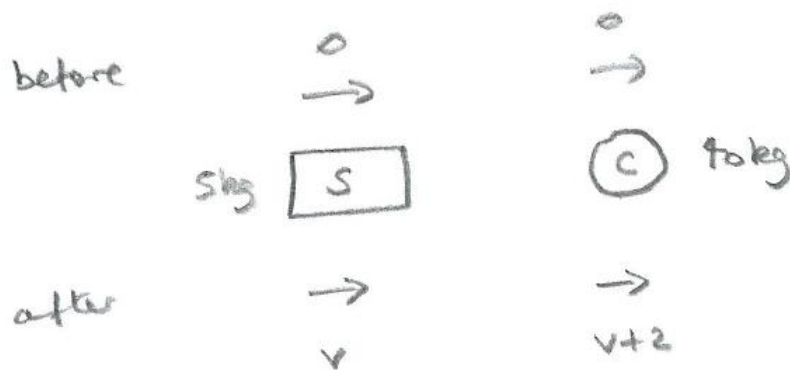


Impulse & Momentum – Q1 (11/6/23)

- (i) A child of mass 40kg is standing on a stationary skateboard of mass 5kg , and jumps off, so that his speed afterwards is 2ms^{-1} relative to the skateboard. What is the speed of the skateboard afterwards?
- (ii) What impulse is given to the skateboard by the child?

Solution

(i)



Conservation of momentum:

$$0 = 5v + 40(v + 2)$$

$$\Rightarrow 45v = -80$$

$$\Rightarrow v = -\frac{80}{45} = -1.78 \text{ ms}^{-1} \text{ (3sf)}$$

so that the skateboard has a speed of 1.78 ms^{-1} (3sf)

(ii) Impulse given to the skateboard by the child, taking left to right as the positive direction: $5v - 5(0) = -\frac{80}{9}$

So impulse [to the left] is $\frac{80}{9} = 8.89 \text{ Ns}$ (3sf)