

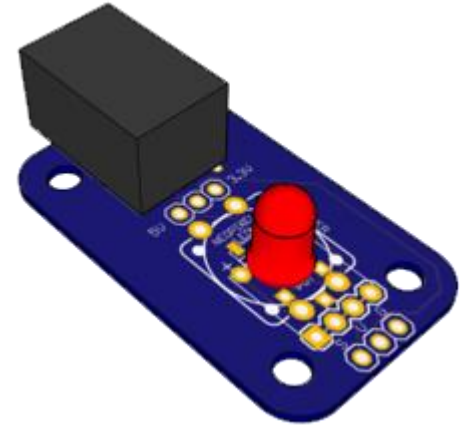
TScratch Basics

Coding with Arduino IDE (Software)

Learning Objective

In this tutorial you will learn:



Coding TScratch (Arduino IDE)



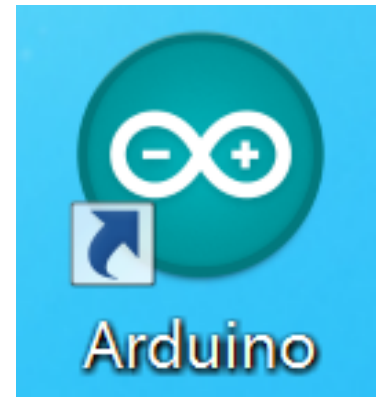
- How to code with TScratch
- How to use TScratch
- Basic coding with Arduino IDE & TSense (LED)

Connecting TScratch

3 STEPS TO CONNECT TScratch

| | | |
|--------|--|--|
| Step 1 | Plug the Mini-USB cable into the TScratch port |  |
| Step 2 | Connect the USB to the PC | |
| Step 3 | Run Arduino IDE on the PC |  |

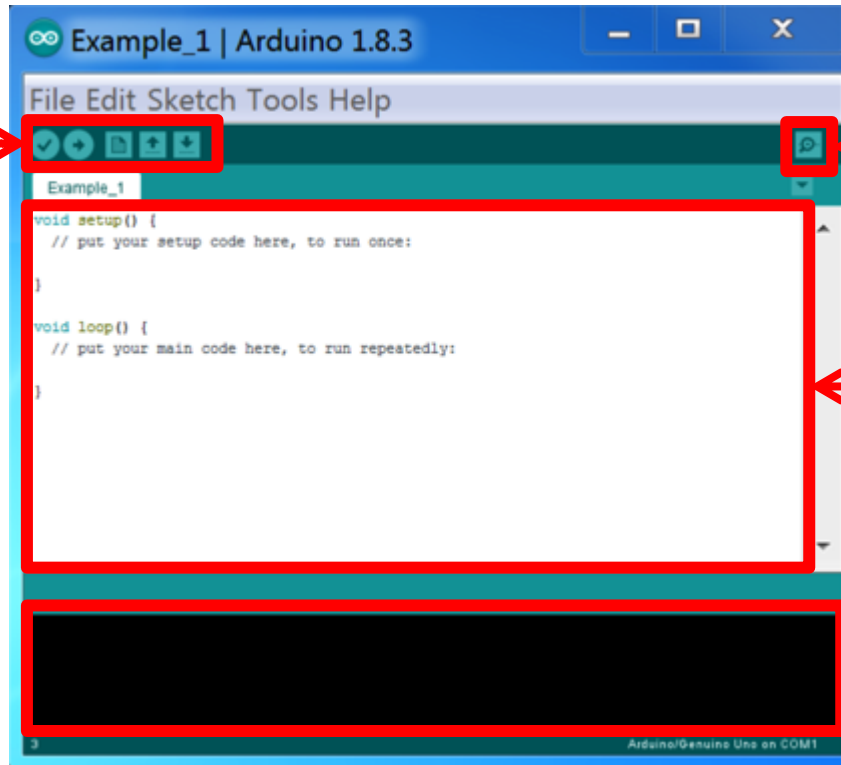
1. Basic GUI
2. Common Logic
3. Conditional Codes



CODING WITH ARDUINO IDE

Arduino User Interface

QuickTools



Serial Monitor

Coding Interface

Debugging
Interface
(Error screen)

Arduino Coding Interface

3-Part coding

```
example1  
  
void setup() {  
  // put your setup code here, to run once:  
}  
  
void loop() {  
  // put your main code here, to run repeatedly:  
  1  
}
```

Declaration space
(Declare variables to be used in the project)

Setup Function
(Run once at the beginning **only**)

Loop Function
(Code in here runs continuously after Setup function)

Signal Directions

There are 2 types of signal directions:

INPUTS

- Gives the user control over the program/instrument
- i.e. On/Off Button, Light Sensors, Smoke Detector, etc.

