

PPS Assignment-2

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- (a) Write a program to print all prime numbers from 1 to 300.
(Hint: Use nested loops, **break** and **continue**)

Program:

```
C primumbers.c > main()
1  #include<stdio.h>
2  int main()
3  {
4      printf("Name: Parijat Kumar\nRoll No.: 20001016037\n*****\n");
5      printf("Printing all prime numbers between 1 and 300\n");
6      int num, i, prime;
7      for(num=1;num<=300;num++)
8      {
9          prime=0;
10
11          for(i=2;i<=num/2;i++)
12          {
13              if(num%i==0)
14              {
15                  prime=1;
16                  break;
17              }
18          }
19
20          if(prime==0 & num!=1)
21              printf(" %d ", num);
22      }
23      return 0;|
24  }
```

Output:

```
Name: Parijat Kumar
Roll No.: 20001016037
*****
Printing all prime numbers between 1 and 300
2 3 5 7 11 13 17 19 23 29 31 37 41 43 47 53 59 61 67 71 73 79 83 89 97 101 103 107 109 113 127 131 137 139 149 151 157
163 167 173 179 181 191 193 197 199 211 223 227 229 233 239 241 251 257 263 269 271 277 281 283 293
```

- (b) Write a program to fill the entire screen with a smiling face. The smiling face has an ASCII value 1.

Program:

Output:

```
Name: Parijat Kumar
Roll No.: 20001016037
*****
```

- (c) Write a program to add first seven terms of the following series using a **for** loop:

$$\frac{1}{1!} + \frac{2}{2!} + \frac{3}{3!} + \dots$$

Program:

```
C sumofseries.c > main()
1  #include<stdio.h>
2  int main()
3  {
4      float f=1,t,s=0;
5      printf("Name: Parijat Kumar\nRoll No.: 20001016037\n*****\n");
6      for (int i = 1; i < 8; i++)
7      {
8          f=f*i;
9          t=i/f;
10         s+=t;
11     }
12     printf("The sum of first seven terms in the series is %f",s);
13     return 0;
14 }
```

Output:

```
Name: Parijat Kumar
Roll No.: 20001016037
*****
The sum of first seven terms in the series is 2.718056
```

- (d) Write a program to generate all combinations of 1, 2 and 3 using **for** loop.

Program:

```
C combinations.c > main()
1  #include<stdio.h>
2  int main()
3  {
4      printf("Name: Parijat Kumar\nRoll No.: 20001016037\n*****\n");
5      for (int i = 1; i <= 3; i++)
6      {
7          for (int j = 1; j <= 3; j++)
8          {
9              for (int k = 1; k <=3; k++)
10             {
11                 if (i!=j && j!=k && k!=i)
12                 {
13                     printf("%d %d %d\n",i,j,k);
14                 }
15             }
16         }
17     }
18 }
19
20 }
21 return 0;
22 }
```

Output:

```
Name: Parijat Kumar
Roll No.: 20001016037
*****
1 2 3
1 3 2
2 1 3
2 3 1
3 1 2
3 2 1
```

- (e) According to a study, the approximate level of intelligence of a person can be calculated using the following formula:

$$i = 2 + (y + 0.5x)$$

Write a program, which will produce a table of values of i , y and x , where y varies from 1 to 6, and, for each value of y , x varies from 5.5 to 12.5 in steps of 0.5.

Program:

```
C intelligence.c > main()
1 #include<stdio.h>
2 int main()
3 {
4     int y;
5     float i, x;
6     printf("Name: Parijat Kumar\nRoll No.: 20001016037\n*****\n");
7     printf("i\tt\tty\ttx\n");
8
9     for(y=1;y<=6;y++)
10    {
11        for(x=5.5;x<=12.5;x+=0.5)
12        {
13            i = 2+(y+0.5*x);
14            printf("%.2f\tt\t%d\t%.2f\n",i,y,x);
15        }
16    }
17    return 0;
18 }
```

Output:

```

Name: Parijat Kumar
Roll No.: 20001016037
*****
i          y          x
5.75      1          5.50
6.00      1          6.00
6.25      1          6.50
6.50      1          7.00
6.75      1          7.50
7.00      1          8.00
7.25      1          8.50
7.50      1          9.00
7.75      1          9.50
8.00      1          10.00
8.25      1          10.50
8.50      1          11.00
8.75      1          11.50
9.00      1          12.00
9.25      1          12.50
6.75      2          5.50
7.00      2          6.00
7.25      2          6.50
7.50      2          7.00
7.75      2          7.50

