Under Siege! Use a Catapult to Storm Castle Walls

Areas of Science	Physics (http://www.sciencebuddies.org/science-fair-projects/project-ideas/physics)
Difficulty	Intermediate MEDIUM
Time Required	Very Short (≤ 1 day)
Prerequisites	None
Material Availability	A kit is available from our partner Home Science Tools (http://www.sciencebuddies.org/store-send?url=https%3a%2f%2fwww.homesciencetools.com%2fproduct%2fping-pong-catapult-kit%3faff%3dSB1). See the Materials (#materials) tab for details.
Cost	Low ($20 - $50)
Safety	Minor injury possible. Keep your fingers clear when launching the catapult. Do not aim the catapult at people.

Abstract

You may have seen movies or read books where armies in medieval times catapulted large rocks or other objects at castles (or each other!). These armies used different types of catapults to accomplish different goals — for example, launching things *over* or *into* castle walls to knock them down. In this experiment, you will use a ping-pong ball catapult to lay siege to a "castle" and find the right settings to hit your targets.

Objective

Using a ping-pong ball catapult, find the right settings to launch a ball either directly into a castle wall or over it.

Credits

Ben Finio, PhD, Science Buddies

Cite This Page

General citation information is provided here. Be sure to check the formatting, including capitalization, for the method you are using and update your citation, as needed.

MLA Style

Finio, Ben. "Under Siege! Use a Catapult to Storm Castle Walls." *Science Buddies*, 20 Nov. 2020, https://www.sciencebuddies.org/science-fair-projects/project-ideas/Phys_p085/physics/use-a-catapult-to-storm-castle-walls. Accessed 3 June 2021.

APA Style

Finio, B. (2020, November 20). *Under Siege! Use a Catapult to Storm Castle Walls.* Retrieved from https://www.sciencebuddies.org/science-fair-projects/project-ideas/Phys_p085/physics/use-a-catapult-to-storm-castle-walls

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Introduction

In medieval warfare (hundreds and hundreds of years ago, before guns were invented), catapults were often used as weapons. A **catapult** is a device that can hurl large objects like rocks very far, using an energy source like gravity or a tightly twisted rope, which would unwind when let go (just like twisting up a rubber band and then releasing it). Catapults were not very good at attacking fast-moving, mobile armies, but they were effective for attacking structures that stood still, like castles. Catapults could be used to accomplish different goals — for example, launching a big rock directly into a wall to knock it down, or launching something over a wall to hit the people or buildings behind it. These different goals require different trajectories. A **trajectory** is the path the rock (or ping-pong ball) follows as it flies through the air. Figure 1 below shows two different trajectories for the same catapult and the same castle.

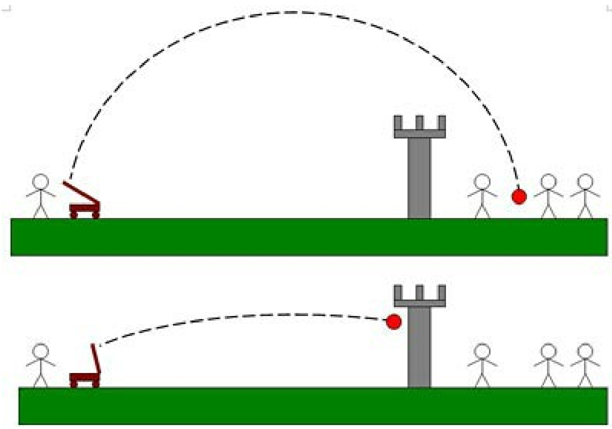


Figure 1. A catapult can be used to make a ball follow different trajectories. In the top picture, the ball follows a high trajectory to go over the castle wall. In the bottom picture, it follows a low trajectory to go into the castle wall. Both of these are bad news for the people inside the castle!

In this project you will use a rubber-band-powered catapult to "attack" a castle wall that you build yourself, and find the right settings to accomplish two different goals:

- Launch the ball into the castle wall and try to knock it over.
- Launch the ball over the castle wall — getting it to land as close as possible to the other side of the wall without actually touching it.

The catapult is designed to launch ping-pong balls (but it can also launch other objects) and let you easily adjust several things to change the trajectory of the ball. Figure 2 below shows a labeled picture of the catapult kit (the parts are listed in italics here). It consists of three main pieces: the *base*, the *disk*, and the *launch arm*. The base is attached to a table (or other surface) with a *clamp*. A *cup* at the end of the launch arm holds the ping-pong *ball*. A *pin* attaches the disk to the base. Finally, *rubber bands* provide the energy to launch the ball. Make sure you can identify all of these parts in your catapult kit and in Figure 2.

