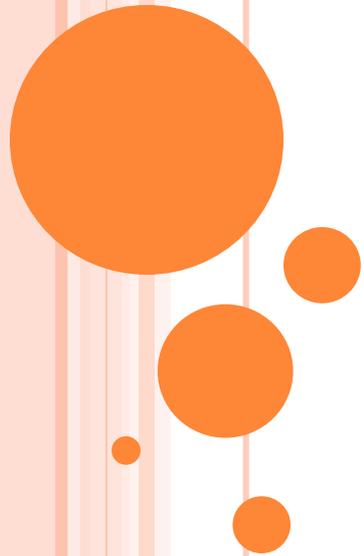
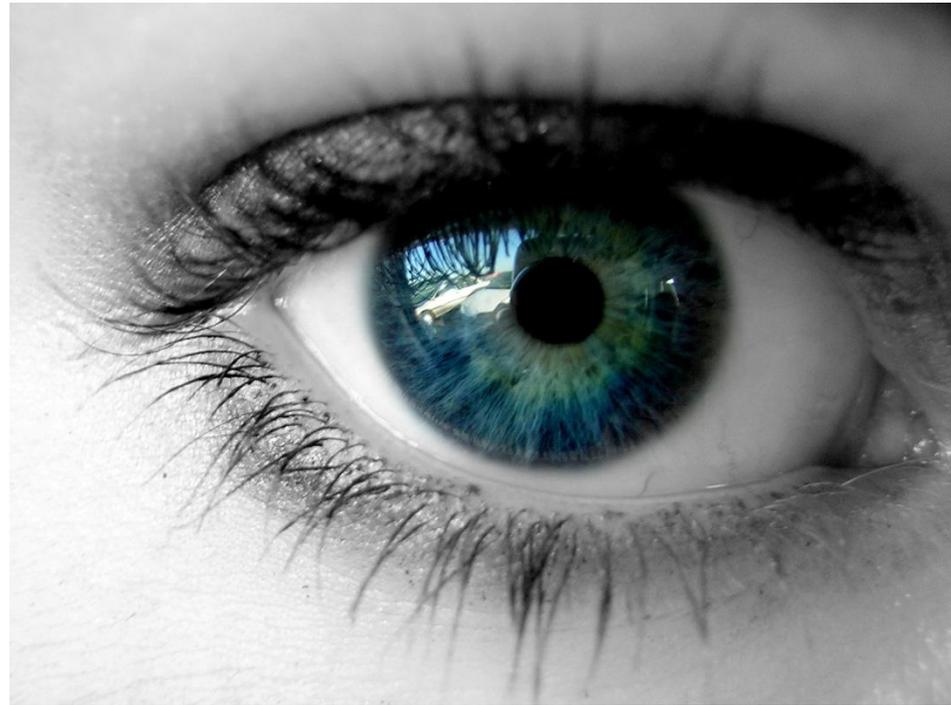
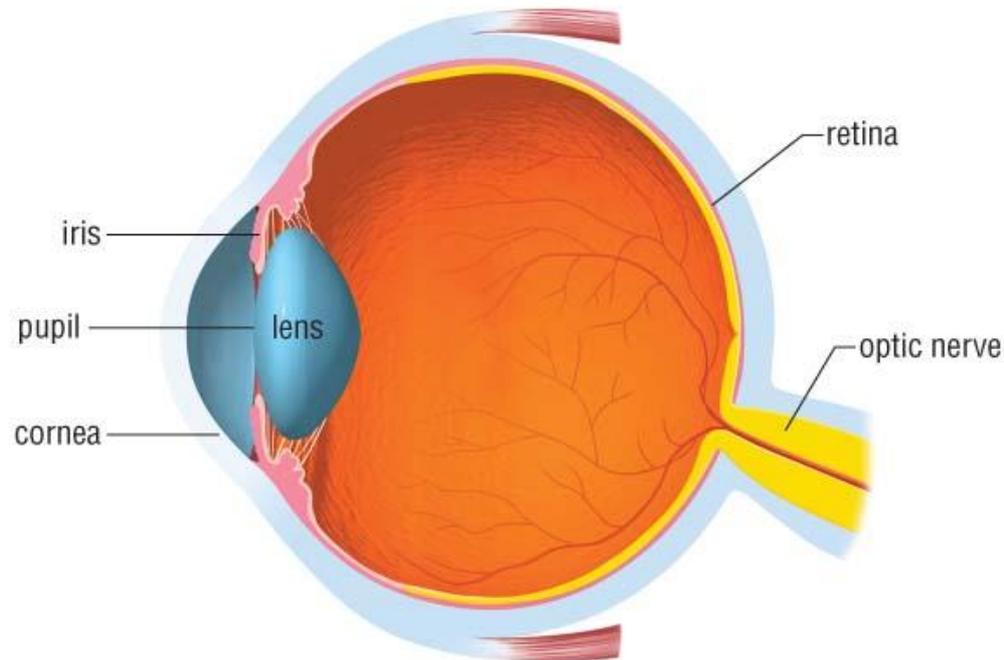


THE HUMAN EYE



THE EYE

- The eye has several different parts that work together to create the image you see.



