Grouping Objects into Collections

Read Chapter 4
Class libraries bundle useful classes together

- A class library is a collection of useful classes
- Using such classes in many applications means that we don’t have to write everything from scratch
- Java calls its libraries packages
- Grouping objects together is a recurring requirement, so
  - The java.util package provides many classes for grouping objects together into collections
Objects can be grouped into a linear sequence

- The **ArrayList** and **Vector** classes group objects into a linear sequence that can be accessed by **position**
- Both keep a group of zero or more objects as if they were arranged in a line from left to right
- The group can be any size, growing and shrinking as you **add** or **remove** objects
- Positions start from zero
- **ArrayList** methods:

  ```java
  boolean add( Object o );
  int size();
  Object get( int index );
  Object remove( int index );
  ```
Let’s extend the lab example from last week

- Last week, you created a simple Student class, together with a Gradebook that could hold student records.
- Let’s look at modifying the Gradebook class to add some features ...
- Also, today we’ll use an ArrayList, like the book.
- Besides slightly different method names, the differences between ArrayList and Vector aren’t important in this course.
  - Vectors are safer when writing concurrent programs.
  - ArrayLists are more efficient when not using concurrency.
Object structures with collections

gradebook: Gradebook
students

:ArrayList
0 1

fred: Student
name
totalPts 160
numAsgn 2

"Fred Flintstone"

betty: Student
name
totalPts 186
numAsgn 2

"Betty Rubble"
Java provides a for loop for definite iteration

- A `for` loop is similar to a `while` loop
- Often used to iterate a fixed number of times
- Often used to iterate over a fixed number of objects or a fixed number of steps
- Repeating something a **fixed** number of times is called **definite iteration**
- Repeating an arbitrary number of times until some condition is achieved is called **indefinite iteration**
Java provides a for loop for definite iteration

- A for loop is similar to a while loop
- Often used to iterate a fixed number of times
- Often used to iterate over an array
“for” provides places for common looping actions

General form of a for loop

```c
for ( initialization; condition; post-body action )
{
    statements to be repeated
}
```

Equivalent in while-loop form

```c
initialization;
while ( condition )
{
    statements to be repeated
    post-body action
}
```