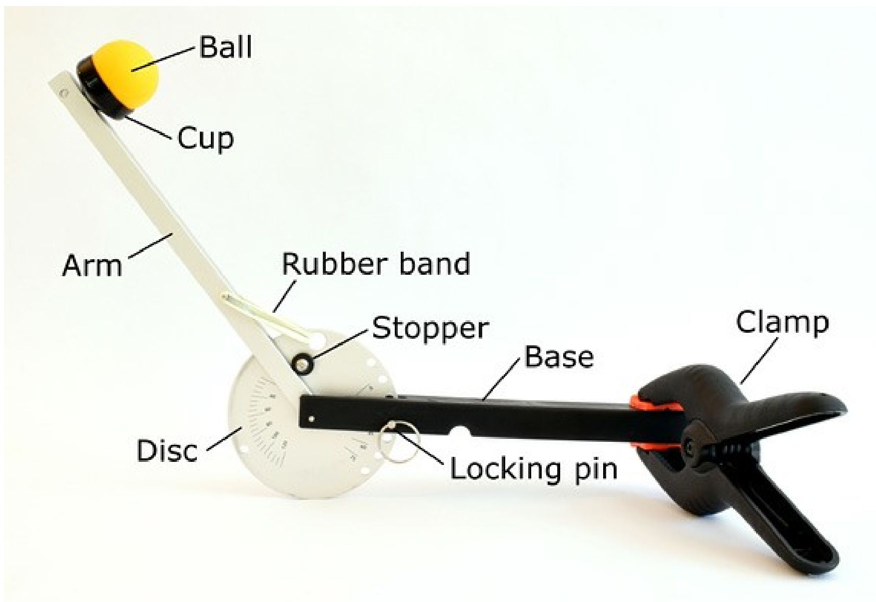


Figure 2. The catapult kit, with labels showing the parts. Here we have included a paper towel between the base and the table to prevent the metal catapult from scratching the wooden table.

You may have noticed markings on the metal disk of the catapult. These markings let you measure the *launch angle* and *pull-back angle* for the catapult in *degrees*. We'll define these terms in case you haven't heard them before:

- A **degree** is a unit used to measure **angles**. There are 360 degrees in one complete circle.
- The **launch angle** is the direction the ball is going (relative to the ground) when it is launched. A launch angle of 90 degrees means the ball is going straight up, and a launch angle of 0 degrees means the ball is going straight out, horizontally.
- The **pull-back angle** is how far back you pull the launch arm before you launch the ball. A pull-back angle of 0 degrees means you have not pulled the launch arm back at all. A pull-back angle of 120 degrees means you have pulled the launch arm back all the way (as high as you can go with this catapult).

Figure 3 below shows a picture to help you understand the launch angle and pull-back angle.

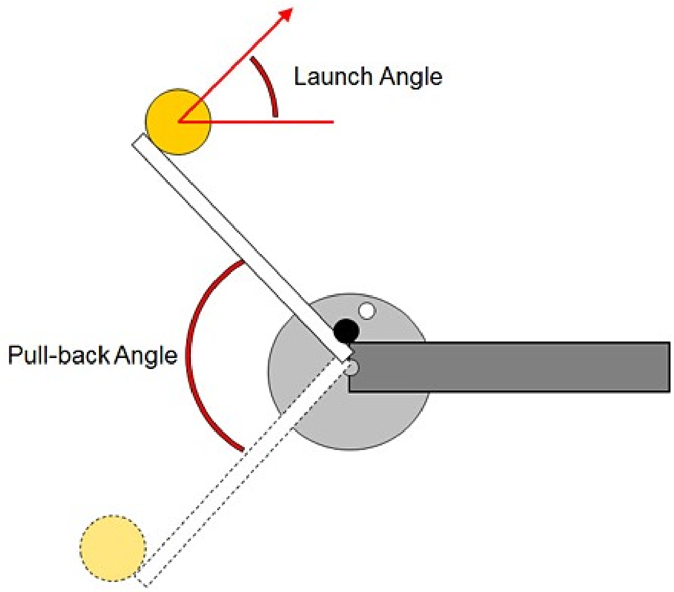


Figure 3. The pull-back angle is how far back you pull the launch arm before you launch the ball. The launch angle is the direction the ball is going when it leaves the catapult.

There are a total of four things you can adjust with the catapult to change the ball's trajectory:

- The type of ball (the kit comes with an orange ping-pong ball and a white WIFFLE® ball, the size of a golf ball)
- The number of rubber bands (the kit comes with three — we do not recommend more than that for safety reasons)
- The launch angle
- The pull-back angle.

Think about how changing these things will change the ball's trajectory — and what you need to do to launch the ball *into* and *over* the castle walls.

Terms and Concepts

Make sure you understand the following terms before you continue with the project. It might help to re-read the introduction and look at the figures.

- Catapult
- Trajectory
- Degree
- Angle
- Launch angle
- Pull-back angle
- Variable

Questions

- What are the parts of a catapult and how does it work? What kind of medieval catapult is this catapult most similar to?
- How will changing the number of rubber bands affect the ball's trajectory? Will more rubber bands make the ball go higher or lower? Farther or less far?
- Ask the same question about the other settings. What happens if you change the launch angle or the pull-back angle?
- Do you think the two different balls will behave differently?

Bibliography

Want to learn more about different types of catapults and the physics involved? You can check out the following references.

