

PROBLEM SET 3

Physics 2021

1. Suppose Eratosthenes had found that the difference in the altitude of the Sun at Syene and Alexandria was 15° . What value would he have found for the resulting circumference of the Earth?
2. Confirm the conclusion that if a star had an angular diameter of 1 arcminute and a distance of 7000 AU it would be much larger than the Sun.
3. Suppose an inferior planet has a sidereal period of 0.6 years. Find the synodic period of the planet.
4. When viewed from Mars, what is the angle between the Earth and the Sun when Earth is at greatest elongation?
5. The synodic period of Mercury (an inferior planet) is 115.88 days. Calculate its sidereal period in days.
6. A general rule for superior planets is that the greater the average distance from the planet to the Sun, the more frequently that planet will be at opposition. Explain how this rule comes about.
7. In 2003, Mercury was at greatest western elongation on February 4, June 3, and September 26. It was at greatest eastern elongation on April 16, August 14, and December 9. Does Mercury take longer to go from eastern to western elongation, or vice versa? Why do you suppose this is the case?
8. How would the sidereal and solar days change (a) if the Earth's rate of rotation increased, (b) if the Earth's rate of rotation decreased, and (c) if the Earth's rotation were retrograde (that is, if the Earth rotated about its axis opposite to the direction in which it revolves about the Sun)?