Learning the Rubik's Cube

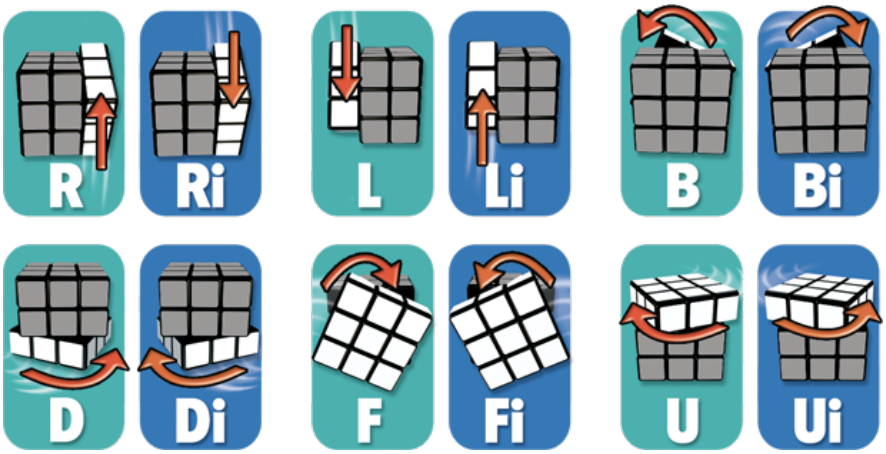
Welcome to your personal Rubik's Cube guide!

Solving a Rubik's Cube can be boiled down to a set of algorithms, and all you have to learn is when to apply them. This will be a detailed, step-by-step instructional guide with lots of pretty pictures to help you follow along!

Terminology and Notation

If you are like me, and have a hard time memorizing algorithms, don't worry! There is something called **Rubik's Cube Notation** that is widely used in order to easily write down the algorithms. Once you learn this notation, you can simply follow the algorithms are they are written down, and eventually after you do them a few times they will become muscle memory.

Here is an image that shows all the notation you will need to know.



Note: "i" stands for inverse. Sometimes this is written as R' instead. It means the same.

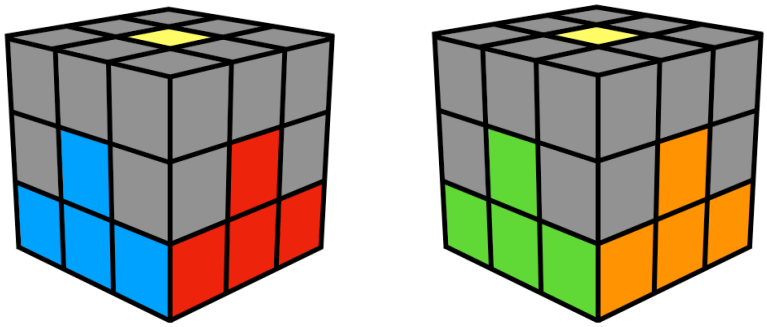
Note: Sometimes we write R2 to mean RR or rotate the right slide twice

An easy way to remember this notation is the regular moves are always **clockwise with respect to the center of the face being rotated**. Conversely, the inverse moves are always counter-clockwise with respect to the center of the face being rotated.

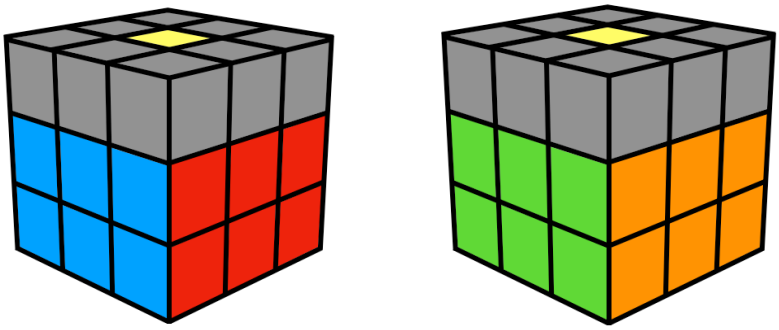
Method Overview

There are actually many methods people have invented to solve a Rubik's Cube. I will be teaching the **Beginners Method** or the **Layer-by-Layer** method. At a high-level, there are 3 steps to this method

