

# Solving the Cube



# Anatomy of the Cube

The Rubik's Cube consists of THREE types of pieces:

## The Center Piece:

A one-sided piece found in the center of the a side or face.

## The Corner Piece:

A three-sided piece displaying three different colors of the cube.

## The Middle Piece:

A two-sided piece displaying only two different colors of the cube.

## Faces:

The standard cube has the following six color faces:

|        |          |        |
|--------|----------|--------|
| White  | opposite | Yellow |
| Orange | opposite | Red    |
| Blue   | opposite | Green  |

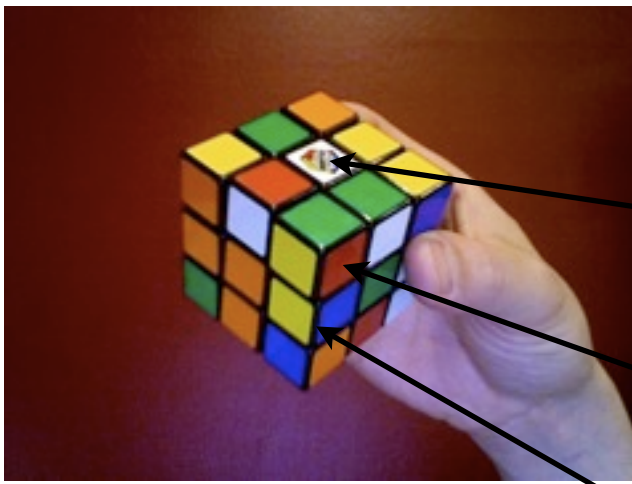
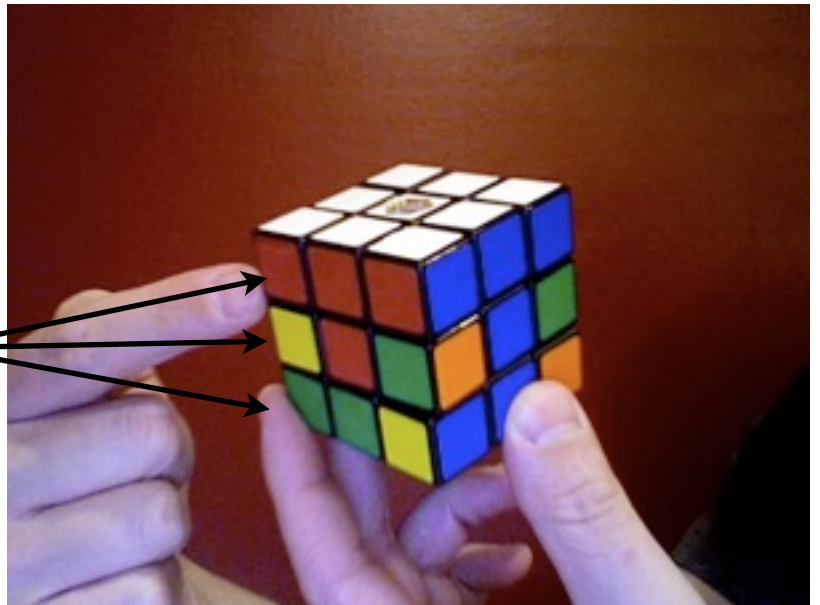
A face's color is designated by its **center** piece.

## Solving the Cube:

The Cube is solved by first correctly solving one face (I always start with the color white) and then solving the subsequent layers.

The Cube has three layers in all.

If you've already figured out how to solve one side of the cube, you're really more than half way there!





## THE FIRST LAYER

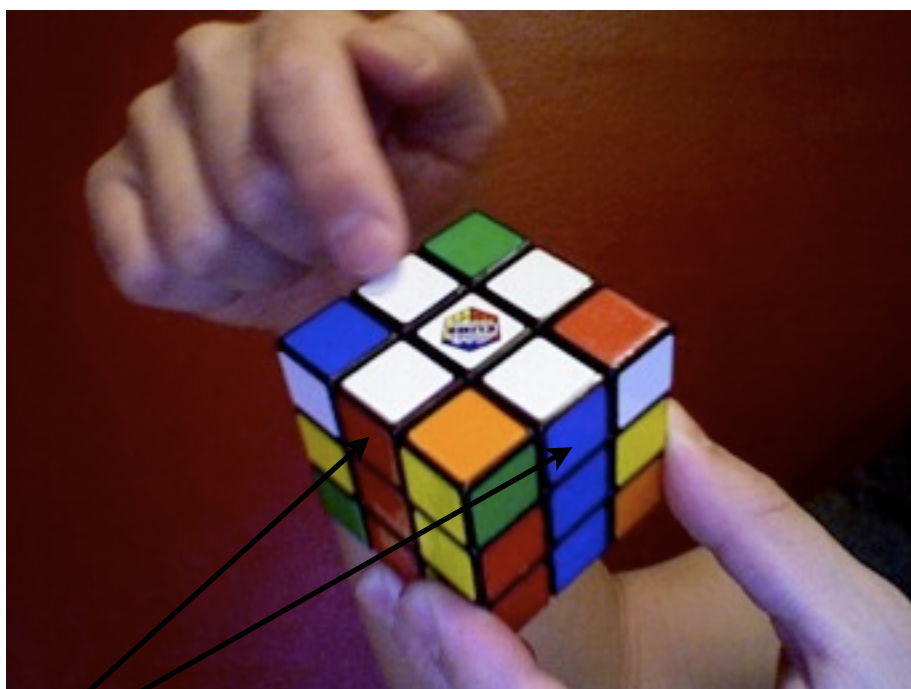
The first layer is solved by simply solving the white side correctly (as shown to our left).

