

# WORKSHEET 1

## INTRODUCTION TO MICROCONTROLLER

### PART A: DIFFERENCE BETWEEN MICROCONTROLLER AND MICROPROCESSOR

1. State the difference between microcontroller and microprocessor

Microcontroller	Microprocessor
1. Can be treated as a small computer	1. It is the <b>CPU</b> in a computer
2. Contains CPU, <b>RAM</b> , <b>ROM</b> dan I/O devices in a single chip.	2. Contains only CPU in the chip.

2. Microcontroller system is like the human **NERVOUS** system.

3. Microcontroller receives **INPUT** and gives out OUTPUT.

4. Microcontroller processes information based on the **PROGRAMMING** in it.

5. Microcontroller keeps the programming in its system once uploaded. It only requires **POWER** for it to work.

## WORKSHEET 1

# INTRODUCTION TO MICROCONTROLLER

### PART B: PARTS IN A MICROCONTROLLER

1. Match the parts of a microcontroller and its function

CPU	Use to produce frequencies for
RAM & ROM	Provides power to the microcon-
Serial input/output	Receives information and pro- gram for it top process input and
Timing circuit	Allows the microcontroller to con- trol the system based on its in-
Timer / Crystal	Connects to input and output devices such as LED, motors and sensors
Power supply	There are two types of signals–
	Memory spaces to store infor-

## WORKSHEET 1

# INTRODUCTION TO MICROCONTROLLER

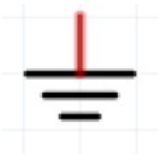
### PART C: SCHEMATIC DIAGRAM

1. Guides to drawing a good schematic diagram.

- a. Ensures that all lines drawn are **STRAIGHT**
- b. Ensures that all lines are not **ARROW**.
- c. Ensures that all lines drawn are **HORIZONTALLY** or **VERTICALLY** only.
- d. Minimize lines **CROSSING** each other to avoid confusion
- e. Use standardized **SYMBOLS** to represent each components.
- f. Ensures that all components in the diagram are **LABELLED**

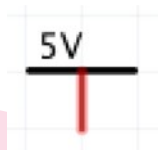
2. What does each of the following symbol means?:

a.



**NEGATIVE TERMINAL / GROUND IN A CIRCUIT**

b.



**POWER SUPPLY**

# WORKSHEET 2

## OUTPUT

## ANSWER SCHEME

### PART A: OUTPUT CIRCUIT PROGRAMMING

A) Answer the following question:

1. Arduino runs two programs—which are **SETUP** and **LOOP**
2. There are two types of signals that can be sent and received by Arduino, which are **DIGITAL** signals and **ANALOG** signals.
3. To use pin 8 to turn on the LED, pin 8 needs to be set as **OUTPUT** with the program command **pinMode(8,OUTPUT)**
4. **pinMode(5, OUTPUT)** sets pin **5** to become **OUTPUT**
5. **digitalWrite(13, HIGH)** will send digital signal **HIGH** to pin **13**
6. **analogWrite(7, 120)** will send analog signal **120** to pin **7**
7. The number 1000 in **delay(1000)** means 1000 **MILLISECONDS**
8. Each program line must end with the symbol: **;**

# WORKSHEET 2

## OUTPUT

## ANSWER SCHEME

B) State the function of the code, or the code for the function:

1. `pinMode(5, INPUT)` : SET PIN 5 AS INPUT
2. `pinMode(8, OUTPUT)` : Tetapkan pin 8 sebagai output
3. `delay(1000)` : WAIT 1000 MILLISECONDS / 1 SECONDS
4. `delay(100)` : Wait 0.1 second
5. `digitalWrite(5, HIGH)` : SEND DIGITAL SIGNAL HIGH TO PIN 5
6. `digitalWrite(8, LOW)` : Send digital signal LOW to pin 8
7. `analogWrite(3, 255)` : SEND ANALOG SIGNAL 255 TO PIN 3
8. `analogWrite(4, 100)` : Send analog signal 100 to pin 4

B) Write the program for the following action:

1. Turn on LED connected to pin 5

```
1 void setup() {  
2     pinMode(5, OUTPUT);  
3 }  
4  
5 void loop() {  
6     digitalWrite(5, HIGH);  
7 }
```

# WORKSHEET 2

## OUTPUT

## ANSWER SCHEME

2. The LED connected to pin 6 will turn on for 3 seconds and turn off for 1 second.

```
1 void setup() {  
2     pinMode(6, OUTPUT);  
3 }  
4  
5 void loop() {  
6     digitalWrite(6, HIGH);  
7     delay(3000);  
8     digitalWrite(6, LOW);  
9     delay(1000);  
10 }
```

