Sorting

Michael R. Nowak

Texas A&M University

Acknowledgement: Lecture slides based on those created by
J. Michael Moore

Sorting Algorithms

- There are lots of ways to sort
  - you will implement several in CSCE 221
- C++ STL has built in sorting
  - So do many other languages
- Still very useful to know how to implement
  - Good first algorithm to code
  - Even a small amount of code can be tricky

Selection Sort

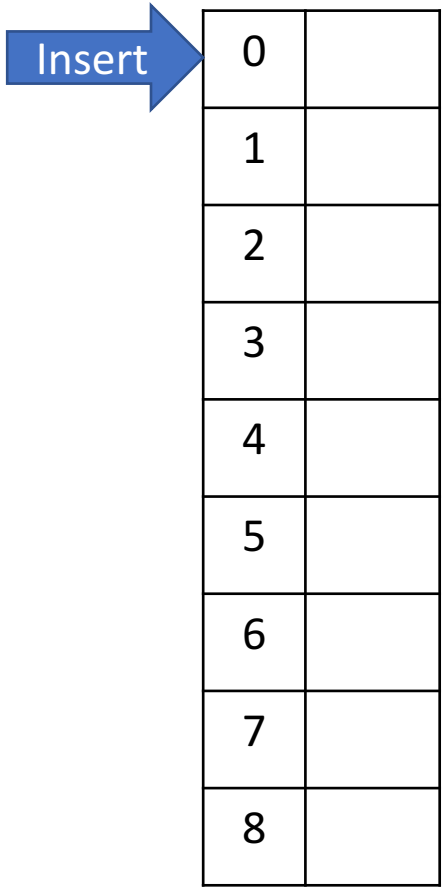
- Start with an ‘empty’ list.
- While we still have values to insert,
  - Find smallest value and put at end of list.

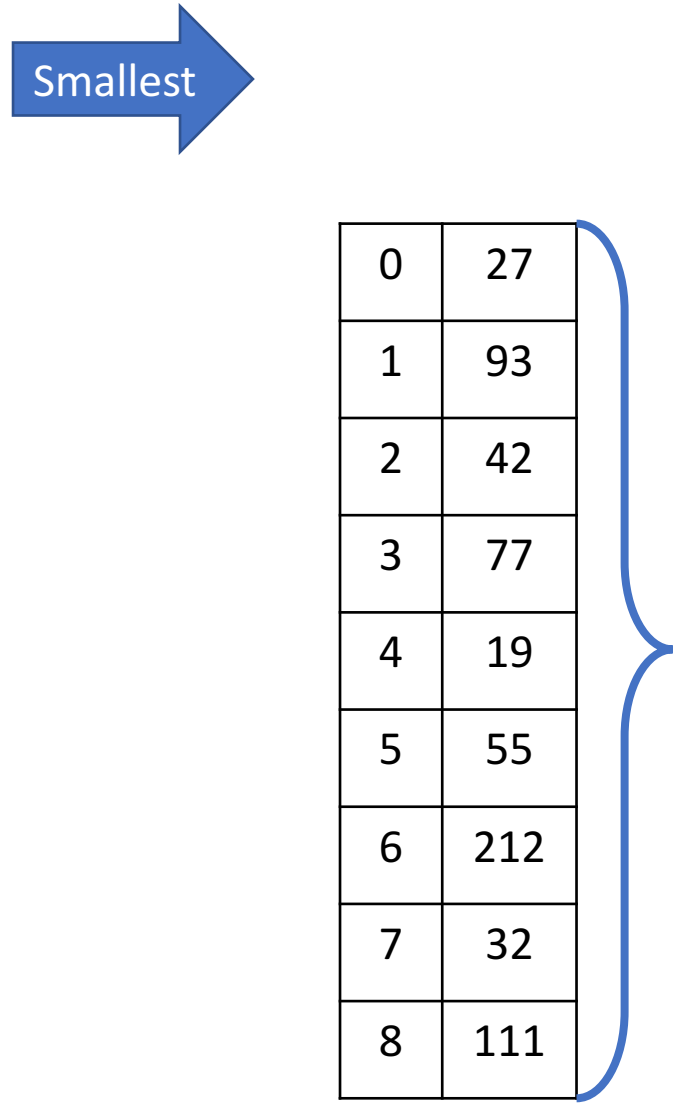
Outer Loop

Inner Loop

Selection Sort

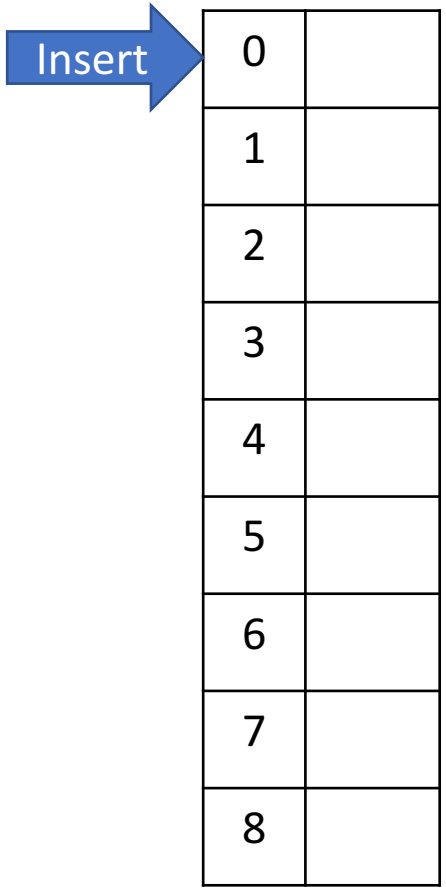
- Start with an ‘empty’ list.
- While we still have values to insert,
  - Find smallest value and put at end of list.

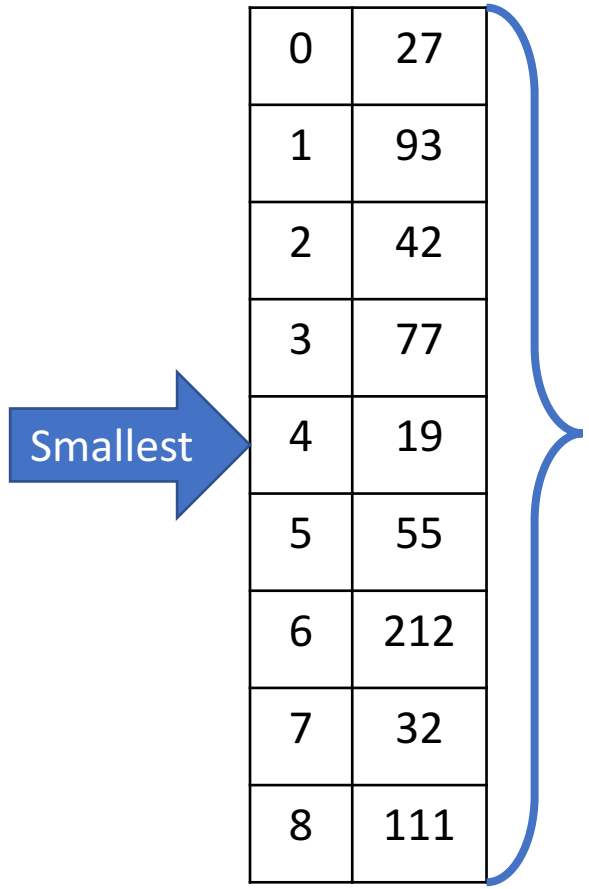




Selection Sort

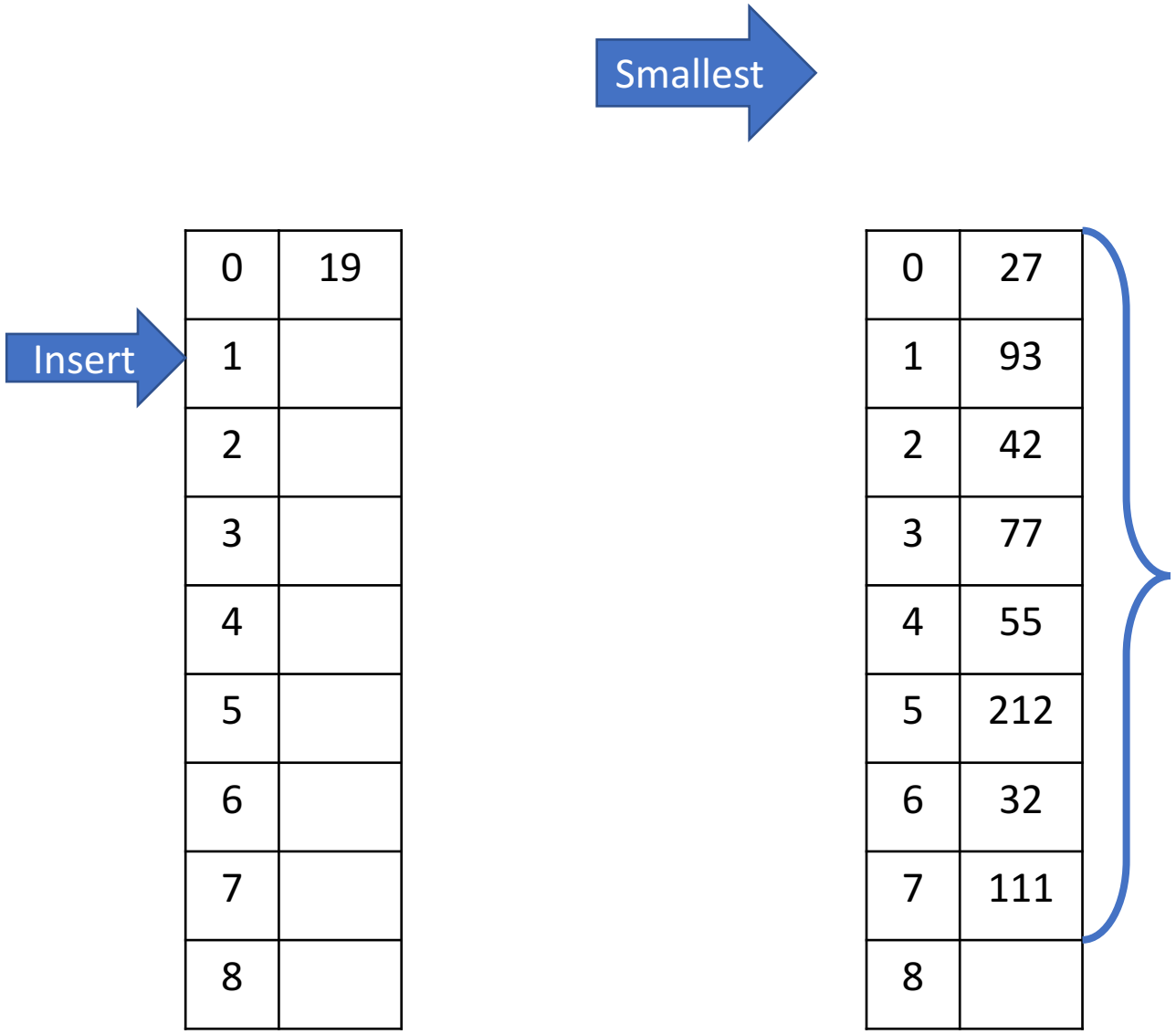
- Start with an ‘empty’ list.
- While we still have values to insert,
  - Find smallest value and put at end of list.





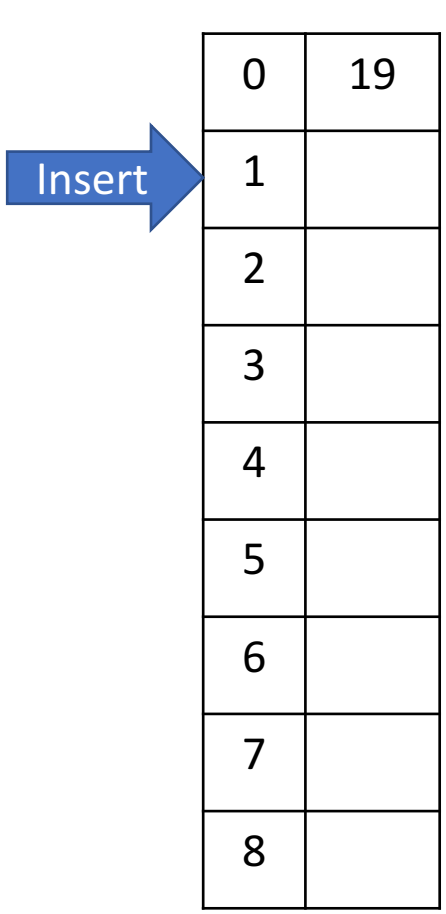
Selection Sort

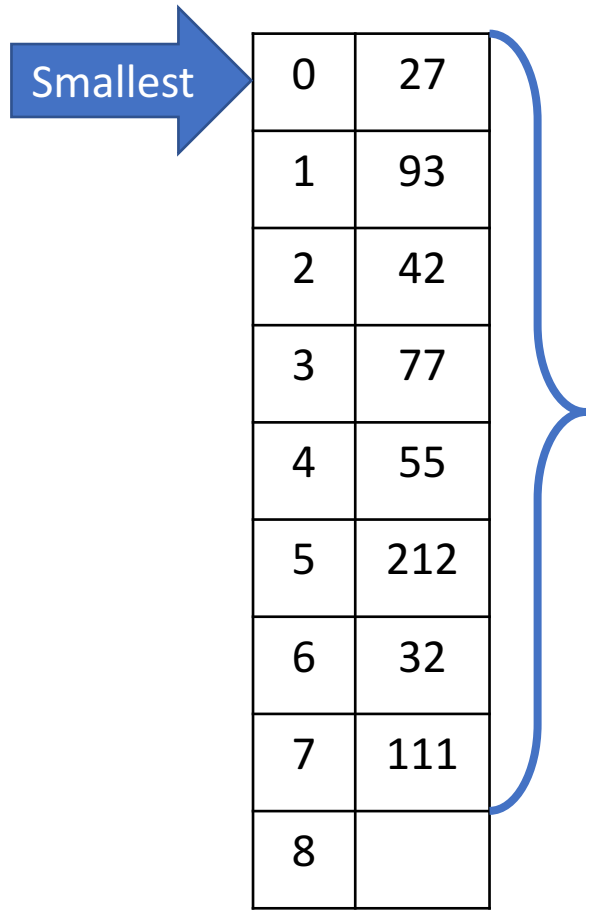
- Start with an ‘empty’ list.
- While we still have values to insert,
  - Find smallest value and put at end of list.



