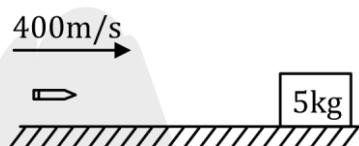


DPP - 03

- Q.1** A car with a gun mounted on it is kept on horizontal friction less surface. Total mass of car, gun and shell is 50 kg. Mass of each shell is 1 kg. If shell is fired horizontally with relative velocity 100 m/sec with respect to gun. what is the recoil speed of car after second shot in nearest integer?
- Q.2** A bullet fired horizontally with a speed of 400 m/sec. It strikes a wooden block of mass 5 kg initially at rest placed on a horizontal floor as shown in the figure. It emerges with a speed of 200 m/sec and the block slides a distance 20 cm before coming to rest. If the coefficient of friction between block and the surface is $\frac{\lambda}{50}$ then find λ . Mass of bullet is 20gm.(take $g = 10 \text{ m/s}^2$)



- Q.3** A boy of mass 60 kg is standing over a platform of mass 40 kg placed over a smooth horizontal surface. He throws a stone of mass 1 kg with velocity $v = 10 \text{ m/s}$ at an angle of 45° with respect to the ground. the displacement of the platform (with boy) on the horizontal surface when the stone lands on the ground is $2\alpha cm$. Value of α ($g = 10 \text{ m/s}^2$)
- Q.4** A man of mass m_1 is standing on a platform of mass m_2 kept on a smooth horizontal surface. The man starts moving on the platform with a velocity v_r relative to the platform. Find the recoil velocity of platform.

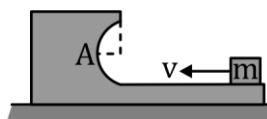
$$(A) V = \frac{m_1 v_r}{m_1 + m_2}$$

$$(B) V = \frac{m_2 v_r}{m_1 + m_2}$$

$$(C) V = \frac{m_1 v_r}{2m_1 + m_2}$$

$$(D) V = \frac{m_2 v_r}{m_1 + 2m_2}$$

- Q.5** Figure shows a small block of mass m which is started with a speed v on the horizontal part of the bigger block of mass M placed on a horizontal floor. The curved part of the surface shown is semicircular. All the surfaces are frictionless. Find the speed of the bigger block when the smaller block reaches the point A of the surface.



$$(A) v_x = \frac{mv}{m+M}$$

$$(B) v_x = \frac{Mv}{m+M}$$

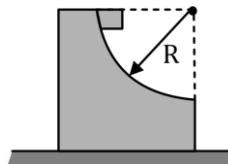
$$(C) v_x = \frac{mv}{m+2M}$$

$$(D) v_x = \frac{Mv}{2m+v}$$

- Q.6** A small cube of mass m slides down a circular path of radius R cut into a large block of mass M as shown in figure. M rests on a table and both blocks move without friction. The blocks are



initially at rest and m starts from top of the path. Find the velocity v of the cube as it leaves the block.



(A) $V_x = \sqrt{\frac{MgR}{M+m}}$

(B) $V_x = \sqrt{\frac{2MgR}{M+m}}$

(C) $V_x = \sqrt{\frac{3MgR}{M+m}}$

(D) $V_x = \sqrt{\frac{MgR}{2(M+m)}}$

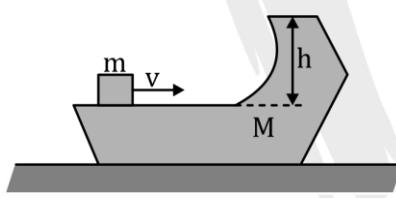
- Q.7** A 500 kg boat has an initial speed of 10 ms^{-1} as it passes under a bridge. At that instant a 50 kg man jumps straight down into the boat from the bridge. The speed of the boat after the man and boat attaining a common speed is

(A) $\frac{100}{11} \text{ ms}^{-1}$ (B) $\frac{10}{11} \text{ ms}^{-1}$ (C) $\frac{50}{11} \text{ ms}^{-1}$ (D) $\frac{5}{11} \text{ ms}^{-1}$

- Q.8** The spacecraft of mass M moves with velocity V in free space at first, then it explodes breaking into two pieces. If after explosion a piece of mass m comes to rest, the other piece of space craft will have a velocity:

(A) $MV/(M - m)$ (B) $MV/(M + m)$ (C) $mV/(M - m)$ (D) $mV/(M + m)$

- Q.9** A body of mass M with a small box of mass m placed on it rests on a smooth horizontal surface. The box is set in motion in the horizontal direction with a velocity u as shown in Figure. Calculate the height relative to the initial level to which the box will rise after breaking off from the body M . Assume all surfaces to be smooth.





ANSWER KEY

1. 4 2. 8 3. 5 4. (A) 5. (A) 6. (B)

7. (A) 8. (A) 9. $H = \frac{Mu^2}{2g(M+m)}$