- The **iris** controls the amount of light that enters the eye. In low light situations (ie: a dark room), the iris is **fully opened**. In bright light (ie: a sunny day), the iris **closes**.

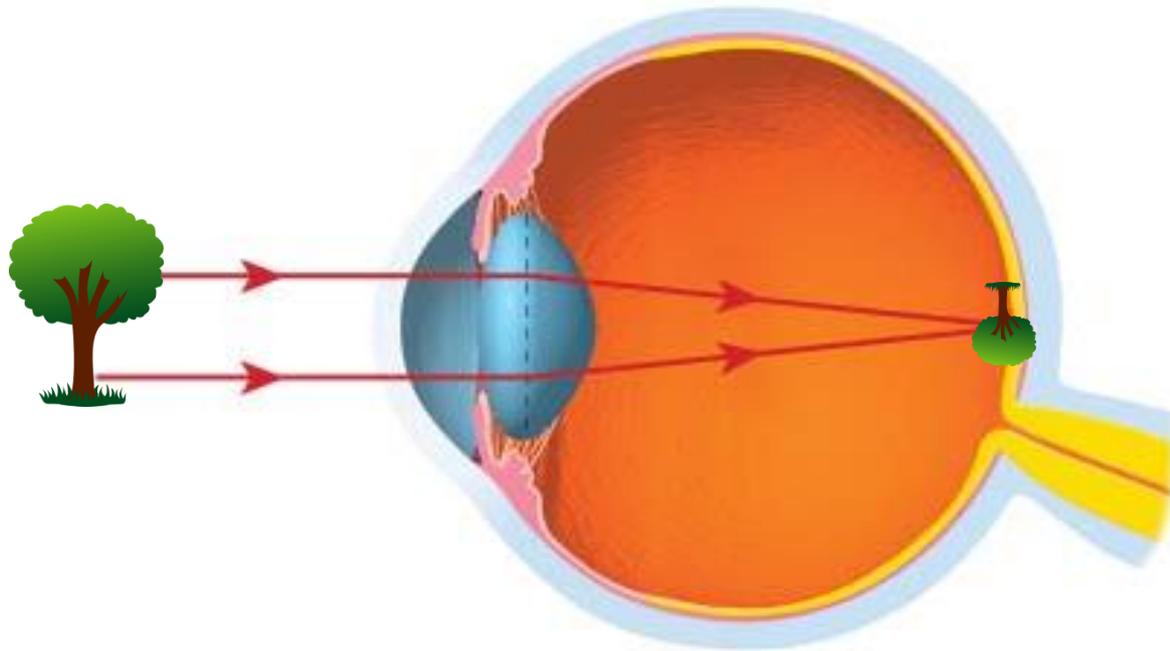


THE EYE

- We actually “see” with our brain, the eye simply gathers the light.
 - The cornea and lens act like a **converging** lens to produce a **smaller, real, inverted image** on the retina.
 - Light rays pass through the **cornea** and the rays **refract**.
 - The rays **refract** again when they pass through the **lens** and then converge on the **retina**.
 - The lens **changes shape** to focus the image on the retina. This process is called **accommodation**
 - Electrical impulses from the retina go to the brain
 - The brain **flips** the image so that the image we see is upright.



THE EYE

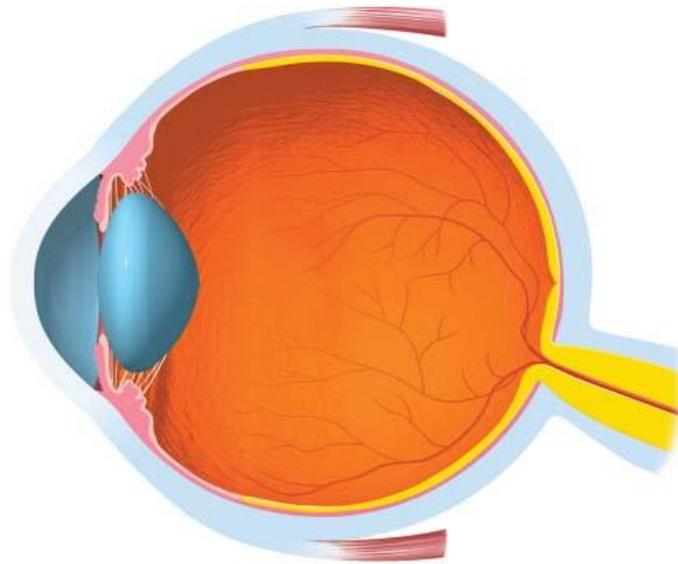


FOCUSING PROBLEMS

- For some people, accommodation does not work well and they cannot focus on objects at every distance.

