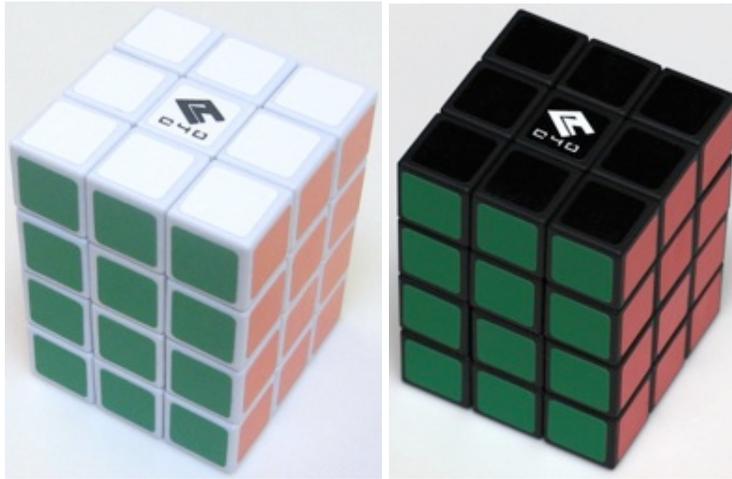# Rubik 3x3x4

Made by Cube 4 You (C4U), 2009.
(plastic, 2.2 by 2.2 by 3 inches;
white body has opposite sides white / blue, red / orange, green / yellow,
the same as the color scheme as the standard Rubik's 3x3x3;
black body has opposite sides black / white, red / yellow, green / blue)

This extension of the standard *Rubik's 3x3x3* cube allows only 180 degree rotations in two of the dimensions. One solution approach is to think of an "outer" *Rubik 2x3x3 Domino* formed by the top and bottom layers with an "inner" domino in the middle:

1. Solve the outer domino.

2. Solve the inner domino, except if your solution makes use of flips of the front, back, or left sides, replace each such flip by a flip of the right side (that is, rotate the middle layers appropriately, flip the right side, rotate the middle layers back).

3. If Step 2 ended up using an even number of flips, then the puzzle is solved. Otherwise, perform the following transformation, adapted from *Jaap's Page* for the domino, that does nothing to the middle two layers (by exchanging an upper and lower middle edge) using an odd number of flips:

$$\textbf{D2 \ R \ M- (D2 \ R)}^{\textbf{3}} \textbf{ \ M \ R \ D2}$$

Notation: R denotes a flip of the right face, M a 90 degree clockwise rotation of the middle two layers (with respect to looking down from the top), D and D- clockwise and counter clockwise rotations of the lower middle layer (with respect to looking up from the bottom), 2 and 3 mean do it two or three times.

Further Reading

Jaap's Page, from: http://www.jaapsch.net/puzzles/cube334.htm
    (Presents a similar approach with many additional transformations.)