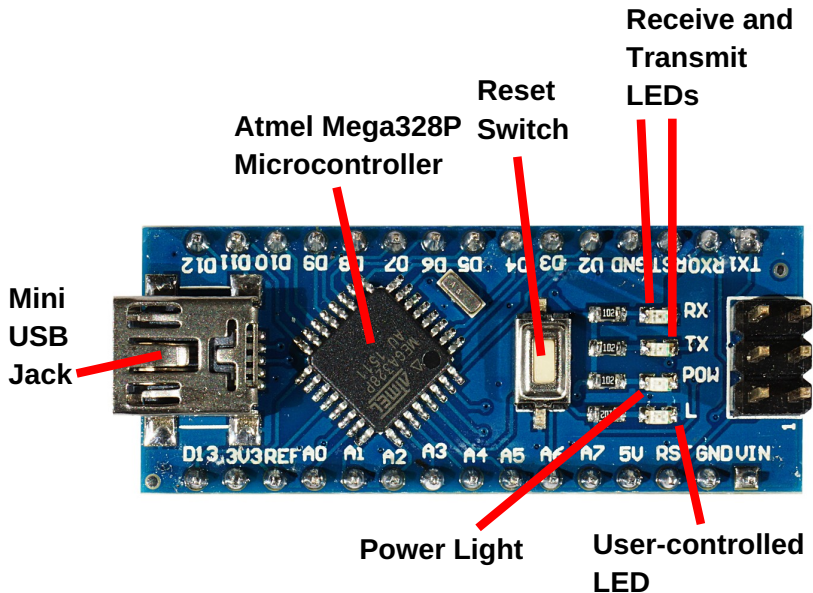


# Programming Tiny, Colorful Computers

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# The Arduino Nano



# Getting Started

Start the Arduino IDE



# Select Tools → Board → Arduino Nano

The screenshot shows the Arduino IDE interface. The 'Tools' menu is open, and the 'Board' submenu is also open. The 'Board: "Arduino Nano"' option is highlighted in the main menu, and the 'Arduino Nano' option is highlighted in the submenu. A mouse cursor is pointing at the 'Arduino Nano' option in the submenu.

File Edit Sketch **Tools** Help

Auto Format Ctrl+T

Archive Sketch

Fix Encoding & Reload

Serial Monitor Ctrl+Shift+M

Serial Plotter Ctrl+Shift+L

WiFi101 Firmware Updater

Board: "Arduino Nano" ▶

Processor: "ATmega328P" ▶

Port ▶

Get Board Info

Programmer: "AVRISP mkII" ▶

Burn Bootloader

Boards Manager...

Arduino AVR Boards

Arduino Yún

Arduino/Genuino Uno

Arduino Duemilanove or Diecimila

• Arduino Nano

Arduino/Genuino Mega or Mega 2560

Arduino Mega ADK

Arduino Leonardo

```
sketch_mar10a
void setup()
// put your code here

}

void loop() {
// put your code here

}
```

