The C-Language Keywords and Symbols

Keywords

MEMORY

01.void
02.char
03.int
04.short
05.long
06.float
07.double
08.signed
09.unsigned
10.struct
11.union
12.enum
13.const
14.volatile
15.auto
16.extern
17.static
18.register
19.typedef
20.sizeof

CONTROL

21.return
22.if
23.else
24.switch
25.case
26.default
27.while
28.do
29.for
30.break
31.continue
32.goto

Symbols

CONTROL

```
#
< >
//
/* */
( )
{ }
;
,
“
‘
=
[ ]
:
?
.
\
```

MEMORY

```
&
*
```

LOGIC

```
==
!=
<
>
<=
>=

&&
||

!
```

MATH

```
*
%
/
+
-
```

BIT OP

```
|
&
^
~
<<
>>
```

Symbols for LOGIC COMPARISON and OPERATION

We use these Symbols to make logic comparison and operations, then based on the results we our PROGRAM can then make various decision

(The foundation for Artificial Intelligence)

We need to use them for some of the C-Language CONTROL Keywords, in this topic we talk about the **if** and **else** Keyword

C-LANGUAGE LOGIC

The C-LANGUAGE LOGIC is simple. It is either TRUE or FALSE

TRUE = 1 and **FALSE = 0**

LOGIC COMPARISON

COMPARISON **between two numbers,** will **return a LOGIC_NUMBER**

LOGIC_NUMBER = 1 for TRUE or **LOGIC_NUMBER = 0 for FALSE**

```
- The COMPARISON Symbol is placed between two numbers
( a == b ) when a EQUAL b,                returns 1, otherwise returns 0
( a != b ) when a NOT EQUAL b,            returns 1, otherwise returns 0
( a < b )  when a LESS THAN b,            returns 1, otherwise returns 0
( a > b )  when a MORE THAN b,            returns 1, otherwise returns 0
( a <= b ) when a LESS THAN or EQUAL b,   returns 1, otherwise returns 0
( a >= b ) when a MORE THAN or EQUAL b,   returns 1, otherwise returns 0
```

NOTE:
a and **b** can be any numbers

LOGIC OPERATION

LOGIC OPERATION, will **return a LOGIC_NUMBER**

LOGIC_NUMBER = 1 for TRUE or **LOGIC_NUMBER = 0 for FALSE**

AND OPERATION (double Ampersand **&&**)
- The **&&** Symbol is placed **between Two LOGIC_NUMBER**

```
( 1 && 1 ) returns 1
( 1 && 0 ) returns 0
( 0 && 1 ) returns 0
( 0 && 0 ) returns 0
```

Easy way to remember the AND Operation: as long as there is a 0, the return is 0

OR OPERATION (double Vertical Bar Symbol **||**)
- The **||** Symbol is placed **between Two LOGIC_NUMBER**

```
( 1 || 1 ) returns 1
( 1 || 0 ) returns 1
( 0 || 1 ) returns 1
( 0 || 0 ) returns 0
```

Easy way to remember the OR Operation: as long as there is a 1, the return is 1

NOT OPERATION (single Exclamation Symbol **!**)
- The **!** Symbol is placed **before One LOGIC_NUMBER**

```
( !1 ) returns 0
( !0 ) returns 1
```

NOTE:
LOGIC_NUMBER is either 1 or 0
- Any **number** that is not 1 or 0 when used in LOGIC OPERATION will be considered as LOGIC_NUMBER = 1

- The Bracket ( ) pair is also used to decide code execution precedence (the most inner bracket is performed first)

