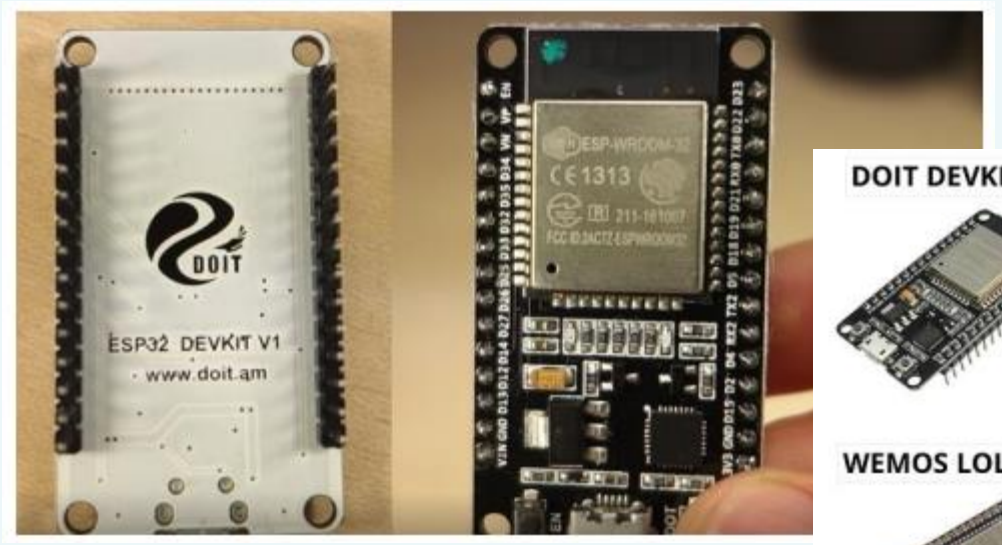
Introducing the ESP32 Board

- **ESP32 DOIT DEVKIT V1 Board**
  - ESP8266 successor
  - with lots of new features
  - combines Wi-Fi and Bluetooth wireless capabilities



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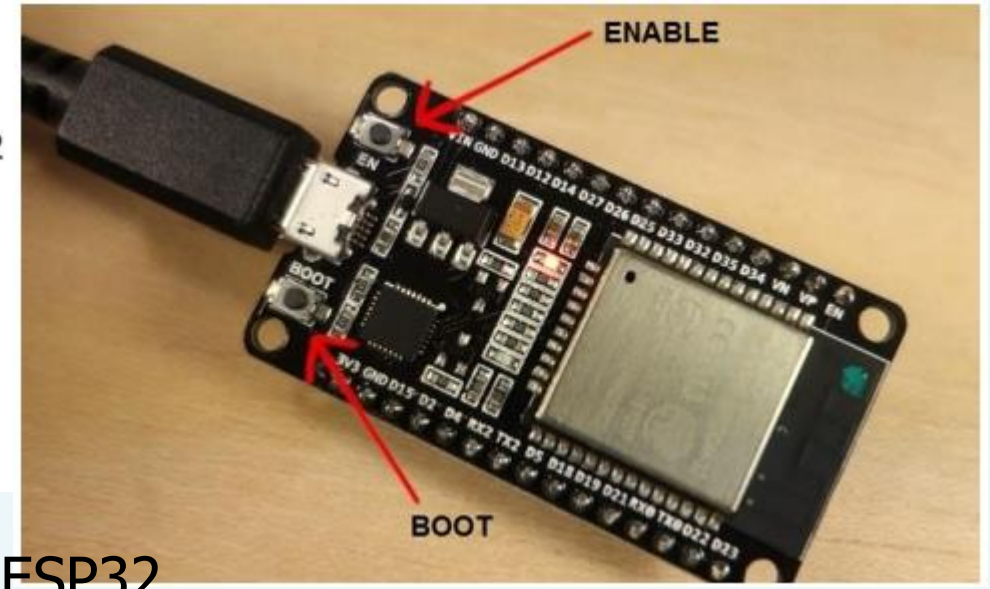
Introducing the ESP32 Board

- **Features**
  - ESP-WROOM-32 chip, 3.3V regulator
  - CP2102 chip to program without FTDI



  - ENABLE button reboots ESP32
  - Holding down BOOT button for programming.

