

Lesson 2 Blink

Overview

In this lesson, you will learn how to program your UNO R3 controller board to blink the Arduino's built-in LED, and how to download programs by basic steps.

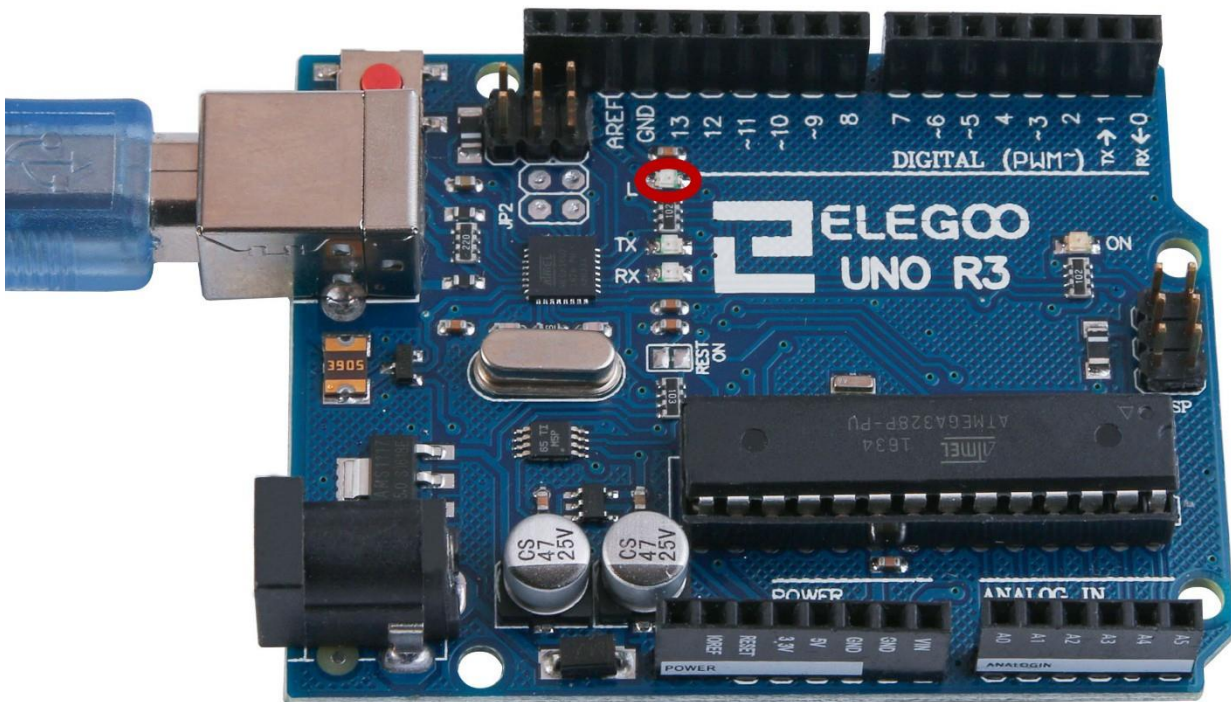
Component Required:

(1) x Elegoo Uno R3

Principle

The UNO R3 board has rows of connectors along both sides that are used to connect to several electronic devices and plug-in 'shields' that extends its capability.

It also has a single LED that you can control from your sketches. This LED is built onto the UNO R3 board and is often referred to as the 'L' LED as this is how it is labeled on the board.