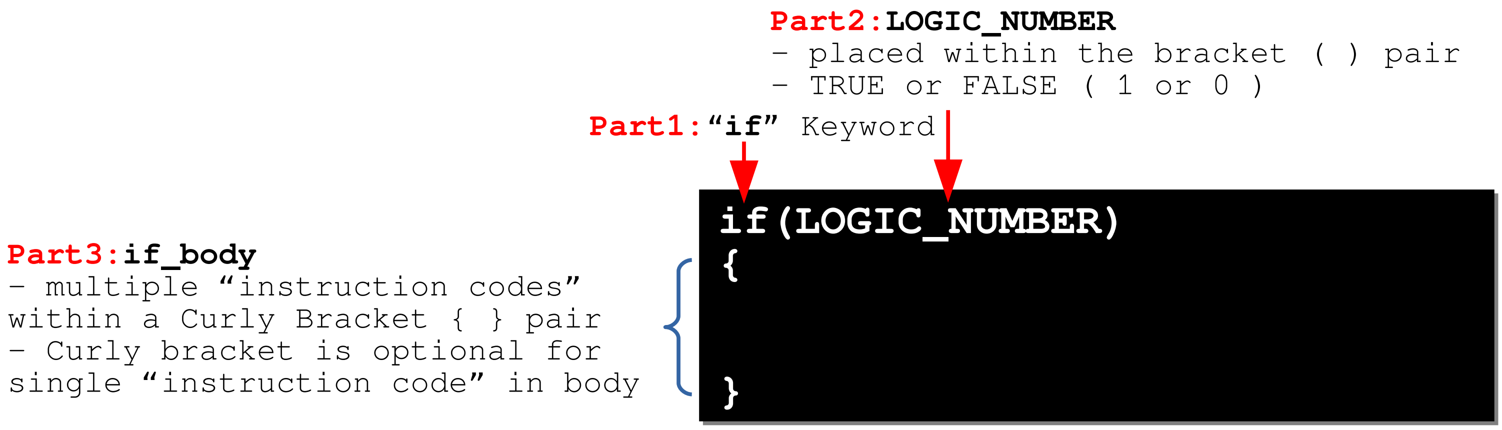
- example: `( ( (a && 1) > b ) || c )`

In the example above, the AND operation (a && 1) will be performed first, result return from that operation will be used for comparison with b using the greater than > symbol, then the result from that comparison will be used to perform the OR operation with c using the || symbol

if

The "if" Keyword allows us to run one or more instruction codes based on a **TRUE LOGIC (LOGIC_NUMBER=1)**

"if" Keyword used alone
Part1:"if" Keyword
Part2:LOGIC_NUMBER – Numbers other than 0 and 1 will be considered as 1
Part3:if_body


Part2:LOGIC_NUMBER
– placed within the bracket ( ) pair
– TRUE or FALSE (1 or 0)
Part1:"if" Keyword
Part3:if_body
– multiple "instruction codes" within a Curly Bracket { } pair
– Curly bracket is optional for single "instruction code" in body

```
if(LOGIC_NUMBER)
{


}
```

Arduino IDE|Save PROGRAM as: **c_if**
Enter codes below and upload. Use the Serial Monitor to see results

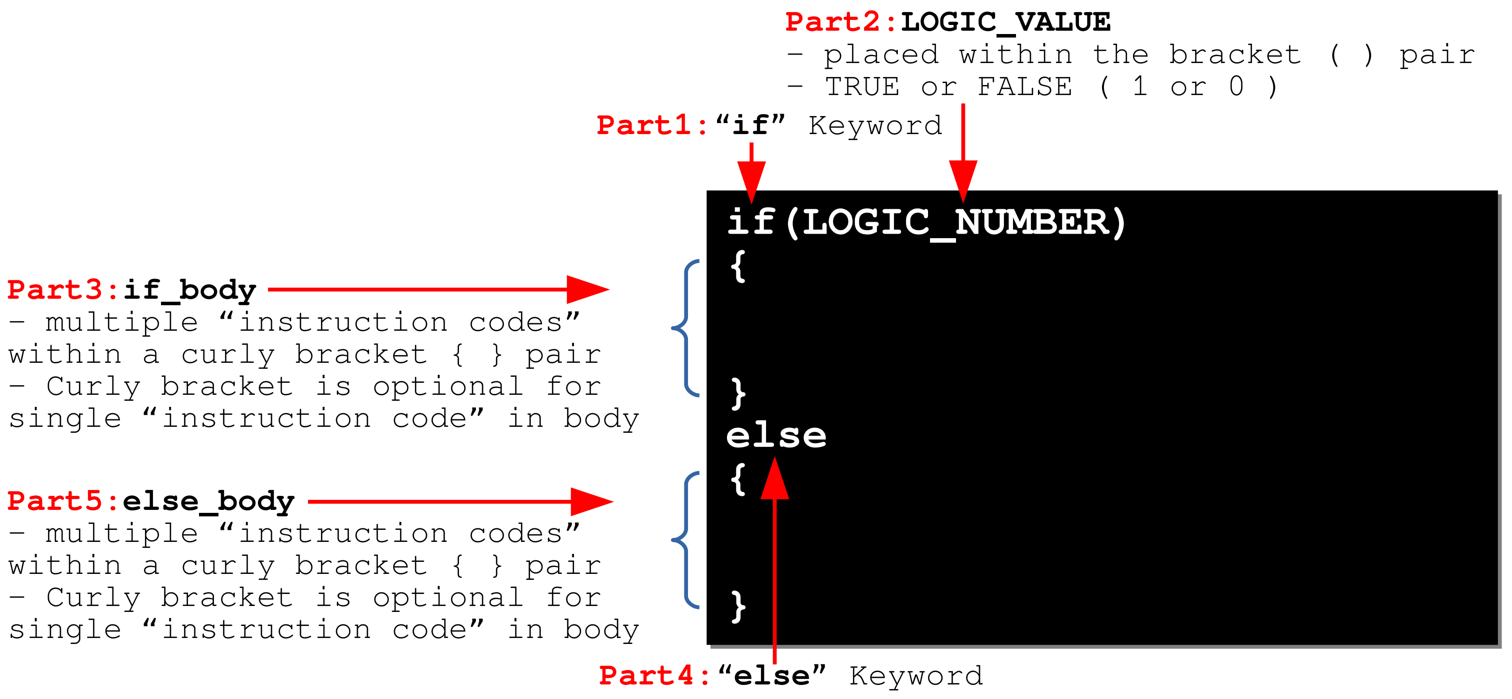
```
void setup() {
  Serial.begin(9600);Serial.print("\n\nSerial Monitor(9600)...");

  Serial.print("\n\nif( LOGIC_NUMBER )");
  if( 1 ) {
    Serial.print("\nLOGIC_NUMBER=1, if_body will be executed");
  }
  if( 0 ) {
    Serial.print("\nLOGIC_NUMBER=0, if_body will NOT be executed");
  }

  int a = 0;
  int b = 6;
  Serial.print("\n\nCOMPARISON if( a < b ), when a=0 and b=6");
  Serial.print("\nif(a < b) will become if(0 < 6)");
  Serial.print("\n(0 < 6) returns ( 1 ), our code becomes if( 1 )");
  if(a < b) {
    Serial.print("\nLOGIC_NUMBER=1, if_body will be executed");
  }
  Serial.print("\n\nOPERATION  if( a || b ), when a=0 and b=6");
  Serial.print("\nif(a || b) will become if(0 || 1)");
  Serial.print("\n(0 || 1) returns ( 1 ), our code becomes if( 1 )");
  if(a || b) {
    Serial.print("\nLOGIC_NUMBER=1, if_body will be executed");
  }
  Serial.print("\n\nOPERATION  if( a && b ), when a=0 and b=6");
  Serial.print("\nif(a && b) will become if(0 && 1)");
  Serial.print("\n(0 && 1) returns ( 0 ), our code becomes if( 0 )");
  if(a && b) {
    Serial.print("\nLOGIC_NUMBER=0, if_body will NOT be executed");
  }
}
void loop(){}
```

