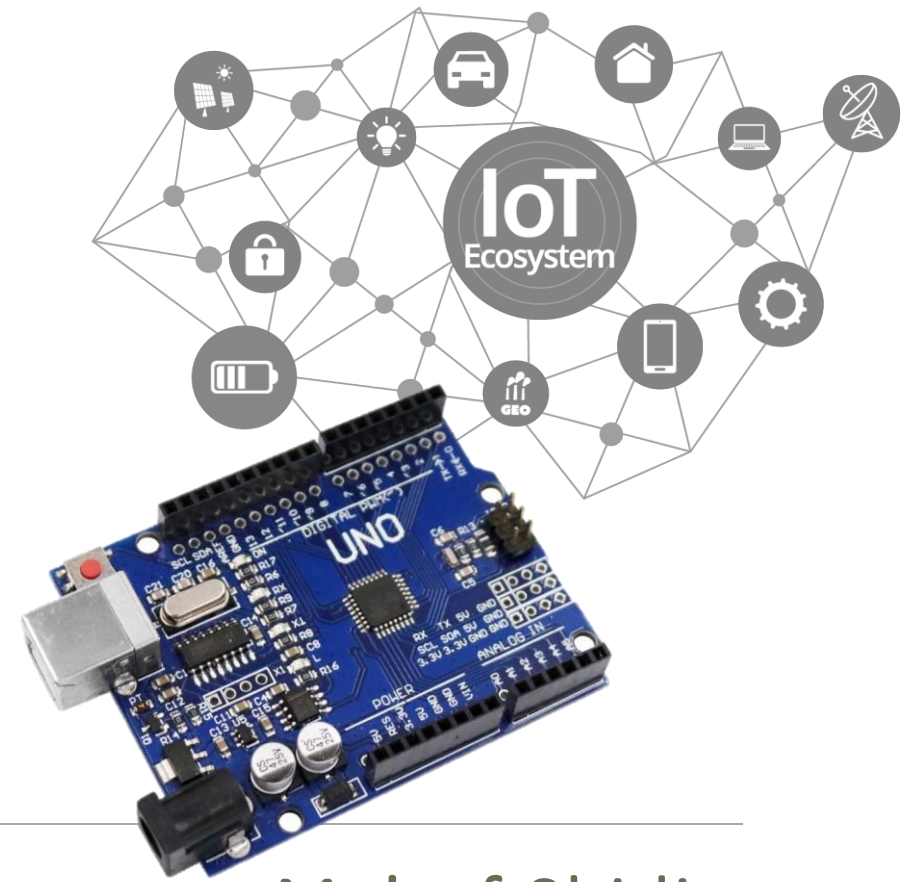


Pengenalan Arduino sebagai dasar materi *Internet of Things* (IoT)



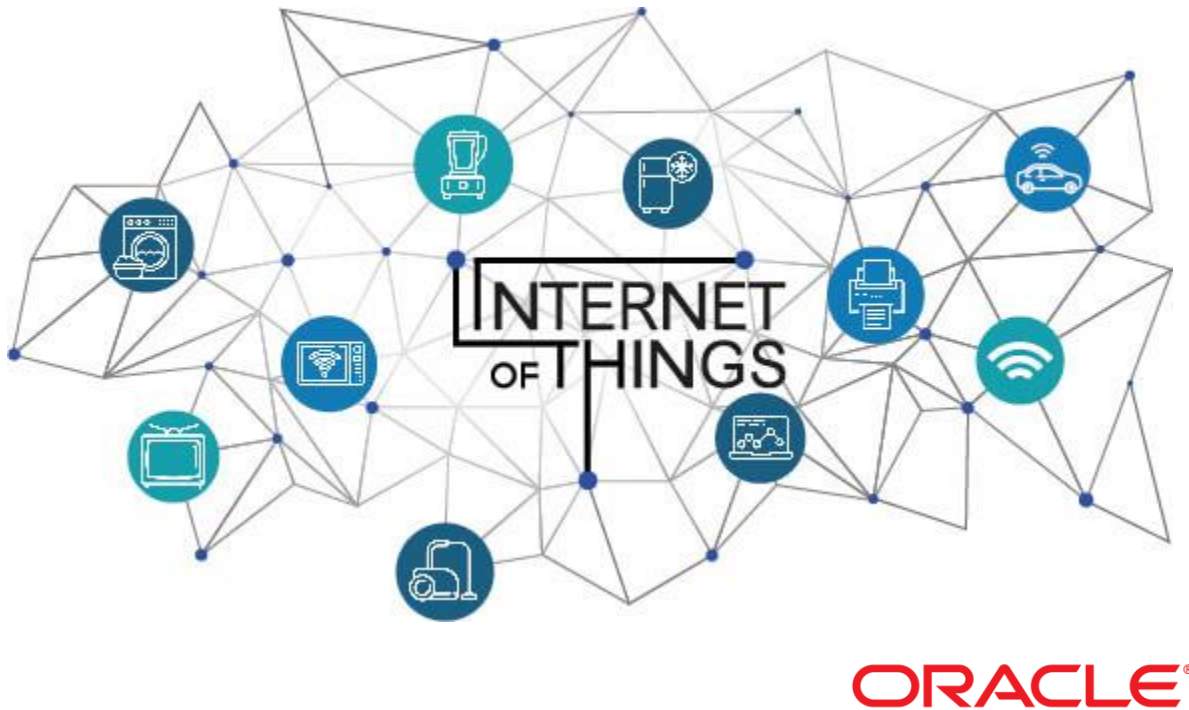
Ma'ruf Shidiq
SMK Negeri 1 Klaten
10 Agustus 2022



Apakah ada yang sebelumnya sudah pernah belajar elektronika?

Apakah ada yang sebelumnya sudah pernah belajar pemrograman?

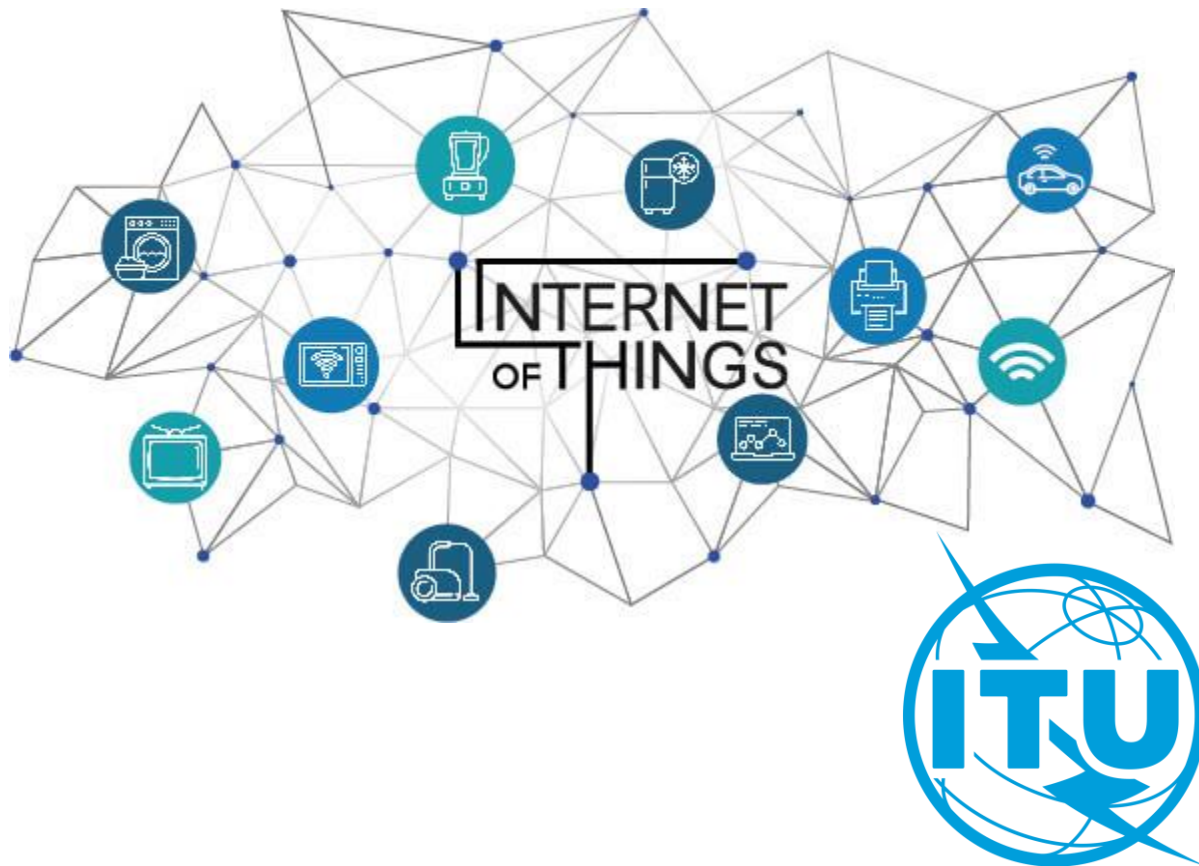
Apa itu *Internet of Things*?



The Internet of Things (IoT) describes the network of physical objects—“things”—that are embedded with sensors, software, and other technologies for the purpose of connecting and exchanging data with other devices and systems over the internet.

- Oracle -

Apa itu *Internet of Things*?



Internet of Things (IoT) as a global infrastructure for the information society, enabling advanced services by interconnecting (physical and virtual) things based on existing and evolving interoperable information and communication technologies.

