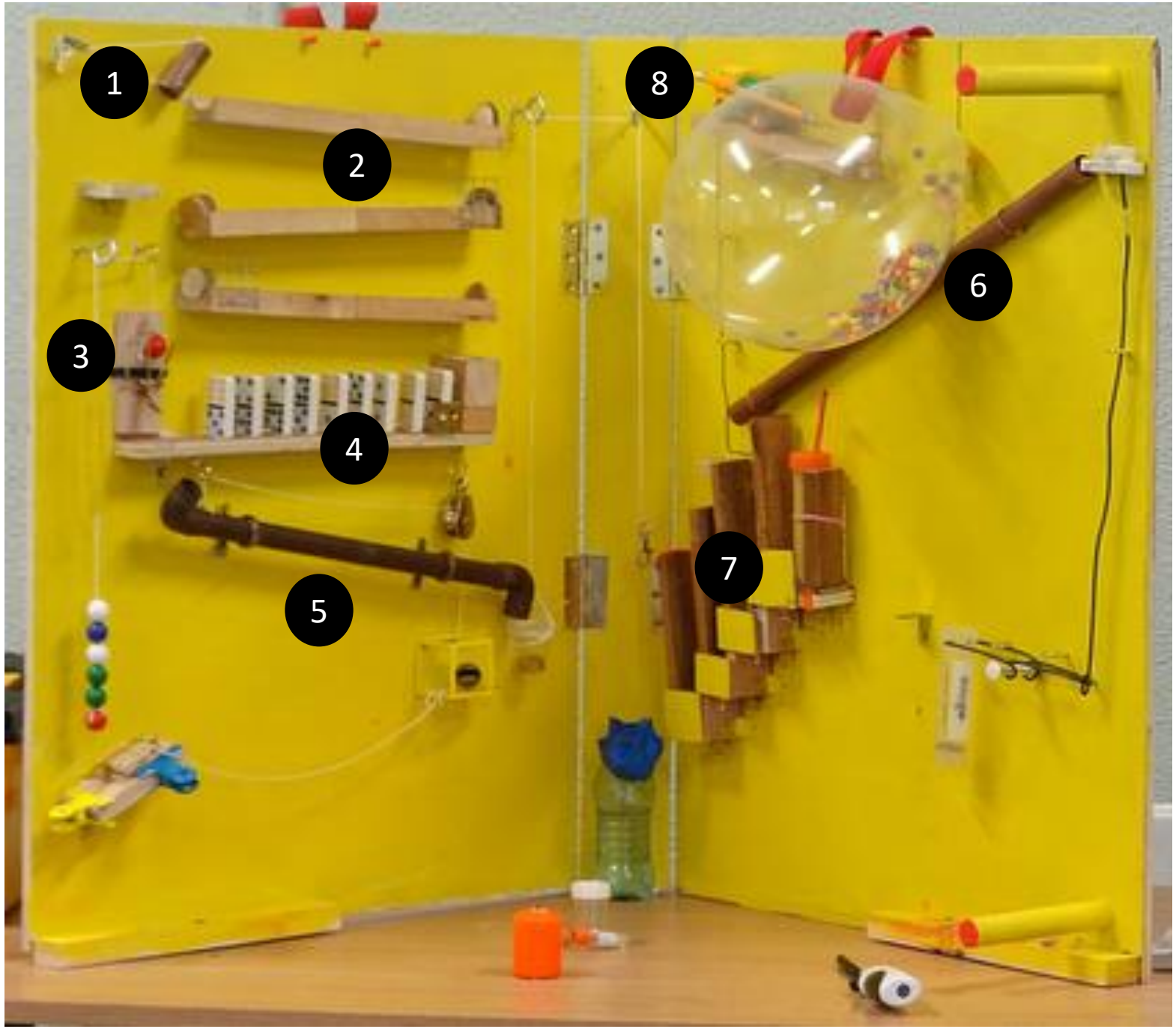
Rube Goldberg Machine

Pop a Balloon

Group Members: Ms. Gorski, Mr. Macklai, Mr. LeBreton



Short Description of Balloon Popping Machine

Steps

1. Lever to release marble. (LeBreton)
2. Series of inclined planes. (Gorski)
3. Pulley to release next marble. (LeBreton)
4. Domino reaction. (Macklai)
5. Pulley to release next marble. (LeBreton)
6. Inclined plane. (Gorski)
7. Pulley to release car with pointy pencil. (Macklai)
8. Car (wheels) to pop balloon. (Macklai)

Simple machines

- Lever (LeBreton)
- Pulley (LeBreton)
- Inclined plane (Gorski)
- Wheels (Macklai)

Phase 1: **Investigation**

Video we watched to give us ideas:

https://www.youtube.com/watch?v=VpLDfkLBJ0Q

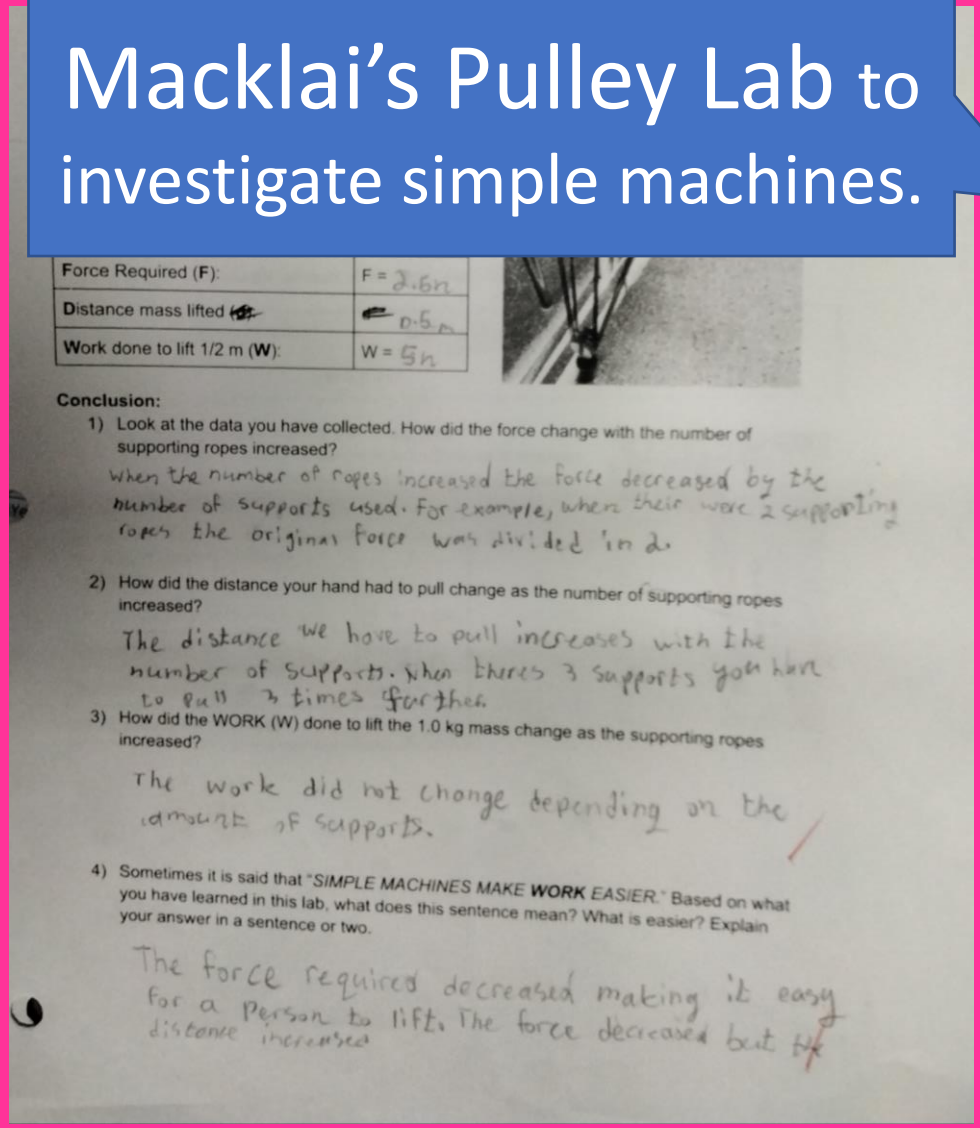
https://www.youtu…om › watch

Largest Rube Goldberg Machine - Guinness World Records

Subscribe || http://gwr.co/YT-SubFavourites || http://gwr.co/YT-FavsThis **Rube Goldberg** contraption consists of 427 individua…

YouTube · Guinness World Records · Dec 10, 2021

Picture of Mr. Macklai's Pulley Lab to investigate simple machines.