- Normani, F. (n.d.). *Catapult physics* *(http://www.real-world-physics-problems.com/catapult-physics.html)*. Retrieved Sept. 27, 2012.
- The Physics Classroom. (n.d.). *Projectile motion* *(http://www.physicsclassroom.com/class/vectors/u3l2b.cfm)*. Retrieved Sept. 27, 2012.

Materials and Equipment Buy Kit (http://www.sciencebuddies.org/store-send?url=https%3a%2f%2fwww.homesciencetools.com%2fproduct%2fping-pong-catapult-kit%3faff%3dSB1)

- Ping Pong Catapult Kit is available from our partner Home Science Tools (http://www.sciencebuddies.org/store-send?url=https%3a%2f%2fwww.homesciencetools.com%2fproduct%2fping-pong-catapult-kit%3faff%3dSB1). The kit includes the catapult, disk, and locking pin, as well as:
  - Three rubber bands (1/8 x 3 inches)
  - Table tennis ball
  - Plastic WIFFLE® ball with holes
  - Clamp for attaching the catapult to a surface

- Surface for mounting catapult (piece of wood on the floor, tabletop, etc.)
- Optional: paper towels, dish towel, or other padding for protecting the mounting surface from being scratched by the attachment clamp
- Open area for launching balls
- Cereal box or similarly sized cardboard box to use as a castle wall, or construction paper/cardboard and tape to make your own
- Tape measure (12 ft. minimum)
- Lab notebook

Recommended Project Supplies

Get the right supplies — selected and tested to work with this project.

Project Kit: $44.95

Experimental Procedure

Safety Note: The catapult is designed to be safe, but it can hurt you if you are not careful! Never launch a ball at other people. The launch arm can move very fast (especially when you use two or three rubber bands), so **always** make sure your fingers and other body parts are safely out of the way before you launch the ball.

Setting up your Catapult and Castle

1. The first thing you will need is a castle wall. *Empty* cereal boxes work great, but if you are feeling creative, you can also make your own wall from cardboard, tape, and construction paper. Feel free to decorate the wall to look more like a real castle, but that isn't required to complete the project. Figure 4 shows several different castle wall ideas.

Figure 4. Several different possible castle walls — a large or small cereal box, a homemade wall with cardboard and duct tape, and in a pinch, even the catapult kit box itself will do!

2. Watch this video to learn how to set up your catapult:

Video instructions for using your ping pong catapult.
https://www.youtube.com/watch?v=pIEjwMhnAGo (https://www.youtube.com/watch?v=pIEjwMhnAGo)

3. Set up the catapult and your castle wall as shown in Figure 5.
   a. The recommended distance from the middle of the catapult disk to the middle of the wall is 8 feet (ft.).
   b. The catapult may scratch furniture, so you might want to use padding, such as a paper towel.
   c. Make sure the catapult and the wall are at roughly the same height.

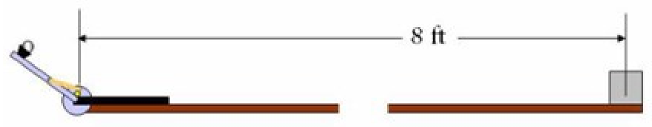


Figure 5. Using a tape measure, set up the catapult and the target 8 ft. apart. Make sure they are at about the same height.

4. Now you need to set up the catapult so it is actually ready to launch balls. Make sure you have already clamped it to a sturdy surface like a table. Next, insert the locking pin with the ring attached through the hole in the catapult base, lined up with a hole in the disk. This sets the launch angle (don't worry, you can always change this angle later). Figure 6 shows you how to do this in steps A through D. Refer back to the Introduction if you need help identifying the parts.

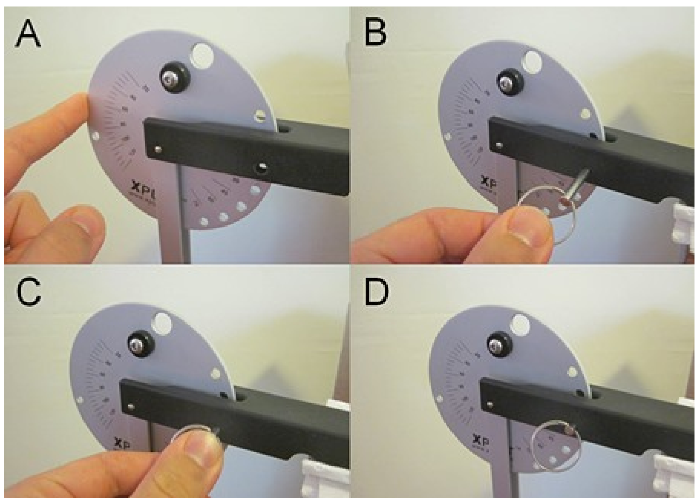


Figure 6. How to insert the locking pin into the catapult base to set the launch angle. Make sure the hole in the catapult base is lined up with a hole in the disk.

