Robotics/Electronics Lesson 3

Overview

In this lesson we will learn how to code a blinking led. Then students will create a traffic light using what we learned so far. We will also learn how to code and wire a button.

Plan

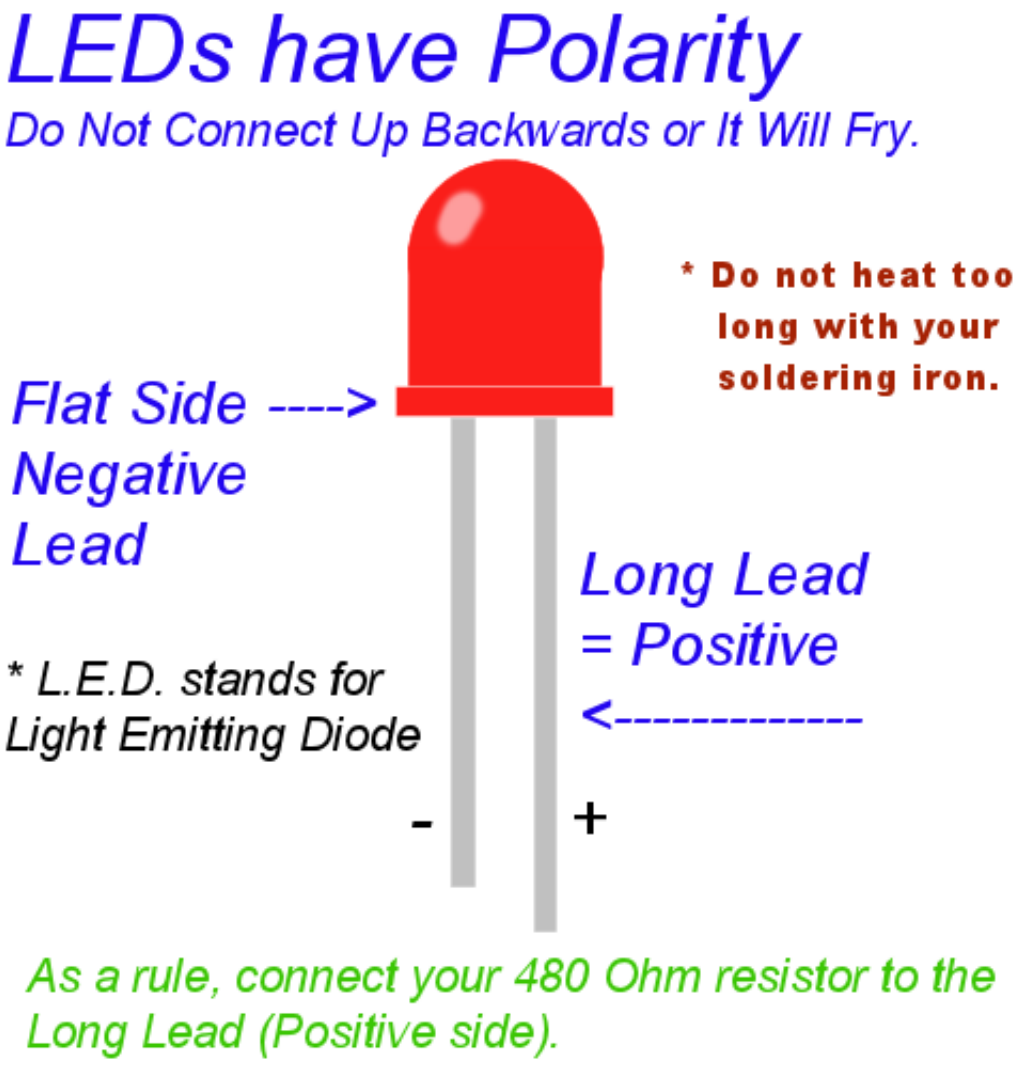
1. Assistants will review concepts from the previous lesson
2. Hand out code from previous lesson
3. Blinking light activity
4. Traffic light activity
5. Button activity

Activity 1: Review lesson 2

JOCYE

Led

1. Draw only the led on the board.



2. In a led electron flow one way. Take out an led from the kit.

3. To the class: *Which way does the electrons flow? From the long leg or the short leg?*

3. **Electron flow from the long leg to the short leg.**

XIAOLIN

Jumper Wire

1. Draw a battery on top of led.

2. To the class: *To connect the battery to the lead what do we need?*

3. **We need jumper wires.** Show the class a jumper wire.