```

(f) Write a program to produce the following output:

```
A B C D E F G F E D C B A
A B C D E F   F E D C B A
A B C D E       E D C B A
A B C D         D C B A
A B C           C B A
A B             B A
A               A
```

Program:

```
C pattern.c > ...
1  #include<stdio.h>
2  int main()
3  {
4      int i,j,k,l,m;
5      printf("Name: Parijat Kumar\nRoll No.: 20001016037\n*****\n");
6      for(i=0;i<=6;i++)
7      {
8          for(k=65;k<=71-i;k++)
9          {
10             printf("%c",k);
11         }
12         for(j=1;j<=i*2-1;j++)
13         {
14             printf(" ");
15         }
16         for(l=71-i;l>=65;l--)
17         {
18             if(l!=71)
19             {
20                 printf("%c",l);
21             }
22         }
23         printf("\n");
24     }
25     return 0;
}
```

Output:

```
Name: Parijat Kumar
Roll No.: 20001016037
*****
ABCDEF G F E D C B A
ABCDEF  F E D C B A
ABCDE   E D C B A
ABCD    D C B A
ABC     C B A
AB      B A
A       A
```

- (g) Write a program to fill the entire screen with diamond and heart alternatively. The ASCII value for heart is 3 and that of diamond is 4.

Program:

```
C diamondsandhearts.c > main()
1  #include<stdio.h>
2  int main()
3  {
4      int i,a=3,b=4;
5      printf("Name: Parijat Kumar\nRoll No.: 20001016037\n*****\n");
6      for(i=1;i<=780;i++)
7      {
8          if(i%2==0)
9              printf(" %c ",a);
10         if(i%2!=0)
11             printf(" %c ",b);
12     }
13     return 0;
14 }
```

Output:

[illegible]

- (h) Write a program to print the multiplication table of the number entered by the user. The table should get displayed in the following form.

29 * 1 = 29

29 * 2 = 58

...

Program:

```
C multiplicationtable.c > main()
1  #include<stdio.h>
2  int main()
3  {
4      int n;
5      printf("Name: Parijat Kumar\nRoll No.: 20001016037\n*****\n");
6      printf("Mulitplication table\n");
7      printf("Enter a number to print its multiplication table: ");
8      scanf("%d",&n);
9      for (int i = 1; i <=10; i++)
10     {
11         printf("%d * %d = %d\n",n,i,n*i);
12     }
13     return 0;
14 }
```

Output:

```
Name: Parijat Kumar
Roll No.: 20001016037
*****
Mulitplication table
Enter a number to print its multiplication table: 29
29 * 1 = 29
29 * 2 = 58
29 * 3 = 87
29 * 4 = 116
29 * 5 = 145
29 * 6 = 174
29 * 7 = 203
29 * 8 = 232
29 * 9 = 261
29 * 10 = 290
```


(i) Write a program to produce the following output:

```
      1
    2  3
  4  5  6
7  8  9 10
```

Program:

```
C 10digitpyramid.c > main()
1  #include<stdio.h>
2  int main()
3  {
4      int i, j, k, count=1;
5      printf("Name: Parijat Kumar\nRoll No.: 20001016037\n*****\n");
6      for(i=1;i<=4;i++)
7      {
8          for(j=1;j<=4-i;j++)
9          {
10             printf(" ");
11          }
12          for(k=1;k<=i;k++)
13          {
14             printf(" %d",count);
15             count++;
16          }
17          printf("\n");
18      }
19      return 0;
20 }
```

Output:

```
Name: Parijat Kumar
Roll No.: 20001016037
*****
      1
    2 3
  4 5 6
7 8 9 10
```

(j) Write a program to produce the following output:

```
      1
    1  1
  1  2  1
1  3  3  1
1 4  6  4  1
```

Program:

```
C pascalsrialangle.c > main()
1  #include<stdio.h>
2  int main()
3  {
4      int n = 1, space, i, j;
5      printf("Name: Parijat Kumar\nRoll No.: 20001016037\n*****\n");
6      printf("Program to print Pascal's triangle upto 5 rows\n");
7      for(i=0; i<5; i++)
8      {
9          for(space=1; space <= 5-i; space++)
10         {
11             printf(" ");
12         }
13         for(j=0; j <= i; j++)
14         {
15             if (j==0 || i==0)
16             {
17                 n = 1;
18             }
19             else
20             {
21                 n = n*(i-j+1)/j;
22             }
23             printf(" %d", n);
24         }
25         printf("\n");
26     }
27     return 0;
28 }
```

