



Physics. You work it out.

[Home](#)[Gameboard](#)[Maths](#)[Geometry](#)[Trigonometry](#)[Essential GCSE Maths 50.9](#)

## Essential GCSE Maths 50.9

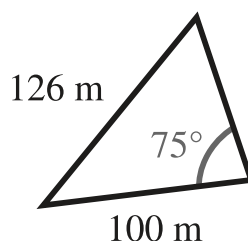
GCSE



A Level



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  $50 \text{ m}^2$  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 answer 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 your answer to the nearest whole tree.

---

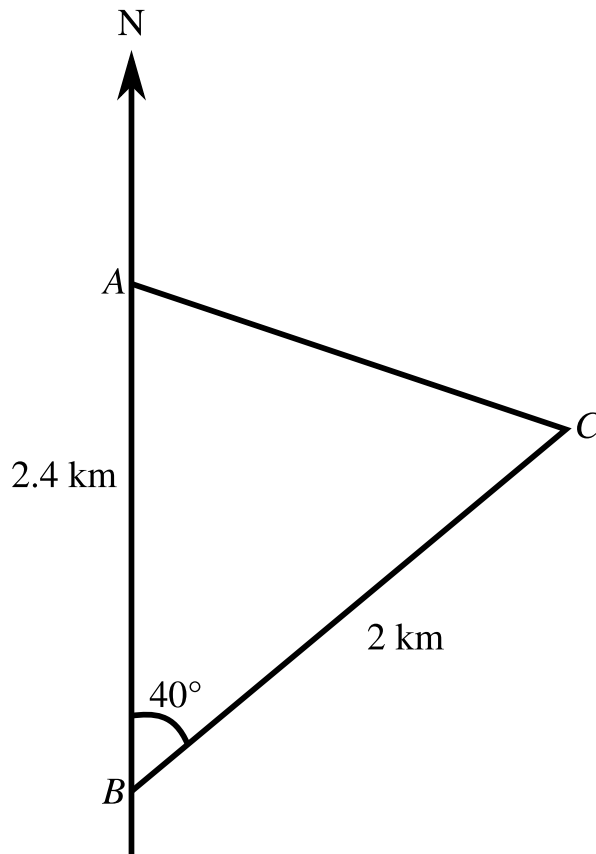
All materials on this site are licensed under the [Creative Commons license](#), unless stated otherwise.



Physics. You work it out.

[Home](#) [Gameboard](#) [Maths](#) [Sine and Cosine Rules and Area 1i](#)

## Sine and Cosine Rules and Area 1i

A Level  
P P P

**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 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 km from  $B$ .

### Part A Find $AC$

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

**Part B Find  $\theta$** 

The bearing of  $C$  from  $A$  is  $\theta^\circ$ . Find the value of  $\theta$  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.

Gameboard:

**STEM SMART Double Maths 3 - Trigonometry**

All materials on this site are licensed under the **Creative Commons license**, unless stated otherwise.



Physics. You work it out.

[Home](#)[Gameboard](#)[Maths](#)[Trigonometry: Basic Functions 2i](#)

# Trigonometry: Basic Functions 2i

A Level



## Part A Trigonometric functions 1

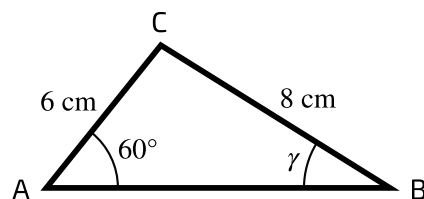
Given that  $\alpha$  is the acute angle such that  $\tan \alpha = \frac{2}{5}$ , find the exact value of  $\cos \alpha$ .

- ☐  $\frac{5\sqrt{29}}{29}$
- ☐  $\frac{5}{29}$
- ☐  $\frac{5\sqrt{2}}{8}$
- ☐  $\frac{\sqrt{2}}{2}$

## Part B Trigonometric functions 2

Given that  $\beta$  is the obtuse angle such that  $\sin \beta = \frac{3}{7}$ , find the exact value of  $\cos \beta$ .

- ☐  $\frac{2\sqrt{10}}{5}$
- ☐  $-\frac{2\sqrt{10}}{3}$
- ☐  $-3\sqrt{10}$
- ☐  $-\frac{\sqrt{40}}{7}$

**Part C** A triangle**Figure 1:** Triangle ABC.

**Figure 1** shows a triangle ABC with  $AC = 6$  cm,  $BC = 8$  cm, angle  $BAC = 60^\circ$  and angle  $ABC = \gamma$ .

Find the exact value of  $\sin \gamma$ , simplifying your answer.

- ☐  $2\sqrt{3}$
- ☐  $\frac{3\sqrt{3}}{8}$
- ☐  $\frac{2\sqrt{5}}{3}$
- ☐  $\frac{3}{\sqrt{5}}$

Used with permission from UCLES, A Level Maths, June 2012, OCR C2, Question 7

Gameboard:

**STEM SMART Double Maths 3 - Trigonometry**

All materials on this site are licensed under the **Creative Commons license**, unless stated otherwise.



