

Name Answer Key
 Honors Physics
 Period _____

Date _____
 Momentum WS #3
 Mrs. Nadworny

Bouncy (Elastic) Collisions

Directions: Read textbook pages 226 – 230. Solve the following problems using the GUESS method and proper significant figures. Be sure to show ALL work.

1. Cart A, of mass 1.2 kg, is at rest on a frictionless air track. It is struck by Cart B, of mass 2.7 kg, which is moving to the right at a velocity of 10.4 m/s. After the collision, Cart A is moving to the right at 4.9 m/s. Calculate the final velocity of Cart B.

Before
$P_{\text{before}} =$ $m_1v_1 + m_2v_2 =$ $(1.2 \text{ kg})(0 \text{ m/s}) + (2.7 \text{ kg})(+10.4\text{m/s}) =$ $28.08 \text{ kg} \cdot \text{m/s} =$ $8.2 \text{ m/s right} =$

After
P_{after} $m_1v_1 + m_2v_2 =$ $(1.2 \text{ kg})(+4.9\text{m/s}) + (2.7 \text{ kg})(v_2) =$ $5.88 \text{ kg} \cdot \text{m/s} + (2.7 \text{ kg})(v_2)$ v_2

2. A 2610 kg truck is traveling West at 23.8 m/s when it collides with a 3660 kg truck traveling East at 15.4 m/s. After the collision, the 2610 kg truck is moving East at 3.91 m/s. Calculate the velocity of the 3660 kg truck.

Before
$P_{\text{before}} =$ $m_1v_1 + m_2v_2 =$ $(2610 \text{ kg})(-23.8 \text{ m/s}) + (3660\text{kg})(+15.4\text{m/s}) =$ $- 5754 \text{ kg} \cdot \text{m/s} =$ $4.36 \text{ m/s West} =$

After
P_{after} $m_1v_1 + m_2v_2 =$ $(2610 \text{ kg})(+3.91\text{m/s}) + (3660 \text{ kg})(v_2) =$ $10205.1 \text{ kg} \cdot \text{m/s} + (3660 \text{ kg})(v_2)$ v_2

3. A 0.158 kg apple is traveling with a momentum of 0.812 kg·m/s East. It collides with a 0.213 kg orange traveling at 7.65 m/s West. After the collision the apple is traveling with a momentum of 1.43 kg·m/s West. Calculate the velocity of the orange after the collision.

Before
$P_{\text{before}} =$ $p_1 + m_2v_2 =$ $(0.812 \text{ kg} \cdot \text{m/s}) + (0.213\text{kg})(-7.65\text{m/s}) =$ $- 0.81745 \text{ kg} \cdot \text{m/s} =$ $2.88 \text{ m/s East} =$

After
P_{after} $p_1 + m_2v_2 =$ $(1.43 \text{ kg} \cdot \text{m/s}) + (0.213 \text{ kg})(v_2) =$ $-1.43 \text{ kg} \cdot \text{m/s} + (0.213 \text{ kg})(v_2)$ v_2

4. Bo Linball rolls a 6.3 kg bowling ball down the alley for the league championships. One pin is standing still, and Bo hits it head-on with a (forward) velocity of 9.2 m/s. The 3.1 kg pin acquires a forward velocity of 14.8 m/s. Calculate the new velocity of the bowling ball.

Before
$P_{\text{before}} =$ $m_1v_1 + m_2v_2 =$ $(6.3 \text{ kg})(+9.2 \text{ m/s}) + (3.1\text{kg})(0.\text{m/s}) =$ $57.96 \text{ kg} \cdot \text{m/s} =$ $1.9 \text{ m/s forward} =$

After
P_{after} $m_1v_1 + m_2v_2 =$ $(6.3 \text{ kg})(v_1) + (3.1 \text{ kg})(+14.8\text{m/s}) =$ $(6.3 \text{ kg})(v_1) + 45.88 \text{ kg} \cdot \text{m/s}$ v_1

Answers in size order: 1.9, 2.88, 4.36, 8.2