A bouncy ball (0.50 kg) is dropped and strikes the ground with a velocity of 12 m/s. The floor applies a force of 400 N over a time period of .02 s. Find the impulse on the ball (magnitude and direction) and final velocity of the ball as it leaves the floor.

Impulse magnitude _____ direction _____

Final velocity magnitude _____ direction ____

$$\bar{J} = \bar{F}\Delta t = \Delta \bar{p} = m\Delta \bar{v}$$

↓   ↓   ↓   ↓   ↓   ↓

impulse   force   time   change in   mass   change in

momentum   velocity
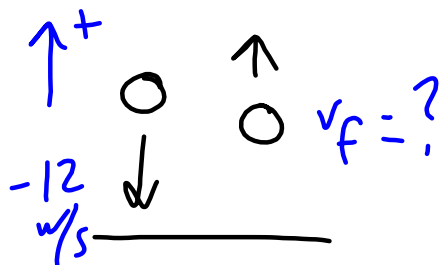
↑+   ○   ↑ ○ $v_f = ?$ $\Delta = final - initial$

−12 m/s ↓

F = 400 N

$\Delta t = 0.02 s$

$$\bar{F}\Delta t = m\Delta \bar{v}$$

$$\bar{F}\Delta t = m\left(\bar{v}_f - \bar{v}_i\right)$$

$$\bar{J} = \bar{F}\Delta t$$

$$= (400 N)(0.02 s)$$

$$= 8 \text{ kg·m/s}$$

$$\bar{v}_f - \bar{v}_i = \frac{\bar{F}\Delta t}{m}$$

$$\bar{v} = \bar{v}_i + \frac{\bar{F}\Delta t}{m}$$

$$= -12 \text{ m/s} + \frac{8 \text{ kg·m/s}}{0.5 \text{ kg}}$$

$$= 4 \text{ m/s}$$

Dish A is dropped on a tile floor and dish B is dropped on carpet from equal heights. Both stop without rebounding.

Which one has a larger change in momentum? (A, B, same)   SAME

Which one has a larger force acting on it? (A, B, same)   A

$$\bar{F}\,\Delta t = \Delta \bar{p}$$

$$\bar{F} = \frac{\Delta \bar{p}}{\Delta t}$$