Physics. You work it out.

[Home](#) [Gameboard](#) [Maths](#) [Trigonometry: Basic Functions 1i](#)

# Trigonometry: Basic Functions 1i



## Part A Sketch a trig function

Sketch the graph of  $y = 2 \cos x$  for values of  $x$  such that  $0^\circ \leq x \leq 360^\circ$ , indicating the coordinates of any points where the curve meets the axes. You can check your sketch after giving the correct answer.

Give the value of the smallest root in degrees.

---

## Part B A trig equation

Solve the equation  $2 \cos x = 0.8$ , giving the highest value of  $x$  between  $0^\circ$  and  $360^\circ$  to 3 significant figures.

---

## Part C Equating trig functions

Solve the equation  $2 \cos x = \sin x$ , giving the value of  $x$  between  $-180^\circ$  and  $180^\circ$  that has the largest negative value.

---

Used with permission from UCLES, A Level Maths, January 2007, OCR C2, Question 7

Gameboard:

[STEM SMART Double Maths 3 - Trigonometry.](#)

All materials on this site are licensed under the [Creative Commons license](#), unless stated otherwise.



Physics. You work it out.

[Home](#) [Gameboard](#) [Maths](#) [Trigonometry: Basic Functions 1ii](#)

## Trigonometry: Basic Functions 1ii



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

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

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  $0^\circ \leq x \leq 360^\circ$ .

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.

---

Used with permission from UCLES, A Level Maths, June 2013, OCR C2, Question 2

Gameboard:

**STEM SMART Double Maths 3 - Trigonometry**

All materials on this site are licensed under the **Creative Commons license**, unless stated otherwise.



Physics. *You work it out.*

[Home](#) [Gameboard](#) [Maths](#) [Trigonometry: Identities and Equations 3i](#)

# Trigonometry: Identities and Equations 3i



## Part A Quadratic equation

Write  $15 \cos^2 \theta = 13 + \sin \theta$  as a quadratic equation in  $\sin \theta$ .

The following symbols may be useful:  $\cos()$ ,  $\sin()$ ,  $\tan()$ ,  $\theta$

---

## Part B Solve equation

Solve the equation  $15 \cos^2 \theta = 13 + \sin \theta$  giving the second largest value in the range  $0^\circ \leq \theta \leq 360^\circ$ , in degrees to 4 significant figures.

---

Used with permission from UCLES, A Level Maths, June 2012, OCR C2, Question 4

Gameboard:

**STEM SMART Double Maths 3 - Trigonometry**

All materials on this site are licensed under the **Creative Commons license**, unless stated otherwise.



*Physics. You work it out.*[Home](#) [Gameboard](#) [Maths](#) [Geometry](#) [Trigonometry](#) [Addition of Angles 1](#)

# Addition of Angles 1

Pre-U Maths for Science H4.1



Without using a calculator, find exact expressions for:

**Part A**  $\sin 15^\circ$

$\sin 15^\circ$

**Part B**  $\cos 165^\circ$

$\cos 165^\circ$

Created for isaacphysics.org by Julia Riley.

Gameboard:

**STEM SMART Double Maths 3 - Trigonometry**

All materials on this site are licensed under the **Creative Commons license**, unless stated otherwise.



Physics. You work it out.

[Home](#)[Gameboard](#)[Maths](#)[Trigonometry: Double Angles 1i](#)

# Trigonometry: Double Angles 1i

A Level



It is given that  $f(\theta) = \sin(\theta + 30^\circ) + \cos(\theta + 60^\circ)$ .

## Part A Double Angles

Show that  $f(\theta) = \cos \theta$ . Hence find an expression for  $f(4\theta) + 4f(2\theta)$ , in terms of  $\cos \theta$ .

The following symbols may be useful: theta

## Part B $\frac{1}{f(4\theta) + 4f(2\theta) + 7}$

Hence determine the greatest and least values of  $\frac{1}{f(4\theta) + 4f(2\theta) + 7}$  as  $\theta$  varies.

Give the greatest value.

Give the smallest value.

**Part C   Solve**

Solve the equation

$$\sin(12\alpha + 30^\circ) + \cos(12\alpha + 60^\circ) + 4\sin(6\alpha + 30^\circ) + 4\cos(6\alpha + 60^\circ) = 1$$

for  $0^\circ < \alpha < 60^\circ$ , in degrees, to three significant figures.

Give the smallest solution.

---

Give the largest solution.

---

Used with permission from UCLES A-level Maths papers, 2003-2017.

Gameboard:

**STEM SMART Double Maths 3 - Trigonometry**

All materials on this site are licensed under the **Creative Commons license**, unless stated otherwise.