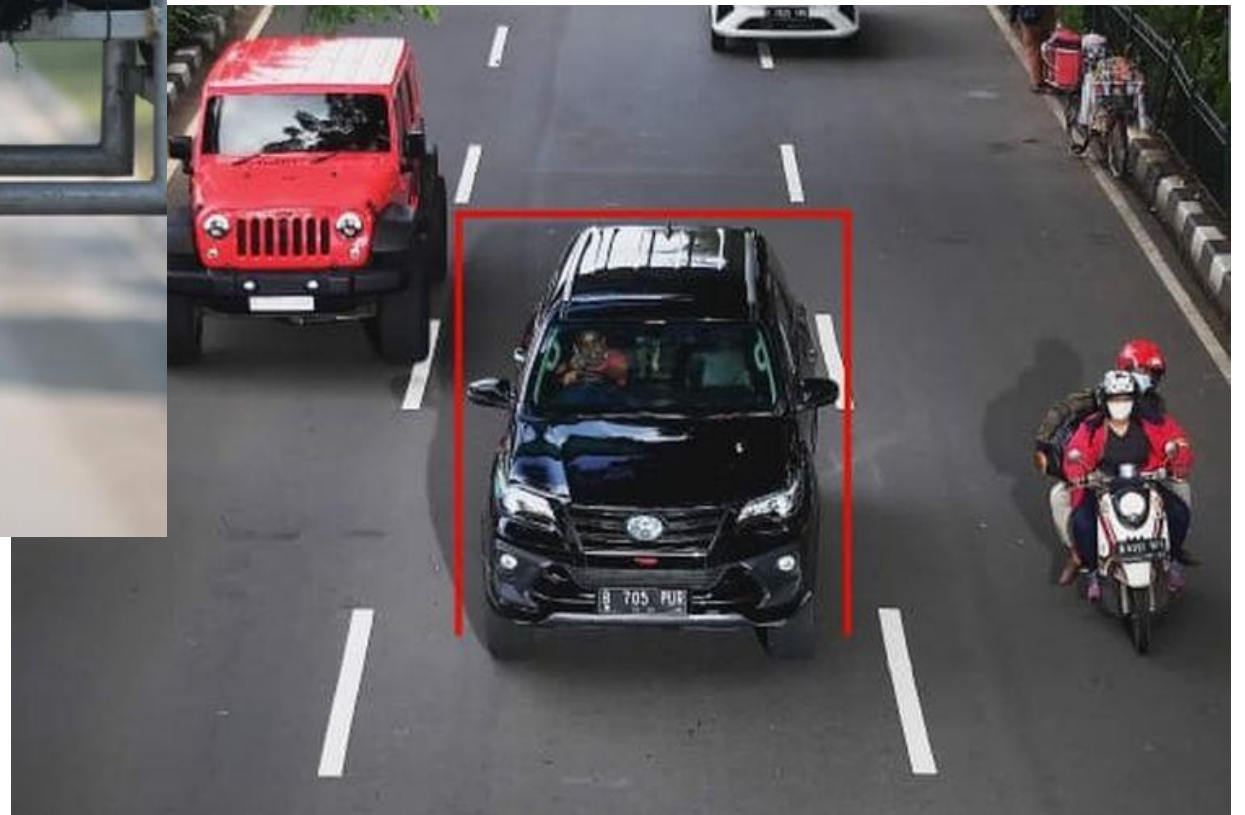
- ITU-T Y.2060 -

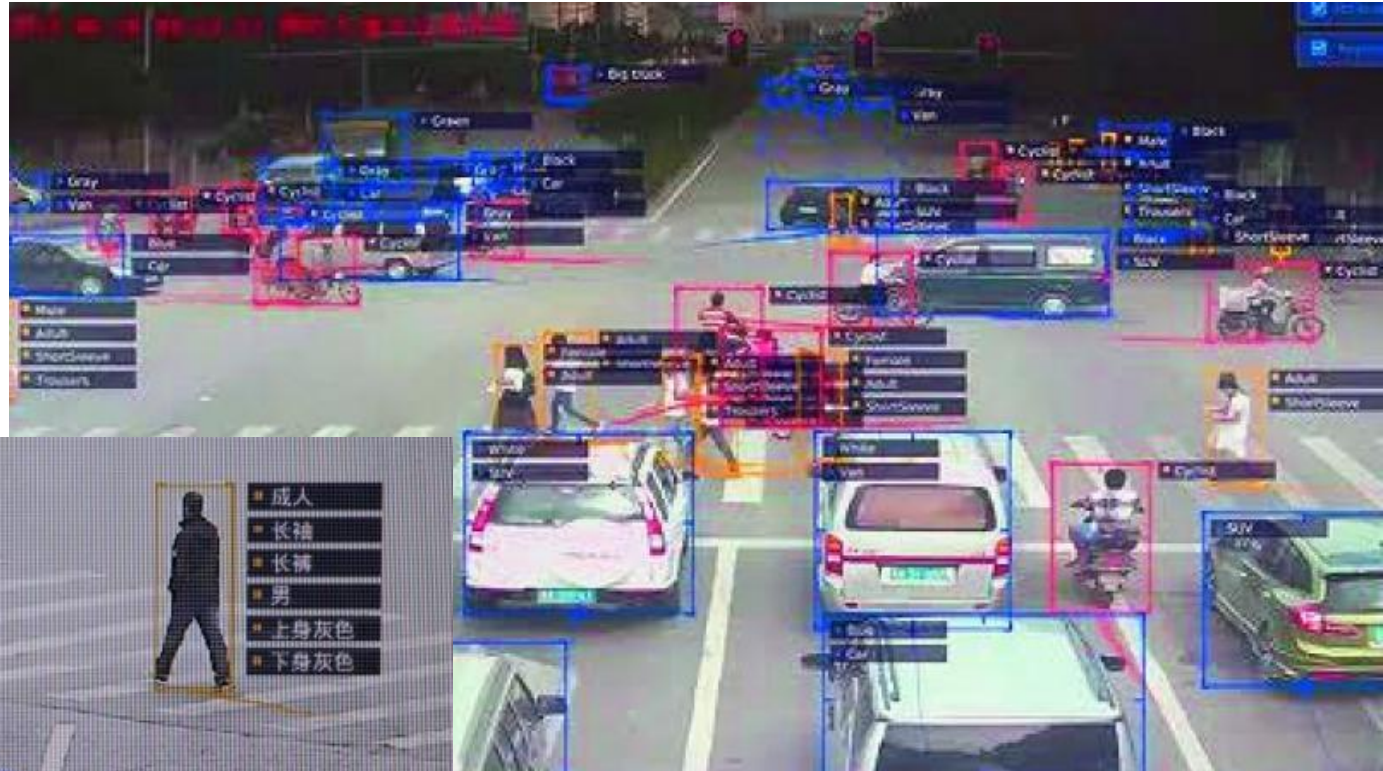
Apakah ada contoh dari perangkat IoT di lingkungan SMK N 1 Klaten?



IP CCTV / IP CAM

Pemanfaatan lain dari IP CCTV / IP Camera





Pemanfaatan lain dari IP CCTV / IP Camera



Studi Kasus untuk penjelasan selanjutnya



IoT World Forum Reference Model

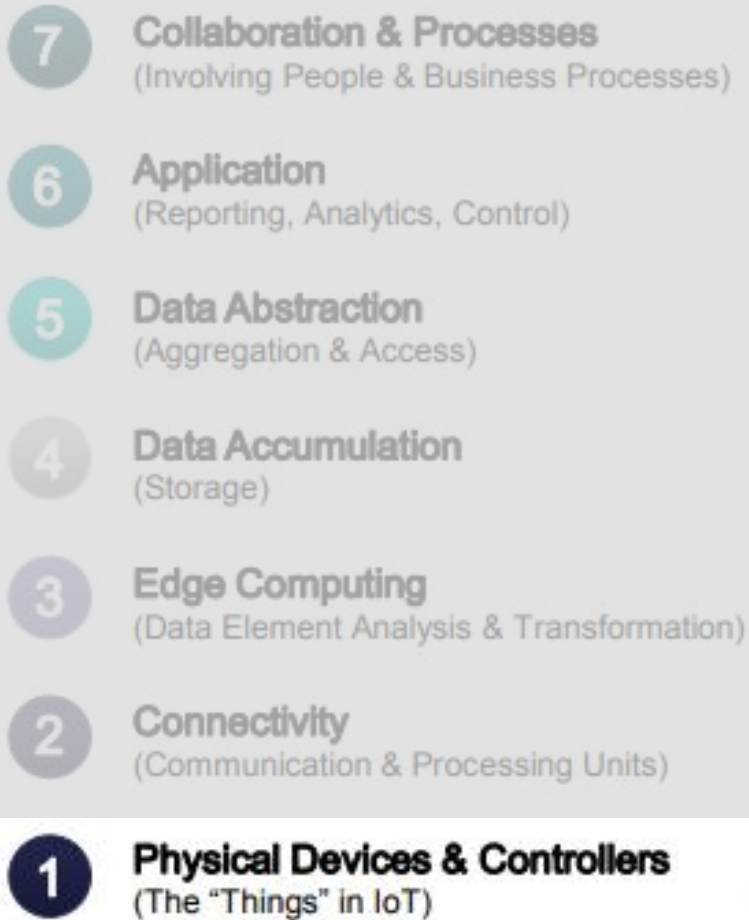
Levels

- 7 Collaboration & Processes**
(Involving People & Business Processes)
- 6 Application**
(Reporting, Analytics, Control)
- 5 Data Abstraction**
(Aggregation & Access)
- 4 Data Accumulation**
(Storage)
- 3 Edge Computing**
(Data Element Analysis & Transformation)
- 2 Connectivity**
(Communication & Processing Units)
- 1 Physical Devices & Controllers**
(The "Things" in IoT)



IoT World Forum Reference Model

Levels

- 
- 7 Collaboration & Processes**
(Involving People & Business Processes)
 - 6 Application**
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 - 1 Physical Devices & Controllers**
(The "Things" in IoT)

Umumnya terdiri dari 3 bagian:

- Sistem Tertanam (Embedded System)
- Sensor
- Aktuator

IoT World Forum Reference Model

Levels



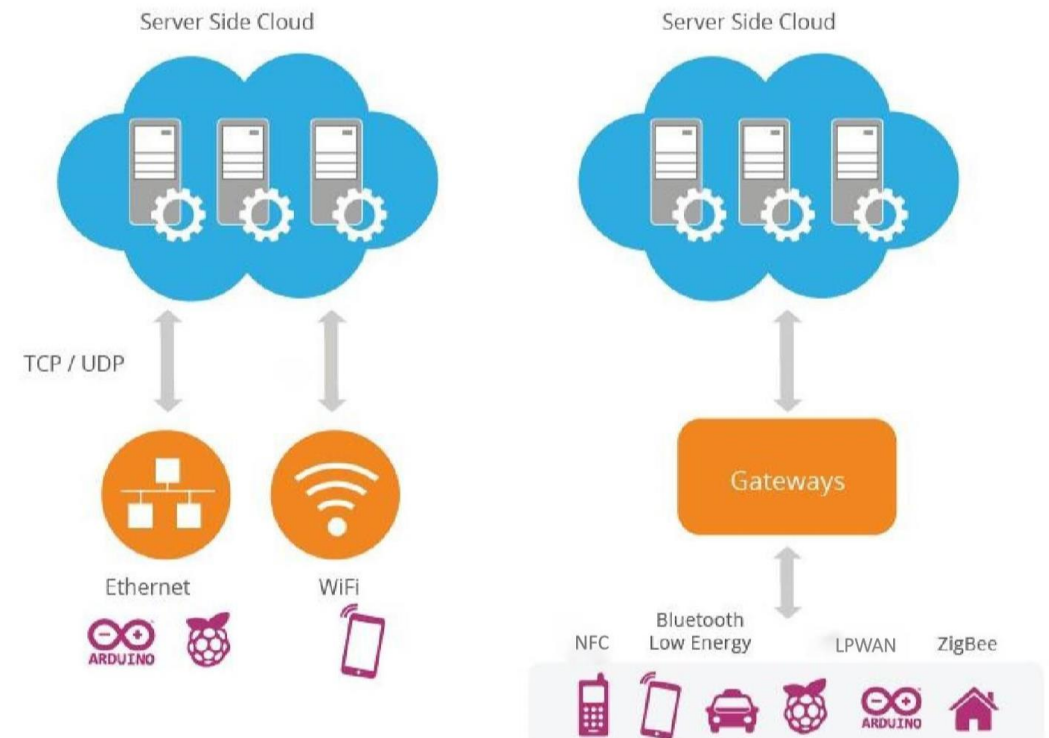
Perangkat dan sistem komunikasi yang menghubungkan antara perangkat fisik dan *edge computing*

- *Gateway*

- *4G*

- *Wifi*

- *LoRA*



IoT World Forum Reference Model

Levels

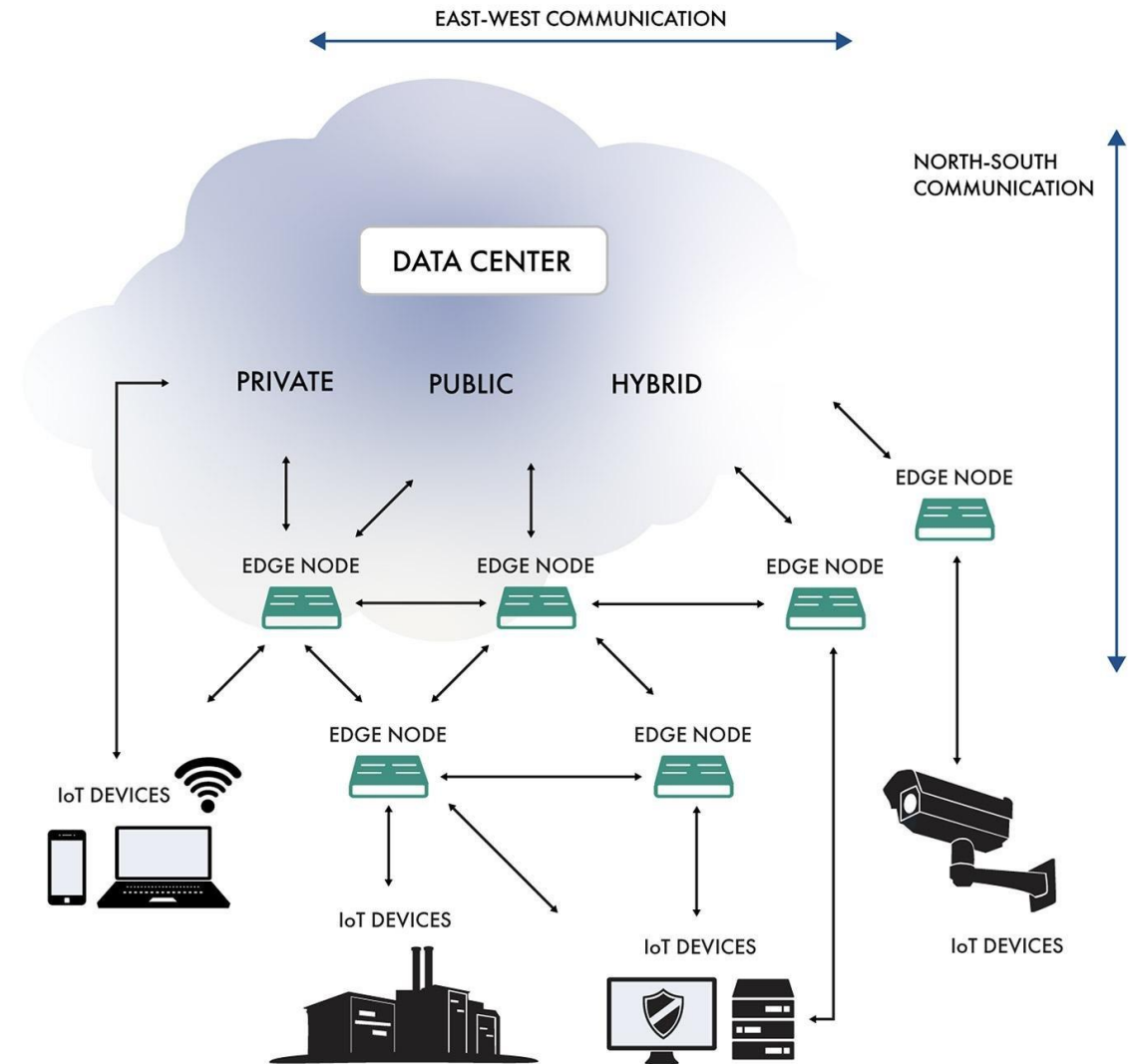
- 7 **Collaboration & Processes**
(Involving People & Business Processes)
- 6 **Application**
(Reporting, Analytics, Control)
- 5 **Data Abstraction**
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- 3 **Edge Computing**
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(Communication & Processing Units)
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(The "Things" in IoT)

