TSA Drone Competition

2025-2026

Safari Rescue

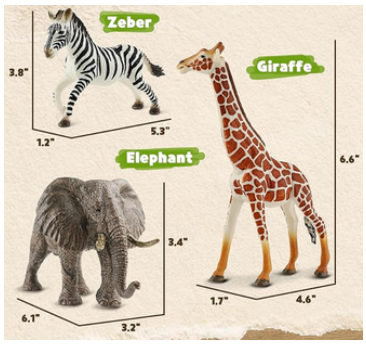
Understanding the Design Challenge

Goals of the Game:

1. Transport animals of various sizes from one location to another.
2. Identify hidden targets and transport them

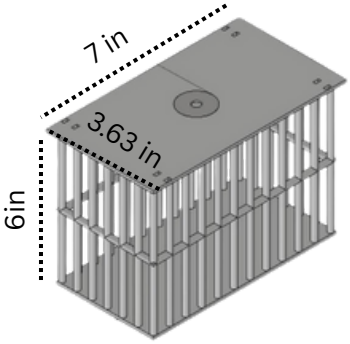
Analyzing the Game Objects:

Payrolls

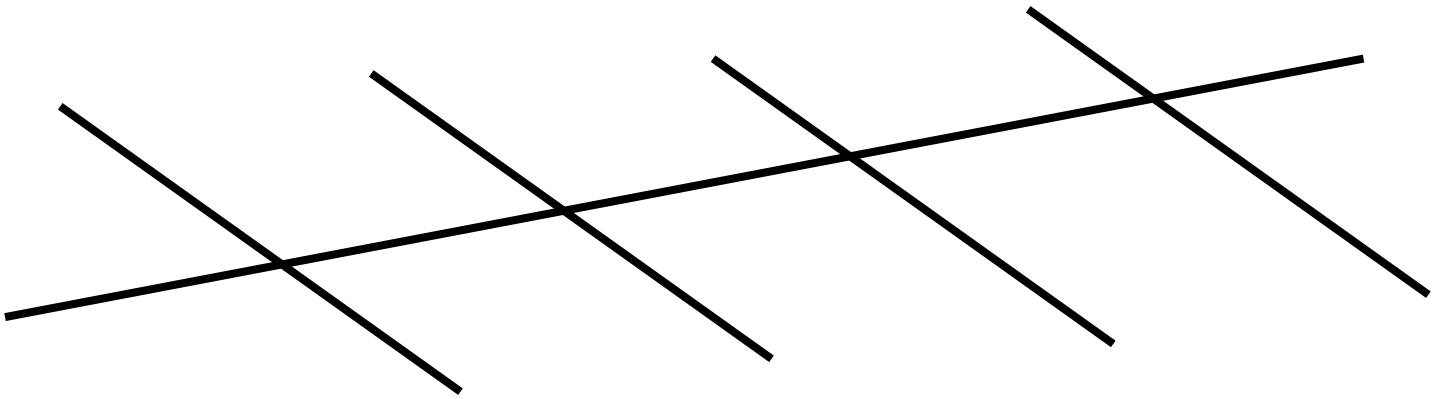


We plan to make our claw mechanism more versatile as the payrolls are different sizes from each other.

*Has a washer on top. Could be used for easy pickup and drop off of payrolls



Cage Diagram: Weight approx. 189 grams



*Animal images sourced from Amazon product provided in the Official Competition Document

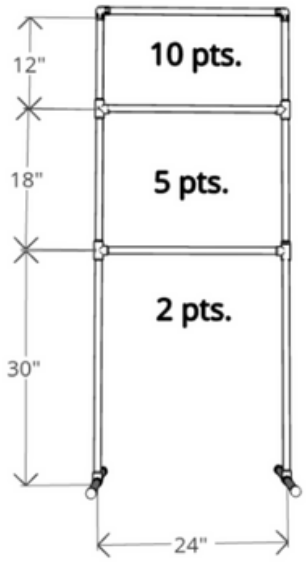
*Cage sourced from the Official Competition Document