# WORKSHEET 2

## OUTPUT

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3. By using the red LED (pin 5), green LED (pin 6) and yellow LED (pin 7), create a traffic light program

```
1 void setup() {  
2     pinMode(5, OUTPUT);  
3     pinMode(6, OUTPUT);  
4     pinMode(7, OUTPUT);  
5 }  
6  
7 void loop() {  
8     digitalWrite(7, LOW);  
9     digitalWrite(5, HIGH);  
10    delay(5000);  
11    digitalWrite(5, LOW);  
12    digitalWrite(6, HIGH);  
13    delay(5000);  
14    digitalWrite(6, LOW);  
15    digitalWrite(7, HIGH);  
16    delay(1000);  
17 }
```

# WORKSHEET 2

## OUTPUT

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## ANSWER SCHEME

4. The LED connected to pin 9 will turn on with 50% brightness

```
1 void setup() {  
2     pinMode(9, OUTPUT);  
3 }  
4  
5 void loop() {  
6     analogWrite(9, 123);  
7 }  
8
```



# WORKSHEET 2

## OUTPUT

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## ANSWER SCHEME

5. Buzzer to play two different sounds

```
1 void setup() {  
2     pinMode(8, OUTPUT);  
3 }  
4  
5 void loop() {  
6     tone(8, 250, 250);  
7     delay(1000);  
8     tone(8, 500, 250);  
9     delay(1000);  
10 }  
11
```

# WORKSHEET 2

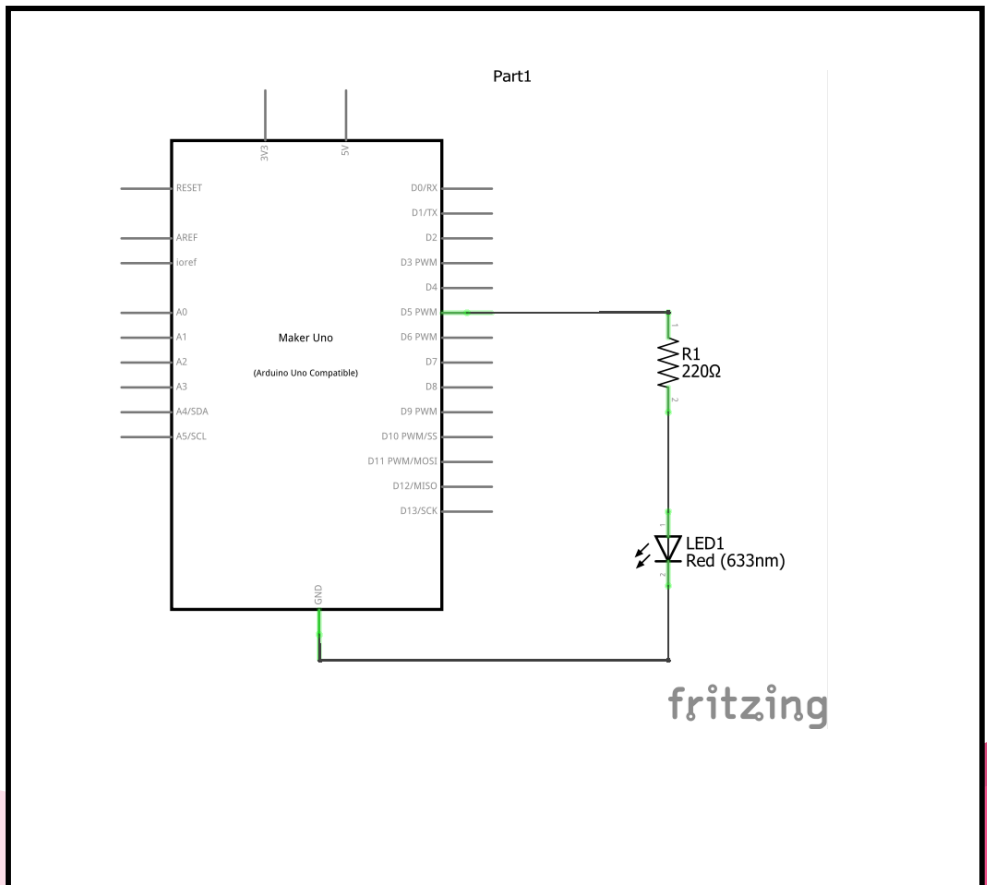
## OUTPUT

## ANSWER SCHEME

### PART B: INTRODUCTION TO OUTPUT CIRCUIT CONNECTION AND SIMULATION

A) Draw the following schematic:

1. 1 LED connected to pin 5

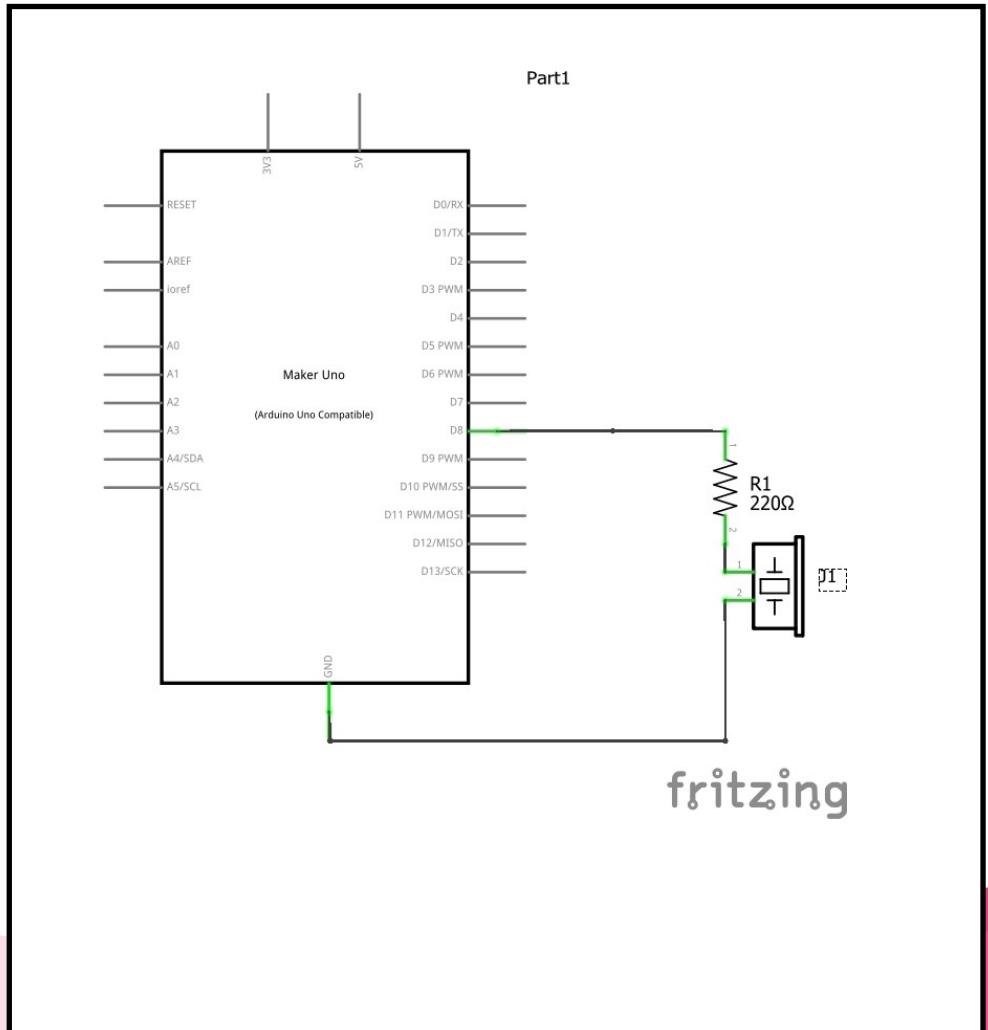


# WORKSHEET 2

## OUTPUT

## ANSWER SCHEME

2. Buzzer connected to pin 8

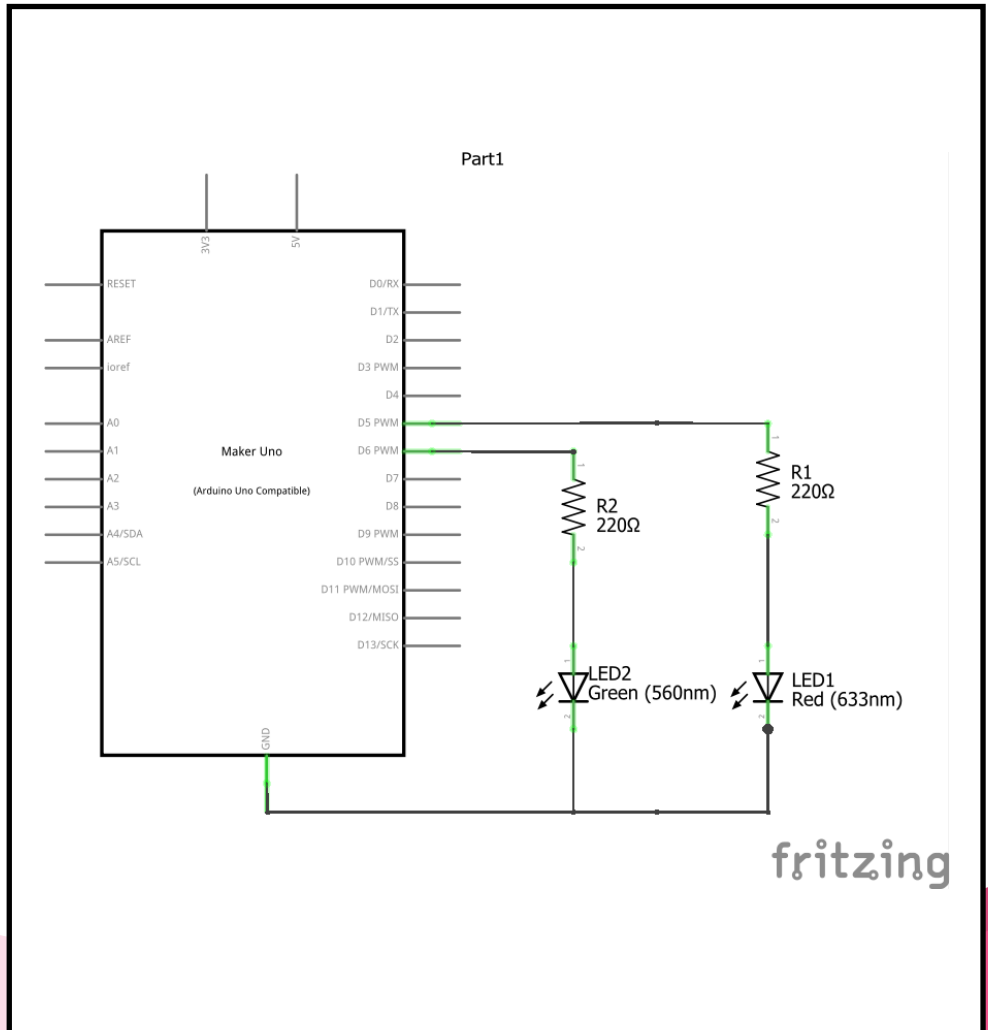


# WORKSHEET 2

## OUTPUT

## ANSWER SCHEME

3. Red LED connected to pin 5 and green LED connected to pin 6



## WORKSHEET 2

### OUTPUT

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B) Simulate the circuit in Part A and produce the program that will perform the following action.

Write the project URL for checking

1) Circuit A1 - Blinking LED

2) Circuit A1 - LED turned on with 50%

3) Circuit A2 - Buzzer to produce a sound

4) Circuit A3 - Turn on a light when a button is pressed

5) Circuit A4 - Traffic light

Any answer that fulfils the requirement is accepted

# WORKSHEET 3

## INPUT

## ANSWER SCHEME

### PART A: INPUT CIRCUIT PROGRAMMING

A) Answer the following question

1. To use pin 8 as input pin, the pin needs to be set as **INPUT** with the programming command **pinMode(8,INPUT)**
2. **analogRead** can be used at pin **A0-A5** only.
3. To open a communication channel between the computer and Arduino, we need to write **Serial.begin(9600)** at setup and **Serial.println()** in loop

B) State the function of the code, or the code for the function

1. **analogRead(A0)** : Reads analog signals from pin **A0**
2. **digitalRead(8)** : Reads digital signals from pin 8
3. **x = analogRead(A0)** : Set the analog value read from pin **A0** to the variable **x**
4. **z = digitalRead(5)** : Set the digital value read from pin 5 to the variable **z**

# WORKSHEET 3

## INPUT

C) Write the program for the following function

1. Read the value received in analog pin A2 and display it through Serial communication

```
1 void setup() {  
2     pinMode(A2, INPUT);  
3     Serial.begin(9600);  
4 }  
5  
6 void loop() {  
7     int x = analogRead(A2);  
8     Serial.println(x);  
9     delay(200);  
10 }
```

# WORKSHEET 3

## INPUT

## ANSWER SCHEME

2. Read the value received in digital pin 5 and display it through Serial communication

```
1 void setup() {  
2     pinMode(5, INPUT);  
3     Serial.begin(9600);  
4 }  
5  
6 void loop() {  
7     int x = digitalRead(5);  
8     Serial.println(x);  
9     delay(200);  
10 }  
11
```



