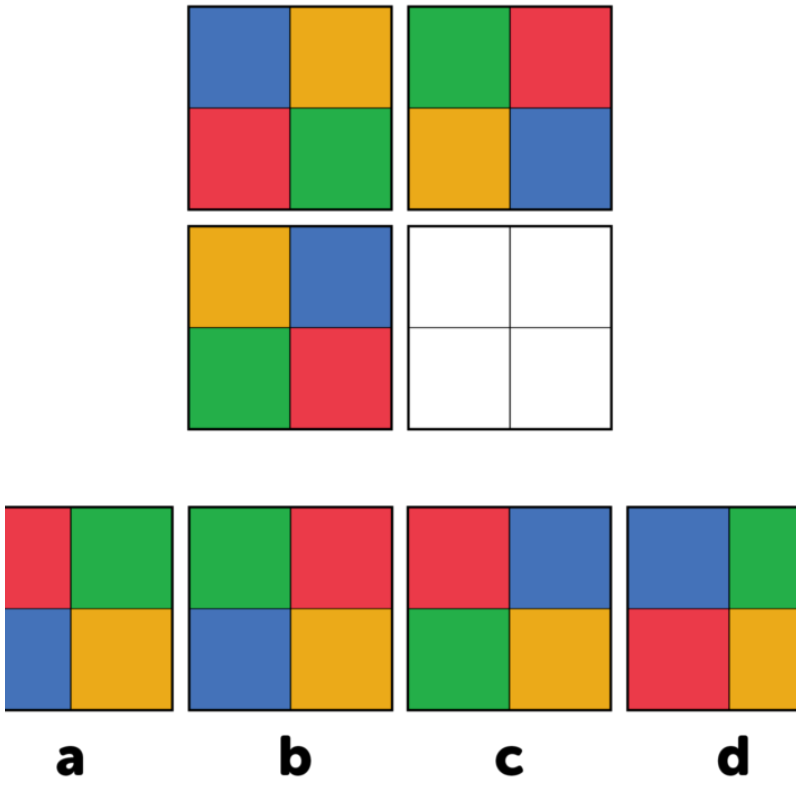
Tech Club
Class 3: Tech FUN-damentals

VOCABULARY:

- **Algorithm:** A series of instructions that must be followed in a specific order to complete a task.
- **Data:** A collection of facts, numbers, or pieces of information about the world.
- **Probability:** A type of mathematics; how likely something is to happen.
- **Venn Diagram:** A way to show the relationship between a group of different things. It allows us to sort data into two circles which overlap in the middle.



MEME DIAGRAMS

BACKGROUND:

Today you will learn about some of the very basics of technology. Many pieces of tech, like computers, sort data into groups using an algorithm. Algorithms are sets of instructions that a computer uses to complete tasks, such as building a website, playing a video game, or calculating math equations. Look around, you will see algorithms in action controlling traffic lights or creating your school schedule. These are all complex processes that start with sorting data.

One way we can visualize separating items into groups is using a Venn Diagram. Venn diagrams show the relationship between groups of different things, allowing us to sort data into circles which overlap in the middle. The data can consist of numbers, ideas, objects, or even people! Venn diagrams are great for helping us organize sets based on their similarities and their differences. Things that have similarities are set within the overlapping circles, while things that are different stand alone in the outer circles. Items that don't belong to any group are placed outside of the diagram. For example, if you were to group the number of students in your class who have brown hair in one circle, and the number of children in your class who wear glasses in another, then in the overlapping circles in the middle you would put down the number of children who have brown hair and wear glasses. Today you will practice sorting items by making memes.

STEPS:

1. A Venn diagram is used to sort items into groups based on different attributes. You will create an example of how this works as a group.
    - All students with brown hair stand in a group to one side of the room.
    - All students wearing glasses stand in a group to the other side of the room.
    - Any student with both brown hair and glasses stands in the middle of the room. This is how a Venn diagram sorts items.

2. In a group with 3 other engineers, look at the **Venn diagram memes sheet.** What do you notice about the groupings?

3. Think about a Venn diagram you could make on your blank **Venn diagram**. If needed, use this space to plan.

4. Look at what other engineers made. Who made the funniest Venn diagram meme?

FOUNDATIONS OF BREADBOARDS

BACKGROUND:

When circuitry components started to become accessible to the public, DIY enthusiasts in the early twentieth century wanted to find a way to make their own circuits at home. Many people decided to use wooden boards used for cutting bread, called breadboards. These boards featured nails or screws to hold components in place and wires to establish connections, with a wooden base that kept the current insulated. Now we have a plastic version that is still called a breadboard, but is a whole lot easier to use.

