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Horizontal Projectile Launcher Competition

Learning objectives:
By the end of this project, you will be able to:
- Use the engineering design process to assess, design, plan, build, test, and improve a solution to a real-world problem.
- Describe the relationship between height, initial velocity, and the distance a projectile will travel.

Materials:
- Arduino UNO w/ USB cable
- computer with Arduino IDE
- 2 infrared proximity sensors
- 1 RGB LED
- 6 female-to-male Dupont wires
- Arduino holder
- materials for projectile launcher
  - cardboard, plastic containers, PVC pipes, popsicle sticks, etc.
  - springs, rubber bands or other elastic material, air pumps, etc.

Step 1: Ask
- What do we want to design?

- What are the project requirements and limitations?

- What is our goal?

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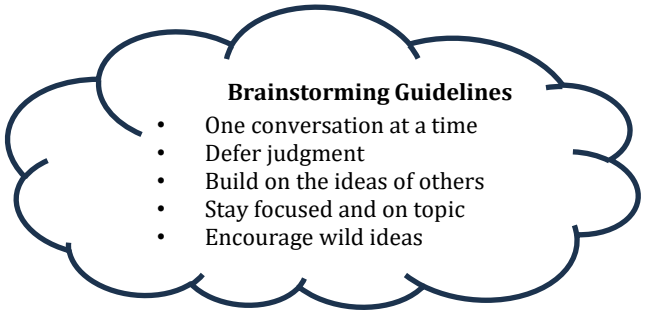
Step 2: Research

List at least three sources and a brief description of what ideas/information you gathered from each source:

Step 3: Imagine

Brainstorm ideas for your design with your group. Each member should contribute at least one idea. Each idea should be listed below with a short pro/con list.



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Step 4: Plan

Select one idea from your brainstorming step to become your group's design. Use the space below to sketch the design. Include measurements, notes about assembly, materials, how parts will attach, and any other vital details in your design.

Make a list of materials you will need below. Make a plan for acquiring the materials.

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Step 5: Create

At this stage, you will need to start building your first prototype. It is important to collaborate during this process. It is okay to make small deviations from your original design based on observations you make or challenges you encounter during this process.

Step 6: Test and Evaluate

At this stage, your prototype should be complete. Test your projectile launcher and answer the following questions. **We will not take measurements of the launch distance until the final competition.**

- Does your launcher work?

- Does your launcher meet all requirements and limitations?

- Are there ways your launcher could be improved?

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Step 7: Improve
Make any improvements you deem necessary to maximize the distance of the projectile. You can continue to test and improve as you go until it is time for the final competition.

Final Competition
At this time, all modifications must be complete. Each team will have three opportunities to launch the projectile. Track the distances in the table below:

Group	A	B	C	D	E
Trial 1 distance (m)					
Trial 2 distance (m)					
Trial 3 distance (m)					
Best (m)					

Final Question: For the winning group, use the distance measured, the standard height, and the kinematic equations to determine the initial velocity of the projectile.