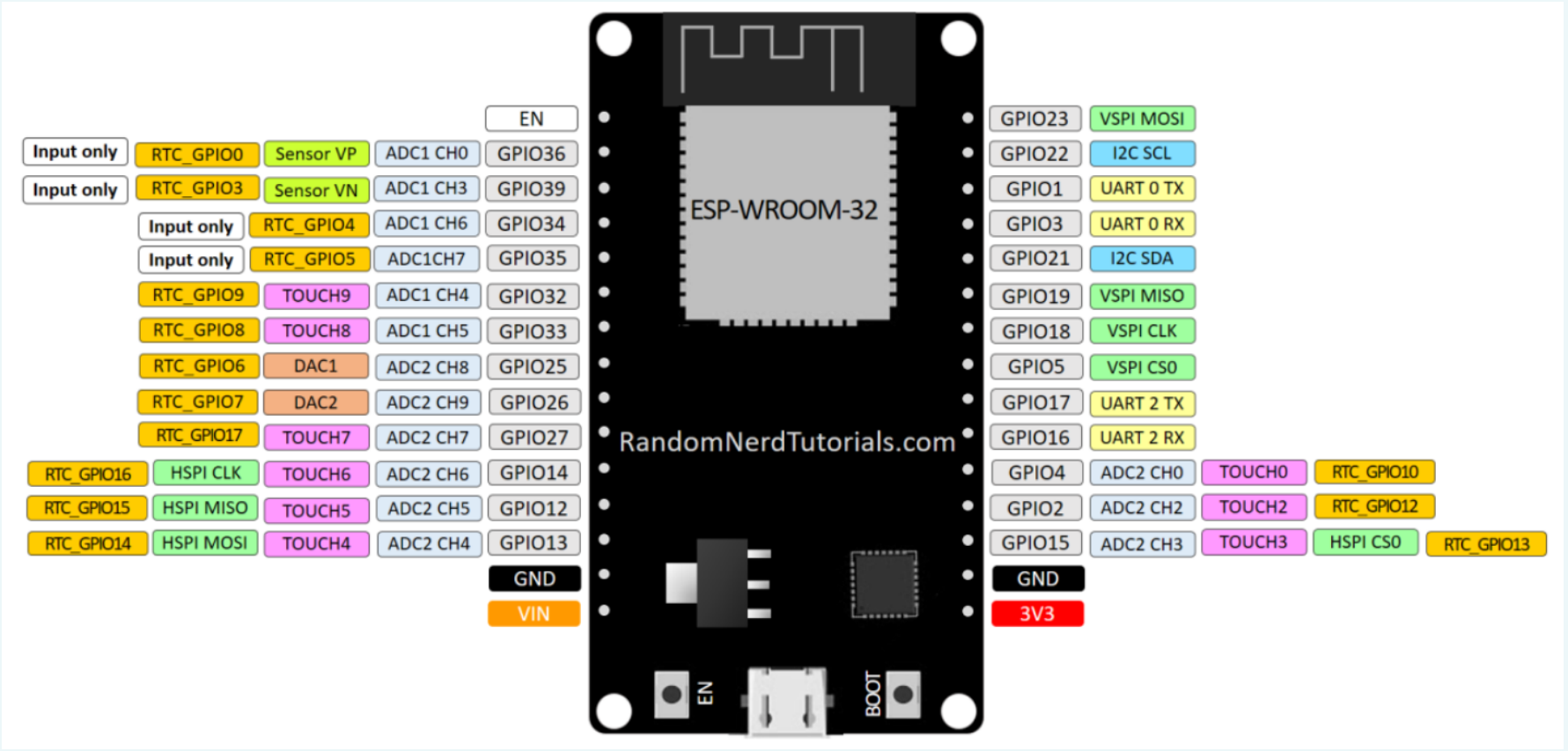
Introducing the ESP32 Board

- **Specifications**

Specifications - ESP32 DEVKIT V1 DOIT	
Number of cores	2 (Dual core)
Wi-Fi	2.4 GHz up to 150 Mbit/s
Bluetooth	BLE (Bluetooth Low Energy) and legacy Bluetooth
Architecture	32 bits
Clock frequency	Up to 240 MHz
RAM	512 KB
Pins	30
Peripherals	Capacitive touch, ADCs (analog-to-digital converter), DACs (digital-to-analog converter), I²C (Inter-Integrated Circuit), UART (universal asynchronous receiver/transmitter), CAN 2.0 (Controller Area Network), SPI (Serial Peripheral Interface), I²S (Integrated Inter-IC Sound), RMII (Reduced Media-Independent Interface), PWM (pulse width modulation), and more.

Introducing the ESP32 Board

- **Pin Inputs / Outputs**



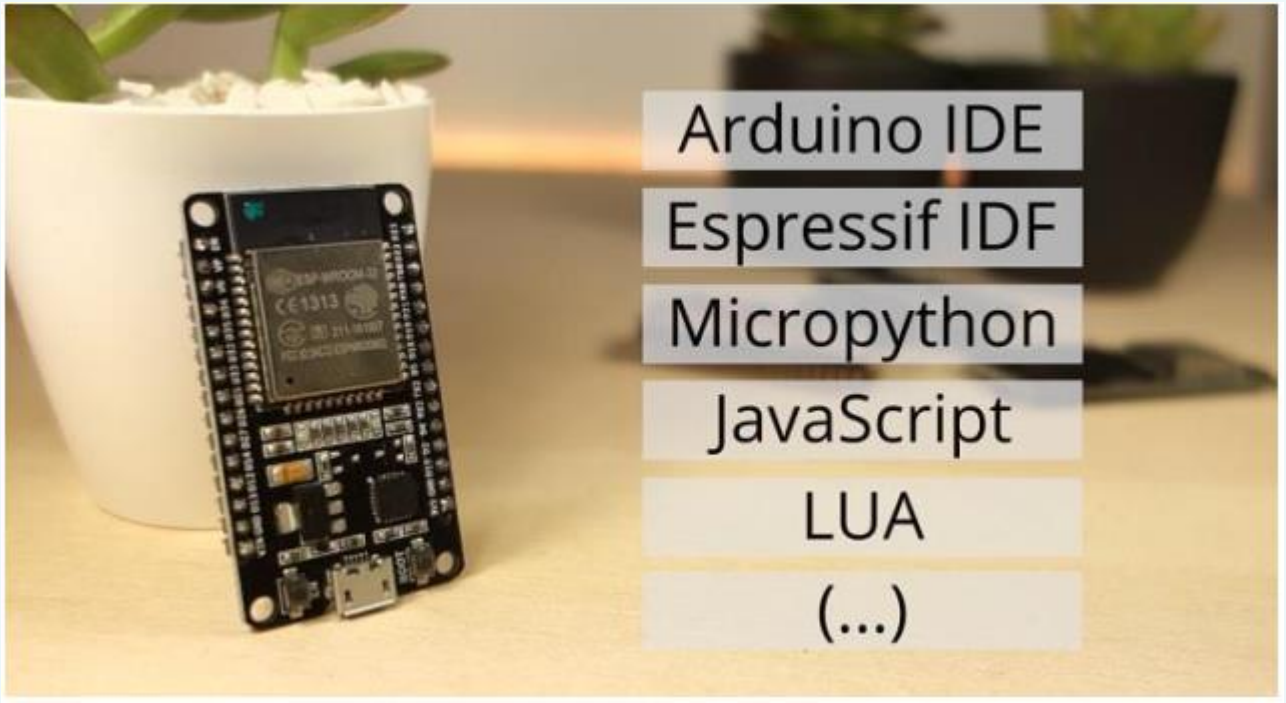
Introducing the ESP32 Board

- **Pin Inputs / Outputs**

GPIO	Input	Output	Notes
0	pulled up	OK	outputs PWM signal at boot
1	TX pin	OK	debug output at boot
2	OK	OK	connected to on-board LED
3	OK	RX pin	HIGH at boot
4	OK	OK	
5	OK	OK	outputs PWM signal at boot
6	x	x	connected to the integrated SPI flash
7	x	x	connected to the integrated SPI flash
8	x	x	connected to the integrated SPI flash
9	x	x	connected to the integrated SPI flash
10	x	x	connected to the integrated SPI flash
11	x	x	connected to the integrated SPI flash
12	OK	OK	boot fail if pulled high
13	OK	OK	
14	OK	OK	outputs PWM signal at boot
15	OK	OK	outputs PWM signal at boot
16	OK	OK	
17	OK	OK	
18	OK	OK	
19	OK	OK	
21	OK	OK	
22	OK	OK	
23	OK	OK	
25	OK	OK	
26	OK	OK	
27	OK	OK	
32	OK	OK	
33	OK	OK	
34	OK		input only
35	OK		input only
36	OK		input only
39	OK		input only

Introducing the ESP32 Board

- **Programming Environments**
  - Support different programming environments
  - Arduino IDE, Espressif IDF (IoT Development Framework), Micropython, JavaScript, LUA, etc.



Introducing Arduino IDE

- **Arduino IDE (통합개발환경)**
  - 편집기, 컴파일러, 업로더 등이 합쳐진 소프트웨어 환경
  - UTF-8 사용
  - 개발에 필요한 각종 옵션 및 라이브러리 관리 가능
  - 개발용 PC와 통신을 위해 가상 시리얼모니터 제공
  - USB을 통한 업로드 (MCU에 USB-UART Converter 내장)
  - MCU가 실행될 때 부트로더가 올라가 있어야 함
  - 아두이노 프로그램은 "**.ino**" 확장자를 가진 '스케치(Sketch)'

