CS106A
Winter 2015

Handout #08S
January 12, 2015

Section Solutions #1

Based on a handout by Eric Roberts and Mehran Sahami

```
/* File: ChadKarel.java
 *
 * A program in which Karel cleans up hanging chads from a
 * ballot.  The specifications of this program are set out in
 * "Handout 08: Section Handout #1"
 */

import stanford.karel.*;

public class ChadKarel extends SuperKarel {
     /* Precondition:  Karel stands at the start of the ballot.
      * Postcondition: Karel is at the end of the ballot and all chad
      *                has been cleared.
      */
     public void run() {
          /* To avoid the fencepost problem, we split the logic into
           * a loop to process rectangles, plus one final call to
           * check the last rectangle.
           */
          while (frontIsClear()) {
               processRectangle();
               move();
          }
          processRectangle();
     }

     /* Precondition:  Karel is standing in the center of a rectangle,
      *                facing East.
      * Postcondition: Karel is standing in the center of the rectangle,
      *                facing East, and all chad has been cleared.
      */
     private void processRectangle() {
          /* If there is chad to clear, clear that chad from the
           * ballot.
           */
          if (noBeepersPresent()) {
               removeAllChad();
          }
     }
```

```
    /* Precondition:  Karel is standing in the center of a rectangle
     *                that needs to be cleared.
     * Postcondition: Karel is standing in the center of a rectangle
     *                that has been emptied.
     */
    private void removeAllChad() {
        /* Clean the upper corner. */
        turnLeft();
        cleanChad();

        /* Clean the lower corner. */
        turnAround();
        cleanChad();

        /* Fix Karel so that he's now facing East. */
        turnLeft();
    }

    /* Precondition:  Karel is facing in some direction just below a
     *                corner to be cleared of chad.
     * Postcondition: Karel is facing in the same direction in the
     *                same location, but all chad has been cleared
     *                from the corner.
     */
    private void cleanChad() {
        move();
        while (beepersPresent()) {
            pickBeeper();
        }
        moveBackward();
    }

    /* Precondition:  Karel is facing some direction.
     * Postcondition: Karel is facing the same direction, but has taken
     *                a step backward.
     */
    private void moveBackward() {
        turnAround();
        move();
        turnAround();
    }
}
```

Try running this program on your own computer by downloading the Karel files from the website. What would you do if you wanted Karel to repair ballots that were broken (that is, the center of a rectangle is not punched out, but some other square in the rectangle is)? What would you do if the height of the ballot rectangles was larger than three, say, five, seven, or nine?