

# **How to Solve a Rubik's Cube (six algorithm method)**

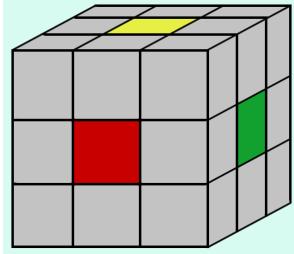
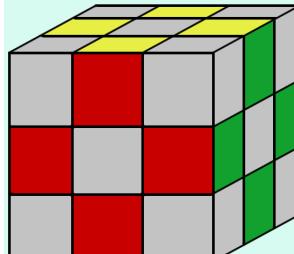
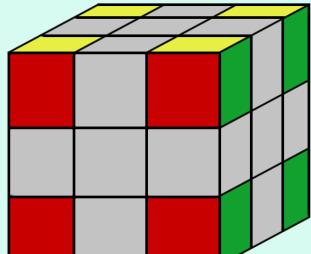
by Cole W. @ Olivet BGC - Pandora Park

## **Information:**

This guide uses a combination of photos and drawings to explain the different elements of cube solving. Drawings are used to give better examples of what pieces are important to each algorithm. Pieces that don't matter for the example will be colored grey.

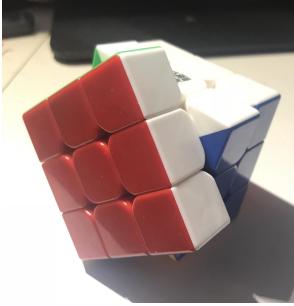
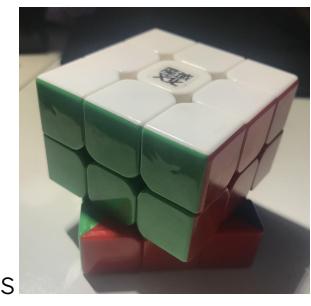
### Understanding the Cube

A Rubik's Cube must be solved layer by layer, not side by side. Each cube has three types of pieces: centers, edges, and corners. It is important to note that pieces cannot switch positions with any other piece. A center/edge/corner will always remain a center/edge/corner and be located in its type's position.

		
<p>Centers Pieces with one color Located in the center of each face 6 total</p>	<p>Edges Pieces with two colors Located between corners 12 total</p>	<p>Corners Pieces with three colors Located diagonally from centers 8 total</p>

### Understanding Cube Notation

Cube notation references the six faces of the cube.

		
Front (F)	Back (B)	Right (R)
		
Left (U)	Up (D)	Down (D)

## Understanding Cube Notation (cont.):

<b>Clockwise ( )</b> Turn the side clockwise if you were looking at it straight on ex. R	<b>Counterclockwise (')</b> Turn the side counterclockwise if you were looking at it straight on ex. R'	<b>Turn Twice (2)</b> Turn the side twice in the same direction ex. R2

Cube notation is written using a series of letters. The cube is turned in the order in which the letters are written.

There are three ways that these letters are written that influence how the cube is turned.

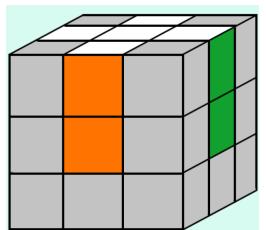
## Solving the First Layer:

The first layer has no algorithms and must be solved intuitively. There are two steps to complete the layer.

### The White Cross

The first step is to solve the white edges. It is important that the cross has all the edges in the correct place so that each edge matches up with its respective center.

The top layer won't be disturbed while solving, but the middle and bottom layers can be used to move edges around. White edges can be found in five possible positions.



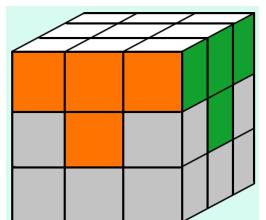
Top layer -> wrong position Turn the piece 90-degrees into the middle layer. Rotate the top layer so that the piece can be turned 90-degrees into the correct position.	Top layer -> inverted Turn the piece 90-degrees into the middle layer. Rotate the top layer to make space for the piece. Turn the piece 90-degrees into place.	Middle layer Turn the piece up into the white cross using a 90-degree rotation.	Bottom layer -> white facing out Make two 90-degree rotations; one to put the edge in the middle layer and another to move it into the cross.	Bottom layer -> white facing down Make a 180-degree turn to bring the white into the cross.



