IT161: Introduction to Programming and Problem Solving

Lab 3/Assignment 3

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PROGRAMS

1. **Sum of Natural Numbers using recursion**

Code:

```c
#include <stdio.h>

int sum(int n){
    if(n == 0){return 0;}
    else{
        return n + sum(n-1);
    }

}

int main(){

    int num;
    printf("\nEnter your Number: ");
    scanf("%d",&num);

    int total_sum = sum(num);

    printf("\nThe Total sum is: %d\n",total_sum);

    return 0;
}
```

Output:

2. **Program to check whether a number can be expressed as sum of two prime numbers**

Code:

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

bool isPrime(int n){

    int temp = 0;
    for(int i = 2;i<n;i++){
        if(n % i == 0){
            temp = temp + 1;
        }
    }
    if(temp == 0){
        return true;
    }
    else{
        return false;
    }
}

bool isPossible(int n){
    bool chk = false;
    for(int i = 2; i < n; i++){
        bool term1 = isPrime(i);

        for(int j = 2;j<n;j++){
            bool term2 = isPrime(j);
            int sum = i+j;
            if(term1 && term2 && sum == n){
```

```
                chk =  true;
                break;
            }
        }
    }
    if(chk){
        return true;
    }
    else{
        return false;
    }
}

int main(){

    int num;
    printf("\nEnter your Number: ");
    scanf("%d",&num);

    bool check = isPossible(num);

    if(check){
        printf("\nYes it is possible!\n");
        }
    else{
        printf("\nNO it is NOT possible!\n");
        }
    return 0;
}
```

Output:

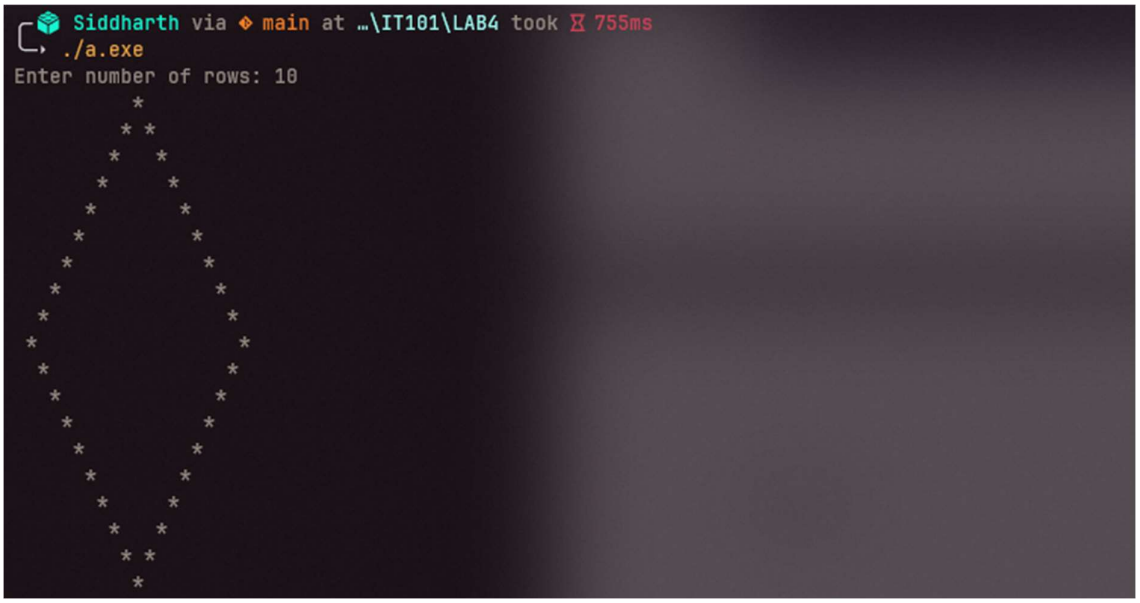
```
Siddharth via ◆ main at …\IT101\LAB4
./a.exe

Enter your Number: 11

NO it is NOT possible!

