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Snake Puzzles and Solutions

A popular puzzle I have is called a "Snake Puzzle". It is composed of a string of 27 cubes connected by a shock cord; in each cube the cord either passes straight through or turns a corner, and the cubes can swivel relative to each other. The trick is to assemble it into a cube, like so:

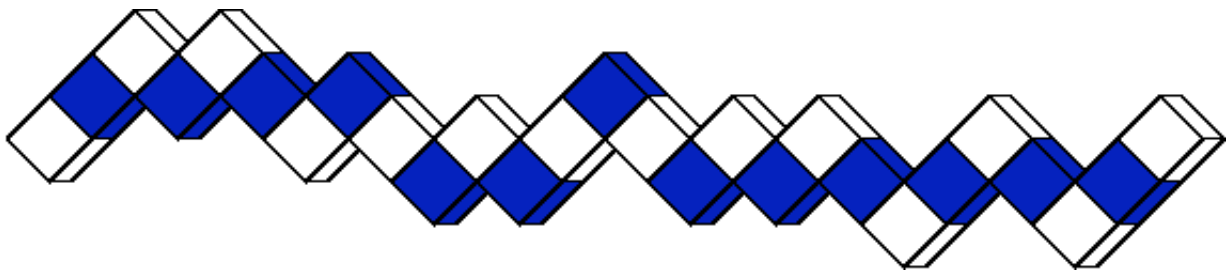


There are several different makes of this puzzle, it also goes under the name Cubra (c).

If you are interested in graph theory these puzzles are interesting as they form Hamilton paths of the 3x3x3 grid graph. One can study which snakes have solutions and which do not, for example one can prove that it is impossible to solve the 3x3x3 cube with a snake composed of all corner cubes. See [1] for more on some of the math behind these puzzles. I generated the solutions to the puzzles shown here by a backtracking program.

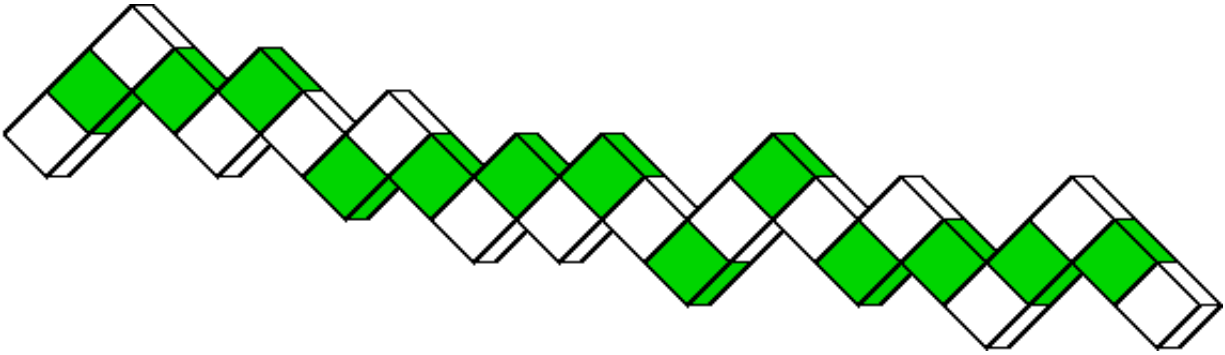
A solution can be described by a string of "directions" that the cube follows when you wrap it into a cube, either **R**ight, **L**eft, **U**p, **D**own, **F**orward, or **B**ack. So for example if a solution starts **R R F L ...** then put the end of the snake with the rest trailing off to the **R**ight, then the next cube goes in the same direction (it must be a straight-through cube), the next cube (a corner cube) turns to point **F**orward, then it goes **L**eft, etc.

The five Cubra puzzles I have seen are as follows, with several solutions for each:



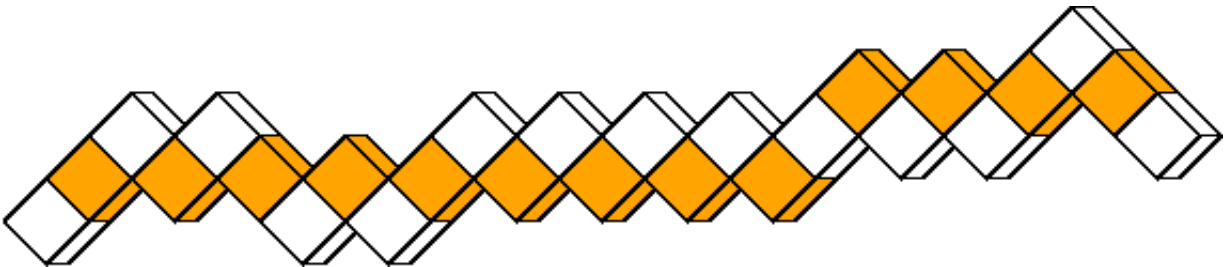
Solutions:

