Team # _____

Overview:

Teams (of either one or two) will participate in a sci-fi space shuttle repair challenge and will be rewarded with points for the amount of repairs they can make within a 2 hour period. Challenges will range from wiring a single LED on a breadboard to building a complete minigame using an OLED display and controls. Students will learn fundamentals of prototyping, Arduino (C) programming, and breadboard circuit design.

During the two hour period you will have 10 shuttle repairs to complete to be able to fly your spaceship home. Each repair will come with broken code and broken wiring diagrams that need to be fixed for things to work properly. Teams will be provided with coding libraries, official Arduino language reference documentation, and basic circuit information about each component. No prior knowledge in any of the subjects or technologies is expected or required. The team that completes the most (or all) repairs in the least amount of time wins the competition. Contest Note: students must be capable of saving their submissions on a USB flash drive from their personal computers. Participants will earn points as they complete each repair. 1 repair mission completed = 1 point. There will be a total of 10 possible points, with each point slightly harder than the last. The final project is a minigame that comes with the bonus prize of inventr.io hoodies to the team that scores the highest. You may skip to this project at any time. If two teams receive the same amount of points the winning team will be decided based on who received that point amount first.

Scoring:
Participants will earn points as they complete each repair. 1 repair mission completed = 1 point. There will be a total of 10 possible points, with each point slightly harder than the last. You must complete repairs in ascending order and can not skip a repair. If two teams receive the same amount of points the winning team will be decided based on who received that point amount first.

Resources:
A student laptop with Internet access, the official Arduino IDE, a USB-A port (or adapter) and a working Web Browser software are required. Firefox and Chrome browsers are recommended. Online, web based tools can be used to solve the challenges. A basic electronics kit will be provided at the time of the event. The last page of this document includes some helpful tools please check those out if you get stuck or need help getting started.

Do not access inventr.io unless you need to access HERO board drivers. Entering any of the course pages on inventr.io's website will result in disqualification.

Day 1: Make the onboard LED Blink:

Story: The year is 30XX, and you are currently working for the ISS (Intergalactic Space Association). You have been tasked to explore uncharted territory and bring back useful geospatial data for the research team. After an unfortunate mistake of forgetting to re-fuel before takeoff, you end up spiraling down on a foreign planet and crash land at the bottom of some ocean millions of light years away. After crash landing, you need to boot up the emergency repair hardware (HERO) in order to start fixing the rest of your ship.

Required components: HERO board, USB cable
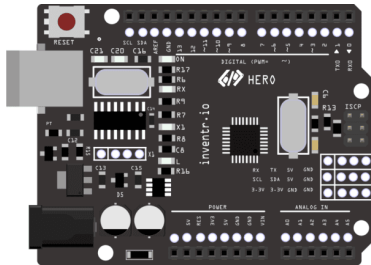
Desired outcome: Make the onboard led of your HERO board "blink". (Hint: File->examples->basics)
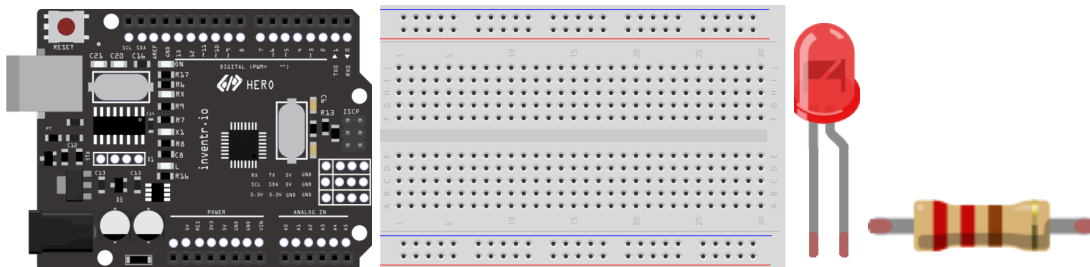
Signed off _____

Time completed _____

Day 2: Blink Breadboard LED

Story: Being deep under the ocean it is VERY dark and you can't see much. You'll need some more light in order to continue working in these conditions.

