Introduction to Java

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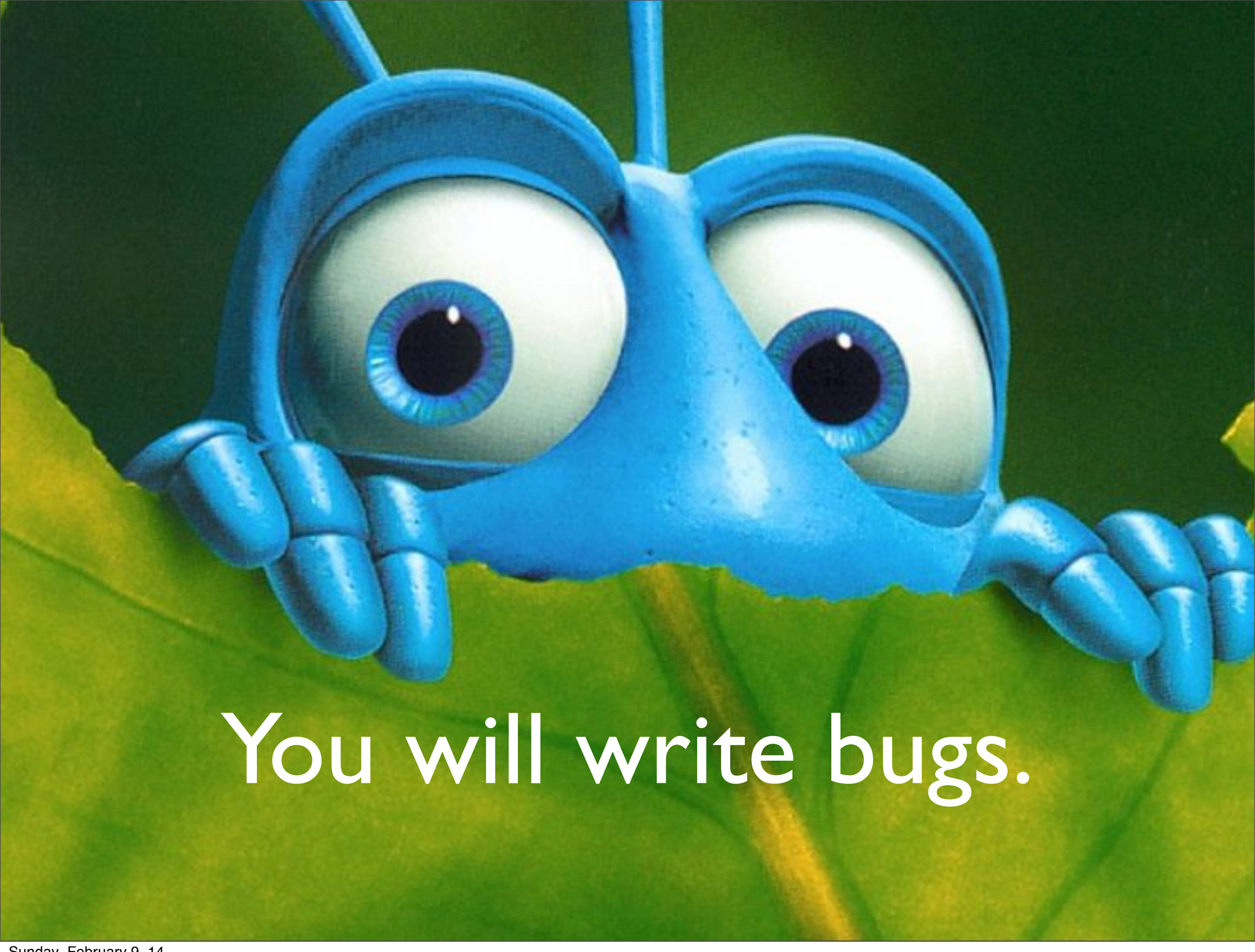
Class Structure

- The Why and What of Java
- Basic Logic
- Object-Oriented Programming
- **When Things Go Wrong**
- Common Java APIs
- JUnit
- Generics
- Putting It All Together I & II


You will write bugs.

Things that can go wrong....