Network	Connectivity	Pros and Cons	Popular use cases
Ethernet	Wired, short-range	<ul style="list-style-type: none"> High speed Security Range limited to wire length Limited mobility 	Stationary IoT: video cameras, game consoles, fixed equipment
WiFi	Wireless, short-range	<ul style="list-style-type: none"> High speed Great compatibility Limited range High power consumption 	Smart home, devices that can be easily recharged
NFC	Wireless, ultra-short-range	<ul style="list-style-type: none"> Reliability Low power consumption Limited range Lack of availability 	Payment systems, smart home
Bluetooth Low-Energy	Wireless, short-range	<ul style="list-style-type: none"> High speed Low power consumption Limited range Low bandwidth 	Small home devices, wearables, beacons
LPWAN	Wireless, long-range	<ul style="list-style-type: none"> Long range Low power consumption Low bandwidth High latency 	Smart home, smart city, smart agriculture (field monitoring)
ZigBee	Wireless, short-range	<ul style="list-style-type: none"> Low power consumption Scalability Limited range Compliance issues 	Home automation, healthcare and industrial sites
Cellular networks	Wireless, long-range	<ul style="list-style-type: none"> Nearly global coverage High speed Reliability High cost High power consumption 	Drones sending video and images

IoT World Forum Reference Model

Levels

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(The "Things" in IoT)

Pada dua *layer* ini data dari perangkat fisik akan disimpan dan diformat sesuai dengan kebutuhan

Selain itu, pada *Data Abstraction*, sistem harus bisa menyediakan data sesuai dengan kebutuhan yang diminta oleh sistem/aplikasi pada *layer* di atasnya

IoT World Forum Reference Model

Levels

- 7 Collaboration & Processes**
(Involving People & Business Processes)
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- 4 Data Accumulation**
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(The "Things" in IoT)

Setelah data tersimpan pada basis data, maka selanjutnya data dapat disajikan sesuai dengan kebutuhan user atau sistem lain

Menu

Weather stations

All stations list



South Perth (SP) ⓘ

Last updated : Wednesday December 12th 2018, 02:40:00pm

Minute

Hourly

Daily

Monthly

Yearly

Charts

TEMPERATURE

25.2°C

Feels like 24.8°C

Min 16.8°C
00:52am

Max 27.2°C
13:16pm

RELATIVE HUMIDITY

50%

Current relative humidity

Min 44.8%
11:59am

Max 90.5%
05:25am

RAINFALL

0 mm

Since 9am

24hrs to 9am
0.2mm

Last 14 days
0.8mm

WIND

10 km/h

10min average at 3m

SW

Max 25km/h
WSW 13:30pm

SPRAYING CONDITION ⓘ

6.5°C

Current Delta-T

Preferred

Dewpoint
13.9°C

EVAPOTRANSPIRATION

3.7 ETo short mm

Since 12am

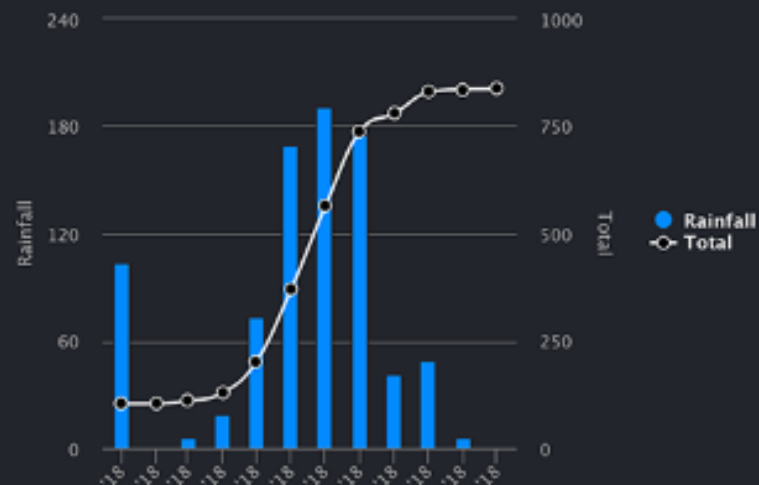
ETo tall
4.1mm

Pan evap.
4.5mm

RAINFALL

South Perth SP

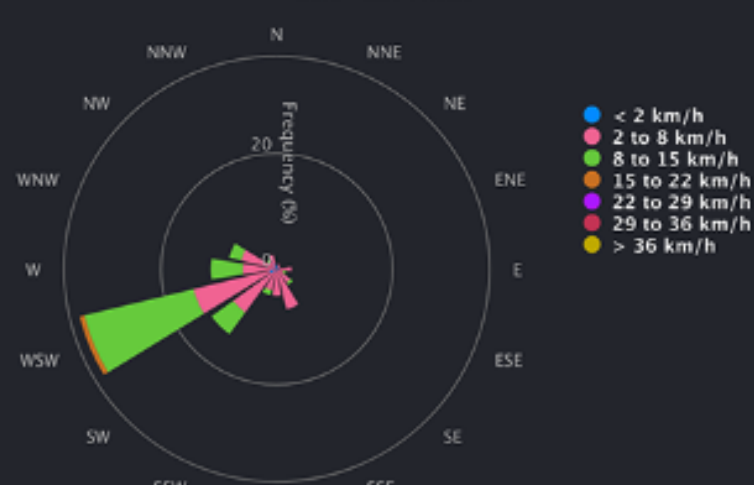
Actual rainfall for the last 12 months



WIND LAST 4 HOURS

South Perth SP

Wind - Last 4 hours



SOIL TEMPERATURE

Current temp.

29.4°C

Min

25.5°C

05:47am

Max

29.5°C

14:39pm

SOLAR RADIATION

Solar exposure

19.1MJ/m²

since 12:00am

Current irradiance

934W/m²

CHILLING

Richardson units

-20 units

24 hours to 9am

Chill hours

0 hrs

24 hours to 9am

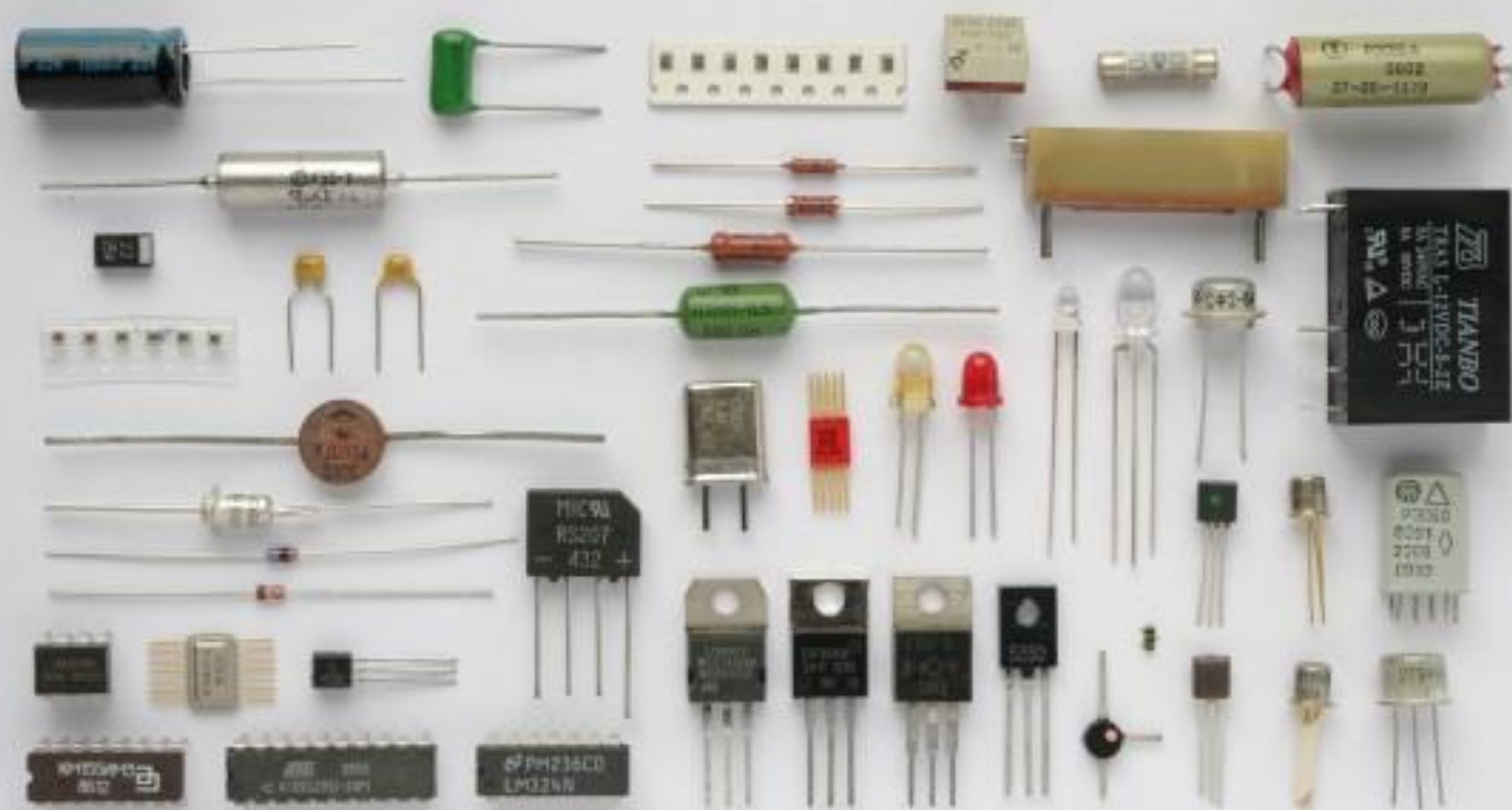


Contoh hasil
penelitian dan
pengembangan
IoT

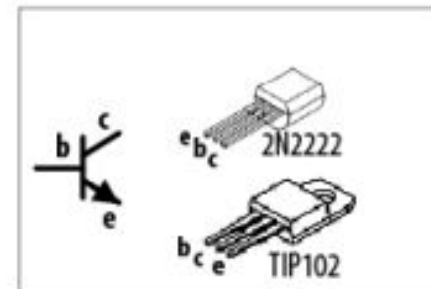
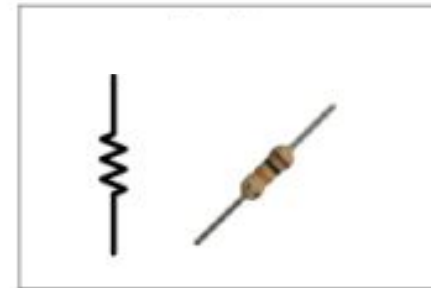
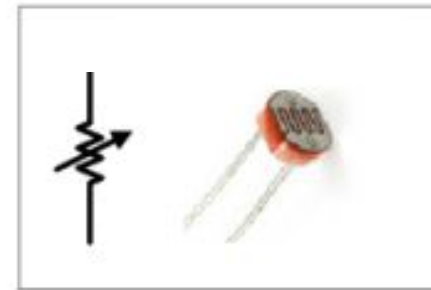
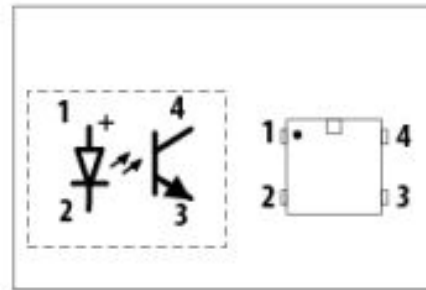
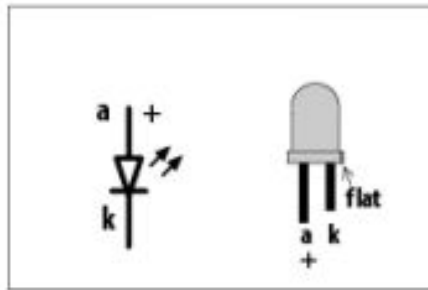
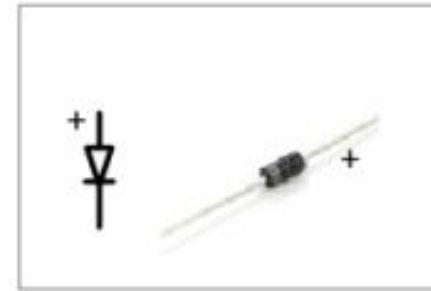
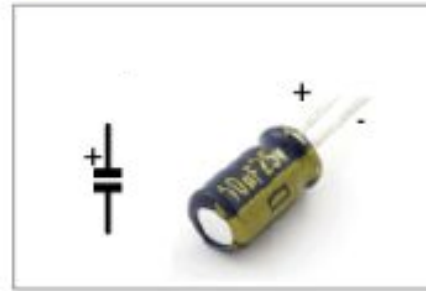
Apa itu Arduino?