5. Attach at least one rubber band (and for safety reasons, no more than three) to the short pins on opposite sides of the launch arm by threading the rubber band through the large hole on the catapult's disk. Figure 7 shows you how to do this - ask an adult if you need help.

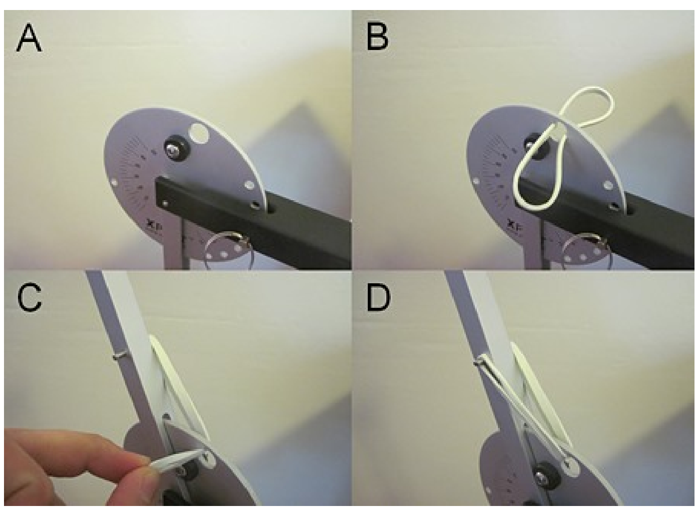


Figure 7. How to attach the rubber bands to the catapult. Each rubber band goes through the large hole at the top of the disk, and then attaches to short pins on opposite sides of the launch arm.

Launching and Testing the Catapult

1. You are almost ready to launch! First, you will need to understand how to measure the launch angle and pull-back angle from the markings on the catapult disk. Remember that the pull-back angle is how far back you pull the launch arm before you let go and launch the ball, and the launch angle is the direction the ball is going when it is launched. Refer to Figure 3 in the Introduction if you need to review the angles. Figure 8 shows you how to measure them on the catapult.

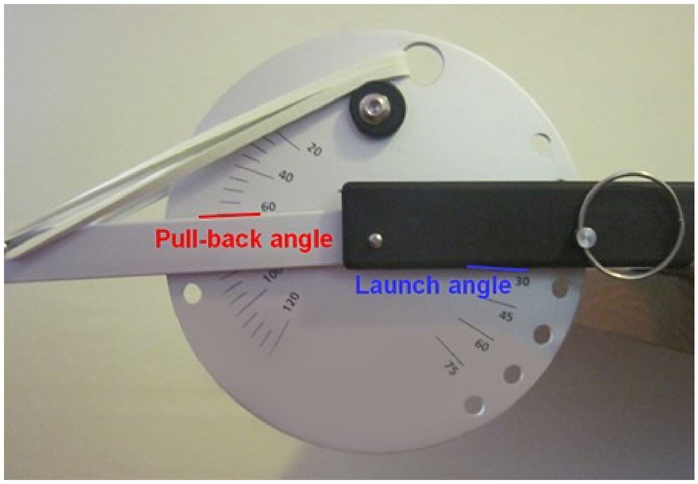


Figure 8. Measure the pull-back angle by reading the tick mark that lines up with the launch arm (on the left). In this picture, the pull-back angle is about 60 degrees. Measure the launch angle by reading the tick mark that lines up with the catapult base (on the right). In this picture the launch angle is 30 degrees. *Note:* Some older versions of the catapult may require that you read the pull-back angle from the *bottom* of the launch arm. You can tell by looking at which side of the launch arm (the top or the bottom) lines up nicely with the tick marks for the pull-back angle. In the picture of a newer catapult, notice how the bottom of the launch arm doesn't line up with a tick mark, but the top (where we drew a red line) does. This might be reversed for older catapults, so be sure to check.

2. Now you are ready to start testing. Remember that for this project you have two different goals:
   a. Hit the front of the castle wall — can you knock it over?
   b. Launch the ball over the wall *without hitting it*. How close to the other side of the wall can you get the ball to land?

   Can you find settings that will accomplish both of these goals? Can you use the same settings for both, or do you have to change something? As you adjust your aim, think back to the questions in the Introduction — what happens to the ball's trajectory as you adjust the ball type, number of rubber bands, launch angle, or pull-back angle?

   Important: This can get very confusing if you start changing many things at once. We recommend keeping three things constant and only changing one at a time. For example, you could pick a number of rubber bands, a launch angle, and a pull-back angle, and then compare the two different balls with those settings.

3. Do multiple tests. If you manage to knock the castle wall over once, can you repeat it with the same settings? Or was it just a lucky shot? Can you find settings that will *reliably* accomplish both of your goals? Try at least ten shots each time you change a variable (http://www.sciencebuddies.org/science-fair-projects/science-fair/doing-a-fair-test-variables-for-beginners) (either the number of rubber bands, launch angle, pull-back angle, *or* ball type). That should give you a good idea of reliability.
4. Be sure to write down your results in your lab notebook. It will be very hard to remember what settings worked best if you have done dozens of tests. Table 1 is just one example of how you could keep track of your results. If the ball goes over the wall, you'll need to decide whether it counts as "close" or if the ball went too far (in real life, it wouldn't do you much good if you shot a rock completely over a castle, would it?). This will be easier if you set up an area behind the castle (for example, using masking tape) that counts as "inside" the castle.

