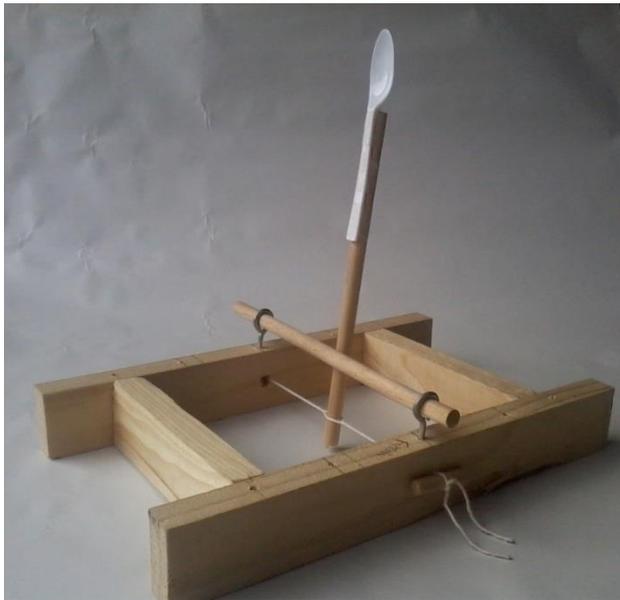


## Catapult Construction

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### Parts

Use the photograph as a guide. The parts are not fastened or glued together. The base and throwing arm are held in place just by the tension in the string. The stopping bar is held by screw eyes.



### Base:

The base is made from 42x19 dressed timber (pine).

You need 2 x 200mm long pieces for **rails** and 2 x 100mm **cross pieces**. The rails have 8mm holes in the middle to take the string.

### Throwing arm

A 150mm length of 8mm dowel has a plastic teaspoon taped to one end.

### Torsion bundle

Cotton string is good to start with because it breaks easily. This invites students to explore ways to improve this part of the machine. In doing so, they will be considering the energy that can be stored by this apparatus and the strength of different strings. Have plenty of string available so you can repair the catapult when it breaks.

Alternatively, use nylon bricklayer's string for more strength, tension, and range.

You also need 2 pegs, 30mm long, to twist the string. These can be cut from the same dowel as the throwing arm.

## Stopping bar

This is also made from the 8mm dowel. It is held in place by two screw eyes fastened to the top of the side rails. I drill a number of pairs of holes for the screw eyes to encourage students to experiment with the position of the stopping bar.

## Construction

I have tried different techniques to construct the catapult, and observed students' attempts as well. What follows has proven to be quick and manageable for most students and adults.

Hold the two rails together so the holes for the string align. Fold the string to form a loop and pass this loop through the holes of both rails. A crochet hook helps with this but it is not essential. Fit a peg into the loop and pull gently on the string to keep the peg in place. Carefully separate the rails while maintaining gentle tension on the string, keeping them parallel, until the space between them is wide enough for the cross pieces. Position the cross pieces to form the base and pick up the second peg. This peg goes against the hole on the outside of the rail with the string passing either side. Tie the string in a tight knot around the second peg. (see photograph)

Position the throwing arm in between the two strands of string in the middle of the base. The strings meet the throwing bar about 1.5cm from the end to allow the throwing arm to move freely back and forth. Tension the string by turning both pegs in the same direction. Experiment with tension, throwing distance and string breakage. About 20 half turns is a good place to start.

Insert the screw eyes into appropriate holes on top of each rail. Pull the throwing arm back and position the stopping bar in front of the throwing arm, and through the screw eyes. Find a ping pong ball and you're ready to go!

To fire, pull the throwing arm back and hold it using one finger on the tip of the spoon. Place the projectile in the spoon and release.

Experiment. Enjoy. Share.

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