eTwinning	TEAM: 9	
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Smartphone-accelerations into physics situations	Italy	Angelica Severi Arianna Carino
EXPERIMENT:		

1. ORIENTATION

Experiment:

We want to do an experiment in which we put a phone in a bucket attached to a rope, so we can search for a relation between the length of the rope and the centripetal force in an uniform motion. One person holds this rope in his hands and starts to turn in circles. That way we can calculate the centripetal force with the app on the phone (in the bucket). We will try to keep the angular velocity consistent. We adjust the length of the rope during the experiment.

1.1. **Research question:**

What is the relation between the length of the rope (radius) and the centripetal force in a uniform circular motion?

Sub-question:

How does the centripetal acceleration changes if you change the length of the rope?

1.2. **Hypothesis:**

If you increase the length of the rope and keep the mass and angular velocity the same, the centripetal force will also increase. Because when you take a look at the formula, if you increase the radius, the force will also increase. We also think if we increase the length of the rope and keep the angular velocity the same, that the centripetal acceleration will decrease for the same reason above.

2. PREPARATION

2.1. **Material**:

- Bucket
- Rope
- Smartphone
- Phyphox
- Tape
- Ruler
- Scale

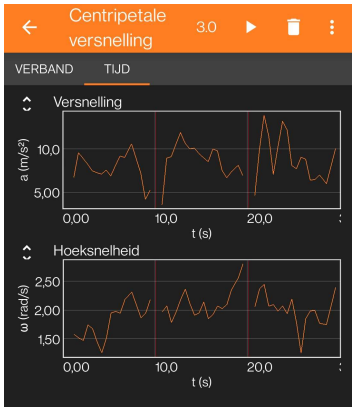
2.2. **Method:**

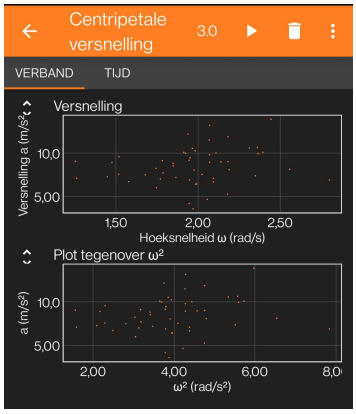
1. You put your smartphone in the bucket and make that it is attached to the bucket with tape.
2. Attach a rope to the bucket and make sure the bucket is well attached.
3. Start the Phyphox program on your phone and go to centripetal acceleration.
4. press on the three points in the right upper corner and press on timed measurement.
5. Delayed start 5s and duration experiment 10s.
6. Press on start button and start spinning around in circles for 15s.
7. When you are ready press again on the three points and export the data to excel.
8. Change the length of the rope and repeat the experiment 3 times with every length. Try to turn each time with the same velocity.

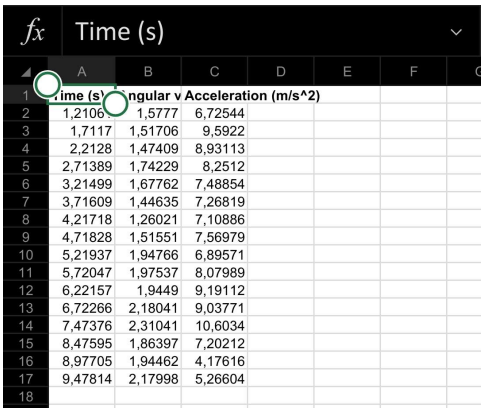
3. En DATA ANALYSIS and DISCUSSION

3.1. Observations and Measurements:

	Belgium	Italy
Mass of bucket	0,360 kg	
Mass of phone	0,209 kg	
Total mass	0,569 kg	
Length arms Thomas	0,50m	
Length arms Arthur	0,55m	
length	Length rope + length arms + length bucket	

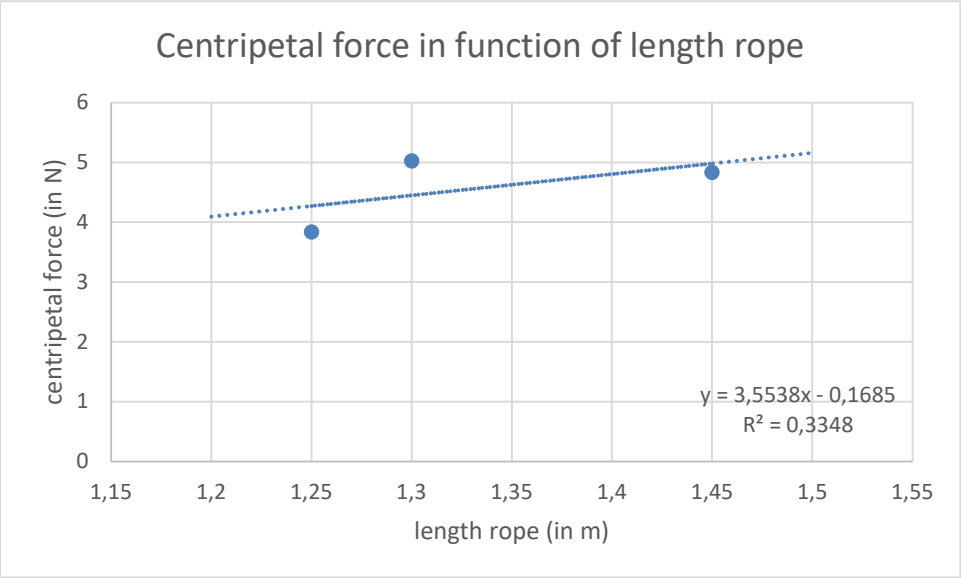






length (in m)	Centripetal acceleration average (in m/s²)	Centripetal force average (in N)	Length (in m) For Italy	Centripetal acceleration average (in m/s²)	Centripetal force average (in N)
1,25	6,75	3,84			
1,3	8,84	5,03			
1,45	8,51	4,84			

Experiment



3.2. Discussion:

When the results of Phyphox were received, the calculations of the average of all seconds were made. The results that were seen, were a bit strange. When the three different lengths were compared, a mistake was noticed. The frequency was obtained with calculations and it was remarkable that the second frequency was a lot faster. This is probably because Thomas did the second one and Arthur the first and the third one. But if you exclude the second measurement, you can clearly see that there is a linear evolution between the centripetal force and the length of the rope if you change the length of the rope. Another reason why the measurements maybe aren't perfect is the app that we used. It measures with a time gap and therefore sometimes there are extremes.

4. REFLECTION

4.1. Conclusion:

It is clear that the relation between the length of the rope and the centripetal force in a uniform motion is that the centripetal force increases if the length increases. That much is clear and is shown on the graph we made of our measurements. The measurements when the length of the rope was 40cm are different.

4.2. Comparison of the results of the different countries

4.3. Reflection:

We think the second measurements are wrong because Thomas did these experiments, and Arthur did the others. It could be he put in a bit more force. Our first hypotheses was correct. It is still clear that our second hypothesis was wrong. Our way of thought was that because a=v^2/r the centripetal acceleration

would decrease, because the r is in the denominator, but there is also a r^2 in the nominator we didn’t see.