

## Roll-experiment report

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|---|--------------------------|---|
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We chose to do the roll experiment; this means we will use our phone with PhyPhox running in the background to measure the speed of a roll going down a slope with a variable angle by neatly putting the phone inside the roll.

### 1) ORIENTATION

#### Research question:

What is the correlation between the size of the orbital speed an object experiences and the angle from which the object is set into a rolling motion?

**Hypothesis:** The correlation is quadratic, because  $v_{orb} = (2\pi * F)^2 * r$

### 2) PREPARATION

#### Material:

- Roll that is big enough to put your phone in
- Phone with PhyPhox
- An incline with adaptable angles. (examples a wooden plank)
- Ruler( to measure the diameter)

#### Method:

- Put your phone inside the roll and make sure it is fastened
- Take the plank and set up your incline
- Hold the roll in its place at the top of the incline
- Set up Phyphox (roll-experiment) to start the measurements
- Press on the three points in the right upper corner and press on timed measurement.
- Delayed start 3s and duration experiment 4s.
- When you are ready press again on the three points and export the data to excel.
- Do this experiment 3 times without changing the angle
- Change the angle to an arbitrary value and repeat the experiment three times over.
- Don't forget to export the data!
- Change the angle one last time and repeat the experiment 3 times.

- Export the data

### 3) DATA ANALYSIS and DISCUSSION

#### Observations and Measurements:

Cylinder diameter= 10,5 cm

|               |  |                              |
|---------------|--|------------------------------|
| <b>Roll 1</b> | <b>average speed:</b><br>-0,176429 m/s | <b>height slope:</b> 6.6 cm  |
| <b>Roll 2</b> | <b>average speed:</b><br>-0,424592 m/s | <b>height slope:</b> 11.6 cm |
| <b>Roll 3</b> | <b>average speed:</b><br>-0,441824 m/s | <b>height slope:</b> 16.6 cm |

#### Discussion:

Despite several attempts, we believe that we have done something wrong in the execution of the experiment, as the speed comes to us negative, which is not possible considering that the roller rolls forward and not backwards; even changing the location of the phone inside the roller, the result was the same.

### 4) REFLECTION

**Conclusion:** Without taking into account the graph, but the motion observed during the execution of the experiment, we can say that the orbital speed and the angle of the axis are directly proportional, because as the amplitude of the angle of the descent increases, Orbital velocity is also higher.

#### Comparison of the results of the different countries:

##### Averages of Belgium

|                 |              |                |         |
|-----------------|--------------|----------------|---------|
| AVG SPEED ROL 1 | 0,434506 m/s | HEIGHT SLOPE 1 | 6,6 cm  |
| AVG SPEED ROL 2 | 0,456256 m/s | HEIGHT SLOPE 2 | 11,6 cm |
| AVG SPEED ROL 3 | 0,552064 m/s | HEIGHT SLOPE 3 | 16,6 cm |

**Reflection:** If our data were positive, then the measurements of roll 2 and 3 would be very similar, while there would be a clear difference with roll 1.

### 5) REFERENCES

<https://youtu.be/gPq4Le9kXWE> (the video by phyphox that helped us to understand the experiment)