

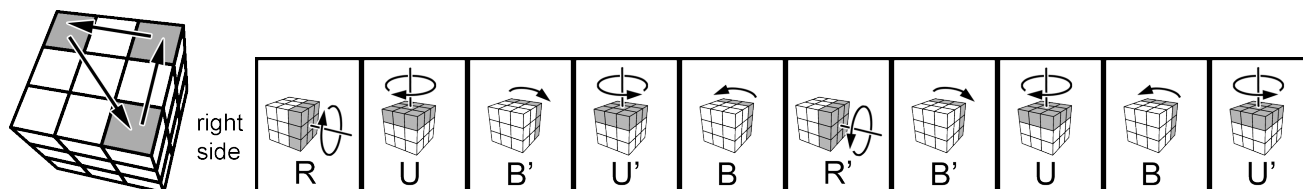
MTH 105 – Rubik’s Cube Algorithms – Part III

III. Solving the 3rd Layer.

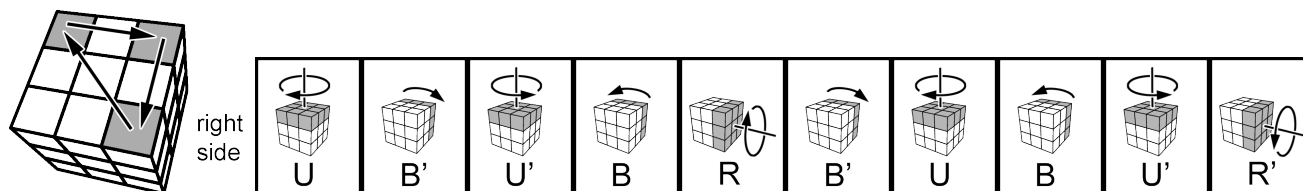
A) Permute Top Layer Corners.

First line up one corner cubie in its correct location. It may not be oriented correctly, i.e. the upper face color might be on a side, that’s ok. You can always turn the top layer until at least one corner cubie is in its correct location. Then look for one of the following patterns:

1. Permute 3 corners counter-clockwise:

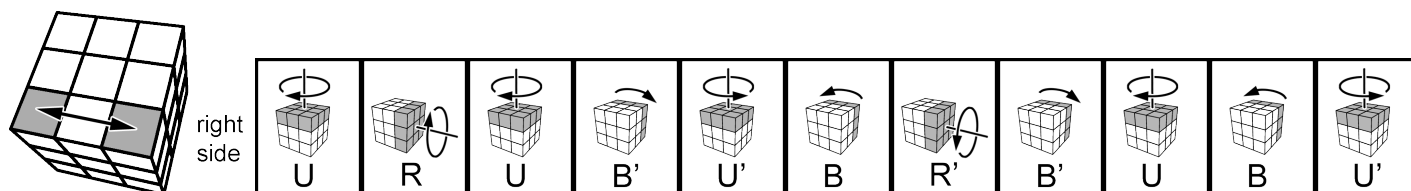


2. Permute 3 corners clockwise:



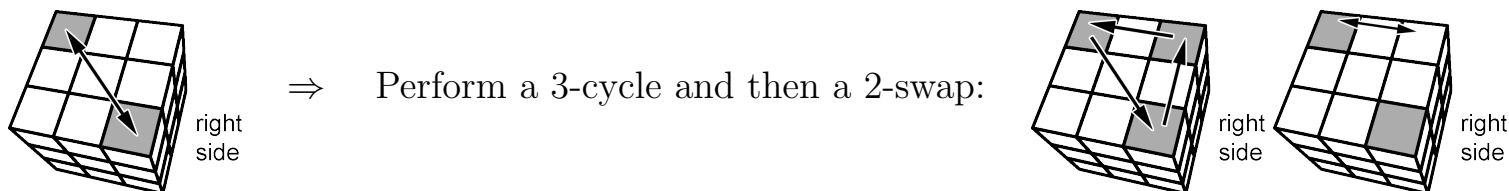
(Note that this is just the ‘opposite’ of the first algorithm: it’s the reverse order and inverse operations.)

