

# About the Course

Andreas Zeller





# Course Topics

- Tracking and Reproducing Problems
- The Scientific Method
- Understanding Programs
- Isolating Failure Causes (automatically)
- Locating and Fixing Defects

*“Why does my Program Fail?”*

# Your Lecturer

Andreas Zeller





# Course Material

- Book “Why programs fail”
- Lecture slides, dates, links on Web page:  
<http://www.whyprogramsfail.com/>



# Course Format

- 20 **lectures** (= twice per week), Tue + Thu
- 3 **projects** (“write your own debugger”)
- Oral **exams** at the end of quarter

# Three Projects

**Simplifying  
Input**  
2 weeks

**Comparing  
Coverage**  
3 weeks

**Locating  
Causes**  
4 weeks

written in Python for Python



# Simplifying Input

What's relevant in here?



# Comparing Coverage

```
$ sample 9 8 7
```

```
Output: 7 8 9
```

```
$ sample 11 14
```

```
Output: 0 11
```

How do these runs differ?



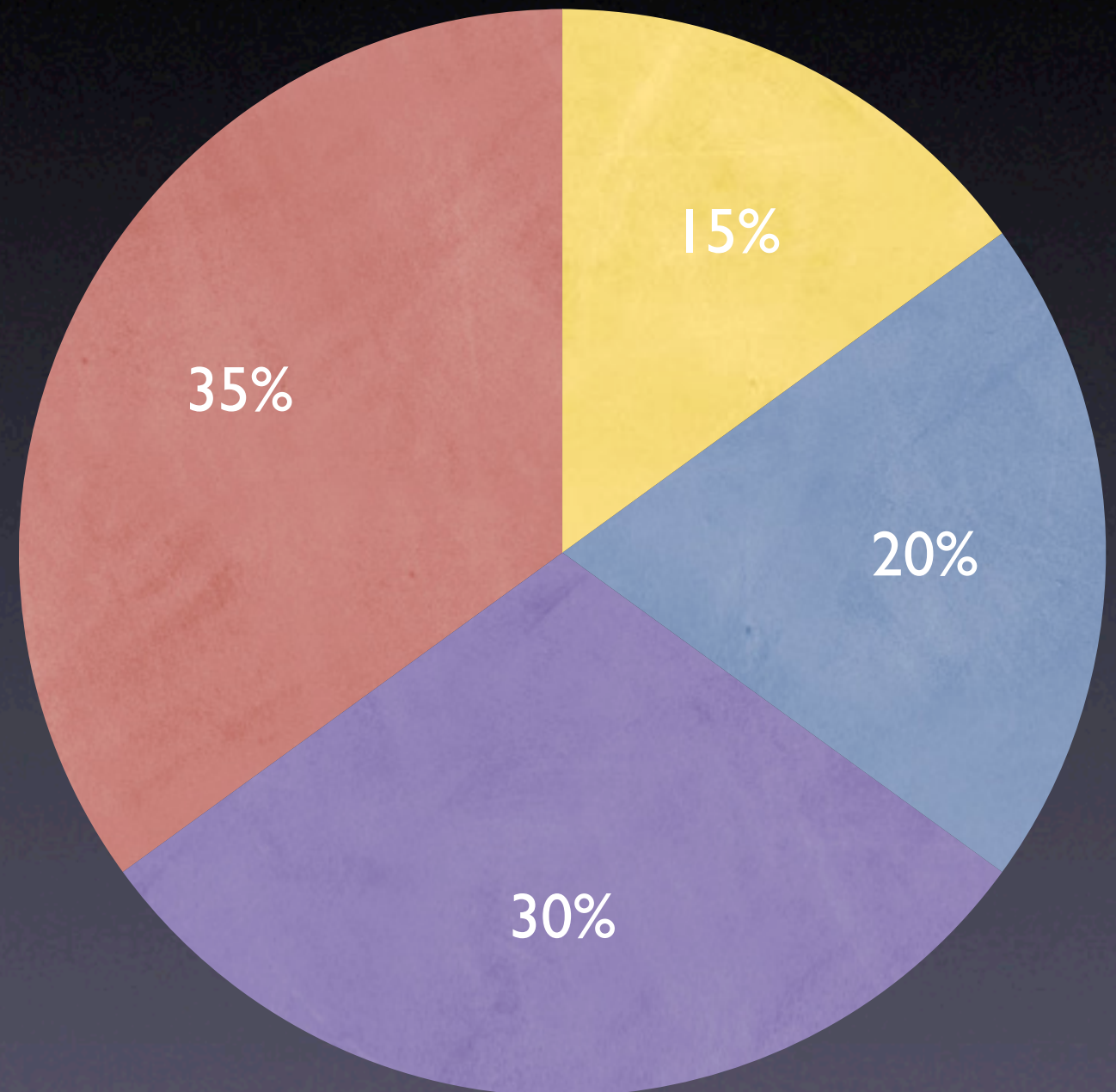
# Locating Causes

```
if (GET_CODE (XEXP (x, 0)) == PLUS {  
  x = apply_distributive_law  
    (gen_binary (PLUS, mode,  
                 gen_binary (MULT, mode,  
                             XEXP (XEXP (x, 0), 0),  
                             XEXP (x, 1)),  
                 gen_binary (MULT, mode,  
                             XEXP (XEXP (x, 0), 1),  
                             XEXP (x, 1))));  
  return x;  
}
```

What causes the failure?