Settings: WIFFLE® ball, 30 degree launch angle, 90 degree pull-back angle			
	Number of Shots Out of 10		
	1 Rubber Band	2 Rubber Bands	3 Rubber Bands
Hit front of wall (didn't knock over)			
Hit front of wall (knocked over)			
Went over wall (close)			
Went over wall (far)			

Table 1. Write the results of your tests in a table like this in your lab notebook, marking the settings, or variables (ball type, degrees of launch and pull-back angles, and number of rubber bands), for each set of tests you perform. You will need to make a separate table each time you change the settings.

Analyzing Your Results

1. What does your data tell you about how each of the variables (ball type, launch angle, pull-back angle, and number of rubber bands) affects the ball's trajectory? For example, what launch angle is better for getting a "shallow" trajectory to hit the wall, or a "high trajectory" to go over it? Did adding rubber bands make it easier or harder to knock the wall over? Go over the wall?

If you like this project, you might enjoy exploring these related careers:

Physicist *In Demand!* (http://www.sciencebuddies.org/science-engineering-careers/earth-physical-sciences/physicist)

Career Profile

(http://www.sciencebuddies.org/science-engineering-careers/earth-physical-sciences/physicist) Physicists have a big goal in mind—to understand the nature of the entire universe and everything in it! To reach that goal, they observe and measure natural events seen on Earth and in the universe, and then develop theories, using mathematics, to explain why those phenomena occur. Physicists take on the challenge of explaining events that happen on the grandest scale imaginable to those that happen at the level of the smallest atomic particles. Their theories are then applied to… Read more (http://www.sciencebuddies.org/science-engineering-careers/earth-physical-sciences/physicist)

Mechanical Engineer (http://www.sciencebuddies.org/science-engineering-careers/engineering/mechanical-engineer)

Career Profile

(http://www.sciencebuddies.org/science-engineering-careers/engineering/mechanical-engineer) Mechanical engineers are part of your everyday life, designing the spoon you used to eat your breakfast, your breakfast's packaging, the flip-top cap on your toothpaste tube, the zipper on your jacket, the car, bike, or bus you took to school, the chair you sat in, the door handle you grasped and the hinges it opened on, and the ballpoint pen you used to take your test. Virtually every object that you see around you has passed through the hands of a mechanical engineer. Consequently, their… Read more (http://www.sciencebuddies.org/science-engineering-careers/engineering/mechanical-engineer)

Civil Engineers (http://www.sciencebuddies.org/science-engineering-careers/engineering/civil-engineers)

Career Profile

(http://www.sciencebuddies.org/science-engineering-careers/engineering/civil-engineers) If you turned on a faucet, used a bathroom, or visited a public space (like a road, a building, or a bridge) today, then you've used or visited a project that civil engineers helped to design and build. Civil engineers work to improve travel and commerce, provide people with safe drinking water and sanitation, and protect communities from earthquakes and floods. This important and ancient work is combined with a desire to make structures that are as beautiful and environmentally sound, as they… Read more (http://www.sciencebuddies.org/science-engineering-careers/engineering/civil-engineers)

Mechanical Engineering Technician (http://www.sciencebuddies.org/science-engineering-careers/engineering/mechanical-engineering-technician)

Career Profile

(http://www.sciencebuddies.org/science-engineering-careers/engineering/mechanical-engineering-technician) You use mechanical devices every day—to zip and snap your clothing, open doors, refrigerate and cook your food, get clean water, heat your home, play music, surf the Internet, travel around, and even to brush your teeth. Virtually every object that you see around has been mechanically engineered or designed at some point, requiring the skills of mechanical engineering technicians to create drawings of the product, or to build and test models of the product to find the best design. Read more (http://www.sciencebuddies.org/science-engineering-careers/engineering/mechanical-engineering-technician)

Variations

- In Figure 4 of the Experimental Procedure we showed a picture of several different things that can be used for castles. What happens if you experiment with different wall dimensions? Are some harder to knock over? Do you have to change your catapult settings for taller or shorter walls?

- Does *where* you hit the front of the wall change how easy it is to knock it over? Which works better: hitting the wall at the bottom or at the top?
- This project can easily be turned into a fun engineering design project with two competing goals. First, you need to make sure you have found catapult settings that can reliably knock over your castle wall. Now you can repeat the following two steps:
  - Can you make your castle wall sturdier so that it can't be knocked over? What do you need to change to make this happen? Can you use different materials, or change the shape?
  - Can you change something about the catapult settings to knock over your new-and-improved castle wall? What about launching heavier objects? (Remember to be careful and *never* aim the catapult at a person!)
  - Be realistic — the catapult is probably not powerful enough to knock over a wall made out of real bricks. So, limit yourself to reasonable construction materials for your wall, like cardboard and tape.

