PROBLEM SET 1
Physics 2021

1. The age of the universe is about 14 billion years. What is this age in seconds? Use powers-of-ten notation.

2. A cluster of stars has an angular size of 1.4^{o}. What is the size of the cluster in arcminutes? In arcseconds?

3. At what distance would a person have to hold a European 2-euro coin (which has a diameter of about 2.6 cm) in order for the coin to subtend an angle of (a) 1^{o}? (b) 1 arcmin? (c) 1 arcsec? Give your answers in meters.

4. What is the linear diameter of an object that has an angular diameter of 20 arcseconds and a distance of 50,000 meters?

5. Suppose that you live at a latitude of 40^{o} N. What is the elevation of the Sun above the southern horizon at noon at the time of the winter solstice? Explain your reasoning. Include a drawing as part of your explanation.

6. In the northern hemisphere, houses are designed to have "southern exposure," that is, with the largest windows on the southern side of the house. But in the southern hemisphere houses are designed to have "northern exposure." Why are the houses designed this way, and why is there a difference between the hemispheres?

7. The city of Mumbia (formerly Bombay) in India is 19^{o} north of the equator. On how many days of the year, if any, is the Sun at the zenith at midday as seen from Mumbia? Explain your answer.

8. On November 1 at 8:30 p.m. you look toward the eastern horizon and see the bright star Bellatrix rising. At approximately what time will Bellatrix rise one week later, on November 8?