

## CMPE112/CMSE112 Questions with solutions

Question 1) Give the outputs of the following 9 programs. Note that your answers must be given in the boxes appended to each question:

A.) `#include <stdio.h>`

```
int main()
{
  int i=3;
  while(i--)
  {
    static int a = 8;
    char b = 20;
    a += 3; b--;
    printf("%d  %d\n", a, b);
  }
  return 0;}
```

```
11 19
14 19
17 19
```

B.) `#include <stdio.h>`

```
int main()
{
  int i , j;
  double x = 0;
  for (i = 0 , j = 7 ; j > 0 ; i++ , j --)
  {
    if (i < j) continue;
    x += i / j;
    printf(" %3.1f" , x);
    if (i == j) break;
  }
  printf("\n i=%d j=%d" , i , j);
  return 0;}
```

```
1.0 3.0 9.0
i=7 j=0
```

C.) `#include <stdio.h>`

```
int f(int a) { return a%2 ? ++a : a--; }
int main()
{
  int i , a = 2;
  for (i = 0 ; i < 5 ; i++)
  { a += i;
    printf(" (%d,%d)" , i , f(a));
  }
  return 0;}
```

```
(0,2) (1,4) (2,6) (3,8) (4,12)
```

**D.)** `#include <stdio.h>`  
`int main()`  
`{`  
`int sum = 0;`  
`for (i=0;i<50;i++);`  
`for (j=0;j<5;j++)     sum += i*j;`  
`printf(“%d\n”,sum);`  
`return 0;}`

500

**E.)** `#include <stdio.h>`  
`void fun(int, int);`  
  
`int main()`  
`{`  
`int x=5, y=11;`  
`fun(x+7, y);`  
`printf(“%d %d\n”, x, y);`  
`return 0;}`  
  
`void fun(int r, int s)`  
`{`  
`r /= 2; s /= 3;`  
`}`

5 11

F)

```
#include <stdio.h>
```

```
void f(float x, float y[],int n)
```

```
{
```

```
int i;
```

```
for(i=0;i<n;i++)
```

```
{
```

```
    x++;
```

```
    y[i]=y[i]+i;
```

```
    printf("I=%d and Y = %.2f X = %.2f \n", i , y[i] , x);
```

```
}
```

```
}
```

```
int main()
```

```
{
```

```
int m=5;
```

```
float x[]={2 , 4 , 8 , 16 , 32};
```

```
f(x[2] , x , m);
```

```
printf("The Result is =%.2f and %.2f ",x[2],x[3]);
```

```
return 0;
```

```
}
```

x (or y)	x (in f)	n	i	i<n
2 → 2	8	5	0	T
4 → 5	9		1	T
8 → 10	10		2	T
16 → 19	11		3	T
32 → 36	12		4	T
	13		5	N

I=0 and Y =2.00 X = 9.00

I=1 and Y =5.00 X = 10.00

I=2 and Y =10.00 X = 11.00

I=3 and Y =19.00 X = 12.00

I=4 and Y =36.00 X = 13.00

The result is = 10.00 and 19.00

G)

```
#include <stdio.h>
```

```
int k , x;
```

```
void f(int x)
```

```
{ static int y=0;
```

```
int z=0;
```

```
printf("%d %d %d %d\n", x , y , z , k);
```

```
if (x > (y+z)) { y+=2;
```

```
z++;
```

```
x--;
```

```
k+=z;
```

```
}
```

```
}
```

```
int main()
```

```
{ x=10;
```

```
k=8;
```

```
while(x>=k)
```

```
    f(x);
```

```

printf("%d %d", x, k);
return 0;
return 0;}

```

**TRACE**

Main		f(x)		
k	x	x	y	z
8	10	10	0	0
9	10	9	2	1
10	10	10	4	0
11	10	9	6	1
		10		1
		9		

**OUTPUT**

10	0	0	8
10	2	0	9
10	4	0	10
10	11		

H)

```
#include<stdio.h>
```

```

void fun1(int a[], int length)
{
int i;
for (i = 0; i<length; i++)
    a[i] = a[i] * a[i] -a[i];
length = 2 * length;
return;
}

```

```

int main()
{
int b[5] = {2, 3, 4, 5, 6};
fun1(b, b[1]);
for (i = 0; i<5; i++)
    printf("%d ", b[i]);
return 0;
}

```

**trace**

<u>i</u>	<u>a[i]</u>	<u>length</u>
0	2	3
1	6	3
2	12	3

**output**

2 6 12 5 6
------------

I)

```
#include <stdio.h>
```

```
int main()
{
    int a=6,b=1,c=3;
    while(a<b<c)
    {
        switch(a<b<c)
        {
            default : ++a;
                    continue;
            case 1 : --a;--c;
            case 0 : ++b;
                    break;
        }
        printf("%d %d %d\n",a,b,c);
    }
    return 0;}

