**2.5 Worksheet: Distance and bearing along a trajectory**

Accessing the Buoy Data:

Open your excel file with buoy data. If you wish, you can download the most recent data (it would have been updated since last lesson) and open this in an excel workbook as you did last lesson.

Identify the latitude and longitude data and identify the time data. Scroll to the end of the data. It might be a long data file. Write down the times and positions for the last day of drift or copy these to a separate excel sheet.

Linear approximation of the buoy trajectory:

Find the **distance** () and **direction** () this buoy has traveled over the last day.

Take the radius of the earth, , to be . Assume the Earth is flat between the position the buoy was at yesterday and today. What is the distance and direction between these two points?

*Finding the distance:*

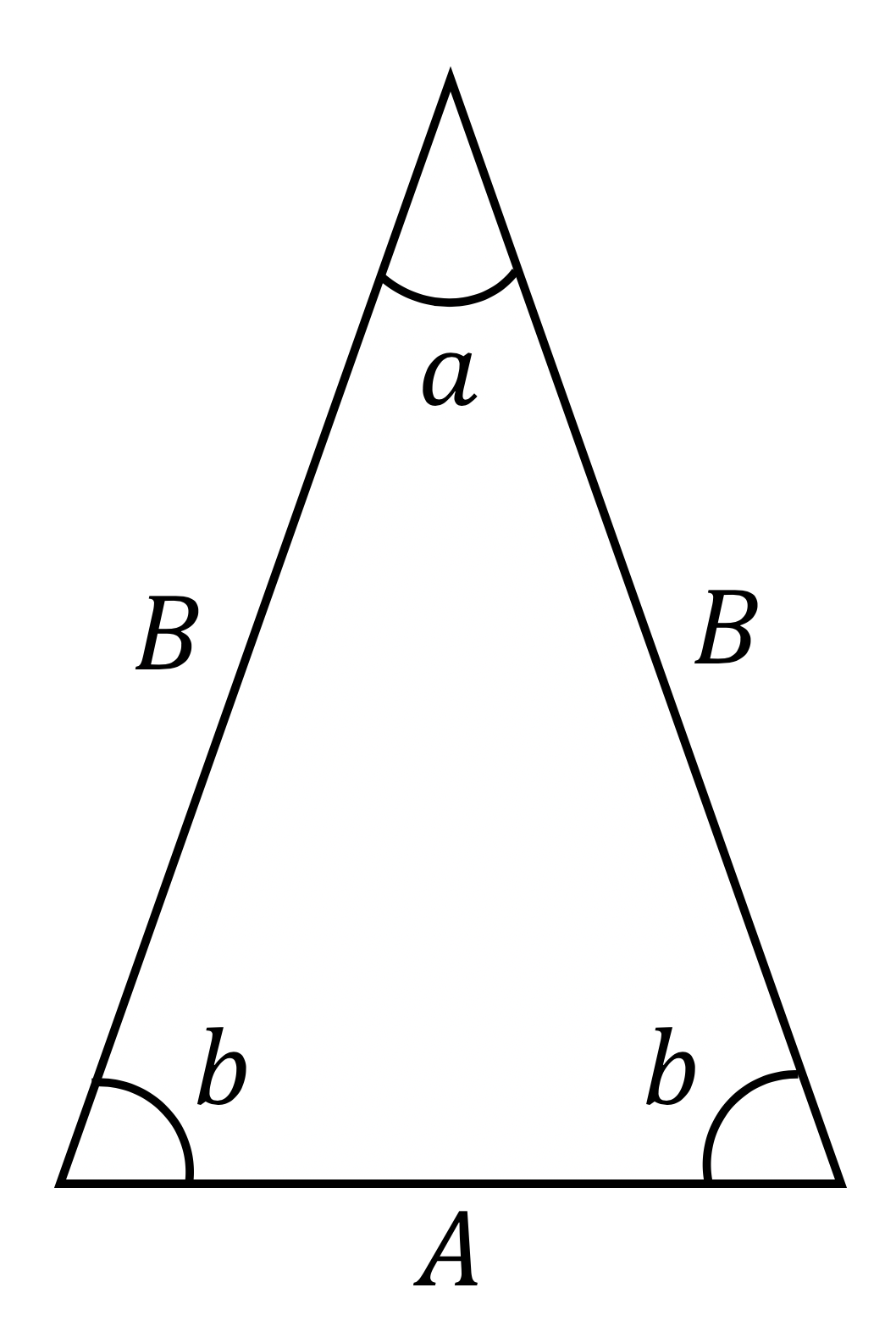
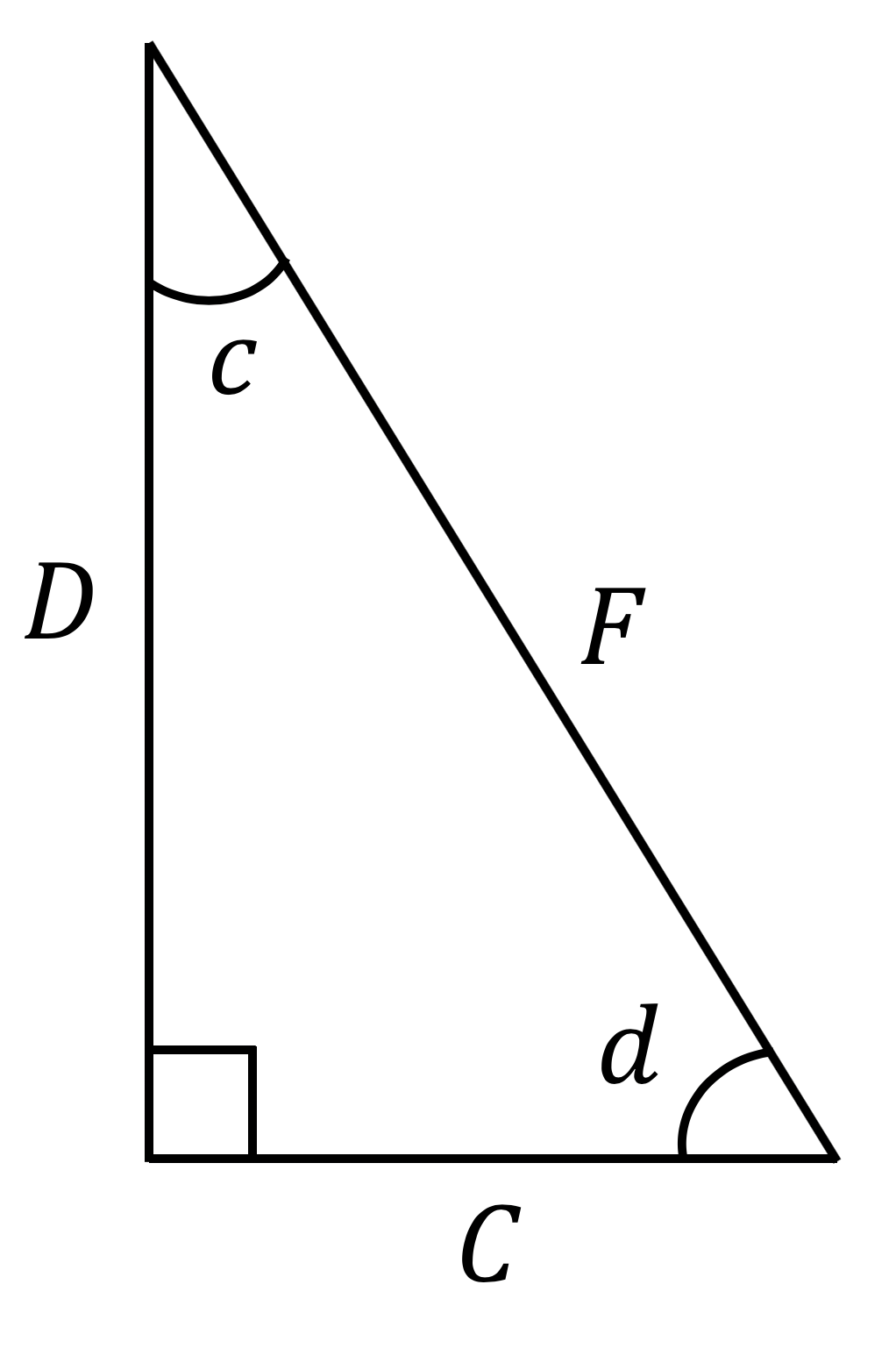
First consider the distance the buoy traveled latitudinally, then the distance it traveled longitudinally. You can find these distances with trigonometry (for example, ).

