

Exact Trig Values

Solutions

For AQA GCSE Mathematics (8300) • Foundation tier

Each question is shown in grey, followed by the working, one step per line. The final answer is in a box. *Marks* shows how the marks are usually given in the exam, and **Tip** points out a common mistake.

1 (1 mark)

Circle the value of $\sin 30^\circ$

Options: 0, $\frac{1}{2}$, $\frac{\sqrt{3}}{2}$, 1

This is one of the exact values you need to learn.

$$\sin 30^\circ = \frac{1}{2}$$

Answer: $\frac{1}{2}$

2 (1 mark)

Circle the value of $\tan 45^\circ$

Options: 0, $\frac{\sqrt{2}}{2}$, 1, $\sqrt{3}$

A right-angled triangle with a 45° angle is isosceles.

So the opposite and adjacent sides are equal.

$$\tan 45^\circ = \frac{\text{opp}}{\text{adj}} = 1$$

Answer: 1

3 (2 marks)

Write down the value of

(a) $\sin 90^\circ$

$$\sin 90^\circ = 1$$

Answer: 1

(b) $\cos 90^\circ$

$$\cos 90^\circ = 0$$

Answer: 0

Tip: Many students mix these up. sin goes from 0 (at 0°) up to 1 (at 90°); cos goes the other way, from 1 down to 0.

4 (3 marks)

Complete the table of exact values.

A pattern to help you remember the sin row:

$$\frac{\sqrt{0}}{2}, \frac{\sqrt{1}}{2}, \frac{\sqrt{2}}{2}, \frac{\sqrt{3}}{2}, \frac{\sqrt{4}}{2}$$

These simplify to 0, $\frac{1}{2}$, $\frac{\sqrt{2}}{2}$, $\frac{\sqrt{3}}{2}$, 1

The cos row is the same values in reverse order.

$\tan = \sin \div \cos$, which gives 0, $\frac{1}{\sqrt{3}}$, 1, $\sqrt{3}$

($\frac{1}{\sqrt{3}}$ can also be written as $\frac{\sqrt{3}}{3}$.) Here is the completed table:

	0°	30°	45°	60°	90°
sin	0	$\frac{1}{2}$	$\frac{\sqrt{2}}{2}$	$\frac{\sqrt{3}}{2}$	1
cos	1	$\frac{\sqrt{3}}{2}$	$\frac{\sqrt{2}}{2}$	$\frac{1}{2}$	0
tan	0	$\frac{1}{\sqrt{3}}$	1	$\sqrt{3}$	undefined

Answer: See the completed table above

Marks: 3 marks for all 9 correct. 2 marks for 6 to 8 correct. 1 mark for 3 to 5 correct.

5 (2 marks)

Work out the value of $\sin 30^\circ + \cos 60^\circ$

$$\sin 30^\circ = \frac{1}{2}$$

$$\cos 60^\circ = \frac{1}{2}$$

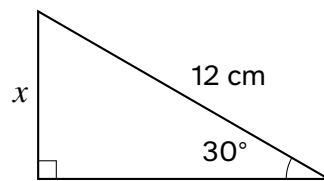
$$\frac{1}{2} + \frac{1}{2} = 1$$

Answer: 1

Marks: 1 mark for both values. 1 mark for 1.

6 (2 marks)

Here is a right-angled triangle.



Not drawn accurately

Work out the length x .

From the 30° angle: x is the opposite and 12 cm is the hypotenuse.

$$\text{SOH: } \sin 30^\circ = \frac{x}{12}$$

$$x = 12 \times \sin 30^\circ$$

$$\sin 30^\circ = \frac{1}{2}, \text{ so } x = 12 \times \frac{1}{2} = 6$$

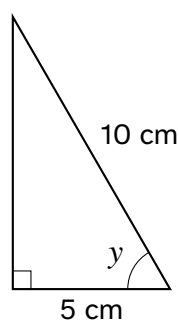
Answer: 6 cm

Tip: Don't stop at $12 \sin 30^\circ$. Use $\sin 30^\circ = \frac{1}{2}$ to finish without a calculator.

