

# Trebuchet vs. Catapult Which Comes Out On Top?

By Madeleine Perrin



## The Academy of Science - St. Louis Science Fair

Inquiry-based learning at its best!

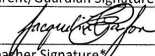
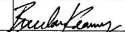
Science • Technology • Engineering • Math

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### 2025 Safety Form

- ☐ I have written a research plan that includes the following:
- The question or problem being addressed and the expected outcome
  - Describes in detail the method and procedures including all safety precautions includes all procedures to be used for data collection and/or building your prototype, if an engineering project
  - Identifies any potential risks and safety precautions to complete the project safely
  - Who will be supervising your project? For approval, an adult over 18 must be present and supervising during experimentation or prototype development and building.
- ☐ I have reviewed this research plan with my:
- Teacher
  - Parent/Guardian
  - Any other 18+ Adult who will be supervising the project (if not listed above)
- ☐ I have reviewed the rules for The Academy of Science - St. Louis Science Fair and verified with my teacher that my project adheres to the rules.
- ☐ I have reviewed the additional rules that apply if my project involves any of the following:
- Mold
  - Bacteria
  - Humans

I acknowledge that all of the above safety precautions will be followed and that this project will be completed in a safe manner. I also acknowledge that no humans or animals (vertebrates or invertebrates) will be harmed in any way.

Print or Type Student Name	Student Signature	Date
Madeleine Perrin	Madeleine Perrin	2025-01-17
Print or Type Parent/Guardian Name	Parent/Guardian Signature	Date
Jacqueline Payton		2025-01-17
Print or Type Teacher Name	Teacher Signature*	Date
Brendan Kearney		1-16-2025

\*You may include a project approval email from your teacher in lieu of a teacher signature.

Questions? Contact your science teacher, or the Academy Fair Director at [sciencefair@academyofsciencestl.org](mailto:sciencefair@academyofsciencestl.org)

# Safety Guidelines

- We made sure to stay away from the things while they were being launched
- We did not launch anything sharp or too heavy
- Our launchers were not made with anything dangerous (hot glue, staples, scissors, exacto knife, etc)
- There were no pinch points in our launchers
- I always had adult supervision during the experiments (my big siblings)

# Hypothesis & Testable Question & Variables

**Q1:** Will heavier items or lighter items go farther?

**Q2:** Will the trebuchet or catapult launch things farther?

**H1:** Heavier items will go farther than lighter items.

**H2:** The trebuchet will launch farther than the catapult.

## **Variables:**

Independent: Weight of projectile, type of launcher

Dependent: Distance launched

Constant: Where projectile was launched from

# Background

To throw things far, like for battles or trying to invade a castle, a long time ago people invented launching machines. There are 2 different types, catapults and trebuchets. Both work with potential energy to launch something from their arms. The catapult arm doesn't move as much as a trebuchet. A trebuchet is different because it rotates and uses a weight. We watched Mythbusters where they built a trebuchet to launch Buster. Buster is their crash test dummy. He flew really far through the air but the trebuchet was destroyed!

# Methods & Materials

catapult



trebuchet



I built a catapult and trebuchet out of craft sticks, scotch tape, rubber bands, a pencil, a spoon, paper, and two small plastic cups. The items I tested were a ball made of model magic, a ball made of rubber, a ball made of foam, and a plastic pen cap.

My big siblings helped me. I launched each thing 5 times with each launcher. One person launched the item and the other marked and measured where the item landed. We used coins to mark the landing places and a measuring tape to measure. All numbers are rounded.



## Data: Weight of launched things

Model Magic Ball	Rubber Ball	Foam Ball	Pen Cap
6 grams	15 grams	<1 gram	2 grams

I used a small scale to measure the weight of each item. The scale didn't measure any weight for the foam ball, so all I know is that it weighed less than one gram.

## Data: distance launched - Catapult

Model Magic Ball	Rubber Ball	Foam Ball	Pen Cap
13in	3.5in	43in	10in
5in	5in	44in	28in
17in	6in	44in	9in
25in	4in	46.5in	16in
21in	5.5in	46.5in	39.5in
Average: 16.2in STD: 7.77	Average: 4.8in STD: 0.93	Average: 44.8in STD: 12.99	Average: 20.5in STD: 1.6



