Goals

- Apply the design recipe!
- Use the listof-X-template!
- Write lots of list functions!
- Illustrate bottom-up development; talk about top-down development.
## Top-Down vs. Bottom-up

<table>
<thead>
<tr>
<th>Top-Down</th>
<th>Bottom-up</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Advantages</strong></td>
<td><strong>Disadvantages</strong></td>
</tr>
<tr>
<td>• Pretty sure you’ll develop the “right” helper functions.</td>
<td>• Hard to test until near the end, developing the “bottom” helper functions.</td>
</tr>
<tr>
<td>• Might be able to start even if you don’t have a clear vision for solving the entire problem.</td>
<td>• Might develop helper functions you don’t actually need.</td>
</tr>
<tr>
<td>• Can test as you go.</td>
<td>• Need a clear vision for the entire solution.</td>
</tr>
</tbody>
</table>
Design Recipe

Module 04 Slide 06:
1. Write a draft of the purpose statement
2. Write Examples (by hand, then using check-expect)
3. Write Definition Header & Contract
4. Finalize the purpose with parameter names
5. Write Definition Body
6. Write Tests
Caesar Cipher

Given a string, \text{text}, and a natural number, \text{shift}, write a function (\text{encrypt text shift}) that produces a new string encrypted using the Caesar cipher. A Caesar cipher replaces each letter in the \text{text} with a letter that is \text{shift} letters away from it in the alphabet.

All characters in \text{text} must be from the alphabet A-Z (upper case letters) plus space. Space is considered to be the next character after Z.

Note: The Caesar cipher is a well-known encryption method, but it is not secure and can be easily hacked. If you would like to learn more, consider taking CS 458: Computer Security and Privacy.
CQ1: Wrapper Functions

Which of the functions we developed are “wrapper functions”?

1. `(define (encrypt text shift)`
   `(list->string (encrypt/lst shift (string->list text))))`

2. `(define (encrypt/lst n loc)`
   `(cond [(empty? loc) empty] ...)

3. `(define (encrypt/char n ch)`
   `(first (drop n (drop-until ch alpha2))))`

4. `(define (drop-until ch loc)`
   `(cond [(empty? loc) empty] ...)

5. `(define (drop n loc)`
   `(cond [ (= n 0) loc] ...)

A. All of them
B. None of them
C. 2, 4, 5
D. 1, 2
E. 1, 3