Date:10/20/2025

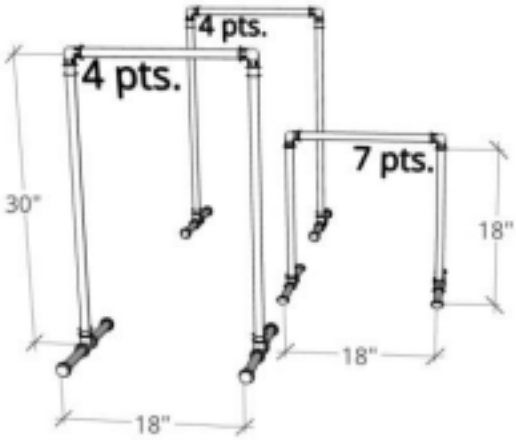
Understanding the Design Challenge

Analyzing the Game Objects continued:

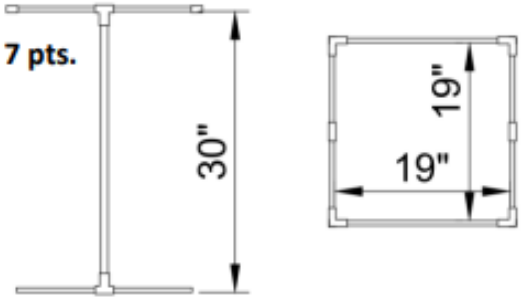
Possible Obstacles

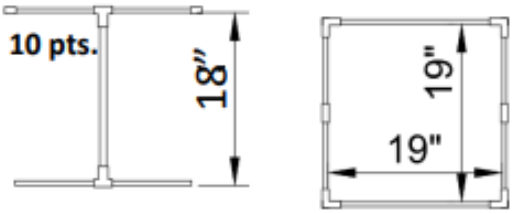


Obstacle 1: The Ladders



Obstacle 2: The Reverse Hurdles





Obstacle 3: The Floating Squares

*made of 1/2 “ PVC pipe, and the measurements are the opening size

*Obstacles Images sourced from the Official Competition Document

Date: 11/26/2025

Understanding the Design Challenge

Analyzing the Game procedures and scoring:

Game Overview

- Propellers must be removed if the drone is outside of the competition tent area (violations resulting in disqualification). Teams will be assigned designated pit areas for the preparation and repair of the drones.

- The drone must return to the starting zone after dropping off a payload before beginning the next pickup run. Therefore, proper time management plans need to be developed.

- Once a payload has been dropped, it remains in place for the remainder of the match and may not be retrieved during the run.

- Payload Runs Scoring: A certain number of points is allotted for the chosen path (Path 1 or 2), but only when the drone is carrying a payload. Obstacle points are added once per run when the drone successfully navigates said obstacles. Finally, points are added for the payload drop accuracy.

- Target Run Scoring: A certain number of path points is added on completion of the path chosen(path1 or 2). Obstacle points are added once per run when the drone successfully navigates said obstacles. Finally, points are added for the identification of targets using the drone camera.

- In case of a tie, the team with a faster mission/match time will advance to the next stage.

Scoring Summary Sheet

Team Number			Time		
Payload Run	**Path Taken**	**Points Acquired**	**Payload Drop Successful**	**Payload Drop Points**	**Run Total Points**
1 Cage animal or Uncaged animal	1 2		Yes or No		
2 Cage animal or Uncaged animal	1 2		Yes or No		
3 Cage animal or Uncaged animal	1 2		Yes or No		
4 Cage animal or Uncaged animal	1 2		Yes or No		
Target Run	**Path Taken**	**Points Acquired**	**Target Identified with Camera**	**Target Identified Points**	**Run Total Points**
Target 1	1 2		Yes or No		
Target 2	1 2		Yes or No		
				Final Total Points	

