

Internet Data Streams

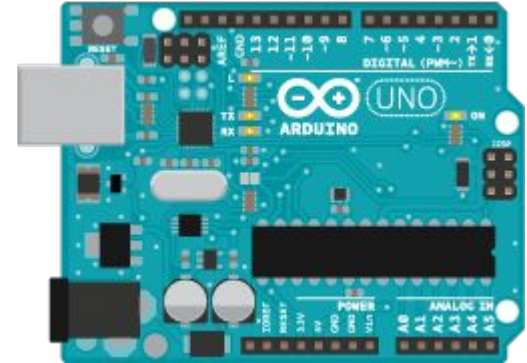
Lecture 2: Arduino Basics

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Current Generation Microcontrollers

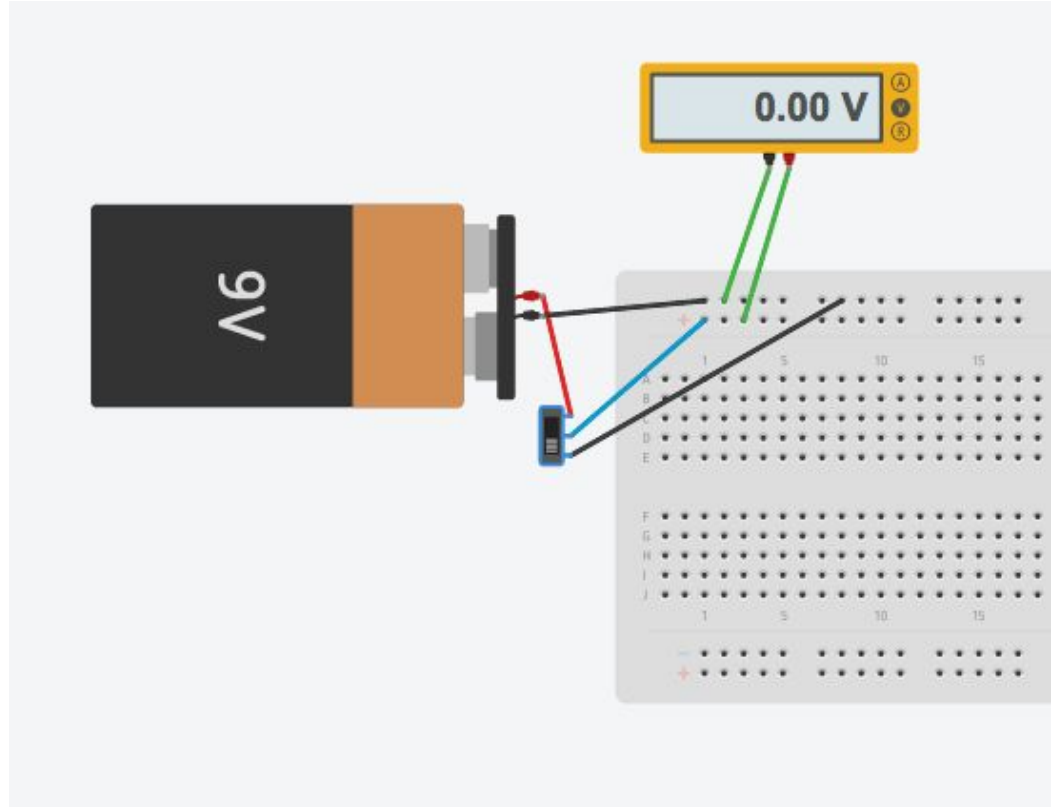
- Standardized circuits
- Easier to program
- Development kits available
- We will look at the Arduino
 - Very common for hobby use
 - Industrial versions for real world
 - <http://www.arduino.cc/>
 - Subject of this week's lab (on a simulator)