else
The "else" Keyword allows us to run one or more instruction codes based on a
FALSE LOGIC (LOGIC_NUMBER=0)
The "else" keyword must be used together with the "if" Keyword

"else" Keyword used with **"if"** Keyword
Part1:"if" Keyword
Part2:LOGIC_NUMBER - Numbers other than 0 and 1 will be considered as 1
Part3:if_body
Part4:"else" Keyword
Part5:else_body


Part2:LOGIC_VALUE
- placed within the bracket ( ) pair
- TRUE or FALSE (1 or 0)
Part1:"if" Keyword
Part3:if_body
- multiple "instruction codes" within a curly bracket { } pair
- Curly bracket is optional for single "instruction code" in body
Part5:else_body
- multiple "instruction codes" within a curly bracket { } pair
- Curly bracket is optional for single "instruction code" in body
Part4:"else" Keyword

```
if(LOGIC_NUMBER)
{

}
else
{

}
```

Arduino IDE|Save PROGRAM as: **c_if_else**
Enter codes below and upload. Use the Serial Monitor to see results

```
void setup() {
  Serial.begin(9600);Serial.print("\n\nSerial Monitor(9600)...");

  Serial.print("\n\nif( LOGIC_NUMBER )");
  if( 1 ) { // LOGIC_NUMBER = 1, will run if body
    Serial.print("\nLOGIC_NUMBER=1, if_body will be executed");
  } else {
    Serial.print("\nLOGIC_NUMBER=0, else_body will be executed");
  }
  if( 0 ) { // LOGIC_NUMBER = 0, will run else body
    Serial.print("\nLOGIC_NUMBER=1, if_body will be executed");
  } else {
    Serial.print("\nLOGIC_NUMBER=0, else_body will be executed");
  }
  int a = 0;
  int b = 6;
  Serial.print("\n\nCOMPARISON if( a < b ), when a=0 and b=6");
  Serial.print("\nif(a < b) will become if(0 < 6)");
  Serial.print("\n(0 < 6) returns ( 1 ), our code becomes if( 1 )");
  if(a < b) { // try change these
    Serial.print("\nLOGIC_NUMBER=1, if_body will be executed");
  } else {
    Serial.print("\nLOGIC_NUMBER=0, else_body will be executed");
  }
}
void loop(){}
```