PROGRAMMING An Arduino

Unleashing Creativity with Microcontrollers

How can we program an Arduino Board

- The programming of arduino is basically in C++ Programming language.
- THe developers of arduino has created a programming language based on C++ which is exclusively used for arduino board
- This language can be used to program any variants of arduino and also some of the other Dev boards mentioned earlier
- Programming of arduino is done through a software called Arduino IDE. Which is also developed by the Arduino community
- The software and the Language is super easy to learn and use
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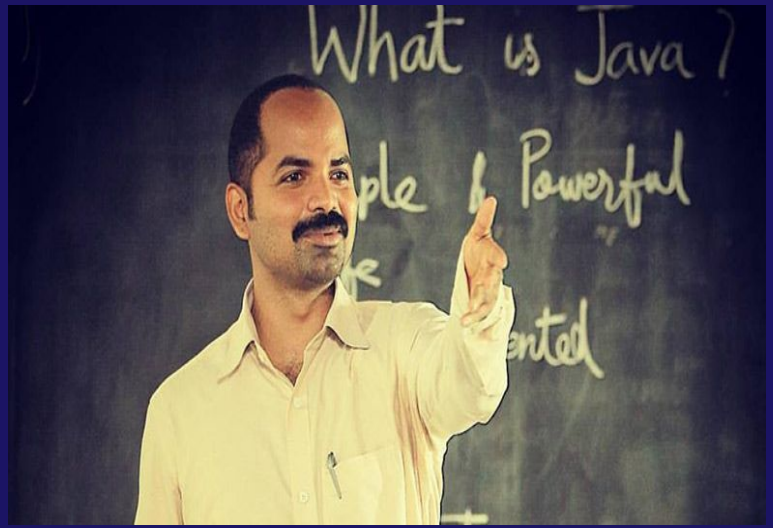

It is simple . But very powerful

So let's move on the software and language

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“"The best way to predict the future is to invent it." ”

—Alan Kay

01

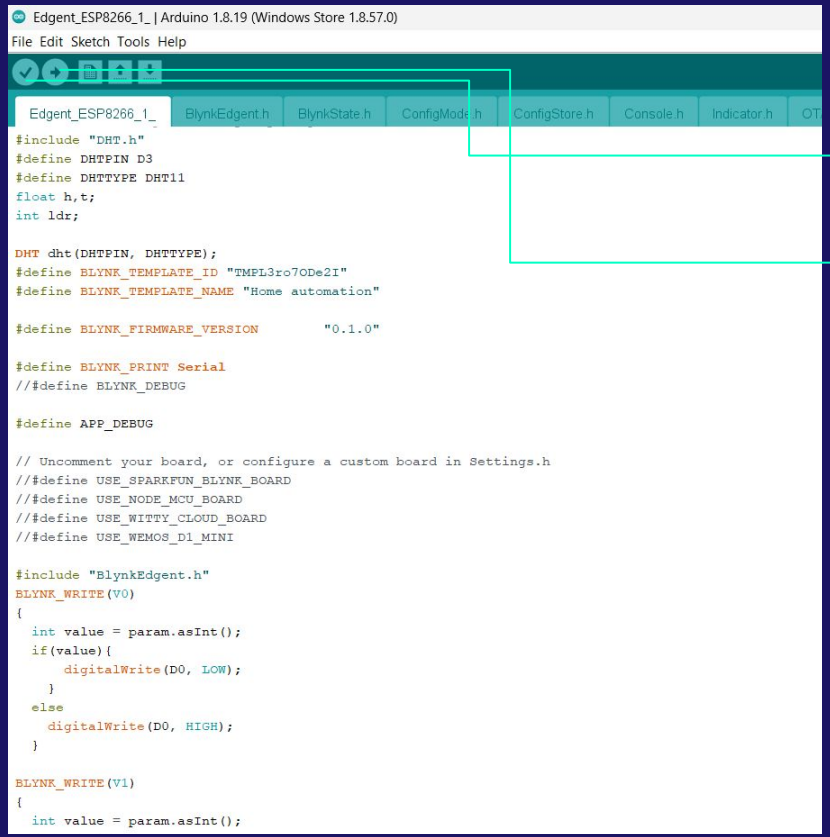
The Arduino IDE

About the IDE

The arduino IDE can be downloaded from the official website of the arduino. Just like the Arduino board the IDE is also open source. There are currently two stable version of the arduino ide. The version we prefer here is 1.8.19.