Force Required (**F**):	F = 2.6n
Distance mass lifted	0.5 m
Work done to lift 1/2 m (**W**):	W = 5n

Conclusion:

1) Look at the data you have collected. How did the force change with the number of supporting ropes increased?

When the number of ropes increased the force decreased by the number of supports used. For example, when there were 2 supporting ropes the original force was divided in 2.

2) How did the distance your hand had to pull change as the number of supporting ropes increased?

The distance we have to pull increases with the number of supports. When theres 3 supports you have to pull 3 times further.

3) How did the WORK (W) done to lift the 1.0 kg mass change as the supporting ropes increased?

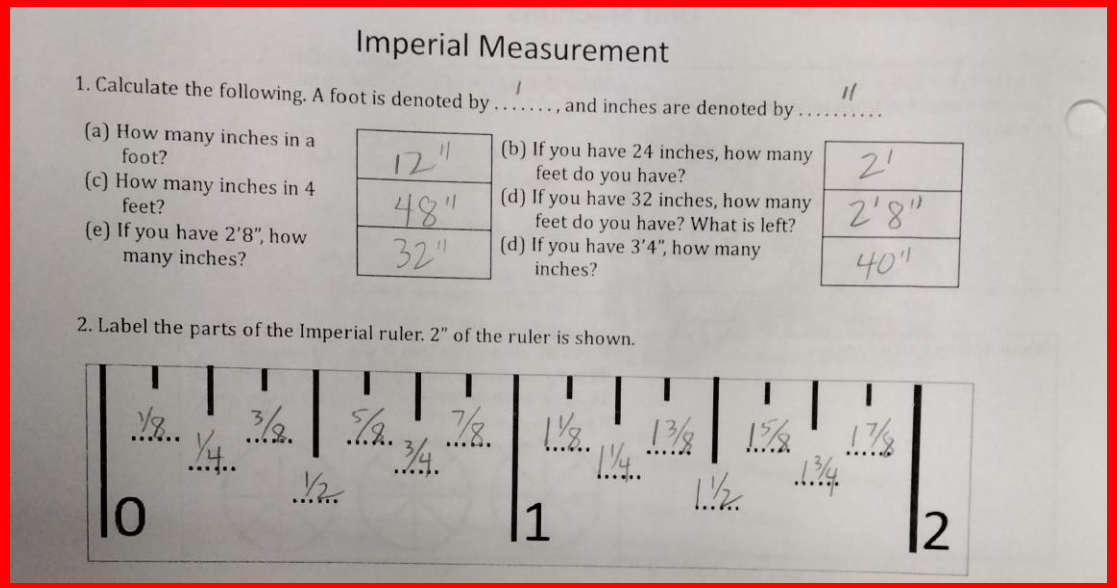
The work did not change depending on the amount of supports.

4) Sometimes it is said that "*SIMPLE MACHINES MAKE **WORK** EASIER.*" Based on what you have learned in this lab, what does this sentence mean? What is easier? Explain your answer in a sentence or two.

The force required decreased making it easy for a person to lift. The force decreased but the distance increased

Phase 2: **Problem Definition**

Work that we did about Imperial Measurement and the measurements we made about the maximum allowed space.



Imperial Measurement

1. Calculate the following. A foot is denoted by ....., and inches are denoted by .....

(a) How many inches in a foot? 12"

(c) How many inches in 4 feet? 48"

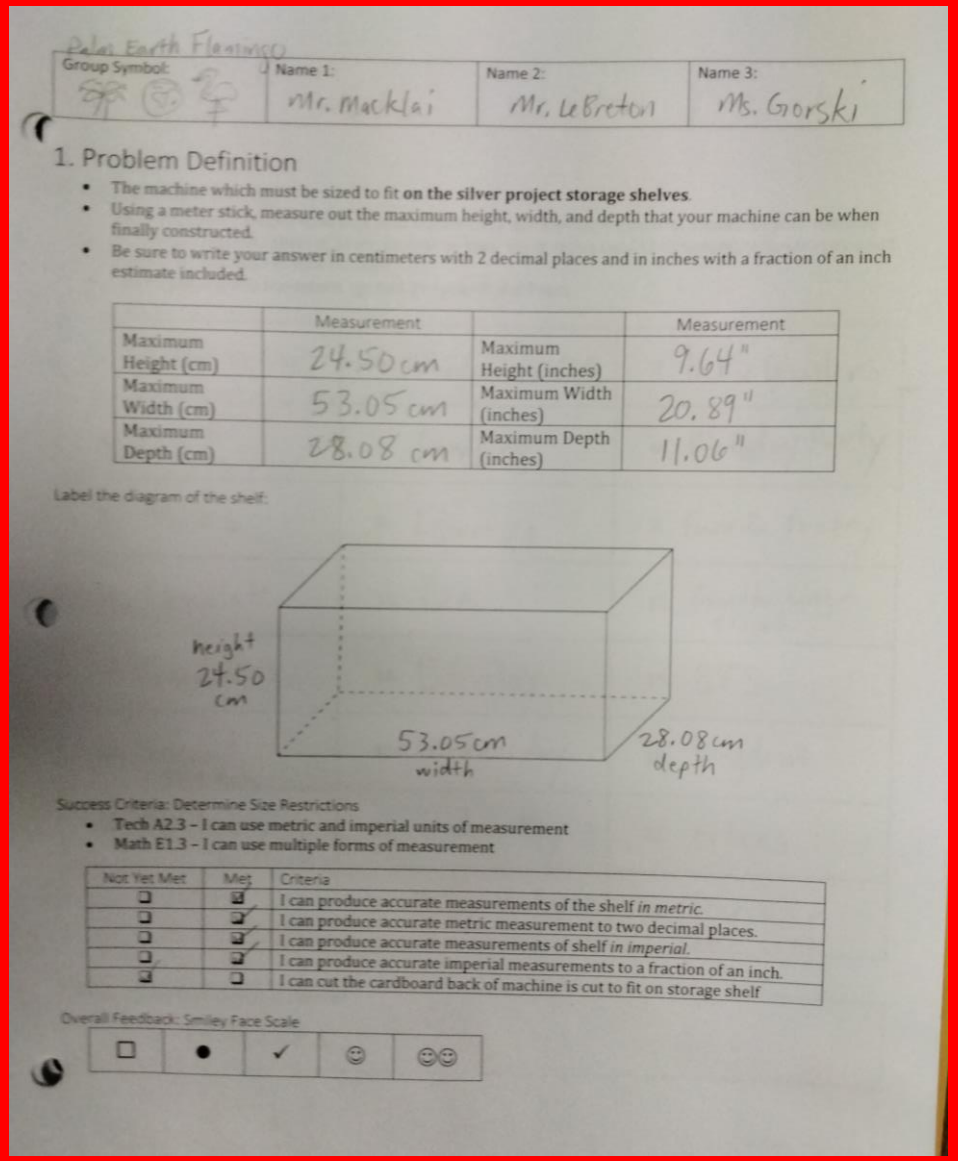
(e) If you have 2'8", how many inches? 32"

(b) If you have 24 inches, how many feet do you have? 2'

(d) If you have 32 inches, how many feet do you have? What is left? 2'8"

(d) If you have 3'4", how many inches? 40"

2. Label the parts of the Imperial ruler. 2" of the ruler is shown.



Polar Earth Flamingo

Group Symbol:	Name 1:	Name 2:	Name 3:
	Mr. Macklai	Mr. LeBreton	Ms. Gorski

1. Problem Definition

- The machine which must be sized to fit **on the silver project storage shelves**.
- Using a meter stick, measure out the maximum height, width, and depth that your machine can be when finally constructed.
- Be sure to write your answer in centimeters with 2 decimal places and in inches with a fraction of an inch estimate included.