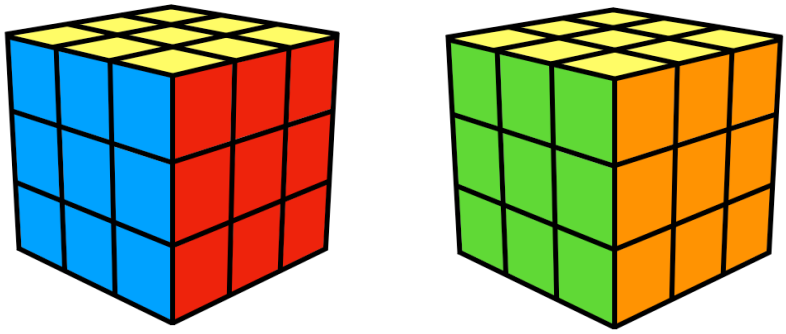
1. Solve the first layer



2. Solve the second layer



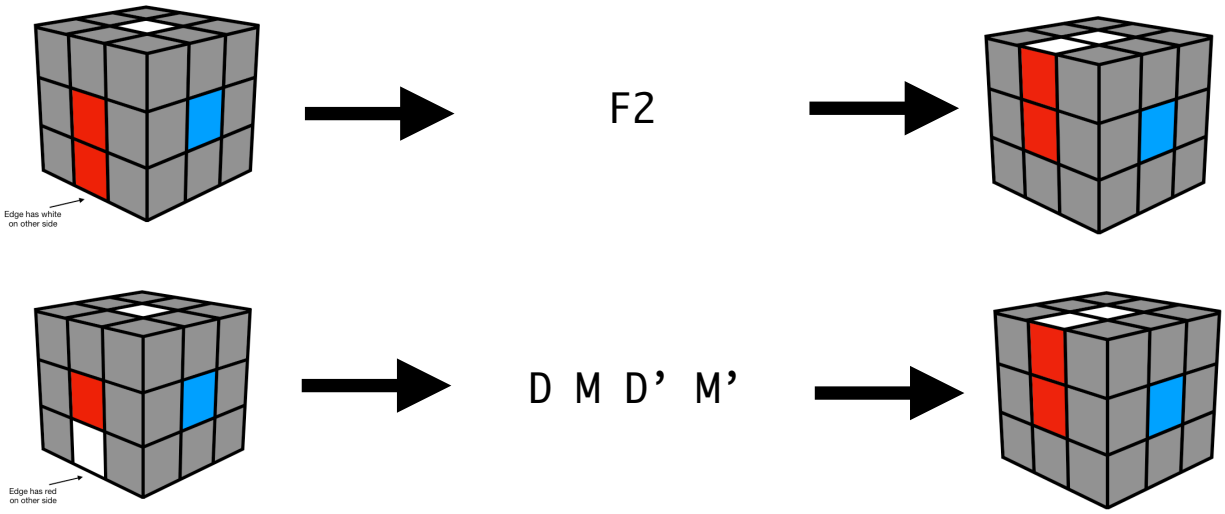
3. Solve the third layer



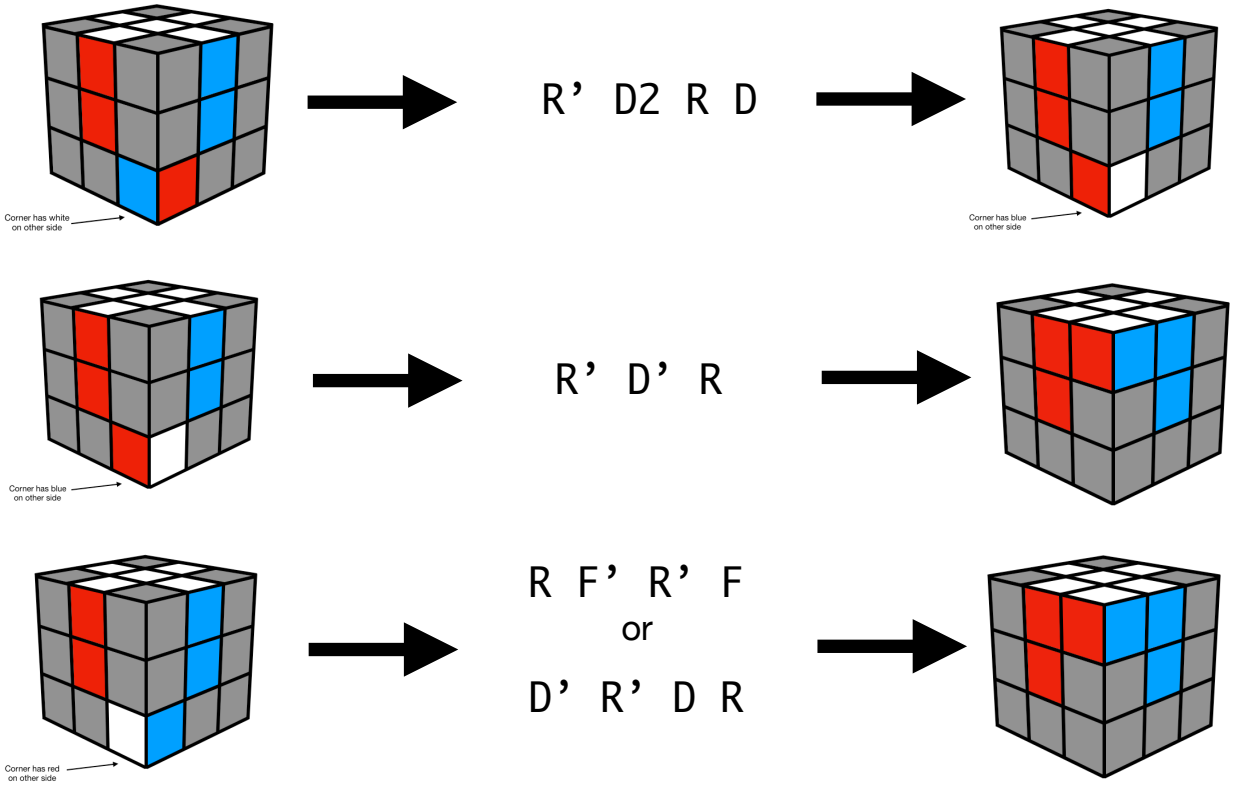
Note: For the cube pictures, always preform algorithm with left face towards you

