AP Computer Science A
Ticket Out the Door
Set 29: Sorts and Searches

Name _____ Period _____

Skill 29.1 Exercise 1

An insertion sort an algorithm that successively moves the lowest element to the front of a list. Consider the following list,

```
int arr = [1, 3, 5, 6, 0, -1, 2, 10, 4];
```

Write a method call `minToFront`, that accepts a parameter called `front`, which represents the index at the front of the list. In the body of the function, write an algorithm that locates the lowest value in the list and swaps it with the `front` location.

Now that we have an algorithm that moves the lowest item in a list to the front, write another function below called `selectionSort`, that sorts the list from low to high.

If an array contains the following elements, what would the array look like after the third pass of `selectionSort`, sorting from high to low?

89 42 -3 13 109 70 2

AP Computer Science A
Ticket Out the Door
Set 29: Sorts and Searches

Name _____ Period _____

Skill 29.2 Exercise 1

An array of Integer objects is to be sorted from biggest to smallest using the insertionSort method. If the array originally contains the integers below, what will it look like after the third pass of the for loop?

1 7 9 5 4 12

```
public class InsertionSort {
    private Integer[] a;
    public void insertionSort(){
        for(int i = 1; i < a.length;i++){
            Integer temp = a[i];
            int j = i - 1;
            while(j >= 0 && temp.compareTo(a[j]) > 0){
                a[j + 1] = a[j];
                j--;
            }
        a[j + 1] = temp;
        }
    }
}
```

Skill 29.3 Exercise 1

Trace the complete execution of the merge sort algorithm when called on the array below. Show the sub-arrays that are created by the algorithm and show the merging of sub-arrays into larger sorted arrays.

int[] numbers = {8, 5, -9, 14, 0, -1, -7, 3};
mergeSort(numbers);

Sub arrays created	Merging of sub arrays

AP Computer Science A
Ticket Out the Door
Set 29: Sorts and Searches

Name _____ Period _____

Skill 29.4 Exercise 1

Given the following list of numbers [14, 17, 13, 15, 19, 10, 3, 16, 9, 12] what are the contents of the list after the second partitioning according to the quicksort algorithm? (Assume the last value in the array is the initial pivot point)

Skill 29.05 Exercise 1

If an array of Integer objects contain the following elements,

89 42 -3 13 109 70 2

Write the method search, that can be implemented as illustrated below,

```
public static void main(String[] args) {
    int arr[] = {2, 3, 4, 10, 40};
    int x = 10;
    int result = Sequential.search(arr, x);
    if(result == -1)
        System.out.print("Element is not present in array");
    else
        System.out.print("Element is present at index " + result);
}

//complete the search method below.
```

AP Computer Science A
Ticket Out the Door
Set 29: Sorts and Searches

Name _____ Period _____

Skill 29.06 Exercise 1

For which of the following arrays could a binary search be applied? Explain.

{1, 10, 22, 32, 100, 200, 302}

{x, y, z, a, b, c, d, f}

{and, ant, bat, cat, dog, rat}

{300.12, 200, 100, 50, 2, 0, -80}

Skill 29.06 Exercise 2

Consider the following binarySearch method. The method correctly performs a binary search.

```
/** Precondition: data is sorted in increasing order. */

public static int binarySearch(int[] data, int target) {

int start = 0;
int end = data.length - 1;

while (start <= end)   {
     int mid = (start + end) / 2;     /* Calculate midpoint */

     if (target < data[mid])     {
          end = mid - 1;
     }     else if (target > data[mid])     {
          start = mid + 1;
     }     else     {
          return mid;
     }
}
return -1;
}
```

Consider the following code segment.

```
int[] values = {1, 2, 3, 4, 5, 8, 8, 8};
int target = 8;
```

What value is returned by the call binarySearch(values, target) ?

Suppose the binarySearch method is called with an array containing 2,000 elements sorted in increasing order.

What is the maximum number of times that the statement indicated by /* Calculate midpoint */ could execute?