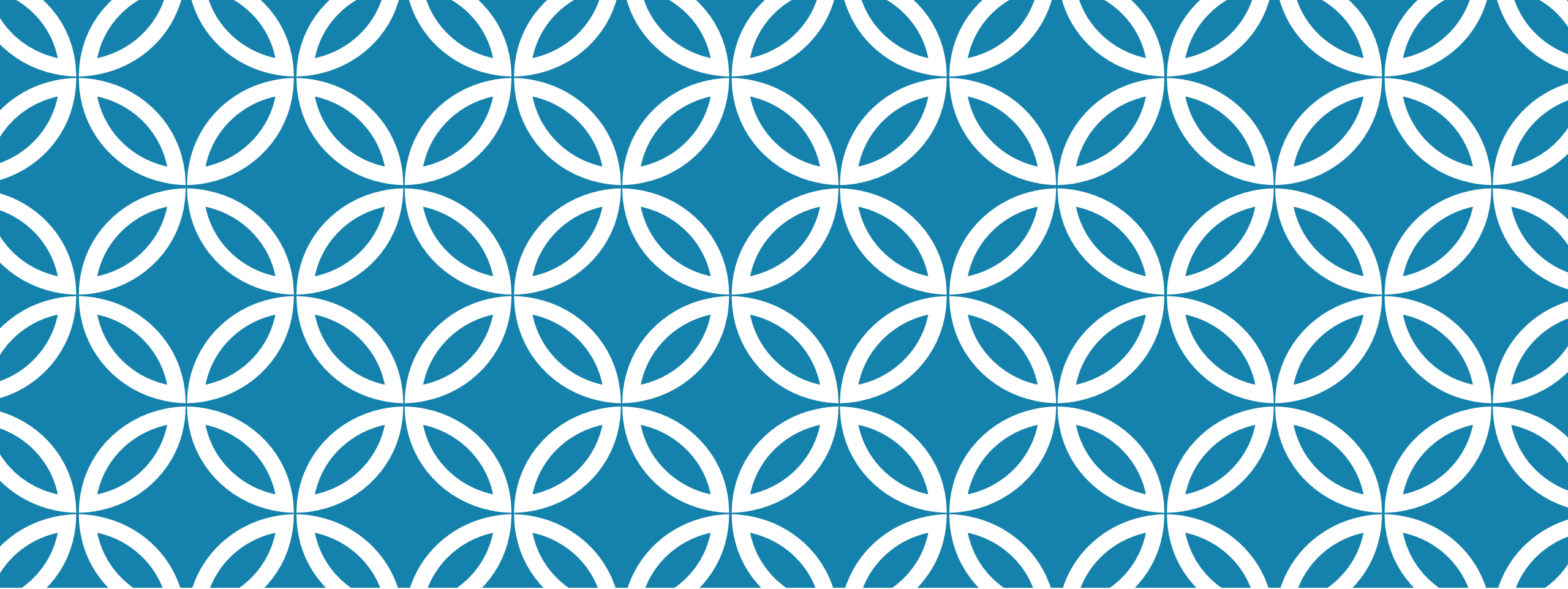




THE HUMAN EYE AND THE COLOURFUL WORLD

MODULE-2



DEFECTS OF VISION AND THEIR CORRECTION

COMMON REFRACTIVE DEFECTS OF VISION

There are mainly three common refractive defects of vision.

These are

- (i) myopia or near-sightedness
- (ii) Hypermetropia or far – sightedness
- (iii) Presbyopia.

