The Panda Math Tutor

www.thepandamathtutor.com

The Sine & Cosine Rules

IGCSE Mathematics

The Panda Math Tutor

Prepared by

Nikolas Agisilaou

Contents

1 Introduction **2**

2 Labelling Non-Right-Angled Triangles **2**

3 The Sine Rule **3**
3.1 Finding a Missing Side Using the Sine Rule 4
3.2 Finding a Missing Angle Using the Sine Rule 6
3.3 The Ambiguous Case (SSA) 7

4 The Cosine Rule **9**
4.1 Finding a Missing Side Using the Cosine Rule 10
4.2 Finding a Missing Angle Using the Cosine Rule 12

5 Area of a Triangle Using the Sine Formula **13**

6 Choosing the Right Rule **16**

7 Multi-Step Problems **17**

8 Summary **19**

9 Additional Resources **21**
9.1 Tips for Success in IGCSE Exams 21
9.2 Common Exam Question Types 21

The Panda Math Tutor

1 Introduction

Note

In the previous chapter on Trigonometry, we worked exclusively with **right-angled triangles** using SOH CAH TOA. However, in many real-world problems, triangles do **not** contain a right angle. To solve these **non-right-angled triangles**, we need two powerful new tools:

- The **Sine Rule** — used when we know a side and its opposite angle.
- The **Cosine Rule** — used when we know two sides and the included angle, or all three sides.
- The **Area Formula using Sine** — used when we know two sides and the included angle.

In this chapter, we will explore:

- Standard labelling notation for non-right-angled triangles
- The Sine Rule and when to apply it
- The ambiguous case of the Sine Rule
- The Cosine Rule and when to apply it
- The area of a triangle using $\frac{1}{2}ab\sin C$
- Choosing the correct rule for a given problem
- Multi-step problems combining the Sine and Cosine Rules

The Panda Math Tutor

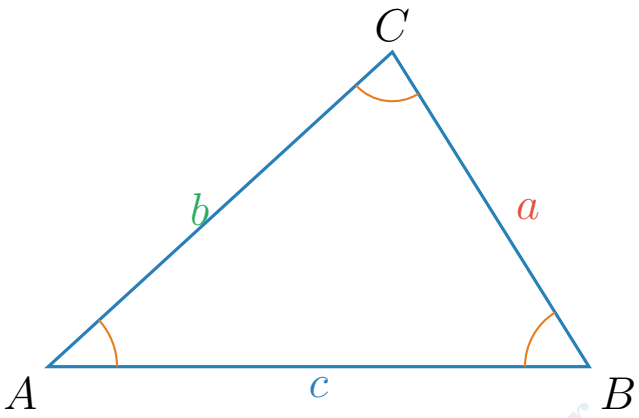
2 Labelling Non-Right-Angled Triangles

Definition

For any triangle, we use the following **standard convention**:

- **Angles** are labelled with capital letters: A, B, C.
- **Sides** are labelled with the corresponding lowercase letter of the **opposite** angle:
  - Side a is opposite angle A

– Side b is opposite angle B
– Side c is opposite angle C



Note

This notation is **universal** and used throughout the Sine Rule, Cosine Rule, and Area Formula. Always label your triangle before attempting any calculation — it prevents errors and makes the rules straightforward to apply.

The Panda Math Tutor

3 The Sine Rule

The Sine Rule

For any triangle with angles A, B, C and opposite sides a, b, c:

$$\boxed{\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}}$$

Equivalently (useful when finding an angle):

$$\boxed{\frac{\sin A}{a} = \frac{\sin B}{b} = \frac{\sin C}{c}}$$

Use the Sine Rule when you know:

- **AAS** — Two angles and any side, **or**
- **SSA** — Two sides and a non-included angle (the angle opposite one of the known sides).

Preview ends here

19 more pages are in the full pack.

The Sine & Cosine Rules — Main Notes — €9.99

Buy the pack and the complete PDF lands in your inbox.

Personal study use only — please don't resell or share.