



## C2 – Characters in C

# CHARACTERS


ASCII      American Standard Code for Information Interchange

EBCDIC    Extended Binary Coded Decimal  
Interchange Code (from IBM)

Characters need to be stored in the ones and zeros of the binary system at heart of computer.

*A portion of the ASCII chart:*

|               | <u>Integer</u> | <u>Binary</u> |
|---------------|----------------|---------------|
| \n (new line) | 10             | 0001010       |
| + (plus sign) | 43             | 0101011       |
| 3             | 51             | 0110011       |
| B             | 66             | 1000010       |
| b             | 98             | 1100010       |



```
int k = 97;  
char c = 'a';
```

---

```
/* print both as characters */
```

```
printf("value of k: %c; value of c: %c \n", k, c);
```

*RESULT:*

value of k: a; value of c: a

---

```
/* print both as integers */
```

```
printf("value of k: %i; value of c: %i \n", k, c);
```

*RESULT:*

value of k: 97; value of c: 97

---



## **Declaration** of Characters & Integers Examples:

```
char name, a1 = 'b';
```

```
int  n1, n2;
```

```

#include <stdio.h>
#include <stdlib.h>
int main (void)
{
    char c1, c2, c3;
    c1 = 'x';
    c2 = '#';
    c3 = '\n';
    printf("%c %c \n", c1, c2);

    putchar(c1);
    putchar(32); /* a space */
    putchar(c2);
    putchar(32); /* a space */
    putchar(c3);
    return EXIT_SUCCESS;
}
/*-----*/

```

x # (NL)

x # (NL)

where (NL) means a NewLine



In a printf  
use `%c` to print single character



These three prints do the SAME thing.

```
putchar(32);
```

```
putchar(' ');
```

```
#define SPACE ' '  
putchar (SPACE);
```

They all print a space.

```
char c1, c2;
printf("Enter two characters (without spaces), then"
      "press return: \n");
scanf("%c%c", &c1, &c2);
putchar(c1);
putchar(c2);
printf("\n %d %d \n", c1, c2);
printf("\n %c %c \n", c1, c2);
/*-----*/
```

## RESULTS:

Enter two characters (without spaces), then press return:

|              |                           |
|--------------|---------------------------|
| xy (NL)      | from the keyboard         |
| xy           | from the putchar          |
| (NL)         | from the 1st printf       |
| 120 121 (NL) | from the 1st printf       |
| (NL)         | from the 1st & 2nd printf |
| x y (nl)     | from the 2nd printf       |



```

char c1, c2;
printf("Enter 2 chars. (no spaces), then press “
    “return: \n “);
c1 = getchar();
c2 = getchar();
putchar(c1);
putchar(c2);
putchar('\n');
/*-----*/

```

## RESULTS:

Enter 2 chars. (no spaces), then press return:

a b (NL)                      from the keyboard

a b (NL)                      from the putchar

The Input Buffer:

|       |       |       |       |
|-------|-------|-------|-------|
| ----- | ----- | ----- | ----- |
| a     | b     | NL    |       |
| ----- | ----- | ----- | ----- |

```
#include <stdio.h>
#include <stdlib.h>
int main (void)
{
    int year;
    char letter_1, letter_2, letter_3;

    printf("Enter a 3-letter nickname and press return: ");
    scanf("%c%c%c", &letter_1, &letter_2, &letter_3);
    printf("\nEnter the current year and press return: ");
    scanf("%d", &year);
    printf("Welcome, %c%c%c. %d is a great year "
           "to study C! \n\n", letter_1, letter_2, letter_3,
           year);
    return EXIT_SUCCESS;
}
/*-----*/
```

## RESULTS:

Welcome, Liz. 2017 is a great year to study C!


Two vertical bars, one dark green and one yellow, are positioned on the left side of the slide.

# The ASCII Table




## ASCII Character Codes


| <u>Dec</u> | <u>Oct</u> | <u>Hex</u> | <u>Chr</u>              |
|------------|------------|------------|-------------------------|
| 000        | 000        | 00         | NULL                    |
| 001        | 001        | 01         | SOH                     |
| 002        | 002        | 02         | STX, Start TX           |
| 003        | 003        | 03         | ETX, End TX             |
| 004        | 004        | 04         | EOT                     |
| 005        | 005        | 05         | ENQ, Inquire            |
| 006        | 006        | 06         | ACK, Acknowledge        |
| 007        | 007        | 07         | BEL, Bell               |
| 008        | 010        | 08         | BS, Back Space          |
| 009        | 011        | 09         | HT, Horizontal Tab      |
| 010        | 012        | 0A         | LF, New Line(Line Feed) |
| 011        | 013        | 0B         | VT, Vertical Tab        |
| 012        | 014        | 0C         | FF, Form Feed           |
| 013        | 015        | 0D         | CR, Carriage Return     |
| 014        | 016        | 0E         | SO, Stand Out           |
| 015        | 017        | 0F         | SI, Stand In            |




| <u>Dec</u> | <u>Oct</u> | <u>Hex</u> | <u>Chr</u>        |
|------------|------------|------------|-------------------|
| 016        | 020        | 10         | DLE               |
| 017        | 021        | 11         | DC1               |
| 018        | 022        | 12         | DC2               |
| 019        | 023        | 13         | DC3               |
| 020        | 024        | 14         | DC4               |
| 021        | 025        | 15         | NAK, Negative ACK |
| 022        | 026        | 16         | SYN               |
| 023        | 027        | 17         | ETB               |
| 024        | 030        | 18         | CAN               |
| 025        | 031        | 19         | EM                |
| 026        | 032        | 1A         | SUB               |
| 027        | 033        | 1B         | ESC, Escape       |
| 028        | 034        | 1C         | FS, Cursor Right  |
| 029        | 035        | 1D         | GS, Cursor Left   |
| 030        | 036        | 1E         | RS, Cursor Up     |
| 031        | 037        | 1F         | US, Cursor Down   |
| 032        | 040        | 20         | SP, Space         |