# WORKSHEET 3

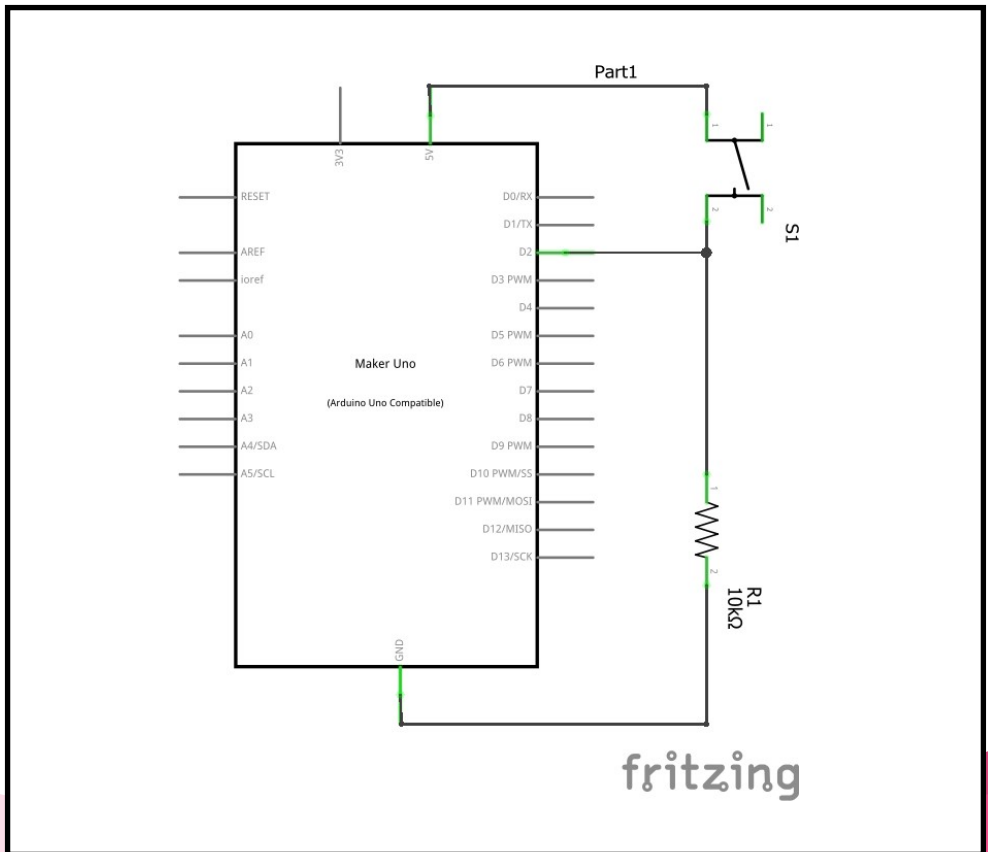
## INPUT

## ANSWER SCHEME

### PART B: INTRODUCTION TO INPUT CIRCUIT CONNECTION AND SIMULATION

A) Draw the schematic for the following circuit

- 1) 1 push button connected to pin 2

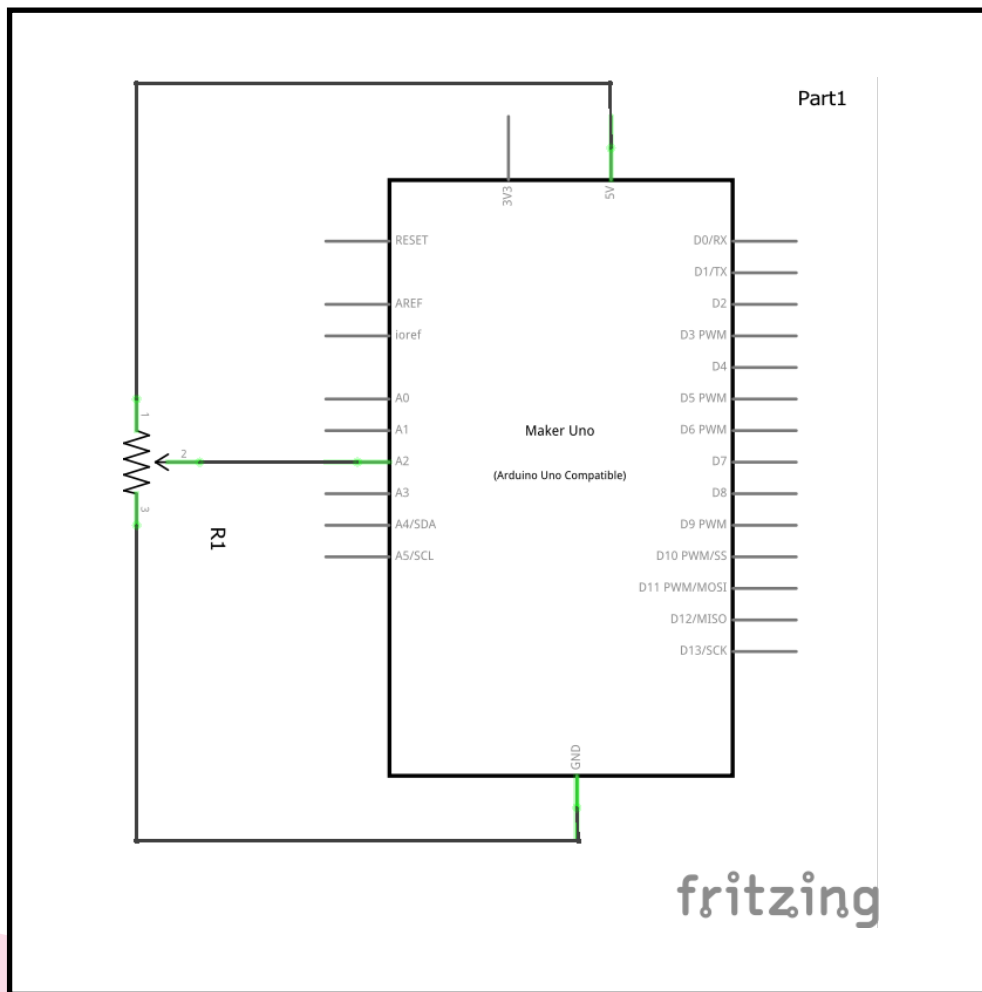


