

Practice Sheet #03

Topic: C-Programming Constructs

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1. Consider the following C function.

```
float f(float x, int y)
{
    float p, s; int i;
    for (s=1, p=1, i=1; i < y; i++)
    {
        p*= x/i;
        s+=p;
    }
    return s;
}
```

For large values of y, the return value of the function f best approximates

- (a) x^y
 - (b) e^x
 - (c) $\ln(1 + x)$
 - (d) x^x
2. Consider the following program fragment for reversing the digits in a given integer to obtain a new integer. Let $n = D_1D_2\dots D_m$

```
int n, rev;
rev = 0;
while (n > 0)
{
    rev = rev*10 + n%10;
    n = n/10;
}
```

The loop invariant condition at the end of the i th iteration is:

- (a) $n = D_1D_2\dots D_{m-i}$ and $rev = D_mD_{m-1}\dots D_{m-i+1}$
- (b) $n = D_{m-i+1}\dots D_{m-1}D_m$ and $rev = D_{m-1}\dots D_2D_1$
- (c) $n \neq rev$
- (d) $n = D_1D_2\dots D_m$ and $rev = D_mD_{m-1}\dots D_2D_1$

3. Consider the following C program

```
main()
{
    int x, y, m, n;
    scanf ("%d %d", &x, &y);
    /* Assume  $x > 0$  and  $y > 0$  */
    m = x;
    n = y;
    while (m != n)
    {
        if (m > n)
            m = m - n;
        else
```

```

        n = n - m;
    }
    printf ("%d", n);
}

```

The program computes:

- (a) $x \div y$ using repeated subtraction
- (b) $x \bmod y$ using repeated subtraction
- (c) the greatest common divisor of x and y
- (d) the least common multiple of x and y

4. What does the following algorithm approximate?

```

x = m;
y = 1;
while (x - y > e)
{
    x = (x + y)/2;
    y = m/m;
}
print(x);

```

(Assume $m > 1$, $e > 0$).

- (a) $\log m$
- (b) m^2
- (c) $m^{1/2}$
- (d) $m^{1/3}$

5. Consider the following C-program:

```

void foo(int n, int sum)
{
    int k = 0, j = 0;
    if (n == 0) return;
    k = n % 10;
    j = n / 10;
    sum = sum + k;
    foo (j, sum);
    printf ("%d", k);
}

int main ()
{
    int a = 2048, sum = 0;
    foo (a, sum);
    printf ("%d\n", sum);

    getchar();
}

```

What does the above program print?

- (a) 8, 4, 0, 2, 14
- (b) 8, 4, 0, 2, 0
- (c) 2, 0, 4, 8, 14
- (d) 2, 0, 4, 8, 0

6. Consider line number 3 of the following C- program.

```

int main () {          /* Line 1 */
    int I, N;          /* Line 2 */
    fro (I = 0, I < N, I++); /* Line 3 */
}

```

Identify the compiler's response about this line while creating the object-module

- (a) No compilation error
- (b) Only a lexical error
- (c) Only syntactic errors
- (d) Both lexical and syntactic errors

7. Consider the following code fragment:

```

if (fork() == 0)
{ a = a + 5; printf("%d,%d\n", a, &a); }
else { a = a -5; printf("%d, %d\n", a, &a); }

```

Let u, v be the values printed by the parent process, and x, y be the values printed by the child process. Which one of the following is TRUE?

- (a) $u = x + 10$ and $v = y$
- (b) $u = x + 10$ and $v \neq y$
- (c) $u + 10 = x$ and $v = y$
- (b) $u + 10 = x$ and $v \neq y$

8. Consider the following C code segment.

```

for (i = 0, i < n; i++)
{
    for (j=0; j < n; j++)
    {
        if (i%2)
        {
            x += (4*j + 5*i);
            y += (7 + 4*j);
        }
    }
}

```

Which one of the following is false?