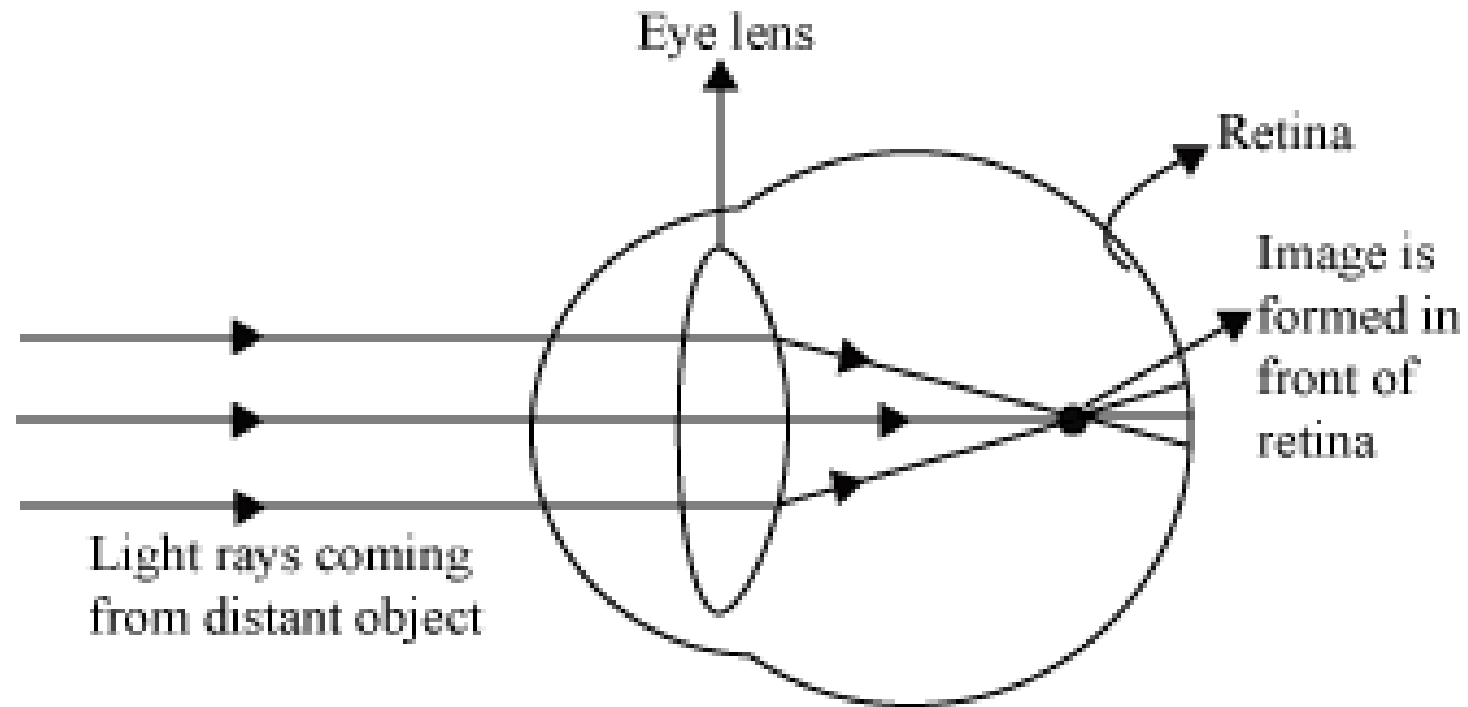
MYOPIA

Myopia is also known as near-sightedness.

A person with myopia can see nearby objects clearly but cannot see distant objects distinctly.

A person with this defect has the far point nearer than infinity. Such a person may see clearly upto a distance of a few metres.

In a myopic eye, the image of a distant object is formed in front of the retina and not at the retina itself.



CAUSE OF DEFECT

This defect may arise due to

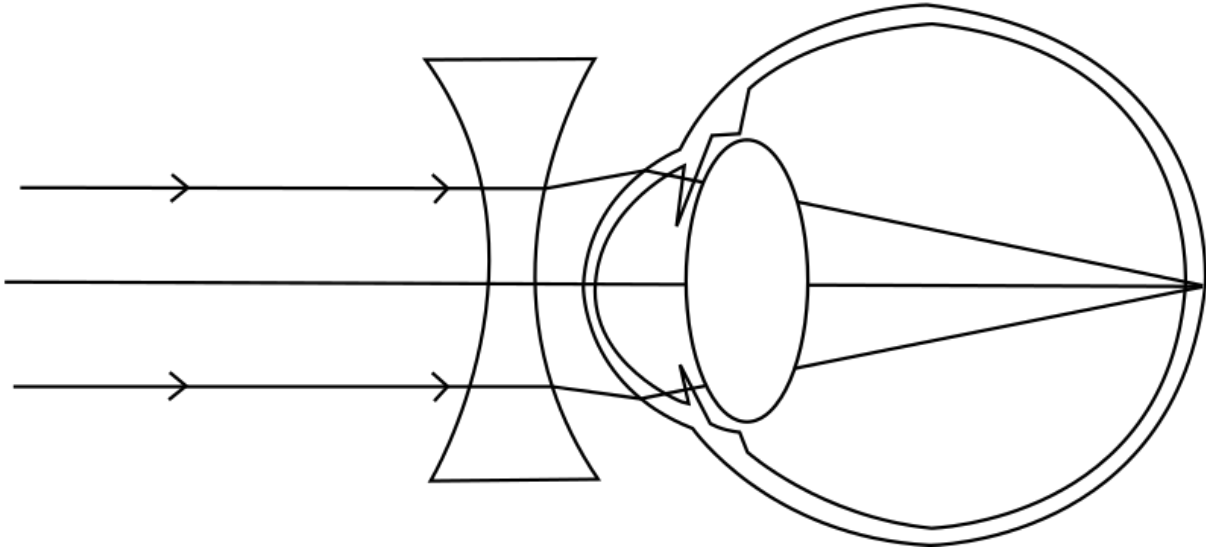
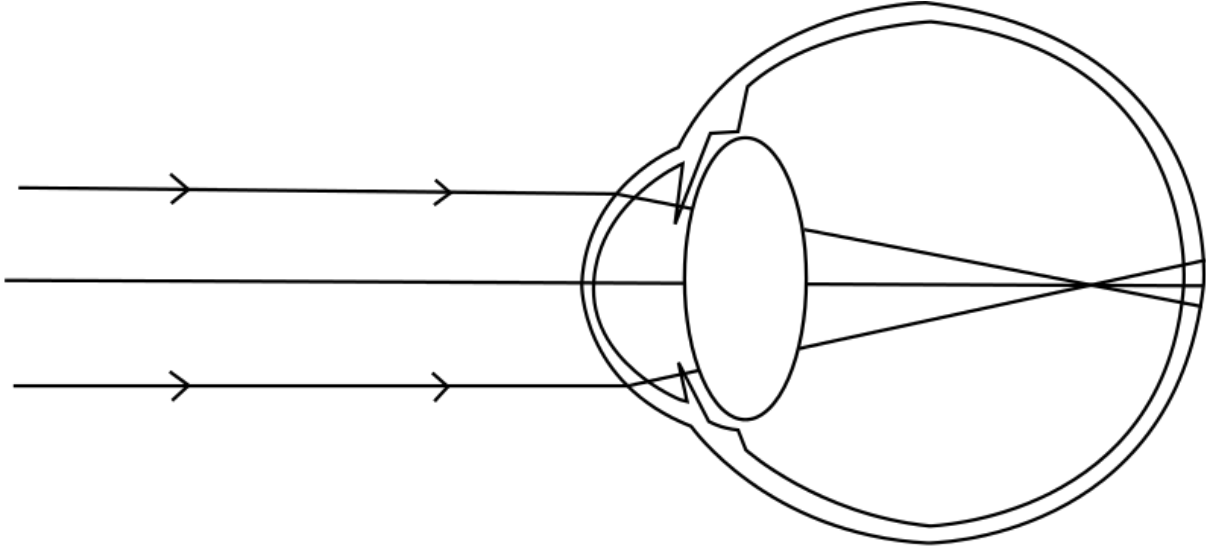
(i) excessive curvature of the eye lens

