



A smooth cylinder is fixed to a rough horizontal surface with its axis of symmetry horizontal. A uniform rod AB , of length $4a$ and weight W , rests against the surface of the cylinder. The end A of the rod is in contact with the horizontal surface. The vertical plane containing the rod AB is perpendicular to the axis of the cylinder. The point of contact between the rod and the cylinder is C , where $AC = 3a$. The angle between the rod and the horizontal surface is θ where $\tan \theta = \frac{3}{4}$ (see diagram). The coefficient of friction between the rod and the horizontal surface is $\frac{6}{7}$.

A particle of weight kW is attached to the rod at B . The rod is about to slip. The normal reaction between the rod and the cylinder is N .

(a) Show that $N = \frac{8}{15} W(1 + 2k)$. [2]

(b) Find the value of k . [5]