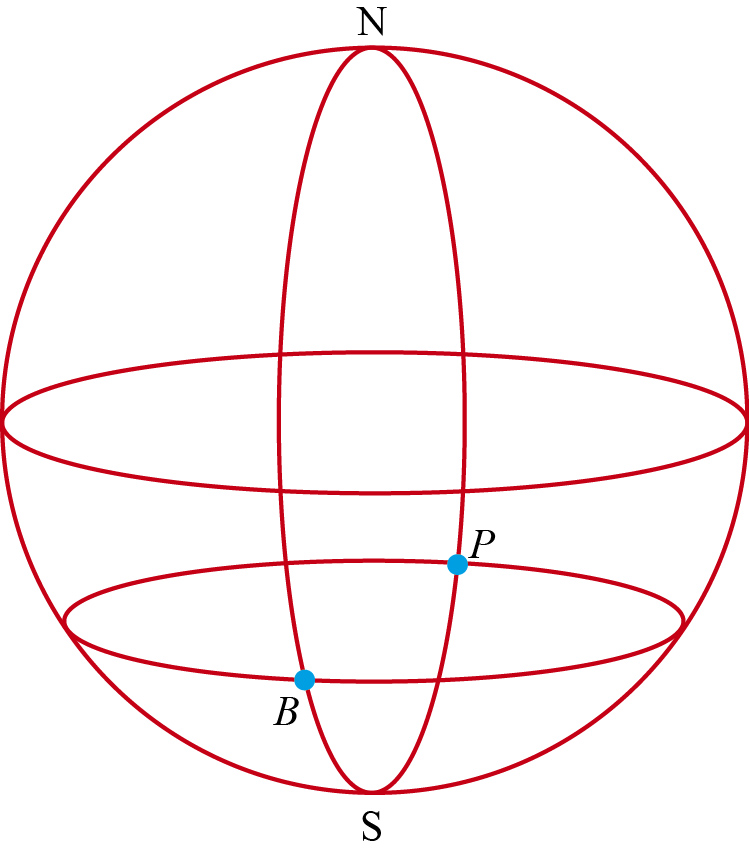
3 Geometry and trigonometry

Activity: Distances on Earth   
(Student version)

Take the radius of the Earth as 6370 km.

Questions

**1** The diagram shows the cities of Buenos Aires (Argentina) 33°S, 60°W and Perth (Australia) 33°S, 120°E.

Find the difference between the distance from Buenos Aires to Perth:

**a** along the circle of latitude (*small circle*)

**b** over the South Pole (*great circle*)

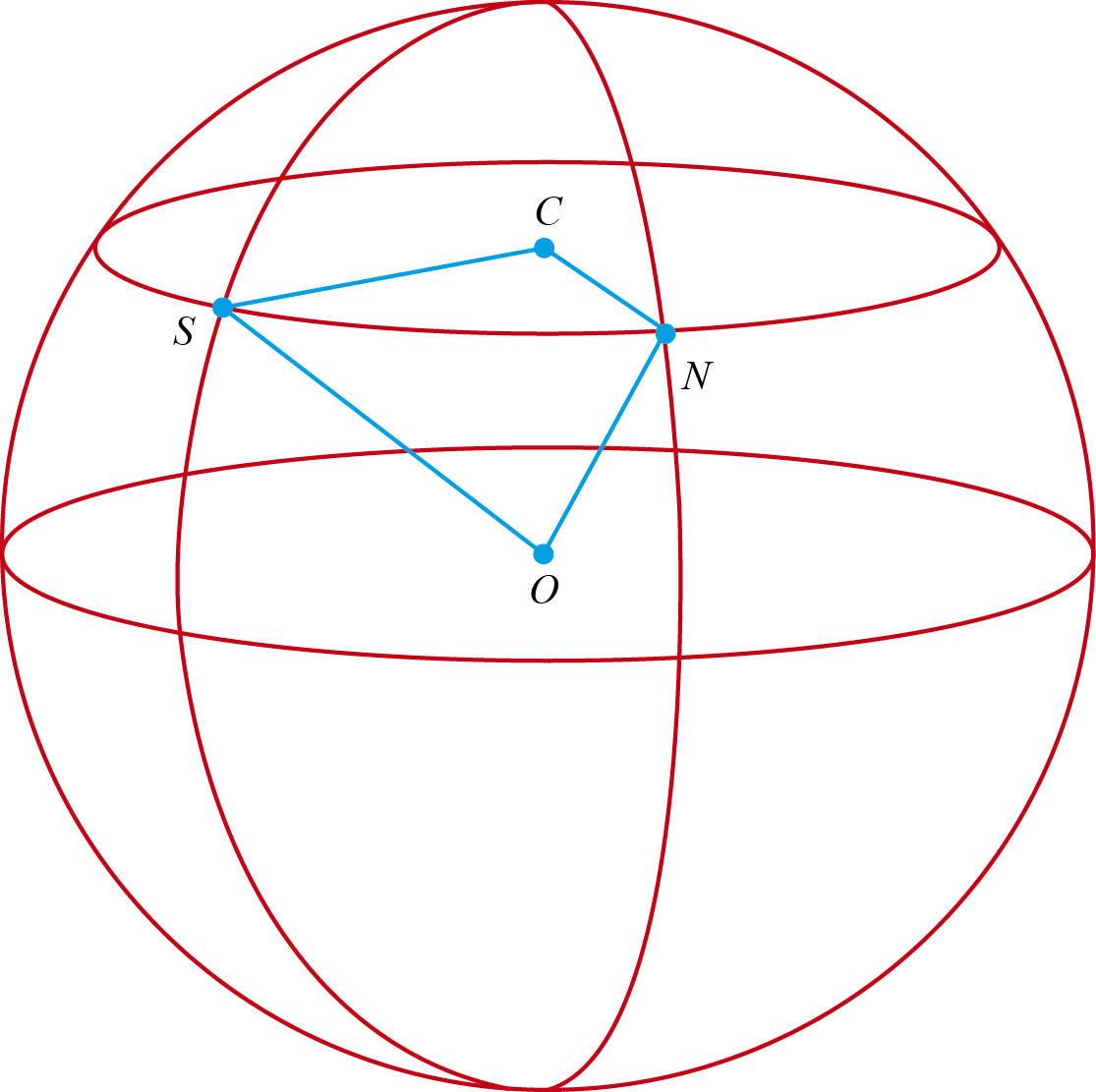
**2** The diagram shows the cities of Norfolk (USA) 38°N, 76°W and San Francisco (USA) 38°N, 123°W. *O* is the centre of the Earth and *C* is the centre of the small circle at 38N.

