How to Develop Small Programming Projects*  
Jill Seaman  
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*without banging your head against the wall

Getting Started

• Start early: we always underestimate the complexity of the problem.
• Understand the material: study first!
• Understand the requirements (READ the directions, don’t make assumptions).
• Use some top-down (or object-oriented) design to break up the problem into pieces.
• Make a plan before you implement.

Develop Programs Progressively  
(incremental development)

• Do not attempt to implement an entire program all at once.
• Implement a very small, but workable, part.
• Compile, fix syntax errors, execute (test), debug
• Add another small part, refine the code
• Compile + test. Any new errors are (probably) due to newly added code.
• Repeat until complete

Compiler (syntax) Errors

• Fix only the first one or two before re-compiling, later errors may be dependent.
• Don’t speak compiler?  
  Google the error text (with caution)
• Think of common syntax errors
  – Missing semicolons
  – Misspelled variable names
  – Misplaced ( ) or { }, backwards << or >>
Testing

• **Testing**: running the program with simulated data, checking the actual output against expected output, in order to find bugs
• **Bug**: coding mistake causing an error in output
• **Test Case**: a set of specific input data and the corresponding expected program output
• Choose input data wisely:
  - Values used in if/while conditions
  - Smallest and largest valid values of a dataset
  - Put data in multiple positions: for maximum, put max value in first position, then last position, then middle position

Debugging

• **Test failure**: actual output from running a test case does not match the expected output.
• **Debugging**: figure out why it failed, find the coding mistake and fix it.
• Add output statements in strategic places:
  - check values of variables (label them!)
  - trace execution path, see which statements are being reached.