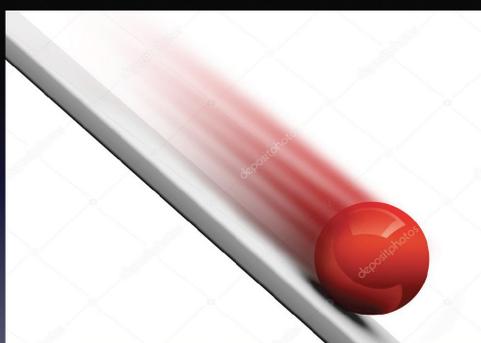


## CBA1 Extended Experimental Investigation



Rolling a ball

## CBA1 Extended Experimental Investigation

### Prediction

- Before I conducted my experiment I had already made some assumptions about what was going to happen. My prediction is that the higher the ramp is the further the ball would roll and I also thought that since I was using a measuring tape that my measurements would always be clear.

### Hypothesis

- The reason I thought the ball would go faster the higher the ramp was because if you rolled a ball down a hill it would go faster than rolling the same ball with the same force on the ground.
- The reason I think my measurements will be accurate is the ramp is holding down the tape so as long as the ramp doesn't move the tape will not move.

**1. Makes a prediction in relation to distance but justification uses the word faster when further is meant.**

## CBA1 Extended Experimental Investigation

### Equipment + Experiment

- Handball
- A wooden ramp at 2m 45 cm
- A stool
- A meter stick
- A measuring tape that is over 30m long
- The way I conducted my experiment was that I got a stool placed it on the the ground then got my ramp and placed it on top of it.
- I then got my meter stick then measured how high the ramp was at the back.
- I put the ball at the top and pushed it with my arm and then measured the distance it traveled from the ramp by using the measuring tape that I placed next to the bottom of the ramp.
- When the ball finished rolling I then got the meter stick and put it right next to the edge of the ball and that is how I measured how far it traveled.
- When I have rolled the ball three times at a certain height I will change it to a different height.

### Safety

- Remember any time you an experiment always try to be safe you wouldn't want to hurt yourself.
- So the most dangerous thing about this experiment is the heavy ramp and how long it is.
- For example if you turned around while holding the ramp is that if you turn you might hit someone in the face.
- Always check your surroundings when you turn and make sure when you are going through a doorway it is able to go through.

2. The height of the ramp at the back and the distance travelled are identified as variables to be changed and measured. Safety is considered and a simple method lacking some detail is described.

## CBA1 Extended Experimental Investigation

### The experiment

- So for my experiment I had to get my ramp and roll a ball on it while measuring it with a measuring tape while recording it within my book.
- I can see what you are all saying but you will be surprised at how hard it is to do this. Lets see what you say after I explain everything



### Raw data

- At 0cm the results were 121.9cm 126cm and 125.1cm the difference between the furthest and the shortest distance is 4.1cm.
- At 25cm the results were 760cm 710cm and 680cm the difference between the furthest and shortest distance is 80cm.
- At 50cm the results were 1440cm 1260cm and 1180cm the difference between the shortest and furthest distance is 260cm.
- At 75cm the results were 2096cm 2160cm and 2081cm the difference between the shortest and furthest distance is 79cm.
- At 100cm the results were 1770cm 1820cm and 1830cm the difference between the shortest and furthest distance is 60cm.
- This therefore means that the 50cm rolls are the most unreliable out of all of them

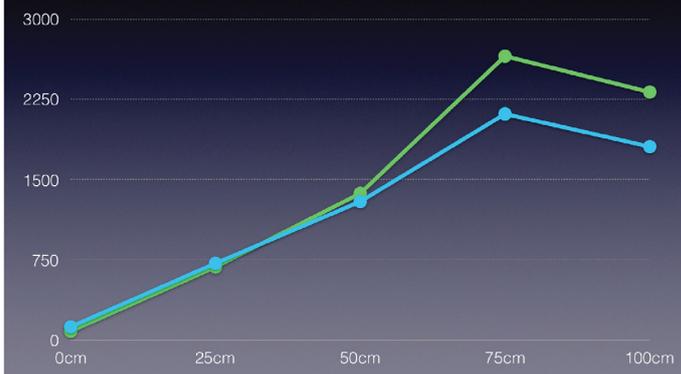
3. Raw data is recorded and a calculation is done to identify reliability of results.

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### What the raw data means

- So first thing as you can see that I have tested each height three times.
- When I say the ball was rolled at 0cm high I mean I got the ramp and placed it flat on the ground and rolled the ball.
- I tried 5 different heights as you can see from the data.
- The accuracy of the results is indicated by the shortest and furthest distance. The smaller the gap the more accurate it is.

