

**Problem 1**

A grasshopper is jumping along a straight line. Each time he jumps either one meter to the left or one meter to the right. Prove that it is possible for the grasshopper to return to the initial spot only after an even number of jumps.

**Problem 2**

An ant is crawling along a cube frame. Each time it moves from a vertex to an adjacent vertex. Prove that it is possible for the ant to return to the original vertex only in an even number of moves.

**Problem 3**

A chess knight jumps across a chessboard. Can the knight end up in a square adjacent to the one it started from in 10 moves?

**Problem 4**

Can a knight visit all orthogonally adjacent squares to its starting position in exactly 20 moves?

**Problem 5**

What's the minimum number of moves needed for a knight to visit at least 3 squares adjacent to its starting position?

**Problem 6**

Starting from a corner square, can a knight return to any adjacent square in exactly 15 moves while visiting every square on a 4x4 board?

You should do a critical analysis for the following answer for 6) done by AI and give the correct reasoning otherwise:

It is impossible, since we:

1. Start on square 1
2. Need to visit remaining 15 squares
3. Each move visits 1 new square
4. Have exactly 15 moves

We must use all moves just to visit new squares, leaving no moves to reach an adjacent square at the end. Below one complete path of 15 moves:

1	8	15	10
14	11	4	7
5	2	9	16
12	13	6	3