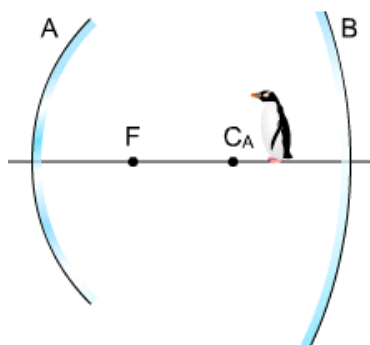


Homework 13

- Two 3.0 meter-tall planar mirrors are placed facing and parallel to each other 0.75 m apart. If a ray of light just passes the bottom edge of one mirror and strikes the other at an incident angle of 10° , how many reflections will the light make before exiting this "hall"?
- A bartender keeps an eye on her customers while her back is turned by way of a mirror mounted behind the bar. The mirror is 0.580 m wide and she is standing 0.750 m from it. How wide an expanse of the parallel wall opposite the mirror can she see in the mirror if the opposite wall is 6.00 m away from the mirror?
- Use the mirror equation to show that for a planar mirror, the magnitude of the image distance equals the magnitude of the object distance. Hint: A planar mirror can be thought of as a spherical mirror with an infinite radius of curvature.
- A mirror produces an inverted image 2.80 cm tall when a 5.60 cm tall object is 25.0 cm away from it. (a) What is the image distance? State your answer with the correct sign. (b) What is the focal length of the mirror? State your answer with the correct sign.
- An object and its image are both 12.4 cm from a spherical mirror, and on the same side of the mirror. (a) Is the mirror concave or convex? (b) What is the mirror's focal length? State your answer with the correct sign.
- You look into a shaving mirror and the upright image of your face is 40.0 cm away from you. The image has a magnification of 1.50. (a) How far away are you from the mirror? (b) What is the radius of curvature?
- Two concave mirrors are arranged as shown in the illustration. Their focal points coincide at point F, and the center of curvature of mirror A is indicated. An object is placed between the mirrors as shown. Consider the image created by mirror B of an image created by mirror A of the object. In other words, first imagine that mirror A creates an image of the object. The image created by A is then used as the object for mirror B to create the "final" image. Ignore all other images created by the mirrors. (a) Is the final image upright or inverted compared to the object? It may help to draw a ray diagram. (b) Is the final image real or virtual? (c) If the focal length of mirror A is 6.00 cm, the focal length of mirror B is 13.0 cm, and the object is 14.0 cm from mirror A, how far is the final image from the object (give a positive answer)?



Homework 13

8. The focal length of a thin lens is 0.110 m. You want to use it to produce a real image at 0.600 meters from the lens. How far from the lens should the object be placed?
9. The focal length of a thin lens is -9.00 cm. You place an object 15.0 cm from the lens. (a) Is the image produced real or virtual? (b) What is the image distance (include the correct sign)?
10. You are making a thin lens. The near surface (the surface on the object side) has a radius of curvature of $+5.00$ cm and the far surface has a radius of curvature of $+6.00$ cm. What is the focal length of the lens if the index of refraction of the material is 1.60? What is the focal length if the near and far surfaces are interchanged?
11. A thin lens has a near surface with a radius of curvature of -5.00 cm and a far surface with a radius of curvature of $+7.00$ cm. (a) Is the lens converging or diverging? (b) What is the focal length of the lens if the index of refraction of the material is 1.74? (c) What is the focal length of the other focal point? (d) what would be the focal length if you place the lens in water ($n = 1.33$)?
12. A camera has a lens of focal length 50.0 mm and is focused on an object 0.800 m from the lens. (a) To focus on an object effectively at infinity, will the lens have to move toward or away from the film? (b) How far will the lens have to move? Give the answer in millimeters.
13. Two converging thin lenses with focal lengths of 0.30 m and 0.50 m are separated by 0.20 m. A candle is placed on the principal axis 0.50 m in front of the first lens with a focal length of 0.30 m. Locate the resulting image with respect to the second lens and its overall magnification m .