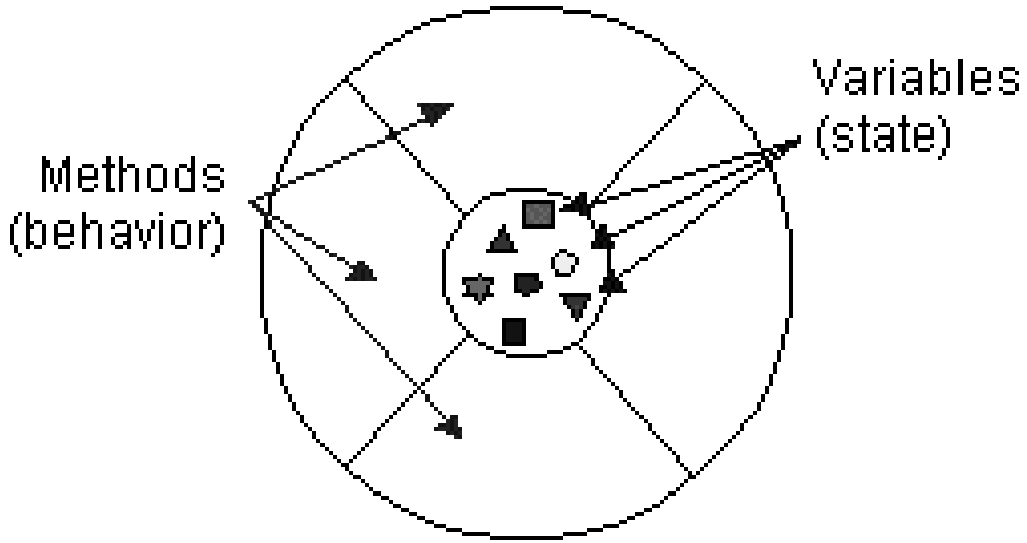
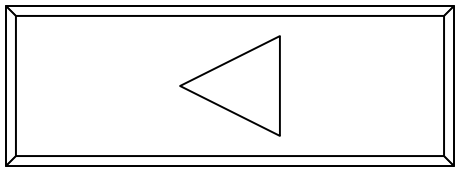
Object Oriented Design 100

- It is a software bundle of variables and related methods, and is an instance of a class



Object Oriented Design 100

- What is an object?



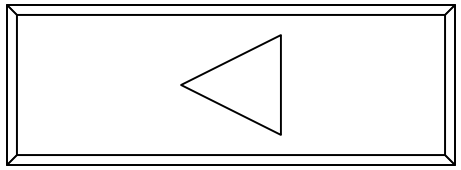
Object Oriented Design 200

- It defines the name and parameters (but **not** the return type) of a method.

Can we have two methods with the same signature but different return types????

Object Oriented Design 200

- What is a method signature?

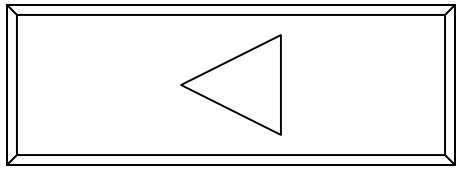


Object Oriented Design 500

- It means that a subclass can redefine a superclass method by using the same signature

Object Oriented Design 500

- What does ”overriding” mean?



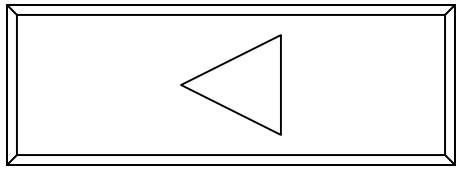
Java 100

- A program can have multiple of these methods – each class should have one to enable unit testing.

Each class can have its own main method – thus enabling unit testing of each class…. Also make use of the toString method for each class

