

Momentum Quiz 6.0

1. (a) What impulse is given to a shopping cart by a 8N force pushing for 5s ?(b) What impulse is given by a 6N friction force if it acts for 5s ?

$$(\text{Impulse}) \vec{J} \equiv \vec{F} \cdot \Delta t$$

$$(\text{Momentum}) \vec{p} \equiv m\vec{v}$$

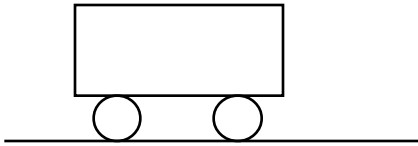
$$\text{Impulse - Momentum Theorem/ } \vec{J}_{\text{Net}} = \Delta\vec{p}$$

2. A 7kg block is pushed along a frictionless floor by a 4N force for 5s. If the block starts from rest, determine v_f after the 5 seconds.

$$[J] = N \cdot s = kg \cdot \frac{m}{s}$$

$$[p] = kg \cdot \frac{m}{s} = N \cdot s$$

3.



A 40kg cart is rolling right at 8m/s. (a) What negative impulse would you have to give to this cart to bring it to rest? (b) What force would you have to apply to this cart to stop it in 2 seconds?

(The floor is newly waxed and the bearings in the wheels are expensive!)

4. (a) What is the impulse given to a baseball by a bat which exerts a 30N force on the ball for .02s ?
(b) What is the change in momentum of the ball?

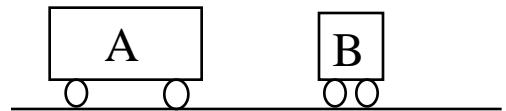
5. A "super" superball rolls toward a wall with $v_o = +5\text{m/s}$. It has a mass of 2kg. It bounces off the wall with a speed of 5m/s. What was the change in momentum of the ball?

6. The same 40kg cart is pushed along a floor, but this time it starts from rest and there is a kinetic friction force of 8N. You push with a 12N force for 5s.

- (a) What is the net force on the cart?
- (b) What is the impulse, J_Y , that you give to the cart?
- (c) What is the impulse, J_F , that friction gives to the cart?
- (d) What is the net impulse, J_{NET} , given to the cart?
- (e) What is the final velocity, v_f , of the cart after 5 seconds?

7. (a) Describe what happens when a steel ball makes an elastic head-on collision with a steel ball of equal mass which is at rest?(b) What happens if the first steel ball makes a glancing collision with the second steel ball which is again initially at rest?

8. An inelastic collision occurs along a railroad track.
 $m_A = 2000\text{kg}$ and $m_B = 800\text{kg}$. $v_{A0} = +6\text{m/s}$ and $v_{B0} = -10\text{m/s}$. Determine the final velocities of A and B.



9. In deep space, a 60kg student is studying his 2kg physics book. He decides to run a physics experiment and throws the book with a velocity of 10m/s to the right according to our reference frame. What is the student's recoil velocity from our point of view?

10. What happens to the speed of a red wagon if rain falls vertically downward into it? The wagon moves with no frictional forces and collects the water.