## Getting Started Continued

Plug the USB cable into your board

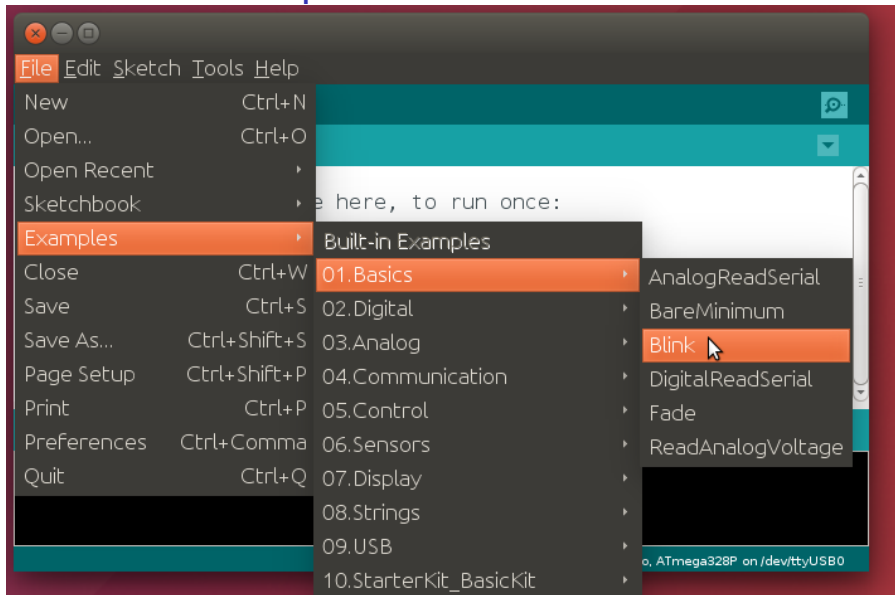
Plug your board into your computer

*The board's power light should be on*

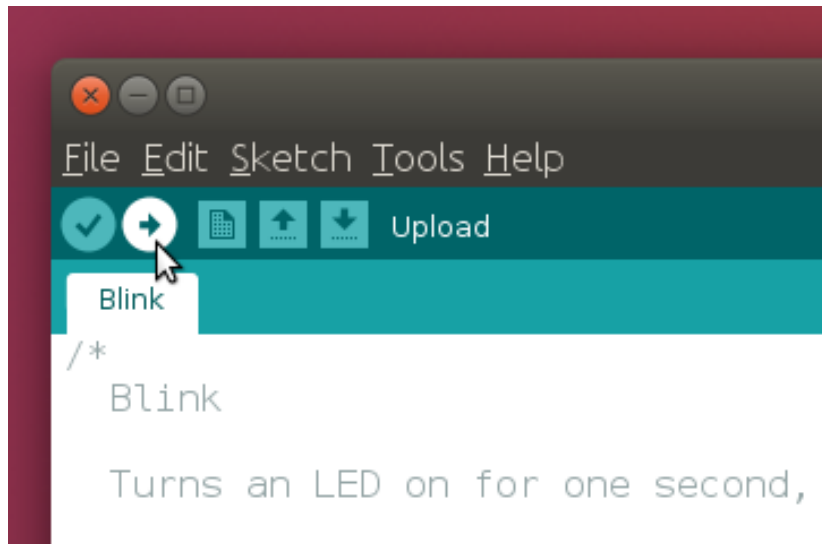
Select Tools→Port→COM3

*Which COM port may vary; choose the one that is there*

# Select File → Examples → 01.Basics → Blink



## Upload the Sketch to the Board



Should say "Done uploading." The user LED should blink

## The Blink Example

*// setup() runs once: when power is applied or after reset*

```
void setup() {
```

*// Set the LED\_BUILTIN pin to be an output.*

```
pinMode(LED_BUILTIN, OUTPUT);
```

```
}
```

*// loop() runs over and over again forever*

```
void loop() {
```

```
digitalWrite(LED_BUILTIN, HIGH); // Turn the LED on ("HIGH")
```

```
delay(1000); // Wait for 1000 ms = 1s
```

```
digitalWrite(LED_BUILTIN, LOW); // Turn the LED off ("LOW")
```

```
delay(1000); // Wait a second
```

```
}
```



## pinMode

Each pin has a number (the pink boxes on “Nano pinout”)

Most pins can be either inputs or outputs

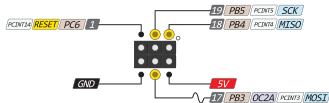
```
pinMode(4, OUTPUT); // Control the voltage on pin 4
```

```
pinMode(6, INPUT); // Observe the voltage on pin 6
```

```
pinMode(19, INPUT_PULLUP); // Observe 19; “suggest” it be high
```

```
pinMode(LED_BUILTIN, OUTPUT); // Control pin 13, LED “L”
```

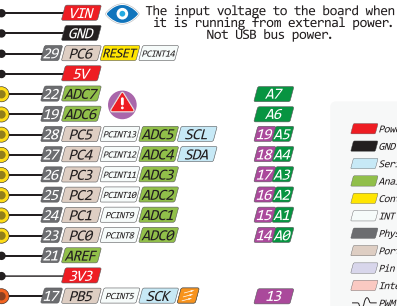
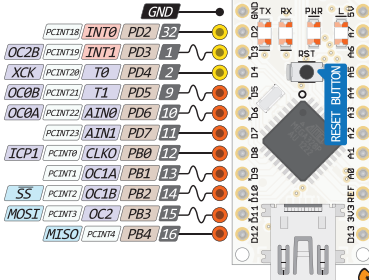
# NANO PINOUT



1  
0



2  
3  
4  
5  
6  
7  
8  
9  
10  
11  
12



A7  
A6  
A5  
A4  
A3  
A2  
A1  
A0  
13

Legend:

- Power (Red)
- GND (Black)
- Serial Pin (Light Blue)
- Analog Pin (Light Green)
- Control (Yellow)
- INT (White)
- Physical Pin (Grey)
- Port Pin (Light Brown)
- Pin function (Light Purple)
- Interrupt Pin (Pink)
- PWM Pin (Light Blue)
- Port Power (Orange)

The input voltage to the board when it is running from external power. Not USB bus power.