https://www.arduino.cc/en/Main/Software

Introducing Arduino IDE

- **Arduino IDE** 설치 및 사용
  - OS환경에 맞게 Download
  - 설치 및 실행

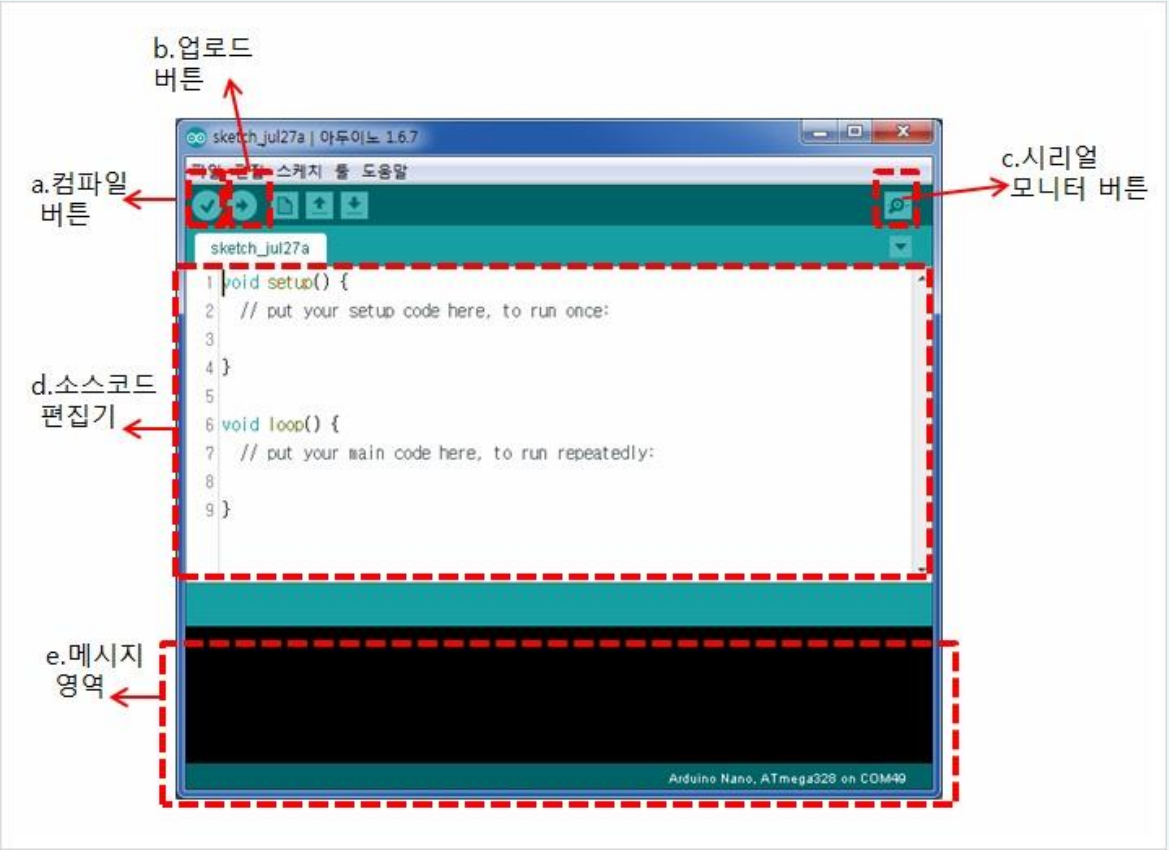
1. 소스편집

2. 컴파일

3. 업로드

4. 메시지확인

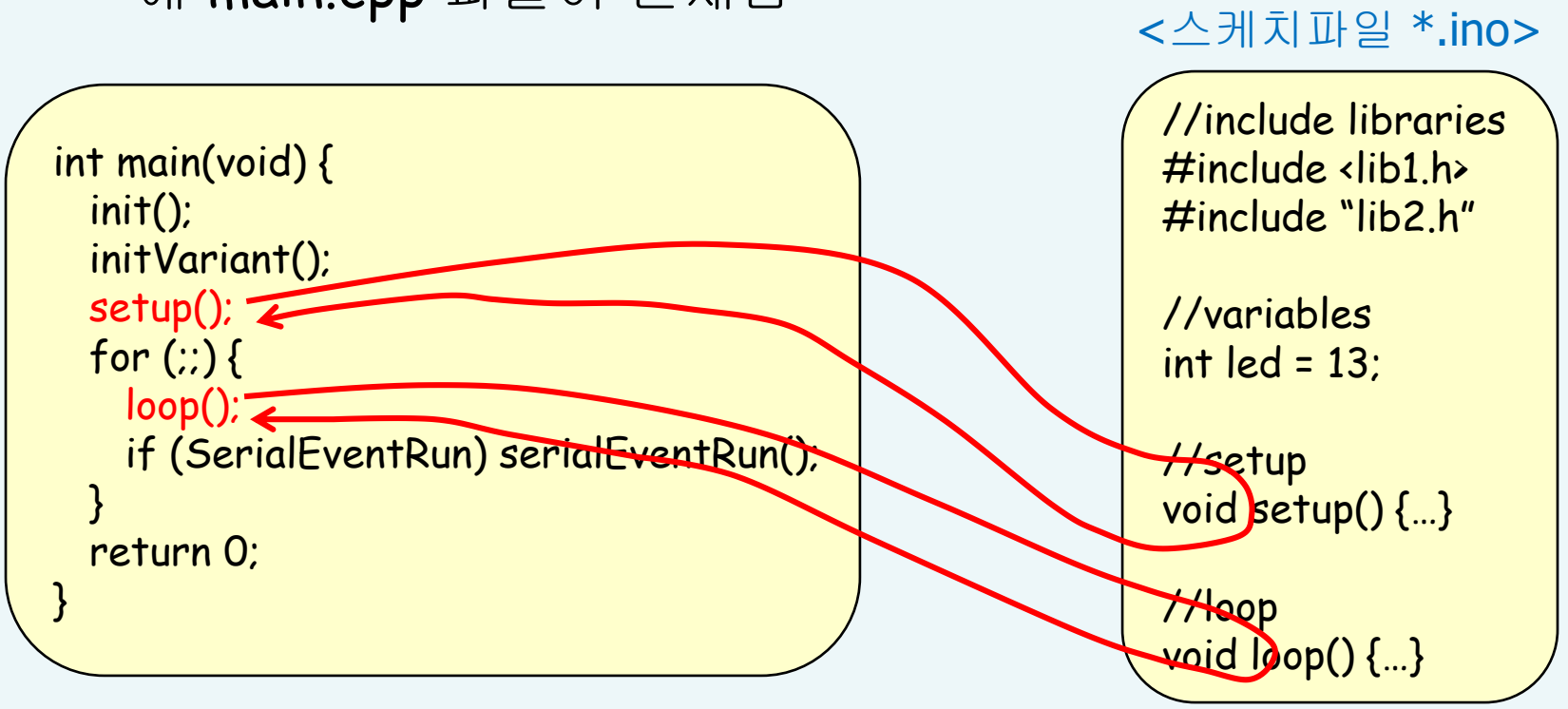
5. 진행상황:
시리얼모니터



Introducing Arduino IDE

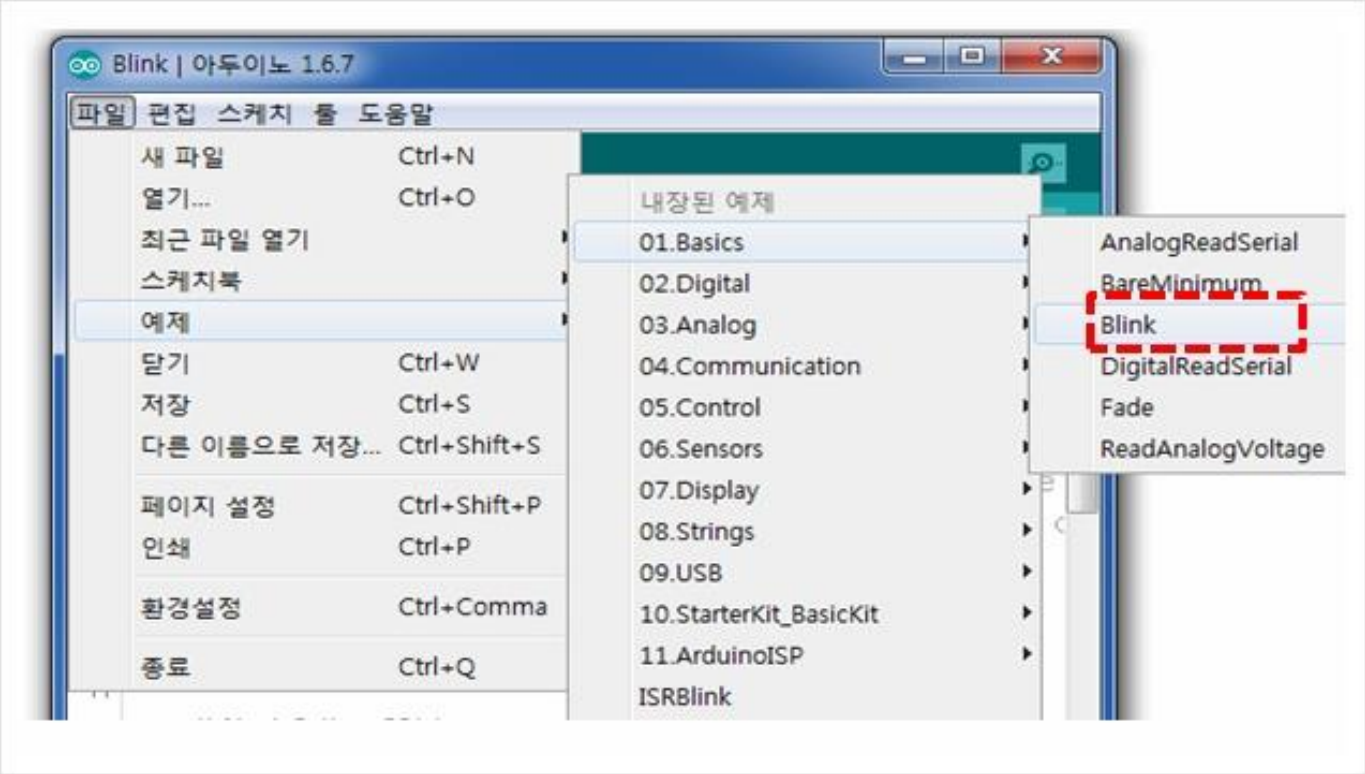