Here's how you do it:

First start by getting the middle pieces (two-sided pieces) in their correct places:

When the middle pieces (two-sided pieces) are in the correct place their colored side will match the color of their respective center piece.

When all four middle pieces are in place correctly you will be able to make out an X on your white face, and all four colors will be lined up with their respective center pieces.



Note how the **red** and **blue** middle pieces match with up with their corresponding center piece.

If you're having a hard time creating the X required in this step, keep working with it. You'll get it. I promise.

## THE FIRST LAYER (continued):

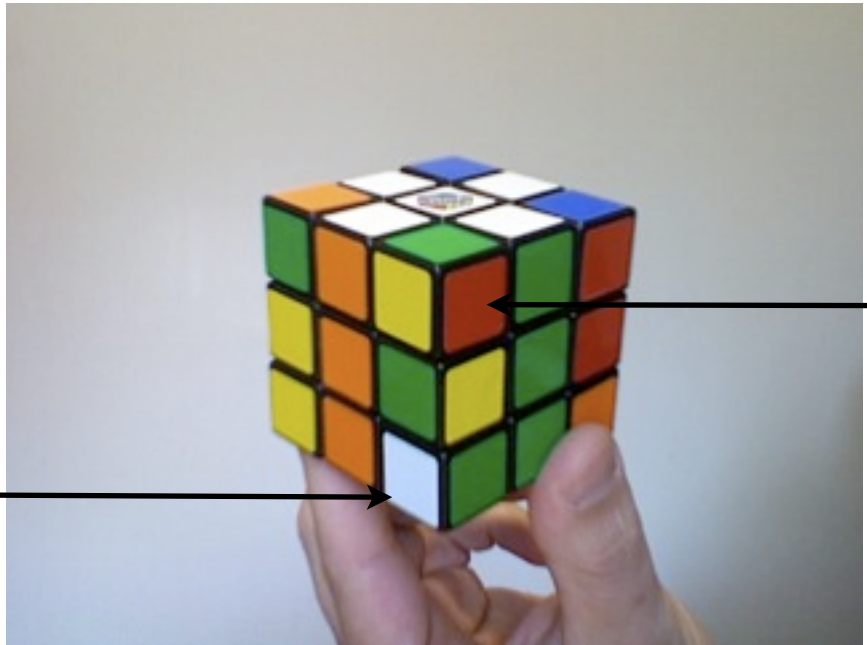
### Next:

Move the white corner pieces (three-sided pieces) into their correct places.

The white corner pieces must be moved from the third layer.

SO, first begin by locating white corner pieces already on the third layer, like this:

Next, look at the colored sides of the corner piece to determine which corner, or place, the piece belongs. Then line up the corner piece directly under its place.



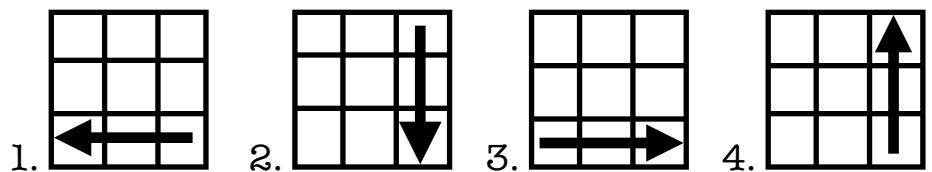
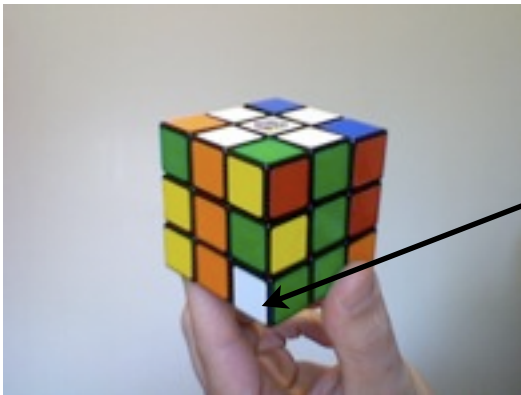
In the above picture, this white corner piece is **green** and **orange** on its other two sides, So it is lined up directly below its proper place, which is here:

## THE FIRST LAYER (continued):

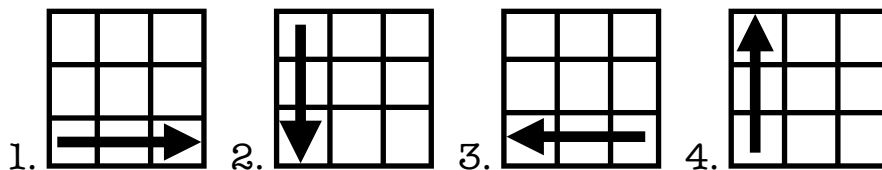
### Moving the Corner Piece from the Third Layer:

Now, to move the corner piece from the third layer to its place on the first layer you must complete this series of four movements (using the cube face with the white side facing you).

If the white piece is on the bottom right of the face (as pictured here) follow this series of movements:



If the white piece is on the bottom left of the face (like in the picture to our right) follow this series of movements:



## THE FIRST LAYER (continued):

### When the Corner Piece is Not on the Third Layer:



Sometimes you will find a white corner piece on the first layer (as pictured to the left), or on the bottom of the cube (as in the picture below).



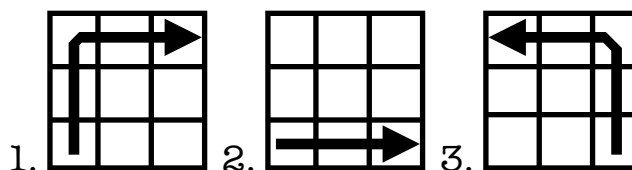
These pieces need to be moved to the third layer first, before getting them into their correct place.

### Moving the Corner Piece from the First Layer to the Third Layer:

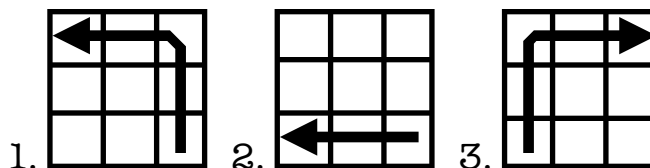


To move a white corner piece from the first layer to the third layer, do the following:

If the white side is in the upper right corner (As pictured to the left) use whichever face the white side is on and do this:



If the white side is in the upper left corner (not pictured) do this:



## THE FIRST LAYER (continued):

### Moving a corner piece from the bottom:



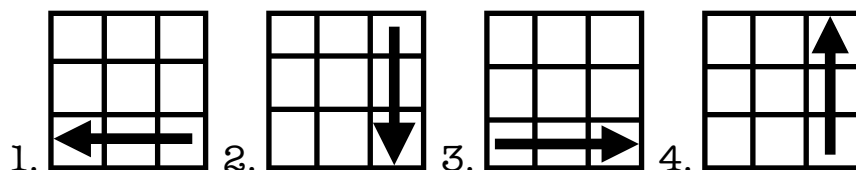
There are several ways to get the white corner piece from the bottom to the first layer, but here's an easy way that works every time:

First, locate a "free" corner space on the top. Orient that corner to be at the upper right, like so.



Then, rotate the bottom layer so that the white face is directly under the upper "free" corner (as shown here).

Once you've done that, simply follow this set of movements:



To recap, in order to get the white corner pieces to their proper place, they must be moved from the third layer.

If the corner piece happens to be on the first layer, you've been instructed on how to get it to the third layer.

If the white corner piece is on the bottom, you now know how to get it to the first layer. Therefore, you now can move the corner piece from the bottom... to the first layer... to the third layer... and finally to its proper place.



The completed first layer will look like this, with all of the colored pieces of the layer in line.

## THE SECOND LAYER

The second layer is solved by moving middle pieces (two-sided pieces) **from** the third layer **to** their proper place on the second layer.

Begin by locating a middle piece on the third layer, both sides of which are **NOT** yellow.



