

A pitcher throws a 0.15-kg baseball so that it crosses home plate horizontally with a speed of 20 m/s. The ball is hit straight back at the pitcher with a final speed of 22 m/s. What is the impulse delivered to the ball?

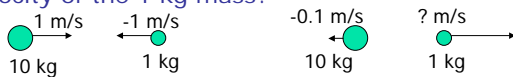
- A. 0.30 kg m/s towards pitcher
  - B. 0.30 kg m/s toward batter
  - ✓ C. 6.3 kg m/s toward pitcher
  - D. 6.3 kg m/s toward batter
- $I = \Delta P$   
 $= P_f - P_i$   
 $= m(V_f - V_i)$   
 $= 0.15 [(-22) - (+20)] \text{ kg m/s}$   
 $= -6.3 \text{ kg m/s}$   
 Negative means toward pitcher

Find the average force exerted by the bat on the ball if the two are in contact for  $2.0 \times 10^{-3} \text{ s}$ .

From last page: impulse delivered to the ball = - 6.3 kg m/s

- ✓ A.  $3.1 \times 10^3 \text{ N}$  towards pitcher
  - B.  $3.1 \times 10^3 \text{ N}$  towards batter
  - C. 6.3 N towards batter
  - D. 6.3 N towards pitcher
- $I = F \Delta t$   
 $F = I / \Delta t$   
 $= -6.3 / 0.002 \text{ N}$

Two objects collide head on. Their masses and initial velocities are given. If the 10 kg mass has a final velocity of -0.1 m/s, what is the final velocity of the 1 kg mass?



- A. -10 m/s
  - B. -1 m/s
  - C. 0.1 m/s
  - ✓ D. 10 m/s
- $m_1 v_{1i} + m_2 v_{2i} = m_1 v_{1f} + m_2 v_{2f}$   
 $10 (1) + 1 (-1) = 10 (-0.1) + 1 v_{2f}$