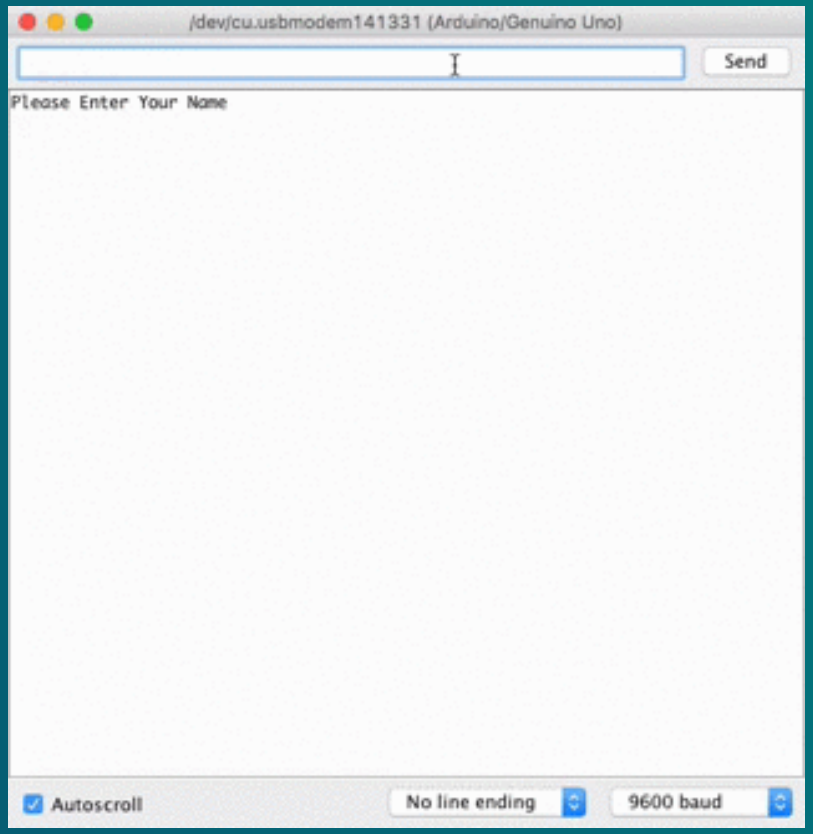
Internet Of Things



Serial Communication

Let's talk to your Arduino

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Serial Communication

- The word serial means "one after the other". Serial data transfer is when we transfer data one bit at a time, one right after the other.
- Serial is used for communication between Arduino board and a computer or other devices. All Arduino boards have at least 1 serial port, also known as UART (universal asynchronous receiver /transmitter).
- It communicates on digital pins 0 (RX) and 1 (TX) as well as with the computer via USB. Thus, if you use these functions, you cannot also use pins 0 and 1 for digital input or output.

Baud Rate

- The baud rate specifies how fast data is sent over a serial line, expressed in units of bits per second (bps).
- Baud rates can be any value, the only requirement is that both devices operate at the same rate. One of the more common baud rates is 9600 bps. Other standard baud rates are 1200, 2400, 4800, 19200, 38400, 57600 and 115200.
- The higher a baud rate goes, the faster data is sent/received, but there are limits to how fast data can be transferred. Get too high, and you'll begin to see errors on the receiving end.

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A little note

A single bit is either a 0 or a 1

8 bits = 1 Byte

1 KB = 1024 Bytes = 8192 bits

1024 KB = 1048576 bytes = 1 MB

1024 MB = 1 GB

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Serial Communication With Arduino IDE

1. Initiate: `Serial.begin(baudrate);`
2. Execute: `Serial.print(x);`
3. See the result on serial monitor

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Hello World on Setup

```
void setup() {
  Serial.begin(9600);
  Serial.print("Hello World!");
  //tulis "Hello World!"
}

void loop() {
}
```

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Hello World on Loop

```
void setup() {
  Serial.begin(9600);
}

void loop() {
  Serial.println("Hello World!");
  delay(1000);
  //tulis "Hello World!“ tiap 1 detik
}
```

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Constant & Variable

3 nanas

6 x = 12

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Arduino Data Type

Datatype	Minimum Value	Maximum Value
unsigned char	0	255
signed char	-128	127
unsigned short int	0	65535
signed short int	-32768	32767
unsigned int	0	65535
signed int	-32768	32767
unsigned long int	0	4294967295
signed long int	-2147483648	2147483647
float	3.4 *10^-38	3.4 *10^38
double	1.7*10^-308	1.7*10^308
long double	3.4*10^-4932	1.1*10^-4932
enum	-32768	32767

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Integer & Float

```
int x = 2;           // x integer = 2
float y = 0.6789     // y float = 0.6789

void setup() {
  Serial.begin(9600);}

void loop() {
  Serial.println(x);    // output = 2
  Serial.println(y);    // out= 0.67
  Serial.println(y,4); // out= 0.6789
  delay(1000);}
```

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Character & String

```
char x = ‘a’;
String y = “Hello World!”

void setup() {
  Serial.begin(9600);
}

void loop() {
  Serial.println(x); // output = a
  Serial.println(y); // Hello World!
  delay(1000);
}
```

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Arithmetic * / + - %

```
int a = 4; int b = 2;

void setup() {
  Serial.begin(9600);}

void loop() {
  Serial.println(a * b); // = 8
  Serial.println(a / b); // = 2
  Serial.println(a + b); // = 6
  Serial.println(a - b); // = 2
  Serial.println(a % b); // sisa = 0
  delay(1000);}
```

