



Armstrong

School Program 2023-2024

Lesson 3



Armstrong

entertainment meets education



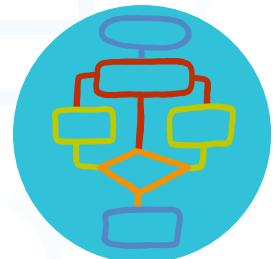
Lesson Content



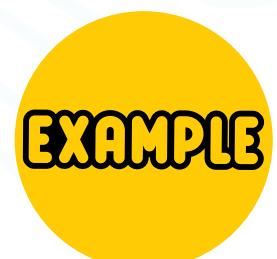
Revision on Variables



Revise the Pushbutton



Revise if | else if | else

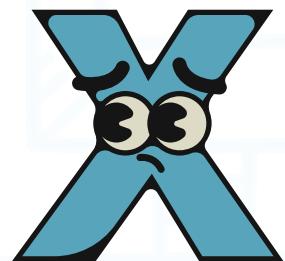


Examples



Remember

What is a variable?



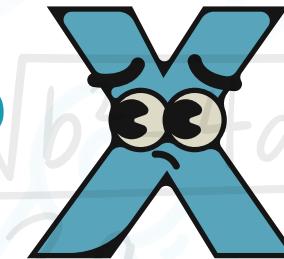
Constants are different from variables, which are words or symbols that can change their values depending on the situation.

For example, the word age is a variable, because it can mean different things for different people. The letter x is also a variable, because it can represent different numbers in different equations.



Remember

Why are variables important in coding?



Variables are useful in coding because they can help us store and manipulate data that can vary based on the program's requirements.



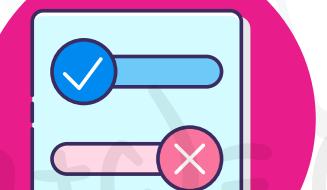
variable type

3

Integer

0.1

Float



Boolean

A

Char

Thank
you!

String

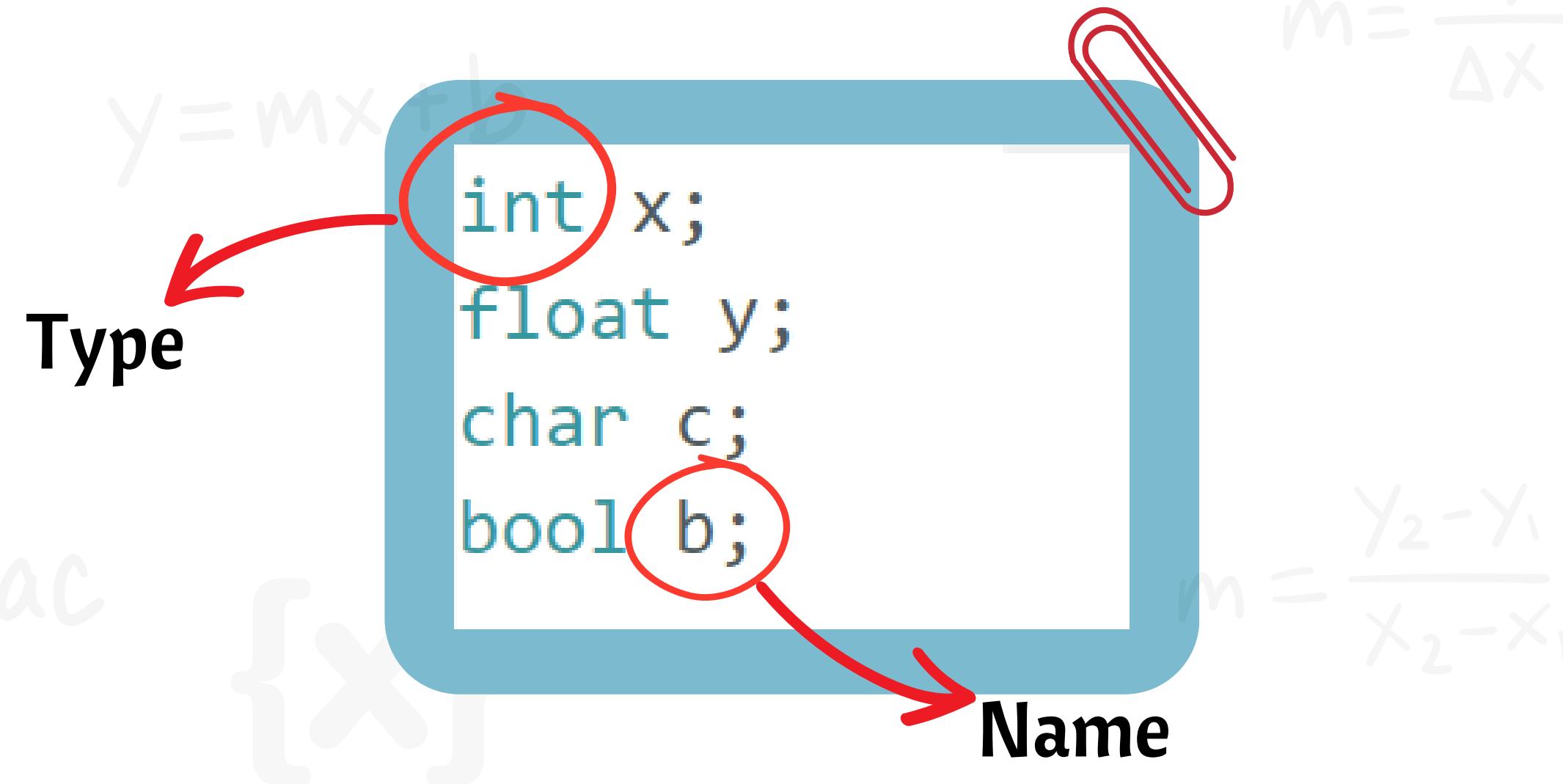
|x|

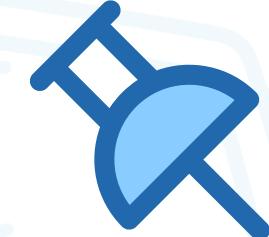


Remember

How to initialize different types of variables?

To define a variable, you need two things: type and name.