OUTPUTS

- Gives the user a signal or indication of what is happening
- I.E. LED, Alarm, Buzzer, Lights, Vibration, Etc.

Arduino Digital Functions

Digital function

Reading the values/state from the sensor inputs

```
digitalRead (sensor);
```

- When required to read a value from the sensor, the `digitalRead()` function will be used.

****Note that the letter R is capitalized**

Arduino Digital Functions

Digital function

Writing the values/state to the output channels
(i.e. buzzer, LED)

`digitalWrite` (output, `HIGH`);

- When required to write a value to the output, the `digitalWrite()` function will be used.

Note that the letter **W is capitalized

Arduino Logics

What are logics?

A simple test to determine if the equation is correct or wrong

- Correct == **TRUE**
- Incorrect == **FALSE**

For example: $1+1=14$?

- True/False

Write your first program

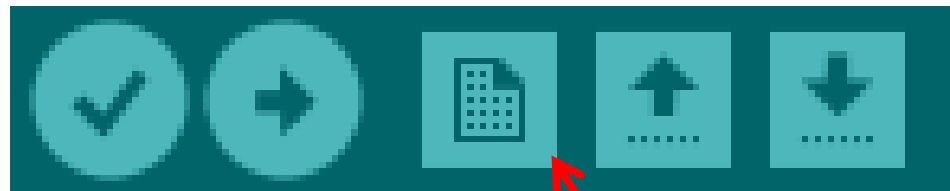
Write your first program for TScratch!

In this program, we will connect the TScratch to the LED (Light-Emitting Diode)!

Since the LED is an output, we code using `digitalWrite()`.

- Create a new project on the QUICK TOOLS

Quick Tools



New Project

Write your first program

- Define the LED as digital pin 12 in the declaration space (Note: Comments on the program follow `//` or `/**/` and have no effect on the code)
- In the setup code, initialize the pin 12 to be an output pin:

```
#define LED_PIN 12                // Defines pin of led as a constant

void setup() {                   // All initializations happen in this function
  pinMode(LED_PIN, OUTPUT);      // Initializes the digital pin 12 as an OUTPUT.
}
```

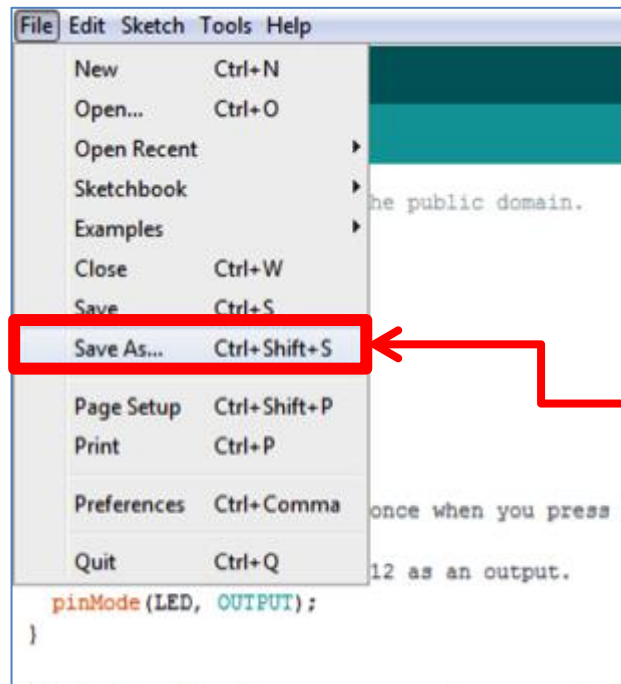
Write your first program

- Lastly in the loop code, add `digitalWrite()` and add a delay of 1000 milliseconds
- Note that the comments explain each line of code

```
void loop() {                                // The loop function will repeat forever
  digitalWrite(LED_PIN, HIGH);              // Turns the led on (HIGH is the voltage level)
  delay(1000);                               // Waits for a second
  digitalWrite(LED_PIN, LOW);               // Turns the led off by setting the voltage level to LOW
  delay(1000);                               // Waits for a second
}
```

