

Java ArrayList

## CS 351

# Design of Large Programs

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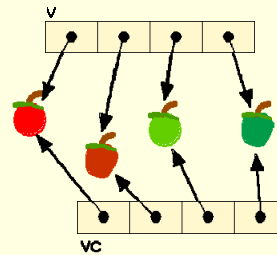
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## Java ArrayList

- An `ArrayList` is a *resizable-array* of *object references* in *continuous memory*.
- Each `ArrayList` instance has a capacity. The capacity is the size of the array used to store the elements in the list.
- The capacity is always at least as large as the list size.
- As elements are added to an `ArrayList`, its capacity grows automatically.
- Details of the growth policy are not specified beyond the fact that adding an element has constant amortized time cost.

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## ArrayList Constructors (partial list)

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- **ArrayList()**
  - Constructs an empty list with an initial capacity of ten.
- **ArrayList(int initialCapacity)**
  - Constructs an empty list with the specified initial capacity.
- **ArrayList<classname>(int initialCapacity)**
  - Constructs an empty list with the specified initial capacity.
  - Allows the compiler to check that all adds and gets insert and return an object that subclasses *classname*.

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## Java ArrayList Methods (partial list)

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- **add(Object o)**

Appends the specified element to the end of this list.
- **add(int index, Object element)**

Inserts the specified element at the specified position in this list.
- **Object get(int index)**

Returns the element at the specified position in this list.
- **clear()**

Removes all elements from this list.

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## Java ArrayList Methods (partial list)

- `ensureCapacity(int minCapacity)`
  - Increases the capacity of this ArrayList instance, if necessary, to ensure that it can hold at least the number of elements specified by the minimum capacity argument.
  - An application can increase the capacity of an ArrayList instance before adding a large number of elements. This may reduce the amount of incremental reallocation.

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## Java ArrayList Methods (partial list)

- `boolean contains(Object elem)`

Returns true if this list contains the specified element. *Note: this only checks equality of element references.*
- `int indexOf(Object elem)`

Searches for the first occurrence of the given argument, testing for equality using the equals method.
- `int size()`
- `Object[] toArray()`

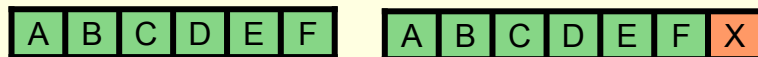
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## ArrayList: Access, Add and Insert

An ArrayList is a continuous block of memory.

The  $i^{\text{th}}$  element can be accessed in constant time.

ArrayList.add(element): *constant time*



ArrayList.add(index, element):  $O(n)$  time

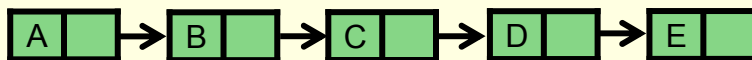


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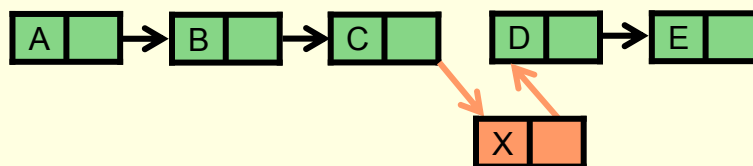
## LinkedList Access and Insertion

■ A LinkedList is, in general, a disjoint set of memory.

■ The  $i^{\text{th}}$  element can be accessed in  $O(n)$  time.



■ LinkedList.add(index, element): *constant time*



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