INDIAN INSTITUTE OF TECHNOLOGY ROORKEE

Programming in C and C++ (CSC-101)

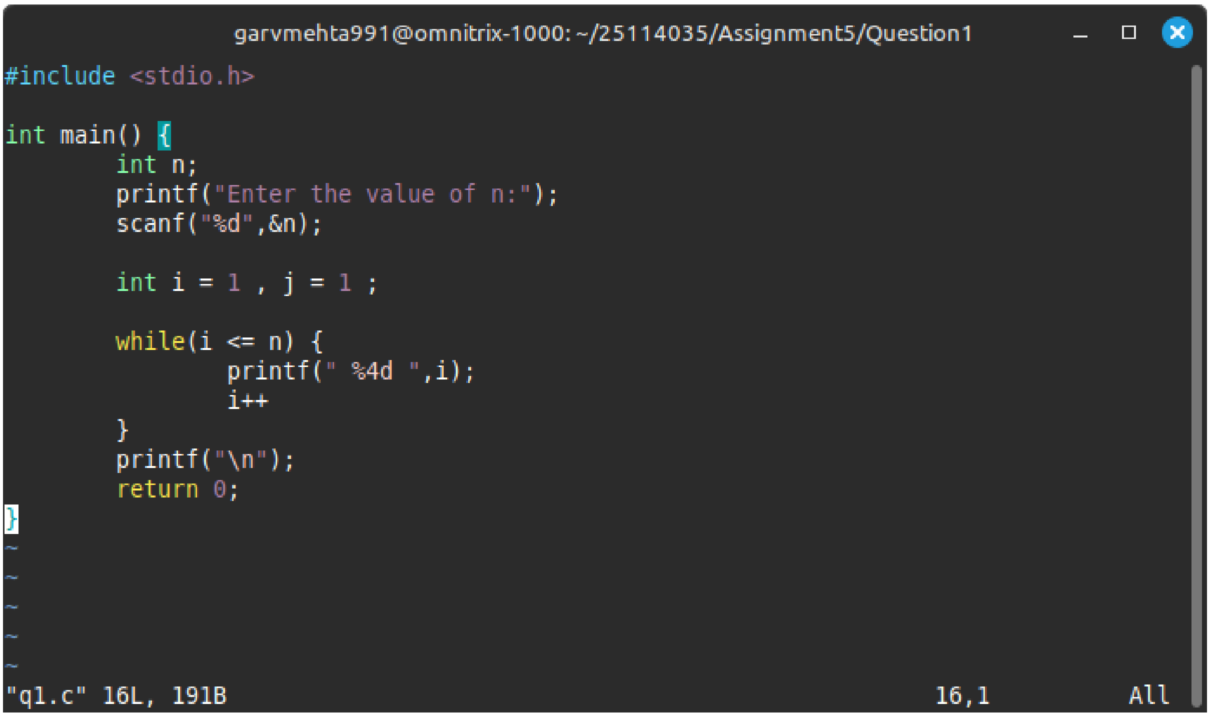
Assignment 4 **40 marks**

Note : (No function / matrix]are allowed to be used)

Q-1) Write a C program that prints numbers from 1 to n*n arranged in a clockwise spiral pattern inside an n x n grid, without using any 2D arrays or function calls.

Enter n: 5

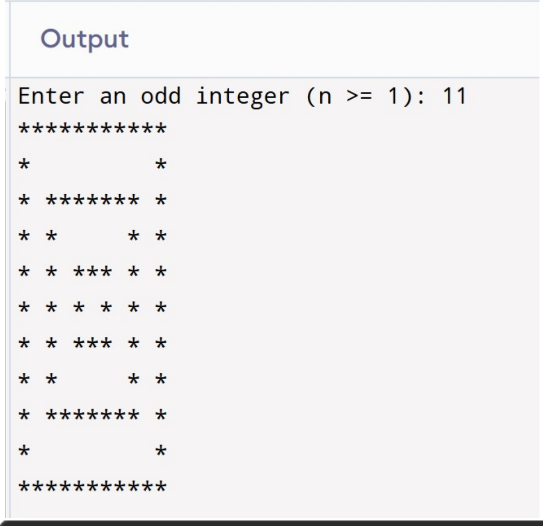
```
 1   2   3   4   5
16  17  18  19   6
15  24  25  20   7
14  23  22  21   8
13  12  11  10   9
```



