(Nabila Salim 10CKg)

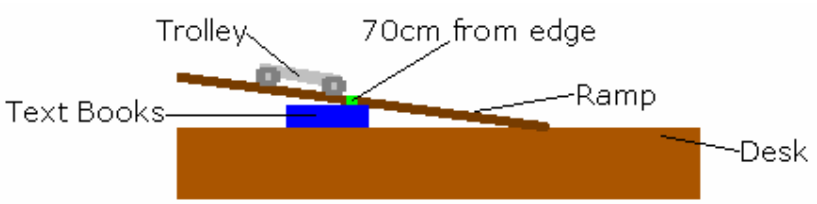
How high, how far?

The aim:
The aim of this experiment is to change the angle of a ramp and place a trolley 70 cm away from its edge and release it and see how far the trolley travels off of the ramp.

Prediction:
I predict that the smaller the angle between the ramp and the desk (the less steep) the less the trolley will travel off of the ramp and the larger the angle between the ramp and the desk (the more steep) the more the trolley will travel off of the ramp.
I think this because if the ramp is steeper the trolley will accelerate more as it goes down it and it will travel further and if the ramp isn't very steep then the trolley will not accelerate very much as it goes down it and it wont travel very far.

Equipment needed:
Desk/floor
Ramp
Trolley
Metre Sticks
Calculator
Textbooks

Equipment set-up:



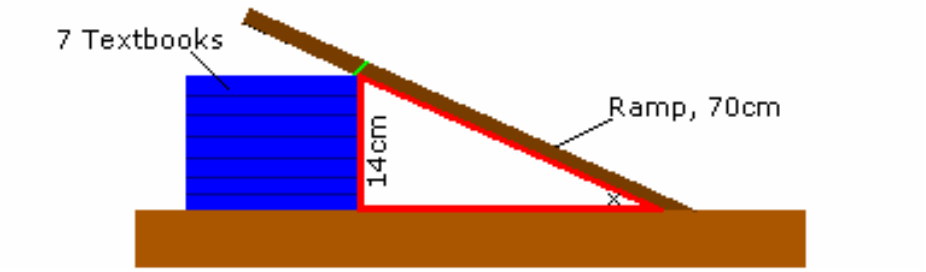
Fairness:
To make this experiment fair I have to make sure that:

- I put the textbooks under the ramp at the same place each time
- I make sure that the front of the trolley starts at the 70cm mark
- I make sure that I let the trolley go rather then push it down the ramp
- I do each test three times and average out the result
- Our trolley isn't biased to one side when it rolls

Measuring:
To find out the distance travelled by the trolley from the end of the ramp I will use a metre stick and will measure from the base of the ramp to the front of the trolley where it has stopped on the desk/floor.
I measured the height of one textbook and found it to be 2cm high, and I made sure that the edge of the textbooks that were holding the ramp up were lined up with the 70cm mark that we made on the ramp.
For each experiment we counted up the number of textbooks and from that calculated the height of the textbooks and we already knew that the ramp from the edge of the books to the desk was 70cm long and from this information and knowledge of the trigonometry equation;

$$\frac{\text{opposite (the height of books)}}{\text{hypotenuse (70cm)}} \times \sin^{-1}$$

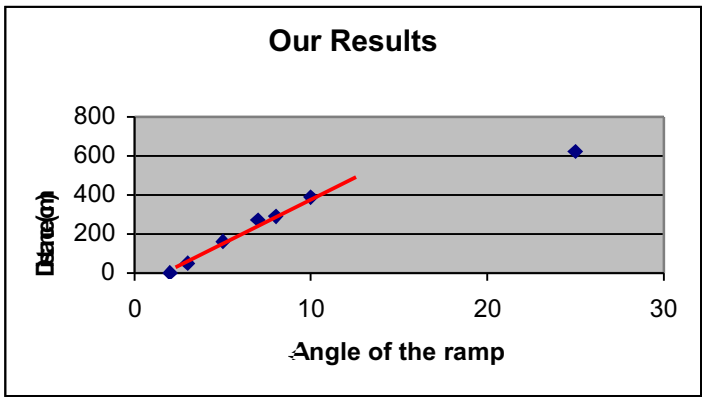
We were able to calculate the angle of the ramp from the desk.