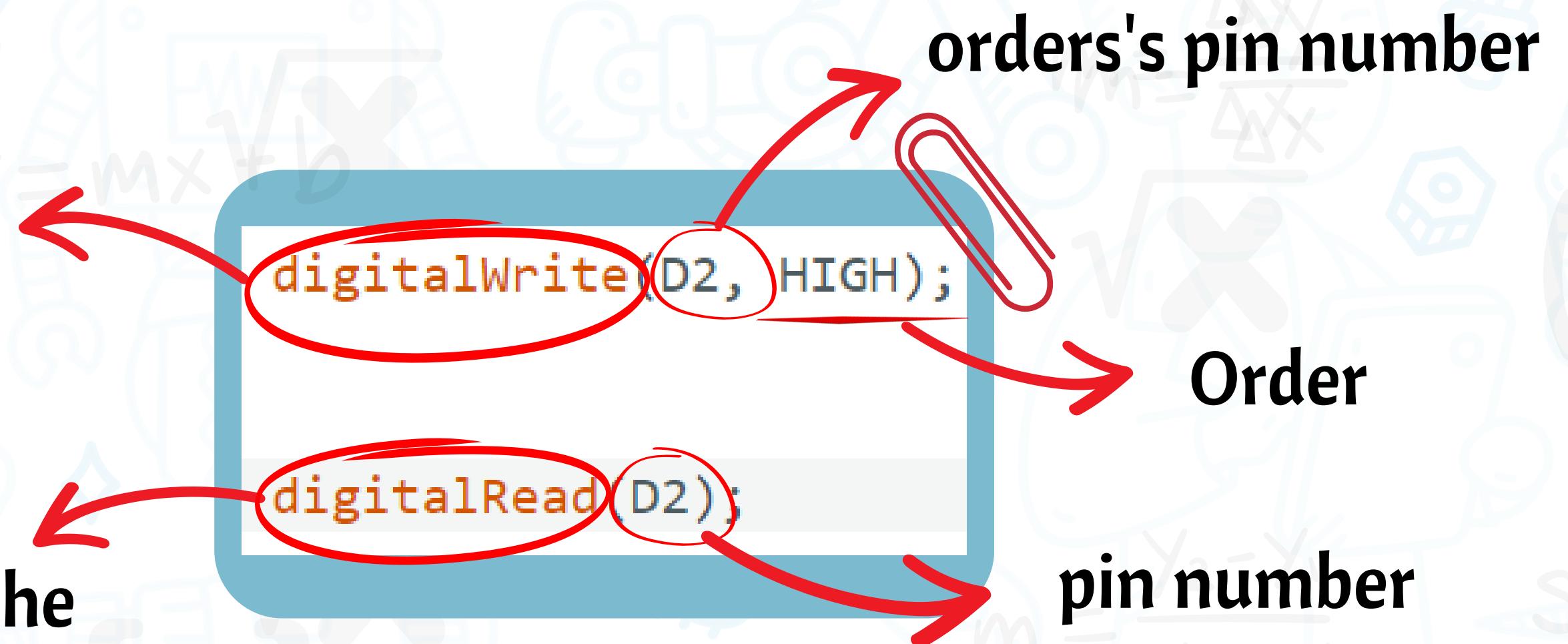


Remember

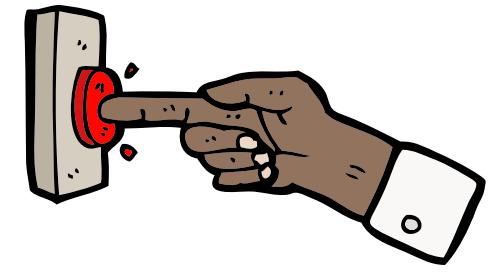
How to take or give info to the arduino ?

gives an order to the component

takes a reading from the component

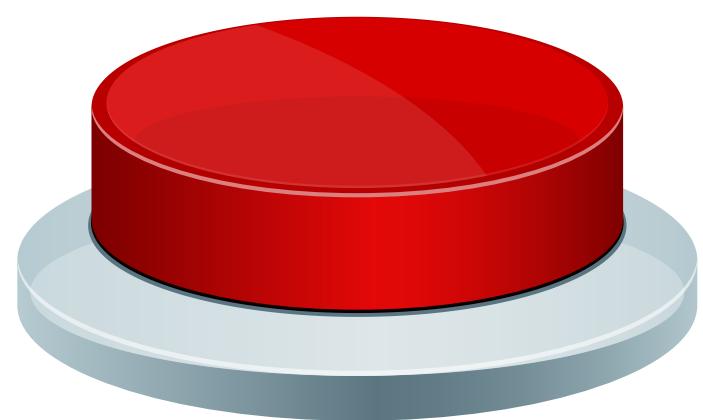


Remember the PushButton



Button Pressed :

High (1)



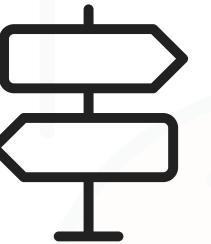
Button Released:

Low(0)

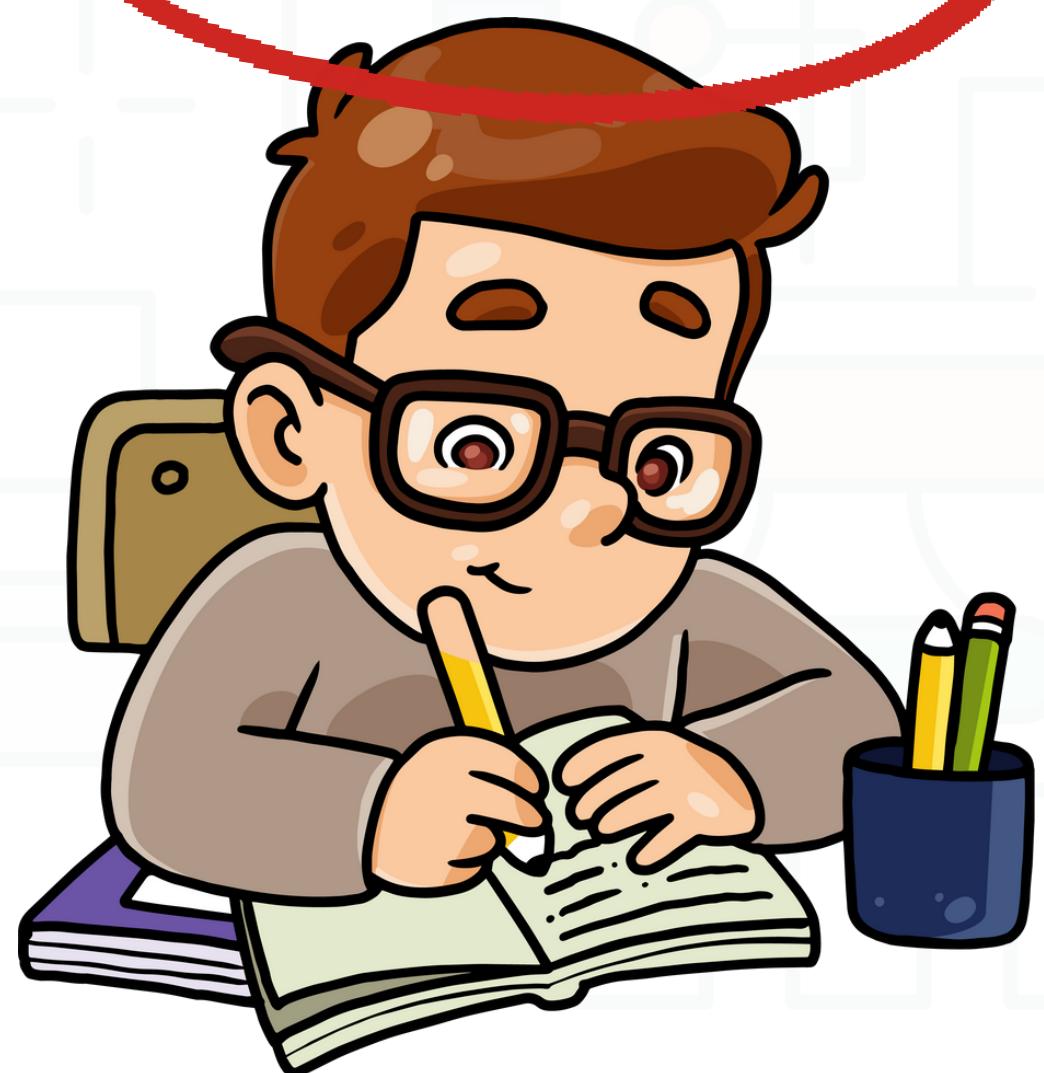


Remember

What are conditions ?