- Compiler errors
- Runtime errors (bugs)
- Exceptions
- Input errors

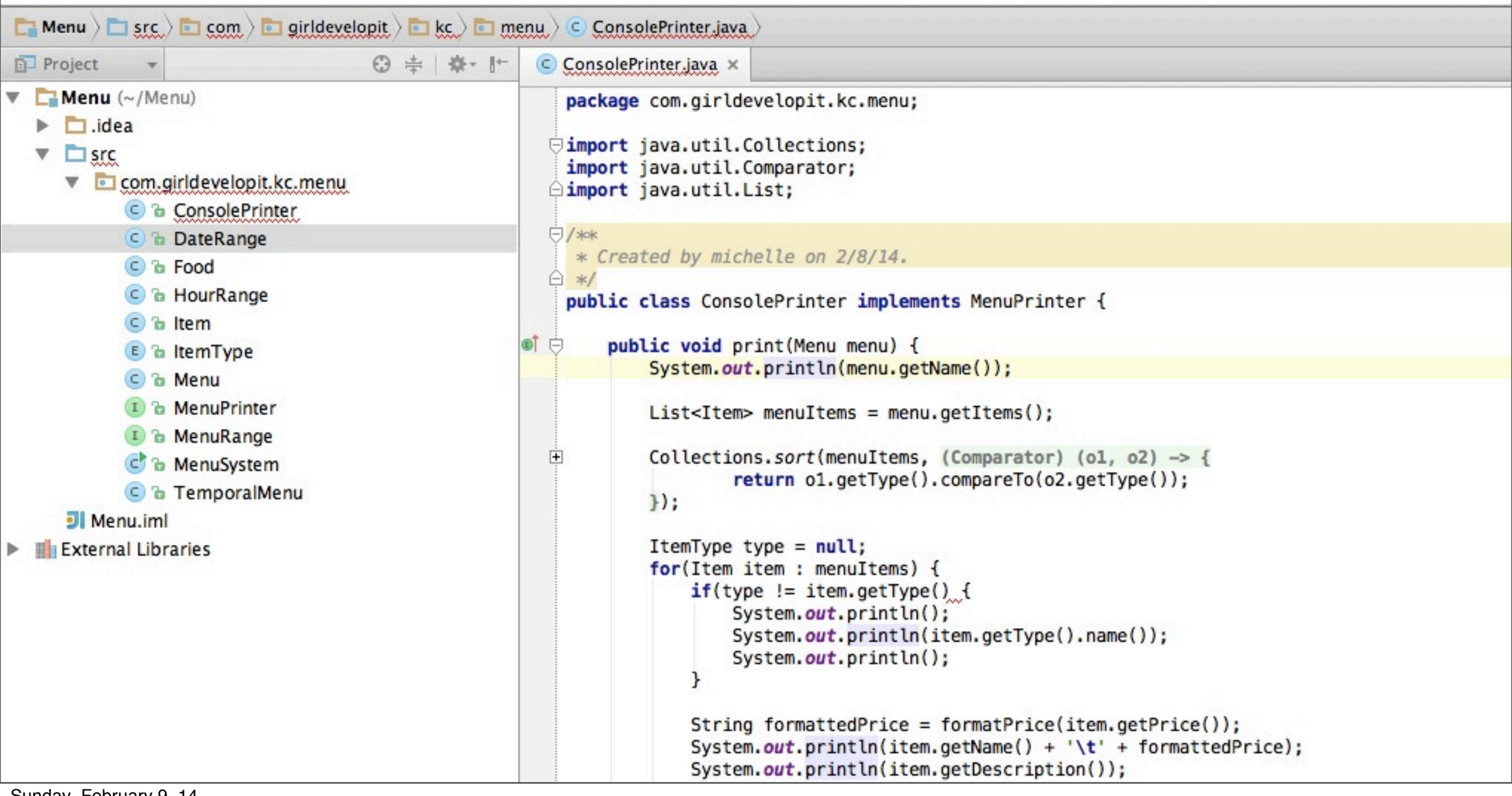
Compiler Errors

Programming languages have **syntax** that you must follow.

Compiler errors happen when your code doesn't follow the **syntax**.

I have no idea what you want me to do.

Red Squiggles



Messages


Messages Make
Information: Using javac 1.7.0_45 to compile java sources
Information: java: Errors occurred while compiling module 'Menu'
Information: Compilation completed with 1 error and 0 warnings in 3 sec
Information: 1 error
Information: 0 warnings
/Users/michelle/Menu/src/com/girldevelopit/kc/menu/ConsolePrinter.java
Error:(26, 38) java: ')' expected

How to Resolve the Error

- Read the error in the message view.
- Read the line of code it references.
- Check your assumptions.
- All else fails, Google it!

Remember...

Computers are 3 year olds that are really good at math and have huge memories.

- They are obstinate.
- They have a poor vocabulary.
- They are never wrong.

Bugs

9/9

0800 Arctan started
1000 " stopped - arctan ✓ { 1.2700 9.037 847 025
9.037 846 ?95 correct
13"u_c (032) MP - MC ~~1.9821647000~~ ~~2.13047641 5 (-3)~~ 4.615925059(-2)
(033) PRO 2 2.130476415
correct 2.130676415
Relays 6-2 in 033 failed special speed test
In relay " 11.00 test.
Relays changed
1100 Started Cosine Tape (Sine check)
1525 Started Multy Adder Test.

1545 Relay #70 Panel F
(moth) in relay.
First actual case of bug being found.
1700 1630 Arctangent started.
closed down.

Relay 2145
Relay 3370

Bugs

Root cause:

The code isn't doing what you think it is.

Solution:

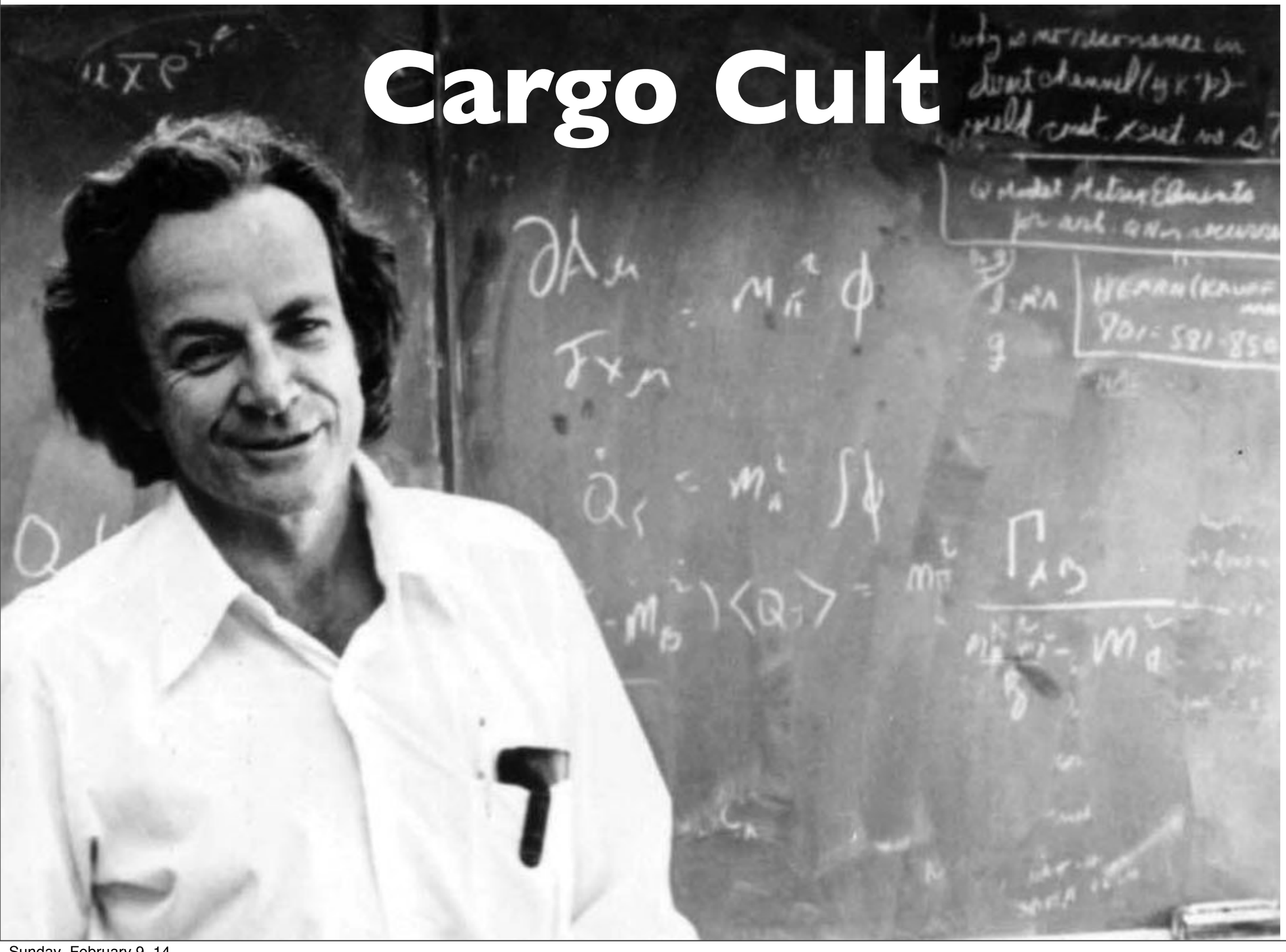
Figure out what the code is really doing.

Scientific Method

1. Characterize the problem.
2. Form a hypothesis.
3. Design an experiment.
4. Perform the Experiment.
5. Evaluate the result.

Don’t just throw code at the problem...

Cargo Cult



Scientific Method

1. **Characterize the problem.**
2. Form a hypothesis.
3. Design an experiment.
4. Perform the Experiment.
5. Evaluate the result.

Characterize the Problem

Date:

In the box, draw & write as many words as you can to tell about your observation

What **observations** can I make about the code?

Don't forget to use your five senses!

Scientific Method

1. Characterize the problem.
2. **Form a hypothesis.**
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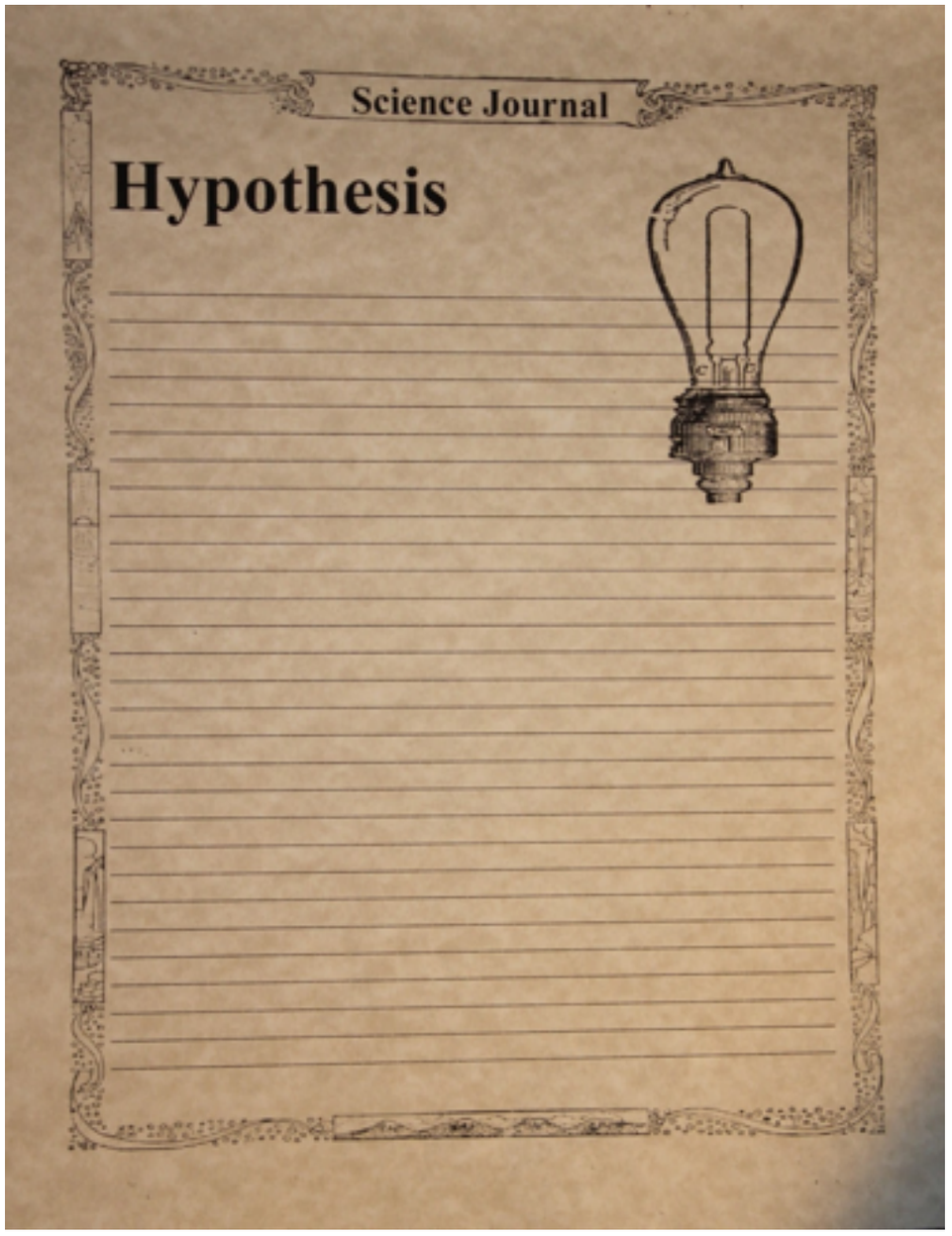
Form a Hypothesis

