSSING</b> | <b>Mark/Punt</b> |
|-----|-----------------------------|------------------|
| 3.1 |                             | (2)              |
|     |                             |                  |
|     |                             |                  |
| 3.2 |                             | (3)              |
|     |                             |                  |
|     |                             |                  |
|     |                             |                  |
|     |                             |                  |

|      |  |             |
|------|--|-------------|
| 3.3. |  | (2)         |
|      |  |             |
| 3.4  |  | (2)         |
|      |  |             |
| 3.5  |  | (2)         |
|      |  |             |
|      |  |             |
|      |  |             |
| 3.6  |  | (4)         |
|      |  |             |
|      |  |             |
|      |  |             |
|      |  |             |
|      |  |             |
| 3.7  |  | (3)         |
|      |  |             |
|      |  |             |
|      |  |             |
| 3.8  |  | (3)         |
|      |  |             |
|      |  |             |
|      |  |             |
|      |  | <b>[21]</b> |

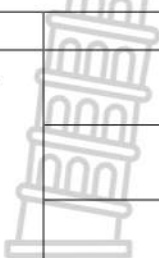
**QUESTION 4 / VRAAG 4**

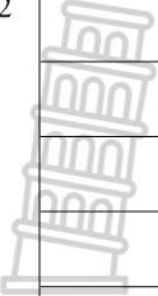


|      | <b>SOLUTION / OPLOSSING</b> | <b>Mark/Punt</b> |
|------|-----------------------------|------------------|
| 4.1. |                             | (3)              |
|      |                             |                  |
|      |                             |                  |
|      |                             |                  |
|      |                             |                  |
|      |                             |                  |
|      |                             |                  |
| 4.2  |                             | (1)              |
|      |                             |                  |
|      |                             |                  |
|      |                             |                  |
|      |                             |                  |
|      |                             |                  |

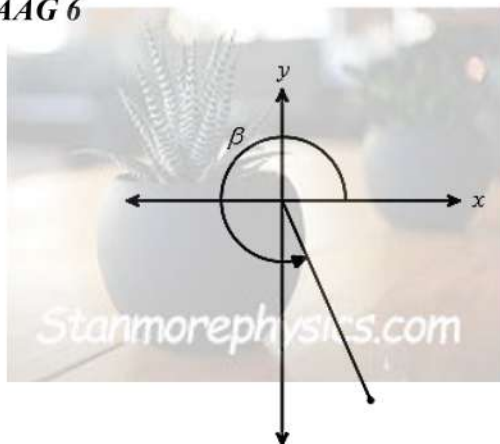


**QUESTION 5/VRAAG 5**

| SOLUTION / OPLOSSING |                                                                                     | Mark/Punt |
|----------------------|-------------------------------------------------------------------------------------|-----------|
| 5.1.                 |    | (6)       |
|                      |                                                                                     |           |
|                      |                                                                                     |           |
|                      |                                                                                     |           |
|                      |                                                                                     |           |
|                      |                                                                                     |           |
|                      |                                                                                     |           |
|                      |                                                                                     |           |
|                      |  |           |
|                      |                                                                                     |           |
|                      |                                                                                     |           |
|                      |                                                                                     |           |
|                      |                                                                                     |           |
|                      |                                                                                     |           |
|                      |                                                                                     |           |
| 5.2.1                |                                                                                     | (2)       |

|       |                                                                                     |      |
|-------|-------------------------------------------------------------------------------------|------|
| 5.2.2 |    | (2)  |
| 5.2.3 |  |      |
| 5.3   |                                                                                     | (3)  |
|       |                                                                                     | [17] |

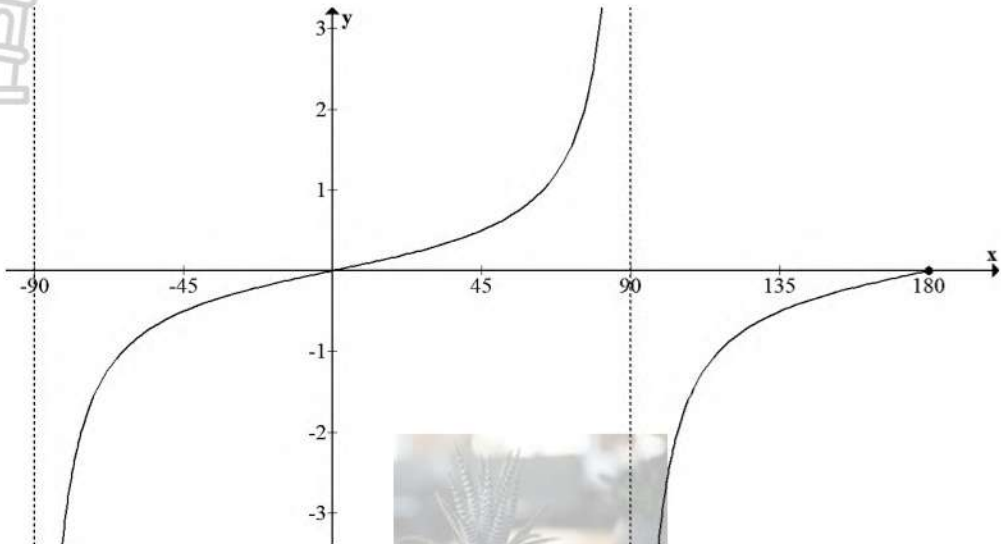
# QUESTION 6/1

[illegible]

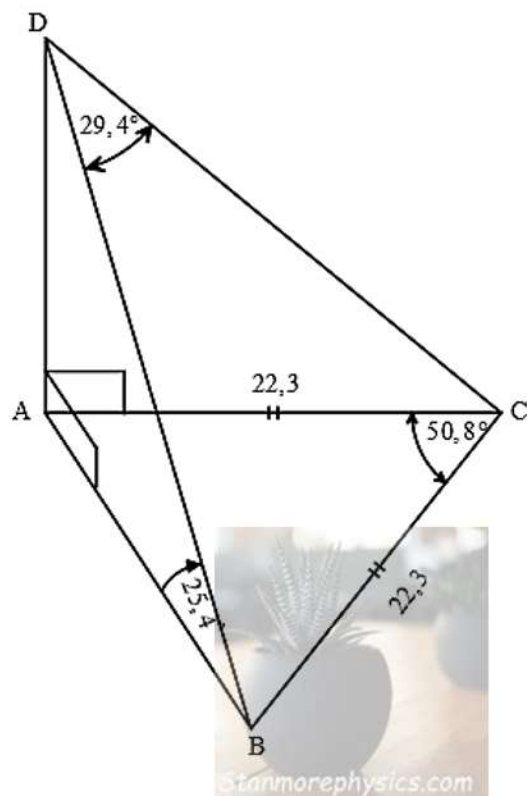
6.2



**QUESTION 7/VRAAG 7**

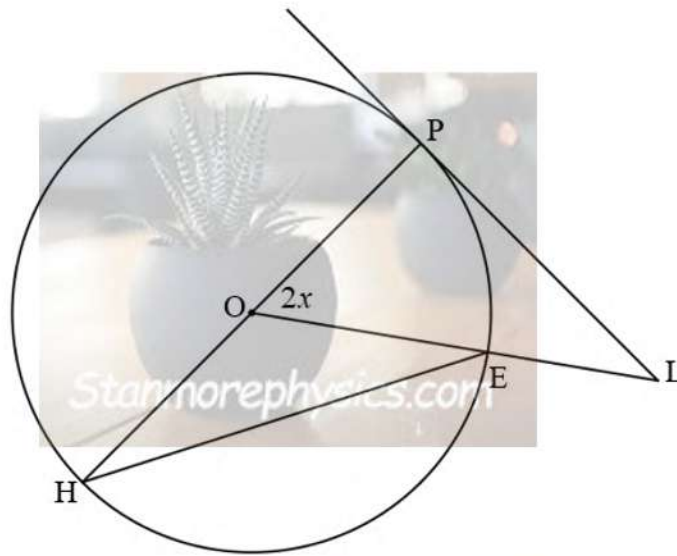
|     |                                                                                                                                                                                                                                                                                                                                                                                                |             |
|-----|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|
| 7.1 |                                                                                                                                                                                                                                                                                                                                                                                                | (1)         |
| 7.2 |                                                                                                                                                                                                                                                                                                              | (3)         |
| 7.3 | <div style="border: 1px solid black; height: 100px; width: 100%; position: relative;"> <div style="position: absolute; top: 0; right: 0; bottom: 0; left: 0; background-color: #f0f0f0; border: 1px solid #ccc; border-bottom: none;"></div> <div style="position: absolute; bottom: 0; left: 0; right: 0; background-color: #f0f0f0; border: 1px solid #ccc; border-top: none;"></div> </div> | (7)         |
| 7.4 |                                                                                                                                                                                                                                                                                                                                                                                                | (3)         |
|     |                                                                                                                                                                                                                                                                                                                                                                                                | <b>[14]</b> |

