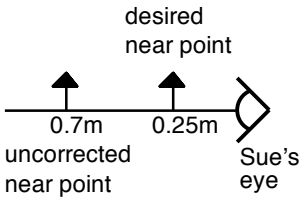
Examples

1. Sue cannot focus clearly on anything that is closer than 0.7 m from her eye. She would like to have glasses that would allow her to focus on objects (especially words on a printed page or computer screen) that are located 25 cm from her eye (the near point for "normal vision"). (a) Where should her glasses place the virtual image of her computer screen when her eyes are about 25 cm from the screen? (b) What lens prescription in Diopters does she need to accomplish this? Be sure to state whether the lenses are converging or diverging and that the algebraic sign (plus or minus) of the power of the lens is consistent with this.



Solution

(a) Sue can focus clearly no closer than 70 cm, so in order to focus clearly on any object closer than 70 cm, she would need to see a virtual image of the closer object located at least 70 cm from her eyes.

(b) We need a lens which produces a virtual image *further* from the lens than the object. A converging lens will do this if the object distance is less than the focal length of the lens. (A converging lens also makes a virtual image, but the image is always *closer* to the lens than is the object.) We use the thin lens formula to calculate the focal length of the required lens, which we then invert to get the power in Diopters. Since we need the focal length in units of meters, we put everything in meters to begin with.

$$\begin{aligned} \text{Power (in Diopters)} &= 1/f = 1/o + 1/i \\ &= 1/.25\text{m} + (-)1/.7\text{m} \\ &= 4 - 1.4 \\ &= +2.6\ \text{D} \end{aligned}$$