Today you will use actual wires to build your circuits, instead of maker tape. This is more challenging and can result in frustration, but is much more versatile than paper circuits. Remember that if an LED isn't lighting up to check that the positive and negative ends are in the correct spots and try again!

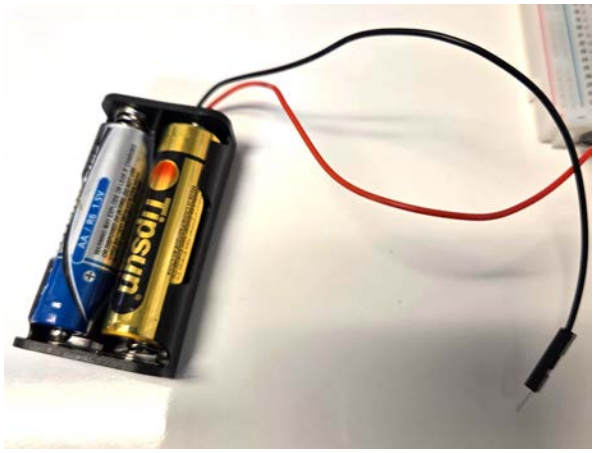
ENGINEER SPOTLIGHT:

Dr. Valerie Taylor, Engineer and Computer Scientist

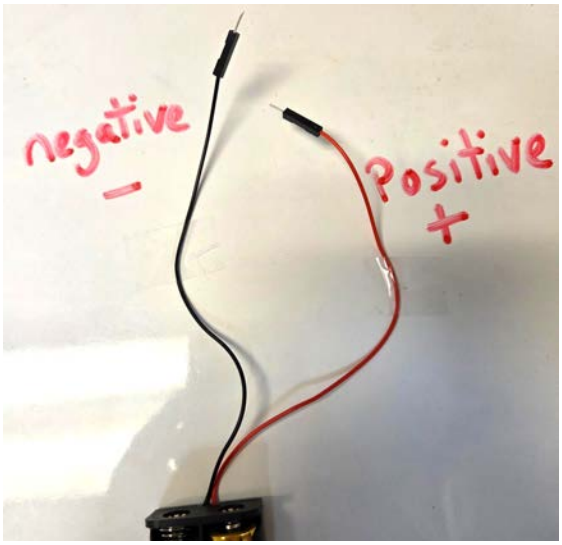
Dr. Valerie Taylor is a Black electrical engineer and computer scientist as well as the President of the Center for Minorities and People with Disabilities in IT. Dr. Taylor has won many awards for her research and leadership, pushing forward computer science research. Let's be electrical engineers like Dr. Taylor by learning more about circuits and how the pieces work together.

STEPS:

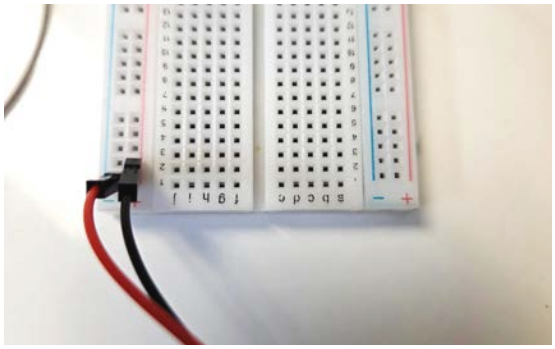
1. You will be using different materials to make circuits this week, a breadboard and wires.
2. Look at your **breadboard and breadboard diagram packet**. Do you recognize any of the features?
    - If you look closely, you will see that the numbers and letters form a coordinate system on the board.
    - Look at the diagram to see how the rows and columns connect to each other.
3. First you will wire the breadboard for power. Add the **AA batteries** to the **battery holder**.



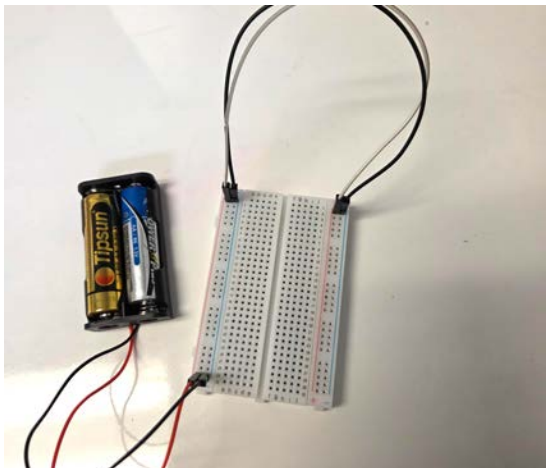
4. Your battery holder has positive and negative wires, like other components you have used in the past. Red is positive, black is negative.



