



LOCKED OUT MATH: WRATH OF THE BIRBS

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Welcome to Locked Out Math: Wrath of the Birbs. This is a fun, two part locked room experience where students play as captain of a space vessel. This locked room is designed for grade 8+ students. Some of the concepts students will need to solve the puzzles are listed below:

- Transformations (translations, reflections in lines/axis, rotations about points)
- Geometry
- Logic and Reasoning
- Cartesian coordinates
- Systems of equations/congruencies

Each part will take a different amount of time. Completing both parts will take about 60-120 minutes (depending on strength of students). This document includes instructions for each of the three parts, and all printable files/video links. The answer sheets include scannable QR codes if students want to take home as homework.

PART 1 INSTRUCTIONS

The goal of the first part of the experience is for the students to obtain the coordinates to the ‘beam zone’ by applying the transformations in the correct order. The answer should be presented as the beam zone drawn on the student’s map. The students are given the following components:

- **Description:** Describes the story. I recommend printing one large copy for everyone participating.
- **Captain’s Log:** Describes the story. Contains the coordinates of the distress signal. Student’s must use the two coordinates to establish the origin of the cartesian plane. I recommend printing one large copy for everyone participating.
- **Map:** Each group participating will need a map. It contains the locations (coordinates) described in the captain’s log. This is also used as answer sheets for part one. The final answer is showing that students have obtained the final transformed beam zone (triangle).
- **Communications Transponder:** This provides the urgent message sent from the crew’s lead engineer. It informs the students that they need to find the proper beam zone coordinates. It also gives students useful information used in **part two** of the room.
- **Transmission Video:** Stream this video on loop for all groups to see. This says the same information as the ‘communications transponder’ document, but adds a nice thematic element that students enjoy. If you chose to opt out of playing the video, I would recommend playing some nice thematic space music instead.
- **Transformations:** This gives the transformations that are applied to the beam zone that students must uncover. Students must match the symbols, and then superimpose the ‘digital clocks’ to order. The order of transformations correspond with the order of clock times. I recommend printing one or two large copies of this for everyone.
- **Solutions:** This shows the original beam zone, and all the transformations applied in the right order.

WRATH OF THE BIRBS: PART I

You are voyagers upon the surveying starship Multi-Kurtotic Endeavour, your crew is on a 10 year mission to explore the far reaches of the galaxy, seeking out valuable resources and potential habitats for colonization. As you traverse the cosmos, your journey brings you to the planet Verdant Aviaria, home to the native species known as “birbs.”

In response to two distress signals detected from the planet’s surface, your vessel halts its interstellar voyage, and you and the head engineer are beamed to the surface to lead separate teams to investigate. Amidst the dense jungle of Verdant Aviaria, you push forward, determined to uncover the source of the distress signal under your charge.

Guided by the enigmatic “birbs,” the engineer’s team advances through the verdant foliage, while your team presses on, navigating the tangled underbrush with urgency. Suddenly, an urgent transmission is received from your communications transponder from your lead engineer.

Captain's Log: Day 1

Today marks our arrival at Verdant Avaria, a stunning planet brimming with life and color. We beamed into the triangular region formed by the set of coordinates $\{(-4,1), (1,2), (2,-2)\}$. The air is thick with anticipation as we prepare to investigate the distress signals detected from the surface. The head engineer, Matrix, and I have been tasked with leading separate teams to uncover the source of these signals.

We've instructed the crew to transform the beam zone to a new position for our return as a security measure. We want to be prepared for any danger that lies ahead.

My team and I venture into the dense jungle, navigating the tangled underbrush with urgency. The vibrant hues of the flora are a stark contrast to the metallic sheen of our equipment, a reminder of the clash between the natural and the artificial.

While we lack the guidance of the enigmatic birbs, the engineer's team is led forward by these mysterious creatures, their melodic chirping guiding them through the verdant foliage. I can't help but feel a pang of envy as I watch them disappear into the depths of the jungle, their progress seemingly effortless compared to our own.

As we press on, I'm reminded of the importance of our mission. Lives may depend on our ability to locate and assist those in distress. We must remain vigilant and focused, ready to face whatever challenges lie ahead.

Distress Signal Coordinates:
Signal 1: X: -12, Y: 18 (North of the Lake)
Signal 2: X: 16, Y: -1 (East of the Lake)

Draw the **transformed** beam zone too escape Verdant Ayaria!





Celestial Nexus Communications Transponder

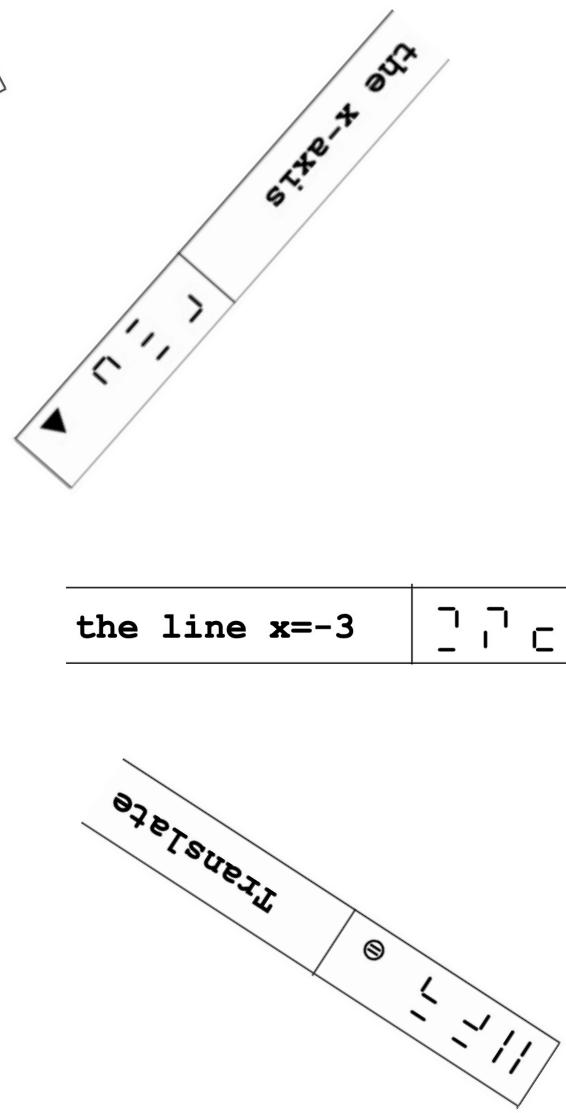
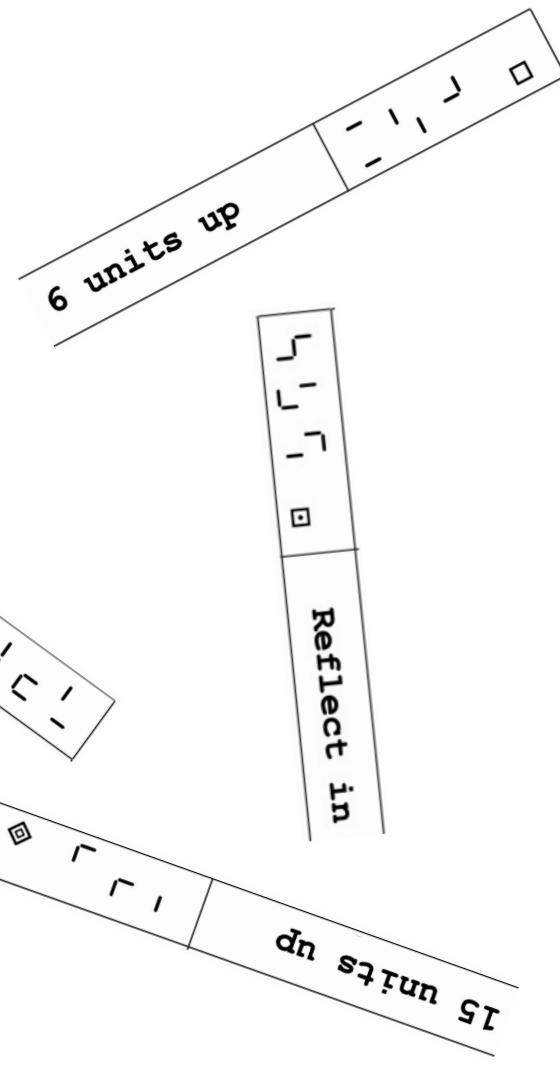
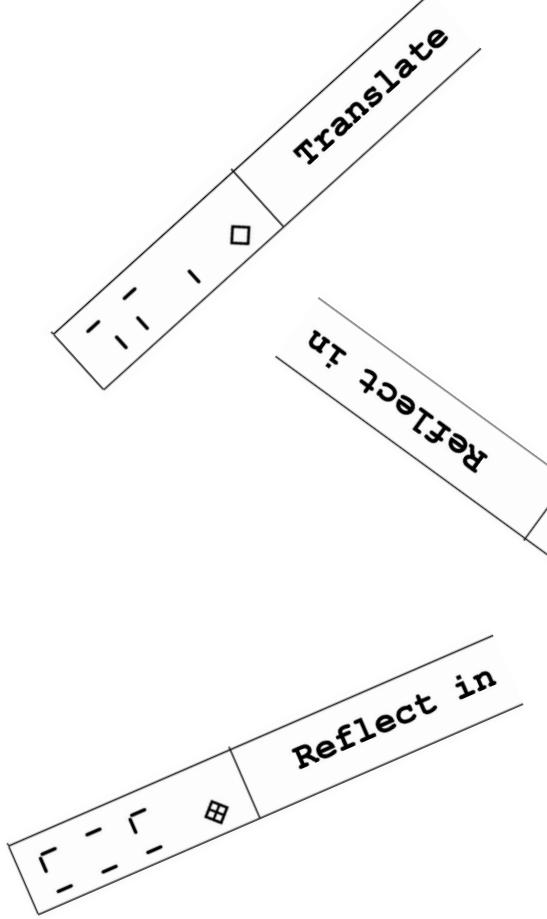