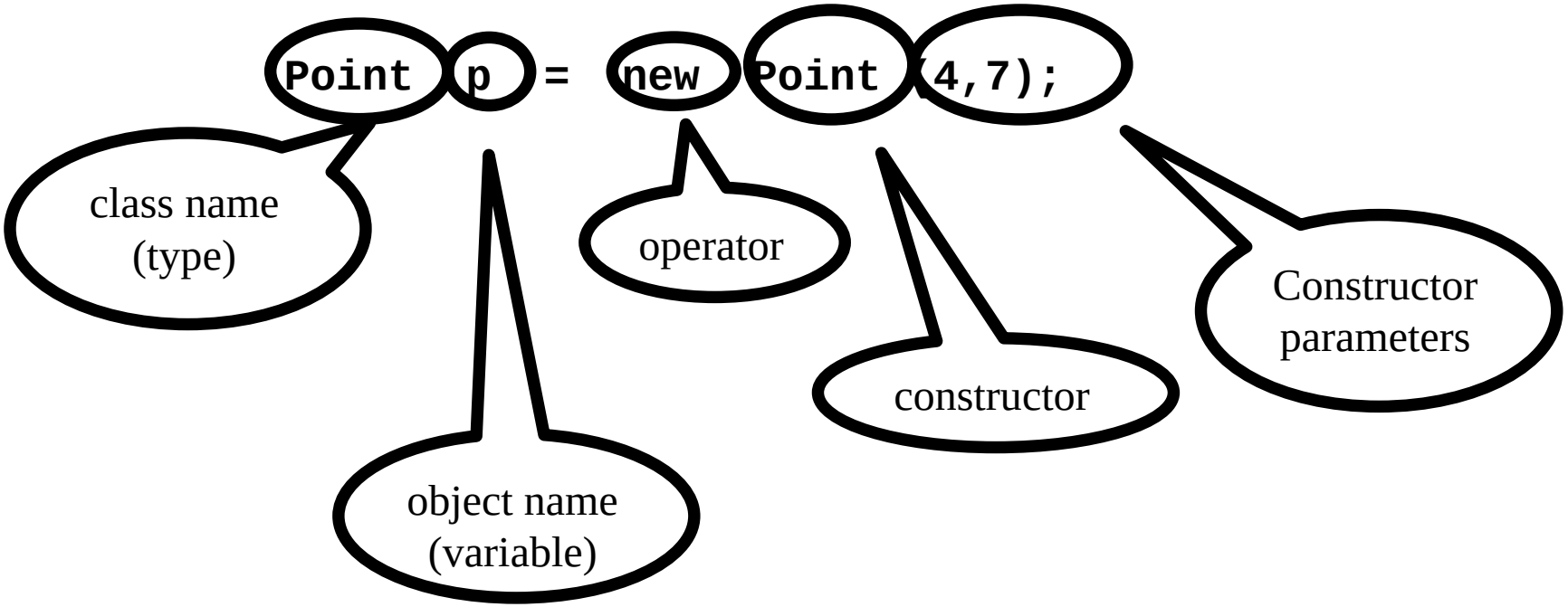
Java 100

- What is a main method?



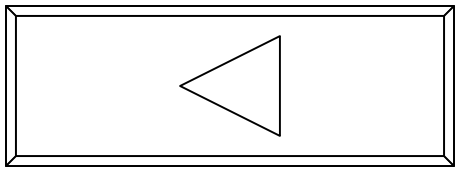
Java 200

- This operator allocates storage for the object on the *heap* and returns a reference to the object



Java 200

- What does the ”new” operator do?



Java 500

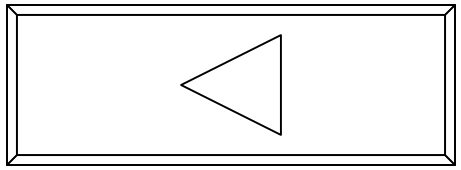
- This class defines methods for a buffered output stream where the characters are put in a temporary location called a buffer, which is then emptied into the Java console window

The PrintStream class defines methods for a buffered output stream where the characters are put in a temporary location called a buffer, which is then emptied into the Java console window

System.out is a static object of type java.io.**PrintStream**

Java 500

- What is the ’PrintStream’ class?



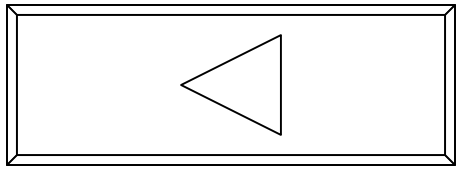
Swing 100

- It was the original Java toolkit for developing user interface. Swing is a set of mostly lightweight components built on top of it.

