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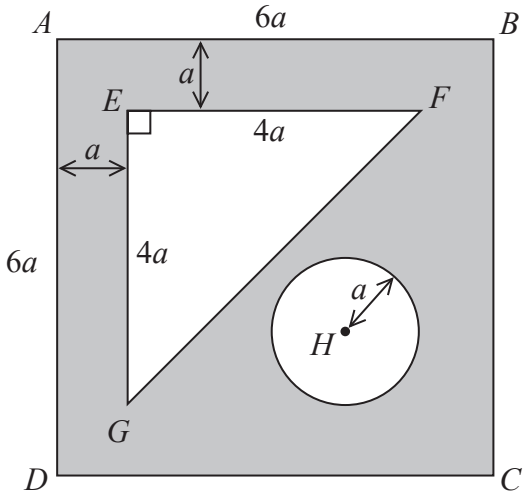


Figure 1

The uniform lamina $ABCD$ is a square of side $6a$. The template T, shown shaded in Figure 1, is formed by removing the right-angled triangle EFG and the circle, centre H and radius a, from the square lamina.

Triangle EFG has $EF = EG = 4a$, with EF parallel to AB and EG parallel to AD. The distance between AB and EF is a and the distance between AD and EG is a.

The point H lies on AC and the distance of H from BC is $2a$.

(a) Show that the centre of mass of T is a distance $\dfrac{4(67 - 3\pi)}{3(28 - \pi)}a$ from AD.

(5)

The template T is suspended from the ceiling by two light inextensible vertical strings. One string is attached to T at A and the other string is attached to T at B so that T hangs in equilibrium with AB horizontal.

The weight of T is W. The tension in the string attached to T at B is kW, where k is a constant.

(b) Find the value of k, giving your answer to 2 decimal places.

(3)

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