QUESTION 8 / VRAAG 8



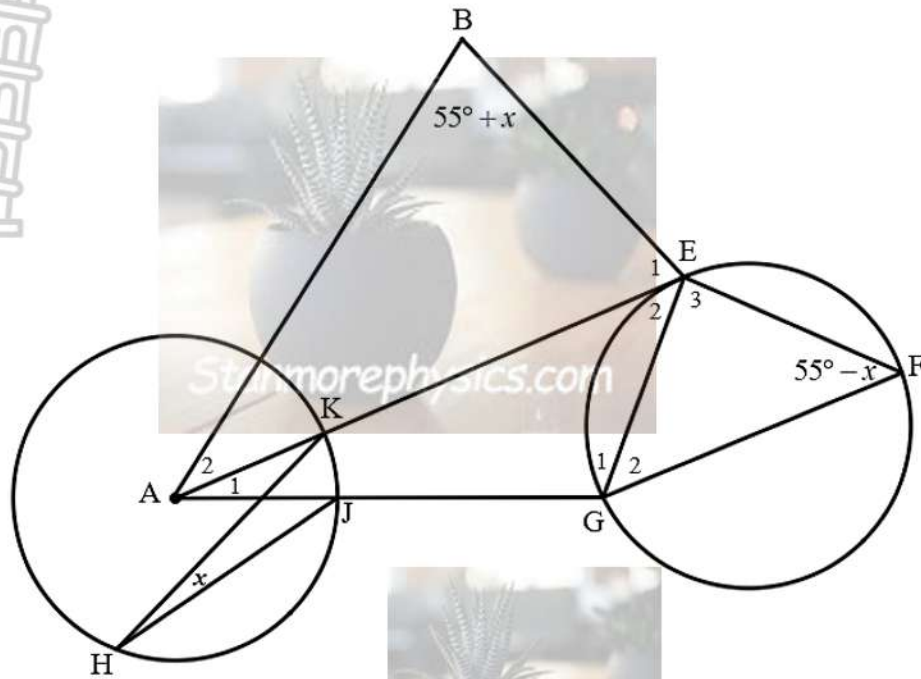
|     | SOLUTION / OPLOSSING | Mark/Punt |
|-----|----------------------|-----------|
| 8.1 |                      | (2)       |
|     |                      |           |
| 8.2 |                      | (3)       |
|     |                      |           |
|     |                      |           |
|     |                      |           |
| 8.3 |                      | (2)       |
|     |                      |           |
|     |                      |           |
|     |                      | [7]       |

**QUESTION 9/VRAAG 9**



|     | <b>SOLUTION / OPLOSSING</b> | <b>Mark/Punt</b> |
|-----|-----------------------------|------------------|
| 9.1 |                             | (4)              |
|     |                             |                  |
|     |                             |                  |
|     |                             |                  |
|     |                             |                  |
|     |                             |                  |
|     |                             |                  |
|     |                             |                  |
| 9.2 |                             | (3)              |
|     |                             |                  |
|     |                             |                  |
|     |                             |                  |
|     |                             | <b>[7]</b>       |

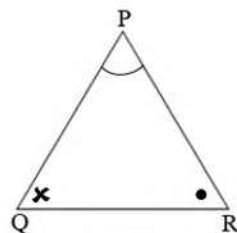
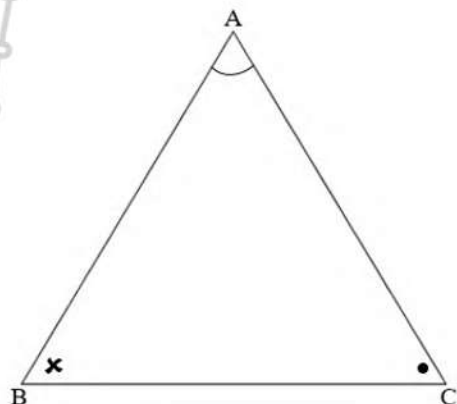
## QUESTION 10/VRAAG 10



|      | SOLUTION / OPLOSSING | Mark/Punt |
|------|----------------------|-----------|
| 10.1 |                      | (2)       |
|      |                      |           |
| 10.2 |                      | (7)       |
|      |                      |           |
|      |                      |           |
|      |                      |           |
|      |                      |           |
|      |                      |           |
|      |                      |           |
|      |                      |           |
|      |                      |           |
|      |                      | (7)       |
|      |                      | [9]       |

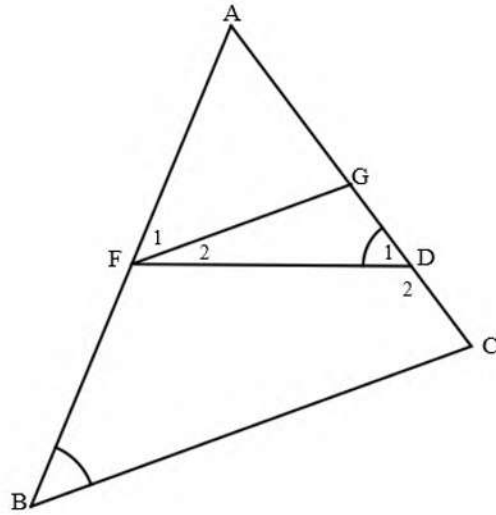
**QUESTION 11/VRAAG 11**

11.1



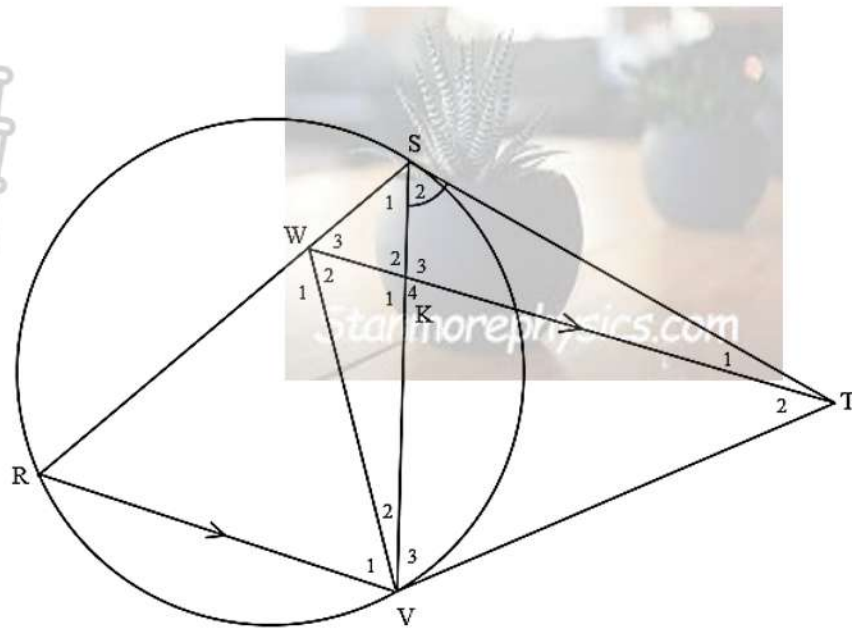
|      | <b>SOLUTION / OPLOSSING</b>                                                         | <b>Mark/Punt</b> |
|------|-------------------------------------------------------------------------------------|------------------|
| 11.1 |  |                  |
|      |                                                                                     |                  |
|      |                                                                                     |                  |
|      |                                                                                     |                  |
|      |                                                                                     |                  |
|      |                                                                                     |                  |
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|      |                                                                                     |                  |
|      |                                                                                     |                  |
|      |                                                                                     | (6)              |