If you finish your homework



condition

Then you could watch TV



action

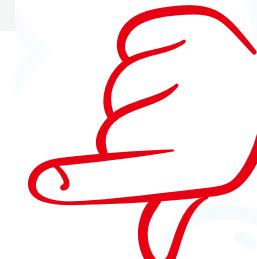


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How to create if condition on arduino IDE

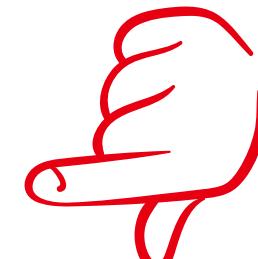
1

```
if (someCondition)
{
    // do stuff if the condition is true
}
```



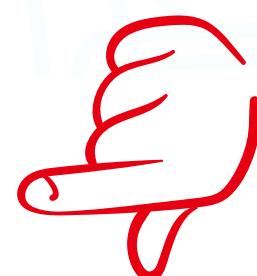
2

```
if (someCondition)
{
    // do stuff if the condition is true
}
else
{
    // do stuff if the condition is false
}
```



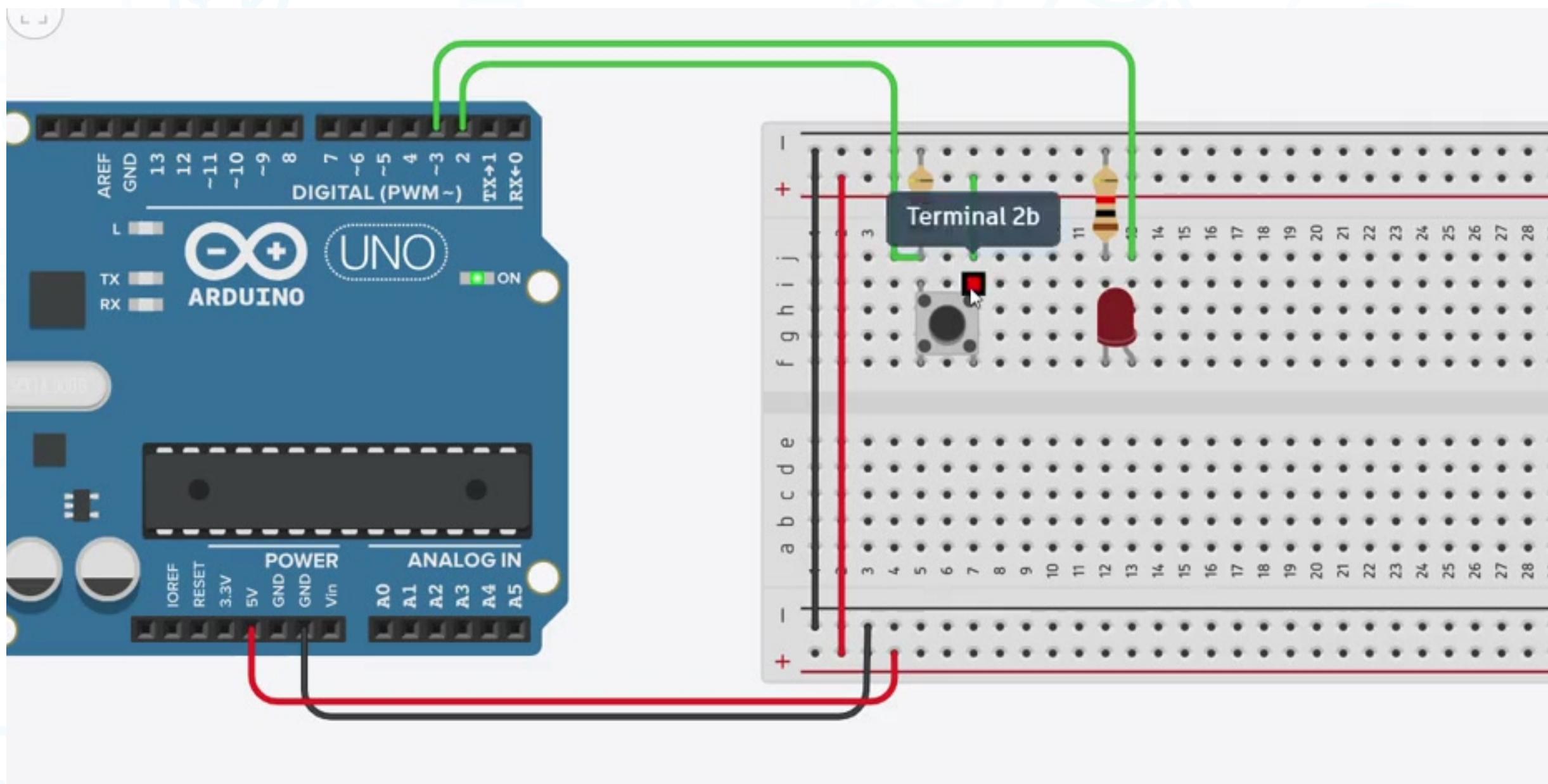
3

```
if (someCondition) {
    // do stuff if the condition is true
}
else if (anotherCondition)
{
    // do stuff only if the first condition is false
    // and the second condition is true
}
else
{
    // do stuff only if all the if conditions above aren't achieved first
}
```



Example(LED and Pushbutton)

Example: Pushbutton that changes the LED state each time pressed



Example(LEDs and Pushbutton)



digitalRead()

```
if (someCondition)
{
    // do stuff if the condition is true
}
else
{
    // do stuff if the condition is false
}
```

Example(LEDs and Pushbutton)

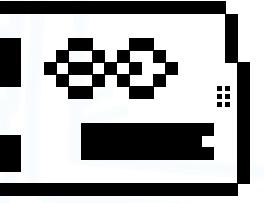


This assigns the value of the right side
to the variable in the left side



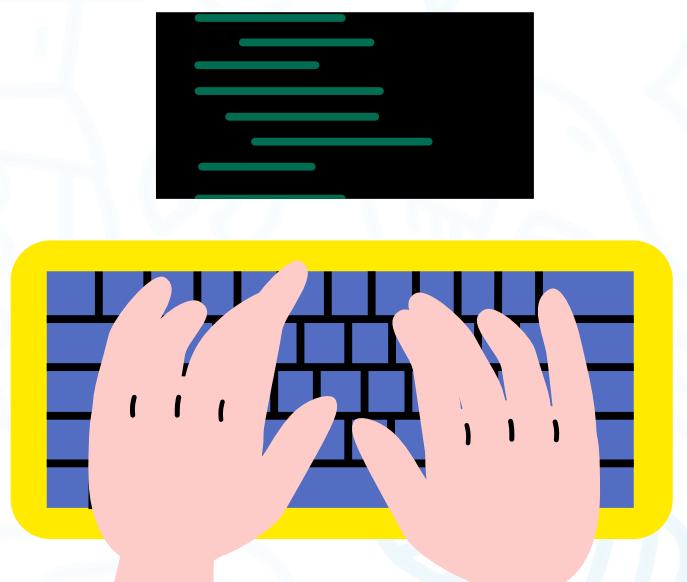
This compares the value of the right
side to the variable in the left side

Let's try it on Arduino IDE



Experiment: Pushbutton and LED

Try to partition the code yourself



Example(LEDs and Pushbutton)

Initialize our three variables

```
int buttonState = 0;          // Variable to store the button state
int lastButtonState = 0;       // Variable to store the previous button state
int ledState = LOW;           // Initial LED state

void setup() {
    pinMode(D8,INPUT);      // Pin for the button
    pinMode(D3, OUTPUT);     // Pin for the LED
}
```

Setting up the pins

Example(LEDs and Pushbutton)

