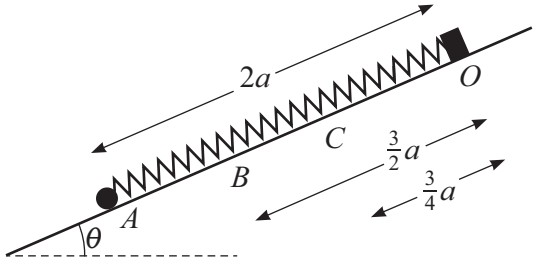
4



A light spring of natural length a and modulus of elasticity kmg is attached to a fixed point O on a smooth plane inclined to the horizontal at an angle θ, where $\sin\theta = \frac{3}{4}$. A particle of mass m is attached to the lower end of the spring and is held at the point A on the plane, where $OA = 2a$ and OA is along a line of greatest slope of the plane (see diagram).

The particle is released from rest and is moving with speed V when it passes through the point B on the plane, where $OB = \frac{3}{2}a$. The speed of the particle is $\frac{1}{2}V$ when it passes through the point C on the plane, where $OC = \frac{3}{4}a$.

Find the value of k. [7]