

# WMS Math Challenge

April 29, 2010

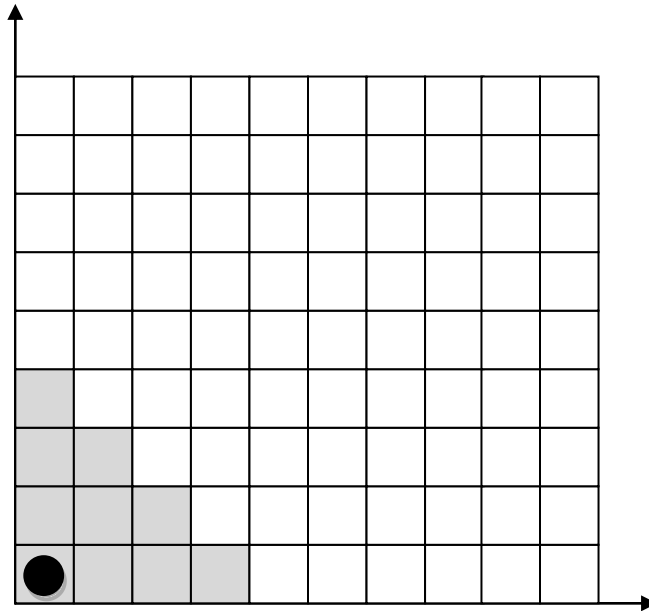
## Challenge Problems

**Problem 1:** Consider the following checkerboard that is infinite in the North and East directions. You start with a ball in the lower left corner (as pictured). A *move* on the checkerboard consists of the following:

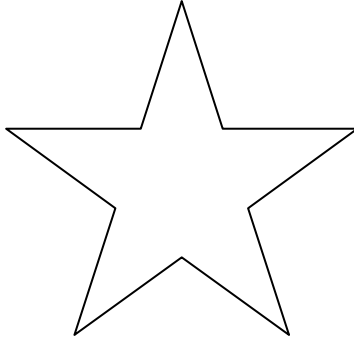
- Pick a ball  $B$  in the grid.
- Add a ball to the square north of  $B$ , and add another ball to the square east of  $B$ .
- Remove the original ball  $B$  from the grid.

No square can be occupied by more than one ball, so in order to remove  $B$  as above, the squares to the north and east of  $B$  must be empty.

*Question:* Can you get all the balls out of the shaded region?



**Problem 2:** We all know that the sum of the interior angles of a triangle is  $180^\circ$ , and that the sum of the interior angles of a quadrilateral is  $360^\circ$ . What is the sum of the interior angles  $A+B+C+D+E$  of a star?



**Problem 3:** A rook starts on square A1 of a chessboard. Players take turns moving the rook as many squares as they want, either horizontally to the right or vertically to the north. The player who moves the rook to square H8 wins. Can one player always win? What if you start with a king on square A1, and players take turns moving the king either one square east, one square north, or one square diagonally north-east?