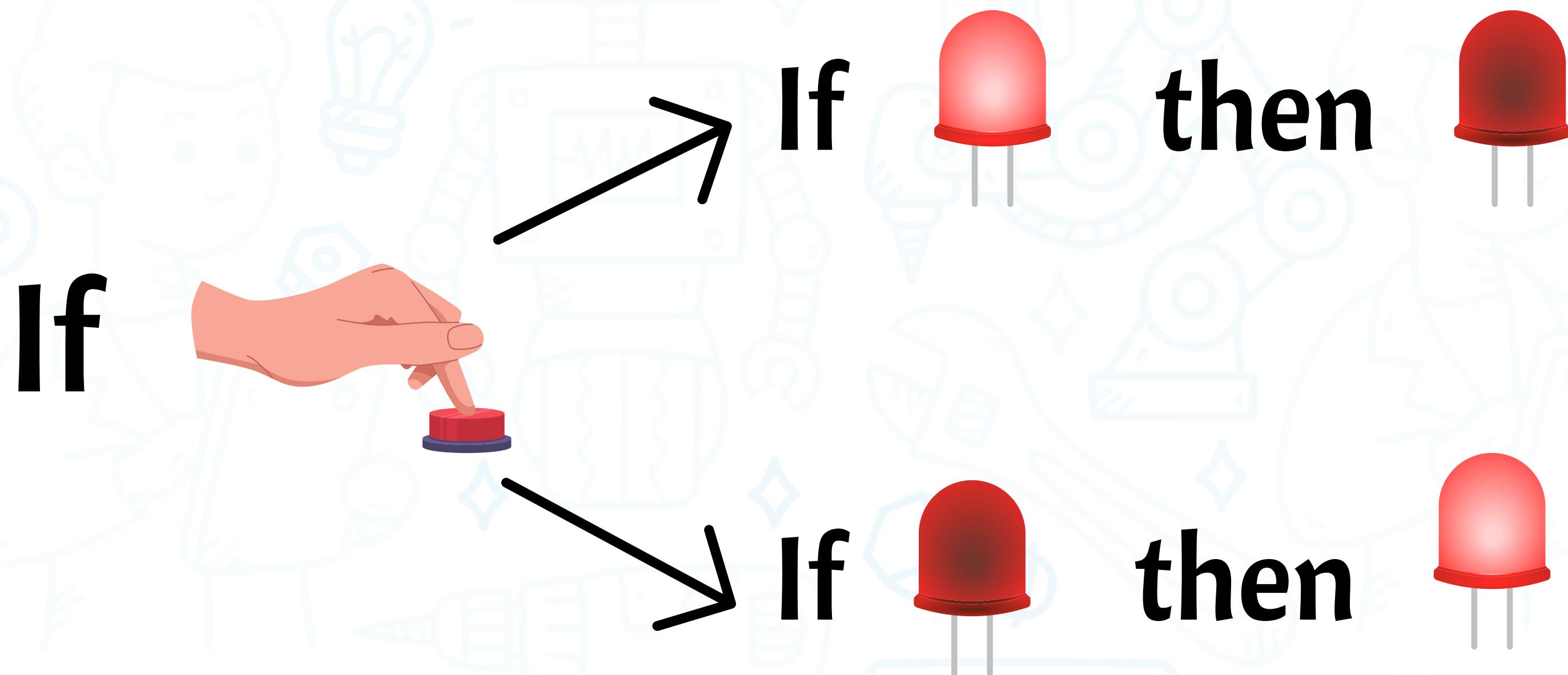
Read the current button state

```
buttonState = digitalRead(D8);
```

```
if (buttonState != lastButtonState)
```

Check if the button state has changed

Example(LEDs and Pushbutton)



Example(LEDs and Pushbutton)

```
if (buttonState == HIGH)
{
    if (ledState==LOW)
    {
        ledState=HIGH;
        digitalWrite(D3, ledState);
    }
    else
    {
        ledState=LOW;
        digitalWrite(D3, ledState);
    }
}
```

If button pressed
If the led is off
turn on the LED

Example(LEDs and Pushbutton)

store thr value of the current button state in the
last button state

```
lastButtonState = buttonState;
```



Example(LEDs and Pushbutton)

```
void loop() {
    buttonState = digitalRead(D8); // Read the current button state

    // Check if the button state has changed
    if (buttonState != lastButtonState) {
        if (buttonState == HIGH)
        {
            if (ledState==LOW)
            {
                ledState=HIGH;
                digitalWrite(D3, ledState);
            }
            else
            {
                ledState=LOW;
                digitalWrite(D3, ledState);
            }
        }
    }

    // Store the current button state for comparison
    lastButtonState = buttonState;
}
```

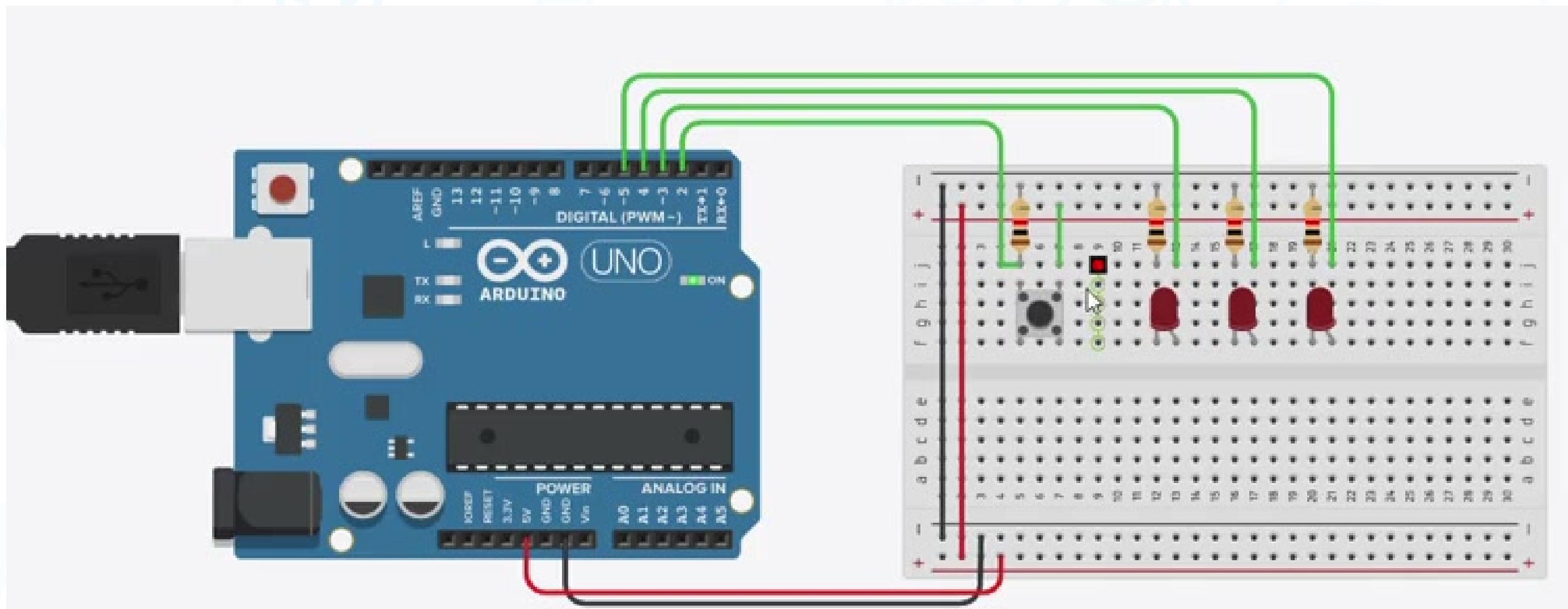
New Example

let's start thinking

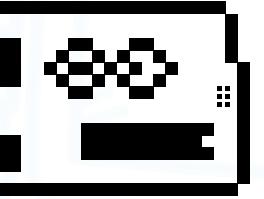


Example(LED and Pushbutton)