- (a) The code contains loop invariant computation
- (b) There is scope of common sub-expression elimination in this code
- (c) There is scope of strength reduction in this code
- (d) There is scope of dead code elimination in this code

9. What will be the output of the following C program segment?

```

char inchar = 'A';
switch (inchar)
{
case 'A' :
    printf ("choice A \n") ;
case 'B' :
    printf ("choice B ") ;
case 'C' :
case 'D' :
case 'E' :
default:
    printf ("No Choice") ;
}

```

- (a) No choice
- (b) Choice A
- (c) Choice B
- (d) Program gives no output as it is erroneous

10. Consider the following C program:

```
#include <stdio.h>
int main()
{
    int i, j, k = 0;
    j = 2 * 3 / 4 + 2.0 / 5 + 8 / 5;
    k -= --j;
    for (i = 0; i < 5; i++)
    {
        switch(i + k)
        {
            case 1:
            case 2: printf("\n%d", i + k);
            case 3: printf("\n%d", i + k);
            default: printf("\n%d", i + k);
        }
    }
    return 0;
}
```

The number of times printf statement is executed is _____.

- (a) 8
 - (b) 9
 - (c) 10
 - (d) 11
11. Determine what the following program prints. (10)
- ```
#include <stdio.h>
main ()
int r, t, m;
scanf("%d", &r); /* Enter the last four digits of your roll number as r */
printf("r = %d\n", r);
m = 0;
while (r > 0){
t = r % 10;
if (t > m) m = t;
r = r / 10;
printf("m = %d\n", m);
}
```
12. How many times is the body of the following loop executed?
- ```
int i;
for (i=0; i<100; i=i+3) printf("i = %d\n", i);
```
- (a) 100
 - (b) 97
 - (c) 34
 - (d) 33

13. Answer the following questions:

a. What does the following function return in terms of the argument n?

```
unsigned int f ( unsigned int n )  
f unsigned int s = 0, t = 0;  
while (n > 0) f s = s + n;  
t = t + n * n * n;  
n = n - 1;  
return (t - s * s);
```

- (a) 0
- (b) 1
- (c) $n^3 - n^2$
- (d) $\frac{1}{12}n(n^2 - 1)(3n + 2)$

b. Consider the following program:

```
#include <stdio.h>  
main ()  
int m, n;  
printf("Supply two integers: ");  
scanf("%d%d",&m,&n);  
m = m - n;  
n = m + n;  
m = n - m;  
printf("%d %d\n", m,n);
```

Describe, in terms of the scanned integers m and n, what integer values are printed at the end of the above program.

14. The following program computes the sum of the digits in the decimal representation of a non-negative integer. For example, the sum of the digits of 320127 is $3 + 2 + 0 + 1 + 2 + 7 = 15$. Fill in the blanks with appropriate C constructs.

```
#include <stdio.h>  
int main ()  
{  
unsigned int n, d, sum;  
/* Read the unsigned integer n*/  
scanf("%u", );  
/* Initialize sum to zero */  
/* Loop as long as n is not reduced to zero*/  
while ( ) {  
/* Store in d the least significant digit of n*/  
d = ;  
/* Add this least significant digit to sum*/  
sum = ;  
/* Remove this digit from n */  
n = ;  
}  
/* Print the sum of digits of the input integer*/  
printf("The sum of digits is \n", );  
}
```

15. Let i, j be integer variables. What is the value printed after the following loop?

```

for (i=j=0; i<10; ++i) {
j = i + j;
++i;
}
printf("%d\n", j);

```

(a) 20
(b) 25
(c) 30
(d) 45

16. Let i, j, s be integer variables. What is the value of s printed after the following outer loop?

```

s = i = 0;
while (i < 10) {
j = 0;
while (j < 5) {
if (i != j) ++s;
++j;
}
++i;
}
printf("%d\n", s);

```

(a) 15
(b) 40
(c) 45
(d) 50

17. Consider the following program:

```

#include <stdio.h>
int main ()
{
int a,b,c,d;
int r,s,t;
scanf("%d%d%d%d", &a, &b, &c, &d);
if (a > b) r = a; else r = b;
if (c > d) s = c; else s = d;
if (r > s) t = r; else t = s;
printf("%d\n", t);
}

```

Suppose that the user inputs the values 5, 3, 5, 9 for a, b, c and d respectively. What value for t does the program print?

