	TEAM: 7	
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Smartphone-accelerations into physics situations	Italy	Diego Paglierani Stela Xhumri
EXPERIMENT: mathematical correlation between inclination and speed		

1. ORIENTATION

Put the smartphone on a sloping surface and let it slide off. Increase the angle of the slope to find the mathematical correlation between the speed of the smartphone and the gradient. Use Phyphox to measure all information.

a. **Research question:**

What is the mathematical correlation between the inclination angle and the acceleration of the smartphone that slides off the slope.

b. Hypothesis

The bigger the angle, the bigger the acceleration of the smartphone will be. (The bigger the angle, the lower the weight of the smartphone, the faster it will slide down)

2. PREPARATION

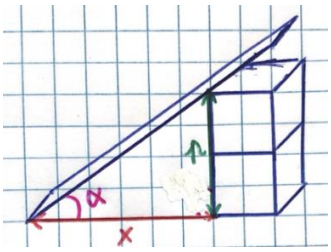
2.1. Material:

- Smartphone with the Phyphox application
- A plank (minimum 1 metre)
- Several (wooden) blocks
- A ruler

2.2. Method:

- First of all, prepare the construction for the experiment:
  Make a tower with the little blocks and let the plank lean on it. (see picture)

- Calcute the angle that you've just made:
  Measure the length between the end of the plank and the beginning of the tower. (red line (x) in the picture) and measure the height of (green line (p) in the picture). Then you can calculate the angle with the formula of the tangent. (tan α = p/x)



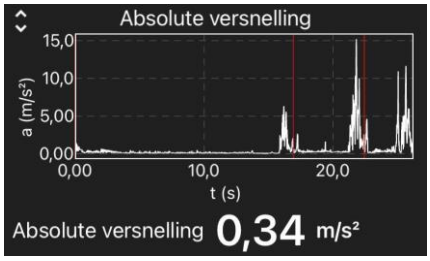
- Let your smartphone slide of the inclination (with Phyphox, use the experiment: 'acceleration without g'). Interpret the a(t) graph (only use the useful information of the graph) repeat 3 times.
- If you interpret the graph, use the column 'absolute'
- Put an extra block on the tower to increase the angle of inclination. Then let your phone slide off again 3 times and interpret the graphs.
- Repeat this experiment at least 3 times with a different inclination angle.

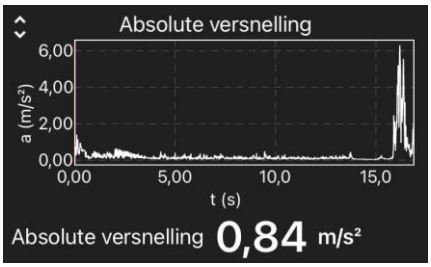
3. DATA ANALYSIS and DISCUSSION

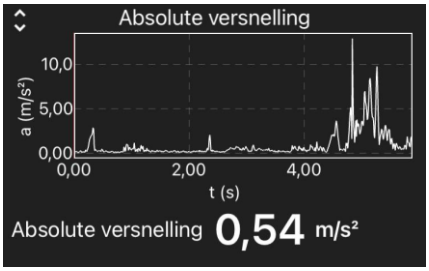
3.1. Observations and Measurements:

	Angle (°) (tan α = p/x)	Sin α	a - take 1 (m/s²)	a - take 2 (m/s²)	a - take 3 (m/s²)	a – average
1	10,5	0,18	0.34	0.84	0.54	0.57
2	12,9	0,22	0.76	0.86	0.79	0.80
3	15,4	0,27	0.54	1.02	1.06	1.04
4	17,8	0,30	1.46	1.64	1.32	1.47

