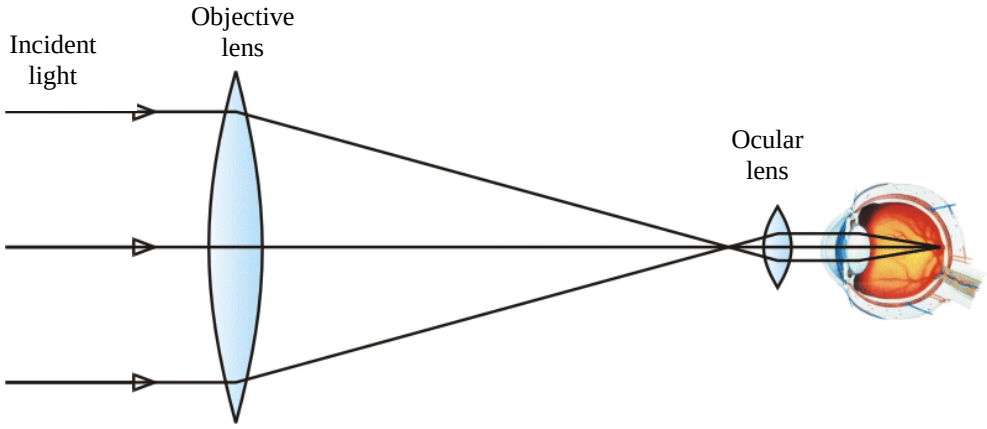
Grid 1. The stars observed with the telescope

The diameter of the objective lens of a telescope, represented in the drawing in figure 1, is $D_{\text{objective telescope}} = 300$ mm, and the diameter of the pupil of the observer's eye is $D_{\text{pupileye}} = 6$ mm.

The degree of collection of light, coming from a star, due to this telescope, is:



a) $g_c = 2500$; b) $g_c = 1500$; c) $g_c = 1000$; d) $g_c = 3000$.

Solution

The degree of collection of light from a star, g_c, by a telescop, used as shown in the drawing in Figure 1, is defined as the ratio of the area of the circle's surface, whose diameter is equal to the diameter of the lens of the telescope, and the area of the circle, whose diameter is equal to the diameter of the pupil of the observer's eye:

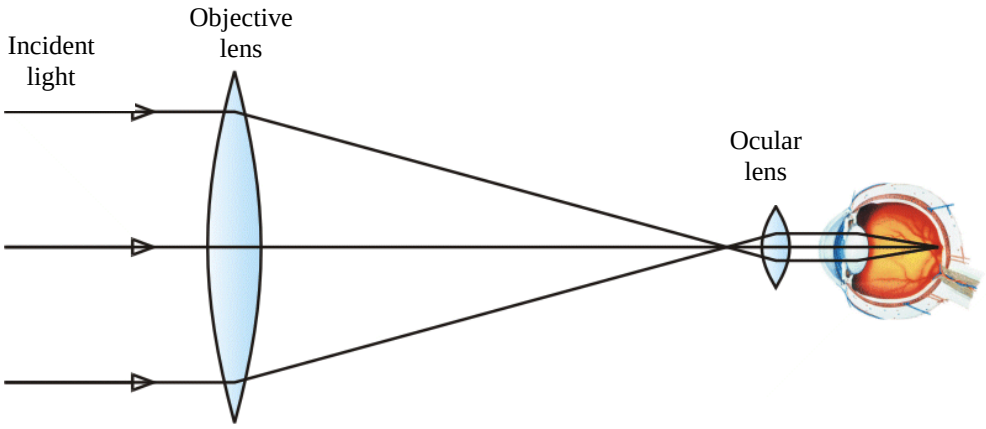


Fig. 1

$$g_c = \frac{\frac{\pi}{4} D^2_{\text{objectivtelescope}}}{\frac{\pi}{4} D^2_{\text{pupileye}}} = \left(\frac{D_{\text{objectivtelescope}}}{D_{\text{pupileye}}} \right)^2 ; \; D_{\text{objectivtelescope}} > D_{\text{pupileye}}; \; g_c > 1.$$