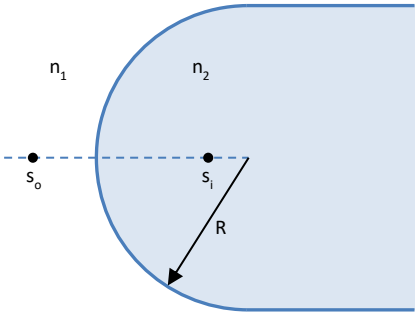
CONCEPT: REFRACTION AT SPHERICAL SURFACES



- A single light ray passing through a transparent surface undergoes refraction
  - Many light rays passing through will also undergo refraction
  - An object placed in front of a spherical surface will form an image
  - These images can be real or virtual, based on the shape of the surface

- The IMAGE DISTANCE for a spherical surface is given by the following equation:

$$\frac{n_1}{s_o} + \frac{n_2}{s_i} = \frac{n_2 - n_1}{R}$$

- The radius of curvature, R, uses the following sign conventions:
  - For a convex surface, $R > 0$
  - For a concave surface, $R < 0$

- We use the same sign conventions for the image distance:
  - If $s_i > 0$ → The image is [REAL / VIRTUAL] and [UPRIGHT / INVERTED]
  - If $s_i < 0$ → The image is [REAL / VIRTUAL] and [UPRIGHT / INVERTED]

EXAMPLE: An object in air is placed 5 cm in front of a transparent, concave surface. If the radius of curvature is 7 cm, and the refractive index behind the surface is 1.44, where is the image located? Is the image real or virtual?

PRACTICE: IMAGE FORMATION BETWEEN GLASS AND WATER

An object is embedded in glass as shown in the following figure. If the glass has a concave face, and is embedded in water, where will the image be located? Will the image be real or virtual?