Siddharth via ◆ main at …\IT101\LAB4 took ⧖ 6s
./a.exe

Enter your Number: 12

Yes it is possible!
```

3. Hollow Diamond Pattern

Code:

```c
#include<stdio.h>

int main()
{
  int n;

  printf("Enter number of rows: ");
  scanf("%d",&n);

  for(int i=1; i<=n; i++)
  {
     for(int j=i; j<=n; j++)
     {
       printf(" ");
     }
     for(int k=1; k<=2*i-1; k++)
     {
       if(k==1 || k==(2*i-1)) printf("*");
       else printf(" ");
     }
     printf("\n");
  }

  for(int i=n-1; i>=1; i--)
  {
     for(int j=n; j>=i; j--)
     {
       printf(" ");
     }
     for(int k=1; k<=2*i-1; k++)
     {
       if(k==1 || k==2*i-1) printf("*");
       else printf(" ");
     }
     printf("\n");
  }

  return 0;
}
```

Output:



4. **GCD using recursion**

Code:

```c
#include <stdio.h>

int gcd(int a , int b){

    if(a == 0 || b == 0){
        return a+b;
    }
    else{
        if(a >= b){
            return gcd(a-b,b);
        }
        else{
            return gcd(a,b-a);
        }
    }
}

int main(){
```

```
    int num1;
    int num2;
    printf("\nEnter your Numbers: ");
    scanf("%d %d",&num1,&num2);

    int g = gcd(num1,num2);

    printf("\nThe GCD for %d and %d is : %d\n",num1,num2,g);
    return 0;
}
```

Output:

```
Siddharth via  main at …\IT101\LAB4
./a.exe

Enter your Numbers: 4 6

The GCD for 4 and 6 is : 2
```

5. **Count digits of a number using recursion**

Code:

```
#include <stdio.h>

int countDigits(int n){

    if(n <= 0){
        return 0;
    }
    else{
        return 1 + countDigits(n/10);
    }

}

int main(){

    int num;
```

```
    printf("\nEnter your Number: ");
    scanf("%d",&num);

    int digits = countDigits(num);

    printf("\nThe number of digits in %d are :
%d\n",num,digits);

    return 0;
}
```

Output:

6.Decimal to Binary using recursion

Code:

```
#include <stdio.h>


int toBinary(int n){

    if(n <= 0){
        return 0;
    }
    else{
        return n%2 + (10 * toBinary(n/2));
    }

}

int main(){

    int num;
```

```
    printf("\nEnter your Number: ");
    scanf("%d",&num);

    int bin = toBinary(num);

    printf("\nThe Binary equivalent for %d is : %d
\n",num,bin);

    return 0;
}
```

Output:

```
Siddharth via  main at …\IT101\LAB4 took  5s
./a.exe

Enter your Number: 5

The Binary equivalent for 5 is : 101
```

7.Print odd or even numbers in a given range

Code:

```
#include <stdio.h>

void printOdd(int a,int b){

    if(b <= a+2){
        return ;
    }
    else{
        printf(" %d", a+2);
        printOdd(a+2,b);
    }
}

void printEven(int a,int b){
```

```c
    if(b <= a+2){
        return ;
    }
    else{
        printf(" %d", a+2);
        printEven(a+2,b);
    }
}


int main(){

    int lowerLimit,upperLimit;

    printf("\nEnter your Numbers: ");
    scanf("%d %d",&lowerLimit,&upperLimit);

    printf("\n Odd Numbers -->  ");
    printOdd(lowerLimit,upperLimit);
    printf("\n");

    printf("\n Even Numbers -->  ");
    printOdd(lowerLimit-1,upperLimit);
    printf("\n");

    return 0;
}
```

Output:

```
Siddharth via ◆ main at …\IT101\LAB4
./a.exe

Enter your Numbers: 1 15

 Odd Numbers ⟶   3 5 7 9 11 13

 Even Numbers ⟶   2 4 6 8 10 12 14
```

8.Calculate power of any number using recursion

Code:

```c
#include <stdio.h>

int findPower(int a , int b){
    if(b == 0){return 1;}
    else{
        return a * findPower(a,b-1);
    }

}

int main(){

    int num1 , base;
    printf("\nEnter your numbers: ");
    scanf("%d %d",&num1,&base);

    int power = findPower(num1,base);

    printf("\nthe power is : %d\n",power);
    return 0;
}
```

Output: