

# Latitude and Longitude General Information

The earth is effectively a sphere, so how do we describe where a point is on its surface? The most common way to locate points on the surface of the Earth is by standard, geographic coordinates called latitude and longitude. These coordinate values are measured in degrees (of arc, not temperature), and represent angular distances calculated from the center of the Earth. However, there are several CORRECT ways to designate them and to use the different values. What is latitude? We can imagine the Earth as a sphere, with an axis around which it spins. The ends of the axis are the North and South Poles. The Equator is a line around the earth, an equal distance from both poles. The Equator is also the latitude line given the value of zero degrees. This means it is the starting point for measuring latitude, up and down, or North and South properly indicated. Latitude values indicate the angular distance between the Equator and points North or South of it on the surface of the Earth. A line connecting all the points with the same latitude value is called a line of latitude. This term is usually used to refer to the lines that represent values in whole degrees. All lines of latitude are parallel to the Equator (and to each other), and they are sometimes also referred to as parallels. Parallels are equally spaced but they do NOT have the same distance around them! There are 90 degrees of latitude going North from the Equator, and the North Pole is at 90 degrees N. There are 90 degrees to the South of the Equator, and the South Pole is at 90 degrees S. Both are obviously the most distant points from any point on the Equator. When the directional designators (N, S, E or W) are omitted, northern latitudes are given positive values and southern latitudes are given negative values.

The Prime Meridian is the alpha and omega of the lines of longitude, called meridians. They run perpendicular to lines of latitude, and all pass through both poles. Each longitude line is part of a great circle. There is no obvious zero degree point for longitude, as there is for latitude. Throughout history many different starting points have been used to measure longitude. By international agreement, the meridian line through Greenwich, England, is currently given the value of zero degrees of longitude; this meridian is referred to as the Prime Meridian. Longitude values indicate the angular distance between the Prime Meridian and points east or west of it on the surface of the Earth. The Earth is divided equally into 360 degrees of longitude. There are 180 degrees of longitude to the east of the Prime Meridian; when the directional designator is omitted these longitudes are given positive values. There are also 180 degrees of longitude to the west of the Prime Meridian; when the directional designator is omitted these longitudes are given negative values. The 180 degree longitude line is opposite the Prime Meridian on the globe, and is the same going either east or west.

How precise can we be with latitude and longitude? Degrees of latitude and longitude can be further subdivided into minutes and seconds (units of arc, not time): There are 60 minutes (') per degree, and 60 seconds (") per minute. For example, a coordinate might be written  $65^{\circ} 32' 15''$ . Degrees can also be expressed as decimals: 65.5375, degrees and decimal minutes:  $65^{\circ} 32.25'$ , or even degrees, minutes, and decimal seconds:  $65^{\circ} 32' 15.275''$ . All these notations allow us to locate places on the Earth quite precisely – to within inches, depending on the accuracy of the equipment doing the measurement. A degree of latitude is approximately 69 miles, and a minute of latitude is approximately 1.15 miles. A second of latitude is approximately 0.02 miles, or just

over 100 feet. A degree of longitude varies in size. At the equator, it is approximately 69 miles, the same size as a degree of latitude. The size gradually decreases to zero as the meridians converge at the poles. At a latitude of 45 degrees, a degree of longitude is approximately 49 miles. Because a degree of longitude varies in size, minutes and seconds of longitude also vary, decreasing in size towards the poles.