You can use the QR Code to download the IDE

The User Interface

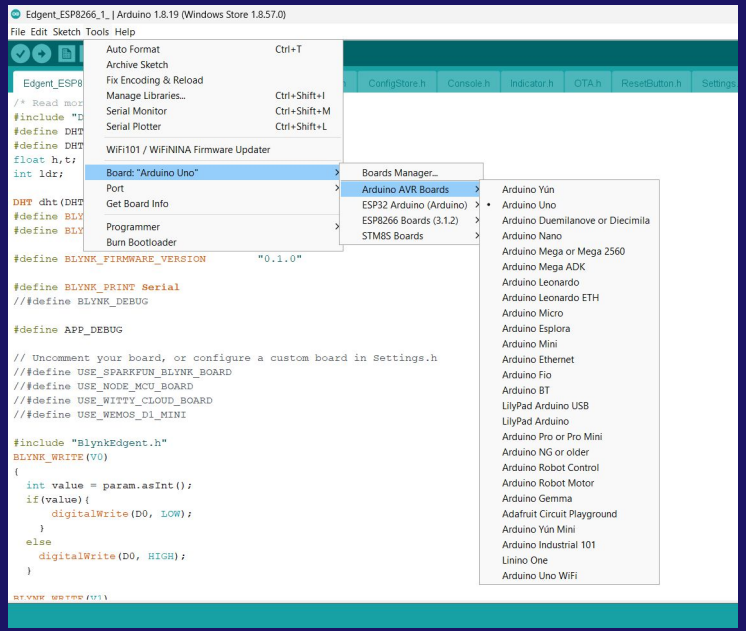


For compiling the Code

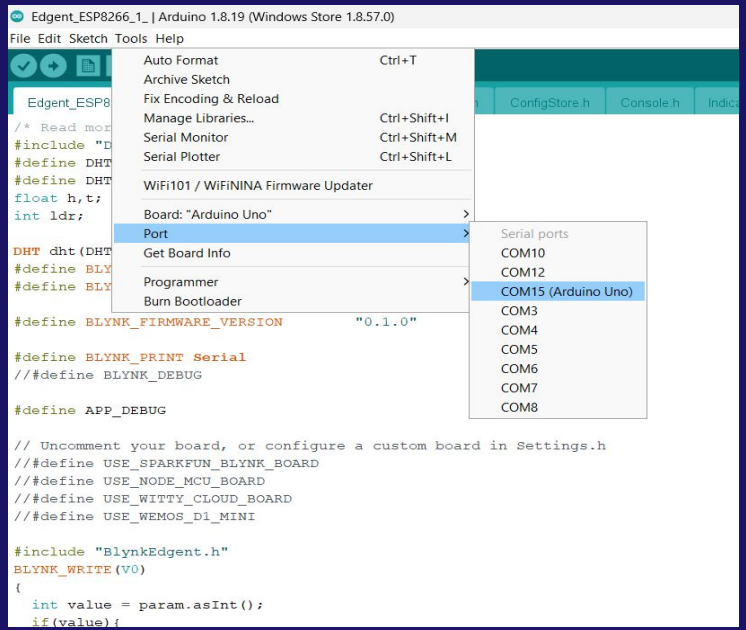
Uploading The code

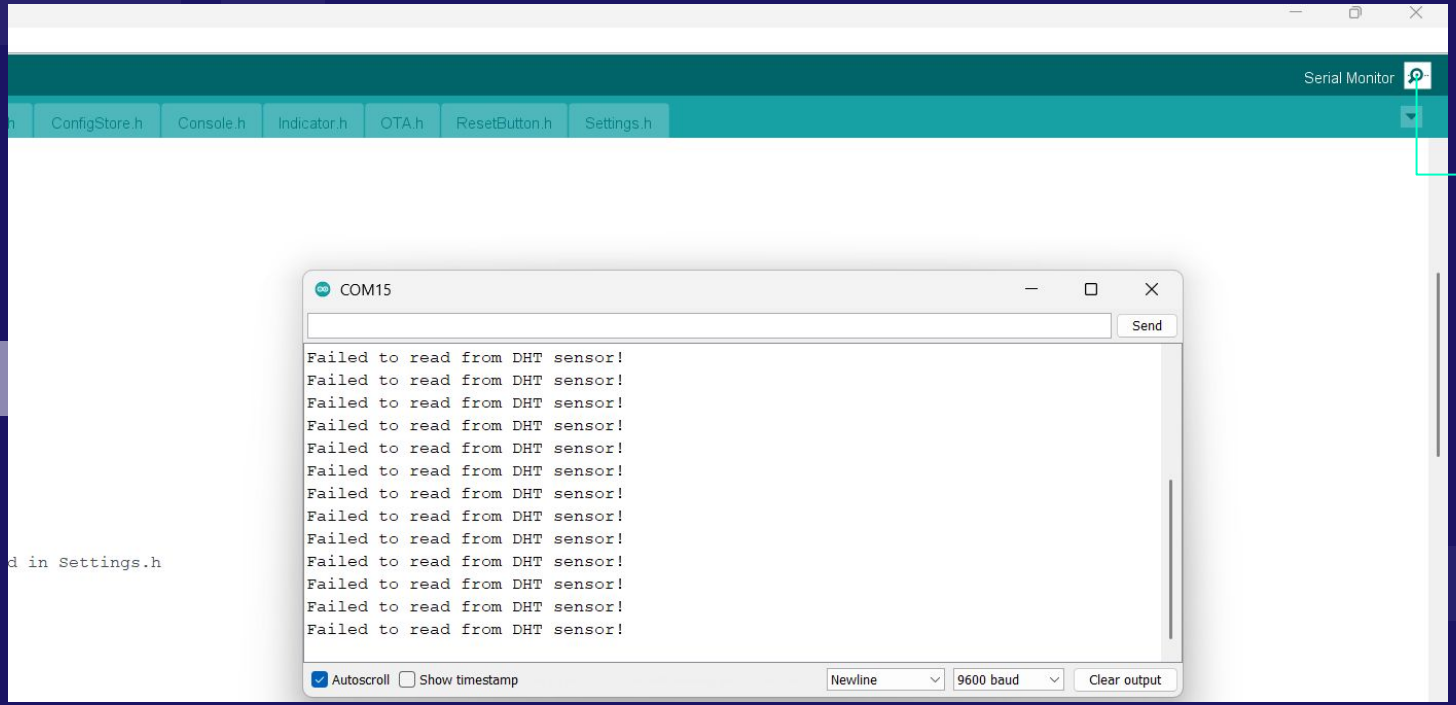
- Under the tools section we can find option to select board. You have to select the board you are working on. In our case Arduino Uno
- Other important thing is the port. Select correct COM port containing the Arduino UNO. This is generally shown in the IDE It self

Selecting the Board



Selecting the Port





To open the Serial Monitor

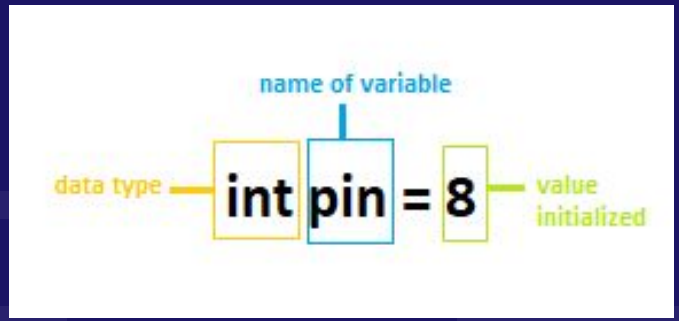
The Serial monitor is used to read the data from arduino and display.
We can also send binary data to the arduino through the Serial Monitor For complex projects.

