Computer Programming

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(day 1)

Computer Programming Basics

- Design
  - Analyze problem
  - Input data
  - Find solution / Algorithm / Formula / Logic thinking
  - Output data
- Writing code (coding)
  - Source code in a programming language (C/C++/C#, Java, etc)
  - Use a good text editor tool /developer tool
    - Eclipse + cygwin (GNU gcc)
- Build program
  - Use compiler to generate executable file/program
- Testing
  - Make test case, run program, and verify the results
- Debugging
  - Trace down the error code point and make a fix
- Submit /Release

Study Knowledge, Think Smart

- USACO:
  - Challenge Problems:
    - strong solving skill, not in school book
  - Fun:
    - lots of talking and rewarding contests
  - Overall knowledge training:
    - reading, thinking, math, logic, carefulness
  - Game:
    - do not care about few failure cases, confident for your code
- Study hard, play hard
  - Switch all gaming time to coding
- Good luck

Programming in C/C++

Programming Language Basics

Types and Variables

- Definitions of data in memory

Expressions

- Arithmetic, logical, and assignment operators in an infix notation

Statements

- Sequences of conditional, iteration, and branching instructions

Functions

- Groups of statements and variables invoked recursively

Data Types and Variables

- Data Types:
  - Basic: char, int, long long, double, bool, etc.
  - User defined
- Variable Name:
  - any string except:
    - Language key word
    - No space
    - Not start with a number
  - Usually meaningful string
- Declaration of variables
  - Statement:

```
DataType VariableName;
e.g.        char  cIn;
            int iSum;
```

Standard Input/Output

Input:

Transform the keyboard enter data into program defined variables, which are saved in memory (Total size has limit, < 32M)

In C: use scanf, etc

In C++: use cin, etc

Output:

Transform variable value, or print out messages to the console/terminal window

In C: use printf, etc.

In C++: use cout, etc

Simple Program

Problem: print out a string message “Hello World”
Input: none
Algorithm: basic function call
Output: Hello World

```
/*
  my first c program
 */
#include <cstdio>

int main ()
{
// output a string
   printf(“Hello World\n”);

   return 0;
}
```

```
/*
  my first c++ program
 */
#include <iostream>
using namespace std;

int main ()
{
// output a string
   cout << “Hello World\n”;

   return 0;
}
```

Data Types and Variables format in printf

Name	Description	Size(byte)	Range	Format
char	Character or small integer.	1	signed: -128 to 127 unsigned: 0 to 255	%c
short	Short Integer	2	signed: -32768 to 32767 unsigned: 0 to 65535	%d
int	Integer.	4	signed: -2.15G to 2.15G unsigned: 0 to 4.3G	%d
long long	Long Integer	8	signed: – (2^{63}) to $2^{63} – 1$ unsigned: 0 to $2^{64} – 1$	%lld
float	Floating point number.	4	+/- 3.4e +/- 38	%f
double	Double precision floating point number	8	+/- 1.7e +/- 308	%lf
bool	Boolean	1	true or false	

C Input and Output Function

- #include <cstdio>
- Input:

  int scanf (const char * format, ...);
- Output:

  int printf (const char * format, ...);
- Format(most useful):

char:	%c		
int:	%d,		
long long:	%lld	(unsigned long long:	%llu)
double:	%lf	(or scientific:	%e)
char array:	%s		
\n:	<return>		
\:	for special char (\007, \\, etc)		
%%: output %			

C Output Example

Example :

```
#include <cstdio>
int main() {
      printf("My name is Ho, Patrick.\n");
      printf("Today is 10/2/2011.\n");
      printf("My home phone number is 408-446-5806.\n");
      printf("I finished my homework 100%%.\n");
      printf("The ; is semi-colon.\n");
      printf("The : is colon.\n");
      printf("The , is coma.\n");
      printf("The . is period.\n");
      printf("The \\ is back-slash.\n");
      printf("The + is plus.\n");
      printf("The - is minus.\n");
      printf("The * is star sign, means multiply.\n");
      printf("The / is slash sign, means divide.\n");
      printf("The $ is dollar.\n");
      printf("The & is and sign.\n");
      printf("The ? is question.\n");
      printf("The \\n is return.\n");
      printf("The \\t is Tab sign (8 or 4 space).\n");

       return 0;
}
```

C Input and Output Example

Example A:

```
/* scanf example */
#include <cstdio>
int main ()
{
    char str[80];
    int i;
    printf("Enter your family name: ");
    //cout<<"Enter your family name: ";
    fflush(stdout);//flush the output buffer
    scanf("%s",str);
    printf("Enter your age: ");
    fflush(stdout);
    scanf("%d",&i);
    printf("Mr. %s, %d years old.\n",str, i);
    printf("Enter a hexadecimal number: ");
    fflush(stdout);
    scanf("%x",&i);
    printf("You have entered %#x(%d).\n",i,i);
    return 0;
}
```

C Input and Output Example

Example B:

```
/* printf example */
#include <cstdio>
int main()
{
   printf ("Characters: %c %c \n", 'a', 65);
   printf ("Decimals: %d %ld\n", 1977, 650000L);
   printf ("Preceding with blanks: %10d \n", 1977);
   printf ("Preceding with zeros: %010d \n", 1977);
   printf ("Some different radixes: %d %x %o %#x %#o \n", 100, 100, 100,
   100, 100);
   printf ("floats: %4.2f %+.0e %E \n", 3.1416, 3.1416, 3.1416);
   printf ("Width trick: %*d \n", 5, 10); printf ("%s \n", "A string");
   return 0;
}
```

C++ Input and Output Function

- #include <iostream>

  using namespace std;
- Input:

  cin >> variable_name;
- Output:

  cout << variable_name (or message in “”);
- Format(most useful):

  compiler auto detect data type. (cost???)

  endl: newline/<return>

  \n: newline / <return>

  \: for special char (\007, \\, etc)

  %%: output %

C++ Input and Output Example

Example:

```
/* cin & cout example */
#include <iostream>
using namespace std;

int main ()
{
    char str [80];
    int i;
    cout << "Enter your family name: ";
    cin >> str;
    cout << "Enter your age: ";
    cin >> i;
    cout << "Mr. " << str << " , " <<
        i << " years old.\n";
    return 0;
}
```

Arithmetic Operations

Operator Name	Symbol
Multiplication	*
Division	/
Modulus	%
Addition	+
Subtraction	-

Arithmetic Assignment Operators

Long Hand	Short Hand
`x = x * y;`	`x *= y;`
`x = x / y;`	`x /= y;`
`x = x % y;`	`x %= y;`
`x = x + y;`	`x += y;`
`x = x - y;`	`x -= y;`

Problem Solving

poj.org

#1000

1> Sign-In

2> Solve it in Eclipse

3> Test

4> Summit

5> Fix Error

6> Pass

1. Solution :

   A> use C Input/Output

   B> use C++ Input/Output

Problem Solving

codeforces.com

1A “Theater Square”

1> Sign-In

2> Solve it in Eclipse

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5> Fix Error

6> Pass

1. Solution :

   A> use C Input/Output

   B> use C++ Input/Output