Selection Sort

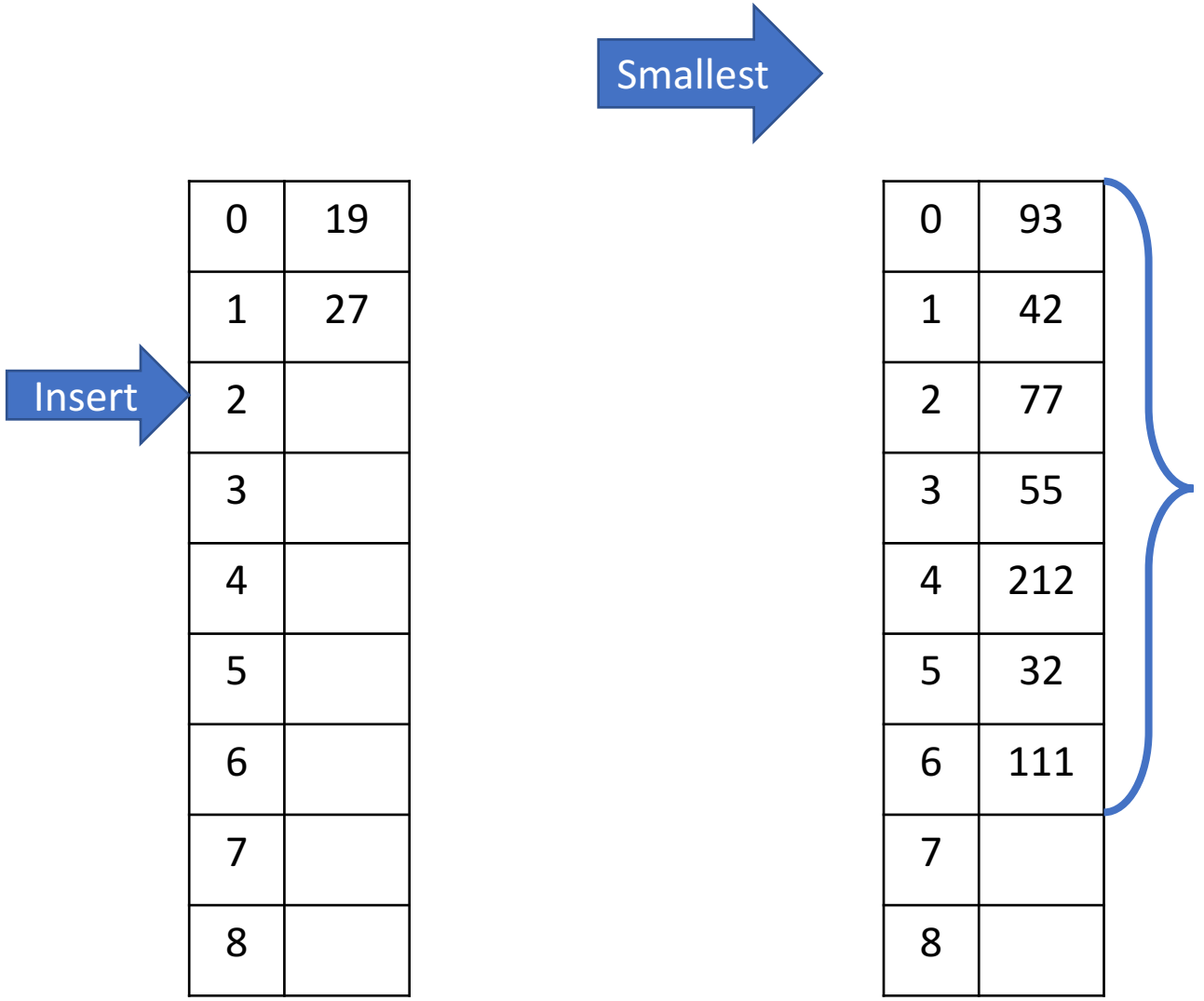
- Start with an ‘empty’ list.
- While we still have values to insert,
  - Find smallest value and put at end of list.





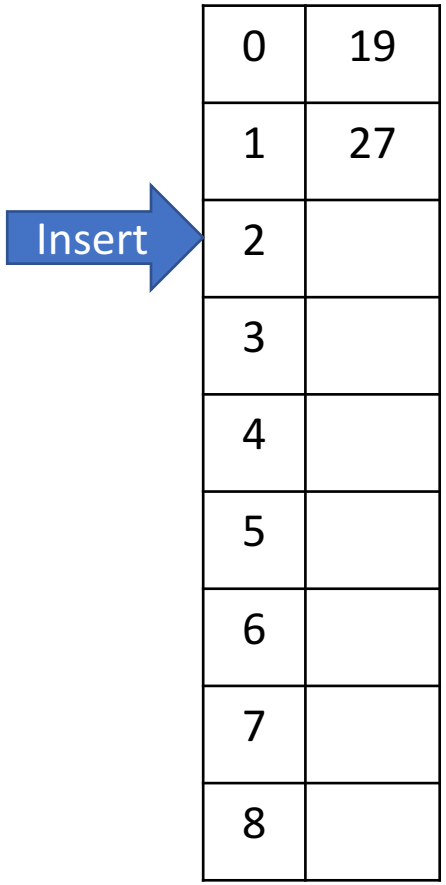
Selection Sort

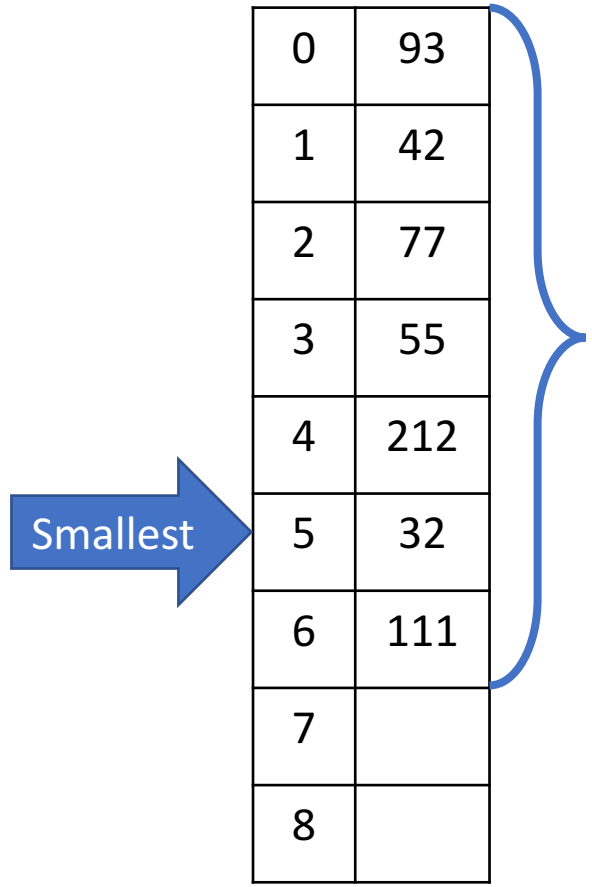
- Start with an ‘empty’ list.
- While we still have values to insert,
  - Find smallest value and put at end of list.



Selection Sort

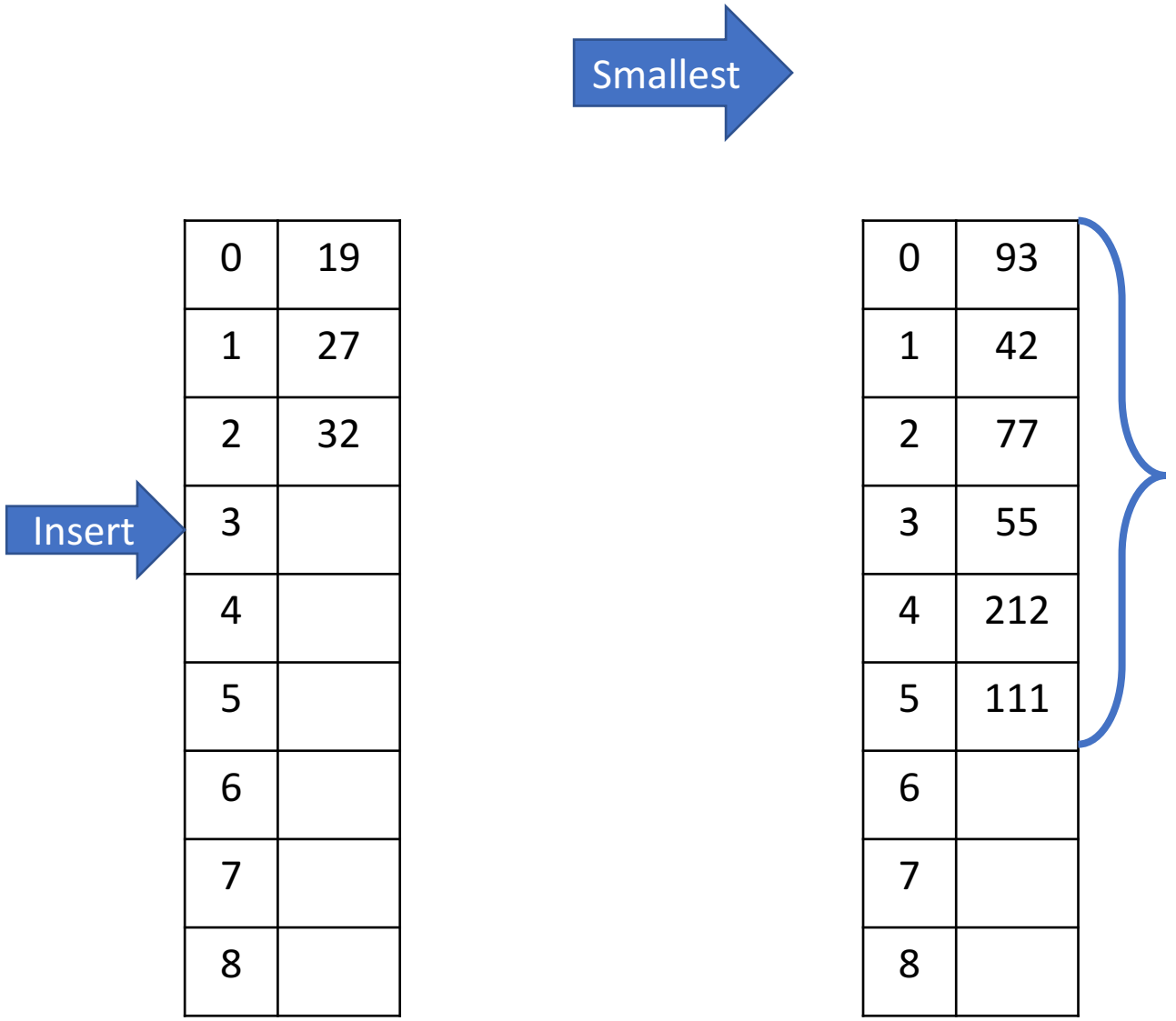
- Start with an ‘empty’ list.
- While we still have values to insert,
  - Find smallest value and put at end of list.





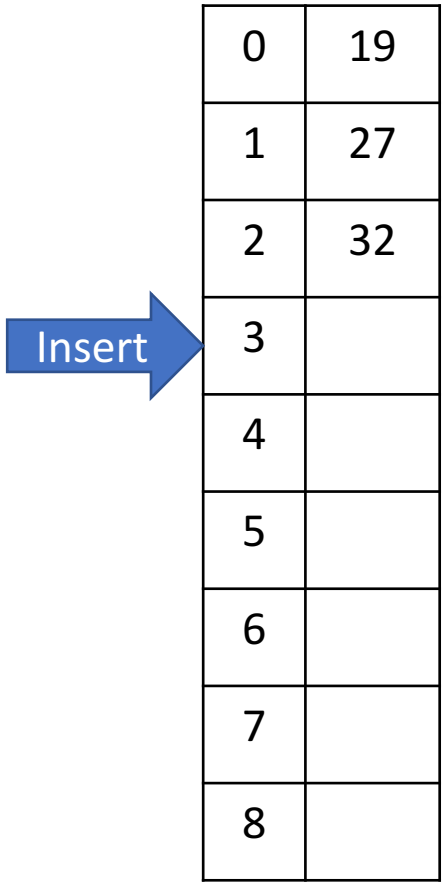
Selection Sort

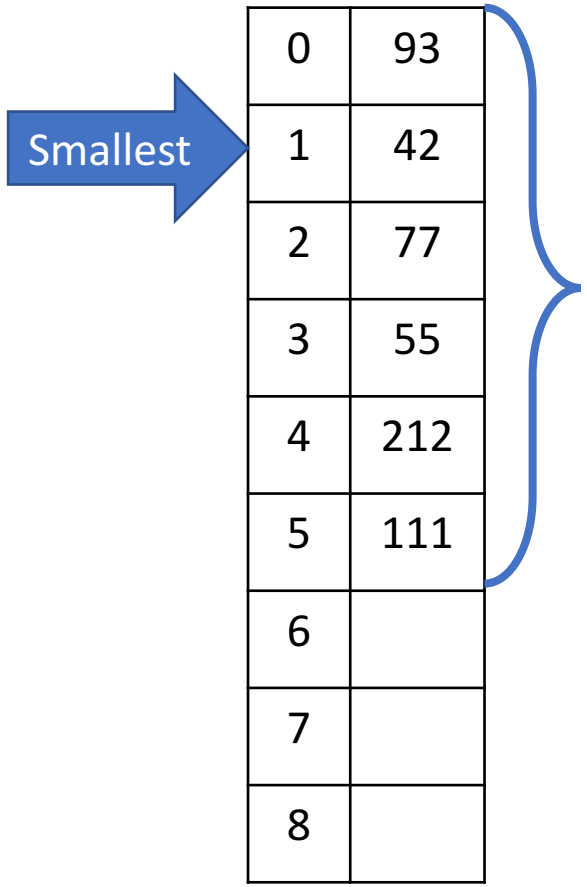
- Start with an ‘empty’ list.
- While we still have values to insert,
  - Find smallest value and put at end of list.