11.2

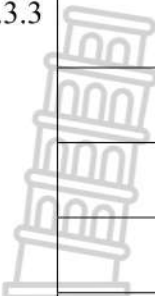


|        | SOLUTION / OPLOSSING                                                                | Mark/Punt |
|--------|-------------------------------------------------------------------------------------|-----------|
| 11.2.1 |  | (3)       |
|        |                                                                                     |           |
|        |                                                                                     |           |
|        |                                                                                     |           |
|        |                                                                                     |           |
|        |                                                                                     |           |
| 11.2.2 |                                                                                     | (5)       |
|        |                                                                                     |           |
|        |                                                                                     |           |
|        |                                                                                     |           |
|        |                                                                                     |           |
|        |                                                                                     |           |

11.3



|        | SOLUTION / OPLOSSING | Mark/Punt |
|--------|----------------------|-----------|
| 11.3.1 |                      | (3)       |
|        |                      |           |
|        |                      |           |
|        |                      |           |
|        |                      |           |
|        |                      |           |
| 11.3.2 |                      | (2)       |
|        |                      |           |
|        |                      |           |
|        |                      |           |
|        |                      |           |
|        |                      |           |

|           |                                                                                     |      |
|-----------|-------------------------------------------------------------------------------------|------|
| 11.3.3    |    |      |
|           |                                                                                     |      |
|           |                                                                                     |      |
|           |                                                                                     |      |
|           |                                                                                     |      |
|           |                                                                                     |      |
|           |                                                                                     |      |
|           |                                                                                     |      |
|           |                                                                                     |      |
|           |                                                                                     |      |
| 11.3.4    |  | (4)  |
|           |                                                                                     |      |
|           |                                                                                     |      |
|           |                                                                                     |      |
|           |                                                                                     |      |
| 11.3.5    |                                                                                     | (3)  |
|           |                                                                                     |      |
|           |                                                                                     |      |
|           |                                                                                     |      |
|           |                                                                                     |      |
|           |                                                                                     |      |
|           |                                                                                     | (2)  |
|           |                                                                                     | [31] |
| TOTAL:150 |                                                                                     |      |

[illegible]

[illegible]



# Northern Cape Department of Education

**CURRICULUM PROVINCIAL QUESTION PAPER/  
KURRIKULUM PROVINSIALE VRAESTEL**

**GRADE/GRAAD 12**

**MATHEMATICS/WISKUNDE**

**PAPER/VRAESTEL 2**

**JUNE/JUNIE 2026**

**MARKING GUIDELINES/NASIENRIGLYNE**

**ADJUSTED MARKING GUIDELINE 9 JUNE 2026**

**MARKS/PUNTE: 150**

**These marking guidelines consist of 20 pages./  
Hierdie nasienriglyne bestaan uit 20 bladsye.**

**NOTE:**

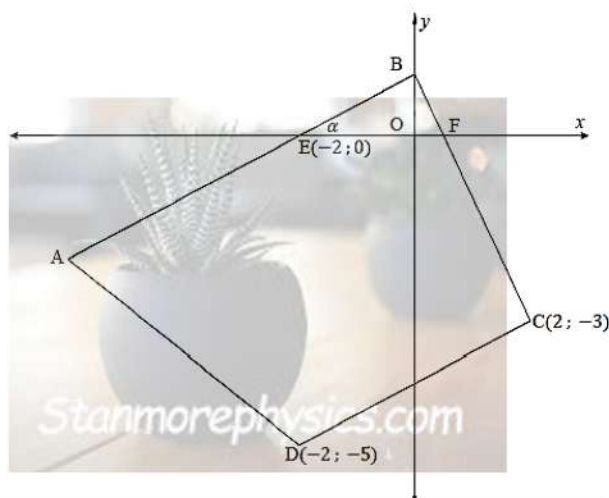
- If a candidate answers a question TWICE, only mark the FIRST attempt.
- If a candidate has crossed out an attempt of a question and not redone the question, mark the crossed-out version.
- Consistent accuracy applies in ALL aspects of the marking guidelines. Stop marking after the second calculation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

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

| QUESTION/VRAAG 1 |                                                                                                                                                                                                                |                                               |
|------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------|
| 1.1              | 10,23<br><div>Penalise for rounding</div>                                                                                                                                                                      | ✓ answer<br>✓ rounding<br>(2)                 |
| 1.2              | $[26,93 - 10,23 ; 26,93 + 10,23]$<br>$[16,7 ; 37,16]$<br>$\frac{11}{15} \times 100 = 73,33\%$                                                                                                                  | ✓ interval<br>✓ interval<br>✓ answer %<br>(3) |
| 1.3              | $\frac{1}{4}(15+1) = 4^{th}$ position $\therefore 19$<br>$\frac{3}{4}(15+1) = 12^{th}$ position $\therefore 35$<br>$Q_3 - Q_1$<br>$= 35 - 19$<br>$= 16$<br><div><math>12 - 4 = 8</math> (B/D) Zero marks</div> | ✓ Q1 19<br><br>✓ Q3 35<br><br>✓ answer<br>(3) |
| 1.4.1            | $26,93 - 5 = 21,93$                                                                                                                                                                                            | ✓ 21,93<br>(1)                                |
| 1.4.2            | 10,23                                                                                                                                                                                                          | ✓ answer<br>(1)                               |
|                  |                                                                                                                                                                                                                | <b>[10]</b>                                   |

| QUESTION/VRAAG 2 |                                                                                                                                                                                             |                                                                    |
|------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------|
| 2.1              | $A = 12$                                                                                                                                                                                    | ✓12<br>(1)                                                         |
| 2.2              | $\frac{1755}{51} = 34,41$ <div style="border: 1px solid black; padding: 5px; display: inline-block;">Answer Only</div> <p><b>CA IF A incorrect:</b></p> $\frac{1455 + A(25)}{51} = \bar{x}$ | ✓ method<br>✓ answer<br>(2)                                        |
| 2.3              |                                                                                                                                                                                             | ✓ upper boundaries + C.F<br>✓ shape<br>✓ (70;51)<br>✓ (0;0)<br>(4) |
| 2.4              | Median at C.F 25,5<br>34 (CA vanaf grafiek / CA from ogive)                                                                                                                                 | ✓ answer<br>(33,34,35)<br>(1)                                      |
| 2.5              | More than 55km: 47 Athletes / Atlete<br><br>$51 - 47 = 4$ (CA vanaf grafiek / CA from ogive)                                                                                                | ✓ value (47)<br>(46,47,48)<br><br>✓ answer<br>(2)                  |
|                  |                                                                                                                                                                                             | <b>[10]</b>                                                        |

QUESTION/VRAAG 3



|     |                                                                                                                                                                                                                     |                                                                                                         |
|-----|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------|
| 3.1 | $m_{CD} = \frac{-5+3}{-2-2}$ $= \frac{-2}{-4}$ $= \frac{1}{2}$                                                                                                                                                      | ✓ substitution C & D<br><br>✓ answer<br><br>(2)                                                         |
| 3.2 | $m_{AB} = m_{CD} = \frac{1}{2} \quad (AB \parallel CD)$ $y = \frac{1}{2}x + c$ $0 = \frac{1}{2}(-2) + c$ $c = 1$ $y = \frac{1}{2}x + 1$                                                                             | ✓ gradient (3.1)<br>✓ Substitute E (-2;0)<br>✓ value of c /equation<br><br>(3)                          |
| 3.3 | $\tan \alpha = \frac{1}{2}$ $\alpha = 26,57^\circ$                                                                                                                                                                  | ✓ method (3.1)<br>✓ answer<br><br>(2)                                                                   |
| 3.4 | $BE = \sqrt{(0+2)^2 + (1-0)^2}$ $= \sqrt{5}$ <p><b>OR</b></p> <p>In <math>\triangle EBO</math>: <math>\cos 26,7^\circ = \frac{2}{EB}</math></p> $EB = 2,24 \text{ units}$ <p><b>OR</b> Any other correct method</p> | ✓ substitution B (3.2) & E<br>✓ answer<br><br>(2)<br><br>✓ substitution $\cos \alpha$ (3.3)<br>✓ answer |

