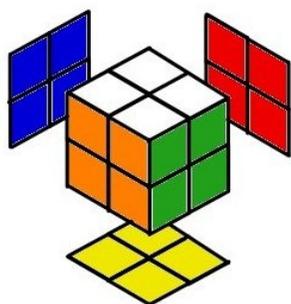


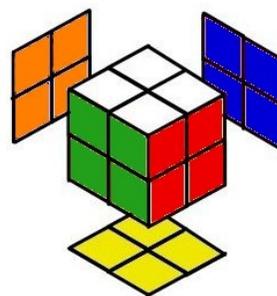
### Solving the 2x2x2 cube: Stage Three

For Stage One, we solved one layer. In Stage Two, we positioned the remaining 4 corners, and in Stage Three, we will rotate them correctly. Please note that a corner may be in the proper location, but only one of three rotations is correct for the corner.

To perform the routine which causes a solved cube to rotate three lower corners clockwise, that is, all but the Right-Down-Front corner, which will be called the "protected position". We need another symbol, "C", to indicate the move which turns the entire cube clockwise 90 degrees while looking down.



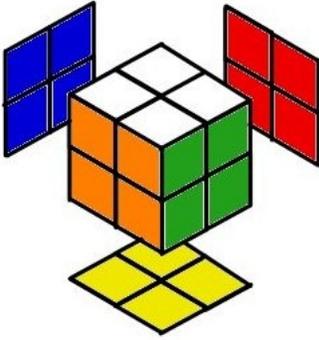
This is the original position.



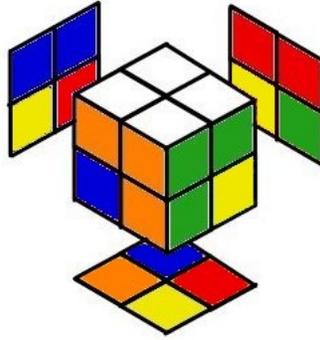
This is the position after a "C" move.

Note, this move is not mathematically necessary, but it makes this next routine easier to perform. For example the following two sequences of moves are the same:

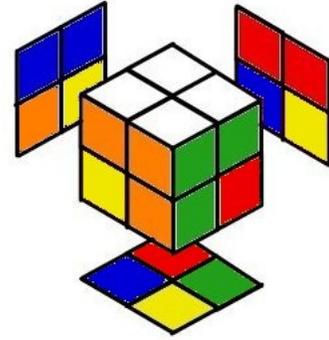
$$(R C)^4 = R C R C R C R C = R B L F$$



The solved position.



Three lower corners rotated clockwise.



Three lower corners rotated counterclockwise.

The routine to rotate three lower corners clockwise is just:

$$(R C)^{12}$$

Naturally, to rotate the same corners counterclockwise, use  $(R C)^{24}$ . It helps to count to 12 while performing this routine, but if you lose count, it's fine, because you know the routine is over when the top layer heals itself.

You may think that this cannot be enough routines to rotate all the corners from any possible configuration, but it is! You need simply to ask yourself a couple of questions and reposition the cube as needed, repeatedly.

Question 1: Look at the bottom of the cube. How many corners are rotated correctly? (Either "one" or "some other number".) If "one", then you are nearly done! Place the single correct corner in the protected position, and perform the routine either once or twice, until cube is solved!

Question 2: This means there was "some other number" of correctly rotated corners. (This would be either zero or two, actually.) Locate any corner which needs to rotate clockwise, and place this in the protected position. Perform the routine. Then go back to Question 1.

Soon, you will hold a solved mini-cube!

Extra:

It is not necessary to refer to this diagram, but it may be helpful for understanding what's going on. The number 1 indicates a clockwise rotation on a corner, while a -1 indicates a counterclockwise rotation. The sum of all the rotations must always equal to 0 mod 3. The diagram shows the 7 possible ways in which the Down layer's rotations can occur in Stage Three. The yellow highlighting indicates which corners are about to receive a clockwise rotation.