Saving the project

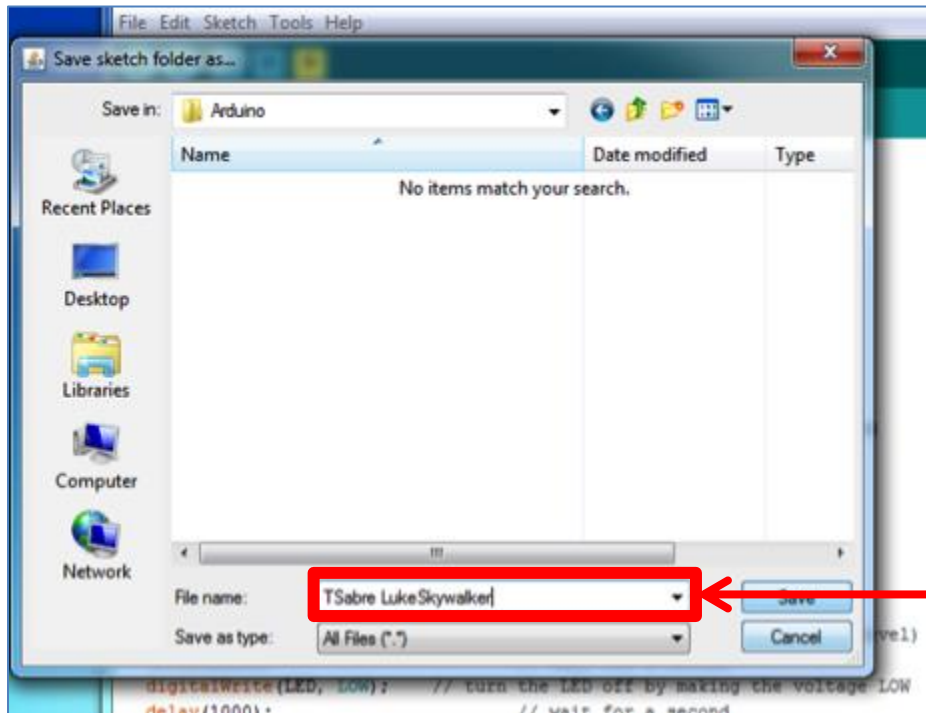
- Do the following steps to save your sketch project properly.
 1. Go to the “File” button on the menu and select it.
 2. Click on “Save As...”



Click on
“Save As”

Saving the project

3. Type the desired project name in the file name space
4. Click on “Save”

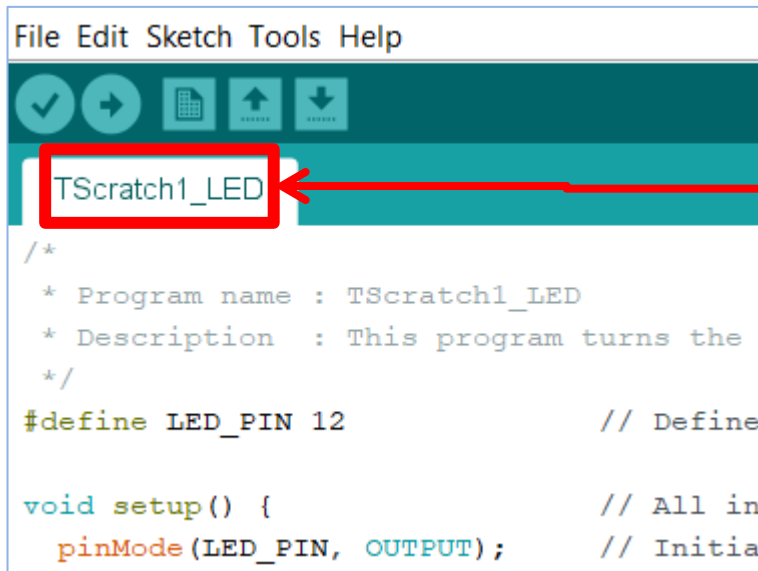


Name the project as
“TScratch1_LED”

Saving the project

5. Check the name of the project to confirm it has been saved

**In case of re-saving under the same project name, ensure that there is no asterisk(*) present.



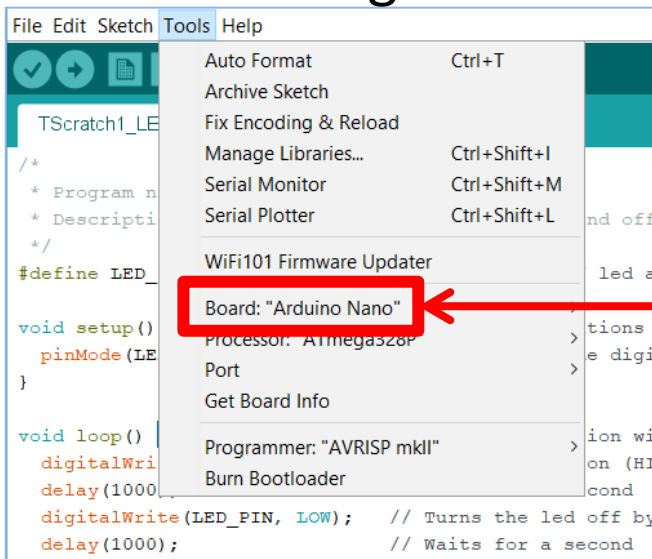
```
File Edit Sketch Tools Help
TScratch1_LED
/*
 * Program name : TScratch1_LED
 * Description  : This program turns the
 */
#define LED_PIN 12           // Define

void setup() {              // All in
  pinMode(LED_PIN, OUTPUT); // Initia
```

Confirm that the name has changed / no asterisk (*) present.