02

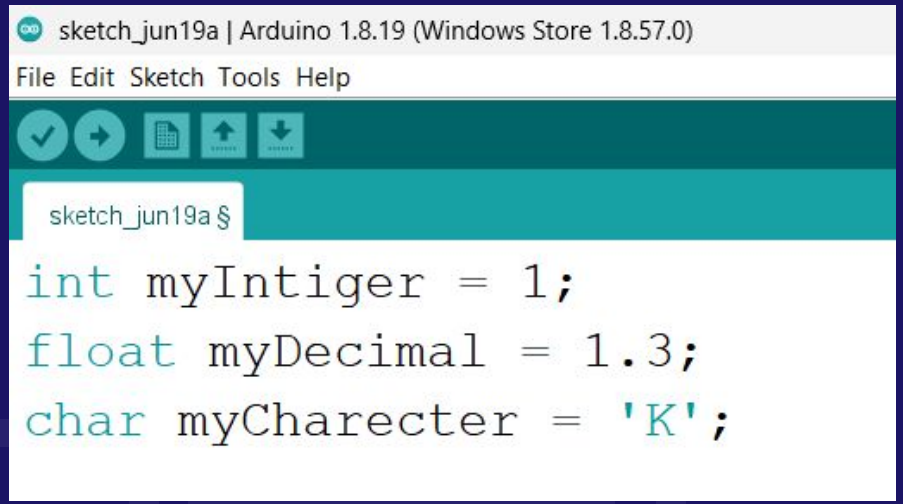
Learning The Language

Variables

- Variables are containers that holds information
- This information can be manipulated and controlled
- The data stored in variable can be passed to arduino board and it can manipulate and analyze it
- Also we can store the data send by arduino into a variable inside our programming language.
- Imagine variables as a box containing information. And that box has a name.
- The information inside the variable Can be Integers, floating point(Decimal number), characters and others



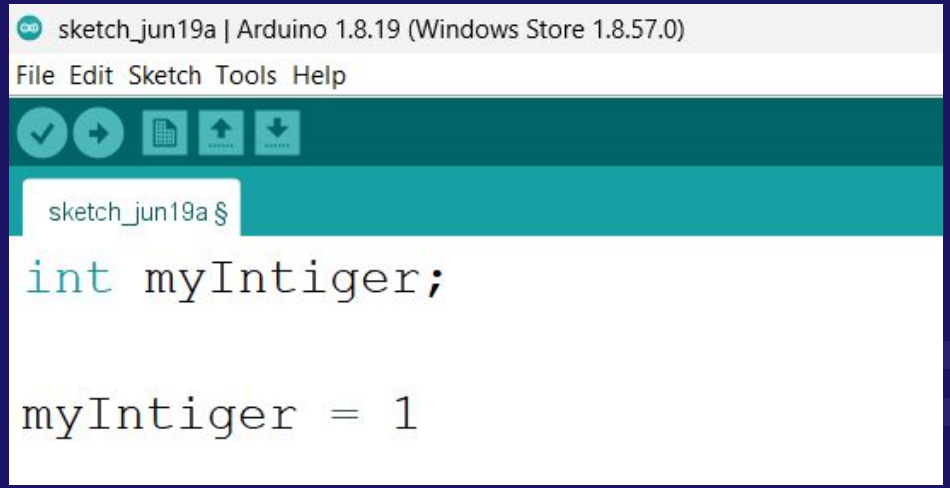
Declaring Variables



- While declaring the variable you need to first specify the data type
- If it is an integer you have to type int
- If it is decimal you can write float or double
- If it is a character value you can write char
- After the data type enter name of variable
- And after that you can assign the value by using an = sign

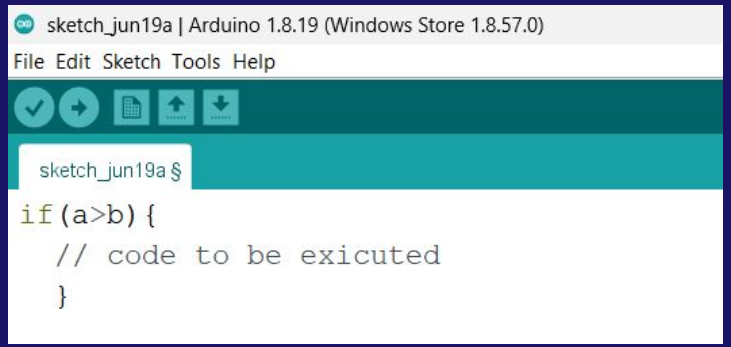
Things to keep in mind while declaring a variable

- Do not use space in variable name. Only use _ sign if necessary.
- Start the variable name always with characters not numbers or other special characters
- You can assign the value to variable after declaring it in any other section of code

