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Home Assignment

1) $m = 0.2 \times 10$

$= 2 kg$

Force $= \frac{m \times dm}{dt}$

$= 150 \times 2$

$F = 300N$

2) $P_{1i} = M_1 U_1$

$P_{2i} = M_2 U_2$

This is the conservation of linear momentum.

Total momentum of the system of two balls before collision

$P_i = P_{1i} + P_{2i} = M_1 U_1 + M_2 U_2$

During the collision m_1 exerts an action force $F_{1,2}$ on m_2

In response, from Newton's third law m_2 exerts a reaction on m_1 that is $F_{2,1}$ such that $F_{1,2} = -F_{2,1}$

Negative sign implies that the two forces are directed in opposite directions.

After the collision they undergo change in velocity and the corres-ponding change in momentum. Momenta of the two balls after collision $p_{1f} = m_1 v_1$, $p_{2f} = m_2 v_2$

Total momentum of the system of two balls after collision $p_f = p_{1f} + p_{2f} = m_1 v_1 + m_2 v_2$

Also from Newton's Second law:

Force = $\frac{\text{change in momentum}}{\text{Time interval}}$

F_{12} = $\frac{\text{Change in momentum produced in Mass } m_2}{\text{Collision time}}$

$$F_{12} = \frac{m_2 v_2 - m_2 u_2}{t}$$

Similarly

$$F_{21} = \frac{m_1 v_1 - m_1 u_1}{t}$$

From Newton's third law $F_{12} = F_{21}$

$$\left(\frac{m_2 v_2 - m_2 u_2}{t}\right) = -\left(\frac{m_1 v_1 - m_1 u_1}{t}\right)$$

$\Rightarrow m_1 u + m_2 u_2 = m_1 v_1 + m_2 v_2$

Total momentum before collision = Total momentum after collision.

Hence this equation implies

3.) A bomb at rest explodes into two pieces. Let the mass of bomb be m and mass of two pieces be m_1 and m_2 respectively. Now according to conservation of momentum

$$Mv = m_1 v_1 + m_2 v_2$$

Here $v = 0$ and v_1 and v_2 are velocities of two masses after explosion

$$M(0) = m_1 v_1 + m_2 v_2$$

$$m_1 v_1 + m_2 v_2 = 0$$

$M_1 V_1 = -M_2 V_2$

Now Masses cannot be negative that means the sign belongs to velocities therefore the two pieces travel in opposite direction.

Home Assignment

1.) Mass of the moving object, $M1 = 1.5$ kg and its initial velocity, $u1 = 5$m/s.

Mass of the wodden block $m2 = 5$kg, and its initial velocity $u_2 = 0$m/s.

We need to find total momentum before and after the collision of both object. Therefore $m1v1 + m2v2 = m1v1 + m2v2 \Rightarrow v = 1.15$m/s
Before collision total momentum 7.5kg/s and after collision 7.5kg/s