

Arduino Programming Cheat Sheet

Primary source: <http://arduino.cc/en/Reference/>

Structure & Flow

Basic Program Structure

```
void setup() {  
  // Runs once when sketch starts  
}  
  
void loop() {  
  // Runs repeatedly  
}
```

Control Structures

```
if (x < 5) { ... } else { ... }  
while (x < 5) { ... }  
for (int i = 0; i < 10; i++) { ... }  
break; // Exit a loop immediately  
continue; // Go to next iteration  
switch (var) {  
  case 1:  
    ...  
  break;  
  case 2:  
    ...  
  break;  
  default:  
    ...  
}  
return x; // x must match return type  
return; // For void return type
```

Function Definitions

```
void, type, name(parameters) { ... }  
e.g. int double(int x) {return x*2;}
```

Operators

General Operators

- assignment
- add + subtract -
- multiply * divide /
- modulo %
- == equal to != not equal to
- < less than > greater than
- <= less than or equal to
- >= greater than or equal to
- == || or
- & not

Compound Operators

- ++ increment
- decrement
- + compound addition
- compound subtraction
- * compound multiplication
- / compound division
- % compound modulus and
- & compound bitwise and

Bitwise Operators

- & bitwise and
- | bitwise or
- ^ bitwise xor
- ~ bitwise not
- << shift left
- >> shift right

Pointer Access

- & reference: get a pointer
- * dereference: follow a pointer

Built-in Functions

Pin Input/Output

```
digital I/O - pins 0-13 AH-AJ  
pinMode(pin,  
  [INPUT, OUTPUT, INPUT_PULLUP])  
int digitalWrite(pin,  
  digitalWrite(pin, [HIGH, LOW])
```

Analog I/O - pins AH-AJ

```
int analogRead(pin)  
analogReference(  
  [DEFAULT, INTERNAL, EXTERNAL])
```

Pulse-Width Modulation - pins 2-5 & 9-10

```
analogWrite(pin, value)
```

Advanced I/O

```
tone(pin, freq_hz)  
tone(pin, freq_hz, duration_ms)  
noTone(pin)  
shiftOut(dataPin, clockPin,  
  [MSB0, LSB0, MSBFIRST], value)  
unsigned long shiftIn(pin,  
  [clock, data])
```

Time

```
unsigned long millis()  
// Overflows at 50 days  
unsigned long micros()  
// Overflows at 70 minutes  
delay(ms)  
delayMicroseconds(us)
```

Math

```
sin(x, y) sin(x, y) sin(x)  
sin(rad) cos(rad) tan(rad)  
exp(x) pow(base, exponent)  
constrain(x, lowest, highest)  
map(val, from_low, from_high, to_low, to_high)
```

Random Numbers

```
randomSeed(seed) // long or int  
long random(max) // 0 to max-1  
long random(min, max)
```

Bits and Bytes

```
lowByte(x) highByte(x)  
bitRead(x, bit)  
bitWrite(x, bit, bit)  
bitSet(x, bit)  
bitClear(x, bit)  
bitWrite(x, bit, bit)
```

Type Conversions

```
char(val) byte(val)  
int(val) word(val)  
long(val) float(val)
```

External Interrupts

```
attachInterrupt(interupt, func,  
  [LOW, CHANGE, RISING, FALLING])  
detachInterrupt(interupt)  
interrupts()  
noInterrupts()
```

Libraries

```
Serial - coms, with PC or via RS485  
begin(long speed) // up to 115200  
end()  
int available() // bytes available  
int read() // -1 if none available  
int peek() // Read w/o removing  
flush()  
print(data) println(data)  
write(byte) write(char * string)  
write(byte * data, size)  
SerialEvent() // Called if data rdy
```

```
SoftwareSerial.h - coms, on any pin  
SoftwareSerial(rxPin, txPin)  
begin(long speed) // up to 115200  
listen() // delay 0 sec listen  
isListening() // at a time  
read, peek, print, println, write  
// Inherited to Serial library
```

```
EEPROM.h - access non-volatile memory  
byte read(addr)  
write(addr, byte)  
EEPROM[addr] // Access as array
```

```
Servo.h - control servo motors  
attach(pin, [min_us, max_us])  
write(angle) // 0 to 180  
writeMicroseconds(us)  
// 1000-2000, 1500 is midpoint  
int read() // 0 to 180  
bool attached()  
detach()
```

```
Wire.h - I2C communication  
begin() // Join a master  
begin(addr) // Join a slave @ addr  
requestFrom(address, count)  
beginTransmission(addr) // Step 1  
send(byte) // Step 2  
send(char * string)  
send(byte * data, size)  
endTransmission() // Step 3  
int available() // Bytes available  
byte receive() // Get next byte  
onReceive(handler)  
onRequest(handler)
```

 by Mark Liffiton

Adapted from:
- Original: Gavin Smith
- SVG version: Frederic Dufourg
- Arduino board drawing: Fritzing.org

Variables, Arrays, and Data

Data Types

Type	Value
boolean	true false
char	-128 - 127, 'a' 'b' etc.
unsigned char	0 - 255
byte	0 - 255
int	-32768 - 32767
unsigned int	0 - 65535
word	0 - 65535
long	-2147483648 - 2147483647
unsigned long	0 - 4294967295
float	-3.4028235E+38 - 3.4028235E+38
double	currently same as float
void	1.e.g. no return value

Strings

```
char str[8] =  
  {'A','B','C','D','E','F','G','H'};  
// Includes null terminator  
char str[8] =  
  {'A','B','C','D','E','F','G','H'};  
// Compiler adds null terminator  
char str[] = "Arduino"  
char str[8] = "Arduino"
```

Numeric Constants

Value	Description
128	decimal
0x01158B1	hexary
0x71	octal - base 8
0x7F	hexadecimal - base 16
128L	force unsigned
128LL	force long
128LL	force unsigned long
128.f	force floating point
1.234E+6	1.2375E+6 = 1237500

Qualifiers

Qualifier	Location
static	globals between calls
volatile	in RAM (value for I/O)
const	read-only
mutable	in flash

Arrays

```
int myData[] = {0, 4, 8, 1, 4};  
int myData[5]; // Array of 5 ints  
myData[0] = 40; // Assigning first  
// Index of myData  
myData[4] = 10; // 00000 Indexes  
// are 0 through 4
```



Arduino Coding Guide

Brian Huang, Derek Runberg



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