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Arithmetic x^2 $\sqrt{x}$

```
int a = 4; int b = 2;

void setup() {
  Serial.begin(9600);}

void loop() {
  Serial.println(pow(a,b)); // = 16
  Serial.println(sqrt(a));  // = 2
  delay(1000);}
```

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Solve It!

$$\sqrt[3]{8} = ?$$

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Solved! $\sqrt[3]{8} = 8^{1/3} = 2$

```
float x = pow(8,0.3333) // 8^0.3333

void setup() {
  Serial.begin(9600);}

void loop() {
  Serial.println(x); // 8^0.3333=2.00
  }
```

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Basic Iteration

```
int a = 0; int b = 1000;

void setup() {Serial.begin(9600);}

void loop() {
  Serial.print(a++);   // +1 per sec
  Serial.print(“ / ”);
  Serial.print(b--);   // -1 per sec
  Serial.print(“ / ”);
  Serial.print(a=+10); // a=a+10
  Serial.print(“ / ”);
  Serial.print(b=-10); // b=b-10
  delay(1000);}
```

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For Loop Iteration

```
void setup() {
  Serial.begin(9600);

  for (int i = 0; i < 10; i++) {
    Serial.print("i = ");
    Serial.println(i);
  }
}

void loop() {
}
```

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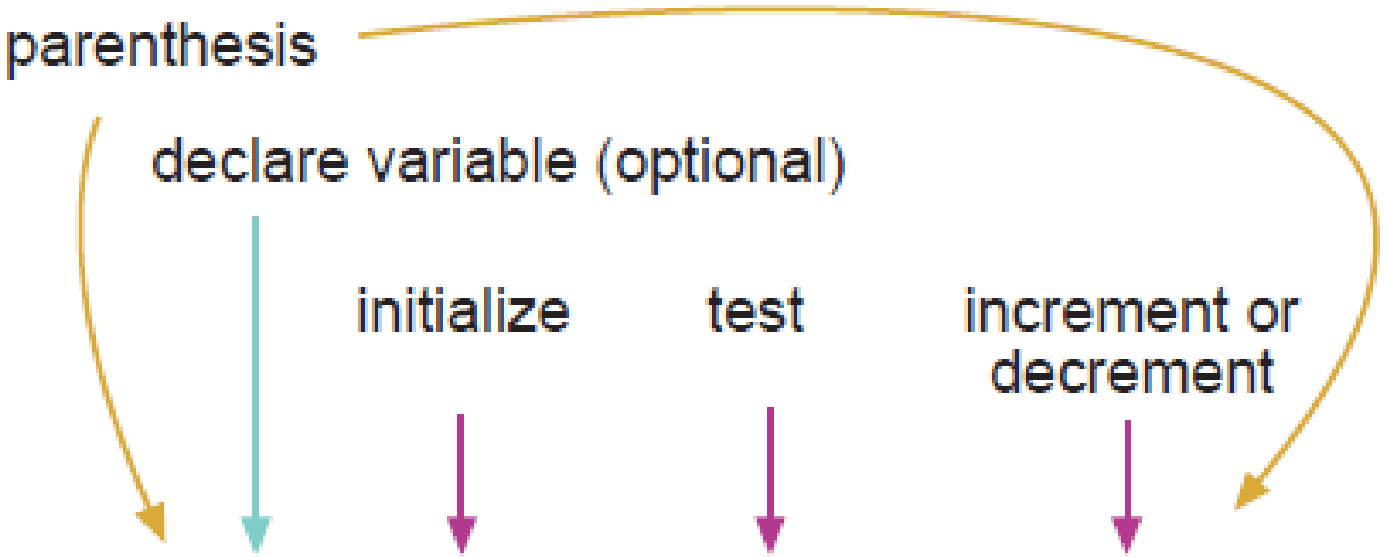
For Loop Iteration




```
for(int x = 0; x < 100; x++){

    println(x);  // prints 0 to 99
}
```

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While Iteration

```
void setup() {
   int x = 0;
   Serial.begin(9600);

      while (x < 25) {
      x = x + 1;
      Serial.println(x);
      delay(1000);}
}

void loop() {
}
```

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Statement If (cond) {prog}

```
void setup() {
  Serial.begin(9600);}

void loop() {
  char input;

  if (Serial.available() > 0) {
    input = Serial.read();
    Serial.print(“Anda mengetik: ");
    Serial.println(input);
  }
}
```

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if(){} else if(){} else{}

```
void setup() {
  Serial.begin(9600);}

void loop() {
  char input;
  if (Serial.available() > 0) {
    input = Serial.read();
    if (input == ‘1’)
       {Serial.println(“Satu”);}
    else if (input == ‘2’ )
       {Serial.println(“Dua”);}
    else {Serial.println(“Lainnya”);}
}}
```

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Blinking LED on board

```
void setup() {
  pinMode(13, OUTPUT);
}

void loop() {
  digitalWrite(13, HIGH);
  delay(1000);
  digitalWrite(13, LOW);
  delay(1000);
}
```

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Control LED via Serial Monitor

```
void setup() {
  Serial.begin(9600);
  pinMode(13, OUTPUT);}

void loop() {
  char input;
    if (Serial.available() > 0) {
    input = Serial.read();
    if (input == 'a’) {
      digitalWrite(13, HIGH);}
    if (input == 'b') {
      digitalWrite(13, LOW);}
  }}
```

OR || & AND &&

```
void setup() {
  Serial.begin(9600);
  pinMode(13, OUTPUT);}

void loop() {
  char input;
    if (Serial.available() > 0) {
    input = Serial.read();
    if (input == 'a’ || input == ‘A’)
    {digitalWrite(13, HIGH);}
    if (input == 'b’ || input == ‘B’)
    {digitalWrite(13, LOW);}
  }}
```