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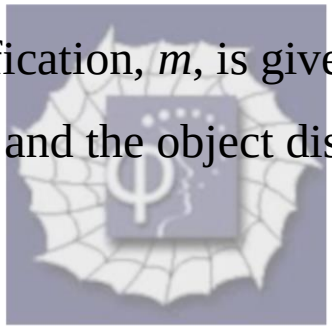
**Problem 44.1 (RHK)**

*A concave shaving mirror has a radius of curvature of* 35 cm. *It is positioned do that the image of a man's face is* 2.7 *times the size of his face. We have to find the distance of the mirror from the man's face.*

**Solution:**



The lateral magnification, *m*, is given in terms of the image distance, $i$, and the object distance, *o*, by the relation

$$m = -\frac{i}{o}.$$

In a shaving mirror the image will be erect. Therefore, image distance, $i$, will be negative and the image will be virtual. As the lateral magnification of the size of the man's face seen in the concave mirror is 2.7, we have

$$i = -2.7 \times o,$$

where *o* is the distance of the man's face from the mirror (cm).

The mirror equation is

$$\frac{1}{o}+\frac{1}{i}=\frac{2}{r}.$$

In a concave mirror the centre of curvature is in the *R*-side. In the standard sign convention, textbook Physics by Halliday Resnick and Krane, the radius of curvature r will be positive. We thus have

$$\frac{1}{o}-\frac{1}{2.7o}=\frac{2}{35}\ \text{cm}^{-1},$$

or

$$\frac{1.7}{2.7\text{o}}=\frac{2}{35}\ \text{cm}^{-1},$$

and

$$o=\frac{1.7\times 35}{2\times 2.7}\ \text{cm}=11.0\ \text{cm}.$$