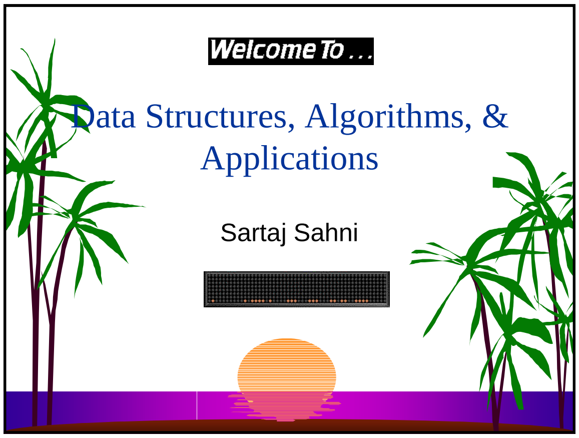
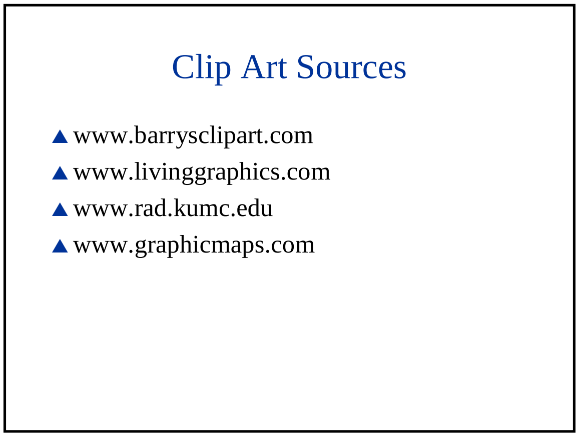


Welcome To . . .

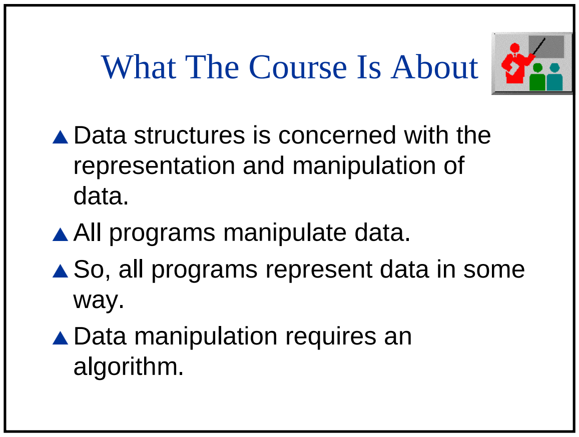
Data Structures, Algorithms, & Applications

Sartaj Sahni



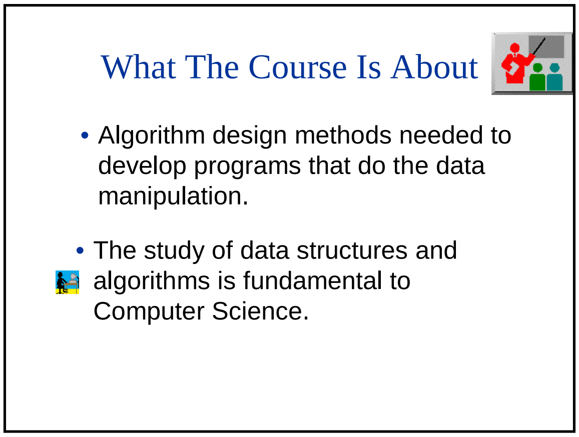
Clip Art Sources

- www.barrysclipart.com
- www.livinggraphics.com
- www.rad.kumc.edu
- www.graphicmaps.com



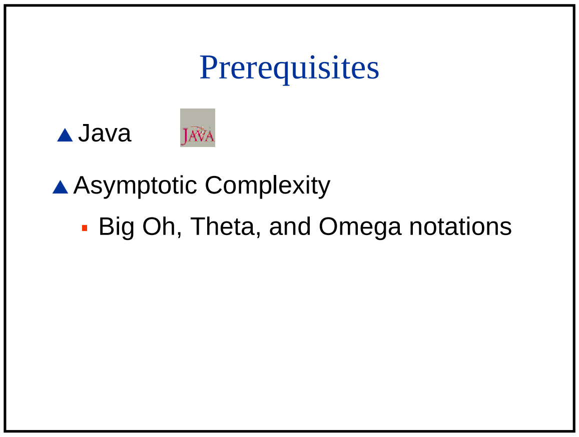
What The Course Is About

- Data structures is concerned with the representation and manipulation of data.
- All programs manipulate data.
- So, all programs represent data in some way.
- Data manipulation requires an algorithm.