# WORKSHEET 3

## INPUT

## ANSWER SCHEME

2) 1 potentiometer connected to pin A2

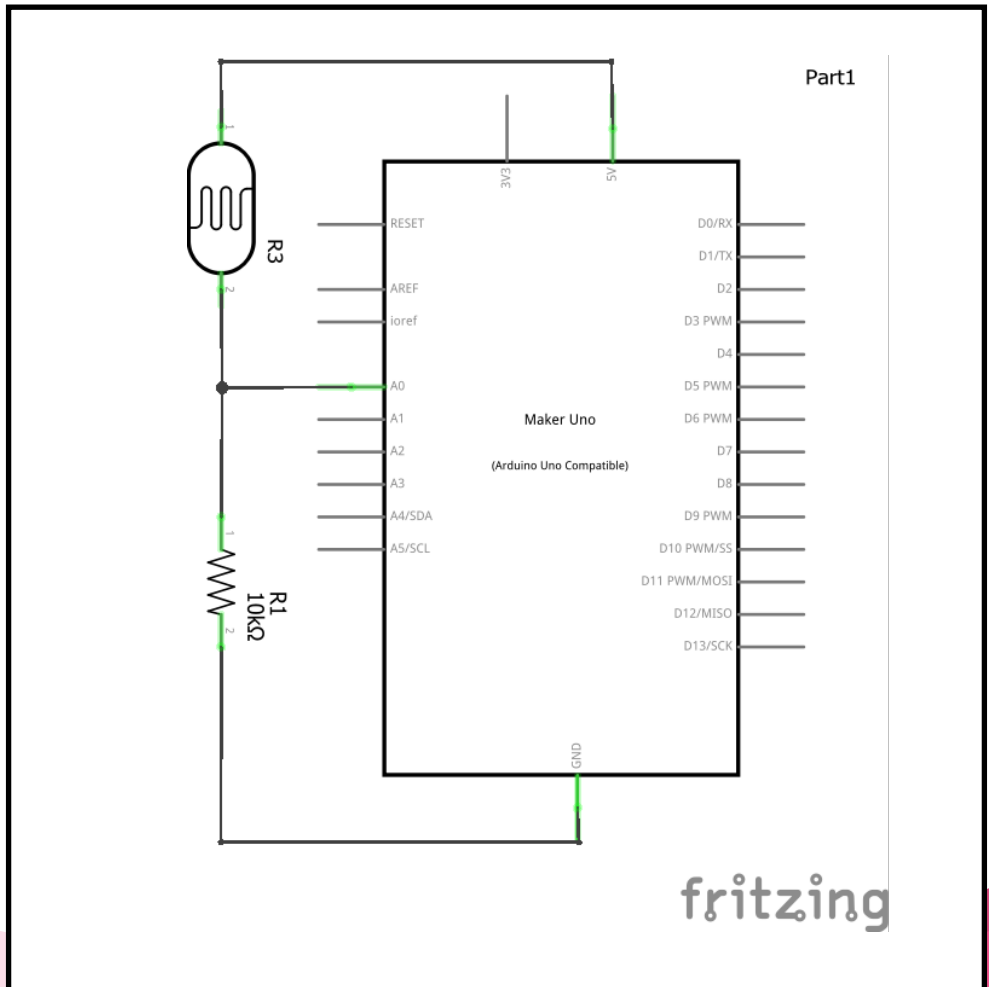


# WORKSHEET 3

## INPUT

## ANSWER SCHEME

3) 1 Light Dependent Resistor connected to pin A0



## WORKSHEET 3

# INPUT

B) Simulate the circuit in A and produce the program that will perform the following action.