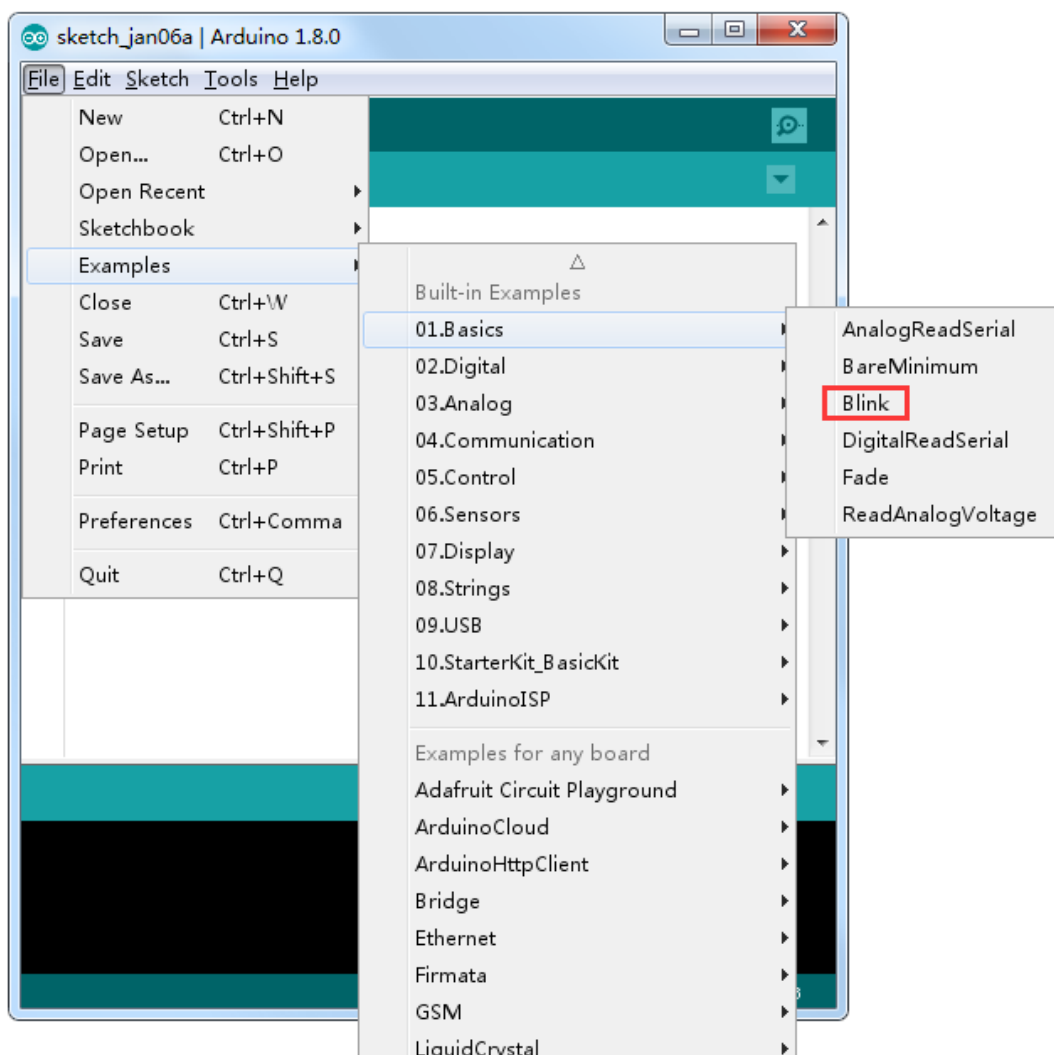
You may find that your UNO R3 board's 'L' LED already blinks when you connect it to a USB plug. This is because the boards are generally shipped with the 'Blink' sketch pre-installed.

In this lesson, we will reprogram the UNO R3 board with our own Blink sketch and then change the rate at which it blinks.

In Lesson 0, you set up your Arduino IDE and made sure that you could find the right serial port for it to connect to your UNO R3 board. The time has now come to put that connection to the test and program your UNO R3 board.

The Arduino IDE includes a large collection of example sketches that you can load up and use. This includes an example sketch for making the 'L' LED blink.

Load the 'Blink' sketch that you will find in the IDE's menu system under File > Examples > 01.Basics



