

BRONX COMMUNITY COLLEGE
Of the City University of New York

Department of Mathematics and Computer Science

CSI30

Chapters 4 and 5 Sample Test

1. Give an algorithm, using pseudocode, that finds the number of non-negative values in the list of integers a_1, \dots, a_n .

2. Take a look at the following algorithm:

Input: a_1, \dots, a_n : integers

Output: won't say

```
procedure m2(a_1, ..., a_n)
  c := 1
  i := 1
  m := a_1
  while i <= n and c != 3:
    if (m = a_i), c := c+1
  End-while
  Return(c)
```

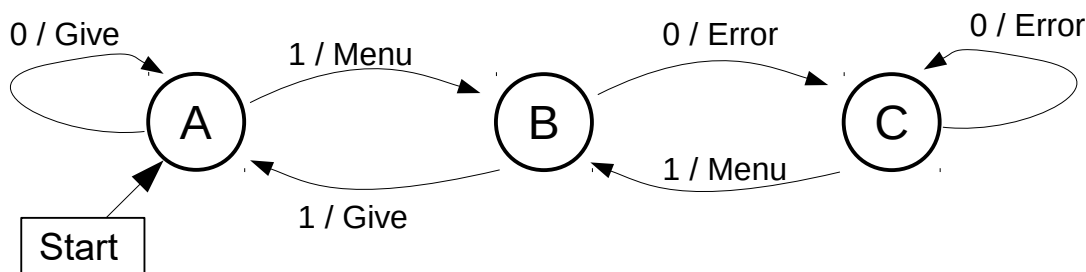
a) when will the while-loop stop?

b) what is returned by the algorithm on the input $\{5, 1, 2, 5, 3, 4, 7, 5, 6, 5, 1, 2\}$?

3. Use **binary search** to find 16 in the following list: 12, 16, 18, 19, 21, 56
Show all the splits, along with the middle elements.

4. We are going to use the **insertion sort** to sort the following list: 6 8 1 7 4. When the algorithm reaches value 1 ($j=3$) what elements will be shifted one space to the right, and where 1 will be placed?

5. For the following Finite State Machine (FSM)



What is the current state and the output after the FSM has processed the following input sequence: 0 1 0 0 1?

6. Consider the following Turing machine:

$$S = \{q_0, q_1, q_3, q_{acc}, q_{rej}\} \quad \Gamma = \{0, 1, 2, *\}$$

	0	1	2	*
q_0	$(q_1, 2, R)$	$(q_0, 1, R)$	$(q_{rej}, 2, R)$	$(q_{acc}, *, L)$
q_1	$(q_1, 0, R)$	$(q_0, 2, R)$	$(q_{rej}, 2, R)$	$(q_{acc}, *, L)$

Show what will the Turing machine produce after it processes the input below and what will be the final state of the machine.

0	1	0	1	0	0	1	1	1	0	0	1	1	1	*	*	...
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