Chapter Review 1

1 Bubbling left to right

Initial list	27	15	2	38	16	1
1st pass	15	2	27	16	1	38
2nd pass	2	15	16	1	27	38
3rd pass	2	15	1	16	27	38
4th pass	2	1	15	16	27	38
5th pass	1	2	15	16	27	38

No further changes ∴ sorted

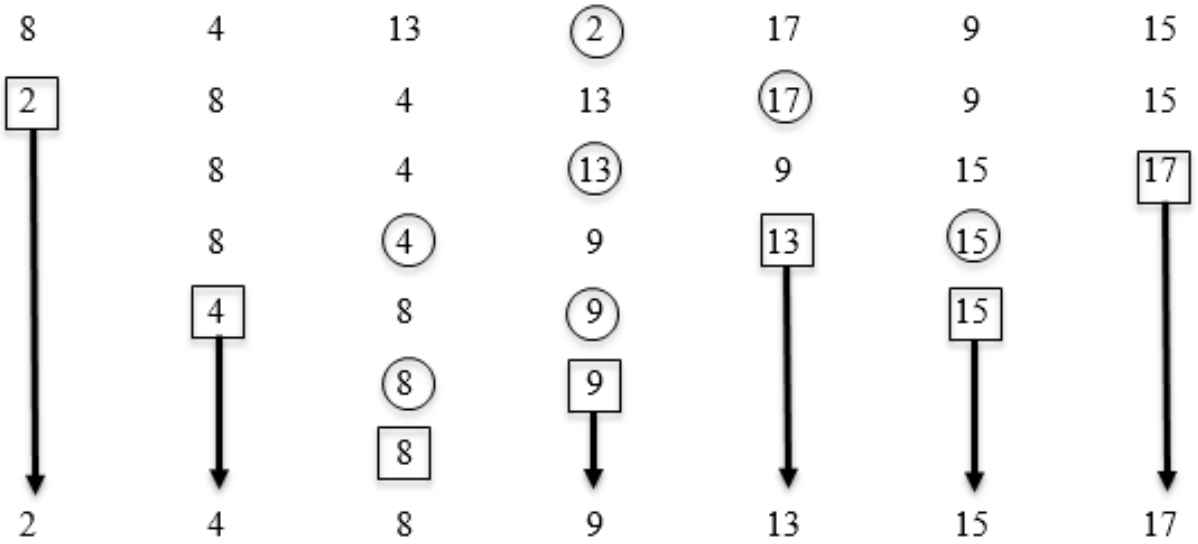
2 a Bubbling left to right

Initial list	25	42	31	22	26	41
1st pass	42	31	25	26	41	22
2nd pass	42	31	26	41	25	22
3rd pass	42	31	41	26	25	22
4th pass	42	41	31	26	25	22

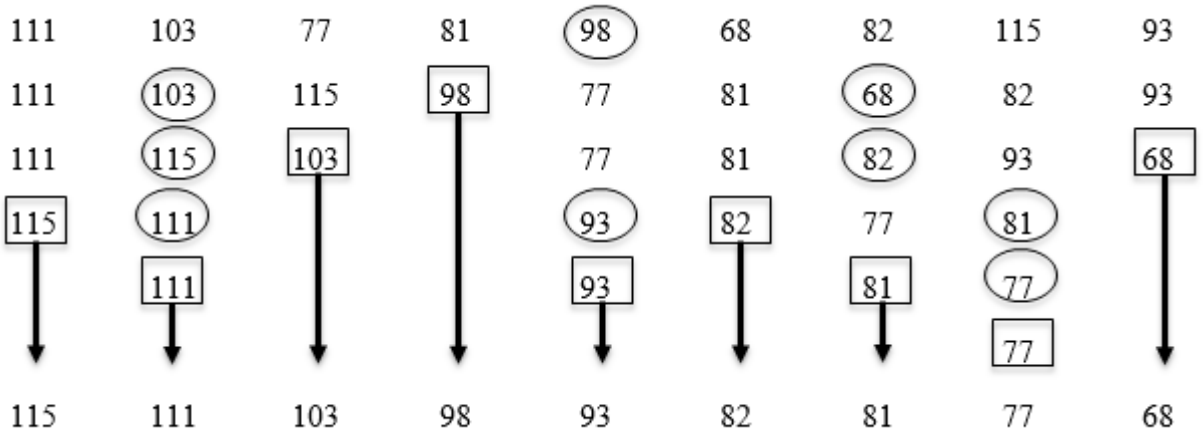
No further changes ∴ sorted

b 15

3



4 a



b i Bin 1: 115 + 82
Bin 2: 111 + 81
Bin 3: 103 + 93
Bin 4: 98 + 77
Bin 5: 68

ii No room in bin 1 (3 left) or bin 2 (8 left) or bin 3 (4 left) but room in bin 4.

5 a Rank the times in descending order and use them in this order. Number the bins starting at 1.
Place each recording time into the first available bin, starting with bin 1 each time.

b

100 92 84 75 60 52 42 30

Bin 1: 100
Bin 2: 92
Bin 3: 84 + 30
Bin 4: 75 + 42
Bin 5: 60 + 52

Unused DVDs = 5 × 120 – (100 + 92 + 84 + 75 + 60 + 52 + 42 + 30)
= 600 – 535
= 65 minutes

c There is room on tape 2 for 28 minutes; one of the 25-minute programmes can be recorded on tape 2. But there is no room on any tape for the second programme.

