Essential GCSE Maths 41.8

Find the following angles of elevation and depression.

In this exercise give your answers to 3 s.f. when rounding is required.

Part A Find θ

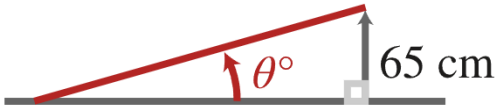

Figure 1: One end of the rod is elevated by 65cm.

A surveyor raises the end of a $2\,\mathrm{m}$ pole upwards by $65\,\mathrm{cm}$.

Part B Find ω

Figure 2: One end of the rod is lowered by $40\,\mathrm{cm}$.

A high-jump official lowers one end of a $3.5\,\mathrm{m}$ pole by $40\,\mathrm{cm}$.

Essential GCSE Maths 41.9

The diagram shows a ship near the coast. The ship is at point A, $200\,\mathrm{m}$ from a buoy at B. On the cliff top there is a lighthouse. The tip of the lighthouse (point C) is $y\,\mathrm{m}$ above the level of the sea at D.

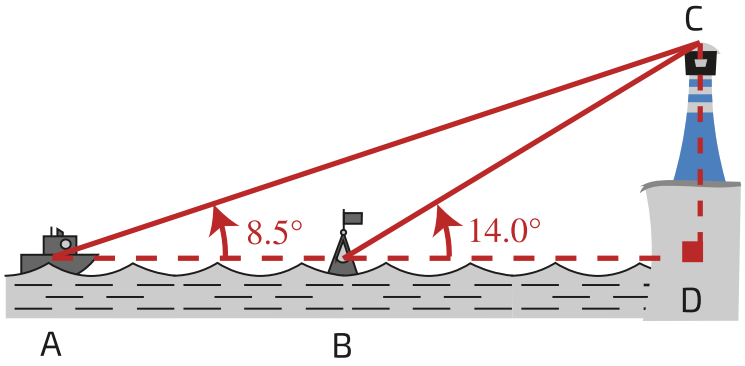

Figure 1: A diagram of the lighthouse, the ship and the buoy.

The angle of elevation of the top of the lighthouse is $8.5°$ at A and $14.0°$ at B.

What is the value of y?

Sine and Cosine Rules and Area 1i

A Level

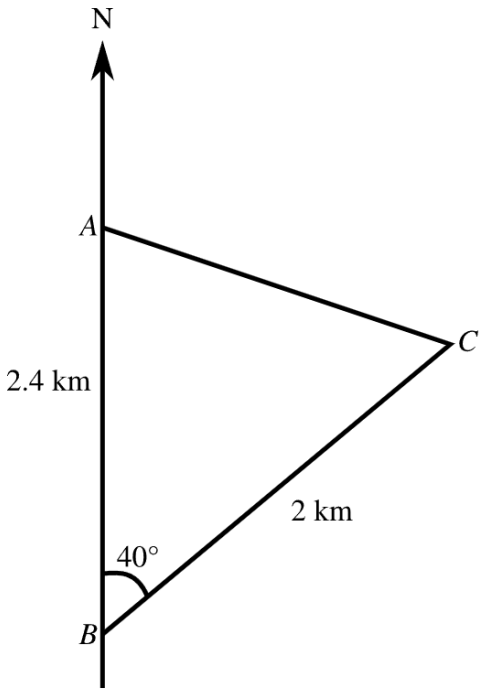

Figure 1: Positions of two points on a coastline, and a nearby ship.

Figure 1 shows two points A and B on a straight coastline, with A being $2.4\,\mathrm{km}$ due north of B. A stationary ship is at a point C, on a bearing of $040\,^\circ$ and at a distance of $2\,\mathrm{km}$ from B.

Part A **Find AC**

Find the distance AC in kilometres, giving your answer correct to three significant figures.

Part B **Find θ**

The bearing of C from A is $\theta\,^\circ$. Find the value of θ correct to three significant figures.

Part C **Shortest distance**

Find the shortest distance from the ship to the coastline, giving your answer in kilometres correct to three significant figures.

Used with permission from UCLES, A level, January 2012, Paper 4722, Question 4.

Trigonometry: Basic Functions 1ii

A Level

Part A $\sin(\frac{1}{2}x) = 0.8$

Solve $\sin(\frac{1}{2}x) = 0.8$, for $0^\circ \leqslant x \leqslant 360^\circ$.

