이름:
학번:

Please note that, for all "What will be output" questions, the answer could be "error" or "indefinite". However, there is no compile error.

1. What will be output if you will execute following c code?

```
#include<stdio.h>
int main(){
    for(;1;)
        printf("hihi\n");
    return 0;
}
```

2. Rewrite the following expression using pointers.

```
int a[100];
int b;
b=a[99];   // → change only this line
```

3. What will be output if you will execute following c code?

```
#include<stdio.h>
int main(){
    int i[2]={6,17};
    *(&(i[0]))++;
    printf("%d\n",i[1]);
    return 0;
}
```

4. Correct the following code, if necessary, to remove run-time errors. Change the code as little as possible. If no change is needed, just say so.
```
void main(void)
{
    char x[3];
    strcpy(x,"dog");
}
```

5. What will be output if you will execute following c
code?

```c
#include<stdio.h>
int main(){
    char c=-'a';
    printf("%c\n",-c+3);
    return 0;
}
```

6. What will be output if you will execute following c code?

```c
#include<stdio.h>
int a=5;
int main(){
    int x;
    x=!a+change();
    printf("%d",x);
    return 0;
}
int change(){
    int x=0;
    return x+1;
}
```

7. What will be output by the following code?

```c
int f(int x)
{ ++x;
return x;
}
void main(void)
{ printf("%d",f(2));
}
```

8. What will be output if you will execute following c code?

```c
#include<stdio.h>
union cqbu{
    int a;    char b;
};
struct cqbs{
    int a;
};
int main(){
    union cqbu u={25};
    struct cqbs *ps=(struct cqbs *)&u;
    union cqbu *pu=(union cqbu *)&u;
    printf("%d %d\n",ps->a);
    printf("%d %d\n",pu->a,pu->b);
    return 0;
}
```

9. What will be output if you will execute following c code?

```c
#include<stdio.h>
struct data {
    int num;
    struct data **p;
    struct data ***q;
};
int main(){
    struct data v,v2;
    struct data *var1,**var2;
    struct data temp={5,&var1,&var2};
    var2=&var1;
    var1=&v;
    var1->num=25;
     v2.num=30;
     temp.p=(struct data**)&v2;
     printf("%d ",(**(temp.q))->num);
    return 0;
}
```

____ ____

10. Mark O or X depending on the correctness of each statement.
(1)
```
float rootbeer[10], things[10][5], *pf, value = 2.2;
int i = 3;
rootbeer[2] = value;          _____
things[4][4] = rootbeer[3];   _____
things[5] = rootbeer;         _____
pf = value;                   _____
pf = rootbeer;                _____
(2)
double rates[5] = {88.99, 100.12, 59.45, 183.11, 340.5};
const double locked[4] = {0.08, 0.075, 0.0725, 0.07};
const double * pd = rates;
pd[2] = 222.22;               _____
*pd = 29.89;                  _____
pd++;                         _____
pd = &rates[3];               _____
pd = locked;                  _____
```

11. What will the following program print out when run?
```
int getSize( char *str ) { return sizeof( str ); }
int main( void ) {
   char S1[30]="I love playing soccer.";
   printf( "%d\n", strlen( S1 ) );
   printf( "%d\n", sizeof( S1 ) );
   printf( "%d\n", getSize( S1 ) );
   strcpy( S1+3, "basketball." );
   S1[6] = '\0';
   printf( "%s\n", S1 );
   printf( "%d\n", strlen( S1 ) );
   return 0;    } /* end main */
```

12. What will the following following program print out when run?
```
int main( void ) {
   char s[]="Alexander Graham Bell";
   char* p=(char*)0;
   int x=45;
   int *px=(int*)0;
   int *sx=&x;
   p=s;
   printf( "%s\n", p );
   *p = 'F';
   printf( "%s\n", s );
   return 0;
} /* end main */
```

13. Correct the following code so it fulfills its specification.
Change the code as little as possible. If it's already correct, just
say so.

```
int count(char c, char *x)
// return the number of characters in string x that are equal to c
{ char *t;
int ans = 0;
for(t=x; t; t++)
{ if(*t == c)
++ans;
}
return ans;
}
```

14. Implement the following function that calculates the factorial of
n using recursions.

```
int fact( int n ) ;
```

15. Fill in the blanks in the source code of a program that outputs the following.

Output:
```
****************************
'Number of divisors'
****************************
Input the first number : 1
Input the second number : 2
Number of divisors of first number is 1
Number of divisors of second number is 2
Result is : 3
```

