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ELECTROMANIA

ELECTROVERSE OF MADNESS

DAY - 1 : Welcome to the world of hardware

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IT ALL STARTED WITH A BIG BANG!

Introduction to IoT (Internet of Things)

- The Internet of Things (IoT) refers to a system of interrelated, internet-connected objects that are able to collect and transfer data over a wireless network without human intervention.

- Basically these ‘Things’ can talk to each other, making them ‘Smart’.

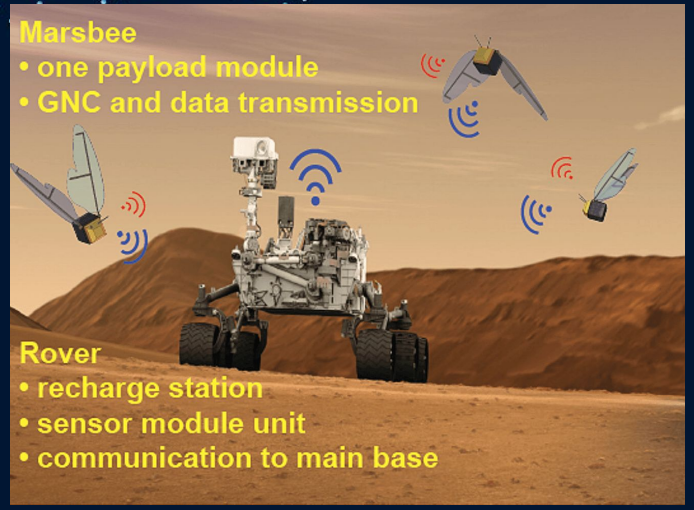
- ‘Things’ include:
  - Appliances: Lighting fixtures, Cameras,etc
  - Devices: Smartphones, Smart speakers, etc.

- One of the biggest use cases of IoT is Automation.

- Basically what it does is receives Information from sensors and can manipulate it. We can perform outputs using actuators depending on the information received from the sensors.

- An advantage of using the internet is that the constraint of geography is eliminated. We can control ‘Things’ that are in a different continent, even a different planet.

- The Mars rover is the most impressive real life application of IoT



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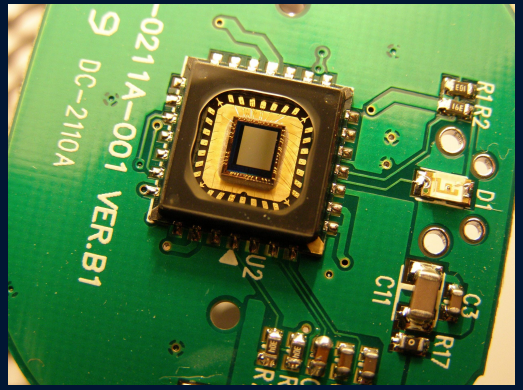
Outline for the Week

1. **Welcome To The Hardware World :** Introduction to Microcontrollers, TinkerCAD and Arduino !

2. **Get Your Hands Dirty...With Sensors :** Cover different sensors like temperature sensor, IR sensor, servo-motor.

3. **Your Wish is My Command, Master:** Communication Protocol - Master-Slave communication



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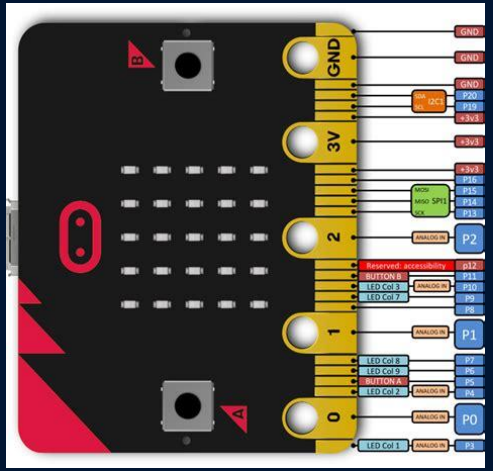
Outline for the Week

4. **Now, Flaunt A Little :**
   Introduction to Arduino IDE and a special showcase done by us!

5. **Shhhh, Beware of Python:**
   Covering basics of Python and Introduction to Micropython.

6. **Let's Fly A Little!**
   AWS and Cloud Computing



aws

Introduction to Micro-Controllers[MCU]:

Definition:

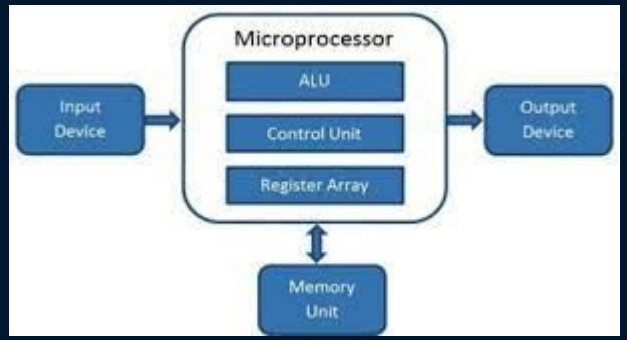
A **microcontroller** (**MCU** for *microcontroller unit*) is a small computer on a single metal-oxide-semiconductor (MOS) integrated circuit (IC) chip. A microcontroller contains one or more CPUs (processor cores) along with memory and programmable input/output peripherals. Program memory in the form of ferroelectric RAM, NOR flash or OTP ROM is also often included on chip, as well as a small amount of RAM. Microcontrollers are designed for embedded applications, in contrast to the microprocessors used in personal computers or other general purpose applications consisting of various discrete chips.

