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Data input/output

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Data input/ouput

- 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

Value	*Spec.*	*Output*
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

Example

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 carries 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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