- **Arduino IDE 구조**
  - Arduino는 C/C++ 개발환경이다
  - 폴더"Arduino\hardware\arduino\avr\cores\arduino\" 에 main.cpp 파일이 존재함

<스케치파일 *.ino>



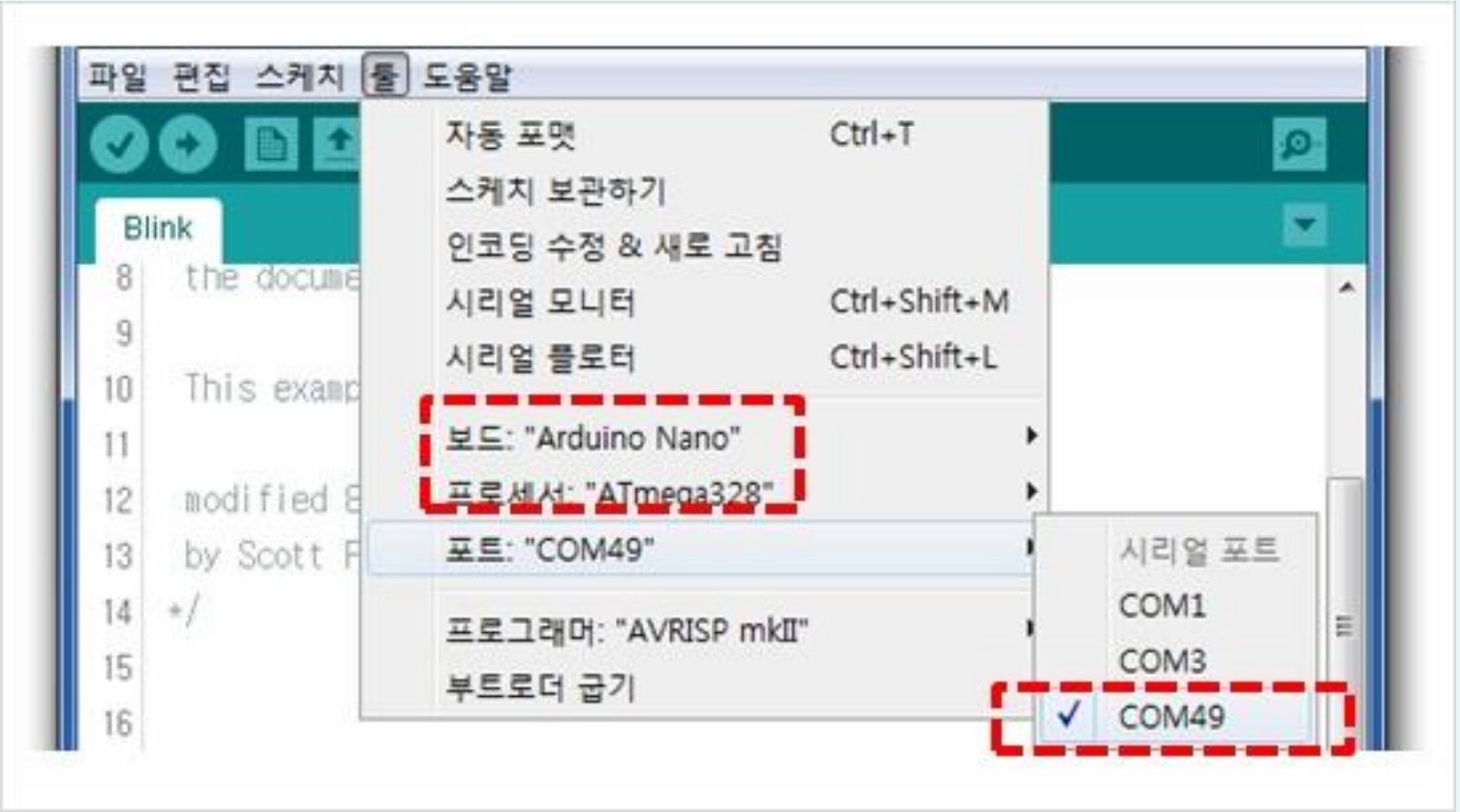
Introducing Arduino IDE

- **Arduino IDE 예제**
  - 다양한 예제 사용가능



Introducing Arduino IDE

- **Arduino IDE 설정**
  - 보드와 시리얼 포트 설정.. ESP32가 안보임??