Swing is a set of mostly lightweight components build on top of the AWT. Swing can take on the look and feel of components on different platforms

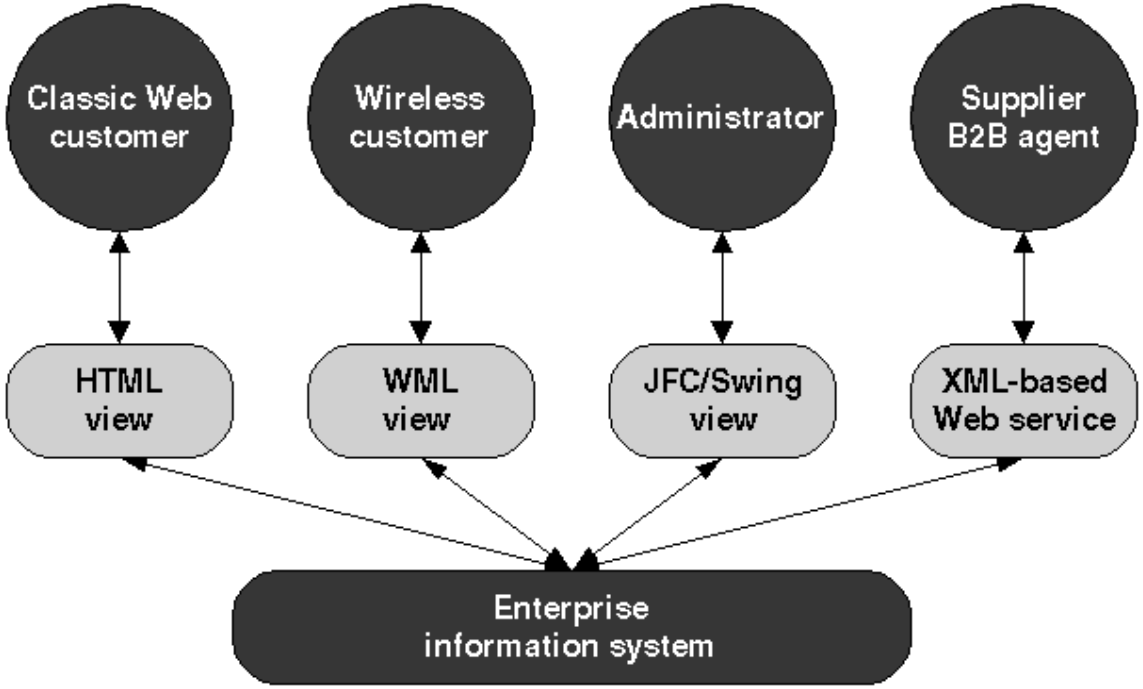
Swing 100

- What is the AWT?



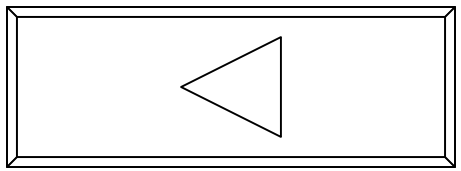
Swing 200

- This architecture was designed for applications that need to provide multiple views of the same data



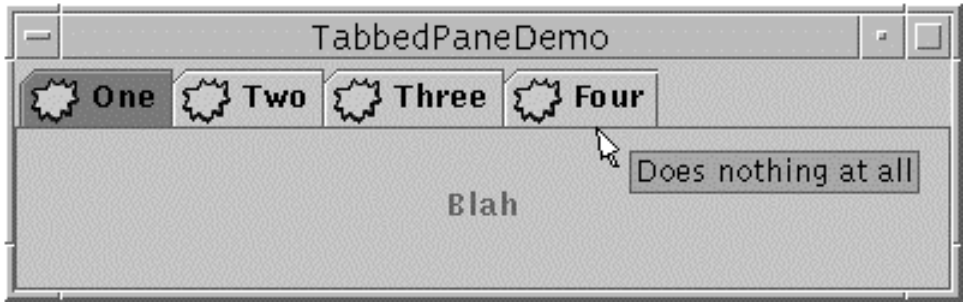
Swing 200

- What is the Model View Controller architecture for?



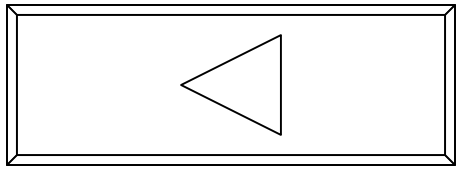
Swing 500

– It is the ancestor class for all Swing lightweight components. It can contain other AWT and Swing components.



Swing 500

- What is a JComponent?



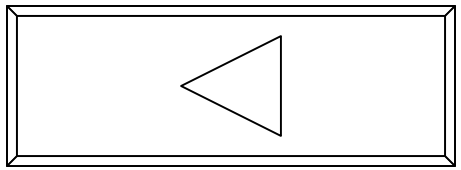
Testing 100

- The practice of testing a single method or class, separately from the overall program in which it is used

- Important things to test for
  - API of a class (methods, parameters)
  - Proper initialization of fields
  - Boundary conditions (e.g., array bounds, off by one)
  - Error conditions
  - Execution paths (*statement coverage*)

Testing 100

- What is unit testing?



