

MTH 105 – Rubik’s Cube Algorithms – Part I

I. Solving the 1st Layer.

A) 1st Layer Edges:

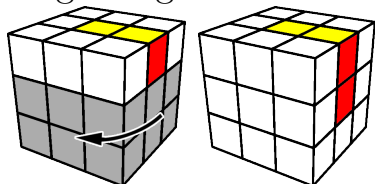
1. First orient the cube so that the center block of the color you want to solve is on top (e.g. yellow).
2. We will now solve the edge cubies in a counter-clockwise order:



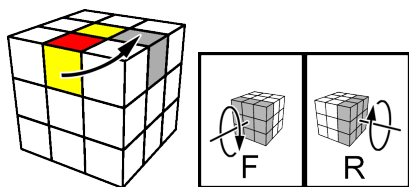
3. Then pick a side color to solve for the corresponding upper edge, e.g. red. We'll call this the *target edge*.
4. Locate the corresponding edge cubie that shares the top color (e.g. red & yellow).
5. There are many possible orientations and locations for that edge, we will only cover a few and leave you to with a general methodology that will solve them all.

The first edge:

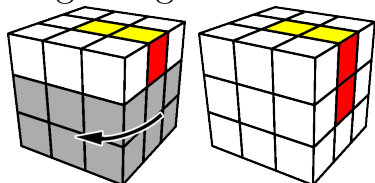
- a) If the target edge is already in the upper layer and is oriented correctly, then just turn the lower two layers until the center red face matches the red on the target edge.



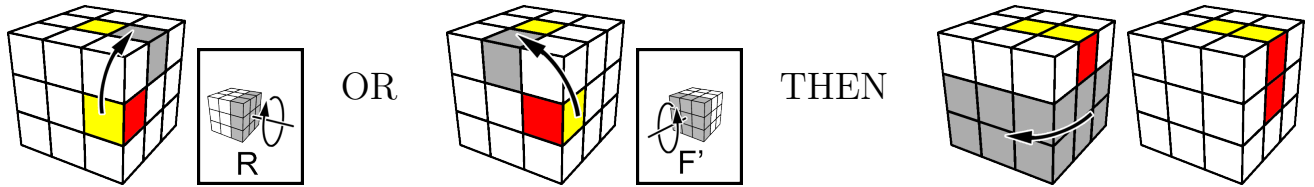
- b) If the target edge is already in the upper layer but is oriented incorrectly, use this algorithm:



Then twist the lower two layers until the center red face matches the red on the target edge.

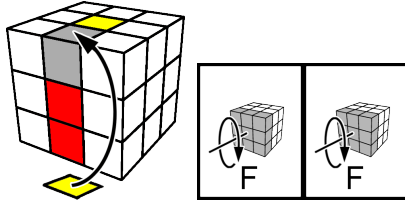


c) If the target edge is in the middle layer, then use one of the following algorithms:

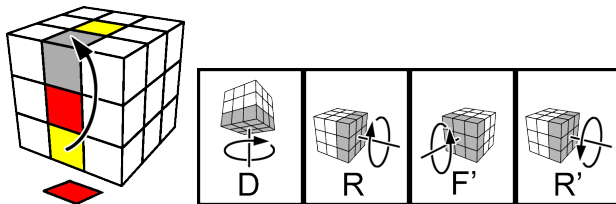


6. If the target edge is in the bottom layer: turn the bottom layer until you have one of the following two orientations, and use the given algorithm.

Top color is on bottom:



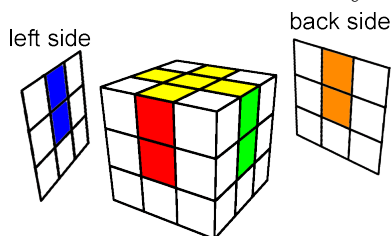
Top color is on side:



(Note that the last R' move above is not necessary except when solving the last edge.)