Myopia (Near-Sightedness)

- Occurs when the image focuses **in front** of the retina. People with this condition cannot see objects that are **distant**



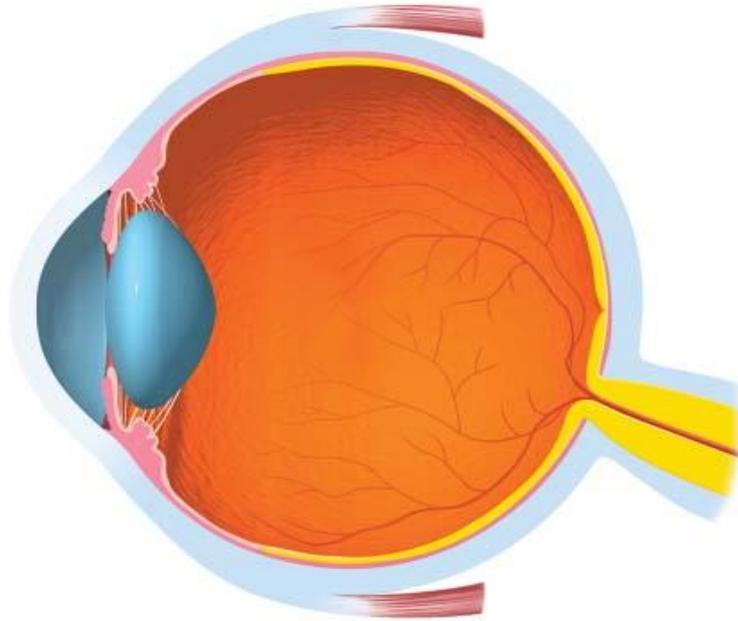
Myopia



FOCUSING PROBLEMS

Myopia (near-sightedness)

- The light refracts **TOO MUCH**. To correct this, a **DIVERGING** lens can be used to focus the light rays in the correct location

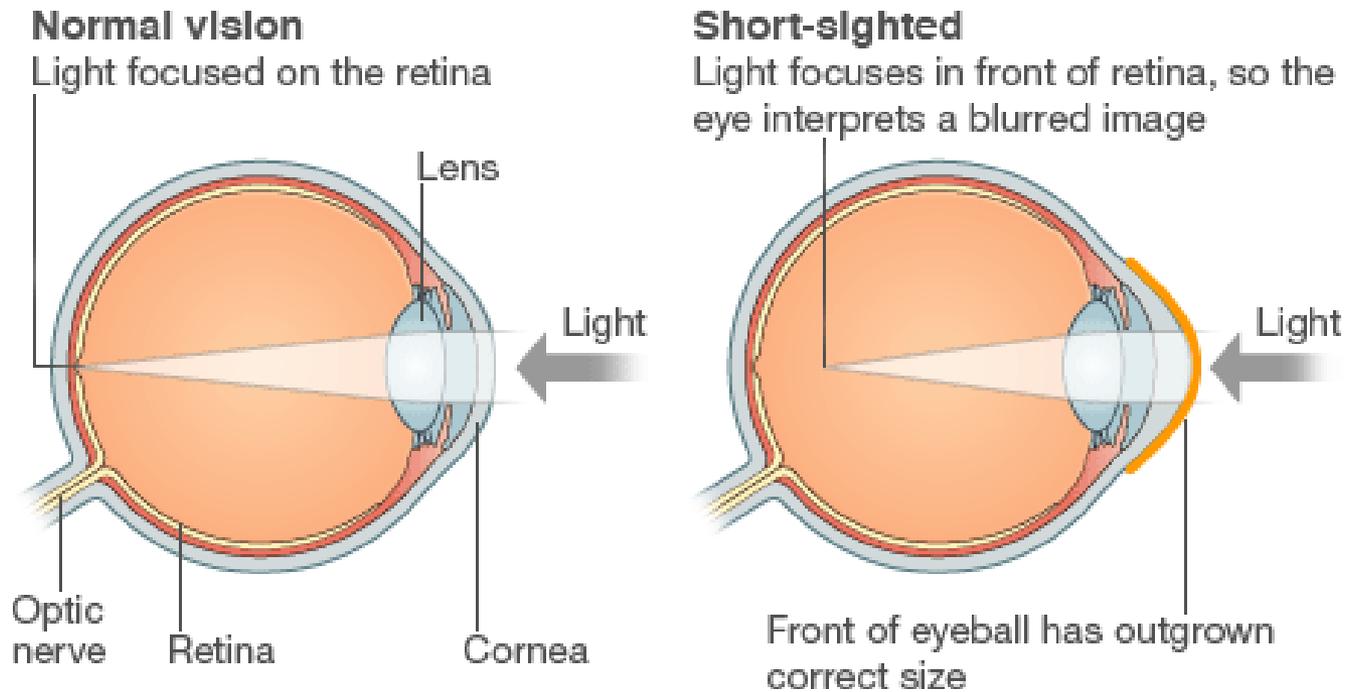


Correcting Myopia



MYOPIA (NEAR-SIGHTEDNESS)

What causes short-sightedness?



