Astronomy Problems I
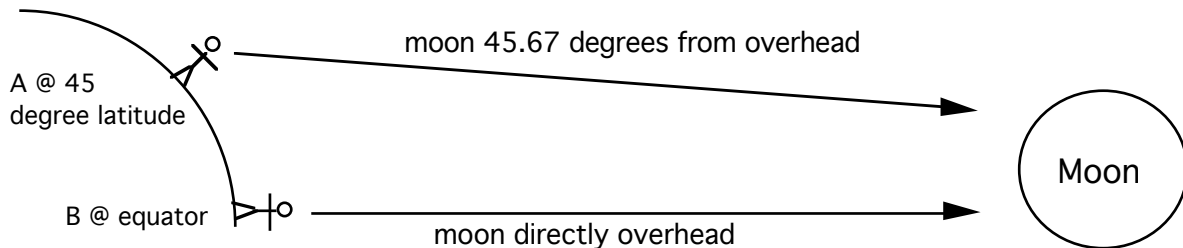
1. At what distance is an object if its parallax, as measured from either end of a 1000 km baseline is 1º?

2. If a star were 10,000 AU away, what would be its parallax, using the diameter of the earth's orbit around the sun as the baseline? (1 AU is the average distance to the sun.)

3. The closest star is Proxima Centauri, and has a parallax of 0.000905º. How far away is it, in AU?

4. Given that the average distance to the Moon is 384,000 km and its angular size is 0.5º, what is the Moon's diameter?

5. If the sun is 20 times farther than the moon, how big is the sun? (Note: the sun is a LOT farther than this, and so is a LOT bigger than your answer.)

6. In the city of Alexandria, where Eratosthenes lived, vertical sticks cast a shadow at noon on the summer solstice, while at the exact same time, a vertical stick would not cast a shadow in the town of Syene, which was 5000 *stadia* to the south of Alexandria. In Alexandria, a 2 meter tall vertical stick would cast a shadow that was 25.3 cm long. What was the circumference of the earth in stadia?

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7. Aristarchus was able to determine the distance to the moon using parallax. If two observers sufficiently far apart locate the moon at the same time, they will see the moon in slightly different places against the background of the stars. Knowing the distance between the observers, one can then triangulate the distance to the moon.

moon 45.67 degrees from overhead

A @ 45 degree latitude

Moon

B @ equator

moon directly overhead

With this data, how far away is the moon? (NOTE: for simplicities sake, just find the distance in terms of the earth's radius, R_e.)

8. Imagine you live on another planet and observe your moon when it is at quarter phase. You also measure the sun and moon to be 88° apart. You also know that the sun is twice the size of the moon in the sky.
    a. How much farther away is the sun compared to the moon?

    b. How much bigger is the sun than the moon?

Answers: 1) 28,600 km   2) 0.0057°   3) 63,300 AU   4) 3350 km   5) 67,000 km
            6) 250,000 stadia   7) 61.2 R_{earth} 8. a) 28.7x   b) 57.3x