It is best to align the secondary colors on the edges with the center of the same color to use as a reference for relative color positions. All the colors will line up with their center when the cross is done properly, but here is a secondary reference. **Blue** is across from **green** and **red** is across from **orange**.

### White Corners

The second step is to focus on solving the white corners. This is done by using the bottom layer to transport the corners around and then moving elements of the top layer out of the way to move the corner into place without disturbing the rest of the layer.



## White Corners (cont.)

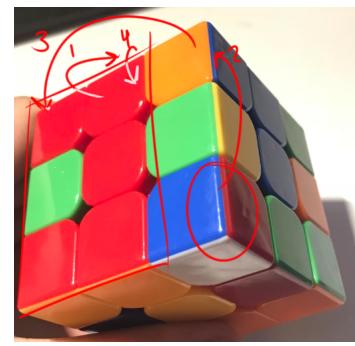
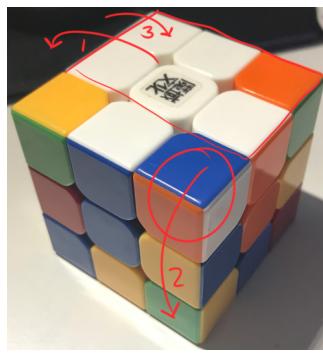


This corner is unsolved because the colors on this corner piece *don't* match up with the colors on its neighboring edge pieces. The corner is red and blue but the edges are green and red.



This corner is solved because the colors on the corner piece *do* match up with the colors on its neighboring edge pieces. The green matches up with green and red matches up with red.

There are four possible positions for incorrect edge pieces. The general idea is to move two layers to the side, turn the corner into place, and then restore the top layer. Pieces should be rotated to below where they should be in their solved position if possible.



Top layer -> wrong position  
Rotate two layers neighboring the piece out of the way. Turn the piece out of the top layer. Restore the layers that were turned back. Refer to “bottom layer -> white facing out.”

Top layer -> wrong orientation  
Move the two layers furthest from the corner out of the way. Turn the corner out of place and refer to “bottom layer -> white facing out.”

Bottom layer -> white facing out  
Move the two layers furthest from the corner out of the way. Turn the corner up into place, then turn the two layers back.

Bottom layer -> white facing down  
Rotate two layers neighboring the piece out of the way. Turn the piece as if it were being slotted in, but turn 180-degrees instead of the usual 90-degrees. Restore the top by turning the two layers back. Refer to “bottom layer -> white facing out.”



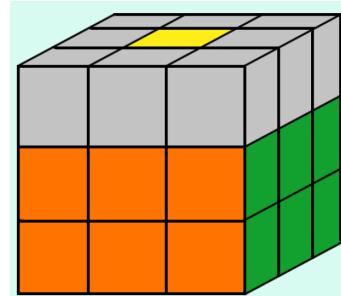
The layer is complete when the white side is solved and each “side” of the layer has three of the same color.

## **Solving the Second Layer:**

From the second layer onwards, the orientation of the cube switches so that *white is held at the bottom (D)* and *yellow is held at the top (U)*. The second layer has two algorithms that are used situationally.

