Instructions:

- There are a total of 57 points on this exam.
- All code is to use the Beginning Student with List Abbreviations language, unless otherwise noted.
- Individual questions will indicate which design recipe components must be included for full marks. Any functions you write that you are not explicitly asked to write (e.g., helper functions) must also include a purpose and a contract.
- When asked to write the function definition include definitions for useful helper functions and constants along with the function required by the question.
- When asked to write a contract or a data definition, you are expected to include any necessary requires clauses.
- Your functions do not have to check for invalid arguments.
- Functions you write may use:
  - Any function you have written in another part of the same question.
  - Any function we asked you to write for a previous part of the same question (even if you did not complete that part).
  - cons, cons?, empty, empty?, first, second, third, rest, list, append, length, and member?. You may not use reverse.
  - Any built-in mathematical function.
  - Any type predicate such as number?, boolean?, symbol?, and so on.
  - Any other built-in function or special form discussed in lecture, and/or on the reference sheet, unless specifically noted in the question. You are not allowed to use if.
- Unless otherwise specified, for questions where you are required to provide a value, you may use either cons, list, or quoted list notation. For stepper questions, switching between these notations does not count as a “step”.
- All of the questions of this exam can be solved with pure structural recursion, but you will not be penalized if you use structural recursion with an accumulator or generative recursion.
- Throughout the exam, you should follow good programming practices as outlined in the course such as appropriate use of constants, meaningful identifier names, and helper functions.
- If you believe there is an error in the exam, notify a proctor. An announcement will be made if a significant error is found.
- It is your responsibility to properly interpret a question.
  - Do not ask questions regarding the interpretation of a question; it will not be answered and you will only disrupt your neighbours.
  - If there is a non-technical term you do not understand you may ask for a definition.
  - If, despite your best efforts, you are still confused about a question, state your assumptions and proceed to the best of your abilities.
- The amount of space allocated to a question does not necessarily reflect the length of the response required.
- If you require more space to answer a question, you may use the blank page(s) at the end of this exam, but you must clearly indicate in the provided answer space that you have done so. Marks for that question will be recorded on the initial page for that question and not the additional space.