

Modified Rubik's Cube Solution – Norm Enger

This solution is based mostly on the solution provided by Mark Jeays at <http://jeays.net/rubiks.htm>, with some simplified notations inserted in places for greater clarity and some of my own modifications as I have seen fit. I have also added some tips for certain situations that may come up.

For an explanation of the notation used below, please see Mark's page at <http://jeays.net/rubiks.htm>.

Step 1 -- Do the first face

Many people can already solve the first (top) face without assistance.

Tip: Solve the top four edge pieces first, then the top four corners.

If you need further assistance with solving the top face, please refer to Mark Jeays' page at <http://jeays.net/rubiks.htm>.

Step 2 -- Do the middle layer edge pieces

Find the first missing edge you want to solve. It is a color a - color b combination, possibly somewhere down in the the D (down) face. See which color of a or b is facing down on D and rotate D so that that color just determined moves to the side opposite of that color's center cube, with the center cube of that color facing you. Now determine if the edge space you are solving is to the left or to the right of that center cube.

If to the **left**, then $F' D' F D L D L'$.

If to the **right**, then $F D F' D' R' D' R$.

Repeat for each remaining middle layer edge piece.

Tip: If a middle layer edge piece is in the right place but rotated incorrectly, first move it out of the middle layer edge position by executing one of the above sequences. Then position it properly on the bottom layer and move it into place per above.

Step 3 -- Form a cross on last layer

Now turn the cube upside down so that the unsolved layer is now the top.

If the pattern formed by the non-corner pieces is an **L shape**, move the cube so that the “L” edge pieces are at the Bottom Edge and Right Edge (as you are looking at the top face), and apply $B U L U' L' B'$.

If the pattern formed by the non-corner pieces is a **horizontal line**, move the cube so that the edge pieces that make up the “Line” are at the Left Edge and Right Edge (as you are looking at the top face), and apply $B L U L' U' B'$.

Tip: If the initial pattern formed by the non-corner pieces is neither an **L shape** nor a

horizontal line, apply either of the sequences above until you have one of those patterns, then execute the appropriate sequence.

The result is a cross, but the edge pieces are not necessarily in their correct positions yet.

Step 4 – Reposition U face edge pieces

Rotate the top layer so that only 1 edge piece is correct (and the other 3 are incorrect), then rotate the cube so that this piece is in the Left Edge position (as you are looking at the top face).

Tip: If more than one piece is in the correct edge position, execute one of the below sequences until you are able rotate the top face so that only one edge piece is in a correct position, then apply the appropriate sequence below to reposition the other three edge pieces.

If the remaining 3 edge pieces need to be repositioned **clockwise**, R2 D' U2 R' L F2 R L' D R2.

If they need to be repositioned **counter-clockwise**, R2 D' R' L F2 R L' U2 D R2.

Tip: If you want to memorize only one of the sequences above, you can execute the **clockwise** sequence twice in a row, which will have the same net effect as executing the counter-clockwise sequence once. Or execute the **counter-clockwise** sequence twice in a row which will have the same net effect as executing the clockwise sequence once.

The four edge pieces will be in the correct positions.

Step 5 -- Reposition U face corner pieces

Now we must move the corner pieces into the right places.

There are 3 possibilities:

All **4 corner pieces are in the right place**, although not necessarily rotated correctly. Do nothing.

1 corner piece is in the right place (and the other three are in the incorrect corner). Hold the cube so that the one in the correct corner is in the Bottom Right position (as you are looking at the top face).

If the remaining three corners need to be repositioned **clockwise**, apply L' U R U' L U R' U'.

If they need to be repositioned **counter-clockwise**, apply U R U' L' U R' U' L.

Tip: If you want to memorize only one of the sequences above, you can execute the **clockwise** sequence twice in a row, which will have the same net effect as executing the **counter-clockwise** sequence once. Or execute the **counter-clockwise** sequence twice in a row which will have the same net effect as executing the **clockwise** sequence once.

0 corner pieces are in the right place.

If they all need to **go to opposite corners**, apply
R' B2 F R F' R' F R F' R' F R F' R' B2 R.

If they need to **go to adjacent corners**, hold the cube so that Bottom Left and Bottom Right pieces need swapping (as you are looking at the top face), and so do the Top Left and Top Right pieces (as you are looking at the top face). Apply B L U L' U' L U L' U' L U L' U' B'.

Tip: As an alternative to using the moves for “0 corner pieces are in the right place” (i.e., you do not wish to memorize these sequences), you can execute either of the “1 corner piece is in the right place” sequences until 1 of the corner pieces is in the right place, then execute the “1 corner piece is in the right place” step, as indicated above, to reposition the other three corner pieces.

All four corner pieces are now in the correct positions but not necessarily rotated correctly.

Step 6 -- Rotate corner pieces

The following moves will make the rest of the cube look scrambled (temporarily) - *don't worry*.

For the *first* incorrectly rotated corner piece **only**, turn the *entire cube* so that the incorrectly rotated corner piece is in the Bottom Right position (as you are looking at the top face).

If it needs to rotate **clockwise**, F D F' D' F D F' D'.

If it needs to rotate **counter-clockwise**, D F D' F' D F D' F'.

Again the rest of the cube will look temporarily scrambled, until the very end.

For the **second and subsequent** incorrectly rotated corner pieces, now *rotate the U (top) face only (not the whole cube)*, so that the next incorrectly rotated corner piece is in the Bottom Right position (as you are looking at the top face). Apply one of the above moves, depending on which way it needs rotating.

Tip: Do not apply the above for any corner pieces that are already correctly rotated, just skip and proceed to the next incorrectly rotated corner pieces.

After you have done this for any remaining corner pieces needing rotation, rotate the U face, and you are done!

Dots in the Center Pattern:

To make a dots in the center pattern, R L' F B' U D' R L'. Make a note of exactly how you were holding the cube if you wish the reverse sequence L R' D U' B F' L R' to work to restore the cube.