Example: Pushbutton that changes the on LED each time pressed



Let's try it on Arduino IDE



Step 1: `digitalRead (button pin)`

Step 2: Previous button state to compare
for a change

Step 3: the on LED

VARIABLE

Button state



last Button state

LED Index



Example(LEDs and Pushbutton)

```
int buttonState = LOW;  
int lastButtonState = LOW;  
int ledIndex = 1;  
  
void setup() {  
    pinMode(D8, INPUT);  
    pinMode(D0, OUTPUT);  
    pinMode(D3, OUTPUT);  
    pinMode(D4, OUTPUT);  
}
```



Initialize our three variables

Setting up the pins

Example(LEDs and Pushbutton)

Read the current button state

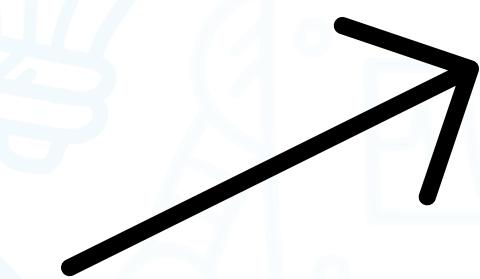
```
buttonState = digitalRead(D8);
```

```
if (buttonState != lastButtonState)
```

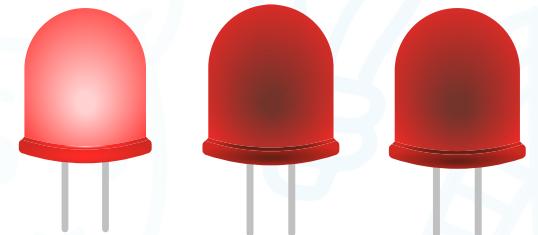
Check if the button state has changed

Example(LEDs and Pushbutton)

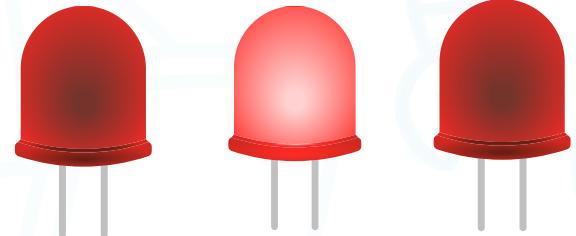
If



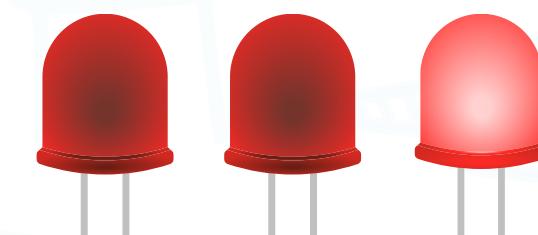
if LED index =1 then



if LED index =2 then



if LED index =3 then



Example(LEDs and Pushbutton)

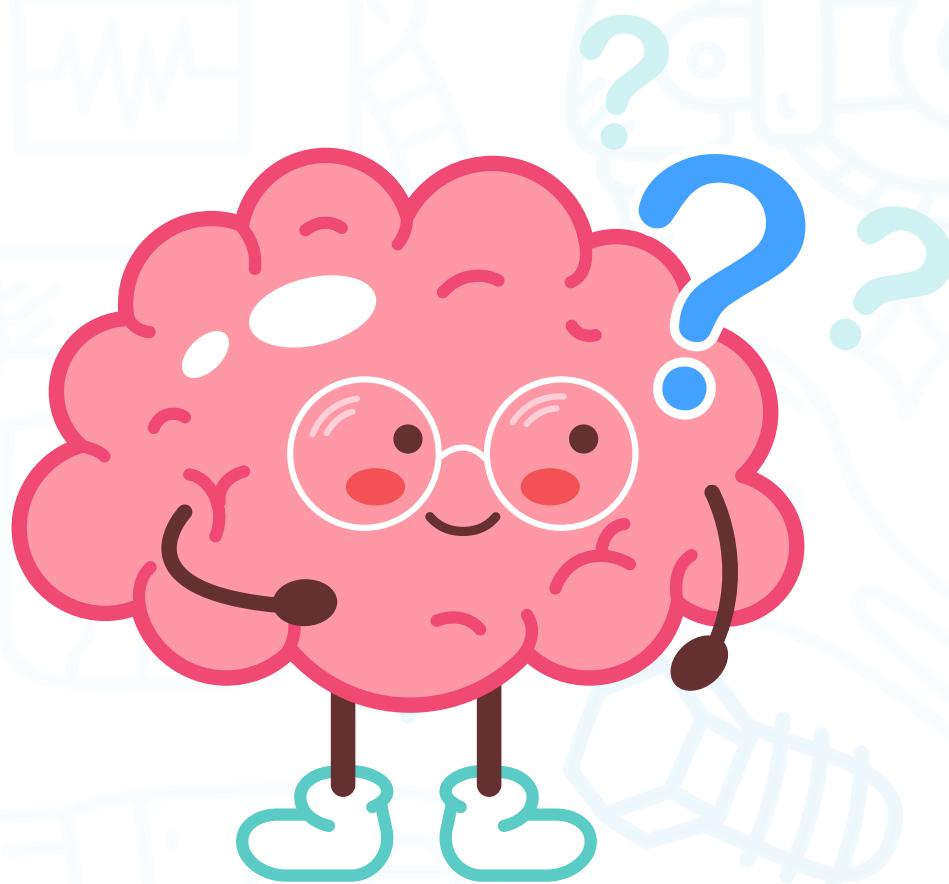
```
if (buttonState == HIGH) {  
    digitalWrite(D0, LOW);  
    digitalWrite(D3, LOW);  
    digitalWrite(D4, LOW);  
  
    if (ledIndex == 1) {  
        digitalWrite(D0, HIGH);  
    } else if (ledIndex == 2) {  
        digitalWrite(D3, HIGH);  
    } else if (ledIndex == 3) {  
        digitalWrite(D4, HIGH);  
    }  
  
    ledIndex++;
```

To turn off the LEDs

increase the number
each press

Think

How can i reset the LEDs to start again ??



Example(LEDs and Pushbutton)

```
if (ledIndex > 3)  
{  
    ledIndex = 1;  
}
```



→ to reset

Example(LEDs and Pushbutton)

store the value of the current button state in the
last button state

```
lastButtonState = buttonState;
```



Example(LEDs and Pushbutton)

```
void loop() {
    buttonState = digitalRead(D8); // Read the current button state

    // Check if the button state has changed
    if (buttonState != lastButtonState) {
        if (buttonState == HIGH)
        {
            if (ledState==LOW)
            {
                ledState=HIGH;
                digitalWrite(D3, ledState);
            }
            else
            {
                ledState=LOW;
                digitalWrite(D3, ledState);
            }
        }
    }

    // Store the current button state for comparison
    lastButtonState = buttonState;
}
```