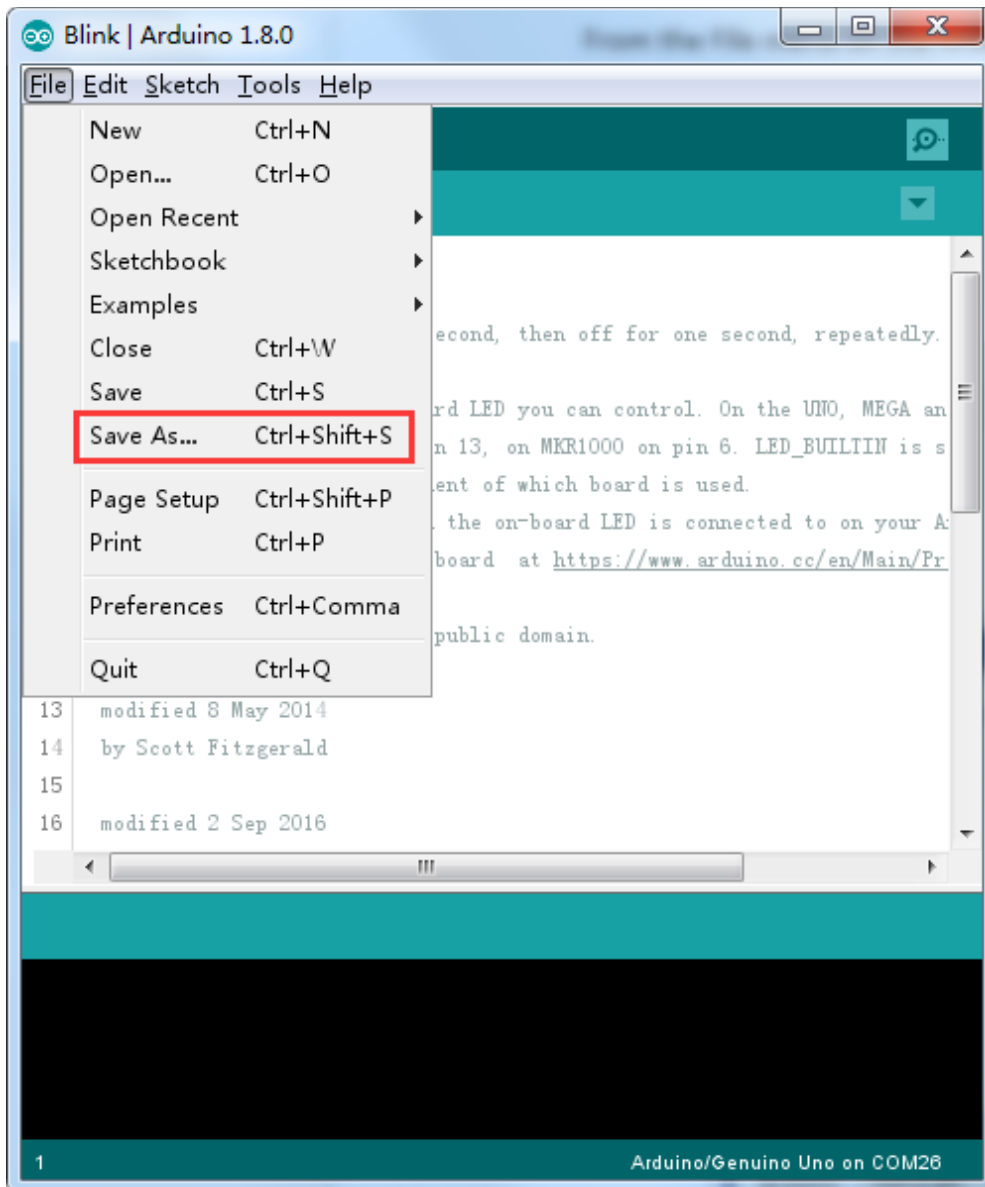
When the sketch window opens, enlarge it so that you can see the entire sketch in the window.



The example sketches included with the Arduino IDE are 'read-only'. That is, you can upload them to an UNO R3 board, but if you change them, you cannot save them as the same file.