3. Swap front two corners:



(Note that this is identical to the 1st algorithm above except for the extra U at the beginning.)

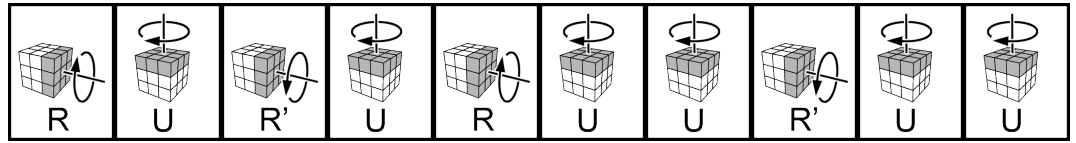
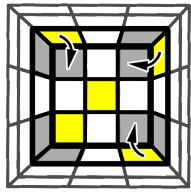
4. If you have to swap two diagonal corners, use two ‘front-corner-swaps’:



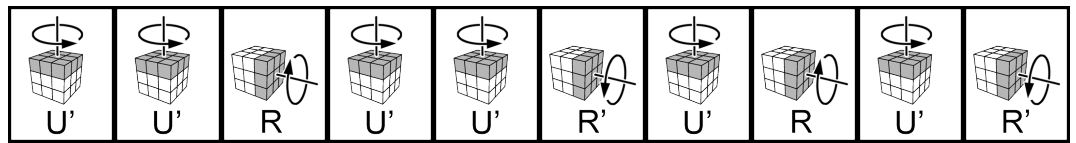
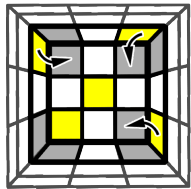
B) Orient Top Layer Corners.

1. These are the only algorithms needed:

a) Main Algorithm:

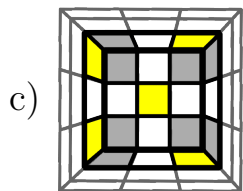


b) Inverse of Main Algorithm (inverse operations in reverse order):

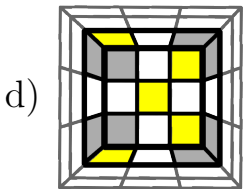


2. Here are the other possible corner orientations:

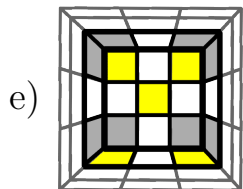
(Note that you may need to rotate the cube in your hand until the top layer matches one of the following images.)



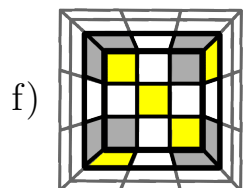
- ⇒ (1) Main algorithm,
 (2) Rotate cube 90° clockwise, (now in case (a) above)
 (3) Main algorithm.



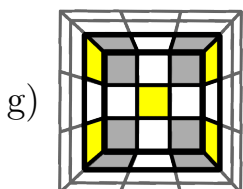
- ⇒ (1) Main algorithm,
 (2) Rotate cube 90° counter-clockwise, (now in case (b) above)
 (3) Inverse main algorithm.



- ⇒ (1) Main algorithm,
 (2) Rotate cube 90° clockwise,
 (3) Inverse main algorithm.



- ⇒ (1) Main algorithm,
 (2) Rotate cube 180° clockwise,
 (3) Inverse main algorithm.



- ⇒ (1) Main algorithm,
 (2) Rotate cube 180° clockwise,
 (3) Main algorithm.

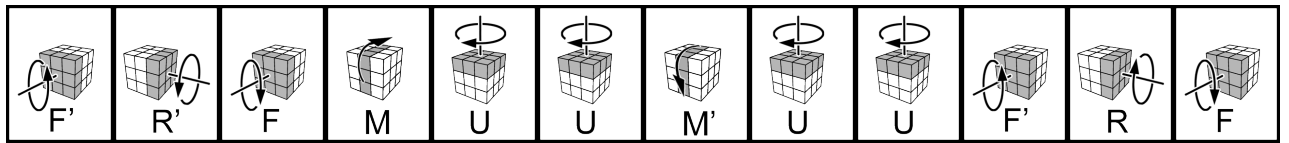
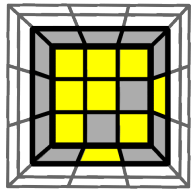
C) Orient Top Layer Edges.

