

MATHEMATICS TOPIC TEST

GRADE 11 · MATHEMATICS · 2026

TRIGONOMETRY: PROBLEMS IN TWO DIMENSIONS

TOTAL: 50 MARKS

TIME: 1 HOUR

EXAMINER: MR SIMONS

INSTRUCTIONS AND INFORMATION

1. Answer ALL the questions.
2. Clearly show ALL calculations that you have used in determining your answers.
3. Answers only will NOT necessarily be awarded full marks.
4. An approved scientific calculator (non-programmable and non-graphical) may be used, unless stated otherwise.
5. If necessary, round off answers to TWO decimal places, unless stated otherwise.
6. Diagrams are NOT necessarily drawn to scale.
7. An information sheet is included on the first page.
8. Write neatly and legibly.

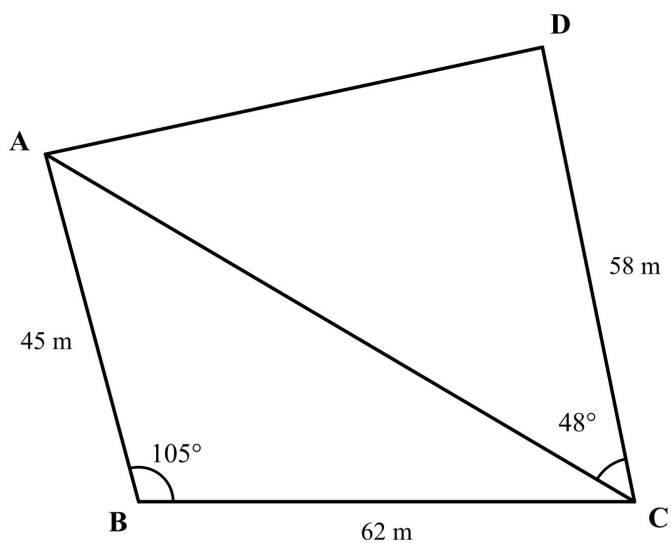
INFORMATION SHEET

In $\triangle ABC$:

$a^2 = b^2 + c^2 - 2bc \cdot \cos \hat{A}$	the cosine rule
$\frac{a}{\sin \hat{A}} = \frac{b}{\sin \hat{B}} = \frac{c}{\sin \hat{C}}$	the sine rule
$\text{area } \triangle ABC = \frac{1}{2} \cdot ab \cdot \sin \hat{C}$	the area rule

QUESTION 1 [13 MARKS]

ABCD is a level field on a smallholding. The diagonal AC is a straight fence dividing the field into two triangular grazing camps. $AB = 45 \text{ m}$, $BC = 62 \text{ m}$, $CD = 58 \text{ m}$, $\hat{A}BC = 105^\circ$ and $\hat{A}CD = 48^\circ$.

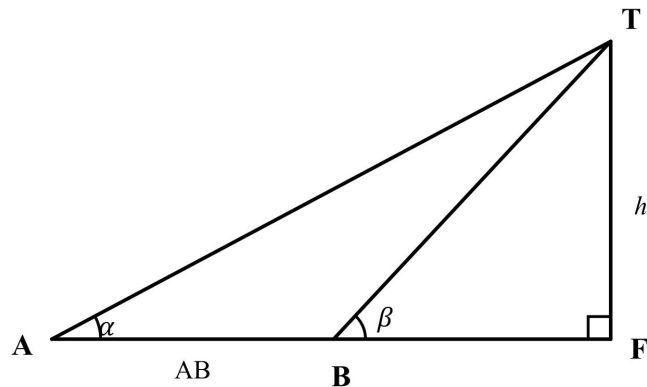


- 1.1 Complete the following statement of the cosine rule: In $\triangle ABC$, $b^2 = \dots$ (2)
- 1.2 Calculate the length of AC. (3)
- 1.3 Calculate the area of $\triangle ABC$. (2)
- 1.4 Calculate the length of AD. (3)
- 1.5 Hence calculate the area of quadrilateral ABCD. (3)

[13]

QUESTION 2 [14 MARKS]

In the diagram below, TF represents a vertical cellphone tower standing on level ground. A, B and F lie on the same horizontal straight line, with B between A and F. The angle of elevation of T from A is α and the angle of elevation of T from B is β . The height of the tower is h .



2.1 Write down the size of $\hat{ATB}$ in terms of α and β . (1)

2.2 Show that: (5)

$$h = \frac{AB \cdot \sin \alpha \cdot \sin \beta}{\sin(\beta - \alpha)}$$

2.3 Calculate the height of the tower, h , if $AB = 60$ m, $\alpha = 28^\circ$ and $\beta = 47^\circ$. (3)

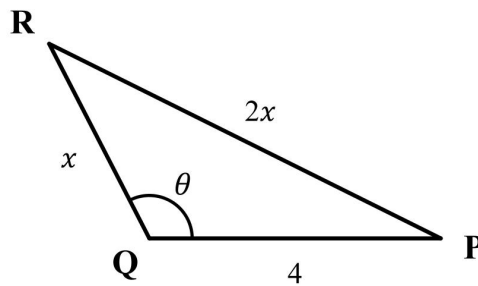
2.4 Calculate the length of BT. (2)

2.5 Calculate the area of $\triangle ABT$. (3)

[14]

QUESTION 3 [12 MARKS]

In $\triangle PQR$, $PQ = 4$ units, $QR = x$ units, $PR = 2x$ units and $\hat{PQR} = \theta$.



3.1 Show that: (4)

$$\cos \theta = \frac{16 - 3x^2}{8x}$$

3.2 If $x = 3$, calculate the size of θ , correct to TWO decimal places. (2)

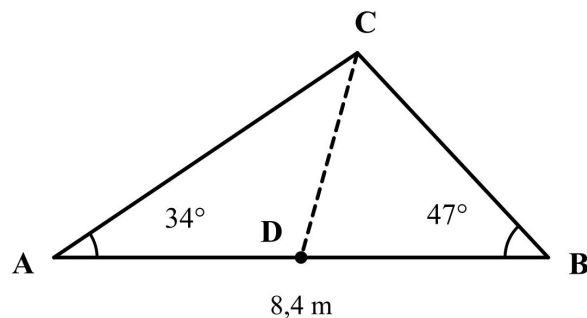
3.3 Hence calculate the area of $\triangle PQR$. (3)

3.4 Determine the values of x for which the triangle exists. (3)

[12]

QUESTION 4 [11 MARKS]

The diagram below shows the wooden frame of a roof truss. AB is horizontal and $AB = 8,4$ m. The rafters AC and CB make angles of 34° and 47° with AB respectively.



4.1 Write down the size of $\hat{ACB}$. (1)

4.2 Calculate the length of AC . (3)

4.3 Calculate the perpendicular height of C above AB . (2)

4.4 Calculate the area of $\triangle ABC$. (2)

4.5 D is the midpoint of AB . Calculate the length of CD . (3)

[11]

TOTAL: 50 MARKS