4. Connect wires from the battery to the led on the board.

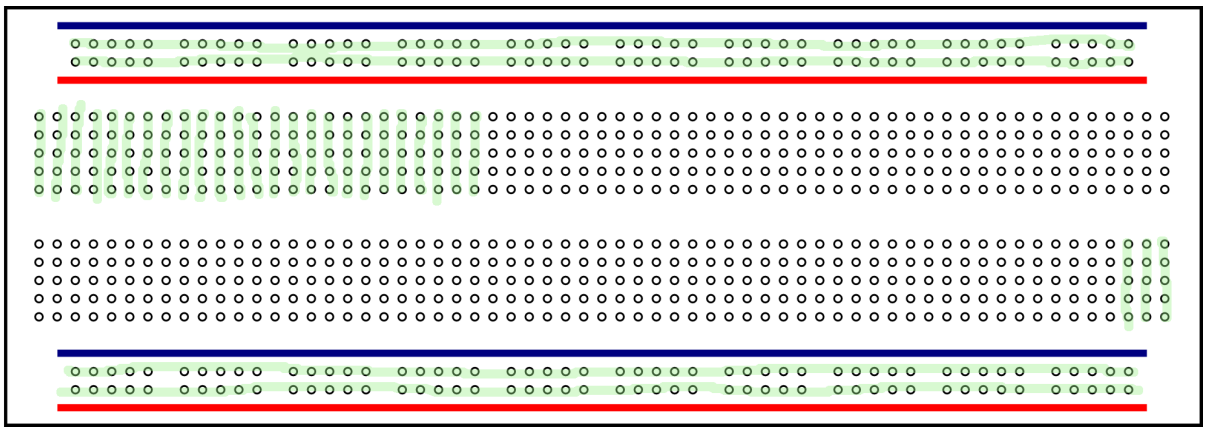
Resistor

1. To the class: *If an led gets electrons too fast what will happen to it?*
2. **It will burn out**
3. To the class: *To reduce the speed of the electrons what do we need?*
4. **We need a resistor to slow down the electrons.** Show the class a resistor.
5. Draw a resistor on the board

JACKIE

Breadboard

1. Draw the breadboard on the board
2. Show the breadboard to the class
2. To the class: *Why do we need a breadboard?*
3. **To create circuits and makes it easier so we don't need to tie wires together**
4. To the class: *What happens if I put a wire on* ***row 1 column 1****? What holes get electricity?*
5. **The entire first row**



6. To the class: *What happens if I put a wire on* ***row 3 column 1****? What holes get electricity?*

7. **Column 1 and Rows 3–7**

8. To the class: *What happens if I put a wire on* ***row 8 column 2****? What holes get electricity?*

9. **Column 2 and Rows 8–12**

Activity 2: Blinking Light

1. **Give examples in the real world that blink/flash**

- Car light's that's blinking when making a turn
- Walk light blinking
- Police lights blinking

2. **Students: Why is blinking important?**

- It acts as communication. For example a walk light blinking is telling you to hurry up. A charger blinking is telling you it's running out of battery.
- Everything around you is communicating something.

3. **Students: How does it work?**

- It turns on and off the switch in a circuit

4. **Demonstrate by turning off and on the light in the class room**

5. **Students: What does it being done between turning on and off**

- Time is passing

6. **Teach milliseconds. 1000 milliseconds are in a 1 second**

- How many millis in .5, 2, 2.75 seconds?

7. **Introduce the delay(1000); function**

Blinking Light Code

Students will be required to write the code below on a piece of paper

```
int led = 8;

// the setup function runs once when you press reset or power the board
void setup() {
  // initialize digital pin LED_BUILTIN as an output.
  pinMode(led, OUTPUT);
}

// the loop function runs over and over again forever
void loop() {
  digitalWrite(led, HIGH);   // turn the LED on (HIGH is the voltage level)
  delay(1000);                       // wait for a second
  digitalWrite(led, LOW);    // turn the LED off by making the voltage LOW
  delay(1000);                       // wait for a second
```

Activity 3: Traffic Light

Given what they have learned so far, students will be required to work together to write code to create a traffic light and then wire it on the board

Easy code

```
int GREEN = 8;
int YELLOW = 9;
int RED = 10;

void setup() {
   pinMode(GREEN, OUTPUT);
   pinMode(YELLOW, OUTPUT);
   pinMode(RED, OUTPUT);
}


void loop() {
  digitalWrite(GREEN, HIGH);
  digitalWrite(YELLOW, LOW);
  digitalWrite(RED, LOW);
  delay(5000);

    digitalWrite(GREEN, LOW);
    digitalWrite(YELLOW, HIGH);
    digitalWrite(RED, LOW);
    delay(200);

    digitalWrite(YELLOW, LOW);
    delay(200);

    digitalWrite(YELLOW, HIGH);
    delay(200);

    digitalWrite(YELLOW, LOW);
    delay(200);

    digitalWrite(YELLOW, HIGH);
    delay(200);

  digitalWrite(GREEN, LOW);
  digitalWrite(YELLOW, LOW);
  digitalWrite(RED, HIGH);
  delay(3000);
}
```

Complex code with for loop

```
int GREEN = 8;
int YELLOW = 9;
int RED = 10;

void setup() {
   pinMode(GREEN, OUTPUT);
   pinMode(YELLOW, OUTPUT);
   pinMode(RED, OUTPUT);
}


void loop() {
  digitalWrite(GREEN, HIGH);
  digitalWrite(YELLOW, LOW);
  digitalWrite(RED, LOW);
  delay(5000);

  for (int i=0; i <= 10; i++) {
    digitalWrite(GREEN, LOW);
    digitalWrite(YELLOW, HIGH);
    digitalWrite(RED, LOW);
    delay(200);

    digitalWrite(GREEN, LOW);
    digitalWrite(YELLOW, LOW);
    digitalWrite(RED, LOW);
    delay(200);
  }

  digitalWrite(GREEN, LOW);
  digitalWrite(YELLOW, LOW);
  digitalWrite(RED, HIGH);
  delay(3000);
}
```

Wiring: wire three jumper wires from the pins into the three led with resistors on the board. Then connect the led to a row that it is connected to ground.

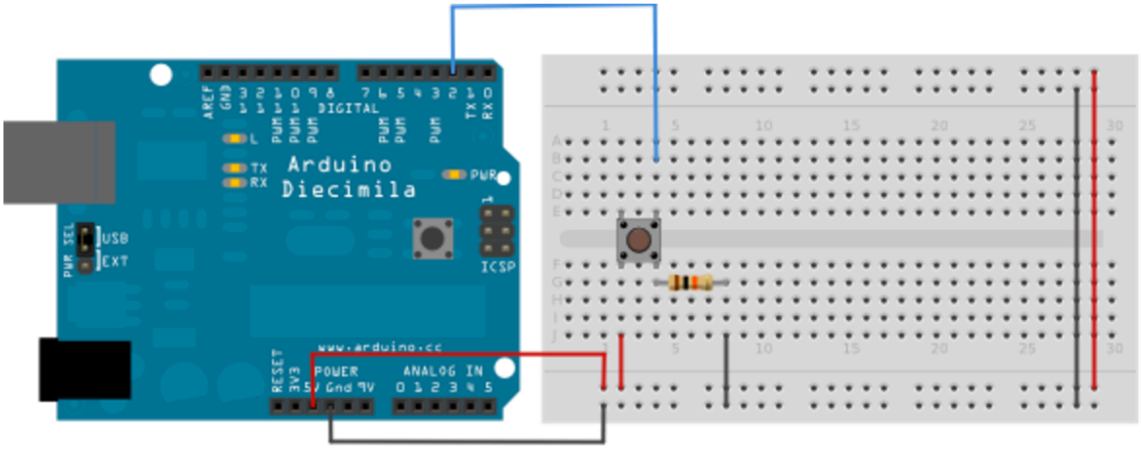
Activity 4: Push button

1. DigitalRead read inputs and check for HIGH or LOW.
2. If statements are conditions. If I give you money you give water.

Code for button

```
// constants won't change. They're used here to
// set pin numbers:
const int buttonPin = 2;     // the number of the pushbutton pin
const int ledPin =  13;      // the number of the LED pin

// variables will change:
int buttonState = 0;         // variable for reading the pushbutton status

void setup() {
  // initialize the LED pin as an output:
  pinMode(ledPin, OUTPUT);
  // initialize the pushbutton pin as an input:
  pinMode(buttonPin, INPUT);
}

void loop() {
  // read the state of the pushbutton value:
  buttonState = digitalRead(buttonPin);

  // check if the pushbutton is pressed.
  // if it is, the buttonState is HIGH:
  if (buttonState == HIGH) {
    // turn LED on:
    digitalWrite(ledPin, HIGH);
  } else {
    // turn LED off:
    digitalWrite(ledPin, LOW);
  }
}
```

Wiring for button


Arduino
Diecimila
DIGITAL
ANALOG IN
POWER
USB
EXT
ICSP
PWR
TX
RX
www.arduino.cc