fashion. The third ray, however, is drawn so that if it were extended, it would connect the focal point in front of the lens, the tip of the object, and the lens in a straight line. To determine where the image is, draw lines extending from the rays exiting the lens back to the point where they would appear to have originated to an observer on the back side of the lens (these lines are dashed in the sixth diagram in **Table 3**).

Diverging lenses produce virtual images from real objects

A diverging lens creates a virtual image of a real object placed anywhere with respect to the lens. The image is upright, and the magnification is always less than one; that is, the image size is reduced. Additionally, the image appears inside the focal point for any placement of the real object.

Did you know?

The lens of a camera forms an inverted image on the film in the back of the camera. Two methods are used to view this image before taking a picture. In one, a system of mirrors and prisms reflects the image to the viewfinder, making the image upright in the process. In the other method, the viewfinder is a diverging lens that is separate from the main lens system. This lens forms an upright virtual image that resembles the image that will be projected onto the film.

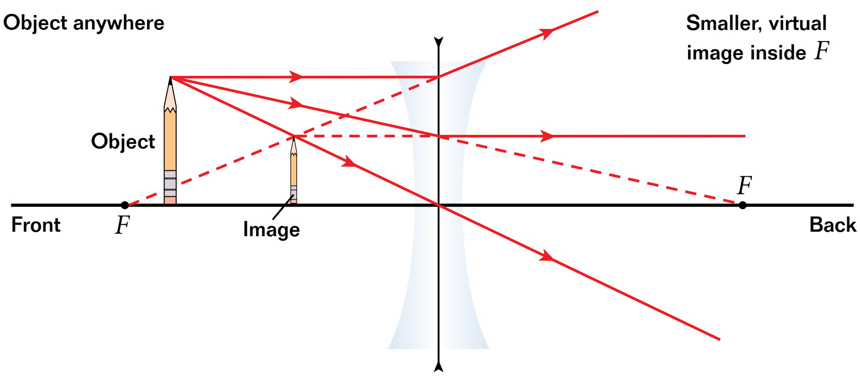

Figure 7
The image created by a diverging lens is always a virtual, smaller image.

The ray diagram shown in **Figure 7** for diverging lenses was created using the rules given in **Table 2.** The first ray, parallel to the axis, appears to come from the focal point on the same side of the lens as the object. This ray is indicated by the oblique dashed line. The second ray passes through the center of the lens and is not refracted. The third ray is drawn as if it were going to the focal point in back of the lens. As this ray passes through the lens, it is refracted parallel to the principal axis and must be extended backward, as shown by the dashed line. The location of the tip of the image is the point at which the three rays appear to have originated.

THE THIN-LENS EQUATION AND MAGNIFICATION

Ray diagrams for lenses give a good estimate of image size and distance, but it is also possible to calculate these values. The equation that relates object and image distances for a lens is called the *thin-lens equation* because it is derived using the assumption that the lens is very thin. In other words, this equation applies when the lens thickness is much smaller than its focal length.