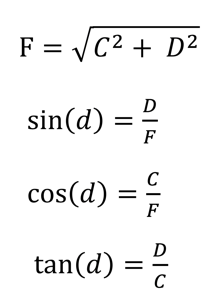
You will need to construct a similar trigonometric identity for the zonal component of the drift. Combine the meridional and zonal distances, and respectively, to find the distance, , between the two points.

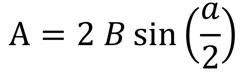
*Finding the direction:*

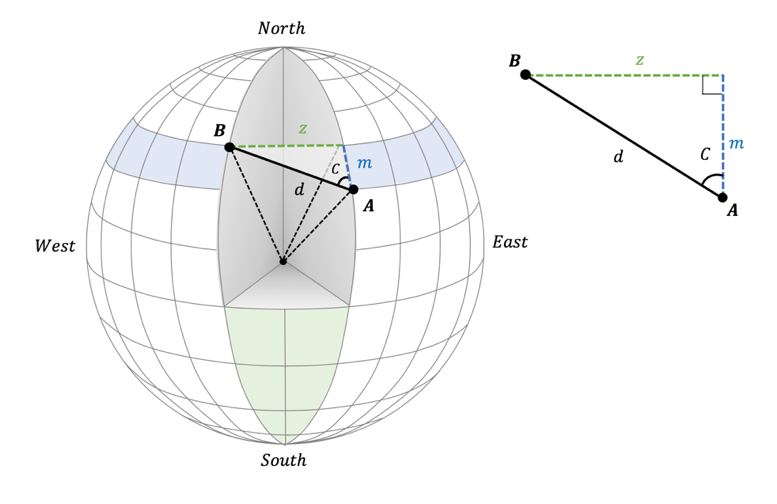
Direction can be found as the angle from the meridian bisecting the buoy’s initial position. This angle is labelled ‘C’ in figure 1. As you know the distancesand , you can find this angle with trigonometry.