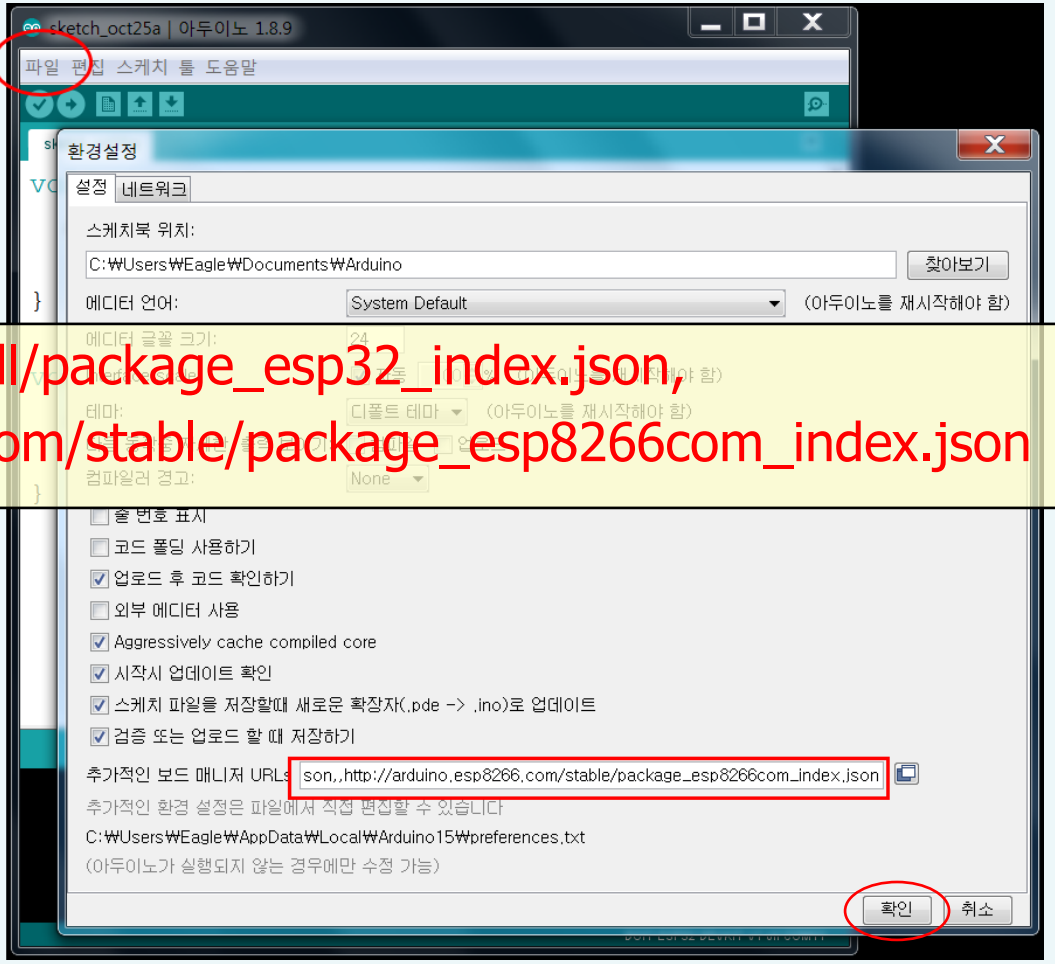


Introducing Arduino IDE

- **ESP32** 보드를 위한 라이브러리 설치
  - 메뉴>파일> 환경설정
  - "추가적인 보드 매니저 URL" 에

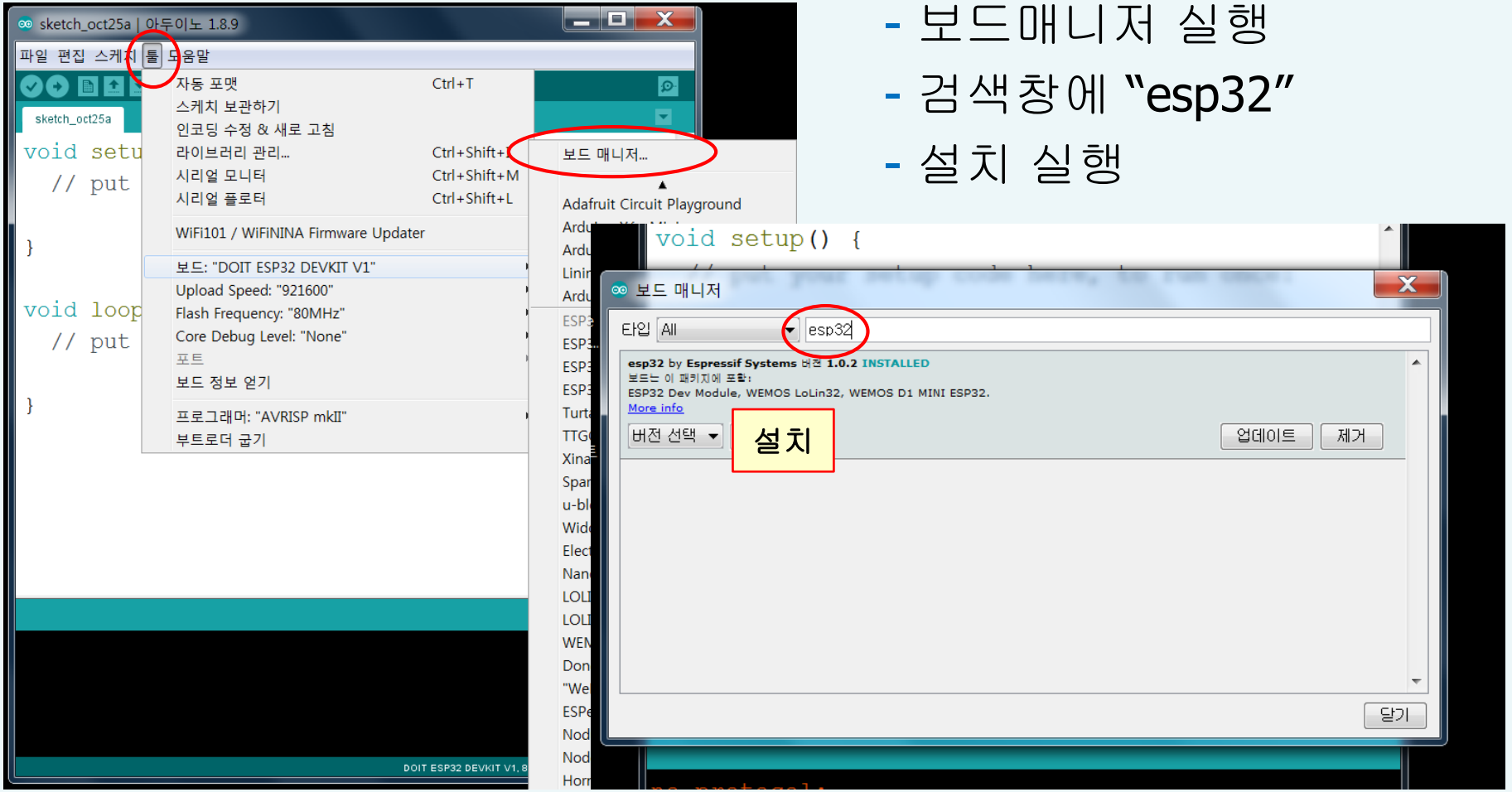
https://dl.espressif.com/dl/package_esp32_index.json,
http://arduino.esp8266.com/stable/package_esp8266com_index.json

