

# E6.4 Trigonometric functions

Name: \_\_\_\_\_ Class: \_\_\_\_\_ Date: \_\_\_\_\_

Total: 12 marks

## Objective

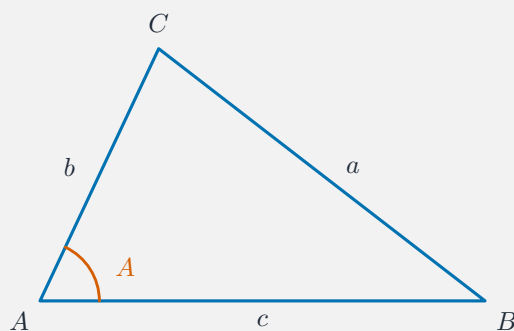
Build the skills to answer Extended exam questions on **trigonometric functions** 三角函数—**exact values** 精确值, solving **trigonometric equations** 三角方程, and the **sine and cosine rules** 正弦和余弦定理.

You must be able to:

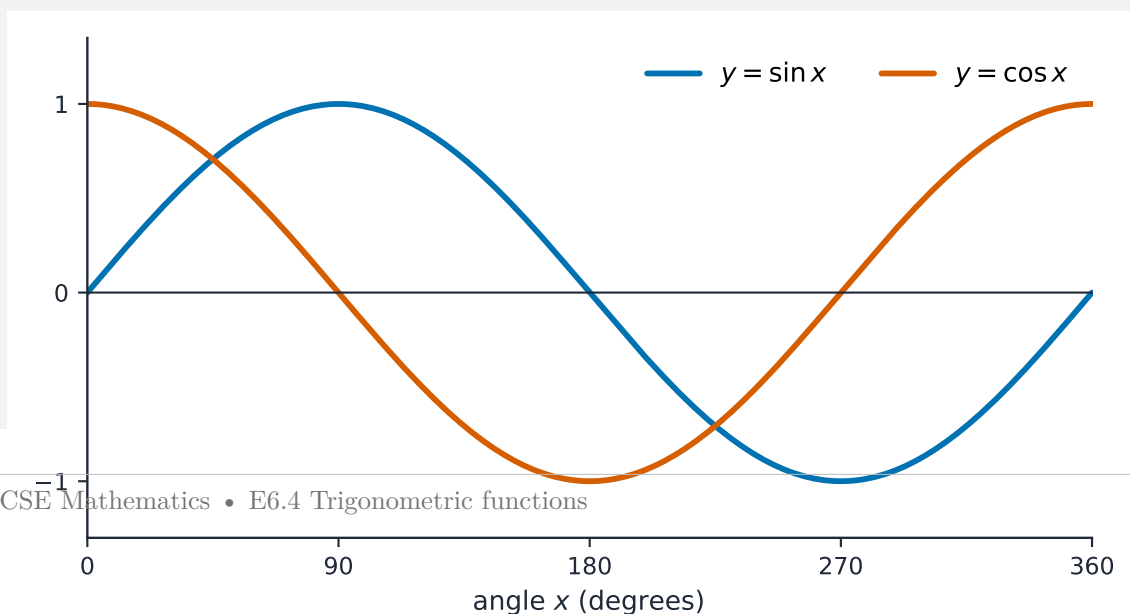
- recall exact values of  $\sin$ ,  $\cos$ ,  $\tan$  for  $0-90^\circ$
- use the cosine rule and the sine rule in any triangle
- find the area of a triangle with  $\frac{1}{2}ab \sin C$

## 1 Worked examples

### ■ The sine and cosine rules



*For any triangle, not just right-angled ones*



$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C} \quad a^2 = b^2 + c^2 - 2bc \cos A \quad \text{area} = \frac{1}{2}ab \sin C$$

- **Cosine rule (two sides + included angle):**  $b = 7$ ,  $c = 8$ ,  $A = 40^\circ \rightarrow a^2 = 49 + 64 - 112 \cos 40^\circ = 27.2 \rightarrow a = 5.2$  cm.
- **Exact:**  $\sin 60^\circ = \frac{\sqrt{3}}{2}$ ; solve  $\sin x = \frac{\sqrt{3}}{2}$  ( $0-360^\circ$ )  $\rightarrow x = 60^\circ$  or  $120^\circ$ .

**Answer shapes:** **M1** a correct method, **A1** the correct answer.

## 2 Practice

**2.1** Write down the exact value of  $\cos 30^\circ$ . [1]

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**2.2** Solve  $\sin x = \frac{1}{2}$  for  $0^\circ \leq x \leq 360^\circ$ . [2]

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**2.3** Find the area of a triangle with sides  $a = 6$  cm,  $b = 9$  cm and included angle  $C = 50^\circ$ . [2]

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## 3 Exam-style questions

**3.1** A triangle has  $b = 5$  cm,  $c = 7$  cm and the angle between them  $A = 60^\circ$ . Find side  $a$ . [3]

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**3.2** In a triangle,  $a = 8$  cm, angle  $A = 40^\circ$  and angle  $B = 75^\circ$ . Use the sine rule to find side  $b$ . [3]

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## 4 Go further

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You are now ready for the real exam questions on this subtopic. Open the **E6.4 Trigonometric functions** past-paper sheet in the Library, or try these in **Practice mode**:

- 0580/22 N25 —Q19 (trigonometry)
- 0580/41 N25 —Q29 (sine / cosine rule)

## Solutions

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Marking: **M1** a correct method, **A1** the correct answer.

**2.1**  $\cos 30^\circ = \frac{\sqrt{3}}{2}$ .

**2.2**  $x = 30^\circ$  or  $x = 180 - 30 = 150^\circ$ .

**2.3**  $\text{area} = \frac{1}{2}(6)(9) \sin 50^\circ = 27 \times 0.766 = 20.7 \text{ cm}^2$ .

**3.1**  $a^2 = 5^2 + 7^2 - 2(5)(7) \cos 60^\circ = 25 + 49 - 70(0.5) = 39$ ;  $a = \sqrt{39} = 6.24 \text{ cm}$ .

**3.2**  $\frac{b}{\sin 75^\circ} = \frac{8}{\sin 40^\circ} \rightarrow b = \frac{8 \sin 75^\circ}{\sin 40^\circ} = \frac{8 \times 0.966}{0.643} = 12.0 \text{ cm}$ .