# MOMENTUM AND IMPULSE - SOLUTIONS

1. GIVEN:

$m = 4.0\,kg$

$v = 12.0\,m/s$

$p = ?$

$p = mv$

$= (4.0)(12.0)$

$= 48\ kg\frac{m}{s}$ EAST

2. GIVEN:

$m = 5.0\,kg$

$p = 25.0\ kg\frac{m}{s}$

$v = ?$

$p = mv$

$v = \frac{p}{m}$

$= \frac{25.0}{5.0}$

$= 5.0\ \frac{m}{s}$ WEST

3. GIVEN:

$v = 8.0\frac{m}{s}$

$p = 36.0\ kg\frac{m}{s}$

$m = ?$

$p = mv$

$m = \frac{p}{v}$

$= \frac{36.0}{8.0}$

$= 4.5\ kg$

4. GIVEN:

$v = 2.0\frac{m}{s}$

$p = 29\ kg\frac{m}{s}$

$F_g = ?$

$p = mv$

$m = \frac{p}{v}$

$= \frac{29}{2.0}$

$= 14.5\ kg$

$$F_g = mg$$
$$= (14.5)(9.8)$$
$$= 140\ N$$

5. given:

$F_g = 6.6\ N$

$v = 3.0\ \frac{m}{s}$

$p = ?$

$$F_g = mg$$
$$m = \frac{F_g}{g}$$
$$= \frac{6.6}{9.8}$$
$$= 0.67\ kg$$

$$p = mv$$
$$= (0.67)(3.0)$$
$$= 2.0\ kg\frac{m}{s}\ \text{NORTH}$$

6. given:

$m = 7.0\ kg$

$d = 2.6\ m$

$t = 1.1\ s$

$p = ?$

$$v = \frac{d}{t}$$
$$= \frac{2.6}{1.1}$$
$$= 2.\overline{36}\ \frac{m}{s}$$

$$p = mv$$
$$= (7.0)(2.\overline{36})$$
$$= 17\ kg\frac{m}{s}\ \text{WEST}$$

7. GIVEN:

$m = 5.0\ kg$

$t = 0.25\ s$

$F_{NET} = F_g = mg$

$p_i = 0$

$p_f = ?$

$F_{NET}\Delta t = \Delta p$

$mg\Delta t = p_f - p_i$ ($p_i = 0$)

$p_f = mg\Delta t$

$= (5.0)(9.8)(0.25)$

$= 12\ kg\frac{m}{s}$ DOWN

8. a) GIVEN:

$m = 1.0\ kg$

$v_i = -2.0\frac{m}{s}$

$v_f = +1.6\frac{m}{s}$

$\Delta p = ?$

TAKE DOWN TO BE NEGATIVE AND UP TO BE POSITIVE.

$\Delta p = m\Delta v$

$= m(v_f - v_i)$

$= (1.0)(1.6 - (-2.0))$

$= +3.6\ kg\frac{m}{s}$

$\rightarrow 3.6\ kg\frac{m}{s}$ UP

b) GIVEN:

$\Delta p = 3.6\ kg\frac{m}{s}$

$t = 0.060\ s$

$F_N = ?$

$\Delta p = F_{NET}\Delta t$

$F_{NET} = \frac{\Delta p}{\Delta t}$

$= \frac{3.6}{0.060}$

$= 60.\ N$


$F_{NET} = F_N - F_g$

$F_N = F_{NET} + F_g$

$= F_{NET} + mg$

$= 60. + (1.0)(9.8)$

$= 70.\ N$ UP

9. GIVEN:

$m = 0.144\ kg$

$v_i = +38\ \frac{m}{s}$

$v_f = -38\ \frac{m}{s}$

IMPULSE = ?

TAKE INITAL DIRECTION TO BE POSITIVE AND FINAL DIRECTION TO BE NEGATIVE

$\text{IMPULSE} = m\Delta v$

$= m(v_f - v_i)$

$= (0.144)(-38-(+38))$

$= -11\ Ns$

→ 11 Ns in the DIRECTION OF THE FINAL VELOCITY

10. GIVEN:

$m = 1200\ kg$

$v_i = 35\ \frac{km}{h}$

$a = 12.5\ \frac{m}{s^2}$

$t = 3.25\ s$

$\Delta p = ?$

$\Delta p = F_{NET}\Delta t$

$= ma\Delta t$

$= (1200)(12.5)(3.25)$

$= 49\,000\ kg\ \frac{m}{s}$ EAST (ASSUMING THE ACCELERATION IS IN THE SAME DIRECTION AS THE INITIAL VELOCITY OF THE DRAGSTER.)

11. GIVEN:

$m = 40.0\ kg$

$F_A = 65\ N$

$t = 5.0\ s$

$v_i = 1.5\ \frac{m}{s}$

$v_f = ?$

$F_{NET}\Delta t = m\Delta v$

$F_A\Delta t = m(v_f - v_i)$

$mv_f = mv_i + F_A\Delta t$

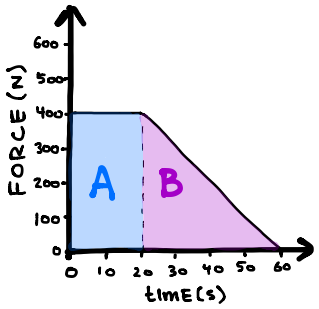
$v_f = \frac{mv_i + F_A\Delta t}{m}$

$= v_i + \frac{F_A\Delta t}{m}$

$= 1.5 + \frac{(65)(5.0)}{40.0}$

$= 9.6\ \frac{m}{s}$

12.




IMPULSE = AREA UNDER F-t GRAPH

$= AREA_A + AREA_B$

$= (20)(400) + \frac{1}{2}(40)(400)$

$= 8000 + 8000$

$= 16000\ Ns$

GIVEN:

IMPULSE $= 16000\ Ns$

$m = 1750\ kg$

$v_i = 0$

$v_f = ?$

$IMPULSE = m\Delta v$

$= m(v_f - v_i)$ ($v_i = 0$)

$= mv_f$

$v_f = \frac{IMPULSE}{m}$

$= \frac{16000}{1750}$

$= 9.1\ \frac{m}{s}$