



## Chess Covers and Tours

A *cover* is when a set of chess pieces is either occupying or attacking every square on the board. A *full cover* is when the occupied squares are also attacked.

A *tour* is when a piece starts on one square and moves so as to visit every square exactly once. A *closed tour* allows the piece to return home when it is done, so the last move is just one move away from the initial position.

Remember Knights move in a (2,1) hop, two squares in one horizontal or vertical direction and one square in a perpendicular direction. Queens move as far as they like in any straight horizontal, vertical, or diagonal line.

1. How many Queens does it take to cover the standard 8x8 chessboard?
  - a. Is there a cover using the fewest possible Queens, *and* with none of the Queens attacking each other?
  - b. Is there a full cover using the same number of Queens?
2. How many Knights does it take to cover the standard 8x8 chessboard?
3. How many Knights does it take for a full cover?
4. Demonstrate a Knight tour. Can you find a closed tour?

A *safe set* is when a collection of pieces are placed on the board such that none of them attack each other.

5. Can you make a safe set with 4 Queens on a 4x4 board?
6. How about with 5, 6, or 7 Queens on the 5x5, 6x6, and 7x7 board?
7. Now try 8 Queens on the 8x8 board.
8. What's the biggest safe set of Knights on the 8x8 board?