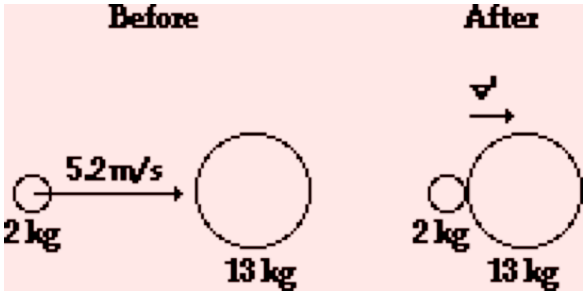
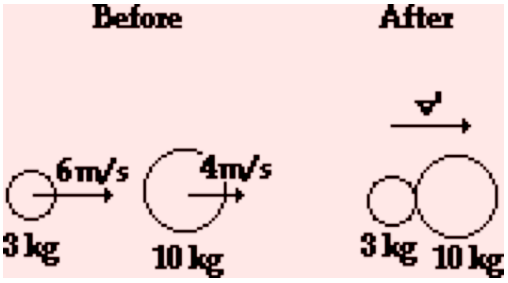
Momentum-Collisions Puzzle Solving **Name:**_____

0. Determine the post-collision velocities of the following objects or combination of objects:

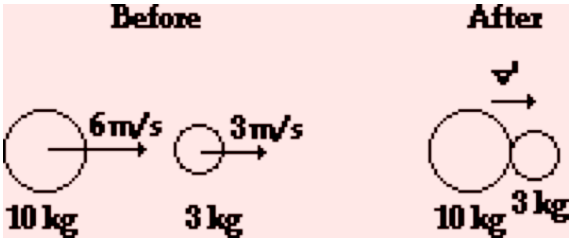
a.



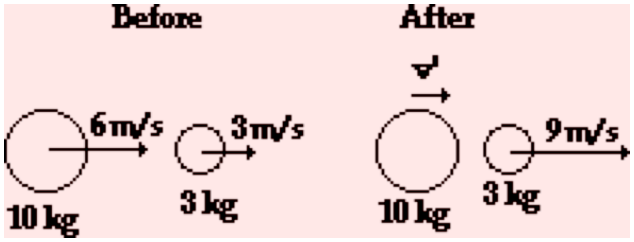
b.



c.

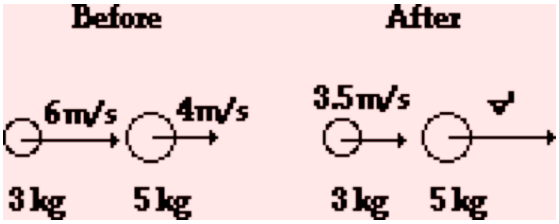


d.



e.

f.

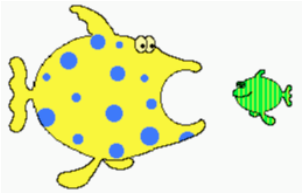


1. A 10-kg medicine ball is thrown at a velocity of 15 km/hr to a 50-kg skater who is at rest on ice. The skater catches the ball and subsequently slides with the ball across the ice.

   Consider the skater and the ball as two separate parts of an isolated system. (no external forces). Fill in the before- and after-collision table below.

	Momentum Before Collision	Momentum After Collision	Momentum Change
Ball			
Skater			
Total			

Determine the velocity of medicine ball and the skater after the collision. **PSYW**

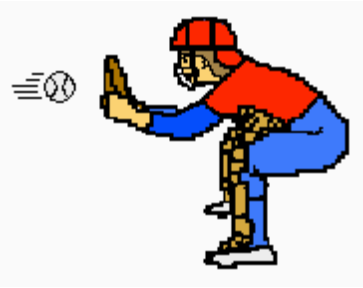


2. A large fish with a mass of 1-kg is in motion at 45 cm/s when it encounters a smaller fish (m=0.25 kg) that is at rest. The large fish swallows the smaller fish and continues in motion at a reduced speed. Fill in the before- and after-collision table below.

	Momentum Before Collision	Momentum After Collision	Momentum Change
Large Fish			
Small Fish			
Total			

Determine the velocity of the large and the small fish after the collision. **PSYW**

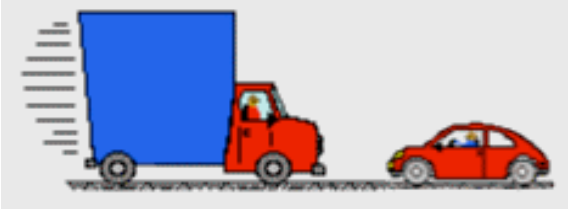
3. A 0.150-kg baseball moving at a speed of 45.0 m/s crosses the plate and strikes the 0.250-kg catcher's mitt (originally at rest). The catcher's mitt immediately recoils backwards (at the same speed as the ball) before the catcher applies an external force to stop its momentum. If the catcher's hand is in a relaxed state at the time of the collision, it can be assumed that no net external force exists and the law of momentum conservation applies to the baseball-catcher's mitt collision. Fill in the before- and after-collision table below.



	Momentum Before Collision	Momentum After Collision	Momentum Change
Baseball			
Catcher's Mitt			
Total			

Determine the velocity of the baseball/catcher's mitt immediately after the collision. **PSYW**

4. A 4800-kg truck traveling with a velocity of +4.0 m/s collides head-on with a 1200-kg car traveling with a velocity of -12 m/s. The truck and car entangle and move together after the collision. Fill in the before- and after-collision table below.



	Momentum Before Collision	Momentum After Collision	Momentum Change
Truck			
Car			
Total			

Determine the velocity of the truck and car immediately after the collision. **PSYW**

5. A 2.1-kg brick is placed gently upon a 2.9-kg cart originally moving with a speed of 26 cm/s. Determine the post-collision speed of the combination of brick and cart. **PSYW**

6. A 98-kg fullback is running along at 8.6 m/s when a 76-kg defensive back running in the same direction at 9.8 m/s jumps on his back. What is the post-collision speed of the two players immediately after the tackle? **PSYW**

7. A 0.112-kg billiard ball moving at 154 cm/s strikes a second billiard ball of the same mass moving in the opposite direction at 46 cm/s. The second billiard ball rebounds and travels at 72 cm/s after the head-on collision. Determine the post-collision velocity of the first billiard ball. **PSYW**

8. A 225-kg bumper car (and its occupant) is moving north at 98 cm/s when it hits a 198-kg car (occupant mass included) moving north at 28 cm/s. The 198-kg car is moving north at 71 cm/s after the head-on collision. Determine the post-collision velocity of the 225-kg car. **PSYW**

9. A 4.88-kg bowling ball moving east at 2.41 m/s strikes a stationary 0.95-kg bowling pin. Immediately after the head-on collision, the pin is moving east at 5.19 m/s. Determine the post- collision velocity of the bowling ball. **PSYW**