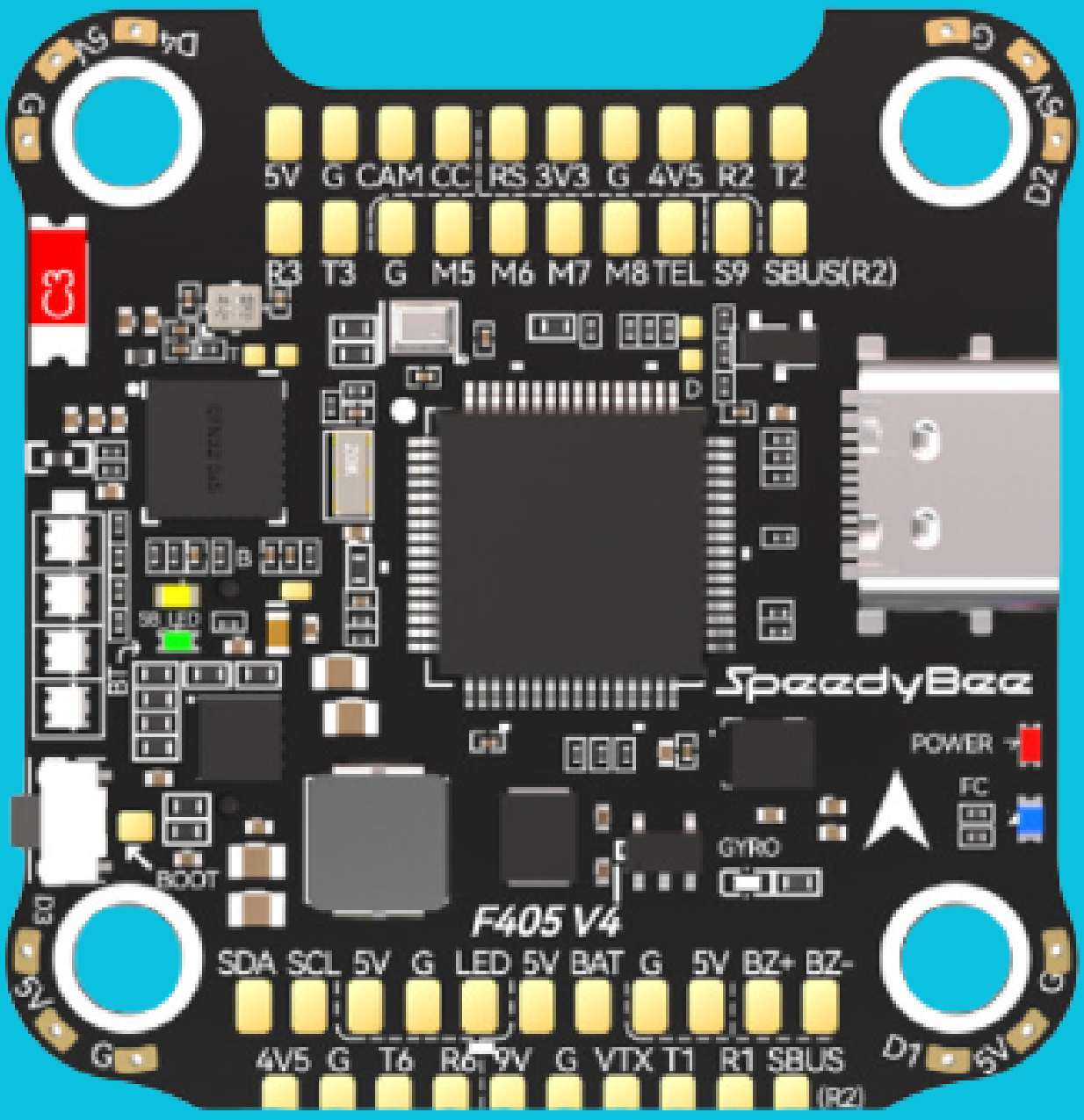
*Scoring Summary Sheet sourced from the Official Competition Document

Date: 11/26/2025

Parts explanation

FC (Flight controller): This component of the drone is like the brain; it controls the motors, supplies power to other components of the drone, which help it function.

