Work Sheet 7a - Collisions and momentum

Introduction

In this activity you will investigate collisions between different mass spheres. The principle of the conservation of momentum always applies to collisions like these.

In this simulation the collisions are perfectly elastic. This means that the total kinetic energy of the colliding objects is the same after they collide as it is before. When a collision is elastic, kinetic energy is not transformed to other forms (heat or sound for example) by the impact.

Preparation

Before you start, review the Introduction and Study Points sections of the topic. In particular make sure you understand what is meant by momentum and the principle of the conservation of momentum.

When the principle of the conservation of momentum is applied to a collision between two masses, m_1 and m_2, moving along a straight line, it is expressed by the equation:

$$m_1u_1 + m_2u_2 = m_1v_1 + m_2v_2$$

where u_1 and u_2 are the masses' initial velocities and v_1 and v_2 their final velocities.

Getting started

Select two spheres which you wish to collide by dragging them into the collision area. You can drag two identical spheres into place or select two different mass spheres.

Type the initial velocities into the boxes above the spheres. Positive velocities are directed from left to right, negative velocities are directed from right to left.

Click the Go button to see what happens. If the spheres collide their new velocities are displayed in the velocity boxes.

Things to investigate

Use the equation above to check that momentum is conserved in all the collisions you investigate.

Try setting up the following collisions. Make notes on what happens in each case.

1. A collision between a moving mass and an identical stationary mass.

2. A collision between two identical masses moving at equal speeds in opposite directions.

3. A collision between a small moving mass and a large stationary mass.

4. A collision between a large moving mass and a small stationary mass.

Can you think of real life examples of each of the collisions above?

Continue to investigate a variety of different collisions for yourself.