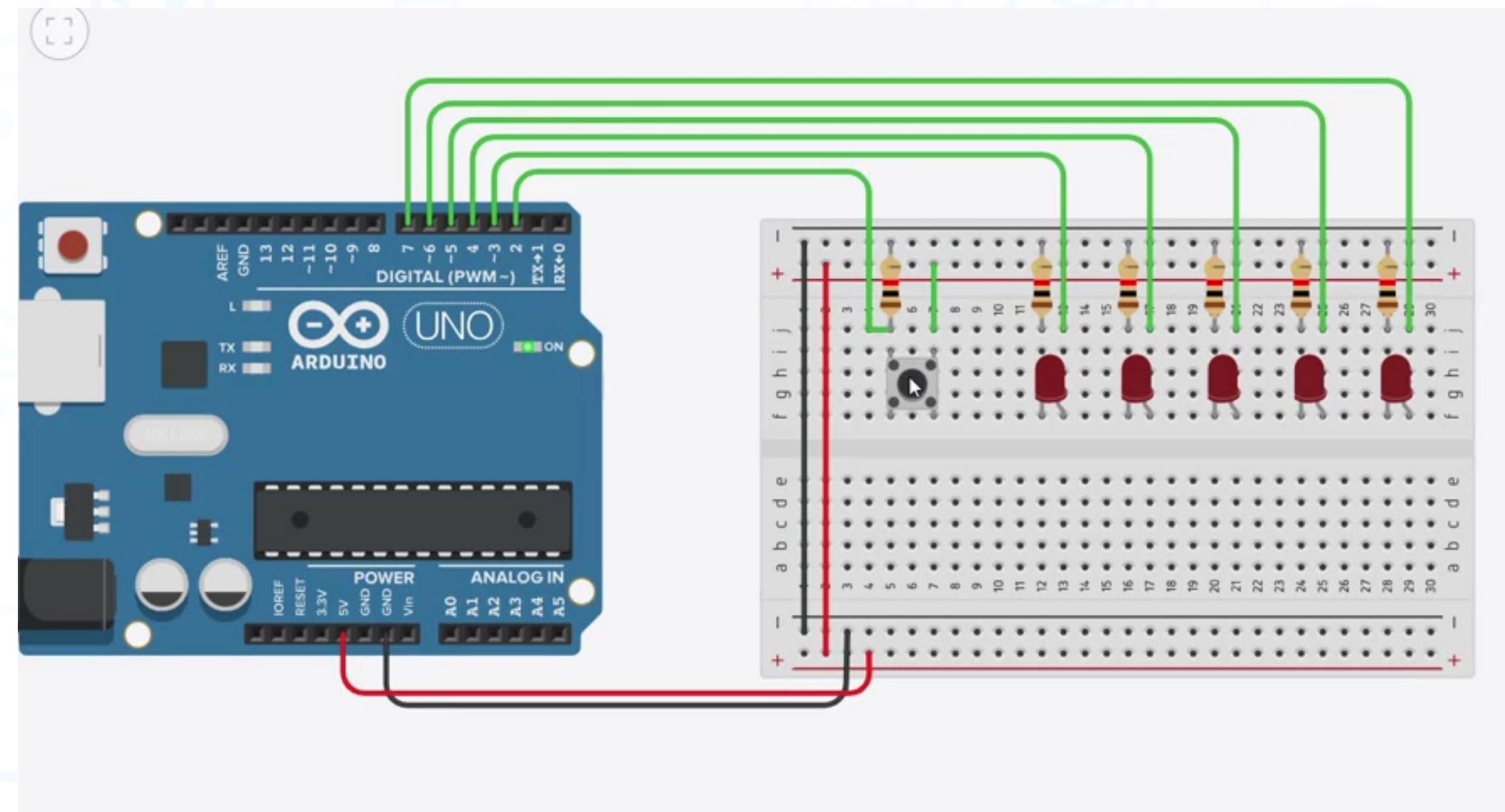
New Example

let's start thinking

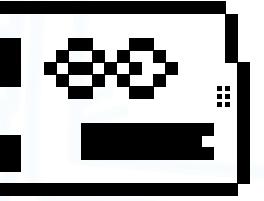


Example(LED and Pushbutton)

Example: Pushbutton that increases the on LED each time pressed



Let's try it on Arduino IDE



Step 1: `digitalRead (button pin)`

Step 2: Previous button state to compare
for a change

Step 3: the on LEDs

VARIABLE

Button state



last Button state

LED Index



Example(LEDs and Pushbutton)

```
int buttonState = LOW;
int lastButtonState = LOW;
int ledIndex = 1;

void setup() {
    pinMode(D8, INPUT);
    pinMode(D0, OUTPUT);
    pinMode(D3, OUTPUT);
    pinMode(D4, OUTPUT);
    pinMode(D5, OUTPUT);
    pinMode(D6, OUTPUT);
}
```



Initialize our three variables

Setting up the pins

Example(LEDs and Pushbutton)

Read the current button state

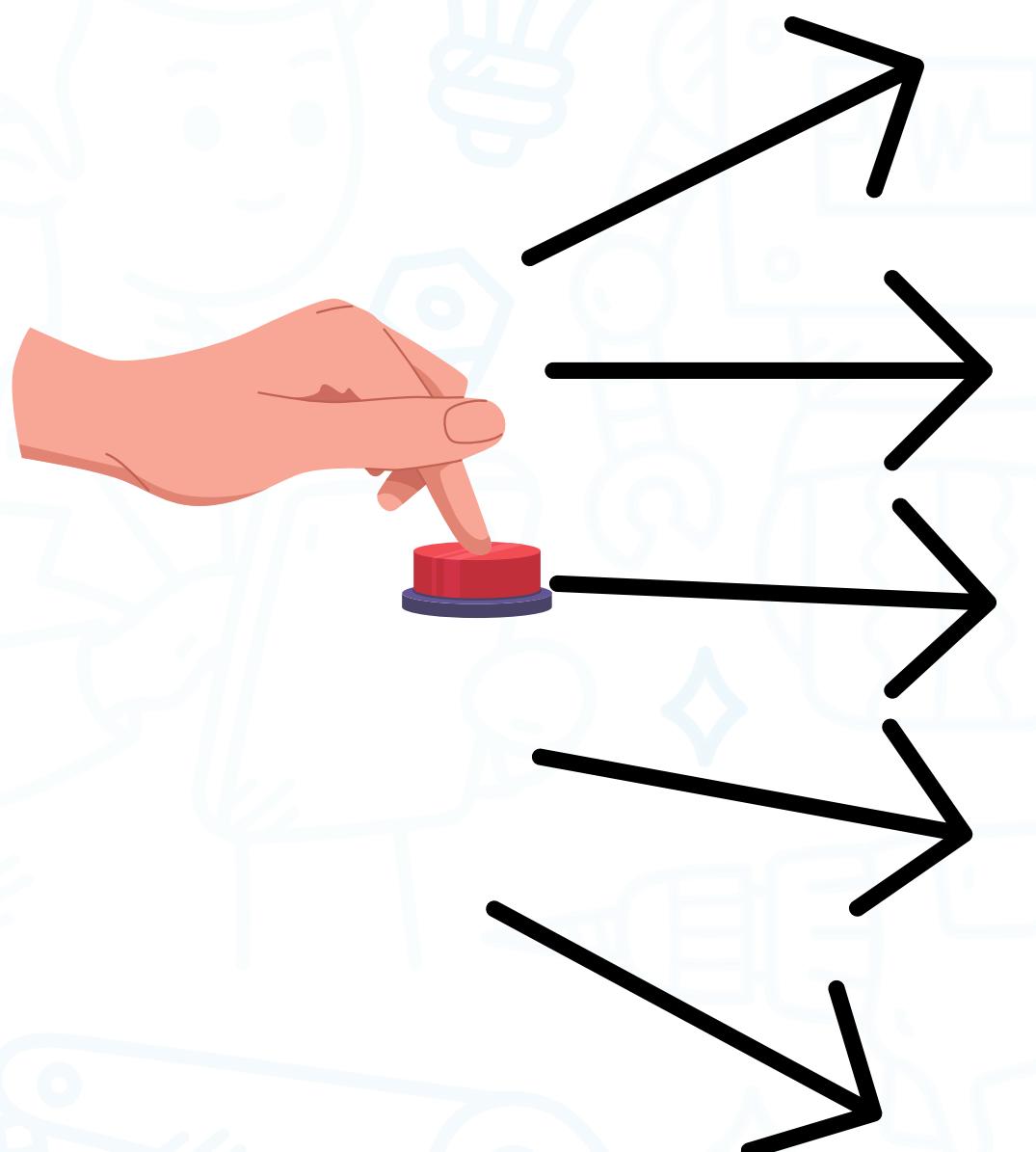
```
buttonState = digitalRead(D8);
```

```
if (buttonState != lastButtonState)
```