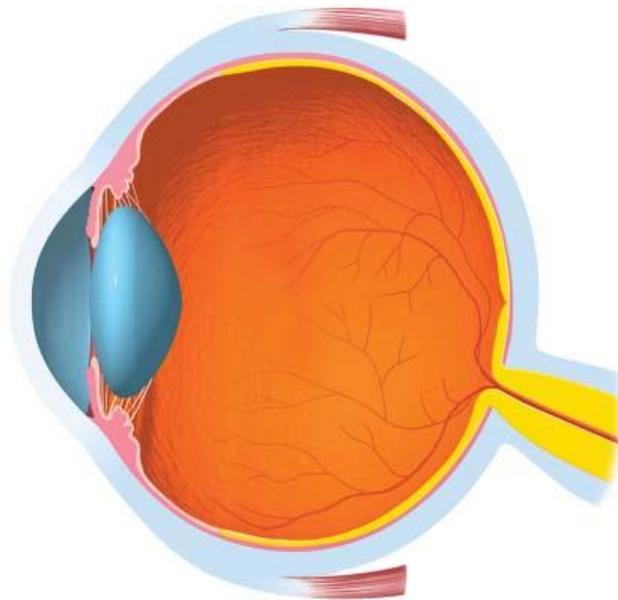
Source: Bupa



FOCUSING PROBLEMS

Hyperopia (far-sightedness)

- Occurs when the image focuses **behind** the retina. People with this condition cannot see objects that are **near**



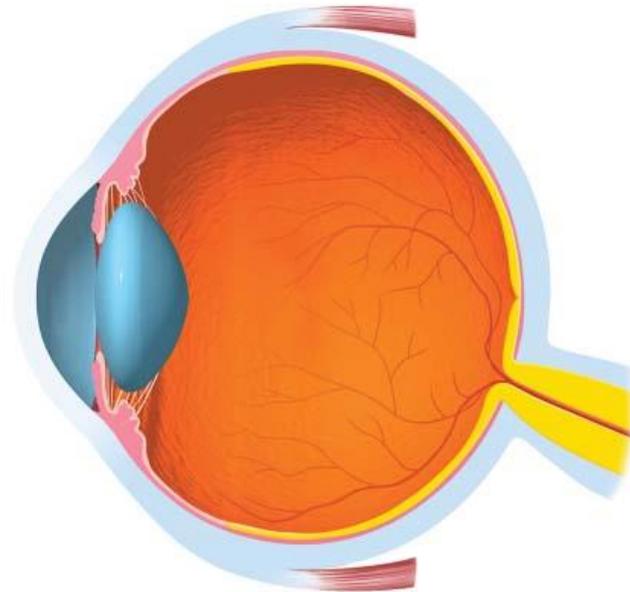
Hyperopia



FOCUSING PROBLEMS

Hyperopia (far-sightedness)

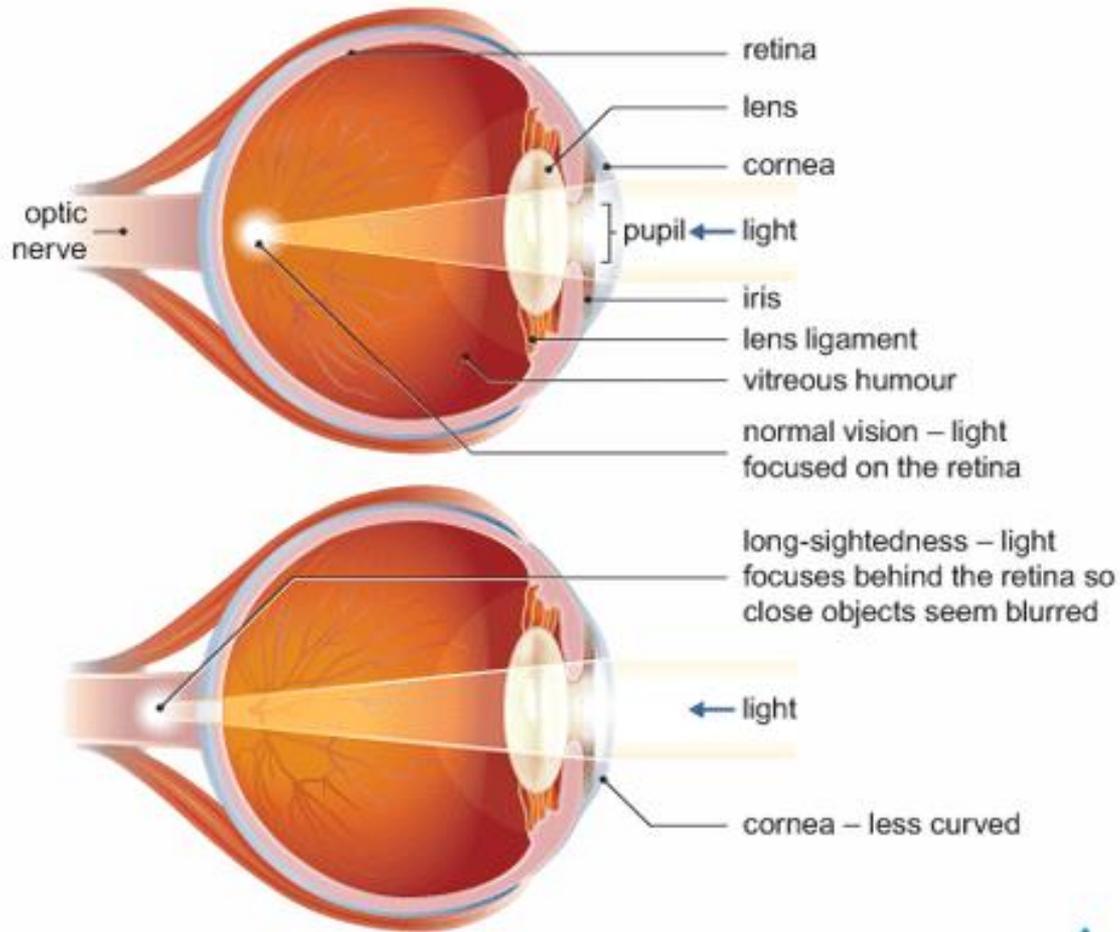
- The light does not refract **ENOUGH**. To correct this, a **CONVERGING** lens can be used to focus the light rays in the correct location