	Measurement		Measurement
Maximum Height (cm)	24.50 cm	Maximum Height (inches)	9.64"
Maximum Width (cm)	53.05 cm	Maximum Width (inches)	20.89"
Maximum Depth (cm)	28.08 cm	Maximum Depth (inches)	11.06"

Label the diagram of the shelf:

Success Criteria: Determine Size Restrictions

- **Tech A2.3 – I can use metric and imperial units of measurement**
- **Math E1.3 – I can use multiple forms of measurement**

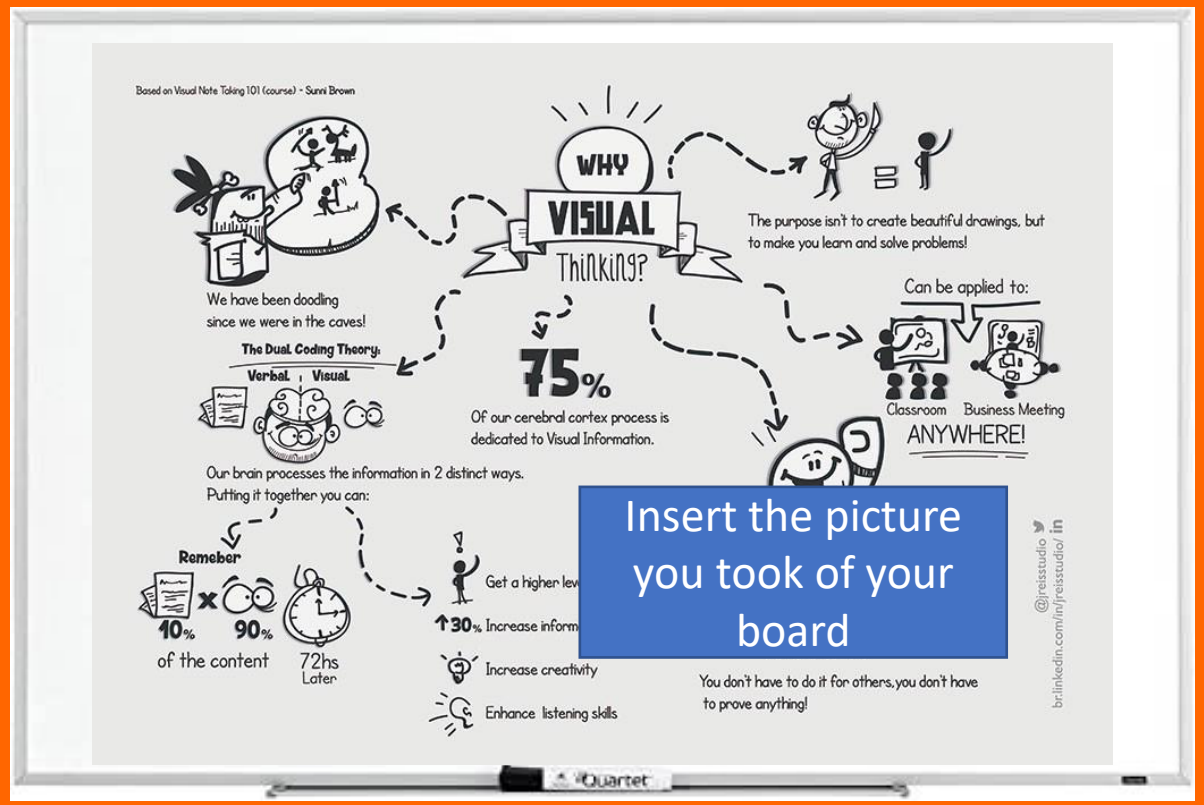
Not Yet Met	Met	Criteria
☐	☑	I can produce accurate measurements of the shelf *in metric*.
☐	☑	I can produce accurate metric measurement to two decimal places.
☐	☑	I can produce accurate measurements of shelf *in imperial*.
☐	☑	I can produce accurate imperial measurements to a fraction of an inch.
☑	☐	I can cut the cardboard back of machine is cut to fit on storage shelf

Overall Feedback: Smiley Face Scale

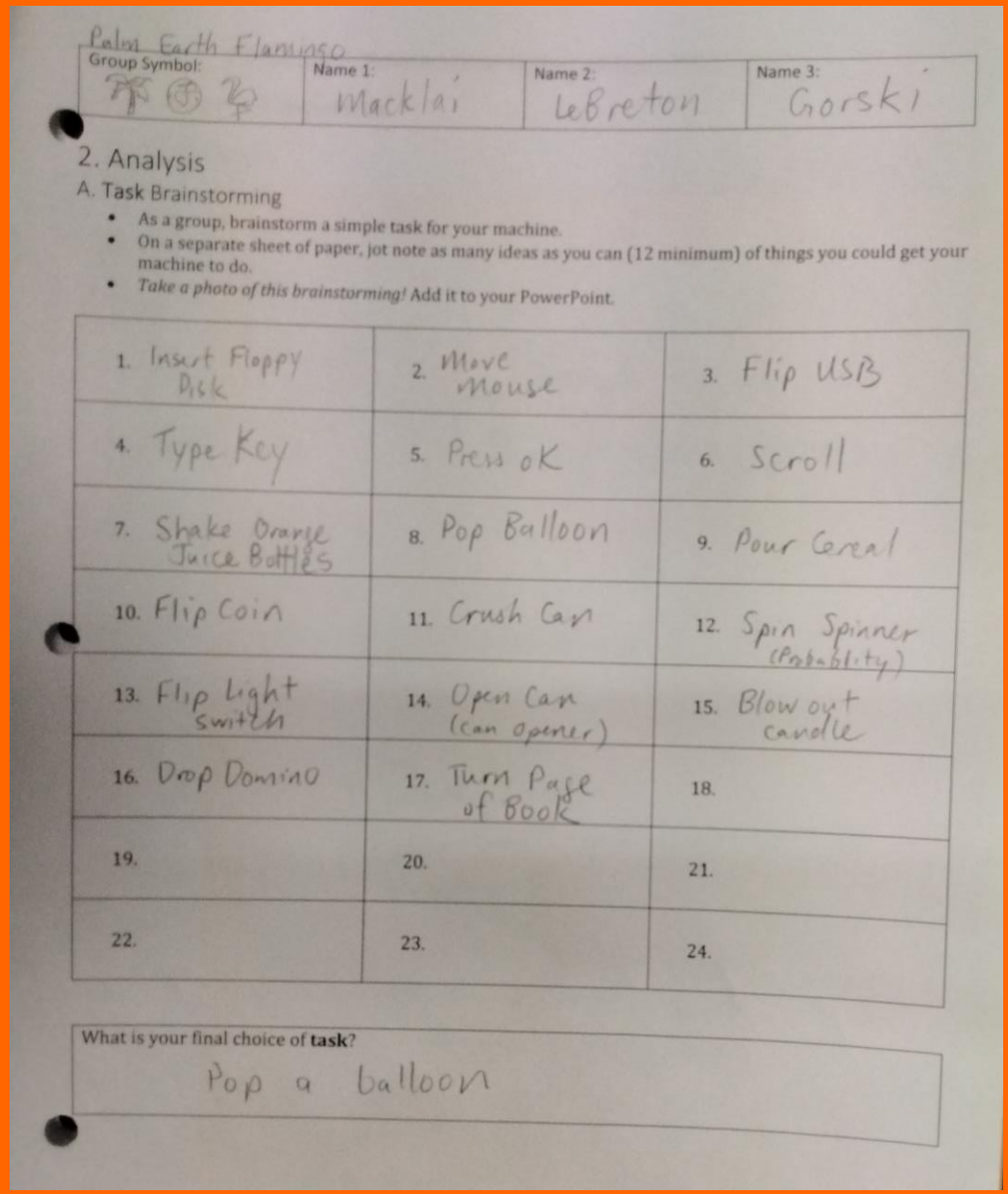
☐ • ✓ ☺ ☺☺

Phase 3: **Analysis**

Our task brainstorming process



Insert the picture you took of your board


Palm Earth Flamingo

Group Symbol:	Name 1:	Name 2:	Name 3:
	Macklai	LeBreton	Gorski

2. Analysis

A. Task Brainstorming

- As a group, brainstorm a simple task for your machine.
- On a separate sheet of paper, jot note as many ideas as you can (12 minimum) of things you could get your machine to do.
- *Take a photo of this brainstorming!* Add it to your PowerPoint.