SpeedyBee F405 V4



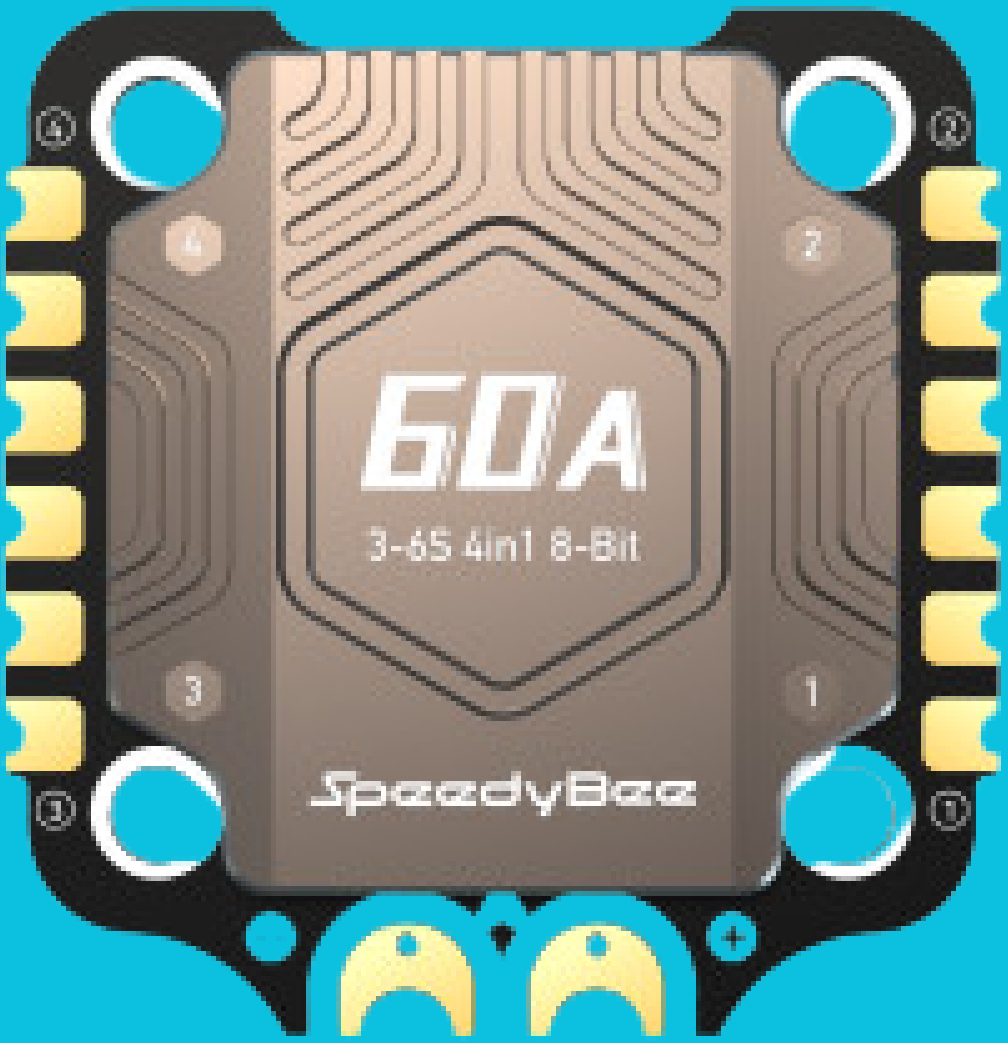
$48.99

Date: 11/30/2025

Parts explanation

ESC: The power supply of the drone connects to the battery using batter leads & it also connects to the motors to directly supply them with power. The ESC is controlled by the FC which it connected to the Esc by a pin connector to provide other aspects of the drone with power as well as so that it can control all the motors to make sure they are working properly and are not overpowering each other or going rouge.

SpeedyBee 60A Esc



$46.99

Date: 11/30/2025

Parts explanation

Motors: one of the major components of the drone the are 4 motors on a normal quadcopter which are soldered onto the esc 3 wires for each motor for a total of 12 motor wires that soldered onto the ESC the motors provide lift and flight to the drone and are used for adjusting Pitch, Yaw, Roll while in flight

Mepsking SZ2306 1950KV motors

$23.67 each

Date: 11/30/2025

Parts explanation

Frame: The Frame is like the case of a PC An FPV drone frame is the essential structural backbone, providing a rigid chassis to mount and protect delicate electronics (motors, flight controller, battery, camera) while also influencing flight dynamics, aerodynamics, and overall performance, with different shapes (X, Deadcat) offering varied agility and stability for different flying styles like freestyle or racing.

Speedybee Mario 5 frame

$30.99

Date: 11/30/2025

Parts explanation

An FPV drone receiver (Rx): Acts as the drone's ears, picking up your remote controller's stick inputs (throttle, yaw, pitch, roll) and relaying them to the flight controller (FC) which it is soldered onto to translate into actual flight movements, ensuring real-time control and communication between pilot and drone.

RadioMaster RP1 V2 2.4GHz ELRS Nano Receiver

$24.99

Date: 11/30/2025

Parts explanation

Parts of a drone

Digital Fpv system (ours is DJI): There are 2 main ways to do FPV 1. Analog (Cheapest) 2. Digital (Much more expensive that Analog). Our team had the Digital version which gives 1080p quality live video of what the drone sees which is trans mitted to specific goggles that only receive digital video. the system consists of 2 components the VTX & the Camera, the camera receives visual that gets sent to the on board VTX which the camera is connected to through a coaxial cable. then the VTX is connected to the FC using a pin connector which supplies it power.