Correcting Hyperopia

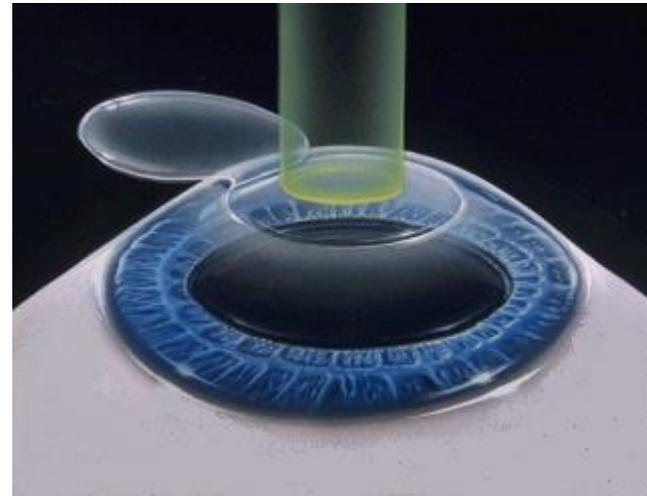


HYPEROPIA (FAR-SIGHTEDNESS)



GLASSES ALTERNATIVES

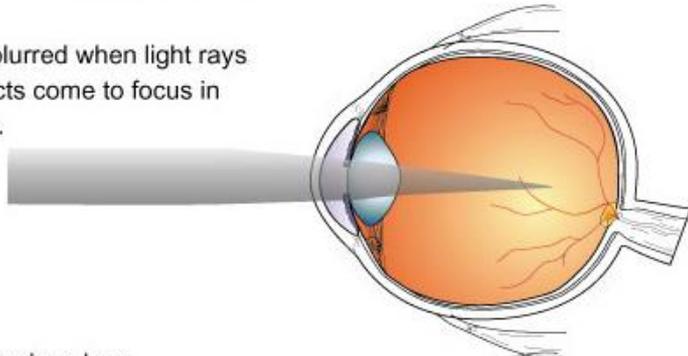
- **Contact lenses** work the same way as glasses – you can have a diverging lens or a converging lens. These lenses are much **thinner** than glasses because the lens is **much closer** to the eye.
- **Laser eye surgery** can also correct myopia and hyperopia. A laser **reshapes the cornea** so that the light rays focus properly on the retina.



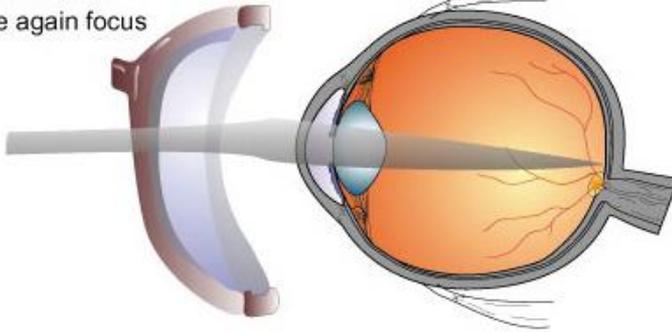
Myopia

(nearsightedness)

Distant vision is blurred when light rays from distant objects come to focus in front of the retina.



