Data analysis exercise with specimen practical results

In an experiment to measure the acceleration due to gravity (g), a steel ball is dropped from rest and the time taken, t for it to fall through a height, h is measured three times. Below are some results for this experiment.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| h / m |  | t / s |  | tav / s | tav2 / s2 |
| 0.100  0.200  0.300  0.400  0.500  0.600  0.700  0.800  0.900 | 0.141  0.203  0.249  0.286  0.316  0.350  0.373  0.407  0.429 | 0.144  0.203  0.248  0.284  0.316  0.351  0.370  0.407  0.427 | 0.141  0.201  0.250  0.284  0.319  0.352  0.372  0.404  0.428 |  |  |

Complete the table adding the average value of t, and the square of this value for each height.

First plot a graph of h v t. This is NOT a straight line graph, and you would NOT expect it to be one. Try to draw the best smooth curve through the points*. How can we tell from this graph what the relationship is between the variables?*  The answer is that we can’t! This is one reason why we choose to plot graphs in straight line form - it is easy to identify a straight line.

Plotting a straight line graph from the experimental data

The equation is h = 1 g t2

2

y = m x + c

To get a straight line graph we need to plot **h** against the **t2**values which you have already calculated in the table.  *Can you see why?* Look at the equation - *what should the gradient equal for this graph?* Is there an intercept term, or will the graph pass through the origin?

Now plot the graph (with h on the y axis and t2 on the x axis) and calculate g *from* the gradient. (N.B. This does not mean g is *equal* to the gradient.)