# Pumpkin Toss

**Overview:** Students will work in teams and build a machine that will launch a pumpkin as far as possible following the rules provided below.

**Goal:** Students will compete in the great pumpkin toss in the fall. They will compete against teams from other schools in the county.

**Unit duration:** (somewhere between 4 – 6 weeks.)

**By the end of this unit, students will be able to:**

- Identify all parts of a catapult
- Create a catapult or a trebuchet
- Invent a device to hold a pumpkin for launch
- Understand how to safely fire the device

**Materials**

- The catapult can be constructed out of a number of different materials and teams can use Wood,Steel or PVC and anything besides the three following items. No compressed air, combustion systems or explosives may be used. Some have been made from 2x4's or 2x6's and other dimensional lumber is more than strong enough to support a catapult.

**Resources**

- https://mae.usu.edu/student-clubs/asme/pumpkintossVideos
- http://www.stormthecastle.com/catapult/pumpkin-chunkin-catapult.htm

**Criteria or Final Contest Rules**

- The Machine must fit in 6'x6'x6' cube when in cocked position
- At no time can the machine be larger than 12'x12'x12'.
- No compressed air, combustion system, or explosives may be used.
- No machine can use any external power sources.
- Each team will launch 5 pumpkins
- Winner will be based on distance of longest throw.
- If there is a tie the winner will be determined by distance of 2nd furthest shot.
- Each team must be accompanied by a faculty member at all times.

**Timeline**

September: Start planning and create list of materials.
October : Start construction of catapult and practice before the competition.
Event held around Halloween possible location TBA.

**Activity Overview includes the following:**

The teams will create a plan for construction of their device. Construction and testing will be very important. The machine must fire safely and any machine deemed unsafe by safety committee will not be allowed in the competition.

# Activity Overview

| Week | Activity | Activity outline | Guiding questions |
|---|---|---|---|
| 1 | **Planning** | Create plan for building the catapult.<br><br>What will frame look like?<br>What will tension bar be made from?<br>How will the catapult be fired?<br>What will be used to hold the Pumpkin? | How big should we make the frame?<br><br>What can we use to hold the pumpkin? |
| 2 | **Materials** | Gathering and preparing the materials<br><br>Create materials list<br>Locate materials<br>Cut pieces to length<br>Pre drill holes<br>Organize necessary hardware | Should we use 2''x4''s or 2''x6''s?<br><br>How much will it cost to construct? |
| 3 | **Construction** | To assemble frame of Catapult<br><br>Build a box/frame to to support firing arm and make sure to reinforce corners and make them strong. There is a lot of stress on the bottom and in corners when fired. | What type of fasteners should we use?<br><br>Are the piece going to fit together? |
| 4 | **Construction** | Assemble tension rod and firing mechanism<br><br>Remember the tension rod needs to swing free and smooth on its path<br><br>Firing mechanism should release easily and safely from a distance that keeps people away from the moving parts. | Can we fire the machine safely?<br><br>Does the catapult have the tension we anticipated? |
| 5 | **Testing** | Test fire Catapult and make adjustments to fire safely and as far as possible.<br><br>Use a 5lb pumpkin and make sure you have enough space in front of catapult. At least 50 yards.<br><br>Check all joints after and look for anything that might be split or separated after the machine has come to rest. | Do we think it launches far enough to win?<br><br>Can the machine withstand multiple launches? |

# Judging Criteria

| Category | Criteria | Scale | Score |
|---|---|---|---|
| Design | Meets the design criteria<br>Frame Dimensions meet<br>Locking mechanism<br>Axle (Steel Wood) | 4-5 – Excellent<br>2-3 – Satisfactory<br>1 – Unsatisfactory<br>0 - Missing | |
| Methodology | Demonstrates intended design<br>Does it fire safely<br>Can machine be carried into place<br>Does pumpkin break when launched | 4-5 – Excellent<br>2-3 – Satisfactory<br>1 – Unsatisfactory<br>0 - Missing | |
| Construction | Craftsmanship<br>Adherence to design<br>Can it be fired multiple times<br>Does it destroy the ground<br>Does the machine stay together when in the launch position | 4-5 – Excellent<br>2-3 – Satisfactory<br>1 – Unsatisfactory<br>0 - Missing | |
| Creativity | Shows creativity and innovation<br>Paint job<br>Fasteners used<br>Medieval looking | 4-5 – Excellent<br>2-3 – Satisfactory<br>1 – Unsatisfactory<br>0 - Missing | |
| Presentation | Clear and professional<br>Thoughtful responses to questions<br>Poster – clarity and aesthetics<br>(List criteria) | 4-5 – Excellent<br>2-3 – Satisfactory<br>1 – Unsatisfactory<br>0 – Missing | |
| | | Total | |