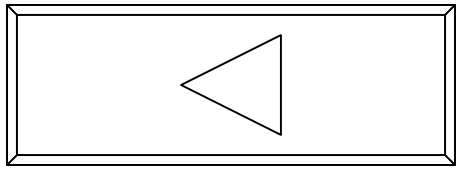
Testing 200

- In this testing approach, you look at the actual code and consider how it works

With black box testing you don't know how it works, just have the specification which specifies the inputs and expected outputs (says nothing about how it does what it does)

Testing 200

- What is ”white-box” testing?



Testing 500

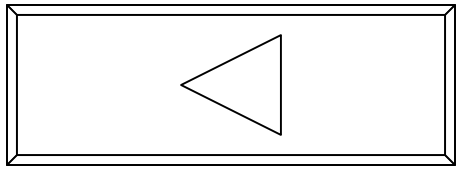
- It is the statement of a fact that should be true at a given point in the execution of a program

e.g. **`assert n > 0 : n; //`** prints “n”

same as: if (n<=0) throw new AssertionError(n);

Testing 500

- What is an assertion?

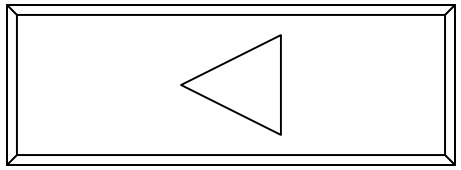


Software Engineering 100

- It is a term used to describe software that can handle unexpected user inputs and does redundancy checks

Software Engineering 100

- What is **robust** software?



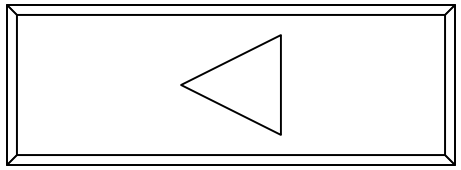
Software Engineering 200

- This term means that there are many dependencies between subsystems

Weak cohesion means that operations within a class are not dependent on one another….

Software Engineering 200

- What does the term ”strong coupling” mean in software engineering?

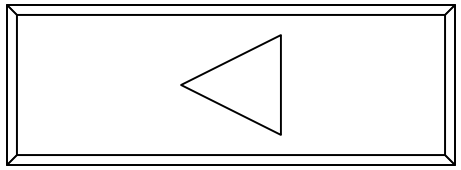


Software Engineering 500

- It is a design principle which describes how we should hide information inside classes so that the implementation of a class can be varied without affecting other classes that use the changed class.

Software Engineering 500

- What does encapsulation mean?

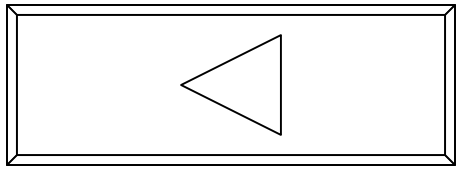


Linked Lists 100

- This data structure consists of nodes, where each node has a next reference to a node, a prev reference to a node and a data reference of type Object.

Linked Lists 100

- What is a doubly linked list?

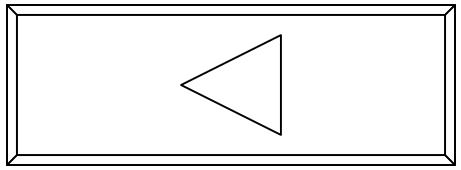


Linked Lists 200

- This data structure has the following methods: pop(), push(), top() and isEmpty().

Linked Lists 200

- What is a stack?

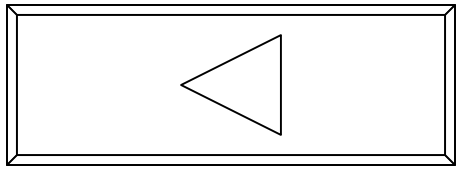


Linked Lists 500

- This data structure has the following operations: insertFirst, insertLast, deleteFirst, deleteLast, isEmpty.

Linked Lists 500

- What is a deque?

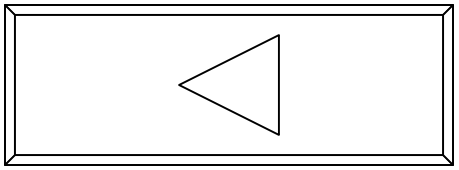


Object Oriented Design 100

– It is a variable that is associated with its class, is shared by all objects of its class, and its storage exists once (i.e., with the class rather than all the objects)

Object Oriented Design 100

- What is a ”static variable”?