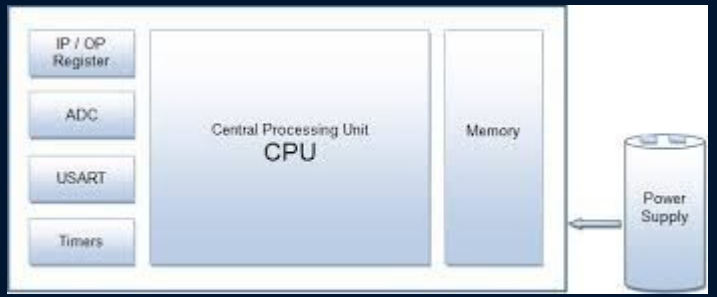
But What is a Micro-controller?

It is the brain of any circuit. There's input and output devices and then there's the data collected. So it is the job of the microcontroller to control the output peripherals based on certain parameters. These parameters are the instructions that we will be giving to it using code. So it is used to perform a task when given the right inputs.

Micro-Processor vs Micro-controller

• The task is not predefined	Performs one specific task
• Contains only the CPU	Contains the CPU, memory, I/O
• Complex and Expensive	Straightforward and inexpensive





Analog vs Digital

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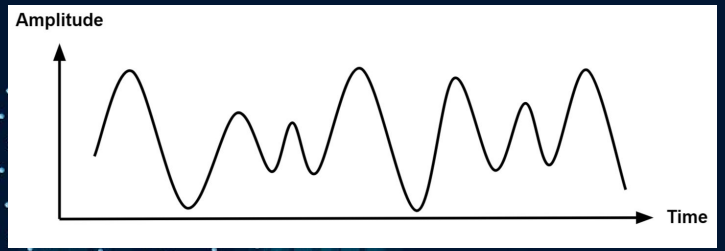
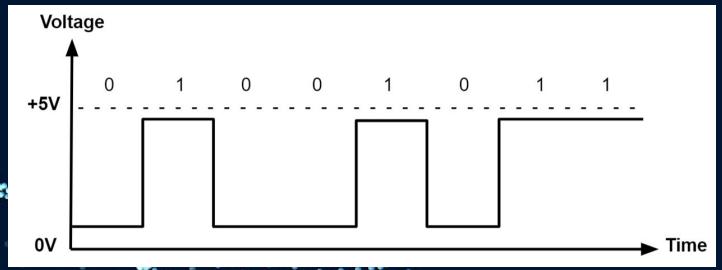
Analog

- An analog signal is a continuous signal that represents physical measurements.
- It is denoted by sine waves.
- It uses a continuous range of values that help you to represent information.
- Example : Temperature sensors, FM radio signals, Photocells, Light sensor, Resistive touch screen, etc.



Digital

- Digital signals are time separated signals which are generated using digital modulation.
- It is denoted by square waves
- It uses discrete 0 and 1 to represent information.
- Example : Computers, CDs, DVDs, etc.



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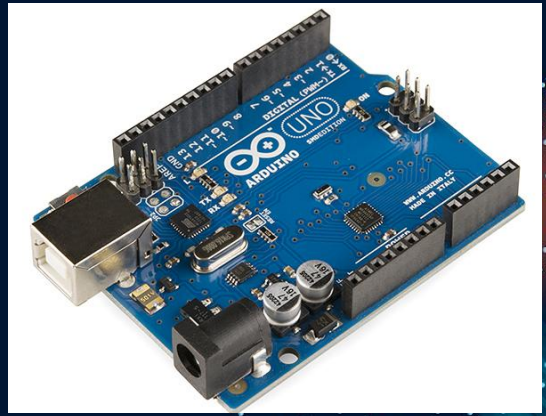
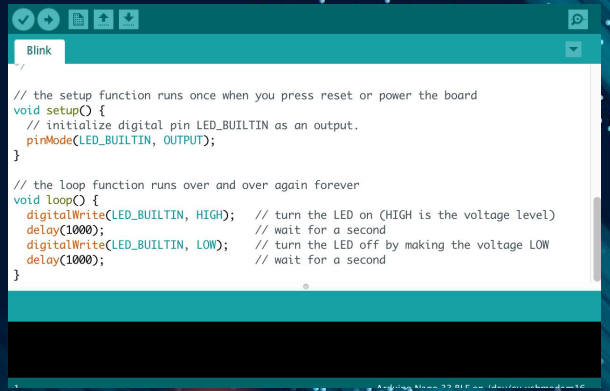
Introduction to Arduino

What is an Arduino?

Arduino is an open-source electronics platform based on easy-to-use hardware and software.

It consists of both a physical programmable circuit board (microcontroller) and a piece of software, or IDE, that runs on your computer, used to write and upload computer code to the physical board.





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Introduction to Arduino

Why do we use Arduino?

- Easy-to-use
- Flexible
- Open source
- Inexpensive

What can we do with an Arduino?

Arduino is a great tool for developing **interactive objects**, taking inputs from a variety of switches or sensors and controlling a variety of lights, motors and other outputs.

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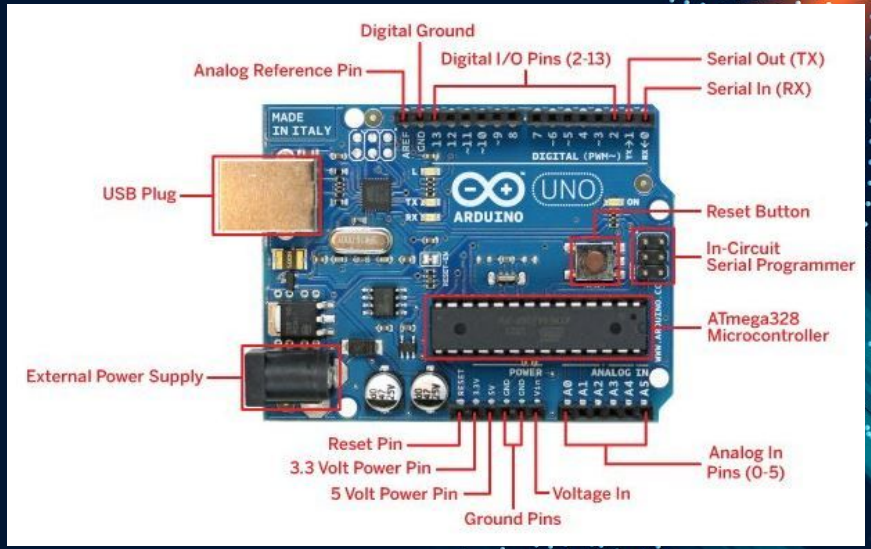
Arduino Schematics

Main Features of the Arduino UNO Board :

- Microcontroller: ATmega328
- 14 Digital I/O Pins - 6 PWM
- 6 Analog Input Pins
- Input voltage : 6 to 20V
  Recommended : 7 to 12V
- USB Power : 5V
- 32 Kb Flash Memory
- 2 Kb SRAM - 1 KB EEPROM
- 16 Mhz Clock Speed
- DC Current per I/O : 40mA
- DC Current output for 3.3V Pin : 50mA



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Demonstration Time!

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Tinkercad

Tinkercad is a free, easy-to-use app for 3D design, electronics, and coding.

Next Steps:

1. Go to tinkercad.com/circuits
2. Launch Circuits
3. Create your account
4. Create a New Circuit

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Project :
Blinking LED

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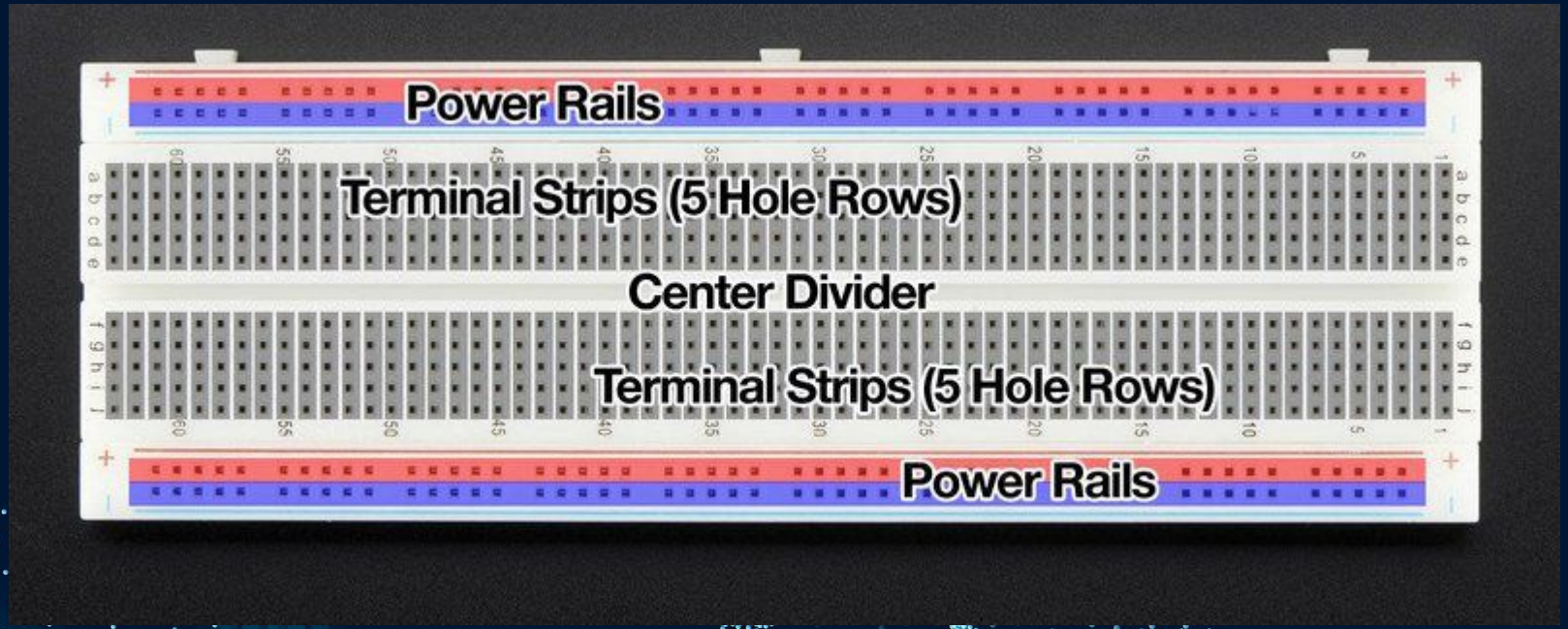
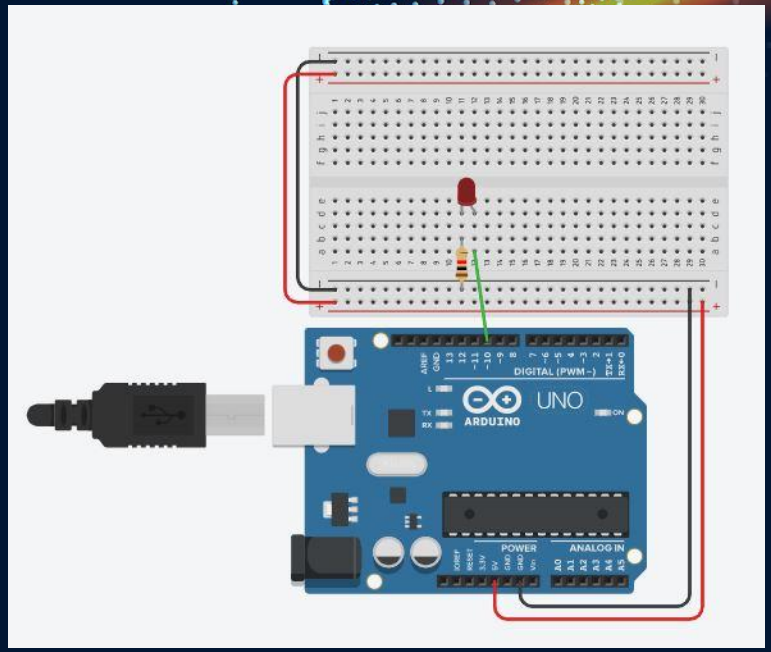
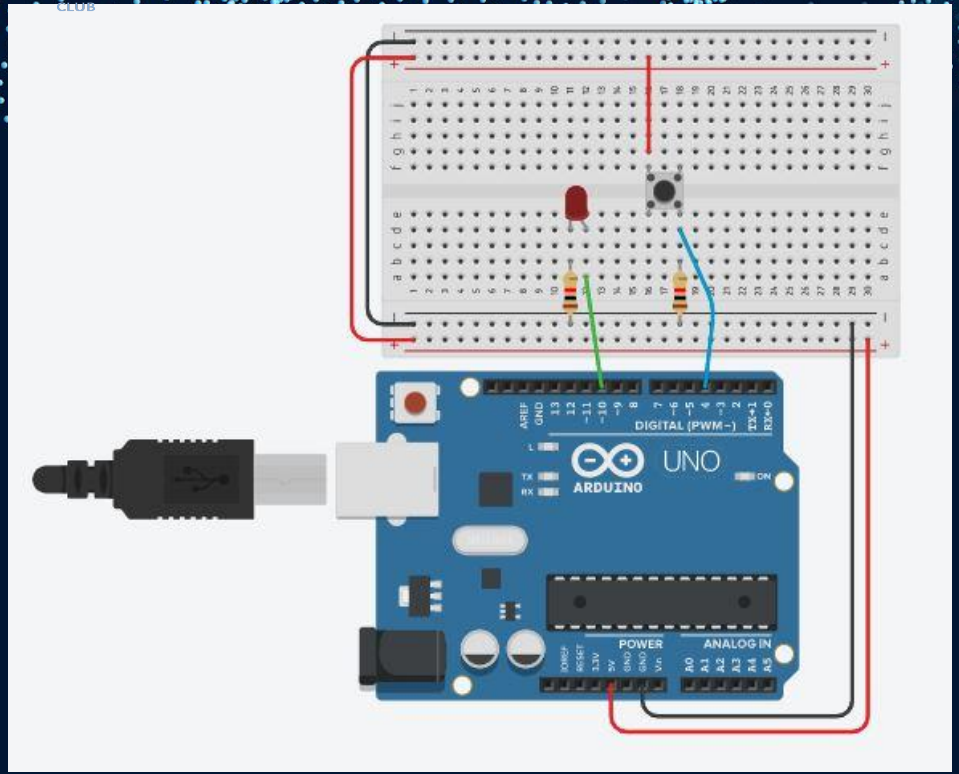
Breadboard Schematic



Assembly and Code





Text

```
// C++ code
//
int buttonRead = 0;
void setup()
{
  pinMode(10, OUTPUT);
  pinMode(4, INPUT);
}

void loop()
{
  buttonRead = digitalRead(4);
  if (buttonRead == HIGH)
  {
    digitalWrite(10, HIGH);
    delay(500); // Wait for 500 millisecond(s)
    digitalWrite(10, LOW);
    delay(500); // Wait for 500 millisecond(s)
  }
}
```

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Find the circuit design here:

https://www.tinkercad.com/things/dpIH6ylzDn7

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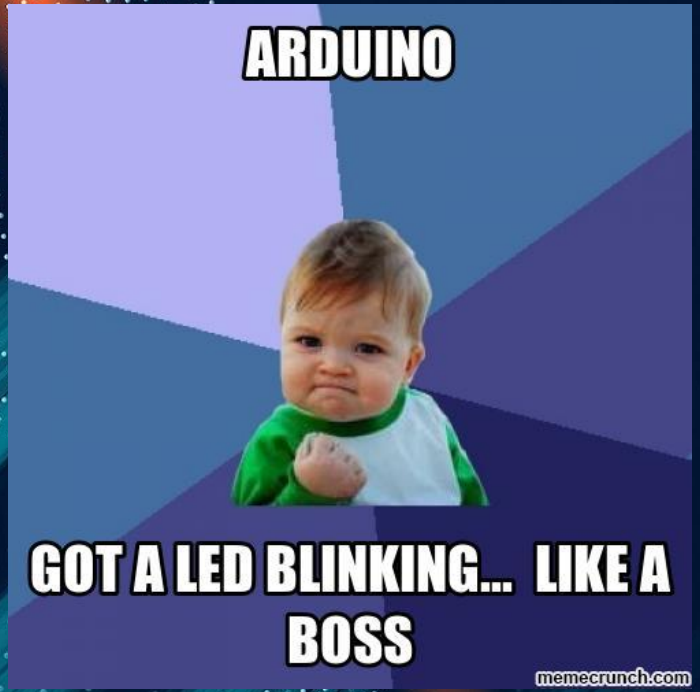

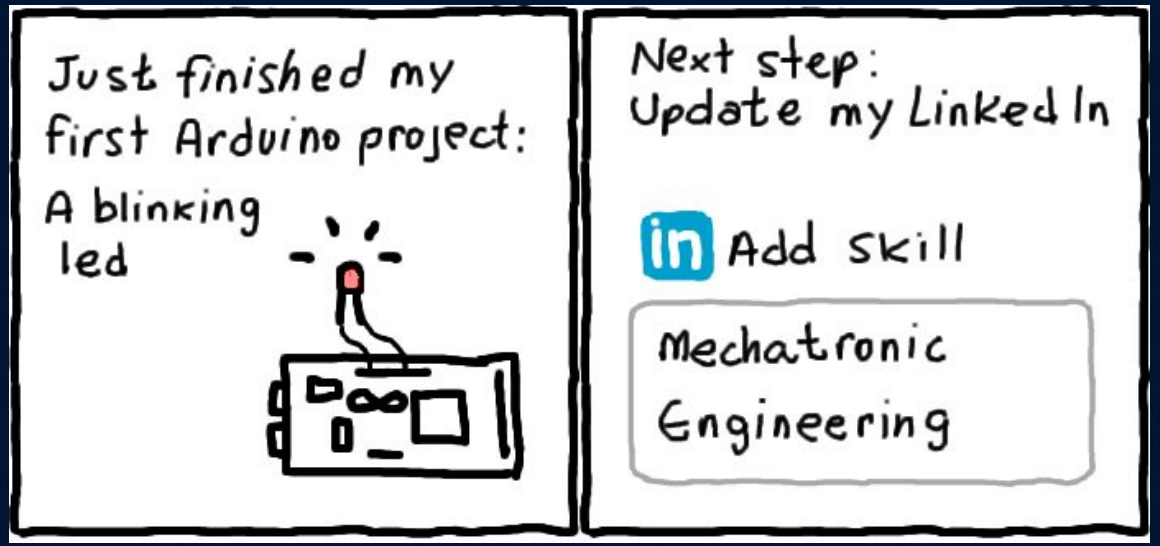

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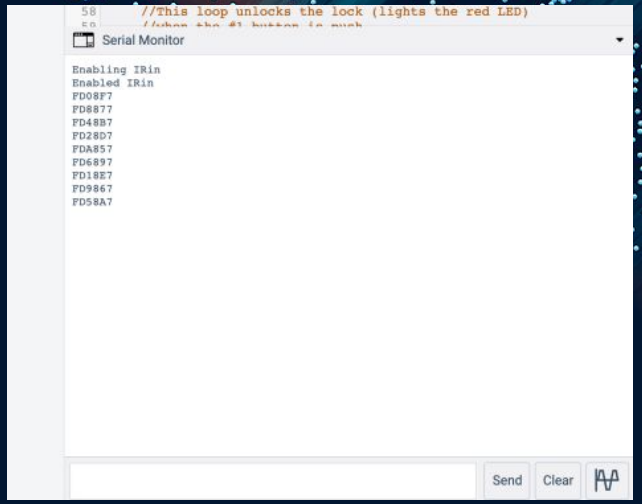
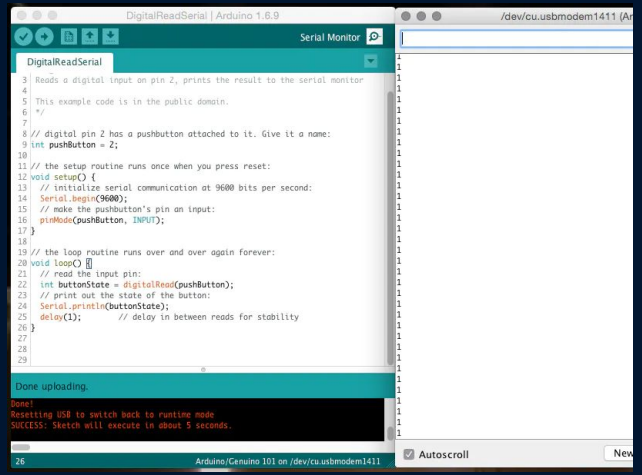
Project : Buzzer

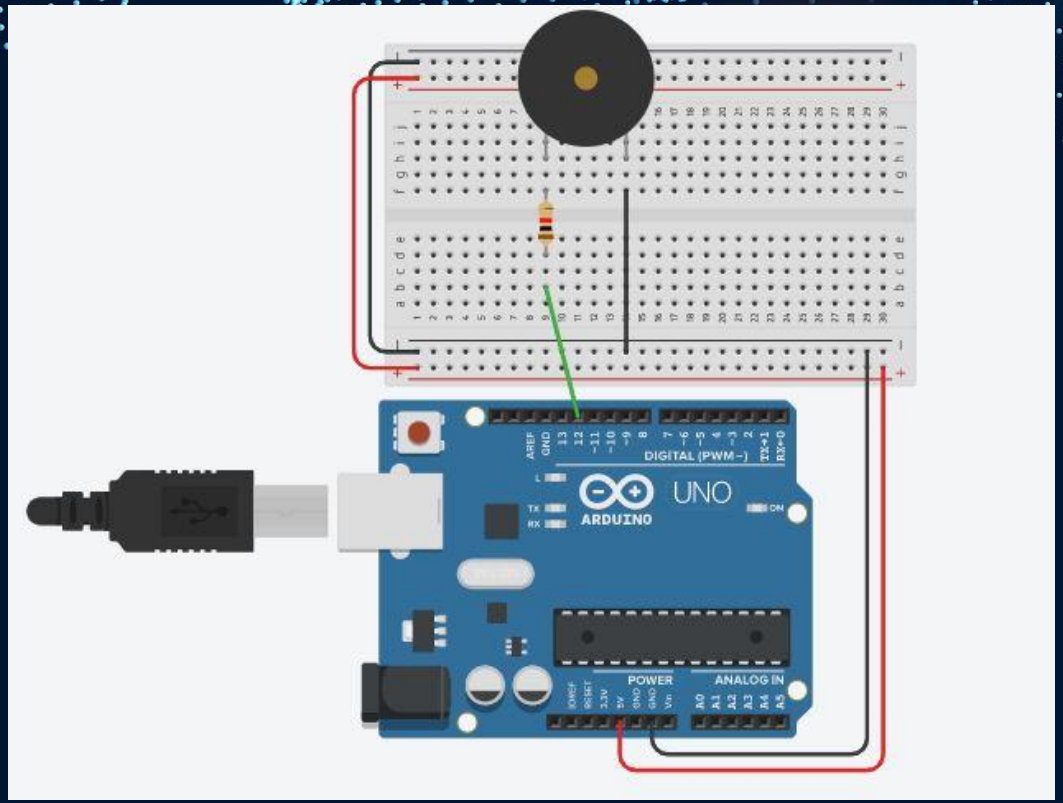
Serial Monitor

- The **serial monitor** is the 'tether' between the computer and your Arduino.
- It is an essential tool when creating projects with Arduino.
- It can be used as a debugging tool, testing out concepts or to communicate directly with the Arduino board.



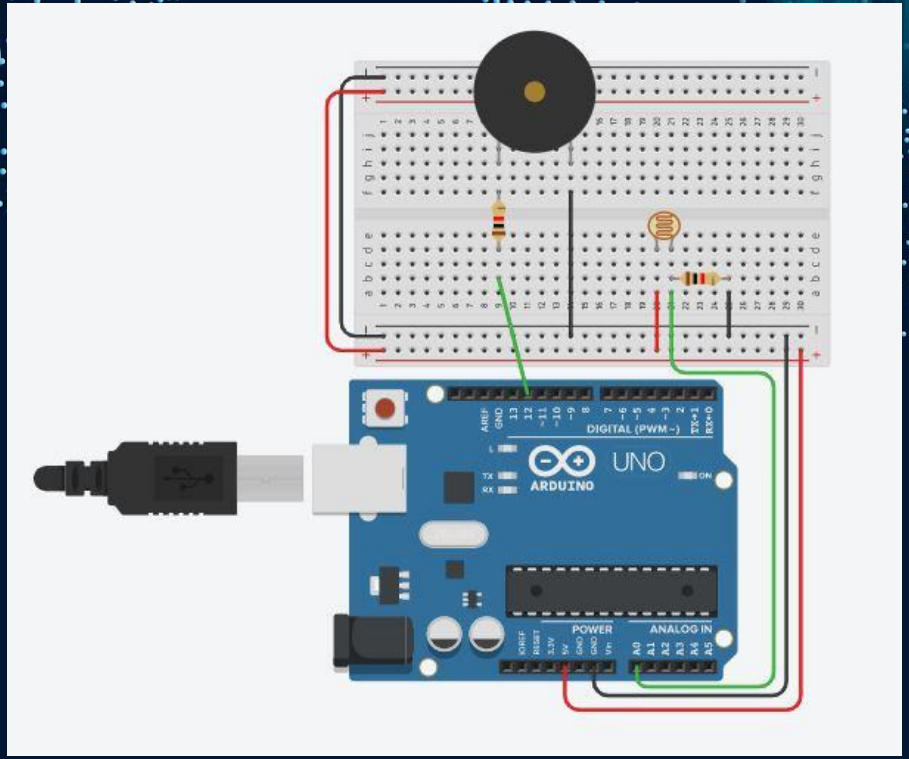


Assembly and Code



Text

```
1  // C++ code
2  //
3  void setup()
4  {
5    pinMode(12, OUTPUT);
6  }
7
8  void loop()
9  {
10   tone(12,440,300);
11   delay(500);
12   tone(12,400,300);
13   delay(500);
14 }
```