(ii) elongation of the eyeball.

CORRECTION OF MYOPIA

This defect can be corrected by using a **concave lens** of suitable power.

A **concave lens** of suitable power will bring the image back on to the retina and thus the defect is corrected.



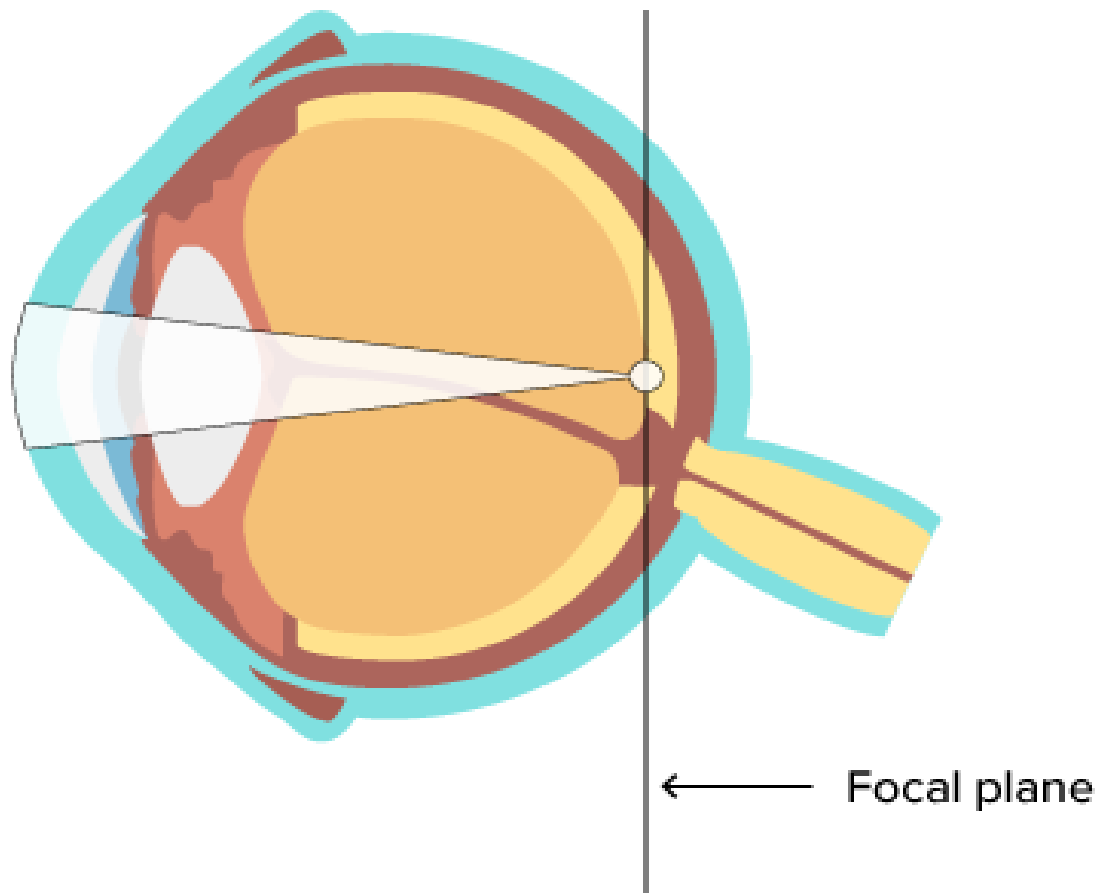


HYPERMETROPIA

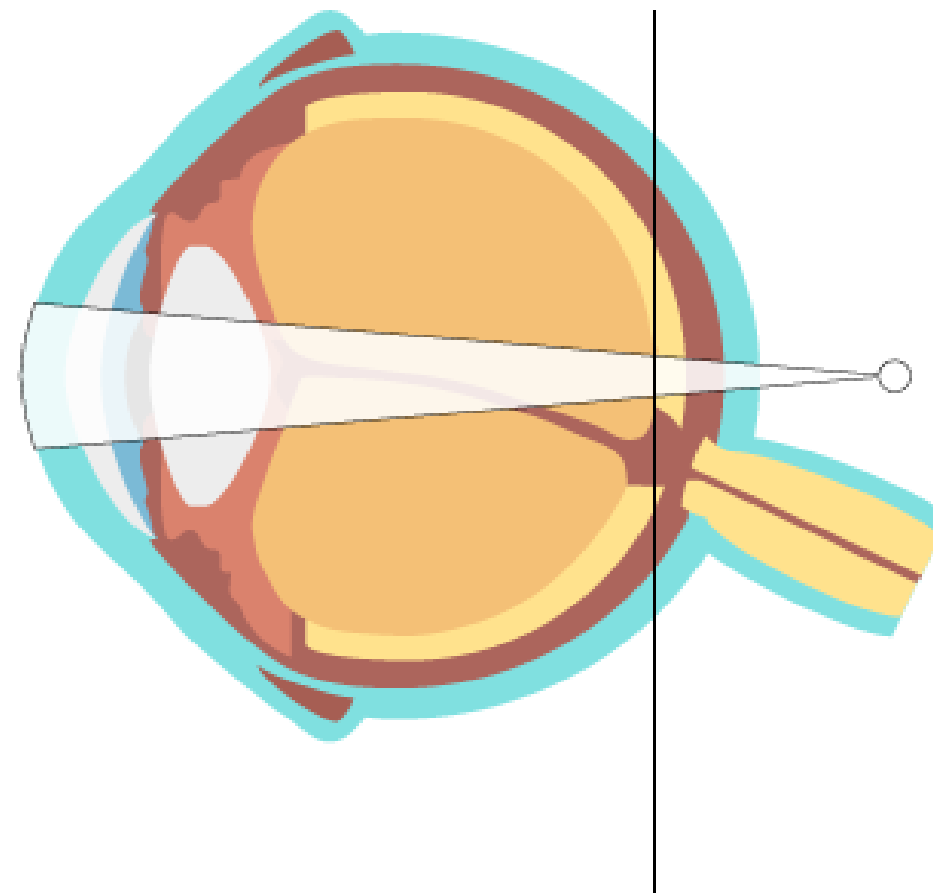
Hypermetropia is also known as far - sightedness.

