

Questions of the Day IP – Impulse & Momentum

Question of the Day

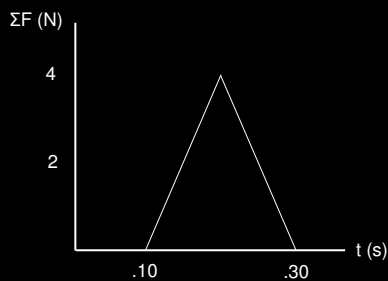
- Where will you be the evening of Tuesday, March 11, 2014?
- Answer: *Physics Fair*

Question of the Day



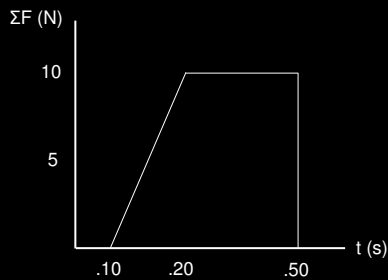
- A 450 g soccer ball approaches a player at 10 m/s and is kicked back at 15 m/s.
 - What was the ball's change in velocity (Δv)?
 - What was the ball's change in momentum (Δp)?
- *Answer: if v_i is in the negative direction, then $\Delta v = v_f - v_i = 15 \text{ m/s} - -10 \text{ m/s} = +25 \text{ m/s}$; $\Delta p = m \cdot \Delta v = (.450 \text{ kg}) \cdot (+25 \text{ m/s}) = 11.25 \text{ kg} \cdot \text{m/s}$*

Question of the Day



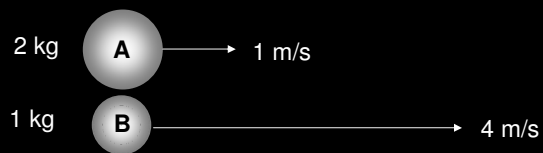
- Based upon this graph, what impulse does the object receive?
- *Answer: $I = \frac{1}{2} * (4 \text{ N}) * (.20 \text{ s}) = .40 \text{ N} \cdot \text{s}$*

Question of the Day



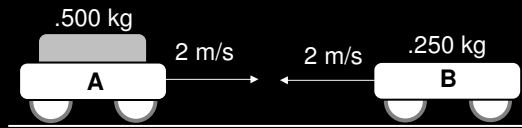
- A force is applied to a 250 g object.
 - What impulse does the object receive?
 - What is the object's change in velocity?
 - If the object's $v_i = -3$ m/s, what is its v_f ?
- Answer: $I = 3.5$ N·s, $\Delta v = +14$ m/s, $v_f = +11$ m/s

Question of the Day



- Compare the momentum of A to B.
- Answer: *Even though B has less mass, it has more momentum since its velocity is so much greater.*

Question of the Day



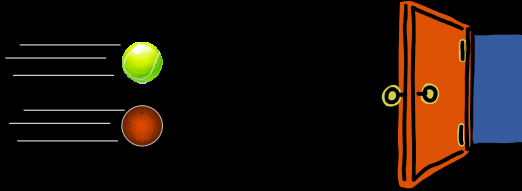
- When A and B collide, which cart will experience the greater amount of impulse?
- *Answer: Since they both experience the same **amount** of force for the same interval of time, they experience the same **amount** of impulse (in opposite directions).*

Question of the Day



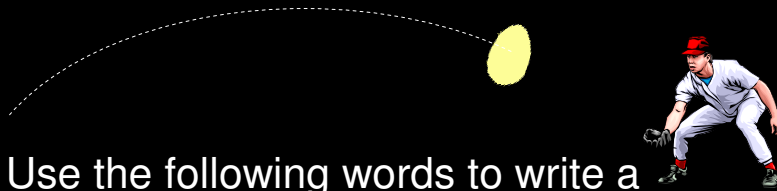
- A bullet leaves a rifle barrel with a high velocity. The rifle recoils back with a low velocity. Why?
- *Answer: Rifle's mass is \gg than bullet's mass, therefore requires less velocity to balance bullet's forward momentum*

Question of the Day



- A bouncy ball and ball of clay have the same mass and the same velocity. Thrown against a door, which one would be more effective at closing a door?
- Answer: *clay sticks to door, more mass moving forward, lower forward velocity; bouncy ball bounces back with negative velocity, door moves forward with positive velocity, closing door more effectively*

Question of the Day



- Use the following words to write a sentence that describes how you would catch a raw egg in order to keep it from breaking.
 - “force”, “time”, “impulse”
- Answer: *“Maximizing the time minimizes the force required to produce the impulse necessary to bring the egg to a stop.”*

Question of the Day



- A 2 kg professional firework shell has a velocity of 10 m/s. The next moment it explodes into approximately 3,172,348,693 pieces. What is the total momentum of all the pieces?
- Answer: $20 \text{ kg} \cdot \text{m/s}$, $p_{i\text{-system}} = p_{f\text{-system}}$