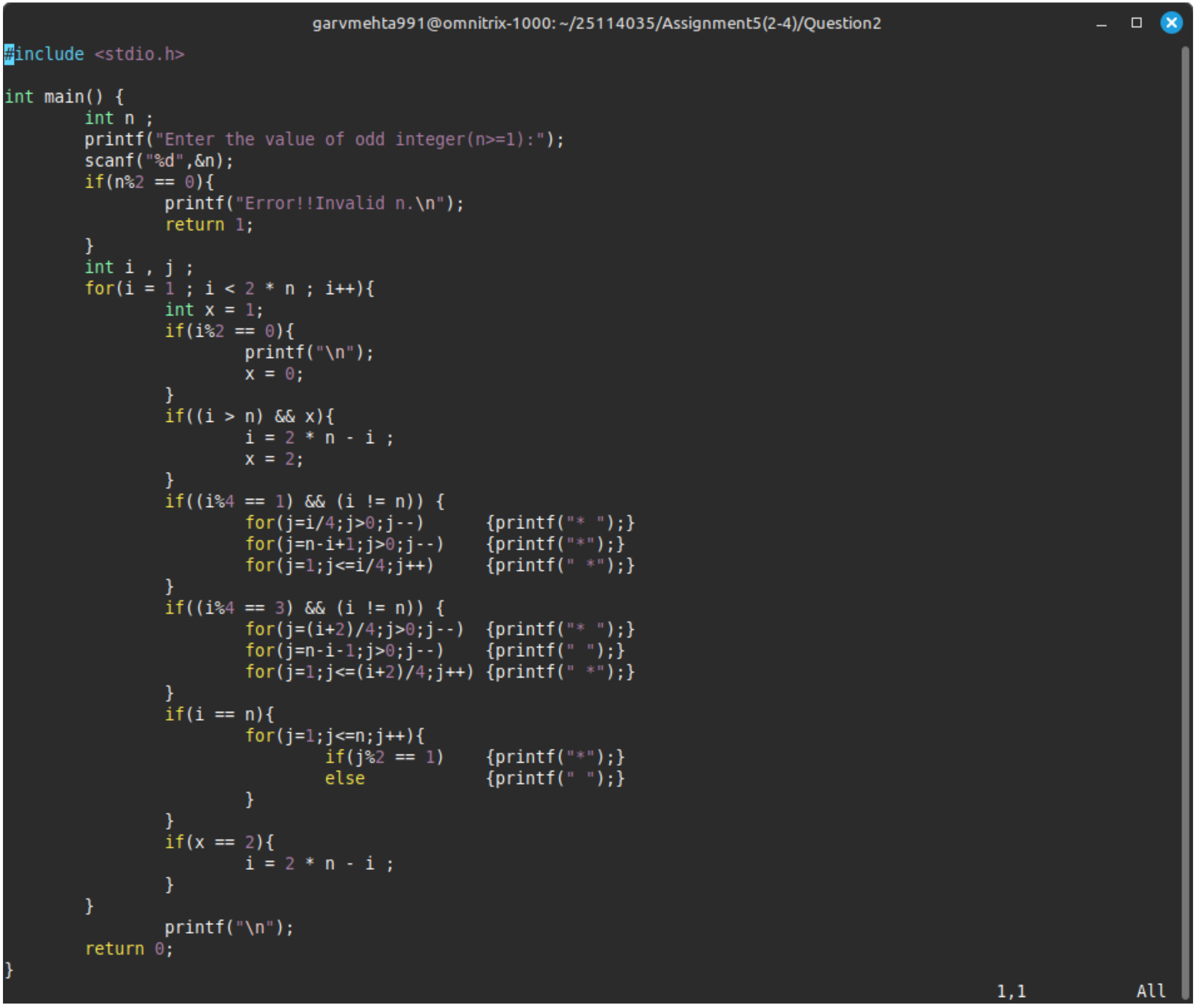
garvmehta991@omnitrix-1000: ~/25114035/Assignment5/Question1

```
#include <stdio.h>

int main() {
        int n;
        printf("Enter the value of n:");
        scanf("%d",&n);

        int i = 1 , j = 1 ;

        while(i <= n) {
                printf(" %4d ",i);
                i++
        }
        printf("\n");
        return 0;
}
~
~
~
~
~
"q1.c" 16L, 191B                                                 16,1          All
```

