Conjunction and Opposition to the Earth

As the planets move, they periodically align themselves with the Earth and Sun. When a planet is on the opposite side (180 degrees) of the Sun from Earth, the alignment is in conjunction with the Earth (relative to the Sun). Similarly, when a planet is the same side (and bearing) of the Sun as Earth, the alignment is in opposition with the Earth (relative to the Sun). Figure 1 illustrates two planets, one in conjunction and one in opposition with the Earth (relative to the Sun).

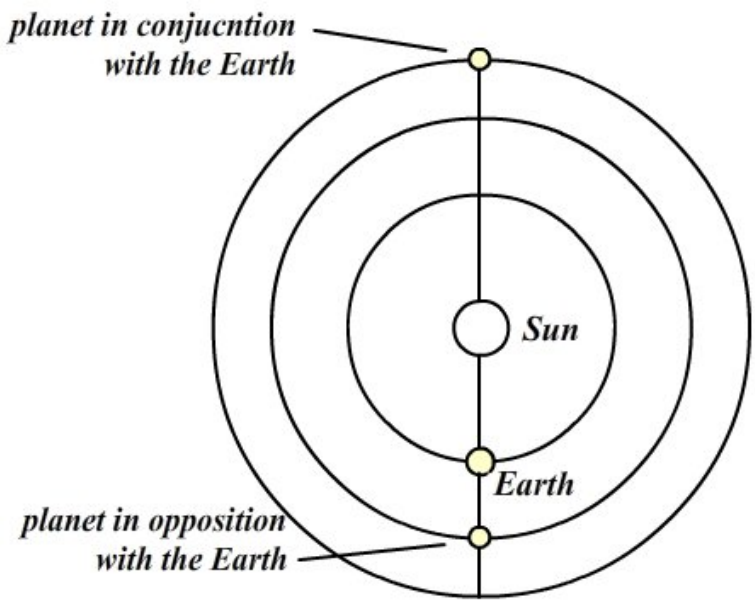

Figure 1- Plans in conjunction and opposition with Earth

Both conjunctions and oppositions are not uncommon. The amount of time between successive conjunctions or oppositions of a planet to Earth is called the synodic period. The synodic period is different for each planet. Table 1 lists the synodic period and sidereal period for each of the planets. Note that the sidereal period is the time for a planet to complete one orbit around the sun.

	Sidereal Period (Earth-days)	Synodic Period (Earth-days)
Mercury	87.96	115.88
Venus	224.70	583.92
Earth	365.25	——
Mars	686.98	779.94
Jupiter	4332.59	398.88
Saturn	10759.22	378.09
Uranus	30685.40	369.66
Neptune	60189.00	367.49

Table 1 – Sidereal and Synodic Periods of Planets

Both conjunctions and oppositions can be predicted with great accuracy. An opposition of a planet occurs when the bearing of the planet and the Earth are the same. Similarly, a conjunction of a planet occurs when the bearing of the planet and the Earth differ by 180 degrees. Figure 2 illustrates the relative bearing for the Earth and another planet for a given 10 year period of time.

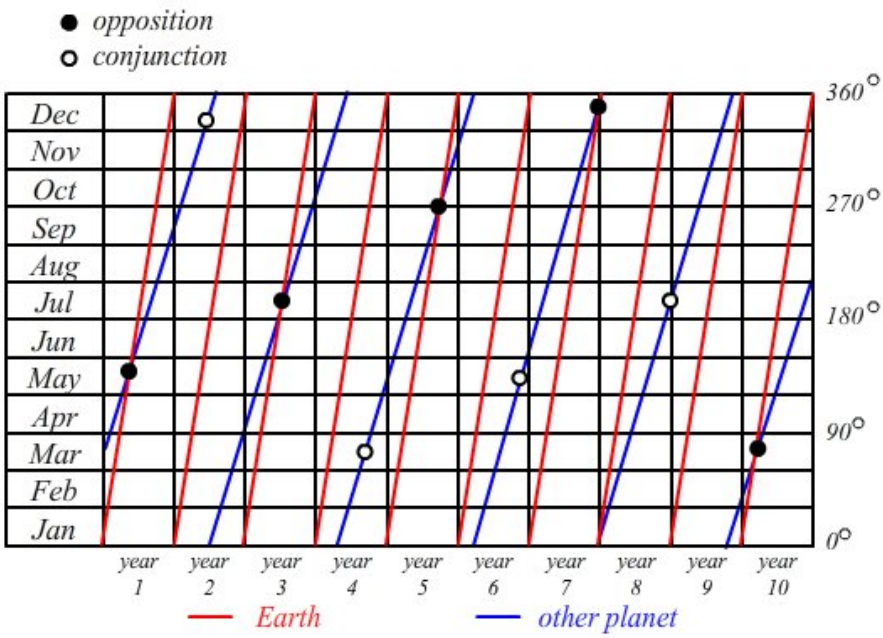

Figure 2 – Bearing of Earth and another planet over a ten-year period