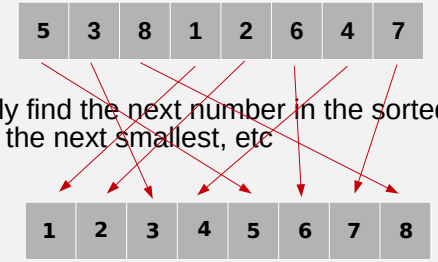
Sorting

- *sorting* refers to putting things in order
- often illustrated with numbers, but the algorithms work with anything where <, >, == can be defined
  - e.g. use `str1.compareTo(str2)` for strings
- often focus on sorting arrays because efficient random access is important
  - for another collection, can copy into an array, sort the array, and copy back without increasing the big-Oh

Sorting

Describe a process for sorting the following array of numbers –



- repeatedly find the next number in the sorted order – the smallest, the next smallest, etc

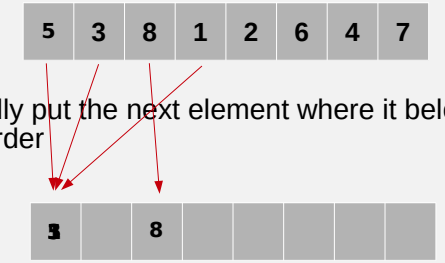
Sorting Algorithms

Selection sort –

	Answer	Respondents	Percentage	
✗	It repeatedly puts the next element from the unsorted part of the array into its correct position within the sorted array.	0	0%	
✗	It repeatedly switches the order of adjacent elements if they are out of order.	1	4%	← this is bubble sort
✓	It repeatedly finds the smallest element and moves it to the beginning.	8	35%	← also valid (and perhaps more common)
✓	It repeatedly finds the largest element and moves it to the end.	14	61%	← the book's description of selection sort

Sorting

Describe a process for sorting the following array of numbers –



- repeatedly put the next element where it belongs in the sorted order

Sorting Algorithms

Insertion sort –

	Answer	Respondents	Percentage	
✓	It repeatedly puts the next element from the unsorted part of the array into its correct position within the sorted array.	13	87%	
×	It repeatedly switches the order of adjacent elements if they are out of order.	1	7%	this is bubble sort
×	It repeatedly finds the smallest element and moves it to the beginning.	1	7%	this is selection sort
×	It repeatedly finds the largest element and moves it to the end.	0	0%	

Sorting Algorithms in Real Life

Answer	selection sort	insertion sort	Distractors
A judge at a dog show assembling the final lineup of winners by pointing to the first place finisher and having them come forward to join the line, then pointing to the second place finisher and having them come forward to join the line, and so forth.	✓ 14	0	0
Going through your to-do list to find the shortest task to do first, then the next shortest, and so on.	✓ 14	0	0
A librarian reshelving a pile of books by repeatedly taking the next one off the pile and putting it in its correct place on the shelf.	1	✓ 13	0
When a player picks up a new card, they put it in the correct position within their existing sorted hand.	0	✓ 14	0

Sorting Algorithms in Real Life

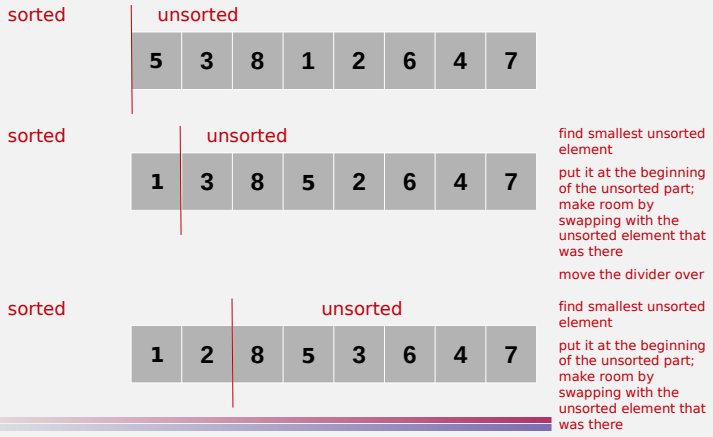
Answer	selection sort	insertion sort	Distractors	
A tournament where competitors are paired up repeatedly, and the winner of each pair moves on to the next round until a final winner is determined.	4	0	✓ 10	not really fully sorting (partial order)
Students lining up in height order for a class photo, where each person looks at those standing to their immediate right and left and switches places if they are out of order.	0	6	✓ 8	this is bubble sort

In-Place Sorting

- *in place* means rearranging the elements within the original array
  - idea – maintain a dividing line between the sorted part at the beginning of the array and the unsorted part at the end

In-Place Sorting

- selection sort



find smallest unsorted element

put it at the beginning of the unsorted part; make room by swapping with the unsorted element that was there

move the divider over

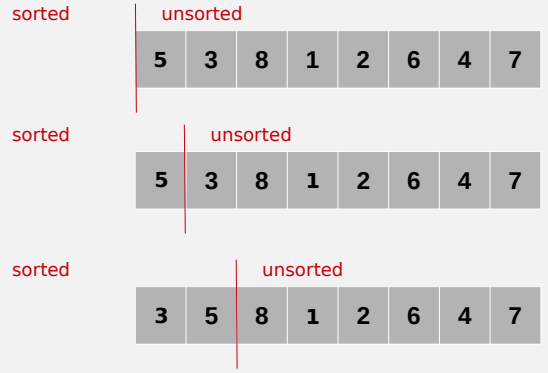
find smallest unsorted element

put it at the beginning of the unsorted part; make room by swapping with the unsorted element that was there

move the divider over

In-Place Sorting

- insertion sort



[put the first unsorted element into the correct spot in the sorted part, shifting sorted elements into the first unsorted spot to make room]

move the divider over

put the first unsorted element into the correct spot in the sorted part, shifting sorted elements into the first unsorted spot to make room

move the divider over