

Q 21

impulse = $F_{avg} (\Delta t)$
 less force
 w/ more time \leftarrow cushion provides more time

work - done by external forces (cushion)

★ see example 10.17 (p. 306-307)

P 41 before
 $m_1 = 50g$ $0.05 kg$
 $v_1 = 2.0 m/s$
 $m_2 = 30g$ $0.02 kg$
 $v_2 = 0 m/s$

after
 $m_1 = 0.05 kg$
 $v_{1+2} = ?$
 $m_2 = 0.02 kg$

$$(m_1 v_1)_i + (m_2 v_2)_i = (m_1 + m_2) v_f$$

$$(0.05 kg \cdot 2.0 m/s) + (0.02 kg \cdot 0 m/s) = (0.05 + 0.02) v$$

$$0.1 \text{ kg} \cdot \text{m/s} + 0 = \frac{(0.07 \text{ kg}) v}{0.07} \quad 0.07$$

~~$$0.14 \text{ m/s} = v$$~~

$$1.43 \text{ m/s} = v$$

P 42

before	after
$m_1 = 100g$ ^{0.1kg}	$m_1 = 0.1 \text{ kg}$
$v_1 = 10 \text{ m/s}$	$v_{1+2} = ?$
$m_2 = 300g$ ^{0.3kg}	$m_2 = 0.3 \text{ kg}$
$v_2 = 0 \text{ m/s}$	

★ inelastic ★

$$(m_1 v_{1i}) + (m_2 v_{2i}) = (m_1 + m_2) v_f$$

$$(0.1 \text{ kg} \cdot 10 \text{ m/s}) + (0.3 \text{ kg} \cdot 0 \text{ m/s}) = (0.1 \text{ kg} + 0.3 \text{ kg}) v$$

$$\frac{(1 \text{ kg} \cdot \text{m/s}) + (0)}{0.4} = \frac{(0.4 \text{ kg}) v}{0.4}$$

$$2.5 \text{ m/s} = v$$

★ elastic ★

$$(m_1 v_{1i}) + (m_2 v_{2i}) = (m_1 v_{1f}) + (m_2 v_{2f})$$

$$v_{1f} = \frac{v_{1i}(m_1 - m_2) + 2(m_2 v_{2i})}{m_1 + m_2}$$

$$= \frac{10(0.1 - 0.3) + 2(0.3 \cdot 0)}{0.1 + 0.3}$$

$$= \frac{-2}{0.4}$$

$$v_{1f} = -5$$

$$v_{2f} = \frac{v_{2i}(m_2 - m_1) + 2(m_1 v_{1i})}{m_1 + m_2}$$

$$= \frac{0(0.3 - 0.1) + 2(0.1 \cdot 10)}{0.1 + 0.3}$$

$$= \frac{2}{0.4}$$

$$v_{2f} = 5$$