Matrix: I've reached position alpha. We've encountered an unforeseen threat - the birbs, they've turned hostile and are ambushing us relentlessly. It's a trap!

The situation has taken a dire turn. The birbs' onslaught is overwhelming. They've eliminated Jenkins and the rest of my team. I'm not going to make it to the extraction point. The priority now is your safety and that of the crew.

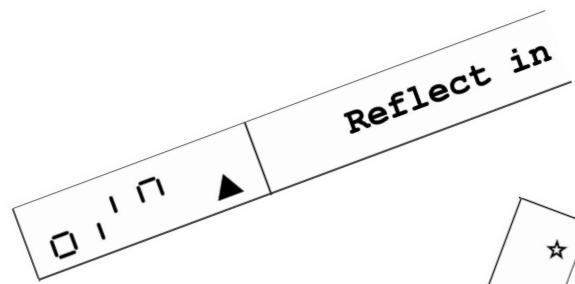
Rendezvous at the designated **beam zone** coordinates and initiate warp as soon as you arrive. The starship must depart immediately upon your extraction. You will be stalled in orbit until the quantum stabilization relay switches are calibrated. Make sure the lights in positions 2, 5, and 7 are activated! I'll do everything in my power to buy you the time to escape!

***** SIGNAL LOST *****

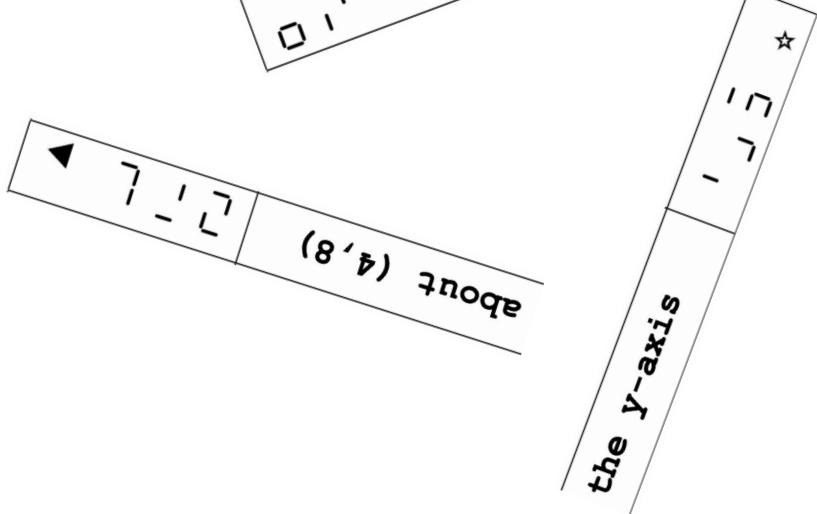




Translate

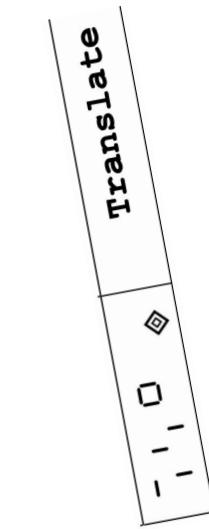


Reflect in

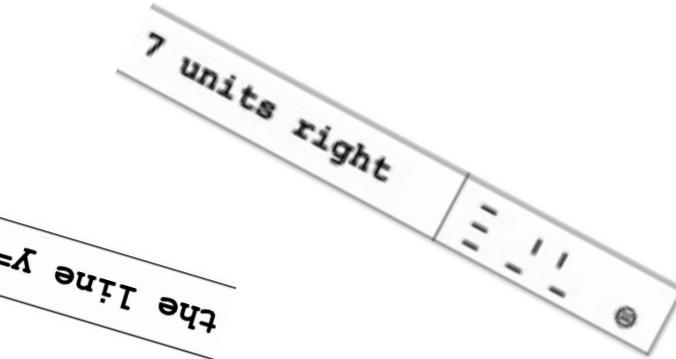
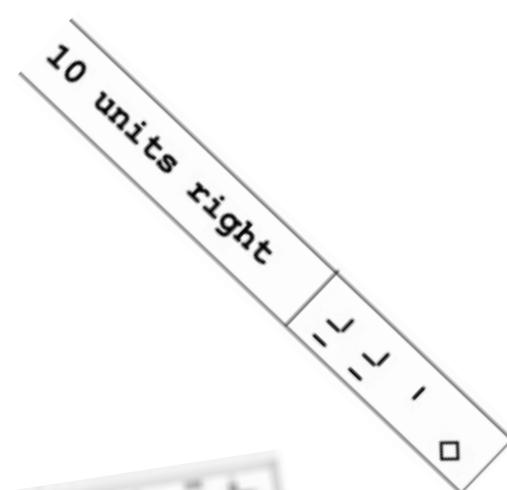


about $(4, 8)$

the y -axis



Translate



the Line $y = -1$

7 units right

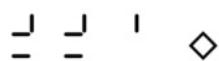


Draw the **transformed** beam zone too escape Verdant Avaria!



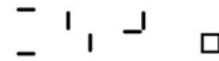
3:21

Translate 10 units right



3:54

Translate 6 units up



6:20

Reflect in the x-axis



7:36

Reflect in the y-axis



7:49

Translate 15 units up



8:25

Translate 7 units right



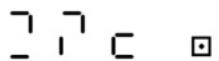
8:26

Rotate 90° C about (4,8)



9:06

Reflect in the line $x=-3$



9:56

Reflect in the line $y=-1$



PART 2 INSTRUCTIONS

The goal of the second room is to ‘stabilize the quantum stabilization relay switches’ (as described by engineer in part 1). Power must also be rewired to all ship devices. All components are described below:

- **Description:** Describes the story. I recommend printing one large copy for the entire group participating.
- **Answer Sheet:** Print one answer sheet for each group participating in the escape room.
- **Quantum Flux Stabilization Puzzle:** Stream this video on loop for all groups to see.
- **Matching Puzzle:** Print one large tabloid of all these documents. Students must match the devices, descriptions, and colours. Answers are the product of the correct chord and its corresponding device.
- **Solutions:** Solutions to matching puzzle, and light switch puzzle.

WRATH OF THE BIRBS: PART II

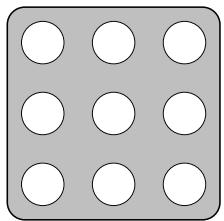
The moment you are beamed to the ship, the pilot delivers an urgent message:

“Captain! You’re back! Thank goodness! We didn’t know if you’d make it. The situation up here is dire. The birb creatures launched an all-out assault on the ship! Their pelican cruisers are swooping in from all angles, firing salvos of energy blasts that are tearing through our defenses like paper.

