Exam Sets 30E
AP Computer Science A

Name ____ Period__________

1. The following code fragment does a sequential search to determine whether a given integer `value` is stored in an array `a[0] … a[n - 1]`. What should replace `/* boolean expression */` so that the algorithm works as intended?

```
int i = 0;
while( /* boolean expression */ )
{
     i++;
}
if(i == n)
     return -1;      //value not found
else
     return i;      //value found at location i
```

2. Refer to the code below to answer the following

```
private int[] a;

/** Does binary search for key in array a[0] … a[a.length-1].
*  sorted in ascending order.
*  @param key the integer value to be found
*  Postcondition:
*  - index has been returned such that a[index] == key
*  - If key not in a, return -1.
*/
public int binSearch(int key){
     int low = 0;
     int high = a.length - 1
     while(low <= high){
          int mid = (low - high) / 2;
          if(a[mid] == key)
               return mid;
          else if(a[mid] < key)
               low = mid + 1;
          else
               high = mid - 1;
     }
     return -1;
}
```

A binary search will be performed on the following list,

a[0]	a[1]	a[2]	a[3]	a[4]	a[5]	a[6]	a[7]
4	7	9	11	20	24	30	41

(a) How many iterations will be required to determine that 27 is not in the list?

(b) If the key value searched is 27, what is the search interval (a[?] … a[?]) for each pass through the while loop?

(c) What will be stored in y after executing the following?

```
      int y = binSearch(4)
```

(d) If the test for the while loop is changed to

```
while(low < high)
```

the `binSearch` method does not work as intended. Which value(s) in the given list will not be found?

3. For each of the following sets, how many iterations will be required to find a key value using an iterative binary search algorithm, (Note: 10^3 ~2^{10})

(a) 1000 elements

(b) 2000 elements

(c) 30,000 elements

(d) 600 elements

(e) 1 million elements

4. An array of integer values is to be searched for a prime number. Once a prime number is found the algorithm will return the value of the prime number. If no prime number is found -1 will be returned.

Consider the examples below,

Array 1: 4 6 8 7 Returns 7	Array 2: 4 6 3 7 Returns 3	Array 2: 4 6 9 2 Returns -1

Write the method findPrimes which accepts a one-dimensional array of integer values and returns the first prime number found or returns -1 if no prime numbers are found.