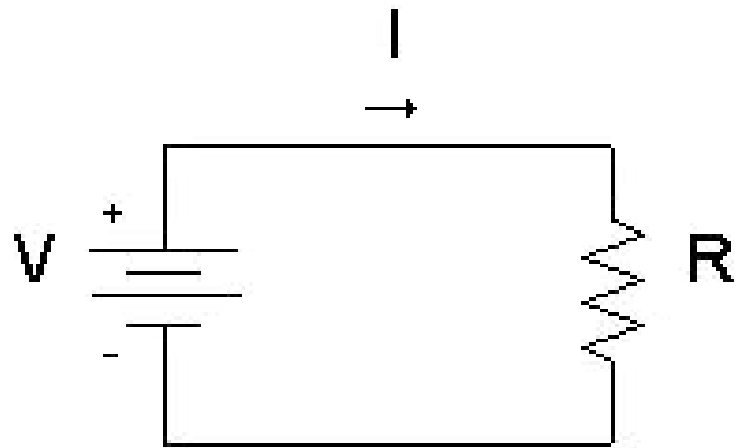
Sebuah ekosistem pengembangan elektronik yang terdiri dari perangkat lunak dan perangkat keras yang dirancang untuk memudahkan pengguna awam maupun ekspert di bidang elektronik.



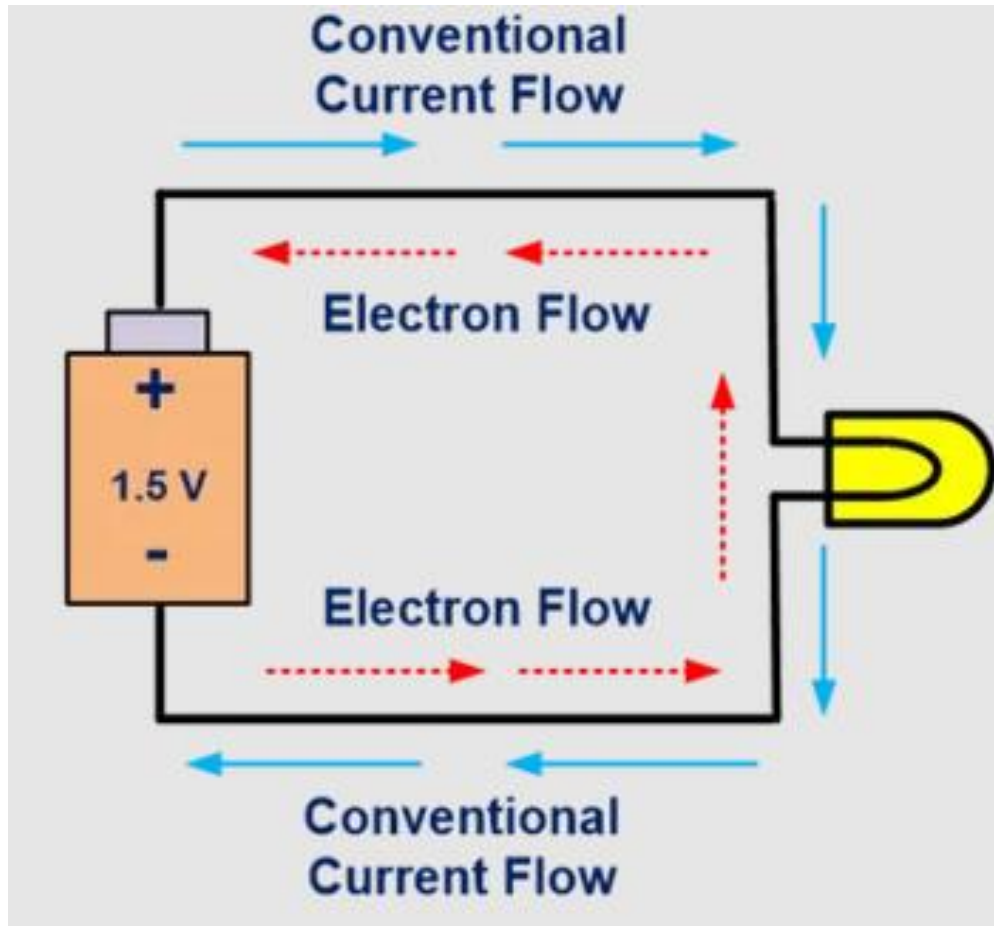
Elektronika dasar



Hukum Ohm



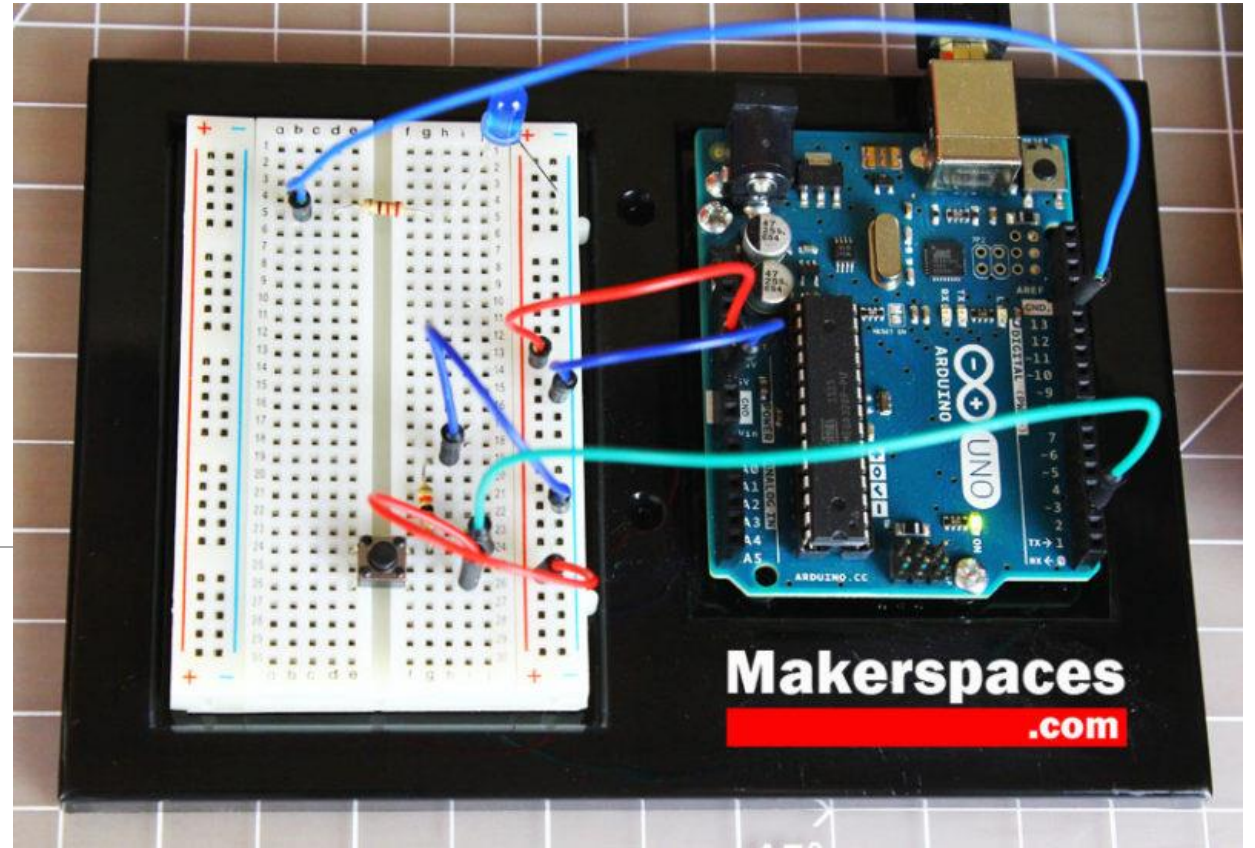
Arus Listrik Searah (DC)



Arus DC akan mengalir dari potensial tinggi ke potensial rendah

Sebaliknya, electron mengalir dari potensial rendah ke potensial tinggi

Hands On

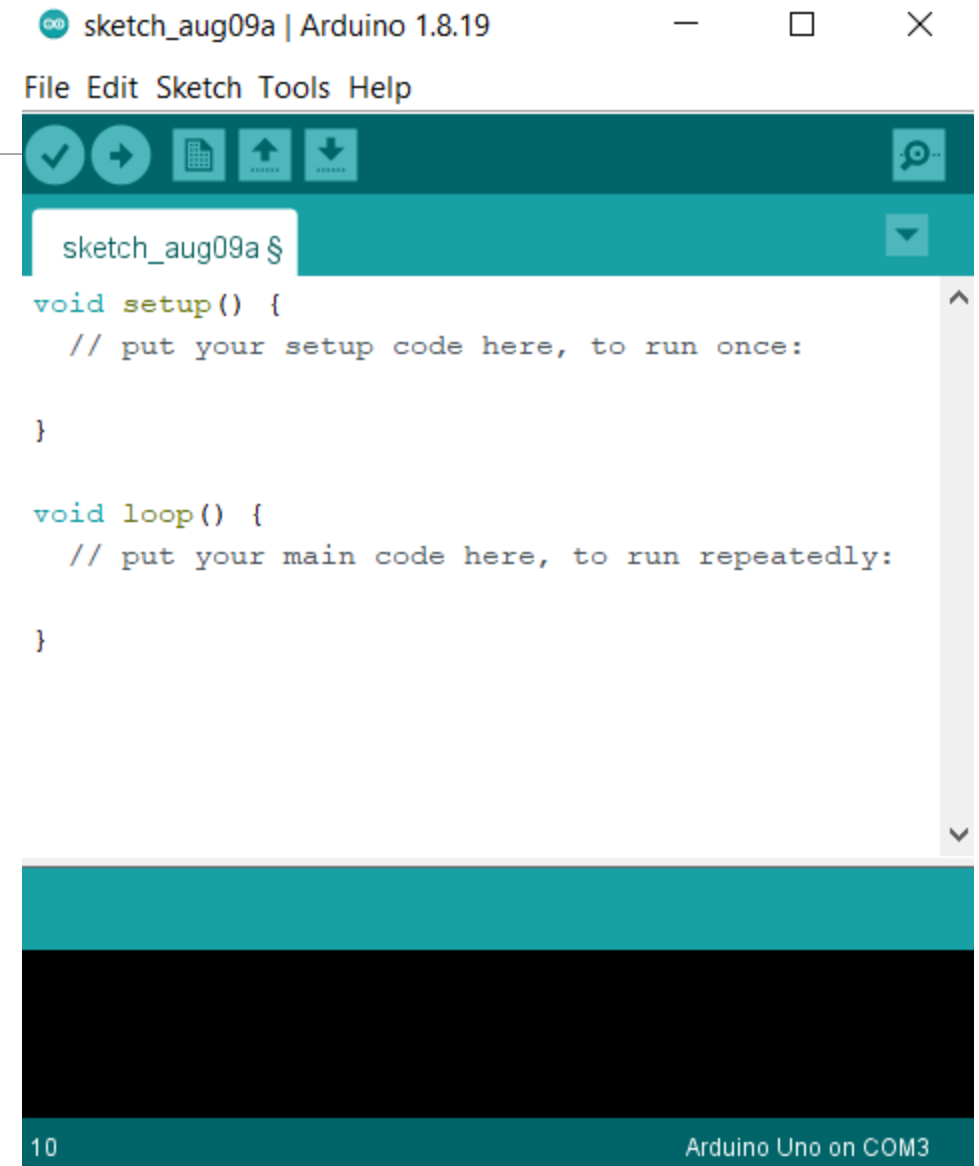
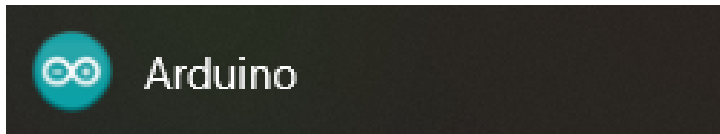