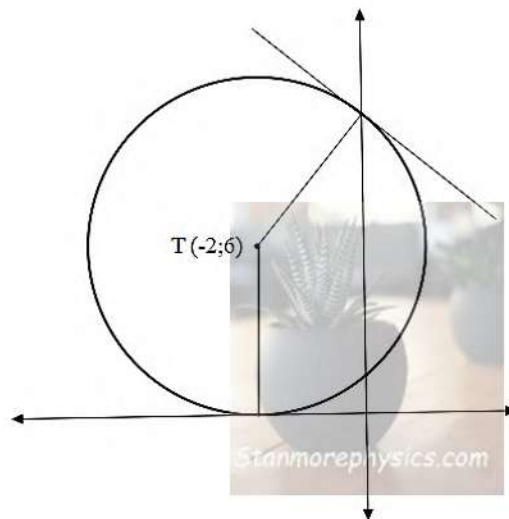
|     |                                                                                                                                                                                                                             |                                                                                                            |
|-----|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------|
| 3.5 | $m_{BC} \times m_{CD}$<br>$= -2 \times \frac{1}{2}$<br>$= -1$<br>$\therefore$ perpendicular / loodreg<br>$\therefore \angle ABC = 90^\circ$                                                                                 | ✓ method (3.1)<br>✓ answer<br>(2)                                                                          |
| 3.6 | $D'(-4; -6)$<br>$D$ to $D'$ 2 units left, 1 unit down<br><b>OR</b><br>$D'(-4; -6)$<br>$D$ to $D'$<br>$(x - 2; y - 1)$                                                                                                       | ✓ -4   ✓ -6<br>✓ answer   ✓ answer<br>(4)<br>✓ -4   ✓ -6<br>✓ answer   ✓ answer<br>(4)                     |
| 3.7 | midpoint AC:<br>$\left( \frac{-6+2}{2}; \frac{-2-3}{2} \right)$<br>$\left( -2; \frac{-5}{2} \right)$<br><b>OR</b><br>midpoint BD':<br>$\left( \frac{0-4}{2}; \frac{1-6}{2} \right)$<br>$\left( -2; \frac{-5}{2} \right)$    | ✓ substitute A & C<br>✓ answer   ✓ answer<br>(3)<br>✓ substitute B (3.2) & D' (3.6)<br>✓ answer   ✓ answer |
| 3.8 | $BC: y = -2x + 1$<br>$F: \left( \frac{1}{2}; 0 \right)$<br>$EF = 2,5$ units<br>$OB = 1$ unit<br>$\text{Area } \triangle BEF = \frac{1}{2} EF \cdot OB$<br>$= \frac{1}{2} (2,5)(1)$<br>$= 1,25 \text{ units}^2$<br><b>OR</b> | ✓ EF length<br>✓ OB length (3.2)<br>✓ answer                                                               |

|                                                                                                                                                                            |                                                                          |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------|
| $\text{Area } \triangle BEF = \frac{1}{2} EF \cdot EB \cdot \sin \alpha$ $= \frac{1}{2} \left( 2 \frac{1}{2} \right) (\sqrt{5}) \sin 26,57^\circ$ $= 1,25 \text{ units}^2$ | ✓ EF length<br><br>✓ substitution area rule (3.4)<br>✓ answer<br><br>(3) |
|                                                                                                                                                                            | [21]                                                                     |

**QUESTION/VRAAG 4**

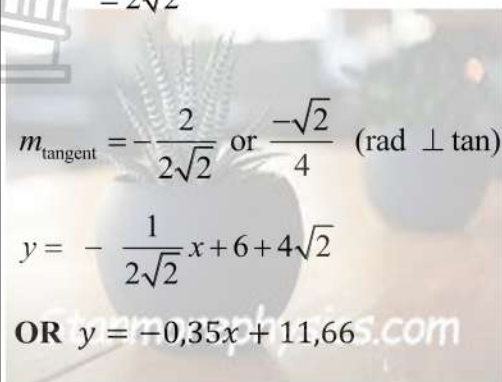
**ERRATA: EQUATION AS GIVEN ON QUESTION PAPER:**

$$x^2 + y^2 + 4x - 12y = 0$$

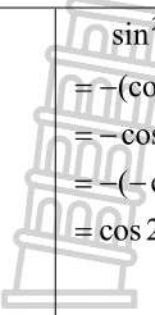


|              |                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                        |
|--------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------|
| 4.1          | $x^2 + y^2 + 4x - 12y = 0$ $x^2 + 4x + 4 + y^2 - 12y + 36 = 0 + 4 + 36$ $(x + 2)^2 + (y - 6)^2 = 40$ <p><math>\therefore</math> midpt T(-2; 6) but <math>r \neq 6</math></p> <div style="border: 1px solid black; padding: 5px; margin: 10px auto; width: fit-content;">                     If started with <math>(x+2)^2 + (y-6)^2 = 36</math><br/>                     Break Down (0 out of 3)                 </div> | ✓ Complete square LHS<br><br>✓ Complete square RHS<br><br>✓<br>$(x + 2)^2 + (y - 6)^2 = 40$<br><br>(3) |
| 4.2<br>Hence | (-2; 0)                                                                                                                                                                                                                                                                                                                                                                                                                  | ✓ (-2;0)<br><br>(1)                                                                                    |

|                       |                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                                                                                                                                                                                                    |
|-----------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>4.2</p>            | <p><b>OR</b></p> <p>Put <math>y = 0</math>:</p> $x^2 + y^2 + 4x - 12y = 0$ $x^2 + 4x = 0$ $x(x + 4) = 0$ $\therefore x = 0 \text{ or } x = -4$ <p><math>(0; 0)</math> or <math>(-4; 0)</math></p>                                                                                                                                                                                                                                     | <p><b>OR</b></p> $\checkmark x^2 + 4x = 0$ <p>(1)</p>                                                                                                                                                                                                              |
| <p>4.3</p> <p>4.3</p> | <p>Put <math>x = 0</math> :</p> $x^2 + y^2 + 4x - 12y = 0$ $y^2 - 12y = 0$ $y(y - 12) = 0$ $y = 0 \text{ or } y = 12$ <p><b>OR</b></p> $(0+2)^2 + (y-6)^2 = 36$ $4 + y^2 - 12y + 36 = 36$ $y^2 - 12y + 4 = 0$ $y = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$ $= \frac{-(-12) \pm \sqrt{(-12)^2 - 4(1)(4)}}{2(1)}$ $= \frac{12 \pm \sqrt{128}}{2}$ $= 6 \pm 4\sqrt{2}$ <p><math>(0; 6+4\sqrt{2})</math> or <math>(0; 6-4\sqrt{2})</math></p> | $\checkmark x = 0$ $\checkmark y^2 - 12y = 0$ $\checkmark \text{factors}$ $\checkmark \text{both answers}$ <p>(4)</p> $\checkmark x = 0$ $\checkmark \text{standard form}$ $\checkmark \text{substitution in formula}$ $\checkmark \text{both answers}$ <p>(4)</p> |

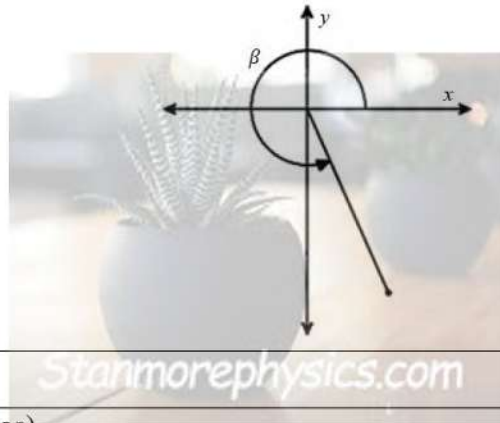
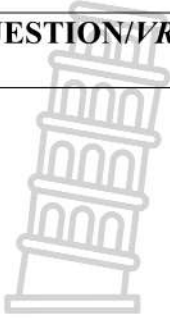
|     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                       |
|-----|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------|
| 4.4 |  $m_{\text{radius}} = \frac{6 - (6 + 4\sqrt{2})}{-2 - 0}$ $= \frac{-4\sqrt{2}}{-2}$ $= 2\sqrt{2}$<br> $m_{\text{tangent}} = -\frac{2}{2\sqrt{2}} \text{ or } \frac{-\sqrt{2}}{4} \text{ (rad } \perp \text{ tan) or } \frac{-1}{2\sqrt{2}}$ $y = -\frac{1}{2\sqrt{2}}x + 6 + 4\sqrt{2}$ <p>OR <math>y = -0,35x + 11,66</math></p> | <p>✓ substitute T and<br/>(0 ; 6 + 4√2)</p> <p>✓ answer</p> <p>✓ gradient of tangent</p> <p>✓ equation</p> <p>(4)</p> |
| 4.5 | $6 + k > 6$<br>$k > 0$<br>OR<br>$6 + k < -6$<br>$k < -12$<br>                                                                                                                                                                                                                                                                                                                                                    | <p>✓ &gt; 6</p> <p>✓ answer</p><br><p>✓ &lt; -6</p> <p>✓ answer</p> <p>(4)</p>                                        |
|     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | <b>[16]</b>                                                                                                           |