Describe in an English sentence the value, in terms of the input integers a, b, c and d, printed by the above program.

18. How many times is the statement $i *= i+1$; (1×10) in the following for loop executed?
for (i=1; i<100; ++i) $i *= i+1$;
How many times is the loop condition $i < 100$ checked in the loop?
What is the value stored in the variable I immediately after the loop terminates?
19. The printf() function returns the number of characters it prints on stdout (screen). What value will be stored in count after the execution of the following code?
int count, n = 100;

```
count = printf("\nn:%d\n",n);
```

20. What will be the contents of the variables a and b after the execution of the following code on the input I do not know ?

```
char a, b;  
scanf("%c do not %c", &a, &b);
```

21. Write an iterative function that reads positive integers a_0, a_1, \dots, a_{n-1} (not necessarily in that order). The function computes and prints the value of $ha_0, a_1, \dots, a_{n-1}$ as a rational number in the form p/q and also its floating-point value. The number of terms, that is, n is supplied to the function as an argument. Make clear in your code in which order you are reading and processing a_0, a_1, \dots, a_{n-1} . There is no need to use an array.

```
void cfracitr ( int n )  
{  
int num, den; /* Numerator and denominator */  
/* Declare other int variables, if necessary */
```

```
printf("Value = %d/%d = %lf\n", num, den, (double)num / (double)den);  
}
```

22. Let a_1, a_2, \dots, a_n be a sequence of positive integers. An increasing subsequence of length l is a contiguous block $a_i, a_{i+1}, \dots, a_{i+l-1}$ satisfying $a_i \leq a_{i+1} \leq \dots \leq a_{i+l-1}$. Write a C program to read a sequence of positive integers and to print the length of the longest increasing subsequence in it. In order to terminate the sequence, the user should enter zero or a negative value. Your program must contain *only one loop*. Both scanning the next integer and processing the scanned integer should be done in that loop. Write no functions other than `main()`. Do not use any array.

Here is a sample run of your program.

```
Enter an integer: 9  
Enter an integer: 2  
Enter an integer: 6  
Enter an integer: 8  
Enter an integer: 5  
Enter an integer: 7  
Enter an integer: -1  
Length of the longest increasing subsequence = 3
```

23. Write the output of the following program in the box below:

```
int main() {  
char x = 'w';  
switch(x)  
{  
case 'a': printf("Append");  
break;
```

```

case 'w': printf("Write");
case 'r': printf("Read");
break;
default : printf("Open");
break;
}
return 0;

```

24. The following program should print the sum of the series $1 + x^2/2! + x^4/4! + \dots + x^{2N}/2N!$. Fill in the blanks in the program.

```

int main() {
int i, N ;
float x, S, term;
S = _____ ;
term = _____ ;
printf ( "Enter N and x" ) ;
scanf( "%d %f", &N, &x);
for ( i = 1 ; i <= N+1 ; i++ ) {
S = S + term;
term = _____ ;
S = S + term;
}
printf ( "The sum of the series is %f", S ) ;
}

```

25. The following program prints the most significant digit of an integer n . Fill in the blanks with only one statement per blank space.

```

int main() {
int n;
printf ( "Enter n" ) ;
scanf ( "%d", &n ) ;
while ( _____ ) {
_____
}
printf ( " The most significant digit is %d", n ) ;
return 0;
}

```

26. Write a C program which reads a sequence of positive integers till the user types -1 . It counts the lengths of the non-decreasing sub sequences, and prints the maximum among them. For example, for input $\{6, 7, 2, 29, 17, 5, 5, 11, 6, 7, 8, -1\}$ the non-decreasing sub sequences are: $\{6, 7\}$, $\{2, 29\}$, $\{17\}$, $\{5, 5, 11\}$ and $\{6, 7, 8\}$. Thus the answer should be 3. Assume that the first integer read is not -1 and a single integer is a sequence of length 1.