| <u>Dec</u> | <u>Oct</u> | <u>Hex</u> | <u>Chr</u> |
|------------|------------|------------|------------|
| 033        | 041        | 21         | !          |
| 034        | 042        | 22         | "          |
| 035        | 043        | 23         | #          |
| 036        | 044        | 24         | \$         |
| 037        | 045        | 25         | %          |
| 038        | 046        | 26         | &          |
| 039        | 047        | 27         | '          |
| 040        | 050        | 28         | (          |
| 041        | 051        | 29         | )          |
| 042        | 052        | 2A         | *          |
| 043        | 053        | 2B         | +          |
| 044        | 054        | 2C         | ,          |
| 045        | 055        | 2D         | -          |
| 046        | 056        | 2E         | ,          |
| 047        | 057        | 2F         | /          |




| <u>Dec</u> | <u>Oct</u> | <u>Hex</u> | <u>Chr</u> |
|------------|------------|------------|------------|
| 048        | 060        | 30         | 0          |
| 049        | 061        | 31         | 1          |
| 050        | 062        | 32         | 2          |
| 051        | 063        | 33         | 3          |
| 052        | 064        | 34         | 4          |
| 053        | 065        | 35         | 5          |
| 054        | 066        | 36         | 6          |
| 055        | 067        | 37         | 7          |
| 056        | 070        | 38         | 8          |
| 057        | 071        | 39         | 9          |
| 058        | 072        | 3A         | :          |
| 059        | 073        | 3B         | ;          |
| 060        | 074        | 3C         | <          |
| 061        | 075        | 3D         | =          |
| 062        | 076        | 3E         | >          |
| 063        | 077        | 3F         | ?          |
| 064        | 100        | 40         | @          |




| <u>Dec</u> | <u>Oct</u> | <u>Hex</u> | <u>Chr</u> |
|------------|------------|------------|------------|
| 065        | 101        | 41         | A          |
| 066        | 102        | 42         | B          |
| 067        | 103        | 43         | C          |
| 068        | 104        | 44         | D          |
| 069        | 105        | 45         | E          |
| 070        | 106        | 46         | F          |
| 071        | 107        | 47         | G          |
| 072        | 110        | 48         | H          |
| 073        | 111        | 49         | I          |
| 074        | 112        | 4A         | J          |
| 075        | 113        | 4B         | K          |
| 076        | 114        | 4C         | L          |
| 077        | 115        | 4D         | M          |
| 078        | 116        | 4E         | N          |
| 079        | 117        | 4F         | O          |
| 080        | 120        | 50         | P          |






| <u>Dec</u> | <u>Oct</u> | <u>Hex</u> | <u>Chr</u> |
|------------|------------|------------|------------|
| 081        | 121        | 51         | Q          |
| 082        | 122        | 52         | R          |
| 083        | 123        | 53         | S          |
| 084        | 124        | 54         | T          |
| 085        | 125        | 55         | U          |
| 086        | 126        | 56         | V          |
| 087        | 127        | 57         | W          |
| 088        | 130        | 58         | X          |
| 089        | 131        | 59         | Y          |
| 090        | 132        | 5A         | Z          |
| 091        | 133        | 5B         | [          |
| 092        | 134        | 5C         | \          |
| 093        | 135        | 5D         | ]          |
| 094        | 136        | 5E         | ^          |
| 095        | 137        | 5F         | _          |
| 096        | 140        | 60         | `          |



| <u>Dec</u> | <u>Oct</u> | <u>Hex</u> | <u>Chr</u> |
|------------|------------|------------|------------|
| 097        | 141        | 61         | a          |
| 098        | 142        | 62         | b          |
| 099        | 143        | 63         | c          |
| 100        | 144        | 64         | d          |
| 101        | 145        | 65         | e          |
| 102        | 146        | 66         | f          |
| 103        | 147        | 67         | g          |
| 104        | 150        | 68         | h          |
| 105        | 151        | 69         | i          |
| 106        | 152        | 6A         | j          |
| 107        | 153        | 6B         | k          |
| 108        | 154        | 6C         | l          |
| 109        | 155        | 6D         | m          |
| 110        | 156        | 6E         | n          |
| 111        | 157        | 6F         | o          |
| 112        | 160        | 70         | p          |
| 113        | 161        | 71         | q          |



| <u>Dec</u> | <u>Oct</u> | <u>Hex</u> | <u>Chr</u>  |
|------------|------------|------------|-------------|
| 114        | 162        | 72         | r           |
| 115        | 163        | 73         | s           |
| 116        | 164        | 74         | t           |
| 117        | 165        | 75         | u           |
| 118        | 166        | 76         | v           |
| 119        | 167        | 77         | w           |
| 120        | 170        | 78         | x           |
| 121        | 171        | 79         | y           |
| 122        | 172        | 7A         | z           |
| 123        | 173        | 7B         | {           |
| 124        | 174        | 7C         |             |
| 125        | 175        | 7D         | }           |
| 126        | 176        | 7E         | ~           |
| 127        | 177        | 7F         | DEL, Delete |



# Characters in C

The End