Pengenalan *Software*

Klik dua kali pada icon



Atau



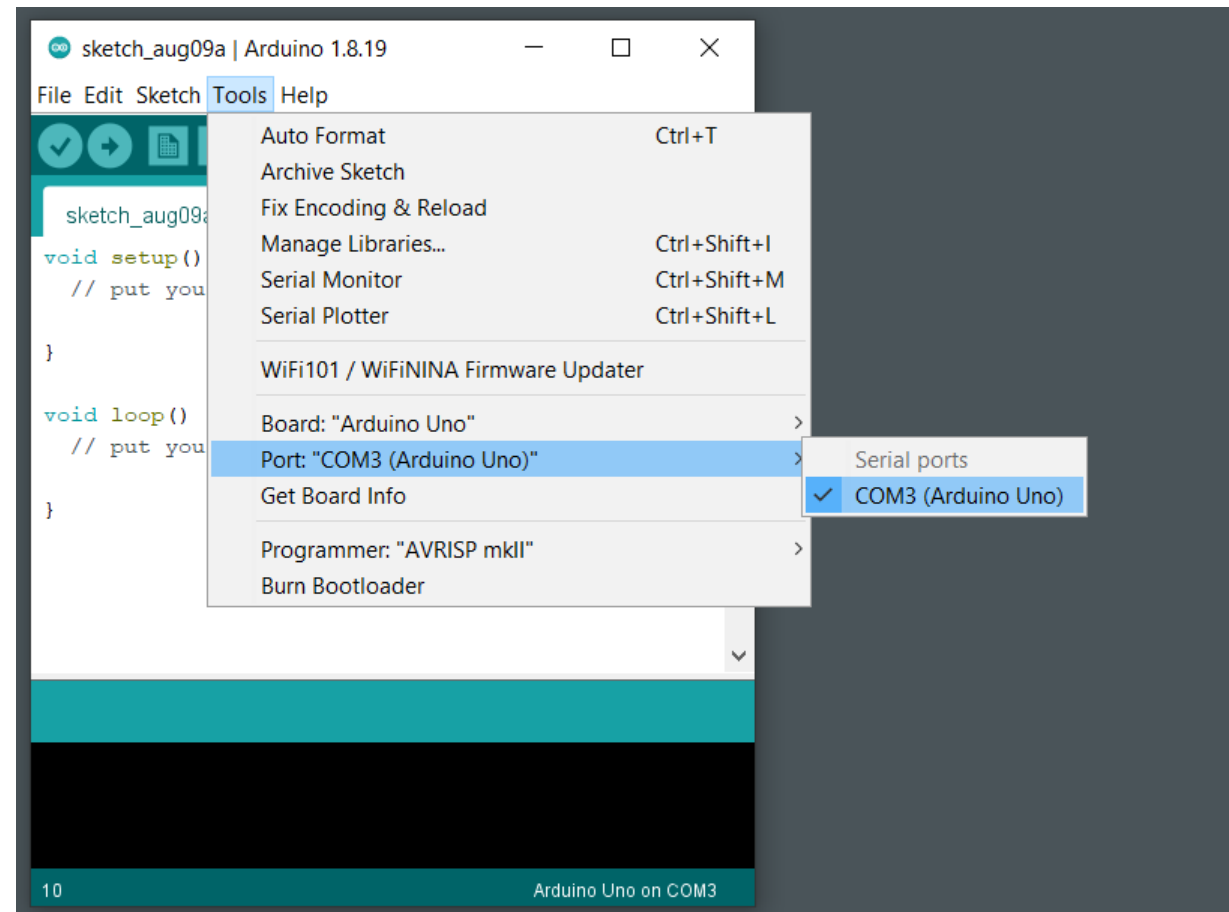
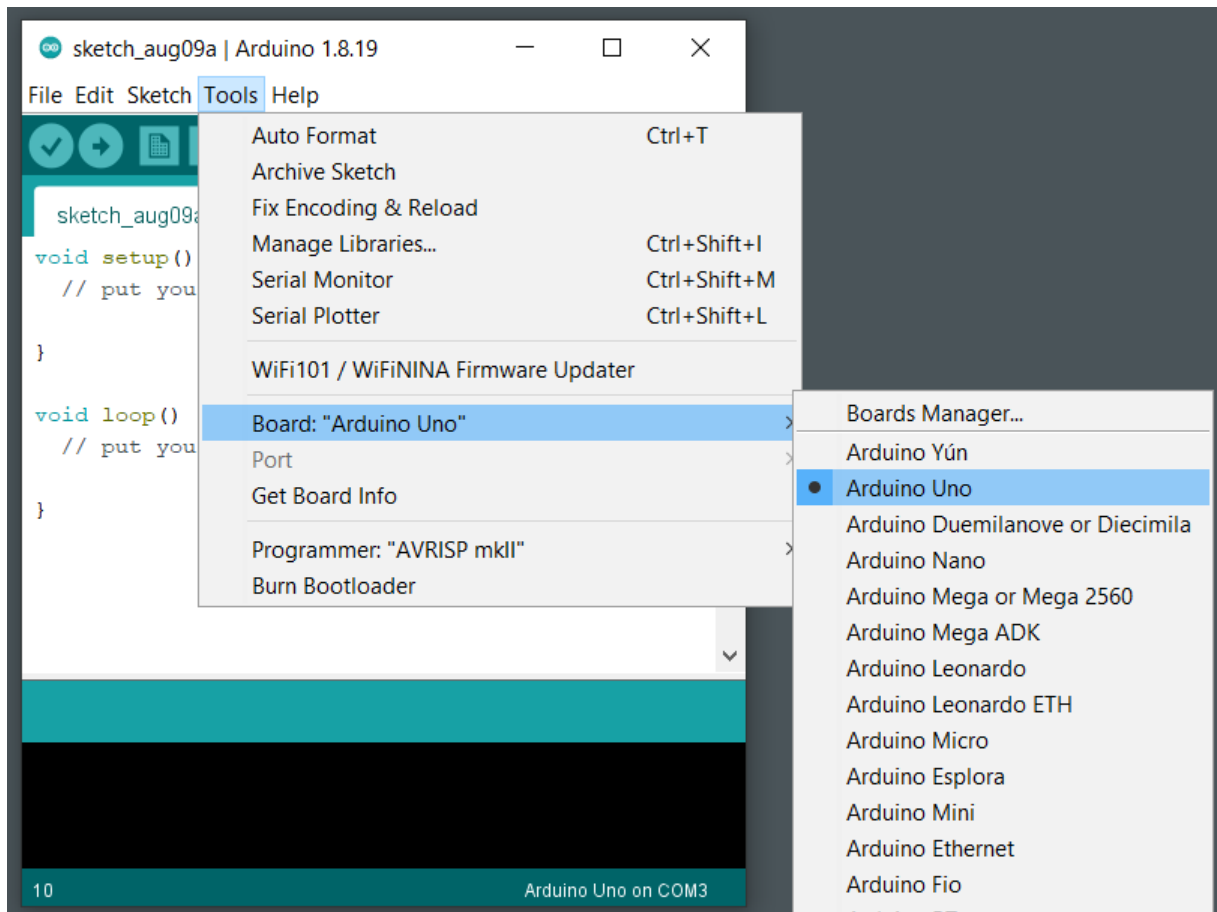
Struktur Pemrograman di Arduino

```
1 void setup() {  
2   // Apapun yang ditulis pada block `setup`  
3   // hanya akan dijalankan 1 kali, yaitu pada  
4   // saat dinyalakan  
5 }  
6  
7 void loop() {  
8   // Apapun yang ditulis pada block `loop`  
9   // akan dijalankan terus menerus secara  
10  // sequential atau berurutan dari atas  
11  // ke bawah, kemudian kembali ke atas lagi  
12 }
```

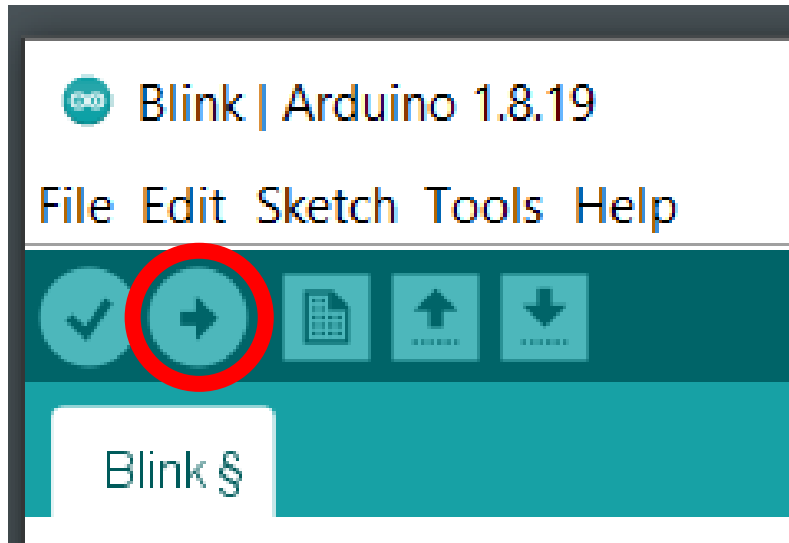
Cara Memasak Mie Instan

- Rebus mie dengan air yang telah mendidih.
- Setelah sudah cukup matang, tiriskan mie untuk beberapa menit dan buanglah air bekas rebusan mie.
- Setelah ditiriskan, tuangkan air panas yang baru sebagai kuahnya.
- Masukkan bumbu-bumbu yang telah tersedia.
- Selamat menikmati mie rebus kesukaan Anda.

Pengenalan Software



Pengenalan Software



Tombol “Upload” digunakan untuk mengirimkan/memasukkan/mengunggah program ke *Hardware* Arduino

Exercise 1

Silahkan buka aplikasi Arduino, kemudian hubungkan perangkat keras Arduino pada komputer anda, lalu tulis atau salin *source code exercise 1* pada aplikasi Arduino

A screenshot of the Arduino IDE window titled "Exercise_1 | Arduino 1.8.19". The window has a menu bar with "File", "Edit", "Sketch", "Tools", and "Help". Below the menu bar is a toolbar with icons for checking, running, uploading, and downloading. The main text area shows the following C++ code:

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

Exercise 1

Amati pada perangkat Arduino anda, apakah ada LED yang berkedip?



Exercise 1

Ubah angka **1000** pada code sebelumnya, dengan angka **3000**, lalu amati apa yang terjadi