USB JACK Mini Type B



! Absolute MAX per pin 40mA recommended 20mA

⊘ Absolute MAX 200mA for entire package

! Analog exclusively Pins

! The power sum for each pin's group should not exceed 100mA

## Digital Input and Output

Digital: on or off, high or low voltage; nothing in between

```
digitalWrite(13, LOW); // Turn off the user LED
```

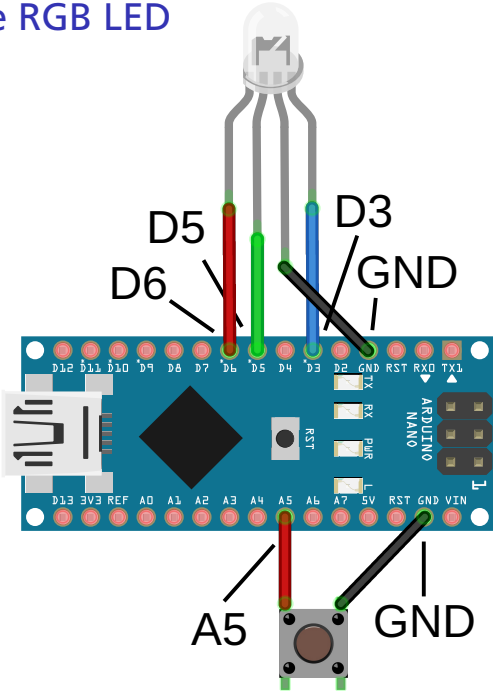
```
digitalWrite(13, HIGH); // Turn on the user LED
```

A digital read from a pin reports either HIGH or LOW

```
if ( digitalRead(19) == LOW ) {  
    // Low voltage on pin 19, a "0"  
}
```

```
if ( digitalRead(19) == HIGH ) {  
    // High voltage on pin 19, a "1"  
}
```

Connect the RGB LED and switch



## Reacting to the switch

```
const int switchpin = 19;           // Marked "A5"

void setup() {
  pinMode(LED_BUILTIN, OUTPUT);
  pinMode(switchpin, INPUT_PULLUP); // HIGH unless pressed
}

void loop() {
  if ( digitalRead(switchpin) == LOW ) { // Switch pressed?
    digitalWrite(LED_BUILTIN, HIGH);    // Yes: light LED
  } else {
    digitalWrite(LED_BUILTIN, LOW);    // No: turn off LED
  }
}
```

## Controlling the RGB LED

```
const int redpin = 3, greenpin = 5, bluepin = 6;  // D3, D5, D6
```

```
void rgb(int r, int g, int b) {  
  analogWrite(redpin, r);  // Set the red brightness  
  analogWrite(greenpin, g); // Set the green brightness  
  analogWrite(bluepin, b); // Set the blue brightness  
}
```

```
void setup() {  
  pinMode(redpin, OUTPUT);  
  pinMode(greenpin, OUTPUT);  
  pinMode(bluepin, OUTPUT);  
}
```

```
void loop() {  
  rgb(10,0,0);  delay(500);  
  rgb(0,10,0);  delay(500);  
  rgb(0,0,10);  delay(500);  
}
```

## Mood Lighting Control

```
const int redpin = 3, greenpin = 5, bluepin = 6; // D3, D5, D6
const int switchpin = 19;
int red = 0, green = 0, blue = 0;

void rgb(int r, int g, int b) {
  analogWrite(redpin, r); // Set the red brightness
  analogWrite(greenpin, g); // Set the green brightness
  analogWrite(bluepin, b); // Set the blue brightness
}

void setup() {
  pinMode(redpin, OUTPUT);
  pinMode(greenpin, OUTPUT);
  pinMode(bluepin, OUTPUT);
  pinMode(switchpin, INPUT_PULLUP);
  red = green = blue = 0; // Start with the LED off
  rgb(red, green, blue);
}
```

```
void loop() {  
  while ( digitalRead( switchpin ) == HIGH ) {}  
  while ( digitalRead( switchpin ) == LOW ) {  
    red = (red + 1) % 12; // Add 1 and wrap around at 12  
    rgb(red, green, blue);  
    delay(200);  
  }  
}
```

```
while ( digitalRead( switchpin ) == HIGH ) {}  
while ( digitalRead( switchpin ) == LOW ) {  
  green = (green + 1) % 12;  
  rgb(red, green, blue);  
  delay(200);  
}
```

```
while ( digitalRead( switchpin ) == HIGH ) {}  
while ( digitalRead( switchpin ) == LOW ) {  
  blue = (blue + 1) % 12;  
  rgb(red, green, blue);  
  delay(200);  
}  
}
```



# Challenge Problems

- ▶ A traffic light  
Red, green, then briefly yellow  
Click to advance
- ▶ Reaction-time game  
Countdown with colors  
Press the button quickly  
Blink or color to indicate your speed
- ▶ Better mood light color control  
Cycle through “good” colors  
Separately cycle through brightness
- ▶ Morse code practice  
Display a color letter code (Red = R, Green = G, etc.)  
Expect player to enter Morse code for the letter  
Display score with blinks or color