Exceptions and Assertions

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Instead of having error codes `Java` support exception handling:

... a method can signal serious problems by throwing an exception;

... one of the method in the call chain can handle the exception.

Throwing exceptions

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Example:

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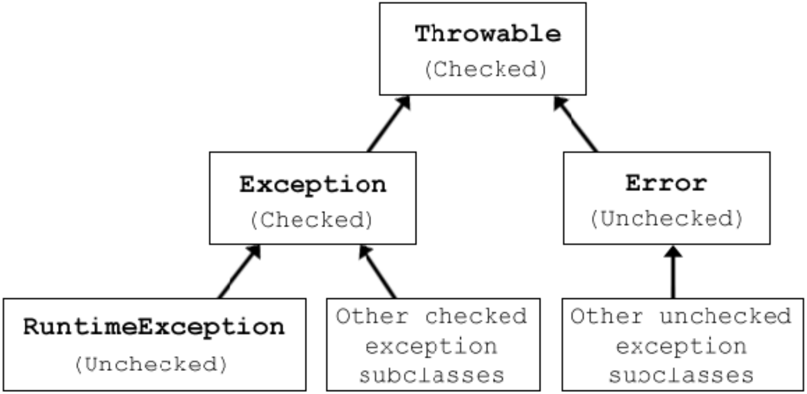
Solution: throw appropriate exceptions!

```
public static int randInt( int low , int high ) {
  if (low > high) {
    throw new IllegalArgumentException(...);
  }
  return low + (int) (Math.random()*(high-low+1));
}
```

The Exception Hierarchy



Extending Exceptions...

```
public class MyException extends Exception {

  public MyException() {
    super();
  }

  public MyException( String message ) {
    super(message);
  }

  public MyException( String message , Exception cause ) {
    super(message,cause);
  }

  ...
```

Declaring Checked Exceptions

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Replace multiple exceptions with a single superclass only when these are related!

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Throw early, catch late!

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Question: why?

Catching Exceptions

To catch an exception we have to put the code in a `try catch` block:

```
try {
  //source block
} catch (ExceptionClass1 ex1) {
  //handling block 1
} catch (ExceptionClass2 ex2) {
  //handling block 2
} catch (ExceptionClass3 | ExceptionClass4 ex2) {
  //handling block 3
}
```

Try-with-Resources Statement

Let us consider the following portion of code:

```
String[] lines = ...;
PrintWriter out = new PrintWriter("output.txt");
for (String str: lines) {
  out.println(line.toLowerCase());
}
out.close();
```

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This code has a hidden danger!

If an exception is thrown, the file is never closed!

Try-with-Resources Statement

Variables can be declared (or referenced) in the try:

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Declared/referenced variable must be an instance of AutoCloseable. This is an interface with the single method:

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public void close() throws Exception
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When the block terminates (normally or due to an exception), the close() method is invoked!

The finally clause

The finally clause can be used to execute something at the end of a try block:

```
try {
  //try block
} catch (Exception1 e1) {
  //handler1 block
} catch (Exception2 e2) {
  //handler2 block
} finally {
  //finally block
}
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Finally block must have not a return statement!

Rethrowing an exception

Sometime is useful to handle only partially a given exception:

```
try {

} catch (ExceptionClass e) {
  //Do something...
  throw e
} catch (AnotherExceptionClass e) {
  //Do something...
  throw new ApplicationSpecificException(e);
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This is useful to transform a *checked* exception into an *unchecked* ones.

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      //Record exception.
   }
);
```

When we are not able to handle an exception, the only solution is to report the stack trace:

```
try {
   Class<?> cl = Class.forName(className);
   ...
} catch (ClassNotFoundException e) {
   ex.printStackTrace();
}
```

Utility methods and classes

Class StackWalker can be used to inspect the stack trace.

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Class Objects provides utility methods that perform convenient null check:

- Objects.requireNonNull(var)
- Objects.requireNonNullElse(var,e)
- Objects.requireNonNullElseGet(var,f)

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Assertions can be used to check if a given condition is satisfied::

```
assert x>=0;
Math.sqrt(x);
```

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N.B.: Assertions can be enabled/disabled at execution time via `-ea` and `-da` parameters.

To be continued. . .