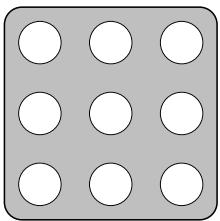
Their tactics are relentless, Captain. They’re coordinated, precise. It’s as if they’ve been planning this attack for ages. We’re doing everything we can to hold them off, but without full power, we’re at their mercy.

But now that you’re here, Captain, we have hope. We need your leadership more than ever. We need to reroute power from the emergency generator to restore full functionality. It’s our only chance to break free from their hold. Please, tell us what to do, and we’ll follow your orders to the letter.”

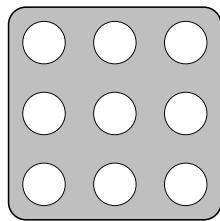
Quantum Flux Calibration Referral Modulator



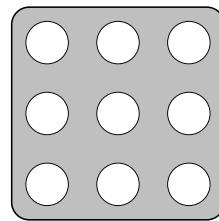
#1



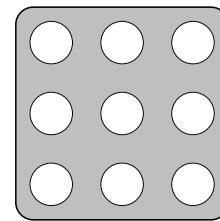
#2



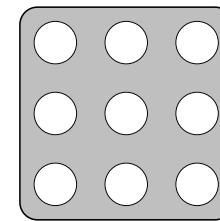
#3



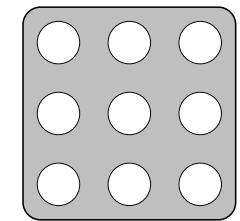
#4



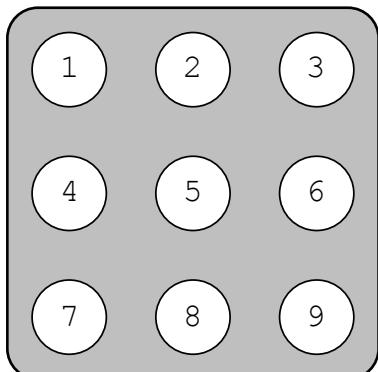
#5



#6

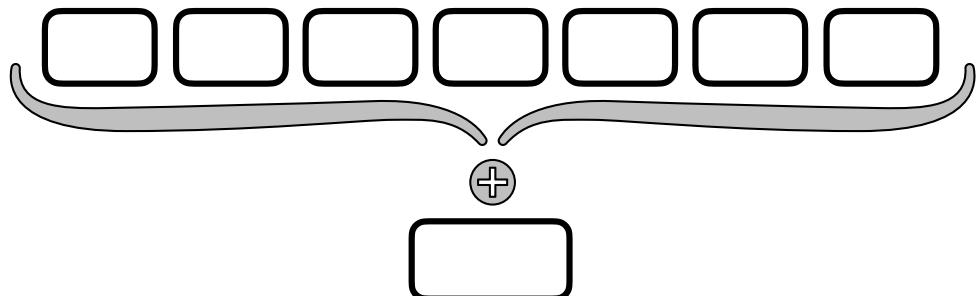


#7



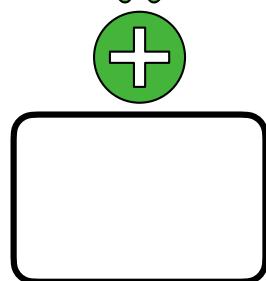
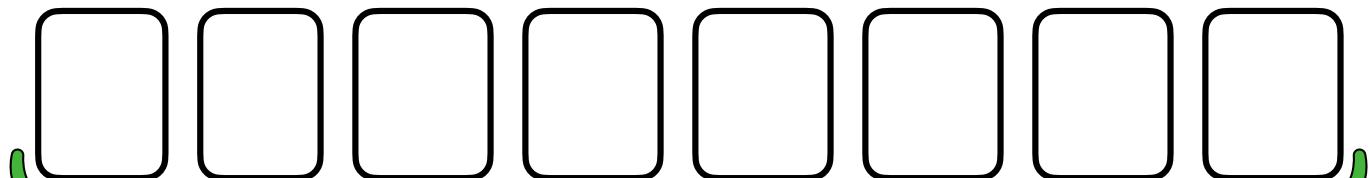
Target

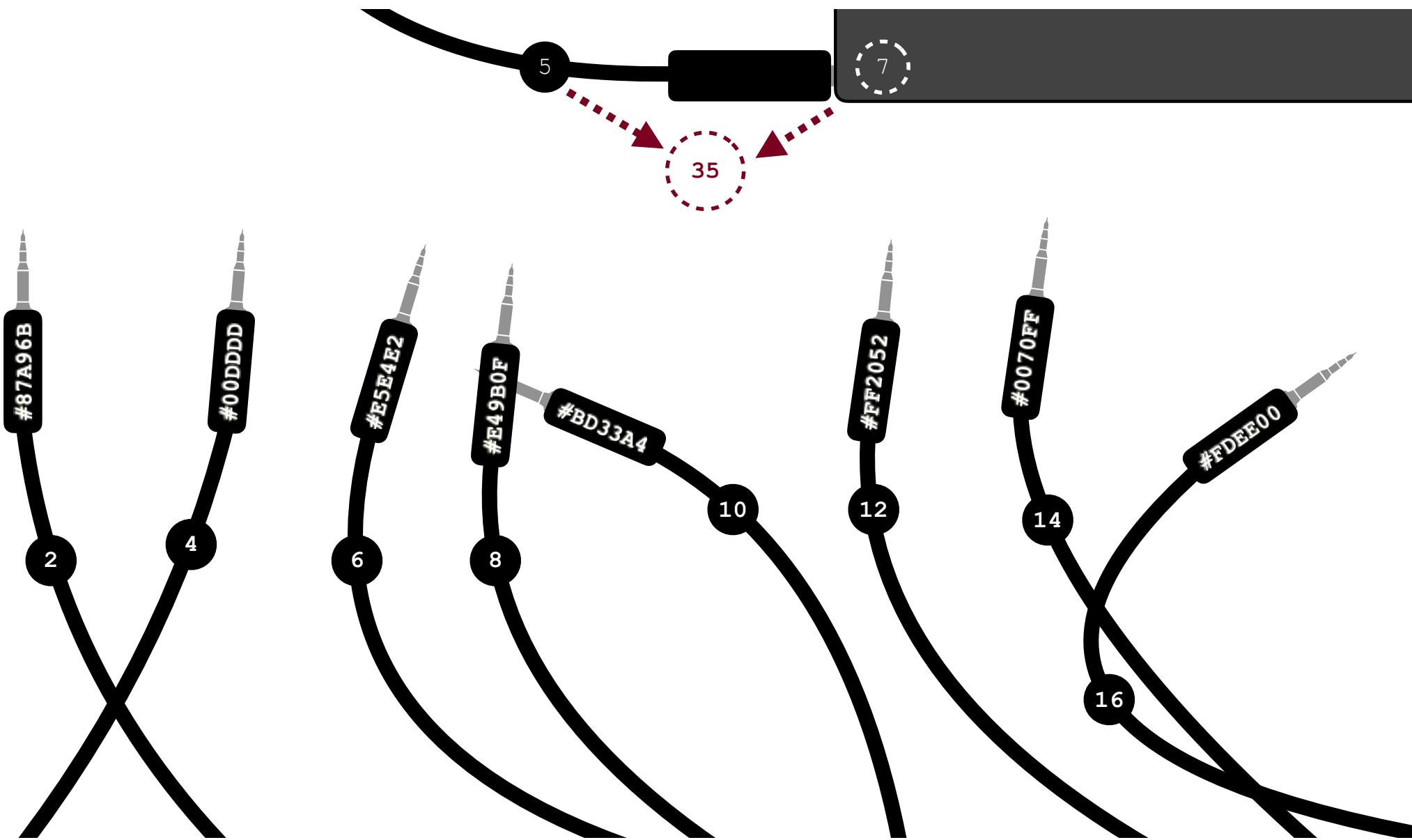
Sum Activated switches to calibrate quantum flux