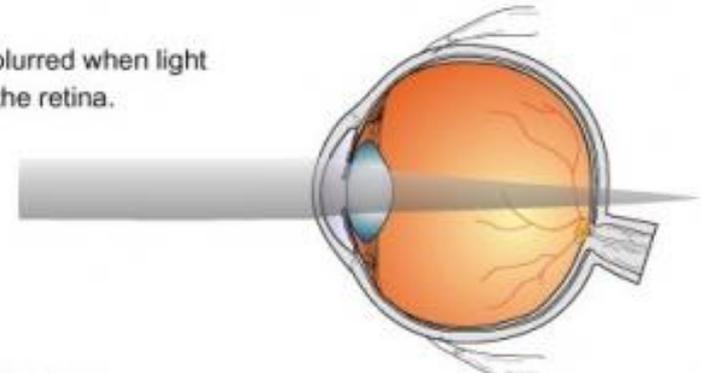
Correction with a minus lens allows light to once again focus on the retina.



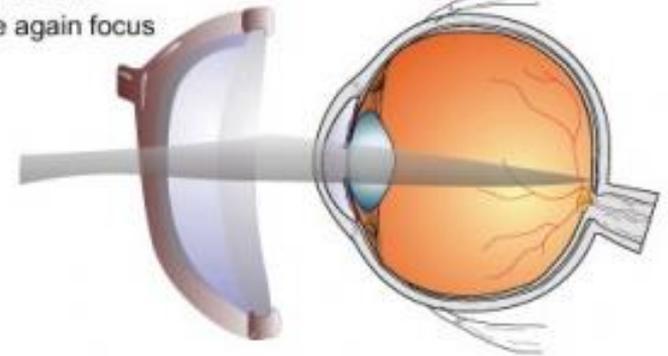
Hyperopia

(farsightedness)

Distance vision is blurred when light rays focus behind the retina.

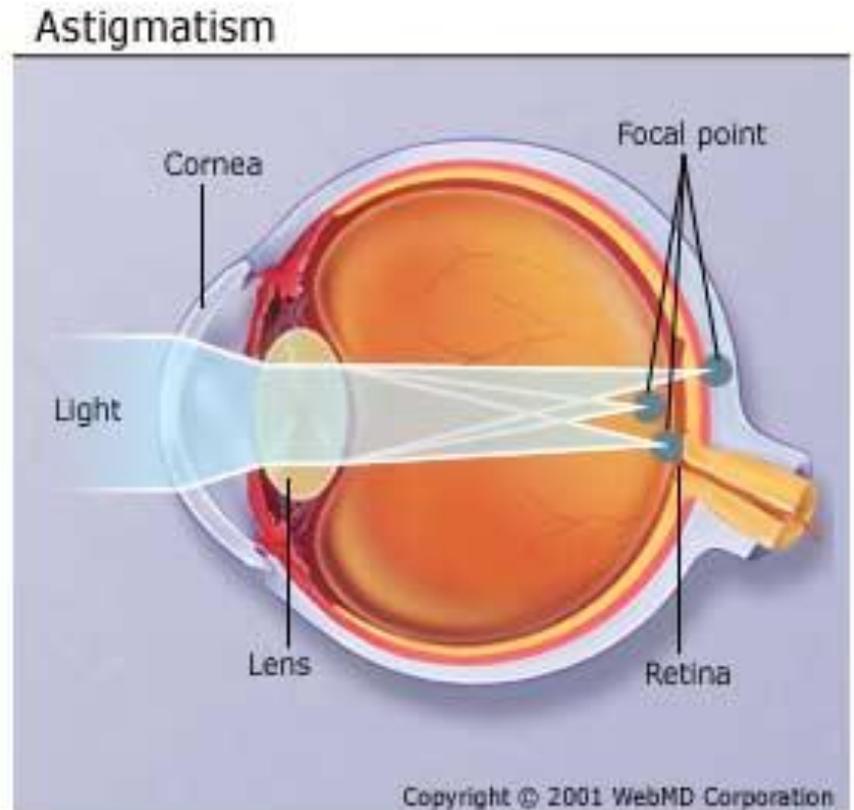
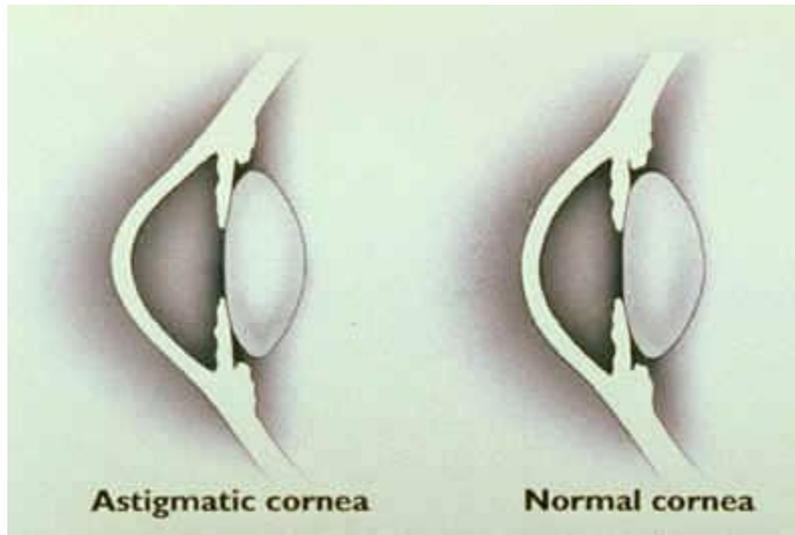


Correction with a plus lens allows light to once again focus on the retina.