Selection Sort

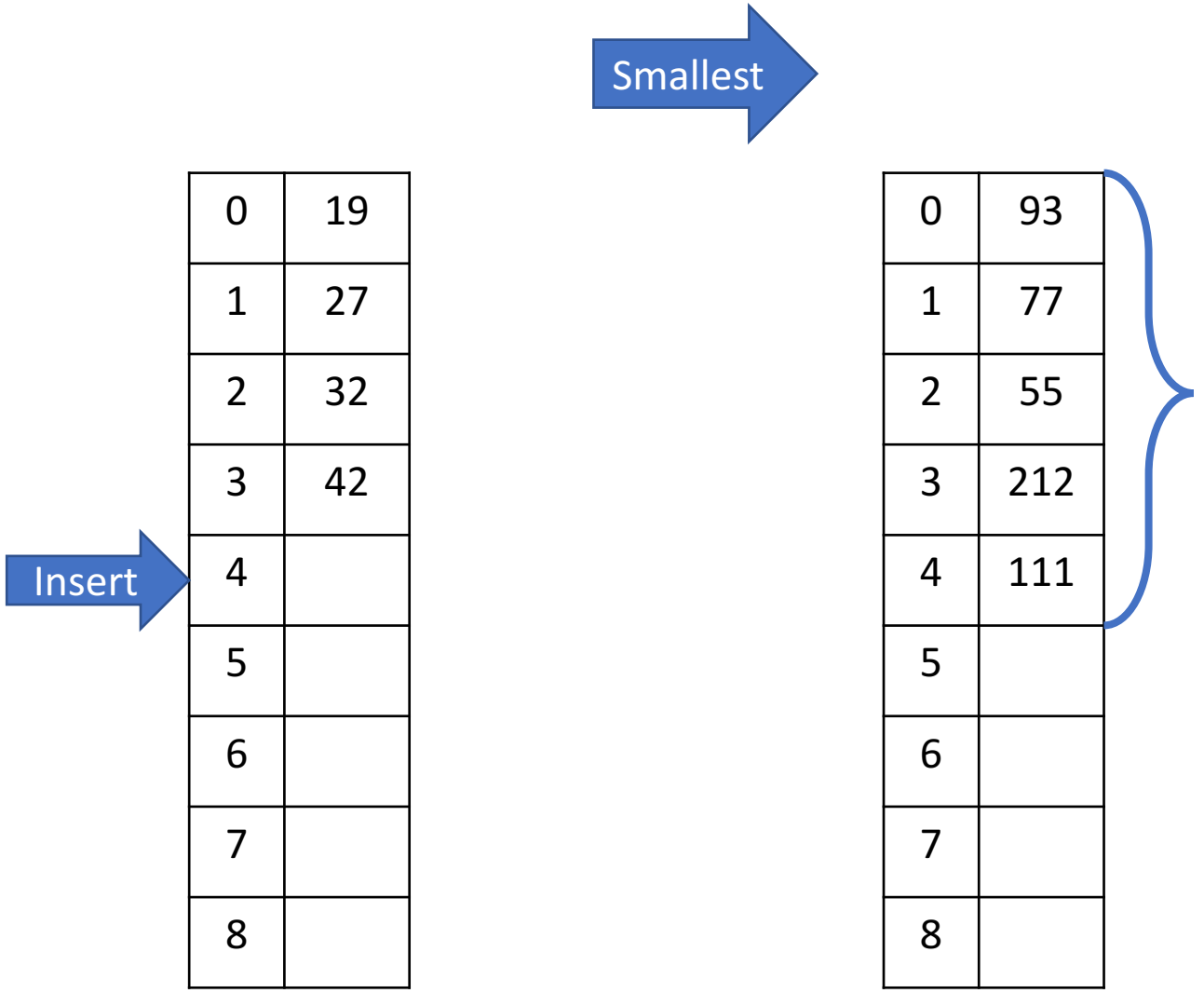
- Start with an ‘empty’ list.
- While we still have values to insert,
  - Find smallest value and put at end of list.





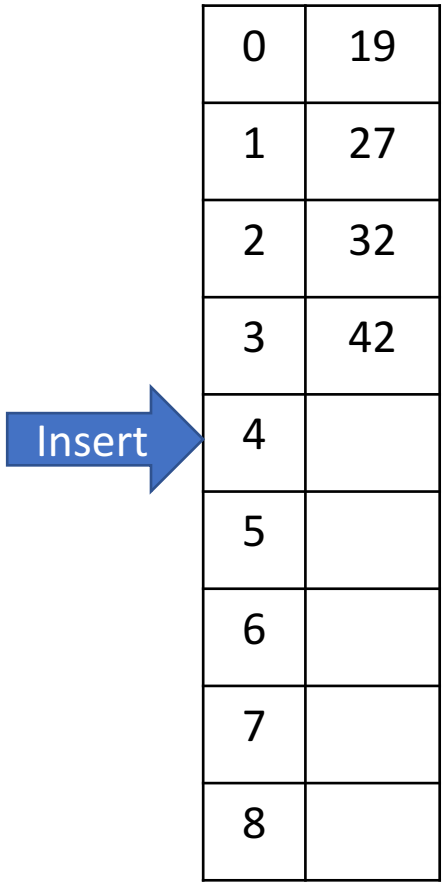
Selection Sort

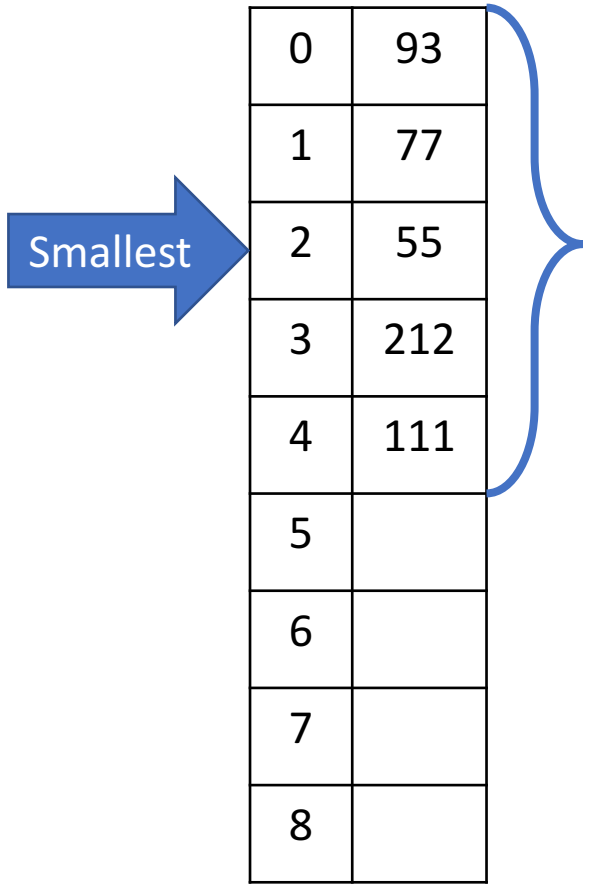
- Start with an ‘empty’ list.
- While we still have values to insert,
  - Find smallest value and put at end of list.



Selection Sort

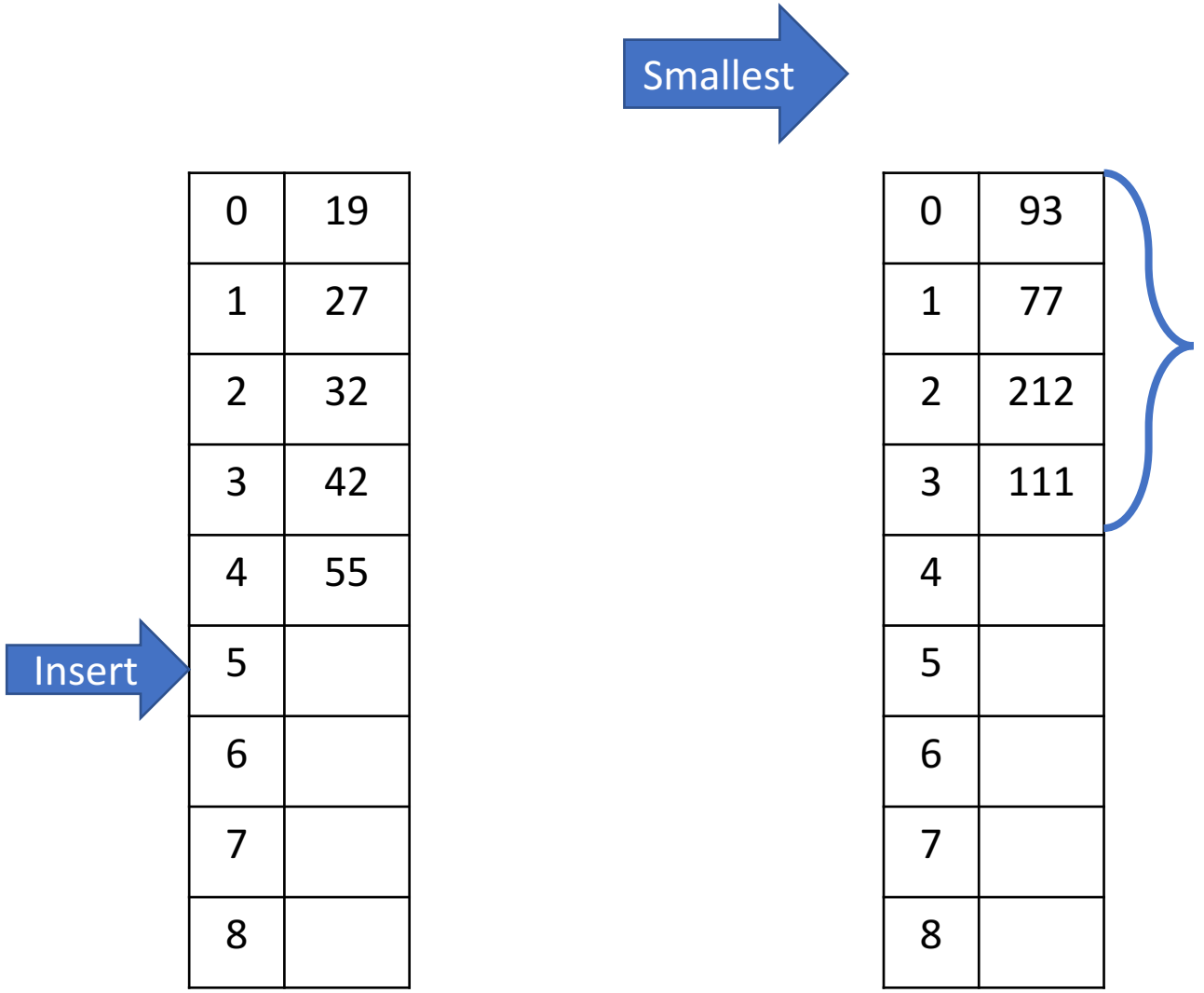
- Start with an ‘empty’ list.
- While we still have values to insert,
  - Find smallest value and put at end of list.





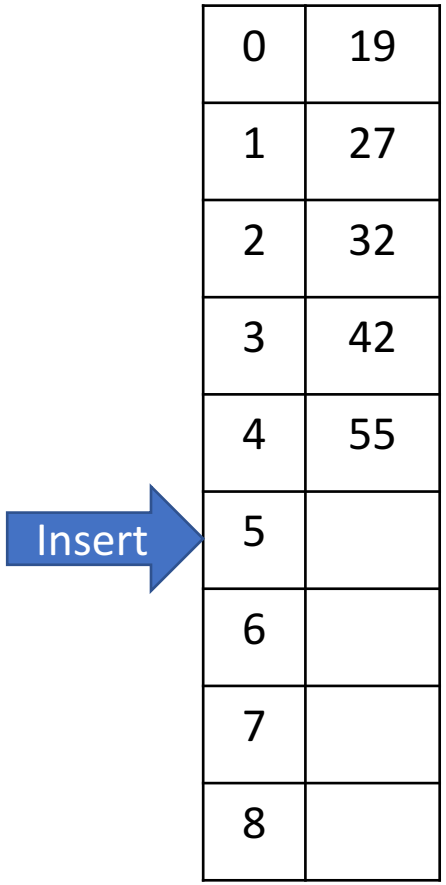
Selection Sort

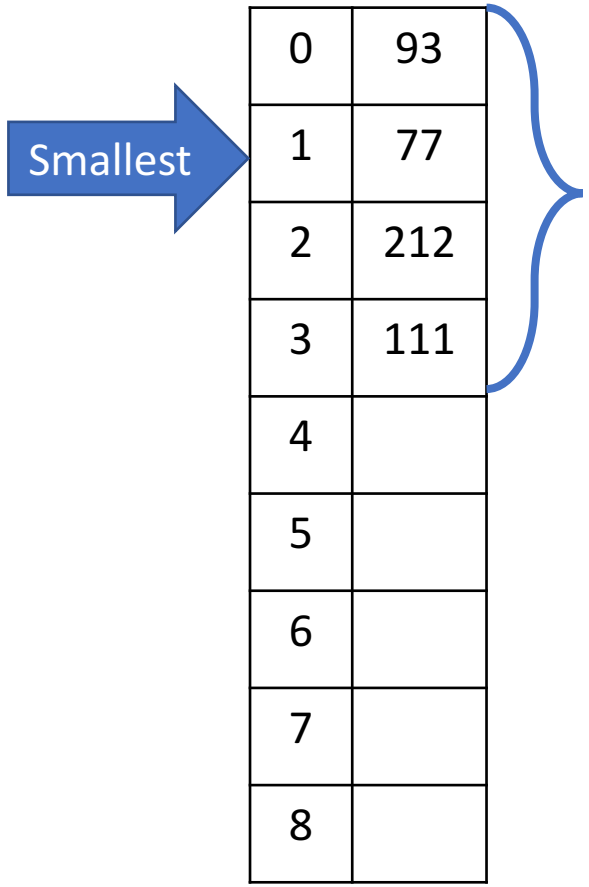
- Start with an ‘empty’ list.
- While we still have values to insert,
  - Find smallest value and put at end of list.



Selection Sort

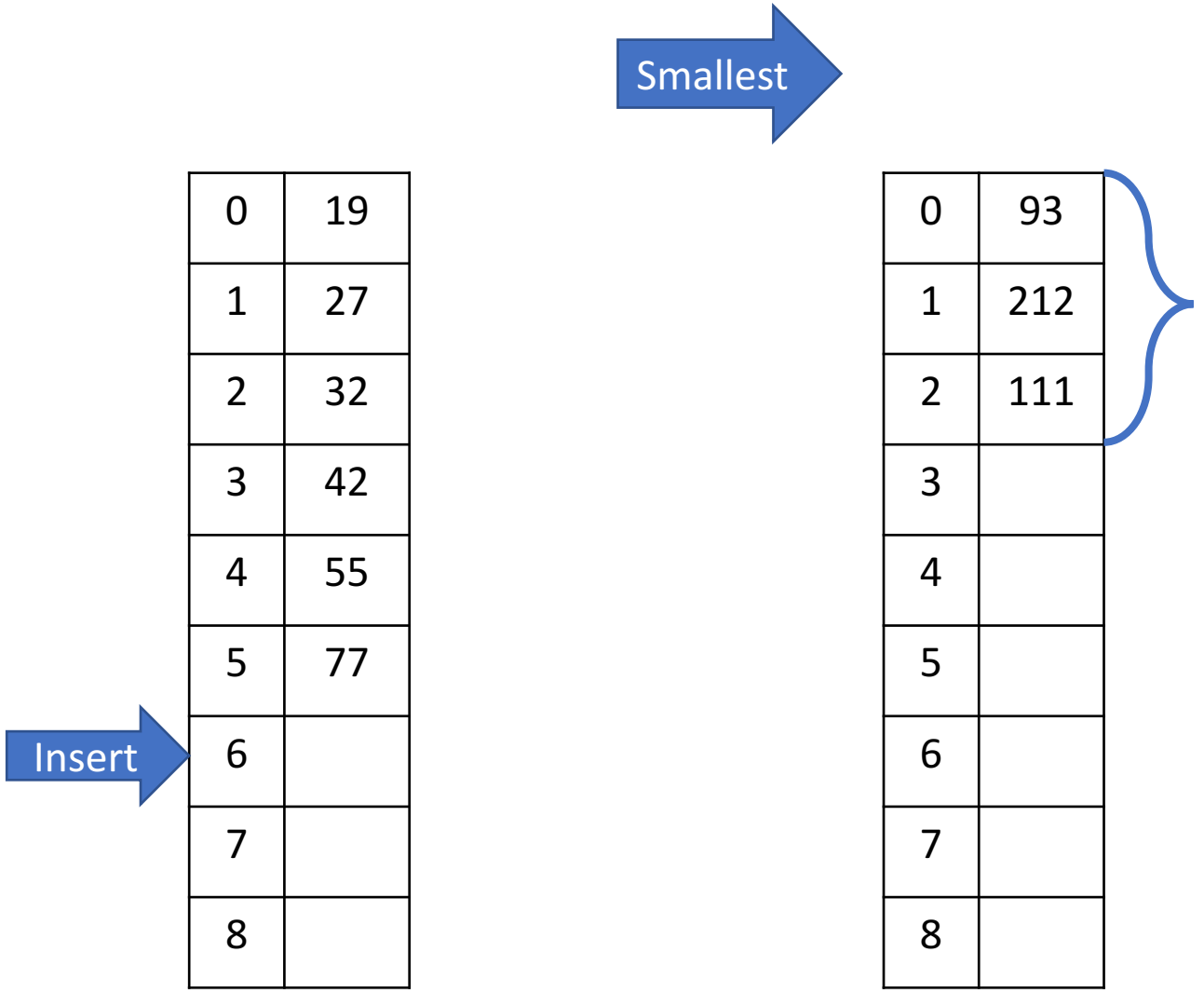
- Start with an ‘empty’ list.
- While we still have values to insert,
  - Find smallest value and put at end of list.