What is a reasonable **guess** as to the source of the issue?



Scientific Method

1. Characterize the problem.
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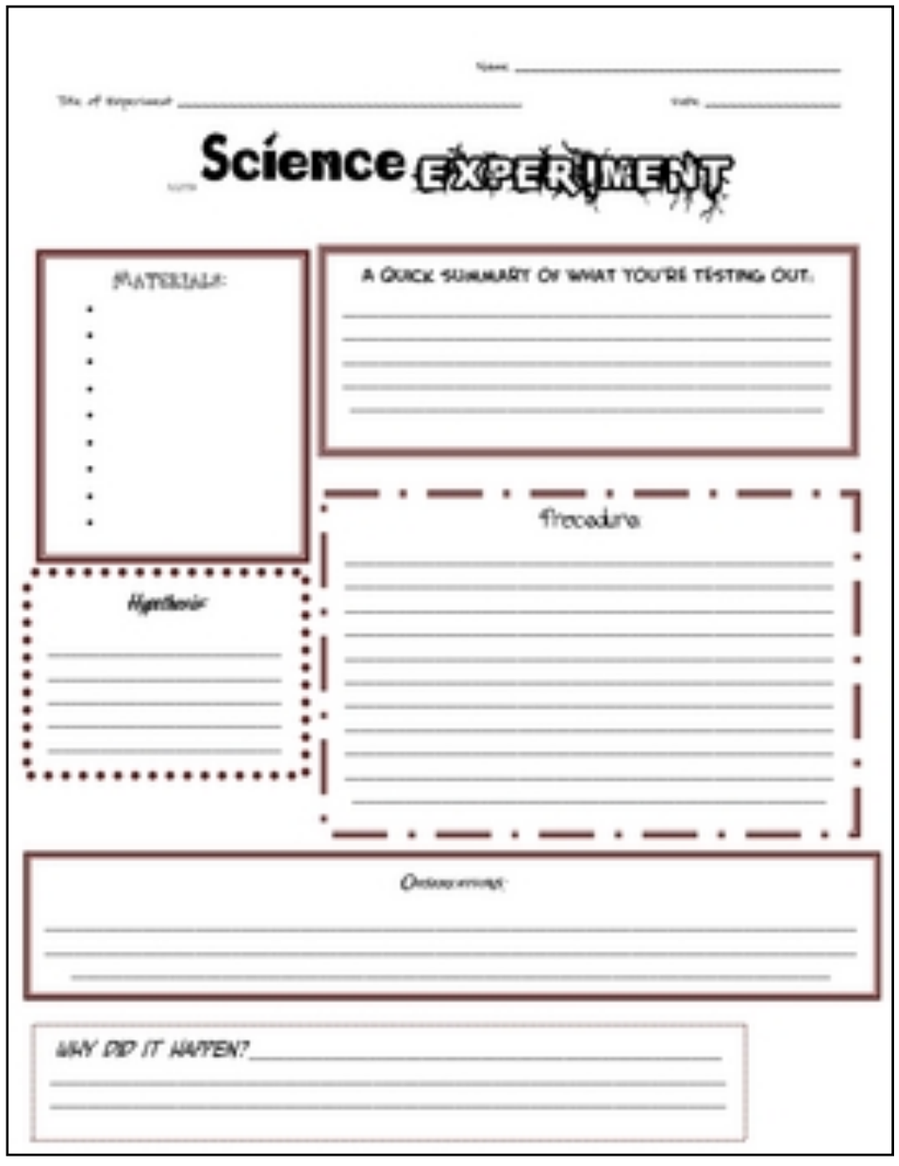
Design an Experiment

What can I do to **test** my hypothesis?