```

```
5 2 2
4 3 1
3 4 0

```

J)

```
#include <stdio.h>
```

```
int main()
{
    int a=0,b=0,c=15;

    do
    {
        printf("res=%d\n",a+b+c);
    }while(++a,b=a+1,c-=a+b);
    return 0;}

```

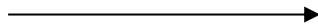
```
res=15
res=15
res=12

```

**Question 2) Give expression equivalent to following:**

a) rewrite using **switch** construction

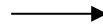
```
if (a=='a') x++;  
else if (a=='b') x--;  
else y++;
```



```
switch(a){  
case 'a':x++;break;  
case 'b':x--;break;  
default : y++;}
```

b) rewrite **without continue**

```
while(1)  
{  
if (scanf("%c",&a) , a == '1' ) continue;  
x++;  
}
```



```
while(1)  
{  
if(scanf("%c",&a) , a != '1') x++;  
}
```

c) rewrite using **for** construction instead of **while**

```
year=1900; sum=0;  
while(year<=4002)  
{  
sum+=year;  
printf("\nYear=%d",year);  
year+=sum;  
}
```



```
for(year=1900,sum=0;year<4002;sum+=year,year+=sum)  
printf("\nYear=%d",year);
```

d) rewrite using ternary **C operator** ?

```
if (x<y) a = x + 1;  
else a = y + 1;
```



```
a=x<y?x+1:y+1;  
or  
x<y? a=x+1:a=y+1;
```

**Question 3)** The following program is supposed to display

```
*****
*   *
*   *
*   *
*****
```

as the output but one statement is missing. Fill the missing statement into **only one** of the spaces given below.

```
#include <stdio.h>
int main()
{
    int i;
    for(i=0;i<5;i++)
    {
        switch(i)
        {
            case 0: _____;
            case 4: printf("*****\n"); break _____;
            default: printf("*   *\n"); _____;
        }
    }
}
```

**Question 4)** Fill in the blanks (denoted by \_\_\_\_ ) in the following program:

```
/* This program computes the arithmetic mean (average) */
/* of those numbers entered upto Ctrl^Z (EOF) is pressed.*/
/* The numbers that are greater than 100 or less than -100 are */
/* ignored and not included in the mean.   */
```

```
#include <stdio.h>
#define THRESHOLD 100
main()
{
    int n;
    float x, sum;
    sum = n = 0;
    while(1)
    {
        if(scanf("%f", &x) == EOF) ____ break _____;
        if(x > THRESHOLD || x < -THRESHOLD) ____ continue _____;
        n++; sum +=
    }
    printf("Arithmetic mean is %6.3f.", sum/n);
}
```

**Question 5)** Write a `main()` using the `dispNumbers()` function to display the output given in the box.

```
#include<stdio.h>
```

```
void dispNumbers(int n)
{
    int i;
    for ( i=n;i>0;i--)
        printf("%d",i);
    printf("\n");
}
```

```
int main()
{
```

```
    int i
    for (i=1;i<4;i++)
        dispNumbers(i);
    for (i=4;i>0;i--)
        dispNumbers(i);
```

```
return 0;}
```

```
1
21
321
4321
321
21
1
```



### Question 6

Write a C program which will **compute and display GPA** value for a student. It is assumed that each student has taken **just 5 courses**. Each course is described by **Course code, Letter grade** and **Course credit**. The input data to the program must be the following information in that order with the data types as indicated:

- Student number (long integer)
  - Name of the student (string)
- For each course;
- Course code (string of 7 characters)
  - Letter grade(one of the characters 'A', 'B', 'C', 'D', 'F')
  - Course Credit (integer)

Grading system shown below will be used for calculating the GPA value:

<i>Letter Grade</i>	<i>Point Count</i>
A	4
B	3
C	2
D	1
F	0

$$GPA = \frac{\sum_{i=1}^5 Credit * Point\ count}{\sum_{i=1}^5 Credit}$$

**Example:** A sample input data entered from the keyboard is as follows:

**970023 MUSTAFA**

**MATH101 B 4**

**PHYS101 C 4**

**CMPE102 A 3**

**MATH163 C 4**

**ELT101 F 3**

Then, the program will display the following output on the monitor:

Student Number = 970023 Name = MUSTAFA GPA = 2.22

Calculation of **GPA** for the given sample input of data is done as follows using the formula above:

$$GPA = (4*3.0 + 4*2.0 + 3*4.0 + 4*2.0 + 3*0.0) / (4 + 4 + 3 + 4 + 3) = 2.22$$

Solution

```
#include <stdio.h>
int main()
{
long studnumber;
char name[15], coursecode[7] , lettergrade;
int credit , i , point;
float totalpoint, totalcredit , gpa;

printf("Enter Student number and Name \n");
scanf("%ld %s",&studnumber , name);
for (i=0;i<5;++i)
{
    printf("Enter %d Course information \n",i+1);
    scanf("%s %c %d",&coursecode, &lettergrade, &credit);
    switch (lettergrade)
    {
        case 'A':point=4;break;
        case 'B':point=3;break;
        case 'C':point=2;break;
        case 'D':point=1;break;
        default : point=0;
    }
    totalpoint+=point*credit;
    totalcredit+=credit;
}
gpa = totalpoint / totalcredit;
printf("Student Number =%ld  Name = %s GPA =
%.2f",studnumber , name , gpa);
return 0;
}
```

**Question 7)** Write a program that:

- a) **Read** two integer arrays of variables **a** and **b** which has 20 and 10 elements in each respectively.
- b) Create a new array **c** by concatenating(combining) them. Put the second array **b** to the tail of the first array **a**.
- c) Find **maximum** and **minimum** elements within the new array **c** and display them with their index numbers(**position**).
- d) Display the elements of the new array **c** in a reverse order.

```
#include<stdio.h>
void main(void)
{
    int a[20] , b[10], int c[30];
    int max, min, maxp, minp;
    int cnt, i;

    printf("Enter the elements of the array a : \n");
    for(i=0;i<20;i++)
        scanf("%d ",a[i]);

    printf("Enter the elements of the array b : \n");
    for(i=0;i<10;i++)
        scanf("%d ",b[i]);

    for(i=0;i<20;i++)
        c[i]=a[i];

    cnt=i;
    for(i=0;i<10;i++)
    { c[cnt]=b[i];
      cnt++;
    }

    max=c[0]; min=c[0]; maxp=0; minp=0;

    for(i=1;i<30;i++)
    { if (max<c[i]){ max=c[i];
        maxp=i+1;}
      if (min>c[i]){ min=c[i];
        minp=i+1;}
    }
    printf("Maximum element in array c is:% and its position is:%d\n", max,maxp);
    printf("Minimum element in array c is:% and its position is:%d\n", min,minp);
    for(i=29;i>=0;i--)
        printf("%d ",c[i]);
}
```

Question 8) Following program reads heights and weights of **n** number of student and finds and display **average** of **height** values and **average** of **weight** values from the monitor.

Write the same program using functions(main and other functions).

**Do not declare global variables.**

```
#include <stdio.h>
#define MAXSIZE 100
int main()
{
    int height[MAXSIZE];
    int weight[MAXSIZE];
    float avrg1,avrg2;
    int t , i , n;

    scanf("%d",&n);

    for(i=0;i<n;i++)
        scanf("%d",&height[i]);

    for(i=0;i<n;i++)
        scanf("%d",&weight[i]);

    t=0;
    for(i=0;i<n;i++)
        t+=height[i];
    avrg1=float(t/n);

    t=0;
    for(i=0;i<n;i++)
        t+=weight[i];
    avrg2=float(t/n);

    printf("Average of Height = %.2f and Average of Weight = %.2f",avrg1,avrg2);

    return 0;
```

## Solution

```
#include <stdio.h>
#define MAXSIZE 100

void getdata(int x[],int m)
{
    int i;
    for(i=0;i<m;i++)
        scanf("%d",&x[i]);
}

float findaverage(int x[],int m)
{
    int i, t=0;
    for(i=0;i<m;i++)
        t+=x[i];
    return float(t/m);
}

int main()
{
    int height[MAXSIZE];
    int weight[MAXSIZE];
    float avrg1 , avrg2;
    int t , i , n;

    scanf("%d",&n);
    getdata(height , n);
    getdata(weight , n);
    avrg1=findaverage(height , n);
    avrg2=findaverage(weight , n);

    printf("Average of Height = %.2f and Average of Weight = %.2f",avrg1,avrg2);

    return 0;
}
```

**Q9)** Write a C program and define the following initialization in a main program and call two functions **findmaxa**, and **findmaxb** with the array arguments **a** and **b** respectively and **find greatest element in matrix a using function findmaxa and find greatest element in array b using function findmaxb** and return its value back to the main program and **list the difference** of these two numbers(greatest values) in the main program.