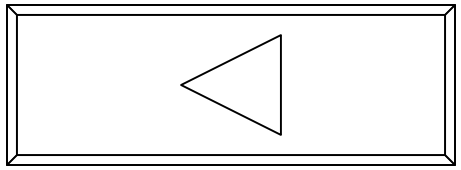


Object Oriented Design 200

– It is a class with only **final** instance variables and only **abstract** methods

Object Oriented Design 200

- What is an ”interface”?

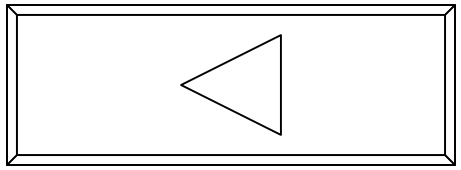


Object Oriented Design 500

– It refers to when you have a method in the same class or a subclass with the same name but different signature

Object Oriented Design 500

- What is ” Overloading ”?



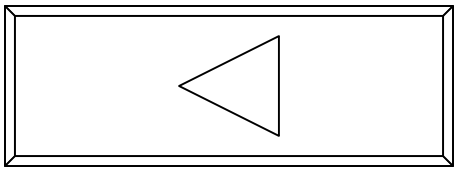
Hashing/Heaps 100

– It is an unordered container that contains key-element pairs.

Dictionaries can be implemented using Log files and Hash Tables

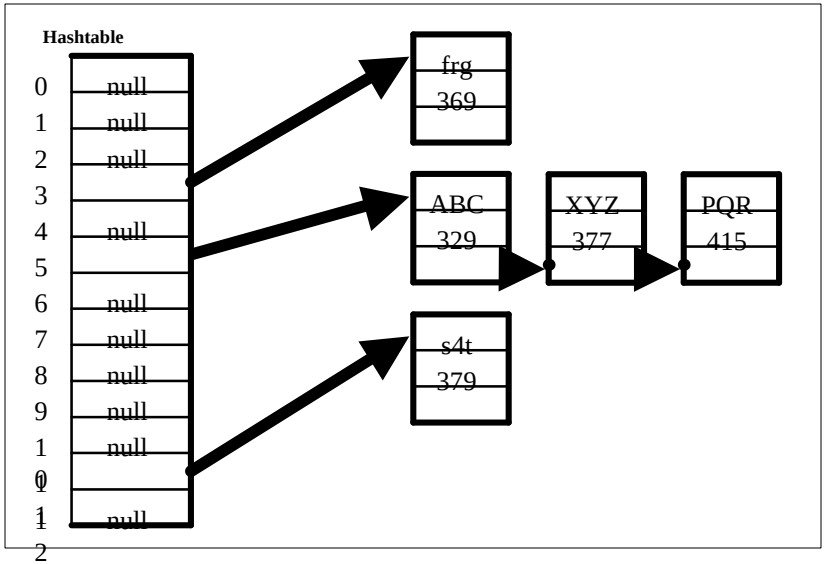
Hashing/Heaps 100

- What is a dictionary?



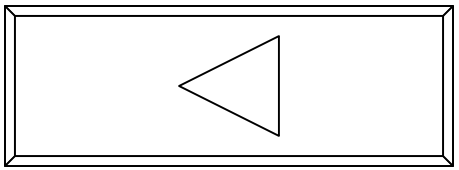
Hashing/Heaps 200

– It is a collision resolution scheme for hashtables which stores all elements which map to the same location in a linked list



Hashing/Heaps 200

- What is separate chaining?



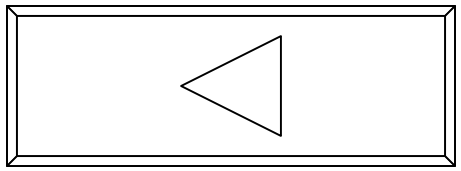
Hashing/Heaps 500

– The running time of this sorting algorithm is O(n log n) given that insert() and deleteMin() both take O(log n) time

Fundamental result of computing science….
Sorting is O(n log n)

