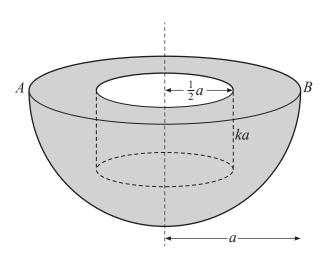
4

(a)



An object is formed by removing a solid cylinder, of height ka and radius $\frac{1}{2}a$, from a uniform solid hemisphere of radius a. The axes of symmetry of the hemisphere and the cylinder coincide and one circular face of the cylinder coincides with the plane face of the hemisphere. AB is a diameter of the circular face of the hemisphere (see diagram).

Show that the distance of the centre of mass of the object from AB is $\frac{3a(2-k^2)}{2(8-3k)}$. [4]

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When the object is freely suspended from the point A, the line AB makes an angle θ with the downward vertical, where $\tan \theta = \frac{7}{18}$.
