1D Collision Practice Name:_____

Reflection and Self-Assessment

Completion: Circle the statement that best describes the completion of this practice.

- I completed every question on the practice.
- I did not complete some questions on the practice because:

_____

Answer Checking: Circle the statement that best describes how you checked your answers

- I checked all my answers against the key at the back and corrected any that were incorrect.
- I did not check all my answers and correct any mistakes because:

_____

Online Worked Solution: Circle the statement that best describes how you used the online worked solutions.

- I did not use the online worked solution at all.
- I used the online solution to understand some questions I got incorrect.
- I used the online solution to help me learn how to answer some questions.

Confidence: Circle the statement that best describes your confidence in answering questions of this type in the future.

- I am confident I can answer nearly any question of this type correctly without using notes or other assistance.
- I am confident I can answer **MOST** questions of this type correctly without using notes or other assistance.
- I am **NOT** confident I can answer most questions of this type correctly without using notes or other assistance.

Time: Circle the statement below that best describes the total amount of time you spent actively working on this practice:

Less than an hour	Between one and two hours	Between two and three hours	Between three and four hours	More than four hours

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1. A 59 kg object is moving at 25 m/s to the left. It collides and sticks to a stationary 65 kg object.
    a. What type of collision is this?

    b. What is the momentum of the 59 kg object before the collision?

    c. What is the momentum of the 65 kg object before the collision?

    d. What must the momentum of the combined object be after the collision?

    e. What is the total mass of the combined object?

    f. What is the velocity of the combined object after the collision?

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2. A 4.6 kg object is moving at 65.2 m/s to the right, it collides with a stationary 6500 kg object. The 4.6 kg object bounces back and the 6500 kg object starts moving at 0.087 m/s to the right.
    a. What is the total momentum before the collision?

    b. What must the total momentum be after the collision?

    c. What is the momentum of the 4.6 kg object after the collision?

    d. What is the velocity of the 4.6 kg object after the collision?

    e. What is the total kinetic energy of objects before the collision?

    f. What is the total kinetic energy of objects after the collision?

    g. What type of collision is this?

3. A 2.0 kg object (Block A), initially travelling at 5.0 m/s to the right has a collision with a 2.0 kg object (Block B), initially travelling 7.0 m/s to the left. They apply a 20.0 Ns impulse to each other.
    a. What is the final velocity of each object?

    b. How much kinetic energy was converted to other forms of energy during the collision? (Remember kinetic energy is a scalar so will never be negative)

4. A 56.0 kg object is moving at 2.8 m/s, it strikes and sticks to a stationary 24.0 kg object. How much kinetic energy was converted into other forms during the collision?

5. A 1.0 kg ball moving at 6.0 m/s to the left, collides elastically with a stationary 2.0 kg ball.
    a. What is the total kinetic energy of the system before the collision?

    b. What must the total kinetic energy of the system be after the collision?

    c. What is the total momentum of the system before the collision?

    d. What is the total momentum of the system after the collision?

    e. After the collision, the 2.0 kg ball is moving at 4.0 m/s to the left. How fast and in what direction is the 1.0 kg ball moving?

    f. What is the kinetic energy of each ball after the collision? (remember kinetic energy is a scalar so will always be positive)

6. A 2.5 kg ball moving at 56 m/s East strikes a 26 kg ball moving at 21 m/s East. After the collision the 2.5 kg ball is moving 11 m/s West.
    a. What is the final velocity of the 26 kg ball?

    b. What is the magnitude of the impulse the balls give to each other?

    c. If the collision lasts 0.023 seconds, what force do the ball apply to each other?

7. A 3.1 kg object collides with and sticks to a stationary 4.8 kg object, after the collision they move at 5.6 m/s. What was the initial speed of the 3.1 kg object?

8. A 5.0 kg object is moving at 25 m/s to the West and strikes another 5.0 kg object moving at 25 m/s to the East. Both objects come to a stop. How much kinetic energy was converted into other forms of energy during the collision?

9. A ballistic pendulum is a device used to measure the velocity of a projectile. A 0.031 kg bullet is fired into a 10.0 kg block of wood hanging from a string. The wood block then swings upward to a height of 0.35 m above where it started.
    a. How much potential energy did the block have at its highest point?

    b. Assuming there was negligible friction in the rope how much kinetic energy did the block/bullet system have when the bullet was lodged into the block?

    c. What was the velocity of the block/bullet system immediately after being struck?

    d. Using conservation of momentum what was the velocity of the bullet just before it hit the block?

10. A 20.0 kg block sliding at 5.0 m/s to the left collides with a 30.0 kg block sliding at 6.0 m/s to the right. The blocks apply a force of 900.0 N to each other during the collision for 0.21 seconds. The blocks then move apart over a surface with $\mu = 0.17$. How far apart are the blocks when they stop?

11. A 1100 kg car rear ends a stationary 1600 kg truck. Together they slide 6.0 m over a surface with $\mu = 0.42$. How fast was the car travelling when it hit the truck?

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Answer Key

1a) Perfectly inelastic	1b) 1500 $\frac{kg \cdot m}{sec}$	1c) zero	1d) 1500 $\frac{kg \cdot m}{sec}$	1e) 120 kg
1f) 12 m/s	2a) $3.0 \times 10^2 \frac{kg \cdot m}{sec}$ to the right	2b) $3.0 \times 10^2 \frac{kg \cdot m}{sec}$ to the right	2c) 270 $\frac{kg \cdot m}{sec}$ to the left	2d) 58 m/s left
2e) 9800 J	2f) 7700 J	2g) Inelastic	3a) Block A: 5.0 m/s left Block B: 3.0 m/s right	3b) 4.0×10^1 J
4) 66 J	5a) 18 J	5b) 18 J	5c) 6.0 $\frac{kg \cdot m}{sec}$ to the left	5d) 6.0 $\frac{kg \cdot m}{sec}$ to the left
5e) 2.0 m/s right	5f) 1kg ball: 2.0 J 2 kg ball: 16 J	6a) 27 m/s East	6b) 170 Ns	6c) 7300 N
7) 14 m/s	8) 3100 J	9a) 34 J	9b) 34 J	9c) 2.6 m/s
9d) 850 m/s	10) 6.0 m	11) 17 m/s		