The First Layer

- *Make White Cross*

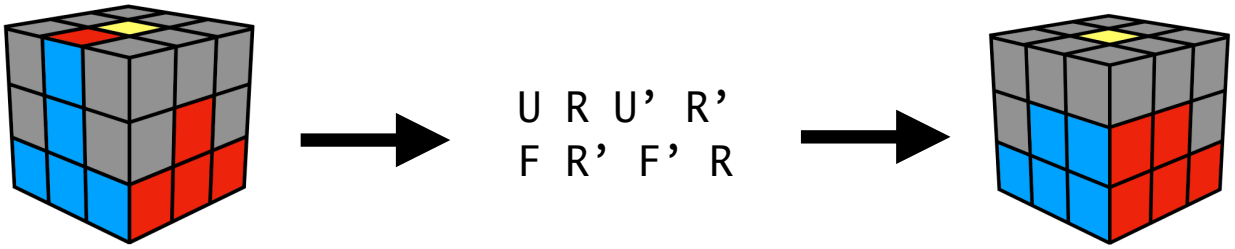


- *Inserting Corners*

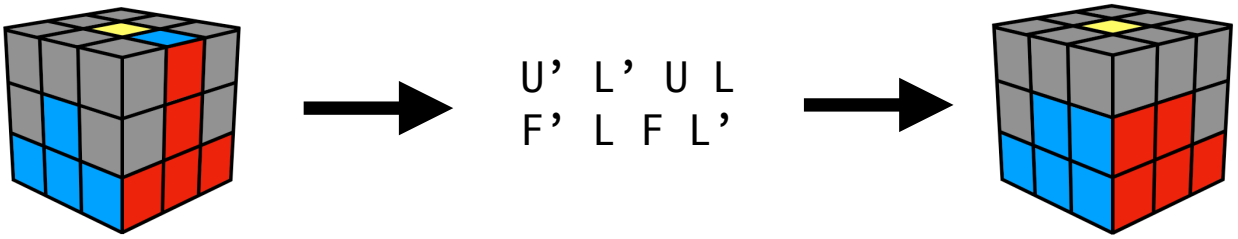


The Second Layer

- *Inserting Edges*



Note: This is the one exception to always do the algorithm with the left face towards you. Do this algorithm with the right face (red) towards you.

