

## Project 1: Introduction to Arduino and LED Blink (Sketch Version)

### Description:

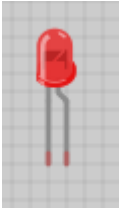
The Arduino is a microprocessor. A Microprocessor is a compact programmable computing device with memory, processing, input, and output pins. In this lesson we will:

1. Build and wire a device with one LED, resistor, and Arduino board.
2. Program the device to “Blink the Light”
3. Identify the flow of electricity / signal in this computing unit.
4. Use the Blockly Programming system to control speed of Blink.

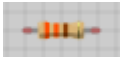
### Build and Wiring:

You will need:

1. LED Light Bulb (Any Color)



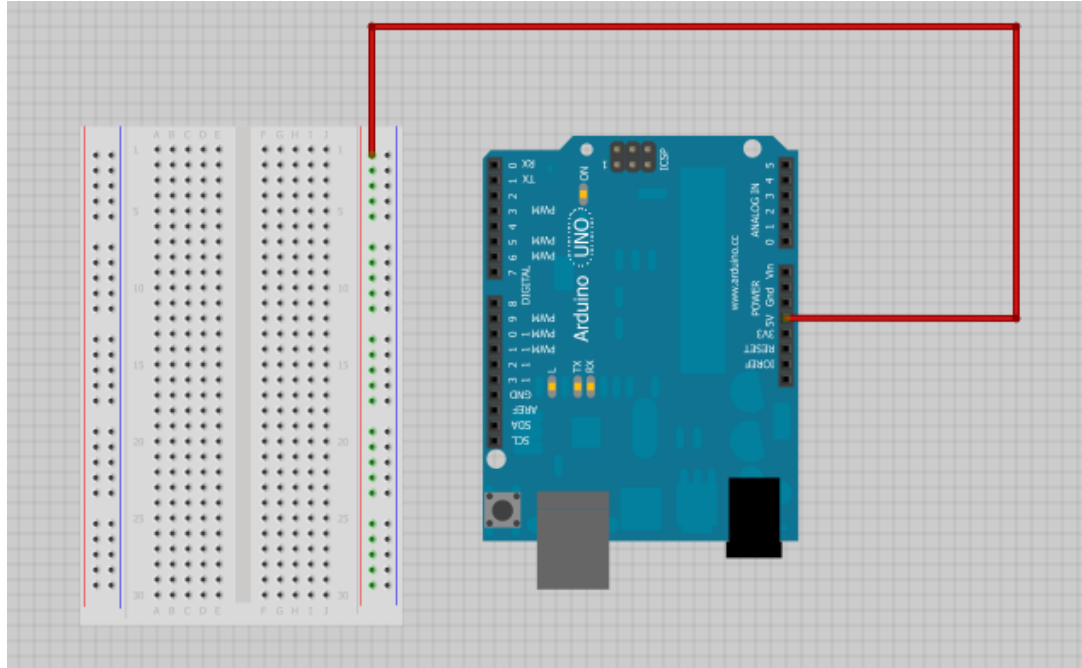
2. 330 Ohm Resistor



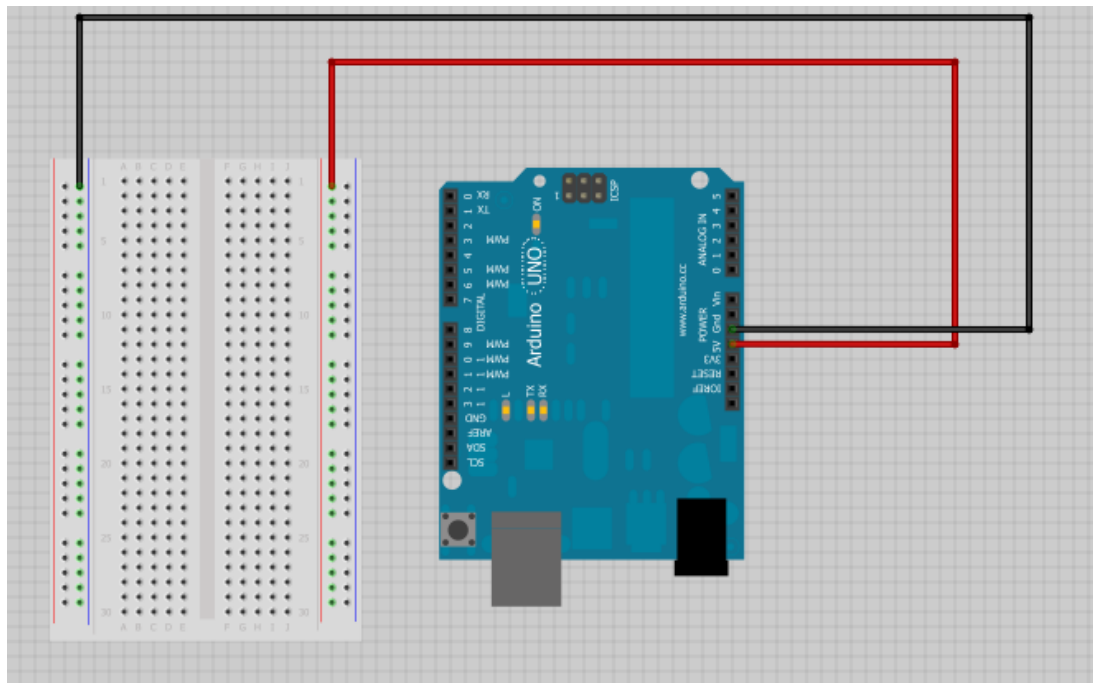
3. Red Wire
4. White Wire
5. Black (Or dark colored Wire)

**Process:**

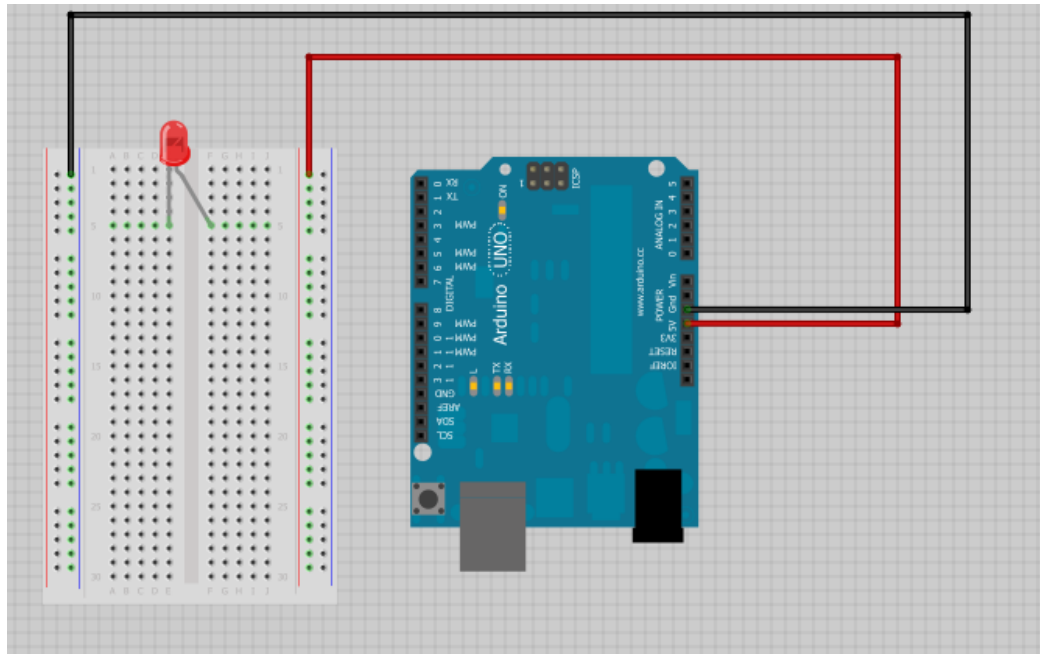
1. Run a red Wire from the 5V Pin to the Red Rail on the Breadboard. This will connect the current side of the circuit.



