



Algorithms & Data Structures

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Assignment04 - Solutions

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1 Problem 1

Write Java Program for Binary Search using Recursive and Iterative methods?

Iterative implementation of binary search

Listing 1: Iterative Binary search

```
public static int Binary1(int [] a, int k){
    int l=0;
    int r=a.length-1;
    int mid;

    while(l<=r){
        mid = (int)Math.floor((l+r)/2);
        if(k == a[mid])
            return mid;
        else if(k<a[mid])
            r=mid-1;
        else
            l=mid+1;
    }
    return -1;
}
```

Listing 2: Recursive Binary search

```
public static int Binary(int [] a, int l, int r, int k){
    if(r>=l)
    {
        int mid = (int)Math.floor((l+r)/2);
        if (k == a[mid])
            return mid;
        else if(k<a[mid])
            return Binary(a, l, mid-1, k);
        else
            return Binary(a, mid+1, r, k);
    }
    return -1;
}
```

2 Problem 2

Write Java program to find Fibonacci Sequence using iterative and recursive solutions?

Listing 3: Recursive Fibonacci

```
public static int fib(int n){
    if (n==0)
        return 0;
    else if (n==1)
        return 1;
    else
        return fib(n-1)+fib(n-2);
}
```

3 Problem 3

Consider the following GCD code, **rewrite it using recursive solutions?**

Listing 4: GCD

```
public static int gcd(int a, int b){
    int r=0;
    while(b!=0)
    {
        r=a%b;
        a=b;
        b=r;
    }
    return a;
}
```

The solution:

The following code is the recursive version of the GCD code.

Listing 5: GCD

```
public static int gcd(int a, int b)
{
    if (b == 0)
        return a;

    return gcd(b, a%b);
}
```