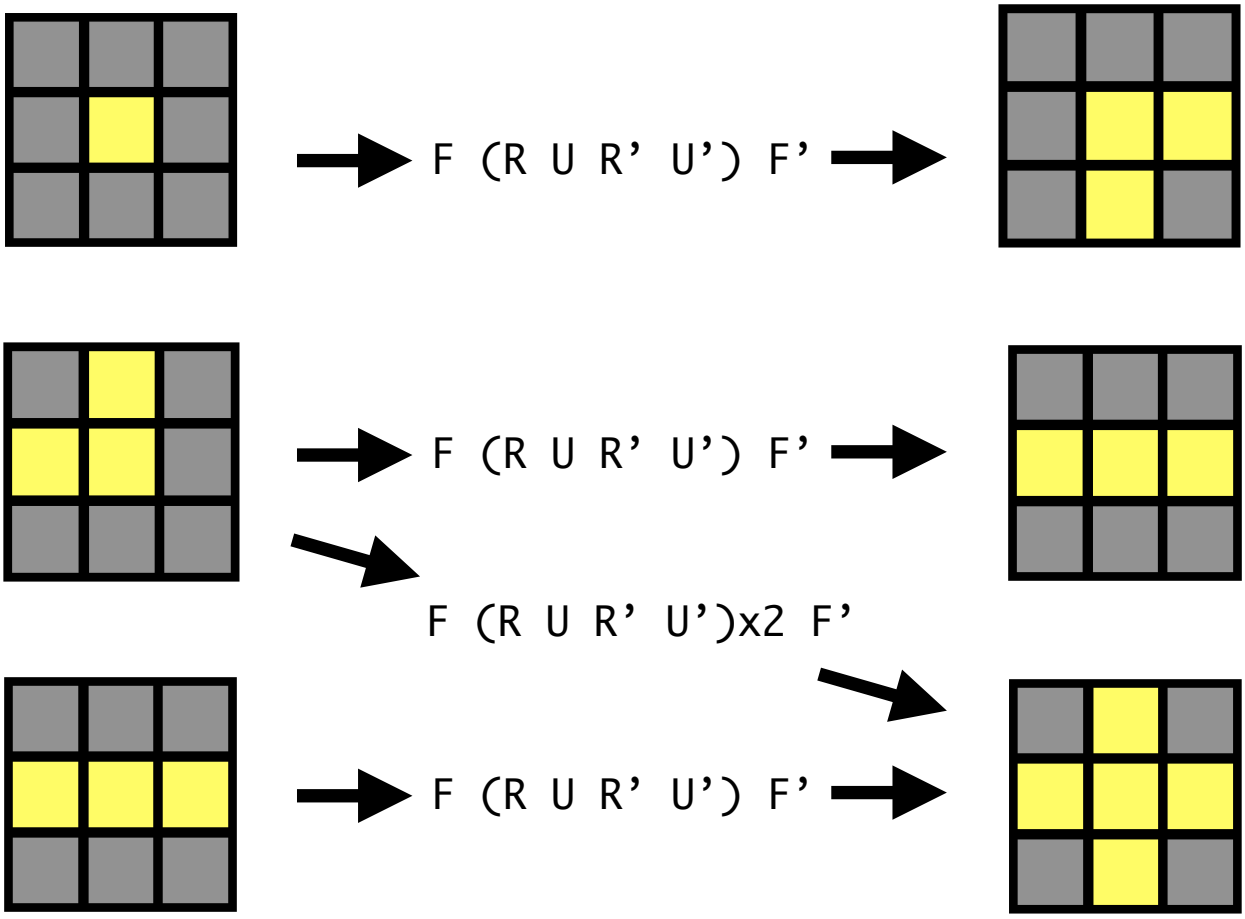


And that's is! This step is very simple.

The Last Layer

- *Make Yellow Cross (Orienting Edges)*

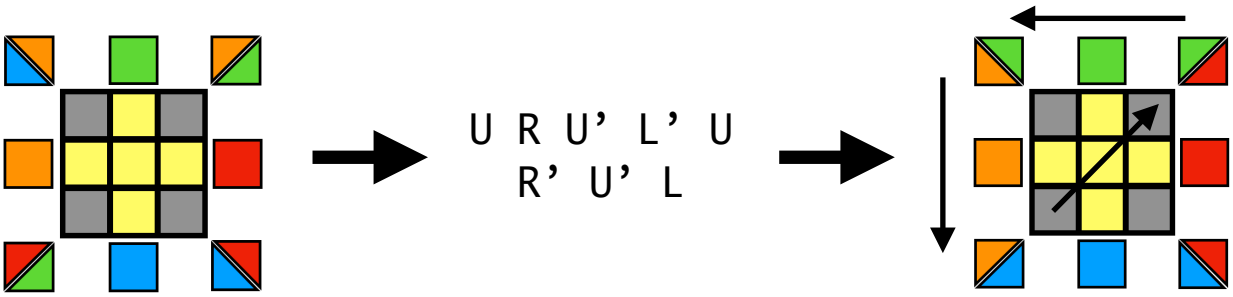
  Note: Preform the algorithm with the bottom/front face towards you, and the yellow face on top