Text

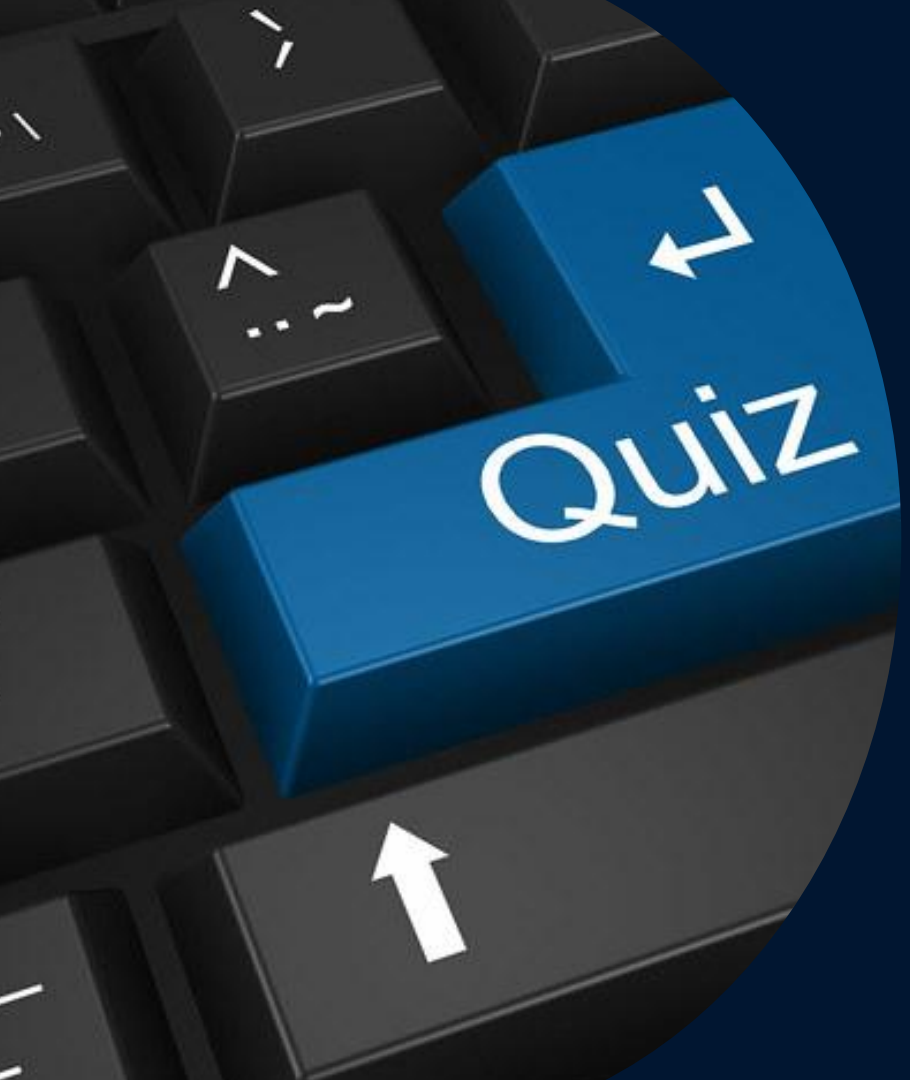
```
// C++ code
//
int lightread = 0;
void setup()
{
  pinMode(12, OUTPUT);
  pinMode(A0, INPUT);
  Serial.begin(9600);
}

void loop()
{
  lightread = analogRead(A0);
  Serial.println(lightRead);
  if (lightRead<=6)
  {
    tone(12,440,300);
    delay(500);
    tone(12,400,300);
    delay(500);
  }
}
```

Serial Monitor

Find the circuit design here :

https://www.tinkercad.com/things/1QvpvPMIIt8



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Quiz Time !

Test yourself on your knowledge of Arduino!

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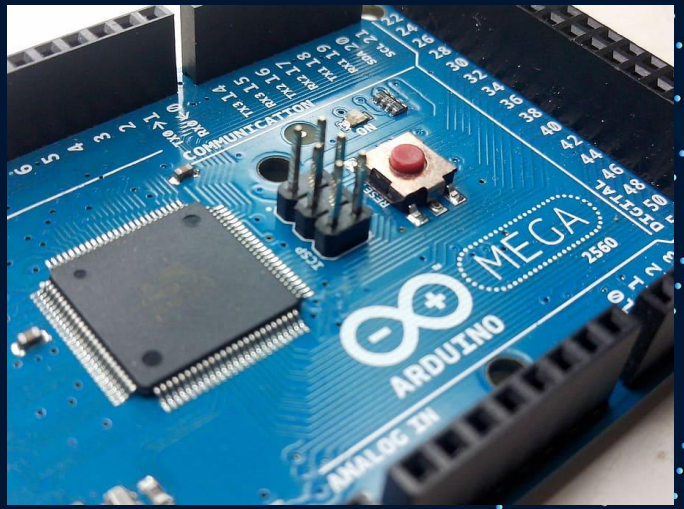
1. When writing a sketch, how do you decide which features belong in the setup function and which belong in the loop function?

A. Features that need to be initialized go in setup
B. Features that need to be initialized go in loop
C. Features that need to run continuously go in setup
D. Features that need to run continuously go in loop

2. Select the function that you can use to detect a button press on the Arduino

A. buttonRead()
B. buttonPress()
C. analogRead()
D. digitalRead()



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3. An Arduino Uno is most suited for _____.

A. Controlling peripherals
B. Powering peripherals
C. Controlling and powering peripherals

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4. An arduino sketch does not have the traditional main() function generally present in C programs

- True
- False

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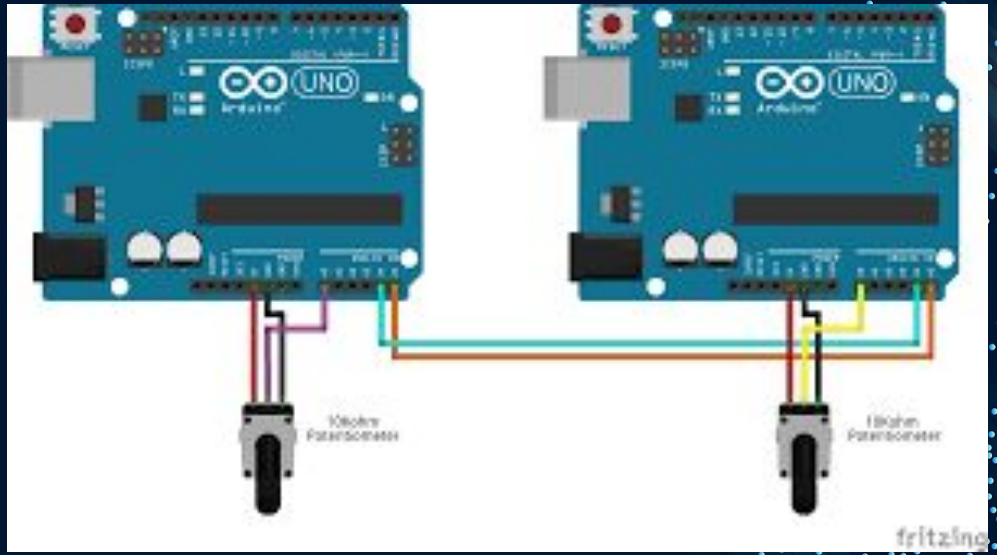
5. To use the I2C communication protocol, you can use the ____ library in your sketch

A. Serial
B. SPI
C. Wire
D. ComI2C



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6. Which function in the Arduino IDE is used to set any pin in output or input state?

A. digitalWrite
B. delay
C. pinMode
D. analogRead

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7. Identify this sensor:

A. Wind sensor
B. Speaker
C. Ultrasonic sensor
D. Temperature sensor

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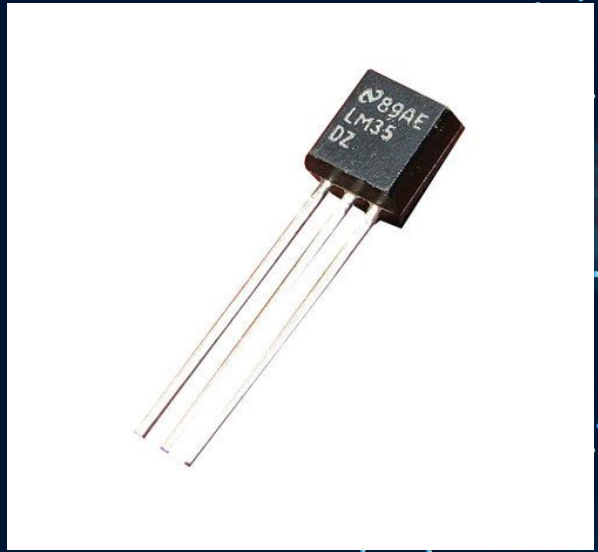
8. Identify this component:

A. Humidity sensor
B. Temperature sensor
C. Capacitive sensor
D. Semiconductor



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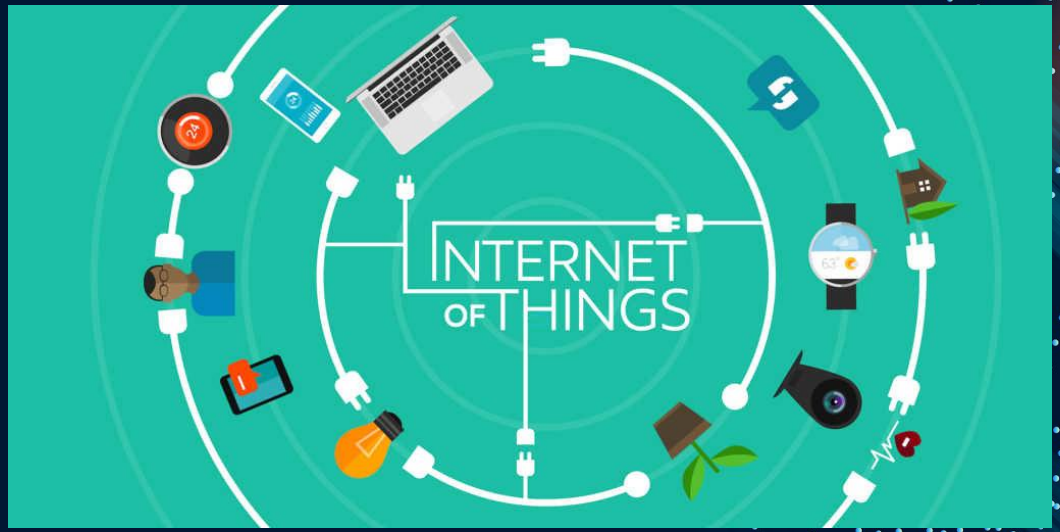
9. Which of the following is the way in which an IoT device is associated with data?

A. Internet
B. Cloud
C. Automata
D. Network



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10. What is J.A.R.V.I.S the abbreviation for

A. Nothing
B. Just a Rather very Important System
C. Just a Rather very intelligent signal
D. Just a Rather very intelligent system

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THANKS!

Do you have any questions?

Send them to us on the doubt forum :

https://forms.gle/X6ry7PcFWmkF9RGA8

Credits :

- Aarya Sumuk (ME20B002)
- Sanjiv B N (EP20B034)