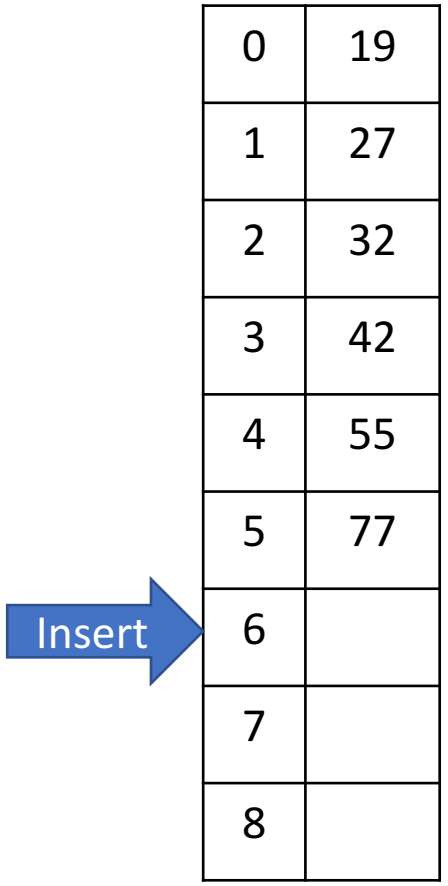
Selection Sort

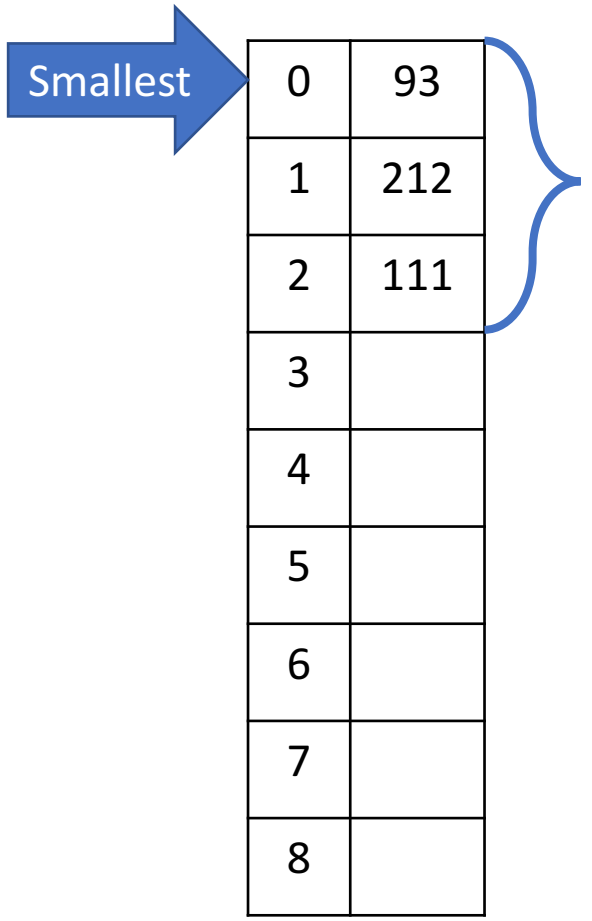
- Start with an ‘empty’ list.
- While we still have values to insert,
  - Find smallest value and put at end of list.



Selection Sort

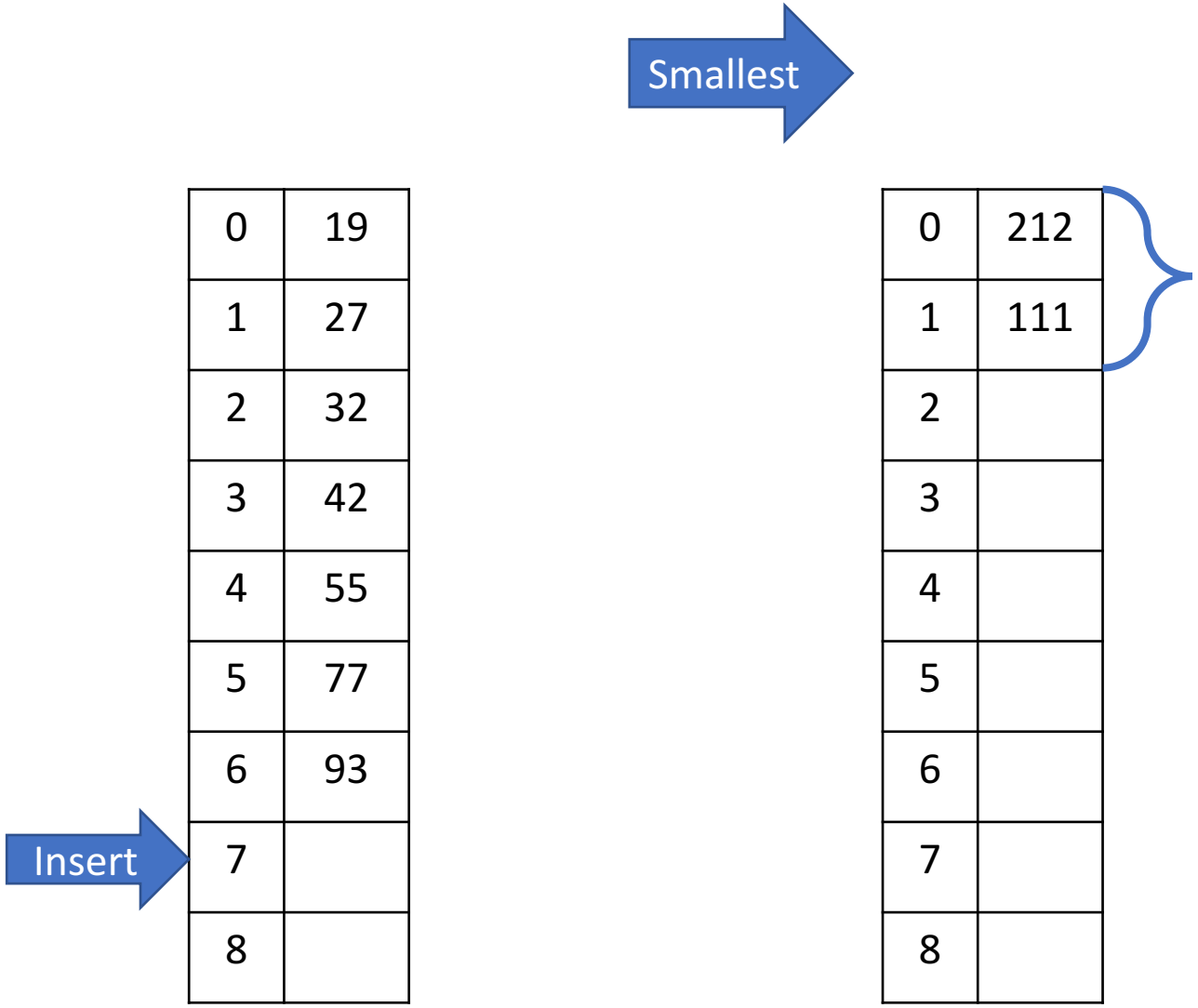
- Start with an ‘empty’ list.
- While we still have values to insert,
  - Find smallest value and put at end of list.





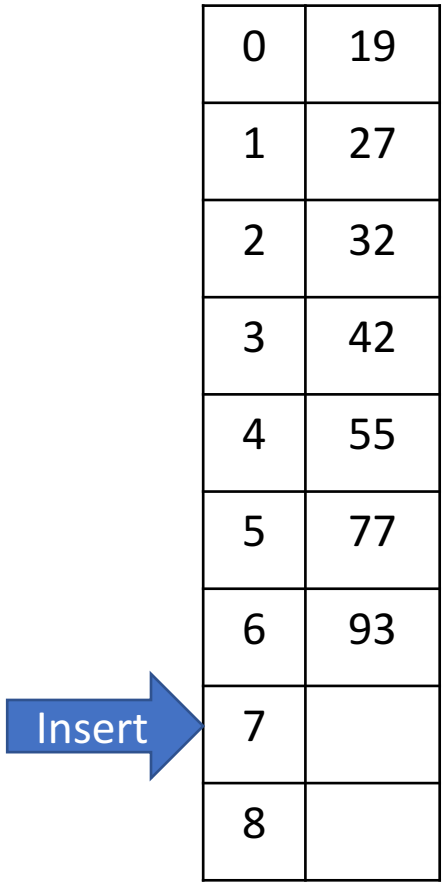
Selection Sort

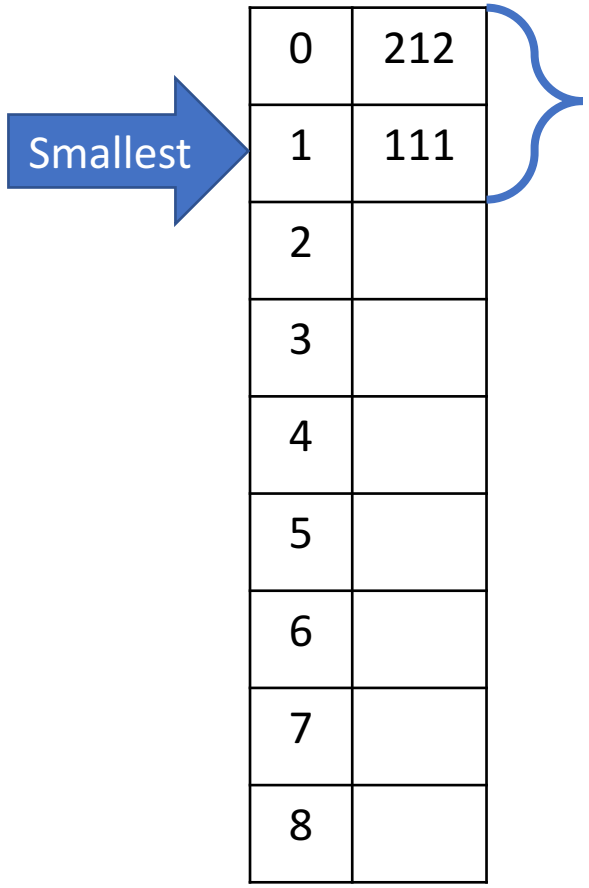
- Start with an ‘empty’ list.
- While we still have values to insert,
  - Find smallest value and put at end of list.



Selection Sort

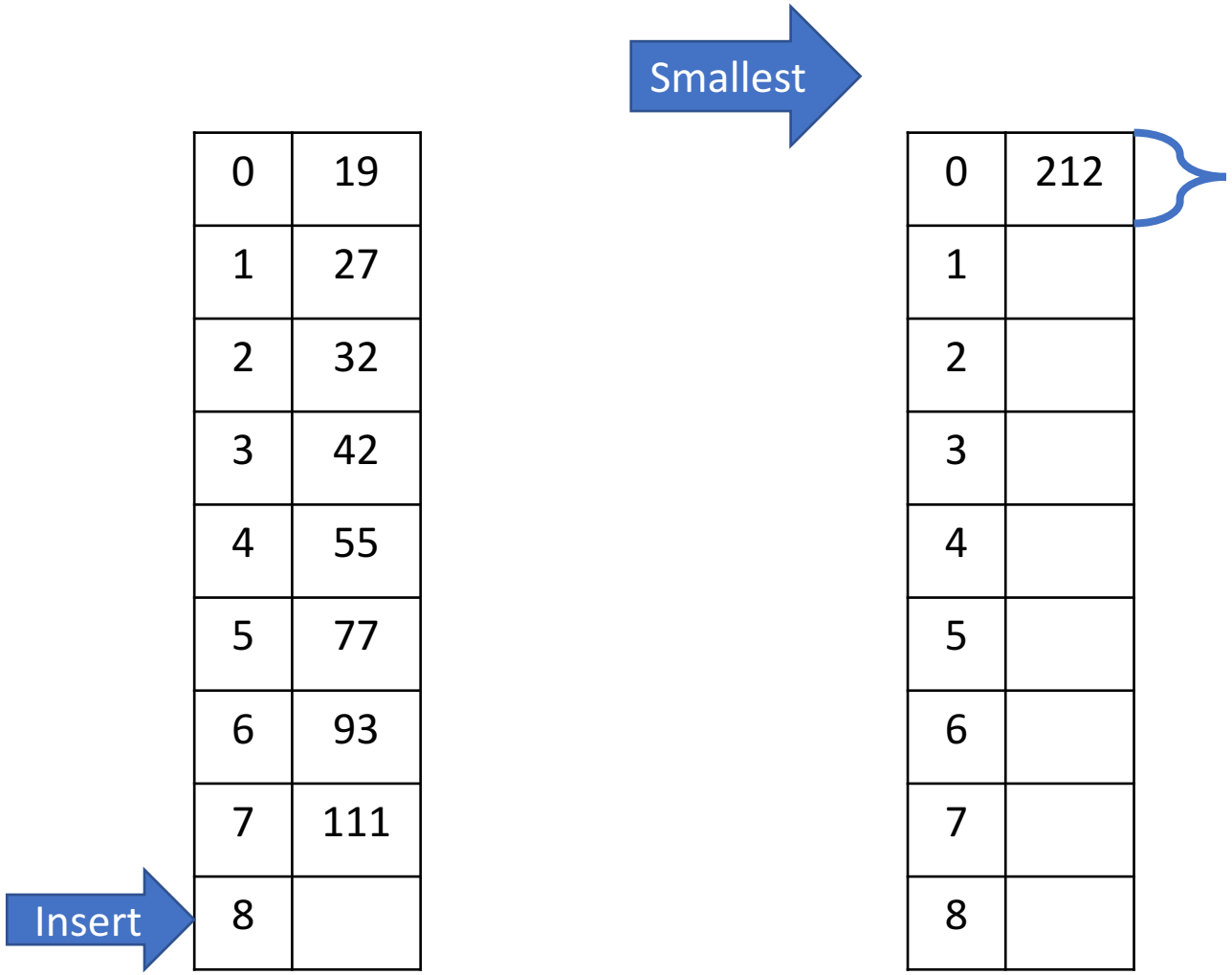
- Start with an ‘empty’ list.
- While we still have values to insert,
  - Find smallest value and put at end of list.