What is the lowest (smallest) solution? Give your answer in degrees, to 3 significant figures.

What is the highest (largest) solution? Give your answer in degrees, to 3 significant figures.

Part B $\sin(x) = 3\cos(x)$

Solve $\sin(x) = 3\cos(x)$, for $0^\circ \leqslant x \leqslant 360^\circ$.

What is the lowest (smallest) solution? Give your answer in degrees, to 3 significant figures.

What is the highest (largest) solution? Give your answer in degrees, to 3 significant figures.

Essential GCSE Maths 50.7

A garden designer is planning to build a semi-circular patio on one side of a triangular lawn.

The plans are shown in the diagram.

In this exercise give your answers to 3 s.f..

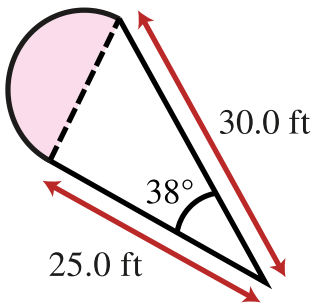

Figure 1: A plan of the garden with a triangular lawn and a semi-circular patio.

Part A What will the area of the lawn be?

What will the area of the lawn be?

Part B What will the area of the patio be?

What will the area of the patio be?

Trigonometry: Basic Functions 2ii

A Level

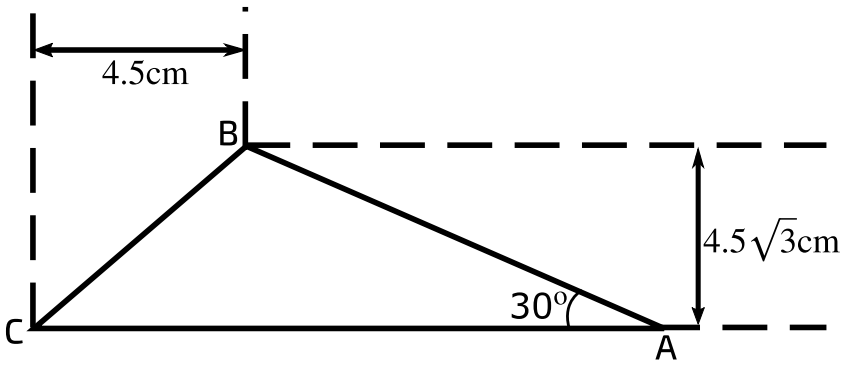

Figure 1: Triangle ABC

Part A

For triangle ABC calculate the exact length of AB in cm.

Part B

For triangle ABC calculate the exact length of AC.

Part C

Given that α is the acute angle such that $\tan(\alpha) = \frac{2}{3}$, find the exact value of $\sin(\alpha)$, giving your answer in the form $\frac{a\sqrt{b}}{c}$, where a,b and c are integers.

Sine and Cosine Rules and Area 2i

A Level

Figure 1 shows ABCD, a quadrilateral in which AD is parallel to BC. It is given that the distance AB $= 9$, BC $= 6$, CA $= 5$ and CD $= 15$.

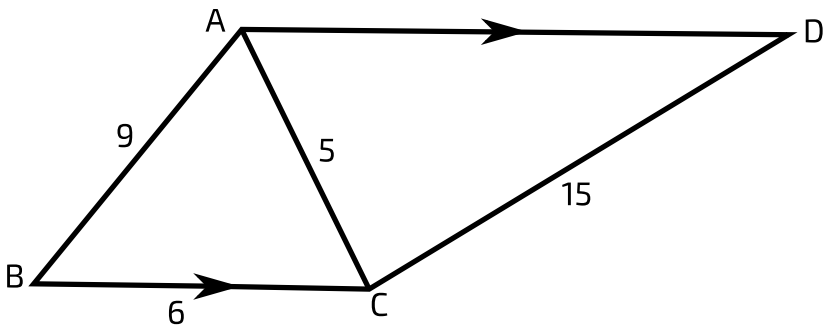

Figure 1: A quadrilateral in which AD is parallel to BC.

Part A Find $\sin$

Show that $\cos(\text{BCA}) = -\frac{1}{3}$, and hence find the value of $\sin(\text{BCA})$, giving your answer to 3 significant figures.

