

42. (a) The first image is figured using Eq. 35-8, with $n_1 = 1$ (using the rounded-off value for air) and $n_2 = 8/5$.

$$\frac{1}{p} + \frac{8}{5i} = \frac{1.6 - 1}{r}$$

For a “flat lens” $r = \infty$, so we obtain $i = -8p/5 = -64/5$ (with the unit cm understood) for that object at $p = 10$ cm. Relative to the second surface, this image is at a distance of $3 + 64/5 = 79/5$. This serves as an object in order to find the final image, using Eq. 35-8 again (and $r = \infty$) but with $n_1 = 8/5$ and $n_2 = 4/3$.

$$\frac{8}{5p'} + \frac{4}{3i'} = 0$$

which produces (for $p' = 79/5$) $i' = -5p'/6 = -79/6 \approx -13.2$. This means the observer appears $13.2 + 6.8 = 20$ cm from the fish.

- (b) It is straightforward to “reverse” the above reasoning, the result being that the final fish-image is 7.0 cm to the right of the air-wall interface, and thus 15 cm from the observer.