How To Read Sky Coordinates

Some new stargazers are terrified by the coordinate system for finding objects in the night sky. But if you understand the concept of latitude and longitude on the Earth, you can understand their celestial equivalents.

First, a quick review…

On maps of the Earth, **latitude** measures how far north or south of the equator a place lies. By convention, the equator has a latitude of zero degrees, the north and south poles have a latitude of 90° North and 90° South, respectively. Chicago has a latitude of 41.8° North; Sydney, Australia has a latitude of about 34° South.

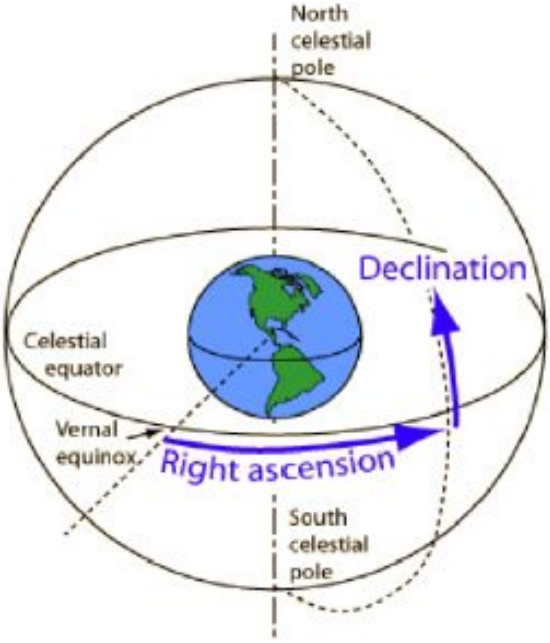
Longitude measures how far east and west a place lies on the Earth's surface. But how far east and west of what? By convention, the reference point of longitude is the great circle running through the earth's poles and the Royal Greenwich Observatory in London, U.K. So Greenwich is at zero degrees longitude. Chicago, west of Greenwich, has a longitude of 88° west. Sydney, east of London, is at a longitude of 151° East. Now imagine the lines of latitude and longitude projected onto the celestial sphere. The celestial equator lies directly above the Earth's equator, and the north and south celestial poles are above the Earth's poles.

Imaginary lines of latitude and longitude are there as well. But in the sky, latitude is called **declination**. By convention, the celestial equator has a declination of 0 degrees. North and south of the celestial equator, declination is marked with a "plus" and "minus" sign. The star Vega, for example, has a declination of +39°. The southern star Achernar has a declination of about -57°.

Each degree is split into 60 smaller units called "minutes of arc", marked by a " ' ", and each minute is split into 60 "seconds of arc", marked by a " " ". So the more precise declination of Achernar is -57° 14′ 12″. And Vega is at +38° 47′ 01″. The celestial equivalent to longitude is called right ascension. It's measured not in degrees but in "hours", from 0h to 24h. Astronomers cooked up this arrangement long ago because the celestial sphere appears to turn once every 24 hours. With 24 hours in the full 360 degrees of sky, each hour corresponds to 15 degrees of angular distance. Like degrees, each hour is split into 60 minutes, and each minute into 60 seconds. The right ascension of the star Achernar, for example, is 01h 37m 43s (one hour, 37 minutes, and 43 seconds); Vega is at right ascension 18h 36m 56s.

By convention, the great circle with right ascension of 0 hours runs through a point in the constellation Pisces at which the ecliptic crosses the celestial equator, and right ascension increases going eastward. (The ecliptic is the great circle around the sky in which you'll find the Sun, Moon, and planets. It's tilted to the celestial equator at an angle of 23.5 degrees.

One more thing… The right ascension and declination of each star are fixed from day to day and year to year. But because the Earth is wobbling in space because of the gravitational influence of the Moon and Sun, the coordinates of celestial objects change over the course of decades. Every 50 years or so, star maps and star coordinates are updated to reflect this change. Current star maps are accurate as of the year 2000.



The celestial sphere, showing right ascension and declination