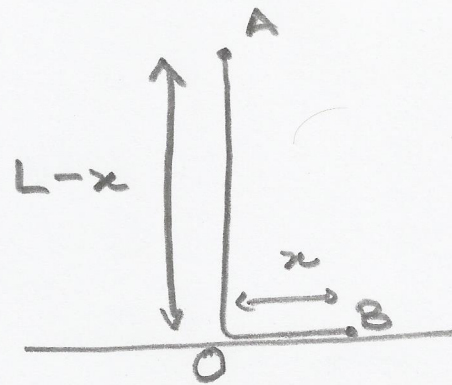


Falling chain

(June 9, 2015)

ADT

Reading on scale will be guided by two parts:



(I) weight of the chain accumulated

(II) the impulse per unit time imparted by the chain colliding with the scale.

Now, (I) $\Rightarrow W_1 = \frac{Mgx}{L}$

For estimating (II), the velocity (v) of the links at the instant of hitting the scale (point O) is given by,

$$v^2 = 2gx \quad (\because v^2 = u^2 + 2as.)$$

\therefore component (II) contributes,

$$\begin{aligned} W_2 &= \frac{dp}{dt} = \frac{d(mu)}{dt} = v \frac{dm}{dt} \\ &= v \frac{d}{dt} \left(\frac{M}{L} x \right) = \frac{vM}{L} v \\ &= \frac{M}{L} 2gx = \frac{2Mgx}{L} \end{aligned}$$

Reading on scale when a length x has fallen is $W = W_1 + W_2 = \frac{3Mgx}{L}$