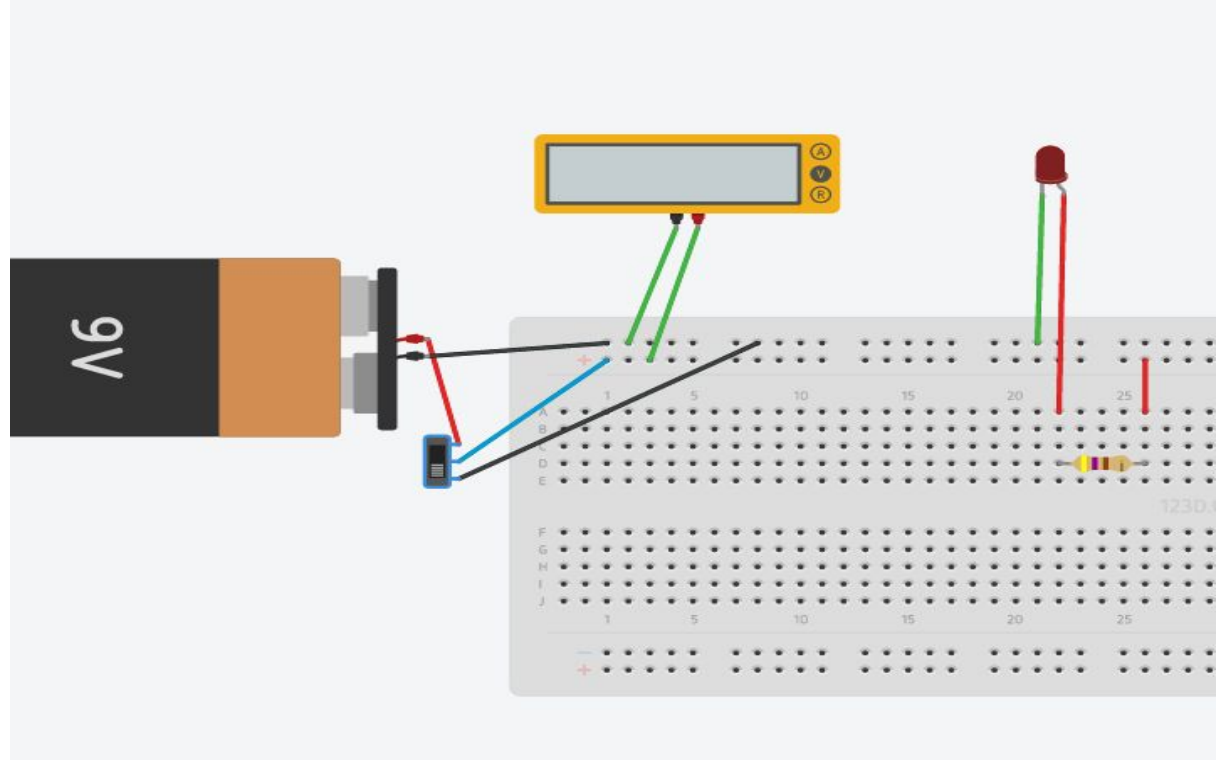
Lab Preparation

- Bring your laptop running Chrome
 - Make sure WiFi works for you
- Read a little about the Arduino
 - <http://www.arduino.cc/>
 - <http://en.wikipedia.org/wiki/Arduino>
- We will be programming a simulated Arduino

