Answer on Question #69262, Physics / Optics

An astronomical telescope is used in normal adjustment when looking at the moon. If the objective has f1=60cm and that of the eye piece is f2=1cm. Suppose the moon has a diameter of 4.50*10^6m and the distance of the moon from the earth is 4.84*10^8m, find the angle of the image of the moon that is subtended by the astronomers eyes.

Find: β - ?

Given:

f_1=60cm

f_2=1cm

D=4.50×10^6 m

a=4.84×10^8 m

Solution:

Angular diameter of the Moon:

$$\delta = 2\arctan\left(\frac{D}{2d}\right) = 2\arctan\left(\frac{4.5\times10^6}{2\times4.84\times10^8}\right) = 0^\circ 32' \text{ (1)},$$

where D is the diameter of the observed object, a is the distance of the observed object from the observer

Of (1) ⇒ α=0.533°

Magnification of the telescope:

$$k = \frac{f_1}{f_2} = \frac{\beta}{\alpha} \text{ (2)},$$

where f_1 is the focal length of objective, f_2 is the focal length of eye piece, α is the angular diameter of the observed object, β is the angular diameter of the observed object in the telescope

Of (2) ⇒ $\beta = \frac{f_1}{f_2}\alpha$ (3)

Of (3) ⇒ β=31.98°

Answer:

31.98°