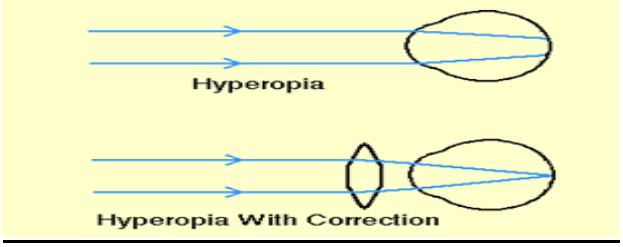
9- **vision problems**

Three common vision problems are farsightedness, nearsightedness, and astigmatism

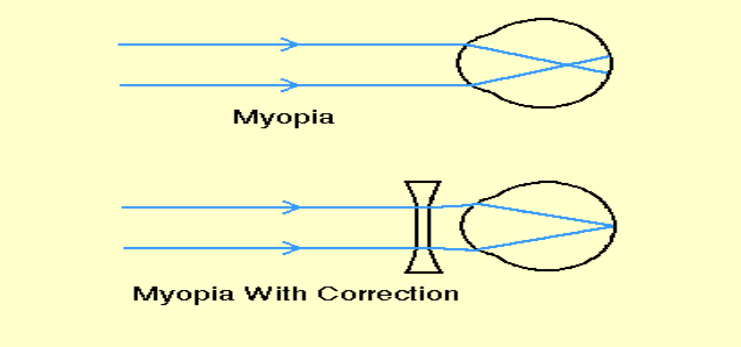
9-1. **Farsightedness, Long sight (Hyperopia)'**

A **farsighted** person has trouble focusing on nearby objects.
The eyeball is too short and images form behind the retina.
Farsighted people have to hold things more than 25 cm away to be able to focus them.
The remedy is to increase the converging effect of the eye by wearing eyeglasses or contact lenses with converging lenses.
Converging lenses converge the rays sufficiently to focus them on the retina instead of behind the retina.



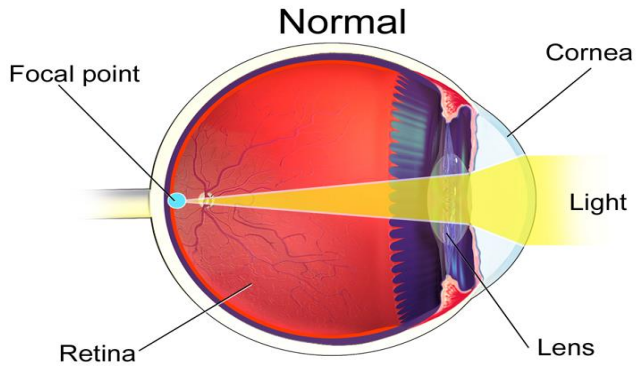
9-2 **Nearsightedness ,Short sight (Myopia)**

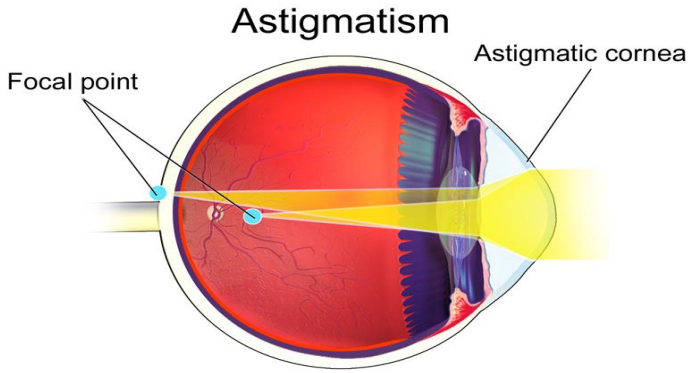
A **nearsighted** person can see nearby objects clearly, but does not see distant objects clearly.
Distant objects focus too near the lens, in front of the retina.
The eyeball is too long.
A remedy is to wear lenses that diverge the rays from distant objects so that they focus on the retina instead of in front of it



9-3Astigmatism

Astigmatism of the eye is a defect that results when the cornea is curved more in one direction than the other.
Because of this defect, the eye does not form sharp images. Light rays coming through the cornea and lens are not focused on to one sharp spot on the retina.
The remedy is cylindrical corrective lenses that have more curvature in one direction than in another.





Astigmatic cornea distorts the focal point of light in front of and/or behind the retina

10- Telescopes

10-1 Types of Telescopes

The purpose of a telescope is to collect as much light as possible and focus it into a small area. This can be done in 2 ways:1-By using a lens to bend, or refract the light
2-By using a mirror to reflect the light
The size of a telescope is characterized by the diameter of its lens or mirror

There are two main types of Telescopes

1-Refractor telescopes, which use glass lenses

2- Reflector telescopes, which use mirrors instead of lenses.

10-2 How does this apply to telescopes?

If you had a bigger eye, you could collect more light from the object. This image could be magnified.

In a telescope, two pieces make this possible

-The objective lens (refractor telescopes) or primary mirror (reflecting telescopes)

The eye piece

10-3 Refracting Telescopes

A refracting telescope uses a lens to concentrate incoming light at a focus

*The **objective lens** (in refractors) collects lots of light from a distant object and brings that light, or image, to a point or **focus**.

*An **eyepiece lens** takes the bright light from the focus of the objective lens "spreads it out" (magnifies it) to take up a large portion of the retina. This is the same principle that a magnifying glass (lens) uses; it takes a small image on the paper and spreads it out over the retina of your eye so that it looks big.