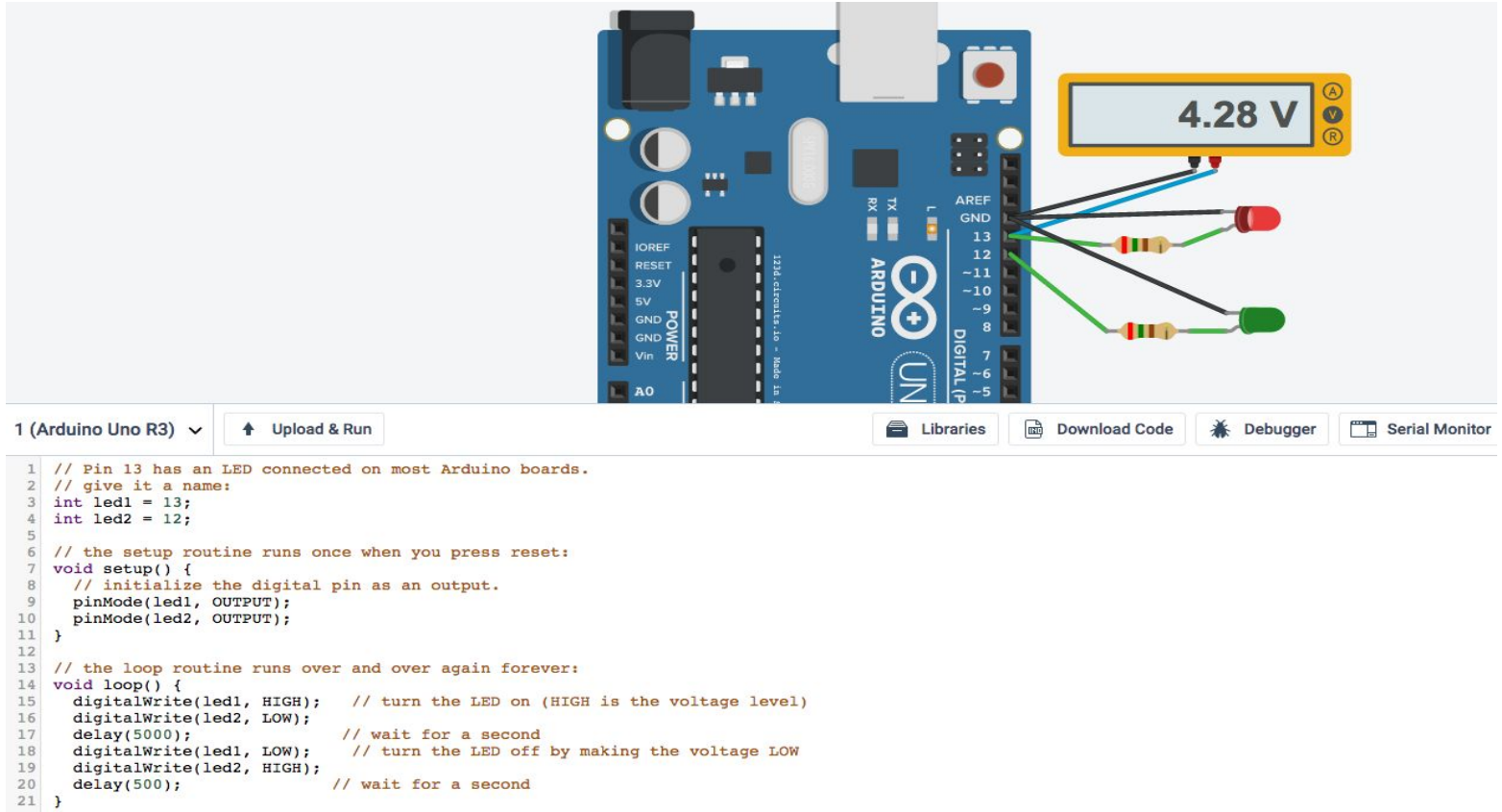
Exercise 1



Exercise 2



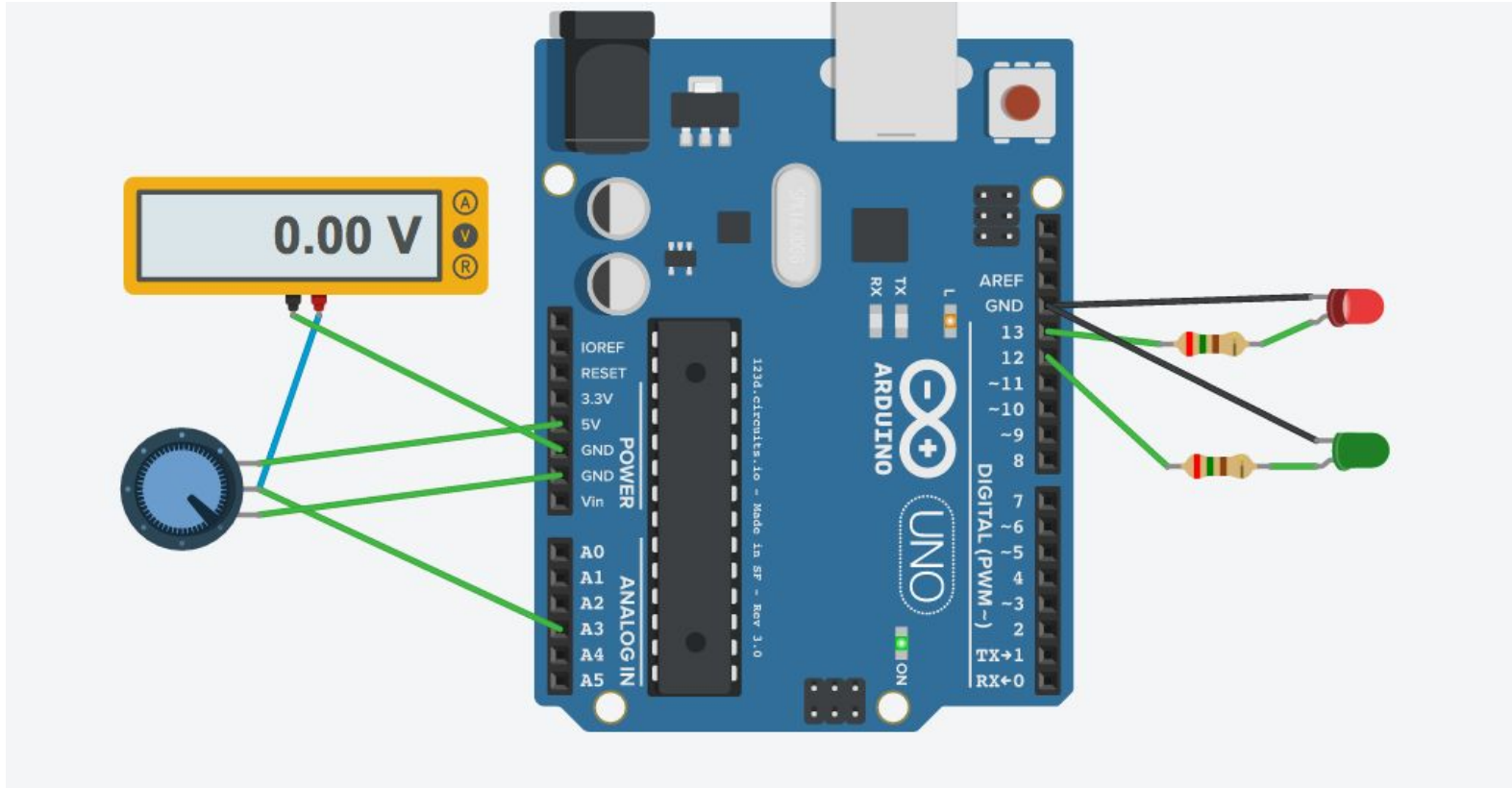
Exercise 3



The image shows a screenshot of the Arduino IDE interface. At the top, there is a circuit diagram of an Arduino Uno R3 board. The board is connected to a digital voltmeter displaying 4.28 V. The voltmeter's positive lead is connected to the AREF pin, and its negative lead is connected to the GND pin. Two LEDs are connected to the digital pins: a red LED is connected to pin 13 (with its anode to the pin and cathode to GND via a resistor), and a green LED is connected to pin 12 (with its anode to the pin and cathode to GND via a resistor). Below the circuit diagram, the IDE interface shows the file name "1 (Arduino Uno R3)" and the "Upload & Run" button. To the right are buttons for "Libraries", "Download Code", "Debugger", and "Serial Monitor". The code editor contains the following C++ code:

```
1 // Pin 13 has an LED connected on most Arduino boards.
2 // give it a name:
3 int led1 = 13;
4 int led2 = 12;
5
6 // the setup routine runs once when you press reset:
7 void setup() {
8   // initialize the digital pin as an output.
9   pinMode(led1, OUTPUT);
10  pinMode(led2, OUTPUT);
11 }
12
13 // the loop routine runs over and over again forever:
14 void loop() {
15   digitalWrite(led1, HIGH); // turn the LED on (HIGH is the voltage level)
16   digitalWrite(led2, LOW);
17   delay(5000);              // wait for a second
18   digitalWrite(led1, LOW);  // turn the LED off by making the voltage LOW
19   digitalWrite(led2, HIGH);
20   delay(500);               // wait for a second
21 }
```

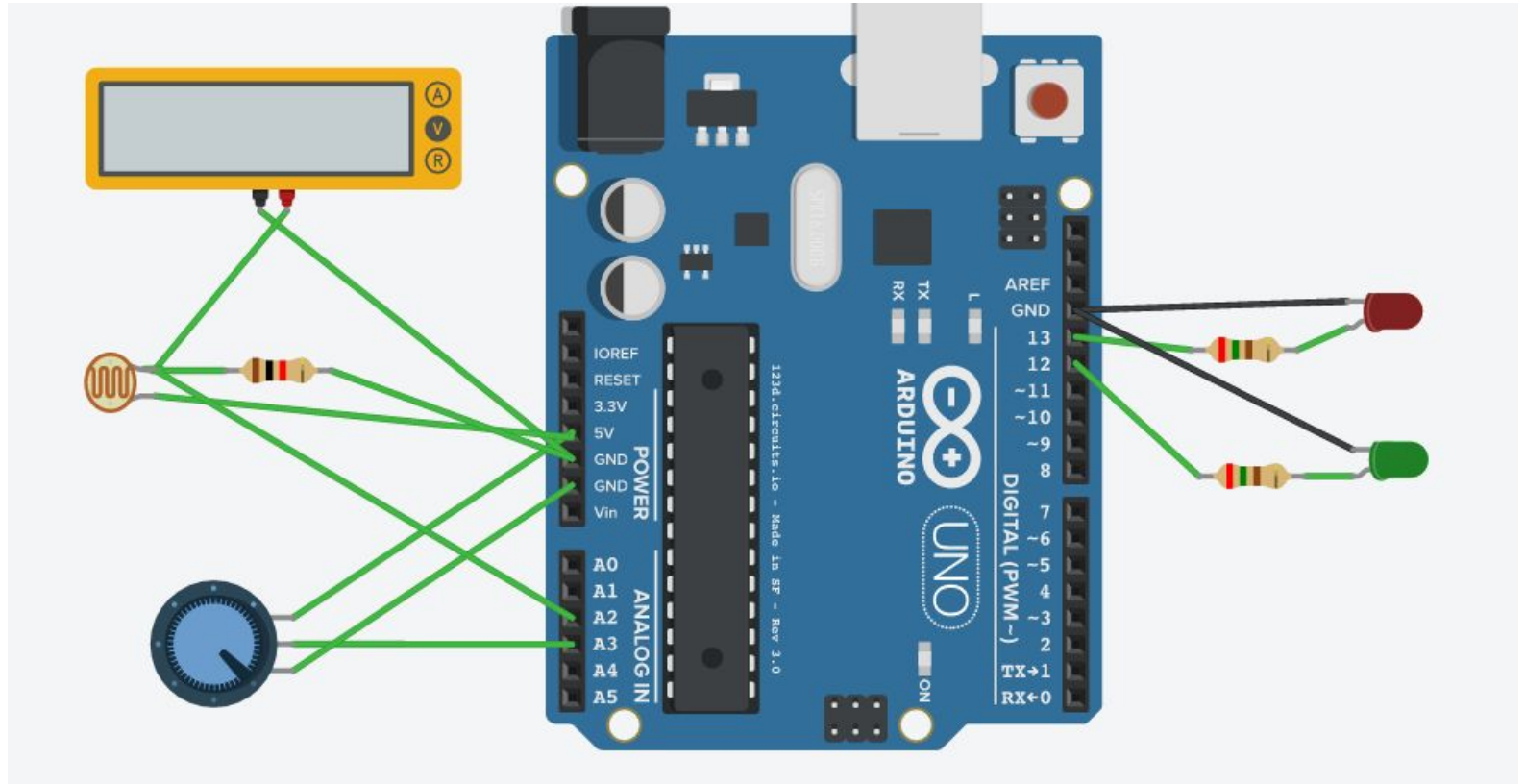
Exercise 4



Exercise 4 (code)

```
1 // Pin 13 has an LED connected on most Arduino boards.
2 // give it a name:
3 int led1 = 13;
4 int led2 = 12;
5 int i = 0;
6 int analogPin = 3;
7
8 // the setup routine runs once when you press reset:
9 void setup() {
10   // initialize the digital pin as an output.
11   pinMode(led1, OUTPUT);
12   pinMode(led2, OUTPUT);
13   Serial.begin(9600);
14 }
15
16 // the loop routine runs over and over again forever:
17 void loop() {
18   i = i + 1;
19   Serial.print("The value of A3 is ");
20   Serial.print(analogRead(analogPin) * 5.0 / 1024.0);
21   Serial.print("\n");
22   digitalWrite(led1, HIGH);    // turn the LED on (HIGH is the voltage level)
23   digitalWrite(led2, LOW);
24   delay(500);                  // wait for a second
25   digitalWrite(led1, LOW);     // turn the LED off by making the voltage LOW
26   digitalWrite(led2, HIGH);
27   delay(500);                  // wait for a second
28 }
```


Exercise 5



Exercise 5 (code)

```
// Pin 13 has an LED connected on most Arduino boards.
// give it a name:
int led1 = 13;
int led2 = 12;
int i = 0;
int analogPin = 3;
int lightSensor = 2;
float lightValue = 0;

// the setup routine runs once when you press reset:
void setup() {
  // initialize the digital pin as an output.
  pinMode(led1, OUTPUT);
  pinMode(led2, OUTPUT);
  Serial.begin(9600);
}

// the loop routine runs over and over again forever:
void loop() {
  lightValue = analogRead(lightSensor) * 5.0 / 1024.0 / 3.5;
  Serial.print("The light value is ");
  Serial.print(lightValue);
  Serial.print("\n");
  if (lightValue > 0.5) {
    digitalWrite(led1, HIGH);    // turn the LED off by making the voltage LOW
    digitalWrite(led2, LOW);
  }
  else {
    digitalWrite(led1, LOW);     // turn the LED off by making the voltage LOW
    digitalWrite(led2, HIGH);
  }
  delay(500);                  // wait for a second
}
```