Output:

```
Name: Parijat Kumar
Roll No.: 20001016037
*****
Program to print Pascal's triangle upto 5 rows
      1
    1 1
  1 2 1
1 3 3 1
1 4 6 4 1
```

- (k) A machine is purchased which will produce earning of Rs. 1000 per year while it lasts. The machine costs Rs. 6000 and will have a salvage of Rs. 2000 when it is condemned. If 12 percent per annum can be earned on alternate investments what would be the minimum life of the machine to make it a more attractive investment compared to alternative investment?

Program:

```
C minimumlifeofmachine.c > main()
1  #include<stdio.h>
2  int main()
3  {
4      int year=0 ,invest=0, alternate=1;
5      printf("Name: Parijat Kumar\nRoll No.: 20001016037\n*****\n");
6      while(alternate>invest)
7      {
8          alternate = year *120;
9          invest = (1000*year) - 4000;
10         year++;
11     }
12     printf("The minimum life of machine should be %d years", year);
13     return 0;
14 }
```

Output:

```
Name: Parijat Kumar
Roll No.: 20001016037
*****
The minimum life of machine should be 6 years
```

- (i) When interest compounds q times per year at an annual rate of $r\%$ for n years, the principle p compounds to an amount a as per the following formula

$$a = p \left(1 + r/q \right)^{nq}$$

Write a program to read 10 sets of p , r , n & q and calculate the corresponding a .

Program:

```
C compoundinterest.c > main()
1  #include<stdio.h>
2  int main()
3  {
4      int p,r,n,q,i,j,product;
5      float a=1;
6      printf("Name: Parijat Kumar\nRoll No.: 20001016037\n*****\n");
7      for(i=0;i<10;i++)
8      {
9          a=1;
10         printf("\nEnter the values of p: \n");
11         scanf("%d",&p);
12         printf("\nEnter the values of r: \n");
13         scanf("%d",&r);
14         printf("\nEnter the values of n: \n");
15         scanf("%d",&n);
16         printf("\nEnter the values of q: \n");
17         scanf("%d",&q);
18         product=n*q;
19         for(j=1;j<=product;j++)
20         {
21             a = a * ( 1 +(float) r / q );
22         }
23         a= p*a;
24         printf("\n%f",a);
25     }
26     return 0;
27 }
```

Output:

```
Name: Parijat Kumar
Roll No.: 20001016037
*****

Enter the values of p:
1000

Enter the values of r:
8

Enter the values of n:
2

Enter the values of q:
4

6561000.000000
Enter the values of p:
█
```

The natural logarithm can be approximated by the following series.

$$\frac{x-1}{x} + \frac{1}{2}\left(\frac{x-1}{x}\right)^2 + \frac{1}{2}\left(\frac{x-1}{x}\right)^3 + \frac{1}{2}\left(\frac{x-1}{x}\right)^4 + \dots$$

If x is input through the keyboard, write a program to calculate the sum of first seven terms of this series.

Program:

```
C naturallogarithm.c > main()
1  #include<stdio.h>
2  #include<math.h>
3  int main()
4  {
5      int i;
6      float x,d,p,t,r=0;
7      printf("Name: Parijat Kumar\nRoll No.: 20001016037\n*****\n");
8      printf("Enter the value of x: ");
9      scanf("%f", &x);
10     d=(x-1)/x;
11     for(i=2;i<=7;i++)
12     {
13         p = pow(d,i);
14         t = p/2;
15         r = r + t;
16     }
17     r = d + r;
18     printf("The required value is %f",r);
19     return 0;
20 }
```

Output:

```
Name: Parijat Kumar
Roll No.: 20001016037
*****
Enter the value of x: 10
The required value is 2.797664
```

(n)

Write a program which to find the grace marks for a student using **switch**. The user should enter the class obtained by the student and the number of subjects he has failed in.