Frequently Asked Questions (FAQ)

If you are having trouble with this project, please read the FAQ below. You may find the answer to your question.

The Science Buddies catapult kit is used in four projects:

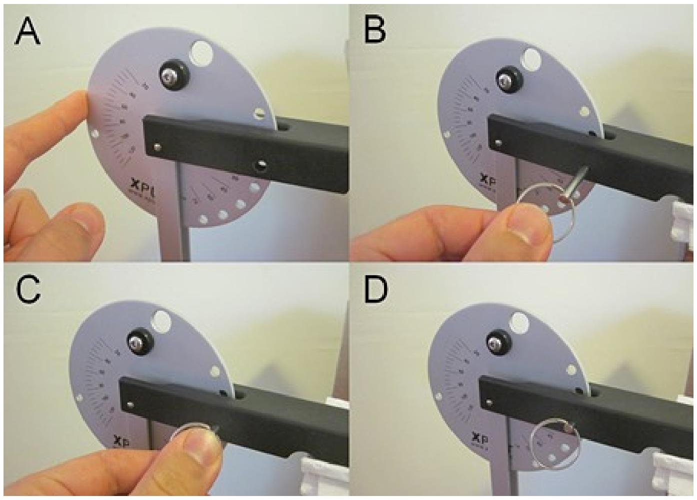
- Bombs Away! A Ping Pong Catapult (http://www.sciencebuddies.org/science-fair-projects/project_ideas/ApMech_p008.shtml)
- Under Siege! Use a Catapult to Storm Castle Walls (http://www.sciencebuddies.org/science-fair-projects/project_ideas/Phys_p085.shtml)
- Launch Time: The Physics of Catapult Projectile Motion (http://www.sciencebuddies.org/science-fair-projects/project_ideas/Phys_p089.shtml)
- Bet You Can't Hit Me! The Science of Catapult Statistics (http://www.sciencebuddies.org/science-fair-projects/project_ideas/Math_p046.shtml)

The FAQs below are used for all four projects. General catapult questions are at the top of the FAQs list and project specific questions are at the bottom of the list.

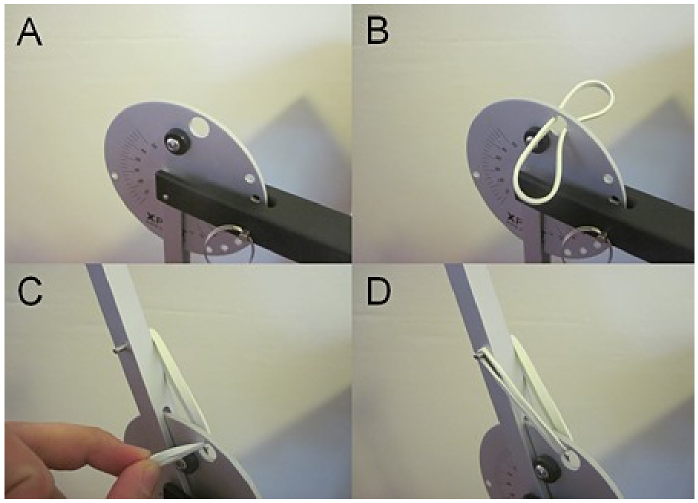
Q: The ball doesn't travel exactly the same distance each time, even when I use the exact same settings. What am I doing wrong?
A: This is OK! Due to many small, random effects beyond your control, like the catapult wiggling a bit between shots, or even air currents in the room, the ball will not travel exactly the same distance every time. In almost all "real world" experiments, you will not get the exact same results every single time.

Q: My catapult seems to move side-to-side slightly after each shot. How can I prevent this?
A: Depending on the surface material you are clamping to, the single clamp provided with the catapult kit may not hold the catapult perfectly still, especially when using two or three rubber bands. The catapult may wiggle a bit after each shot. This wiggle will may affect your left-to-right aim but will not have a significant effect on your distance or vertical trajectory. If you would like to eliminate the wiggle try stacking heavy objects, like textbooks, on top of the catapult base — just make sure they don't interfere with movement of the launch arm.

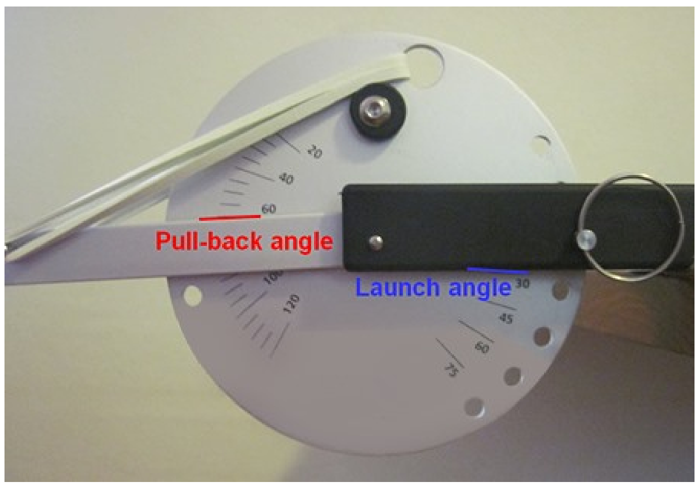
Q: How do I set the launch angle on the catapult?
A: The launch angle is set by inserting a metal pin through holes on the aluminum disk that align with the black metal base of the catapult. This picture shows the process:



