In this experiment, we will verify Newton's Second Law by changing the force used. Newton's Second Law is shown by the equation force (F) equals mass (m) times acceleration (a).

To do this we will use:

An air track with air source. The air track reduces the amount of friction.
A light gate which is attached to a motion sensor
A pulley wheel at the end of the track
A glider fitted with a double mask
The glider is attached by a length of string to a hanger
We will also use additional masses.

In this setup, the force is the weight of the hanger. As the hanger falls, it accelerates the glider, which is the mass, along the track. We will vary the force by adding mass to the hanger.

Draw up a simple table for the results. This should have columns for force and acceleration.

We do not need units for the force as it is proportional to the number of masses on the hanger. Acceleration is measured in metres per second per second.

Let's begin the experiment: Set up the motion sensor to measure acceleration and enter the width of the double mask. In this case, each part is one centimetre or 0.01 metres.

The first trial uses the hanger with no additional masses. Start the blower and let the glider slide through the light gate on the air track.

Use the motion sensor to record the acceleration and note this in the results table. In this case, the acceleration was 0.47 metres per second per second.

Repeat the experiment with two masses - the mass of the hanger and one additional mass.

Three masses.

Four masses.

And five masses.

We can use the results to draw a graph with force on the y-axis and acceleration on the x-axis. Plot the results and then draw a line of best fit.

The result is a straight line with a positive gradient which passes through the origin of the graph. It shows that as the force increases, so does the acceleration.

There is a direct relation between force and acceleration for a constant mass which verifies the equation force: F() equals mass, (m )times acceleration (a).