

### Collision Analysis

Read from **Lesson 2** of the **Momentum and Collisions** chapter at **The Physics Classroom**:

<http://www.physicsclassroom.com/Class/momentum/u4l2d.html>  
<http://www.physicsclassroom.com/Class/momentum/u4l2e.html>

**MOP Connection:** Momentum and Collisions: sublevels 7, 8 and 9



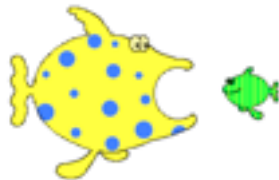
1. A 10-kg medicine ball is thrown at a velocity of 15 km/hr to a 50-kg skater who is at rest on ice. The skater catches the ball and subsequently slides with the ball across the ice.



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**

## Momentum and Collisions

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