Momentum & Impulse

Exercise 1

1. A snooker ball of mass 0.15 kg is given a speed of 2.4 m s$^{(1}$. Calculate the impulse it
    receives from the cue. [0.36 Ns]

    $(0.15)(2.4) = 0.36 Ns$

2. A spaceship of mass 8 tonnes at lift-off achieves a speed of 7.2 km s$^{(1}$. Calculate the
    impulse imparted to it by the rocket motors. [5.76xl0^{7}Ns]

    $(8000)(7.2 \times 1000) = 5.76 \times 10^7 Ns$

3. A squash ball of mass 24 grams is served with an impulse of 1.2 N s. How fast is it
    going when it leaves the racket? [50 ms$^{(1}$]

    $v = \dfrac{1.2}{0.024} = 50ms^{-1}$

4. A football of mass 450 grams is moving horizontally at head height with a speed of 2
    m s$^{(1}$. A player scores a goal by heading it back along the same line at 8 m s$^{(1}$.
    Calculate the impulse on his head. [4.5 Ns]

    $(0.45)(8+2) = 4.5 Ns$

5. A table-tennis ball of mass 2½ grams crosses the table at a speed of 4 m s$^{(1}$, and is
    smashed back along the same line with an impulse of 0.04 N s. What is the speed of
    the ball on its return? [12 ms$^{(1}$]

    $\dfrac{0.04}{\frac{\left(\frac{5}{2}\right)}{1000}} = 16$

    $v - (-4) = 16$

    $v = 12ms^{-1}$

6. A truck of mass 1200 kg, moving along a straight horizontal track at 4 ms$^{(1}$, runs into
    fixed buffers and rebounds with a speed of 3 ms$^{(1}$. The truck and the buffers are in
    contact for 0.2 s. Calculate
    (a) the impulse of the force between the buffers and the truck in Ns, [8400 Ns]
    (b)   the average force, in N, exerted by the buffers on the truck.
                                                                          [42000N]

    a) $(1200)(7) = 8400 Ns$

    b) $Force = \dfrac{8400}{0.2} = 42000 N$