MODELLING MOTION WITH QUADRATIC REGRESSION

1. Gather two metre sticks, a stop watch and a ball. Support the two metre sticks at one end so that the ball will roll down the space between the sticks. Experiment with the height of the support until the ball takes 5 – 10 seconds to roll 1 m.
2. Place the ball at the 0 cm mark. Let it roll for 1 s and measure the distance that it rolled. Record the time and distance in the table below.
3. Repeat step # 2 for 2 s, 3 s, and so on, until the ball runs off the metre sticks.
4. Complete the First Differences and Second Differences column of the table.

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| Time (s) | Distance (cm) | First Differences | Second Differences |
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1. Examine the distance travelled in 1s and in 2 s. How do the two compare?

Examine the remaining seconds – is there a trend?

1. Without graphing the information, predict the shape of the graph, if time is on the horizontal axis and distance is on the vertical axis.
2. Graph the time and distance. Compare the shape of the graph with your prediction in # 6? Were you correct?
3. When an object rolls down a ramp, what is the relationship between the distances travelled for equal time intervals?
4. The first differences show the rate of change of distance with respect to time. What units should be used for the rate of change?
5. Does the change in distance over equal time intervals appear to be increasing, constant or decreasing? Explain how you know.
6. Examine the data in the Second Differences column. What type of relationship should this be? Why?
7. How would you determine the equation of the line?