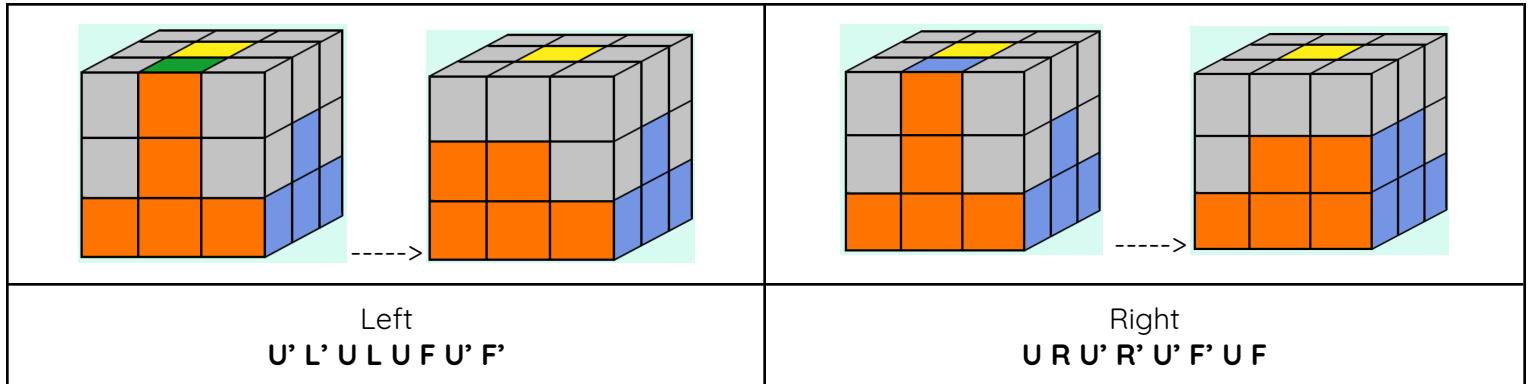


Solving the second layer involves finding edges that don't have yellow on them, aligning them properly, then picking the appropriate algorithm to slot it into place. Alignment is done by using the color on the side of the edge piece and matching it up to the correct center. The red-blue edge is aligned properly with the red center because red is the color on the side and blue is the color on top.



## The Two Algorithms

After the edge is aligned, the edge should be slotted into the second layer. The edge will be slotted into the side that's center is the same color as the color found on the top. In the example above, the edge piece will be slotted into the left side to match up with the blue center.



If an edge is stuck in the second later, perform the algorithm on a yellow-edge in the top position. This will move the stuck edge into the top layer while slotting in the yellow-edge.

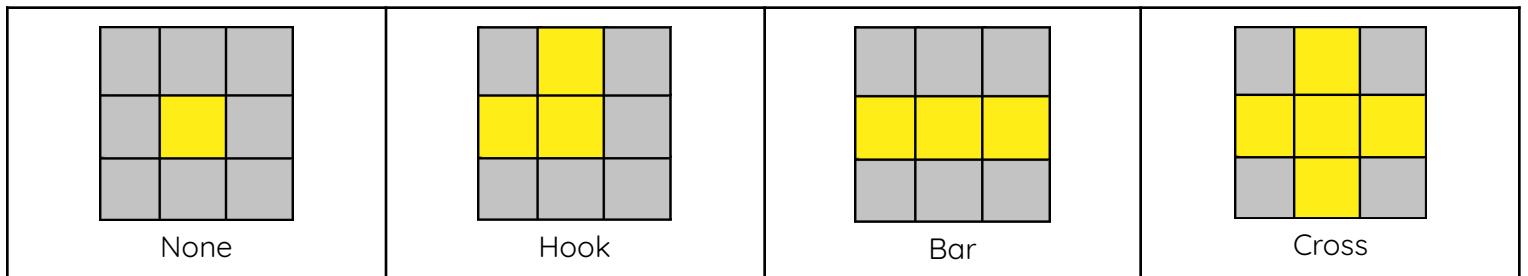
## **Solving the Third Layer:**

The third layer involves doing four more algorithms in the correct order to complete the cube. It is possible to skip any of the algorithms on the third layer.

### Yellow Cross

After solving the second layer, it is possible to see one of four possible scenarios, which rotate through none -> hook -> bar -> cross. It is important to hold the cube so that the pattern is oriented in the way shown below. Stop doing the algorithm once the cross pattern is reached.