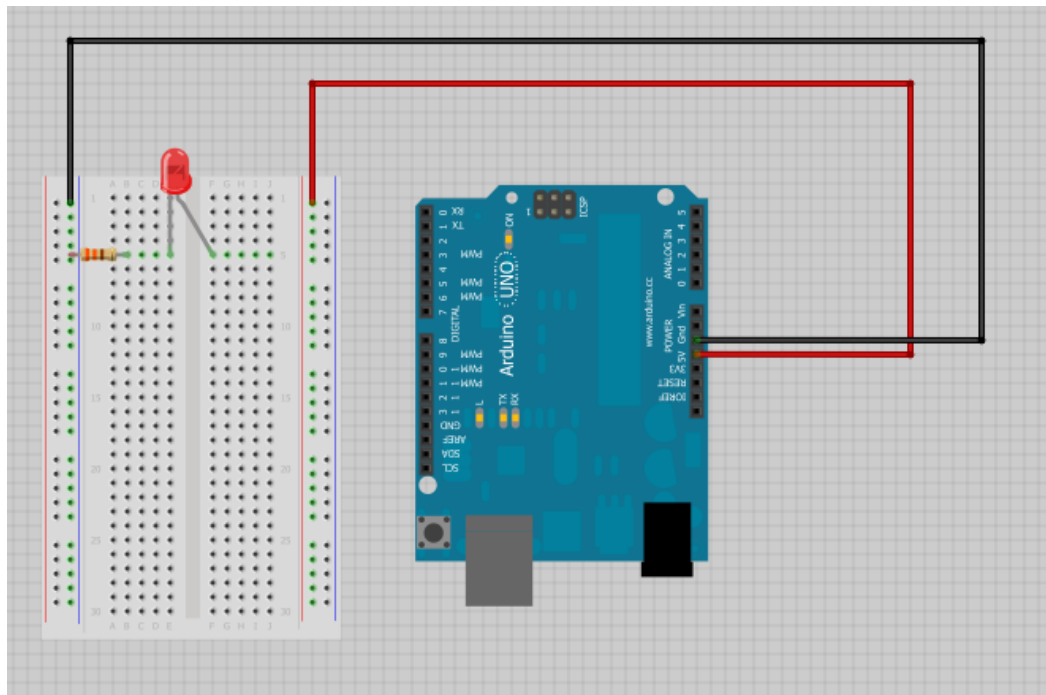
2. Run a black (or dark colored wire) from the Gnd Pin of the Arduino to the Blue Rail on the far side of the Breadboard.



