

How many solar and lunar eclipses in one calendar year?

Each calendar year has at least four eclipses – two solar and two lunar. Most years have four, but five, six or even seven eclipses are also possible. The next eclipse is a partial eclipse of the sun on September 13, 2015, visible from the southern part of Africa. One fortnight (two weeks) after that, it'll be a total eclipse of the year's closest supermoon on the night of September 27-28, visible from North and South America.

A solar eclipse can happen only at new moon, when the moon passes directly between the sun and Earth. A lunar eclipse happens when the Earth, sun and moon align in space, with Earth in the middle.

How many solar or lunar eclipses occur in one calendar year? The answer very much depends on the year. **One calendar year has a minimum of four eclipses – two solar eclipses and two lunar eclipses. Most years – such as 2015 – have only four eclipses, although you can have years with five eclipses (2013, 2018 and 2019), six eclipses (2011 and 2020) or even as many as seven eclipses (1982 and 2038).**

It is rare to have seven eclipses in one calendar year. Any calendar year presenting the maximum seven eclipses must have the first eclipse coming in early January, in order to leave enough room for the seventh eclipse to take place in late December. Then the middle part of the year has to stage three eclipses within the framework a single lunar month – the period of time between successive new moons or full moons. The lunar (or synodic) month has a mean duration of 29.53059 days.

Is it possible to have three eclipses in one month? It's quite rare to have three eclipses in one calendar month. The last time it happened was in the year 2000, and the next time won't be until the year 2206!

It's more common to have three eclipses within one lunar month. A lunar month refers to time period between successive new moons, or successive full moons. The last time three eclipses happened in a lunar month was in the year 2013. The next time will be 2018.

Three eclipses in a month can be either two solar eclipses and one lunar eclipse, or two lunar eclipses and one solar eclipse. If the first of three eclipses is a solar eclipse, then the third eclipse will be solar and the middle one lunar. If, on the other hand, the first eclipse is lunar, the third will be lunar and the middle one solar. That's because a solar eclipse happens within one fortnight (two weeks) of a lunar eclipse – and vice versa.

Although a minimum of two lunar eclipses happen every year, one or both could be penumbral, meaning the moon never enters the Earth's dark umbral shadow. In the year 2016, both lunar eclipses will be penumbral. The diagram illustrates the penumbral lunar eclipse of March 23, 2016. The Moon has a nearly circular orbit ($e=0.05$) which is tilted about 5° to the plane of the Earth's orbit. Its average distance from the Earth is 384,400 km.

Eclipses of the sun and moon excite more interest than any other event in astronomy. And no wonder. It's a thrill to go outdoors, witness these grand spectacles of nature, and stand in line with the sun, Earth and moon.

AK from EarthSky Notes



This solar eclipse in August, 1999 is a combination of 22 photographs digitally processed to highlight faint features. The outer pictures of the sun's corona were digitally altered to enhance dim, outlying waves and filaments. The inner pictures of the usually dark moon were enhanced to bring out its faint glow from doubly reflected sunlight.



This is what a total eclipse of the moon looks like. It was the total lunar eclipse of October 27, 2004

