CS212

Exceptions

http://java.sun.com/docs/books/tutorial/essential/exceptions.html

Motivation

- Some design considerations:
  - Why do programs crash?
  - Can a programmer account for every problem in the universe?
  - Should a program gracefully warn a user about a problem?
- So, what do you do?

Mistakes

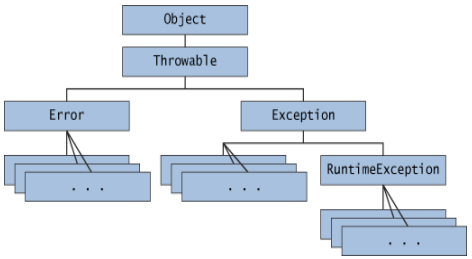
- When/how mistakes can occur:
  - editing
  - compiling
  - runtime
  - logic
- How to handle each of these?
  Want ways to deal with reality of errors:
  - smarter editors
  - smarter compilers
  - clearer runtime environment alerts

Handling

- Common concepts:
  - program must find the mistake: ***catch***
  - program must alert something/someone: ***throw***
- Java uses `Object`s:
  - `Throwable` object: special object that can be "sent" by code to other code (the "alert")
  - `Error`: special kind of `Throwable` for grievous error; not meant to recover
  - `Exception`: all other errors that can be dealt with (catch and throw)

Throwable Hierarchy

From Java's on-line tutorial:



Error: serious problem...crash!
Exception: something you can handle...catch!

Exceptions

- Java **`Exception`**:
  - Compile time
  - Runtime
- Compile time:
  - ***checked exception***
  - you must handle somehow in your code
  - example: see File I/O code
- Runtime:
  - ***unchecked exception***
  - you do not need to handle in your code
  - eg) array out of bounds, null pointers, divide by zero...
- An aside...your compiler:
  - When you write your compiler, what kind of exceptions (for the most part) are you dealing with?
  - When we grade your compiler, what kind of exceptions are we looking for?

Handling Exceptions

- Three operations:
  - claiming exception:
    - method informs compiler about its possible exceptions
    - sometimes you see method headers like this:
      `public void myMethod() throws IOException`
  - throwing exception:
    - statement can cause (compile time) or does cause (runtime) an error
    - method creates an exception object, which has info about program state, and passes to JVM
    - you can also deliberately throw an exception with **`throw`**
  - catching exception:
    - Java looks for code that handles the exception
    - starts in current method and then works backward in chain of method calls

Catching Exceptions

- Catching exceptions in body of method:

```
try {
   statements
}
catch (Exception1 e) {
   statements
}
catch (Exception2 e) {
   statements
}
.
.
.
finally {
   statements
}
```