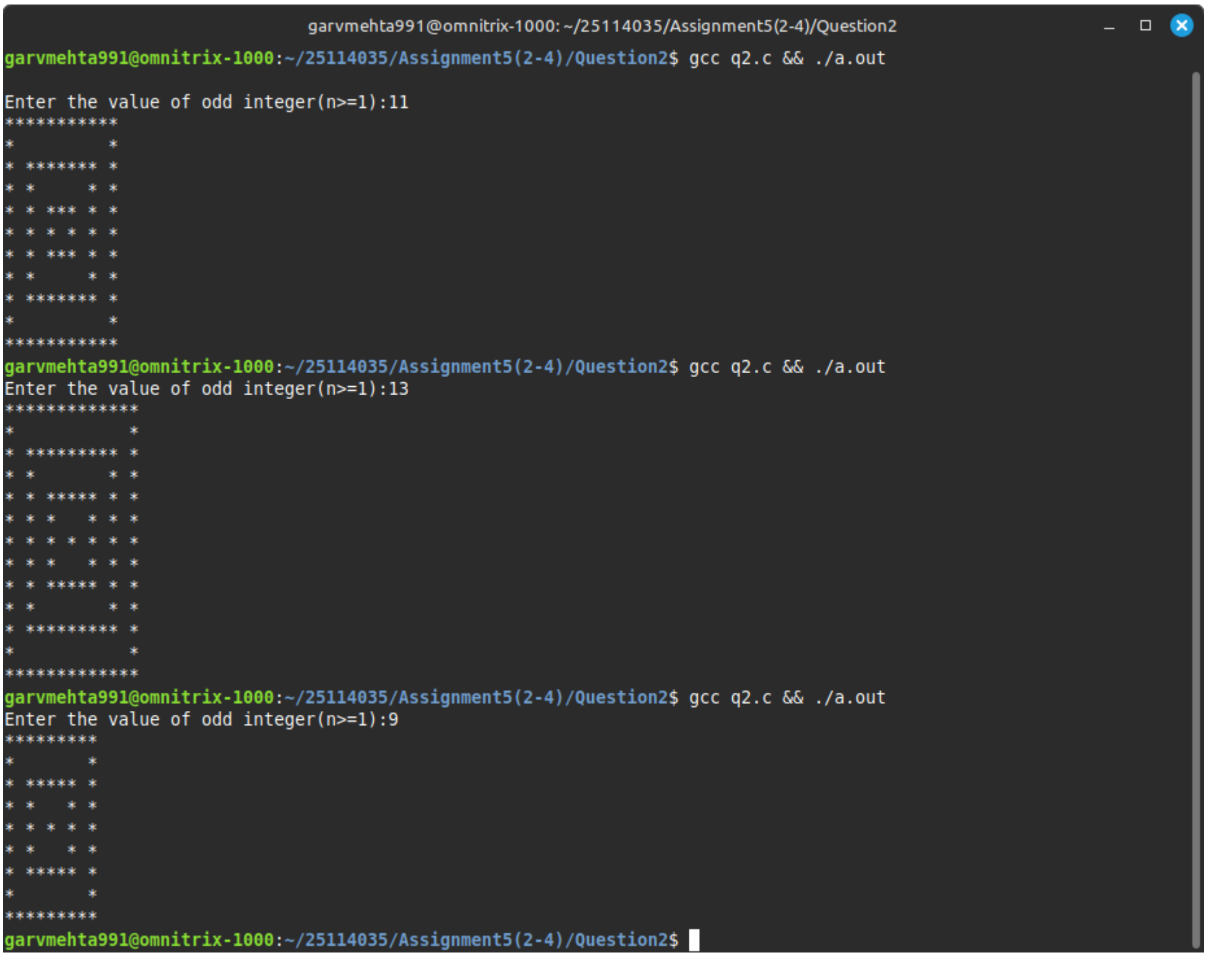
Q-2) Write a C program to print concentric square patterns which use only while loops. It only takes an odd number as input. If the user gives an even number it gives an error.



```
Enter an odd integer (n >= 1): 11
***********
*         *
* ******* *
* *     * *
* * *** * *
* * * * * *
* * *** * *
* *     * *
* ******* *
*         *
***********
```


