General: We will focus on the Earth’s orbit around the Sun, and the terms used to define directions or times during the orbit.

II. Earth’s orbit around the Sun

You should be familiar with the following 5 terms:

- **Ecliptic Plane**: The plane within which lies the Earth’s orbit around the Sun.
- **Zodiac**: The 12 constellations on the celestial sphere which are intersected by the ecliptic plane.
- **Year**: The time that it takes for the Earth to complete one full revolution (i.e. orbit) around the Sun such that the Sun is in the same direction with respect to the fixed stars. This is referred to as a solar year, which at the moment is equal to 365.256 Earth solar days.
- **Equinoxes**: The direction of the Sun (as seen from Earth) at the 2 points in the Earth’s orbit when the Sun passes through the zenith for an observer on the equator.
- **Solstices**: The direction of the Sun (as seen from Earth) at the 2 points in the Earth’s orbit when the Sun passes through the zenith for an observer at Lat = +23.5° and at Lat = -23.5°.

III. Calendars

The method of keeping track of the Earth’s period of revolution (year) around the Sun. The most natural unit of measure for building an Earth calendar is an Earth day, in particular a solar day since this is what affects our lives and is also what we observe for the position of the Sun. As with any repeating phenomenon, we can define the repetitive motion by a starting point and the time it takes to return to the starting point. However, because the Earth’s period of revolution (year) is not equal exactly to an integer number of Earth days, it is not possible to use both to describe the orbit without devising a separate method for accounting for the fraction of a day left over each year after the Earth has completed one full orbit. For the current Earth calendar, this is done by adding one day to the calendar approximately every 4 years, and occasionally an extra second at times mandated by the International Astronomical Union.

- **Day**: The time that it takes for the Earth to complete one full rotation about its own axis with respect to the fixed stars is referred to as a sidereal day, which is equal to 23h56m. A solar day (24h) is the amount of time for the Earth to complete one full rotation about its own axis with respect to the Sun.

- **Julian calendar**: The calendar introduced by Julius Caesar in 46 BC, which has 365-day years with an extra day added every 4 years (or leap year).

- **Gregorian calendar**: Similar to the Julian calendar except for further refinements in the number of leap years. Introduced in 1582 AD by Pope Gregory XIII due to the fact that the Julian calendar was actually to long by 0.007 days each year, such that in the ~1600 Julian years since the introduction of the Julian calendar the starting point for the year was off by nearly 10 days! The Gregorian calendar started by dropping 10 days from the year 1582 in order to get the “zero point” of the orbit back in the correct place, and then proceeded to cut out certain leap years in order to keep the year beginning at the same point in the orbit at the beginning of every century (1000 years).