Measurement 1

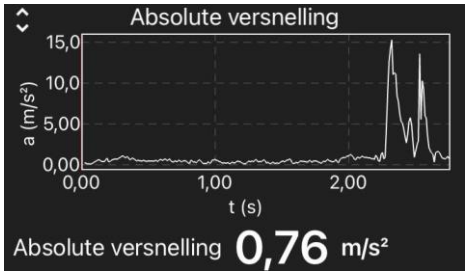


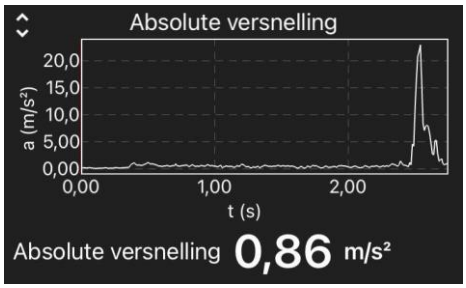


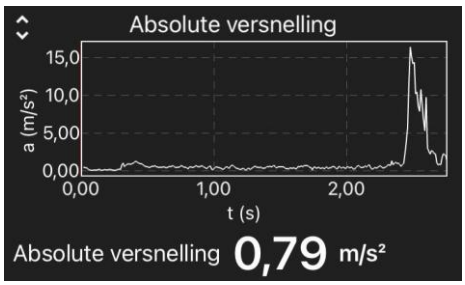


Experiment

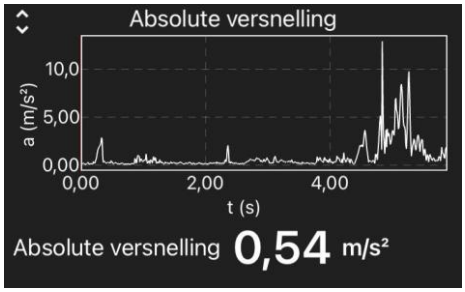
Measurement 2

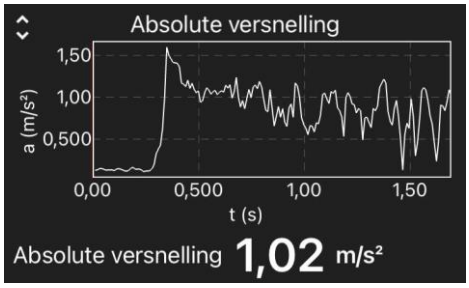


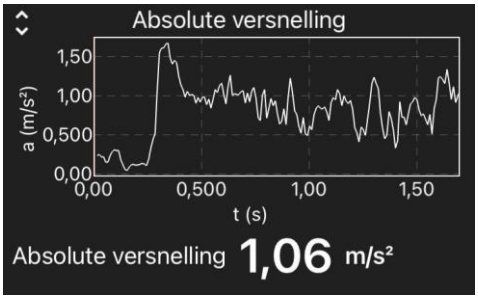




Measurement 3

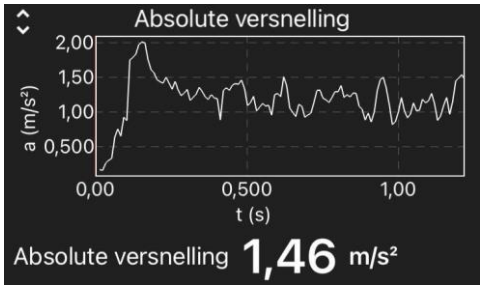


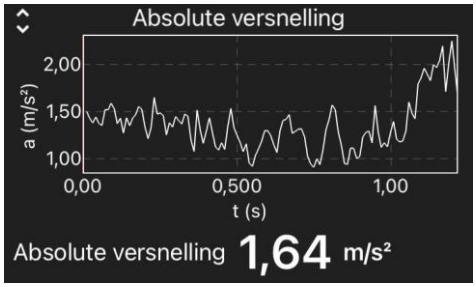


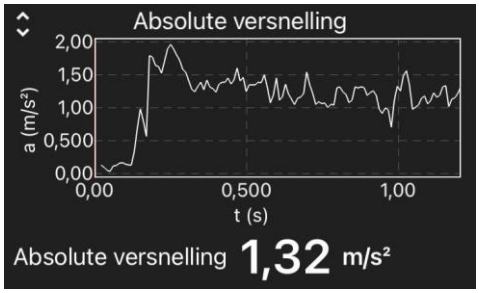


Experiment

Measurement 4







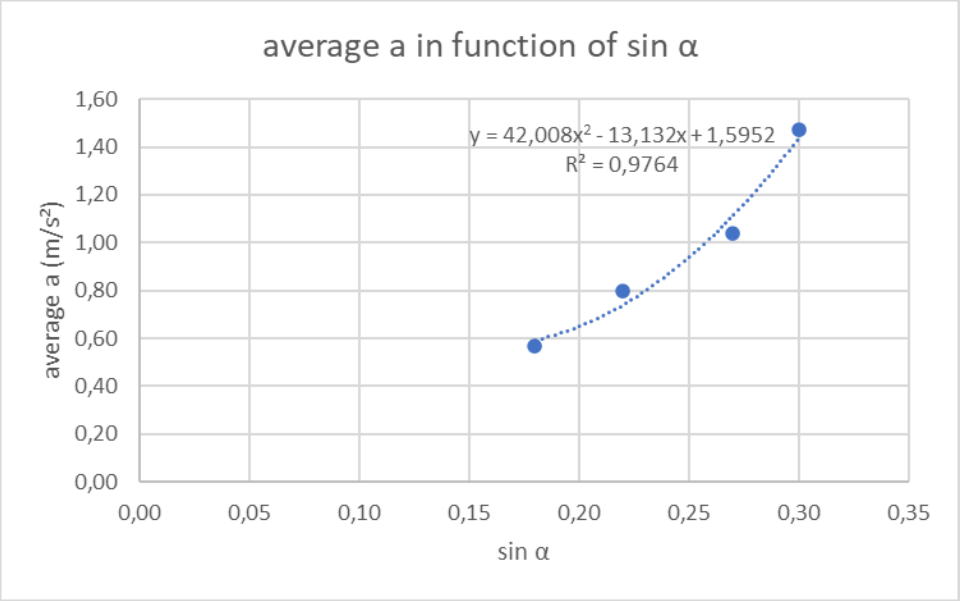
3.2. Discussion:

We put all our measurements in a table in excel. (All our measurements = Sin α and average a.)

We are looking for a correlation between the sine of the different angles and the average acceleration. So we create a graph with that little table, in that graph, on the x-axis are the values of the sine of the different angles. On the y-axis, there are the values of the average acceleration.

In addition to the table, we also need a equation to interpret the mathematical correlation between the angle and the acceleration. Excel finds the equation:

$y = 42{,}008X^2 - 13{,}132X + 1{,}5952$, a quadratic correlation. It follows that as the angle increases, so will the acceleration.



4. REFLECTION

4.1. **Conclusion**:

The mathematical correlation between the inclination angle and the acceleration of the smartphone that slides off the slope is a “to the power” correlation.

4.2. **Comparison** of the results of the different countries

4.3. **Reflection:**

At the first take of the third angle, we ran into a problem. Phyphox registered a very low value for a, which was not within our range of expectations. Then we decided to disregard this value. (We took the average of the second and third take.)

We didn’t keep in mind that with the ruler we used, we could measure more accurate by measuring the millimeters also.

R^2 is close to 1, so that shows that our graph is almost correct.

5. REFERENCES