Uploading the project

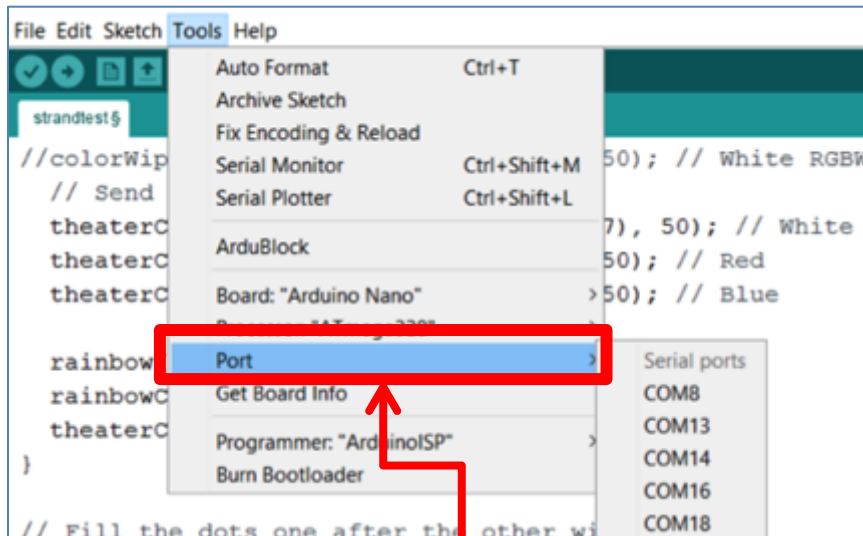
- Do the following steps to upload your sketch project into the Arduino.
1. Go to the “Tools” button on the menu.
 2. Click on it and scroll to “Board”
 3. Select and change to “Arduino Nano”