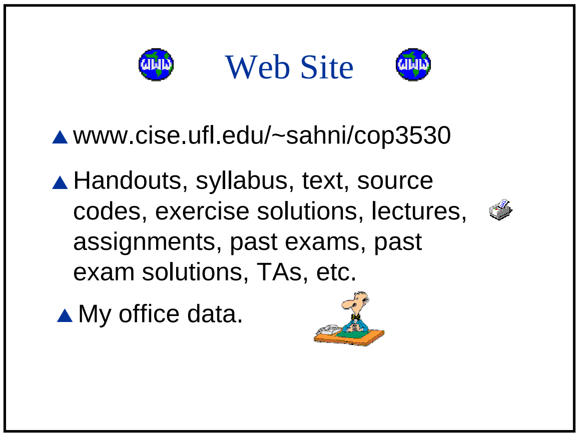
What The Course Is About

- Algorithm design methods needed to develop programs that do the data manipulation.
- The study of data structures and algorithms is fundamental to Computer Science.



Prerequisites

- Java
- Asymptotic Complexity
  - Big Oh, Theta, and Omega notations

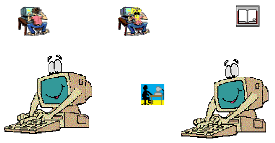


Web Site

- www.cise.ufl.edu/~sahni/cop3530
- Handouts, syllabus, text, source codes, exercise solutions, lectures, assignments, past exams, past exam solutions, TAs, etc.
- My office data.

Assignments

- Assignment guidelines
- Submission procedures
- Do Assignment 0 by next week.



Source Codes

- Read download and use instructions.
- Must have Java 1.2 or higher.
- See ProgramIndex.htm, AllNames.html and other html files produced by Javadoc for Java codes.

Discussion Sections

- Go to any one
- TA will answer your questions
- TA will go through a few exercises from the book
- Web site lists what is done in each meeting of the discussion section

Organization of Text

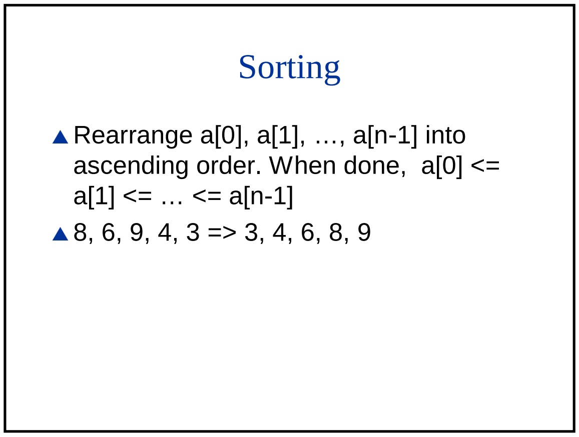
- Three parts
- Part I … Chapters 1-4, Background
- Part 2 … Chapters 5-17, Data Structures
- Part 3 … Chapters 18-22, Algorithms
- Each chapter … concepts + applications

Grades

- 25% for assignments
- 25% for each test

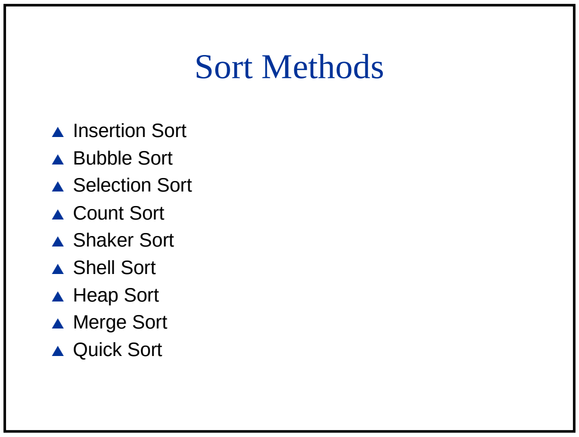
Grades (Rough Cutoffs)

