

15. $p = mv$

$$m = \frac{p}{v}$$

$$= \frac{6.0 \text{ kg}\cdot\text{m/s}}{3.0 \text{ m/s}}$$

$$= 2.0 \text{ m/s}$$


$$v_f^2 = v_0^2 + 2ad$$

$$(2.0 \text{ m/s})^2 = 2(-9.80 \text{ m/s}^2)d$$

$$d = -0.20 \text{ m or } 0.20 \text{ m}$$

Lesson 8—Conservation of Momentum (linear interactions)


1. before collision



$m = 30.0 \text{ kg}$	$m = 20.0 \text{ kg}$
$v = 1.00 \text{ m/s}$	$v = -5.00 \text{ m/s}$
$p = 30.0 \text{ kg}\cdot\text{m/s}$	$p = -100 \text{ kg}\cdot\text{m/s}$

$$p_{\text{before}} = -70.0 \text{ kg}\cdot\text{m/s}$$

after collision



$m = 30.0 \text{ kg}$	$m = 20.0 \text{ kg}$
$v = ?$	$v = -1.25 \text{ m/s}$
$p = -45.0 \text{ kg}\cdot\text{m/s}$	$p = 25.0 \text{ kg}\cdot\text{m/s}$


$$p_{\text{after}} = -70.0 \text{ kg}\cdot\text{m/s}$$

$$v = \frac{p}{m}$$

$$= \frac{-45.0 \text{ kg}\cdot\text{m/s}}{30.0 \text{ kg}}$$

$$= -1.50 \text{ m/s left}$$

2. before collision



$m = 4.50 \times 10^3 \text{ kg}$	$m = 6.50 \times 10^3 \text{ kg}$
$v = 5.0 \text{ m/s}$	$v = 0$
$p = 2.25 \times 10^4 \text{ kg}\cdot\text{m/s}$	$p = 0$


$$p_{\text{before}} = 2.25 \times 10^4 \text{ kg}\cdot\text{m/s}$$

after collision



$m = 1.10 \times 10^4 \text{ kg}$	
$v = ?$	
$p = 2.25 \times 10^4 \text{ kg}\cdot\text{m/s}$	
$p_{\text{after}} = 2.25 \times 10^4 \text{ kg}\cdot\text{m/s}$	
$v = \frac{p}{m}$	
$= \frac{2.25 \times 10^4 \text{ kg}\cdot\text{m/s}}{1.10 \times 10^4 \text{ kg}}$	
$= 2.0 \text{ m/s east}$	

3. before collision



$m = 925 \text{ kg}$	$m = ?$
$v = 18.0 \text{ m/s}$	$v = 0$
$p = 1.67 \times 10^4 \text{ kg}\cdot\text{m/s}$	$p = 0$

$$p_{\text{before}} = 1.67 \times 10^4 \text{ kg}\cdot\text{m/s}$$

after collision



$m = ?$	
$v = 6.50 \text{ m/s}$	
$p = 1.67 \times 10^4 \text{ kg}\cdot\text{m/s}$	
$p_{\text{after}} = 1.67 \times 10^4 \text{ kg}\cdot\text{m/s}$	

$$m = \frac{p}{v}$$


$$= \frac{1.67 \times 10^4 \text{ kg}\cdot\text{m/s}}{6.50 \text{ m/s}}$$

$$= 2.57 \times 10^3 \text{ kg}$$

$$m = 2.57 \times 10^3 \text{ kg} - 925 \text{ kg}$$

$$= 1.64 \times 10^3 \text{ kg}$$

4. before collision



$m = 0.050 \text{ kg}$	$m = 7.00 \text{ kg}$
$v = ?$	$v = 0$
$p = 35.3 \text{ kg}\cdot\text{m/s}$	$p = 0$

$$p_{\text{before}} = 35.3 \text{ kg}\cdot\text{m/s}$$