Q: How do I attach the rubber bands to the catapult?
A: The rubber bands go through a hole in the circular aluminum disk, and hook onto pins on the launch arm. This picture shows the process in four steps:



Q: How do I measure the launch angle/pull-back angle?
A: The launch angle and pull-back angle are measured by tick marks on the side of the aluminum disk. When facing the writing on the side of the catapult, the launch angle tick marks will be on your right — they line up with the *bottom* edge of the base of the catapult (the black part that should be clamped to a table). The pull-back angle tick marks are on your left — they line up with the *top* edge of the launch arm. This picture shows how to read each angle:



Note: On older versions of the Xpult brand catapult, the pull-back angle may be read from the *bottom* edge of the launch arm. If you just ordered a new Science Buddies catapult kit for your project (as of October 2012), then you should follow the directions above.

Q: How can I stop the ball from bouncing out of the target in the Bombs Away! A Ping Pong Catapult (http://www.sciencebuddies.org/science-fair-projects/project_ideas/ApMech_p008.shtml) project?
A: The ball is likely to bounce out of targets like metal pots or hard plastic trash cans, which can make chasing it all over the place annoying (especially if it rolls under furniture). Place a crumpled-up hand towel or t-shirt in the bottom of your target to reduce bouncing. Remember though - any shot that lands inside the target, even if it bounces out, still counts as a successful hit.

Q: I'm having trouble knocking over the box wall in the Under Siege! Use a Catapult to Storm Castle Walls (http://www.sciencebuddies.org/science-fair-projects/project_ideas/Phys_p085.shtml) project. What should I do?
A: First, make sure the box you are using for a castle wall isn't too big or heavy. We found that *empty* cereal boxes work well. A full cereal box will be much too heavy. Second, adjust your settings and aim — try using a different number of rubber bands, or switching your aim to a different part of the wall (top/bottom/middle). Remember, change *one* variable at a time and keep a good data table in order to figure out what is working!

Q: I'm having trouble filming the ball in Launch Time: The Physics of Catapult Projectile Motion (http://www.sciencebuddies.org/science-fair-projects/project_ideas/Phys_p089.shtml) project — it always looks blurry in each frame of my video. What can I do?
A: This is most likely due to poor lighting conditions. Many video cameras will automatically adjust their exposure time depending on the brightness of the scene. A poorly lit area will result in a longer exposure time, to let more light into the camera — however, this will also make fast-moving things appear blurry. If possible, try filming outside in direct sunlight (but not on a windy day!), or use extra lamps if filming indoors (remove lampshades to increase brightness).

Depending on your camera, you may also be able to manually adjust settings and decrease the exposure time. Consult your camera's manual to see if that is possible.

Q: My experimental results do not match up with my theoretical predictions in Launch Time: The Physics of Catapult Projectile Motion

(http://www.sciencebuddies.org/science-fair-projects/project_ideas/Phys_p089.shtml) **project. Am I doing something wrong?**

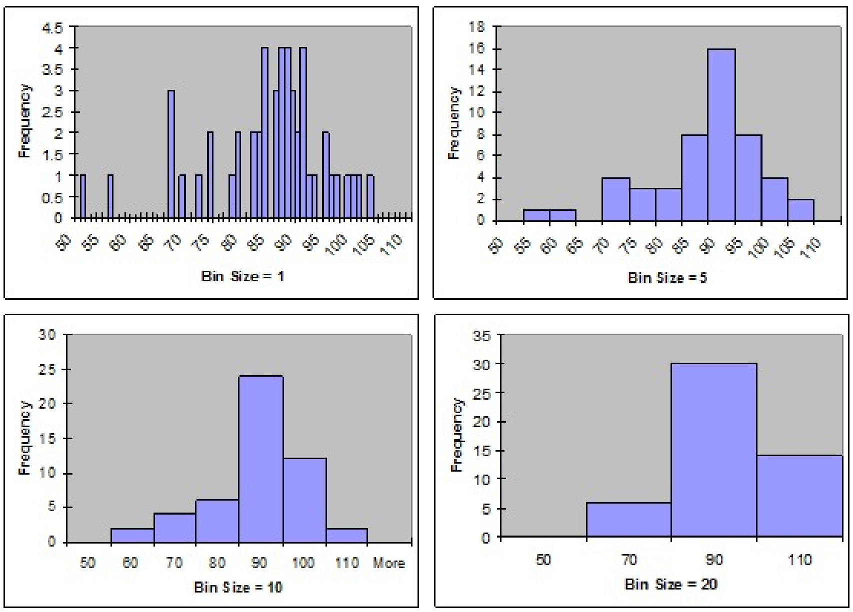
A: If your theoretical and experimental results don't match up exactly, but are "reasonably" close to each other (for example, both show the ball going a couple meters before it hits the ground), then this is perfectly normal. There are parameters in both the theoretical predictions and the experiments that can vary slightly and affect your results. For example, the spring coefficient of your rubber bands could be slightly different than the number we provided, and if your catapult is not clamped down very well, the *actual* launch angle could be slightly different from the launch angle you set, as the catapult can "bounce" a bit during launch. All of these factors can contribute to make your experimental and theoretical results slightly different — but this is OK.