**F R U R' U' F'**

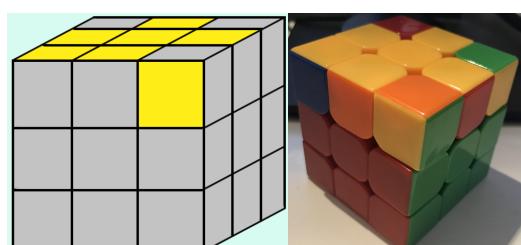


### Orient the Yellow Corners

The corners are solved once the entire yellow *side* appears to be solved. This is achieved by repeating this algorithm multiple times:

**R U R' U R U2 R'**

The trick is to get the upside-down "L" pattern with the yellow facing out, then perform the algorithm on it in the orientation seen in the drawn example.



The algorithm can be performed on the following corner patterns to get the upside-down "L."



Upside-down "L" without yellow facing out	Four corners with yellow in opposite directions

### Position the Yellow Corners

Look for “headlights.” It is possible to *not* have a set of headlights; in this case, perform the algorithm once to get a set of headlights then proceed with the following directions.

Headlights are two corner pieces that share a color on the same side. The color of the edge does not matter. Preform this algorithm with the headlights on the back (B) face.

**R' F R' B2 R F' R' B2 R2**

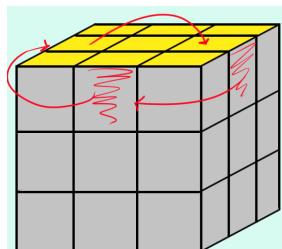
Headlights		Not Headlights

If done correctly, all sides should now have a set of headlights.

### Position the Yellow Edges

After this step, there are two possible outcomes, besides a solved cube. Align the headlight colors with their respective side.

One side solved (orange in this example)	All headlights



The algorithm rotates three edge pieces in a clockwise direction. It will need to be performed a *maximum of three* times to solve the cube. If your cube has all headlights, perform the algorithm once to get one side solved. Place the solved side on the back (B) face.

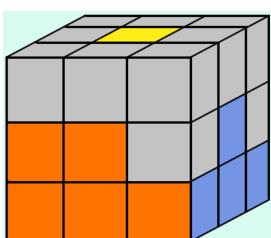
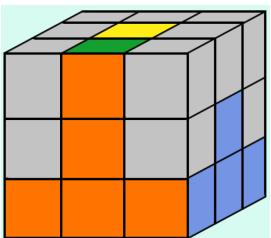
**R2 U R U R' U' R' U' R' U R'**

**Solved!**

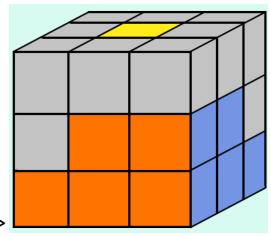
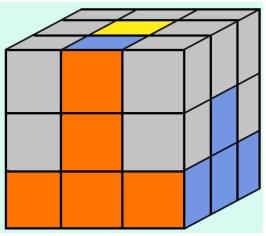


# Algorithm Quick Reference Sheet

## Second Layer

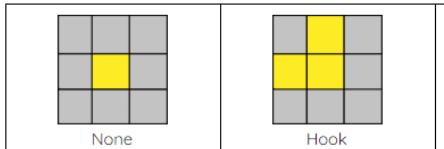


Left  
**U' L' U L U F U' F'**

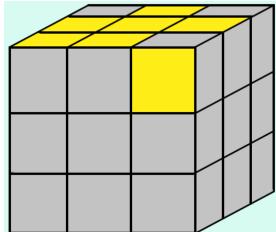
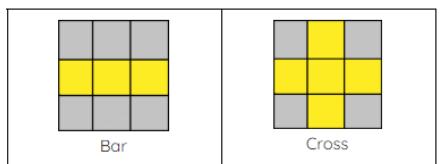


Right  
**U R U' R' U' F' U F**

## Third Layer



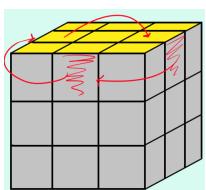
Get Yellow Cross  
**F R U R' U' F'**



Orient Yellow Corners  
**R U R' U R U2 R'**



Position Yellow Corners  
**R' F R' B2 R F' R' B2 R2**



Position Yellow Edges  
**R2 U R U R' U' R' U' R' U' R'**