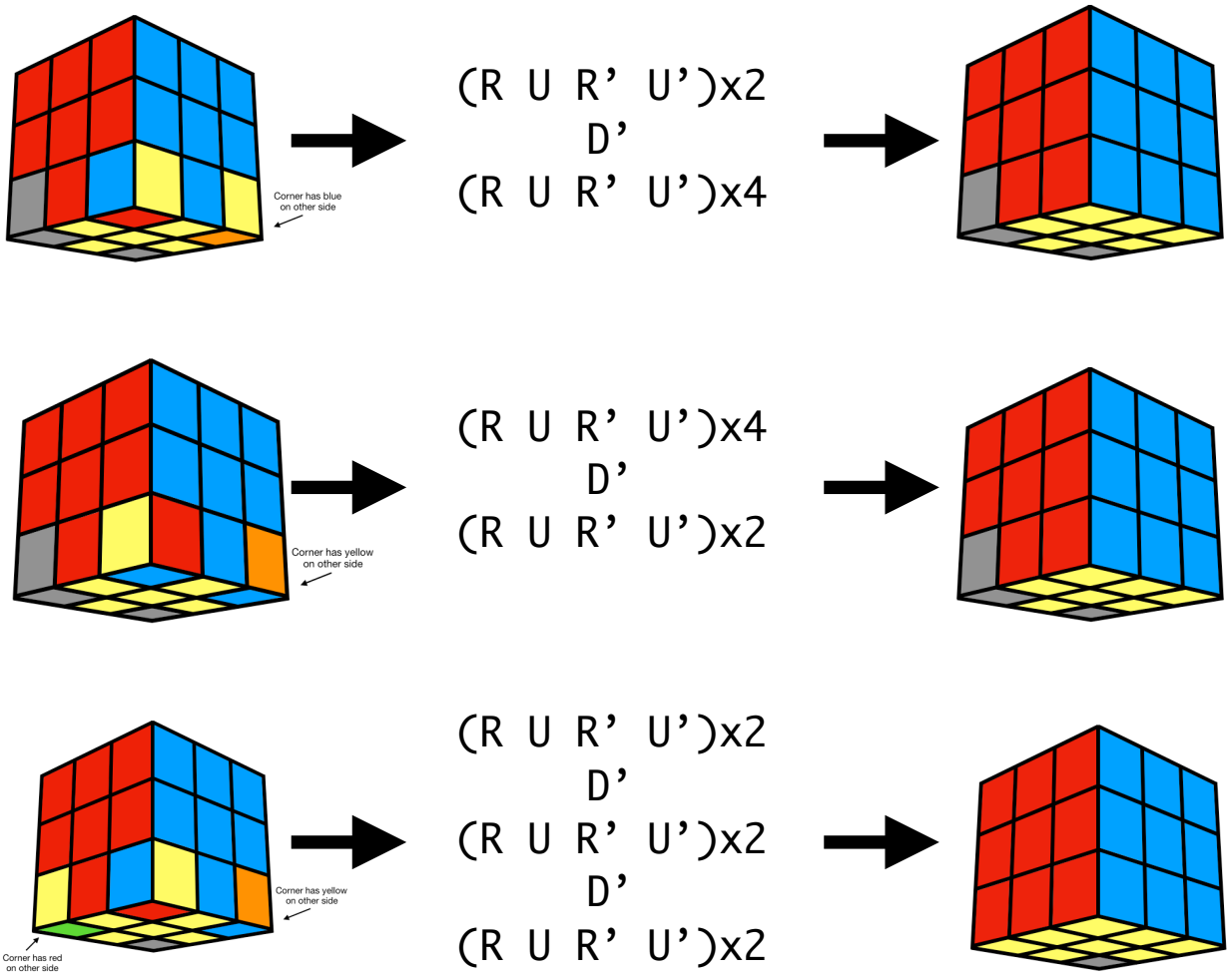
- *Permuting Edges*

  Note: the red, blue, green, orange represent the other color of the yellow edge
  Note: Preform the algorithm with the bottom/front face (blue) towards you