- A >= 83%
- B+ >= 75%
- B >= 70%
- C+ >= 65%
- C >= 60%
- D+ >= 55%
- D >= 50%



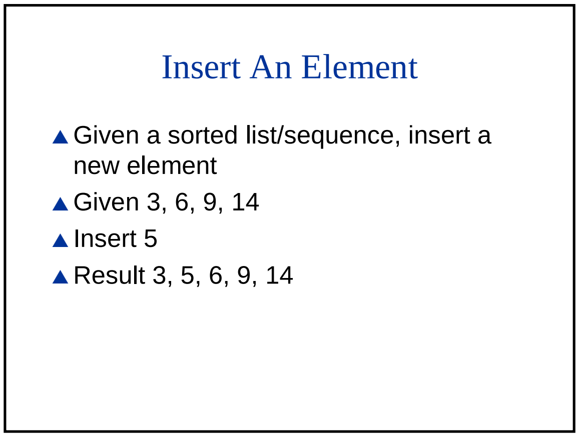
Sorting

- Rearrange a[0], a[1], …, a[n-1] into ascending order. When done, a[0] <= a[1] <= … <= a[n-1]
- 8, 6, 9, 4, 3 => 3, 4, 6, 8, 9



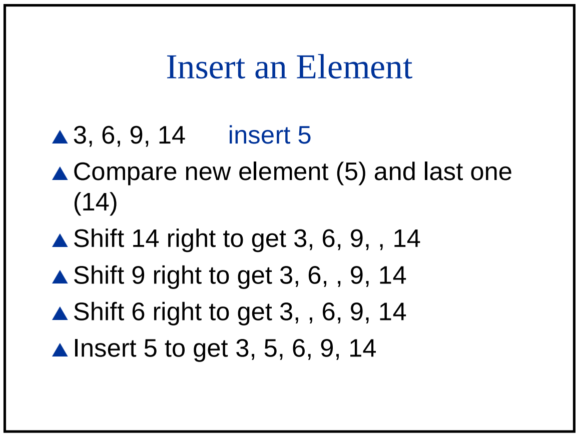
Sort Methods

- Insertion Sort
- Bubble Sort
- Selection Sort
- Count Sort
- Shaker Sort
- Shell Sort
- Heap Sort
- Merge Sort
- Quick Sort



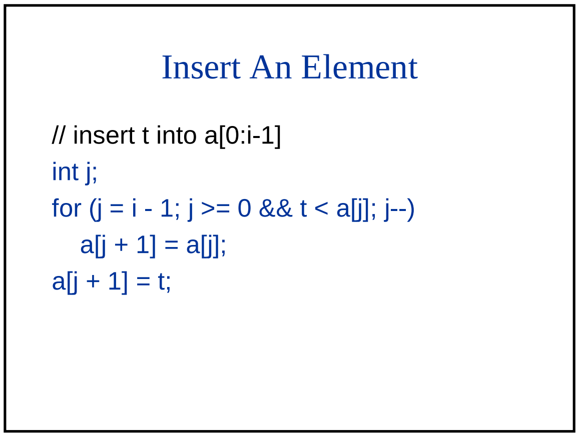
Insert An Element

- Given a sorted list/sequence, insert a new element
- Given 3, 6, 9, 14
- Insert 5
- Result 3, 5, 6, 9, 14