| QUESTION/VRAAG 5 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                                                                                                                                                               |
|------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 5.1              | $LHS: \frac{-1 + \cos(180^\circ - \theta) \cdot -\cos \theta}{\cos(-\theta) \cdot \cos \theta \cdot \tan^2(540^\circ + \theta)}$ $= \frac{-1 - \cos \theta \cdot -\cos \theta}{\cos \theta \cdot \cos \theta \cdot (\tan \theta)^2}$ $= \frac{-1 + \cos^2 \theta}{\cos^2 \theta \cdot \frac{\sin^2 \theta}{\cos^2 \theta}}$ $= \frac{-(1 - \cos^2 \theta)}{\sin^2 \theta}$ $= \frac{-\sin^2 \theta}{\sin^2 \theta}$ $= -1$ $= RHS$                                                                                                                                                                                                                                                                                               | <p>✓ <math>-\cos \theta</math><br/>✓ <math>\cos \theta</math><br/>✓ <math>\tan \theta</math></p> <p>✓ <math>\frac{\sin \theta}{\cos \theta}</math></p> <p>✓ <math>-(1 - \cos^2 \theta)</math></p> <p>✓ <math>\sin^2 \theta</math><br/>identity</p> <p>(6)</p> |
| 5.2.1            | $\sin 40^\circ = k$<br>$\frac{1}{\sin 140^\circ} = \frac{1}{\sin 40^\circ} = \frac{1}{k}$                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | <p>✓ <math>\sin 40^\circ</math> ✓ answer<br/>(2)</p>                                                                                                                                                                                                          |
| 5.2.2            | $\frac{1}{2}(2\sin 20^\circ \cdot \cos 20^\circ)$ $= \frac{1}{2}(\sin 40^\circ) = \frac{1}{2}k$                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | <p>✓ half a double angle<br/>✓ answer<br/>(2)</p>                                                                                                                                                                                                             |
| 5.2.3            | <div style="display: flex; align-items: center;"> <div style="flex: 1;"> <math display="block">\sin(60^\circ - 40^\circ)</math> <math display="block">= \sin 60^\circ \cos 40^\circ - \cos 60^\circ \sin 40^\circ</math> <math display="block">= \frac{\sqrt{3}}{2} \cdot \sqrt{1 - k^2} - \frac{1}{2} \cdot k</math> <math display="block">= \frac{\sqrt{3} \cdot \sqrt{1 - k^2} - k}{2}</math> </div> <div style="flex: 1; text-align: center;"> </div> </div> <p>OR</p> <p><math>\sin(50^\circ - 30^\circ)</math></p> <p>OR</p> <p>Any other valid solution</p> <p>NOTE: FORMULA OF <math>\sin(\alpha - \beta)</math> omitted on formula sheet.<br/>Do not penalize incorrect <math>\sin(\alpha - \beta)</math> expansion</p> | <p>✓ sketch/<math>\sqrt{1 - k^2}</math><br/>✓ <math>\sin(60^\circ - 40^\circ)</math><br/>✓ expansion<br/>✓ substitution<br/>(4)</p>                                                                                                                           |

|     |                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                         |
|-----|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 5.3 |  $\begin{aligned} & \sin^2 76^\circ - \cos^2 76^\circ \\ &= -(\cos^2 76^\circ - \sin^2 76^\circ) \\ &= -\cos 152^\circ \\ &= -(-\cos 28^\circ) \\ &= \cos 28^\circ \end{aligned}$ <p><b>OR</b></p> $\begin{aligned} & (\sin 76^\circ)^2 - (\cos 76^\circ)^2 \\ &= (\cos 14^\circ)^2 - (\sin 14^\circ)^2 \\ &= \cos 2(14^\circ) \\ &= \cos 28^\circ \end{aligned}$ | <p>✓ common factor</p> <p>✓ <math>-\cos 152^\circ</math><br/>cos double angle</p> <p>✓ <math>-\cos 28^\circ</math><br/>(3)</p><br><p>✓ co-function<br/>✓ co-function<br/>✓ cos double angle<br/>(3)</p> |
|     |                                                                                                                                                                                                                                                                                                                                                                                                                                                    | <b>[17]</b>                                                                                                                                                                                             |



QUESTION/VRAAG 6



|       |                                                                                                                                                                                                                                                                                          |                                                                                              |                                                                                                                                                                          |
|-------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 6.1.1 | $r = 5$ (Pythagoras)<br>$\sin \beta = -\frac{4}{5}$                                                                                                                                                                                                                                      | <div style="border: 1px solid black; padding: 2px; display: inline-block;">Answer Only</div> | ✓ $r = 5$<br>✓ answer<br>(2)                                                                                                                                             |
| 6.1.2 | $\sin(\beta + \alpha)$<br>$= \sin \beta \cos \alpha + \cos \beta \sin \alpha$<br>$= \left(-\frac{4}{5}\right)\left(-\frac{3}{5}\right) + \left(\frac{3}{5}\right)\left(-\frac{4}{5}\right)$<br>$= \frac{12}{25} - \frac{12}{25}$<br>$= 0$                                                |                                                                                              | ✓ expansion<br>✓ substitution<br>✓ simplification<br>(3)                                                                                                                 |
| 6.2   | $\sin x(3 \sin x + 1) = 0$<br>$\sin x = 0$<br>$x = 0^\circ + 180^\circ k; k \in \mathbb{Z}$<br><br>or $\sin x = -\frac{1}{3}$<br>$\text{ref } \angle : 19,47^\circ$<br>III: $x = 199,47^\circ + 360^\circ k; k \in \mathbb{Z}$<br>IV: $x = 340,53^\circ + 360^\circ k; k \in \mathbb{Z}$ |                                                                                              | ✓ $\sin x = 0$<br>✓ $x = 0^\circ + 180^\circ k$<br><br>✓ $\sin x = -\frac{1}{3}$<br><br>✓ $199,47^\circ;$<br>$340,53^\circ$<br>✓ $+360^\circ k; k \in \mathbb{Z}$<br>(5) |
|       |                                                                                                                                                                                                                                                                                          |                                                                                              | <b>[10]</b>                                                                                                                                                              |

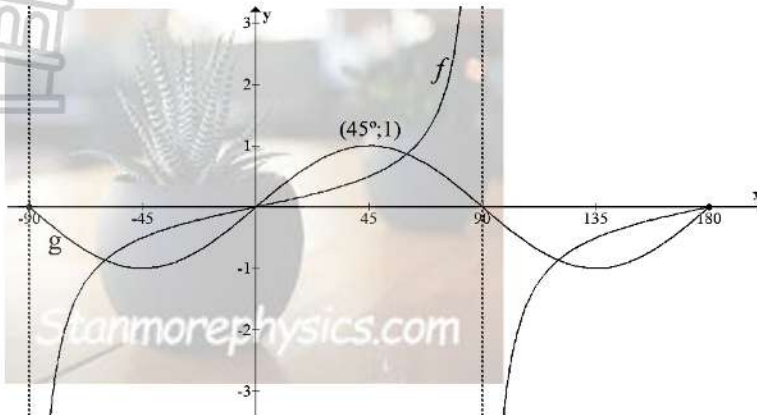
**QUESTION/VRAAG 7**

7.1  $x = 0^\circ; x = 180^\circ$

✓ both answers

(1)

7.2



$g(x) = \sin 2x$

✓ TP

✓  $x$  – intercepts

✓ shape

(3)