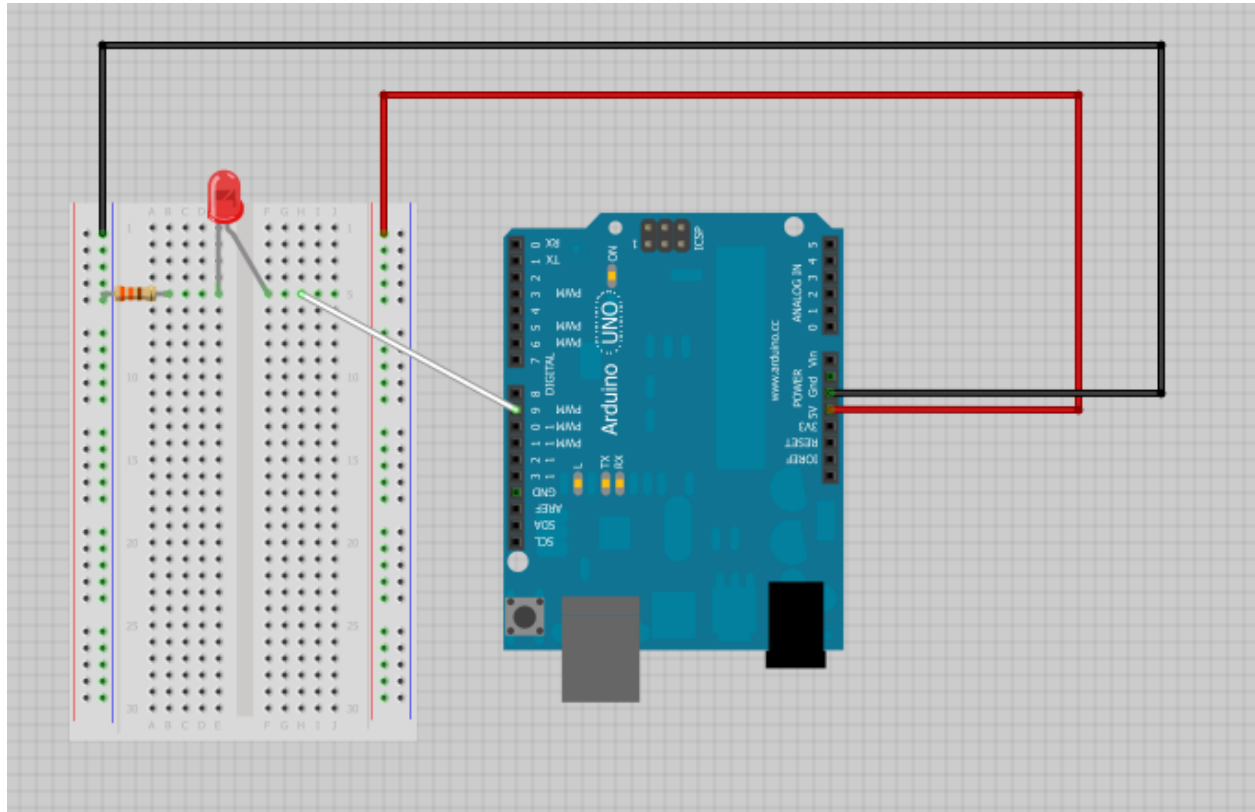
3. Plug an LED bulb into the circuit. Note that the longer pin will face the Arduino Board and the pins should cross the "gap" in the breadboard. (Plug the Long Pin into F5 and the Short Pin into E5).



4. This step is VERY IMPORTANT!!! Plug a 330 OHM resistor from Port B5 to Ground (The blue rail). An LED bulb must ALWAYS have a Resistor in the circuit. If we do not use a Resistor, we will burn out the bulb or the Arduino Board.



5. Now we will run the signal wire. Wire Pin 9 on the Arduino to H5 on the Breadboard. This will carry the current from the Arduino Pin to the LED and allow the Arduino to switch on and off the LED.



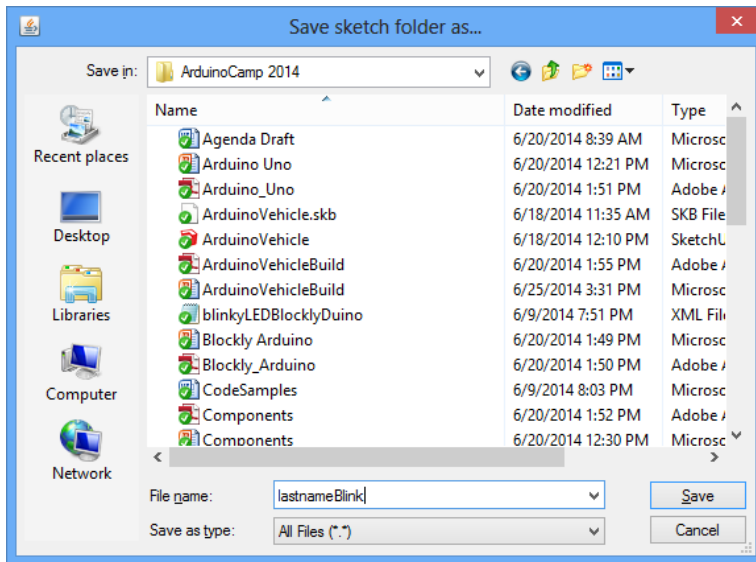
6. You are finished! Go on to the next section to program your Arduino.