6 a For example, the length total is 12m so no wastage is permitted. We are therefore seeking a full bin solution.
The two 1.2m lengths cannot be 'made up' to 2m bins since these are only $2 \times 0.4\,\text{m}$ length. Two of these can be used to make a full bin, $1.2 + 0.4 + 0.4$, but the second 1.2m cannot be made up to 2m since there is only 1 remaining 0.4 m length.

b Bin 1: 1.6 + 0.6
Bin 2: 1.4 + 1
Bin 3: 1.2 + 1.2
Bin 4: 1 + 1 + 0.4
Bin 5: 0.6 + 0.6 + 0.6 + 0.4
Bin 6: 0.4

6 c For example:
Bin 1: 1.6 + 0.4 + 0.4
Bin 2: 1.4 + 1
Bin 3: 1.2 + 1.2
Bin 4: 1 + 1 + 0.4
Bin 5: 0.6 + 0.6 + 0.6 + 0.6

7 a

	I	*M*	Box 4	*A*	Temp	Box 6
Initial conditions	1	-		6.1	1.1	
1st pass	2	1.9	No	6.1	1.1	Yes
2nd pass	3	0.7	Yes	5.7	0.7	Yes
3rd pass	4	0.2	Yes	4.8	0.2	Yes
4th pass	5	0.3	No			No

Output = 4.8

b It selects the number nearest to 5.

c It would select the number furthest from 5.

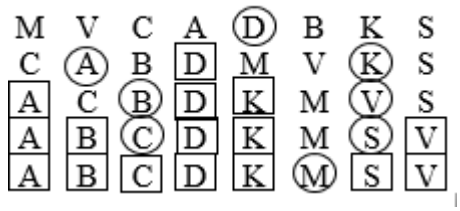
8 a Bubbling left to right
After 1st pass: 2.0 1.3 1.6 0.3 1.3 0.3 0.2 2.0 0.5 0.1
After 2nd pass: 2.0 1.6 1.3 1.3 0.3 0.3 2.0 0.5 0.2 0.1
After 3rd pass: 2.0 1.6 1.3 1.3 0.3 2.0 0.5 0.3 0.2 0.1
After 4th pass: 2.0 1.6 1.3 1.3 2.0 0.5 0.3 0.3 0.2 0.1
After 5th pass: 2.0 1.6 1.3 2.0 1.3 0.5 0.3 0.3 0.2 0.1
After 6th pass: 2.0 1.6 2.0 1.3 1.3 0.5 0.3 0.3 0.2 0.1
After 7th pass: 2.0 2.0 1.6 1.3 1.3 0.5 0.3 0.3 0.2 0.1
After 8th pass: 2.0 2.0 1.6 1.3 1.3 0.5 0.3 0.3 0.2 0.1
No swap in 8th pass, so the list is in descending order.

b Sorting into descending order, 2.0, 2.0, 1.6, 1.3, 1.3, 0.5, 0.3, 0.3, 0.2, 0.1
Bin 1: 2.0
Bin 2: 2.0
Bin 3: 1.6 + 0.3 + 0.1
Bin 4: 1.3 + 0.5 + 0.2
Bin 5: 1.3 + 0.3
5 lengths of pipe needed

c Yes: The lower bound is given by $\frac{2.0+2.0+1.6+1.3+1.3+0.5+0.3+0.3+0.2+0.1}{2} = \frac{9.6}{2} = 4.8$

rounded up to 5 lengths of pipe.

9



There are 8 names in the list, so the pivot should be the name to the right of the middle (Daisy). Starting at the beginning of the list, each name is compared with Daisy and placed on the left side if it comes before D or the right side if it comes after D to produce two sub lists. The process is repeated for each sub-list with pivot of A on the left and K on the right. Select further pivots from within each sub-list and repeat the process until the names are in alphabetical order.

Challenge

a The names are not in ascending alphabetical order and so a binary search cannot be done.

b Starting at the beginning of the list, compare the first two letters. If they are in alphabetical order, leave them in position, otherwise swap them. Continue through the list, to the end, comparing every pair of letters in the same way.

J M C B T H K R G F
J C B M H K R G F T
C B J H K M G F R T
B C H J K G F M R T
B C H J G F K M R T
B C H G F J K M R T
B C G F H J K M R T
B C F G H J K M R T

Bubble sort.
(Alternatively, quick sort could have been used to achieve the same result.)

c The middle name is the $\left(\frac{10+1}{2}=5.5\right)$ 6^{th} name:

6 Jenny
Kim is after Jenny so the list reduces to:
1 Kim
2 Merry
3 Richard
4 Toby

The middle name is the $\left(\frac{4+1}{2}=2.5\right)$ 3rd name:

3 Richard
Kim is before Richard so the list reduces to:
1 Kim
2 Merry

The middle name in this sublist is the $\left(\frac{2+1}{2}=1.5\right)$ 2nd name:

2 Merry
The list reduces to
1 Kim
The search is complete as Kim has been found.