A batsman hits back a ball straight in the direction of the bowler without changing its initial speed of 12 ms^{-1}. If the mass of the ball is 0.15 kg, determine the impulse imparted to the ball.
(Assume linear motion of the ball)

SOLUTION

The initial momentum of ball $P_1 = m\vec{v}$, after batsman hits ball and reverses its direction, momentum of ball $P_2 = -m\vec{v}$

Magnitude of change in momentum
$$\Delta p = |P_2 - P_1| = |-2m\vec{v}| = 2m\,|\vec{v}|$$

from data given in question
$$m = 0.15kg; \quad |\vec{v}| = 12m/s$$
$$\Delta P = 2 \times 0.15 \times 12 = 3.6kgm/s$$