Design the Experiment

- Test
- Debug
- Eliminate Possibilities

Scientific Method

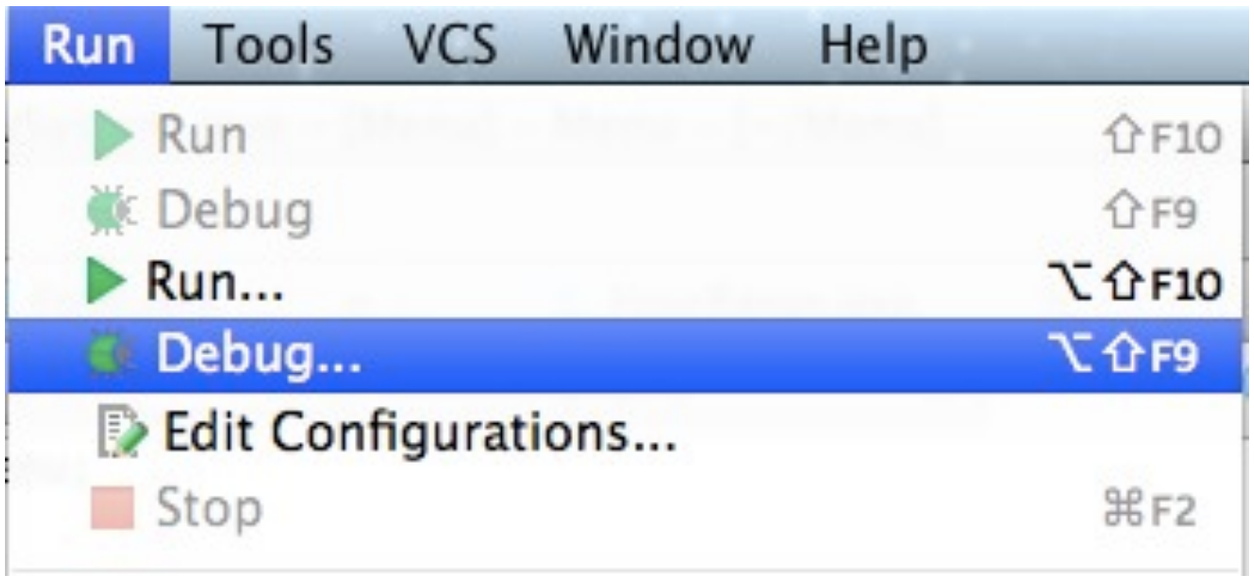
1. Characterize the problem.
2. Form a hypothesis.
3. Design an experiment.
4. **Perform the Experiment.**
5. Evaluate the result.

Test

- Try different inputs.
- Exercise different parts of the program.

Poke at the program.

Debugger


Run
Tools
VCS
Window
Help
Run ⇧F10
Debug ⇧F9
Run... ⌥⇧F10
Debug... ⌥⇧F9
Edit Configurations...
Stop ⌘F2

Debugging Terms

- Breakpoint
- Step over
- Step into
- Step out of

Scientific Method

1. Characterize the problem.
2. Form a hypothesis.
3. Design an experiment.
4. Perform the Experiment.
5. **Evaluate the result.**

Evaluate the Result

- Did what I expected to happen, happen?
- Did I see something that surprised me?
- Is the cause obvious?

If not, repeat the process.

Exceptions

Exceptions are objects.

They are "**thrown**" when something potentially bad happens.

You can "**catch**" them.

Throwing

```
throw new RuntimeException(“Error!”);
```

Catching

```
try {
    //some operation
} catch (RuntimeException e) {
   //handle it
}
```

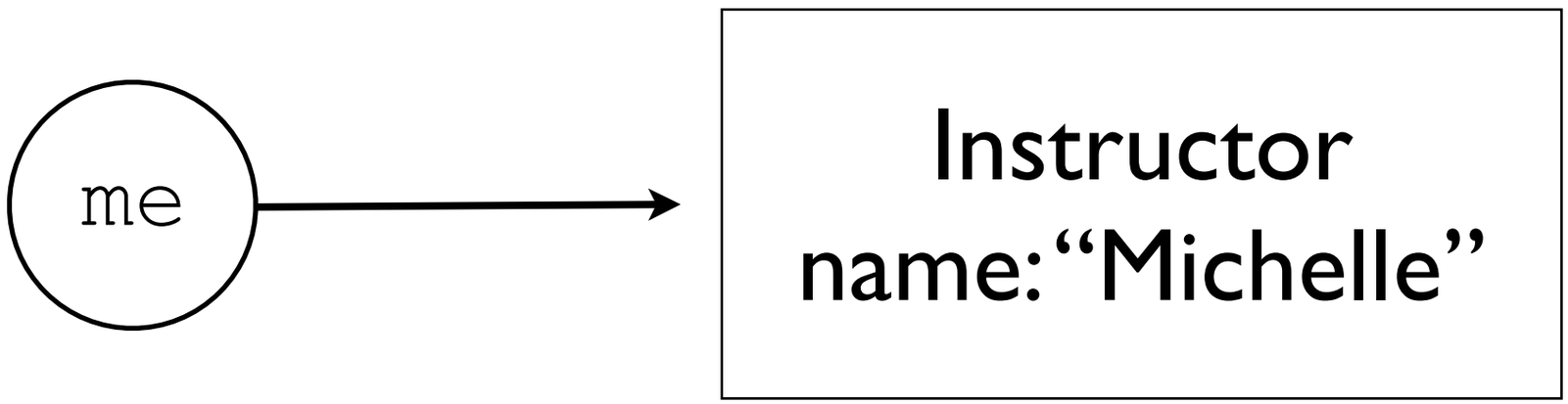
Why?

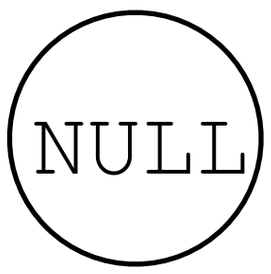
- Your function gets bad parameters
- The computer ran out of memory
- A file couldn't be opened
- Something didn't exist
- Something isn't configured properly

Most Common

An object is null.

