Nested Iterations

Nested For Loop

A for loop can contain any kind of statement in its body, including another for loop.

The inner loop must have a different name for its loop counter variable so that it will not conflict with the outer loop. Nested loop: Loops placed inside one another, creating a loop of loops.

IMPLEMENTATION IN C

```
#include<stdio.h>
int main()
{

for (int i=1; i<=5;i++)
{
    for (int j=1;j<=i;j++)
    {
     printf("*");
    }
printf("\n");
}
```

→

```
for ( expr1a; expr2a; expr3a )
{
                :
  for ( expr1b; expr2b; expr3b )
  {
                        :
   }
                :
}
```

Nested While Loop

Using While loop within while loops is said to be Nested while loop.In nested while loop one or more statements are included in the body of the loop.

IMPLEMENTATION IN C

```
#include<stdio.h>
int main()
{
  int r,c,s;
  r=1;
  while(r<=5)  /*outer loop*/
  {
   c=1;
   while(c<=2)  /*inner loop*/
   {
    s=r+c;
    printf("r=%d c=%d sum=%d\n",r,c,s);
    c++;
   }
  printf("\n");
  r++;
}}
```

→

```
while (expr1)
        {
        :
                while (expr2)
                {
                        :
                        Update expr2;
                }
                :
                update expr1;
        }
```

Nested Do While Loop

Using do While loop within do while loops is said to be Nested while loop.

In nested do while loop one or more statements are included in the body of the loop.

IMPLEMENTATION IN C

```
#include<stdio.h>
int main()
{
  int i=1,j=0,sum;
  do
  {
   sum=0;
   do
   {
     sum=sum+j;
     printf("%d",j);
      j++;
      if(j<=i)
      {
         printf("+");
       }
    }
     while(j<=i);
    printf("=%d\n",sum);
    j=1;
    i ++;
    }
    while(i<=10);
}
```

```
do
    {
    :
        do
        {
            :
            Update expr;
        }while(expr);

        :

        update expr;
    }while(expr);
```

Task 01: Write a program which ask the user to input a number as input greater than or equal to four digits. Then find the sum of entered number until the result is in single digit as follows.

Note: Use Nested loops.

```
Enter any Number :  45678

Total num of digits      :5
Digital root of number   :3
```

Task 02: Write a program which generate multiplication tables within range (3-10) for odds number only as follows. Note: Use Nested loops.

```
3 * 1 = 3       5 * 1 = 5       7 * 1 = 7       9 * 1 = 9
3 * 2 = 6       5 * 2 = 10      7 * 2 = 14      9 * 2 = 18
3 * 3 = 9       5 * 3 = 15      7 * 3 = 21      9 * 3 = 27
3 * 4 = 12      5 * 4 = 20      7 * 4 = 28      9 * 4 = 36
3 * 5 = 15      5 * 5 = 25      7 * 5 = 35      9 * 5 = 45
3 * 6 = 18      5 * 6 = 30      7 * 6 = 42      9 * 6 = 54
3 * 7 = 21      5 * 7 = 35      7 * 7 = 49      9 * 7 = 63
3 * 8 = 24      5 * 8 = 40      7 * 8 = 56      9 * 8 = 72
3 * 9 = 27      5 * 9 = 45      7 * 9 = 63      9 * 9 = 81
3 * 10 = 30     5 * 10 = 50     7 * 10 = 70     9 * 10 = 90
```

Task 03: write a program by declaring an array for six elements. Use for loop to assign the given set {3.14, 3.24, 3.34, 3.44, 3.54} numbers to them. Display your stored numbers in descending order as well.

Note: Use nested for loop.

Task 04:

Write a program which can stores 6 integers. Then check your stored array that it's symmetric or not. As the number of elements are even in given problem. Make sure that your code is generic and work for odd elements size as well. The array is symmetric if the value of the first element is equal to the last one, the value of the second one is equal to the value of the last but one, and so on. (Symmetric and Asymmetric differentiated in following figures)

Note: Use Nested loop and Decision statements if required.