7.

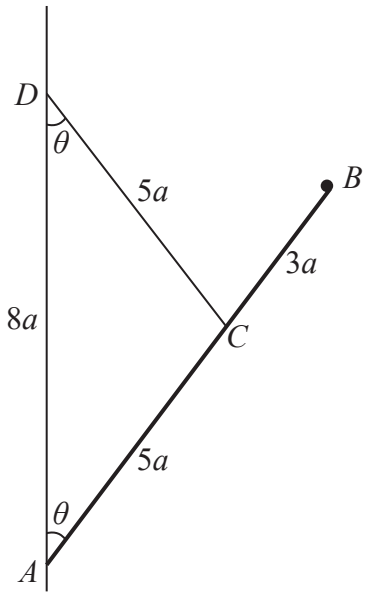


Figure 6

A uniform rod AB has length $8a$ and weight $12W$.
The end A of the rod is freely hinged to a fixed point on a vertical wall.
The rod lies in a vertical plane that is perpendicular to the wall.
A particle of weight W is attached to the rod at B.
A light inextensible string of length $5a$ has one end attached to the rod at the point C, where $AC = 5a$.
The other end of the string is attached to the wall at the point D, where D is above A and $AD = 8a$.
Angle DAC = Angle $ADC = \theta$, as shown in Figure 6.

The rod and the particle rest in equilibrium.

The tension in the string is T.

(a) Show that $T = 7W$.

(4)

The force exerted on the rod by the hinge at A acts at $\alpha°$ above the rod, where $0 < \alpha < 90$

(b) Find the value of α.

(6)

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