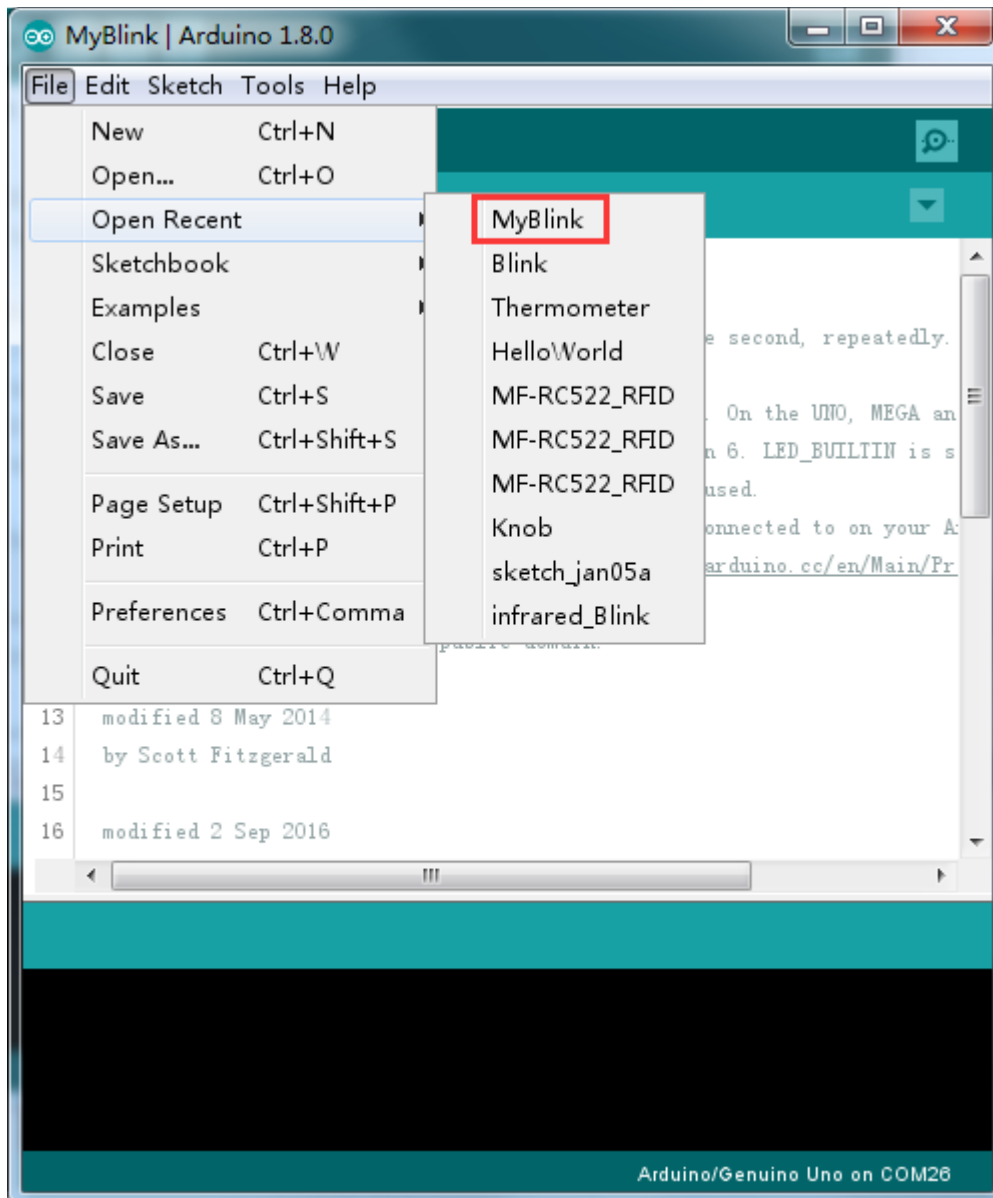
Since we are going to change this sketch, the first thing you need to do is save your own copy.

From the File menu on the Arduino IDE, select 'Save As..' and then save the sketch with the name 'MyBlink'.

