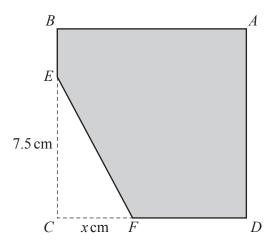**4**

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

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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]

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