A person with hypermetropia can see distant objects clearly but cannot see nearby objects distinctly

Normal eye



Eye with hypermetropia



CAUSES OF DEFECT

This defect arises either because

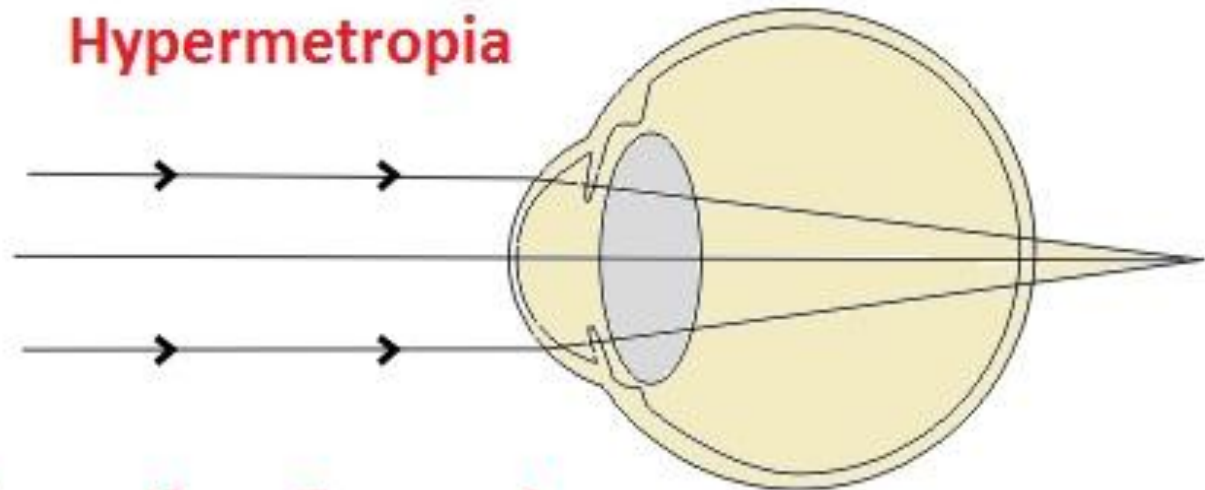
- (i) the focal length of the eye lens is too long
- (ii) the eyeball has become too small.

CORRECTION OF HYPERMETROPIA

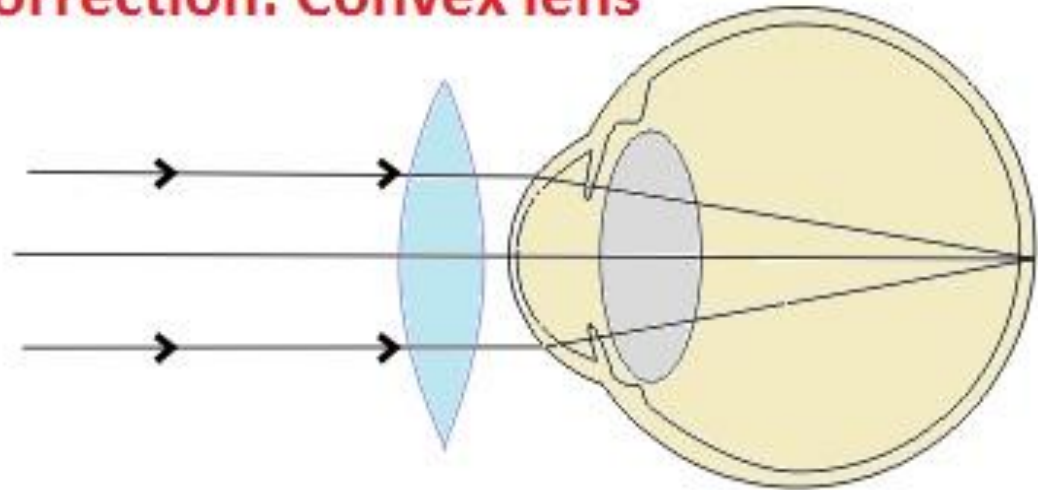
This defect can be corrected by using a convex lens of appropriate power.