27. How many '*'s are printed by the following code segment ?

```

for (i=0; i< 10; i++)
for (j=i; j>0; j--)
printf( "*" ) ;

```

28. Fill in the blanks (for appropriate actions mentioned in brackets):


```

/* Include a header file for I/O operation. (1) */
main()
{
float x,y;
int z;
printf("Read x and y \n");
scanf("_____", __, __); /* Read x and y in appropriate format. (1)*/
z= _____(int)____(x+y); /* Type-cast. (1) */
if (z _____ 0) /* Check equality with zero. (1) */
printf("x=____, y=____\n",____, ____); /* Print values of x, and y. (1) */

```

29. Write a C-program to print the first ten multiples of 5 using a while loop.
[Sample Output : 5 10 15 20 25 30 35 40 45 50]

Ans.

```

#include<stdio.h>
main(){
int i=5;
while(i<=50){
    printf("%d\t",i);
    i=i+5;}
printf("\n");}

```

30. Consider the following code:

```

int main(){
int a = 0, b = 100;
if (a)
if (b) printf("abc\n");
else printf("bcd\n");
}

```

- a. What will be the output generated by the above code? Also explain your reasoning in one sentence.
b. What will be the output generated by the above code when a = -100 and b = 100? Also explain your reasoning in one sentence.

31. Consider the following C-code which intends to compute simple interest on an amount of Rs. 2000/- for a period of four years at simple interest rate of 10.5% per annum.

```

# include <stdio.h>
int main (){
int amount = 2000;
int time = 4 ;
float rate = 10.5;
float simInt;
simInt = time/100 * amount * rate;
printf("Interest on Rs %d at %f per annum for %d y = %d\n",
amount, rate, time, simInt);
return 0;
}

```

- a. What will be the output given generated by the above code? Write the reason(s) in one sentence.

- b. Modify the above code so that you get the correct output. Explain your answer in one sentence.
32. In the following code snippet , replace the while loop by a for loop. Your program should produce identical output after you replace the statements commented "Replace With a for loop".
- ```
int i;
int j=5;
int sum=0;
while(sum<10000){ /* Replace */
sum=sum+i*j; /* With a */
i++; /* for */
} /* loop */
printf("%d %d \n",sum,i,j);
```
33. What would be the output of the following program? In one sentence justify your answer.
- ```
main(){
printf("Expression values = %d %d\n", 5/2*2, 2+5/2*3-1);
}
```
34. What will be printed when the following program is executed with 75 and 35 as the keyboard inputs? What does the program compute?
- ```
#include <stdio.h>
main(){
 int x, int y ;
 printf("Enter two numbers: ");
 scanf("%d%d", &x, &y);
 while(x!=y){
 if(x>y) x-=y;
 else y-=x;
 printf("x=%d y=%d\n",x,y);
 }
printf("%d\n",x);
```
35. How many times will the print statement be executed?
- ```
for(i=0;i<=99;i++)
for(j=i;j<100;j++)
printf("Class Test 1\n");
```
36. How many times will the following while loop execute? Explain your answer.
- ```
char a='a';
while(a > 'a' && a <= 'z') a++;
```
37. What is the value of x after the execution of the following program segment? Explain your answer.
- ```
x=-5; y=10;
if(x>y)x=1;
else if(y<0) x=(x) * (-1);
else x=2*x;
```
38. What will be printed by the following code segment? Explain your answer.

```
int i=0, j=45, x;
x= i++ + ++j;
printf("x=%d, i=%d j=%d \n",x,i,j);
```

39. What will be printed by the following code segment? Explain your answer.

```
char c='r';
switch(c)
{
case 'b': printf("Blue \n");
case 'r': printf("Red \n");
case 'g': printf("Green \n");
break;
case 'y': printf("Yellow \n");
default:
printf("Other \n");
}
```

40. What will be printed by the following code segment? Explain your answer.

```
int i=1;
if (i=0)
printf("False \n");
else
printf("True \n");
```

41. Write a function named cosine which shall take a floating point variable x and evaluate the cosine series to the 5th decimal point of accuracy and returns the value as a double data type. Your program should compute each successive term based on the previously computed terms:

42. Write a main program which reads three values for a triangle, namely lengths of its two sides (say, a and b), and the angle in radian formed by them (say, z). Using the above function and the formula given below, print the length of the other side (say c) : $c = \sqrt{a^2 + b^2 + 2 \cdot a \cdot b \cdot \cos(z)}$

43. Write a C-function named parking_fee that takes the following two parameters – (i) Type of the vehicle, ('M' or 'm' for motorbike, 'C' or 'c' for car, and 'B' or 'b' for Bus), and (ii) Number of hours that a vehicle spent in the parking lot. The function should return the parking charge based on the following parking rates – Rs. 5, Rs. 10 and Rs. 50 per hour respectively for motorbike, car and bus.