1. Insert Floppy Disk	2. Move mouse	3. Flip USB
4. Type Key	5. Press oK	6. Scroll
7. Shake Orange Juice Bottles	8. Pop Balloon	9. Pour Cereal
10. Flip Coin	11. Crush Can	12. Spin Spinner (Probability)
13. Flip Light switch	14. Open Can (can opener)	15. Blow out candle
16. Drop Domino	17. Turn Page of Book	18.
19.	20.	21.
22.	23.	24.

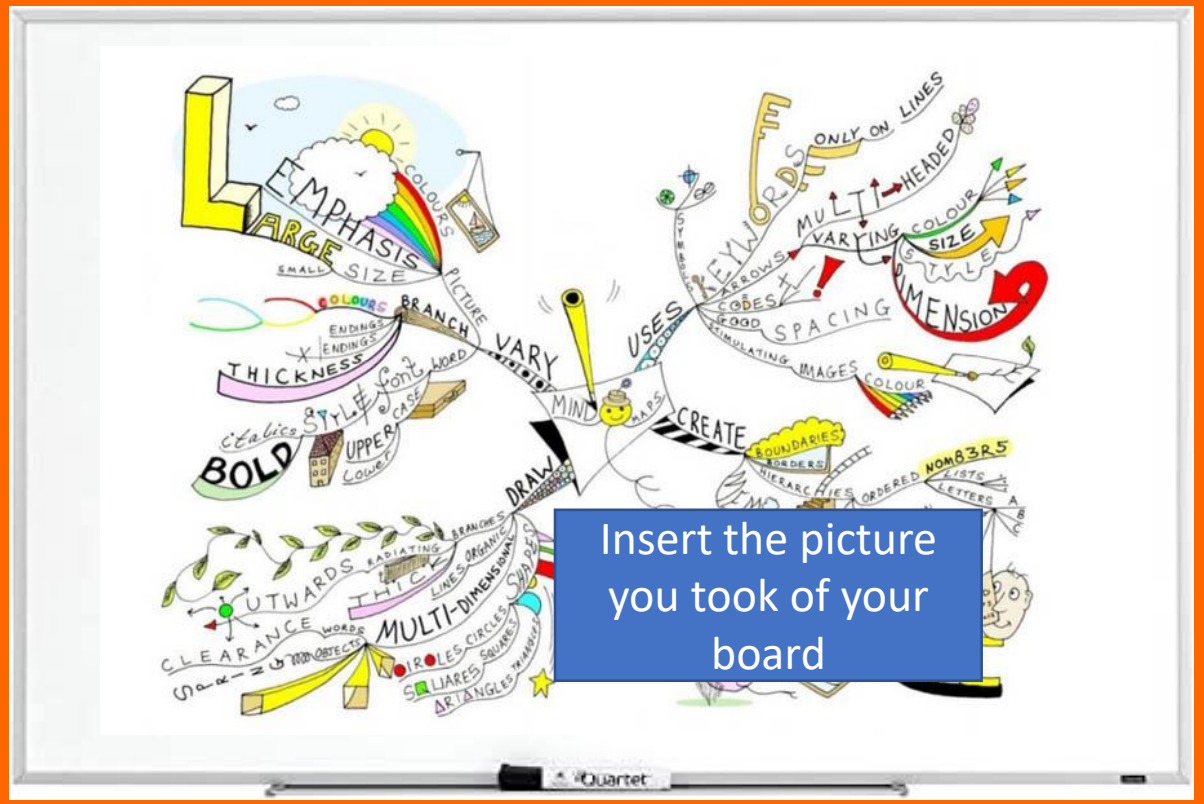
What is your final choice of **task**?

Pop a balloon

Our choice: Pop a balloon.

Phase 3: **Analysis**

Our theme brainstorming process



Our choice: Pop a balloon.

Palm Earth Flamingo

Group Symbol:	Name 1:	Name 2:	Name 3:
	Macklai	LeBreton	Gorski

2. Analysis

B. Theme Brainstorming

- Once you have decided on the task your machine will accomplish, brainstorm themes for your machine.
- On another separate sheet of paper, jot note as many ideas as you can (12 minimum) of themes you could include in the design of your machine.
- *Take a photo of this brainstorming!* Add it to your PowerPoint.

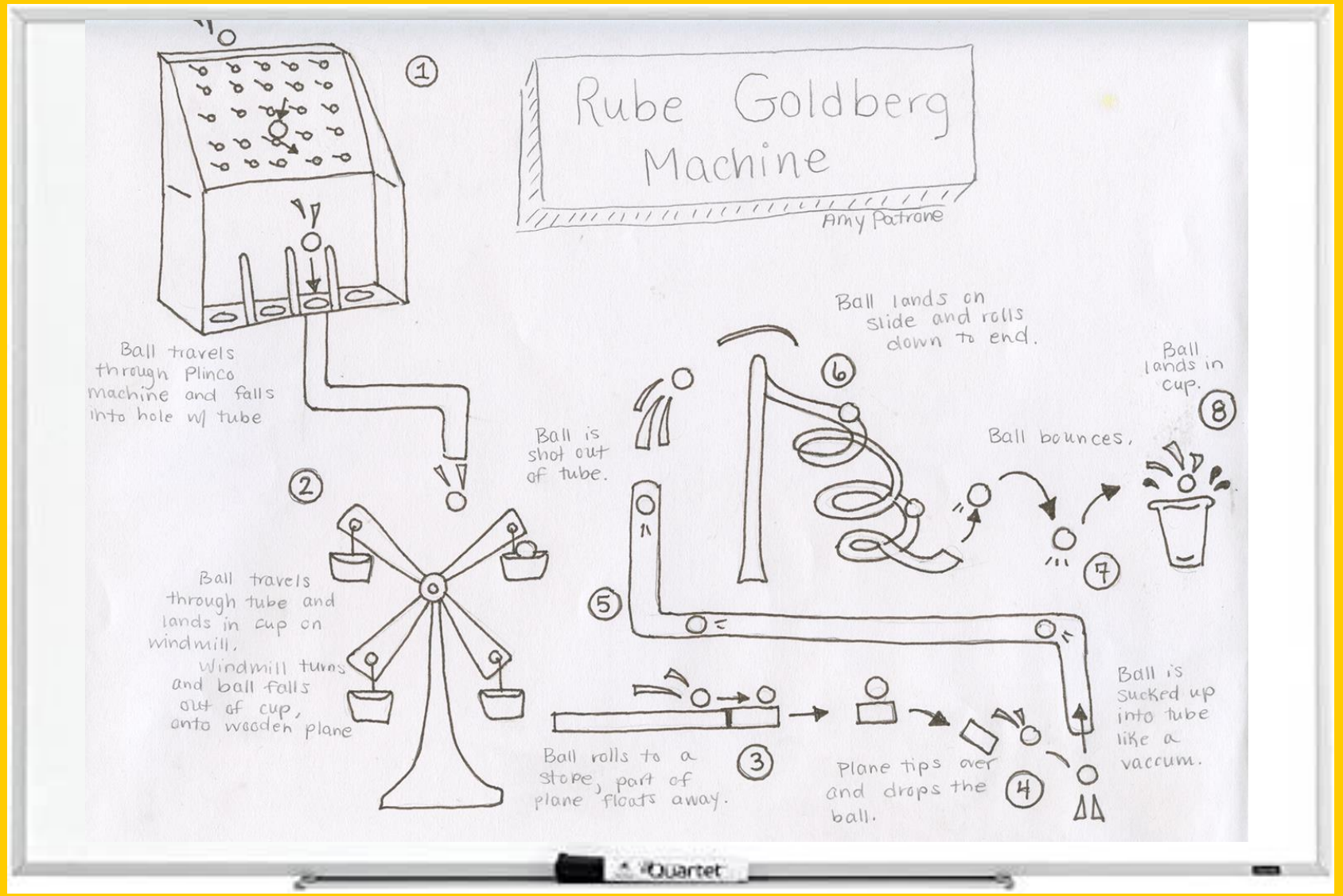
1. Under the Sea	2. Canadian Wildlife	3. Herb Gardens
4. 1984	5. Camping	6. Birthday Party
7. Aliens	8. Libraries	9. From the Pantry
10. Chocolate	11. Cats	12. From the Linen Closet
13. Computers	14. Calculas	15. BTS
16. Social Media	17. Wednesday	18. Kingdom
19. Avatar Blue People	20. Lock n Key	21. titans
22. Avatar the Last Airbender	23. Baby Yoda	24. Star War Star Trek

