

HOW TO SOLVE A RUBIK'S CUBE

The Beginner Method

Solving a Rubik's Cube is usually done layer by layer. Trying to do it face by face would be nigh impossible, as you couldn't do the other faces without screwing up the ones you may have already done. I will cover three ways of solving the Rubik's Cube: beginner, intermediate and advanced, and I advise you to start with the beginner method. The intermediate method is similar to the beginner, except the last layer is slightly different, allowing for faster times. The advanced method is what is known as the Fridrich method and, with practice, will allow you to achieve times of less than 20 seconds. I myself use a mixture of the intermediate and advanced methods, as I have not yet learnt all of the Fridrich method.

I will try to explain everything in a way where you can understand, as when I first learnt I had to figure stuff out because the tutorial wasn't that good.

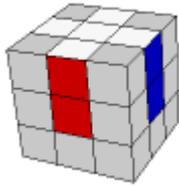
Before we begin, I recommend you go to the NOTATION page and familiarise yourself with it. I shall refer to it throughout this guide, but worry not! It's really rather simple.

Step 1 - The Cross

The first thing to know about the cube is that the middle pieces don't move. Go ahead, try and move them. They rotate, but they never move in relation to each other, which means that each face will always be that face. Also, a common mistake when people first approach an unsolved cube is to think they have to solve 54 stickers. This is wrong, as there are only 20 pieces that actually move around - 8 corner pieces and 12 edge pieces.

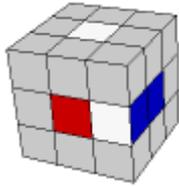
Throughout this website, it will be assumed that the first face is the white face. Every single time you do the cube, you should start with the white face so you get used to always looking out for the same colours at different stages. If I were to pick up a cube and start with, say, the green face, I would get hideously confused when it came to the last layer because I am so used to looking for yellow pieces instead of blue ones.

The first thing you have to do is to create a cross on the first layer, like so:

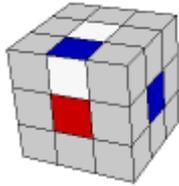


Grey cubies show cubies that aren't important at this stage - just ignore them.

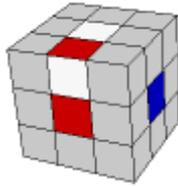
There aren't many algorithms to achieve this as it relies mostly on logic, but there are some scenarios you can watch out for:



R

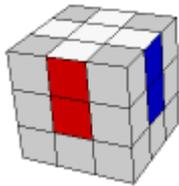


F R

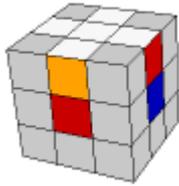


F R U

It is also important to remember that the edge colours have to be aligned with the centers like this:

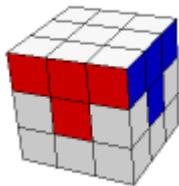


and not like this:

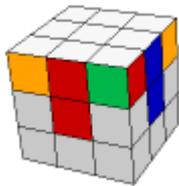


Step 2 - The Corners

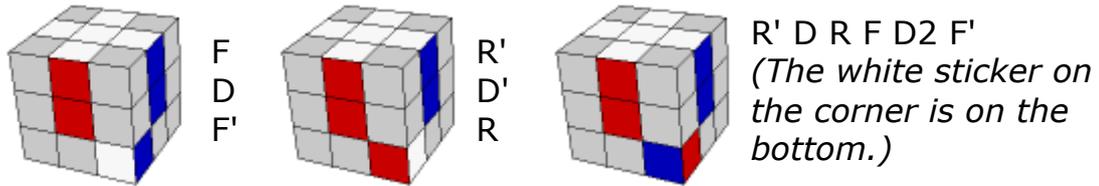
The next step is to put the corners in, like this:



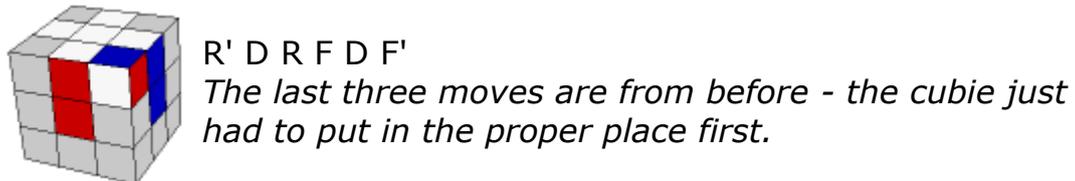
Just like the edge pieces before, it is important that the corner pieces match with the pieces around it, i.e. not like this:



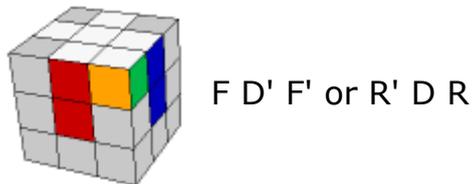
The corners will most likely be on the bottom layer. It is important to first put the cubie you wish to move underneath where it needs to go. That is, the white-blue-red cubie should be underneath the white-blue-red corner. There is an algorithm for each situation:



In some cases, the corner will be on the top layer but just needs reorienting or repositioning, for example:



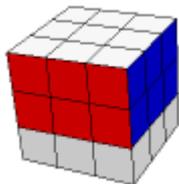
If a corner cubie is in the top layer but in the wrong place, it also needs to be taken down to the bottom layer. This can be done with either of the following algorithms:



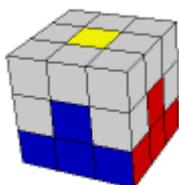
Once the cubie is on the bottom layer, it can be put in the correct place by using the above algorithms. When you can, always try to use one of the first two instead of the third as they are shorter and will save you time.

Step 3 - The Second Layer

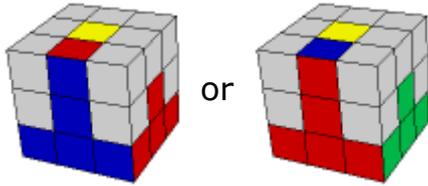
The next step is to put the four second layer pieces in the right place, like this:



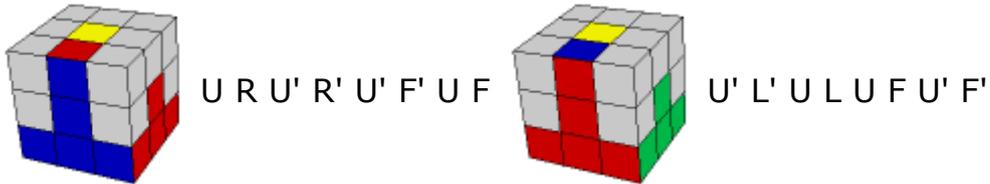
The first thing to do is to turn the cube upside-down, so you have this:



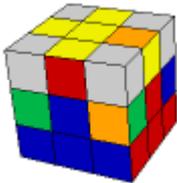
Then find the piece that you need to put in the correct place - in this case the blue and red edge piece. You need to get to one of two situations:



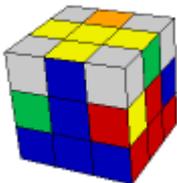
To put the piece in the correct place, you need one of two algorithms, and one is the inverse of the other. These are the longest algorithms you'll need to learn.



Sometimes, the second layer is sneaky and will throw this sort of situation at you:

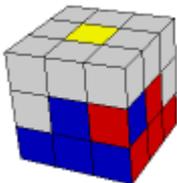


Here, none of the second layer pieces are in the right places but you can't get to one of the above situations. To fix this, just do the algorithm anyway. In the above picture, using the first algorithm on the yellow-red edge piece will displace the orange-green piece, like so:



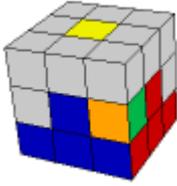
Now that the orange-green piece is in the top layer, you can solve it like normal.

Sometimes, you may meet this situation:



You can solve this in the same way as before, by using the normal algorithm on a yellow edge piece and displacing the red-blue piece so it can be solved as normal. Or, if you're feeling clever, you can show it who's boss and give it a bit of the old $R U' R' U F' U^2 F U F' U^2 F$.

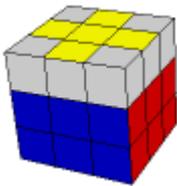
There will be times where there is a piece where another piece needs to go, like this:



Don't be tempted to remove this piece in order to put it in the right place, as that takes time. Instead, put the red and blue piece there like normal and this will displace the foreign piece. This way, the algorithm only needs to be done once and not twice. The foreign piece can then be put in its correct place like normal.

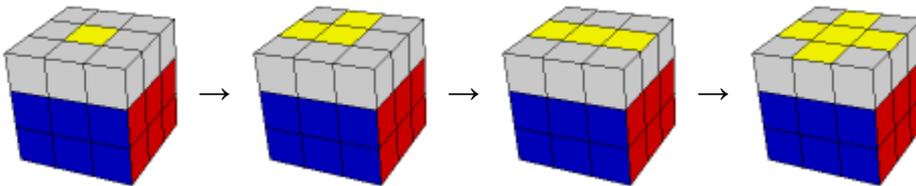
Step 4 - The Last Layer Cross

As the name suggests, this stage comprises of creating a cross on the last layer, like this:



This can't be done in the same way as the first cross, so there are two small algorithms to learn.

There are four combinations you may have on the last layer to begin with and the two algorithms will cycle through these combinations in the order given.



