How to solve a Rubik's Cube

These instructions will take you through the process of solving a Rubik's cube, no matter how scrambled the cube starts. If you get lost at any point, and can't get back to the state you were in, don't worry - you can always start again from the beginning. Solving gets easier with practise, and soon you'll be doing it without looking at the sheet at all!

It's important to think of the Rubik's cube not as a collection of coloured squares, but as a set of smaller cubes, each of which lives in a specific place on the solved cube.

There are three kinds of smaller cube on the Rubik's cube: corner pieces, edge pieces and centres. There are six centres, one of each colour, and they are fixed in place relative to each other. The face of the cube with the white centre on it we call the white face.

The twelve edge pieces each sit between a pair of centres, and have two colours each, and the eight corners each have three colours. So, there's an orange-blue edge piece, and a blue-red-yellow corner piece.

**Step 1.** Make a cross shape on the white face, making sure that each edge piece matches the centre below it.

One way to do this is move the four white edge pieces down to the opposite face (yellow), then one by one match them with the correct colour centre and rotate up to the white face, as shown in the diagrams below.

![Diagram of Rubik's Cube with cross shape on white face.][1]

When you've finished, the cube should have a cross on the white face, and the edge pieces in the top layer should match the centres on all four sides.
Step 2. Finish the corners of the white face, using a sequence of moves called the CORNER SWAP.

Find the corner piece you're trying to put in place, put it directly under where it needs to end up, and hold the cube so that corner is the near right.

Then perform the corner swap: turn the RIGHT face anticlockwise (as you look at it) one quarter turn, then the DOWN (bottom) face a quarter turn anticlockwise. Then turn the RIGHT face clockwise, then the DOWN face clockwise. This should put the corner piece into the top right corner. If it's not the right way round, you can repeat that sequence once to take it out and again to put it back in. Each time it will go back in facing a different way.

Repeat this until it's right, and repeat for each of the other corners.

If the corner pieces you're looking for are in the top layer but in the wrong place, just replace them with a different corner piece using the CORNER SWAP method, and then they will be on the bottom layer.

You should now have solved the whole first layer of the cube, and you're ready to move on to the next step.
Step 3. Next we need to fix the middle layer, and for this we use the EDGE SWAP. There are two sequences in the EDGE SWAP, called EDGE SWAP 1 and EDGE SWAP 2, and to put a piece into the right place in the middle layer, you need to use both but in a different order, depending on where your piece is coming from.

If we're trying to place the blue-orange edge piece, we need to position it in the bottom layer, directly underneath either the blue or orange - depending on which way round it is, it will be in one of two places, as shown in the diagram.

If the piece is in position A (because the bottom face is orange, use EDGE SWAP 2 then EDGE SWAP 1. And if it's in position B, use EDGE SWAP 1 then EDGE SWAP 2.

The two EDGE SWAP sequences are as follows: Hold the cube so the orange face is pointing towards you (so the position where the edge piece is to end up is on the left), and then perform the following quarter turns:

**EDGE SWAP 1:** DOWN face clockwise, LEFT face clockwise, DOWN face anticlockwise, LEFT face anticlockwise.

**EDGE SWAP 2:** DOWN face anticlockwise, FRONT face anticlockwise, DOWN face clockwise, FRONT face clockwise.

This should place the blue-orange edge piece in the place it's supposed to be, but without damaging any of your existing top layer of solved cube. If the edge piece you are looking for isn't on the bottom layer, it will be in one of the other edge spaces (or in the edge space it's supposed to be in, but the wrong way round). Again, if this happens you can use the EDGE SWAP to put a different piece in the place it is, and then it should be on the bottom layer.

If you repeat this until all four middle layer edge pieces are in place, you should have two whole layers of cube solved!
**Step 4.** The only layer not solved now should be the bottom layer. Flip the cube over so it's the top layer, and look at the shape you've got. It should match one of the four diagrams below.

![CROSS SHAPE: Congratulations! You already have a cross on top and can skip to the next step.](image1)

![HORIZONTAL LINE: Hold it this way round, and perform the move CROSSMAKER L.](image2)

![V SHAPE in top corner: Hold it this way round, and perform the move CROSSMAKER V.](image3)

![SINGLE SQUARE in the centre: perform one of the two CROSSMAKER sequences, then you should find you have a LINE or V.](image4)

**CROSSMAKER L: FRONT face clockwise**
RIGHT face clockwise, UP (top) face clockwise
RIGHT face anticlockwise, UP face anticlockwise
FRONT face anticlockwise.

**CROSSMAKER V: FRONT face clockwise**
UP (top) face clockwise, RIGHT face clockwise
UP face anticlockwise, RIGHT face anticlockwise
FRONT face anticlockwise.

**Step 5:** You now need to get the corners in on the yellow face. We don't mind which way round the corner pieces are for now, but you should be able to rotate the top face of the cube until at least TWO of the corners are in the right place (even if they are not the right way round). You can now use the CORNER SPIN sequence to put the other two in the right place. (If all four are in the right place, Congratulations! You can skip to Step 6.)

Hold the cube so that the yellow face is on top, and the two pieces you want to swap are on the right. If they're not on the same side of the cube, perform the corner swap once with the cube any way round, and you will then have two adjacent wrong corners.

**CORNER SPIN: LEFT face clockwise, UP face anticlockwise**
RIGHT face anticlockwise, UP face clockwise
LEFT face anticlockwise, UP face anticlockwise
RIGHT face clockwise, UP face clockwise TWICE.
Step 6. You should now have the corner pieces in the right places, but they might not all be the right way round. This uses the same CORNER SWAP sequence as we used in Step 2.

Put the corner you want to rotate in the top right of the cube, and as before use the CORNER SWAP sequence to move it out and back in, rotating it until it faces the correct way. This will mess up the rest of the cube! But don't worry. Once this corner piece is in the correct orientation, don't move the cube but just spin the top face so another corner which needs rotating is in the top right position, and repeat the CORNER SWAP again until if faces the correct way. If you repeat this until all the corners are facing the right way, it will also return the rest of the cube to its solved position.

If you get lost or mixed up part way through this process, you might not be able to get the cube back to where it was. You may have to skip back a few steps to get yourself back to where you were.

Step 7. You should now have a cube which is almost solved, and the only wrong pieces will be the edge pieces on the top layer. We have a move, called the EDGE SPIN, which will rotate three of the pieces without messing up the rest of the cube.

If NONE of the pieces are wrong, your cube should be solved. Well done!
If THREE of the four pieces are in the wrong place, you will need to rotate them either clockwise or anticlockwise (as you look at the top of the cube). There are two different EDGE SPIN moves for these two cases. Hold the cube so yellow is on top and the face which has already been solved on your LEFT.
Then perform the following quarter turns:

**CLOCKWISE EDGE SPIN:** RIGHT face TWICE
UP face clockwise, FRONT face clockwise
BACK face anticlockwise, RIGHT face TWICE
FRONT face anticlockwise, BACK face clockwise,
UP face clockwise, RIGHT face TWICE.

**ANTICLOCKWISE EDGE SPIN:** RIGHT face TWICE
UP face anticlockwise, FRONT face clockwise
BACK face anticlockwise, RIGHT face TWICE
FRONT face anticlockwise, BACK face clockwise,
UP face anticlockwise, RIGHT face TWICE.

If all four of the edge pieces are in the wrong place, you can do either of the two EDGE SPIN sequences, then after which you'll have one correct edge and you can EDGE SPIN the other three.

Congratulations! You've solved the Rubik's cube!