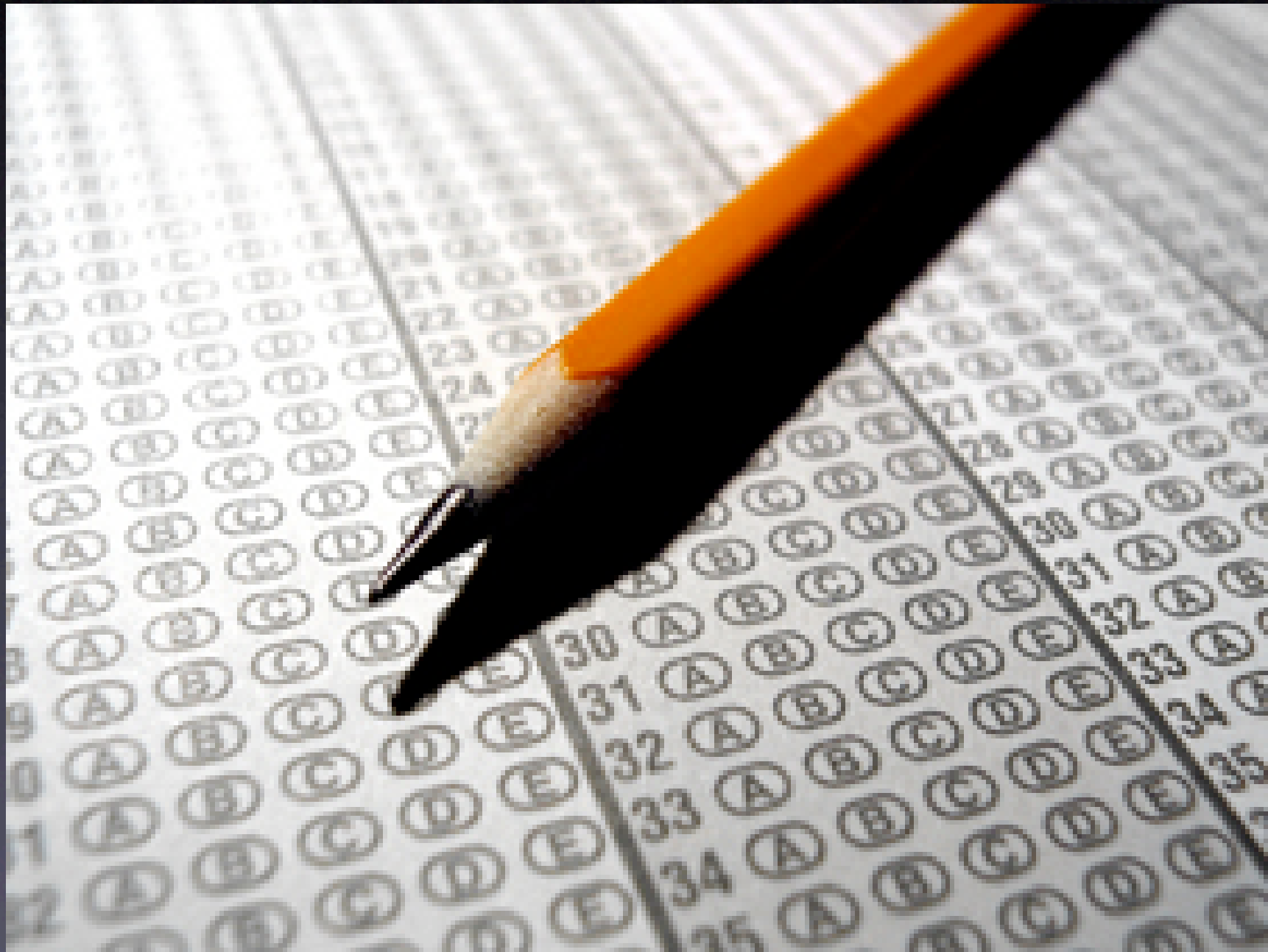
# Grading

- Simplifying Input
- Comparing Coverage
- Locating Causes
- Oral Exam

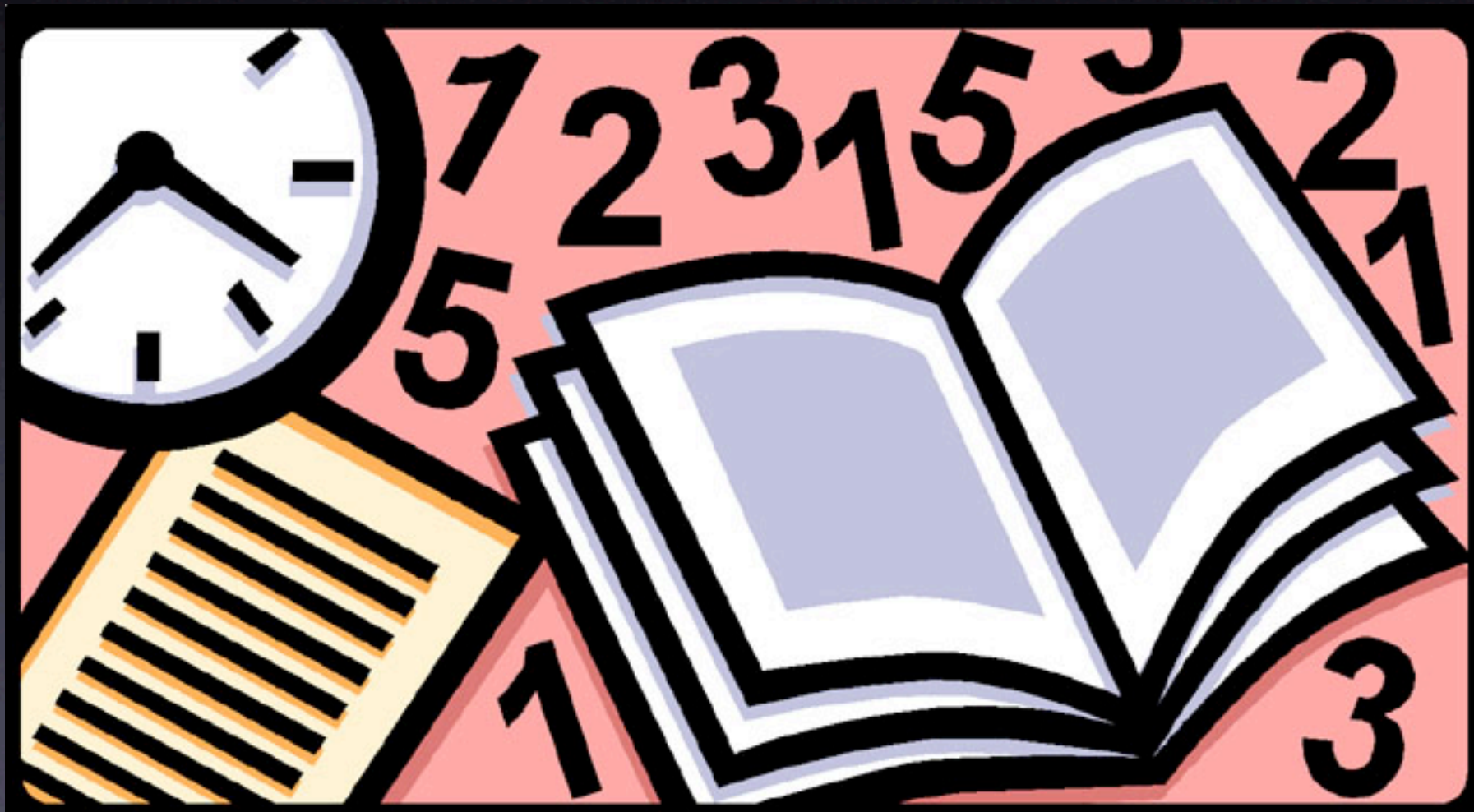




# Assessment



# Exam





## About the Course

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## How Failures Come to be

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## Tracking Problems

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## Making Programs Fail

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## Reproducing Problems

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## Simplifying Problems

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## The Scientific Method

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## Deducing Errors

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## Observing Facts

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## Tracking Origins

