CSSE2002/7023

Programming in the large

Week 3.2: Exceptions

This hour:

- Exception example
- Throwing exceptions
- Exceptions and inheritance
- Pros and cons of exceptions
- Collections
- java.util.Stack
- Primitive wrappers

Exceptions

`exc1.java`

- Don’t just squash exceptions
- Once an exception has been thrown, it will unwind the stack until caught. Return does not happen.
- `finally` happens whether or not an exception was caught
- Trigger an exception with `throw`.
- A `try` can have multiple `catch` blocks

If they aren’t caught …

Let’s have `exc1` raise a `java.io.IOException`.

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If Java knows that some types of exceptions *could be thrown*, it insists you do something about them. You must either:

1. `catch` it
2. Declare that the method could throw

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Use `throws`

Inheritance and Exceptions

Exceptions are objects (and hence described by classes). Eg:

```
try {


} catch (IOException e)  {
    // FileNotFoundException,
    // UnknownHostException
    // EOFException, ...
}
```

Inheritance and Exceptions

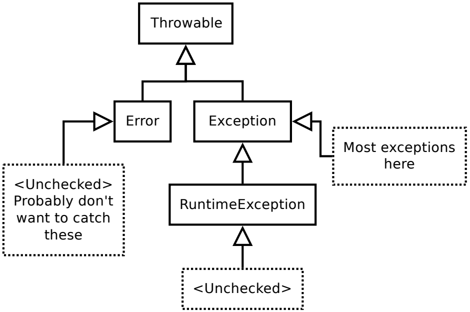
```
try {

} catch (FileNotFoundException e) {
    // This could execute
} catch (IOException e)  {
    // this could execute
} catch (EOFException e) {
    // this will not execute
    // already dealt with by
    // superclass above
}
```

Be sure to put the most general class last.

Exception heirachy

In `java.lang`:



You don’t need to declare methods throw things which are subclasses of `RuntimeException` or `Error`.
You could `catch Throwable`. Don’t! Errors are generally very bad.
What about `catch Exception` — need a good reason.

Pros and Cons

- The code that detects the problem may not know what it should do about it (move IO to borders of the program).
- Exception propagation means decisions can be made elsewhere (without needing to code a return path all the way back).
- Can carry a lot of information
- Can’t just be ignored (unless squashed)
- Java likes them
- Did something go wrong (waves vaguely) somewhere in there.
- Not as good if the problem should be checked immediately.
- Less convienient where fine control is needed
- Better for “exceptional” circumstances
- If it can be checked for ahead of time, is it better to do that instead?

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Why not arrays?

Arrays aren't great for everything:

- Fixed size at creation time — do you know how much space you are going to need?
- Don't automatically close gaps

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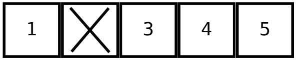

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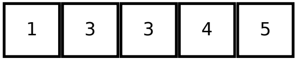

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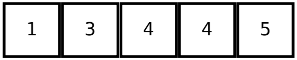

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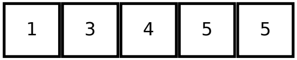

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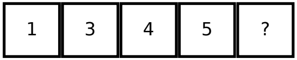

Other options

We will talk about some other datastructures. We are looking at their API (what they can do) not (unless otherwise indicated) their performance (how fast they do it)[1].

- stack
- vector
- list
- set
- map

All of these live in `java.util.*`.

[1]See an algorithms course for that.

Stack / L.I.F.O

`empty()`	is this stack empty?
`peek()`	Return the object at the top of the stack.
`pop()`	Remove the object at the top of the stack and return
`push(obj)`	Put `obj` on the top of the stack.

Stack — generics

Originally Java collections stored `Object`s.
We often want to be more restrictive (so that we don't get `Car`s in our stack of `Cat`s).
To declare a stack of `String`s:

```
Stack<String> s=new Stack<String>();
```

Stack

`Stackdemo.java`

What is it good for?

- Reversing things?
- Putting something aside to come back to later while you deal with something else now.
- “Depth-first” algorithms

Primitives in Collections

What about `Stack<int>`? No. Collections will only store Objects.
Java has a class[2] for each primitive type:
`Boolean, Byte, Character, Double,`
`Float, Integer, Long, Short`

So you can have `Stack<Integer>`.

`IntStack.java`

Autoboxing — create objects in the background. Primitives are still not objects.

[2] In `java.lang`