입력하고 확인



Introducing Arduino IDE

- **ESP32** 보드를 위한 라이브러리 설치



- 보드매니저 실행
- 검색창에 "esp32"
- 설치 실행

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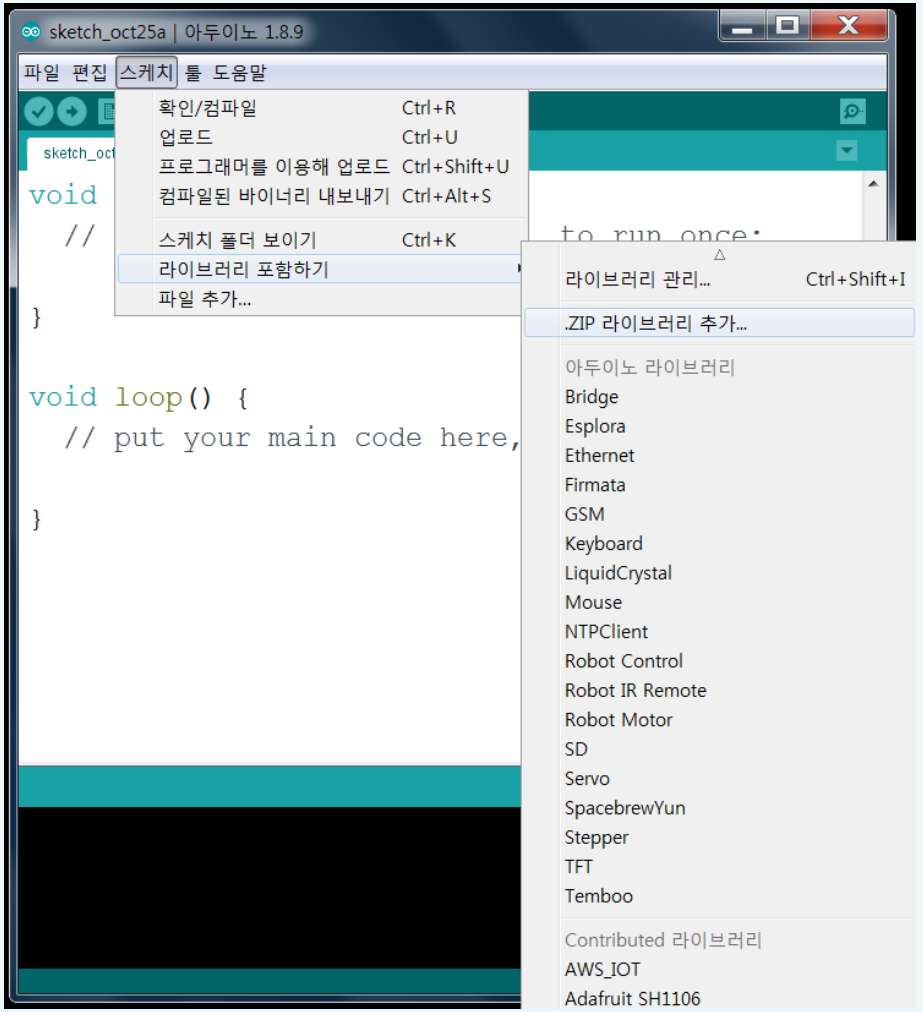
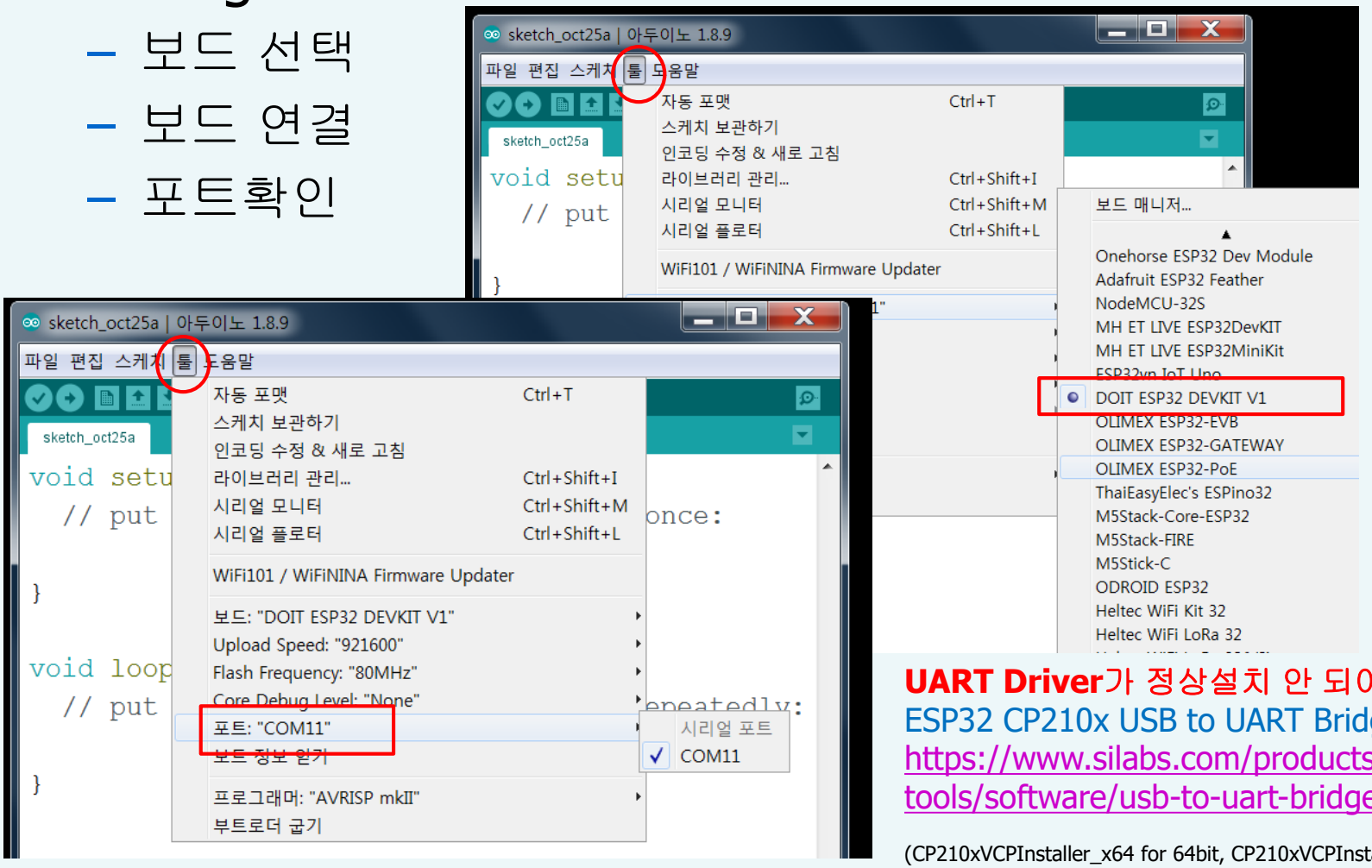
Introducing Arduino IDE

