Decision 1 Sorting Questions

2 Use the quicksort algorithm to rearrange the following numbers into ascending order. Indicate clearly the pivots that you use.

<div align="center">

18   23   12   7   26   19   16   24

</div>

(5 marks)

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2 **(a)** Use a shuttle sort to rearrange the following numbers into ascending order.

<div align="center">

18   2   12   7   26   19   16   24

</div>

(5 marks)

(b) State the number of comparisons and swaps (exchanges) for each of the first three passes.

(3 marks)

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4 **(a)** A student is using a bubble sort to rearrange seven numbers into ascending order.

Her correct solution is as follows:

Initial list	18	17	13	26	10	14	24
After 1st pass	17	13	18	10	14	24	26
After 2nd pass	13	17	10	14	18	24	26
After 3rd pass	13	10	14	17	18	24	26
After 4th pass	10	13	14	17	18	24	26
After 5th pass	10	13	14	17	18	24	26

Write down the number of comparisons and swaps on each of the five passes.

(6 marks)

(b) Find the maximum number of comparisons and the maximum number of swaps that might be needed in a bubble sort to rearrange seven numbers into ascending order.

(2 marks)

2 (a) Use a Shell sort to rearrange the following numbers into ascending order, showing the new arrangement after each pass.

$$28 \quad 22 \quad 20 \quad 17 \quad 14 \quad 11 \quad 6 \quad 5$$

(5 marks)

  (b) (i) Write down the number of comparisons on the first pass.   *(1 mark)*

   (ii) Write down the number of swaps on the first pass.   *(1 mark)*

  (c) Find the total number of comparisons needed to rearrange the original list of 8 numbers into ascending order using a shuttle sort.

  (You do not need to perform a shuttle sort.)   *(1 mark)*

Decision 1 Sorting Answers

2	18 23 12 7 26 19 16 24	M1 M1		SCA consistent points
	12 7 16 18 23 26 19 24	A1		1st pass
	7 12 16 18 19 23 26 24	A1		2nd pass
	7 12 16 18 19 23 24 26	A1	5	all correct
	Total		**5**	

(2)(a)	18 2 12 7 26 19 16 24 2 18 12 7 26 19 16 24 2 12 18 7 26 19 16 24 2 7 12 18 26 19 16 24 2 7 12 18 26 19 16 24 2 7 12 18 19 26 16 24 2 7 12 16 18 19 26 24 2 7 12 16 18 19 24 26	M1 A1 A1 A1 A1	 5	Shuttle SCA 1st Pass 3rd Pass 4th Pass All correct
(b)	Pass C S 1 1 1 2 2 1 3 3 2	 B1 B1 B1	 3	 SC All C correct B1 or all S correct B1 or 6,4 scores B1
	Total		**8**	

4(a)	Comparisons Swaps 6 5 5 3 4 2 3 1 2 0	B1B1 B1B1 B1 B1	 6	 Other 3 comparisons Other 3 swaps. Ignore 6th pass
(b)	21 21	B1 B1	 2	
	Total		**8**	

2(a)	28	22	20	17	14	11	6	5	M1		SCA
	14					28					
		11				22					
			6				20				
				5				17	M1		4 sublists
	14	11	6	5	28	22	20	17	A1		correct 1st pass
	6		14		20		28				
		5		11		17		22	M1		2 sublists
	6	5	14	11	20	17	28	22			
	5	6	11	14	17	20	22	28	A1	5	All correct
(b)(i)	4								B1		
(ii)	4								B1	2	
(c)	28								B1	1	
								Total		**8**	