7.3  $\frac{1}{2} \tan x = \sin 2x$

$$\frac{\sin x}{2 \cos x} = 2 \sin x \cos x$$

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

$$0 = 4 \sin x \cos^2 x - \sin x$$

$$0 = \sin x (4 \cos^2 x - 1)$$

$$\sin x = 0$$

$$x = 0^\circ + 180^\circ k; k \in \mathbb{Z}$$

$$\cos^2 x = \frac{1}{4}$$

$$\cos x = \pm \frac{1}{2} \quad \text{ref } \angle : 60^\circ$$

$$I : x = 60^\circ + 360^\circ k; k \in \mathbb{Z}$$

$$IV : x = 300^\circ + 360^\circ k; k \in \mathbb{Z}$$

$$II : x = 120^\circ + 360^\circ k; k \in \mathbb{Z}$$

$$III : x = 240^\circ + 360^\circ k; k \in \mathbb{Z}$$

$$-60^\circ \quad 0^\circ \quad 60^\circ \quad 120^\circ \quad 180^\circ$$

No  $\pm$  No mark

CA Quadrants

Answer Only

2 out of 7

✓ tan identity

✓ sin double angle

✓ factors

✓

$$x = 0^\circ + 180^\circ k; k \in \mathbb{Z}$$

$$\checkmark \cos x = \pm \frac{1}{2}$$

✓ CA

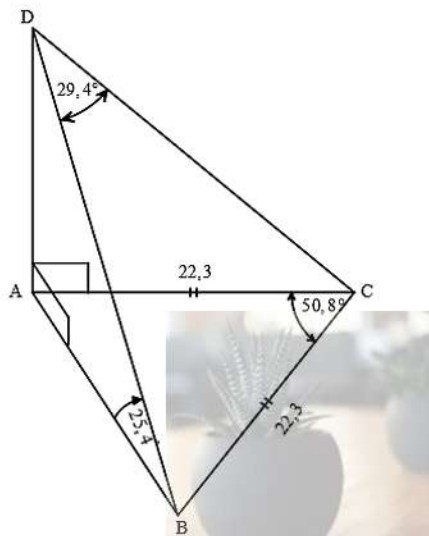
$60^\circ \quad 300^\circ \quad 120^\circ \quad 240^\circ$

✓ answer

(7)

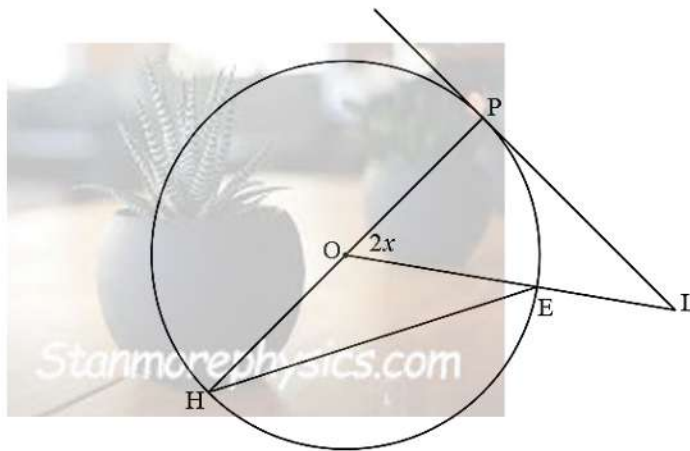
|     |                                                                   |                                                                                                                                                                                             |                                                                 |
|-----|-------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------|
| 7.4 | $\frac{1}{2} \tan x \geq \sin 2x$<br>$60^\circ \leq x < 90^\circ$ | <div style="border: 1px solid black; padding: 5px; width: fit-content;">                     Inequality mark may ONLY be awarded if the critical values are correct.                 </div> | ✓ $\sin 2x$<br>✓ critical values<br>✓ correct inequality<br>(3) |
|     |                                                                   |                                                                                                                                                                                             | [14]                                                            |

QUESTION/VRAAG 8



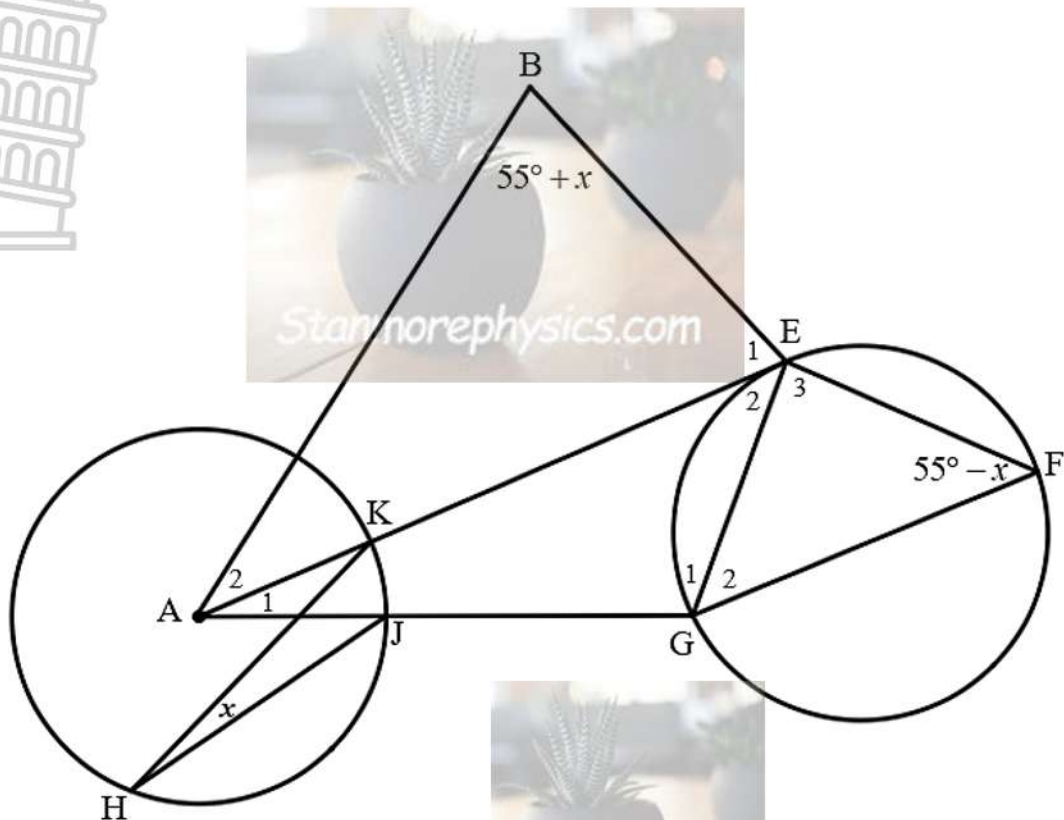
|     |                                                                                                                                                            |                                                             |
|-----|------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------|
| 8.1 | $\text{Area of } \triangle ABC = \frac{1}{2} (22,3)(22,3) \sin 50,8^\circ$ $= 192,69 \text{ units}^2$                                                      | ✓ substitute in area rule<br>✓ answer<br>(2)                |
| 8.2 | In $\triangle ABC$ :<br>$AB^2 = 22,3^2 + (22,3)^2 - 2(22,3)(22,3) \cos 50,8^\circ$<br>$AB^2 = 365,976...$<br>$AB = 19,13$                                  | ✓ substitution in cos rule<br>✓ simplify<br>✓ answer<br>(3) |
| 8.3 | In $\triangle BCD$ :<br>$\frac{CD}{\sin 43,6^\circ} = \frac{22,3}{\sin 29,4^\circ}$ $CD = \frac{22,3 \cdot \sin 43,6^\circ}{\sin 29,4^\circ}$ $CD = 31,32$ | ✓ substitution in sin rule<br>✓ answer<br>(2)               |
|     |                                                                                                                                                            | [7]                                                         |