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## Asserting Expectations

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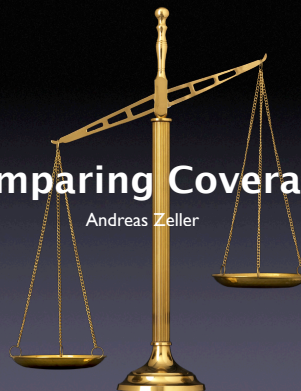
## System Assertions

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## Comparing Coverage

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## Detecting Anomalies

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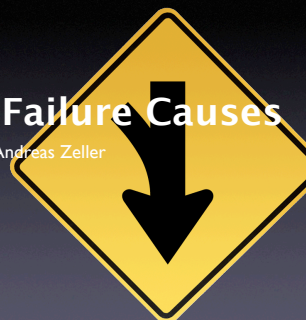
## Causes and Effects

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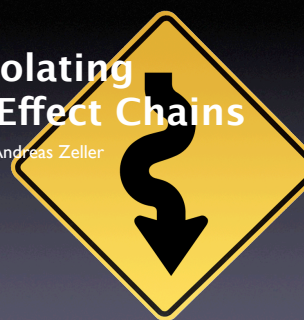
## Isolating Failure Causes

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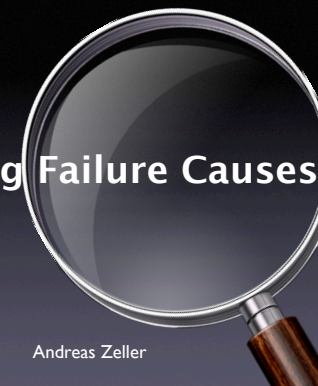
## Isolating Cause-Effect Chains

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## Locating Failure Causes

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## Fixing the Defect

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