### The result



4. The results are displayed on a graph and the y-axis units are identified on the following slide. Axes require labels.

## CBA1 Extended Experimental Investigation

### Results meaning

Green is tennis ball

- Blue equals handball
- The y axis is measured in cm

The line graph shows us how far the ball was traveling from the height the ramp was positioned at.

As you can see added all the graph uses the averages of each height them by three is what I used in my diagram.

### The pattern

- So the first thing I tried to do was find if there was a pattern between the distance and the height but when I tried to do this I couldn't find the connection.
- When I tried to figure out if there was a pattern I found out there was one until it came to 75cm because it then got lower. One of the reasons might be because it started bouncing at this point which made it lose momentum.
- Maybe one of the reasons this is that it might be because of the problems with my measuring tape that I used because sometimes when I looked at where the measuring tape was it had been moved. Maybe the measuring tool used can affect the distance.

5. States a relationship between variables up to 75cm in the second paragraph and then proposes reasons for the change in the relationship at higher heights.

## CBA1 Extended Experimental Investigation

### Testing the pattern

- So I wanted to see if this pattern applied to other balls so I decided to try my experiment with a tennis ball.
- When I tried it these are the results I got.
- At 0cm the results were 79cm 68cm 102cm.
- At 25cm the results were 890cm 552cm 605cm.
- At 50cm the results were 1550cm 1340cm 1220cm.
- At 75cm the results were 2570cm 2830cm 2557cm.
- At 100cm the results were 1950cm 2460cm 2540cm
- Even before averaging these you can tell that 75cm was better than 100cm and we can see the pattern stays the same.

### Joke Analysis

- The y axis is measured in cm
- I was wrong

6. Conducts a second experiment to test whether the relationship identified can be repeated.

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### True Analysis

- From checking the results we learned some interesting information.
- We found out that the higher the slope is doesn't actually make it go further it is actually 75cm that is the best slope height out of all of them to roll any ball at from what angles I tried.
- But I think I have figured out why the slope at 75cm is better than 100cm.

### 75cm better that 100cm

- The reason I think that the reason that 75cm was better than 100cm is in my opinion because of the angle the ramp was at let me explain.
- When I had the at 25cm it was at a wide angle and then when it was 50cm the angle got shorter and as you can guess with 75cm it got shorter which made the distance increase which and for clarification the angle I am talking about is the angle of the ramp to the floor.As soon it came to 100cm the angle was at its shortest but this time it didn't go further it rolled less.The reason I think this is so is because a short angle is good but when it is to short it isn't good and that is why I think 75cm is the best because of how it was angled.

7. Comments on the investigation without making a conclusion.

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- I also used the formula for finding the slope of a graph and my findings were interesting.
- The formula is  $y_2 - y_1$  divided by  $x_2 - x_1$ .
- $Y$  = the distance that the ball travelled and  $x$  = the height the ramp was at.
- When I used this formula I found out the slope was increasing steadily until it came to the 75cm and the 100cm.
- When I used the formula 75cm = 26.5 rounded and 100cm = 16.8 rounded.
- This just proves even more that 75cm is better than 100cm.

## The variables

- Whenever I rolled the ball the angle of the ramp turns a little which makes it not as accurate as it could be.
- The amount of force I used every time I rolled the ball I rolled the balls with various different amounts of strength which makes my calculations not 100% accurate

## CBA1 Extended Experimental Investigation

### Ways to improve

- Making the ramp completely stable so the angle the ball is rolling at is always the same.
- Automating the rolling of the ball would increase the accuracy of the ball distance from the ramp
- Also making sure the ramp doesn't go down lower when you roll it is also something you would have to fix for accuracy since you can't have a ramp 75cm high then after a roll it goes down to 70cm.

### Conclusion

- So in the end I was wrong as we can tell from the data I have collected.
- At the start I believed that the higher the ramp the further it would go but that has been debunked.
- The slope formula just proves that my hypothesis was wrong or it didn't apply to this particular experiment.
- I would have to say when I first made the graph I was thinking that I did it wrong but now I understand that it wasn't.
- I thought that the anomaly was the fact that at 0cm to 25cm it had an incredible increase of over 500cm but now I realize it was just the way it was.
- The anomaly is now 100cm ramp height and this is because if the 100cm ramp made the ball roll further than the 75cm ramp my hypothesis would have been right but now I know I wasn't.

8. Draws a conclusion and identifies weaknesses and suggests improvements

**Overall judgement:**  In line with expectations