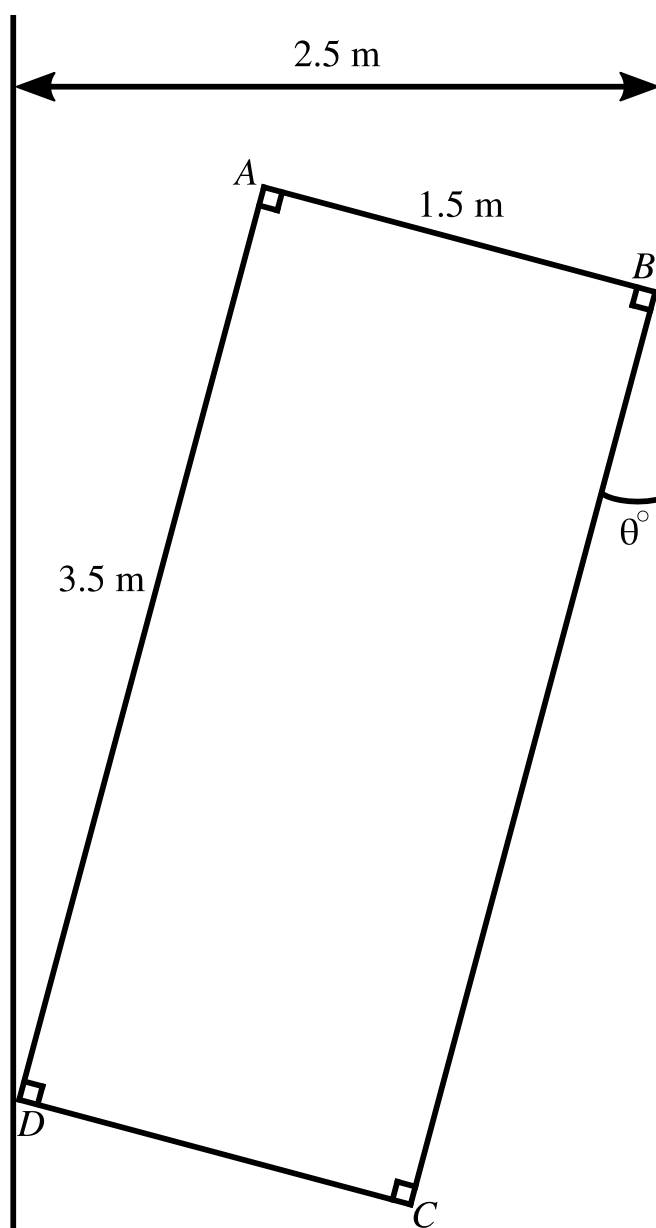
Physics. You work it out.

[Home](#) [Gameboard](#) [Maths](#) [Trigonometry: Combined Angles 3i](#)

## Trigonometry: Combined Angles 3i

A Level  
P P P

In **Figure 1**,  $ABCD$  represents a rectangular table with sides 3.5 m and 1.5 m. It has been turned so it wedges in a passage of width 2.5 m.



**Figure 1:** The rectangular table  $ABCD$ .

**Part A** Value of  $7 \sin \theta^\circ + 3 \cos \theta^\circ$ 

Given that  $\theta$  is the acute angle between the longer side and the passage, as shown in the diagram, find the exact value of  $7 \sin \theta + 3 \cos \theta$ .

The following symbols may be useful:  $\cos()$ ,  $\sin()$ ,  $\tan()$ ,  $\theta$

---

**Part B** The form  $R \sin (\theta^\circ + \alpha^\circ)$ 

Express  $7 \sin \theta + 3 \cos \theta$  in the form  $R \sin (\theta + \alpha)$ , where  $R > 0$  and  $0^\circ < \alpha < 90^\circ$ .

Give the exact value of  $R$ .

The following symbols may be useful:  $R$

---

Give the value of  $\alpha$  to 3 significant figures.

---

**Part C** Find  $\theta$ 

Find  $\theta$ , to 3 significant figures.

---

Used with permission from UCLES A-level Maths papers, 2003-2017.

Gameboard:

**STEM SMART Double Maths 3 - Trigonometry**

All materials on this site are licensed under the **Creative Commons license**, unless stated otherwise.

Physics. *You work it out.*[Home](#) [Gameboard](#) [Maths](#) [Geometry](#) [Trigonometry](#) [Addition of Angles 7](#)

# Addition of Angles 7

Pre-Uni Maths for Science H4.10

A Level Further A



Two waves

$$\psi_1 = A \cos \left( 2\pi ft - \left( \frac{2\pi}{\lambda} \right) x + \phi \right)$$

and

$$\psi_2 = A \cos \left( 2\pi ft - \left( \frac{2\pi}{\lambda} \right) x - \phi \right)$$

interfere, such that the resultant wave is given by  $\psi = \psi_1 + \psi_2$ . Express  $\psi$  as the product of two terms.

Express  $\psi$  as the product of two terms.

The following symbols may be useful: A, f, lambda, phi, pi, t, x

Created for isaacphysics.org by Julia Riley.

All materials on this site are licensed under the **Creative Commons license**, unless stated otherwise.