## Sketch Programming:

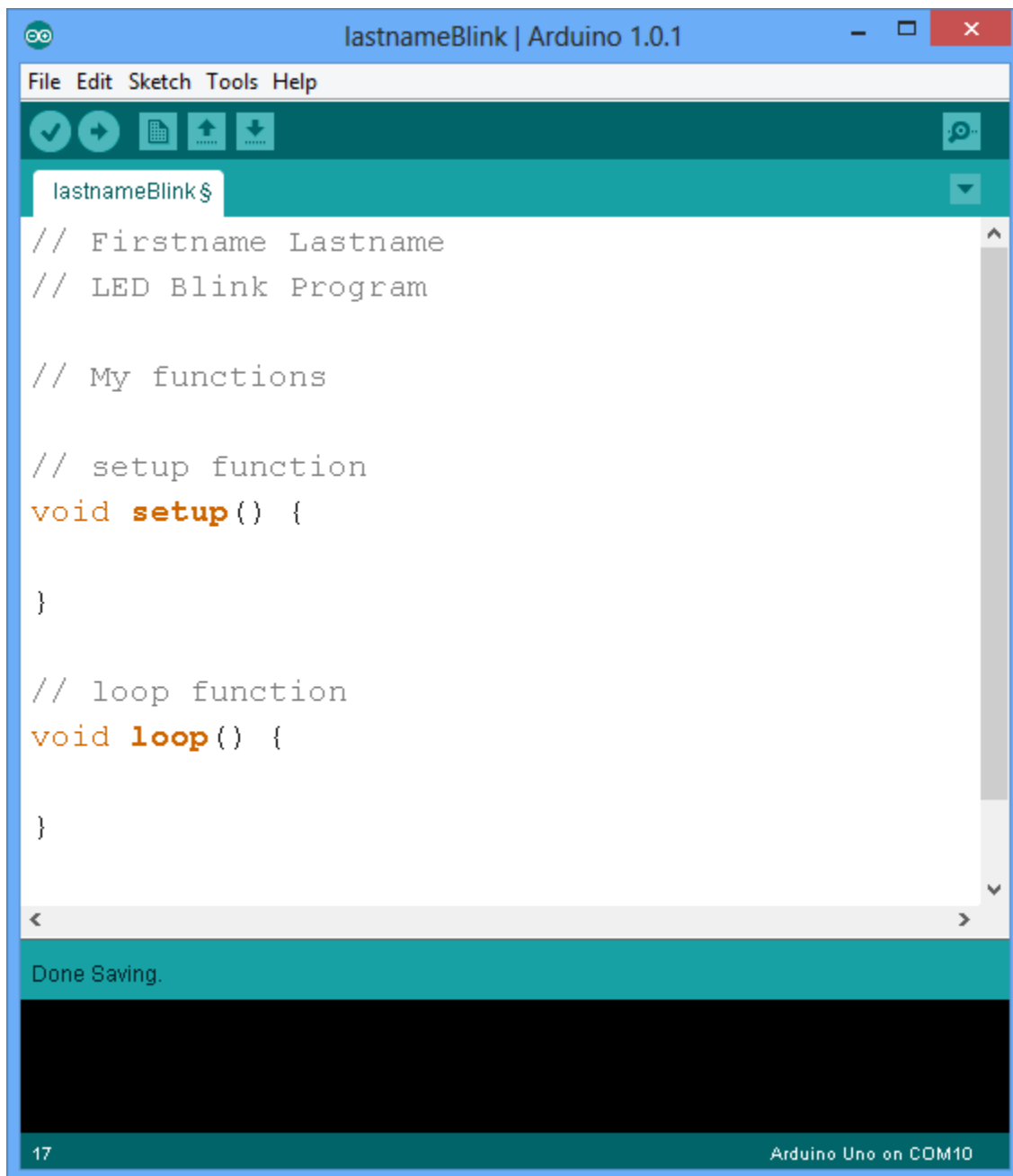
1. Start your Arduino Sketch Program by clicking on the Sketch Icon.