44. What is the value of s after the termination of the following loop?

```
int n = 100, s;
for (s = 2; n > 2; - -n) {
s += 2; n -= 2;
}
```

45. What values does the following code print?

```
int k; int num = 30;
k = num > 5 ? (num <= 10 ? 100:200):500;
printf ( "k = %d\n", k );
```

46. What is the output of the following code?
- ```
do {
while (0) printf ("0\n");
printf ("1\n");
} while (0);
```
47. Given below is a program to find the second largest of **TOTAL** (   2) integers. You are required to fill up the parts of the code that are left blank so that the overall code has the required functionality.
- ```
#include <stdio.h>
#define TOTAL 1000
int main () {
int i, num, max1 /* largest */, max2 /* second largest */;
scanf ("%d%d", &max1, &max2); // read first two numbers
if (max2 > max1) { // interchange these (in three steps)
_____
_____
_____
}
for (i = 3 ; i <= TOTAL; i++) {
scanf ("%d", &num); // read next number
// make necessary updates to max1 and max2
_____
_____
if (num > max1) {
} else if (num > max2 && num < max1)
_____
} // end-for
printf ("Second largest integer: %d\n", max2);
return 0;
}
```
48. Divisibility of a number by 9 is defined recursively as follows: 0 and 9 are divisible by 9, any other number is divisible by 9 if and only if the sum of its digits is divisible by 9. Write a code to test whether the given number is divisible by 9.
49. Let **n**, **i** and **sum** be **int** variables. The user enters a positive value of **n**. Which of the following program segments prints the largest value of **sum**?
- sum = 0; i = 1; while (++i < n) sum += i; printf("%d", sum);
 - sum = 0; i = 1; while (i++ < n) sum += i; printf("%d", sum);
 - for (sum = 0, i = 1; i < n; i++) sum += i; printf("%d", sum);
 - for (sum = 0, i = 1; i <= n; ++i) sum += i; printf("%d", sum);
50. What is printed by the following program?
- ```
main ()
{
int x = 0, y = 10, z = 20;
while (1) {
x++;
```

```

if (y > z) break;
y += 4*x; z += 2*x;
}
printf("x = %d, y = %d, z = %d", x, y, z);
}

```

51. What is printed by the following program?

```

main() {
int x = 1, y = 0, z = 1, t;
for (t = 0; t < 10; ++t) {
y += (x) ? z : -z;
z++; x = !x;
}
printf("y = %d", y);
}

```

52. What is printed by the following program?

```

main ()
{
int x = 0;
if (x = 0) printf("Case (a): %d", x);
else if (x -= 7) printf("Case (b): %d", x);
else printf("Case (c): %d", x);
}

```

53. A positive integer is called square-free if it is not divisible by the square of any prime number. For example,  $98 = 2 \times 7^2$ ,  $99 = 3^2 \times 11$ ,  $100 = 2^2 \times 5^2$  are *not* square-free, whereas 101 (a prime) and  $102 = 2 \times 3 \times 17$  are square-free. Your task is to find the divisor  $m$  of a positive integer  $n$  supplied by the user, such that  $m$  is square-free and as large as possible. Indeed,  $m$  is the product of all the distinct prime factors of  $n$ , each taken only once. For example, for  $n = 98, 99, 100, 101, 102$ , the values of  $m$  will be  $14 = 2 \times 7, 33 = 3 \times 11, 10 = 2 \times 5, 101, 102 = 2 \times 3 \times 17$ , respectively. Complete the following program to solve this problem.

```

main ()
{
int n, m, d;
scanf("%d", &n); /* Assume that a positive integer is entered as n */
d = 2; m = 1; /* Initialize d (potential divisors of n) and m (the output) */
while () { /* Supply a condition on n */
if () { /* if n is divisible by d */
/* If the above condition is true, then d is prime (see the note below) */
m = ; /* Record this prime factor of n in m */
/* Write a loop to remove all factors of the prime d from n */
}
d++; /* Check the next potential divisor in the next iteration */
}
printf("The desired square-free divisor is %d\n", m);
}

