

9주차 실습

2017-11-2

조교에게 연락할 때

과제 질문이나 문의사항이 있을 때

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지난 주차 과제의 예시 정답들 공개

<https://github.com/ryanking13/2017f-PP-solution>

이제부터 github 사이트에서 찾아볼 수 있습니다!

Topic

- Array of pointer
- Function pointer
- Bitwise operator

Task 9_1

Description

Given N ($N \leq 20$), and two square matrices (the size of array is N by N), print the multiplication of two matrices. Each entries of matrix is an integer between -1000 and 1000.

Example

Input	Output
2 1 2 2 1 0 3 2 3	4 9 2 9
3 1 2 3 4 5 6 7 8 9 2 3 4 5 6 7 8 9 10	36 42 48 81 96 111 126 150 174

Task 9_2

Description

Prof. Lee asked to you to make calculator for complex number. Implement 4 blank functions to complete professor's request.

Task 9_2

Skeleton code

- You should submit
this part

```
#include <stdio.h>
typedef void (*calcFuncPtr)(int, int, int, int, int*, int*);

void plus(int r1, int i1, int r2, int i2, int* r3, int* i3){
    // fill here
}

void minus(int r1, int i1, int r2, int i2, int* r3, int* i3){
    // fill here
}

void mult(int r1, int i1, int r2, int i2, int* r3, int* i3){
    // fill here
}

void calc(int r1, int i1, int r2, int i2, int* r3, int* i3, calcFuncPtr func){
    // fill here
}
```

Task 9_2

Skeleton code

- Main function code for testing
- 주석 처리 or 삭제 후 제출!

```
int main(){
    calcFuncPtr f = NULL;
    int r1, r2, r3, i1, i2, i3;
    char op;

    scanf("%d %d %c %d %d", &r1, &i1, &op, &r2, &i2);
    switch(op){
        case '+': f = plus; break;
        case '-': f = minus; break;
        case '*': f = mult; break;
    }

    calc(r1, i1, r2, i2, &r3, &i3, f);
    printf("%d %d\n", r3, i3);
    return 0;
}
```


Task 9_2

Example

Input	Output
2 3 + 4 5	6 8
5 3 - 6 2	-1 1
-2 3 * 5 -1	-7 17

Task 9_3

Description

A set of words is given. Separate the given set by words. Then, **sort by word frequency in descending order**. (The given set consists of at most 10,000 words, and the length of each word is lower than 1,000. And the frequency of each word is always different.)

Hint

First sort the set in alphabetical order by word using "strcmp."

Task 9_3

Example

Input	Output
a b b c c c d d d d e e e e e f f f f f f g	g f e d c b a
l l l l l l l l l l got C in in in in in C C l anguage language	l in C language got

Task 9_4

Description

Kwanghyun just got homework from Professor Lee. He must do 100000 operations with two sets. But he wants to play PUBG and let his computer solve all the problems. Let's help him so he can eat chicken dinner!

In this problem, input parsing may be troublesome part. But don't worry, Kwanghyun has already done that work for you. So **you just need to implement 6 functions**. Take Kwanghyun's skeleton code and fill in 6 functions.

Task 9_4

You will handle two sets : **A** and **B**

You will handle **7 types of queries** (see examples for detail)

- (1) "**add** x **into** A"(or B) : add element x into a set.
- (2) "**delete** x **from** A"(or B) : remove element x from a set.
- (3) "**union**" : replace set A with $A \cup B$
- (4) "**intersection**" : replace set A with $A \cap B$
- (5) "**setminus**" : replace set A with $A - B$
- (6) "**print** A"(or B) : print elements of a set. (See examples)
- (7) "**quit**" : terminate program.

Task 9_4

For each of these queries, **you must implement corresponding functions**

*** In this task, you cannot use arrays, Use bit representation of set**

- (1) `int my_add(int setA, int x)` : returns bitmask represent of $A \cup \{x\}$
 - (2) `int my_delete(int setA, int x)` : returns bitmask represent of $A - \{x\}$
 - (3) `int my_union(int setA, int setB)` : returns bitmask represent of $A \cup B$
 - (4) `int my_intersection(int setA, int setB)` : returns bitmask represent of $A \cap B$
 - (5) `int my_setminus(int setA, int setB)` : returns bitmask represent of $A - B$
 - (6) `void my_print(int setA)` : prints every element of A. Separated by spaces, and newline character at the end. (See examples)
- * Every elements will be in range in 0 ... 31

Task 9_4 Approach

- Implement sets with bits

Implementing sets with bits

- Set of decimal digits. Each set is represented by **single integer**.
- Each 32 bits of integer represents existence of elements.
- {5} -> 0000 ... 0010 0000 = **32**
- {0} -> 0000 ... 0000 0001 = **1**
- {0,1,2,3} -> 0000 ... 0000 1111 = **15**
- {1,3} -> 0000 ... 0000 1010 = **10**
- Φ -> 0000 ... 0000 0000 = **0**
- 7 = 0000 ... 0000 0111 -> {0,1,2}

Implementing sets with bits – Addition

- Think about adding 2 into {1,3,5}
- {1,3,5} -> 0000 ... 0010 1010 = 42
- {1,2,3,5} -> 0000 ... 0010 1110 = 46

- $46 = 42 \mid (1 << 2)$

- How about deletion?

