Have you ever thrown a ball and wondered how to make it go further?

Now it’s time to put your skills to the test; with this catapult build you get to design and prototype your very own catapult using your engineering skills.

By the end of this session you would have considered some key principles related to projectiles and built a catapult which puts these concepts into practice.
**VOCABULARY**

**Basket** - Where the load/ball rests

**Pivot Arm** - Part of the catapult that moves the load/ball forward (lever)

**Fulcrum** - The point where the pivot arm moves

**Stop Block** - The part of the catapult that stops the arm after it launches

**Base** - Supports the catapult

**Potential Energy** - Energy which is stored in an object due to it being either elevated or, if the object is elastic, due to it being stretched or compressed.

**Ballista** - Missile weapon that launches large projectiles, similar to the crossbow

**Mangonel/Catapult** - Most iconic catapult type, with bucket to hold the missile/load

**Trebuchet** - Designed for maximum power and distance, utilises a fulcrum and counterbalance

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**EACH TEAM WILL NEED**

- **Elastic Band**: 20
- **Lollipop Stick**: 10
- **Pom-Pom or Ping-Pong Ball**: 1
- **White Tac**
MAIN CHALLENGE

As a team, you are going to work together to build structurally stable catapults.

Using the materials and instructions provided, you should build a catapult which is stable enough to launch six projectiles. The success of this will be measured in two categories: accuracy and distance.

After completing the instructions, you can try to alter your design to increase accuracy and distance.

WARM-UP ACTIVITIES

A

Using an elastic band to help you, answer the following questions

• What happens when you stretch the rubber band? Is this potential or kinetic energy?

• What happens when you release the rubber band? Is this potential or kinetic energy?

• What other objects have potential and kinetic energy?

B

Describe the functions of these catapult components, the ambassador will provide answers at the end of the activity.

• Basket
• Pivot arm (lever)
• Fulcrum
• Base
• Potential energy
• Bonus Question: How is potential energy being stored?

Did you know? Catapults were originally designed and used as weapons during battles. Today they are used for a variety of different reasons ranging from toys, to launching jets from aircraft carriers that have limited runway space.
BUILDING THE CATAPULT

A
Connect two lollipop sticks to form a right angle. The sticks can be held in place by using an elastic band. It may be necessary to wrap the band around the joint several times if the joint isn’t secure enough.

B
Repeat step A until four lollipop sticks have been connected to form a square structure. This will form the base of your catapult.

C
Join a lollipop stick to the base using an elastic band so that it is vertical. Again, you may need to wrap the band around the joint several times if the joint is not secure enough.

D
Repeat step C, joining another lollipop stick vertically to the base so that it is in line with the one already fixed in place. They should be able to cross over each other as shown below.
E
Repeat step D for the other side and fix each side in a cross shape using an elastic band as shown below. The location at which you choose to cross the lollipop sticks will dictate the angle the projectile is released from the basket.

F
Using elastic bands, fix two lollipop sticks horizontally to the front edges of the two swept back angled lollipop sticks. One lollipop stick should be joined near the bottom, close to the base and one should be added at the top, above the area where the sticks cross.

G
Place a final lollipop stick vertically between the two sticks added in step F as shown below. The bottom should be in front of the lower horizontal lollipop stick and the top should be behind the upper horizontal lollipop stick. Try to position it centrally and fix the bottom of the stick to the lower horizontal lollipop stick using an elastic band. This will be your catapult's fulcrum.

H
Using the white tac, use your hands to form a basket large enough to hold the projectile. Stick it to the very top of the vertical lollipop stick added in step G to complete your catapult!