What is null?





Points to nothing

Null

Null is a reference to nothing.

Where do null objects come from?

```
//We explicitly create them.
Object obj = null;
```

Where do null objects come from?

```
//We fail to initialize a member.
public class Food {
    private String name;
    private String description;
    public Food(String name) {
        this.name = name;
    }
```

Where do null objects come from?

```
//We get them from a function.

Object obj = getObject();
```

What happens if we use null?

```
Object obj = null;

//Throws an exception
obj.equals(“happy”);
```

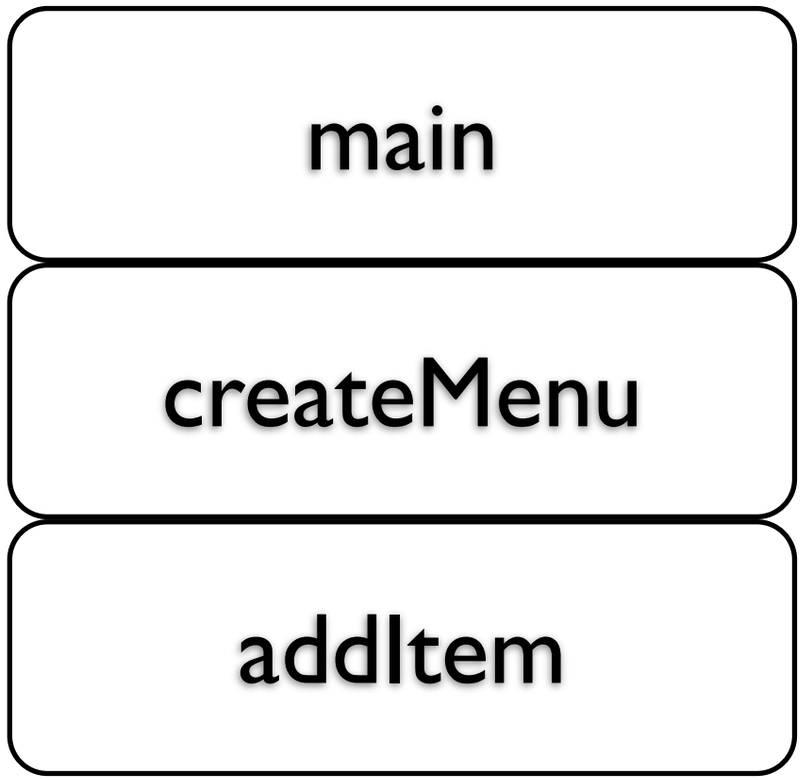
NullPointerException

http://docs.oracle.com/javase/7/docs/api/java/lang/NullPointerException.html

RuntimeException

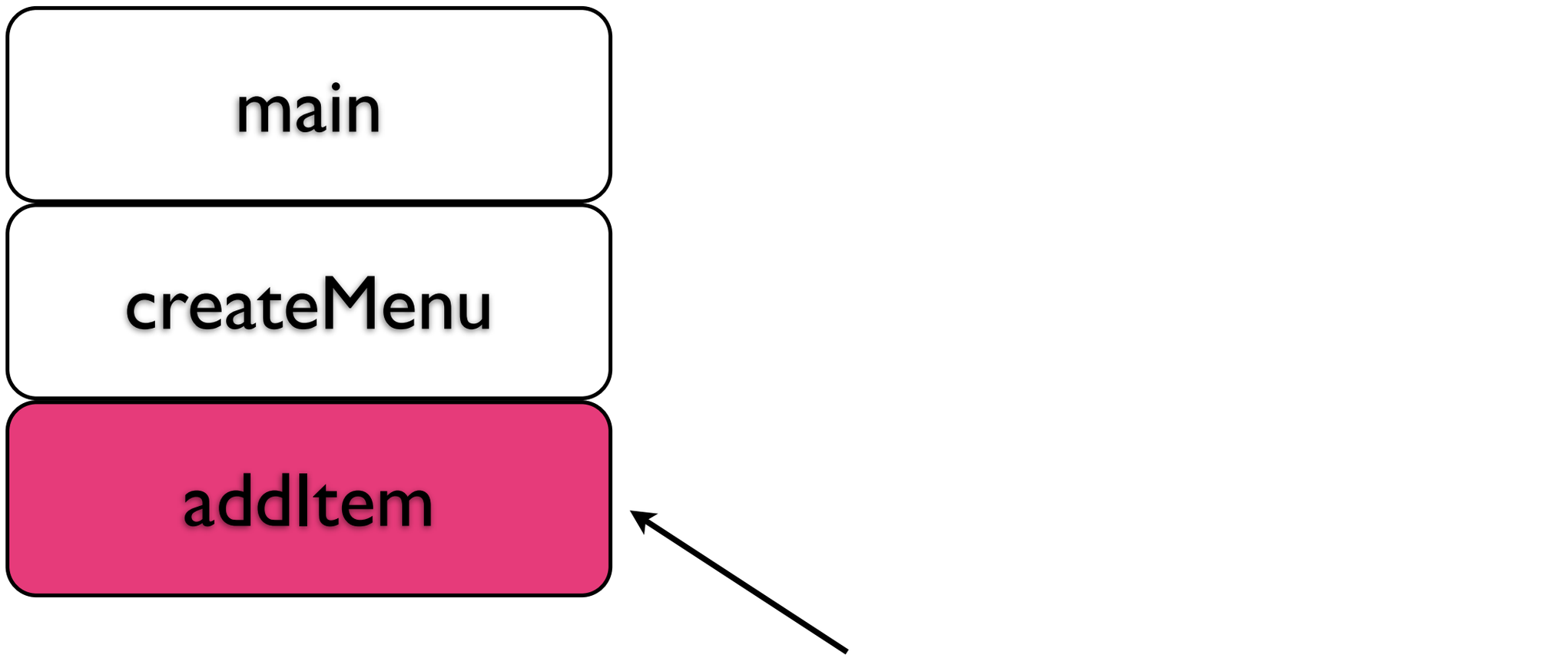
- You can catch them.
- If you don't, your program will terminate.