- *Orienting Corners*



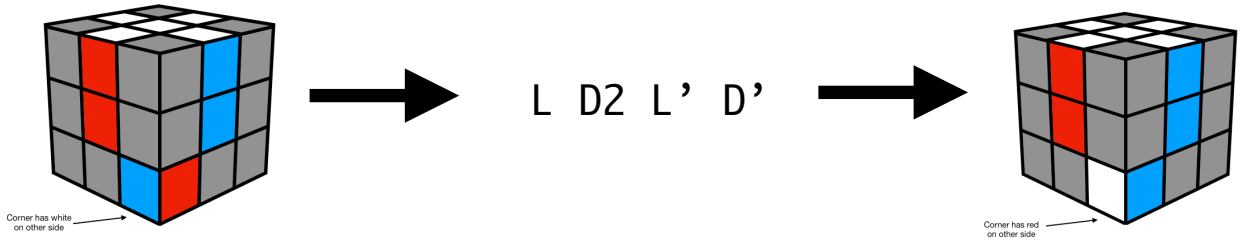
- *Permuting Corners*

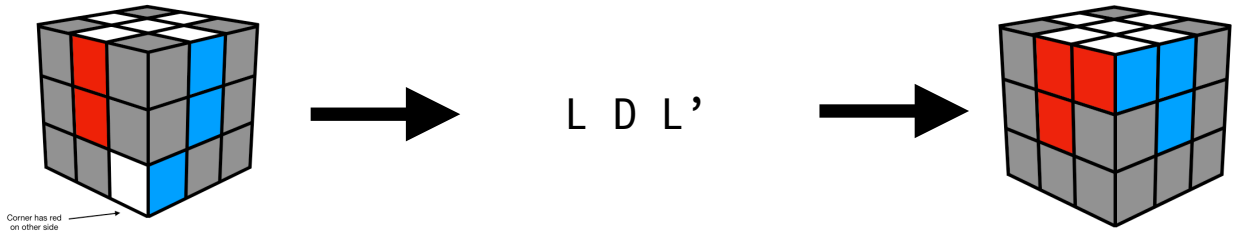


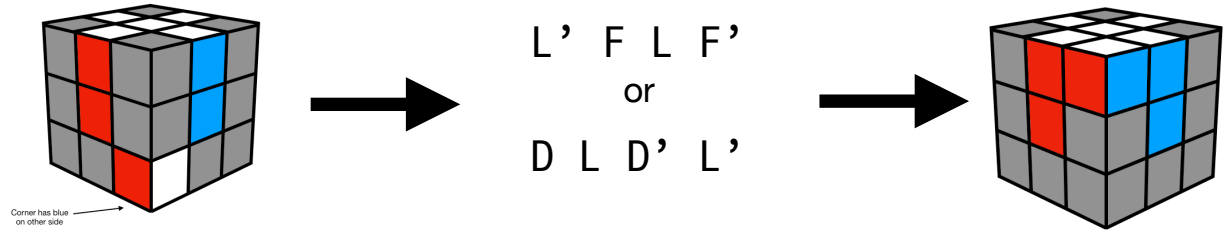
Some Additional Notes

Inserting Corners

All the algorithms I gave work symmetrically. So if you instead have the right face (blue) towards you, then you can accomplish the same thing with the following algorithms







