# Binary Search

1. Suppose that an array contains the following elements.

| 23 | 27 | 30 | 34 | 41 | 49 | 51 | 55 | 57 | 60 | 67 | 72 | 78 | 83 | 96 |
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   Trace the execution of the binary search algorithm as it searches for the following values:
   a) 72
   b) 41
   c) 62

2. **BinarySearchString.java**: Write a method to search, using the binary search algorithm, for the given string, on the given array of strings. The method should return the location (index) of the item on the array.
   a) Implement the binary search algorithm using simple iteration (loops)
   b) Test the method: write a main method that creates an array of 20 strings that are sorted in alphabetical order. Then, it prompts user to enter a string, then searches for the string and outputs its position or indicates if the string is not present in the array.

3. **BinarySearchDescending.java**: Write a method that implements the binary search algorithm that searches an array of integers that is sorted in descending order. Create the main method to test the method accordingly.

4. **BinarySearchNearest.java**: Write a method that implements the binary search algorithm so that, if a search is unsuccessful, the method will return the index of the value nearest to item, instead of returning -1. (If there is a tie, return the smaller index.) Create the main method to test the method accordingly.

5. What is the maximum number of comparisons that might be necessary to perform a binary search on a list containing
   a) 7 items
   b) 3 items
   c) 15 items
   d) 31 items
   e) 63 items
   f) 100 items
   g) 500 items
   h) 1000 items
   i) 10000 items