Eye-glasses with converging lenses provide the additional focussing power required for forming the image on the retina.

Hypermetropia



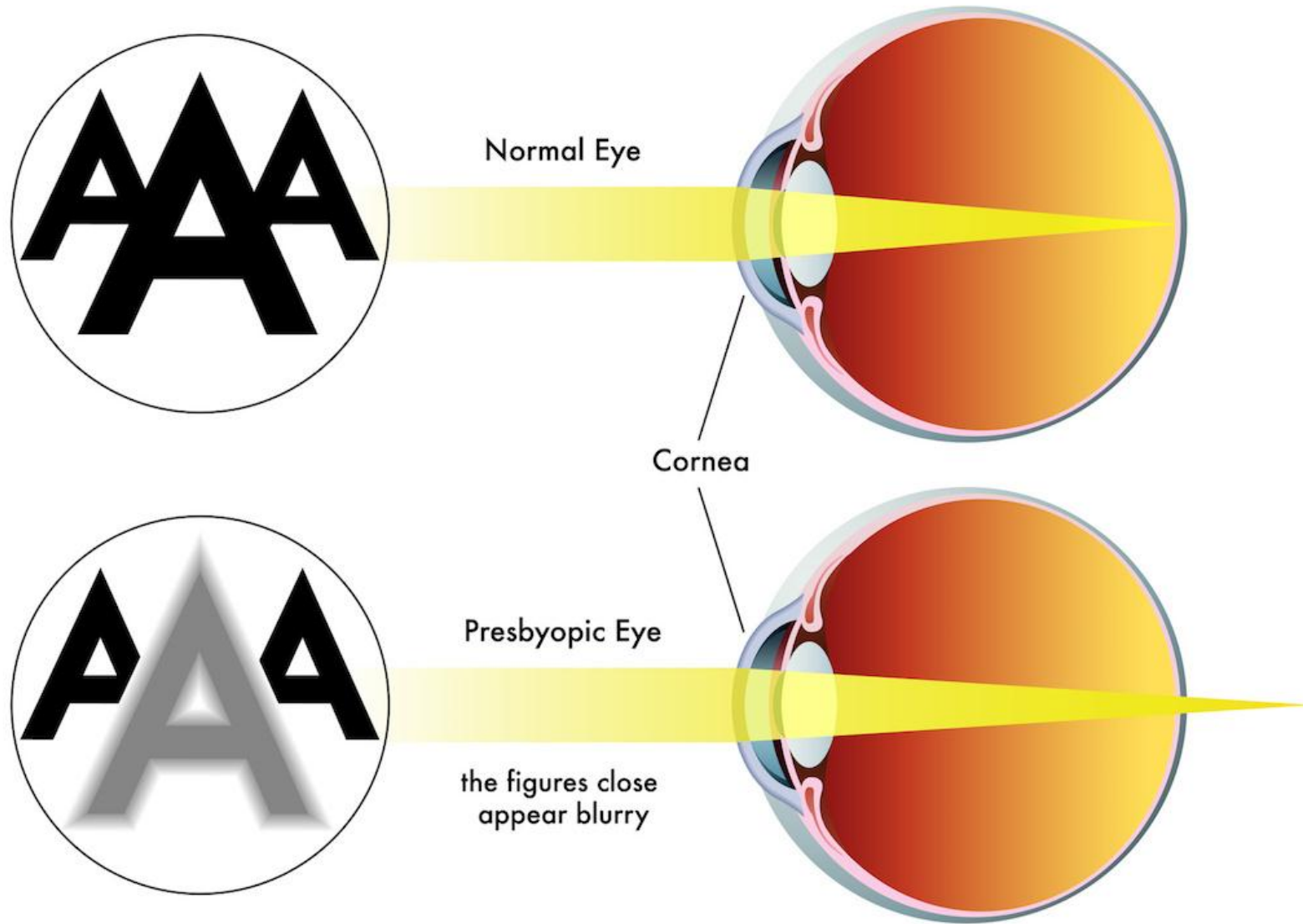
Correction: Convex lens





PRESBYOPIA

The power of accommodation of the eye usually decreases with ageing. For most people, the near point gradually recedes away. They find it difficult to see nearby objects comfortably and distinctly without corrective eye-glasses. This defect is called **Presbyopia.**



CAUSE OF DEFECT

It arises due to the gradual weakening of the ciliary muscles and diminishing flexibility of the eye lens.