Marks: 1 mark for $12 \sin 30$. 1 mark for 6.

7 (2 marks)

Here is a right-angled triangle.



Not drawn accurately

Work out the size of angle y .

From the angle y : 5 cm is the adjacent and 10 cm is the hypotenuse.

$$\text{CAH: } \cos y = \frac{5}{10} = \frac{1}{2}$$

Which angle has $\cos = \frac{1}{2}$? From the table, $\cos 60^\circ = \frac{1}{2}$.

So $y = 60^\circ$

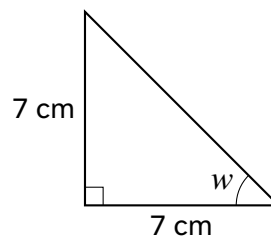
Answer: 60°

Tip: Use the exact values backwards: $\cos y = \frac{1}{2}$ means $y = 60^\circ$, not 30° .

Marks: 1 mark for $\cos y = \frac{5}{10}$. 1 mark for 60.

8 (2 marks)

Here is a right-angled triangle.



Not drawn accurately

Work out the size of angle w .

From the angle w : both the opposite and the adjacent are 7 cm.

$$\text{TOA: } \tan w = \frac{7}{7} = 1$$

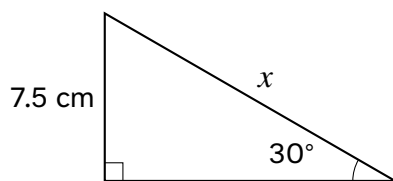
$\tan 45^\circ = 1$, so $w = 45^\circ$

Answer: 45°

Marks: 1 mark for $\tan w = 1$. 1 mark for 45.

9 (3 marks)

Here is a right-angled triangle.



Not drawn accurately

Work out the length of the hypotenuse, x .

From the 30° angle: 7.5 cm is the opposite and x is the hypotenuse.

$$\text{SOH: } \sin 30^\circ = \frac{7.5}{x}$$

$$\sin 30^\circ = \frac{1}{2}, \text{ so } \frac{1}{2} = \frac{7.5}{x}$$

So 7.5 is half of x .

$$x = 7.5 \times 2 = 15$$

Answer: 15 cm

Tip: The hypotenuse is the longest side, so your answer must be more than 7.5 cm. Multiplying $7.5 \times \frac{1}{2}$ is a common mistake.

Marks: 1 mark for $\sin 30 = \frac{7.5}{x}$. 1 mark for using $\sin 30 = \frac{1}{2}$. 1 mark for 15.

10 (2 marks)

Show that $10 \sin 30^\circ - 3 \tan 45^\circ = 2 \cos 0^\circ$

$$\sin 30^\circ = \frac{1}{2}, \tan 45^\circ = 1 \text{ and } \cos 0^\circ = 1$$

$$\text{Left-hand side: } 10 \times \frac{1}{2} - 3 \times 1 = 5 - 3 = 2$$

$$\text{Right-hand side: } 2 \times 1 = 2$$

Both sides equal 2, so $10 \sin 30^\circ - 3 \tan 45^\circ = 2 \cos 0^\circ$

Answer: Both sides equal 2

Tip: $\cos 0^\circ$ is 1, not 0. It is $\sin 0^\circ$ that equals 0.

Marks: 1 mark for all three values. 1 mark for showing both sides equal 2.

11 (3 marks)

A rectangle has length $18 \sin 30^\circ$ cm and width $6 \tan 45^\circ$ cm.

Work out the area of the rectangle.

$\sin 30^\circ = \frac{1}{2}$, so the length is $18 \times \frac{1}{2} = 9$ cm

$\tan 45^\circ = 1$, so the width is $6 \times 1 = 6$ cm

Area = length $\times$ width

$= 9 \times 6 = 54$

Answer: 54 cm^2

Tip: $18 \sin 30^\circ$ means $18 \times \sin 30^\circ$. Work out each length on its own line first, then multiply.

Marks: 1 mark for a length of 9. 1 mark for a width of 6. 1 mark for 54.