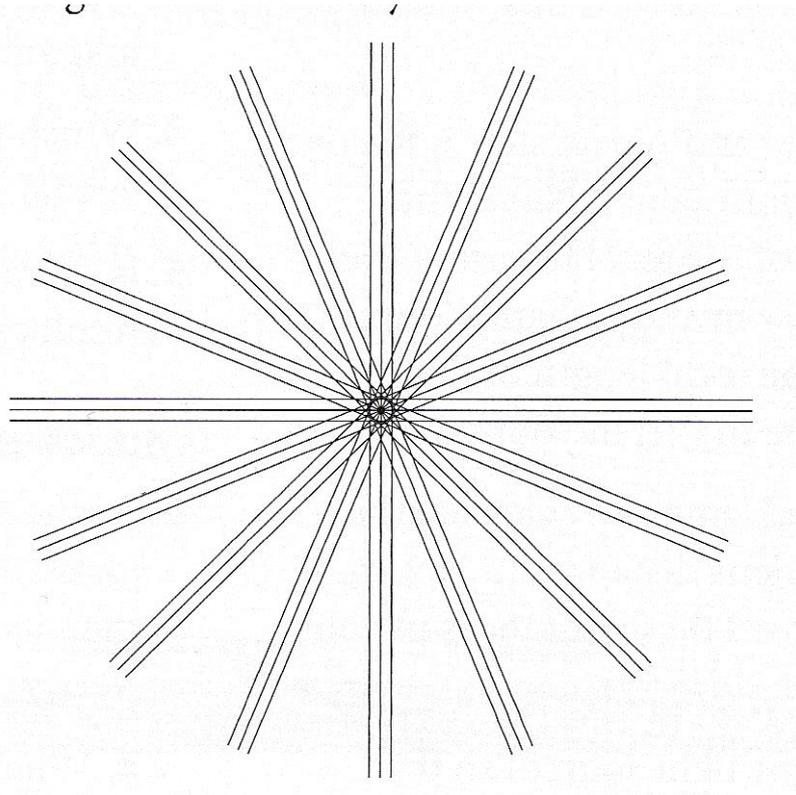
ASTIGMATISM

- Irregular shaped cornea
- Cornea is “pointy”
- Light rays focus all over the place; like having both myopia and hyperopia at the same time.



TEST FOR ASTIGMATISM

- Close one eye and look at the diagram below
- Do some lines appear blurred or darker than others?