What is your final choice of **theme**?

Computers

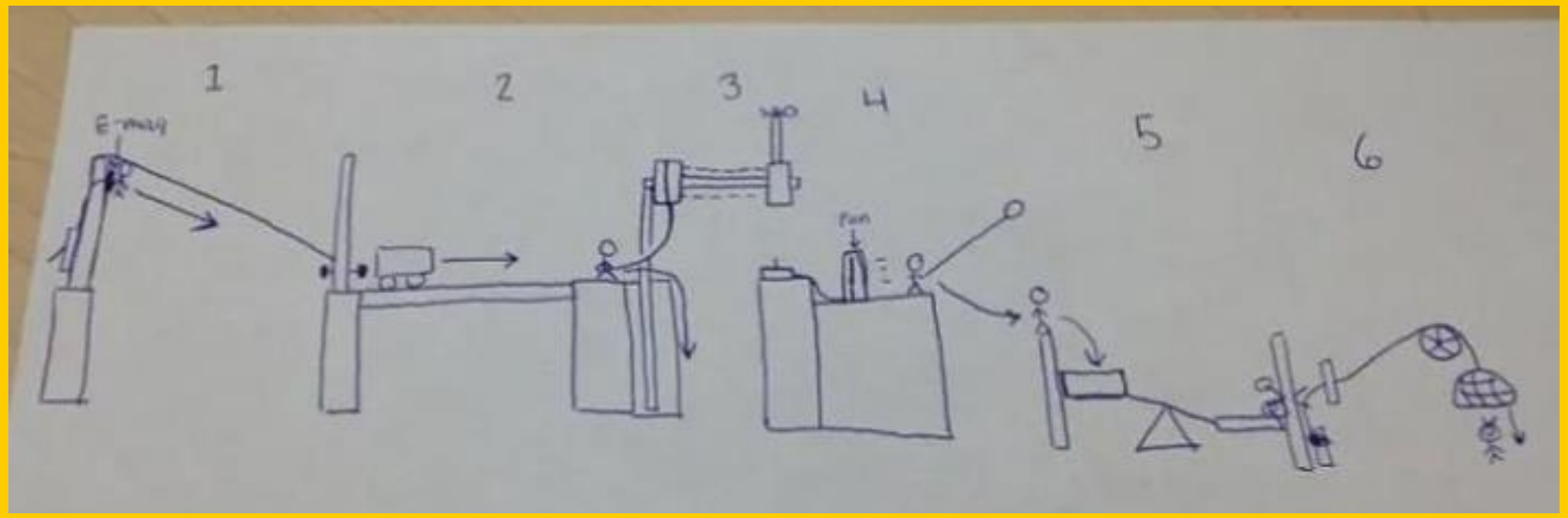
Phase 4: **Design**

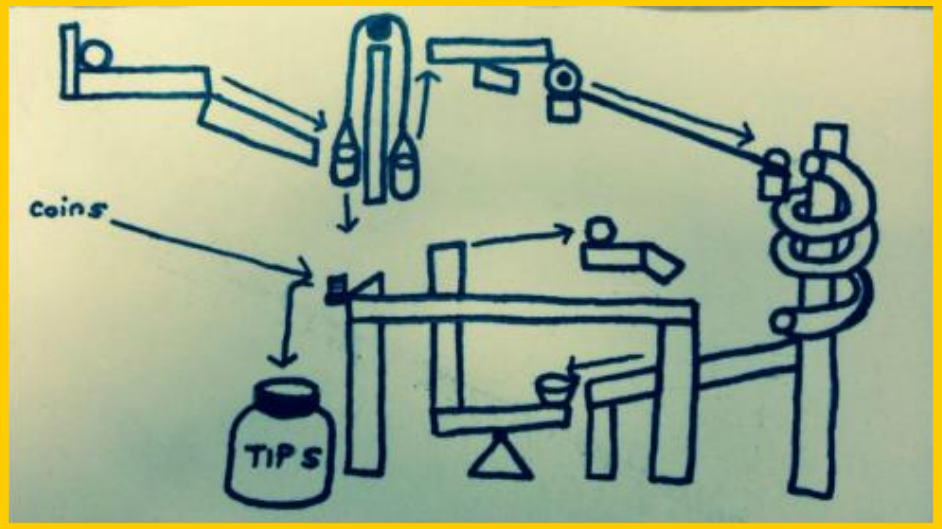
Initial Design as Sketched on White board