RunCam Link Wasp System Digital HD FPV VTX WASP 120FPS FOV155 4:3 Micro Camera

$169

Date: 11/30/2025

Parts explanation

Battery: A simple thing that everyone knows it supplies the drone with power. It comes in different capacities (mAh) different cell sizes (1S, 2S up to 8S) most quadcopters use 6S or 4S.

Ovonic 1600mAh 120C 6S battery

$33.99

Goggles: Goggles that receive live onboard video & sometimes audio straight to the goggles to give the pilot a immersive experience to give a First Person View (FPV)

DJI FPV Goggles V2

$499

Date: 11/30/2025

Parts explanation

Propellors: These are the blades that attach to the motor and screw on, they provide lift by spinning with the the motors which cause the quadcopter to go airborne.

MEPS SZ5145 3-Blade Propeller

$52.07

MEPS SZ4942 3-Blade Propeller

$4.90 each

Date: 11/30/2025

Parts explanation

Radio: An FPV radio's primary function is to wirelessly send your stick movements and switch commands from your hands to the drone's receiver (Rx), controlling its flight, while also receiving vital data (telemetry) like battery voltage, signal strength, and flight modes back to your controller's screen or goggles for crucial feedback, creating a seamless, responsive link for piloting

Radiomaster Pocket

$64.99

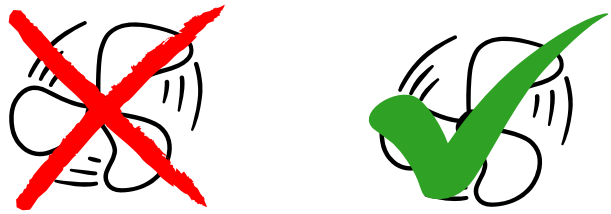
Date: 11/30/2025

Bill of Materials

SpeedyBee F405 V4	$48.99
SpeedyBee 60A Esc	$46.99
Mepsking SZ2306 1950KV motors	$23.67
Speedybee Mario 5 frame	$30.99
RadioMaster RP1 V2 2.4GHz ELRS Nano Receiver	$23.67
RunCam Link Wasp System Digital HD FPV VTX WASP 120FPS FOV155 4:3 Micro Camera	$24.99
Ovonic 1600mAh 120C 6S battery	$33.99
DJI FPV Goggles V2	$499
MEPS SZ5145 3-Blade Propeller	$52.07
MEPS SZ4942 3-Blade Propeller	$4.90
Radiomaster Pocket	$64.99
Total Price:	$789.26

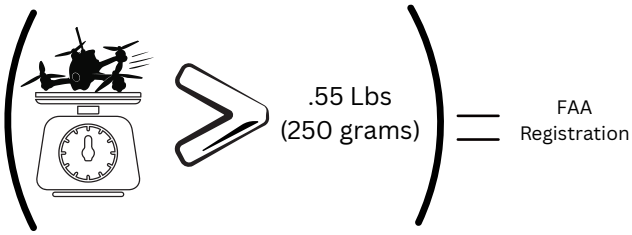
Researching Drone Flight Regulations

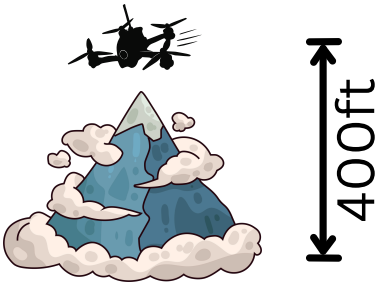
- UAV Drone propellers removed when outside of the competition tent area.



Outside Inside

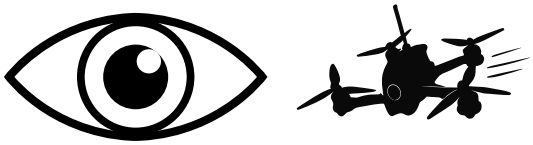
- Drones over 0.55 lbs (250g) must be registered with the FAA.





- Drone should be in your line of sight.