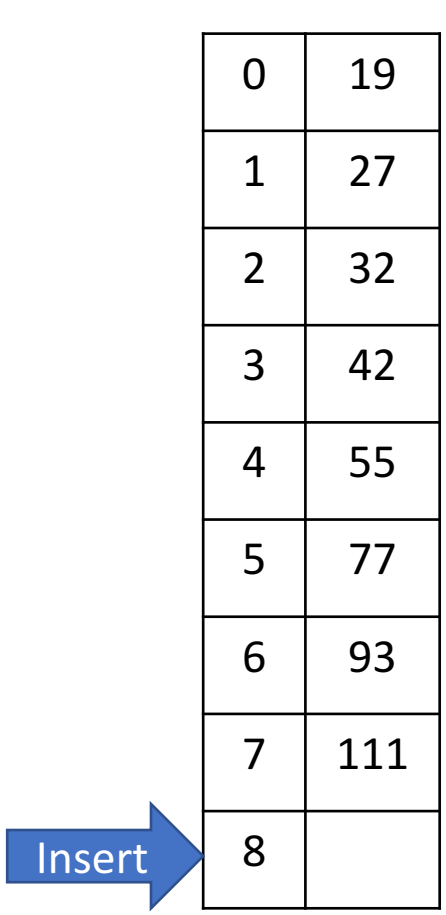
Selection Sort

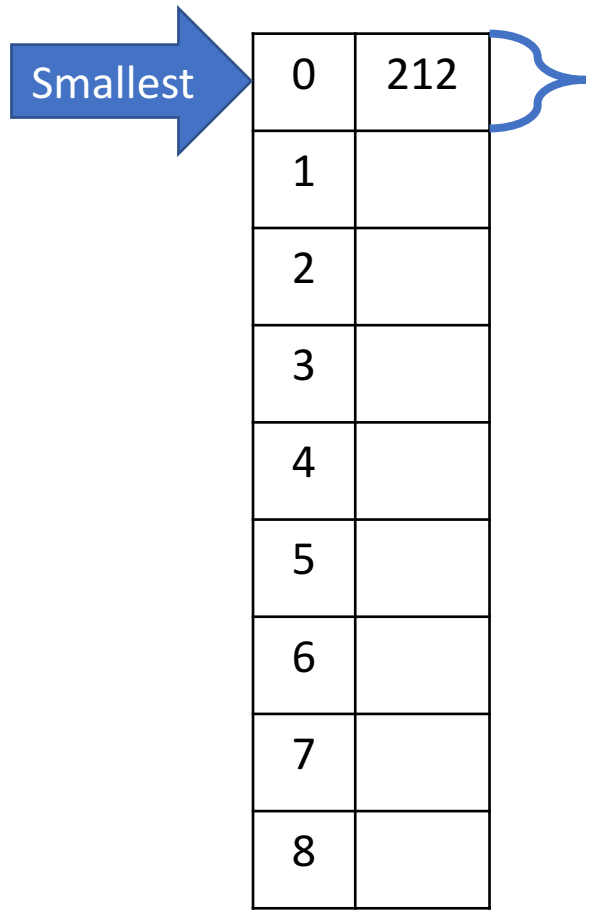
- Start with an ‘empty’ list.
- While we still have values to insert,
  - Find smallest value and put at end of list.



Selection Sort

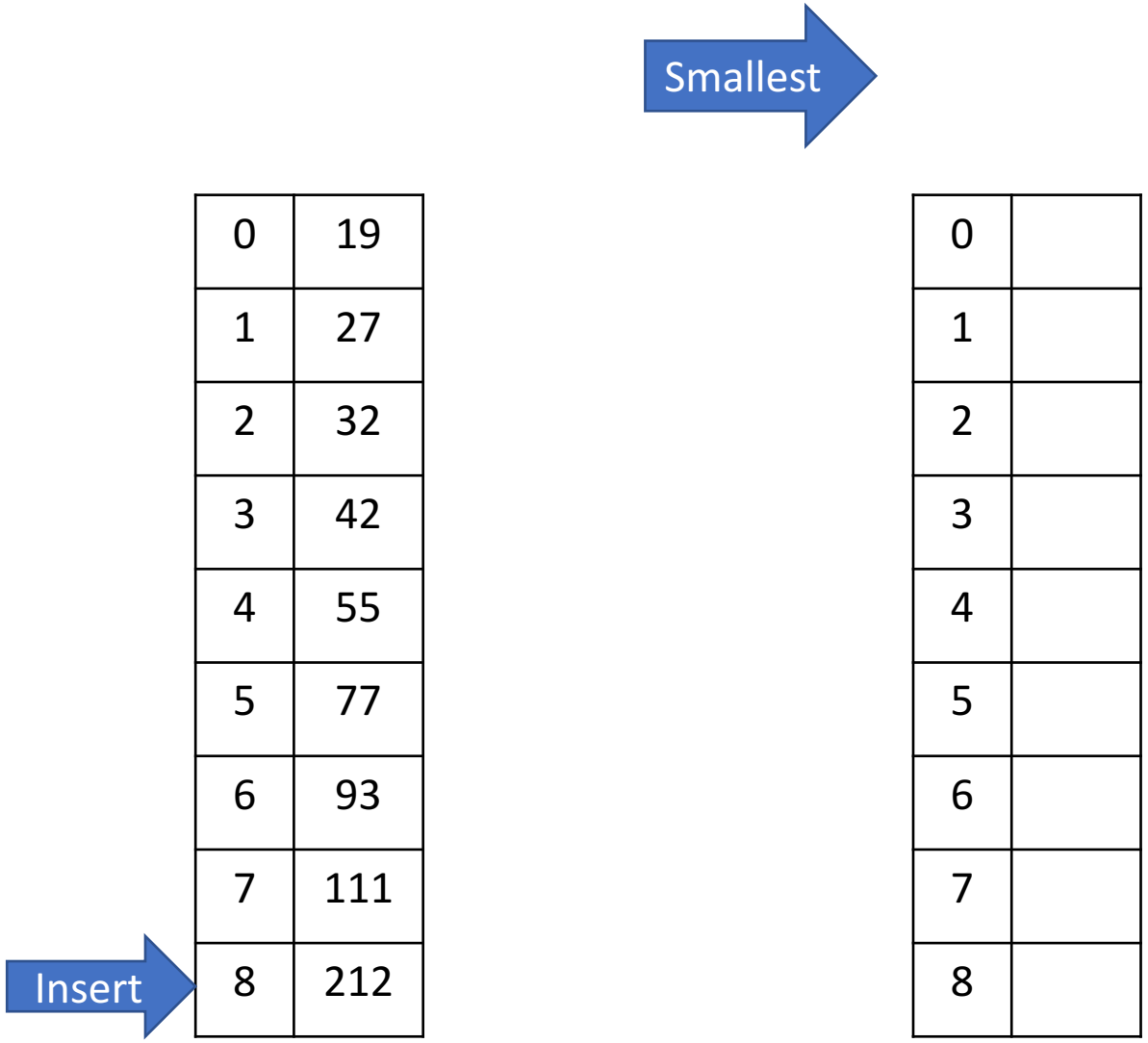
- Start with an ‘empty’ list.
- While we still have values to insert,
  - Find smallest value and put at end of list.





Selection Sort

- Start with an ‘empty’ list.
- While we still have values to insert,
  - Find smallest value and put at end of list.



Selection Sort

- Start with an ‘empty’ list.
- While we still have values to insert,
  - Find smallest value and put at end of list.

Sorted!

0	19
1	27
2	32
3	42
4	55
5	77
6	93
7	111
8	212

0	
1	
2	
3	
4	
5	
6	
7	
8	

Improve?

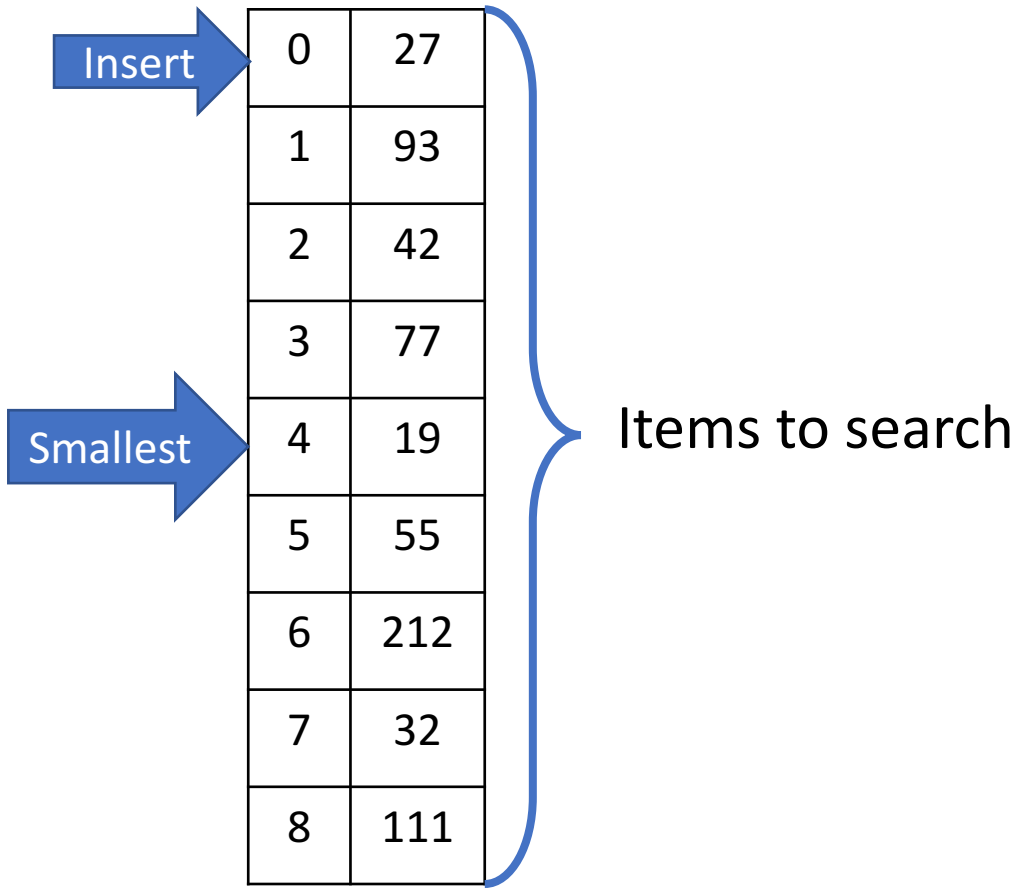
- Created a second vector.
  - Do we have to?
    - NO!
- Keep sorted list and remaining items to place in the same vector.
- When we start
  - the sorted list has size 0 (zero)
  - the number of items to place is the size of the list
- Start with the place to insert at zero
  - Find smallest starting from the place to insert
  - Swap smallest with item in the place to insert
  - Increment place to insert

Selection Sort (Second Version)

- Set place to insert to first location in list
- While we still have values to insert,
  - Find smallest value and swap with location to insert.
  - Increment place to insert

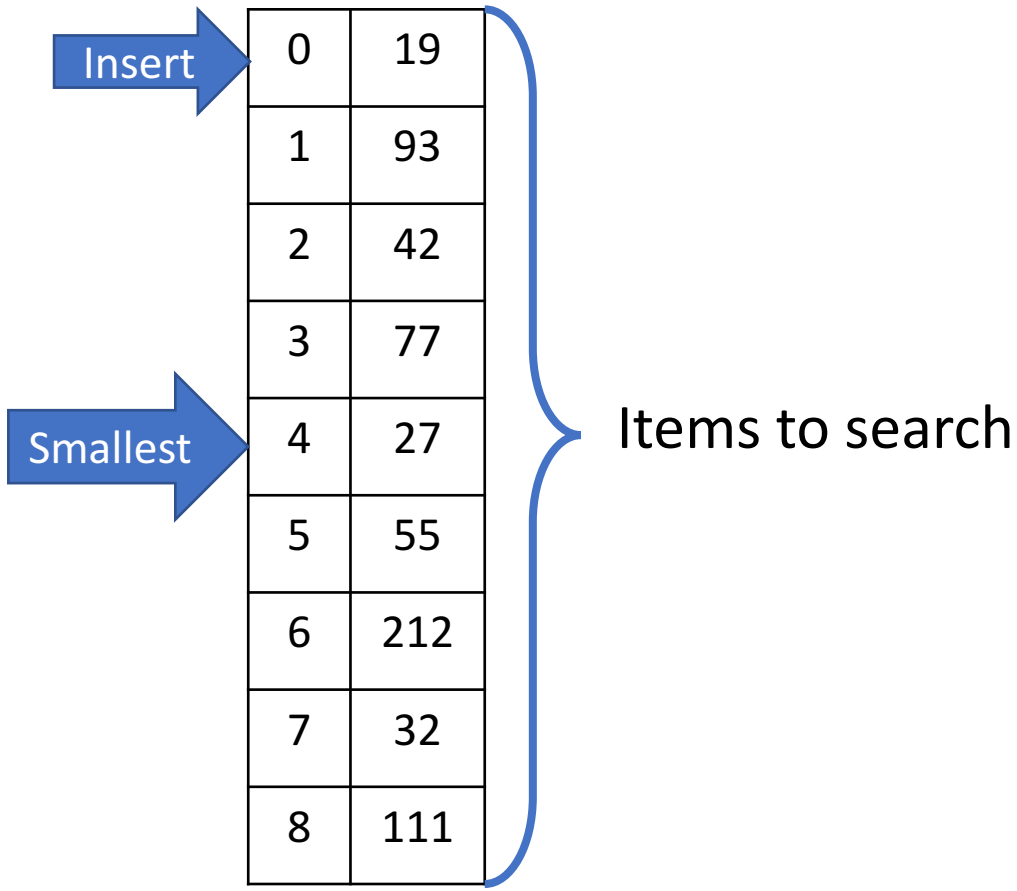
Selection Sort

- Set place to insert to first location in list
- While we still have values to insert,
  - Find smallest value and swap with location to insert
  - Increment place to insert