Exceptions

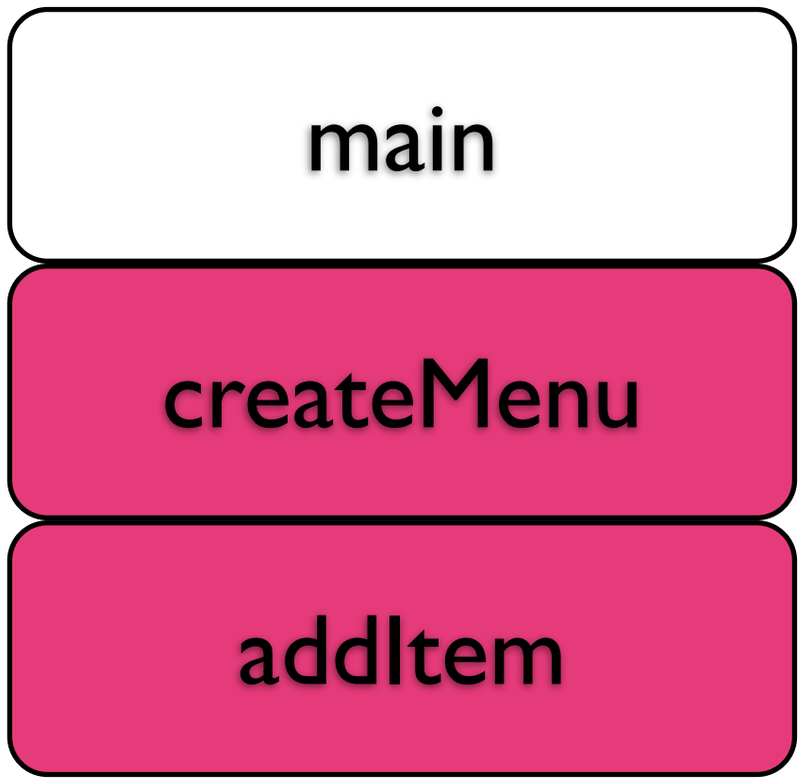


When an exception is thrown, the program immediately **jumps out** of the current function.