Phase 4: **Design**

A Rough Sketch by Mr. Macklai

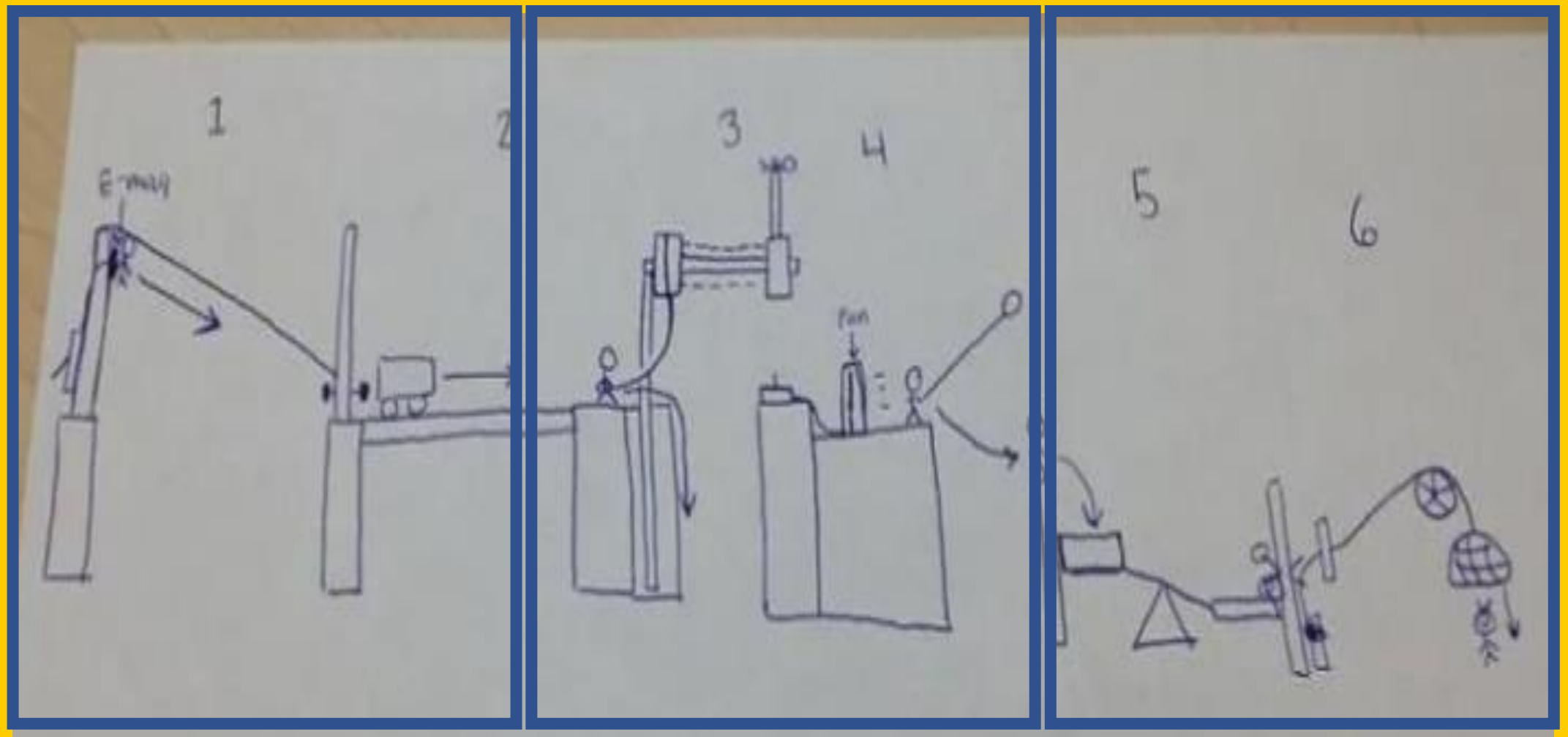




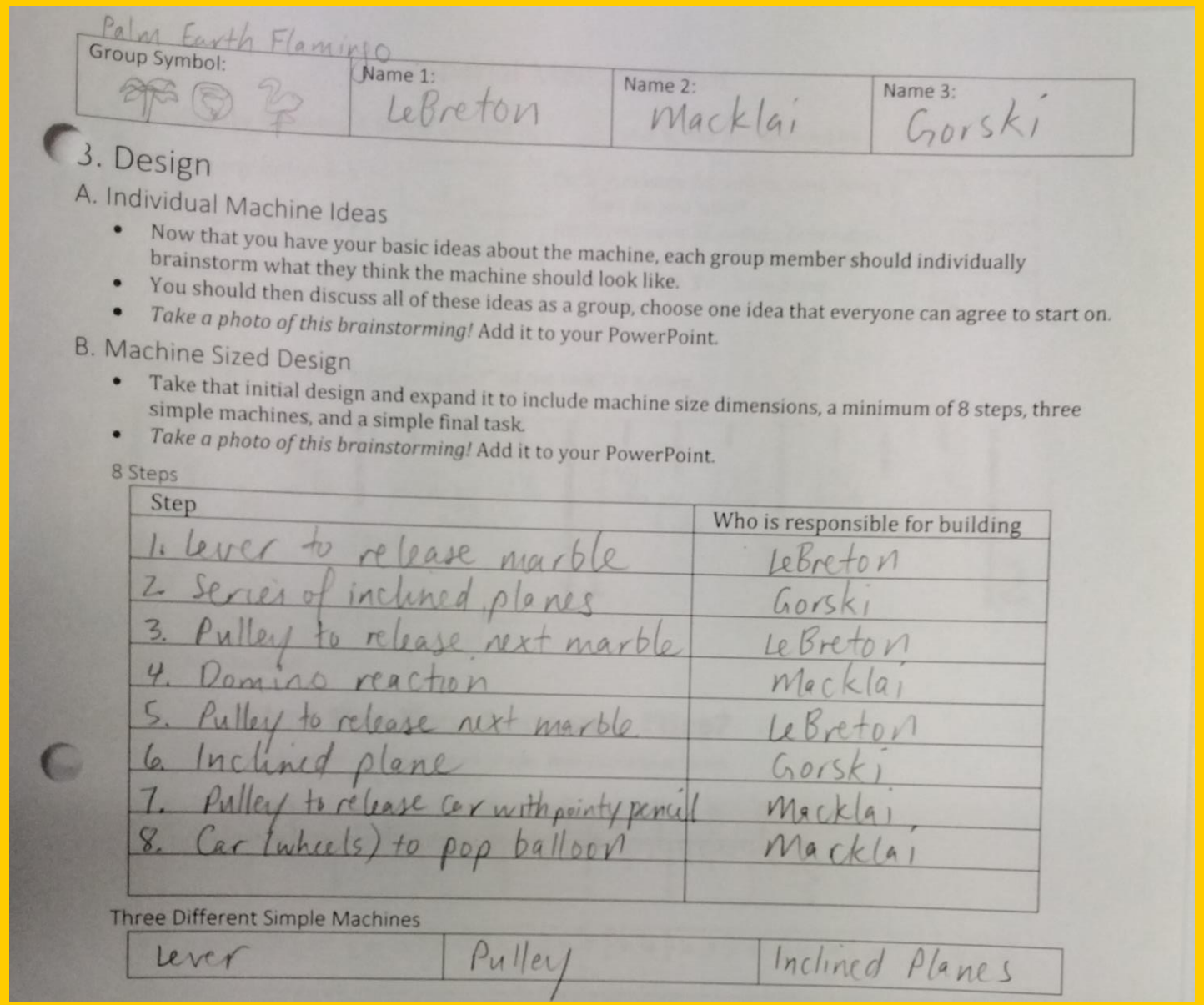
A Rough Sketch by Mr. LeBreton

Phase 4: **Design**

Scale-Size Diagram



Phase 4: **Design**



Palm Earth Flamingo

Group Symbol:	Name 1:	Name 2:	Name 3:
	LeBreton	Macklai	Gorski

3. Design

A. Individual Machine Ideas

- Now that you have your basic ideas about the machine, each group member should individually brainstorm what they think the machine should look like.
- You should then discuss all of these ideas as a group, choose one idea that everyone can agree to start on.
- *Take a photo of this brainstorming!* Add it to your PowerPoint.

B. Machine Sized Design

- Take that initial design and expand it to include machine size dimensions, a minimum of 8 steps, three simple machines, and a simple final task.
- *Take a photo of this brainstorming!* Add it to your PowerPoint.

8 Steps

Step	Who is responsible for building
1. Lever to release marble	LeBreton
2. Series of inclined planes	Gorski
3. Pulley to release next marble	LeBreton
4. Domino reaction	Macklai
5. Pulley to release next marble	LeBreton
6. Inclined plane	Gorski
7. Pulley to release car with pointy pencil	Macklai
8. Car (wheels) to pop balloon	Macklai