garvmehta991@omnitrix-1000: ~/25114035/Assignment5(2-4)/Question2

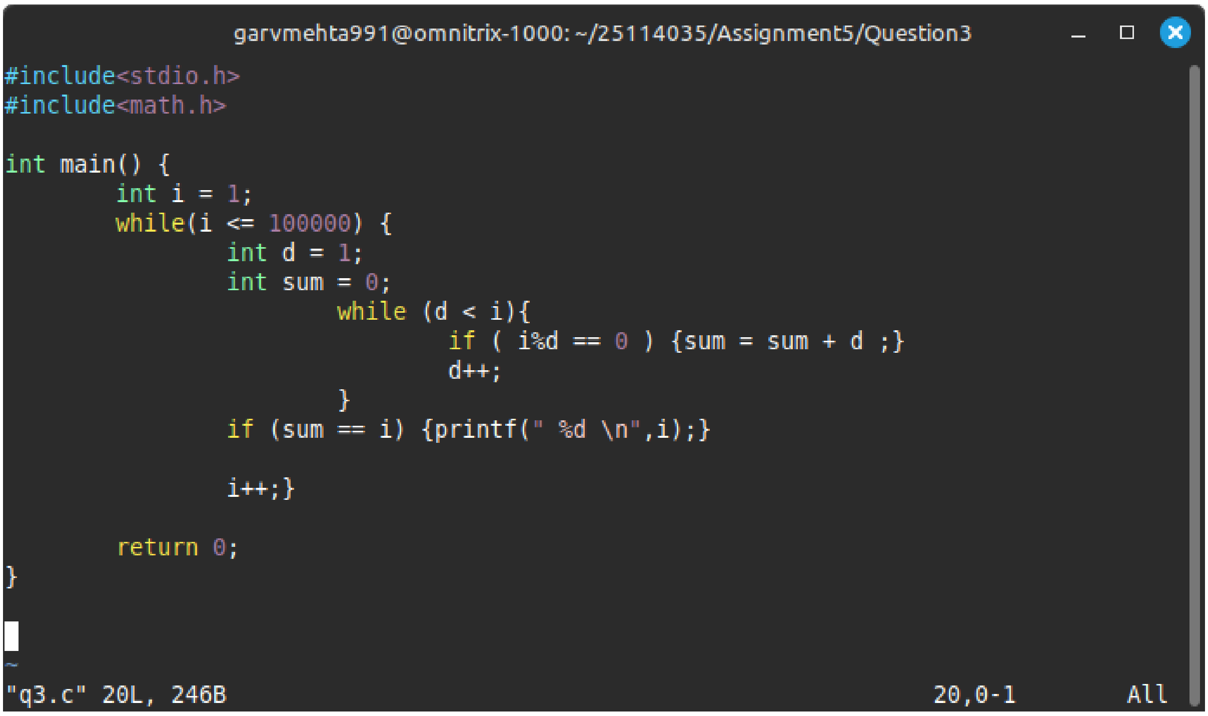
```
#include <stdio.h>

int main() {
        int n ;
        printf("Enter the value of odd integer(n>=1):");
        scanf("%d",&n);
        if(n%2 == 0){
                printf("Error!!Invalid n.\n");
                return 1;
        }
        int i , j ;
        for(i = 1 ; i < 2 * n ; i++){
                int x = 1;
                if(i%2 == 0){
                        printf("\n");
                        x = 0;
                }
                if((i > n) && x){
                        i = 2 * n - i ;
                        x = 2;
                }
                if((i%4 == 1) && (i != n)) {
                        for(j=i/4;j>0;j--)      {printf("* ");}
                        for(j=n-i+1;j>0;j--)    {printf("*");}
                        for(j=1;j<=i/4;j++)     {printf(" *");}
                }
                if((i%4 == 3) && (i != n)) {
                        for(j=(i+2)/4;j>0;j--)  {printf("* ");}
                        for(j=n-i-1;j>0;j--)    {printf(" ");}
                        for(j=1;j<=(i+2)/4;j++) {printf(" *");}
                }
                if(i == n){
                        for(j=1;j<=n;j++){
                                if(j%2 == 1)    {printf("*");}
                                else            {printf(" ");}
                        }
                }
                if(x == 2){
                        i = 2 * n - i ;
                }
        }
                printf("\n");
        return 0;
}
                                                                             1,1           All
```



