1.main.c

```
#include <stdio.h>
#include <stdlib.h>
#include "header.h"

int main(){
   array a;
   int key, pos;
   init(&a, 5);
   append(&a, 5);
   append(&a, 8);
   append(&a, 9);
   append(&a, 2);
   append(&a, 3);

   bubble_sort(&a);

   printf("Sorted array: \n");
   print_array(&a);

   printf("Enter key to search (Binary Search): ");
   scanf("%d", &key);
   pos = binarySearch(a, key);
   if (pos != -1) printf("Key found at index %d\n", pos);
   else printf("Key not found\n");
   return 0;
}
```

2.header.h

```
typedef struct{
   int *A;
   int size;
   int len;
}array;

void init(array *arr, int size);
void append(array *arr, int d);
void bubble_sort(array *arr);
int binarySearch(array a, int key);
void print_array(array *arr);
```

3.logic.c

```
#include <stdio.h>
#include <stdlib.h>
#include "header.h"

void init(array *arr, int size){
   arr -> A = (int *)malloc(sizeof(int) * size);
   arr -> size = size;
   arr -> len = 0;
}

void append(array *arr, int d){
   if(arr -> len < arr -> size){
      arr -> A[arr -> len++] = d;
   }
}

void bubble_sort(array *arr){
   int temp;
   for(int i = 0; i < arr->len - 1; i++){
      for(int j = 0; j < arr->len - 1 - i; j++){
         if(arr -> A[j] > arr -> A[j+1]){
            temp = arr -> A[j];
            arr -> A[j] = arr -> A[j + 1];
            arr -> A[j + 1] = temp;
         }
      }
   }
}
```

```
int binarySearch(array a, int key) {
   int l, h, mid;
   l = 0;
   h = a.len - 1;

   while (l <= h) {
      mid = (l + h) / 2;
      if (key == a.A[mid])
         return mid;
      else if (key < a.A[mid]) {
         h = mid - 1;
      } else {
         l = mid + 1;
      }
   }
   return -1;
}

void print_array(array *arr) {
   for (int i = 0; i < arr->len; i++) {
      printf("%d ", arr->A[i]);
   }
   printf("\n");
}
```

Output:

```
PS D:\COEP\DSA\Serious\Assignments\Assignment7\2.BinarySearch> gcc -Wall  main.c logic.c
PS D:\COEP\DSA\Serious\Assignments\Assignment7\2.BinarySearch> ./a
Sorted array:
2 3 5 8 9
Enter key to search (Binary Search): 9
Key found at index 4
PS D:\COEP\DSA\Serious\Assignments\Assignment7\2.BinarySearch>
```