Assignment Guidelines.

- This assignment covers material in Module 5.

Submission details:
- Solutions to these questions must be placed in files `a04q1.rkt`, `a04q2.rkt`, `a04q3.rkt`, and `a04q4.rkt`, respectively, and must be completed using Racket Intermediate Student.
- Unless otherwise indicated in the question you may use only the built-in functions and special forms introduced in the lecture slides from CS115 up to and including the modules covered by this assignment.
- Download the interface file from the course Web page to ensure that all function names are spelled correctly and each function has the correct number and order of parameters.
- All solutions must be submitted to MarkUs. No solutions will be accepted through email, even if you are having issues with MarkUs.
- Verify using MarkUs and your basic test results that your files were properly submitted and are readable on MarkUs.
- For full style marks, your program must follow the CS115 Style Guide.
- Be sure to review the Academic Integrity policy on the Assignments page.
- For the design recipe, helper functions only require a purpose, a contract and an example.

Restrictions:
- Unless the question specifically describes exceptions, you are restricted to using the functions and special forms covered in or before Module 5.
- Read each question carefully for additional restrictions.

Do not use `lambda` on this assignment.

The solutions you submit must be entirely your own work. Do not look up either full or partial solutions on the Internet or in printed sources.
1. **Enough Vowels.** For our purposes we define a *vowel* as one of the characters \( \texttt{a}, \texttt{e}, \texttt{i}, \texttt{o}, \texttt{u} \). (So here we are *not* counting \( \texttt{y}, \texttt{A}, \texttt{E}, \texttt{I}, \texttt{O}, \texttt{U}, \texttt{Y} \) as vowels.)

   **Exercise**

   Write a function `(vowel-heavies L)` that consumes a `(listof Str)` and returns a list containing all the values from L where at least half the characters are vowels.

   For example,

   ```scheme
   (check-expect (vowel-heavies (list "a" "banana" "is" "tasty" "and" "good")) (list "a" "banana" "is" "good"))
   (check-expect (vowel-heavies (list "aa!!" "ee!!" "WOO")) (list "aa!!"))
   ```

2. **The Sum of All Ph34rz.**

   **Exercise**

   Write a function `(sum-digits s)` that consumes a `Str` and returns a `Nat` which is the sum of all the numeric characters in s. For example,

   ```scheme
   (check-expect (sum-digits "31337 H4X0R") 21)
   (check-expect (sum-digits "ph34r my 1337 hax0rz skillz") 23)
   (check-expect (sum-digits "What?") 0)
   ```

   Read through the extra documentation on Strings and characters.

3. **A Function for Finding Few Factors.**

   **Exercise**

   Write a function `(fff n)` that consumes a `Nat` and returns a `(listof Nat)` containing all the numbers between 1 and n (inclusive) that are divisible by *exactly one* of 2, 3, and 7.

   With \( n = 15 \), numbers divisible by at least one of these values are `(list 2 3 4 6 7 8 9 10 12 14 15)`. But 6, 12, and 14 are divisible by two of these numbers. So

   ```scheme
   (check-expect (fff 15) (list 2 3 4 7 8 9 10 15))
   ```
4. First Glimpse at Databases. We can store a lot of information by making a list that contains lists. Each such list we will call a Book, and write:

;; a Book is a (list Str Str Nat)

Here are a few examples of a Book:

(define watney (list "Weir" "The Martian" 369))
(define potter (list "Rowling" "Harry Potter and the Philosopher's Stone" 223))

We can extract individual values from a Book:

(first watney) => "Weir"
(second watney) => "The Martian"
(third watney) => 369

We can then make a (listof Book), which can store a lot of information. For example:

(define booklist
  (list
    (list "Liu" "The Three Body Problem" 302)
    (list "Nawaz" "Songs for the End of the World" 400)
    (list "Heinlein" "The Moon Is a Harsh Mistress" 382)
    (list "Weir" "The Martian" 369)
    (list "Rowling" "Harry Potter and the Philosopher's Stone" 223)))

We can make another (listof Book) with one more item in it:

(define longer-booklist (cons (list "Austen" "Sense and Sensibility" 400) booklist))

Exercise
Write a function (count-pages L). It consumes a (listof Book) and returns the total number of pages.
(check-expect (count-pages booklist) 1676)

Exercise
Write a function (longest-book L). It consumes a non-empty (listof Book) and returns the Book with the largest number of pages. For example:
(check-expect (longest-book booklist) (list "Nawaz" "Songs for the End of the World" 400))
If more than one book has the largest number of pages, return the one closer to the front of the list:
(check-expect (longest-book longer-booklist) (list "Austen" "Sense and Sensibility" 400))