

E6.4 Trigonometric functions

Name: _____ Class: _____ Date: _____ **Total: 24 marks**

KEY WORDS exact values 精确值 • sine and cosine rules 正弦和余弦定理
• trigonometric equation 三角方程 • trigonometric functions 三角函数 • sine 正弦

Objective

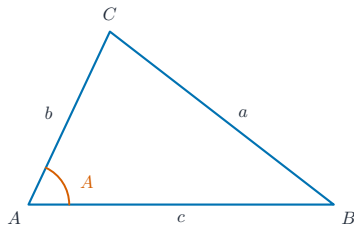
Build the skills to answer Extended exam questions on **trigonometric functions** 三角函数 — **exact values** 精确值, solving **trigonometric equations** 三角方程, and the **sine and cosine rules** 正弦和余弦定理.

You must be able to:

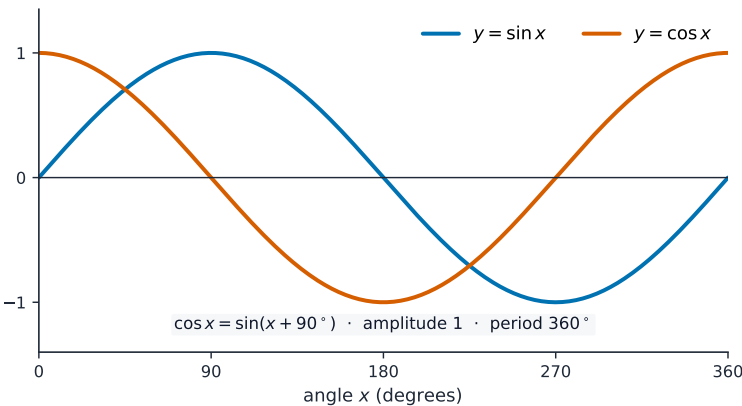
- recall exact values of sin, cos, tan for 0–90°
- use the cosine rule and the sine rule in any triangle
- find the area of a triangle with $\frac{1}{2}ab \sin C$

1 Worked examples

■ The sine and cosine rules



For any triangle, not just right-angled ones



The sine and cosine function graphs

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

- **Cosine rule (two sides + included angle):** $b = 7, c = 8, A = 40^\circ \rightarrow a^2 = 49 + 64 - 112 \cos 40^\circ = 27.2 \rightarrow a = 5.2 \text{ cm}.$
- **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]

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

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

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]

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]

3.3 (a) Write down the exact values of $\sin 30^\circ$, $\cos 45^\circ$ and $\tan 60^\circ$. [3]

(b) Solve $2 \sin x = 1$ for $0^\circ \leq x \leq 360^\circ$. [3]

(c) Solve $\cos x = -0.5$ for $0^\circ \leq x \leq 360^\circ$. [3]

(d) Sketch $y = \sin x$ for $0^\circ \leq x \leq 360^\circ$, mark its maximum and minimum, and use the sketch to explain why $\sin x = 1.4$ has no solution. [4]