

## Projectile Launcher – “Sweetening Foreign Relationships”

### Challenge:

The United States is trying to boost its relationship with Sweet-den. Your part in this effort is to send sweets across the ocean to the Sweetish citizens. You can choose what kind of sweet to send to them:

- M&M’s
- Sprees
- Starburst
- Tootsie Rolls
- Gumballs
- Nestle Crunch Bars
- Snickers Bars

Your projector launcher is to be built from the following materials:

- 25 “office-style” rubber bands
- 5 unmodified push pins
- 1 piece of cardboard (corrugated or flat), maximum size 12” x 18” – may be cut into more than one piece
- Scotch tape (intended for office use only – not packing/strapping tape, maximum width  $\frac{3}{4}$ ”)
- 5 wooden dowels, 0.25” in diameter and 36” in length
- 1 strip of metal (maximum size 0.623” x 12” x less than 0.623”) – may not be cut into more than one piece
- 1 piece of string/cord (maximum diameter of 0.25” and maximum length of 3’)



Use only the materials specified above. Not all materials need be used. The launcher cannot be touched once set into motion. Food cannot be launched into air by hand with throwing motion.

### Testing Rules:

1. The ocean will be 12’ x 3’.
2. The landing pad for food (or TARGET REGION) will be stationed on the other side of the ocean, 12’ feet away from the launch line. The target region will be a 17.5” x 11” x 9” box. Any food that does not land within this space will not be counted.
3. The launcher must rest on the floor when fired (i.e. not hand-held or resting on a table).
4. The launcher must not damage the floor.
5. The launcher cannot be touched once set into motion.
6. No tape or other adhesives may be used to attach the device to the floor.
7. All launchers must pass a safety inspection prior to launching - judged decisions on safety are final - make it safe!
8. All team members must wear eye protection while in the firing area (bring your own).
9. The FRONT CENTER of the launcher must be placed within one foot behind the “launch line.” The “launch line” is the 3’ edge of the ocean. The front of the launcher is defined as the forward-most point in contact with the ground when in the “ready to fire” position.
10. The front center of the launcher must be distinctly marked.
11. Points decrease for multiple shots with the same payload. See test scoring below.

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### 12. Specifications of the sweets to be launched:

- a. M&M: approximately 0.525” diameter, approximate mass of 0.9 g
- b. Spree: approximately 0.7” diameter, 0.2” thick, approximate mass of 1.9 g
- c. Starburst: approximately 0.75” square, approximate mass of 5 g
- d. Tootsie Roll: approximately 1.15” long, 0.5 – 0.6” diameter, approximate mass of 6.7 g
- e. Gumball: approximately 0.9” diameter, approximate mass of 8 g
- f. Nestle Crunch Bar: approximately 2.6” x 1.1”, approximate mass of 12.7 g
- g. Snickers Bar: approximately 1.8” x 1”, approximate mass of 17.7 g

All of the food will be in their original wrappers with the exception of the M & Ms, Sprees and the gumballs.

### Testing Procedure (See Figure 1 for testing schematic):

1. Each team must check in and have their launcher weighed and judged for safety and proper use of materials before entering the testing area.
2. Each team must enter the launching area with an un-set launcher. The team will have 5 minutes to load and launch a payload six times. Once the judge marks the scorecard and is ready, the team can launch the next payload. Teams will NOT be allowed ANY mis-fires or mis-aims. All six attempts will be recorded. If a team is taking too long it might not be able to take all six shots. A payload cannot bounce off of the “ocean” or floor into target.
3. The target region measures 17.5” x 11” x 9”. The front edge of the target region will be located 12’ from the launch line.
4. The front center of the launcher must be placed within one foot behind the launch line (see schematic).
5. All payload materials will be provided. Teams may not launch their own materials.
6. In case of an overall tie, the team with the highest total payload divided by launcher mass will be the winner of the tie. Student teams may verify measurements prior to the start of the competition and may inform the launcher judge prior to the start of competition of any concerns.
7. No coaches are allowed within the competition area.
8. All decisions are at the discretion of the judges and NOT at the discretion of fellow competitors.  
**Teams found not to be practicing gracious professionalism will not be allowed to compete.**
9. A friction increasing device (i.e. rubber mats, carpet, etc.) will be allowed to be placed under the launcher. However, NO adhesive will be allowed. If you choose to use such a device and it leaves ANY residue on the floor surface your team will be assessed penalties or disqualified from the event. NO chemicals of any kind (including water) may be placed on the floor. Teams or judges may wipe the floor clean with a dry towel. Any friction aiding device used must be weighed with the launcher at time of check-in. Any friction increasing device other than rubber mats or carpet must be pre-approved prior to testing (i.e. - email [norma@mtu.edu](mailto:norma@mtu.edu) for approval).