```

54. In this exercise, your task is to evaluate a polynomial  $a_0 + a_1x + a_2x^2 + \dots + a_dx^d$  with floating-point coefficients  $a_i$  at a floating-point value of  $x$ . The user supplies the

degree  $d$ , the value of  $x$ , and then the coefficients  $a_0, a_1, \dots, a_d$ . In the following program, the variable **sum** accumulates the desired output value, and the variable **xpower** stores the value of  $x^i$  in the  $i$ -th iteration. Complete the program.

```
main ()
{
int i, d;
float x, a, sum, xpower;
scanf(); /* Read both d and x from the user */
xpower = ; sum = ; /* Initialize */
/* Loop for reading the coefficients and updating sum and xpower */
for (; ;) {
scanf(); /* Read ai to a */
/* Update sum */
/* Update xpower for next iteration */
}
printf("The polynomial evaluates to %f\n", sum);
}
```

55. What is the output of the following program?

```
main()
{
int s = 0;
while (s++ < 10) {
if ((s < 4) && (s < 9)) continue;
printf("%d,", s);
}
}
```

56. You write a program which runs a loop for the user to enter a sequence of zeros and ones. Entering an integer other than 0;1 terminates the loop. Your task is to count how many times the user enters the sequence 1010. For example, if the user enters 1;0;0;1;0;1;0;1;0;0;1;0;1;0;1;1; 2, then the sequence 1010 occurs thrice:

1 0 0 1 0 1 0 1 0 0 1 0 1 0 1 1

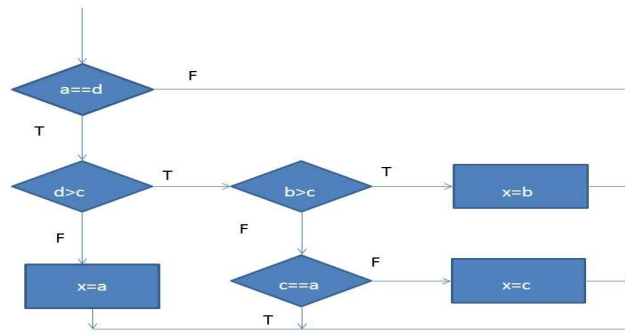
In order to solve this problem, you maintain a progress indicator *preflen* to remember the length of the longest prefix of 1010, that you have read in the last *preflen* iterations (including the current one). For example, at the beginning of the loop, or after reading two consecutive zeros, *preflen* is zero (indicating that we cannot be somewhere inside a match of 1010 at this point of time). On the other hand, if you read two consecutive ones, *preflen* should be one, because if the user enters 0;1;0 in the next three iterations, then you locate one occurrence of the pattern 1010. For the user input in the example above, *preflen* changes as follows. The *preflen* value after processing each scanned integer is shown below.

Input 1 0 0 1 0 1 0 1 0 0 1 0 1 0 1 1

*preflen* 1 2 0 1 2 3 2 3 2 0 1 2 3 2 3 1

Here, *preflen* starts with the value 0 before any user input. After the first input (1), match occurs with the first symbol of 1010, so *preflen* becomes 1. After the second input (0), the length of the matched prefix increases to two. The third input (0) destroys the partial match, so *preflen* reduces to zero.

57. Which of the following *nested if* statements are logically equivalent to the flow chart below?



- (a) if(a==b)if(d>c) if(b>c)x=b; else if (c==a);else x=c; else x=a;
- (b) if(a==b)if(d>c) if(b>c)x=b; else if (c==a) x=c; else x=a;
- (c) if(a==b)if(d>c) if(b>c)x=b; else if (c!=a) x=c; else x=a;
- (d) if(a==b)if(d>c) if(b>c)x=b; else if (c!=a) x=c; else; else x=a
- (e) None of the above.