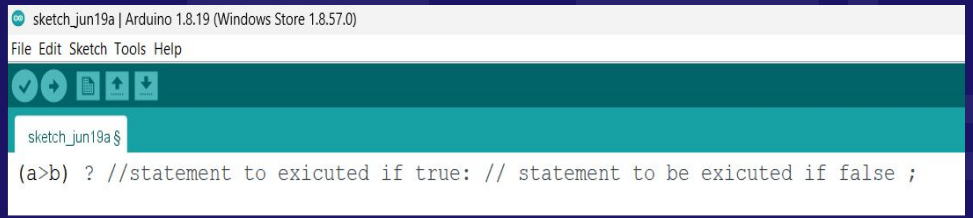


Conditional Statement

- Conditional statement comes to play when we want to execute a block of codes when only a specific condition come true
- There are two ways in which we can do conditional statement
- One is Ternary statement and other is if statement
- We will be working more with the if statement
- An if statement is complete with if else if and else statements



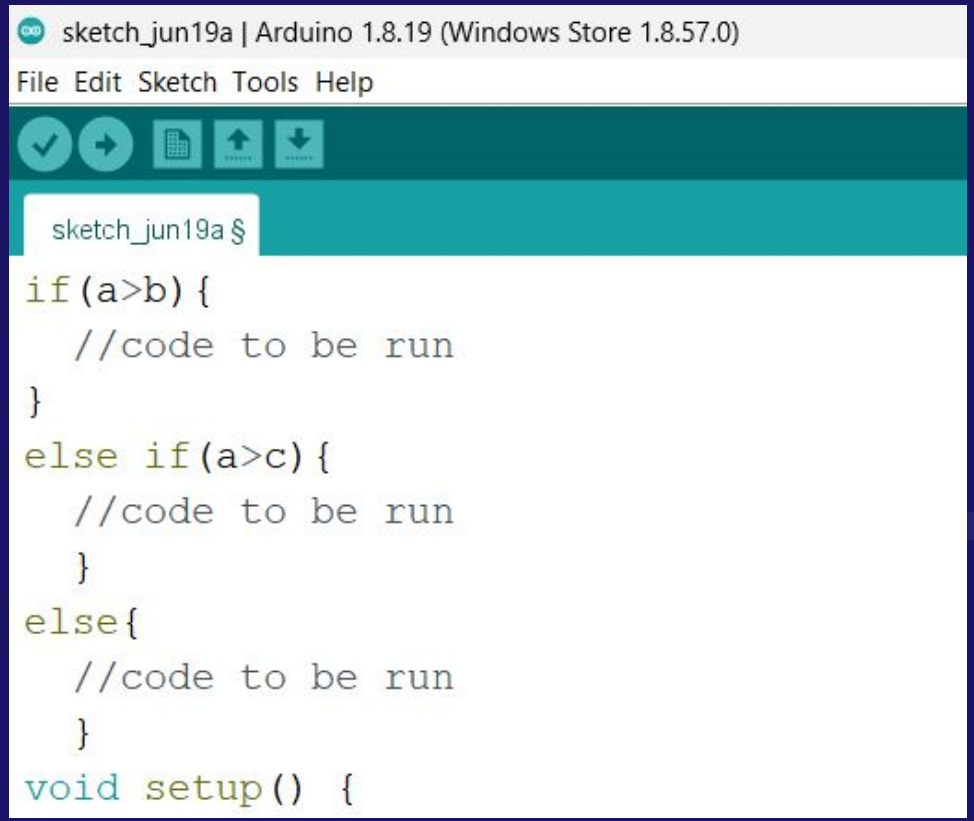
If statement



Ternary statement

Conditional Statement

- In an if else ladder. The programm check if the first condition if true
- It moves on to the next only if the condition is false
- If the condition is true . The code is executed and comes out of the ladder
- A model of if else ladder is given

