Learning objectives

By the end of this chapter, the students should be able to:
1. Distinguish between great circles and small circles on a spherical surface.
2. Recall and use the definitions of lines of longitude (including the Greenwich Meridian) and latitude (including the equator) on the surface of the Earth.
3. Determine and sketch the position of a point on the surface of the Earth in terms of its latitude and longitude, for example, (14°N, 26°E) or (37°S, 105°W).
4. Calculate the distance between two points on a great circle (meridian and equator).
5. Calculate the distance between two points on a parallel latitude.
6. Calculate the speed of a point on the surface of the Earth due to the Earth’s rotation.
7. Compare great-circle and small-circle routes on the surface of the Earth.

Teaching and learning materials

Teacher: Globe of the Earth, a skeletal model of a sphere with at least three great circles (including the equator) and at least one circle of latitude, potter’s clay to make a globe and fishing line to cut through the clay, a 360° protractor and a transparency pen to draw on the clay.

Teaching notes

• If you want the students to understand how latitude lines work, you must show them by making a model.
  • Make a sphere of potter’s clay.
  • Then, cut it into two hemispheres using a piece of fishing line or a thin wire.
  • Now, find the approximate centre of the circles of the flat sides of the hemispheres.

• Then, use a protractor (preferably a 360° protractor), mark lines as shown in the sketch above and lengthen and draw the lines along the curved sides of the hemispheres.

• Now, explain to the students that these lines are the latitude lines and that the line along which you cut with the fishing line, represents the Prime Meridian or Greenwich Meridian.

• You could also explain to the students that these latitude lines are like the rungs of a ladder and run from east to west and tell how far up (North) one can go and how far down (South) one can go.
  • These lines form circles around the earth.
  • These circles become smaller the nearer they are to the poles of the Earth.

• To explain how longitude lines work, you can make another sphere out of potter’s clay, cut it into two hemispheres and use a protractor (preferably a 360° protractor) to mark lines as shown in the sketch below. You can then explain to the students that all these lines come together at the poles, and give the distance East or West of the Greenwich Meridian.
Areas of difficulty and common mistakes

- Many students find it extremely difficult to see 3-dimensionally from a sketch.
  - Use models of wire or the clay model above to explain better.
  - Then, make the sketch which represents the 3-dimensional situation and from that the plane view.
  - Always go back to the real model, if students still find it difficult to picture the situation.
- Students may find it difficult to understand how to find the radius of a parallel latitude.
  - To explain this better, a wire model of a ball is ideal.
  - You can use Figure 7.21a to give you an idea of how to make such a model that you can use to explain how to find the radius of the smaller circle.

• Explain to the students that longitude lines form great circles, but latitude lines form circles that become smaller as one goes up (North) from the equator or down (South) of the equator.