58. How many times will the following program segment print **chocolate** ?

```

int x = 3; int y = 10;
while (x < y)
{
printf("chocolate");
x = x + 1;
y = y - 1;
}

```

59. Fill in the empty boxes in order to have this program segment to print **cartoon**

```

int one = ?
int two = ?
int three = ?
int i;
do
{
one++;
printf("cart");
} while (one < 3);
for (i = 0; i < two; i++)
{
printf("o");
}
while (1)
{
three++;
if (three == 5)
{
break;
}
printf("n");
}

```

60. What will be printed run the following program segment?
- ```

int j, i=1;
for(j=0;j<5;j=j+2)
{
i=(i*i)+j;
}
switch (i)
{
case 3:
printf("zero");
break;
case 13:
printf("one");
case 175:
printf("two");
default:
printf("default");
}

```
61. How many times biscuit will be printed by the following program segment?
- ```

int value = 5; int value2 = 1;
while (value2 < 4)
{
for (; value >= value2 ; value--)
{
printf("biscuit");
}
value2++;
}

```
62. Which of the following is true for the program below?
- ```

#include <stdio.h>
void main ()
{
int num1 = 5, num2 = 10;
if(num1 < num2)
{
printf("num1 less num2");
}
else
printf("num1 not less num2");
}
}

```
- (a) Will compile and output "num1 less num2"
(b) Will compile and output "num1 not less num2"
(c) Will not compile successfully
(d) None of the above
63. Elnino Pizza has found out that IIT Kgp students have finished their mid semester examination. They have announced a special discount of 10% on purchases priced strictly greater than Rs. 500. Purchases having price less than or equal to Rs. 500 have no discount. Assume that a float variable 'pizza_price' stores the price of the pizza. Which of the following statements will correctly calculate the price after discount?

- (a) `pizza_price -= (pizza_price > 500 ? pizza_price * 1.1 : pizza_price);`
 (b) `pizza_price -= (pizza_price > 500 ? pizza_price * 0.1 : pizza_price);`
 (c) `pizza_price -= (pizza_price > 500 ? pizza_price * 0.9 : pizza_price);`
 (d) `pizza_price -= (pizza_price > 500 ? pizza_price * 0.1 : 0);`
 (e) None of the above
64. A student has written the program shown below for doing some mysterious computation. Suppose we compile and run this program. Which of the following is true for the number of "!"s printed by the program?
- ```
#include<stdio.h>
void main(){
int m, n, temp;
printf("Give integers m and n: ");
scanf("%d%d",&m, &n);
do {
if (m < n) n = n - m;
if (n < m) {temp = m; m = n; n = temp;}
if (m > n) printf("!");
} while (m < n);
}
```
- (a) For some values of 'm' and 'n', exactly one "!" is printed.  
 (b) For all values of 'm' and 'n', no "!" is printed.  
 (c) For all values of 'm' and 'n', the number of "!"s printed is either 1 or a positive even number.  
 (d) For all values of 'm' and 'n', the number of "!"s printed is a positive odd number.  
 (e) None of the above
65. Write the output of the following code segments
- ```
int X= 2, Y = 5;
(X > Y) ? printf("%d", Y) : printf("%d", X);
```
66. Given, $a = 20$, $b = 15$, $c = 10$, and $x = 1$, $z = 2$, before the following nested-if statement is executed. What are the values of x and z after the nested-if statement is executed.
- ```
if (a < b) x=a; else if (b > c) if (c > a) z=a; else z=b; else x=b;
```
67. Consider the program segment:
- ```
int sum = 0;
int i = 0;
while (i < 5)
{
sum = sum + i;
i++;
}
printf("%d\n",sum);
```
- Suppose we replace the while loop in the segment above with a for loop. Which of the following for loops will result in the same value of sum printing out?
- (a) `for (int i = 0; i <= 5; i++)`
`sum = sum + i;`
 (b) `for (int i = 1; i <= 5; i++)`
`sum = sum + i;`
 (c) `for (int i = 1; i < 5; i++)`

```

    sum = sum + i;
(d) for (int i = 2; i < 5; i++)
    sum = sum + i;
(e) for (int i = 1; i < 6; i++)
    sum = sum + i;

