**Distances of Inferior Planets from the Sun**

Johannes Kepler was able to find the distance of the inferior planets (Mercury and Venus) from the Sun by using geometric drawings. That is, he made a scale drawing of the orbits of Earth and inferior planets in which he called the distance between Earth and Sun 1 Astronomical Unit (A.U.).



As Mercury and Venus orbit the Sun as seen from Earth, they reach a greatest elongation (greatest angle) east or west of the Sun as seen in the sky from Earth. When an inferior planet has a greatest eastern elongation, it can be seen in the western evening sky after sunset. When an inferior planet has a greatest western elongation, it can be seen in the eastern sky before sunrise. During times of greatest elongation, the sun-planet line forms a 90º angle with the earth-planet line. (See diagram.)

The average greatest elongation for the planet Mercury is 23º. The average greatest elongation for Venus is 46º. Using this information, determine the average distance of Mercury and Venus from the Sun in A.U. by doing the following:

1. On a sheet of paper, place a dot at the center to mark the position of the Sun.
2. Using a compass, make a large circle centered on the Sun’s position to represent the orbit of Earth.
3. Arbitrarily draw a point on the large circle to represent the position of the Earth.
4. Draw a line between Earth and Sun as shown in the drawing above.
5. Measure an angle 23º to the left of the sun as seen from the Earth’s position to represent Mercury at one of its greatest elongations.
6. Draw a line from the Sun to Mercury so that it is perpendicular to the greatest elongation line.
7. Measure the ES line. Measure the PS line. The values can be used to form ratios in an effort to find Mercury’s average distance (ave dist) from the Sun in A.U. That is,



1. Do the same thing using the greatest elongation of Venus, and determine its average distance from the Sun using the same approach.

Planet Average Distance (A.U.)

Mercury

Venus