

Slide 1

Administrivia

- Reminder: Quiz 6 Thursday.
- Reminder: Homework 6 design due today, code Thursday.
- Homework 7 to be on Web soon.

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I/O In Java — Overview

- Abstract view — “file” is a collection of data. Java provides methods for sequential and “random” (non-sequential) access.
- Sequential file access is via “streams” — concept that applies to other kinds of sequential I/O (stdin/stdout, sockets, etc.).
- Stream — sequential flow of data.
 - Input streams connect program with an outside “source” (stdin, file, socket, etc.). (If data is characters, use “reader” instead.)
 - Output streams connect program with outside “destination”. (If data is characters, use “writer” instead.)

Stream I/O

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- I/O in Java often requires at least two classes:
 - One that connects to the desired source/destination (file, socket, array, string, etc.).
 - One that defines interface for program (character or binary data, byte-by-byte or a line at a time, etc.)

- Short examples:

```
BufferedReader rdr =  
    new BufferedReader(new FileReader("in.txt"));  
String s = rdr.readLine();
```

```
PrintWriter pw =  
    new PrintWriter(new FileWriter("out.txt"));  
pw.println("hello, world");
```

I/O and Exceptions

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- Many I/O methods throw “checked” exceptions — which your code must explicitly do something about. Sensible but sometimes annoying.
- First example from previous page would not compile — either declare that the method it's in throws an `IOException`, or use a “try” block, e.g.,

```
try {  
    BufferedReader rdr =  
        new BufferedReader(new FileReader("in.txt"));  
    String s = rdr.readLine();  
}  
catch (FileNotFoundException e) {  
    System.err.println(e); // or better error message  
}  
catch (IOException e) {  
    System.err.println(e); // or better error message  
}
```

Character-Based Stream I/O

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- Prior to Java 1.5, typical way to parse input was to read a line at a time and use `String` methods, `Integer.parseInt`, `Double.parseDouble`, etc. `StringTokenizer`, `StreamTokenizer` also sometimes useful.
- Now, `Scanner` class may do what you need. `split()` method of `String` class may also be useful.
- For output, `PrintWriter` methods will likely be useful. Notice that Java also has (as of 1.5) a `printf!`
- (Example — “almost an editor” program(s).)

Binary Stream I/O

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- Can also read/write binary data:
 - `DataInputStream`, `DataOutputStream` to write out primitive types.
 - `ObjectInputStream`, `ObjectOutputStream` to write out primitives, `Serializable` objects.
- Object serialization:
 - Object and all referenced objects (except `static` and `transient` variables) are turned into sequential stream of bytes.
 - Can override `readObject`, `writeObject` to control what happens more precisely.
- (Example — “silly class” and saver.)

Minute Essay

- Try writing code to count the lines of a file containing character data. (No need to make a complete class or method.)

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Minute Essay Answer

- One way:

```
BufferedReader rdr =  
    new BufferedReader(new FileReader("whatever"));  
String line;  
int lines = 0;  
while ((line = rdr.readLine()) != null)  
    ++lines;
```

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