- If the student gets first class and the number of subjects he failed in is greater than 3, then he does not get any grace. If the number of subjects he failed in is less than or equal to 3 then the grace is of 5 marks per subject.
- If the student gets second class and the number of subjects he failed in is greater than 2, then he does not get any grace. If the number of subjects he failed in is less than or equal to 2 then the grace is of 4 marks per subject.
- If the student gets third class and the number of subjects he failed in is greater than 1, then he does not get any grace. If the number of subjects he failed in is equal to 1 then the grace is of 5 marks per subject

Program:

```
C: gracemarks.c > main()
3
4 int g, f, grace=0;
5 printf("Name: Parijat Kumar\nRoll No.: 20001016037\n*****\n");
6 printf("Enter the class obtained by the student\n");
7 scanf("%d", &g);
8 printf("How many subjects has the student f\n");
9 scanf("%d", &f);
10 switch(g)
11 {
12     case 1:
13         if(f > 3)
14         {
15             grace = 0;
16         }
17         else
18         {
19             grace = 5;
20         }
21         break;
22     case 2:
23         if(f > 2)
24         {
25             grace = 0;
26         }
27         else
28         {
29             grace = 4;
30         }
31         break;
32     case 3:
33         if(f > 1)
34         {
35             grace = 0;
36         }
37         else
38         {
39             grace = 5;
40         }
41         break;
42     default: printf("You entered wrong class for the student\n");
43 }
44
45 if(g == 1 || g == 2 || g == 3)
46 {
47     printf("The student has obtained a grace marks of %d per subject\n", grace);
48 }
49 return 0;
50
```

Output:

```
Name: Parijat Kumar
Roll No.: 20001016037
*****
Enter the class obtained by the student
1
How many subjects has the student f
2
The student has obtained a grace marks of 5 per subject
```


(o) Write a recursive function to obtain the first 25 numbers of a Fibonacci sequence. In a Fibonacci sequence the sum of two successive terms gives the third term. Following are the first few terms of the Fibonacci sequence:

1 1 2 3 5 8 13 21 34 55 89...

Program:

```
C fibonacciseries.c > main()
1  #include<stdio.h>
2  int fib(int n);
3  int main()
4  {
5      int n, i;
6      printf("Name: Parijat Kumar\nRoll No.: 20001016037\n*****\n");
7      printf("Enter no. of terms of Fibonacci series to be printed\n");
8      scanf("%d", &n);
9      for(i = 1; i <= n; i++)
10     {
11         printf("%d ", fib(i));
12     }
13     return 0;
14 }
15 int fib(int n)
16 {
17     if(n == 1)
18     {
19         return 0;
20     }
21     else if(n == 2 || n == 3)
22     {
23         return 1;
24     }
25     else
26     {
27         return( fib(n-1) + fib(n-2) );
28     }
29 }
```

Output:

```
Name: Parijat Kumar
Roll No.: 20001016037
*****
Enter no. of terms of Fibonacci series to be printed
25
0 1 1 2 3 5 8 13 21 34 55 89 144 233 377 610 987 1597 2584 4181 6765 10946 17711 28657 46368
```


(p) A positive integer is entered through the keyboard, write a function to find the binary equivalent of this number using recursion.

Program:

```
C binaryequivalent.c > main()
1  #include<stdio.h>
2  int binary(int);
3  int main()
4  {
5      int n,b;
6      printf("Name: Parijat Kumar\nRoll No.: 20001016037\n*****\n");
7      printf("Enter the number for which you have to find the binary equivalent: ");
8      scanf("%d",&n);
9      b=binary(n);
10     printf("The binary equivalent is %d",b);
11     return 0;
12 }
13 int binary(int n)
14 {
15     if (n==0)
16     {
17         return 0;
18     }
19     else
20     {
21         return (n%2+10*binary(n/2));
22     }
23 }
```

Output:

```
Name: Parijat Kumar
Roll No.: 20001016037
*****
Enter the number for which you have to find the binary equivalent: 15
The binary equivalent is 1111
```

(q) Write a recursive function to obtain the running sum of first 25 natural numbers.

Program:

```
C sumofnnaturalnos.c > main()
1  #include<stdio.h>
2  int sum(int n);
3  int main()
4  {
5      int n,s;
6      printf("Name: Parijat Kumar\nRoll No.: 20001016037\n*****\n");
7      printf("Enter a number to find sum of first n natural numbers: ");
8      scanf("%d",&n);
9      s=sum(n);
10     printf("The sum of first %d natural numbers: %d",n,s);
11
12     return 0;
13 }
14 int sum(int n)
15 {
16     if (n==0)
17     {
18         return 0;
19     }
20     else
21     {
22         return (n+sum(n-1));
23     }
24 }
```

Output:

```
Name: Parijat Kumar
Roll No.: 20001016037
*****
Enter a number to find sum of first n natural numbers: 25
The sum of first 25 natural numbers: 325
```