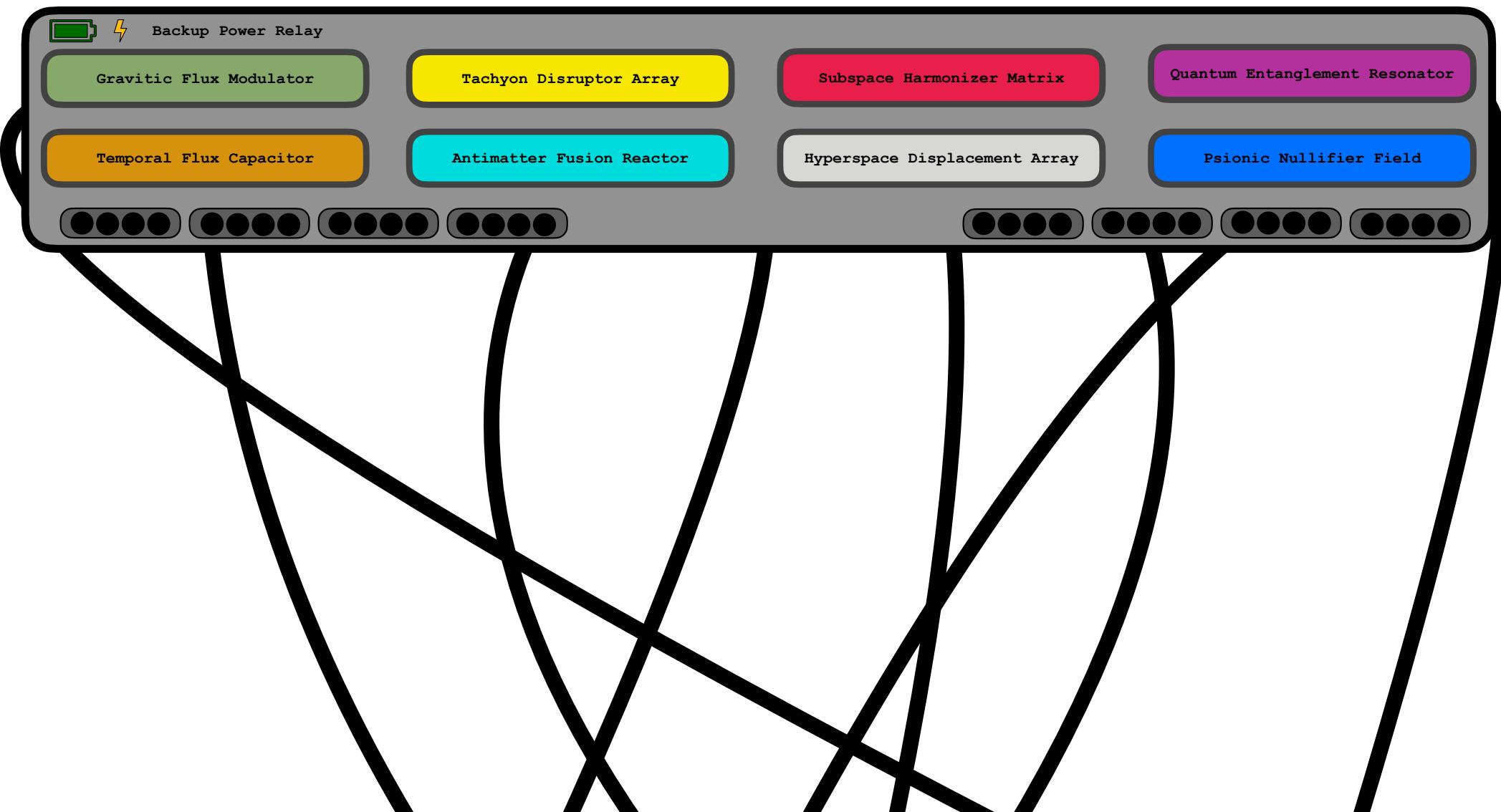


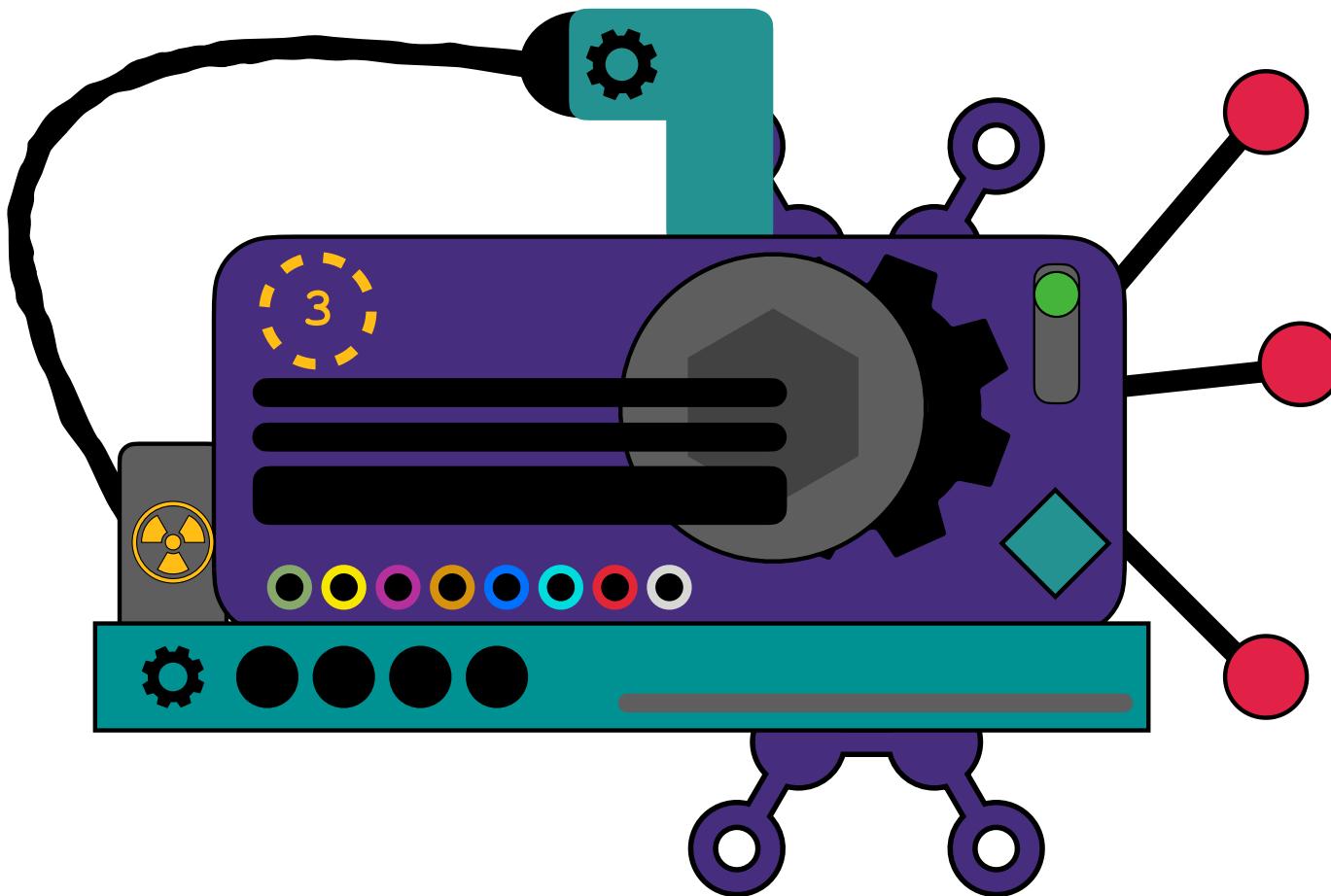
Connect the respective devices with cords to relay power