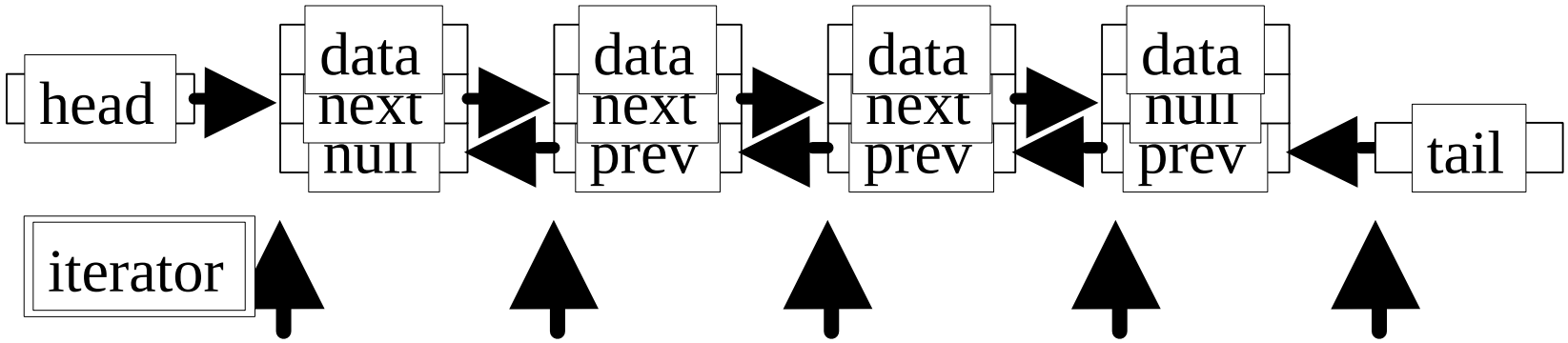
Hashing/Heaps 500

- What is HeapSort?



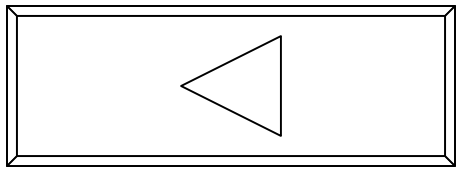
Iterators /Exceptions 100

– It is an object that allows us to enumerate or go through all the elements of a collection or a data structure



Iterators /Exceptions 100

- What is an iterator?



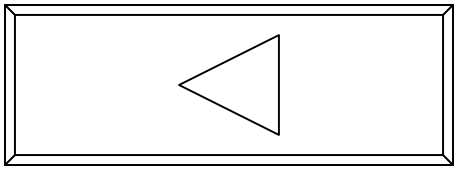
Iterators/Exceptions 200

– It is preferable to implement these using inner classes.

It is a better strategy to define the iterator as an inner class of the data structure. As a result, the iterator is intimately tied to the data structure and the implementation details are nicely hidden