Implementing sets with bits – Set Union

- Think about $\{1,2,3,5\} \cup \{2,4\}$
- $\{1,3,5\} \rightarrow 0000 \dots 0010 \ 1110 = 46$
- $\{2,4\} \rightarrow 0000 \dots 0001 \ 0100 = 20$
- $\{1,2,3,4,5\} \rightarrow 0000 \dots 0011 \ 1110 = 62$
- $62 = 46 \mid 20$
- How about intersection?

Task 9_4

For each of these queries, **you must implement corresponding functions**

*** In this task, you cannot use arrays, Use bit representation of set**

- (1) `int my_add(int setA, int x)` : returns bitmask represent of $A \cup \{x\}$
 - (2) `int my_delete(int setA, int x)` : returns bitmask represent of $A - \{x\}$
 - (3) `int my_union(int setA, int setB)` : returns bitmask represent of $A \cup B$
 - (4) `int my_intersection(int setA, int setB)` : returns bitmask represent of $A \cap B$
 - (5) `int my_setminus(int setA, int setB)` : returns bitmask represent of $A - B$
 - (6) `void my_print(int setA)` : prints every element of A. Separated by spaces, and newline character at the end. (See examples)
- * Every elements will be in range in 0 ... 31

Task 9_4

Skeleton Code

You can write following codes into your file or..
command

`wget https://raw.githubusercontent.com/ryanking13/2017f-PP-solution/master/Week9/Task4/9_4_skeleton.c`

To download the file "9_4_skeleton.c" from server

```
4 // Implement below functions
5 int my_union(int setA, int setB){
6 }
7 int my_intersection(int setA, int setB){
8 }
9 int my_add(int setA, int x){
10 }
11 int my_delete(int setA, int x){
12 }
13 int my_setminus(int setA, int setB){
14 }
15 void my_print(int setA){
16 }
```

Task 9_4

```
18 ▾ int main(){
19     int setA = 0, setB = 0;
20 ▾ while(1){
21     char op[30], opA[10], dummy[10];
22     scanf("%s",op);
23
24     if( strcmp(op,"quit") == 0 ) break;
25
26 ▾ if( strcmp(op,"print") == 0 ){
27     scanf("%s",opA);
28     if( strcmp(opA,"A") == 0 ) my_print(setA);
29     if( strcmp(opA,"B") == 0 ) my_print(setB);
30 }
31
32 ▾ if( strcmp(op,"add") == 0 ){
33     int x; scanf("%d",&x);
34     scanf("%s%s",dummy,opA);
35     if( strcmp(opA,"A") == 0 ) setA = my_add(setA,x);
36     if( strcmp(opA,"B") == 0 ) setB = my_add(setB,x);
37 }
38
39 ▾ if( strcmp(op,"delete") == 0 ){
40     int x; scanf("%d",&x);
41     scanf("%s%s",dummy,opA);
42     if( strcmp(opA,"A") == 0 ) setA = my_delete(setA,x);
43     if( strcmp(opA,"B") == 0 ) setB = my_delete(setB,x);
44 }
45
46 if( strcmp(op,"union") == 0 ) setA = my_union(setA,setB);
47
48 if( strcmp(op,"intersection") == 0 ) setA = my_intersection(setA,setB);
49
50 if( strcmp(op,"setminus") == 0 ) setA = my_setminus(setA,setB);
51
52 }
53 }
```

Task 9_4

Example

Input	Output
add 1 into A add 2 into B print A print B union print A quit	1 2 1 2
add 1 into A add 2 into A print A delete 1 from A print A add 3 into A print A delete 2 from A print A quit	1 2 2 2 3 3

Task 9_4

Example

add 1 into A add 2 into A add 2 into B add 3 into B print A print B intersection print A quit	1 2 2 3 2
add 1 into A add 2 into A add 2 into B add 3 into B print A print B setminus print A quit	1 2 2 3 1

Task 9_4

Example

add 1 into A	1 2 3
add 2 into A	10 20
add 3 into A	1 2 3
add 10 into B	1 2 3
add 20 into B	1 2 3 10 20
print A	
print B	
delete 5 from A	
print A	
setminus	
print A	
union	
print A	
quit	