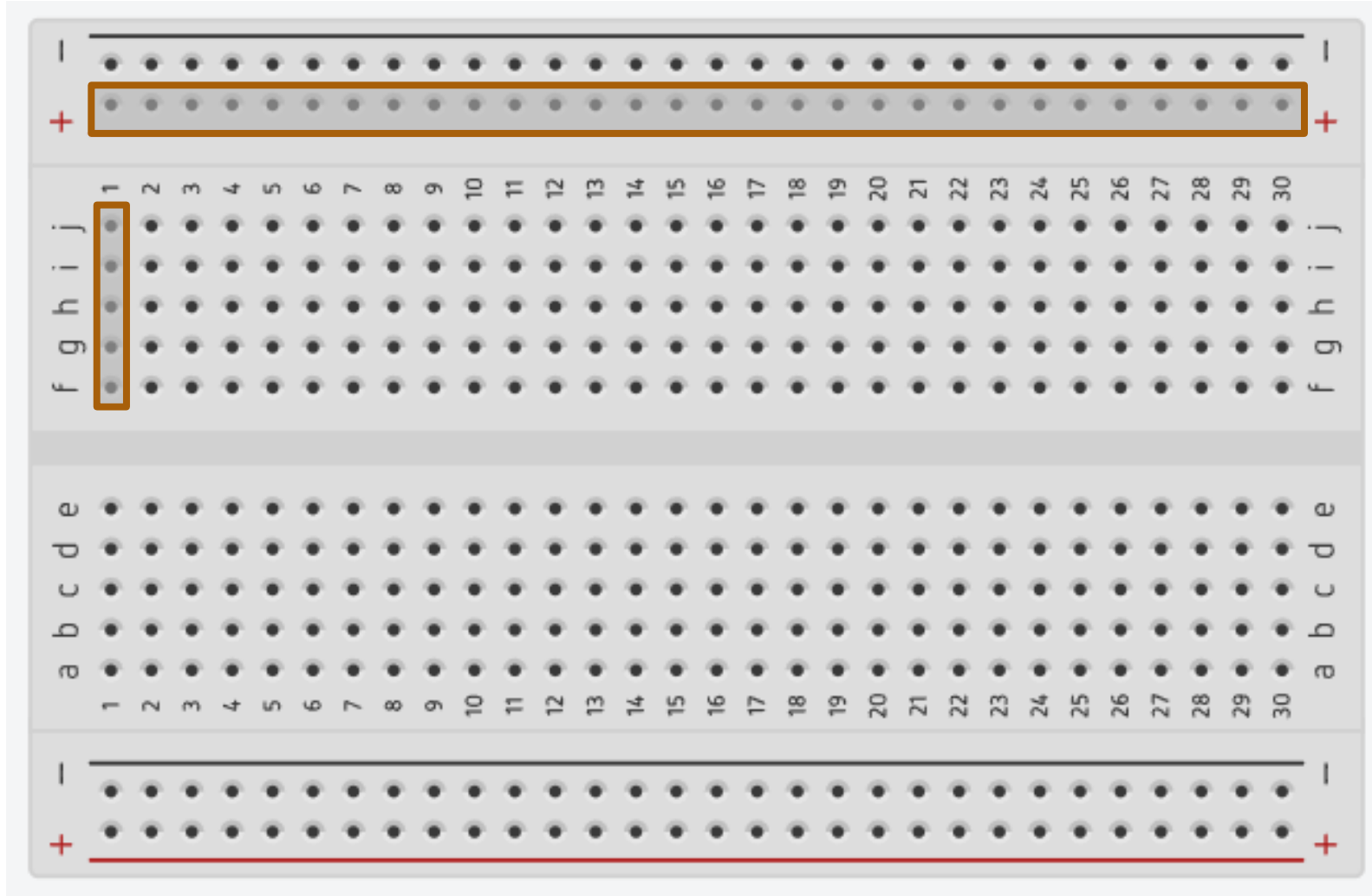


```
Exercise_1 | Arduino 1.8.19
File Edit Sketch Tools Help

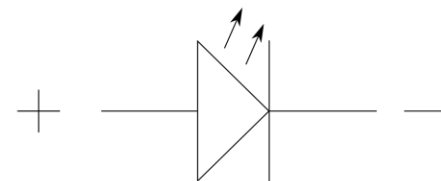
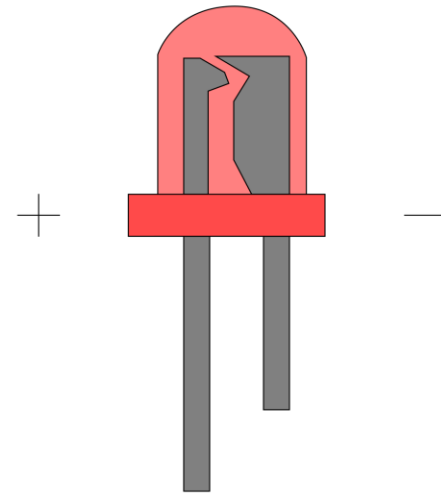
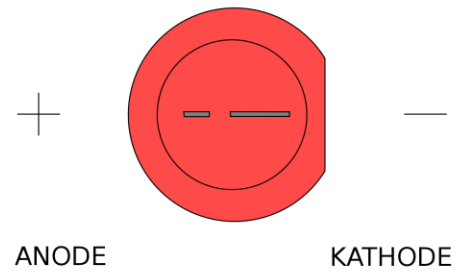
void setup() {
  pinMode(LED_BUILTIN, OUTPUT);
}

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


Breadboard



Light Emitting Diode

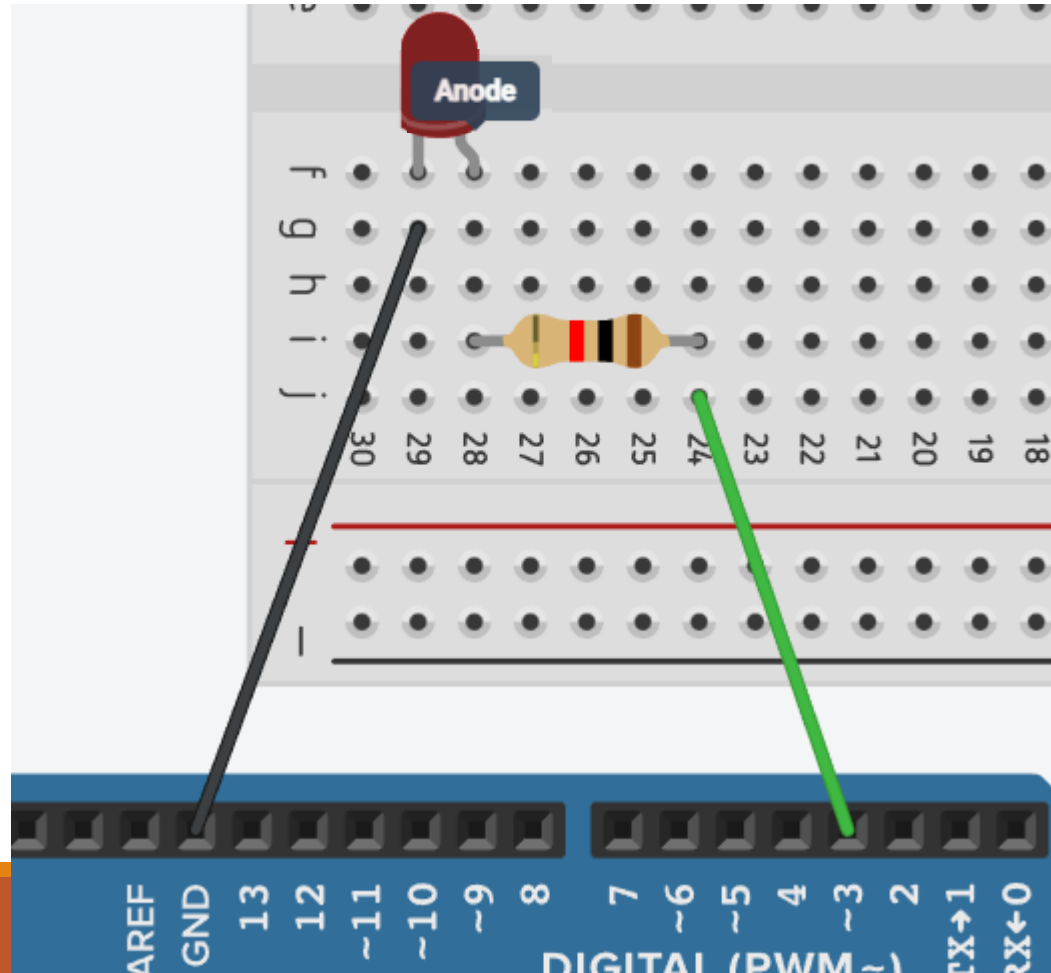


Exercise 2

Ganti program anda dengan source code pada exercise 2, kemudian lepas perangkat Arduino dari komputer anda, lalu rangkai sesuai dengan gambar berikut

Exercise_2

```
void setup() {  
  pinMode(3, OUTPUT);  
}  
  
void loop() {  
  digitalWrite(3, HIGH);  
  delay(1000);  
  digitalWrite(3, LOW);  
  delay(1000);  
}
```

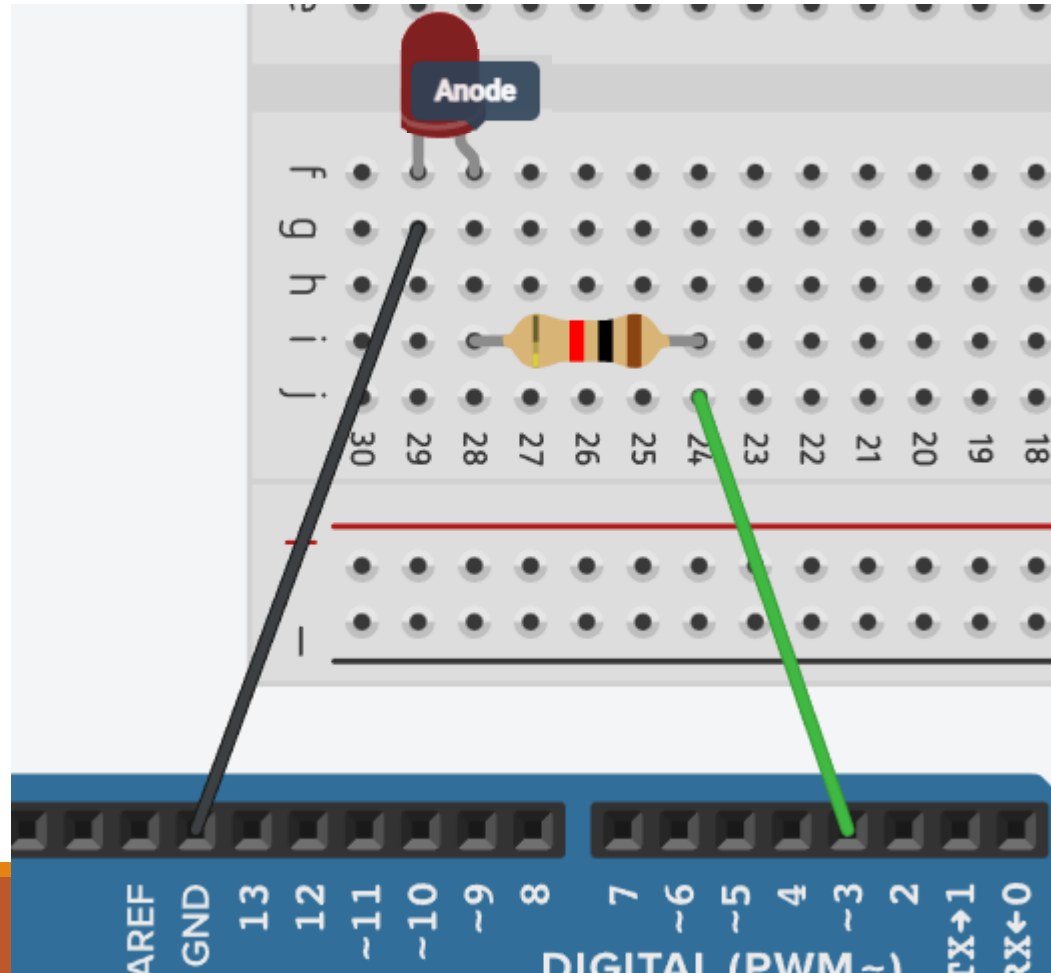


Exercise 3

Dengan menggunakan rangkaian yang sama, silahkan ganti programnya dengan exercise 3, amati apa yang terjadi

Exercise_3

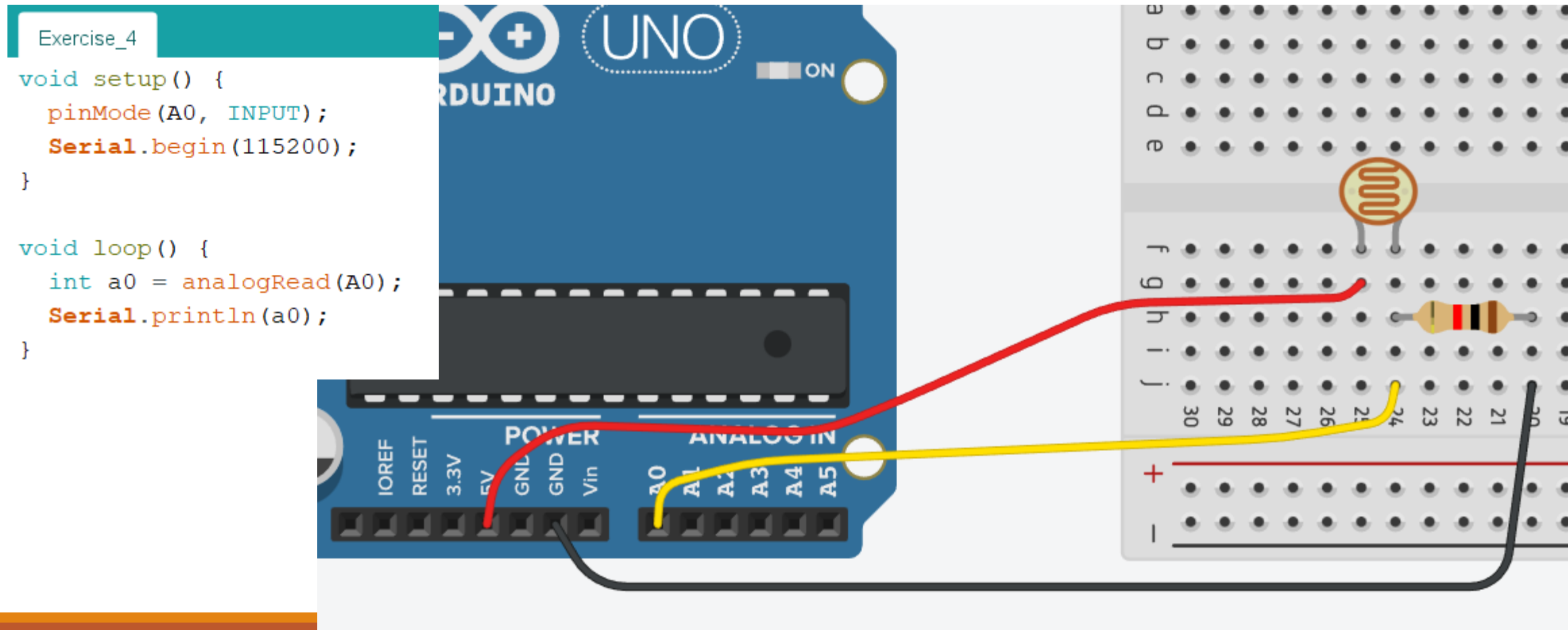
```
void setup() {  
  pinMode(3, OUTPUT);  
}  
  
