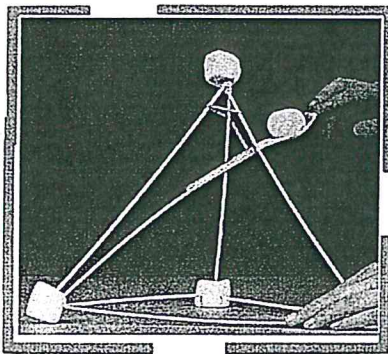


DIY Marshmallow Catapult

What Do I Need?

- 5 marshmallows
- 7 wooden skewers
- 1 plastic dessert spoon
- 1 rubber band about 8 cm long
- 2 sandwich bag ties
- Sticky tape



How Do I Do It?

1. Lay 3 skewers out to make a triangle. This will be the base of your catapult.
2. Attach marshmallows to two of the corners of your skewer triangle and use a sandwich bag tie to join the third corner.
3. Once tied, push a marshmallow over the tied ends. Make a mark on this marshmallow.
4. Use 3 more skewers to make a pyramid, pushing the ends into each marshmallow of the base triangle. Where the 3 skewers meet at the top, use a bag tie to tie all 3 skewers together.
5. Once tied push a marshmallow over the tied ends.
6. Tape the plastic spoon securely to the remaining skewer (see image).
7. Loop the rubber band over the marshmallow at the top of the pyramid. Insert the skewer with the spoon attached so it passes through the loop formed by the band and sticks into the marked marshmallow on the base. You are ready to go!
8. Put another marshmallow into the spoon, hold the front of your catapult, pull the spoon down (stretching the rubber band) and release. Your marshmallow should fly!

Skill Level:

Medium

Time

5 minutes

Continued overleaf

Safety Advice:

IMPORTANT GENERAL SAFETY NOTE FOR SUPERVISING ADULTS: This Terrific Scientific investigation has been devised so that with adult supervision, reasonable care and by following the instructions provided, no special safety equipment or knowledge is required to enjoy the experience safely. These safety reminders are designed to assist the supervising adult when planning and carrying out the investigation. Please read the instructions fully before starting.

- We have suggested you launch marshmallows as they are soft. Do not launch anything that may cause harm or damage.
- When pushing the skewers into the marshmallows always push the sharp end away from you.
- Marshmallows should not be pushed on to the skewers using the palm of the hand.
- Make sure the rubber band is around the skewer and spoon, not just the spoon, as both together are stronger.

What's Happening? The Sciency Bit:

As the spoon is pulled down the rubber band stretches; storing energy (called potential energy). When you release it the stored energy quickly forces the band up (the stored potential energy is converted into kinetic energy) and launches your marshmallow.

What do you think of the shape of your catapult? There's a triangle and a pyramid. You could make another catapult where the base has a square and a four sided pyramid.

Try pulling the spoon a little way down and a long way down; how far does the marshmallow travel?

Why not make a target. Can you land your marshmallow on the bullseye?

