## **STEM: Index Card Tower Challenge**

Challenge: Create the tallest index card tower that is free standing and remains self-supporting for 10 seconds. The tower must hold a stuffed animal.

#### Materials:

- ✓ 1 package of index cards (100 cards)
- ✓ Roll of cellophane tape
- ✓ Tape measure or meter stick
- ✓ Scissors
- ✓ Stuffed animal
- ✓ No other materials are allowed

#### **Competition Rules:**

1. Each team must complete the construction of its tower within 30 minutes.

- 2. The index cards may be cut into pieces and reassembled as desired.
- 3. Tape is to be used to fasten parts of the tower together. It may not be used to attach the

tower to the floor or any other object. Tape may not be used to extend the height of the tower.

4. A tower shall be declared free-standing if it remains self-supporting for more than 10

seconds. The tower must support a stuffed animal. (no part of the animal can touch the

ground or anything else)

5. Height is determined by measuring the perpendicular distance from the base of the tower to the highest point of the tower/animal.

6. The highest tower will be declared the winner with the rest of the competitors ranked accordingly.



# **STEM: Paper Airplane Loops**

# Challenge: Create a paper airplane using instructions provided. Make modifications to your airplane so it can perform the most loops before hitting the ground.

### Materials:

- ✓ Paper plane instructions
- ✓ Scissors
- ✓ Tape
- ✓ No other materials are allowed

## **Competition Rules:**

- 1. Each team must create a paper airplane using the instructions provided.
- 2. Modify the airplane using the scissors and tape. The airplane must perform as many loops

as possible before hitting the ground.

- 3. Practice launching the airplane so as to get it to loop as many times as possible.
- 4. A loop is considered one full circle.
- 4. The paper airplane that has the most number of loops before hitting the ground is the

winner.



Extension: Design airplane to meet the following challenges- longest air time, longest distance, hit a specific target, travels the highest, or travels the fastest.

# **STEM: Catapult Challenge**

#### **Challenge: Create a Catapult**

A **catapult** is a ballistic device used to launch a projectile a great distance without the aid of explosive devices.

#### **Suggested Materials:**

- ✓ Rubber bands
- ✓ Craft sticks
- ✓ Plastic spoon
- ✓ Straws
- ✓ Plastic bottle top
- ✓ Small cup
- ✓ Clothes pins
- ✓ Paper clips
- ✓ Toilet paper rolls
- ✓ Mini marshmallows
- ✓ Tape measure

#### **Competition Rules:**

- 1. Each team must create a working catapult.
- 2. The catapult must be able to launch a marshmallow.
- 3. The group whose marshmallow travels the longest distance after 3 trials is the winner.



Extension: Have students modify their catapult to launch marshmallows to hit a target or to land in a cup.

# **STEM: Catapult Challenge**

#### **History of Catapults:**

Catapults have been integral to siege warfare since antiquity. Ancient Catapults were one of the most effective weapons in siege warfare. Various types of Catapults have been used by the Greeks, Romans, and Chinese.

The first catapults were early attempts to increase the range and power of a crossbow. Siculus, a Greek historian, was the first to document the use of a mechanical arrow firing catapult in 399 BC. Catapults as we think of them were introduced to Europe during the Middle Ages.

Catapults made their exhibition in England in 1216 during the Siege of Dover, the French crossed the Channel and were the first to use Catapults on English soil. With war prevalent throughout Europe during the Middle Ages the popularity of fortified castle and city wall rose significantly. This made Catapults an essential. Catapults were used to launch missiles (many different objects were utilized). These missiles were either launched directly at the wall to cause maximum damage to the fortifications or were launched over the wall to lay siege on the population within the protective walls. Catapults were also used to throw missiles at soldiers.

The first accounted acts of Biological Warfare involved catapults. Bodies of the diseased were hurled over the city walls to infect the residing citizens. Catapults were used extensively throughout Europe (predominantly by the French) until 885-886 AD when new defense systems rendered catapults ineffective.

Catapults were known for throwing a multitude of objects at the enemy.

These include but were not limited to:

- stones
- sharp wood poles
- darts
- pots of Greek fire
- quicklime -- lit and thrown react with CO2 in air increase heat of the fire when contact water, would continue to burn in water
- burning tar
- burning sand -- became trapped inside armor
- dung
- dead animals
- body parts
- dead and mutilated bodies
- diseased bodies -- first biological warfare

Modern Day Uses for Catapults

- target practice to shoot clay pigeons in the air
- launch planes into the air (When an aircraft carrier doesn't have the runway space to allow for a plane to accelerate to take off as it would on the ground so an catapult is used to propel the aircraft into the air in a very short distance.)



## **STEM: Kinetic Sculpture Challenge**

Challenge: Make a sculpture that is at least six inches tall and has two parts that move in the wind. That's what makes it kinetic—it moves. But watch out...the wind might also knock it over.

## **Materials:**

- ✓ Hair dryer
- ✓ Ruler
- ✓ Cardboard
- ✓ Markers Paper cups
- ✓ Scissors
- ✓ Straws
- ✓ Strips of colored paper or fabric
- ✓ String
- ✓ Toilet paper rolls
- ✓ Masking tape
- ✓ (any other "junk")



## **Rules:**

1. Create a kinetic (moving) sculpture that is aesthetically pleasing and has 2 parts that move.

2. The sculpture must be at least 6 inches tall.

3. The sculpture will be tested with a blow dryer for 30 seconds at a distance of 12 inches.

4. The winner is the most creative/colorful sculpture that withstands the blown air for 30 seconds without falling over.

This activity is adapted from the Design Squad Event Guide. <u>http://pbskidsgo.org/designsquad/engineers</u>