void loop() {  
  for (int i = 0; i < 255; i++) {  
    analogWrite(3, i);  
    delay(10);  
  }  
  
  for (int i = 255; i > 0; i--) {  
    analogWrite(3, i);  
    delay(10);  
  }  
}
```



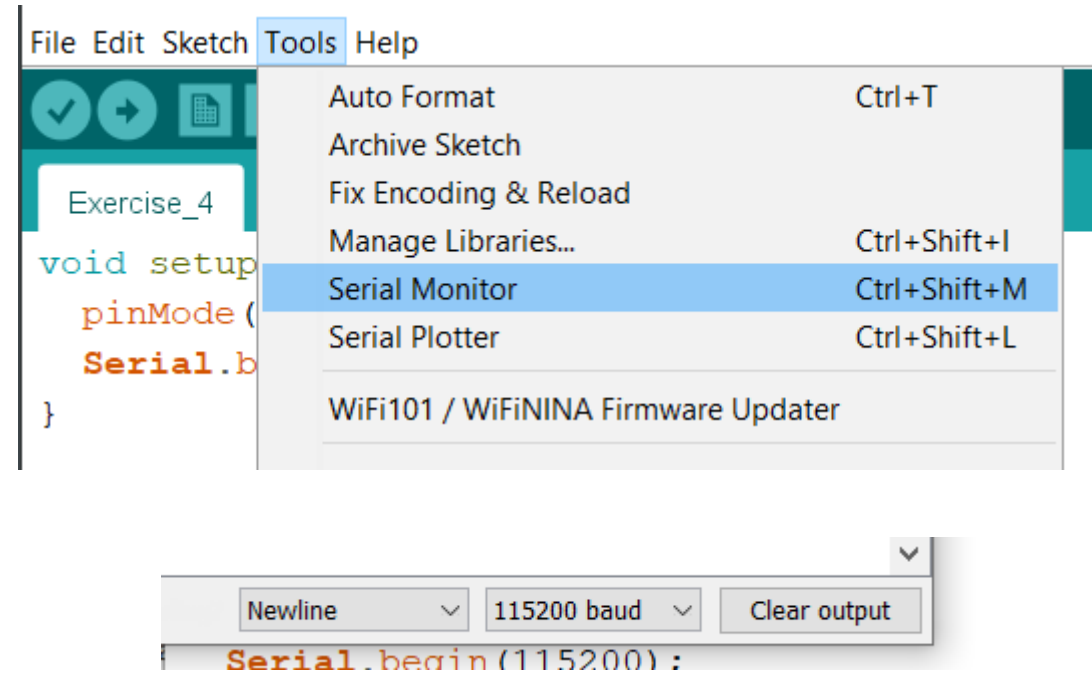
Ada yang ingin
ditanyakan?

Exercise 4

Rangkai semua komponen sebagai berikut:



Exercise 4

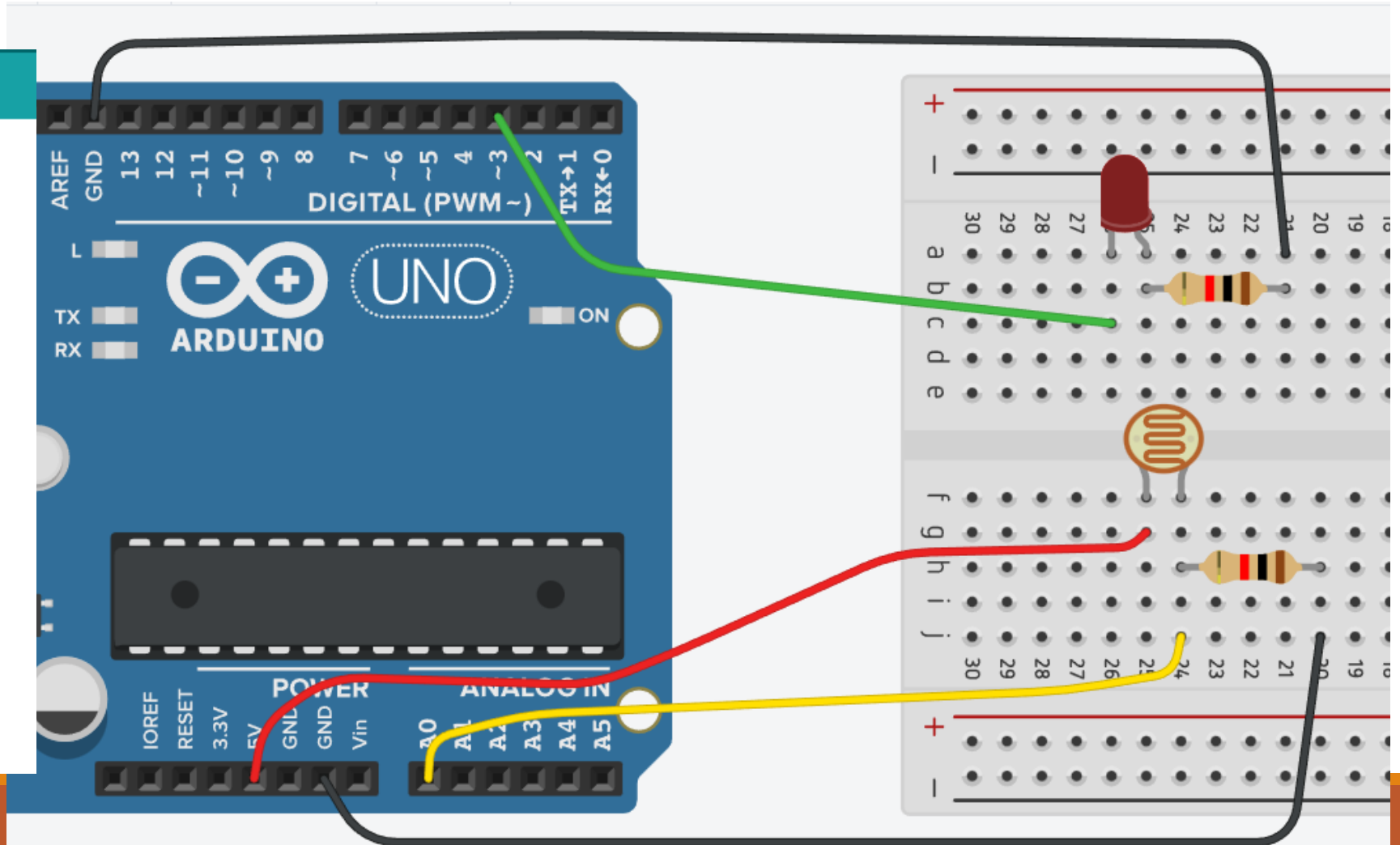


Exercise 5

Rangkai semua komponen sebagai berikut:

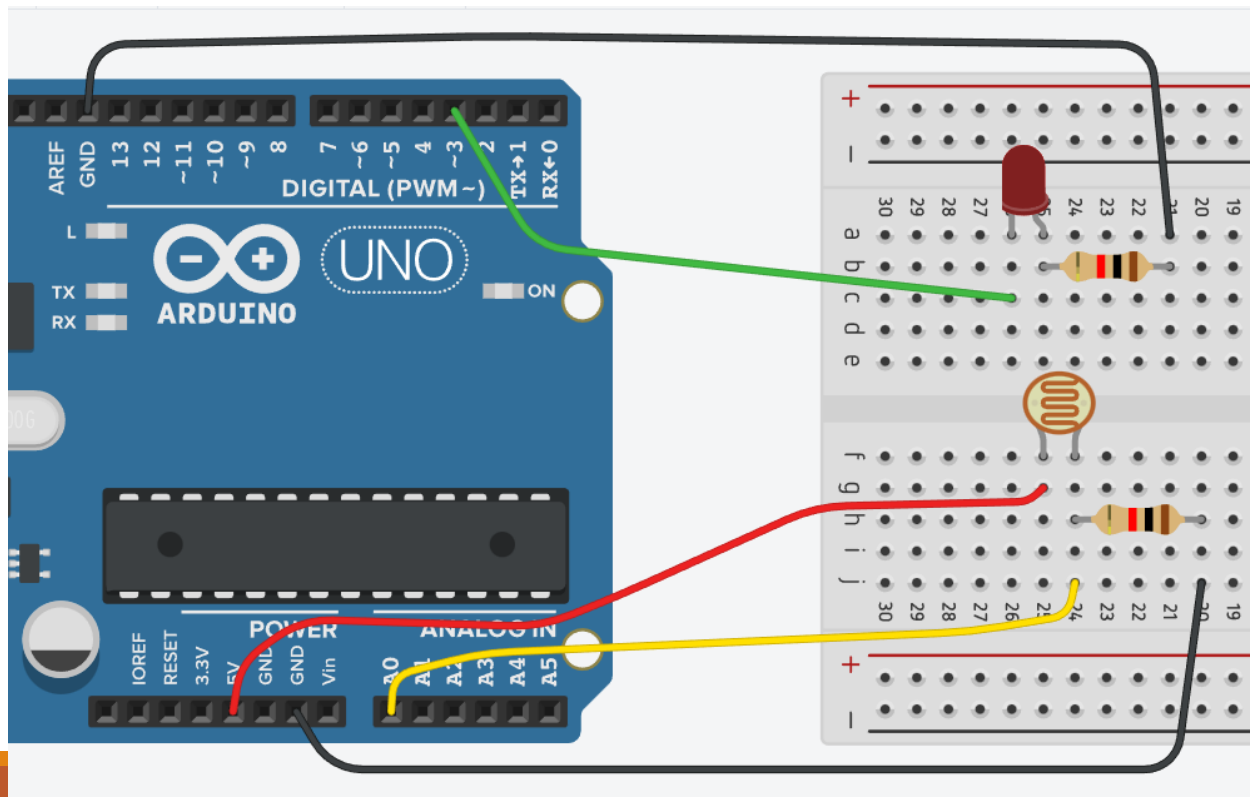
Exercise_5 §

```
void setup() {  
  pinMode(A0, INPUT);  
  pinMode(3, OUTPUT);  
  Serial.begin(115200);  
}  
  
