10-0: **Debugging**

- Your code is misbehaving. What do you do?
  - What is the first step for debugging?

10-1: **Debugging**

- Step I:
  - Reproduce the bug!
  - Find a method that consistently displays the unwanted/unexpected behavior
  - Find the \textit{smallest possible} case that displays the problem
  - If necessary, change your code (#ifdefs, comments) to make it as simple as possible while still showing the problem

10-2: **Debugging**

- Step II:
  - Determine the “edges” of the bug
  - That is, under what conditions does the bug appear? Disappear?

10-3: **Debugging**

- Step III:
  - Once you know exactly when & where the bug appears, you should have a good idea about where in the code the problem shows up
  - This is not where the problem \textit{is}, necessarily, just where the problem is \textit{seen}
  - Time to break out the tools

10-4: **Using the tools**

- Breakpoints, call stacks, watches
- Looking through the callstack
- Breakpoints on data changes

10-5: **Examples**

- Debugging Example 1

10-6: **Examples**

- Debugging Example 1
  - Overwriting data by going past bounds of an array

10-7: **Examples**

- Debugging Example 2
10-8: Examples
  - Debugging Example 2
    - Overwriting “this” pointer

10-9: Examples
  - Debugging Example 3

10-10: Examples
  - Debugging Example 3
    - Interpreting the data as the wrong type

10-11: Examples
  - Debugging Example 4

10-12: Examples
  - Debugging Example 4
    - Maintaining a pointer to data on the stack

10-13: Examples
  - Debugging Example 5

10-14: Examples
  - Debugging Example 5
    - Destructor without copy constructor
      - Rule of 3:
        - Constructor
        - Copy Constructor
        - Copy Assignment Operator
        - If you have one, you probably need all three ...

10-15: Examples
  - Tank example
    - No tanks can move ... why?

10-16: Examples
  - Checking for collisions
    - Array of tanks
    - Check each tank for collisions with all other tanks
    - No tank can move
10-17: **Examples**

- Checking for collisions
  - Array of tanks
  - Check each tank for collisions with all other tanks
  - Each tank collides with itself

10-18: **Examples**