For the final stage, there is only a single algorithm we will need (plus its inverse). However, depending on the state of the cubies, it may need to be applied more than once.

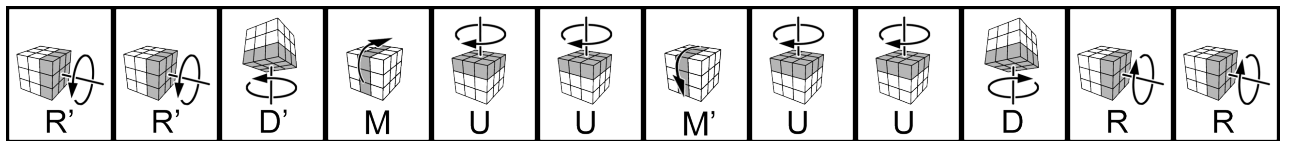
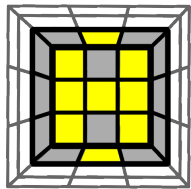
1. All edges are oriented correctly, i.e. that the top color is correct. Of course, the side colors of the edges might not match up yet. If this is the case, then skip this step and move on to the next step: Permute Top Layer Edges. (skip to the next page)

2. Only 2 edges need to be flipped:

a) 2 Adjacent Edges:

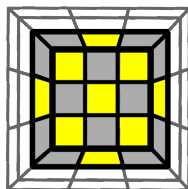


b) 2 Opposite Edges:



Then use the algorithm (a) above to orient the 2 target edges.

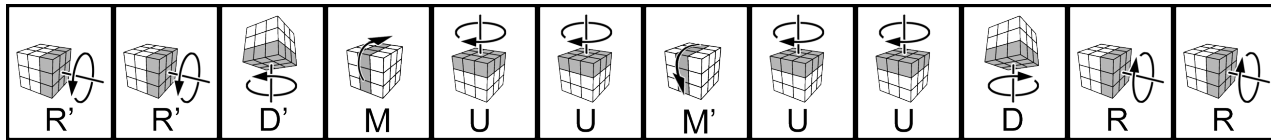
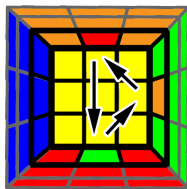
3. All four edges need to be flipped:



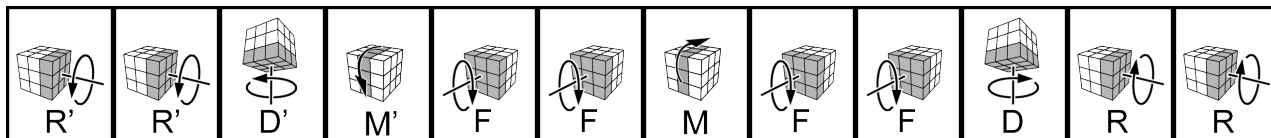
⇒ Solve it using the above algorithm (a) twice.

D) Permute Top Layer Edges

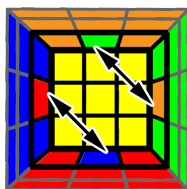
- Counter-clockwise 3-cycle permutation:



- Clockwise 3-cycle permute:

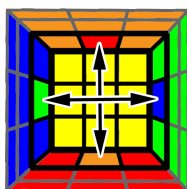


- Swap adjacent edges:



- Perform algorithm (1) above,
- then rotate cube 90° clockwise (relative to the upper face),
- then perform algorithm (1) above again.

- Swap opposite edges:



- Perform algorithm (1) above,
- then rotate cube 90° counter-clockwise (relative to the upper face),
- then perform algorithm (1) above again.

Now your cube is solved!!! \Rightarrow