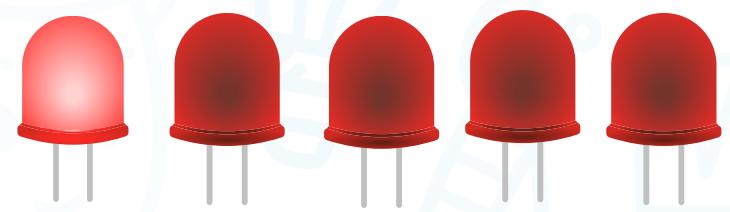
Check if the button state has changed

Example(LEDs and Pushbutton)

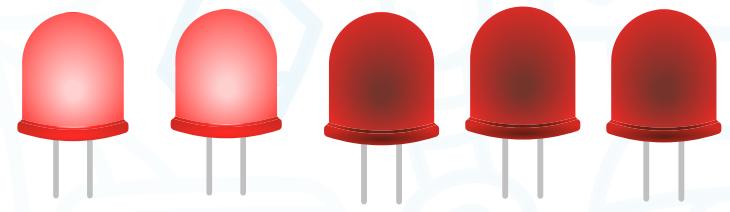
If



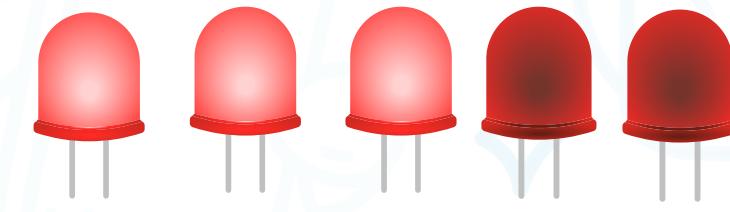
if LED index =1 then



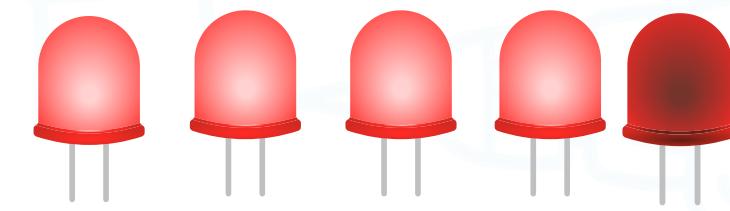
if LED index =2 then



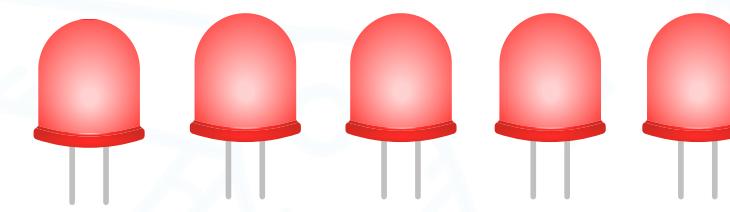
if LED index =3 then



if LED index =4 then

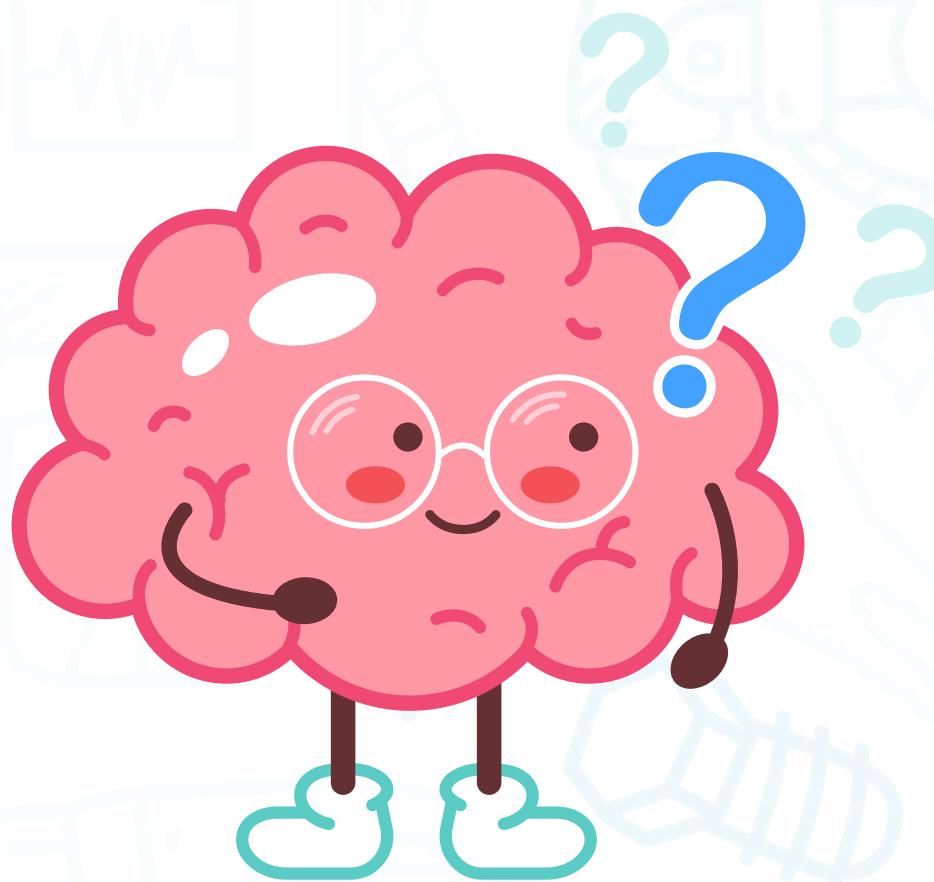


if LED index =5 then



Think

What are the modifications to the past code ??



Example(LEDs and Pushbutton)

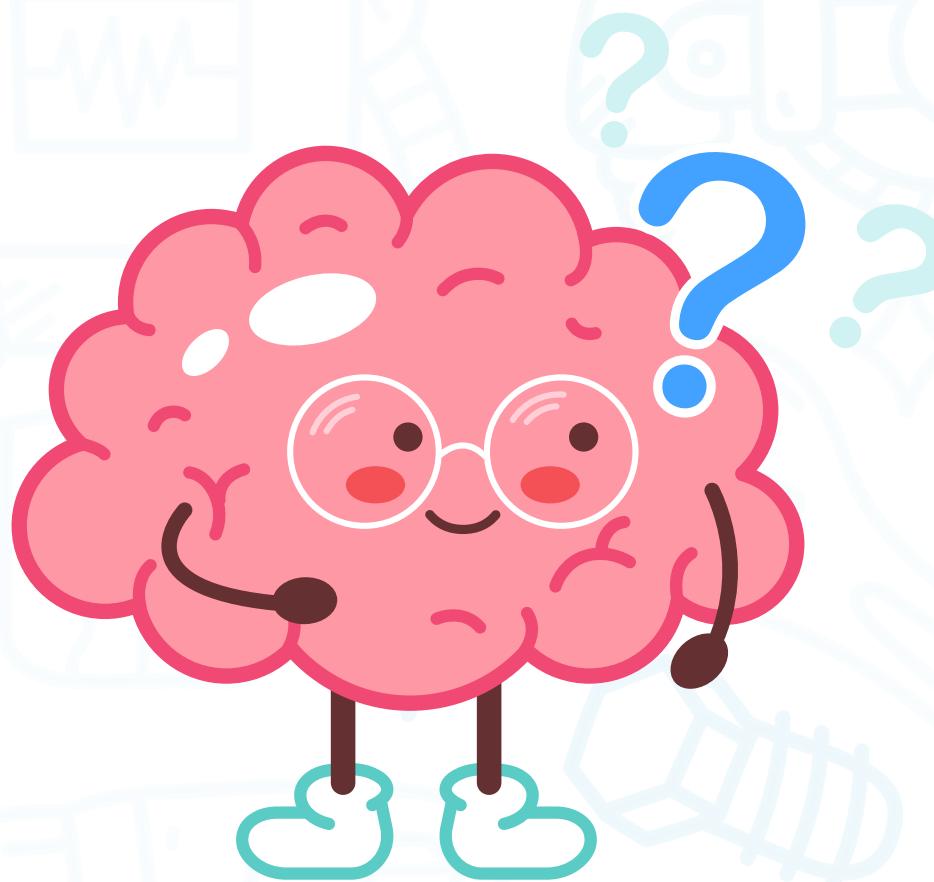
```
if (buttonState == HIGH) {  
  
    if (ledIndex == 1) {  
        digitalWrite(D0, HIGH);  
    } else if (ledIndex == 2) {  
        digitalWrite(D3, HIGH);  
    } else if (ledIndex == 3) {  
        digitalWrite(D4, HIGH);  
    }else if (ledIndex == 4) {  
        digitalWrite(D5, HIGH);  
    }else if (ledIndex == 5) {  
        digitalWrite(D6, HIGH);  
    }  
  
    ledIndex++;
```