For speed cubers it's important to be "ambidextrous", but you can just learn 1 way of inserting corners that works for you. I gave only the right-handed algorithms in the original breakdown since I assume you are more comfortable rotating with your right hand.

Permuting Corners

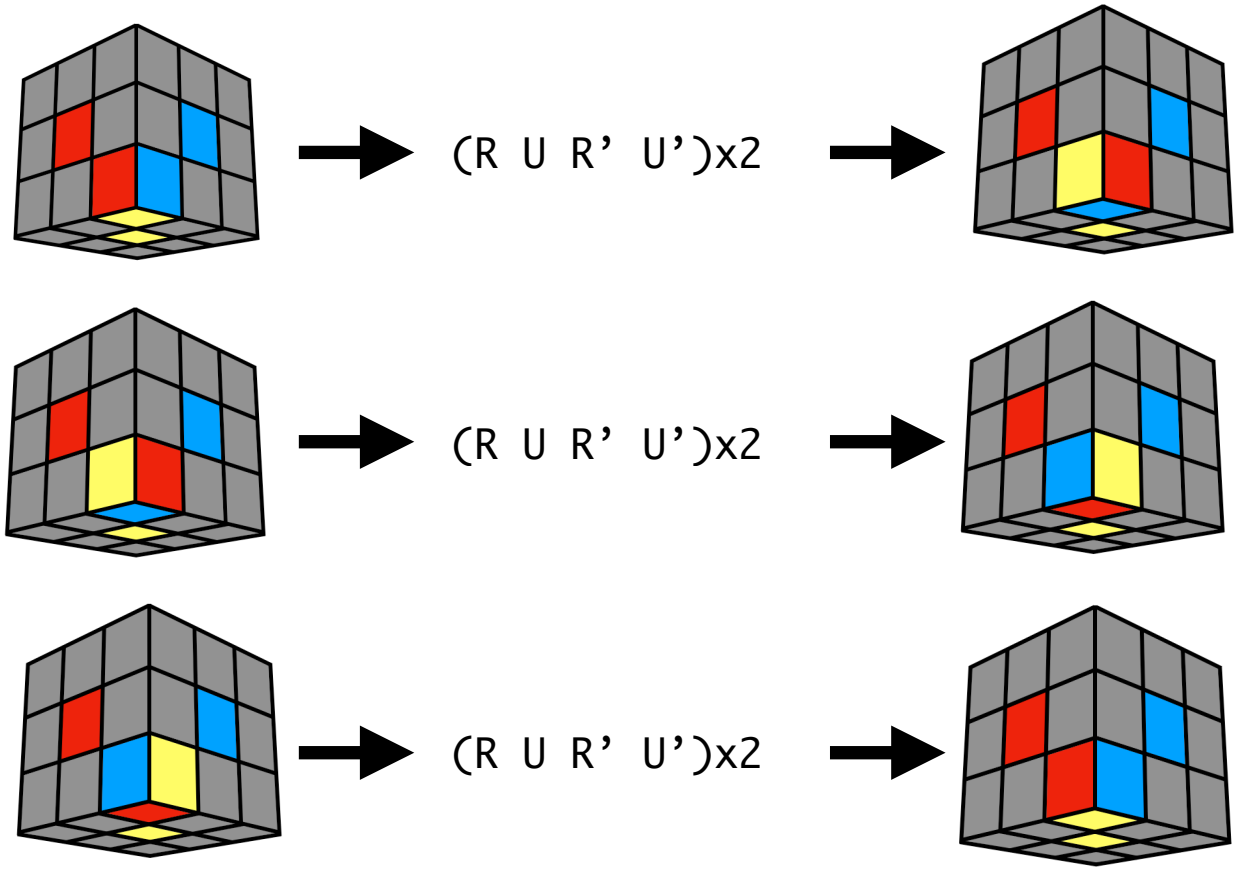
You may have noticed the sequence (R U R' U') or some variation of it occurs a few times in the algorithms I have provided.