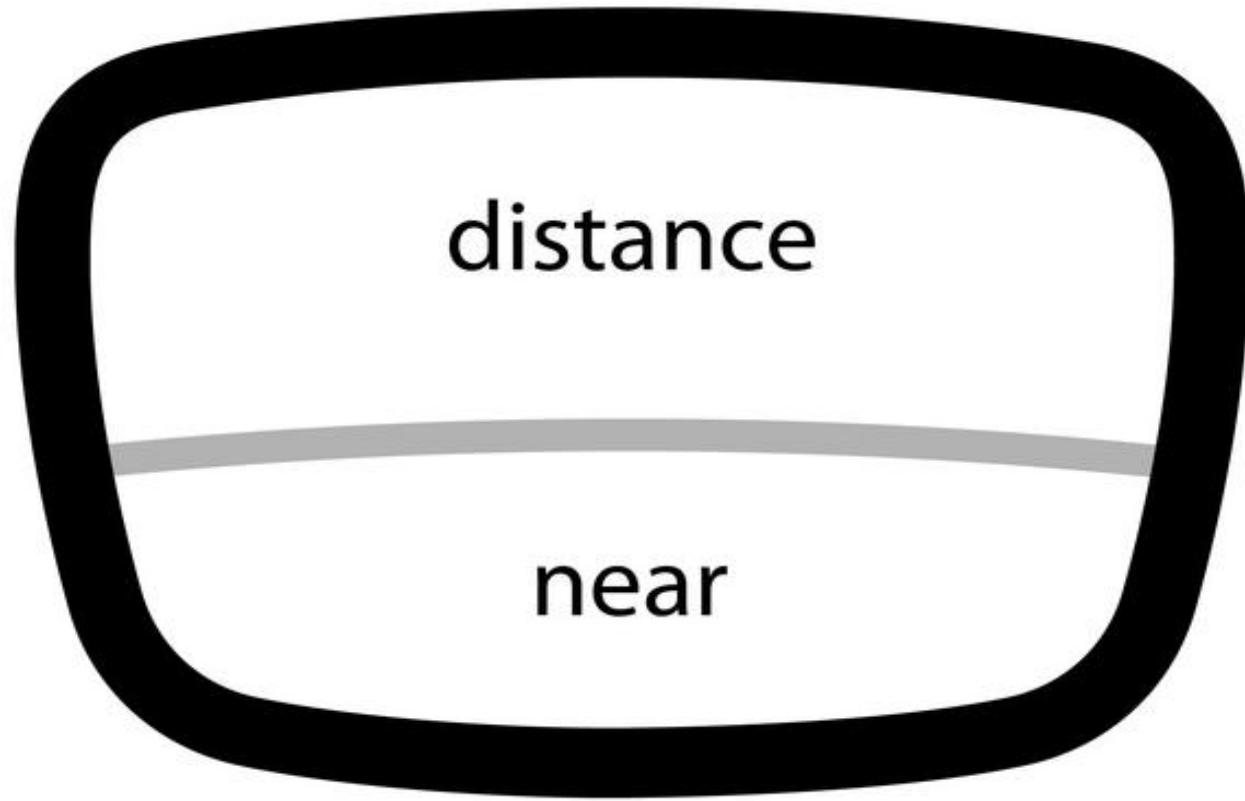
USE OF BIFOCAL LENSES

Sometimes, a person may suffer from both myopia and hypermetropia. Such people often require bifocal lenses.

STRUCTURE OF BIFOCAL LENSES

A common type of bi-focal lenses consists of both concave and convex lenses. The upper portion consists of a concave lens. It facilitates distant vision. The lower part is a convex lens. It facilitates near vision.

Bifocal Lens



PRISM

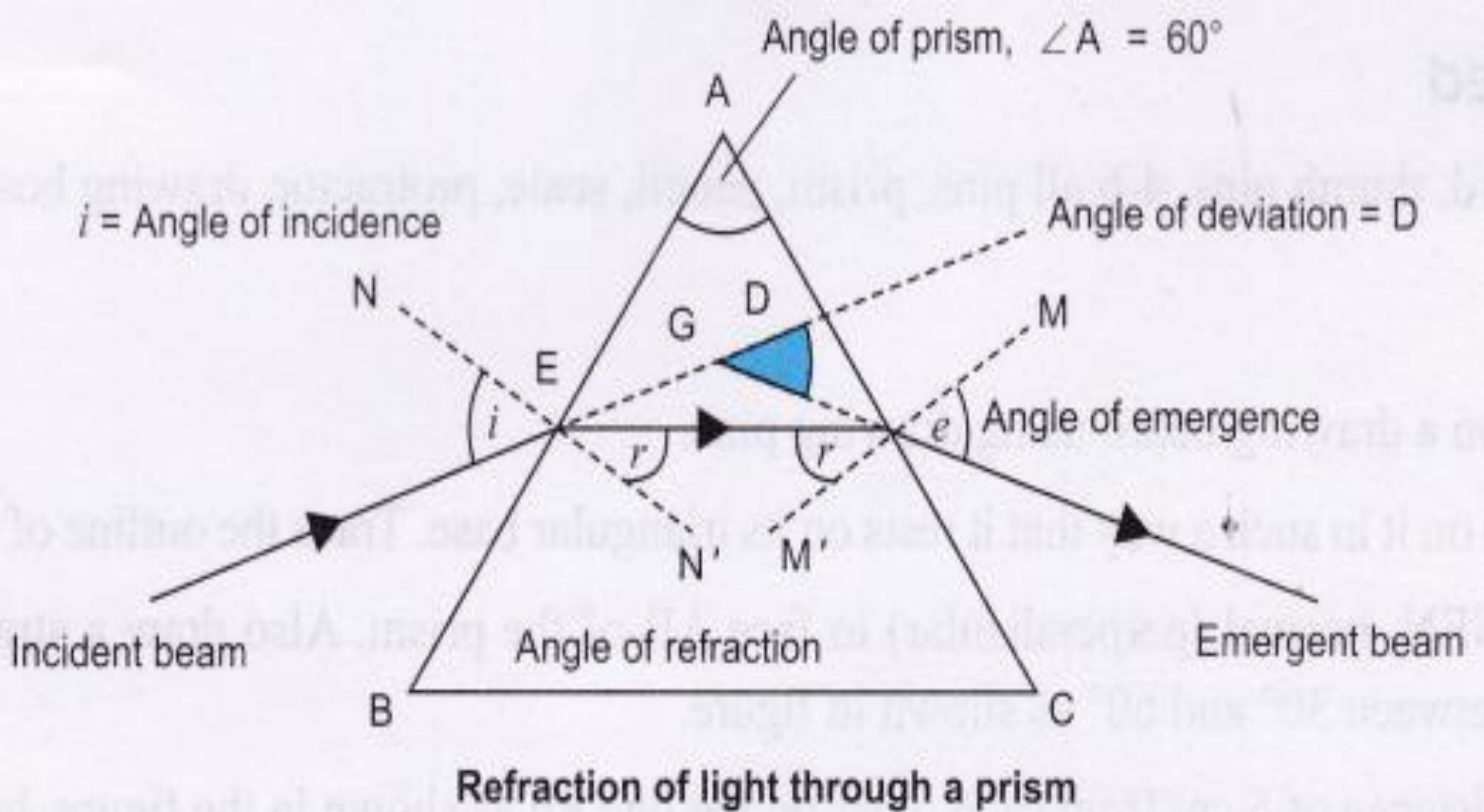
An **optical prism** is a transparent optical element with flat, polished surfaces that refract light.