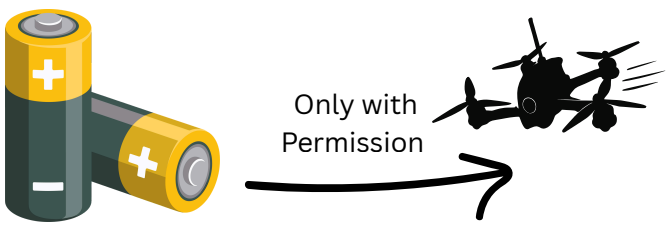
- Drone maximum altitude should be equal to or less than 400ft.



- Must pass the TRUST test for educational/recreational flights

FAA Recreational Drone Testing Logo

- Only add batteries to a Drone when not in the flight area and power only only with permission



Claw Brainstorming

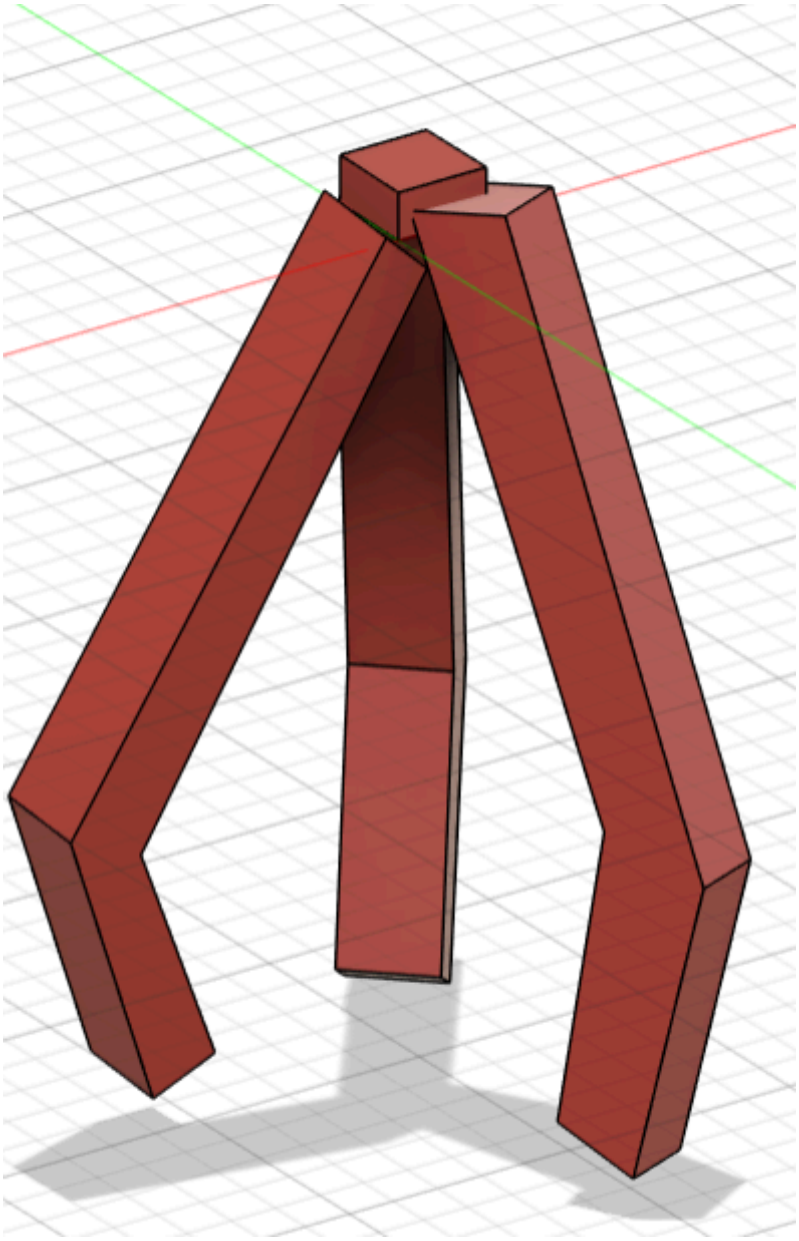
Agreed upon Claw specifications:

- Be lightweight
- Grip objects well
- pick up and move certain objects
- Be durable
- Cheap to make
- Easily attatchable

Deciding on material for claw:

- Metal is too heavy and expensive (aluminum was considered but ruled out)
- 3D printing is light, cheap, and strong if we use the right filament
- Rubber bands can be added for better grip
- Can be mounted with screws
- 3D printing meets all our requirements (weight, cost, durability, ease of mounting)

Basic Claw Design



Decided on 3 finger claw because it covers entire area and anything more than this seemed excessive and wastage of time.