You have 70 minutes.

No notes, books, calculators, computers, etc. are allowed.

If you cannot understand what a question is asking, then ask for clarification. If you cannot obtain clarification, then include your interpretation of the problem in your solution. Never interpret a problem in a way that renders it trivial.

Unless a problem tells you that no explanation is needed, you are required to explain your reasoning or otherwise show your work, so that I can understand how you arrived at your answer. Incorrect answers with solid work often earn partial credit. Correct answers without explanatory work rarely earn full credit.

Good luck. :)

A. Is our Scheme parser more like a top-down parser or a bottom-up parser? Your explanation might benefit from pictures. It might also benefit from a concrete example.

This question is about the Scheme interpreter that we are implementing in our project.

B.A. Give an example of an error that we detect while tokenizing.

B.B. Give an example of an error that we detect while parsing.

B.C. Give an example of an error that is undetected during tokenization or parsing, but which we'll almost certainly detect later.

Suppose that we're using a buddy system to manage a 64-megabyte region of heap memory. We perform the following sequence of four `malloc`s and `free`s in the given order. For each step in the sequence, draw a sketch showing the state of the buddy system (which regions are claimed, which regions are free, and how big they all are) after that step.

C.A. `a = malloc(5 * megabyte);`

C.B. `b = malloc(28 * megabyte);`

C.C. `c = malloc(12 * megabyte);`

C.D. `free(a);`

D. The diagram below shows a global frame and some heap objects that are about to undergo stop-and-copy garbage collection. Each object consists of an integer and zero or more references to other objects. Draw a new diagram showing how the system looks after the first object x in the global frame has been copied (completely, including its recursions).
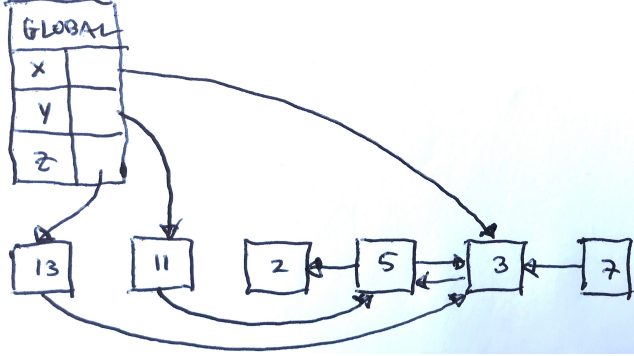
E.A. What are the big advantages of static typing over dynamic typing?

E.B. What are the big advantages of dynamic typing over static typing?