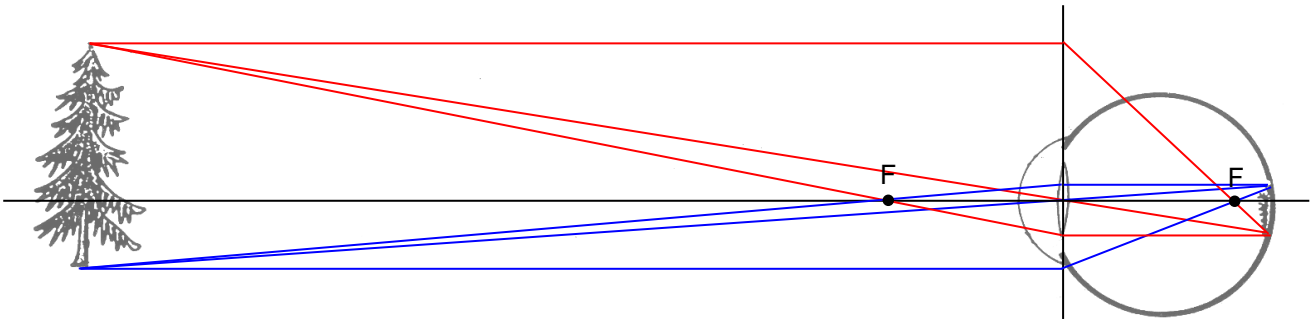
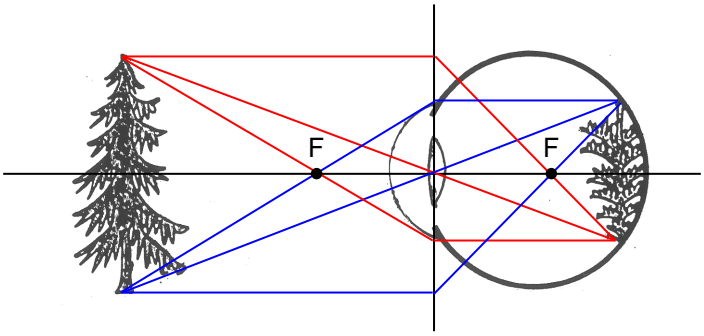
1. a)



b) f = 23 mm, d_o = 130 mm, d_i = 28 mm

$$\frac{1}{f} = \frac{1}{d_o} + \frac{1}{d_i} = \frac{d_i}{d_o \cdot d_i} + \frac{d_o}{d_i \cdot d_o} = \frac{d_i + d_o}{d_o \cdot d_i} \qquad f = \frac{d_o \cdot d_i}{d_o + d_i} = \frac{130\text{ mm} \cdot 28\text{ mm}}{130\text{ mm} + 28\text{ mm}} = \underline{23\text{ cm}}\ \checkmark$$

a)



b) f = 16 mm, d_o = 41 mm, d_i = 26 mm

$$\frac{1}{f} = \frac{1}{d_o} + \frac{1}{d_i} = \frac{d_i}{d_o \cdot d_i} + \frac{d_o}{d_i \cdot d_o} = \frac{d_i + d_o}{d_o \cdot d_i} \qquad f = \frac{d_o \cdot d_i}{d_o + d_i} = \frac{41\text{ mm} \cdot 26\text{ mm}}{41\text{ mm} + 26\text{ mm}} = \underline{16\text{ cm}}\ \checkmark$$

2. If the eyeball's length is too **short**, light converges to a point **behind** retina. **Close** objects cannot be seen clearly while **distant** objects might be clear. This is called **farsightedness** or **hyperopia**.

   Correction of this vision defect requires a **converging** lens to **increase** the power of the cornea – lens combination, causing the light to converge to a point on the retina instead of **behind** it.

3. If the eyeball's length is too **long**, light converges to a point **in front of** the retina. **Distant** objects cannot be seen clearly while **close** objects might be clear. This is called **nearsightedness** or **myopia**.

   Correction of this vision defect requires a **diverging** lens to **decrease** the power of the cornea – lens combination, causing the light to converge to a point on the retina instead of **in front of** it.

4. a) converging (positive focal length)

   b) far sighted (because the eyeball is too short a converging lens is needed, see 2.)

   c) $P = \frac{1}{f} = \frac{1}{0.250\ \text{m}} = \underline{\underline{4.00\ \text{D}}}$

5. a) diverging (negative focal length)

   b) near sighted (because the eyeball is too long a diverging lens is needed, see 3.)

   c) left: $f = \frac{1}{P} = \frac{1}{-1.25\ \text{D}} = \underline{\underline{-0.800\ \text{m}}} = \underline{\underline{-80.0\ \text{cm}}}$ right: $f = \frac{1}{P} = \frac{1}{-2.00\ \text{D}} = \underline{\underline{-0.500\ \text{m}}} = \underline{\underline{-50.0\ \text{cm}}}$