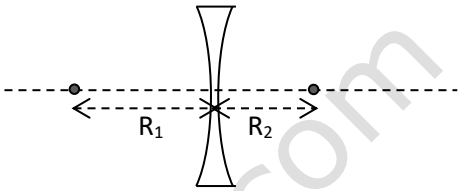
Q- A double concave lens of index of refraction 1.45 has radii of magnitudes 31 cm and 21 cm. An object is located 80 cm to the left of the lens. Find the following answers.

(a) the focal length of the lens

The focal length of the lens can be calculated using lens maker's formula as

$$\frac{1}{f} = (\mu - 1)\left(\frac{1}{R_1} - \frac{1}{R_2}\right)$$

or $$\frac{1}{f} = (1.45 - 1)\left(\frac{1}{-31} - \frac{1}{+21}\right) = -\frac{23.4}{651}$$



Or f = - 27.82 cm

(b) the location of the image

The image distance can be given by using lens formula as

$$\frac{1}{v} - \frac{1}{u} = \frac{1}{f}$$

Here using the signs according to sign conventions

u = -80 cm

v =?

f = - 27.82 cm

we have $$\frac{1}{v} - \frac{1}{-80} = \frac{1}{-27.82}$$

or $$\frac{1}{v} = -\frac{1}{80} - \frac{1}{27.82} = \frac{-27.82-80}{80*27.82} = -\frac{107.82}{2225.6}$$

gives v = - 2225.6/107.82 = - 20.64 cm

the negative sign shows that the image is on the left, same side as that of object and hence virtual.

(c) the magnification of the image

For the lens the magnification is given by

$$m = \frac{I}{O} = \frac{v}{u} = \frac{-20.64}{-80} = 0.26$$

The positive magnification means that the image is erect.

(d) Describe the image.

The image is virtual and erect or upright, diminished and on the same side of the object.