If your theoretical and experimental results are *very* different, there are a couple things you can check:

- Are your theoretical predictions *reasonable*? You should be able to launch the ball across an average-sized room in your house — meaning it should go a couple meters before it hits the ground, for typical catapult settings. If your predictions indicate that the ball will travel several *kilometers*, or only a couple *millimeters*, then odds are you made a mathematical mistake. Double-check your calculations, and be extra careful to look for typos if you entered equations into a spreadsheet program.
- Make sure you properly used a scale factor to convert the distances you measure on your computer screen to real-world distances for your experimental data. Again, make sure the distance the ball travels is *reasonable* — if your experimental data says that the ball traveled 100 meters, then you probably used the scale factor incorrectly.

Q: I can't get a nice histogram for the Bet You Can't Hit Me! The Science of Catapult Statistics (http://www.sciencebuddies.org/science-fair-projects/project_ideas/Math_p046.shtml) **project. What am I doing wrong?**

A: The first thing you can do is try to adjust the bin size of your histogram — how you group and count the frequency of your data. A bin size that is too small or too large will make it difficult to see the true shape of the distribution. Here are four different histograms for the same set of data, all with different bin sizes:



Notice how the shape of the distribution is evident with bin sizes of 5 or 10, but rather difficult to see with bin sizes of 1 or 20. As a general rule of thumb, more data will allow you to use a smaller bin size, which will give you a more accurate picture of the distribution — so if you have time, try to do more than 50 trials with the catapult.

Q: I'm having trouble accurately recording the distance the ball travels in the Bet You Can't Hit Me! The Science of Catapult Statistics (http://www.sciencebuddies.org/science-fair-projects/project_ideas/Math_p046.shtml) **project. What am I doing wrong?**

A: First, it is essential to have two people for this part of the project — one to operate the Xpult, and another to record the distance the ball travels. You won't be able to do both by yourself.

For the person recording distances, we recommend watching where the ball lands and immediately marking the location with your finger. *Then* take a reading from the tape measure. Trying to watch where the ball lands and simultaneously read the tape measure will be very difficult.

Also, you probably won't be able to get fraction-of-an-inch accuracy on your readings — getting the closest one-inch increment will be good enough.

Ask an Expert

The Ask an Expert Forum is intended to be a place where students can go to find answers to science questions that they have been unable to find using other resources. If you have specific questions about your science fair project or science fair, our team of volunteer scientists can help. Our Experts won't do the work for you, but they will make suggestions, offer guidance, and help you troubleshoot.

Ask an Expert (http://www.sciencebuddies.org/science-fair-projects/ask_an_expert_intro.shtml)

Contact Us

If you have purchased a kit for this project from Science Buddies, we are pleased to answer any question not addressed by the FAQ above.

In your email, please follow these instructions:

1. What is your Science Buddies kit order number?
2. Please describe how you need help as thoroughly as possible:

   Examples

   Good Question *I'm trying to do Experimental Procedure step #5, "Scrape the insulation from the wire. . ." How do I know when I've scraped enough?*
   Good Question *I'm at Experimental Procedure step #7, "Move the magnet back and forth . . ." and the LED is not lighting up.*
   Bad Question *I don't understand the instructions. Help!*
   Good Question *I am purchasing my materials. Can I substitute a 1N34 diode for the 1N25 diode called for in the material list?*
   Bad Question *Can I use a different part?*

Contact Us (mailto:service@homesciencetools.com?subject=ScienceBuddies:Under+Siege!+Use+a+Catapult+to+Storm+Castle+Walls)

Related Links

- Science Fair Project Guide (http://www.sciencebuddies.org/science-fair-projects/project_guide_index.shtml)
- Other Ideas Like This (http://www.sciencebuddies.org/search?v=solt&pi=Phys_p085)
- Physics Project Ideas (http://www.sciencebuddies.org/science-fair-projects/project-ideas/physics)
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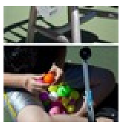

Family Fun with Physics: Launching Plastic Eggs with the Ping Pong Catapult (http://www.sciencebuddies.org/news/article?id=97658), *Science Buddies Blog*, April 18, 2014

Projectile Physics and Catapult Science (http://www.sciencebuddies.org/news/article?id=194754), *Science Buddies Blog*, January 22, 2016

Launch and Catapult Science (http://www.sciencebuddies.org/news/article?id=319450), *Science Buddies Blog*, June 27, 2017

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