Bouncing balls

Belgium

Conservation of momentum – the effect of collisions

You will need...

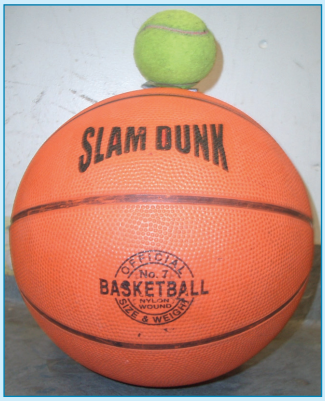
- ✔ a tennis ball
- ✔ a basket ball
- ✔ a lofty room (e.g. a sports hall)

Background

Momentum is the product of mass and velocity.

Follow these steps

1 Drop the tennis ball and the basketball independently from the same height and see how high they both bounce.
2 Hold the tennis ball on top of the basketball, then drop them both at the same time.
3 Watch how high the two balls bounce now.



So what happened?

If the tennis ball bounces off the top of the basket ball then it bounces high into the air – approximately nine times as high as previously.

This is a demonstration of conservation of momentum. Some of the momentum from the basket ball is transferred to the tennis ball, thereby causing the tennis ball to bounce higher.

There are also other reasons why the ball bounces higher, such as the different sizes, elasticity and air resistance of the two balls.

Safety note

- Remove breakables from the vicinity and do not stand over the balls as you bounce them.

What next?

A number of people have looked at the maths of this exercise. You can find out more at http://physics.ucsd.edu/students/courses/fall2001/physics2a/tennis-basket-balls.pdf and at http://www.physics.otago.ac.nz/teaching/PHSI110/jakub/Momentum.html.