```

68. What is the output of the program segment:

```

int x=0;
for(int i=0; i<3; i++) {
for( int j=i; j<3; j++) {
x = x + j;
}
}
printf("%d",x);

```

69. What is the output of the following program segment:

```

int num = 1, x = 10;
do
{
x += 10;
num ++;
}
while (num == 2);
printf("Num = %d, x = %d", num, x);

```

70. Rewrite the following statement using a switch statement.

```

if( letter == 'X' )
sum = 0;
else if ( letter == 'Z' )
valid_flag = 1;
else if( letter == 'A' )
sum = 1;
else
printf("Unknown letter -->%c\n", letter );

```

Problems for Programming Practice

(After the successful studies of **Lecture 03 (C Programming Constructs)** the students are supposed to solve the following problems in C programming language.)

- Read the symbol of a binary arithmetic operator (such as +, -, *, /) and its two operands from the keyboard and perform the operation on those two operands depending upon the operator entered by the user. Print the result accordingly.
- Write a C program to do the following.
 - Read the mark (maximum 100) obtained by a student in a subject.
 - Convert the mark entered to an appropriate grade as per the following scheme.
 - Grade = X if *mark* is greater than or equal to 90
 - Grade = A if mark is between 80 to 89

- iii) Grade = B if mark is between 70 to 79
- iv) Grade = C if mark is between 60 to 69
- v) Grade = D if mark is between 50 to 59
- vi) Grade = P if mark is between 35 to 49.
- vii) Else the grade is F.

- Print the grade.

3. A point in a plane can be represented by its X and Y coordinates. Write C programs to do the following.
 - i) Read the coordinates of a pair of points and find the distance between these two points and print the result.
 - ii) Read the coordinates of three points and then check whether they can constitute a triangle. If so, find the area and perimeter of the triangle and check whether it is a scalene, isosceles or an equilateral triangle.
4. Read a sequence of integer numbers (terminated by 0) and find the maximum, minimum and average value of the numbers (excluding 0) that have been entered.
5. Read a sequence of characters (terminated by new line character '\n') and count the number of vowels entered.
6. A number is called a perfect number, if the number is equal to the sum of all its positive divisors except the number itself. For example, (6 = 1 + 2 + 3, 28 = 1 + 2 + 4 + 7 + 14). Find and print all the perfect numbers less than or equal to 1000.
7. Read an integer number and convert it to its hexadecimal equivalent representation.
8. Write a program that reads three integers representing time of a day. The integers are SS, MM, HH, representing seconds, minutes and hours. Write a program to print "valid time" if the integers represent a valid time of the day.
9. Write a program to read three integers and print the largest among them.
10. Write a program to compute and print the taxi fare based on the following chart. Total number of Kilometers traveled will be input by the user as a floating point number.

First 12 KM: Rs. 100/-
 Next 4 KM: Rs. 8 / KM
 Next 4 KM: Rs 6 / KM
 Above 20 KM: Rs 5 / KM

11. Read n integers and print the third largest among them. n is input by user. Don't use any array.
12. Read any 4 digit number and print the sum of its digits.
13. Find the sum of the first n terms of the following series.

$$1 + x + x^2/2! + x^3/3! + \dots$$

[Hint: Value of x and n is input by user. Do not use the factorial or power functions available in math.h]

14. A number is called a perfect number, if the number is equal to the sum of all its positive divisors except the number itself. For example, $6 = 1 + 2 + 3$, $28 = 1 + 2 + 4 + 7 + 14$ are the two perfect numbers. Find and print all the perfect numbers less than or equal to 1000.
15. Read a sequence of integer numbers (terminated by 0) and find the maximum, minimum and average value of the numbers (excluding 0) that have been entered.

--*--