Motion Sensor/Timer

What science says

If 's' is used to stand for distance and 't' for time then:
velocity (v) = ds/dt
acceleration (a) = d^2s/dt^2 = dv/DT
Hence - when starting from zero velocity - the distance and acceleration are related by:
$s = 1/2(a.t^2)$
(Check that you understand why this equation follows from the ones above.)

Capturing the data

Timing

What data can you actually measure using the equipment?
How can/does the machine transform this to the variables you may wish to use?

Motion sensor

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How can/does the machine transform this to the variables you may wish to use?

Modelling the data

Motion sensor

It is often hard for children to appreciate what constant velocity and/or acceleration feel like. This experiment is designed to help you try to recreate the model by physical action. Move your hand/yourself to make graphs of constant velocity and acceleration (both positive - speeding up - and negative - slowing down) appear on the screen.

Timing

Does the data fit the model? What aspects of the equipment are designed to help this fit be as close as possible?

Extensions

Motion sensor

Are the graphs what you expect? Try recreating more complex motion curves.

Timing

Try dropping a ball through the two sensors arranged vertically. How can you use this to measure the acceleration due to gravity?
Devise a way of using the sensors to measure reaction rates of individuals. Use the model to make a prediction - then test this empirically.