Required components: HERO board, USB cable, breadboard, wires, 1x LED, 220 ohm resistor
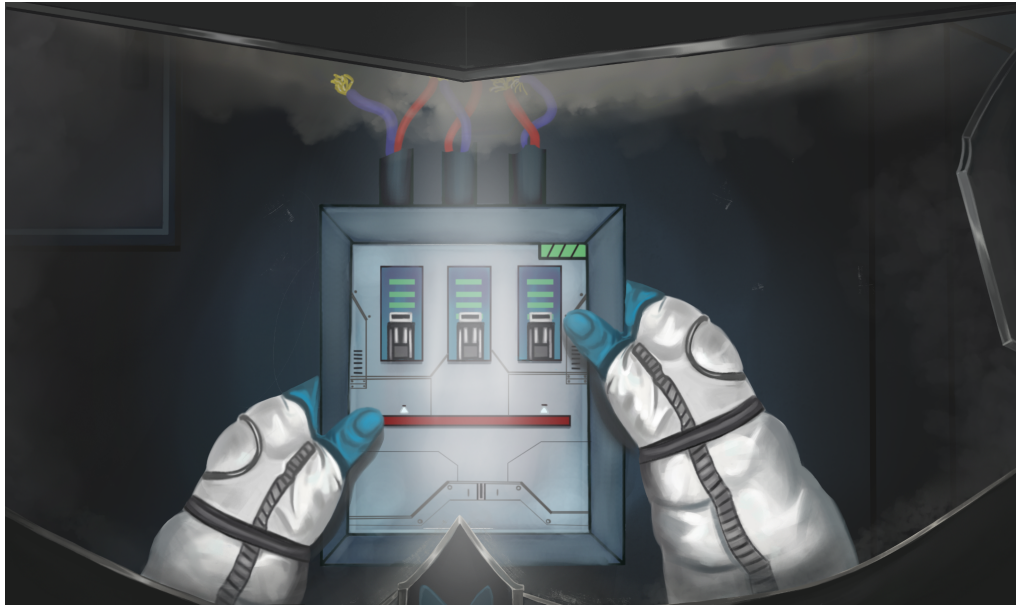

Desired outcome: Similarly to day 1, "blink" an external LED instead of the onboard LED. Remember to use a resistor for the power line! (hint: long pin is VCC (power), short pin is Ground)
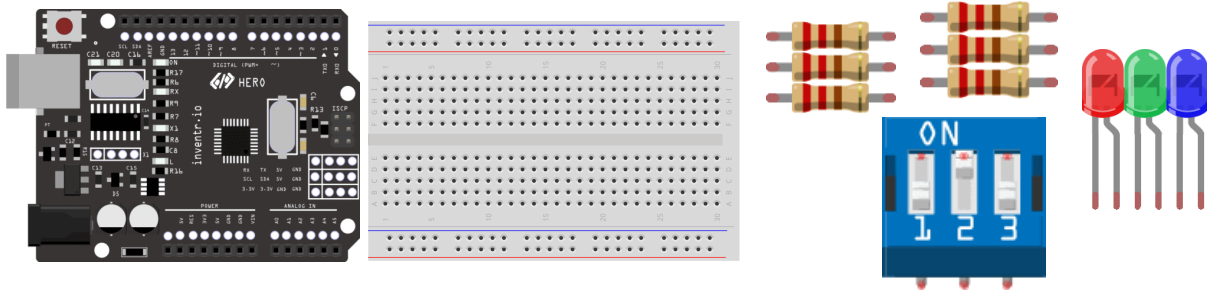
Signed off _____

Time completed _____

Day 3: Dip switch 3x Lights

Story: You hooked up too many lights and the battery won't last! We need to add a light switch to control these lights in our shuttle. If we don't do that our battery will drain and we won't be able to get out of this situation.

Required components: HERO board, USB cable, breadboard, wires, 3x LED, 6x 220 ohm resistor, DIP switch
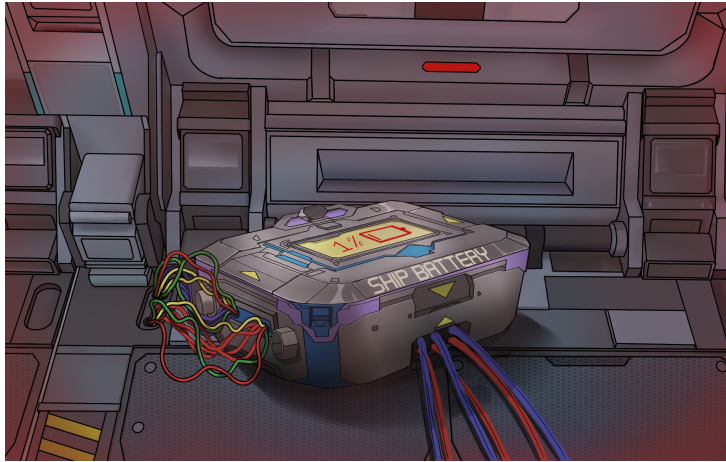

Desired outcome: Using the dip switch, make a light switch for 3 separate LED's to turn them on and off as needed. One switch controlling one LED.

