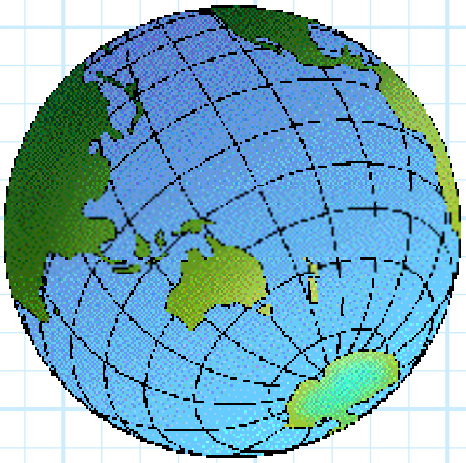
Spherical Coordinates

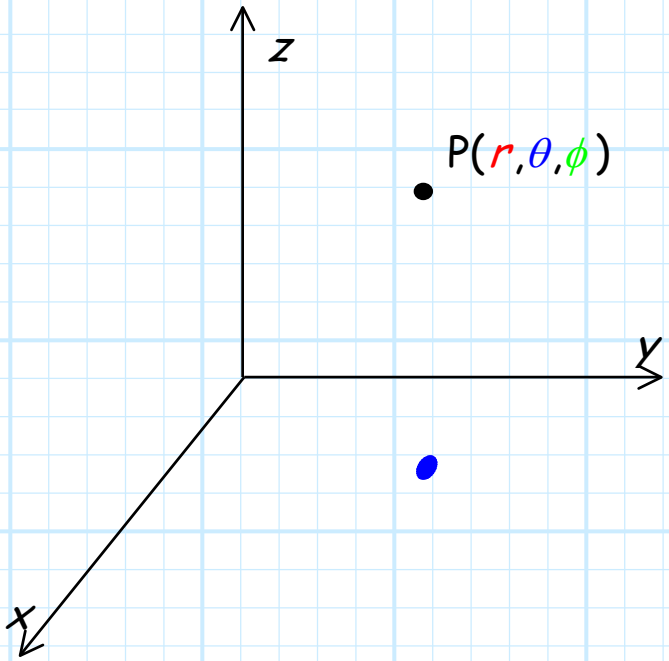


* **Geographers** specify a location on the Earth's surface using **three** scalar values: **longitude**, **latitude**, and **altitude**.

* Both longitude and latitude are **angular** measures, while altitude is a measure of **distance**.

* Latitude, longitude, and altitude are similar to **spherical coordinates**.

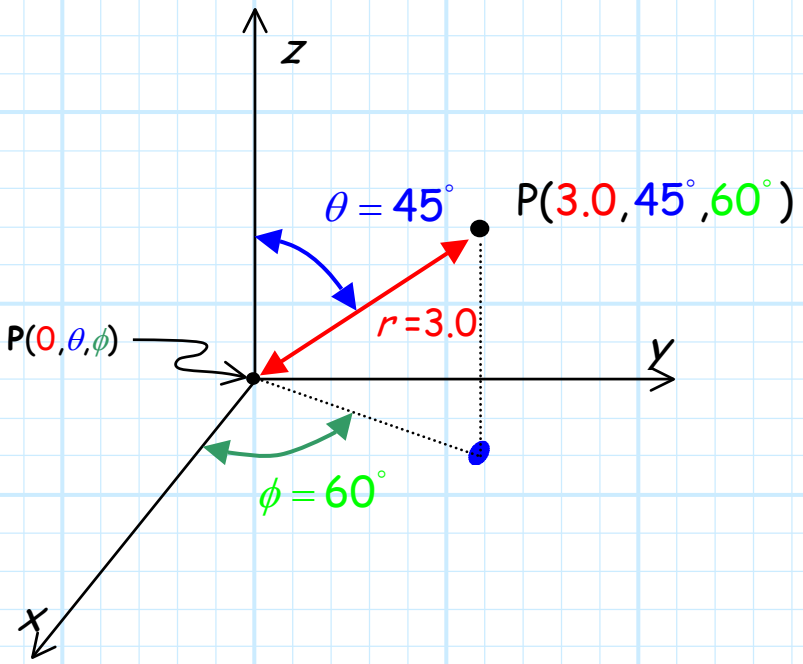
* Spherical coordinates consist of one scalar value (r), with units of **distance**, while the other two scalar values (θ,ϕ) have **angular** units (degrees or radians).



1. For spherical coordinates, r $(0 \le r < \infty)$ expresses the **distance** of the point from the **origin** (i.e., similar to **altitude**).

2. Angle θ $(0 \le \theta \le \pi)$ represents the angle formed **with the z-axis** (i.e., similar to **latitude**).

3. Angle ϕ $(0 \le \phi < 2\pi)$ represents the rotation angle around the z-axis, **precisely** the same as the **cylindrical** coordinate ϕ (i.e., similar to **longitude**).



Thus, using **spherical** coordinates, a point in space can be unambiguously defined by **one distance** and **two angles**.