
Logic for Computer Science – Christmas puzzles

Sneaky santa

There is a house with 16 rooms, arranged in a 4x4 grid. There is a door between every pair of adjacent rooms (“adjacent” meaning north, south, west, and east, but no diagonals). Only the room in the northeast corner has a door that leads out of the building.

Santa has entered the building through the chimney in the southwest corner. The other 15 rooms have sleeping children with an empty stocking in them. Whenever Santa he enters a room with an empty stocking, he immediately fills it. But Santa does not want to run the risk of being caught by young children who may have woken up: he can never enter a room with a filled stocking.

Yet somehow Santa managed to leave the building through the door in the northeast corner, filling all 15 stockings along the way. What path did he take?

Directions to Santa

Suppose you walk one mile due south, one mile due east, and one mile due north. Somehow you have ended up at the same location you started – describe *all* points on the globe where you might be.

Coal on the table

Two elves are playing a game. The game board is a circular table. The elves have access to an ample supply of equal-sized perfectly circular lumps of coal. The elves alternate turns, with each turn adding a single lump of coal to the table. The coal is not allowed to overlap. Once a lump of coal is placed on the table, it is not allowed to be moved. The elf who has no place to put his next lump of coal loses. Develop a winning strategy for the player who starts. (The table is large enough to accommodate at least one lump of coal.)

Diamond in the rough

You have 12 lumps of coals, 11 of which are the same weight and one lump of coal with a hidden diamond in it. The lump of coal with the diamond does not weigh as much as the other lumps – but you do not know whether it weighs more or less. You have a balance that in each weighing tells you whether the two sides are of equal weight, or which side weighs more. How many weighings do you need to determine: which is the lump of coal has the hidden diamond, and whether it weighs more or less than the other lumps of coals. How?