Exceptions

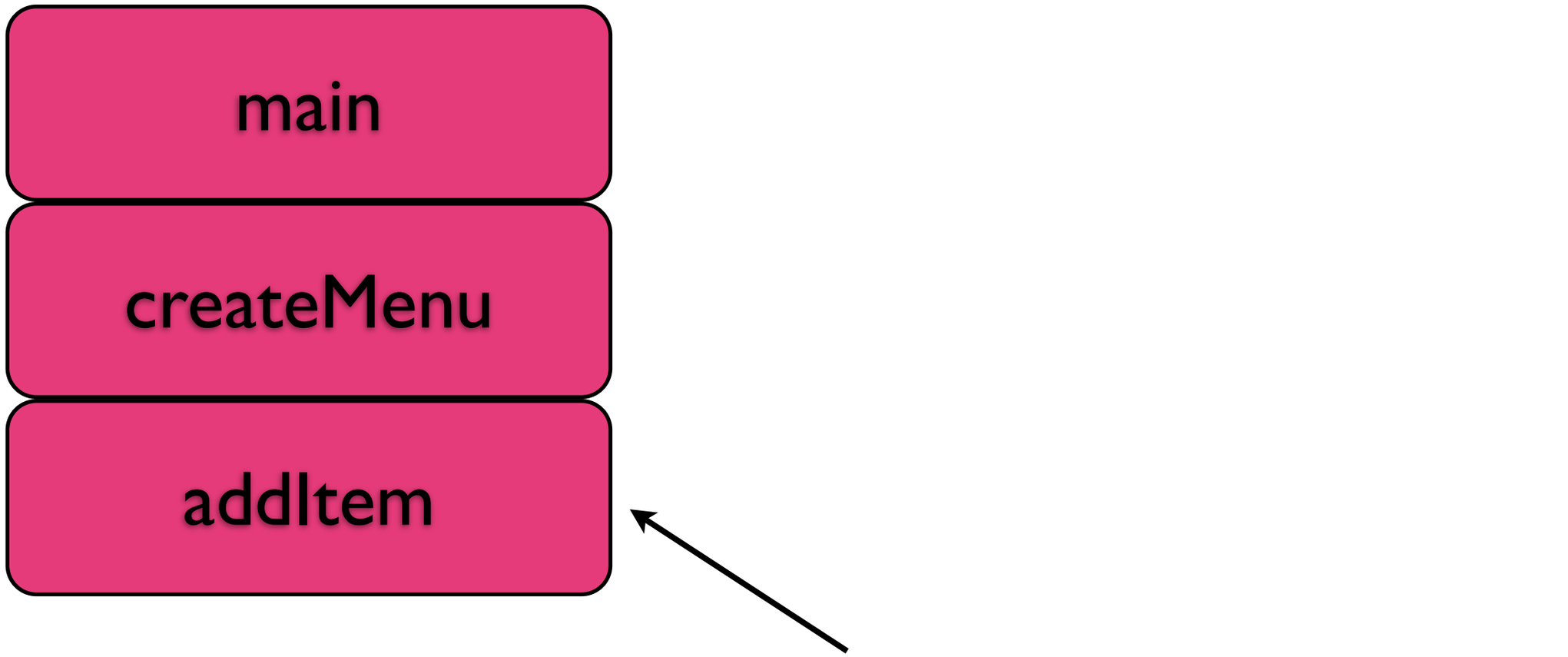


Exceptions

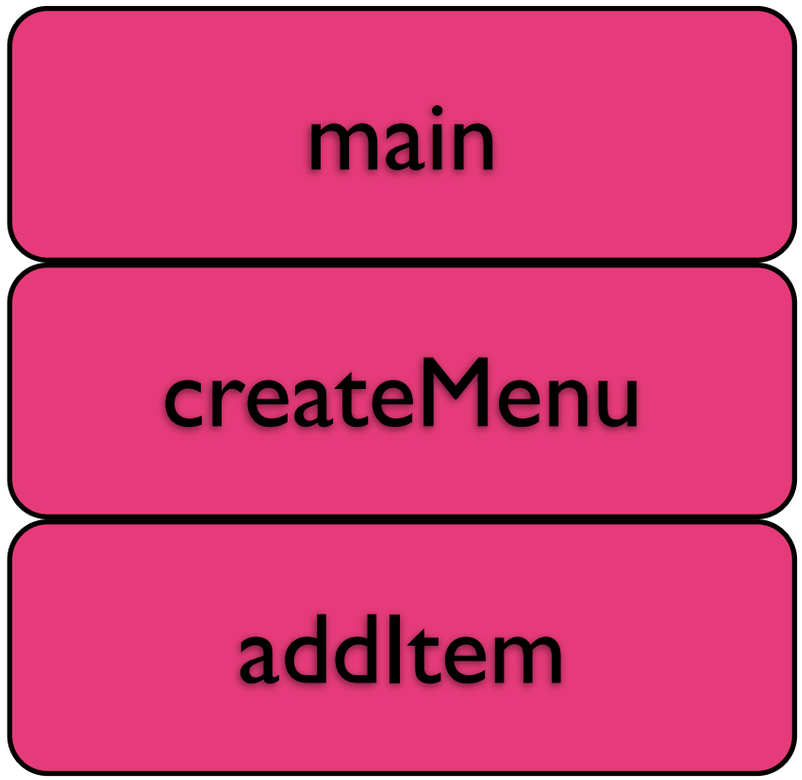



```
throw new NullPointerException();
```

Exceptions



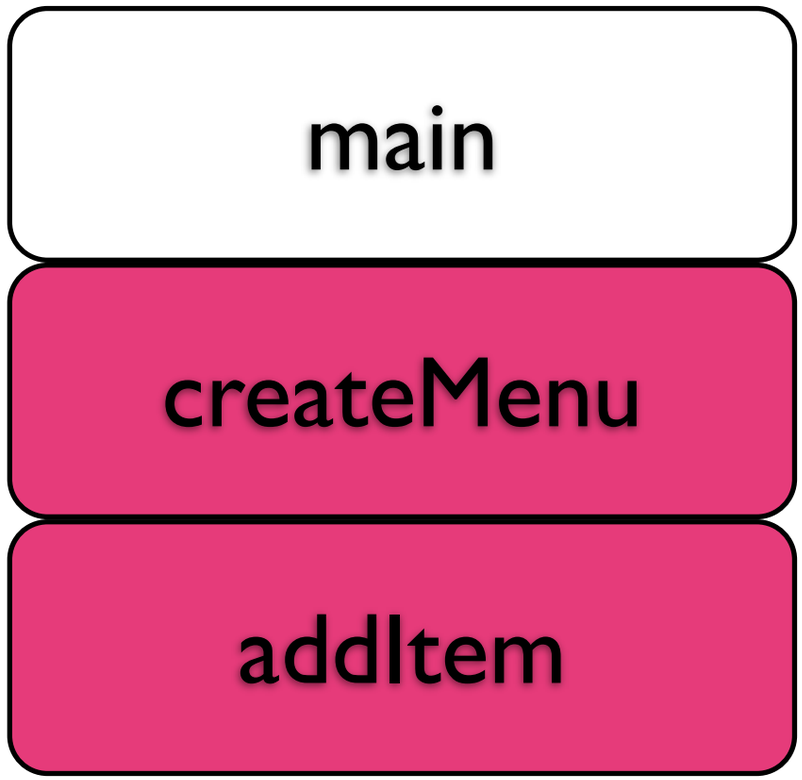
Exceptions



Program terminates.

```
throw new NullPointerException();
```

Exceptions




```
try {
    menu.addItem(...)
} catch(NullPointerException e){
    //handling code
}
```

```
throw new NullPointerException();
```

CheckedExceptions

- Compiler error if you don't recognize it.
  - try/catch
  - throws

Proper Exceptions

- Only used for unexpected events
- Checked exceptions should be

Proper Exceptions

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Creating Your Own

Checked	**Unchecked**
Exception class	RuntimeException class

http://docs.oracle.com/javase/tutorial/essential/exceptions/runtime.html

Define reasonable...

Creating Your Own

```
class MenuException extends RuntimeException {

    public MenuException(String message) {

       super(message);

    }

}
```


Fix my code.

Download

https://github.com/gdikc/IntroductionToJava

Menu under samples