Question Breakdown - Set 1, Question 5

Uluru is a large rock on flat ground in Central Australia. Three tourists, A, B and C are observing Uluru from the ground. A is due North of Uluru, C is due East of Uluru and B is on the line-of-sight from A to C and between them[1]. The angles of elevation to the summit of Uluru from A, B and C are 26, 28°and 30°respectively.

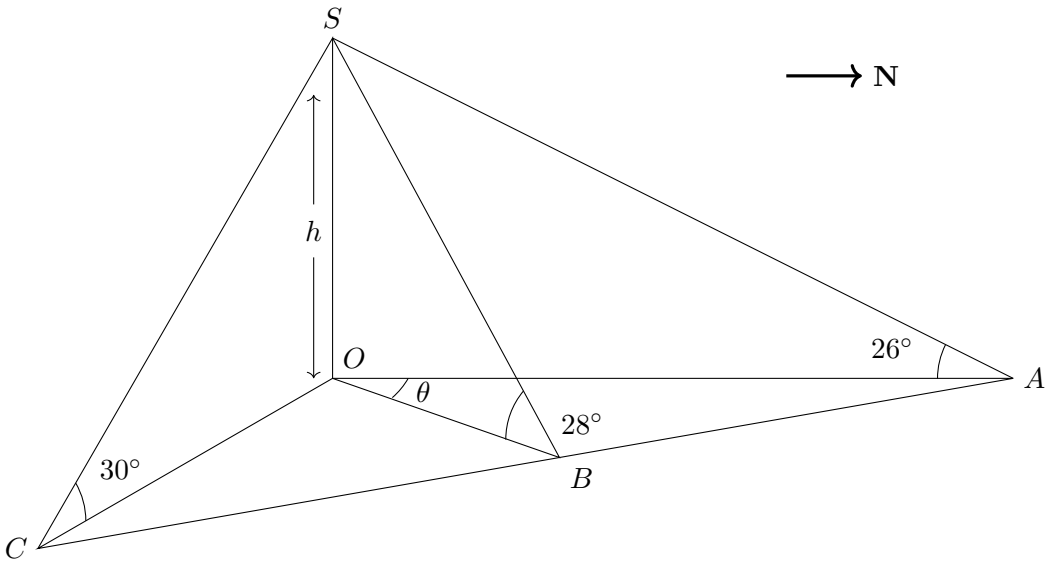
Determine the bearing of B from Uluru.

Solution

This question combines a few major topics of study in trigonometry; in particular, bearings, non-right-angled trigonometry and 3D trigonometry. When addressing especially 3D trigonometry and bearings problems, the best place to start is with a **diagram**. In particular, ensure that your diagram

- is **large** (about half a page is sufficient);
- **contains all the information given** in the question (in this case, the angles at A, B and C);
- **contains what you are required to find** (the bearing of B from Uluru, which will involve the angle between B and North);
- if necessary, **contains other quantities that you define**; and
- has **North labelled clearly** (if the question involves bearings).

Let the point O be the base of Uluru and the point S be the summit. We are given that $\angle SAO$, $\angle SBO$ and $\angle SCO$ are 26°, 28° and 30° respectively. In addition, let $SO = h$, the height of Uluru, and $\angle AOB = \theta$, the angle between the lines from the base of Uluru to A and B respectively.



This diagram is an isometric view of the problem. However, the angle we really want to find here is θ. As this is in $\triangle AOB$, a second diagram, drawn from above, might be more illuminating.

[1] i.e. on the line from A to C.