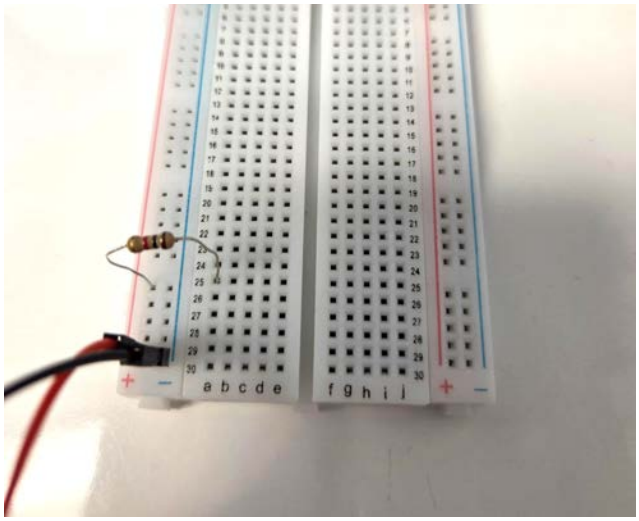
5. Plug the red wire into the positive rail of the breadboard and the black wire into the negative rail.



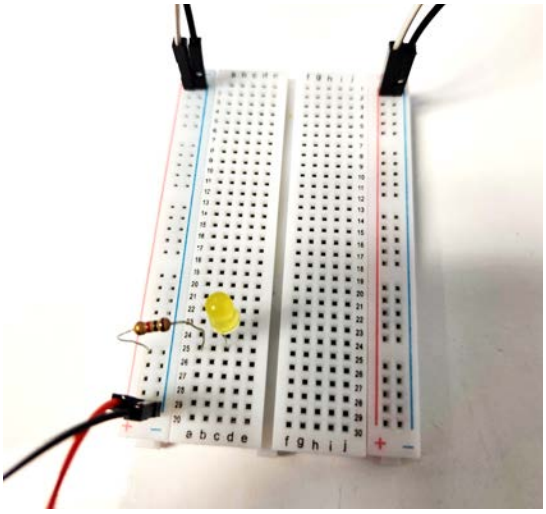
6. Now you will connect both sides of the breadboard with **jumper wires**. This is so both sides of the board can be powered by the batteries.

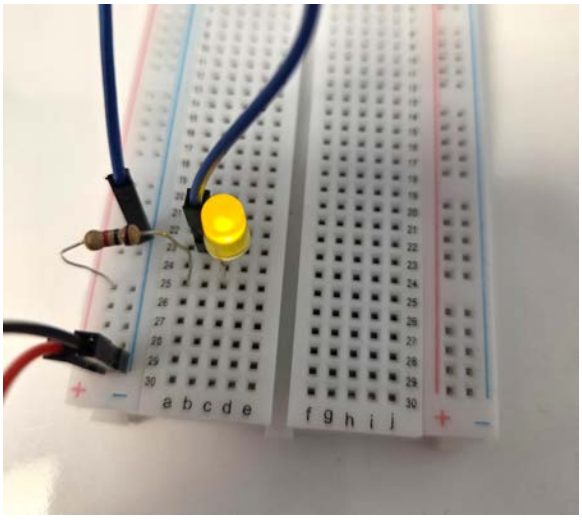


7. Time to make a circuit! You will receive **one LED and a resistor**. Bend the resistor into an upside down U shape, then plug it into the positive rail and spot A25. Look at your diagram for a closer picture.



