Acceleration due to Gravity

Apparatus

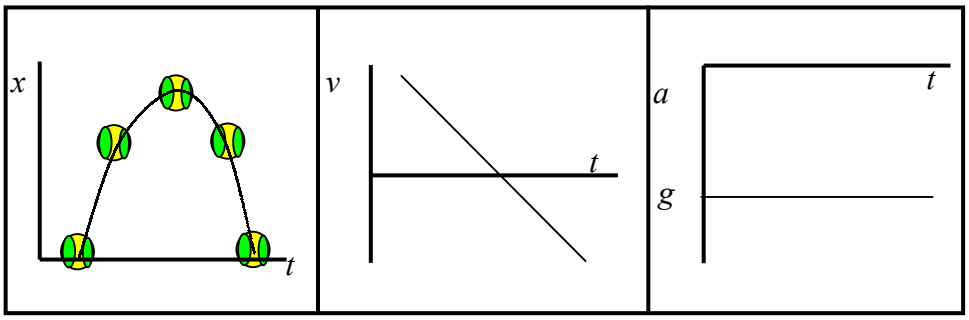
tennis ball

Action

The students throw the ball directly up into the air and catch it again. They should watch to see how the ball's velocity changes, and consider the direction of acceleration of the ball during its flight.

The Physics

Once the ball has left the student's hand there is only the force of gravity acting on it (neglecting air resistance). Hence the only acceleration is that due to gravity, and the acceleration is always downwards. The velocity of the ball decreases as it goes up, becomes zero, and then negative as it falls back down. Hence the speed (magnitude of velocity) decreases and then increases again, but the velocity only decreases. This exercise helps students recognise that acceleration is not always in the direction of velocity (or displacement). Many students find this a difficult concept.



Accompanying sheet

Acceleration due to Gravity

Throw the ball straight up into the air,
and catch it when it comes back down again.

Describe what happens to the velocity and acceleration of the ball.

Sketch the acceleration as a function of time.
Sketch the ball's velocity and displacement as a function of time.