# Data: distance launched - Trebuchet

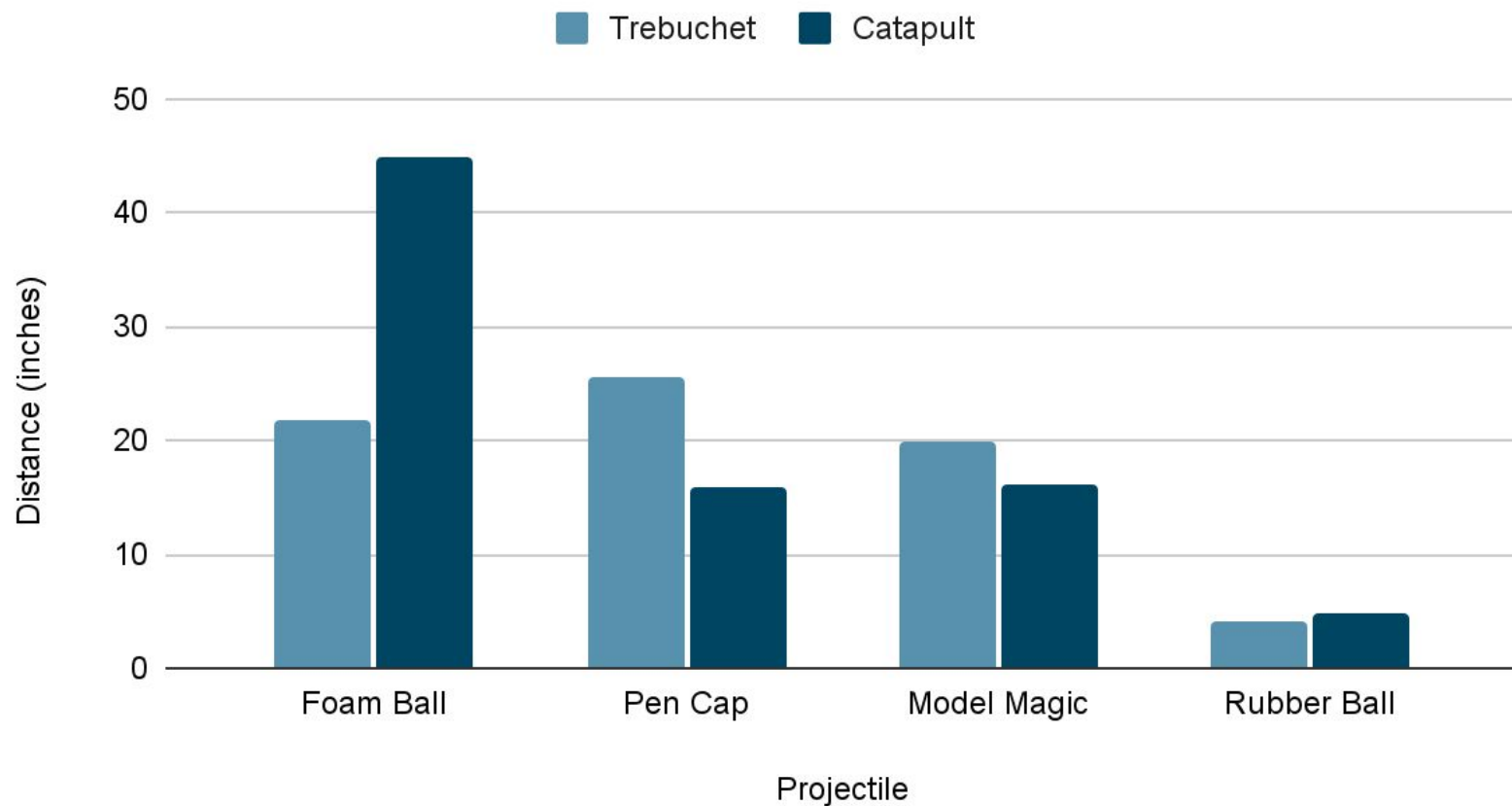
Model Magic Ball	Rubber Ball	Foam Ball	Pen Cap
16in	6in	16.5in	18in
21in	2in	22in	30in
23.5in	6in	22in	30in
16.5in	5in	19in	26.5in
22in	1in	30in	23in
Average: 19.8in STD: 3.34	Average: 4in STD: 2.42	Average: 21.9in STD: 5.23	Average: 25.5in STD: 5.12

# Data: Comparison

	Model Magic	Rubber Ball	Foam Ball	Pen Cap
Trebuchet	19.8in	4in	21.9in	25.5in
Catapult	16.2in	4.8in	44.8in	15.75in
Difference	+3.6in	-0.8in	-22.9in	+10.25in

Trebuchet	Catapult	Distances
Pen Cap (2g)	Foam Ball (<1)	25.5in vs. 44.8in
Foam Ball (<1g)	Model Magic (6g)	21.9in vs. 16.2in
Model Magic (6g)	Pen Cap (2g)	19.8in vs. 15.75in
Rubber Ball (15g)	Rubber Ball (15g)	4in vs. 4.8in

# Projectile vs Launcher vs Distance



# Conclusions

The weight is important but the shape isn't. The non-spherical object actually had one of the highest scores in terms of distance.

Weight is important because the lighter objects went farther than the heavier objects which is not what my hypothesis said.

For the foam ball, the trebuchet launched farther. For the other things, the catapult launched farther. The difference between them was the weight of the objects.

The trebuchet launched the lighter thing farther but the catapult launched the heavier things farther. This is sort of what my hypothesis was.

# BOOKS and websites

1. National Geographic Kids “Make This” by Ella Schwartz. 2019.
2. <https://www.sciencebuddies.org/blog/mini-trebuchet-science>
3. <https://www.etsy.com/listing/813587951/diy-catapult-engineering-kit-for-kids-at>