void loop() {  
  int a0 = analogRead(A0);  
  Serial.println(a0);  
  if(a0 > 100) {  
    digitalWrite(3, LOW);  
  }  
  else {  
    digitalWrite(3, HIGH);  
  }  
}
```



Exercise 5.1

Dengan rangkaian yang sama, ubahlah program yang ada sehingga sistem bekerja berkebalikan dari sistem sebelumnya, yaitu saat ditutup maka LED akan mati dan saat dibuka maka LED akan menyala

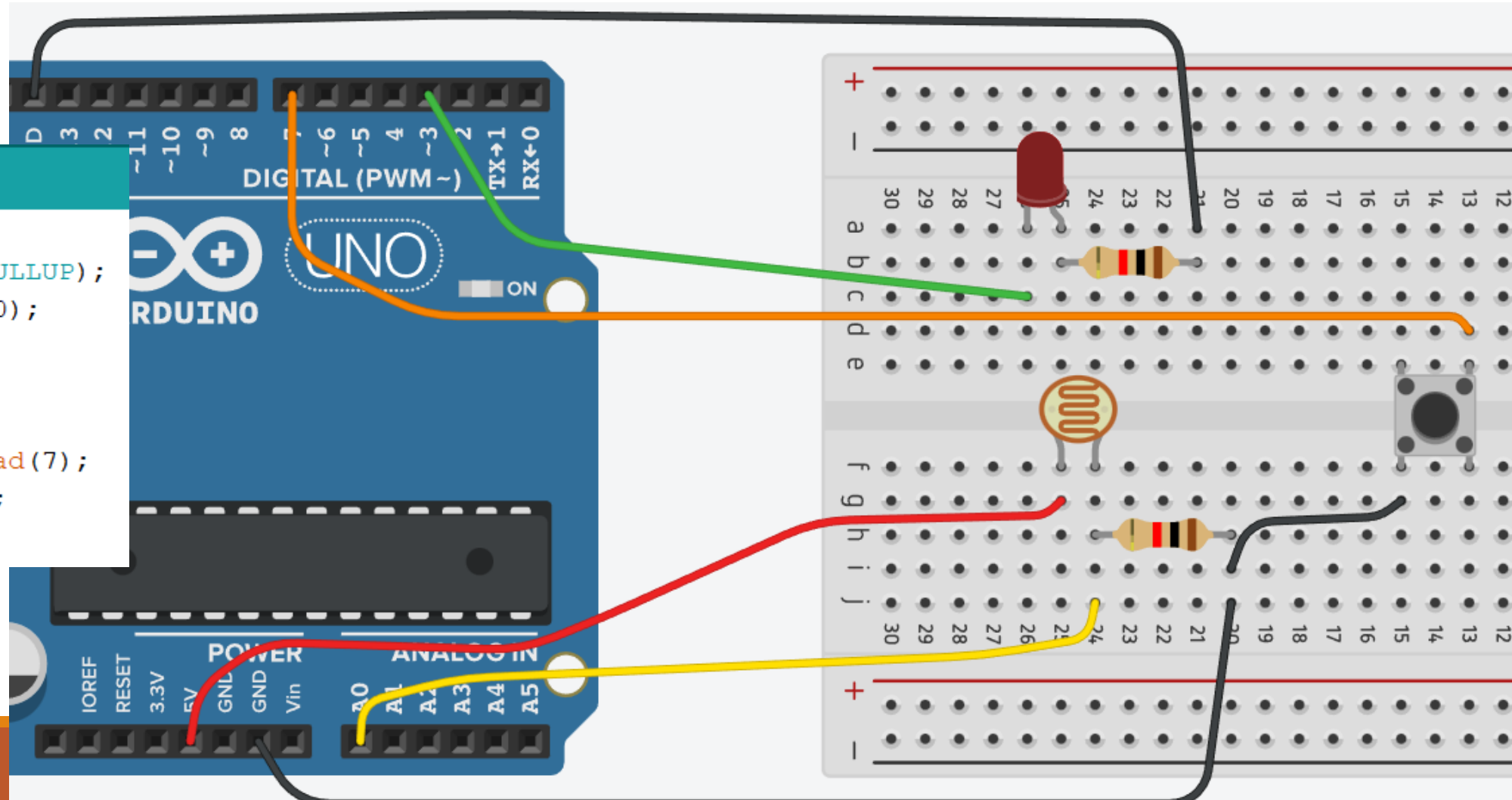


Exercise 6

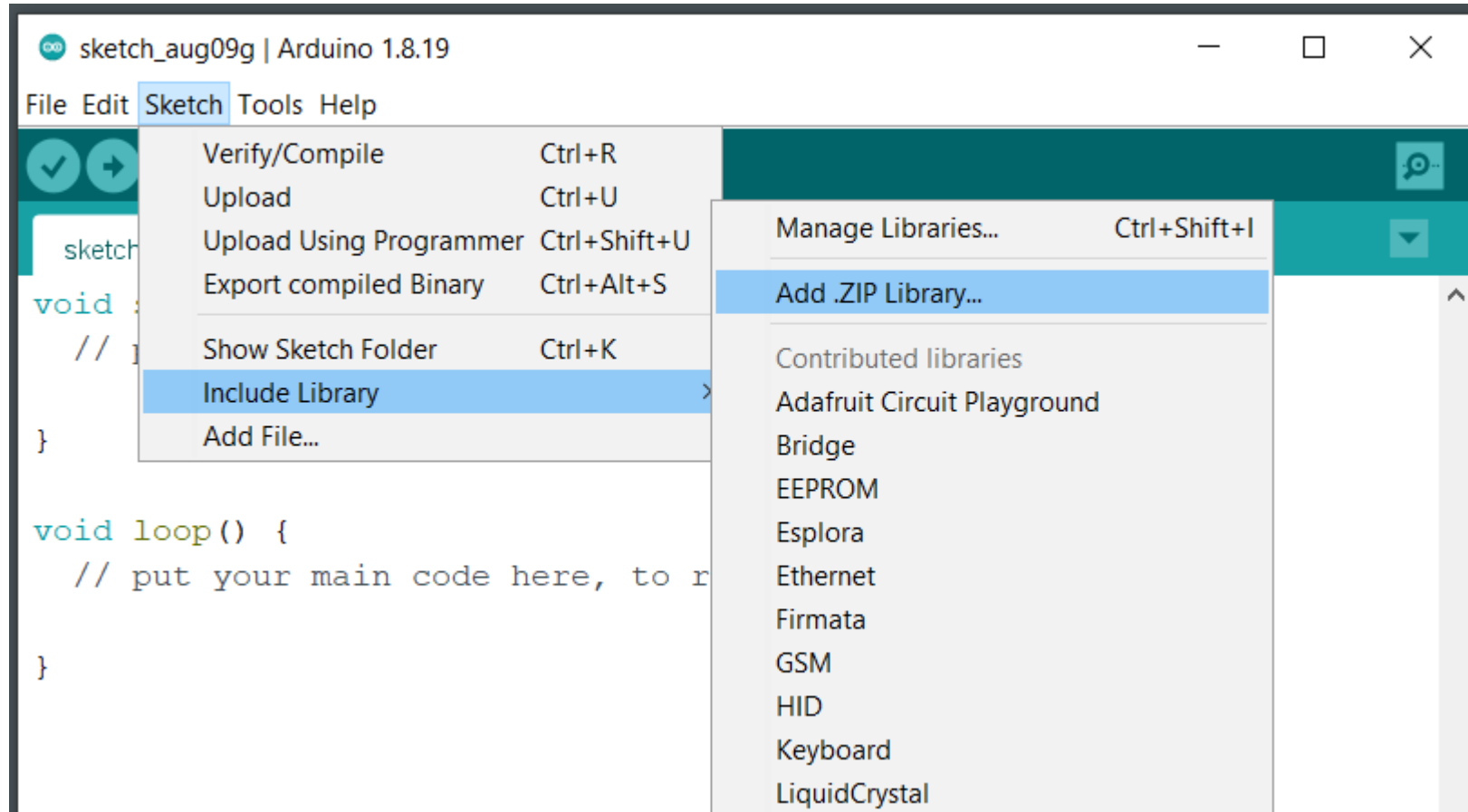
Tambahkan rangkaian push button, kemudian ubah program menjadi exercise 6

Exercise_6

```
1 void setup() {  
2   pinMode(7, INPUT_PULLUP);  
3   Serial.begin(115200);  
4 }  
5  
6 void loop() {  
7   int pb = digitalRead(7);  
8   Serial.println(pb);  
9 }
```

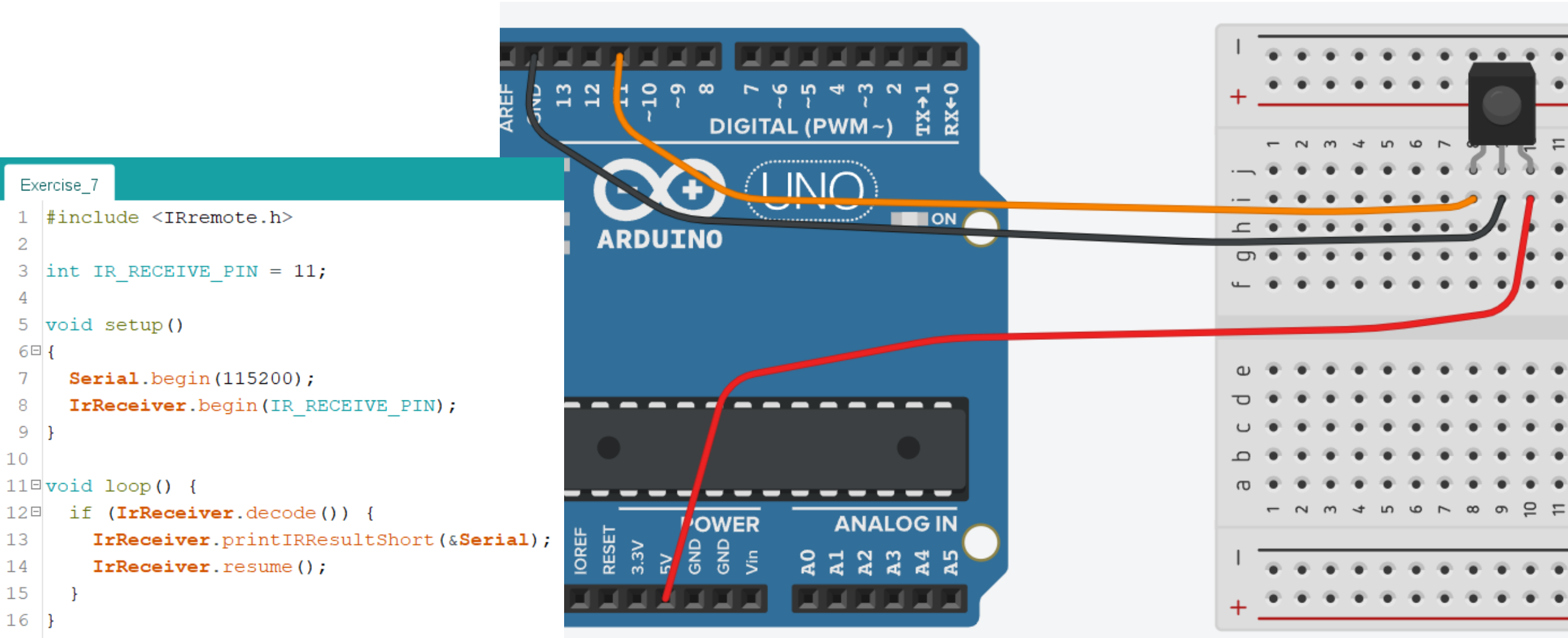


Menambahkan *Library*



Exercise 7

Rangkai semua komponen sebagai berikut

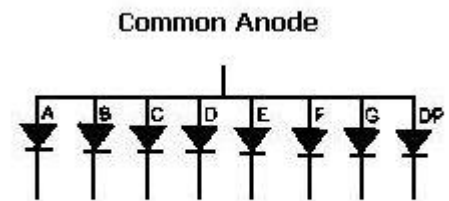
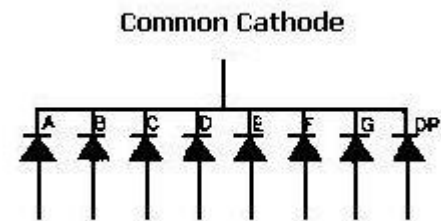
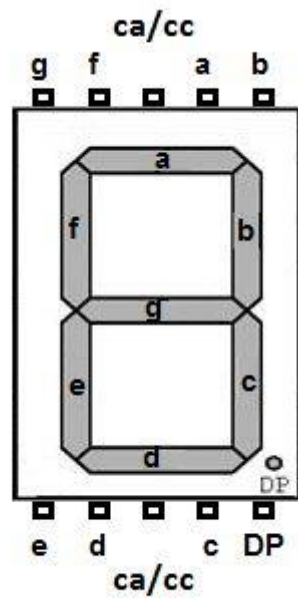


Exercise 8

Dengan rangkaian yang sama, ubah program menjadi exercise 8

Exercise_8

```
1 #include <IRremote.h>
2
3 int IR_RECEIVE_PIN = 11;
4
5 void setup()
6 {
7     Serial.begin(115200);
8     pinMode(13, OUTPUT);
9     IrReceiver.begin(IR_RECEIVE_PIN);
10 }
11
12 void loop() {
13     if (IrReceiver.decode()) {
14         IrReceiver.printIRResultShort(&Serial);
15         IrReceiver.resume();
16
17         if (IrReceiver.decodedIRData.command == 0x16) {
18             Serial.println("0");
19             digitalWrite(13, LOW);
20         } else if (IrReceiver.decodedIRData.command == 0xC) {
21             Serial.println("1");
22             digitalWrite(13, HIGH);
23         }
24     }
25 }
```



NEWS

BISNIS

BOLA

SPORT

LIFESTYLE

ENTERTAINMENT

OTOMOTIF

TEKNO

HEALTH

FOTO

CLICKMOV

NETWORKS

INDEKS

yOursay.id

✓ Cek Fakta

© Infografis

JAKARTA

BOGOR

BEKACI

JABAR

JOGJA

JATENG

MALANG

JATIM

BALI

LAMPUNG

Regional lainnya ▾

Keren! Pelajar di Kediri Ciptakan Drone Berdaya Asam Pohon Pepaya

Oke Atmaja

Minggu, 28 Juni 2020 | 07:50 WIB



Pelajar Madrasah Aliyah Negeri 2 Kota Kediri, Muhammad Azhar Syahrudin melakukan pengisian daya baterai pesawat nirawak (drone) buatannya di pohon pepaya di Desa Bendo, Kediri, Jawa Timur, Sabtu (27/6). [ANTARA FOTO/Prasetia Fauzani]