Momentum & Impulse

Friday, April 6, 2018 11:05 AM

Momentum : $\bar{p} = m\bar{v}$, kg m/s

: a vector, direction is important (vector diagrams)

Change in Momentum

$$\Delta p = \Delta(mv)$$

$\Delta p = \Delta m \cdot v$ $\qquad$ $\Delta p = m\,\Delta v$ $\qquad$ $a = \frac{\Delta v}{\Delta t}$, $\Delta v = a\,\Delta t$

$\Delta p = m(a\,\Delta t)$

$\Delta p = F \cdot \Delta t$

$\Delta p = m\,\Delta v = F\,\Delta t = I$ mpulse units N·s

ex: A force of 12N [E] acts on a 5.0kg ball for 2.0s. If the ball has a V_o = 4.0m/s [W], what is its V_f?

$F = 12N$
$m = 5.0kg$
$t = 2.0s$
$V_o = -4m/s$

$m\,\Delta v = F\,\Delta t$
$5(\Delta v) = 12(2.0)$
$\Delta v = 4.8 m/s$

$V_f - (-4) = 4.8 m/s$
$V_f + 4 = 4.8$
$V_f = 0.8 m/s$
$= 0.8 m/s$ [E]

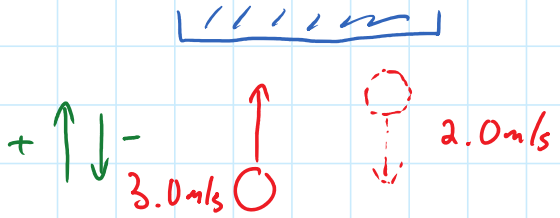
12N →

4m/s ←

Ex A 1.2kg ball moving at 3.0m/s [N] strikes a wall & bounces back at 2.0m/s [S]. Find the Impulse the wall exerts on the ball.

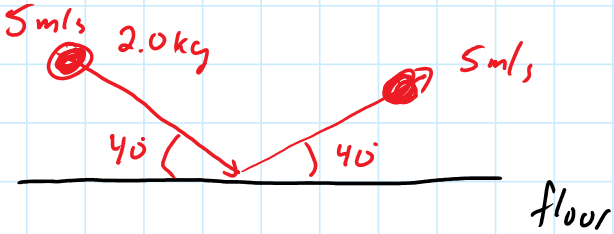
$I = m \times v$

(the wall exerts on the ball.)



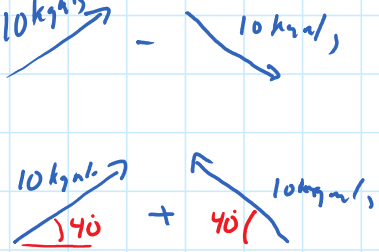
$$I = m\Delta v$$
$$= (1.2\,kg)(-2.0\,m/s - 3.0\,m/s)$$
$$= -6.0\ N\cdot s$$

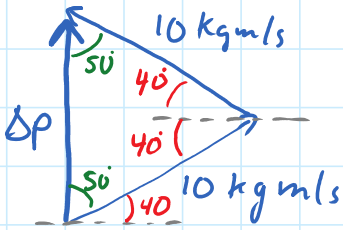
Ex



Find the Δp of the ball.

$$\Delta p = p_f - p_0$$





$$\frac{\Delta p}{\sin 80} = \frac{10}{\sin 50^\circ}$$

$$\Delta p = 12.9\ kgm/s$$