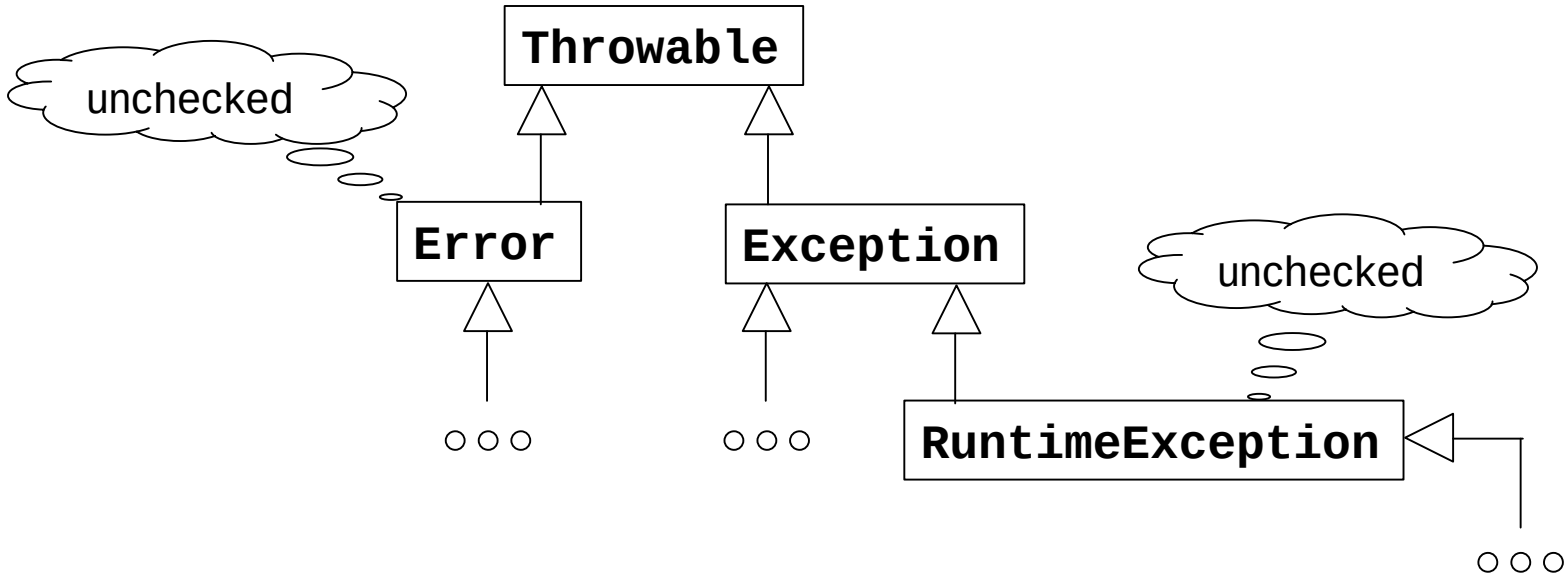
Iterators/Exceptions 200

- Iterators can be implemented in 2 ways, which is the best way?



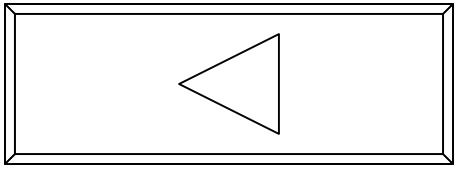
Iterators /Exceptions 500

- All exception classes inherit from this class.



Iterators /Exceptions 500

- What is the Throwable class?



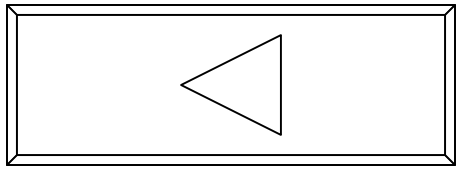
Recursion 100

– A method that is partially defined in terms of itself.

- A recursive algorithm consists of
  - a base case
  - a recursive call (with smaller or simpler arguments)
- Very important to ensure that the recursion terminates… that the base case is always reached for any input

Recursion 100

- What is ”a recursive method”?



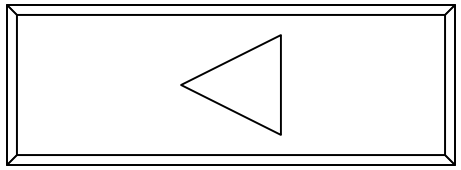
Recursion 200

– Each number in this sequence is the addition of the previous two numbers.

```
int F(int n) {
if (n==0 || n==1) return 1;
    else return F(n-1)+F(n-2);
}
```

Recursion 200

- What is the fibonacci sequence?



Recursion 500

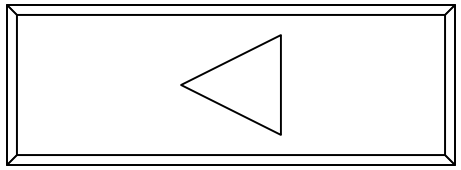
You can compute this recursively as follows:

```
int answer(int k) {
  if (k==1) return 1;
  else return answer(k-1) + k;
}
```

What is the running time of this algorithm?

Recursion 500

- What is the sum of 1..k?

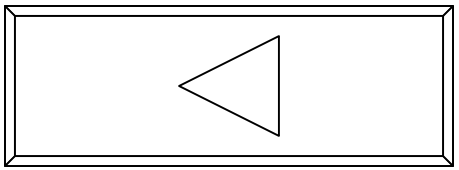


Analysis 100

- It is a function of the size of the input data with units such as comparisons, assignments, arithmetic operations, trigonometric operations.

Analysis 100

- What is the running time of an algorithm?



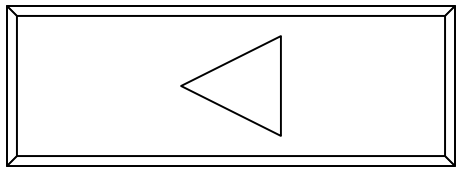
Analysis 200

– This searching algorithm has to look at every element in the array and takes O(n) time to find an element in the worst case.

```
int linearSearch(int[] a,
   int x) {
   int k = 0;
   while (k<a.length) {
     if (a[k] == x) return k;
     k = k + 1;
   }
}
```

Analysis 200

- What is Linear Search?



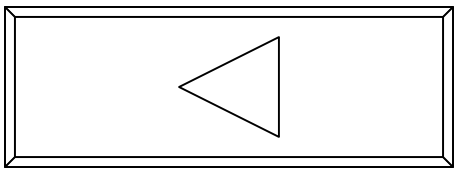
Analysis 500

– This searching algorithm searches a sorted array, and halves the search space with each iteration therefore only requiring O(log n) work in the worst case.

```
int binarySearch(int[] a, int x) {
  int l = 0;
  int r = a.length -1;
  while (l<=r) {
    int m = (l+r)/2;
    if (a[m] == x) return m;
    else if (x < a[m]) r = m-1;
    else l = m+1;
  }
  return -1;
}
```

Analysis 500

- What is Binary Search?