Source code:
```c
#include <stdio.h>
int numOfDivisors(int number);
int main(void)
{
        int i, num1, num2;
        printf("Input the first number : "), scanf("%d", &num1);
        printf("Input the second number : "), scanf("%d", &num2);
        printf("Number of divisors of first number is %d\n",
numOfDivisors(num1));
        printf("Number of divisors of second number is %d\n",
numOfDivisors(num2));
        printf("Result is : %d\n", numOfDivisors(num1) +
numOfDivisors(num2));
        return 0;
}

int numOfDivisors(int number)
{
        int i, result = 0;
        for (i=1; i<=number; i++)
        {
            if (_____)
                        result ++;
        }
        return result;
}
```

16. What will be the output of this program?

```c
#include<stdio.h>
int main(void) {
int i,j,n;
int set[100][100];
n = 6;
for(i = 0; i <= n; i++) {
   for(j = 0; j <= n; j++) {
      set[i][j] = 0;
   }
}
set[0][0] = 1;
for(i = 1; i <= n; i++)
   for(j = 1; j <= i; j++)
      set[i][j] = set[i - 1][j] + set[i - 1][j - 1];
printf(" Index");
for(i = 1; i <= n; i++)
   printf("%3d", i);
printf("\n");
for(i = 1; i <= n; i++) {
   printf("%4d ", i);
   for(j = 1; j <= n; j++)
      printf("%3d",set[i][j]);
   printf("\n");
}
return 0;
}
```

17. (linked list) Consider the following data structure, whose
individual elements are declared as follows:

```
struct node {
int data;
struct node *next;
}
```

Assuming this declaration, write just the necessary C code in order
to insert a new node after the index-th element (currNode).

```
Node* InsertNode(Node* head, int index, double x) {
   if (index < 0) return NULL;
   Node* newNode =new Node;
   newNode->data =x;
   int currIndex;
   Node* currNode;
   for( currNode = head, currIndex = 0;currNode && currIndex<index ;
currNode=currNode->next)
       currIndex++;
   if (currNode == NULL) return NULL;


   _____


   _____
   return newNode;
}
```

18. (linked list) Write a function to search for a node with the
value equal to x in the list. If such a node is not found, return
NULL. Assume the head node is a dummy.

```
Node* FindNode(Node* head, int x)
{




}
```

19. What will be printed by the following code?
```
#define CUBE(x) x*x*x
void main(void)
{ printf("%d", CUBE(2+2));
}
```

20. The function void qr(int n, int m, int *q, int *r) is designed to compute the quotient and remainder (q and r) of n on division by m. For example, the quotient and remainder of 25 on division by 7 are 3 and 4, since 3 times 7 is 21, which is 4 less than 25. How would you use qr? Fill in the missing lines of code:

```
void main(void)
{ int n = 25;
int m = 7;
int q, r;
_____
printf(q = %d and r = %d", q, r); // prints "q = 3 and r = 4",
}
```

21. What is the output of the following program, assuming that the address of x is 003674D0 (hexadecimal : 16진수), the address of a is 00367038?
(Hint: %p prints hexadecimal numbers. For example, 0x0004)

```
#include <stdio.h>
int main()
{
    int *p, x,y;
    int a[5]={ 100,200,300,400,500};
    int *p2;
    p=NULL;
    x=10;
    p=&x;
    printf("1) %d %d %p %p %p \n",x,*p,p,&x,&p);
    p2=&x;
    printf("2) %d %d %p %p \n",x,*p2,p2,&x);
    p2=a;
    printf("3) %d %d %p %p \n",a[0],*p2,p2,a);
    p2=&a[2];
    printf("4) %d %p %p \n",*p2,p2,a);
```

```c
   p2++;
   printf("5) %d %p \n",*p2,p2);
   p=a;
   y=*(p+2);
   printf("6) %d %d \n",y,a[2]);
   printf(" loop using pointer \n");
   for ( int * p3=a; p3 <= &a[4]; p3++)
      printf("loop: %d %p \n",*p3,p3);   }
```

22. (Scope of a variable) What will be output if you will execute following c code? (There is no error.)

```c
#include<stdio.h>
int main()
{
   int a=5;
   {
      int b=10;
      ++b;
      ++a;
      {
         int a=20;
         ++a;
         a=++b;
      }
      ++a;
      ++b;
      printf("%d %d",a,b);
   }
   printf(" %d",a);
   return 0;
}
```

23. What is the output of this program?

```c
void accumulate(int * x, int * y)
{
   *x = *y + *x;
}
void main(void)
{
   int x = 20;
   int y = 10;
   accumulate(&x, &y);
   accumulate(&x, &y);
   printf("x: %i,y: %i\n", x, y);
}
```

24. What is the output produced by this program?

```c
#include <stdio.h>
void main(void)
{
   int x[2] = {10, 20};
   int *ptrX;
   ptrX = x;
   (*ptrX)++;
   --x[1];
   --(*ptrX);
   printf("(%i, %i)\n", x[0], x[1]);
}
```