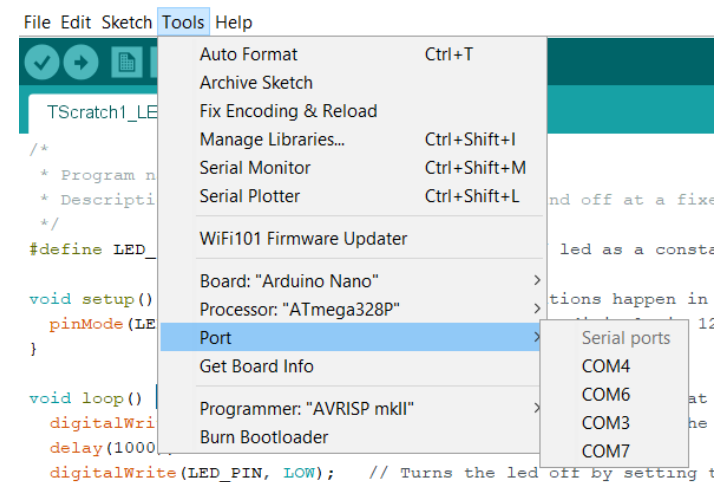
Ensure that
Arduino Nano is
selected

Uploading the project

4. Click on the “Tools” button again and go to “Port”
5. You should see the screen to the Right.

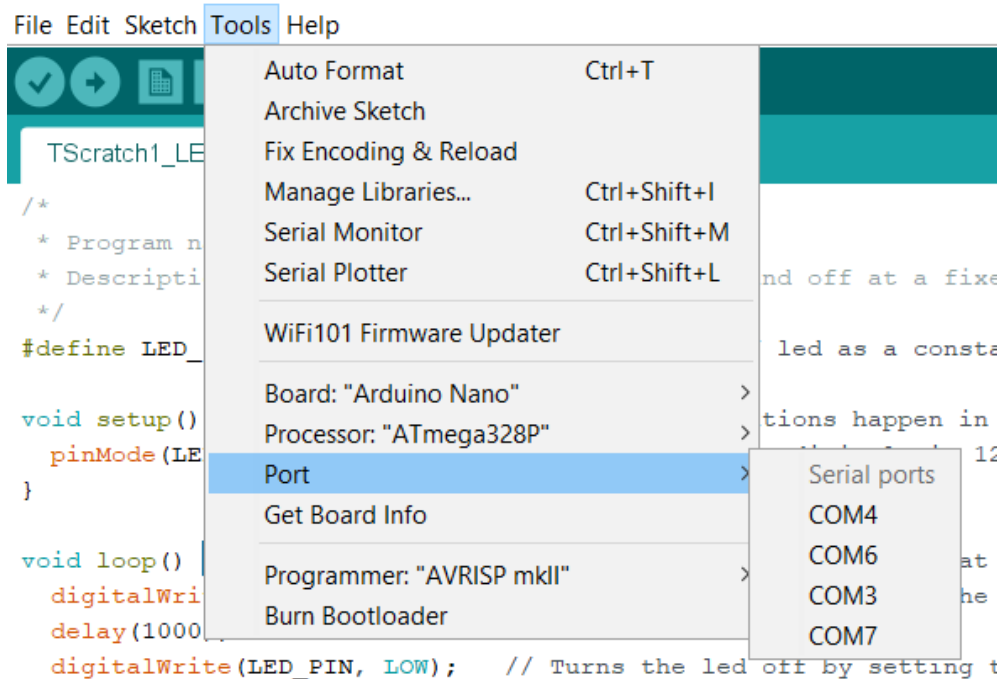


“Tools” → “Port”



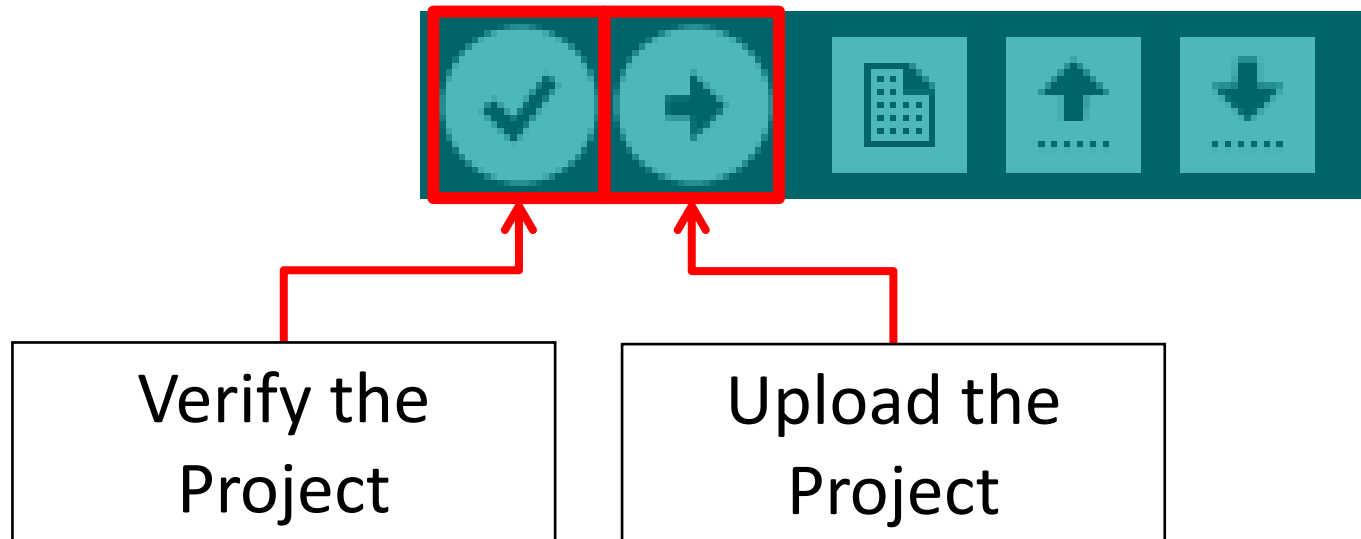
Uploading the project (cont')

6. Select the port that your TScratch is connected to (note: you may need to trial-and-error if you do not know your serial port number)



Uploading the project (cont')

7. Verify the project
8. Troubleshoot the project (if required)
9. Upload the project



Try it yourself

- Change the value of the delay to a different value (i.e. 2000)

```
#define LED_PIN 12          // Defines the LED pin as a constant

void setup() {
  pinMode(led, OUTPUT);    // initialize digital pin 12 as an 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(2000);             // wait for 2 seconds
  digitalWrite(led, LOW);  // turn the led off by making the voltage LOW
  delay(2000);             // wait for 2 seconds
}
```



Change to (2000)