- 라이브러리 추가
  - 새로운 부품으로 개발할 때..
    > 개발사가 제공하는 라이브러리를 추가함
    > 예제도 추가됨



Introducing Arduino IDE

- Testing the Installation
  - 보드 선택
  - 보드 연결
  - 포트확인

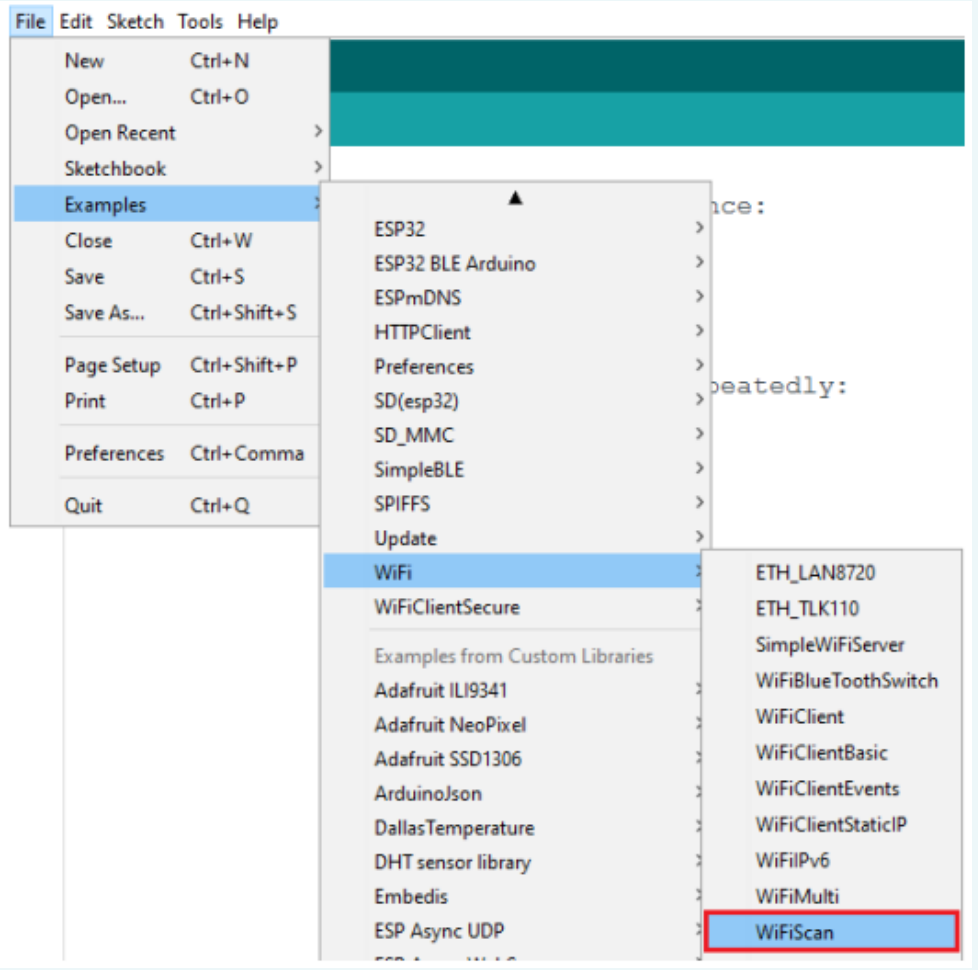


UART Driver가 정상설치 안 되어 있을 경우:
ESP32 CP210x USB to UART Bridge VCP Drivers
https://www.silabs.com/products/development-tools/software/usb-to-uart-bridge-vcp-drivers

(CP210xVCPInstaller_x64 for 64bit, CP210xVCPInstaller_x86 for 32bit)

Introducing Arduino IDE

- Testing the Installation
  - 예제에서 WiFiScan 선택



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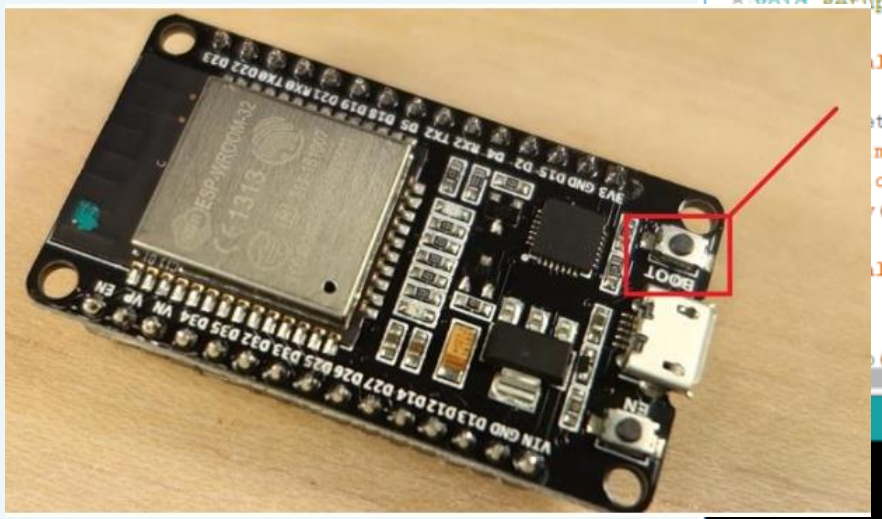
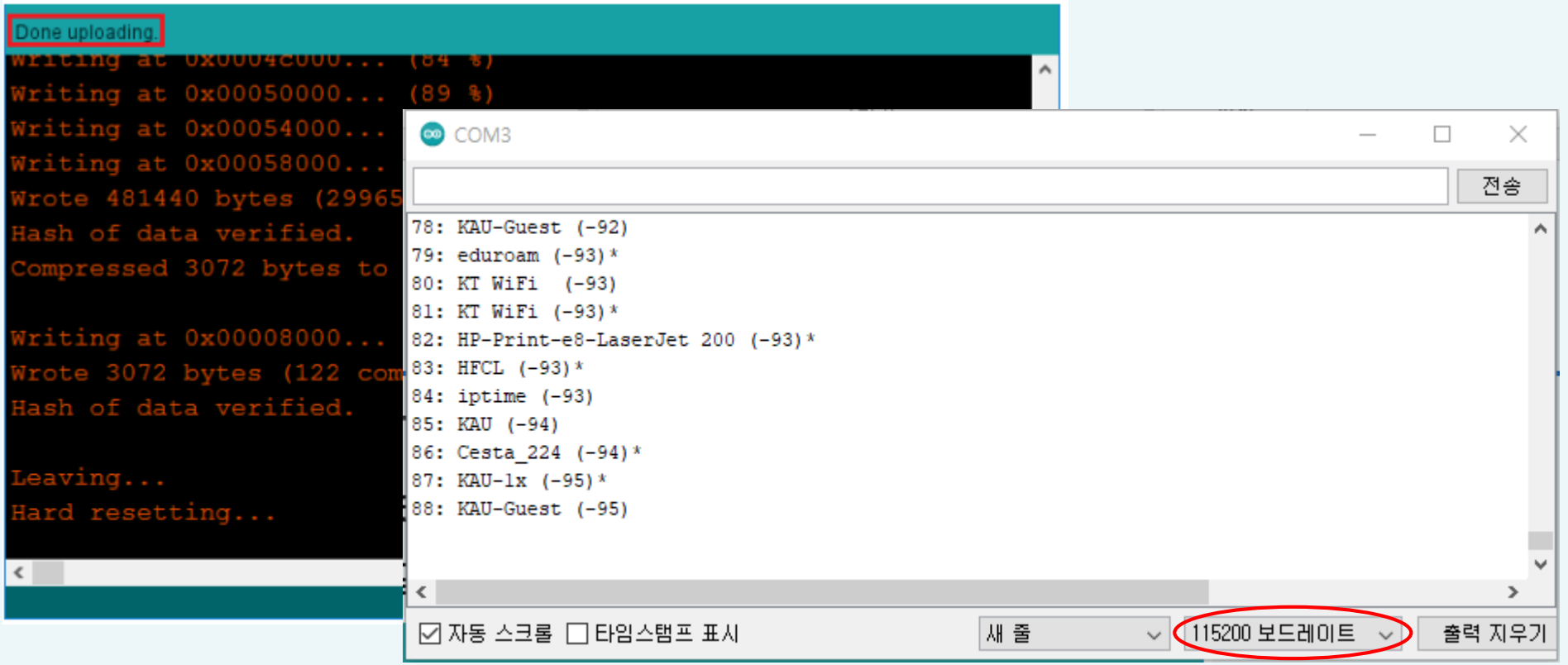
Introducing Arduino IDE