garvmehta991@omnitrix-1000: ~/25114035/Assignment5(2-4)/Question2

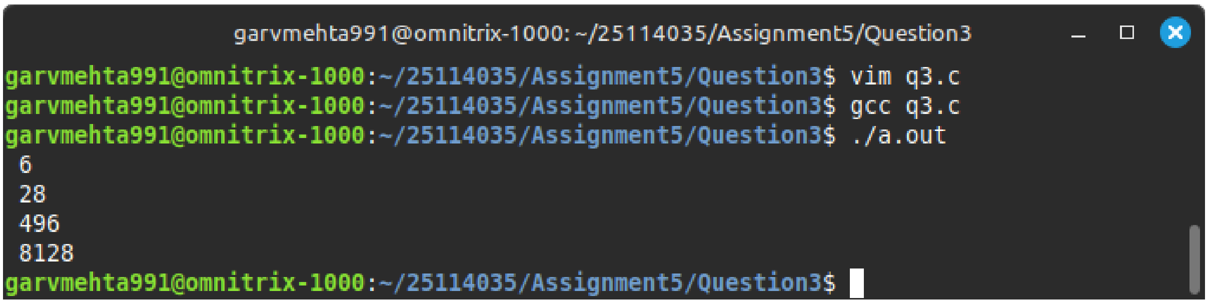
```
garvmehta991@omnitrix-1000:~/25114035/Assignment5(2-4)/Question2$ gcc q2.c && ./a.out

Enter the value of odd integer(n>=1):11
***********
*         *
* ******* *
* *     * *
* * *** * *
* * * * * *
* * *** * *
* *     * *
* ******* *
*         *
***********
garvmehta991@omnitrix-1000:~/25114035/Assignment5(2-4)/Question2$ gcc q2.c && ./a.out
Enter the value of odd integer(n>=1):13
*************
*           *
* ********* *
* *       * *
* * ***** * *
* * *   * * *
* * * * * * *
* * *   * * *
* * ***** * *
* *       * *
* ********* *
*           *
*************
garvmehta991@omnitrix-1000:~/25114035/Assignment5(2-4)/Question2$ gcc q2.c && ./a.out
Enter the value of odd integer(n>=1):9
*********
*       *
* ***** *
* *   * *
* * * * *
* *   * *
* ***** *
*       *
*********
garvmehta991@omnitrix-1000:~/25114035/Assignment5(2-4)/Question2$ 
```

3)Write a C program to find all perfect numbers between 1 and 100,000. A number m is called a perfect number if the sum of all its positive divisors, excluding the number itself, equals m. In other words, if σ(m) = m, where σ(m) is the sum of all positive divisors of m, excluding m itself. For example, σ(12) = 1 + 2 + 3 + 4 + 6 = 16, so 12 is not a perfect number because 16 ≠ 12, 28 is a perfect number because σ(28) = 1 + 2 + 4 + 7 + 14 = 28.



garvmehta991@omnitrix-1000: ~/25114035/Assignment5/Question3

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

int main() {
        int i = 1;
        while(i <= 100000) {
                int d = 1;
                int sum = 0;
                        while (d < i){
                                if ( i%d == 0 ) {sum = sum + d ;}
                                d++;
                        }
                if (sum == i) {printf(" %d \n",i);}

