

Impulse & Momentum – Q2 (11/6/23)

A cat of mass 4kg is sitting on a stationary sledge of mass 8kg . It then starts to walk along the sledge at a speed of 1ms^{-1} , relative to the sledge. What happens to the sledge?

Solution

The initial momentum of the system is zero.

Afterwards, let the speed of the sledge be v , in the direction that the cat walks.

Then the final momentum of the system is $8v + 4(v + 1)$

By conservation of momentum, $8v + 4(v + 1) = 0$,

so that $12v = -4$, and $v = -\frac{1}{3}$

ie the sledge moves at a speed of $\frac{1}{3} \text{ ms}^{-1}$ in the opposite direction to that in which the cat initially walked.