Part B Find angle

Find the angle ADC, giving your answer in degrees to 3 significant figures.

Sine and Cosine Rules and Area 3i

A Level

A landmark L is observed by a surveyor from three points A, B and C on a straight horizontal road, where $AB = BC = 200\,\mathrm{m}$. Angles LAB and LBA are $65\,^\circ$ and $80\,^\circ$ respectively (see **Figure 1**).

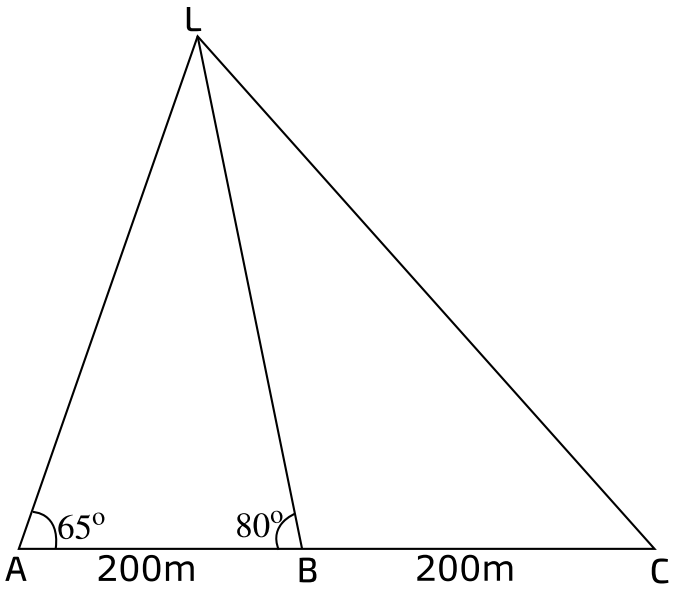

Figure 1: A triangle where $AB = BC$ and B connects to L

Part A Shortest distance

Calculate the shortest distance from L to the road. Give your answer in metres, to the nearest metre.

Part B Distance LC

Calculate the distance LC. Give your answer in metres, to the nearest metre.

Used with permission from UCLES, A Level Maths, January 2005, OCR C2, Question 3

Essential GCSE Maths 50.9

A landowner has a triangular piece of land. They are planning to build a path along the boundary of the land, and plant trees in the centre. Each tree will need $50\,\mathrm{m}^2$ of land when it is mature. The landowner knows that some trees will not survive to maturity. They plant 30% more trees than the maximum suggested by an area calculation.

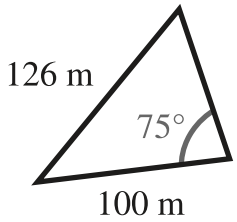

Figure 1: A plan of the piece of land that trees are going to be planted on.

Part A How long is the path?

How long is the path? Give your answers to 3 s.f..

Part B How many trees will be planted

Assuming that the landowner plants as many trees as possible, how many trees will be planted? Round up to the nearest whole tree.

Trigonometry: Basic Functions 3i

A Level

Part A sin and cos graphs

On the same set of axes sketch the graphs of $y = \sin x$ and $y = \cos x$ for values of x such that $0° \leq x \leq 360°$.

Easier question?

Part B Trigonometric values

Work out from first principles the exact values of $\sin 60°$ and $\cos 120°$. Let these values be s_1 and c_1.

Give the exact value of $\sin 60°$.

Give the exact value of $\cos 120°$.

Part C sin and cos graphs 2

Add to your sketch two lines of the form $y = k$ to illustrate the graphical method for solving equations $\sin x = s_1$ and $\cos x = c_1$.

Easier question?

Part D Solve angles

Give any of the solutions to the equation $\sin x = s_1$ for values of x such that $0^\circ \leq x \leq 720^\circ$. Give your answer in degrees.

Give any of the solutions to the equation $\cos x = c_1$ for values of x such that $0^\circ \leq x \leq 720^\circ$.

Part E Smallest x value

What is the smallest positive value of x for which $\sin x = \cos x$? Give your answer in degrees.

Part F Number of solutions

How many solutions exist for the equation $\sin x = \cos x$ for values of x such that $-360^\circ \leq x \leq 360^\circ$?