QUESTION/VRAAG 9



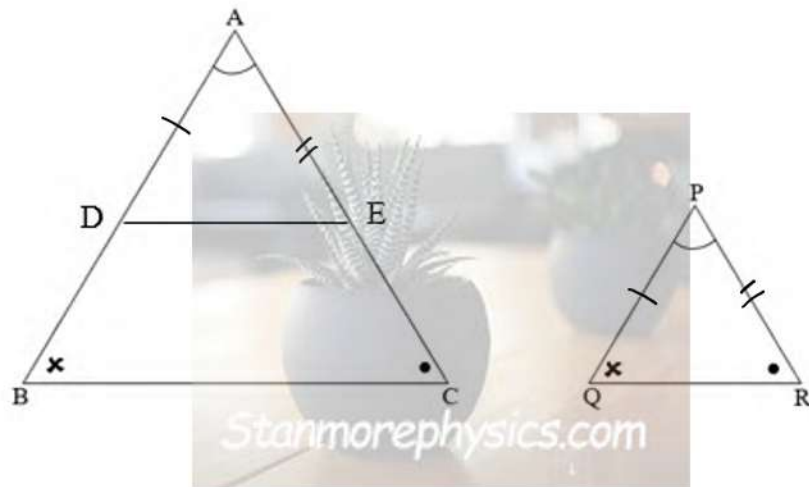
|     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                     |
|-----|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 9.1 | <p><math>\hat{H}OE = 180^\circ - 2x</math> (Hoeke op 'n reguitlyn / Angles on a straight line)</p> <p><math>OH = OE</math> (Radiusse / Radii)</p> <p><math>\hat{H} = \hat{OEH}</math></p> <p><math>\hat{OEH} = x</math> (Hoeke teenoor gelyke sye / Angles opp equal sides)</p> <p><b>OR</b></p> <p><math>OH = OE</math> (Radiusse / Radii)</p> <p><math>\hat{H} = \hat{OEH}</math> (Hoeke teenoor gelyke sye / Angles opp equal sides)</p> <p><math>\hat{OEH} = x</math> (Buite hoek van driehoek / Ext Angle of triangle)</p> <p><b>OR</b></p> <p><math>\hat{H} = x</math> (Mdpt <math>\angle = 2 \times</math> omtrekshoek)</p> <p><math>OH = OE</math> (Radiusse / radii)</p> <p><math>\hat{OEH} = x</math> (Hoeke teenoor gelyke sye / Angles opp equal sides)</p> | <p>✓S/R</p> <p>✓ <math>OH = OE</math></p> <p>✓S ✓R</p> <p>✓<math>OH = OE</math></p> <p>✓S ✓R</p> <p>✓S/R</p> <p>✓S/R</p> <p>✓ <math>OH = OE</math></p> <p>✓S ✓R</p> |
| 9.2 | <p><math>\hat{OPL} = 90^\circ</math> (Radius <math>\perp</math> Raaklyn / Radius <math>\perp</math> tangent)</p> <p><math>\hat{L} = 180^\circ - 90^\circ - 2x</math></p> <p><math>= 90^\circ - 2x</math> (Binnehoeke v driehoek / Angles of Triangle)</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | <p>✓S ✓R</p> <p>✓S</p>                                                                                                                                              |
|     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | [7]                                                                                                                                                                 |

QUESTION/VRAG 10



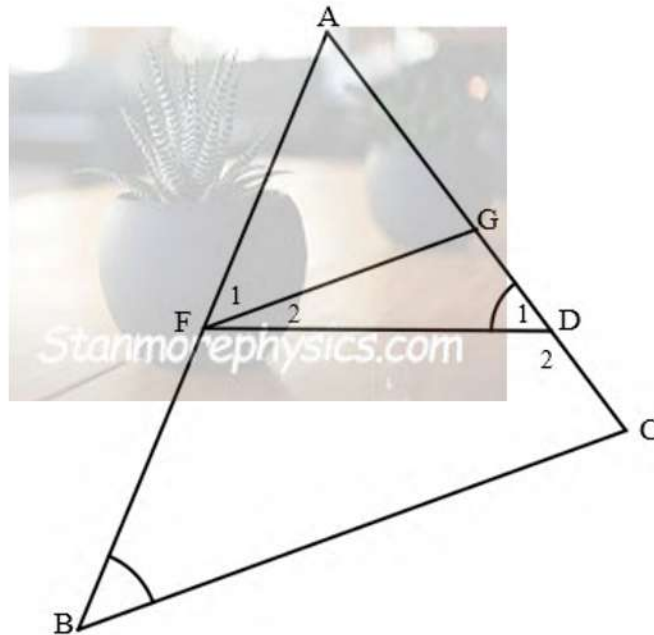
|      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                        |
|------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------|
| 10.1 | $\hat{E}_2 = 55^\circ - x$ (Raaklyn - koord st / Tan - chord th)                                                                                                                                                                                                                                                                                                                                                                                                     | ✓S ✓R<br>(2)                           |
| 10.2 | $\hat{A}_1 = 2x$ (Mdptshoek = $2 \times$ omtrekshoek / Angle at centre = $2 \times$ angle at the centre)<br>$\hat{G}_1 = 180^\circ - 2x - (55^\circ - x)$ (Binnehoeke v driehoek / Angles of Triangle)<br>$= 125^\circ - x$<br>$\hat{G}_1 + \hat{B} = 55^\circ + x + 125^\circ - x$<br>$= 180^\circ$<br>$\therefore$ ABEG a cyclic quad (Teenoorst hoeke v vierhoek supp / Opp angles of quad supp)<br>OR (Omg teenoorst $\angle$ kvh / Conv opp angles cyclic quad) | ✓S ✓R<br><br>✓S<br><br>✓S<br>✓R<br>(5) |
|      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | [7]                                    |

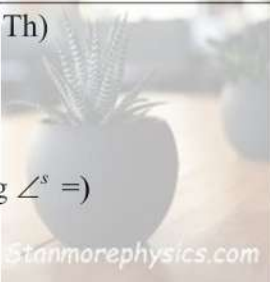
QUESTION/VRAAG 11

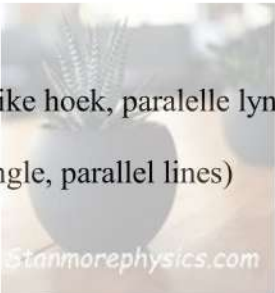


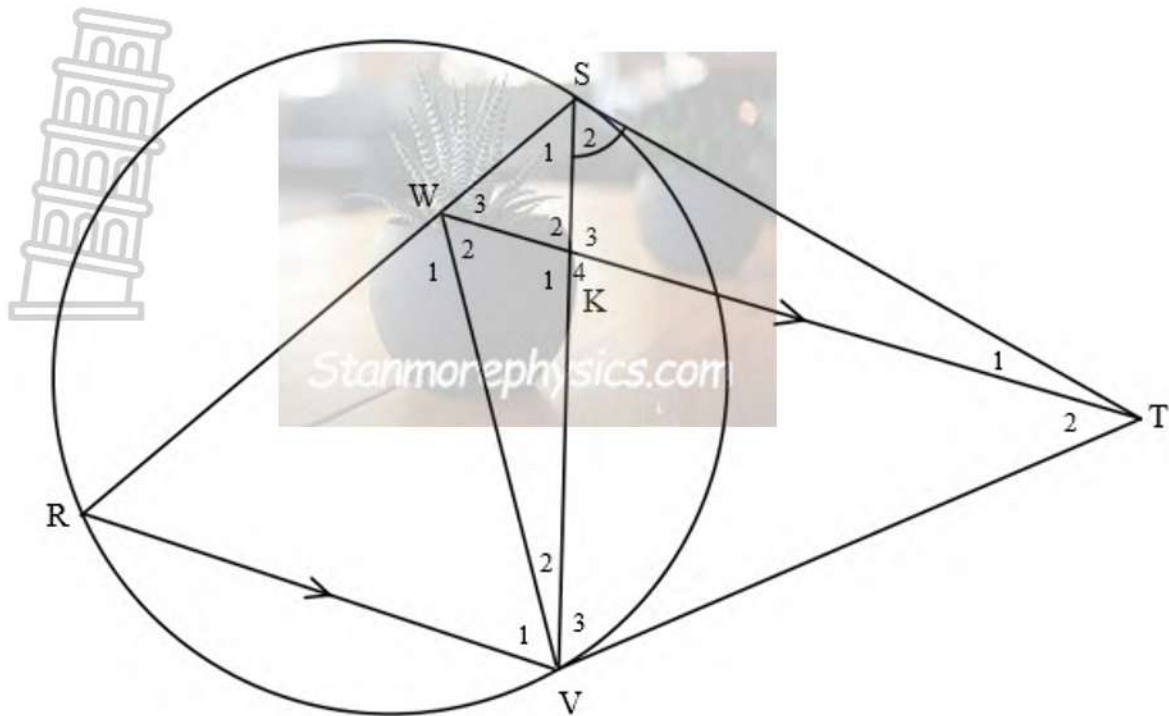
|      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                                    |
|------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------|
| 11.1 | <p><b>NO / INCOMPLETE CONSTRUCTION – BREAK DOWN (0 out of 6)</b></p> <p>Mark off D on AB and E on AC ,such that <math>AD = PQ</math> and <math>AE = PR</math>. Draw DE.</p> <p>In <math>\triangle ADE</math> and <math>\triangle PQR</math>:</p> <p><math>\hat{A} = \hat{P}</math> (Gegee/given)</p> <p><math>PQ = AD</math> (Konstruksie/Construction)</p> <p><math>PR = AE</math> (Konstruksie/Construction)</p> <p><math>\therefore \triangle PQR \equiv \triangle ADE</math> (SHS / SAS)</p> <p><math>\hat{ADE} = \hat{Q}</math> (Vanuit <math>\equiv</math> / From <math>\equiv</math>)</p> <p><math>\hat{Q} = \hat{B}</math> (Gegee / Given)</p> <p><math>\therefore \hat{ADE} = \hat{B}</math></p> <p><math>DE \parallel BC</math> (ooreenk <math>\angle^e =</math> / corr <math>\angle^s =</math>)</p> <p><math>\frac{AB}{AD} = \frac{AC}{AE}</math> (Lyn parallel een sy van driehoek)</p> <p>(Line parallel one side of triangle)</p> <p>but <math>AD = PQ</math> and <math>AE = PR</math></p> <p><math>\frac{AB}{PQ} = \frac{AC}{PR}</math></p> | <p>✓ Construction</p> <p>✓ S/R</p> <p>✓ S/R</p> <p>✓ S/R</p> <p>✓ S</p> <p>(6)</p> |
|------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------|

