Assignment No. 2.

Name :- Ayesha Khalid Ag. No = 2022-ag-2403

```
import Java.util.Arrays;
Public class BinarySearch
{
  Public static int rank(int key, int[] a)
  {
    int lo = 0;
    int hi = a.length - 1;
    while (lo<=hi)
    {
      int mid = lo+(hi-lo)/2;
    if      (key<a[mid]) hi = mid-1;
    else if (key>a[mid]) lo = mid+1;
    else                 return mid;
    }

Public static void main(String[] args)
{
  int[] whitelist = In.readInts(args[0]);
  Arrays.sort(whitelist);
  while (!StdIn.readInt())
  {
    int key = StdIn.readInt();
      if(rank(key, whitelist)==-1)
        stdout.println(key);
  }
}
```

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1. Anatomy of Binary Search

```
import Java.util.Arrays;
```

It is an external library which will import in our program. we can use built in functions of Java. This class provide static methods & the methods of object class..

```
Public class BinarySearch{
```

Name of class. it defined a method of ranking within binary search.

```
Public Static int rank(int key, int[] a)
```

Data type.

Keyword. | return type. | Method Name. | Parameter | Parameter.

Static is a keywork.
int is return type.
Rank is a method name.
Key → parameters.

It is a static method which does not require any object for call method. we can call Static method directly when we have defined it in the same class.

```
int lo = 0;
```

Initilizing Declaration Statement.

lo => Lower boundry variable is declared "lo" which is initiliazed by "0".

```
int hi = a.length -1;
```

Datatype — Variable Name

hi => higher boundry & will be calculated a method length.

a => String type of parameter.

It will count all values of array "a" & subtract one from it.

```
while (lo <= hi) {
```

Loop — Boolean Expression.

Bodean Expression will execute the sequence of statements in the block... If it expression is false its do nothing.

```
if (key < a[mid]) hi = mid - 1
```

if statement executes.

the compiler checks the condition of If Statement.

else else condition is executed in case "if" condition is false.

```
if (key > a[mid]) lo = mid + 1;
```

The expression will be executed in else Statement when the first "if" Statement will be declared false.

```
else
    return mid; }
```

↓ Keyword.

This will return if both condition are false.

```
return -1; }
```

return Statement.

```
Public static void main (String[ ] args)
```

Keyword ↓ [No return value side effects] ↓ Datatype. ↓ Array. | └→ Array Name

The Static is a Keyword & void shows that there is no return value.

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```
int [ ] whitelist = In.readInts(args[0]);
```

Data type — Array — Name of Array — Class — Calls a method in library — Methods — Index of Array.

whitelist ⇒ Array that store some values we have passed whitelist in sorted method.

The array that has been passed as a parameter makes it whitelist sorted.

```
Arrays.sort(whitelist);
```

Arrays ⇒ Data operator. sort(whitelist); ⇒ Call a method in Java library.

It is a built in function of Java.util.Arrays library which automatically sort the array in ascending order.

```
while (!StdIn.isEmpty()) {
```

while ⇒ Loop; StdIn ⇒ External Library.

StdIn class ⇒ This soould be in our directory which contains the source code of our binary search class otherwise we can give the path.

```
Int key = StdIn.readInt();
```

StdIn ⇒ class name.

It reads all values which we want to search from a sorted array.

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if rank (key, whitelist) == -1) → calls a local Method.

Method Name → Parameter.

In the rank methods 2 parameters are being passed. In "if" statement, after checking condition it will give values when you are searching in this array.

StdOut.printIn (key); → Parameter Name

StdOut → ClassName

printIn → Static Method.

} } }

The StdOut class provide methods for printing Strings & numbers to standard out.

PrintIn :- print an object to this output stream & terminates the line.

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Flow chart Binary Search.