2. Save the code by selecting “File-Save” and naming the program “lastnameBlink”.



3. We want to set up the code by writing some comments and defining the two required functions (void setup() and void loop())

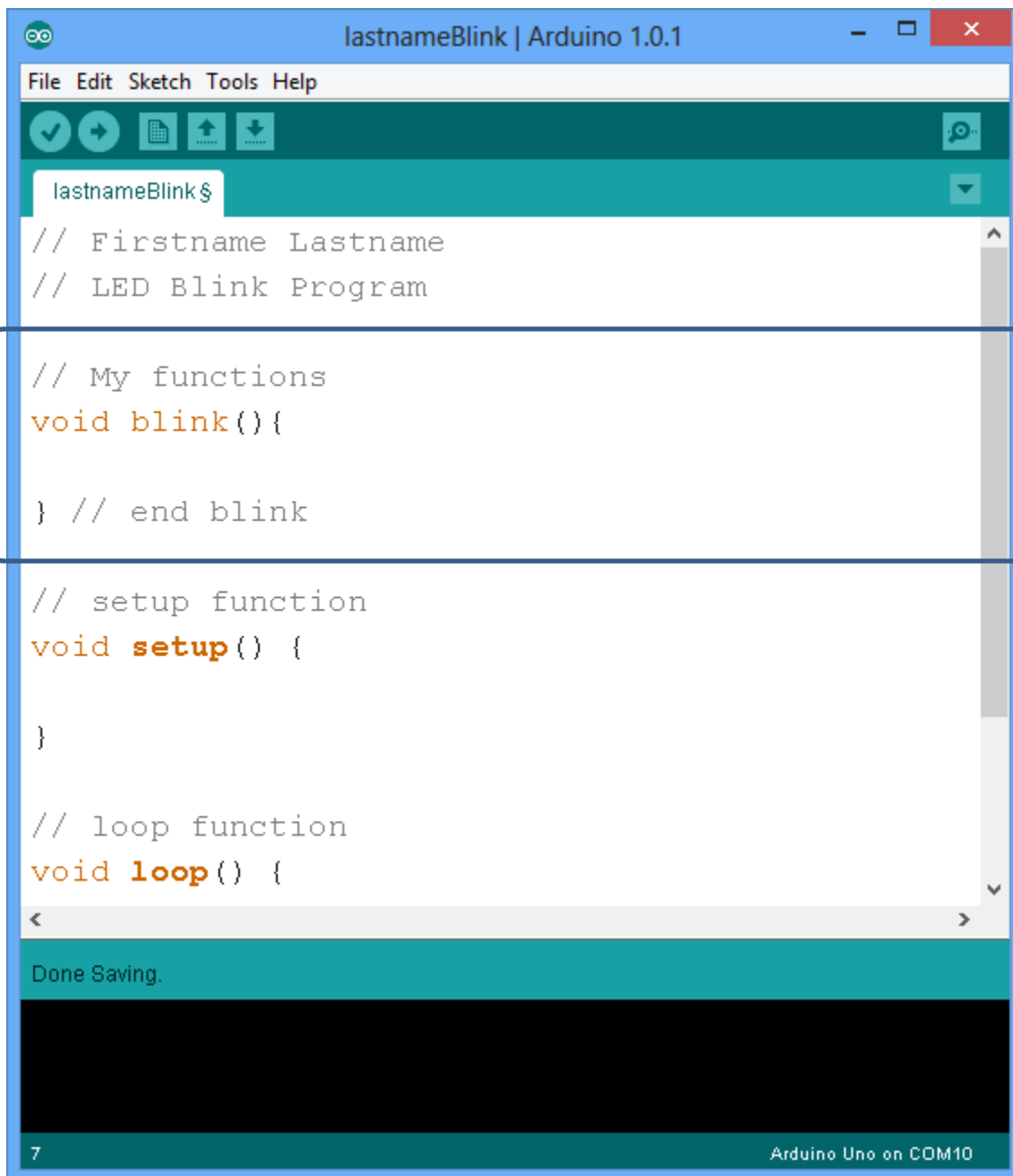


The screenshot shows the Arduino IDE interface. The title bar reads "lastnameBlink | Arduino 1.0.1". The menu bar includes "File", "Edit", "Sketch", "Tools", and "Help". The toolbar contains icons for checkmark, play, file, upload, and download. The main text area contains the following code:

```
lastnameBlink $  
// Firstname Lastname  
// LED Blink Program  
  
// My functions  
  
// setup function  
void setup() {  
  
}  
  
// loop function  
void loop() {  
  
}
```

At the bottom of the IDE, a status bar shows "Done Saving." on the left, "17" in the center, and "Arduino Uno on COM10" on the right.

4. We want to write a function for our Arduino to switch the light. Outline the function 'blink' as demonstrated:



```
lastnameBlink | Arduino 1.0.1
File Edit Sketch Tools Help
lastnameBlink$
// Firstname Lastname
// LED Blink Program

// My functions
void blink(){

} // end blink

// setup function
void setup() {


}

// loop function
void loop() {

}
Done Saving.
7 Arduino Uno on COM10
```

5. Our Arduino device has the LED plugged in to Pin 9. So we will write the command 'digitalWrite(9, HIGH)' inside the 'blink function.' (Note that HIGH means 'on' or current will flow from pin 9)

```
lastnameBlink$  
// Firstname Lastname  
// LED Blink Program  
  
// My functions  
void blink(){  
    digitalWrite(9, HIGH);  
} // end blink  
  
// setup function  
void setup() {  
  
}
```





6. We want the program to wait 1 second. So we will write 'delay(1000)' in the function. Note that 1000 stands for 1000 milliseconds or 1 second.

```
lastnameBlink$
// Firstname Lastname
// LED Blink Program


// My functions
void blink(){
  digitalWrite(9, HIGH);
  delay(1000); ←
} // end blink

// setup function
void setup() {

}
```

7. Now we want PIN 9 to switch to LOW and then wait one second. Write the command 'digitalWrite(9, LOW)' and then delay(1000) in the blink function.

```
lastnameBlink$  
// Firstname Lastname  
// LED Blink Program  
  
// My functions  
void blink(){  
    digitalWrite(9, HIGH);  
    delay(1000);  
    digitalWrite(9, LOW);  
    delay(1000);  
} // end blink  
  
// setup function  
void setup() {  
  
}
```



8. We now need to initialize PIN 9 as an output pin. We do this initialization in the setup() function. Go to the setup function and add the code 'pinMode(9, OUTPUT);'

```
lastnameBlink $
void blink(){
  digitalWrite(9, HIGH);
  delay(1000);
  digitalWrite(9, LOW);
  delay(1000);
} // end blink

// setup function
void setup() {
  // Setup Pin 9 for output
  pinMode(9, OUTPUT);
}
```

9. Now we want the program to call the blink() function over and over so the LED will blink as long as the Arduino is on. Move to the loop() function and call 'blink()'

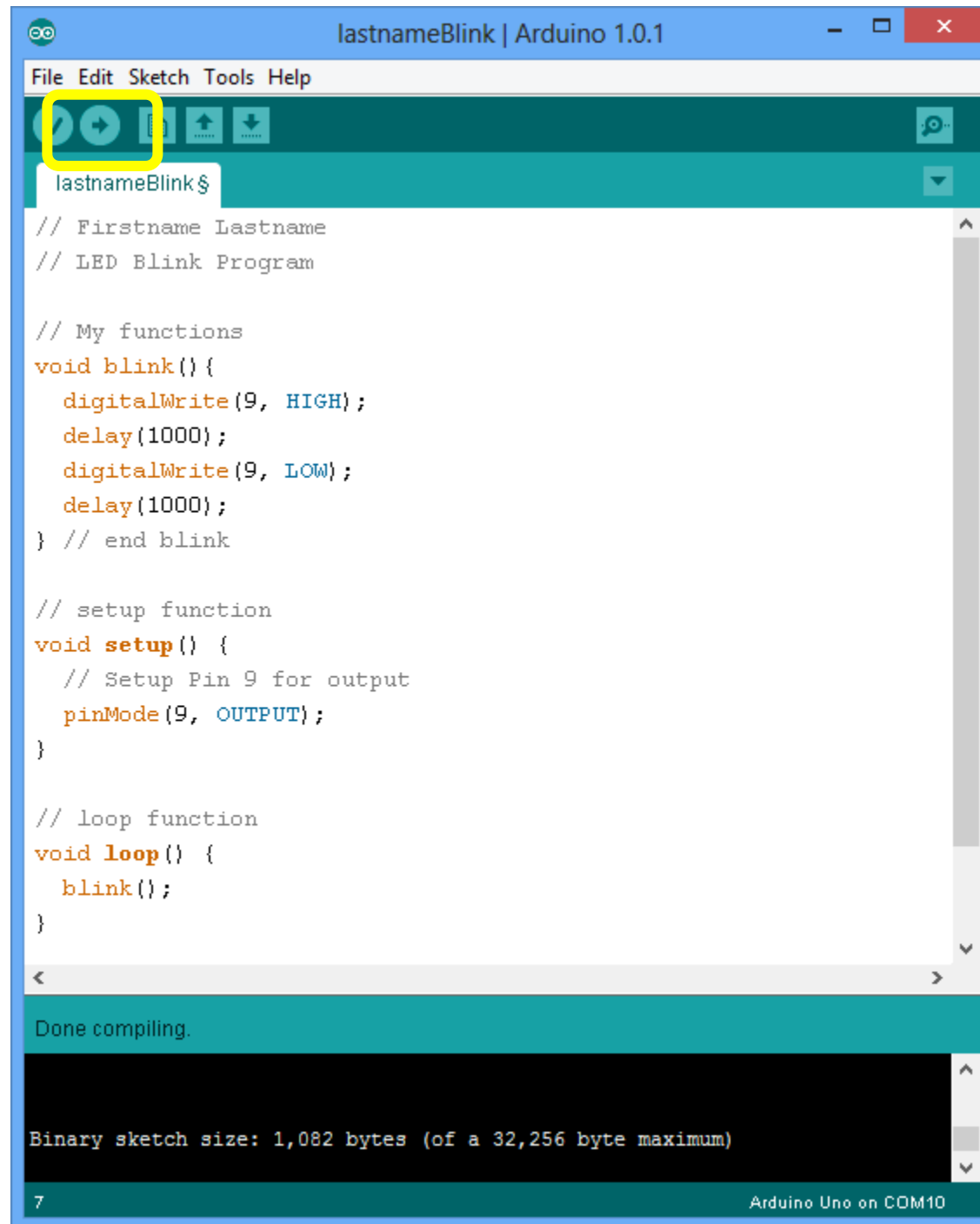
```
// setup function
void setup() {
  // Setup Pin 9 for output
  pinMode(9, OUTPUT);
}

// loop function
void loop() {
  blink(); ←
}
```

10. Select 'File-Save' and save your code. We are now ready to run the code on the Arduino.

## Downloading the Blockly Program to the Arduino

1. Make sure you have the 'lastnameBlink' program open from the previous section.
2. Plug in your Arduino board to your computer via the USB port.
3. Click the Upload Icon to lead the code onto the Arduino. The light should blink!



7. Congratulations! Here are some other ideas to try:

- a. Change the value of the 'delay' code to control the speed of the blink.
- b. Create a new function 'blinkFast' and write a function that will blink the light faster than 'blink'

**Vocabulary:**

**Arduino Micro-Processor:** A mini computer with memory, processing, input, and output. We can program this computer to control electrical current and signals to control electric powered devices.

**Breadboard:** Where we can wire electrical circuits and make connections without permanently soldering the connections. A test platform for developing electronic devices.

**Signal:** A pulse or pulses of electrical current to carry information. The Arduino uses signals to control LED's, speakers, motors, and other devices.

**Current:** A steady state of charge from the positive side of the circuit

**Volts:** The measure of potential energy difference between the positive and negative side of a circuit.

**Amps:** The measure of how much current passes through the circuit in a given length of time.

**Ground:** The source of electrons or the negative side of the circuit.

**LED:** Light Emitting Diode. Acts as a one way gate for current and will emit a light when current is passed through the LED. LED's use very little power and are very common in electronic devices. Any light you see on an electronic device most likely is created by an LED.

**LED's have two pins:**

The Long Pin is wired to the Current side (+ side) of the circuit (Anode)

The Short Pin is wired to the Ground side (- side) of the circuit (Cathode)

**Resistor:** Resists the flow of current and electrons in a circuit. Measured in Ohms.