Question 8 [16 marks]:

Perform a binary search on the given sequence of numbers to find each of the following targets. State clearly the values of "First", "Mid", "Last" and the comparison made with the target for each step. Take note that "First", "Mid" and "Last" are numbers that correspond to sequence indices.

1	2	4	7	9	11	17	23	27	30	34	38	43

(a) The target is 38

(b) The target is 25

Q8

Index	0	1	2	3	4	5	6	7	8	9	10	11	12
Seq	1	2	4	7	9	11	17	23	27	30	34	38	43

Q8a Target = 38
Step 1:
F = 0, l = 12, hence mid = $\lfloor (0 + 12)/2 \rfloor = 6$
As target 38 is > Seq[6] = 17, f of step 2 = 6 + 1 = 7, l = 12
Step 2:
F = 7, l = 12, hence mid = $\lfloor (7 + 12)/2 \rfloor = 9$
As target 38 is > Seq[9] = 30 , f of step 3 = 9 + 1 = 10, l = 12
Step 3:
F = 10, l = 12, hence mid = $\lfloor (10 + 12)/2 \rfloor = 11$
As target 38 = Seq[11] = 38, target is found at index 11.

Q8b Target = 25
Step 1:
F = 0, l = 12, hence mid = $\lfloor (0 + 12)/2 \rfloor = 6$
As target 25 is > Seq[6] = 17, f of step 2 = 6 + 1 = 7, l = 12
Step 2:
F = 7, l = 12, hence mid = $\lfloor (7 + 12)/2 \rfloor = 9$
As target 25 is < Seq[9] = 30 , f of step 3 = 7, l of step 3 = 9 – 1 = 8
Step 3:
F = 7, l = 8, hence mid = $\lfloor (7 + 8)/2 \rfloor = 7$
As target 25 is > Seq[7] = 23 , f of step 4 = 7 + 1 = 8, l of step 4 = 8
Step 4:
F = 8, l = 8, hence mid = $\lfloor (8 + 8)/2 \rfloor = 8$
As target 25 < Seq[8] = 27, f of step 5 = 8, l of step 4 = 8 – 1 = 7
Step 5:
F = 8, l = 7, as f > l, there is no such subsequence. Hence, target 25 cannot be found.