### Testing Scoring:

Each payload is worth the following number of points. Points decrease for multiple shots with the same payload (i.e. 20, 5, 1 see below), then remain at the lowest point value for subsequent successful launches. If more than one item is shot in a launch, the point value will be increased for the initial shot (see below). You may not launch more than one type of food in a single launch.

- Snickers: First successful shot: 1 Snicker - 30 points, 2 or more Snickers - 40 points  
Subsequent shots: 5, 1
- Nestle Crunch: First successful shot: 1 Crunch – 25 points, 2 or more Crunch – 35 points  
Subsequent shots: 5, 1

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- Gumball: First successful shot: 1 Gumball – 20 points, 2 or more Gumballs, 30 points  
Subsequent shots: 5, 1
- Tootsie Rolls: First successful shot: 1 Tootsie Roll - 15 points, 2 or more Tootsie Rolls - 25 points  
Subsequent shots: 5, 1
- Starburst: First successful shot: 1 Starburst - 10 points, 2 or more Starbursts - 20 points  
Subsequent shots: 5, 1
- Spree: First successful shot: 10 points  
Subsequent shots 8, 6, 4, 2, 1
- M & Ms: First successful shot: 5 points  
Subsequent shots: 4, 3, 2, 1

For example, if for your first shot you successfully land *two* Snickers in the target area, you will earn 40 points for that shot. If for a subsequent shot, you land *one* Snicker in the target area, you will earn 5 points for that shot.

### Testing Schematic:

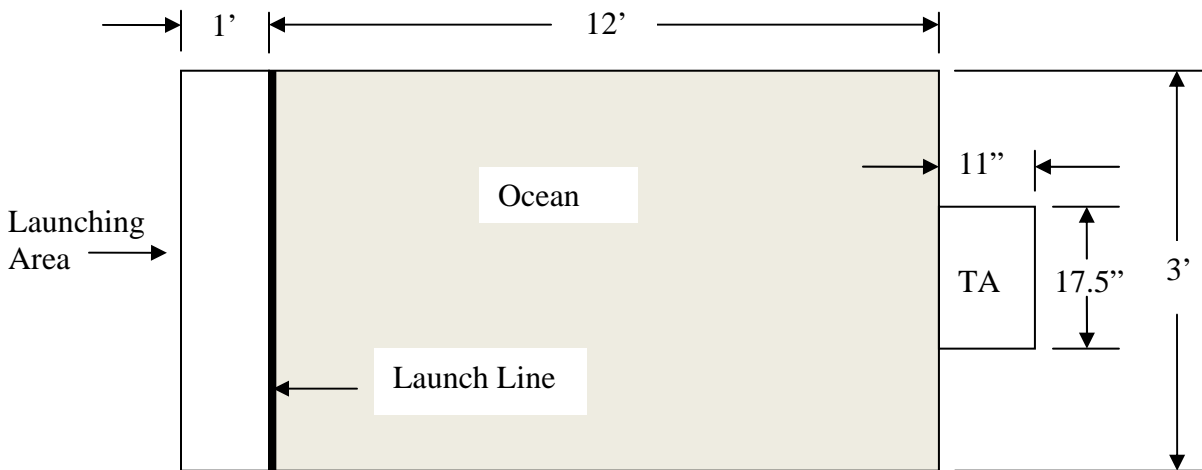


Figure 1: Sweetening Relationships Testing Diagram (not to scale)

TA = Target Area, centered  
on 3' ocean width, a  
17.5" x 11" x 9" box