At least one surface must be angled—elements with two parallel surfaces are not prisms.

The traditional geometrical shape of an optical prism is that of a triangular prism with a triangular base and rectangular sides, and in colloquial use "prism" usually refers to this type.

REFRACTION OF LIGHT THROUGH A PRISM

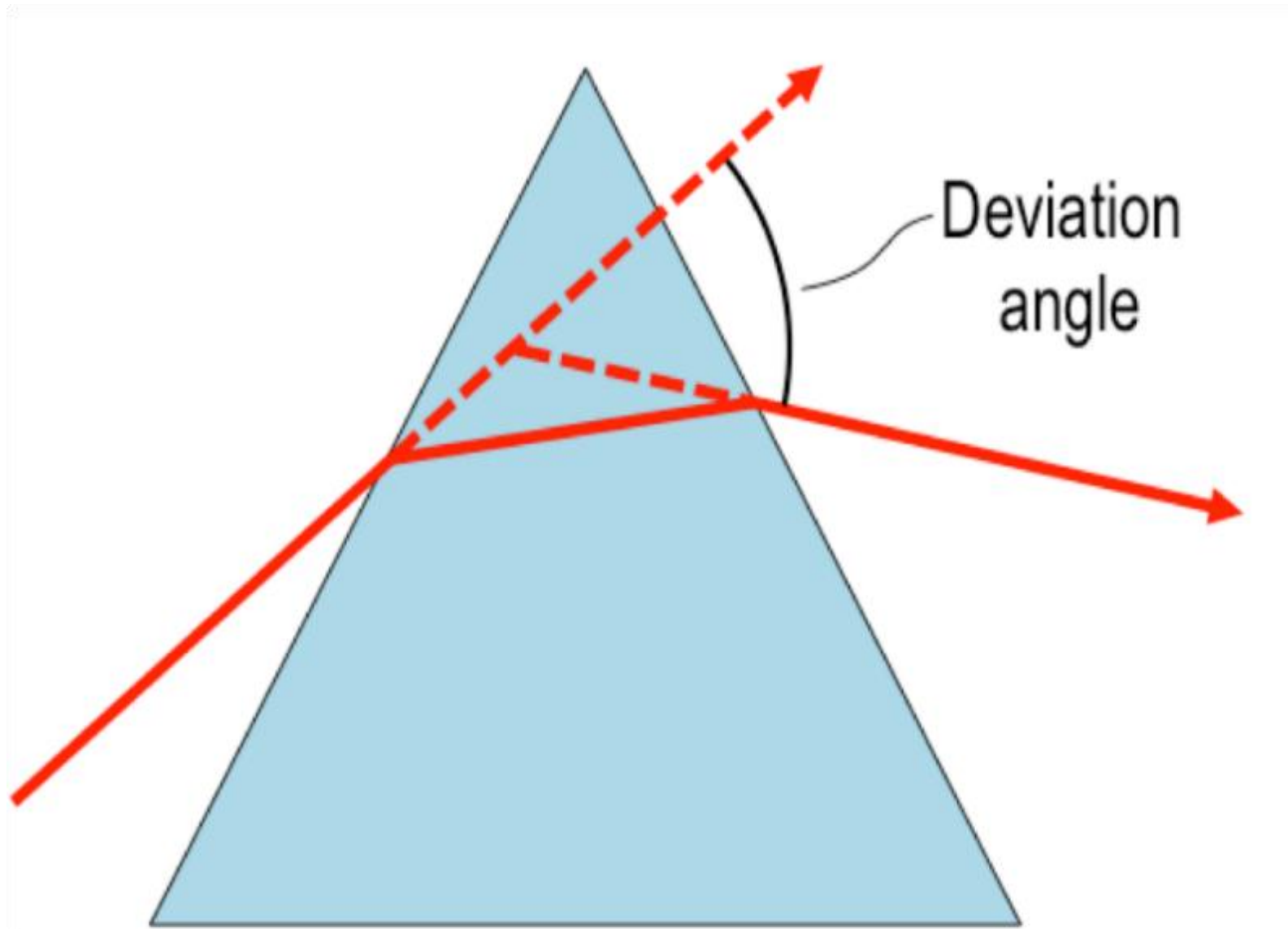
Consider a triangular glass prism. It has two triangular bases and three rectangular lateral surfaces. These surfaces are inclined to each other. The angle between its two lateral faces is called the angle of the prism.

