Background Context:
Ballistics is the science of mechanics that deals with the launching, flight, behavior, and effects of projectiles. Catapults, bows, and slings are just a few of the projectile launchers that have been used for centuries.

Design Problem Statement:
Using the materials provided, create a device that will be able to complete one or both of the following challenges:
  A) Accurately launch a ball at a target of 10 feet
  B) Launch the ball as far as possible

(Bonus points will be awarded to teams that can complete both challenges)
Criteria:

In order for your launcher to enter the challenge, all of the following design criteria MUST be met:

- Your device must be powered by the energy stored in the device
- Your entire device must remain behind the start line until it is launched
- Your team may only use materials provided
- Your design must be approved before construction
- Teams are not allowed to give the ball an added push as it is launched. They are allowed to use a helping hand to prepare for the launch, i.e. pull it back to load it before the launch.

Components of Assignment

1. **Evidence of research**: List of sources used and images found during the research stage. Minimum of one page of research. This portion can include links to specific websites, screenshots, references, mind maps, etc. (due week 1)

2. **Progress logs**: Weekly logs of what was accomplished and significant challenges and solutions that were presented (one paragraph per week).

3. **Design sketches**: Considering the material list, come up with at least 5 sketches of possible designs as well as the chosen design. Sketches should show a variety of different ideas and concepts. The final sketch should be the chosen concept and should be shown in more detail. (due week 1)

   Design Considerations:
   There are many factors to think of when designing your projectile launcher:

   - How can you design your launcher to be accurate?
   - How will the object be launched?
   - Will the distance and height your object travels be adjustable?
   - How will you keep your launcher stable during operation?
   - How can you make your launcher more durable?

4. **Orthographic drawings**: An orthographic drawing depicting the TOP, FRONT and SIDE view of the prototype along with appropriate dimensions. The dimensions should convey enough information so that another person could build your prototype based on the orthographic drawings alone. (due week 2)
Note: you must not start construction of your launcher until your orthographic drawings are complete and Mr Reeves has approved your design.

5. **Project Construction:** The construction phase will take up the majority of your time in this challenge. Be prepared to make some major adjustments to your design. During this phase you will go through a number of trial and error tests to refine your design.

- Each team will be provided with a box filled with materials that could be used to create a launching device.
- Each team will receive only one set of materials.
- Teams may ONLY use all or part of the materials in THEIR box and are not allowed to share materials with other teams.
- All unused materials should be saved in case repairs are needed during competition.

Be sure the following materials are in your bin before construction:

<table>
<thead>
<tr>
<th>Adhesive materials:</th>
<th>5 heavy duty rubber bands</th>
<th>20 Index cards</th>
</tr>
</thead>
<tbody>
<tr>
<td>Each team may use an appropriate amount of:</td>
<td>5 light duty rubber bands</td>
<td>5 Pieces of paper</td>
</tr>
<tr>
<td>Hot glue gun sticks</td>
<td>12”x12”x2” Styrofoam board</td>
<td>2 Plastic spoons</td>
</tr>
<tr>
<td>Duct tape</td>
<td>1 golf tee</td>
<td>1 Mousetrap</td>
</tr>
<tr>
<td>Masking tape</td>
<td>2’ of wooden doweling</td>
<td>3 welding rods</td>
</tr>
<tr>
<td>5 Plastic cups</td>
<td>10 paper clips</td>
<td>2 binder clips</td>
</tr>
<tr>
<td>2 binder clips</td>
<td>25 Wooden craft sticks</td>
<td>4’ of string</td>
</tr>
<tr>
<td>25 Wooden craft sticks</td>
<td>Ping pong ball (for projectiles)</td>
<td></td>
</tr>
</tbody>
</table>

6. **Challenge day:**

The challenge day Schedule is as follows:

1. Each team will get two attempts to launch the ball at a target of 10 feet
2. Teams will receive 5 minutes to make adjustments
3. Each team will get two attempts to launch the ball as far as possible

Team members must wear safety goggles during the launch!

**Evaluation**
The Launcher will only be evaluated if all of the previously mentioned criteria has been met and all the components of the assignment have been completed.

The entire project will be evaluated as follows:

- Evidence of research /10
- Design sketches /10
- Orthographic drawings /10
- Progress logs /10
- Challenge results /20
- Quality & Creativity /15
- Work ethic/participation /15

Total /100