

Impulse & Momentum Overview (11/6/23)

Q1

(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?

Q2

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?

Q3

A ball is projected vertically upwards at a speed of 5ms^{-1} when it is 3m above the ground. Given that it just returns to its original height after bouncing on the ground (and assuming that there is no air resistance), find the coefficient of restitution between the ball and the ground. (Assume that $g = 9.8$)

Q4

A spaceship has a geostationary orbit about the earth (ie it stays above the same point on the earth's surface). An astronaut walks from one end of the spaceship to the other. Describe what happens, relative to the earth's surface.