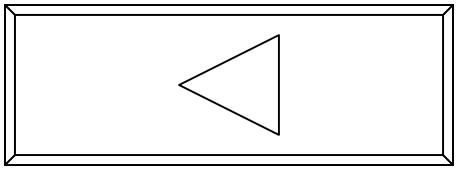
Vectors/Trees 100

– It describes the fact that k elements come before element e in a vector.

We can think of vectors as extended, resizeable arrays

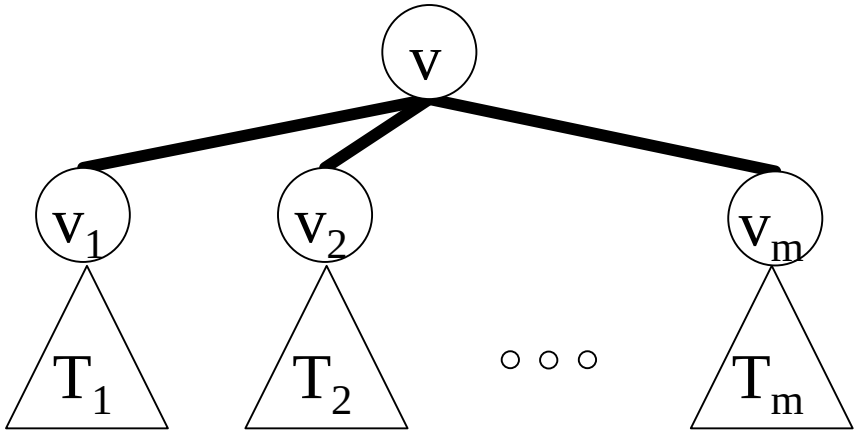
Vectors/Trees 100

- What is the rank of an element in a vector?



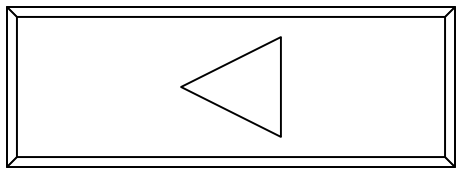
Vectors/Trees 200

– This traversal visits all nodes on each level before progressing to the next level.



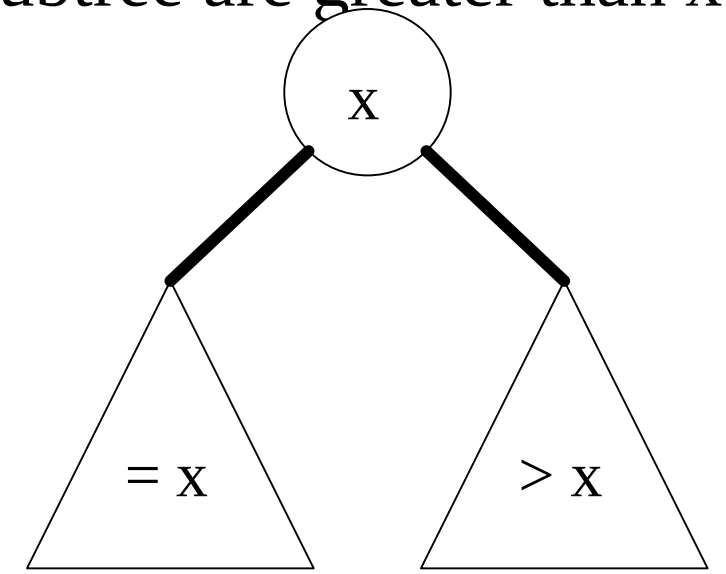
Vectors/Trees 200

- What is an level order traversal for a tree?



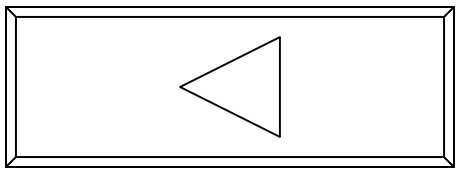
Vectors/Trees 500

– It is a binary tree in which the nodes are labelled with elements of a set such that all elements in the left subtree of a node labelled x are less than or equal to x and all the elements in the right subtree are greater than x.



Vectors/Trees 500

- What is a binary search tree?



CSC 115 - REVIEW

M. Storey, Fall 2002