                i++;}

        return 0;
}

~
"q3.c" 20L, 246B                                                  20,0-1        All
```



garvmehta991@omnitrix-1000: ~/25114035/Assignment5/Question3

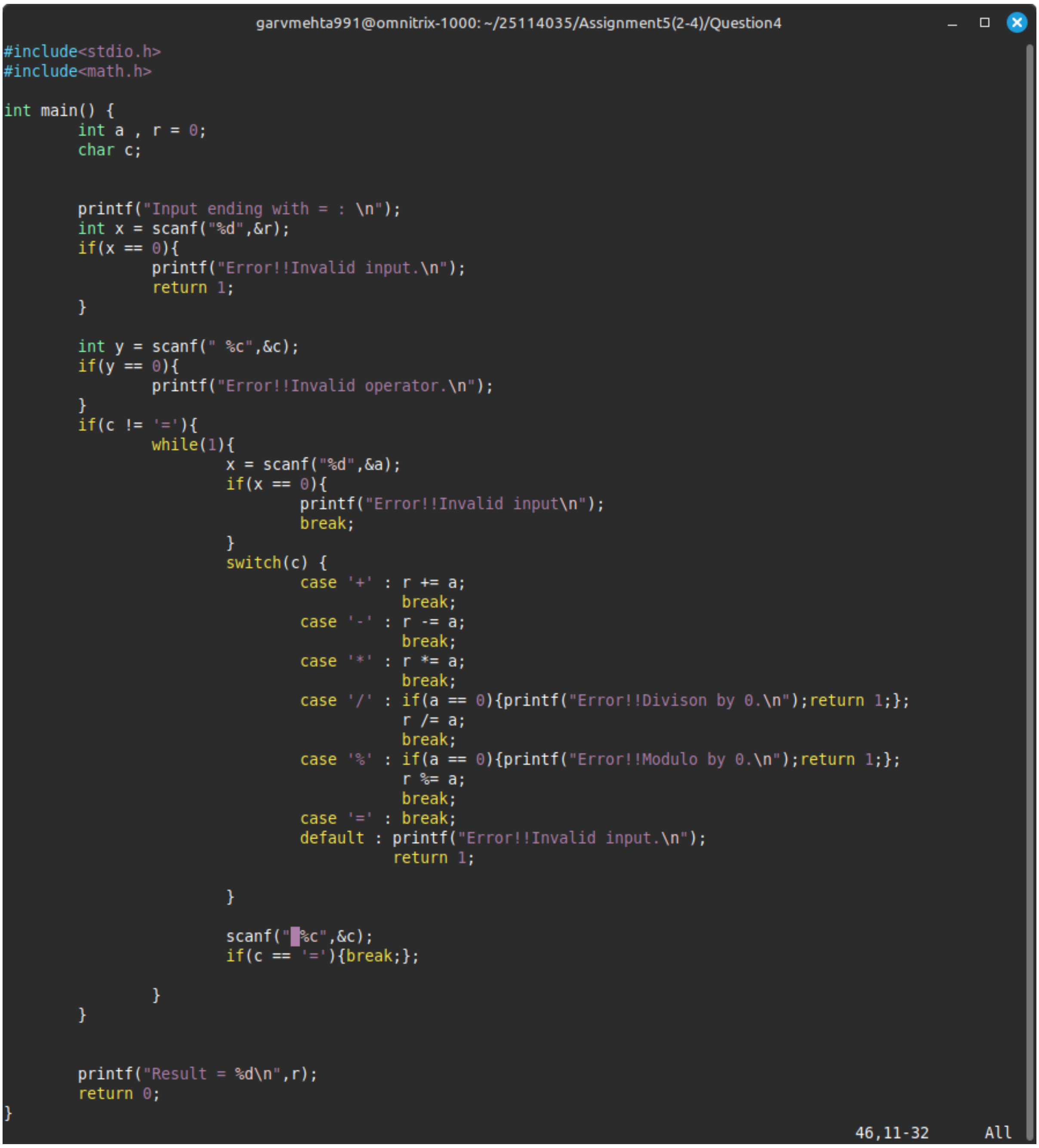
```
garvmehta991@omnitrix-1000:~/25114035/Assignment5/Question3$ vim q3.c
garvmehta991@omnitrix-1000:~/25114035/Assignment5/Question3$ gcc q3.c
garvmehta991@omnitrix-1000:~/25114035/Assignment5/Question3$ ./a.out
 6
 28
 496
 8128
garvmehta991@omnitrix-1000:~/25114035/Assignment5/Question3$ 
```

4)Write a C program that performs a sequence of arithmetic operations on integers using a switch statement. Operators can be +, -, *, /, or % and are treated as equal precedence and the expression ends with =. The evaluation happens from left to right. Your program should compute the result, handle division/modulo by zero, and report invalid operators or if the expression is invalid i.e two operator/number consecutive and all possible checking should be done. Use switch for operation control, and include appropriate logic where appropriate.

Output:

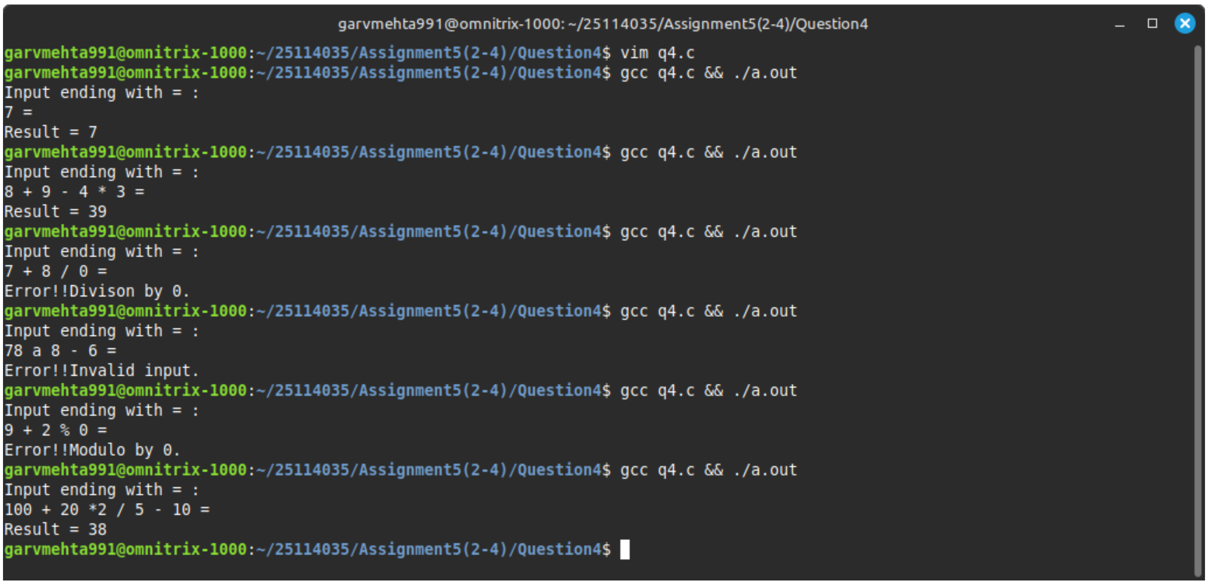
Input ending with = :
100 + 20 * 2 / 5 - 10 =

Output:
Result = 18



garvmehta991@omnitrix-1000: ~/25114035/Assignment5(2-4)/Question4

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

int main() {
        int a , r = 0;
        char c;


        printf("Input ending with = : \n");
        int x = scanf("%d",&r);
        if(x == 0){
                printf("Error!!Invalid input.\n");
                return 1;
        }

        int y = scanf(" %c",&c);
        if(y == 0){
                printf("Error!!Invalid operator.\n");
        }
        if(c != '='){
                while(1){
                        x = scanf("%d",&a);
                        if(x == 0){
                                printf("Error!!Invalid input\n");
                                break;
                        }
                        switch(c) {
                                case '+' : r += a;
                                           break;
                                case '-' : r -= a;
                                           break;
                                case '*' : r *= a;
                                           break;
                                case '/' : if(a == 0){printf("Error!!Divison by 0.\n");return 1;};
                                           r /= a;
                                           break;
                                case '%' : if(a == 0){printf("Error!!Modulo by 0.\n");return 1;};
                                           r %= a;
                                           break;
                                case '=' : break;
                                default : printf("Error!!Invalid input.\n");
                                          return 1;

                        }

                        scanf(" %c",&c);
                        if(c == '='){break;};

                }
        }


        printf("Result = %d\n",r);
        return 0;
}
                                                                                    46,11-32      All
```


