

A set of sign conventions for the three variables must be established for use with the mirror equation. The region in which light rays reflect and form real images is called the front side of the mirror. The other side, where light rays do not exist—and where virtual images are formed—is called the back side of the mirror.

Object and image distances have a positive sign when measured from the center of the mirror to any point on the mirror's front side. Distances for images that form on the back side of the mirror always have a negative sign. Because the mirrored surface is on the front side of a concave mirror, its focal length always has a positive sign. The object and image heights are positive when both are above the principal axis and negative when either is below.

Magnification relates image and object sizes

Unlike flat mirrors, curved mirrors form images that are not the same size as the object. The measure of how large or small the image is with respect to the original object's size is called the *magnification* of the image.

If you know where an object's image will form for a given object distance, you can determine the magnification of the image. Magnification, M , is defined as the ratio of the height of the bulb's image to the bulb's actual height. M also equals the negative of the ratio of the image distance to the object distance. If an image is smaller than the object, the magnitude of its magnification is less than 1. If the image is larger than the object, the magnitude of its magnification is greater than 1. Magnification is a unitless quantity.

EQUATION FOR MAGNIFICATION

$$M = \frac{h'}{h} = -\frac{q}{p}$$

$$\text{magnification} = \frac{\text{image height}}{\text{object height}} = -\frac{\text{image distance}}{\text{object distance}}$$

For an image in front of the mirror, M is negative and the image is upside down, or *inverted*, with respect to the object. When the image is behind the mirror, M is positive and the image is *upright* with respect to the object. The conventions for magnification are listed in **Table 2**.

Table 2 Sign Conventions for Magnification

Orientation of image with respect to object	Sign of M	Type of image this applies to
upright	+	virtual
inverted	−	real