

## Lab 10/4

**Please do not use math functions, loop, if/else, and array in this Lab.**

### ■ Lab Part

1. Let user input a decimal number ABC.DEF. Then convert it into **A0B0C0.D0E0F** and the reverse **F0E0D.0C0B0A**.

- 1) The output should be printed as one variable.
- 2) You cannot print each digit separately.
- 3) The output should be like: `printf("%lf",.....);`
- 4) Use only one variable.

Input/Output Example:

```
Please input a number (format: ABC.DEF): 987.654
Output (format: A0B0C0.D0E0F): 908070.60504
Reverse (format: F0E0D.0C0B0A): 40506.070809
```

2. Assume the three equations are solvable by Cramer's rule.

**Cramer's Rule**

$$a_1x + b_1y + c_1z = d_1$$

$$a_2x + b_2y + c_2z = d_2$$

$$a_3x + b_3y + c_3z = d_3$$

Let  $D = \begin{vmatrix} a_1 & b_1 & c_1 \\ a_2 & b_2 & c_2 \\ a_3 & b_3 & c_3 \end{vmatrix}$

If  $D \neq 0$  then

$$x = \frac{\begin{vmatrix} d_1 & b_1 & c_1 \\ d_2 & b_2 & c_2 \\ d_3 & b_3 & c_3 \end{vmatrix}}{D}$$

$$y = \frac{\begin{vmatrix} a_1 & d_1 & c_1 \\ a_2 & d_2 & c_2 \\ a_3 & d_3 & c_3 \end{vmatrix}}{D}$$

$$z = \frac{\begin{vmatrix} a_1 & b_1 & d_1 \\ a_2 & b_2 & d_2 \\ a_3 & b_3 & d_3 \end{vmatrix}}{D}$$

Please solve x, y, and z by the formula above.

Let the user input 12 integers a1, b1, c1, d1, a2, b2, c2, d2, a3, b3, c3, and d3 respectively. Then print out the three equations and the answers x, y, z. Please print floating-point number to the **4th decimal place** (using format specifier).

- 1) Use `printf("000x + 000y + 000z = 000|\n", a1, b1, c1, d1);` to print the equations. (modify "000" to fit the example)
- 2) Use `printf("x = 000|\n");` to print the answer. (modify "000" to fit the example)

Input/Output Example:

```

a1, b1, c1, d1: 123.456 456.789 789.123 987.654
a2, b2, c2, d2: 654.321 321.987 135.791 246.802
a3, b3, c3, d3: 147.258 369.147 258.369 546.234
-----
The equations are:
1234567890123456789012345678901234567890123456789012345678901234567890
000000123.45600x + 456.789000y + 789.123 z = 987.65400 |
        654.321x + 321.98700 y + 0135.7910z = 246.8020|
147.25800 x + 00000369.147y + 258.37z = 0000546.23|
-----
The answers are:
x = -0000.33|
y = 1.17578 |
z = 0.6227|
  
```

3. Please compute the summation of two positive integers, **both of which are smaller than 16**, and output their **binary representations** and the answer.

1) DO NOT use operator **+, -, \*, /, and %**.

2) You can only use bit operators **&, |, ^, ~, <<, >>, &=, |=, ^=, <<=, and >>=**.

**Hint: Consider 1-bit case**

Sum:	Carry:
$0 + 0 \Rightarrow 0$	$0 + 0 \Rightarrow 0$
$0 + 1 \Rightarrow 1$	$0 + 1 \Rightarrow 0$
$1 + 0 \Rightarrow 1$	$1 + 0 \Rightarrow 0$
$1 + 1 \Rightarrow 0$	$1 + 1 \Rightarrow 1$
$\Rightarrow$ Use xor	$\Rightarrow$ Use and

You can use '**<<**' to calculate every bit separately. And Use '**|**' to add every bit result.

Input/Output Example:

Input: 13 7	Input: 5 6
13 $\Rightarrow$ 1101	5 $\Rightarrow$ 0101
7 $\Rightarrow$ 0111	6 $\Rightarrow$ 0110
13 + 7 = 20	5 + 6 = 11

## ■ Homework Part

4. Write a program that prompts for and reads a **floating-point value**. The program prints **the whole part** on one line and the **decimal (fraction) part** on a second line. **Use ONE variable only**

For example, if the input value is 123.456, it would print the output:

the input value is 123.456

the whole part is **123**

the decimal(fraction) part is **0.456**

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**1) You can use ONE variable only.**

### **Modification:**

Please print the decimal part to the **5th decimal place**.

Calculate **the integer part times the decimal part**, and print it to the **2th decimal place**.

Input/Output Example:

```
Input: 12345.56789
```

```
Output:
```

```
The whole part is 12345
```

```
The decimal part is 0.56789
```

```
The integer part times the decimal part is 7010.60
```

5. Write a program that asks the user to enter **two real numbers** (with type **double**), and calculate the sum, product, difference, and quotient of the two numbers in following data types.
- Please declare two double variables for user input.
  - And then declare two int variables and float variables, assign values of the double variables to these int/float variables to calculate the sum, product, difference, and quotient of the required cases.
  - You can directly print out the first two lines of outputs.
  - Please use format specifier in printf() to meet the required output format shown in below example.

	Number1	Number2
Case I	int	int
Case II	float	float
Case III	double	double
Case IV	int	float

**Modification:**

**Add the following four cases as below:**

	Number1	Number2
Case V	float	double
Case VI	float	int
Case VII	double	int
Case VIII	int	double

**Compare the precision of Case II, Case III, and Case V.**

**Please adjust three cases to the correct order and replace “?” by “>”, “<” or “=” in the last line.**

**Input/Output Example:**

```

Input two numbers: 1.2345 9.8765
123456789012345 123456789012345 123456789012345 123456789012345
sum | product | difference | quotient
Case 1: 10 | 9 | -8 | 0
Case 2: 11.1110000610 | 12.1925401688 | -8.6420001984 | 0.1249936745
Case 3: 11.1110000000 | 12.1925392500 | -8.6420000000 | 0.1249936718
Case 4: 10.8765001297 | 9.8765001297 | -8.8765001297 | 0.1012504399
Case 5: 11.1110000505 | 12.1925397492 | -8.6419999495 | 0.1249936770
Case 6: 10.2344999313 | 11.1105003357 | -7.7655000687 | 0.1371666789
Case 7: 10.2345000000 | 11.1105000000 | -7.7655000000 | 0.1371666667
Case 8: 10.8765000000 | 9.8765000000 | -8.8765000000 | 0.1012504430
Precision: Case2?Case3?Case5.

```

6. Solve a set of simultaneous equations:

$$ax + by = c$$

$$dx + ey = f$$

Input data: six real numbers.

Output all the input values  $a$ ,  $b$ ,  $c$ ,  $d$ ,  $e$ , and  $f$  and the computed values for  $x$  and  $y$ .

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**Modification:**

- 1) Normalize the coefficient of  $x$ , and only use  $b$ ,  $c$ ,  $e$ ,  $f$  to solve this problem.
- 2) You can only use one more variable to help solve this problem. In other words, five variables at most can be used in this problem.
- 3) Use data type "double" as input. Print the value with total field width 12 and to the 4th decimal place.

Input/Output Example:

```
Please input six real numbers for a,b,c,d,e,f: 6.6 7.7 8.8 9.9 8.8 10.1
12345678901234567890123456789012345678901234567890
a =      6.6000 b =      7.7000 c =      8.8000
d =      9.9000 e =      8.8000 f =     10.1000
x =      0.0182 y =      1.1273
```