

### Answer on Question #55519-Physics-Optics

A convex lens forms a real image of a point object at a distance of 50cm from convex lens. A concave lens is placed 10 cm behind the convex lens on the image side. On placing a plane mirror on the image side and facing concave lens, it is observed that the final image now coincides with the object itself. The focal length of the concave lens is-

#### Solution

The image coincides with the object only if the ray retraces its path. So the rays are perpendicular to the plane mirror. This means that the image is formed at infinity by the concave lens when there is no mirror.

$$v = -\infty$$

Since the image supposed to form 50 cm from the convex lens and the concave lens is 10 cm away from the convex lens,  $u = 10 \text{ cm} - 50 \text{ cm} = -40 \text{ cm}$ .

Using the lens formula, the focal length can be calculated.

$$\frac{1}{u} + \frac{1}{v} = \frac{1}{f}$$

$$\frac{1}{40} + \frac{1}{-\infty} = \frac{1}{f} \rightarrow f = 40 \text{ cm}.$$

**Answer: 40 cm.**