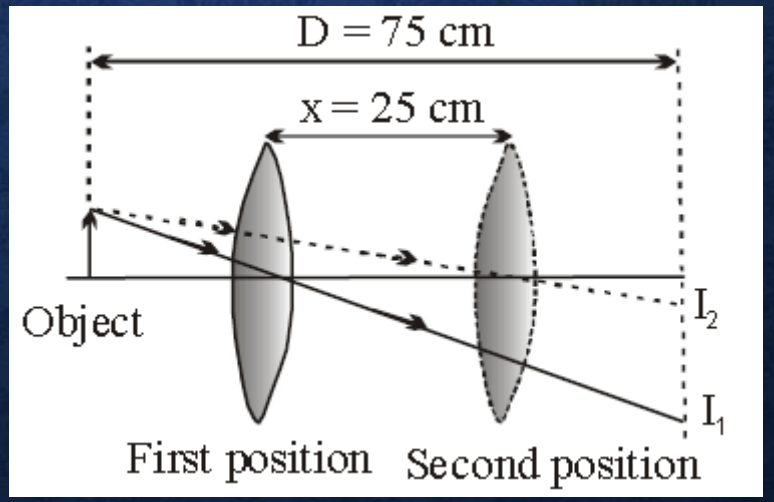
A convex lens when placed in the first position forms a real image of an object on a fixed screen. The distance between the object and the screen is 75 cm. On displacing the lens from first position by 25 cm to the second position, again a real image is formed on the screen. Then the focal length of the lens is