increase the number
each press

Think

What is the difference from the last code ?



Example(LEDs and Pushbutton)

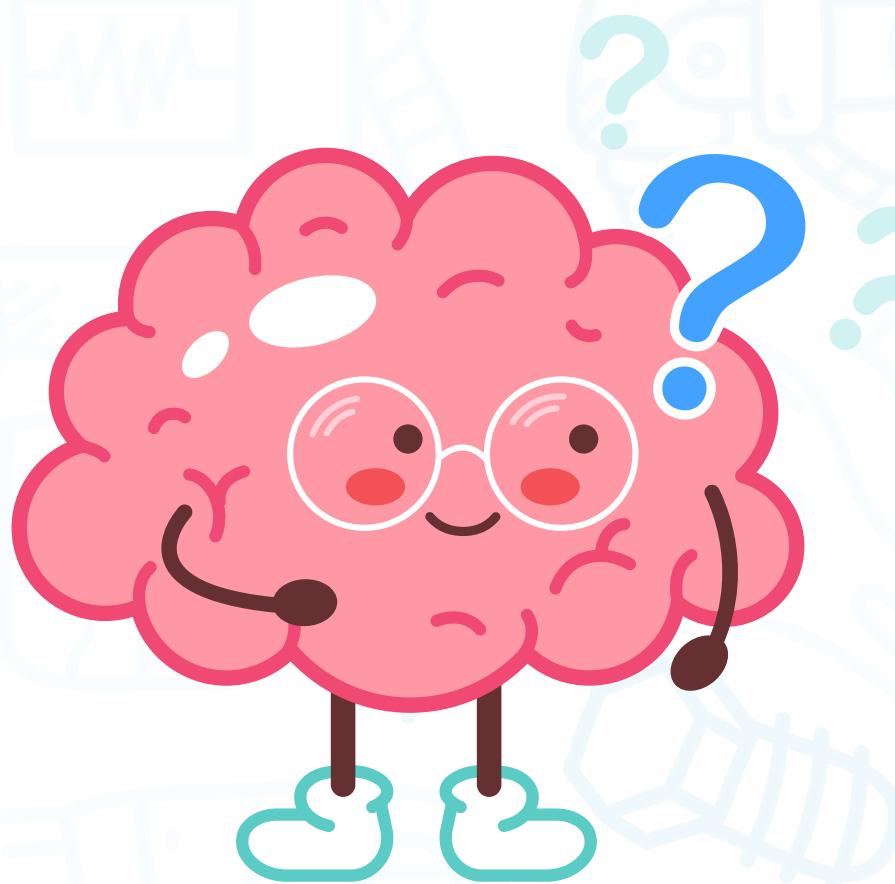
```
if (buttonState == HIGH) {  
    digitalWrite(D0, LOW);  
    digitalWrite(D3, LOW);  
    digitalWrite(D4, LOW);  
  
    if (ledIndex == 1) {  
        digitalWrite(D0, HIGH);  
    } else if (ledIndex == 2) {  
        digitalWrite(D3, HIGH);  
    } else if (ledIndex == 3) {  
        digitalWrite(D4, HIGH);  
    }  
  
    ledIndex++;
```

removed this part so
the led once on stays
on its state till reset

```
if (buttonState == HIGH) {  
  
    if (ledIndex == 1) {  
        digitalWrite(D0, HIGH);  
    } else if (ledIndex == 2) {  
        digitalWrite(D3, HIGH);  
    } else if (ledIndex == 3) {  
        digitalWrite(D4, HIGH);  
    }else if (ledIndex == 4) {  
        digitalWrite(D5, HIGH);  
    }else if (ledIndex == 5) {  
        digitalWrite(D6, HIGH);  
    }  
  
    ledIndex++;
```

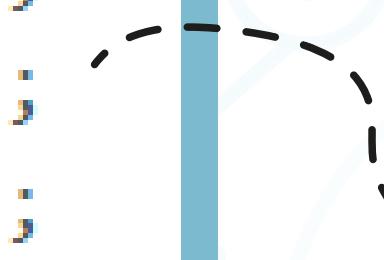
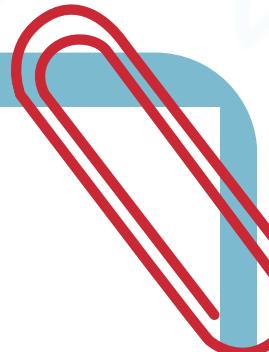
Think

How to reset ?



Example(LEDs and Pushbutton)

```
if (ledIndex > 6)
{
    ledIndex = 1;
    digitalWrite(D0, LOW);
    digitalWrite(D3, LOW);
    digitalWrite(D4, LOW);
    digitalWrite(D5, LOW);
    digitalWrite(D6, LOW);
}
```



to reset

Example(LEDs and Pushbutton)

store the value of the current button state in the
last button state

```
lastButtonState = buttonState;
```



Example(LEDs and Pushbutton)

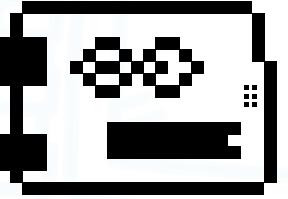
```
void loop() {
    buttonState = digitalRead(D8);

    if (buttonState != lastButtonState) {
        if (buttonState == HIGH) {

            if (ledIndex == 1) {
                digitalWrite(D0, HIGH);
            } else if (ledIndex == 2) {
                digitalWrite(D3, HIGH);
            } else if (ledIndex == 3) {
                digitalWrite(D4, HIGH);
            }else if (ledIndex == 4) {
                digitalWrite(D5, HIGH);
            }else if (ledIndex == 5) {
                digitalWrite(D6, HIGH);
            }

            ledIndex++;
            if (ledIndex > 6)
            {
                ledIndex = 1;
                digitalWrite(D0, LOW);
                digitalWrite(D3, LOW);
                digitalWrite(D4, LOW);
                digitalWrite(D5, LOW);
                digitalWrite(D6, LOW);
            }
        }
        lastButtonState = buttonState;
    }
}
```

Let's try it on Arduino IDE



Try it by yourself