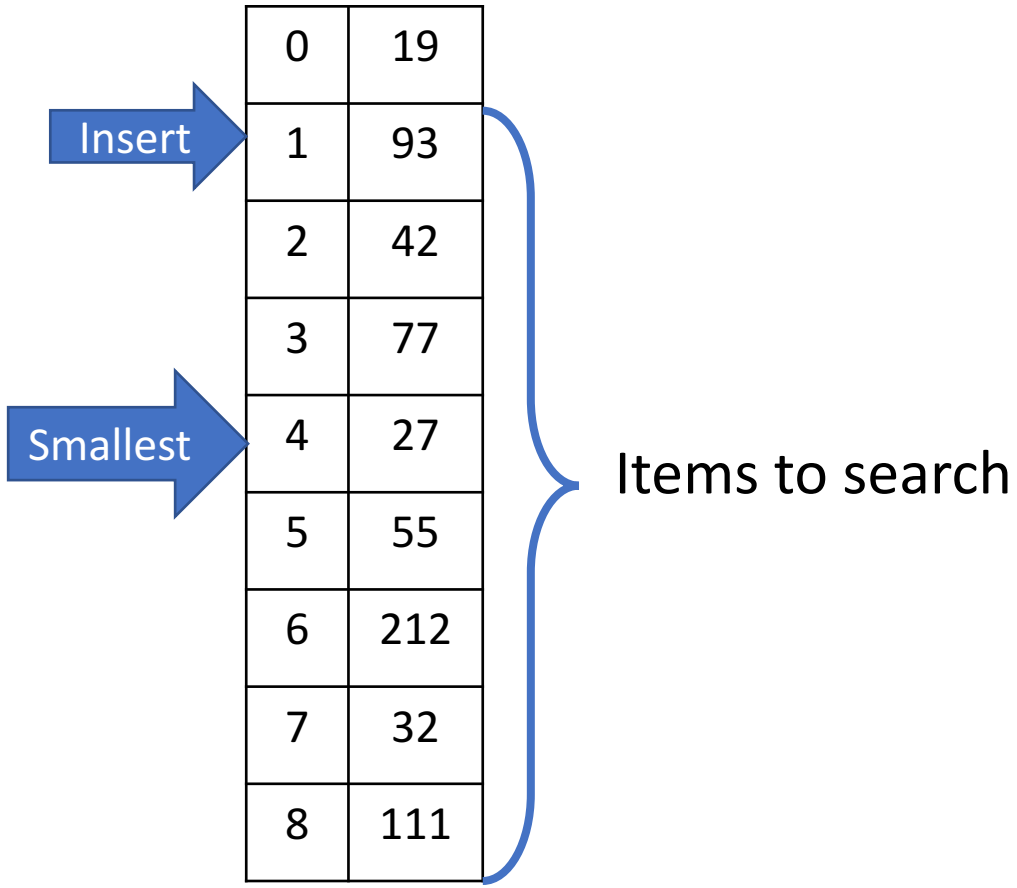
Selection Sort

- Set place to insert to first location in list
- While we still have values to insert,
  - Find smallest value and swap with location to insert
  - Increment place to insert



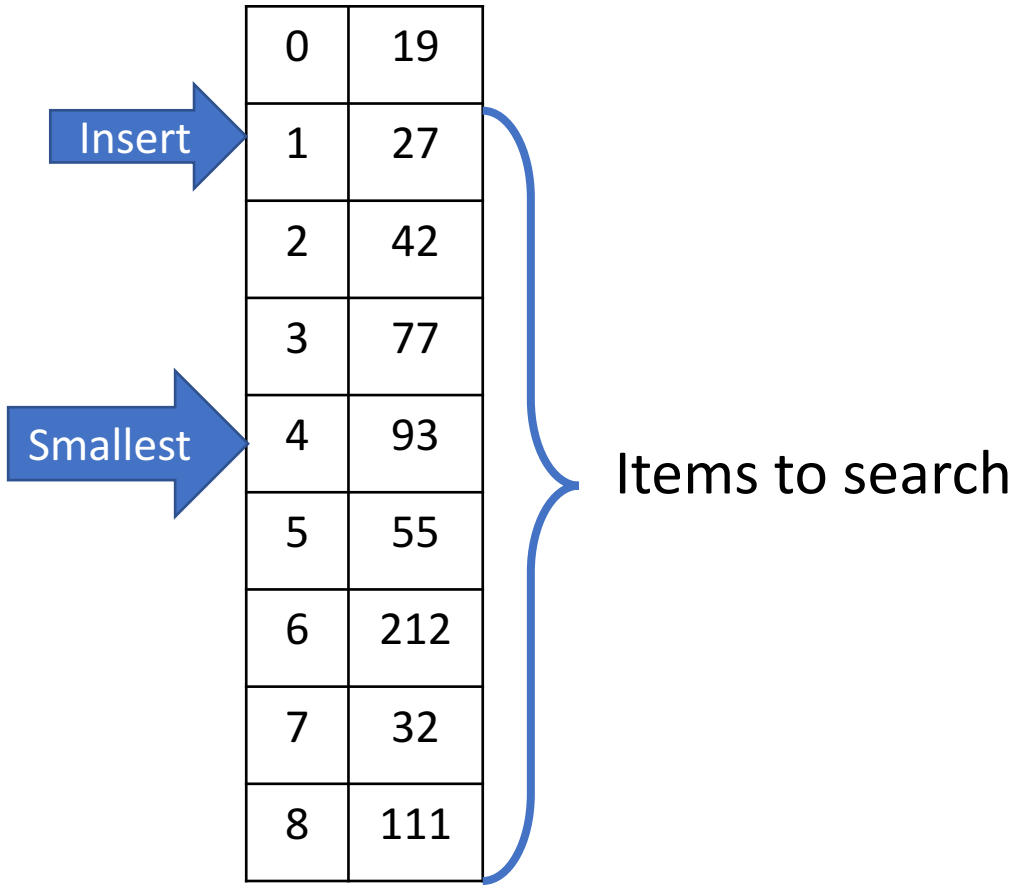
Selection Sort

- Set place to insert to first location in list
- While we still have values to insert,
  - Find smallest value and swap with location to insert
  - Increment place to insert



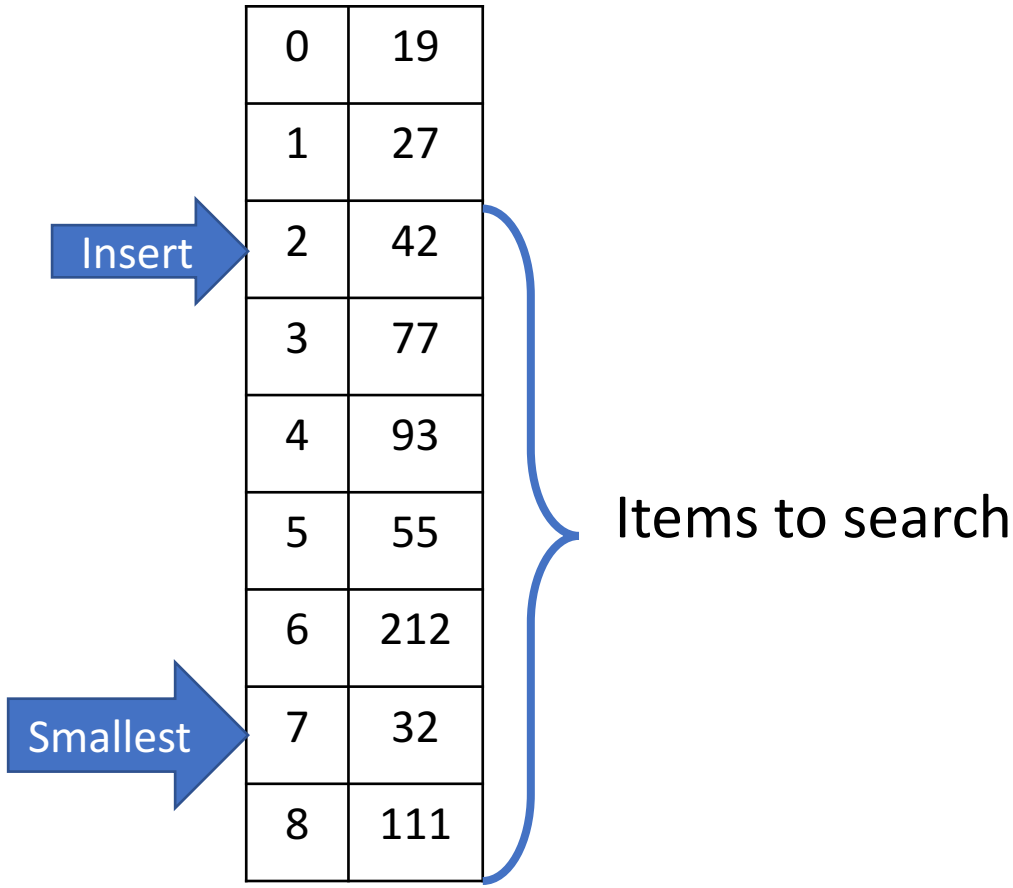
Selection Sort

- Set place to insert to first location in list
- While we still have values to insert,
  - Find smallest value and swap with location to insert
  - Increment place to insert



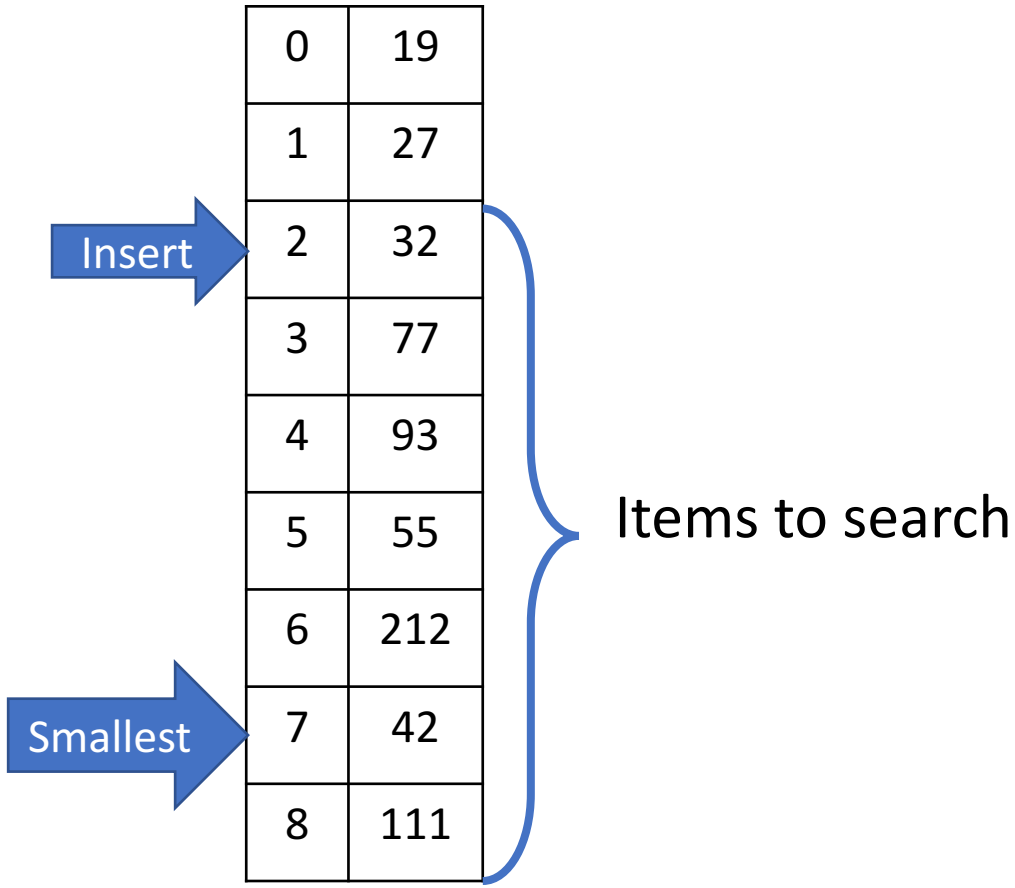
Selection Sort

- Set place to insert to first location in list
- While we still have values to insert,
  - Find smallest value and swap with location to insert
  - Increment place to insert



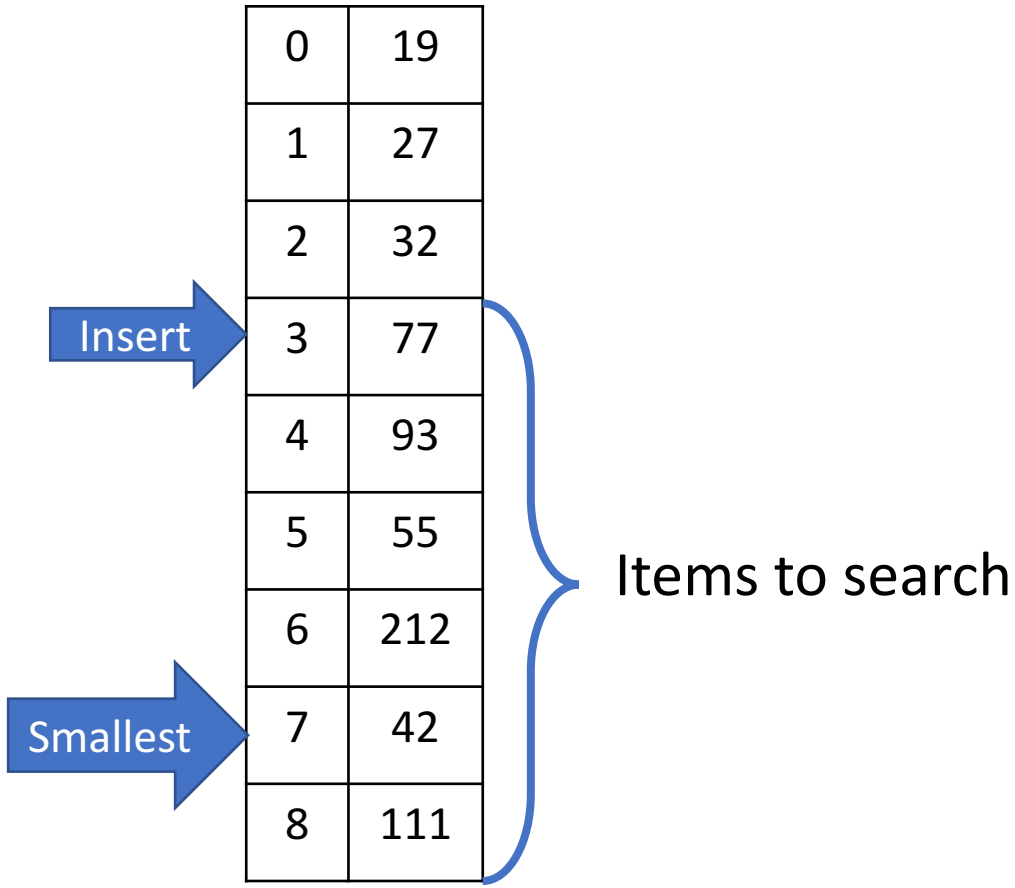
Selection Sort

- Set place to insert to first location in list
- While we still have values to insert,
  - Find smallest value and swap with location to insert.



