Part 1: Carpeting Rooms

A robot named karel has been hired to carpet some rooms along a section of its world. A room is one block wide and may be of any height, but must have continuous walls on its west and east side and at its northern end. If any walls are missing, the area must not be carpeted. Also, karel must not reuse beepers. This means that once a beeper has been put down, it must not be picked up. (Start your robot off with an infinite number of beepers.) When the robot encounters a beeper on street 1, then the carpeting is complete.
Part 2: Following a Path

2.a. A robot named karel likes to take long meandering walks in the woods in the world, and even though he has a built-in compass, the robot sometimes cannot find its way back home. To alleviate this problem, before karel walks in the woods that robot fills its beeper-bag and then it leaves a trail of beepers (a la Hansel and Gretel). Program karel to follow this path back home.

Assumptions: assume that no wall boundaries or wall sections interfere with karel, and assume that the end of the path is marked by two beepers on one corner. Each beeper will be reachable from the previous beeper by the execution of one move. Also, the path will never cross over itself.

Hint: it might be useful for karel to pick up the beepers as it follows the path; otherwise it may get caught in an infinite loop going backward and forward.

2.b. How difficult would it be to program karel to follow the same type of path as in problem a, if we allowed a beeper to be missing occasionally (but not missing two beepers in a row)? Program a solution to this problem.
Part 3: Escaping a Maze

Program a robot to escape from a maze that contains no islands. The exit of the maze is marked by a beeper on the first corner that is outside the maze, next to the right wall. The robot should start at the origin.

Hint: this task can be accomplished by commanding the robot to move through the maze always keeping a wall to its right.
Part 4: Infinite Pile of Beepers

There is a menace in Karel’s world—an infinite pile of beepers. Yes, it sounds impossible but occasionally one occurs in the world. If Karel accidentally tries to pick up an infinite pile of beepers, it is forever doomed to pick beepers from the pile. Karel’s current situation places the robot in grave danger from such a pile. The robot is standing outside two rooms: one is to the west and one is to the east. Only one of these rooms has a pile of beepers that Karel can pick. The other room has the dreaded infinite pile of beepers. Karel must decide which room is the safe room, enter it and pick all of the beepers. To help the robot decide which room is safe, there is a third pile of beepers on the corner at which Karel is currently standing. If this third pile has an even number of beepers, the safe room is the eastern room. If the pile has an odd number of beepers, the safe room is the western room. There is at least one beeper in the third pile. Program Karel to pick the beepers in the safe room.

Use top-down design to solve this problem!
5.a. Instruct a robot to escape from any rectangular room that has an open doorway exactly one block wide. After escaping from the room, the program must command the robot to turn itself off.

5.b. Program a robot to escape from a rectangular room if it can find a doorway. Can you use your program from 5.a? You may assume that the robot has a beeper in its beeper-bag, which it can use to remember if it has circumnavigated the room. The robot should turn itself off if it is in a completely enclosed room, and should turn itself off when it escapes from a room with a doorway.