Recording my results:
To make my experiment fair I will do each test three times and then work out the average distance. I will use this table to record my results:

Angle of ramp	**Distance travelled by trolley (cm)**			
	Test 1	Test 2	Test 3	Average
2	0	0	0	0
3	52	55	44	50.3
5	151	168	165	161.3
7	277	270.5	267	271.5
8	275	305	287.8	289.3
10	387	392	384.5	387.8
25	617	619	625	620.3

I highlighted some of the results that seemed a bit of a distance away from the others in red, I think that our results were unreliable.
Our trolley always leant to the right when it was rolling and this could have affected our measurements of the distance travelled a lot.

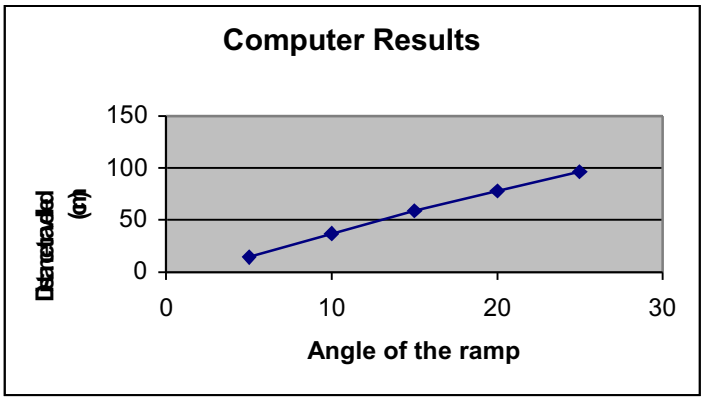


I put our results into a scatter graph using the average distance to display them clearly, our results may have been affected by the quality of our trolley but there is still a clear pattern visible within our results. The bigger the angle of the ramp the greater the distance the trolley travelled.
We were running out of time to do our experiment so we decided to get the ramp angle up to 25 (using trigonometry to work out how many books we needed to do this) so that we could compare our results fairly to the results we gathered from a computer. But if we had the time then I would've liked to record some results for the angles between 10 and 25, to make sure that they followed the same pattern as the other angles did.

Using a computer I collected these results:

Angle of ramp	**Distance travelled by trolley (cm)**			
	Test 1	Test 2	Test 3	Average
5	14.8	13.9	14	14.2
10	37.1	36.7	36.6	36.8
15	57.9	61.3	56.8	58.6
20	76.9	78.5	77.8	77.7
25	93.8	98.6	96.8	96.4

I highlighted some of the results that seemed a bit of a distance away from the others in red, I don't know what could have affected these results because they were done by a computer.



I also displayed the computers results into a scatter graph using the average distance and these results seem a lot more reliable then ours because the line on the graph is at a constant slope upwards.

Conclusion:

In our results the trolley travelled much much further then in the results I collected from the computer. I think that this could be due to a lot of reasons:

- ✓ Maybe the trolley on the computer was a different size, weighed differently and rolled differently to the one that we used.
- ✓ Maybe the ramp on the computer was made of different material or was smoother or rougher then ours.
- ✓ Maybe the floor that the trolley ran on on the computer was smoother or rougher then ours. (Etc)

But what was shown by both results was the fact that the larger the angle of the ramp the further the trolley travelled off of the ramp.

My prediction was correct, if the ramp is steeper the trolley will accelerate more as it goes down it and it will travel further.

Evaluation:

I think that our results were unreliable because of the slanted wheels on the trolley but other then that I don't believe that anything else could have affected this experiment.

I think that the computer's results were very clear and it was very easy to spot the pattern between the angle of the ramp and the distance travelled by the trolley.

To improve this experiment I think that we would need to find a simpler way to measure/work out the angle of the ramp and I think that we should make sure to use a better trolley next time.