Signed off _____

Time completed _____

Day 4: Photoresistor turns RGB Light to red/green

Story: To make matters worse, We realized the battery status indicator was giving off inaccurate information this whole time. We need to fix the indicator, pronto. Looks like our battery is almost dead. Wire up the photoresistor to help us charge the battery.

Required components: HERO board, USB cable, breadboard, wires, 1x RGB LED, 3x 220 ohm resistor, 1x photoresistor
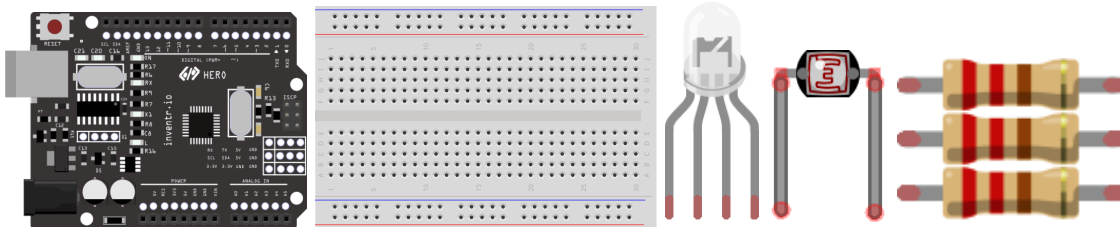
Desired outcome: Using the RGB LED and Photoresistor, turn the RGB LED from RED at 0% battery and then to green when the battery is at 100%. The photoresistor should speed up the charging process when more light is applied and should slow it down when the area around it is dark.

Signed off _____

Time completed _____

Day 5: Repair Security System (Fix bug in function)

Story: Due to an issue with the security system, we can't proceed any further or receive any incoming transmissions until the security system is re-configured. It's having an issue where it's no longer secure and easily brute-forceable. We'll need to go in and edit the function to ease the brute-force bug.

Required components:
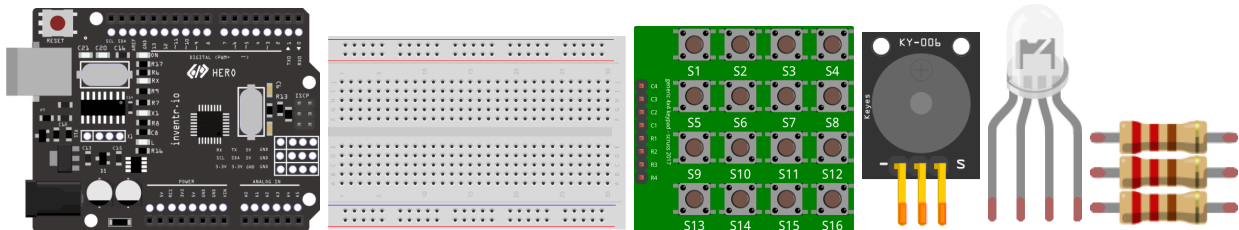
Desired outcome: Fix the function "unlockMode()" so it doesn't return anything until all 4 digits of the pins are pressed, instead of returning as soon as a bad one is pressed. (Hint: you should not need to edit anywhere else outside of "unlockMode()".
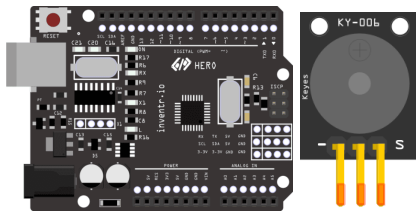
Signed off _____