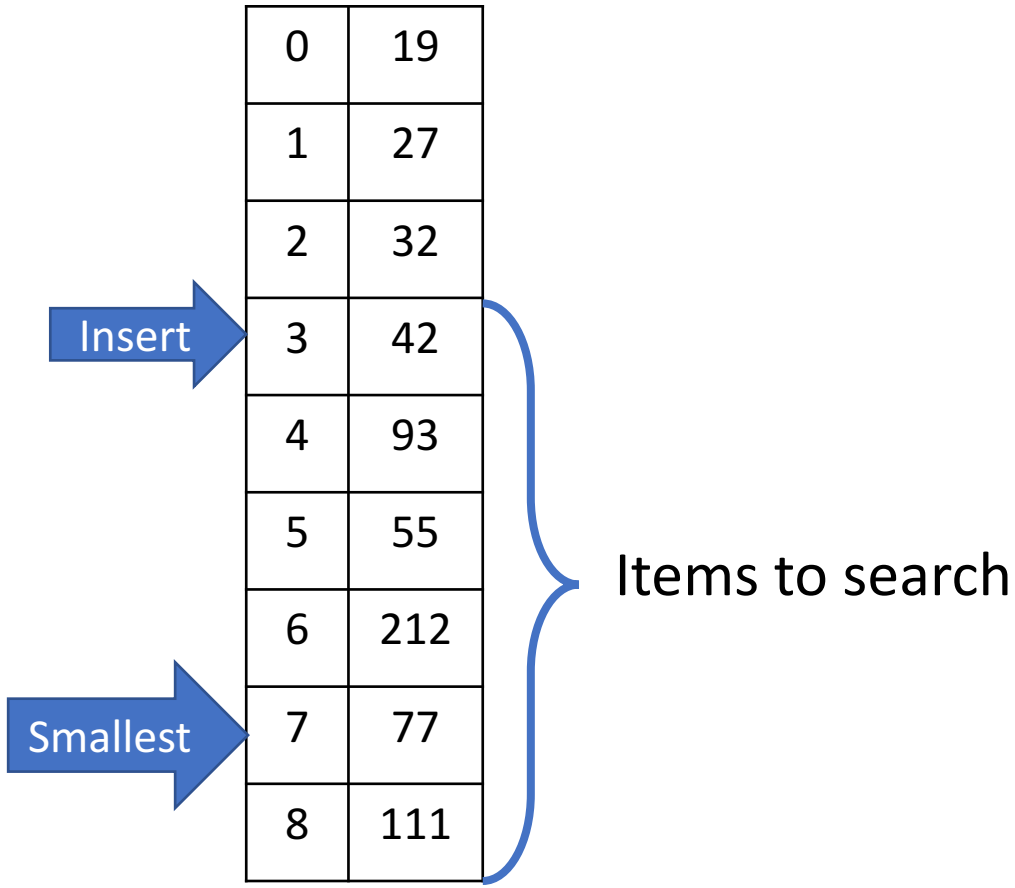
Selection Sort

- Set place to insert to first location in list
- While we still have values to insert,
  - Find smallest value and swap with location to insert.



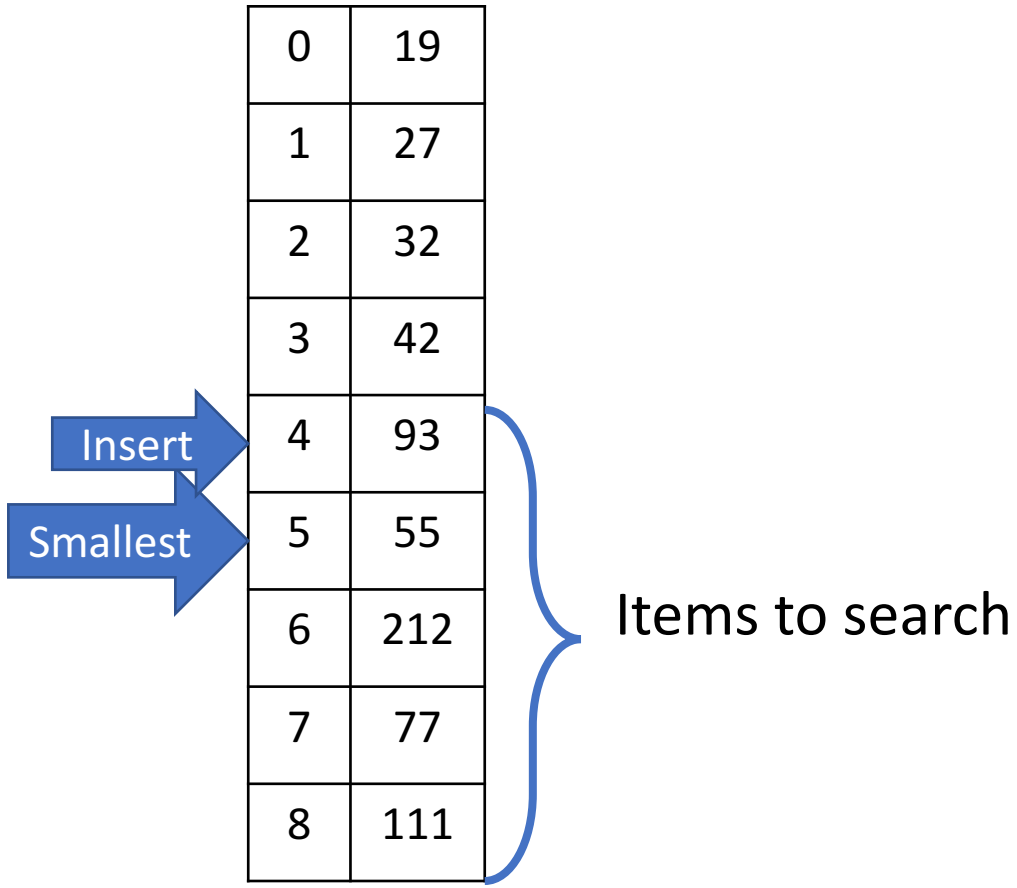
Selection Sort

- Set place to insert to first location in list
- While we still have values to insert,
  - Find smallest value and swap with location to insert.



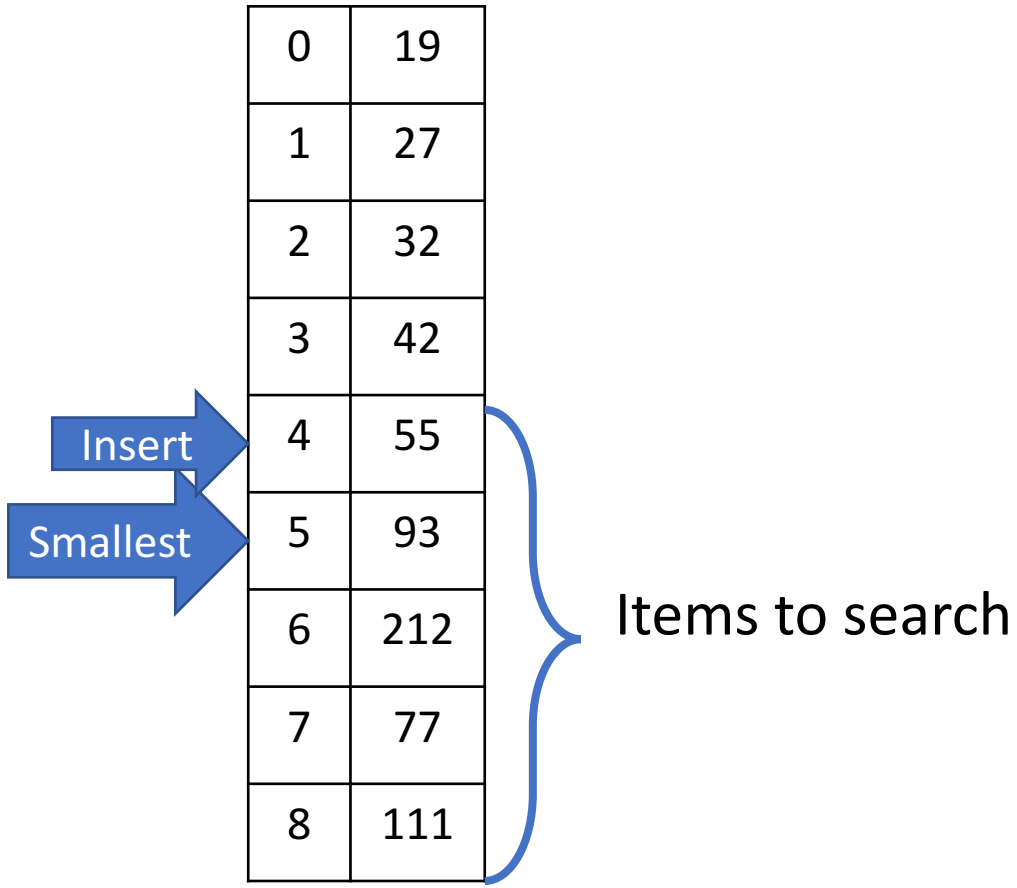
Selection Sort

- Set place to insert to first location in list
- While we still have values to insert,
  - Find smallest value and swap with location to insert
  - Increment place to insert



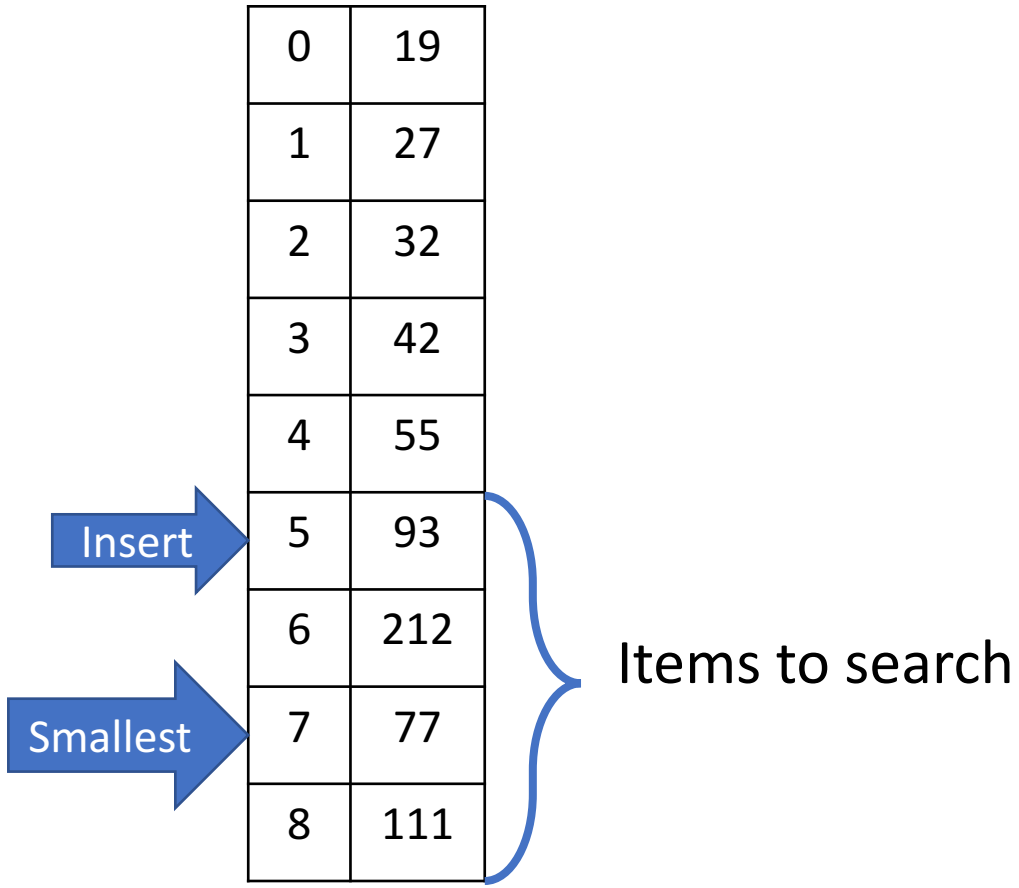
Selection Sort

- Set place to insert to first location in list
- While we still have values to insert,
  - Find smallest value and swap with location to insert
  - Increment place to insert



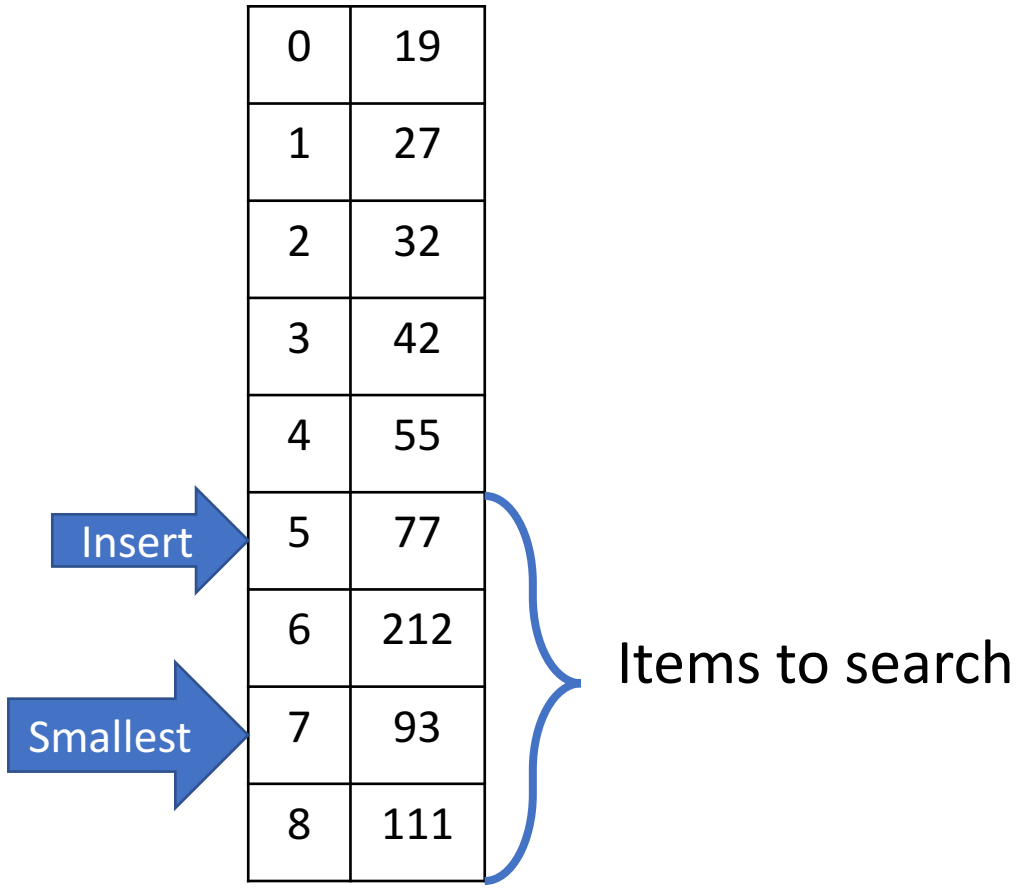
Selection Sort

- Set place to insert to first location in list
- While we still have values to insert,
  - Find smallest value and swap with location to insert
  - Increment place to insert