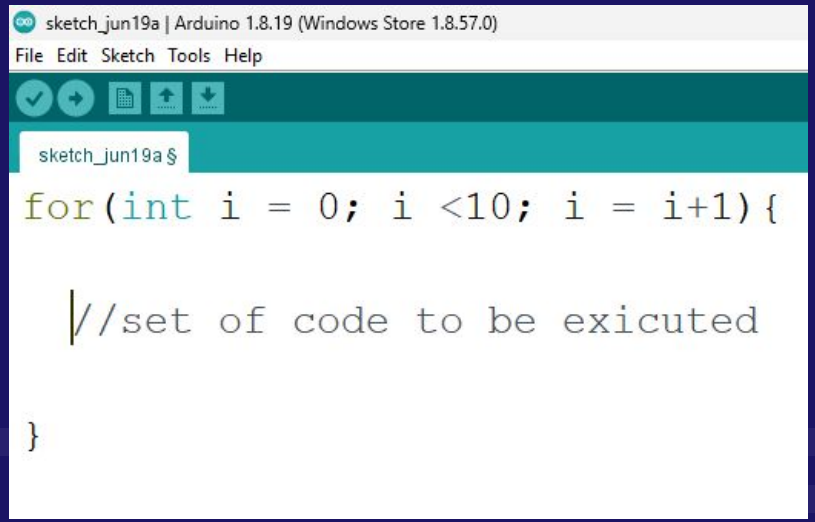


Loop statement

- Loop statement is used when a specific set of code is set to be run continuously till a condition is reached
- There are mainly two kinds of loops used in arduino programming language
- One is for loop and the other once is while loop

For loop

- An example for loop is given here
- Inside the bracket we initiate variable i to be 0
- After the the condition is given as per the condition program runs till i is lesser that 10
- Every time after the execution of code value of i is added by 1 this is the last block inside the parentheses(Bracket)
- The set of code to be executed is placed inside the curly bracket coming after tht loop. For loop is the most commonly used loop



While loop

- While loop is another kind of loop used here
- As u can see after typing while condition comes inside parentheses
- The code inside the curly bracket is executed while the condition is true
- Comes in handy in some situation where we cannot use for loops

Things to keep in mind

- After every line use semicolon (;) to indicate the line is closed
- Don't use the sign after for loop or while loop or if statement
- Choose friendly name for variable(MyNum, irpin etc)
- Use comments in code for better readability and understanding
- Comments can be types inside code with // sign
- Comments won't be executed when the code is being executed.

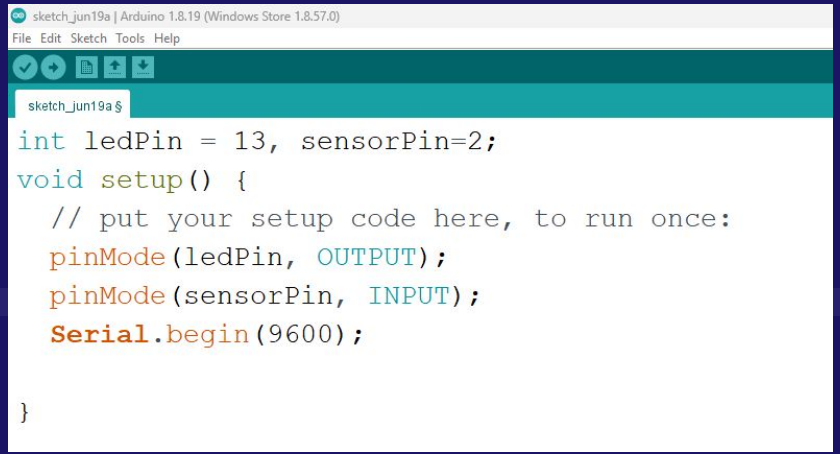
Specific Things in Arduino Programming language

- void setup() : Here the setup code is passed. Like specifying pins used are for input or output and other
- void loop(): Here the main code to be executed is passed. The entire process is passed through void loop statement
- Initialising the variable can also be done out of the two functions
- The code inside setup function only runs once and the loop function runs throughout the runtime of the arduino

```
void setup() {
  // put your setup code here, to run once:

}

void loop() {
  // put your main code here, to run repeatedly:

}
```

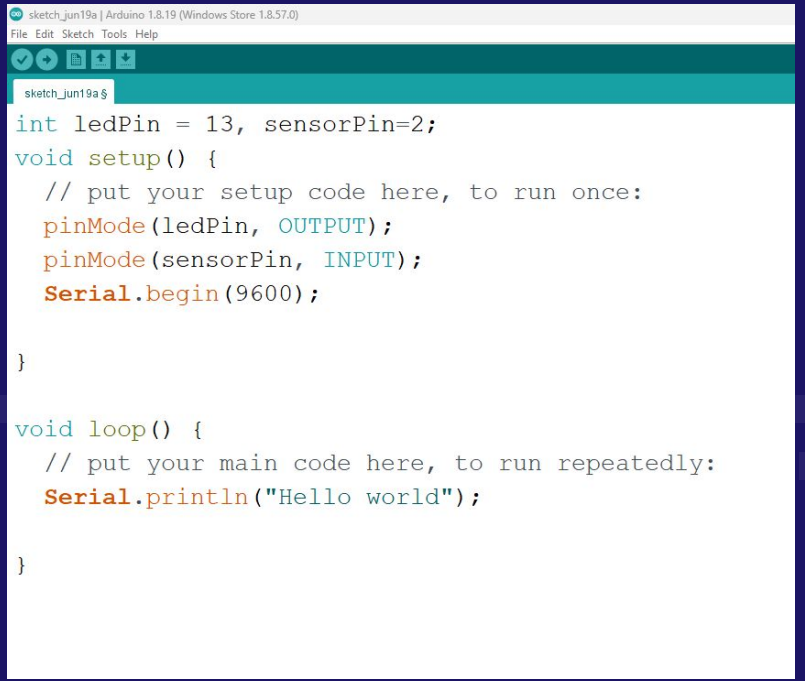
Specific Things in Arduino Programming language