Time completed _____

Day 6: Incoming signal

Story: You were able to get the security system online, and you just received your first message! Quick, play it! Maybe it's useful?
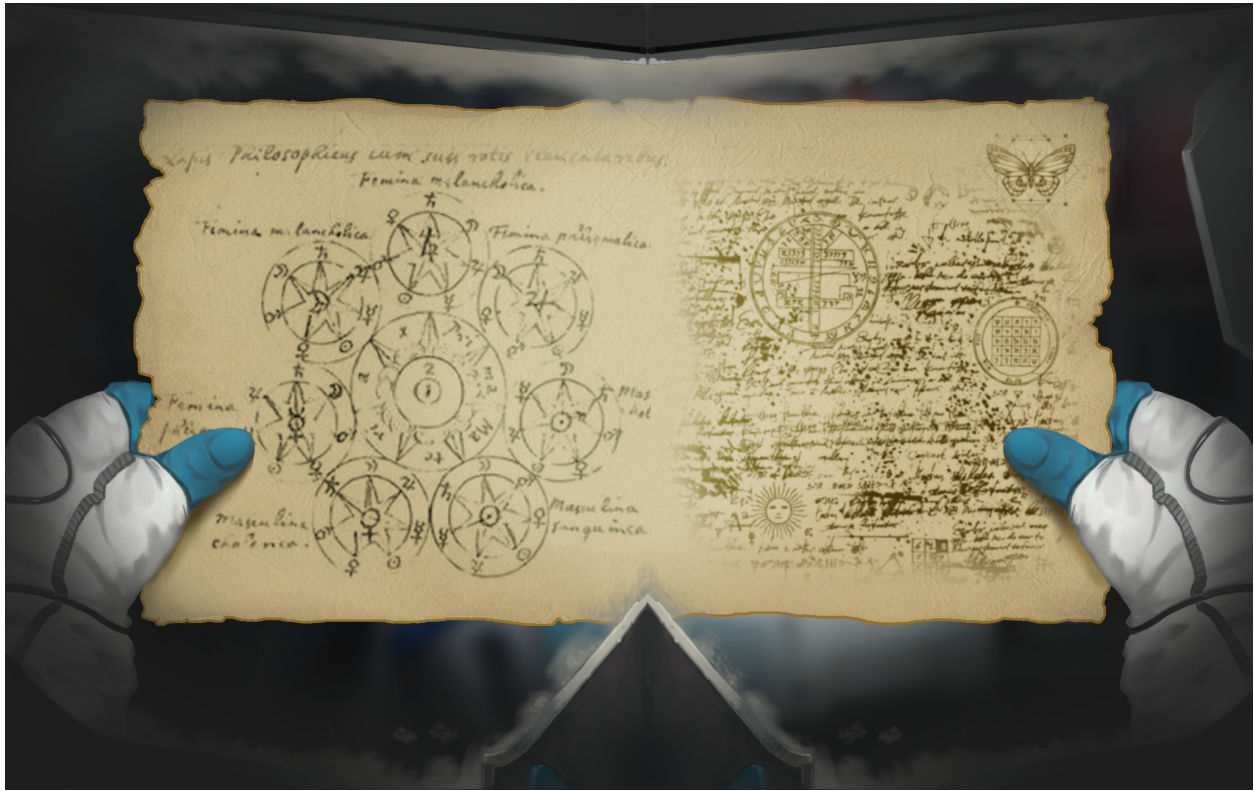
Required components:

Desired outcome: Never give up! Play the file's contents, and you won't be let down.
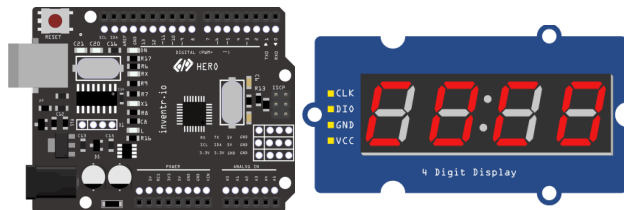
Signed off _____

Time completed _____

Day 7: Decoding the password to access the air override controls

Story: You were able to get an incoming message (for real this time) that gave you the password (in this case, source code) to access the air override controls. But it's completely encrypted! We need these to be able to float back to the surface of the water. The only userful bit you were able to make out is the word "Ceasar". Better figure out how to decrypt it!

