E-TWINNING EXPERIMENT TEAM 6

1. **ORIENTATION**

1.1. **Description**:

Put your phone or other tracking device in a cylinder. After that, the second step is to build an inclination using a wooden shelf. After that, we will roll the cylinder with the phone in it from the top to the bottom and thus tracking the speed. We will repeat this process a few times, each time with another type of surface.

1.2. **Research question**:

What is the relation between the surface used for rolling an object and the speed of that moving object?
Also by changing surfaces, the speed of the cylinder remains constant.

1.3. **Sub-questions**:

• Which material causes the least friction and what is the effect on the speed of the object?
• How big are the differences between the speed of the roll on each one of the surfaces?
According to what I said before, I don't have enough data to answer to these questions.

1.4. **Hypothesis**:

The paper underground will show the highest, final velocity and thus the highest speed, as it has the smoothest surface with the least amount of irregularities. It will show a huge difference between the sandpaper and fabric. The fabric will be the worst, because we think that that experiment will prove the existence of a high value of friction. Fabric isn't the most smooth surface, so we think that the roll will be slowed down rapidly. Sandpaper also contains an irregular underground, which will have an impact on the speed of the object. It will all depend on which kind of wood used. If the wooden shelf doesn't contain any wrinkles. However, we think that the relation between the speed of the different undergrounds will be as following:
paper > wood > sandpaper > fabric

2. **PREPARATION**

2.1. **Material**:

- Cylinder tube wide enough to put a phone in
- Wood to let the cylinder roll off
- Wood, fabric, normal white paper and sandpaper used as surfaces on the wooden inclination
- Phone with app of Phyphox
- ruler

2.2 **Method**:

1. Put your phone or tracking device into a cardboard cylinder with a radius of around 5cm.
2. Build an inclination using the wooden shelf at about 45°.
3. Place a piece of white paper on the wooden shelf so that it is entirely covered.
4. Let the cylinder roll from the top of the shelf to the bottom, where you will stop the cylinder (at the bottom). This way, you will measure the speed of the cylinder from the top to the bottom. Do this 3 times in order to receive a most perfect measurement.
5. Repeat this process another 3 times, once with sandpaper, another time without any extra

surface and thus on the wood itself and a last time on a fabric underground.
6. This way, you will have done this experiment 4 times, and each surface tested and repeated 3 times. In total: 12 measurements.
7. Put these data into a graph and evaluate the data. Answer on the research question and read the hypothesis another time.

3. **DATA ANALYSIS and DISCUSSION**

3.1. **Observations and Measurements**:

2,72310279	1,00050564	20,0101128
2,76301978	1,00050564	20,0101128
2,80299781	1,00050564	20,0101128
2,84288429	1,00050564	20,0101128
2,88286231	1,00050564	20,0101128
2,92284034	1,00050564	20,0101128
2,96275733	1,00050564	20,0101128
3,00273536	1,00050564	20,0101128
3,0427439	1,00050564	20,0101128
3,0826609	1,00050564	20,0101128
3,12260841	1,00050564	20,0101128
3,16261695	1,00050564	20,0101128
3,20253394	1,00050564	20,0101128

Paper's speed.

3,48039367	1,00050564	20,010112
3,5203717	1,00050564	20,010112
3,56041076	1,00050564	20,010112
3,60035827	1,00050564	20,010112
3,6403363	1,00050564	20,010112
3,68031432	1,00050564	20,010112
3,72023132	1,00050564	20,010112
3,76017882	1,00050564	20,010112
3,80015685	1,00050564	20,010112
3,84007384	1,00050564	20,010112
3,88005187	1,00050564	20,010112
3,91999938	1,00050564	20,010112
3,95994689	1,00050564	20,010112

Fabric's speed.

2,21719588	1,00050564	20,0101128
2,25714339	1,00050564	20,0101128
2,29715194	1,00050564	20,0101128
2,33712997	1,00050564	20,0101128
2,37710799	1,00050564	20,0101128
2,41702499	1,00050564	20,0101128
2,45700301	1,00050564	20,0101128
2,49695052	1,00050564	20,0101128
2,53692855	1,00050564	20,0101128
2,57687606	1,00050564	20,0101128
2,6168846	1,00050564	20,0101128
2,65683211	1,00050564	20,0101128
2,69671859	1,00050564	20,0101128
2,73669662	1,00050564	20,0101128

Sandpaper's speed.

2,23545139	1,00050564	20,0101128
2,27542942	1,00050564	20,0101128
2,31540745	1,00050564	20,0101128
2,35535496	1,00050564	20,0101128
2,39527195	1,00050564	20,0101128
2,43528049	1,00050564	20,0101128
2,47528904	1,00050564	20,0101128
2,51526706	1,00050564	20,0101128
2,55521458	1,00050564	20,0101128
2,5951926	1,00050564	20,0101128
2,63520115	1,00050564	20,0101128
2,67520969	1,00050564	20,0101128
2,71518772	1,00050564	20,0101128
2,75519626	1,00050564	20,0101128

Wood's speed.

3.2. **Discussion**:
As we can see in the tables, the speed of the rotating object is always 1m/s. Even if we change surfaces, the results are the same. In the hypothesis it says that changing the surface should also change the speed, but it doesn't happen. In all of the images we have 1,00050564m/s. This problem could be due to the inclination of the wooden shelf, which is always the same, while it should change every time that we repeat the experiment.

4. **REFLECTION**

Conclusion:

The data demonstrates that regardless of the surface we use, the speed of the cylinder remains always the same.