This is actually a very powerful set of moves that is used in many advanced algorithms, and has been given the name **The Sexy Move** because using finger tricks it's really fun to execute for speed cubers.

In the "Permuting Corners" part I did not give every possible case you may encounter, I only give a few examples. I would like to explain exactly what the Sexy Move is doing in this last step.

TL;DR

- every time you apply the Sexy Move 2 times, it will rotate the right edge once.
- Preforming the Sexy Move 6 times will bring you back to where you started

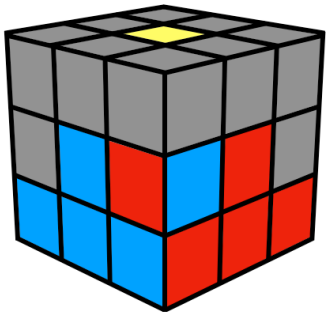


So, in the last step we need to rotate the last corners. Doing the Sexy Move 2 times would accomplish this, but it would also mess up the top 2 layers. By rotating the bottom layer (D moves) and always doing the Sexy Move in multiples of 6, we are able to rotate the bottom corners in any order we want while maintaining the top 2 layers.

Some Issues you May Encounter

- *The piece is already in the spot I want it to go, but it's not oriented correctly.*

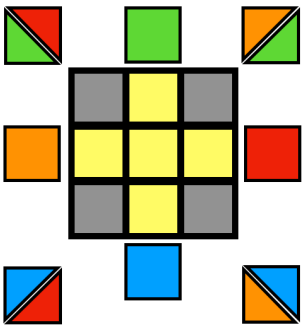
For example, you may encounter this:



The solution is you simply need to insert another random piece into that slot, in order to get that piece out. Then you re-insert it in the correct orientation.

- *I'm trying to orient the corners, but none of them are in the correct place.*

For example, you may encounter this:



The solution is you need to do the algorithm once in order to get 1 corner in the correct spot. For example. Preforming the algorithm with the blue side face you would make the top left corner in the correct spot. You would then preform the algorithm 2 more times with the green side facing you, and the corners will be correctly oriented.