4. The following list of eleven **distinct integers** is to be sorted into ascending order.

44	35	73	x	24	58	32	21	61	54	31

The first two passes of bubble sort are

35	44	x	24	58	32	21	61	54	31	73
35	44	24	x	32	21	58	54	31	61	73

(a) Explain why x must satisfy the inequality $45 \leqslant x \leqslant 57$

(2)

(b) Carry out one more pass of bubble sort, showing the result at the end of the pass.

(2)

Given that

- when the numbers are placed in bins of size 120, the lower bound for the number of bins required is five
- when the first-fit decreasing algorithm is used to place the numbers in bins of size 160, x is placed in the second bin, which also contains 54

(c) determine the value of x. You must make your reasoning clear.

(3)

(Total for Question 4 is 7 marks)