



# Magnification and Field of View

## True angular field

As its name implies, the true angular field of view is the small portion of the celestial dome seen in the eyepiece.

Many bright star clusters, nebulae, and galaxies have a true field of  $0.5^\circ$ , some even wider.

The moon has a true angular width of just  $0.5^\circ$ . The true angular diameters of the planets are much smaller – approximately 1% that of the moon!

## Apparent angular field

✦ The apparent angular field is the angle the eye sees as it peers through the eyepiece. It is the true field magnified.

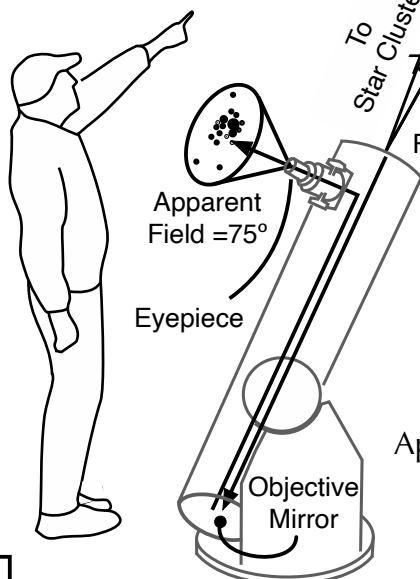
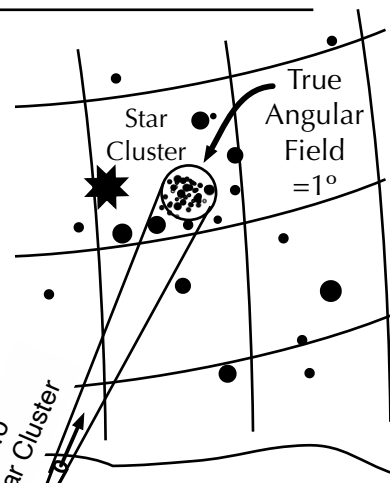
✦ It is determined by the design of the eyepiece and can not be changed by the observer.

## Magnification

✦ Magnification = Focal length of the objective / Focal length of the eyepiece

Make sure that the focal lengths are expressed in the same units, such as millimeters.

✦ Magnification = Apparent field / True field

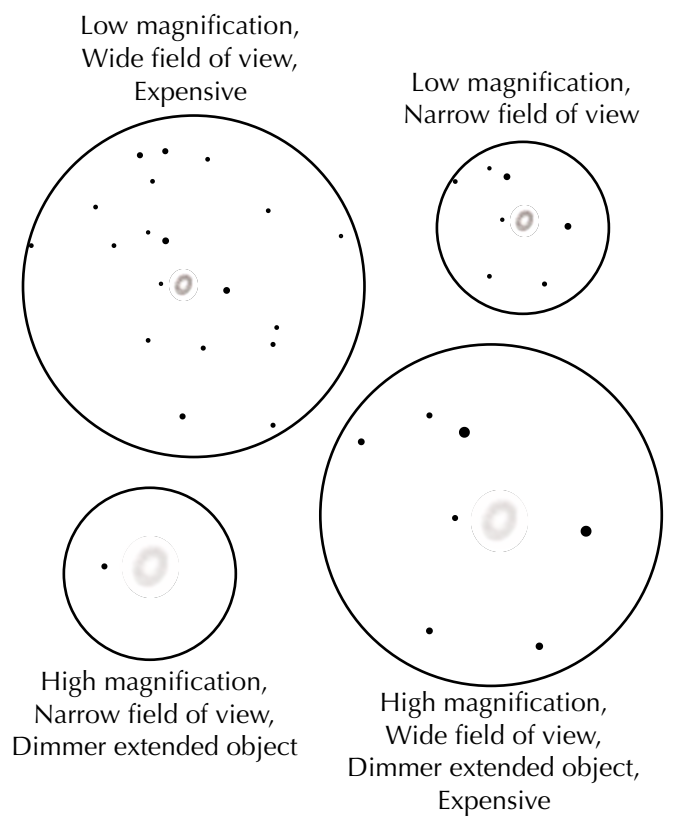


True Field =  $1^\circ$

10x50 binoculars typically have a true field of view of  $5-6^\circ$ .

$$\text{Magnification} = \frac{\text{Apparent field}}{\text{True field}} = \frac{75^\circ}{1^\circ}$$
$$\text{Magnification} = 75$$

## The view through eyepieces giving high and low magnifications and wide and narrow fields of view.



## Magnification & Field of View

- ✦ Wide field eyepiece designs use many glass elements often made of exotic glass compositions. Each element must have no optical imperfections, and must be exactly ground and polished on both sides. Hence, their high cost.
- ✦ In general, the higher the magnification that an eyepiece gives, the smaller the field of view that it provides. Therefore, low magnification eyepieces with a wide true field are best used when locating objects.
- ✦ Typical low powers are achieved with eyepieces having a focal length of 20 mm or longer. High magnifications are obtained using eyepieces of focal lengths of less than 10 mm.
- ✦ Because increasing the magnification spreads the light of an extended object over a greater apparent area, it appears dimmer.