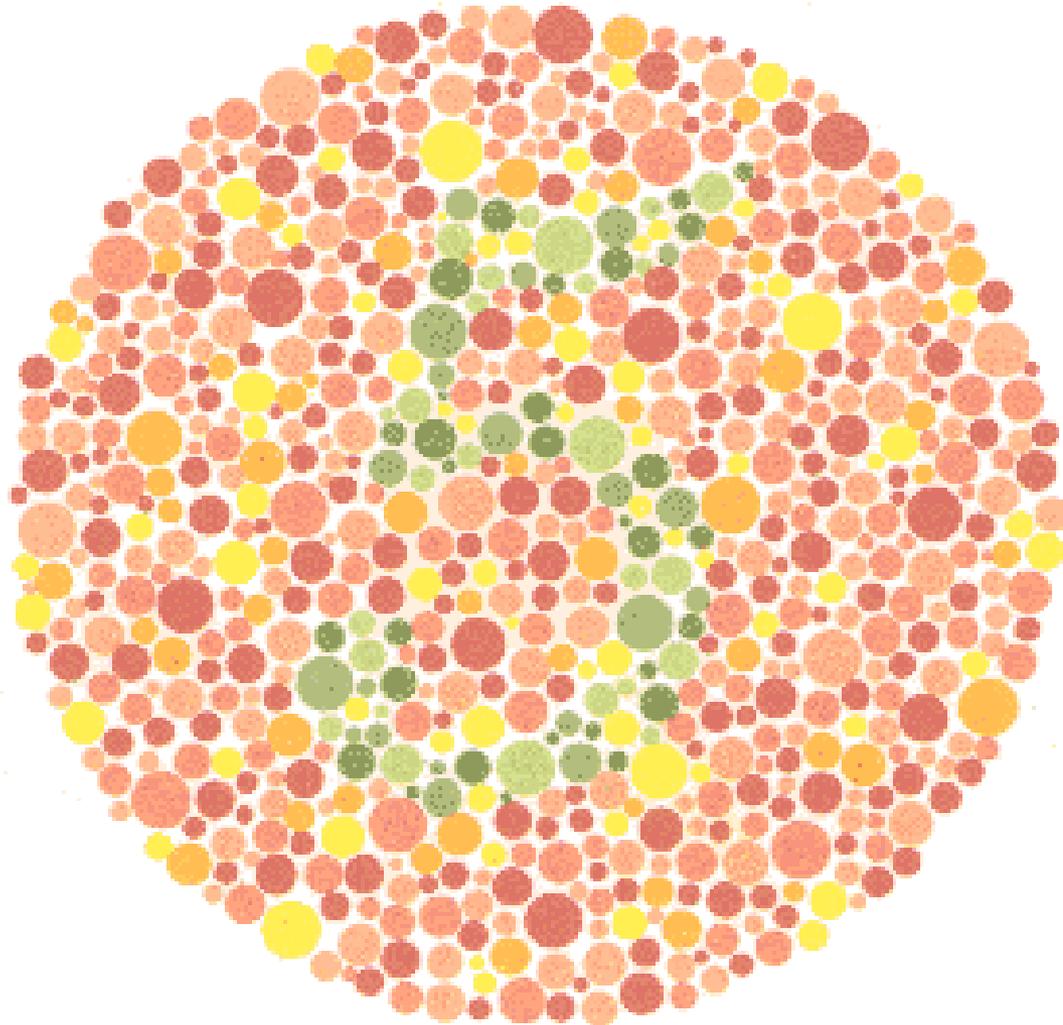


COLOUR BLINDNESS

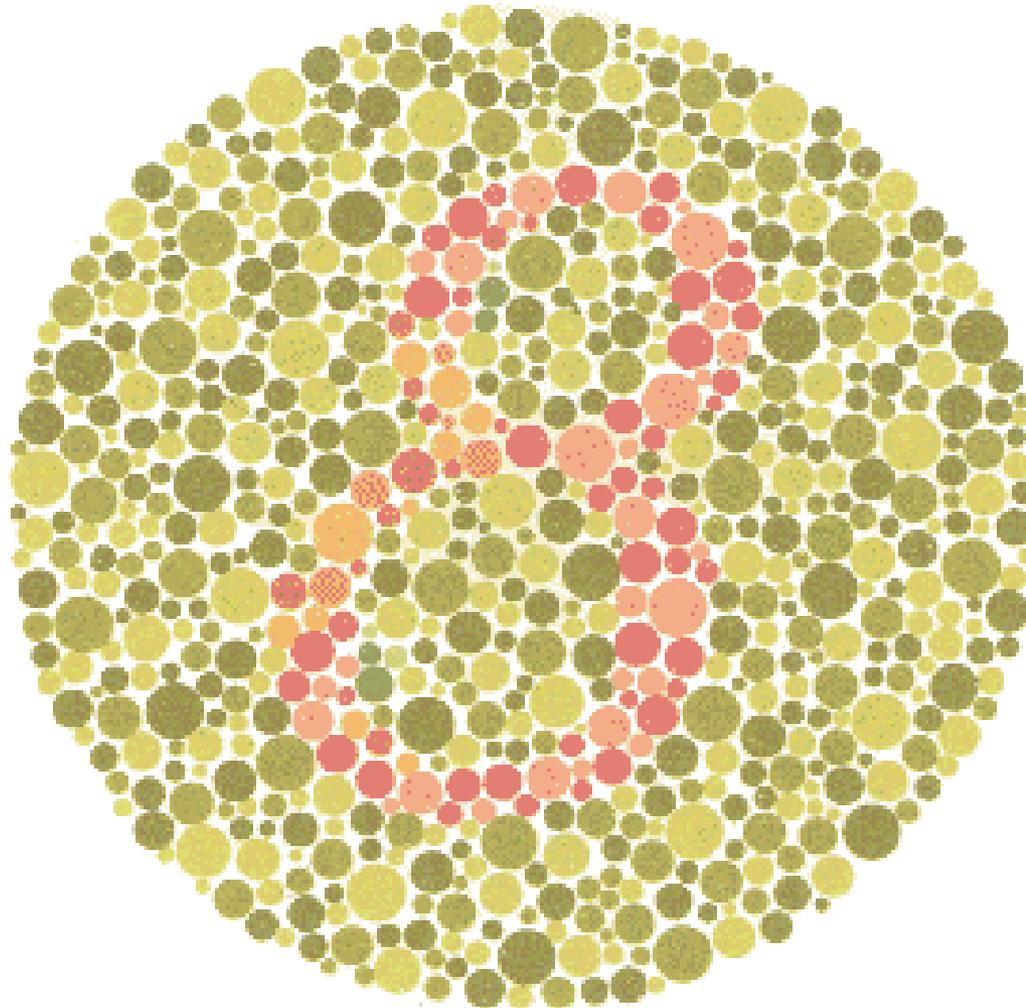
- True colour blindness (can only see shades of grey) is very rare
 - Occurs 1 person in 40 000
- Colour vision deficiency is more common
 - Occurs in 1% of females and 8% of males
 - Ability to distinguish some colours but not others



COLOUR BLINDNESS TESTS



COLOUR BLINDNESS TESTS



ANNNNNND.....

- That's all for optics!

