Bearings — Worksheet

Do the warm-up first, then the main question. Show every step of your working, even for the warm-up — the sketch and the working are where most of the marks are, not just the final number. Mark yourself from *02 — Answer Sheet* only after you've attempted the whole sheet.

The one rule + the method

A bearing is only meaningful from the point it's measured at. The bearing of B from A is NOT the bearing of A from B — to go backwards you need the **back bearing**:

$$\text{back bearing} = \text{bearing} + 180^\circ \quad (\text{subtract } 180^\circ \text{ instead if the result would be} \geq 360^\circ)$$

To find the angle at a turning point B (between path $\mathrm{A} \to \mathrm{B}$ and path $\mathrm{B} \to \mathrm{C}$): 1. Find the back bearing of A from B (add/subtract 180° to the bearing of B from A). 2. The angle $\angle \mathrm{ABC}$ is the **delta** (difference) between that back bearing and the bearing of C from B. 3. Now it's just a triangle: **cosine rule** for a missing side, **sine rule** for a missing angle.

Cosine rule: $c^2 = a^2 + b^2 - 2ab\cos C$ Sine rule: $\dfrac{a}{\sin A} = \dfrac{b}{\sin B} = \dfrac{c}{\sin C}$

Warm-up — just the back bearing + delta

W1. A path runs on a bearing of 048° from P to Q. What is the bearing of P from Q?

W2. A path runs on a bearing of 210° from P to Q. What is the bearing of P from Q?

W3. A hiker walks from X to Y on a bearing of 070°, then turns and walks from Y to Z on a bearing of 160°. Find $\angle \mathrm{XYZ}$. *(back-bearing of X from Y, then subtract the new bearing)*

Main Question — the rover (extended response)

An autonomous rover leaves base camp A and drives on a bearing of 065° for 12 km to a relay point B. At B it changes course and drives on a bearing of 152° for 9 km to a sensor drop point C.

(a) Sketch the situation (north line at A, B, and C; mark both bearings). Find the bearing of A from B.

(b) Hence find $\angle \mathrm{ABC}$ — the angle the rover turns through at B — using the delta between the back bearing and the bearing of C from B.

(c) Use the cosine rule to find the direct distance AC, correct to 2 decimal places.

(d) Use the sine rule to find $\angle \mathrm{BAC}$, correct to the nearest degree. Hence state the bearing of C from A.