Experiencing the Engineering Design Process through a Math Lens
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EDP	Questions to Consider	Barbie Bungee
Step 1: **Identify the Problem**	*What problem are you trying to solve? What are you being asked to find? What are the constraints?*	
Step 2: **Research**	*What do you already know about this problem? What do you need to know to solve this problem?*	
Step 3: **Develop Possible Solutions**	*What ideas do you have? How does your research support these solutions? What materials will you need?*	
Step 4: **Select the Best Solution**	*What is the best solution? Why? What materials will you need?*	
Step 5: **Construct a Prototype**	*What is the procedure for building the prototype? What materials do you actually use?*	
Step 6: **Test and Evaluate**	*What data are you going to collect? What happened? How did the prototype perform? Do your results make sense?*	
Step 7: **Communicate the Solution**	*How will you share your results?*	
Step 8: **Redesign**	*How could you improve your solution?*	

Engineering Design Plan (aka the "other" EDP)
Catapult Launchers

Read the "Questions to Consider" on the front page when thinking about what to write in your engineering design plan

Step 1: Identify the Problem

Design a catapult that accurately launches an M&M so it hits the target

Constraints:

Step 2: Research

Step 3: Develop Possible Solutions

- Sketch:
- Materials Needed:

Step 4: Select the Best Solution

Step 5: Construct a Prototype

Step 6: Test and Evaluate

a) Put your catapult on the floor. Practice launching the M&M a few times, then record the distance (meters) and time (sec) for 3 trials in a t-chart. Calculate the average distance and average time.

b) Determine the average fall time of your M&M:

c) An object's freefall can be determined by the equation, $d = \frac{1}{2}gt^2$, where d is the vertical distance traveled in meters, g is the effect of gravity (9.8 meters/s^2), and t is the average fall time (sec). The y-value of your vertex is d. Find d.

Step 6 Continued:

d) The x-value of your vertex can be found by dividing the average horizontal distance by 2:

e) Write a quadratic equation in vertex form to model the flight path of your M&M.

f) New challenge: Launch your M&M onto the floor, while the catapult is on the table. How does this effect your equation? Where would you expect your M&M to land now? Where should you place the target? Try it!

Step 7: Communicate the Solution

Step 8: Redesign

The calculations in Step 6 were inspired by this blog post (see post for student-friendly version with more scaffolding):
Sweeney, Sean. (2009, Sept 1). M&M Catapult project pt. 2- The project [web blog post]. Retrieved from http://sweeneymath.blogspot.com/2009/09/m-catapult-project-pt-2-project.html