Three Different Simple Machines

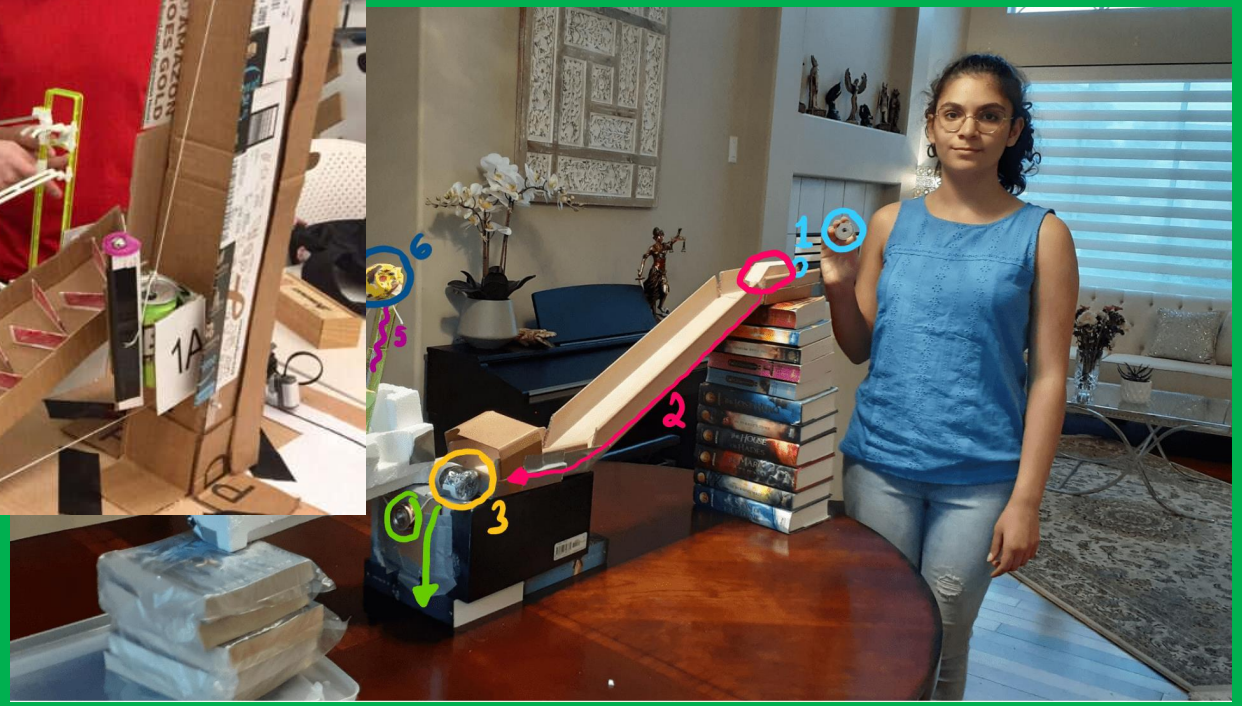
Lever	Pulley	Inclined Planes

Design Documentation

Our final design submission which assigned the Rube Goldberg machine pieces to various group members.

Phase 5: **Creation**

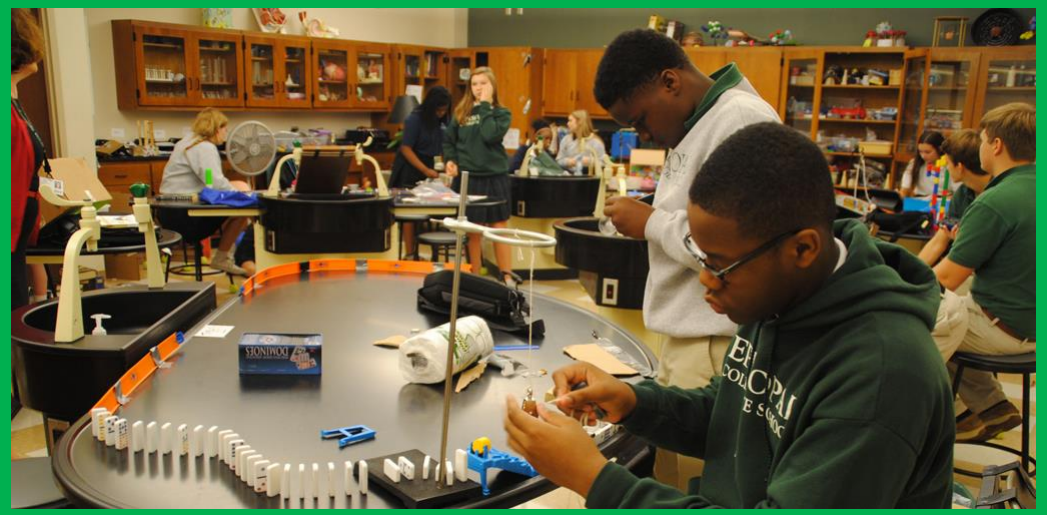
This shows our group working on our machine

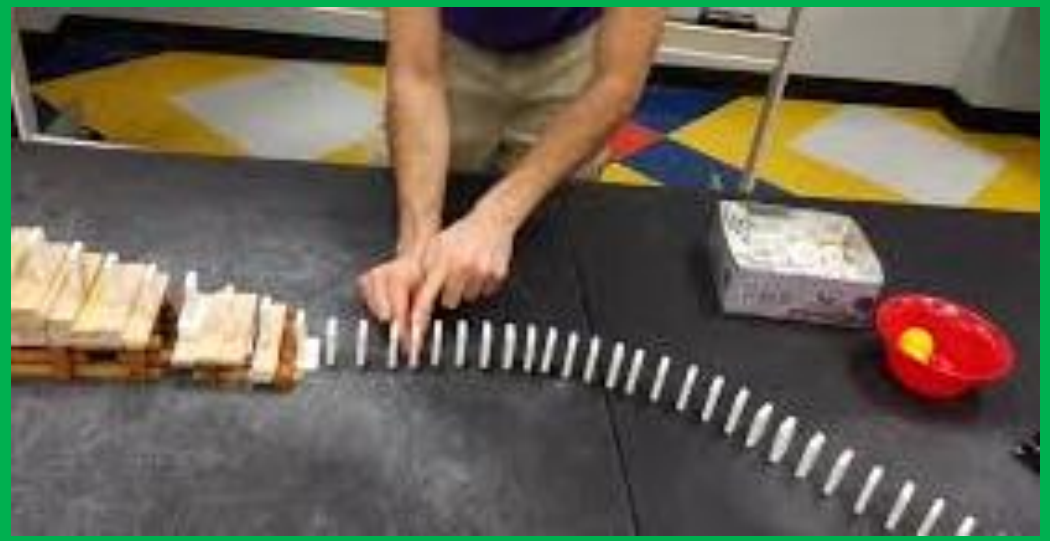


Phase 5: **Creation**

This shows the steps we took to build our Archimedes' screw.