11.2



|        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                                                |
|--------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 11.2.1 | $\hat{F}_1 = \hat{D}_1$ (Raaklyn - koord St / Tan chord Th)<br>$\hat{D}_1 = \hat{B}$<br>$\therefore \hat{F}_1 = \hat{B}$<br>$FG \parallel BC$ (Ooreenk $\angle^e = /$ Corresponding $\angle^s =$ )                                                                                                                                                                                                                                                                                                                                                     | <br>$\checkmark$ S/R<br>$\checkmark$ S $\hat{F}_1 = \hat{B}$<br>$\checkmark$ R<br>(3)                                                                                                       |
| 11.2.2 | $\frac{AC}{GC} = \frac{AB}{FB}$ (Lyn $\parallel$ een sy van driehoek / Line $\parallel$ one side of triangle)<br>OR (Eweredigheid st $FG \parallel BC$ / Proportionality th $FG \parallel BC$ )<br>$\frac{2k-6}{k+9} = \frac{5}{3}$<br>$6k-18 = 5k+45$<br>$k = 63$<br><b>OR</b><br>$\frac{AG}{AC} = \frac{AF}{AB}$ (Lyn $\parallel$ een sy van driehoek / Line $\parallel$ one side of triangle)<br>OR (Eweredigheid st $FG \parallel BC$ / Proportionality th $FG \parallel BC$ )<br>$\frac{k-15}{2k-6} = \frac{2}{5}$<br>$4k-12 = 5k-75$<br>$k = 63$ | $\checkmark$ S $\checkmark$ R<br><br>$\checkmark$ Substitute lengths<br>$\checkmark$ correct ratio<br><br>$\checkmark$ Answer<br><b>OR</b><br>$\checkmark$ S $\checkmark$ R<br><br>$\checkmark$ Substitute lengths<br>$\checkmark$ correct ratio<br>$\checkmark$ Answer<br>(5) |

|        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|--------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 11.2.3 | <div>  </div> <div> <math display="block">\frac{\text{AREA of } \triangle AFG}{\text{AREA of } \triangle ABC} = \frac{0,5(2k)(2p) \sin A}{0,5(5k)(2p) \sin A}</math> <math display="block">= \frac{4}{25}</math> </div> <div> <p><b>OR</b></p> </div> <div> <math display="block">\frac{\text{AREA of } \triangle AFG}{\text{AREA of } \triangle ABC} = \frac{0,5 AF \cdot AG \sin A}{0,5 AB \cdot AC \sin A}</math> <math display="block">= \left( \frac{AF}{AB} \times \frac{AG}{AC} \right) = \left( \frac{2}{5} \right)^2</math> <math display="block">= \frac{4}{25}</math> </div> <div> <p><b>OR</b></p> </div> <div> <math display="block">\frac{\text{AREA of } \triangle AFG}{\text{AREA of } \triangle ABC} = \left( \frac{AF}{AB} \right)^2</math> <math display="block">= \left( \frac{2}{5} \right)^2 \text{ (Gemeenskaplike hoek, paralelle lyne)}</math> <p style="text-align: center;">( Common Angle, parallel lines)</p> <math display="block">= \frac{4}{25}</math> </div> <div>  <p style="text-align: center;">Stanmorephysics.com</p> </div> | <div style="border: 1px solid black; padding: 5px; margin: 10px;"> <p>If no ratio indicated with variable – penalise 1 mark</p> </div> <div> <p>✓ area rule with ratio on top<br/>✓ area rule with ratio on bottom<br/>✓ answer</p> </div> <div> <p><b>OR</b></p> </div> <div> <p>✓ area rule<br/><br/>✓ substitute ratio<br/><br/>✓ answer</p> </div> <div> <p>✓ ratio ✓ R</p> </div> <div> <p>✓ answer</p> </div> <div> <p>(3)</p> </div> |
|--------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|



|        |                                                                                                                                                                                                                                                                                                 |                                                                                     |                                                                               |     |
|--------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------|-----|
| 11.3.1 | $\hat{V}_3 = x$<br>$\hat{R} = x$<br>$\hat{W}_3 = x$                                                                                                                                                                                                                                             |  | $\checkmark$ S<br>$\checkmark$ S<br>$\checkmark$ S                            | (3) |
| 11.3.2 | $\hat{W}_3 = \hat{V}_3 = x$ (From 11.3.1)<br>$\therefore$ WSTV a cyclic quad (lyn onderspan gelyke hoeke)<br>(Line subtends equal angles)<br>OR (Omg hoeke in dies sirkelsegment)<br>(Conv angles in the same segment)                                                                          |  | $\checkmark$ S<br>$\checkmark$ R                                              | (2) |
| 11.3.3 | $\hat{S}_2 = \hat{W}_2 = x$ (Hoeke in dies sirkelsegment)<br>(Angles in the same segment)<br><br>$\hat{W}_2 = \hat{V}_1 = x$ (verw $\angle^e$ , WT $\parallel$ RV)<br>(Alternate $\angle^s$ , WT $\parallel$ RV)<br>$\therefore WR = WV$ (Sye teenoor gelyke hoeke)<br>(Sides opp equal angles) |                                                                                     | $\checkmark$ S $\checkmark$ R<br><br>$\checkmark$ S/R<br><br>$\checkmark$ S/R | (4) |

|        |                                                                                                                                                                                                            |                                          |
|--------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------|
| 11.3.4 | <p>In <math>\Delta RVW</math> en <math>\Delta SVT</math> :</p> $\hat{R} = \hat{S}_2 = x \quad (\text{from } 11.3.1)$ $\hat{V}_1 = \hat{V}_3 = x$ <p><math>\Delta RVW \parallel \Delta SVT</math> (AAA)</p> | <p>✓S</p> <p>✓S</p> <p>✓R</p> <p>(3)</p> |
| 11.3.5 | $\frac{RV}{SV} = \frac{VW}{VT} = \frac{RW}{ST} \quad (\text{Vanuit } \parallel) \quad (\text{From } \parallel)$                                                                                            | <p>✓S ✓R</p> <p>(2)</p>                  |
|        |                                                                                                                                                                                                            | [31]                                     |
|        |                                                                                                                                                                                                            | <b>TOTAL/TOTAL: 150</b>                  |