The two algorithms will cycle through these combinations in the order given. However, one of these algorithms will move one step in the cycle and the other will move two. These algorithms are:

$F R U R' U' F'$ for one step

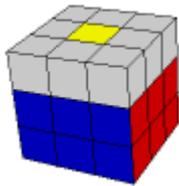
and

$F U R U' R' F'$ for two steps.

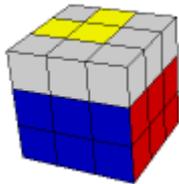
As you can see, they are quite similar and small so they are quite easy to remember. **Remember, when you get to the L shape it must be held in the top left of the face and the line must be**

held horizontally (as shown in the pictures).

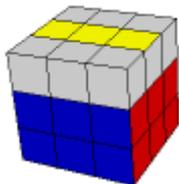
For your ease, I have provided a table to show which algorithm to use at each situation:



Use both, in either order.



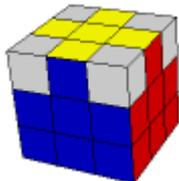
F U R U' R' F'



F R U R' U' F'

Step 5 - The Last Layer Edges

This step will change the orientation of the edges of the cross you just created to line up with the centers, like such:

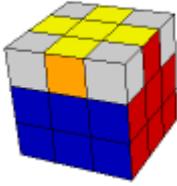


There is one algorithm to achieve this:

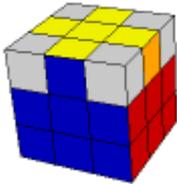
R U R' U R U² R' U

It is quite easy to remember, as it only uses the right and up face, and the up face only moves clockwise. However, the cube must be held in a specific way before the algorithm is applied. Firstly, twist the top face until two of the edges are correct. There will always be two that are correct, whether they be adjacent or opposite each other.

If they are adjacent, hold one correct one away from you and one in your right hand, like this:



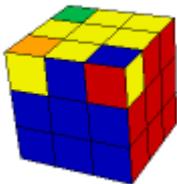
If they are opposite each other, hold one correct one away from you and the other towards you, like this:



If they are opposite each other, applying the algorithm will change it so they are adjacent to each other. You then apply the algorithm again (holding it correctly) and they will all be correct.

Step 6a - The Last Layer Corners A

This step alters the corners so they are all in the right place, but not necessarily in the right orientation, like this:



This is just an example - your corners may be in a different orientation once you've done this.

First thing to do is to examine your cube and see if there are any corners that are already in the right place, e.g. the red, blue and yellow one in the picture above. It's in the right place, just not the right way around. If there are, **make sure you hold it in the bottom right corner of the top face when you apply the algorithm - but don't move the top layer, move the whole cube to put it there.** If there aren't any correct, you can apply the algorithm when the cube is held in any way (yellow face on top of course).

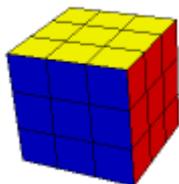
The algorithm is this:

U R U' L' U R' U' L

Some people (including myself) prefer to think of this as the top face, the right side away, the top face back again, the left side away, top side back again, right side towards, top side back again, left side towards. After the algorithm, the corner cubies (except the one in the bottom right - your possibly correct one) will have changed around. If they still aren't all correct, keep applying the algorithm until it is. If you started with one correct, you'll only have to do this algorithm twice. If you didn't, it may take more.

Step 6b - The Last Layer Corners B

This is the last step, so will result in the completed cube:



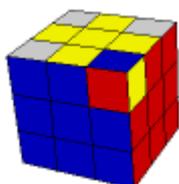
I advise that you read through this section completely before attempting it. If you mess it up, you'll ruin everything, become sad and frustrated, and have to start all over again.

There is only one algorithm for this section:

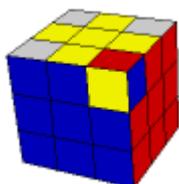
$R' D' R D$ (Reminder - it is important that the turns are done as if you were looking directly at the face! Don't let the Ds catch you out!)

This algorithm gets applied to **each incorrectly oriented cubie, a number of times**. If you don't have any, congratulations! You've solved the Rubik's Cube. But if you do, read on.

You must hold any incorrect cubie in the bottom right of the up face (the Red-Blue-Yellow corner in the above picture, as Blue is the front). Then keep applying the algorithm until the yellow is pointing upwards. You will either need to do it two or four times:



Do the algorithm twice.



Do the algorithm four times.

Once the two or four algorithms are completed, twist **only the top face** until another incorrectly oriented cubie is in the bottom right of the top face and **do the algorithms again on that incorrect cubie**.

Whilst you are doing these algorithms, the bottom two layers of the cube may become a jumbled mess. Worry not! They are sensible, and will resolve themselves once you have finished the algorithms on the last incorrect cubie.

Once these algorithms are complete, you are only one or two turns away from completing the Rubik's Cube.

Congratulations!

Culled from: <http://solve-the-cube.com/>