10-3.1parts of refractive telescope

Refractors are the type of telescope that most of us are familiar with. They have the following parts:

1-a long tube, made of metal, plastic, or wood

2- a glass combination lens at the front end (**objective lens**)

3-a second glass combination lens (**eyepiece**)

Refracting telescopes focus light rays by bending them with glass

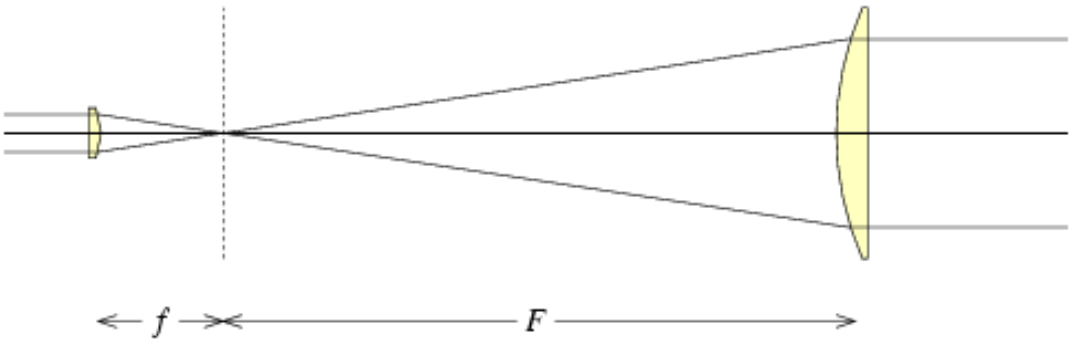
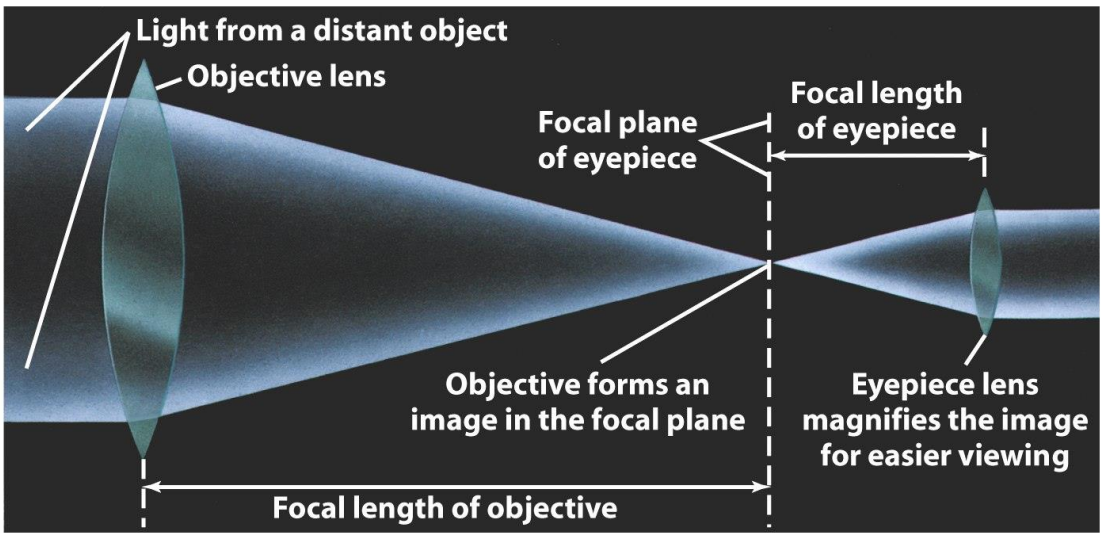


Diagram of a simple telescope. Parallel light rays enter from the left, pass through the objective lens, come to a focus at the focal plane, and exit through the eyepiece lens. The focal length of the objective is *F*, and the focal length of the eyepiece is *f*.

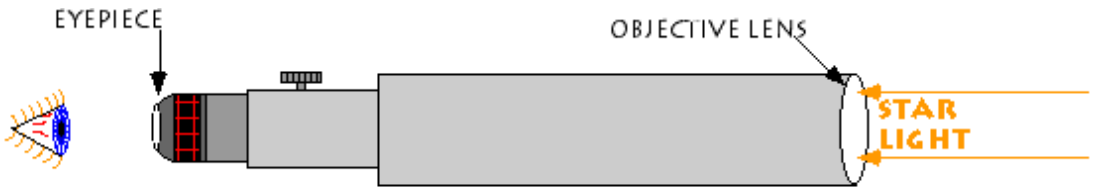


The magnification of a telescope is equal to the focal

length of the objective divided by the focal length

of the eyepiece

Refracting telescopes use a lens to bring the light to a focus. Light passes through the primary to the eyepiece



LIGHT PATH FOR A REFRACTING TELESCOPE

10-4 properties

how well it can collect the light

(the aperture)

how much it can magnify the image

(the magnification)

10-4.1 The Aperture

A telescope's ability to collect light is directly related to the diameter of the lens or -the **aperture** -- that is used to gather light. Generally, the larger the aperture, the more light the telescope collects and brings to focus, and the brighter the final image

10-4.2 Magnification

The telescope's **magnification**, its ability to enlarge an image, depends on the combination of lenses used. The eyepiece performs the magnification