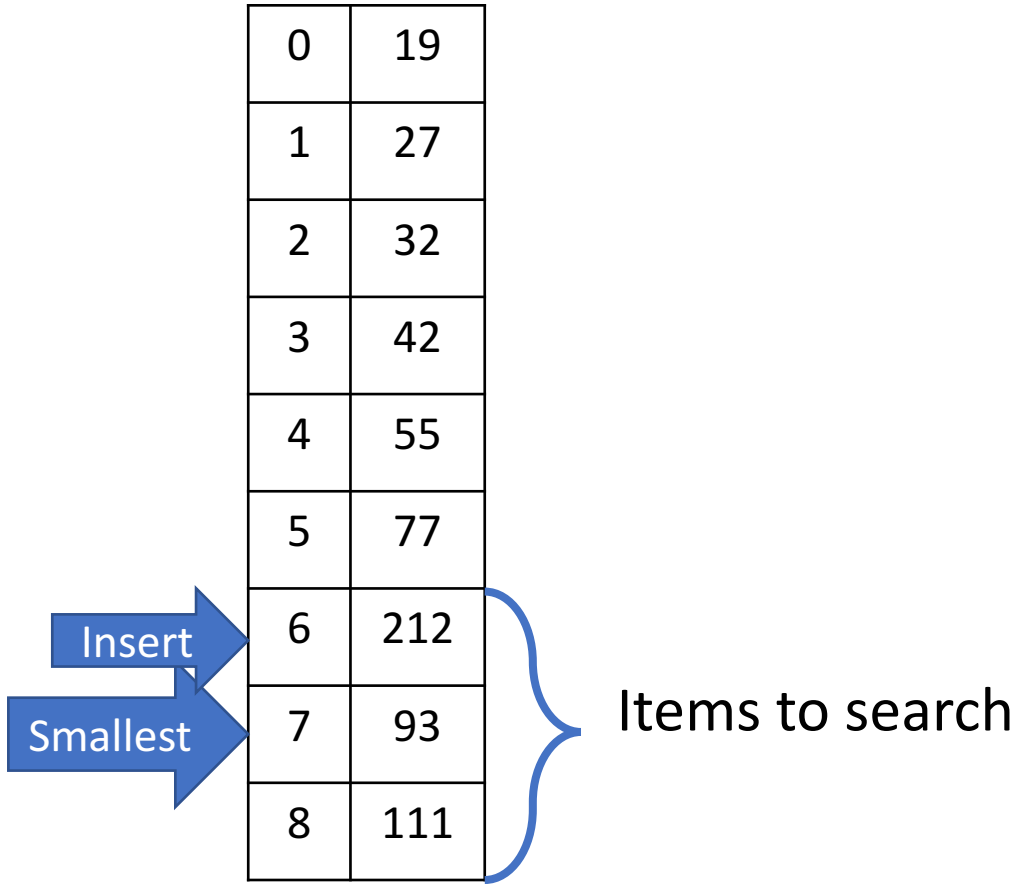
Selection Sort

- Set place to insert to first location in list
- While we still have values to insert,
  - Find smallest value and swap with location to insert
  - Increment place to insert



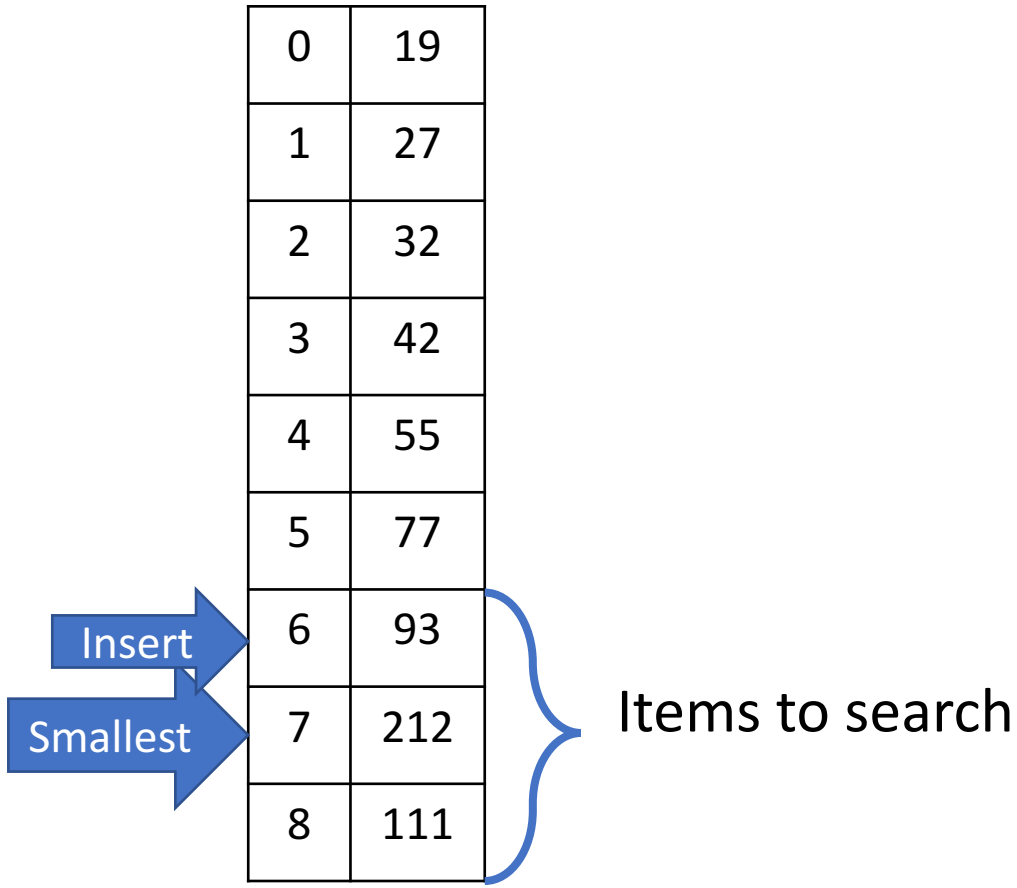
Selection Sort

- Set place to insert to first location in list
- While we still have values to insert,
  - Find smallest value and swap with location to insert
  - Increment place to insert



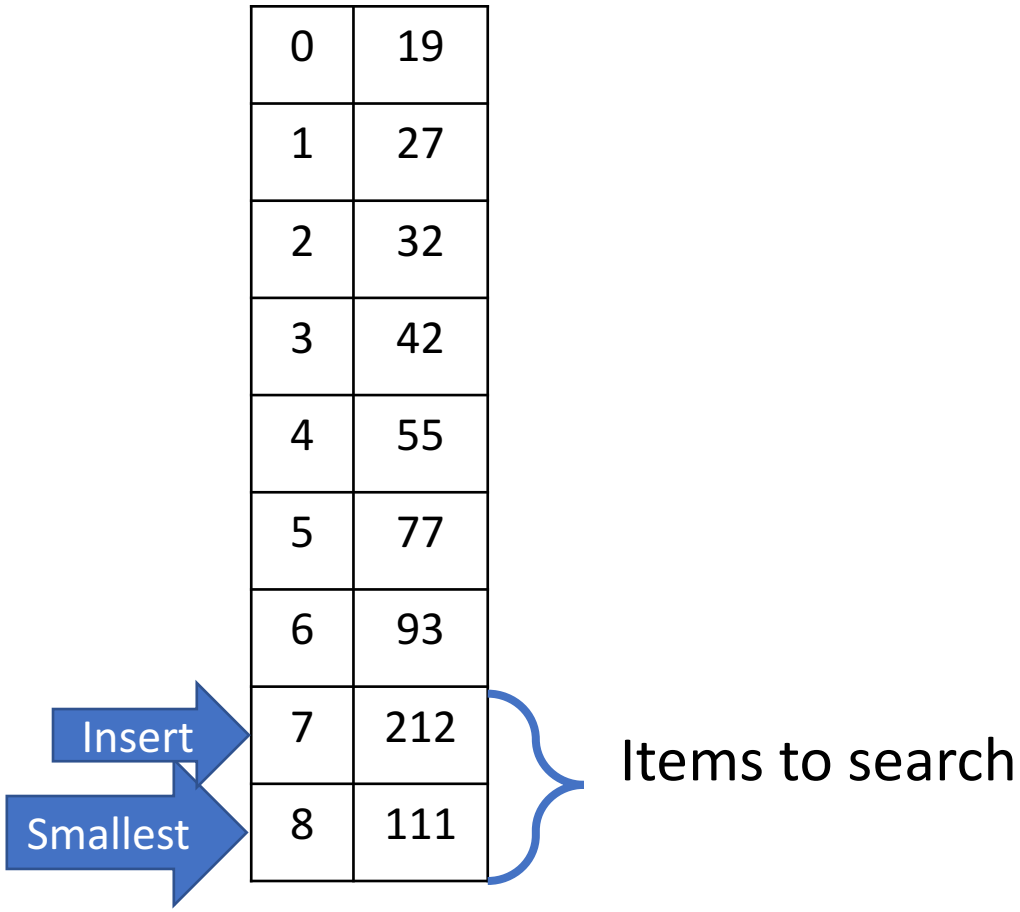
Selection Sort

- Set place to insert to first location in list
- While we still have values to insert,
  - Find smallest value and swap with location to insert
  - Increment place to insert



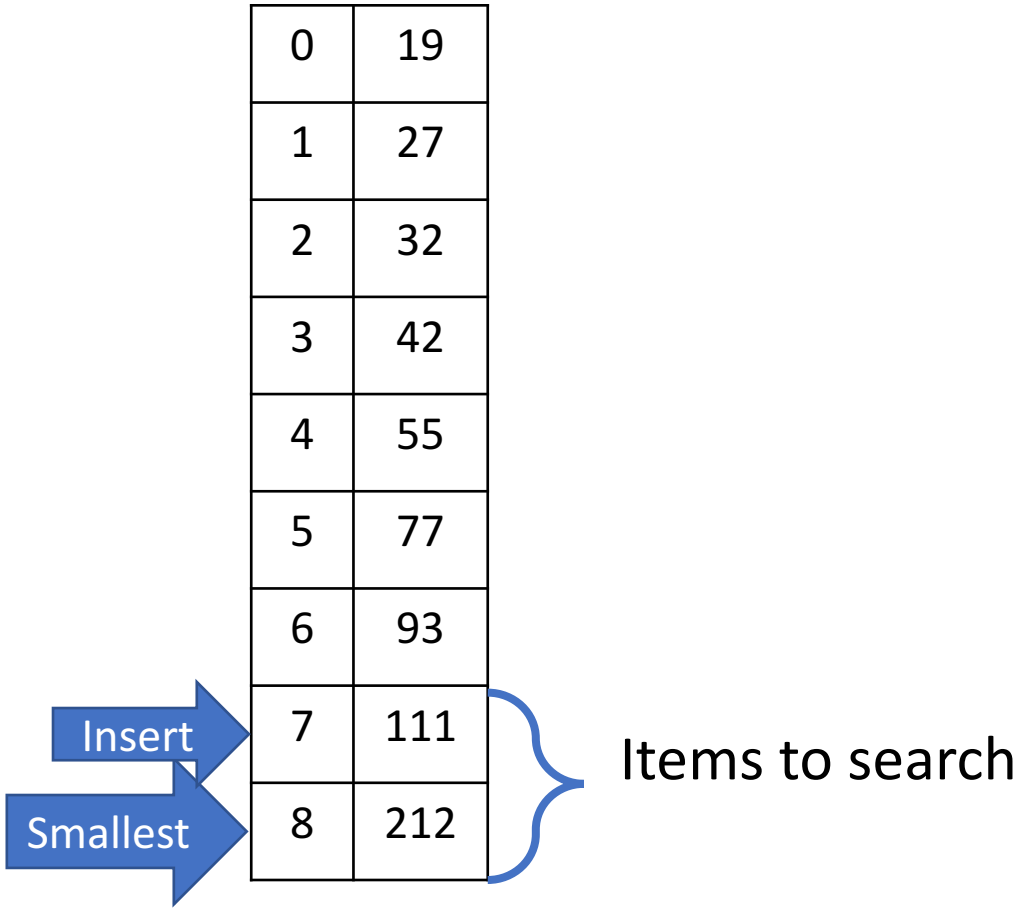
Selection Sort

- Set place to insert to first location in list
- While we still have values to insert,
  - Find smallest value and swap with location to insert
  - Increment place to insert



Selection Sort

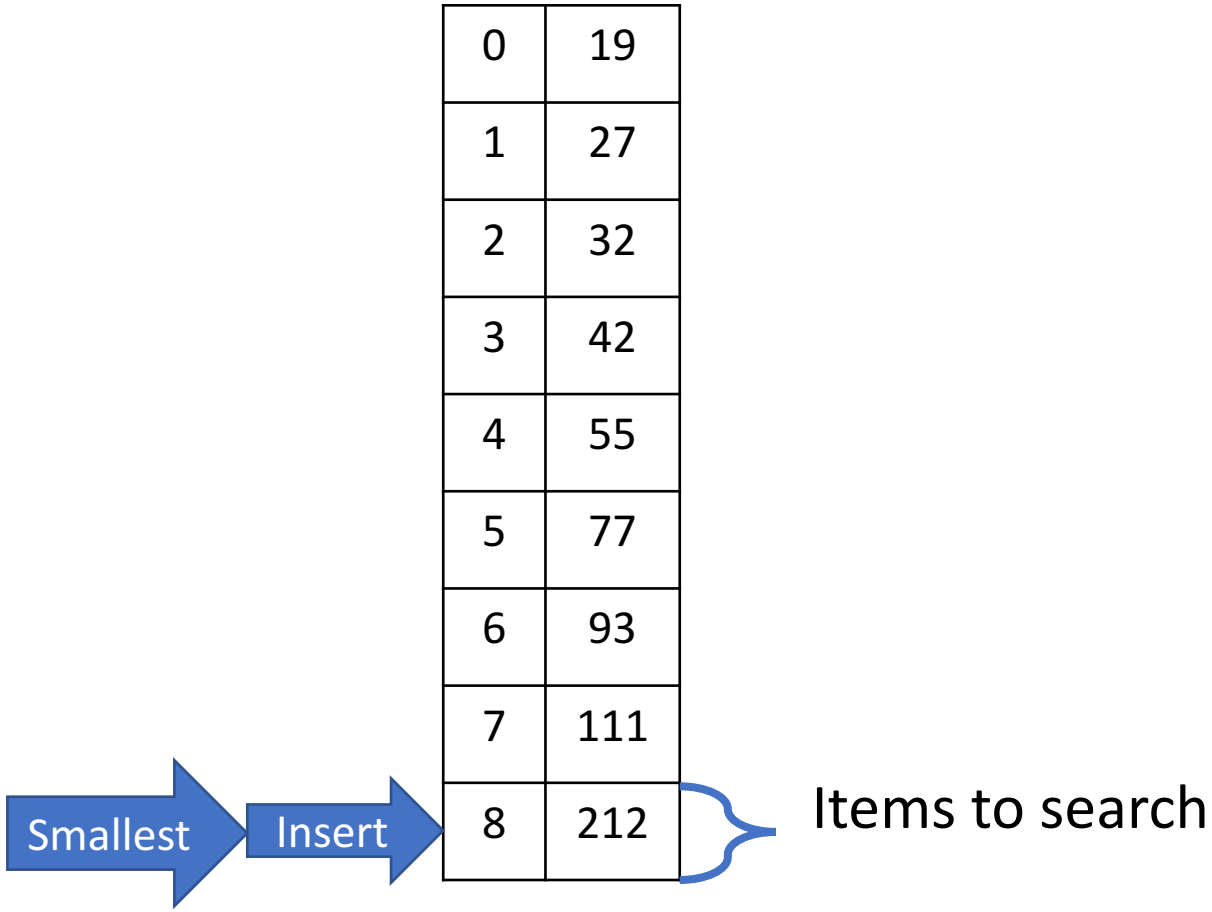
- Set place to insert to first location in list
- While we still have values to insert,
  - Find smallest value and swap with location to insert
  - Increment place to insert



Selection Sort

Since last item has to be in the right place,
we actually stop before inserting into last location.

- Set place to insert to first location in list
- While we still have values to insert,
  - Find smallest value and swap with location to insert
  - Increment place to insert



Selection Sort

- Set place to insert to first location in list
- While we still have values to insert,
  - Find smallest value and swap with location to insert
  - Increment place to insert

Sorted!

0	19
1	27
2	32
3	42
4	55
5	77
6	93
7	111
8	212