- pinMode(): pinMode function is where you specify if the pin is used as an input or output
- The pinMode() is used inside the void setup() function
- Defining the pinMode is very important step in programming and arduino
- Serial.begin() : Serial.begin is used to start the serial monitor in arduino
- Inside the parentheses we should specify the boadrate . In arduinos case it is 9600.



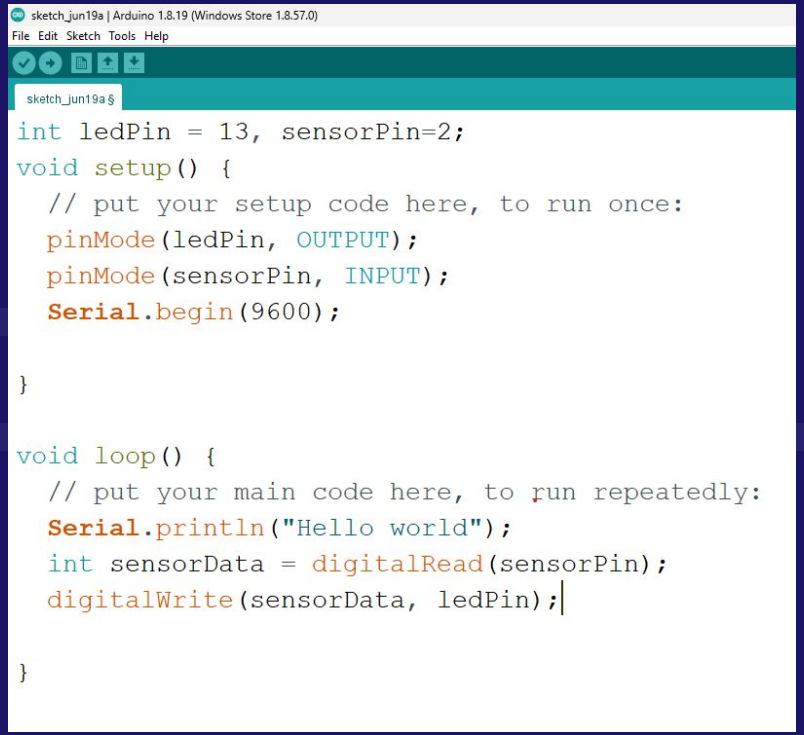
Specific Things in Arduino Programming language

- Serial.print(), and Serial.println:
- Serial.print() is used to print data to the serial monitor
- Serial.println is used when data has to be printed in a new line
- This command can only be done after executing Serial.begin
- Used in both void loop and void setup



Specific Things in Arduino Programming language

- digitalRead() : digitalRead function is used to read digital data(1 and 0) from the sensor
- analogRead() : analogRead function is used to read analog data coming from a sensor.
- Similarly digitalWrite and analogWrite function are used to write digital and analog data respectively to actuators.
- The analog data can only be wrote through the PWM pins of arduino
- The HIGH and LOW terms corresponds to on and off in arduino. It can be used in digitalWrite function.