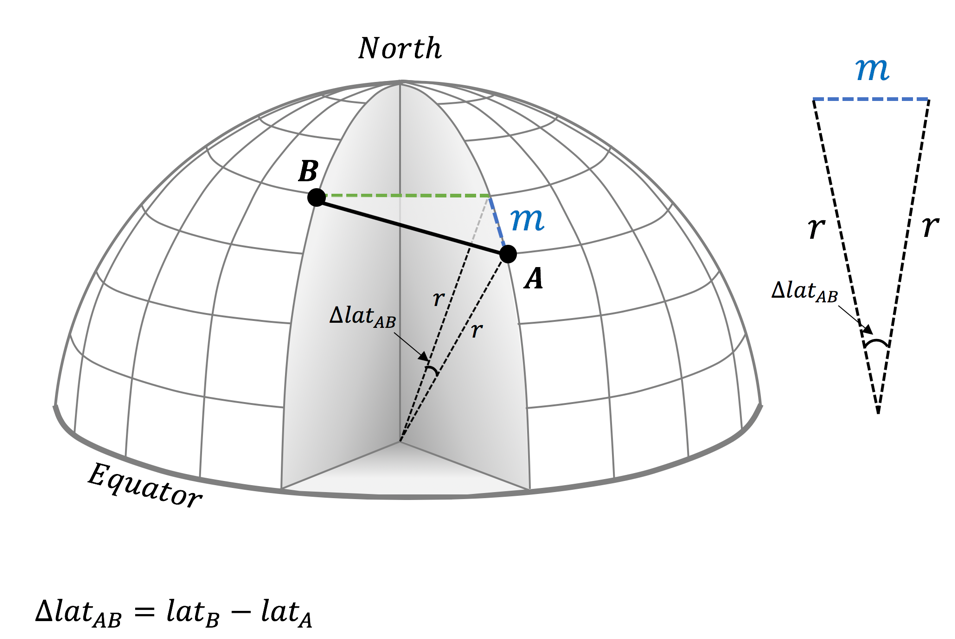
**Useful triangle Identities:**









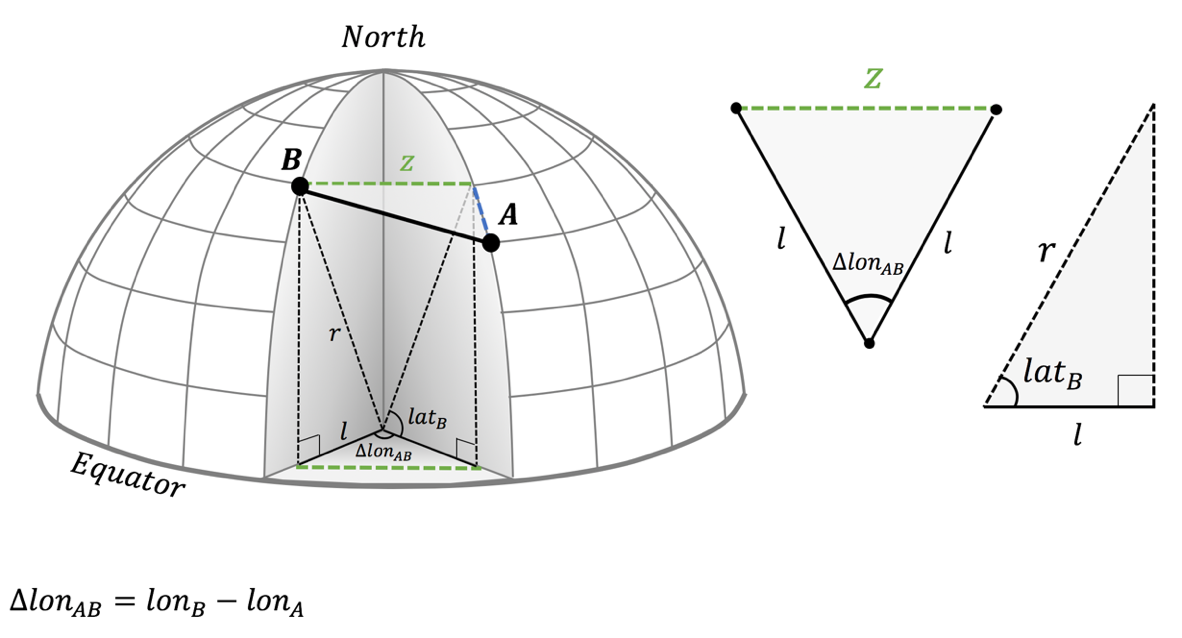


Figure 1: Depiction of the path traveled by the ice from point A () to point B (). By knowing the latitude and longitude of the ice’s initial and ending locations, the distance,, traveled and bearing, , of the ice’s motion can be calculated.