Initialize following **real** numbers into two dimensional matrix **a (3 x 4)**,

**3.2 , 5.8 , 4.0 , 0.0, 6.4 , 10.5, -8.4 , 6.5 , -14.5 , 5.6 , 0.0, 7.2**

and initialize following **integer** numbers into one dimensional array **b**

**88 , 77 , 12 , 96 , 51 , 78 , 12**

*Solution*

```
#include <stdio.h>

float findmaxa(float x[][4] , int k , int m)
{
    int i,j;
    float max;

    max = x[0][0];
    for(i=0; i<k; i++)
        for(j=1; j<m; j++)
            if (x[i][j]>max) max=x[i][j];
    return max;
}

int findmaxb(int x[],int k)
{
    int i,max;

    max = x[0];
    for(i=0; i<k; i++)
        if (x[i]>max) max=x[i];
    return max;
}

int main()
{
    float a[3][4]={3.2,5.8,4.0,0.0,6.4,10.5,-8.4,6.5,-14.5,5.6,0.0,7.2};
    int b[7]={88,77,12,96,51,78,12};
    float m;
    int n;

    m=findmaxa(a,3,4);
    n=findmaxb(b,7);

    printf("Diffrence= %.1f", (float)m-n);
    return 0;
}
```

**Q1) (12 pts)** Find the output of each of the following C code segments. In each case write your final answer in the corresponding boxes on the right:

a) `int x=2, j=8, n=5, m=3;  
m = 3 * (n = 3);  
m *= n--;  
j = m + n;  
printf("m=%d n=%d j=%d\n", m, n, j);`

m = 27 n = 2 j = 29

b) `int x1=1, x2=2, x3=3;  
x1 /= x2 = x3 = x1 * x2 + x3;  
printf("x1=%d", x1);`

x1 = 0

c) `int x1, x2, x3;  
x1 = x2 = x3 = 3;  
x1 %= (x2+x3);  
printf("x1=%d", x1);`

x1 = 3

d) `int x1=1, x2=2, x3=3;  
x1 = x3 != x2 < x3 * x2;  
printf("x1=%d", x1);`

x1 = 1

e) `int x1=1, x2=2, x3=3, x4;  
x4 = --x1 || --x2 && x3++;  
printf("x4=%d", x4);`

x4 = 1

f) `int x1=0, x2=1, x3=2, x4;  
x4 = x1++ ? x2-- : x3--;  
printf("x4=%d", x4);`

x4 = 2

**Q2) (12 pts)** Rewrite the following C program fragment using only **if - else** statements in place of the **switch** statement:

```
switch(ch)
{
    case 'p': x+=2; y += 3;
    case 'q': x *= 4; y*=5; break;
    default : x++; y++; break;
}
```

```
if (ch == 'p')
    { x+=2; y += 3;
      x *= 4; y*=5; }
else if (ch == 'q')
    { x *= 4; y*=5; }
else
    { x++; y++; }
```

Q10) Give the outputs for each of the following C program fragments in the corresponding boxes on the right:

a)

```
int x = -3, y = 0, k, j;
```

x = -1 y = 4 k = -3 j = 0

```
for(k = j = -3; x += k < j, ++j; y += 2); /*semicolon here!*/  
printf("x = %d y = %d k = %d j = %d\n", x, y, k, j);
```

---

b)

```
int x = 0, z = -7;  
do  
{  
    z++;  
    if(x)  
    {  
        printf("How \n");  
        if(z == x) break;  
        printf("Are you \n");  
    }  
    x -= 2;  
    printf("Today ? \n");  
}while(z < -3);
```

Today ?  
How  
Are you  
Today ?  
How

c)

```
int x = 0, j, k;
```

j = 7 k = 3 x = 12

```
for(j = 1; j < 6; j += 2)  
    for(k = 1; k < 3; k++) x += j/k; /*semicolon here!*/  
printf("j = %d k = %d x = %d\n", j, k, x);
```

---

d)

```
int x = 0, z = -7;  
do  
{  
    z++;  
    if(x)  
    {  
        printf("How \n");  
        if(z+3 == x) continue;  
        printf("Are you \n");  
    }  
}
```

Today ?  
How  
How  
Are you  
Today ?



```

    x -= 2;
    printf("Today ? \n");
}while(z < -4);

```

e)

```

int x = 2, y = 1, k;
while(x <= 5)
{
    x += 3/x;
    for(k=0; k<4; k++)
    {
        y++;
        if(y%2 == 0) continue;
        else break;
        y = 3;
    }
    x++;
}
printf("x = %d y = %d\n", x, y);

```

<pre> x = 6   y = 7 </pre>
----------------------------

f)

```

int x = 0, y = -4, k;

for(k=0; k<3; k++)
{
    while(x++ && (y += 2))
    {
        printf("Hello\n");
        if(x) break;
    }
    printf("x = %d y = %d\n", x, y);
}

```

<pre> x = 1   y = -4 Hello x = 2   y = -2 x = 3   y = 0 </pre>
--

g)

```

int x = 8, y = 2;
while(x%2 ? ++x : (x -= 5, --y))
    printf("x = %d y = %d\n", x, y);
printf("x = %d y = %d\n", x, y);

```

<pre> x = 3   y = 1 x = 4   y = 1 x = -1  y = 0 </pre>
--