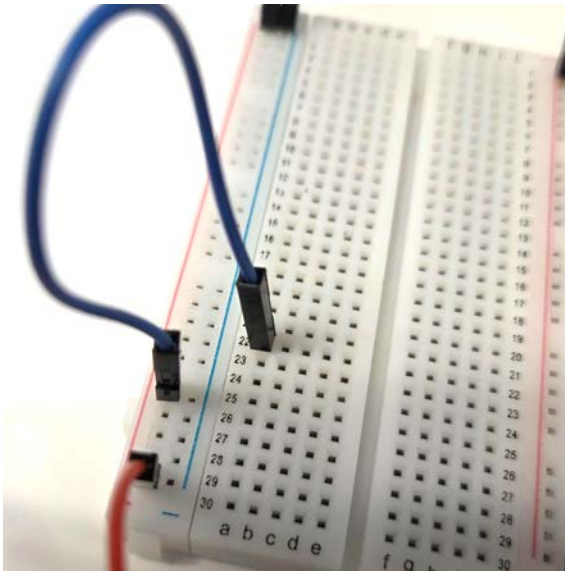
8. Pull the LED legs apart and insert the positive leg into D25, the negative leg into D23. Then use a jumper wire to connect B23 and the negative rail on the left side of the breadboard.



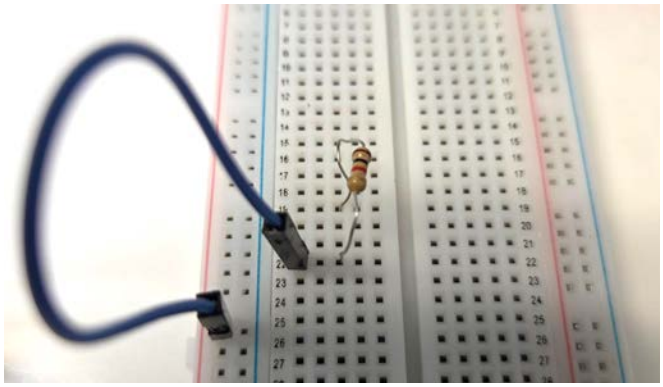


9. Time to make a hypothesis! Can a parallel circuit be made on a breadboard? How?

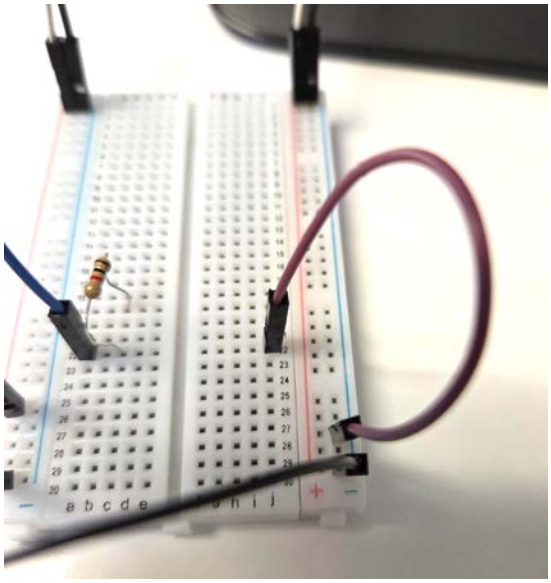
10. You will receive another **resistor and LED**. Remove the resistor and LED from the breadboard. Move the jump wire so one side is plugged into the positive rail and the other side is plugged into A23.



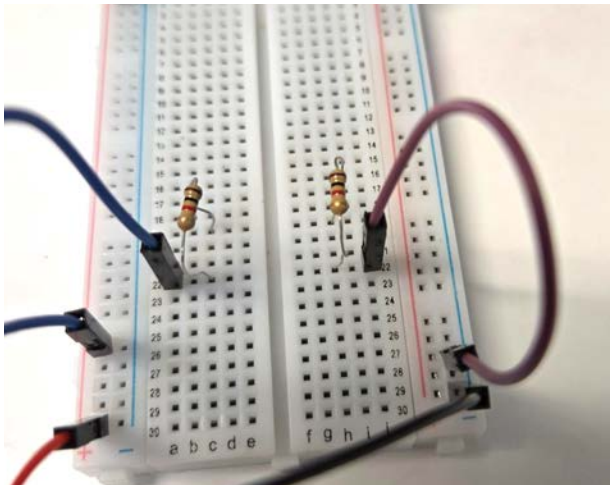
11. Insert one leg of the first resistor into C23, the other leg goes in C20.



