Home Assignment

6. Here, $u = 0$
$s = 400m$
$t = 20s$
$m = 7 \text{ tonnes} = 7000 kg$
(i) Using, $s = ut + \frac{1}{2}at^2$
$400 = 0 + \frac{1}{2}a \times 400 = 200a$
$\Rightarrow a = 2 m/s$
(ii) $F = ma = 7000 \times 2 = 14000 N$

6 Here, $m = 1kg$
$u = 20 m/s$
$v = 0 m/s$
$s = 50 m$
$F = ?$
$v^2 - u^2 = 2as = 0 - (20)^2 = 2a \times 50 = 100a$
$a = \frac{-400}{100} = -4 m/s^2$
The force of friction - $F = ma$
$F = 1(-4) = -4N$

7 (a) Net accelerating force
= Force exerted by engine − Frictional force
$= 40000 - 5000 = 35000 N$
(b) Acceleration - $\frac{\text{Accelerating force}}{\text{Mass}}$
$= \frac{35000}{(3 \times 5000) + 8000} = \frac{35000}{18000}$
$= 1.94 m/s^2$

8 Mass of vehicles = 1500 kg
Acceleration = 1.7 m/s²
Force req. to stop vehicles must be in the direction opposite to motion
⇒ F = ma
⇒ 1500 × 1.7 = F
= 2550 N
So, the force req. to stop the vehicle = 2550 N

18. The force exerted by the boy on the truck is equal & opposite to the direction of the force exerted by truck on him. Hence these two equal and opposite forces acting on to different obj. cancel each other & result in no motion of the truck.

13 Mass of the ball = 200g = $\frac{200}{1000}$ = 0.2 kg
(u) of ball = 10 m/s , (v) = −5 m/s
Momentum = MV
Change in momentum = Final Momentum − Initial momentum
Initial momentum (P_i) = mu = 0.2 × 10
= 2 kg m/s
Final momentum P_f = mv = 0.2 × −5
= 1 kg m/s

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Acceleration = 1.7 m/s²
Force req. to stop vehicles must be in the direction opposite to motion
$\Rightarrow F = ma$
$\Rightarrow 1500 \times 1.7 = F$
$= 2550\ N$
So, the force req. to stop the vehicle = 2550 N

12. The force exerted by the boy on the truck is equal & opposite to the direction of the force exerted by truck on him. Hence these two equal and opposite forces acting on to different obj. cancel each other & result in no motion of the truck.

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Momentum = MV
Change in momentum = Final Momentum − Initial momentum
Initial momentum $(P_i) = mu = 0.2 \times 10$
$= 2$ kg m/s
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Cw

15. Given,

Mass of the wooden block = 1kg

Velocity before collision (u_1) = 10m/s

Mass of the wooden block = 5kg

u_2 = 0 m/s

Hence, momentum of two objects before collision

$= m_1u_1 + m_2u_2$

$= 1 \times 10 + 5 \times 0$

$= 10$ kg m/s

$m_1u_1 + m_2u_2 = m_1v + m_2v$

$\Rightarrow m_1u_1 + m_2u_2 = v(m_1 + m_2)$

$\Rightarrow v = (m_1u_1 + m_2u_2) / (m_1 + m_2)$

$\Rightarrow (1 \times 10 + 5 \times 0) / (1 + 5) = 1.67$ m/s