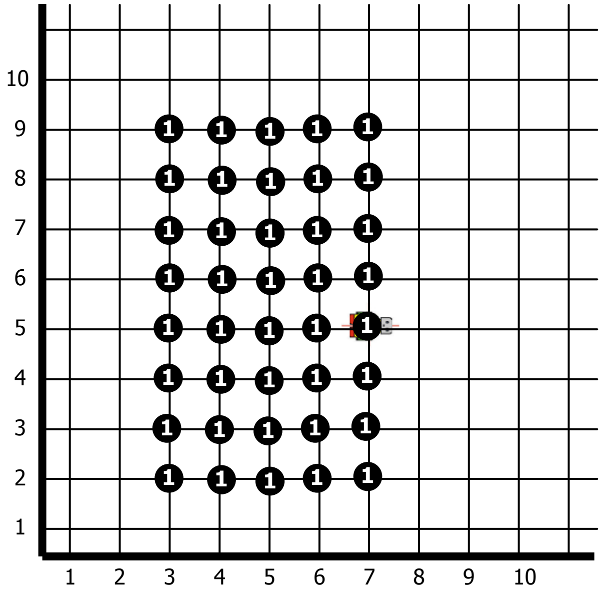
AP Computer Science
Karel Chapter 6 Programs

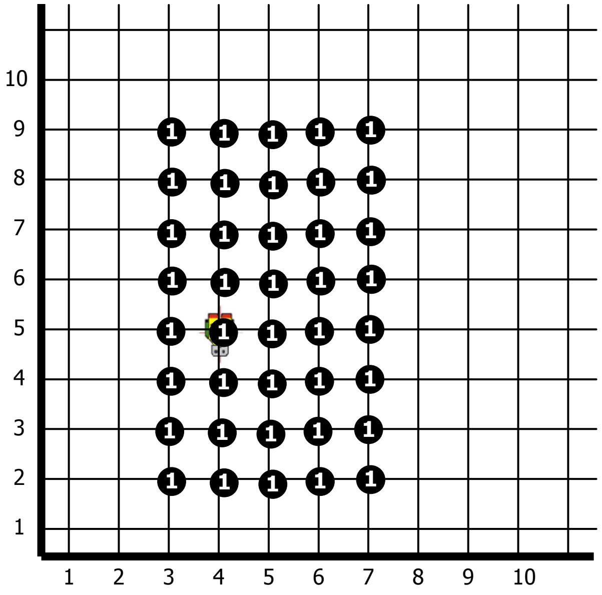
Name: ______________________________
Date: _________________ Period: _______

1. Let's write a complex program using stepwise refinement. Suppose that we need to patrol the perimeter of a rectangular field of beepers. Imagine that there has been theft of the beepers and we need a robot guard to walk around the edge of the field. Build a class of Guard robots with a method `walkPerimeter`. The robot will initially be positioned somewhere in the field, but not necessarily on an edge.

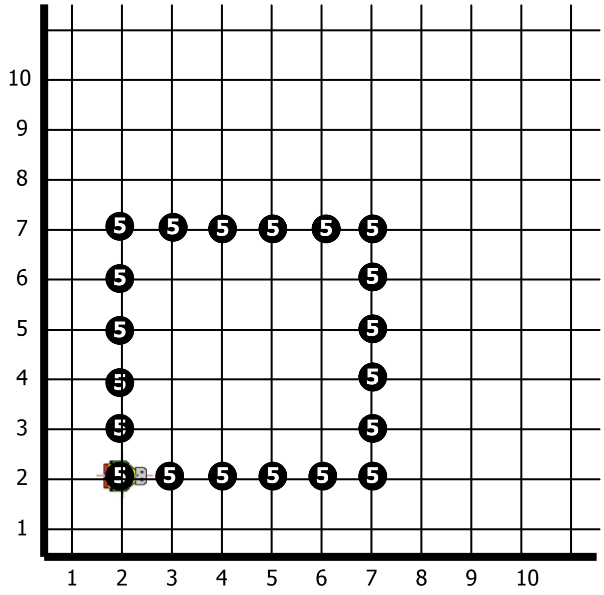
To make the problem more definite, let's suppose that the field is at least two beepers wide and two beepers long. The path we want the robot to follow is one that walks along corners that actually contain the beepers marking the outer edge of the field. Below is a sample situation.



Will your program from above work in the situation below? If not, fix it so that it does.