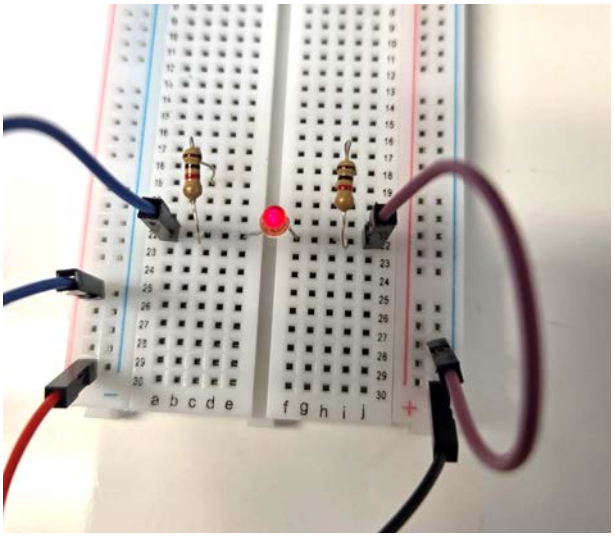
12. Insert one leg of a second jumper wire into the negative rail on the right side of the breadboard. Plug the other leg into J23.

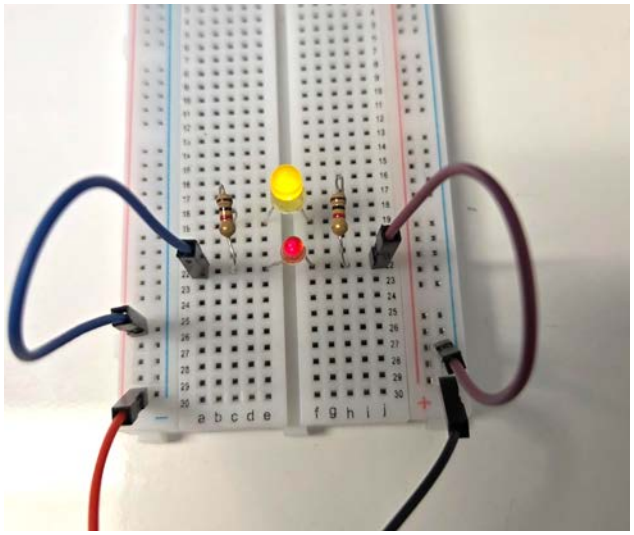


13. Bend the second resistor into the U shape then insert the legs into H23 and H20.



14. Using one of the LEDs, insert the positive leg into E23, the negative leg in F23. Repeat with the second LED, inserting the positive leg into E20, negative leg into F20.





15. Did both LEDs light up? What happens if you remove one?
16. Was your hypothesis supported?

Yes or **No**

17. You will be saving this breadboard to use in the next class. Do not dismantle your breadboard - but remove the wires for the battery pack! This will prevent the battery from running out.
18. Can you draw this circuit?

19. Place your breadboard in the **box** provided. Write your name on the box in crayon.

GREEDY PIG PROBABILITIES

BACKGROUND:

Did you know that when you predict whether something will happen that you are using math? Every day, all day, you are constantly predicting what will happen: you select clothes based on what you think the weather will be, or maybe you pick what table to sit at in the cafeteria based on where you think your friends will sit. You choose and choose and choose, and every choice is a prediction of how likely you think an event or series of events is to happen. We can actually measure how likely it is for something to happen, and that measurement is called probability. Today you will play a game to demonstrate probabilities.

STEPS:

1. What is the probability that you would roll a 1 on a 6-sided die that is equally weighted on all sides?

2. Today you will be playing Greedy Pig. Each group will receive **one die and a score sheet**.
3. Designate one person to be the score keeper.
4. The person with the next occurring birthday goes first.
5. Game rules:
    - Each player can roll as many times as they want. If they roll a 2-6, they score that number of points.
    - Players can choose to stop rolling at any time.
    - Points accumulate as long as they keep rolling, but if a 1 is rolled they lose all points and their turn is over.
    - Once a player decides to stop or rolls a 1, play passes clockwise to the next student.

- The player's score is written on the score sheet. The students keep the points recorded, even if they roll a 1 on the next turn.
- Once a player reaches a score of 100, they win.

6. Use this space to keep track of points on your turn:

7. Who won?

8. Did you use any strategies to collect points? Did your strategy work?

FOR FUN! Write a secret message in binary!

ASCII BINARY ALPHABET

A	1000001	N	1001110
B	1000010	O	1001111
C	1000011	P	1010000
D	1000100	Q	1010001
E	1000101	R	1010010
F	1000110	S	1010011
G	1000111	T	1010100
H	1001000	U	1010101
I	1001001	V	1010110
J	1001010	W	1010111
K	1001011	X	1010111
L	1001100	Y	1011001
M	1001101	Z	1011010