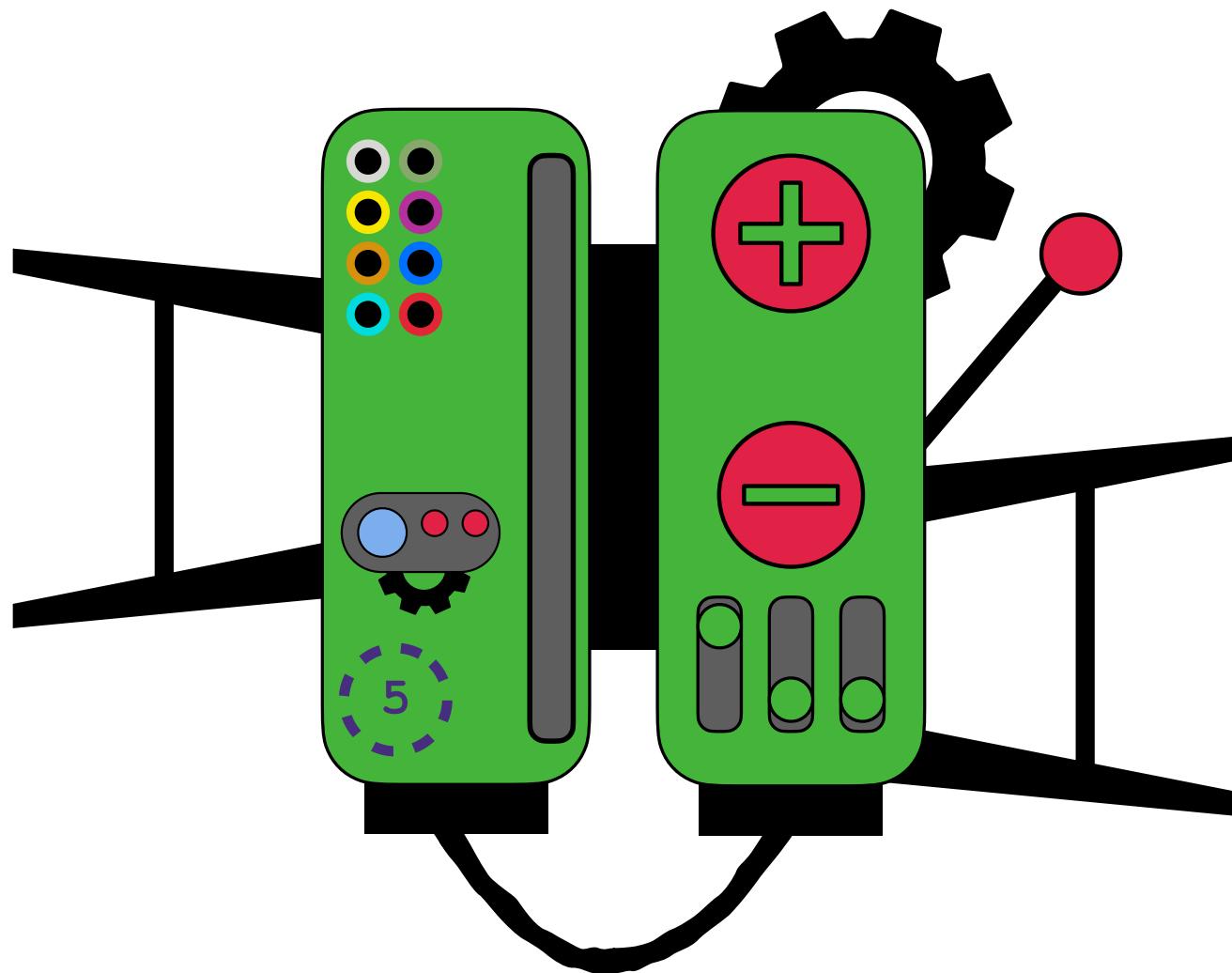
Power Relay Initiation Meter

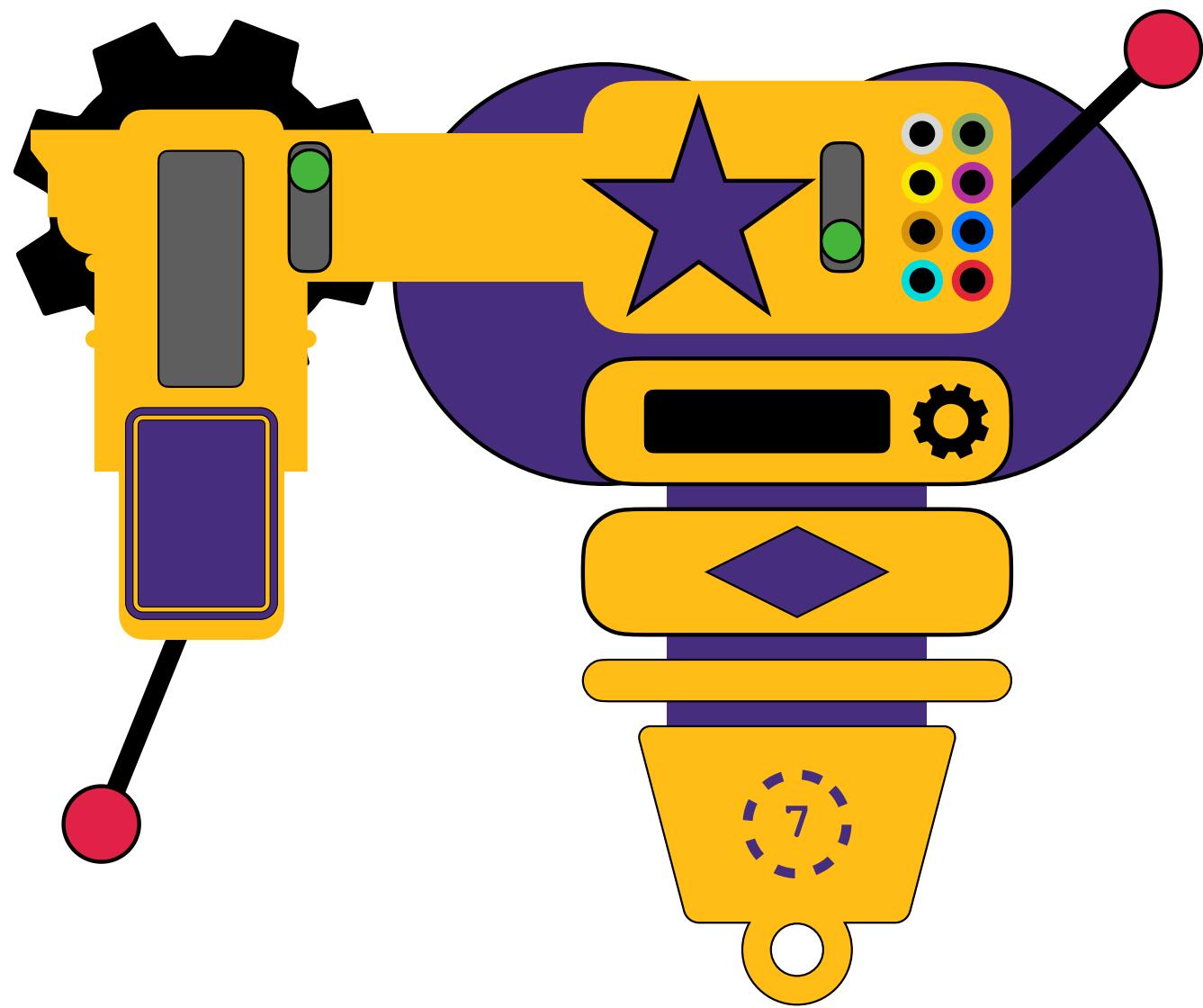


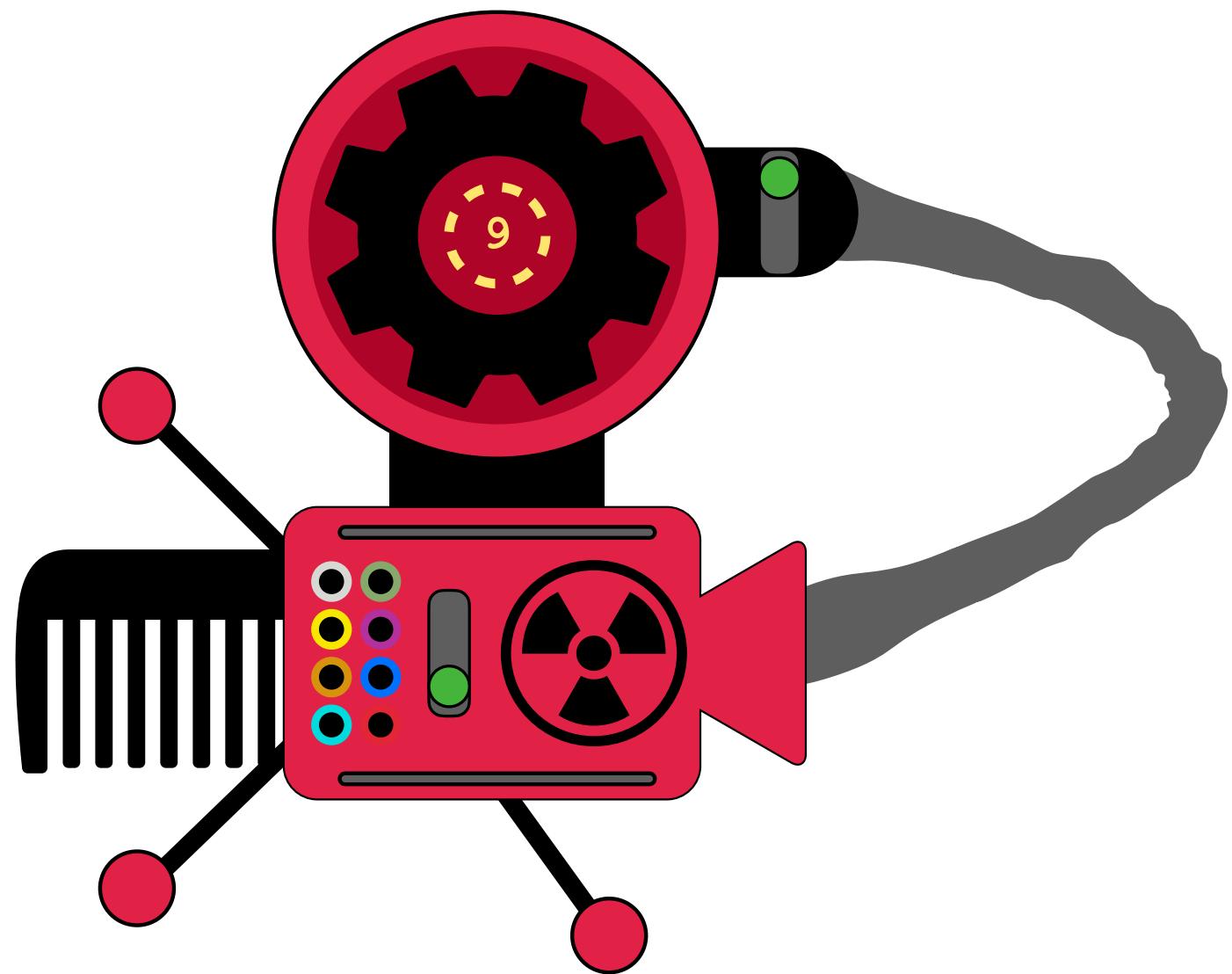


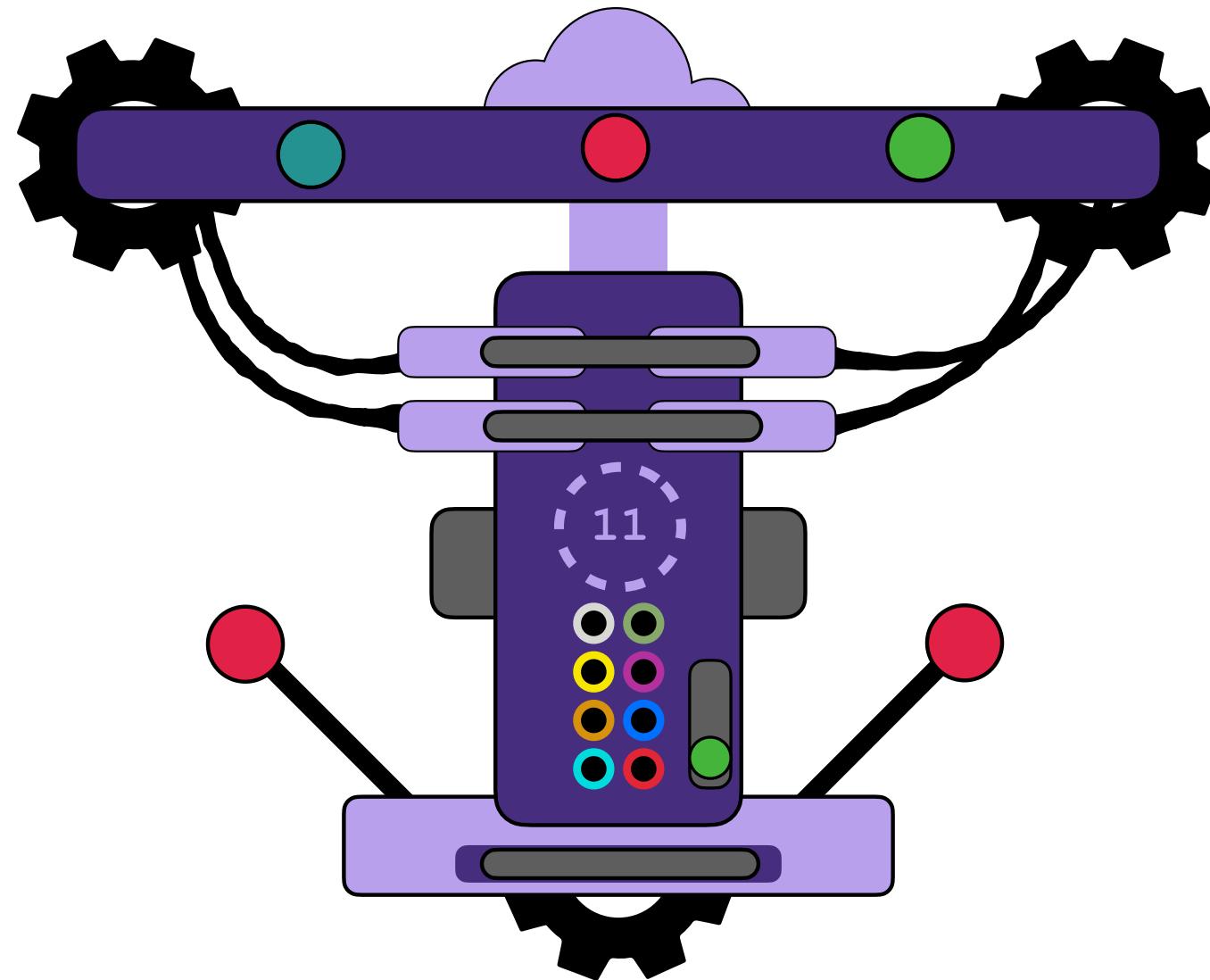


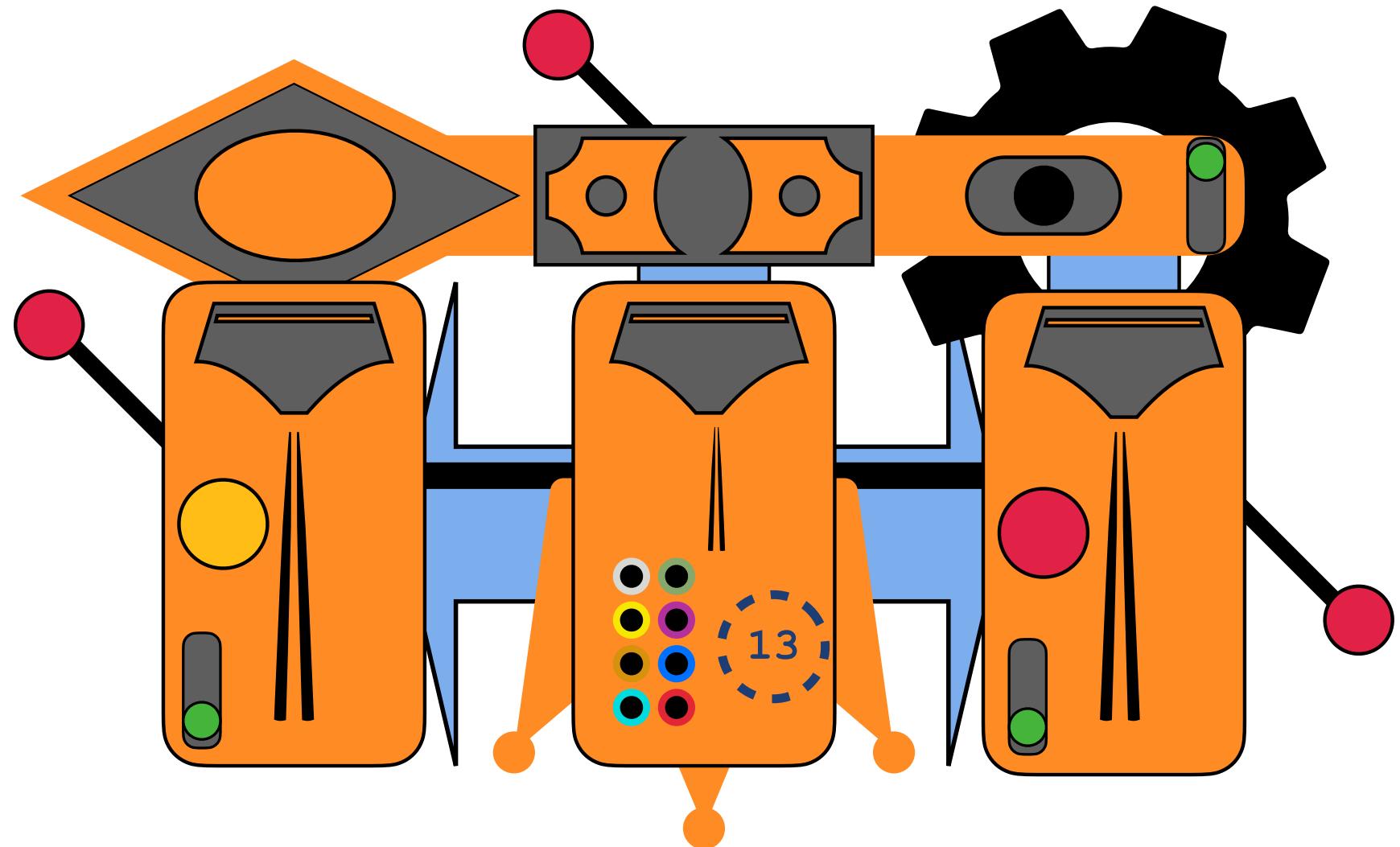


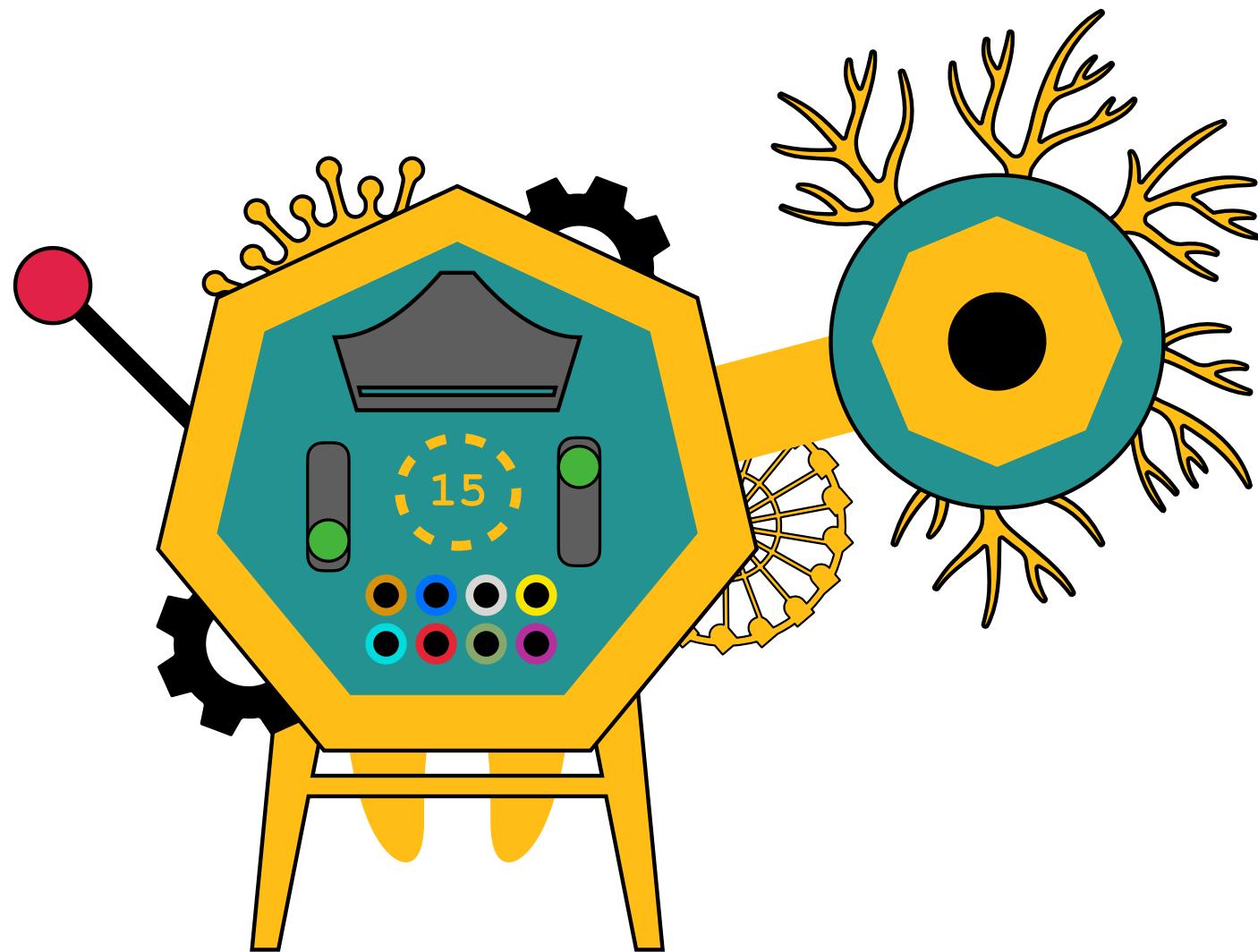


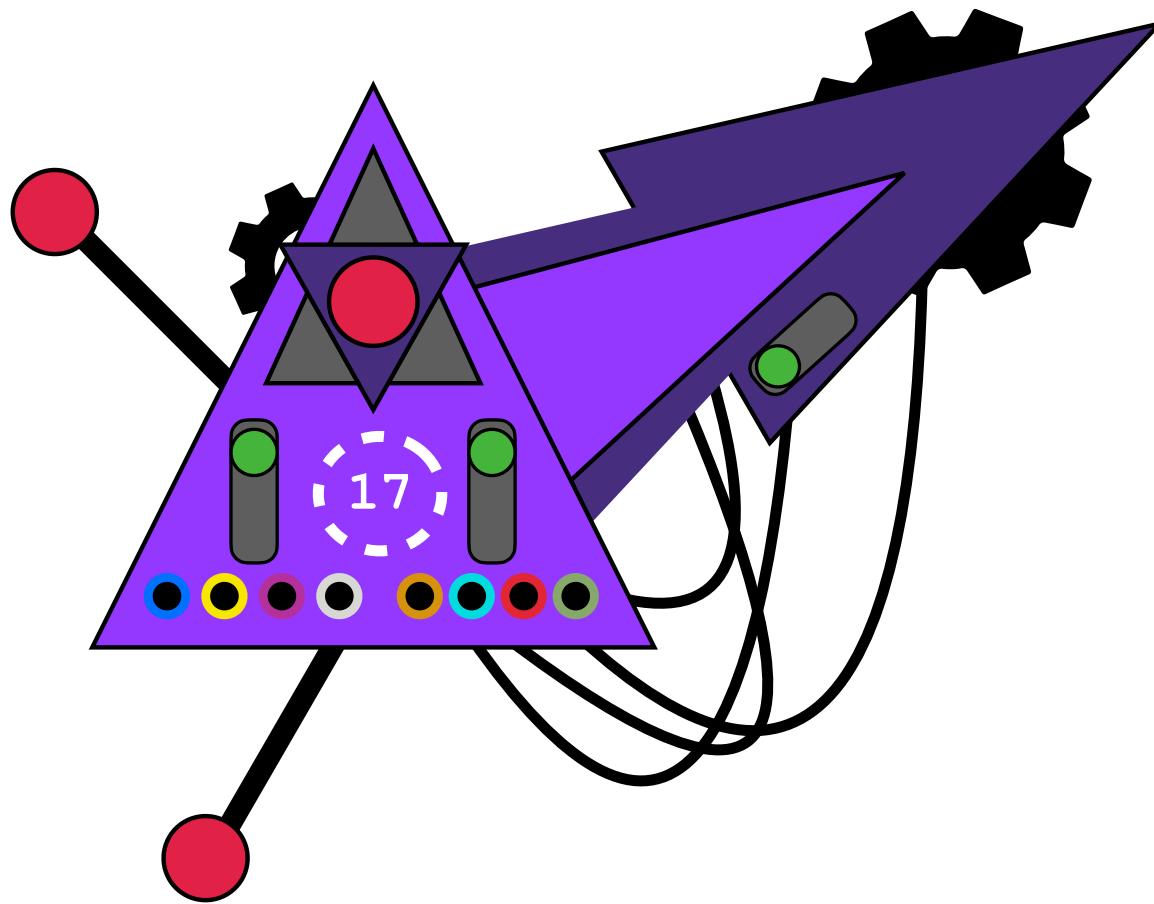












GRAVITIC FLUX MODULATOR

Within the heart of the starship's engineering bay lies the Gravitic Flux Modulator, a marvel of gravitational engineering. Featuring an intricate array of 3 levers, 1 switch, and 3 gears, this device is designed to manipulate gravitational flux with unparalleled precision. Its purpose is twofold: to optimize propulsion efficiency during high-speed maneuvers and to ensure stability in the face of gravitational anomalies encountered during space travel. Crew members carefully monitor its readings, fine-tuning gravitational parameters to maintain optimal performance. Whether navigating treacherous asteroid fields or executing evasive maneuvers in the heat of battle, this device stands as a testament to the ingenuity of starship engineering.

