Name (Last, First): ______________________________ Student ID: ____________________

Quiz 8 on March 17, 2016: "Divide into Cases", "Work Backwards", and the Pigeonhole Principle. You have 25 minutes to solve the following two problems. Please write on both sides of the page. **Good Luck!**

Problem 1 (near Larson's 2.5.11). Let T_n denote the number of ways of placing n nonattacking rooks on an $n \times n$ chessboard so that the resulting arrangement is symmetric about both diagonals. Find a recursive formula for T_n.

Problem 2 (near Larson's 2.6.10). Let α be any real number. Prove that among the numbers $\{\alpha, 2\alpha, \ldots, (n-1)\alpha\}$ there is one that differs from an integer by at most $1/n$. *Hint.* The bins could be $[\frac{1}{n}, \frac{2}{n})$, $[\frac{2}{n}, \frac{3}{n})$, $\ldots$, $[\frac{n-2}{n}, \frac{n-1}{n})$.