



ĐẠI HỌC BÁCH KHOA HÀ NỘI
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Data input/output

Department of Information System

SoICT, HUT

Data input/output

- To read and write data in C, we use two standard functions that include in the file `<stdio.h>`
- `printf()` – prints something to the screen. This function accepts parameters as variables to display their values
- `scanf()` – receives values from the standard input and assign them to variables

Example

```
/* Calculate the area of circle */
#include <stdio.h>

int main()
{
    float r, s;

    printf("Enter the radius of circle: ");
    scanf("%f", &r);

    s = 3.14*r*r;
    printf("The area of circle is: s=%f", s);

    return 0;
}
```

Formatting with printf()

- Syntax

```
printf("string...", variables or numbers);
```

- The simplest use of printf is to just print out a string:

```
printf ("Hello world!");
```

- Print out a single integer number:

```
int number = 42;
```

```
printf ("Some number = %d", number);
```

Conversion character

- Conversion characters (starts with %) do not display in the screen but they are replaced by values
- Basic conversion character
 - %d: signed decimal integer
 - %u: unsigned decimal integer
 - %x: hexadecimal integer
 - %o: octal integer
 - %s: string
 - %c: single character
 - %f: fixed decimal floating point
 - %e: scientific notation floating point
- To print a character %, use %% in the format string

Print a value in different formats

- A same value can be printed in different format.
- Example

```
char ch = 'A';
```

```
printf ("%d\n", ch);
```

→ print out 65

```
printf ("%c\n", ch);
```

→ print out 'A'

- %d is called a conversion character for integers because it tells the compiler to treat the variable to be filled into it as an integer

Print a value in different formats

```
#include <stdio.h>

int main()
{
    char c = 'A';

    printf("Print c in the char format: %c\n", c);
    printf("Print c in the interger format: %d\n", c);
    printf("Print c in the hexa format: %x", c);

    return 0;
}
```

Output: **Print c in the char format: A**
 Print c in the interger format: 65
 Print c in the hexa format: 41

Formatting with printf

- Use special control characters such as `\n`, `\t`
- We can specify the field width by following:

`% [-] [fwidth] [.p] X` where:

- [*fwidth*] the field width
- [-] left justified.
- [*.p*] the number of decimal places or how many characters are to be printed.

Example

<i>Value</i>	<i>Spec.</i>	<i>Output</i>
42	%6d	42
42	%-6d	42
'z'	%3c	z
'z'	%-3c	z
2.71828	%10f	2.71828
2.71828	%10.2f	2.71
2.71828	%-10.2f	2.71
2.718	%.4f	2.7180
2.71828	%10e	2.71828e+00
"printf"	%s	printf
"printf"	%10s	printf

Exercises

1. Write a program to display a menu of a restaurant, including 3 columns: meal's code, meal's name, price

MENU

Code	Name	Price
1	Aaa	45000.00
2	Bbb	12500.00

2. Initiate value for a character in a program. Display it and its ASCII code in the form '0': 48 (in the screen)

scanf()

- Syntax

```
scanf ("string...",pointers);
```

- Note: Not variables which are listed after the control string but point to variables.

Example:

```
int i;
```

```
char ch;
```

```
float x;
```

```
scanf ("%d%c%f", &i, &ch, &x);
```

// enter an integer, a character, and a real number

- Notice the & characters which make the argument pointers

Formatting with scanf

- The conversion characters for scanf are not identical to those for printf, but much more precise
 - %d : decimal integer (int)
 - %ld : long decimal integer (long)
 - %x : hexadecimal integer
 - %o : octal integer
 - %h : short integer (short)
 - %f : float type
 - %lf : long float or double
 - %c : single character
 - %s : character string

Common errors

- Find errors in the following codes:

```
float a, b, c;  
scanf("%f", a);  
scanf("%d", &b);  
scanf("%f", &c);
```

Example

Input octal integer, output integer as decimal

```
#include <stdio.h>

int main() {
    int i ;
    scanf("%o", &i) ;
    printf("%d", i) ;
    return 0 ;
}
```

Input: 70

Output: 56

Exercise

Input a letter, output its order in alphabetical table

```
#include <stdio.h>

int main(void)
{
    char letter;

    printf("Enter a regular letter\n");
    scanf("%c",&letter);

    printf("The order of entered letter is: %d\n",letter-
'a'+1);

    return 0;
```

Scan input data

- Values stored in variables are scanned relying on input string from user. The scan process is carried out sequentially and can stop when an error occurs.
- Example:

```
int i = 0;  
char ch = '*';  
float x = 0;  
scanf ("%d%c%f ",&i,&ch,&x);  
printf ("%d %c %f\n ",i,ch,x);
```

If input : 1x2.3

We have output: 1 x 2.300000

If input : 1 x 2.3

We have output: 1 0.000000

Skipping Characters in Input Stream

- Skipping blank spaces

`scanf("%d %d %d", &day, &month, &year);`

- Skipping dashes (Enter data as dd-mm-yyyy)

`scanf("%d-%d-%d", &day, &month, &year);`

- *Example:*

If input is 1-1-2000, then day=1, month=1, year=2000

- As usual, if the skip string cannot be matched, scanf will abort, leaving the remaining characters in the input stream.

Return value of scanf()

- The general form of the scanf function is:

`n = scanf ("string...", pointers);`

- The value n returned is the number of items matched or the end of file character EOF, or NULL if the first item did not match

- Example:

`n=scanf("%d-%d-%d", &day, &month, &year);`

- If input is 1-1-2000, then day=1, month=1, year=2000, n=3
- If input is 1/1/2000, then day=1 and the scanf is broken, return n=1

Checking input value

```
int n;  
printf("n = ");  
if (scanf("%d", &n) != 1)  
    printf("Can not get value for n");
```

Exercises

1. Write a program to get a character from the user and then display its ASCII code in the form '0':
48
2. Input a number and a string from the keyboard. Display them to the screen.
3. Input two-time values from the keyboard and display the distance (in seconds) between them. The input time format is hh:mm:ss



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