TACHYON DISRUPTOR ARRAY

Housed within the armory of the starship is the formidable Tachyon Disruptor Array, a weapon of precision and power. Boasting a configuration of 1 lever, 3 switches, and 2 gears, this array is engineered to emit bursts of tachyon energy capable of disrupting enemy sensors and communications systems with pinpoint accuracy. Crafted from sleek obsidian and adorned with glowing crimson glyphs, the Tachyon Disruptor Array exudes an aura of intimidation. Its operation is overseen by skilled technicians who monitor its performance with unwavering focus. When unleashed in battle, it unleashes torrents of disruptive energy, scattering enemy formations and crippling their ability to coordinate. In the hands of a skilled crew, this array is a force to be reckoned with.

SUBSPACE HARMONIZER MATRIX

At the heart of the ship's subspace communications hub lies the Subspace Harmonizer Matrix, a nexus of interstellar communication. Configured with

2 levers, 2 switches, and 2 gears, this matrix synchronizes subspace frequencies to facilitate long-range communication and data transmission across the cosmos. Its design, devoid of external adornments, belies its critical role in maintaining contact with distant allies and outposts. Crew members interface with the matrix through a series of calibrated controls, adjusting subspace harmonics with precision. When activated, it emits a subtle hum, resonating with the fabric of subspace as it establishes secure communication channels. In the vast expanse of space, the Subspace Harmonizer Matrix serves as a lifeline, connecting the crew with the wider universe.

QUANTUM ENTANGLEMENT RESONATOR

Nestled within the confines of the ship's quantum laboratory is the Quantum Entanglement Resonator, a pinnacle of quantum communication technology.

Featuring 3 levers, 2 switches, and 1 gear, this resonator harnesses the phenomenon of quantum entanglement to establish secure and instantaneous communication channels across vast distances. Its housing, devoid of ornamentation, houses a complex array of quantum processors and entanglement nodes. Crew members operate the resonator with meticulous care, fine-tuning quantum frequencies to ensure optimal transmission efficiency. When activated, it emits a faint shimmer, indicative of the intricate quantum processes at work. In the realm of quantum communication, the Quantum Entanglement Resonator stands as a beacon of connectivity, bridging the gaps between distant worlds.

TEMPORAL FLUX CAPACITOR

Within the ship's temporal navigation systems lies the Temporal Flux Capacitor, a device of temporal manipulation. Configured with 2 levers, 1 switch, and 3 gears, this capacitor regulates temporal flux to facilitate precise time-space manipulation and temporal displacement maneuvers. Its sleek housing, adorned with intricate temporal glyphs, houses a labyrinth of temporal regulators and phase modulators. Crew members monitor its operation with keen scrutiny, adjusting temporal coefficients to navigate through the currents of time. When activated, it emits a soft hum, resonating with the ebb and flow of temporal energies. In the hands of skilled navigators, the Temporal Flux Capacitor unlocks the mysteries of time itself.

ANTIMATTER FUSION REACTOR

At the heart of the starship's engineering core lies the Antimatter Fusion Reactor, a marvel of energy generation. Configured with 3 levers, 3 switches, and 1 gear, this reactor harnesses the cataclysmic energy released from matter-antimatter annihilation to provide unparalleled power for propulsion and systems operations. Encased within a radiant amber housing, adorned with pulsating green plasma conduits, the reactor hums with contained power. Its operation is overseen by a team of expert engineers who monitor its output with unwavering diligence. When engaged, it emits a soft, pulsating glow, illuminating the engineering bay with the brilliance of a miniature star. In the vast reaches of space, the Antimatter Fusion Reactor serves as the beating heart of the starship, driving it forward with inexhaustible energy.

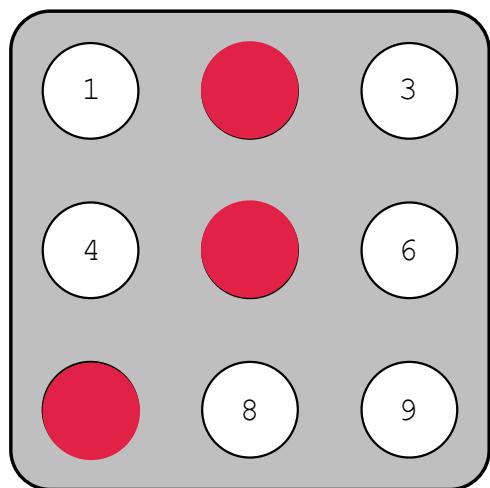
HYPERSPACE DISPLACEMENT ARRAY

Positioned within the ship's hyperspace navigation chamber is the Hyperspace Displacement Array, a gateway to alternate dimensions. Featuring a configuration of 1 lever, 2 switches, and 2 gears, this array generates micro-wormholes to facilitate rapid transit through hyperspace and bypass spatial obstacles. Crafted from shimmering cobalt with pulsating cyan highlights, the array emanates an aura of otherworldly power. Its operation is overseen by skilled navigators who manipulate its controls with practiced precision. When activated, it emits a soft hum, resonating with the fabric of hyperspace as it creates transient rifts in the cosmic continuum. In the uncharted depths of the cosmos, the Hyperspace Displacement Array unlocks pathways to new frontiers, propelling the starship into the unknown.

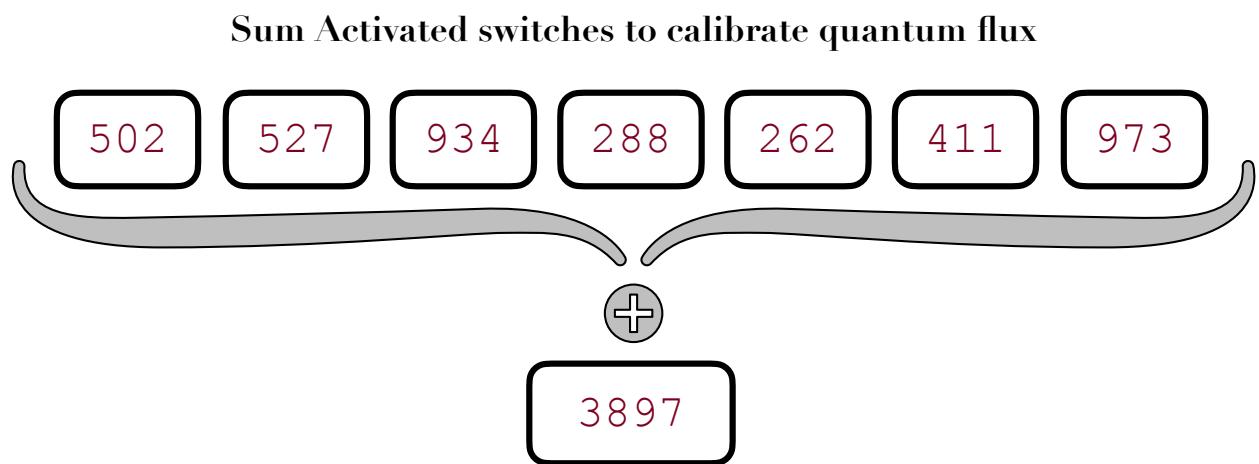
PSIONIC NULLIFIER FIELD

Safeguarding the starship against psychic threats is the Psionic Nullifier Field, a barrier of mental fortification. Configured with 2 levers, 3 switches, and 2 gears, this field generator creates a nullifying field that dampens and neutralizes psionic energies, providing protection against psychic attacks. Encased within a matte onyx housing adorned with pulsating violet energy arcs, the field generator exudes an aura of impenetrable defense. Its operation is overseen by skilled telepaths who manipulate its controls with focused concentration. When activated, it emits a subtle ripple in the fabric of reality, creating a barrier of psychic resistance around the starship. In the ethereal realm of the mind, the Psionic Nullifier Field stands as a bulwark against unseen adversaries, ensuring the safety of all aboard.

Quantum Flux Calibration Referral Modulator



Target



Connect the respective devices with cords to relay power