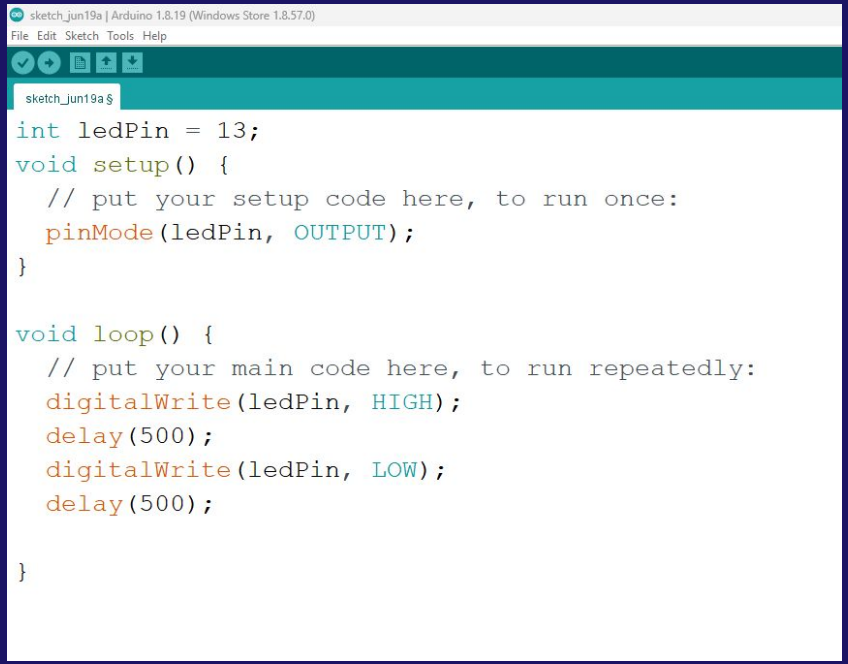


03

Your first arduino Programme

Let’s get practical

- The inbuilt led of arduino is connected to the digital pin 13 of arduino.
- We are going to make the led blink
- What are the steps ?
- We declare the ledPin variable to have value 13
- The in void setup set it to be an output pin
- After that digitalWrite the pin to be high
- Here we learn about a new thing called as delay()



- The delay function is used to make the program wait for a specified amount of time.
- During delay time the arduino board does nothing but wait
-
- The time specified under the delay function is millisecond
- After writing the program compile it and upload it

Congratulation You have successfully done your first program Using an Arduino

ARDUINO

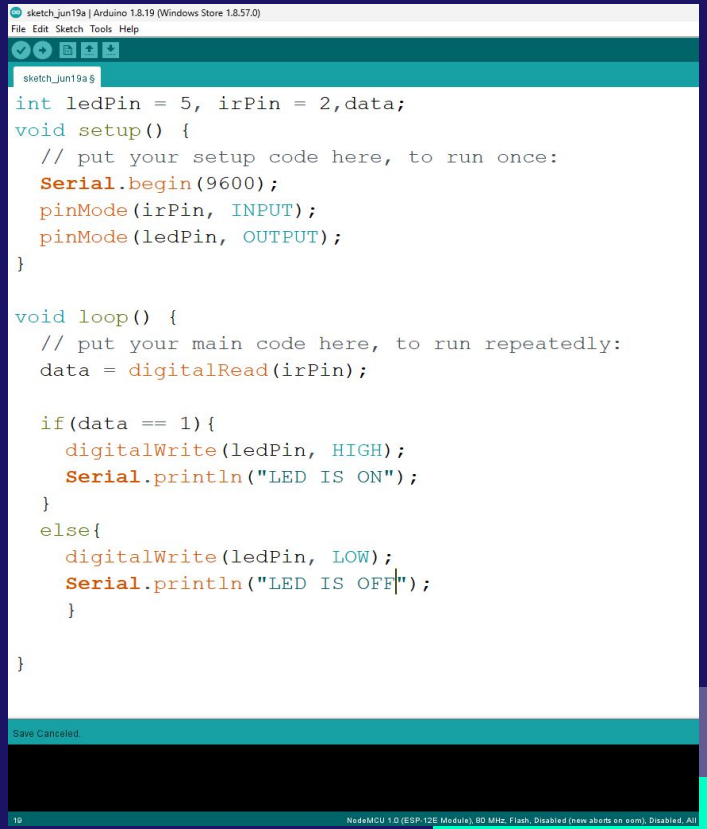
04

A Task For you Guys

Question

- Read data from the IR Pin given
- Store the data to a variable
- If the data is equal to 1 then make the led bright
- If the data is equal to 0 then make the led off
- Also print the state of led into a Serial monitor

Now you Guys can try doing this on your own



Yay you Guys have done it

Made By : Harikesh OP

Now we can do some fun projects with our arduino and some sensors