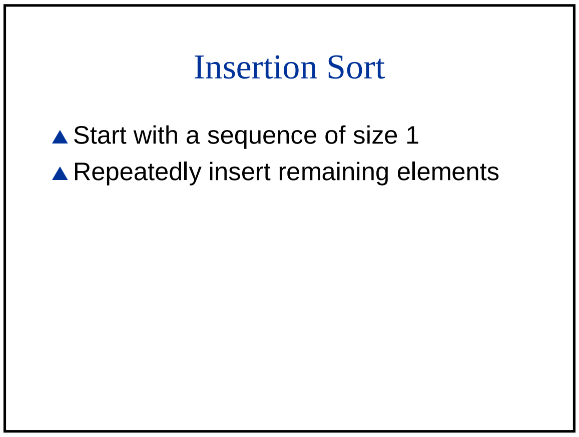
Insert an Element

- 3, 6, 9, 14   insert 5
- Compare new element (5) and last one (14)
- Shift 14 right to get 3, 6, 9, , 14
- Shift 9 right to get 3, 6, , 9, 14
- Shift 6 right to get 3, , 6, 9, 14
- Insert 5 to get 3, 5, 6, 9, 14



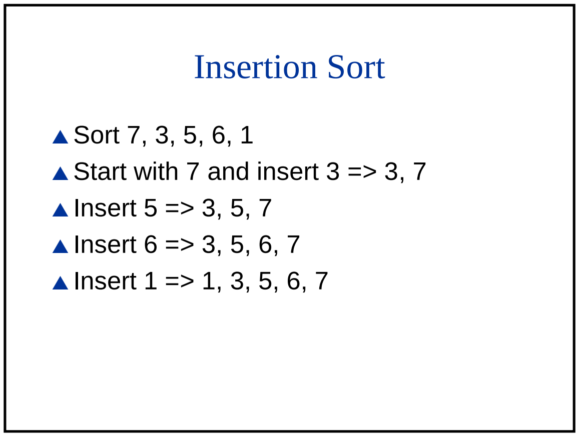
Insert An Element

```
// insert t into a[0:i-1]
int j;
for (j = i - 1; j >= 0 && t < a[j]; j--)
   a[j + 1] = a[j];
a[j + 1] = t;
```



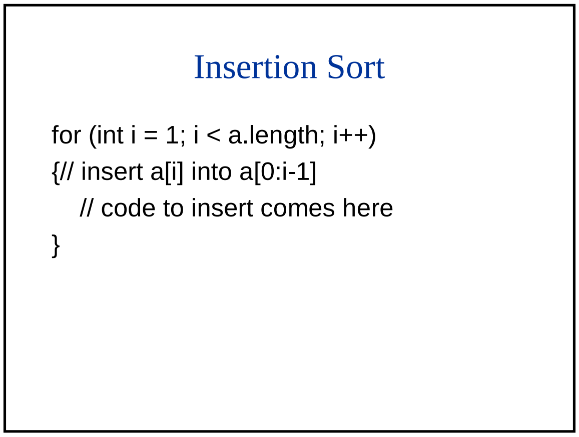
Insertion Sort

- Start with a sequence of size 1
- Repeatedly insert remaining elements



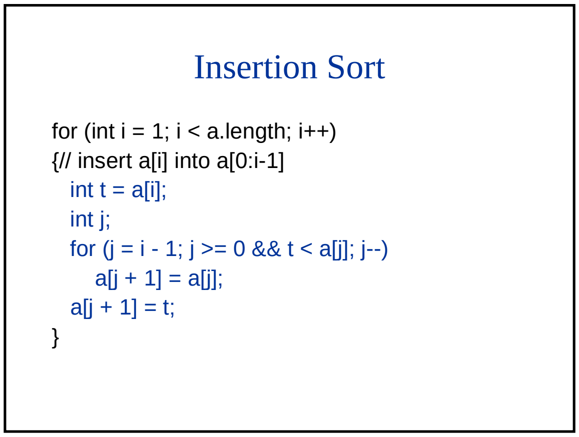
Insertion Sort

- Sort 7, 3, 5, 6, 1
- Start with 7 and insert 3 => 3, 7
- Insert 5 => 3, 5, 7
- Insert 6 => 3, 5, 6, 7
- Insert 1 => 1, 3, 5, 6, 7



Insertion Sort

```
for (int i = 1; i < a.length; i++)
{// insert a[i] into a[0:i-1]
   // code to insert comes here
}
```



Insertion Sort

```
for (int i = 1; i < a.length; i++)
{// insert a[i] into a[0:i-1]
   int t = a[i];
   int j;
   for (j = i - 1; j >= 0 && t < a[j]; j--)
      a[j + 1] = a[j];
   a[j + 1] = t;
}
```