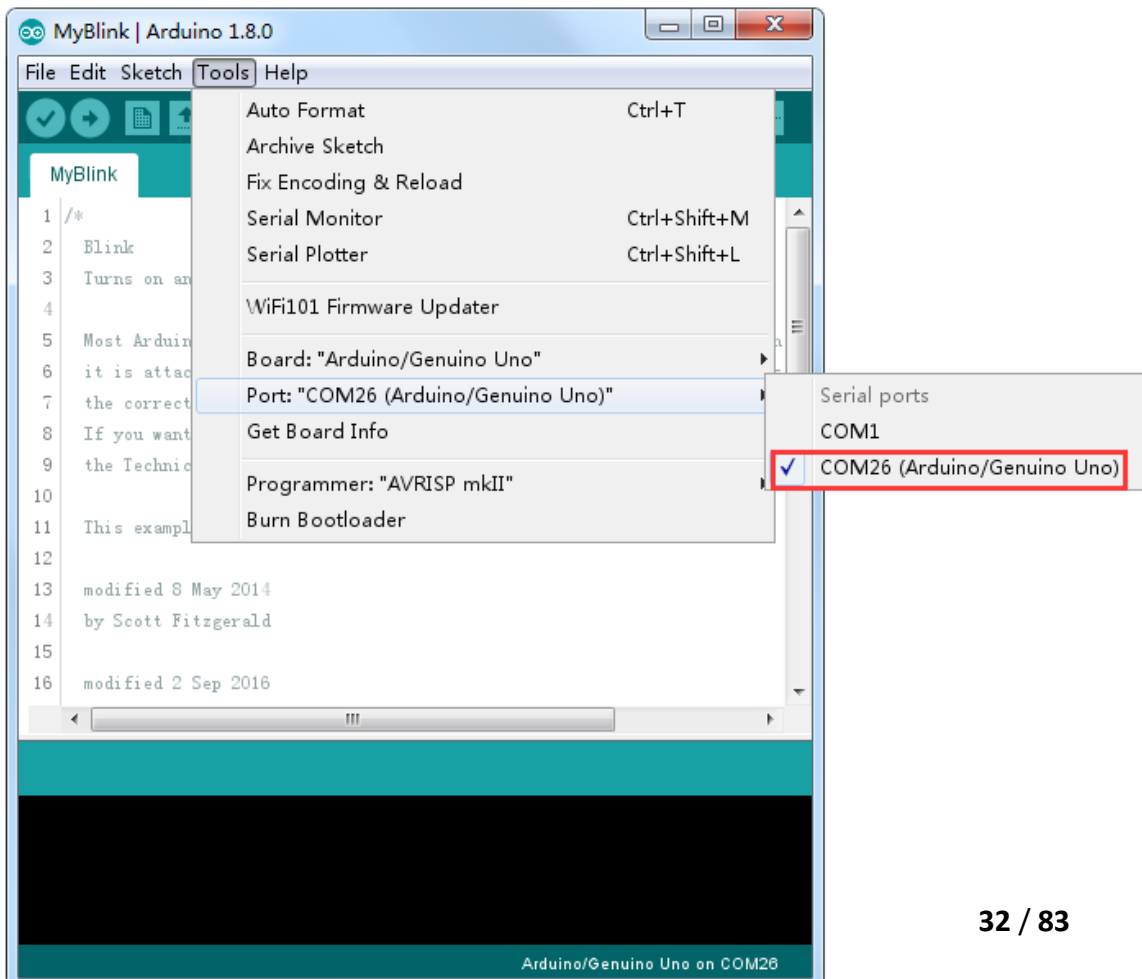
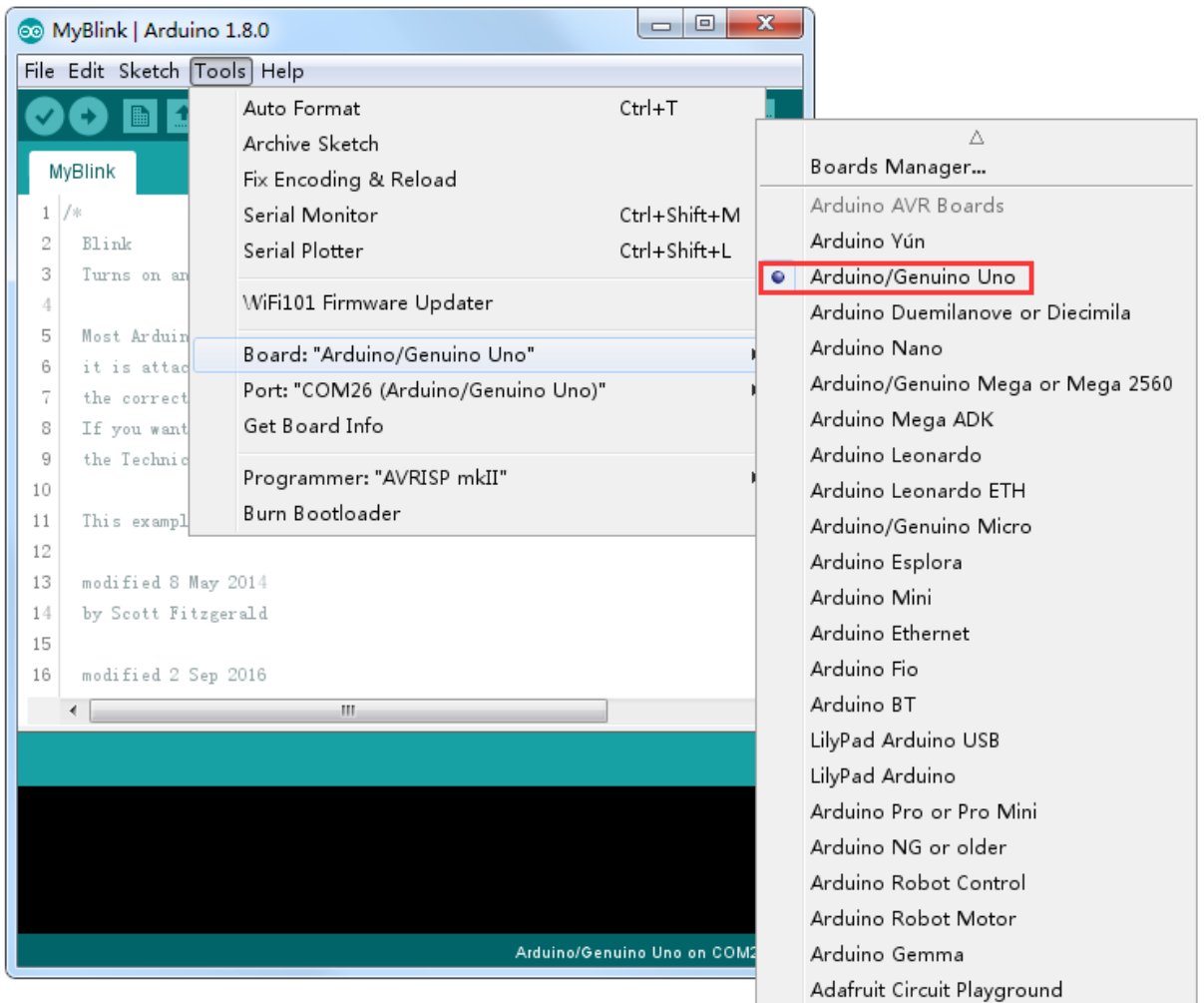