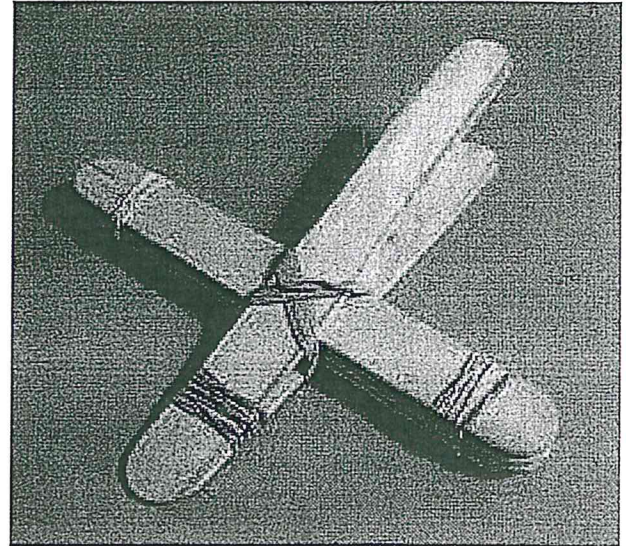
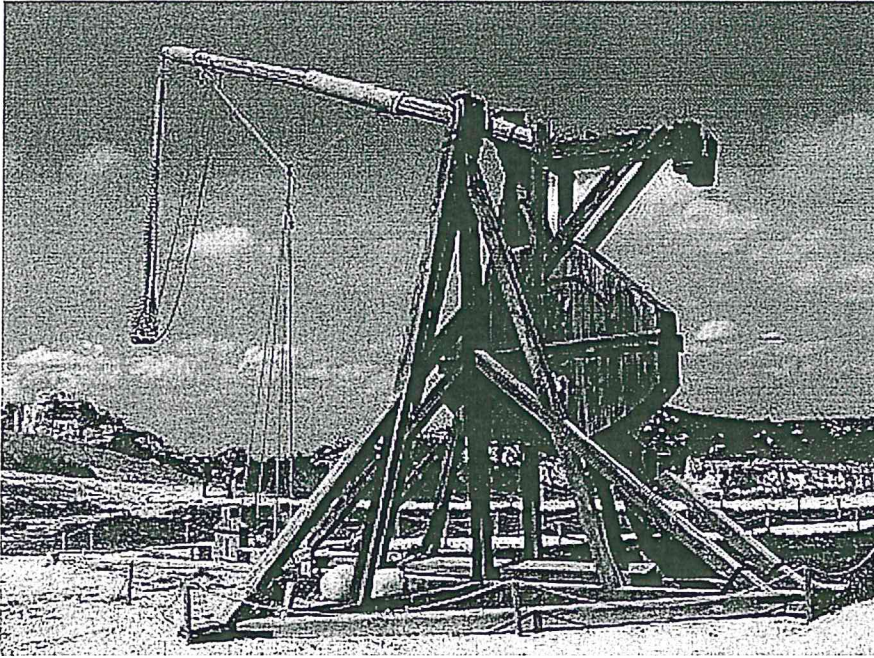
What different materials did we use for each part of your catapult? What is special about rubber? Why did we use wooden sticks?

Why not go online and investigate medieval machines for attacking castles. One is very similar to your model!

My Catapult Doesn't Work... What Can I Do?

- The catapult is weak; put bag ties at each corner before covering them with the marshmallows.
- Can't pull down the rubber band: try replacing the rubber band with a stretchier one.
- Can't get the marshmallow to fly very far: practise.
- My catapult has fallen apart: you have eaten the marshmallows!

Popsicle Stick Catapult



Materials

- 6 popsicle sticks
- 5 rubber bands
- Safe projectiles (cotton balls, mini marshmallows)

Procedure –

1. Stack four popsicle sticks. Using a rubber band at each end, squeeze the bundle tightly together.
2. Place the remaining two popsicle sticks together. Bundle only one end together using an additional rubber band.
3. Pry the unbundled end open enough to be able to slide the set of four sticks in between perpendicularly to form a cross. Slide the bundle of four sticks down as closely as you can get it to the rubber band that's holding the two sticks together.
4. Finish your catapult by securing the body to the wings (diagonally at the point where the popsicle sticks intersect) by crisscrossing a rubber band from the back of the right wing to the front of the left several times. Repeat with the final rubber band.
5. Place your projectile at the end of the popsicle stick that is highest in the air. Hold the set of four sticks with one hand, and push down on the angled stick just behind the projectile.
6. Release your projectile!

-A catapult uses stored energy to launch a **projectile**. In our catapult, the energy is stored by changing the shape of the popsicle stick from what it normally would be.

QUESTION: Energy needs to come from somewhere. Where does the energy come from to power your catapult?

-Catapults were used in warfare for centuries, especially to damage structures, and are a great example of the power of a lever in action.

QUESTION: What other materials might make good projectiles? Safely try a few different options and observe the differences.

-Changing the construction of your catapult will change the way it works. For example, how far the cross bar is from the front, or how many popsicle sticks are used. Engineers try to build the best tools by thinking about what will work well, testing, measuring what happened, and changing their plans based on those experiments.

QUESTION: What can you change in your catapult? Try two changes, and make two observations about what happens when you use it.

DO try this at home! Experiment with different materials and designs to create new catapult variations.