



A uniform square lamina $ABCD$ has sides of length 10 cm. The point E is on BC with $EC = 7.5$ cm, and the point F is on DC with $CF = x$ cm. The triangle EFC is removed from $ABCD$ (see diagram). The centre of mass of the resulting shape $ABEFD$ is a distance \bar{x} cm from CB and a distance \bar{y} cm from CD .

- (a) Show that $\bar{x} = \frac{400 - x^2}{80 - 3x}$ and find a corresponding expression for \bar{y} . [4]

The shape $ABEFD$ is in equilibrium in a vertical plane with the edge DF resting on a smooth horizontal surface.

- (b) Find the greatest possible value of x , giving your answer in the form $a + b\sqrt{2}$, where a and b are constants to be determined. [3]