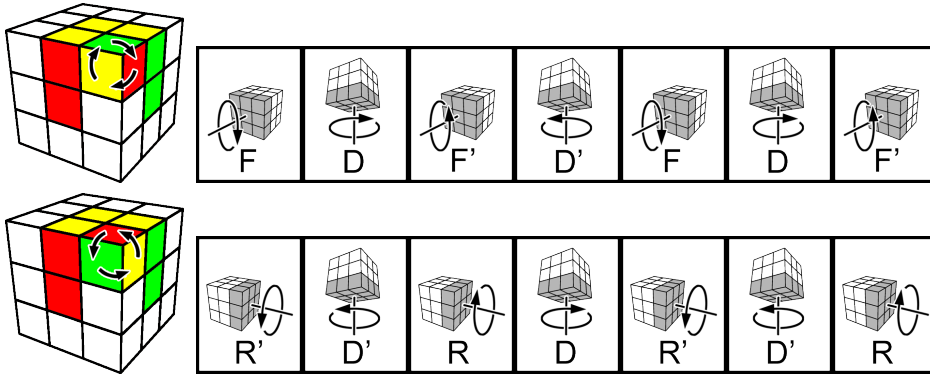
7. Continue in a counter-clockwise fashion, solving the four edges of the top layer.
 - i. Place the target edge cubie onto the down (bottom) layer. This should only take one turn. Be sure to keep track the center square on the top layer as you want to keep is as the top layer. Sometimes, you have to temporarily twist a side that causes an edge you previously solved to be moved out of place. That's ok, just be sure to move it back into its solved position.
 - ii. Turn the down (bottom) layer until one of the above algorithms will solve it.
 - iii. Execute the necessary algorithm.

8. When finished, you should have solves the 'cross' which is the top edges all solved and oriented correctly:



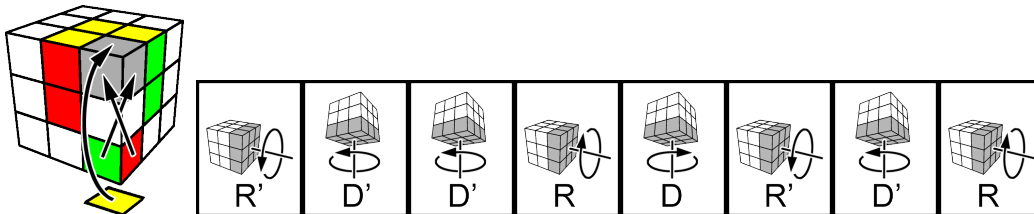
B) 1st Layer Corners:

1. Corner is in correct location but oriented incorrectly (top color not correct).

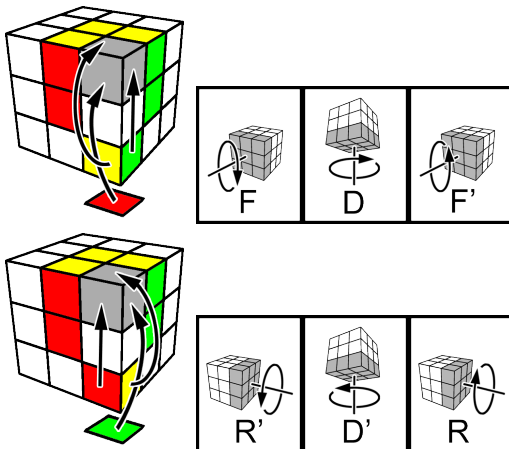


If the corner is in the bottom layer, turn the bottom layer until the desired corner piece is on the bottom-right-front corner, giving one of the following positions:

2. Corner is in bottom layer and bottom color needs to be moved to the top.



3. Corner is in bottom layer and side color needs to be moved to the top.



4. If the target corner cubie is in the top layer but the wrong position, then use one of the last three algorithms above to swap it out with any corner cubie from the bottom layer. Then the target corner cubie will be in the bottom layer and one of the last three algorithms works.