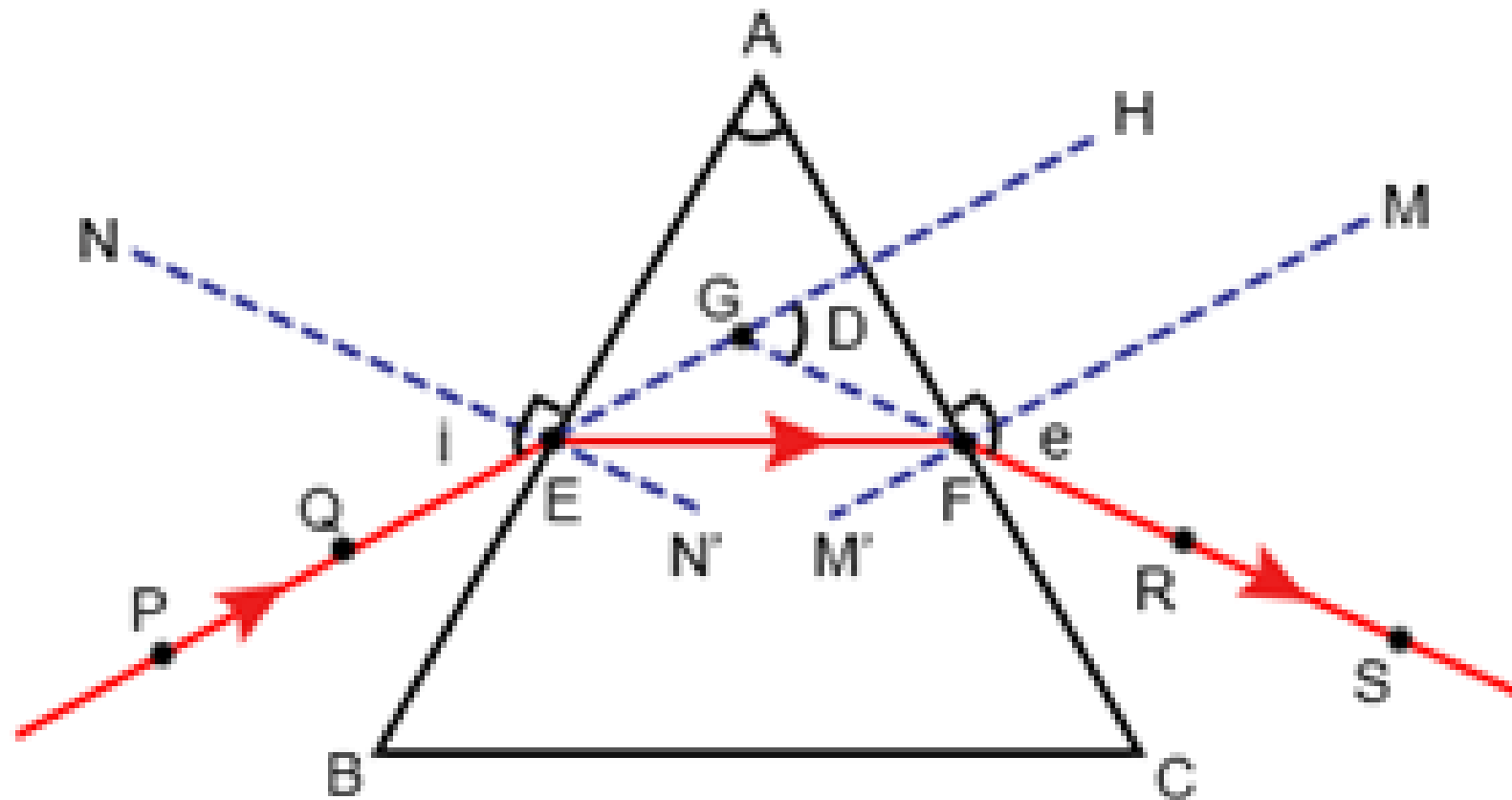


ANGLE OF DEVIATION

Deviation of a ray on passing through a prism depends on the angle of prism, nature of the material of prism and angle of incidence of the ray on one face of the prism.

$$\angle A + \angle D = \angle i + \angle e$$





PE - Incident ray
EF - Refracted ray
FS - Emergent ray
A - Angle of the prism

$\angle i$ - Angle of incidence
 $\angle r$ - Angle of refraction
 $\angle e$ - Angle of emergence
 $\angle D$ - Angle of deviation