

PhyzJob: Conservation of Momentum Number Puzzles

PART 2: SPEED



INSTRUCTIONS: In each of the scenarios below, some information regarding the system (or elements within the system) is given. Determine the missing speed based on what you know about conservation of momentum.

1. A Stationary Bomb Explodes.

BEFORE  *BOOM!* AFTER 

$v = 0 \text{ m/s}$

$m_1 = 7.0 \text{ kg}$
 $v_1' = -1.43 \text{ m/s}$

$m_2 = 3.0 \text{ kg}$
 $v_2' = ?$

DON'T THINK:	$p = p'$
	$p_1 + p_2 = p_1' + p_2'$
	$m_1v_1 + m_2v_2 = m_1v_1' + m_2v_2'$
THINK:	$v_1 = v_2 = v = 0$
APPLY:	$0 = m_1v_1' + m_2v_2'$

EXAMPLE

SOLVE: $0 = m_1v_1' + m_2v_2'$

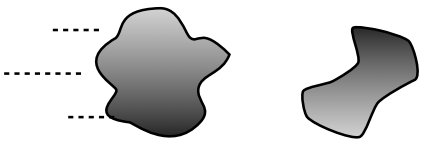
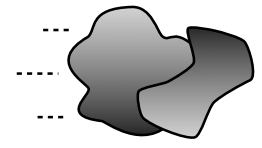
$m_2v_2' = -m_1v_1'$

$v_2' = -m_1v_1'/m_2$

$v_2' = -7.0 \text{ kg} \cdot -1.43 \text{ m/s} / 3.0 \text{ kg}$

$v_2' = 3.3 \text{ m/s}$

2. Moving Blobs of Clay Collide.

 *smash* 

$m_1 = 5.0 \text{ kg}$
 $v_1 = 8.0 \text{ m/s}$

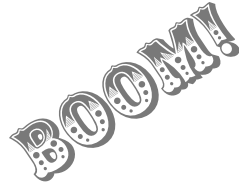
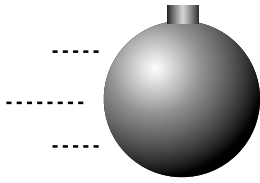
$m_2 = 3.0 \text{ kg}$
 $v_2 = 0 \text{ m/s}$

$v' = ?$

Now the moving mass is $5 \text{ kg} + 3 \text{ kg} = 8 \text{ kg}$.

DON'T THINK:	$p = p'$
	$p_1 + p_2 = p_1' + p_2'$
	$m_1v_1 + m_2v_2 = m_1v_1' + m_2v_2'$
THINK:	$v_2 = 0, v_1' = v_2' = v'$
APPLY:	$m_1v_1 = m_1v' + m_2v'$

3. A Moving Bomb Explodes.



$$m_1 = 6.0 \text{ kg} \quad m_2 = 4.0 \text{ kg}$$

$$v = +9.0 \text{ m/s}$$

$$v_1' = -7.5 \text{ m/s}$$

$$v_2' = ?$$

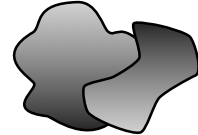
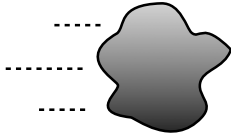
$$p = p'$$

$$p_1 + p_2 = p_1' + p_2'$$

$$m_1v_1 + m_2v_2 = m_1v_1' + m_2v_2'$$

$$v_1 = v_2 = v$$

4. Moving Blobs of Clay Collide. (YOU draw the "speed lines.")



$$m_1 = 8.0 \text{ kg}$$

$$v_1 = +4.0 \text{ m/s}$$

$$m_2 = 5.0 \text{ kg}$$

$$v_2 = -2.0 \text{ m/s}$$

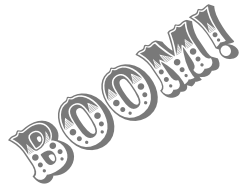
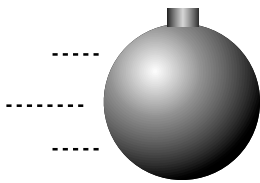
$$v' = ?$$

$$p = p'$$

$$p_1 + p_2 = p_1' + p_2'$$

$$m_1v_1 + m_2v_2 = m_1v_1' + m_2v_2'$$

5. A Moving Bomb Explodes.



$$m_1 = 4.0 \text{ kg} \quad m_2 = 3.0 \text{ kg}$$

$$v = ?$$

$$v_1' = -5.0 \text{ m/s}$$

$$v_2' = +12 \text{ m/s}$$

5. 2m/s 3. 34 m/s 4. 1.1 m/s 2. 5.3 m/s