# ICS 111
# Preview of ICS 211

- some review of ICS 111 programming material
- some new Java programming
- many new concepts
- data structures: linked lists, queues, hash tables, simple trees, recursive data structures
- sorting algorithms, binary search
- organizational differences

# ICS 211 preview: review of Java programming

- review of programming material from ICS 111
- similar to the review we will do in the next three lectures
- expressions, statements including loops and conditionals, arrays, exceptions,

# ICS 211 preview: new programming concepts

- iterators are objects that provide methods that allow us to look at each element a collection of data

```
interface Iterator<E> {
  boolean hasNext();  // is there a next element?
  E next();           // give me the next element
  void remove();      // remove the last element
}
```

- iterators are called automatically when we use the enhanced for statement:

```
for (T e: C) {
```

calls `C.iterator()` to obtain an `Iterator<T> it` object, then repeatedly calls `it.hasNext()` and `it.next()` to obtain all the elements in C

# ICS 211 preview: more on Java programming

- recursion will be used a lot more, including to traverse recursive data structures
- review and deepen concepts about types, objects, classes, interfaces, inheritance and the class hierarchy
- possibly more details about Java, e.g. bitwise operators

# ICS 211 preview: new concepts

- lists and data structures
- abstract data types
- algorithm analysis and efficiency: log, linear, quadratic, exponential time
- evaluating expressions
- data compression

# ICS 211 preview: data structures

- **data structures** are used to organize collections of data
  - in each case learn implementation as well as definition of each data structure
- lists

  `interface List<E> extends interface Collection<E>`
  - ArrayList was introduced in ICS 111: ICS 211 looks closely at its implementation
  - linked lists
- stacks and queues
  - organize data in Last-In-First-Out (LIFO) or First-In-First-Out (FIFO) order
- hash tables
  - for when data can be indexed by a numeric key
- recursive data structures: trees
  - for when data is indexed by a key, may need to search given a key, and the data structure must be able to grow and shrink efficiently
- heaps

# ICS 211 preview: Algorithms

- binary search: finding an element in a sorted array
- many algorithms for sorting, including
  - insertion sort, selection sort
  - heapsort, mergesort, quicksort
- tree traversals
- linked list insertion and deletion

# ICS 211 preview: organization

- spring 2021: 3 sections
  - sections 1 and 2 taught by Carleton (Cam) Moore
  - section 3 taught by Edoardo (Edo) Biagioni
- I last taught ICS 211 in fall 2017
- contents in 2021 will be the approximately the same as in 2017, possibly slightly reordered
- likely online
  - not yet sure of the format
  - even if lecture is prerecorded, may not have curated transcript
  - assignments, quizzes, maybe exams