Phase 5: **Creation**



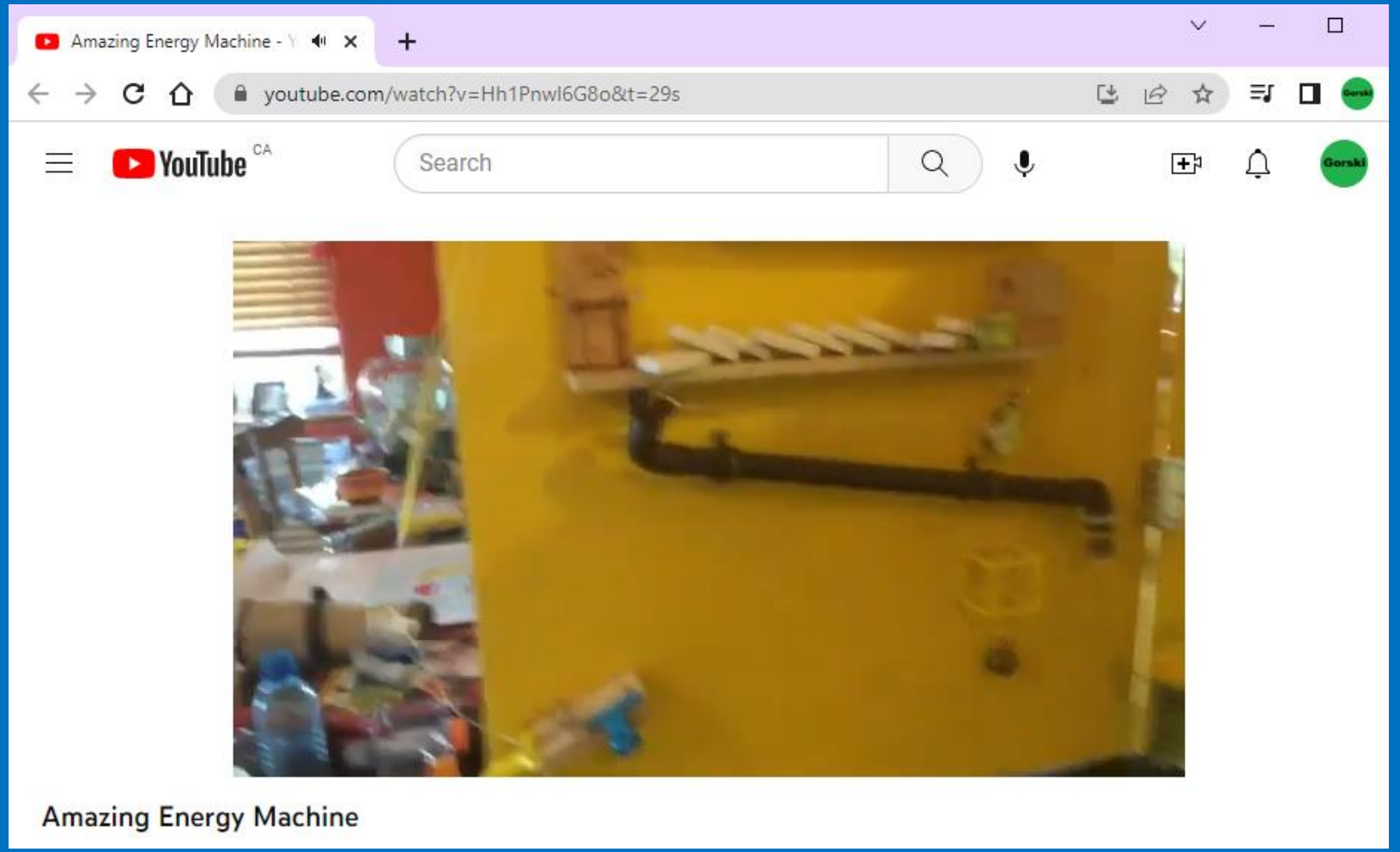


This shows us trying out different domino runs before we picked one.

Phase 6: **Testing**

This is a video of our machine not working. The dominoes don't have enough force to push the car into the balloon.

https://www.youtube.com/watch?v=Hh1Pnwl6G8o&t=29s



Phase 6: **Revisions**

1. Increased slope of first inclined plane so marble rolls faster.

Before

After

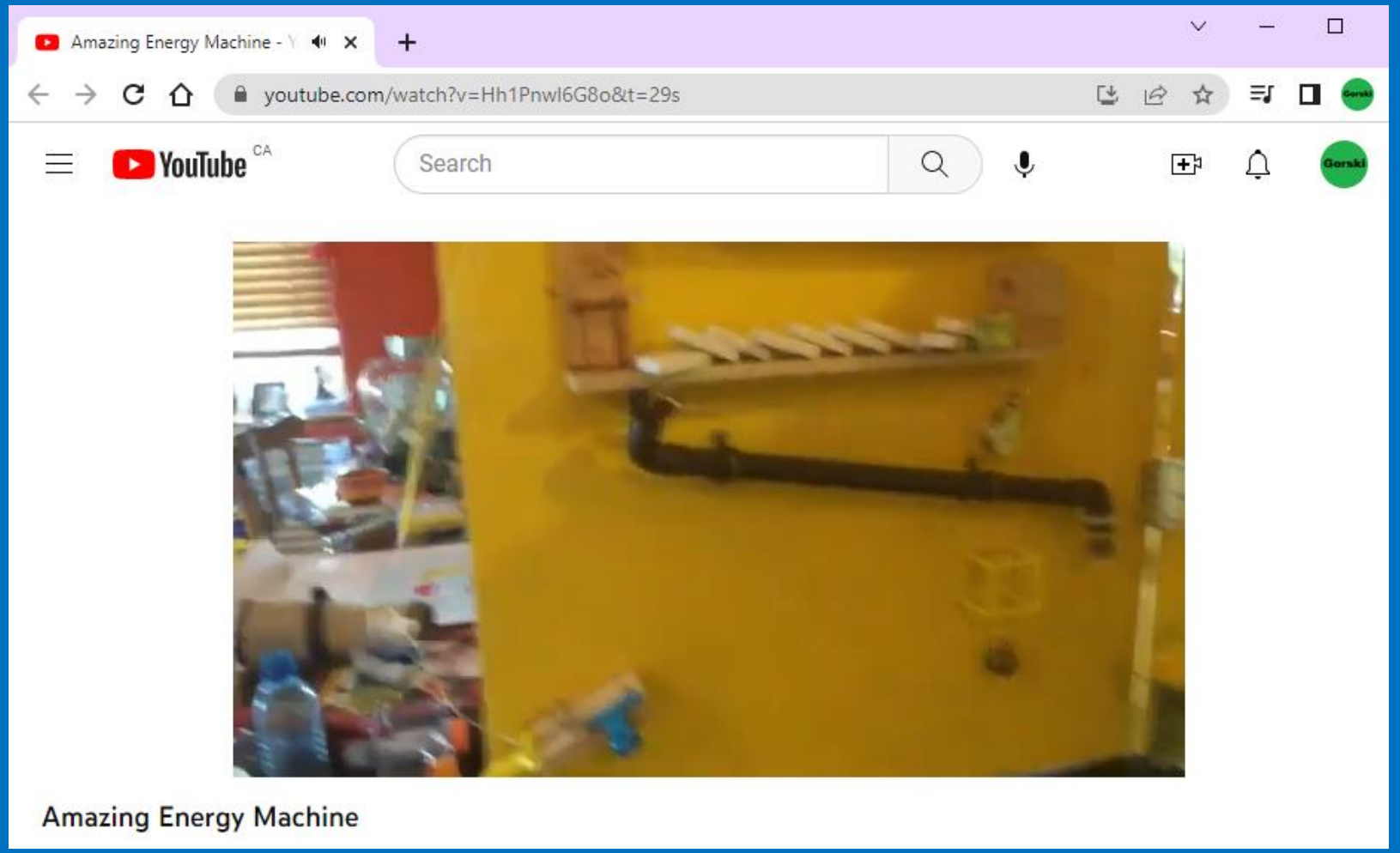
2. Increased hole size on Archimedes screw so it can pick up the cereal.

3. Replaced first car with one with better wheels so it rolls faster into the balloon

Phase 6: **Testing**

This is a video of our fully finished machine.

https://www.youtube.com/watch?v=Hh1Pnwl6G8o&t=29s



Phase 7: **Reflection**

Choose some of the following reflection questions to answer.

1. What role does imagination play in creativity?
2. What qualities make a good student?
3. Is concrete knowledge better than theoretical knowledge?
4. How does the ability to access knowledge from different subjects change the project creation phase?
5. What qualities make a good learning environment?
6. How important is detailed planning in the building of a creative project?
7. What is the relation between theory and practice?
8. What have you learned that you think everyone should know?
9. What makes a great project?
10. How does collaboration contribute to a great project?
11. When is trial and error an appropriate problem-solving technique?
12. When is “not failing” the same as success, and when are they different?
13. How can you minimize the damage of failure?
14. What makes great feedback within a group?
15. What is an essential prerequisite for good collaboration?

Credits

Rube Goldberg Machine Build

Machine Item	Who Did it
1. Lever to release marble	LeBreton
2. Series of inclined planes	Gorski
3. Pulley to release marble	LeBreton
4. Domino reaction	Macklai
5. Pulley to release marble	LeBreton
6. Inclined plane	Gorski
7. Pulley to release car	Macklai
8. Car pops balloon	Macklai

Documentation of STEAM cycle

Item	Who Did it
Opening Slide	
Slide #2 – Description	
Preliminary Investigation Slide	
Problem Definition	
Analysis	
Design	
Creation	
Testing Fail Video	
3 Fixes	
Completion Video	
Reflection	