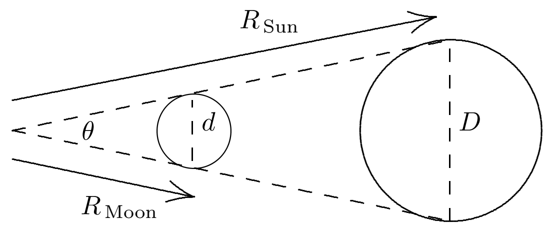
35. (a) When θ is measured in radians, it is equal to the arclength divided by the radius. For very large radius circles and small values of θ, such as we deal with in this problem, the arcs may be approximated as straight lines – which for our purposes correspond to the diameters d and D of the Moon and Sun, respectively. Thus,



$$\theta = \frac{d}{R_{\text{Moon}}} = \frac{D}{R_{\text{Sun}}} \implies \frac{R_{\text{Sun}}}{R_{\text{Moon}}} = \frac{D}{d}$$

which yields $D/d = 400$.

(b) Various geometric formulas are given in Appendix E. Using r_s and r_m for the radius of the Sun and Moon, respectively (noting that their ratio is the same as D/d), then the Sun's volume divided by that of the Moon is

$$\frac{\frac{4}{3}\pi r_s^3}{\frac{4}{3}\pi r_m^3} = \left(\frac{r_s}{r_m}\right)^3 = 400^3 = 6.4 \times 10^7 \ .$$

(c) The angle should turn out to be roughly 0.009 rad (or about half a degree). Putting this into the equation above, we get

$$d = \theta R_{\text{Moon}} = (0.009)\left(3.8 \times 10^5\right) \approx 3.4 \times 10^3 \text{ km} \ .$$