1 Basics and Notation

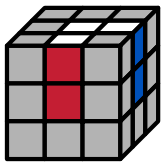
The cube consists of three types of pieces – 6 *centers*, which have one face and are attached to a solid core (so they are fixed in place), 12 *edges* which have two faces, and 8 *corners*, which have three faces. Each piece is unique – no two distinct pieces share the same coloring. We will be using Singmaster notation. The faces are labeled with the leading letters of **U**p, **D**own, **R**ight, **L**eft, **F**ront, **B**ack. A standard move, e.g. R, is a 90° turn *clockwise* of the corresponding face. An inverse turn is denoted, e.g., R', and is a 90° counterclockwise twist. Finally, double moves like R^2 are 180° turns of the corresponding faces (I use the exponent as it is natural given the group-theoretic nature of the cube and because it looks nice, but many other sources will simply write $R2$). Pictures will generally present the Up and Front faces predominately, with either Right or Left also visible, depending on the algorithm.

The primary algorithms we will be using are the *inverse sexy move* and its left-handed mirror, which I will call **ISM** and **LISM**. These are $URU'R'$ and $U'L'UL$, respectively. Note that the term "sexy" is used here à la sexy primes, as this sequence has period 6 (though it does also flow quite smoothly). Longer algorithms will be broken up into triggers with parentheses. Any appearance of parentheses are simply syntactic sugar: they just make it easier to keep track of smaller parts of the algorithm at a time.

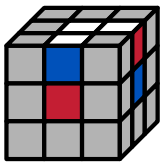
One final note – when beginning, it is natural to try to turn by grabbing a face and moving your wrist. In fact, modern speedcubes can generally be fairly easily turned using single fingers – I recommend at least performing U moves with your index fingers, as it reduces the chance that you lose track of your orientation partway through an algorithm (R and L moves are generally still done with wrists). Regardless, make sure you keep either White or Yellow on top the whole time.

2 Making the White Cross

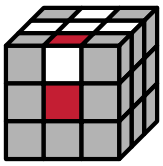
We first solve the white edges. This step is mostly intuitive. Make sure to place the pieces in the correct relative positions!



Good



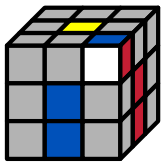
Bad



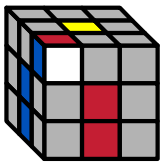
$FU'RU$

3 White Corners

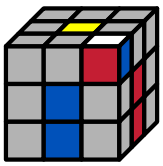
Flip the cube over (white on bottom). We now insert the corners of the white face. If a corner is already in the white layer but incorrect, you can use any of these to insert a different corner from the top layer to replace it.



ISM



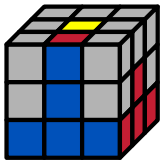
LISM



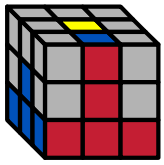
(**ISM**)^3

4 Second Layer Edges

Find a non-yellow edge in the top and align it (and rotate the cube) so that it matches the front face. We then perform either **ISM** or **LISM** to remove the corner of the target space, rotate the whole cube so that the white face of the removed corner is on the front, and apply the other to insert it back. If there are no edges in the top, they are all in the middle – find one that is incorrect and insert any other edge to kick it out.



ISM (rotate CW) **LISM**

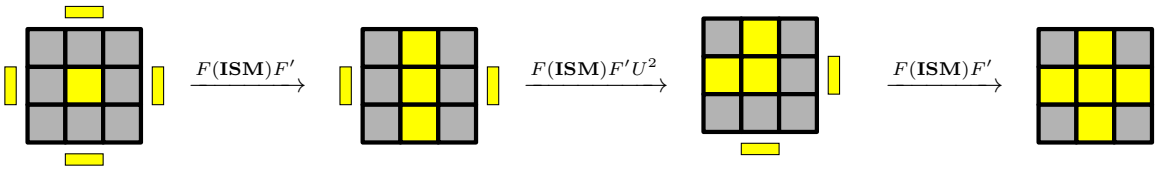


LISM (rotate CCW) **ISM**

5 Last Layer Edge Orientation

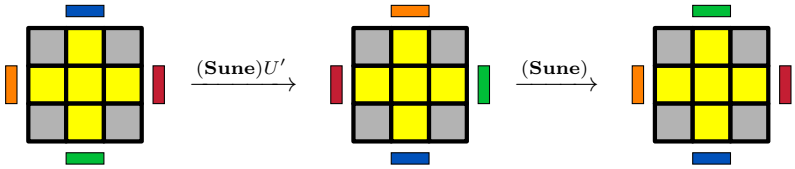
This step orients the yellow edge pieces, so that we form a yellow cross on top (like the white cross before). We don't need to place them in the correct positions – we can do that later.

There are a few cases to worry about. Either 0, 2, or 4 edges will be correctly oriented (yellow on top). We can repeatedly apply variants of **ISM**. These diagrams show the U face, with R facing right.



6 Last Layer Edge Permutation

Now we will permute the yellow edge pieces so that they are in the correct positions. Here, we will use the following algorithm named "Sune": $(RUR'U)RU^2R'$. You can track the path of the down-front-right corner – it moves to the top layer, and around the whole layer (the last U-move is a double so that it can get back down in time). Line up as many of the yellow edges as possible – you can always align either 2 or 4 in the correct positions. If the two correct edges are adjacent, place them in the back and right, and perform a sune. If they are opposite, then you will need two sunes (the first can be done from any position).



7 Last Layer Corner Permutation

We now permute the yellow corners to be in the correct positions. This step is performed using an algorithm named "Niklas": $(RU'L'U)(R'U'LU)$. I find it most intuitive to watch the up-front-left corner – you are essentially performing R/L moves and repeatedly moving it out of the way. You can have either 0, 1, or 4 corners correct here. Note that we only care about whether the piece is in the correct position – it may be twisted incorrectly! Use the surrounding edge pieces to help you. If there is 1 correct corner, hold the cube so that it is in the Up-Front-Left position and perform Niklas (you may need to do it twice). If there are 0, then perform Niklas from any position, after which one corner will be in the right spot.

8 Last Layer Corner Orientation

All of the pieces should now be solved into the correct positions. However, some of the yellow corners may be twisted incorrectly. Flip the cube back over (white top) and hold it so that an incorrect corner is in the down-front-right slot. Repeatedly perform **ISM** until it is in the right spot and in the correct orientation. The rest of the cube may still be messed up here – this is okay! Perform D moves to move another incorrectly oriented corner into the down-front-right slot and repeat – Do not rotate the cube. If you do this until all the corners are solved, you will find that the cube fixes itself. All that remains is to align the bottom layer with D moves. One common mistake here is that people do not execute the entire Inverse Sexy Move – don't forget that this sequence starts with a U move.