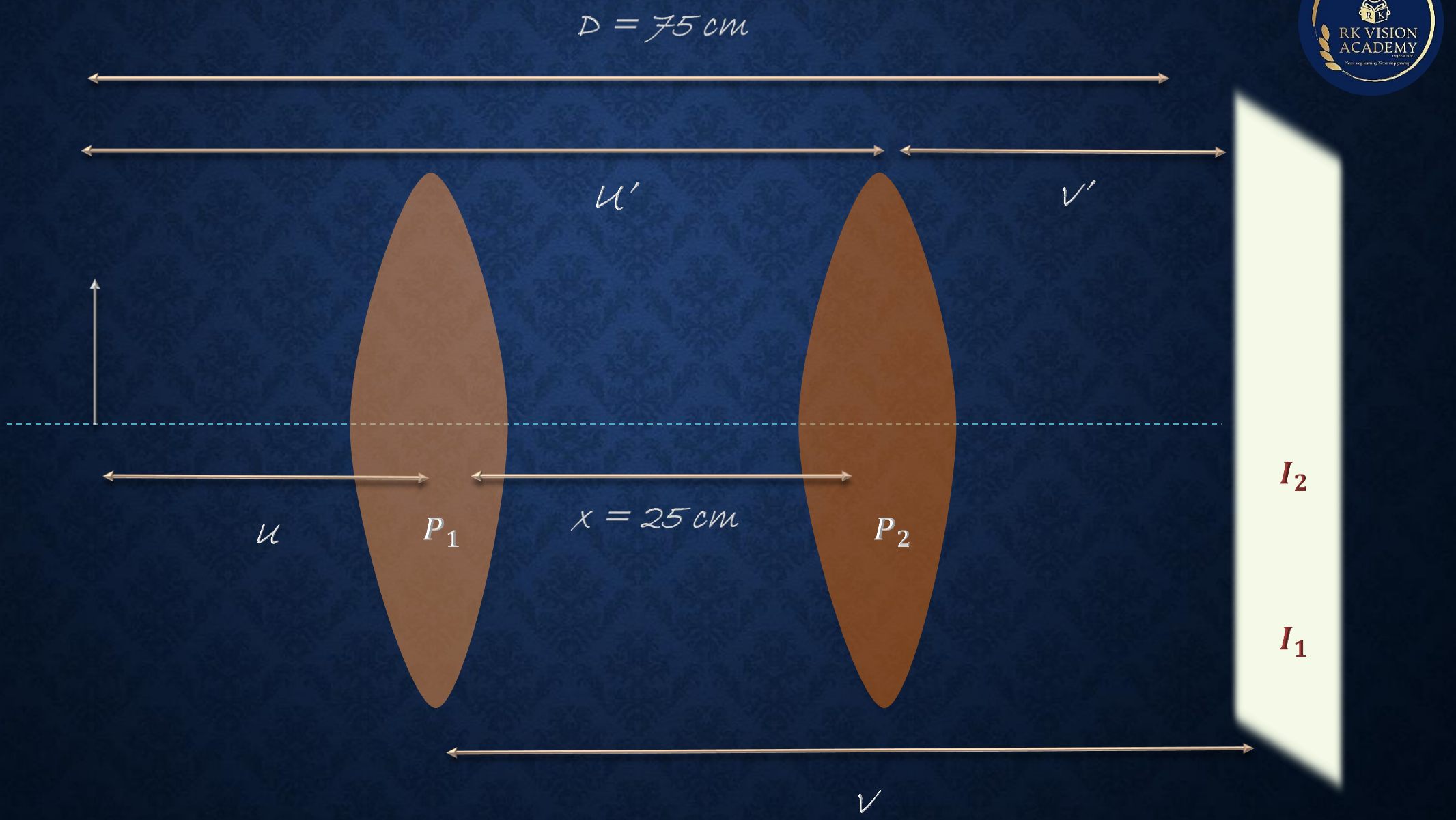
(a) 25.0 cm

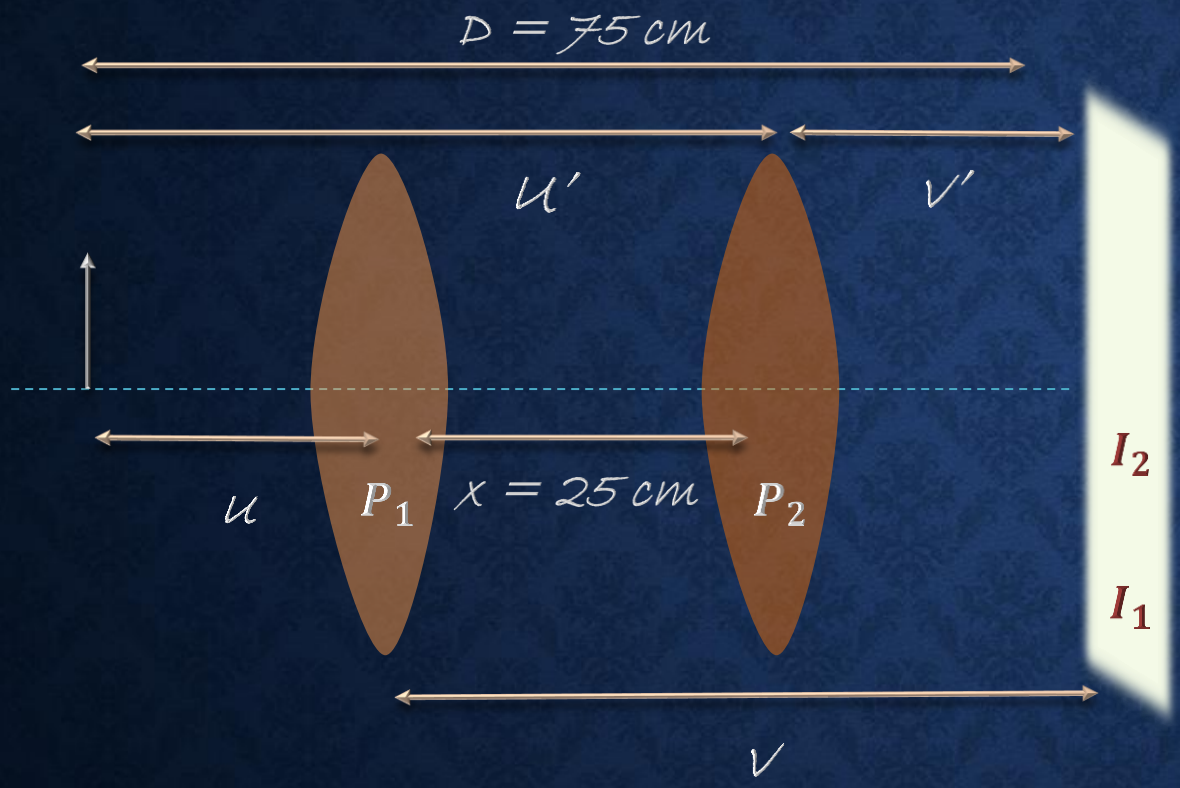
(b) 16.7 cm ✓

(c) 50.3 cm

(d) 33.3 cm







Displacement method

Assumptions:

$u = v'$

$v = u'$

Equations:

$v + u = D$

$v - u = x$

$2v = D + x$

$v = \frac{D + x}{2}$

$u = \frac{D - x}{2}$

Substituting in lens formula

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

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

$$f = \frac{D^2 - x^2}{4D}$$

$$= \frac{75^2 - 25^2}{4(75)}$$

$$= 16.6667$$

A convex lens of power 4D is kept in contact with a concave lens of power 3D, the effective power of combination will be

a) 7D

b) 4D/3

c) 1D

d) 3D/4