- Testing the Installation
  - BOOT Button을 누른채..
    컴파일 및 업로드 실행



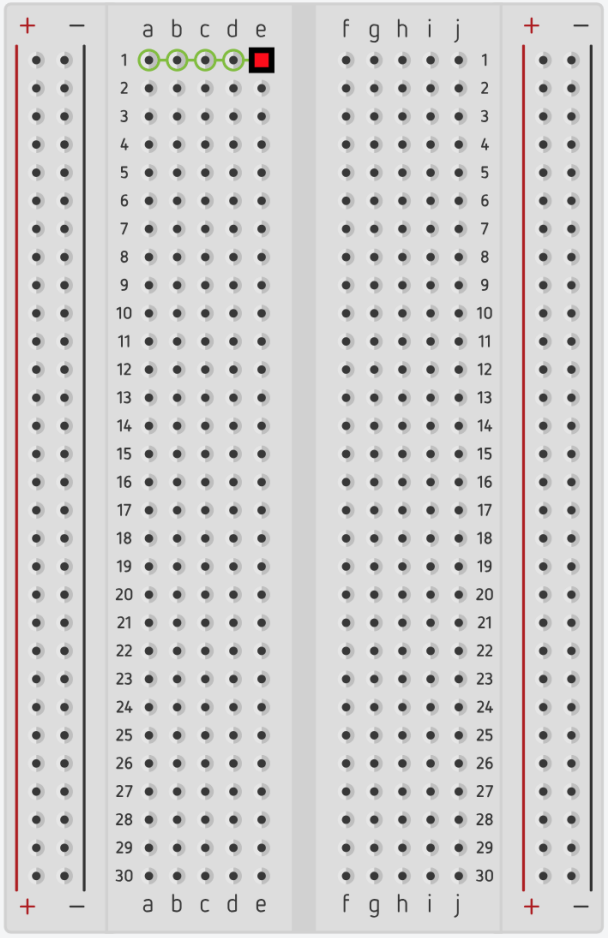
Introducing Arduino IDE

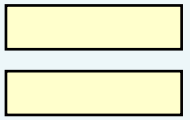
- Testing the Installation
  - Enable Button을 눌러 Reset
  - 시리얼모니터를 열어 정상 실행하는지 확인 (보레이트 확인)

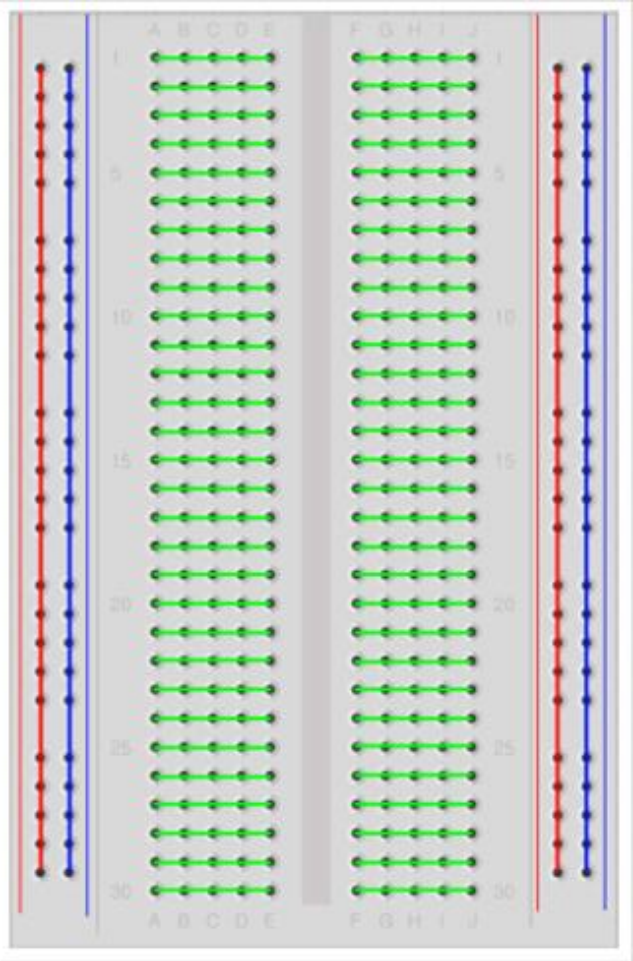


The First Try.. Understanding Breadboard

- Breadboard(빵판)은 그림과 같이 내부적으로 연결되어 있다







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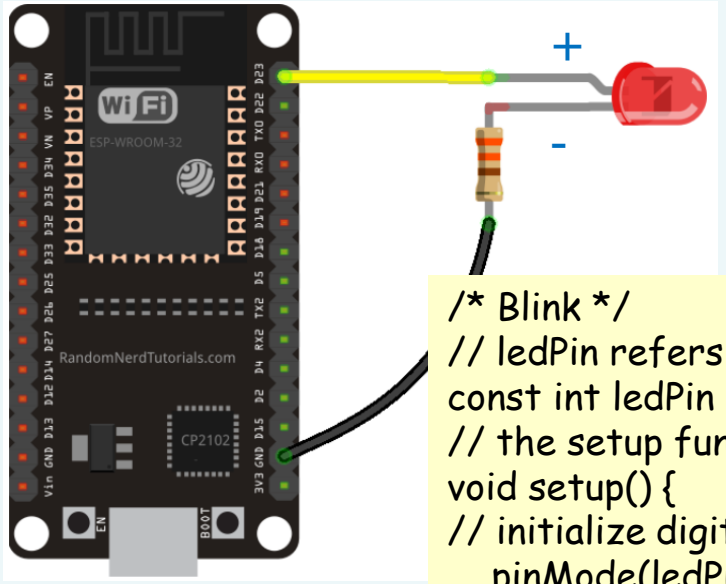
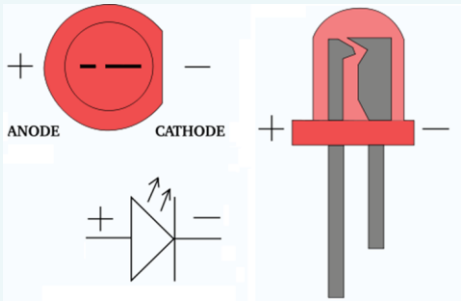
The First Try.. LED Blink

- LED, 220옴 저항을 GPIO23, GND에 연결






```
/* Blink */
// ledPin refers to ESP32 GPIO 23
const int ledPin = 23;
// the setup function runs once when you press reset or power the board
void setup() {
// initialize digital pin ledPin as an output.
    pinMode(ledPin, OUTPUT);
}
// the loop function runs over and over again forever
void loop() {
    digitalWrite(ledPin, HIGH); // turn the LED on (HIGH is the voltage level)
    delay(1000); // wait for a second
    digitalWrite(ledPin, LOW); // turn the LED off by making the voltage LOW
    delay(1000); // wait for a second
}
```

The First Try.. LED Blink

- ESP32 모듈 연결 방법