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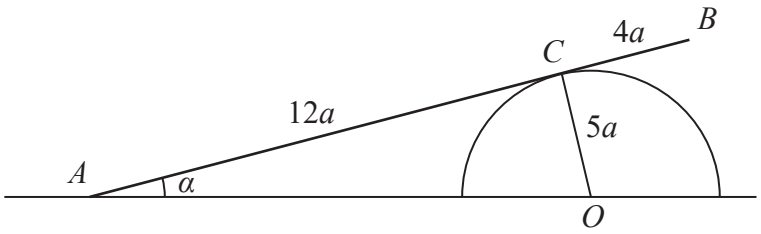


Figure 1

A smooth solid hemisphere is fixed with its flat surface in contact with rough horizontal ground. The hemisphere has centre O and radius $5a$.
A uniform rod AB, of length $16a$ and weight W, rests in equilibrium on the hemisphere with end A on the ground. The rod rests on the hemisphere at the point C, where $AC = 12a$ and angle $CAO = \alpha$, as shown in Figure 1.

Points A, C, B and O all lie in the same vertical plane.

(a) Explain why $AO = 13a$

(1)

The normal reaction on the rod at C has magnitude kW

(b) Show that $k = \frac{8}{13}$

(3)

The resultant force acting on the rod at A has magnitude R and acts upwards at θ° to the horizontal.

(c) Find

(i) an expression for R in terms of W

(ii) the value of θ

(8)

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