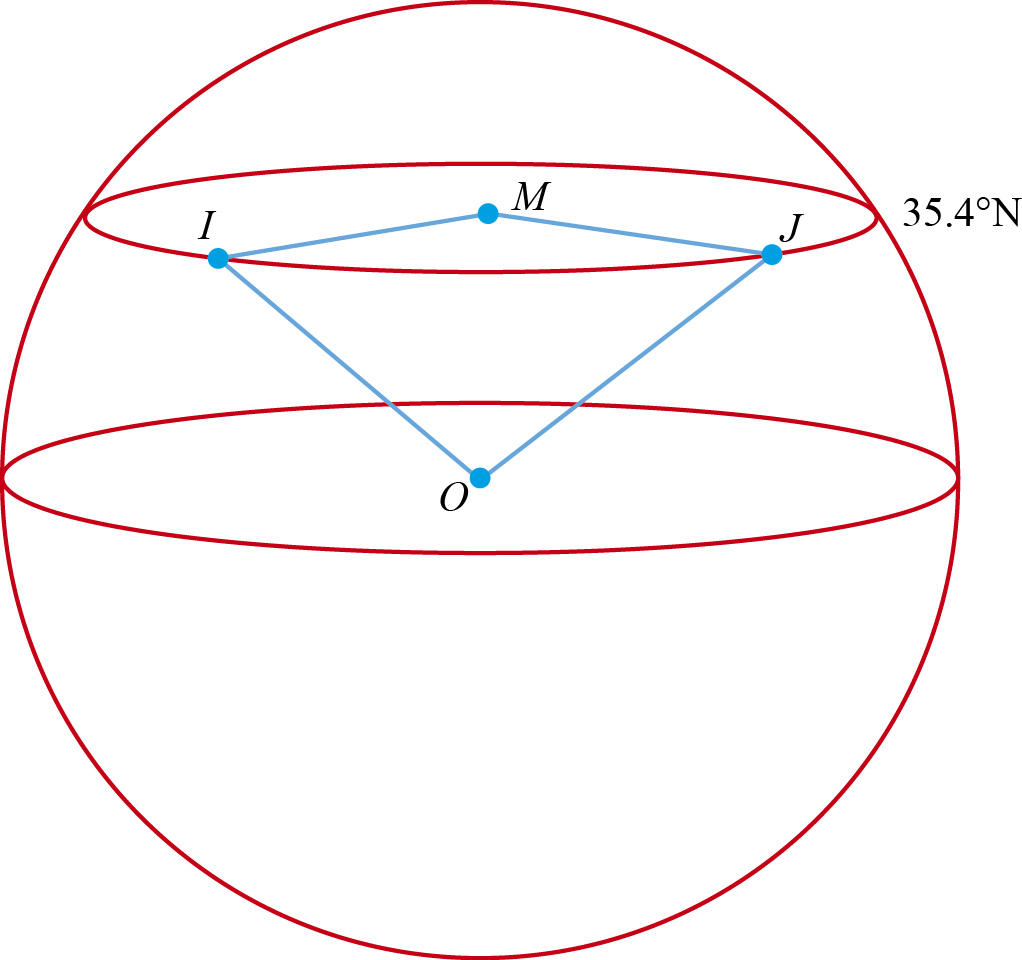
**a** Find the distance across the USA along the circle of latitude from Norfolk (*N*) to San Francisco (*S*).

**b** i Use trigonometry in Δ*CSN* to find the chord length *SN*.

**ii** Use trigonometry in Δ*OSN* to find the size of angle *NOS*.

**iii** Find the distance along the great circle from *N* to *S*. (Assume the shorter distance, i.e. over the North Pole.)



**3** To the nearest tenth of a degree, Tokyo (Japan) is located at approximately 35.4°N, 139.5°E and Tehran (Iran) is at 35.4°N, 51.3°E.

*O* is the centre of the Earth, *M* is the centre of the small circle 35.4°N, Tehran is shown by *I* on the diagram and *J* represents Tokyo.

**a** i Find angle *JMI*.

ii Find the distance around the smaller of the arcs along the line of latitude 35.4°N.

**b** Using triangle *JIM*

i what type of triangle is *JIM*?

ii find the length of the chord *IJ*.

**c** i Write down the lengths of *OI* and *OJ*.

ii What type of triangle is triangle *JOI*?

iii Find angle *JOI*.

iv Find the distance along the great circle from *I* to *J*.