33.7. **(a)** The reflected ray makes an angle of 47.5° with the surface of the glass.
(b) The refracted ray makes an angle of 66.0° with the surface of the glass.

33.12. **(a)** θ_{water}=25.5°
(b) This calculation has no dependence on the glass.

33.19. **(a)** θ_b=58.1°
(b) θ_b=22.8°

33.23. $\theta_a = 24.4°$.

33.47. n = 1.84

33.52. n_b=1.40

34.2. h_{tree}=3.24 m

34.24. **(a)** f=-48.0 cm, $f < 0$ and the lens is diverging.
(b) The image is 6.38 mm. $m > 0$ and the image is erect.
(c) The principal-ray diagram is sketched in Figure 34.24.

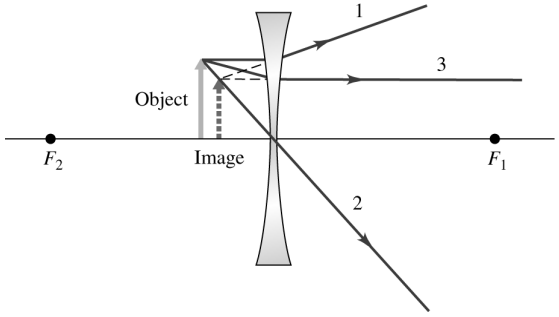

Figure 34.24

34.28.
(a) $s' = 5.93$ m.
(b) The image is inverted since both the image and object are real $(s' > 0, s > 0)$.
(c) f = 0.0732 m, and the lens is converging.

34.96. **(a)** $\frac{1}{s_1}+\frac{1}{s_1'}=\frac{1}{f_1}\Rightarrow\frac{1}{s_1'}=\frac{1}{f_1}-\frac{1}{s_1}$ and $\frac{1}{s_2}+\frac{1}{s_2'}=\frac{1}{-s_1'}+\frac{1}{s_2'}=\left(\frac{1}{s_1}-\frac{1}{f_1}\right)+\frac{1}{s_2'}=\frac{1}{f_2}$. But overall for the lens system, $\frac{1}{s_1}+\frac{1}{s_2'}=\frac{1}{f}\Rightarrow\frac{1}{f}=\frac{1}{f_2}+\frac{1}{f_1}$.
(b) $f = 8.93$ cm.

34.99. f =-26.7 cm.