You have saved your copy of 'Blink' in your sketchbook. This means that if you ever want to find it again, you can just open it using the File > Sketchbook menu option.

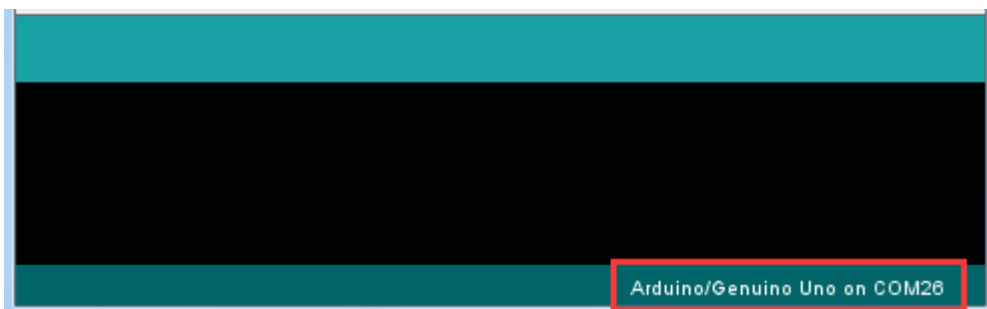


Attach your Arduino board to your computer with the USB cable and check that the 'Board Type' and 'Serial Port' are set correctly.



Note: The Board Type and Serial Port here are not necessarily the same as shown in picture. If you are using 2560, then you will have to choose Mega 2560 as the Board Type, other choices can be made in the same manner. And the Serial Port displayed for everyone is different, despite COM 26 chosen here, it could be COM3 or COM4 on your computer. A right COM port is supposed to be COMX (arduino XXX), which is by the certification criteria.

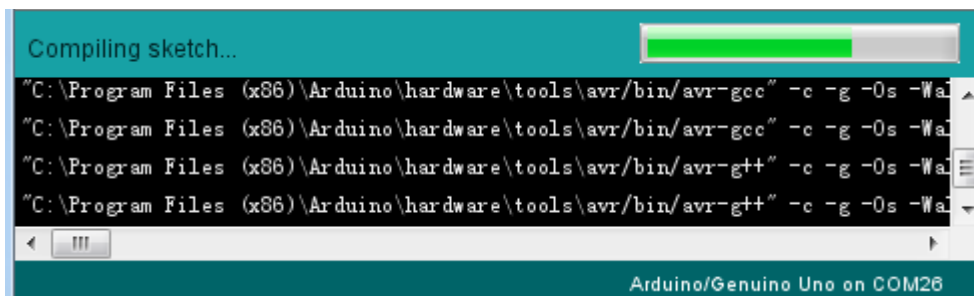
The Arduino IDE will show you the current settings for board at the bottom of the window.



