

1.5 Choose and apply trigonometric ratios and triangle rules

Name: _____ Class: _____ Date: _____

Total: 24 marks

KEY WORDS sine rule 正弦定理 • cosine rule 余弦定理 • bearing 方位角

Objective

Choose and apply trigonometric ratios and triangle rules. Original GAC004-aligned practice, not an official assessment. Show the method as well as the result. All applied scenarios are invented classroom problems.

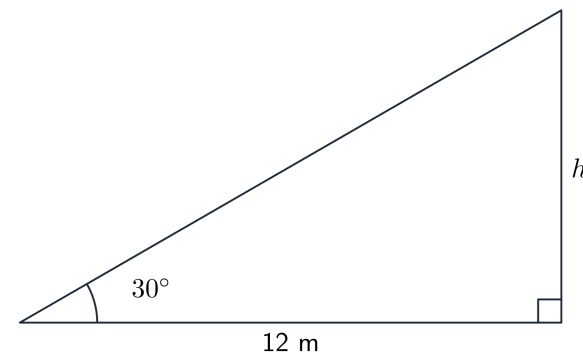
1 Key knowledge and worked examples

■ Key knowledge: the known sides and angles determine which rule to use

In a right triangle, sine is opposite divided by hypotenuse; cosine is adjacent divided by hypotenuse; tangent is opposite divided by adjacent. Opposite and adjacent depend on the chosen angle. Set calculator angle mode to match the data: degrees and radians are different measures, with $180^\circ = \pi$ radians.

The **sine rule** 正弦定理 pairs each side with its opposite angle. Side-side-angle data can produce two possible triangles; do not assume an inverse sine gives every valid answer. The **cosine rule** 余弦定理 works with two sides and their included angle, or three sides. A **bearing** 方位角 is measured clockwise from north and written with three digits in degrees. Angle of elevation is measured upward from a horizontal line.

■ Worked example: height from a horizontal distance and angle



not to scale

Known: horizontal distance $d = 12$ m and elevation $\theta = 30^\circ$. Height h is opposite and d is adjacent, so use tangent in degree mode.

$$\tan \theta = \frac{h}{d}$$

$$h = d \tan \theta = 12 \tan 30^\circ \approx 6.93 \text{ m}$$

This is the height above the observer's horizontal sight level, not automatically the height above the ground.

2 Practice

2.1 A right triangle has opposite side 6 cm and hypotenuse 10 cm for an acute angle theta. Find theta to 1 decimal place. [2]

2.2 Convert 150° to radians, giving an exact answer in terms of pi. [2]

2.3 In triangle ABC, $A = 40^\circ$, $B = 65^\circ$ and side a opposite A is 8 cm. Find side b opposite B to 3 significant figures. [3]

2.4 Two sides of a triangle are 7 and 9 cm with included angle 60° . Find the third side to 3 significant figures. [3]

3 Exam-style questions

3.1 A walker travels 4 km due east, then 3 km due north. (a) Find the straight-line distance from the start. (b) Find the bearing of the finishing point from the start, to the nearest degree. (c) Find the reverse bearing, also to the nearest degree. [6]

[8]