

Transits of Venus

The transits following
2012, June 5 will be:

2117, December 10
2125, December 8
2247, June 11
2255, June 8
2360, December 12
2368, December 10

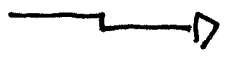
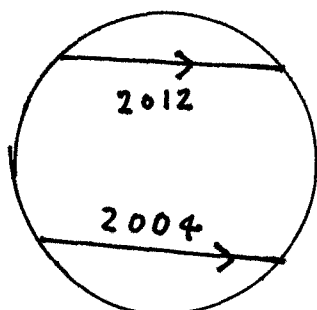
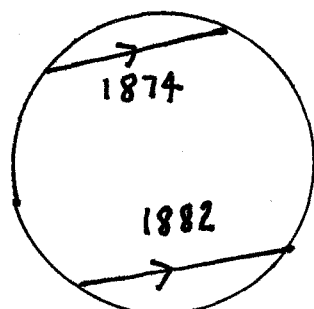
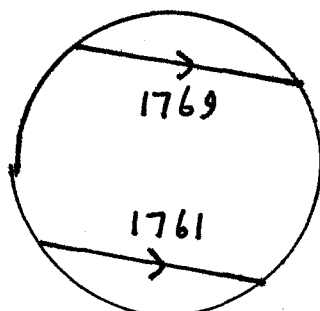
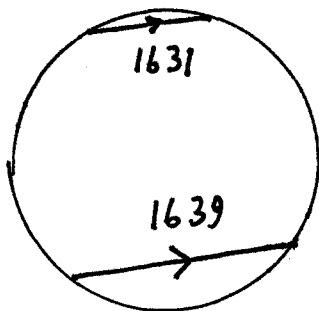
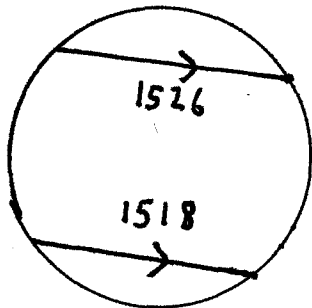
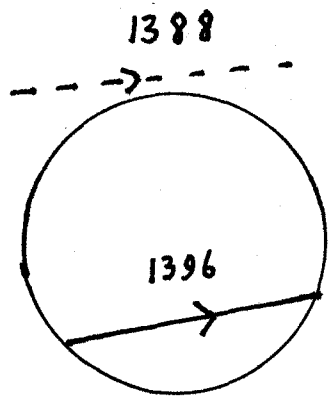
↓
3818, Christmas Day

Were the orbits of Venus and the Earth in the same plane, a transit would occur at every inferior conjunction.

However, the orbit of Venus is inclined to ours at the small, but significant, angle of 3.4° ; this is enough to ensure that transits are rare.

Represent the orbits of the Earth and Venus by two hoops, crossing each other at an angle of 3.4° . The points where the two hoops are known as the nodes. Half of the orbit of Venus is North of the orbit of the Earth and the other half below.

Venus takes 224.7 Earth-days to go revolve around the Sun. For a transit to occur, Venus must be at, or very near, a node, when it is between the Earth and the Sun. The plane of the orbit of Venus passes through that of the Earth twice each year, June 6 and December 7. This means that a transit can occur only on, or very near, one or other of these dates. There is a certain amount of leeway, but not much, because the orbit of Venus is



nearly circular; the eccentricity is only 0.007, whereas that of the orbit of the Earth is 0.017.

It so happens that eight Earth years are very nearly equal to thirteen Venus years, so that after eight years the two planets and the Sun are in nearly the same relative positions (the vital word here is "nearly"). A transit is likely to be followed by another transit eight years later, as happened in 1874 and 1882. But in 1889, when the relative positions were again nearly the same, the alignment was no longer exact enough for a transit to occur, and observers had to wait patiently for the next pair, due in 2004 and 2012.

To summarize: at the present epoch, transits occur in pairs, each pair being separated from the next by over a century. At least a transit of Venus is a leisurely affair. For example, the transit of 2004, June 8 began at 05:13 (G.M.T.) and ended at 11:25.

The first transit predictions were made by Johannes Kepler. In 1627 he finished what proved to be his last work, a set of new and more accurate tables of planetary motions, named the "Rudolphine Tables",

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in honour of his old benefactor, Rudolph II. From these, he was able to calculate that both Mercury and Venus would transit the Sun during 1631, Mercury on November 7 and Venus on December 6.

Kepler predicted no more transits of Venus before 1761; apparently, (and most surprisingly) he missed the fact that they occur in pairs, separated by eight years.

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2011, May 1