*Required components:

Desired outcome: Decrypt the message and run the code. Give the three numbers to proceed and get the signature. (hint: https://cryptii.com/pipes/caesar-cipher)
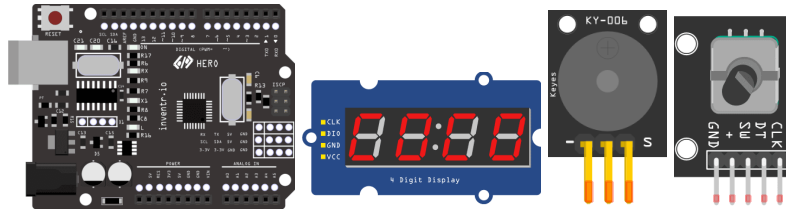
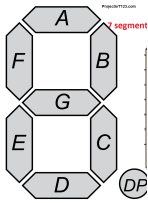Signed off _____

Time completed _____

Day 8: Floating to the surface (fix bugs in code)

Story: You got the air systems overridden! You're finally starting to float to the surface! But we can't go too fast, or else the pressure will destroy us. Find a way to safely manage the speed of ascent to the surface.

Required components:

Desired outcome: Fix the incorrect text on the display so it says "done" instead of "nogo" when you get to the surface.
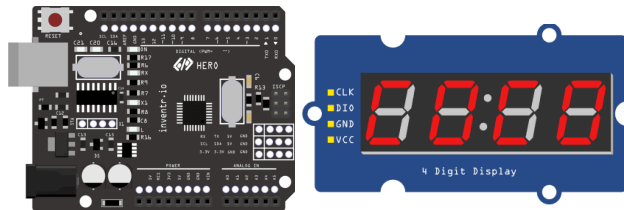

(Hint):

Signed off _____

Time completed _____

Day 9: Liftoff 7-segment Countdown

Story: You've made it to the surface! It's finally time to go home. Let's make a final countdown timer to prepare for liftoff.

Required components:

Desired outcome: Create a countdown timer that starts at a time of your choosing using the 7-segment display module.

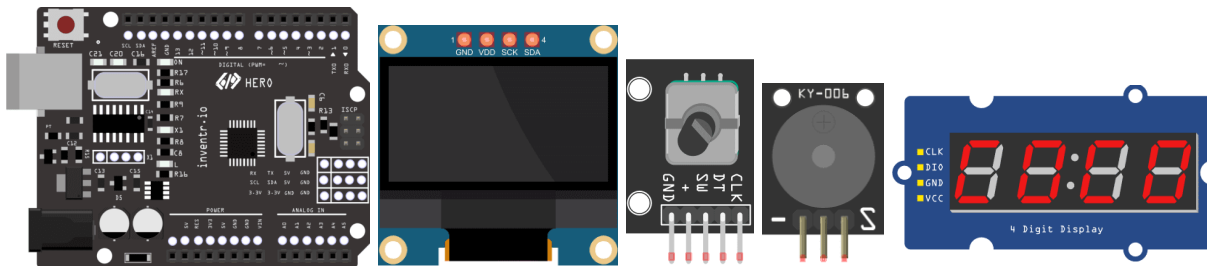Signed off _____

Time completed _____

Day 10: Chrome Dino OLED Game (endless mode)

Story: You've made it to space and are on your way home! With the time left on your journey, let's create a game using the OLED.

Bonus prize: Highest scoring team on the dino game wins inventr.io hoodies.

Required components: 1x HERO board, 1x 4 segment display, 1x Buzzer module, 1x OLED, 1x potentiometer

Desired outcome: If you were able to make it this far, play the dino game on the OLED. We will provide the code DO NOT CHANGE ANYTHING. Good luck winning the free hoodie!

Signed off _____

Time Completed _____

Highest Score _____

Helpful resources section:

Arduino Reference Library: https://www.arduino.cc/reference/en/
Need to know how to write a loop? Need to know how to turn on an LED? This is an amazing tool you can use to learn more about the syntax running your HERO/Arduino board.

Inventr.io's video library: @InventrKits on YouTube
Although you cannot access our course pages on our website you are allowed to view our videos on YouTube. These videos contain most of the information you need to solve all of these challenges but it's too much footage to watch all within 2 hours. Use your time and these videos wisely.

ChatGPT: https://chat.openai.com/chat
When in doubt, work with AI to help you solve problems. You can paste code and ask it to find errors or ask it how certain functions should work. If you have questions this is the fastest way to gain answers. It's not always perfect because it can't see your circuits so use this tool wisely and be careful not to short any components.