Entry Ticket Jan 19

Do **one** of the activities in this ticket.

Activity 1. Define binary search

In your own words, describe the binary search strategy used in the guessing game.

Activity 2. Apply binary search to lists of numbers

Last week, you learned the *binary search* strategy to guess a number between 1 and 100. Your task is applying the binary search strategy to determine if a number is contained in a sorted list.

Example 1: Search for 30 in the list 20,40,50.

The output of your algorithm should be either -1, if the number is not in the list, or the index in the list.

Step 1: Search for 30 in the list *20,40,50*

- 40 is the element in the middle of the list

- Since 30<40, we search in the left sub-list

Step 2: Search for 30 in the list *20,40,50*

- 20 is the element in the middle of the new list

- Since 20<30, we search in the right sub-list

Step 3: Search for 30 in the empty list (*20,40,50*)

- 30 is not in the empty list

- The output is -1.

Index	0	1	2
List element	20	40	50

The execution of the algorithm can be summarized in the table below.

Step	List	Middle	Index of middle in the given list (2,4,5)
1	20,40,50	40	1
2	20,40,50	20	0
3	20,40,50		

Output: -1

Example 2: Search for 8 in the list 3,4,5,6,7,8.

The execution of the algorithm can be summarized in the table below.

Step	List	Middle	Index of middle
1	3,4,~~5~~,6,7,8	5	2
2	~~3,4,5~~,6,~~7~~,8	7	4
3	~~3,4,5,6,7~~,~~8~~	8	5

Output: 5

Your turn: Search for 16 in 1,3,6,7,8,11,12,15,16,29,32,78.

Index	0	1	2	3	4	5	6	7	8	9	10	11	12
List elt.	1	3	6	7	8	11	12	15	16	29	32	78	80

Question 1. Record the steps of the binary search in the table below. Circle the middle and cross-off the parts of the list that are longer considered.

You may not need to fill in the entire table.

Search for 16

Step	List	Middle	Index of middle
1	1, 3, 6, 7, 8, 11, 12, 15, 16, 29, 32, 78	12	6
2	~~1, 3, 6, 7, 8, 11, 12,~~ 15, 16, 29, 32, 78		
3			
4			
5			

Question 2. What is the output of the algorithm?