Write the project URL for checking

1) Circuit A1 - Read the pushbutton value and display it on the Serial Communication

2) Circuit A2 - Read the potentiometer value and display it on the Serial Communication

3) Circuit A3 - Read the potentiometer value and display it on the Serial Communication

Any answer that fulfils the requirement is accepted

# WORKSHEET 4

## INPUT AND OUTPUT

### PART A: INPUT AND OUTPUT PROGRAMMING

A) State the meaning of the following symbol:

1. > : Bigger than
2. < : Smaller than
3. <= : Smaller than or equals to
4. >= : Bigger than or equals to
5. != : Not equals to
6. == : Equals to

B) Write the program that performs the following function:

- 1) Read the pushbutton at pin 2. If it is pressed, turn on the LED at pin 5

```
1 void setup() {  
2   pinMode(2, INPUT);  
3   pinMode(5, OUTPUT);  
4   Serial.begin(9600);  
5 }  
6  
7 void loop() {  
8   int x = digitalRead(5);  
9   Serial.println(x);  
10  if(x == 1){  
11    digitalWrite(5, HIGH);  
12  } else {  
13    digitalWrite(5, LOW);  
14  }  
15 }  
16
```

## WORKSHEET 4

# INPUT AND OUTPUT

2) Read the light dependent resistor connected to pin A0. If the value read is more than or equals to 500, turn off the LED at pin 5 and 6.

```
1 void setup() {  
2     pinMode(A0, INPUT);  
3     pinMode(5, OUTPUT);  
4     pinMode(6, OUTPUT);  
5     Serial.begin(9600);  
6 }  
7  
8 void loop() {  
9     int x = analogRead(A0);  
10    Serial.println(x);  
11    if(x >= 500){  
12        digitalWrite(5, LOW);  
13        digitalWrite(6, LOW);  
14    } else {  
15        digitalWrite(5, HIGH);  
16        digitalWrite(6, HIGH);  
17    }  
18 }  
19
```

# WORKSHEET 4

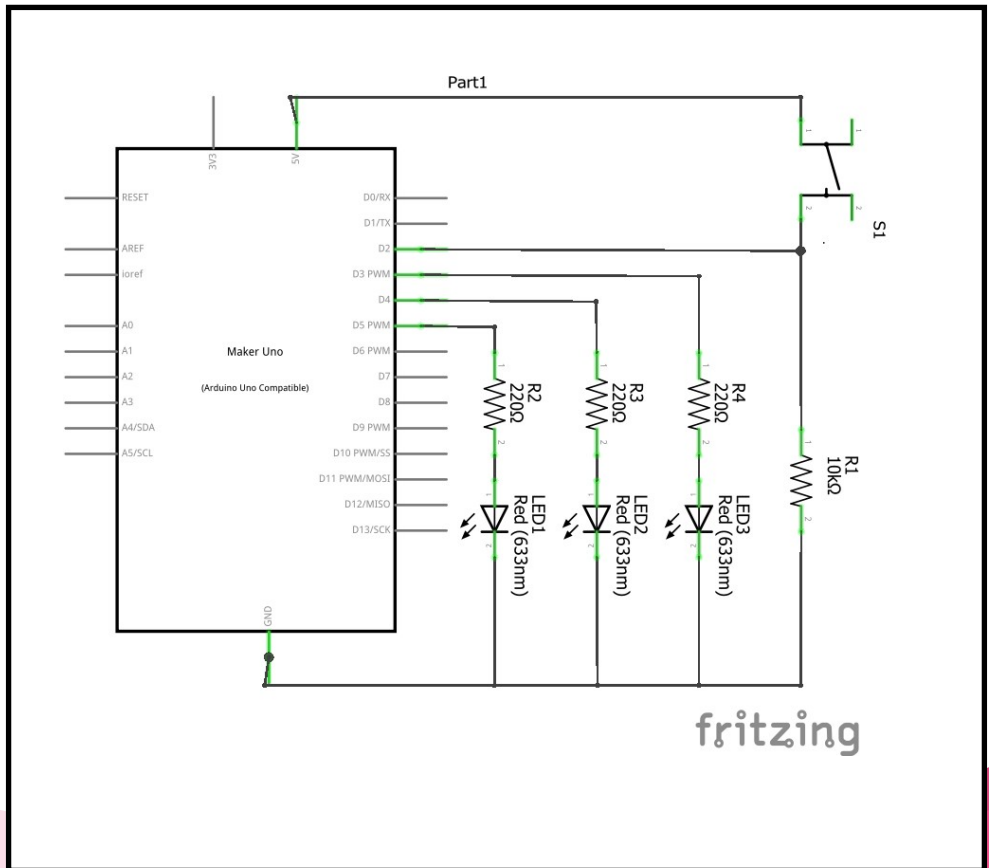
## INPUT AND OUTPUT

## ANSWER SCHEME

### PART B: INTRODUCTION TO INPUT AND OUTPUT CIRCUIT CONNECTION AND SIMULATION

A) Draw the following schematic:

- 1) Push button connected to pin 2 and 3 LED connected to pin 3,4 and 5

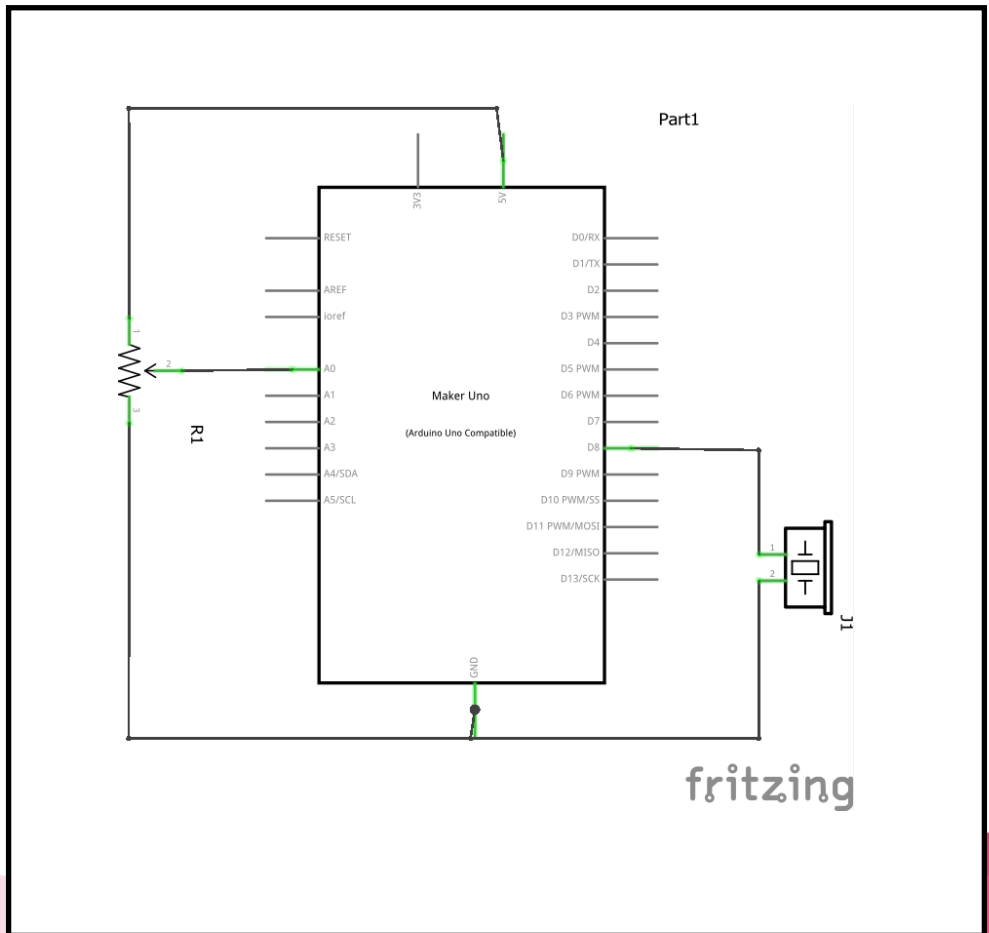


# WORKSHEET 4

## INPUT AND OUTPUT

## ANSWER SCHEME

2) Potentiometer connected to pin A0 and buzzer connected to pin 8





## WORKSHEET 4

# INPUT AND OUTPUT

B) Simulate the circuit in A and produce the program that will perform the following action.

Write the project URL for checking

1) Circuit A1 - Read the pushbutton. If the pushbutton is pressed, turn on the LED at pin 3 and 4. Or else, turn on the LED at pin 5.

2) Circuit A2 - Read the pushbutton. If the pushbutton is pressed, turn on all the LEDs. Or else, turn off all the LEDs.

3) Circuit A3 - Read the potentiometer value. If the potentiometer value is more than 250, play sound on the speaker.

Any answer that fulfils the requirement is accepted

## WORKSHEET 4

# INPUT AND OUTPUT

By using the components provided, choose and make one:

- 1) Alarm that will be activated when the door is opened
- 2) Music box
- 3) LEDs that will be turned on when it is night time

For each project, you need to produce the following documents:

1. Block diagram for project design
2. Schematic diagram for the circuit
3. Program for the circuit and choose the program structure
4. Simulation on tinkercad
5. Actual functioning project
6. Recommendation for the project

Collect all the evidences for your portfolio for your creation.

Any answer that fulfils the requirement is accepted