RRFLUUFDDRUBBLLFDFUUBBRRFF
RRULFFUBBRFDDLLUBUFFDDR RUU



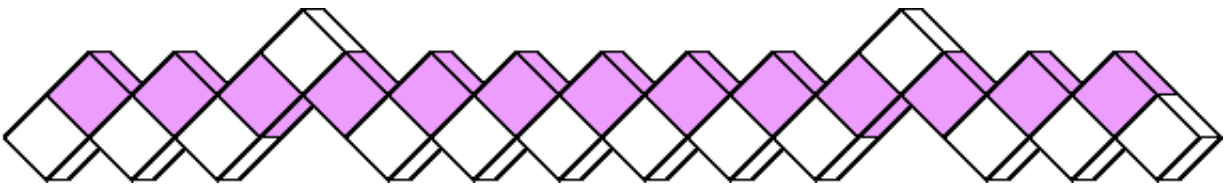
Solutions:

**RRFFLUUBDDLUFBBRRFFUBBLLFF
RRUULFFDBBLUFDDRRUUFDDLLUU**



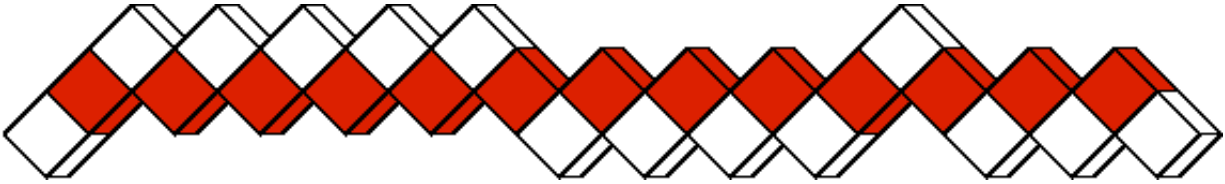
Solutions:

**RRFLUUFRRDDLULDBUBRRFUBLLFF
RRULFFURBBLFLBDFDRRUFDLLUU**



Solutions:

**RFLFRRUUBLFLDRBRDBUULLFDBR
RFLFRRUUBLFDLUBDBURRDDFULB
RFLFUURRBLDFDRUBDBUULLFDBR
RFLFUURRBLDLUBDRURDDFFLURB
RFRBUULLFRFLDRBRUFDDLLBUBR
RFRBUULLFRDFDRUBUFLLDDBUBR
RULUFFRRDLBLFDBRFRBBUULFRD
RUBDLLFFUBRURBLDLUFFRRDLDR
RULURRFFDLUBLFDBDFRRBBUFLD
RULURRFFDLULBRDRBDFLLUBDR
RFDLLUUFDFURDBDLFRRUUBLBR
RURDFFLLURULBRDRFUBBLLDFDR
RFULDDBBURDRUFDLFRUUBBLFLB**



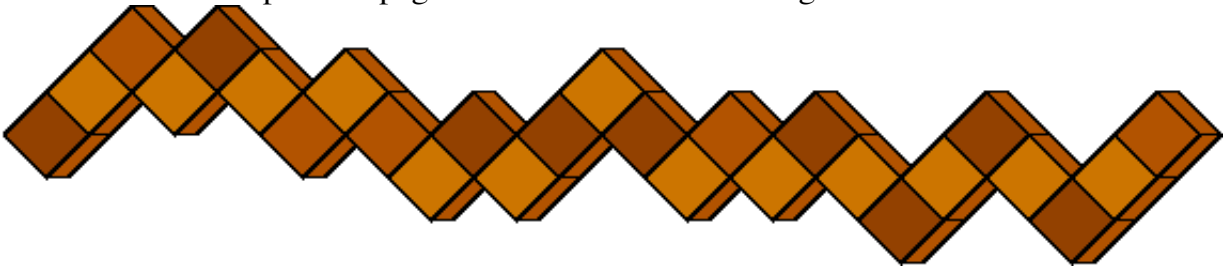
Solutions:

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RRFLFRULURBBDFLUBLFFDDBUBR
RRFUBLFULFDDRBLUBURRFFLDRD
RRFUBLFDLFUURBLDBURRFFDLDR
RRFUBLURFLDDLFURDRUULLBDBU
RRFUBUFLFRDDLUBDLFUUBBRDLF
RRFUBUFLBDFFLDBRFRUULLBDBU
RRFUBULDLUFFRDBURFDDLUBDR
RRFUBULDLUFFDBRDLFRRUUBLFD
RRFUBULDLUFFDRUBRFDDLBRUL
RRFUBULDLUFFDRUBRFDDLBURD
RRUFDFLBLFUUBRFRUBBLLDFRB
RRUFDFLBLFUUBRFRUBBLLDRFL
RRUFDFLBLFUUBDRBLURRFFDLUB
RRUFDFLBLFUURBDFRUBBLLFDBR
RRUFDFULURBBLFDLUFFDDRBLU
RRUFDFULDBUULBDRURFFLLDBDF
RRUFDFLFRULBBLUFRBRFFLLDBDF
RRUFDLUFLUBBRDLFDFRRUULBRB
RRUFDLUBLUFFRDLBDFRRUUBLBR
RRULURFLFRDDBULFDLUUBBDFDR

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The wooden version at the top of the page looks like this when straightened out:



This is identical to the blue Cubra snake above and thus has the same solutions.

[Jaap's Puzzle Page](#) has a far more thorough analysis of snake cube puzzles, including a nice Javascript snake cube.

[1] F. Ruskey, and J. Sawada, **Bent Hamilton Cycles in Grid Graphs**, Electronic Journal of Combinatorics, #R1, 10 (2003) 18 pages.

2003, M. Weston