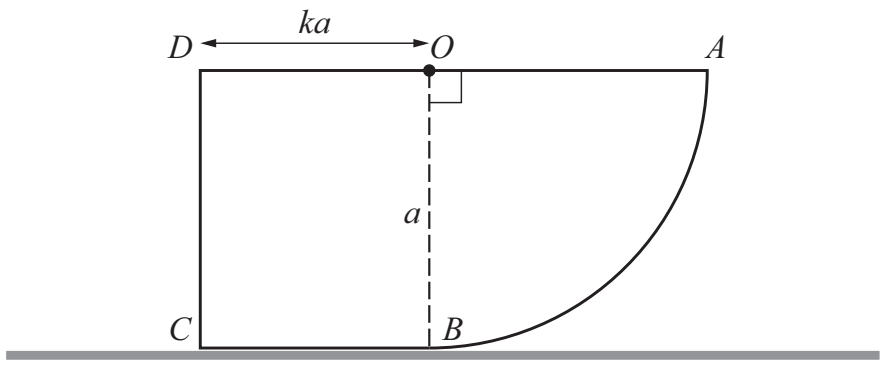
3 A uniform lamina *OABCD* is in the form of a rectangle, *OBCD*, joined along the edge *OB* to a quarter circle *OAB*. The length of *DO* is *ka* and the length of *OB* is *a*. The lamina rests in a vertical plane with its edge *CB* on a horizontal surface (see diagram).



(a) Find, in terms of k, a and π, an expression for the distance of the centre of mass above the horizontal surface. [4]

[You may use without proof the result for the centre of mass of a circular sector in the list of formulae (MF19).]

The lamina is on the point of toppling about *B*.

(b) Find the value of k. [2]