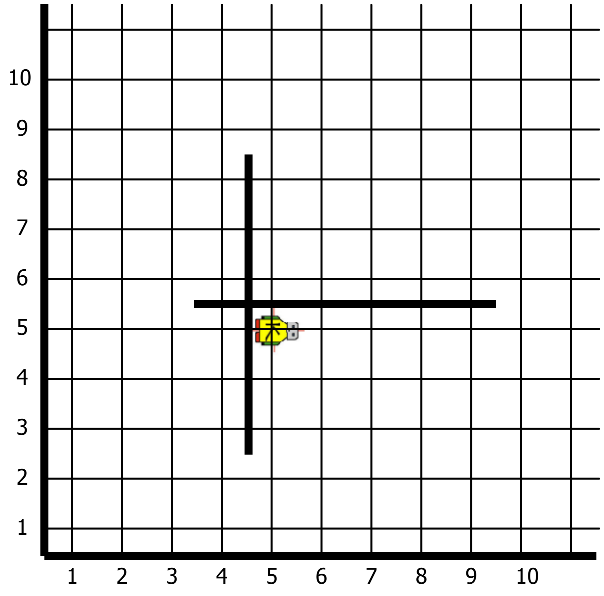


2. A robot must place 5 beepers on each corner in the exact arrangement shown below.



3. Program a robot to escape from a rectangular room if it can find a doorway. If there is no doorway, the robot must turn itself off. Hint: There is a slightly messy way to solve this problem without resorting to beepers. You can write the program this way, or you can assume that the robot has one beeper in the beeper-bag, which it can use to remember if it has circumnavigated the room. This program may require a separate turnOff instruction for the completely enclosed situation in addition to a turnOff instruction for the situation with a door.

4. Karel is working once again as a gardener. Karel must outline the wall segment shown below with beepers. One and only one beeper is to be planted on each corner that is adjacent to a wall. You may assume that karel always starts in the same relative position and has exactly enough beepers to do the task. A simple variation can be programmed in which karel has infinitely many beepers rather than exactly the right number.



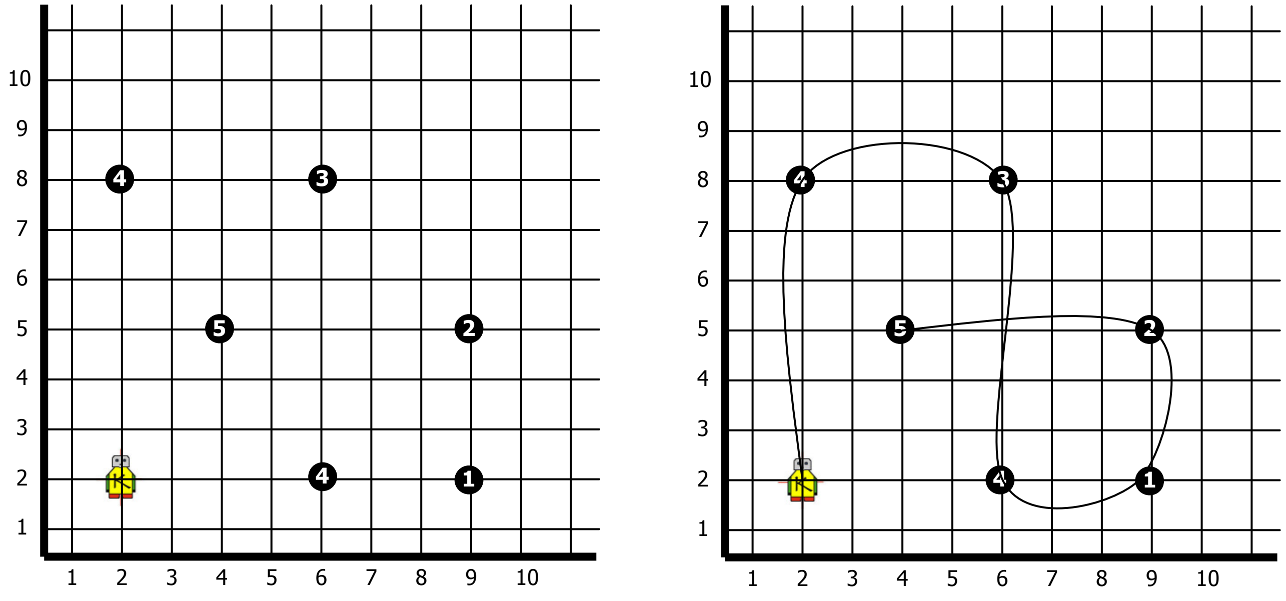
5. Assume that a robot is somewhere in a completely enclosed rectangular room that contains two beepers on different corners. Program the robot to find the beepers, pick them up, and turn itself off. The main method should read as follows:

```
public static void main(String[] args)
{
     World.readWorld("problem4.kwld");
     World.setVisible(true);
     World.setDelay(5);

     BeeperFinder brenda = new BeeperFinder(3, 3, North, 0);
     brenda.findBeepers();
}
```

6. Program a robot named karel to go on a treasure hunt. The treasure is marked by a corner containing five beepers. Other corners (including the corner on which karel starts) contains clues, with each clue indicating in which direction karel should proceed. The clues are as follows: 1 beeper means karel should go north, 2 means west, 3 means south, and 4 means east. Karel should follow the clues until it reaches the treasure corner where the robot should turn itself off. The figure below shows one possible treasure hunt.

(In this situation, karel starts on a corner with 1 beeper.



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