garvmehta991@omnitrix-1000: ~/25114035/Assignment5(2-4)/Question4

```
garvmehta991@omnitrix-1000:~/25114035/Assignment5(2-4)/Question4$ vim q4.c
garvmehta991@omnitrix-1000:~/25114035/Assignment5(2-4)/Question4$ gcc q4.c && ./a.out
Input ending with = :
7 =
Result = 7
garvmehta991@omnitrix-1000:~/25114035/Assignment5(2-4)/Question4$ gcc q4.c && ./a.out
Input ending with = :
8 + 9 - 4 * 3 =
Result = 39
garvmehta991@omnitrix-1000:~/25114035/Assignment5(2-4)/Question4$ gcc q4.c && ./a.out
Input ending with = :
7 + 8 / 0 =
Error!!Divison by 0.
garvmehta991@omnitrix-1000:~/25114035/Assignment5(2-4)/Question4$ gcc q4.c && ./a.out
Input ending with = :
78 a 8 - 6 =
Error!!Invalid input.
garvmehta991@omnitrix-1000:~/25114035/Assignment5(2-4)/Question4$ gcc q4.c && ./a.out
Input ending with = :
9 + 2 % 0 =
Error!!Modulo by 0.
garvmehta991@omnitrix-1000:~/25114035/Assignment5(2-4)/Question4$ gcc q4.c && ./a.out
Input ending with = :
100 + 20 *2 / 5 - 10 =
Result = 38
garvmehta991@omnitrix-1000:~/25114035/Assignment5(2-4)/Question4$ 
```