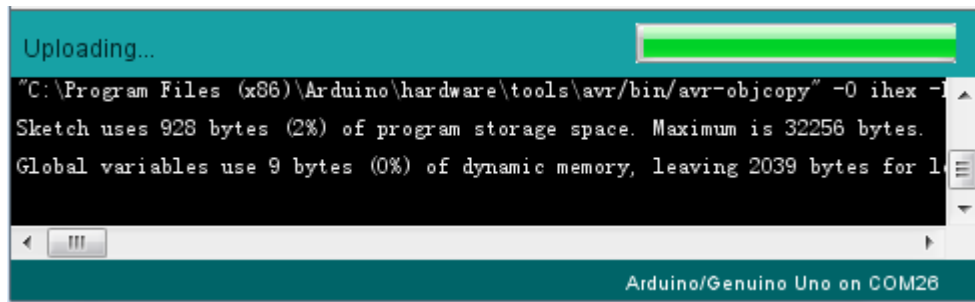
Click on the 'Upload' button. The second button from the left on the toolbar.



If you watch the status area of the IDE, you will see a progress bar and a series of messages. At first, it will say 'Compiling Sketch...'. This converts the sketch into a format suitable for uploading to the board.



Next, the status will change to 'Uploading'. At this point, the LEDs on the Arduino should start to flicker as the sketch is transferred.



Finally, the status will change to 'Done'.



The other message tells us that the sketch is using 928 bytes of the 32,256 bytes available. After the 'Compiling Sketch..' stage you could get the following error message:



It can mean that your board is not connected at all, or the drivers have not been installed (if necessary) or that the wrong serial port is selected.

If you encounter this, go back to Lesson 0 and check your installation.

Once the upload has completed, the board should restart and start blinking.

Open the code

Note that a huge part of this sketch is composed of comments. These are not actual program instructions; rather, they just explain how the program works. They are there for your benefit.

Everything between /* and */ at the top of the sketch is a block comment; it explains what the sketch is for.

Single line comments start with `//` and everything up until the end of that line is considered a comment.

The first line of code is:

```
int led = 13;
```

As the comment above it explains, this is giving a name to the pin that the LED is attached to. This is 13 on most Arduinos, including the UNO and Leonardo.

Next, we have the 'setup' function. Again, as the comment says, this is executed when the reset button is pressed. It is also executed whenever the board resets for any reason, such as power first being applied to it, or after a sketch has been uploaded.

```
void setup() {  
  // initialize the digital pin as an output.  
  pinMode(led, OUTPUT);  
}
```

Every Arduino sketch must have a 'setup' function, and the place where you might want to add instructions of your own is between the `{` and the `}`.

In this case, there is just one command there, which, as the comment states tells the Arduino board that we are going to use the LED pin as an output.

It is also mandatory for a sketch to have a 'loop' function. Unlike the 'setup' function that only runs once, after a reset, the 'loop' function will, after it has finished running its commands, immediately start again.

```
void loop() {  
  digitalWrite(led, HIGH);  // turn the LED on (HIGH is the voltage level)  
  delay(1000);              // wait for a second  
  digitalWrite(led, LOW);  // turn the LED off by making the voltage LOW  
  delay(1000);              // wait for a second  
}
```

Inside the loop function, the commands first of all turn the LED pin on (HIGH), then 'delay' for 1000 milliseconds (1 second), then turn the LED pin off and pause for another second.

You are now going to make your LED blink faster. As you might have guessed, the key to this lies in changing the parameter in `()` for the 'delay' command.

```
30 // the loop function runs over and over again forever
31 void loop() {
32   digitalWrite(LED_BUILTIN, HIGH); // turn the LED on (HIGH is the volt
33   delay(500) // wait for a second
34   digitalWrite(LED_BUILTIN, LOW); // turn the LED off by making the vo
35   delay(500) // wait for a second
36 }
```

This delay period is in milliseconds, so if you want the LED to blink twice as fast, change the value from 1000 to 500. This would then pause for half a second each delay rather than a whole second.

Upload the sketch again and you should see the LED start to blink more quickly.