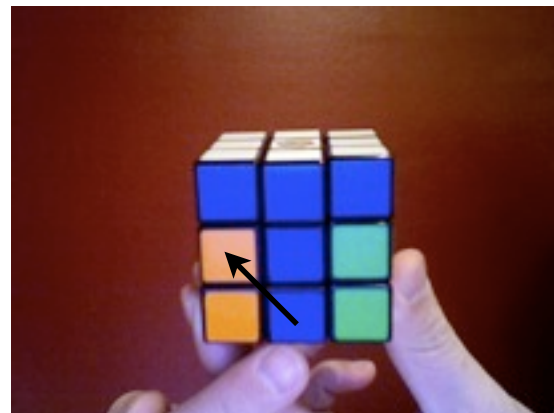
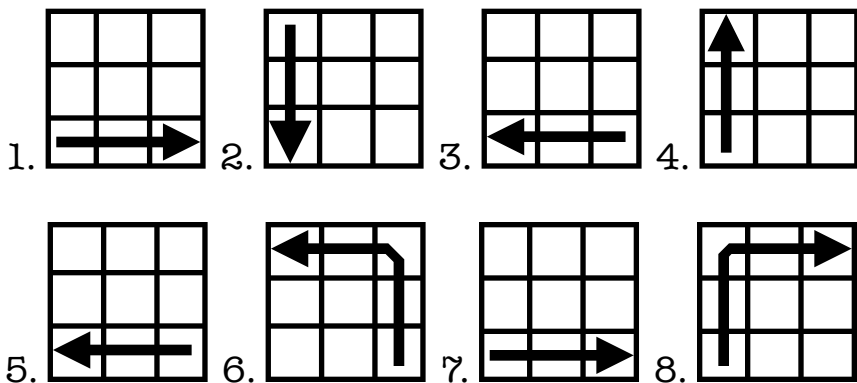
Next, line up the middle piece so that the color on the third layer corresponds to its face.

In the picture to the left, the **blue** side of the middle piece has been lined up with its center piece. When done properly, you will be able to make out a distinct T shape of all the same color.

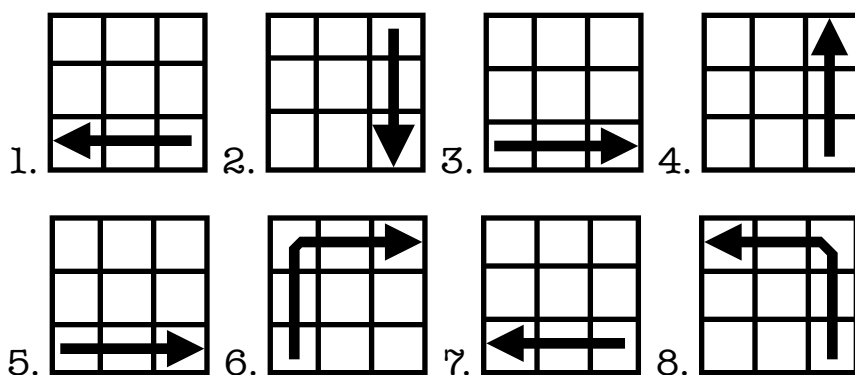
Now, the color on the bottom of this middle piece will determine which direction the piece needs to move. On a standard cube, if the bottom color in the picture above is **red**, then the piece will need to move to the upper left place. If the bottom color of this piece is **orange**, then it will need to move to the upper right place.

## THE SECOND LAYER (continued):

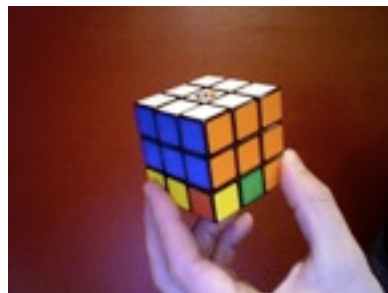
To move a middle piece from the bottom layer to its place to upper left, complete this series of eight movements:



To move a middle piece from the bottom layer to its place to upper left, complete this series of eight movements:



Sometimes you'll find a middle piece already on the second layer, but in the wrong place. If this is the case, simply conduct the series of movements using a random middle piece from the bottom row. This will move the misplaced piece on the second layer to the third layer, where you can then put it into its correct place.



Once you have all the second layer's middle pieces in their correct places, your cube will look like this one above.

# THE THIRD LAYER

To this point, we have been holding the cube with the white side **up**. To work on the third layer, we will be holding the cube with the white side **down**.

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The third layer begins by first getting the middle pieces in their correct **position** and then in their correct **place**,

followed by getting the corner pieces in their correct **position** and then their correct **place**.

## The Correct Position:

The Correct Position means that the piece is in the correct spot, but turned wrong. The two photos on this page depict pieces that are in their correct position, but not in their correct place. To the right, the corner piece is in its correct position. See how the colors **green**, **orange** and **yellow** correspond to the three sides. This piece is in its correct **position**, but must be rotated to be in its correct **place**. Also, above, the middle **blue** piece is where it needs to be but is turned incorrectly.



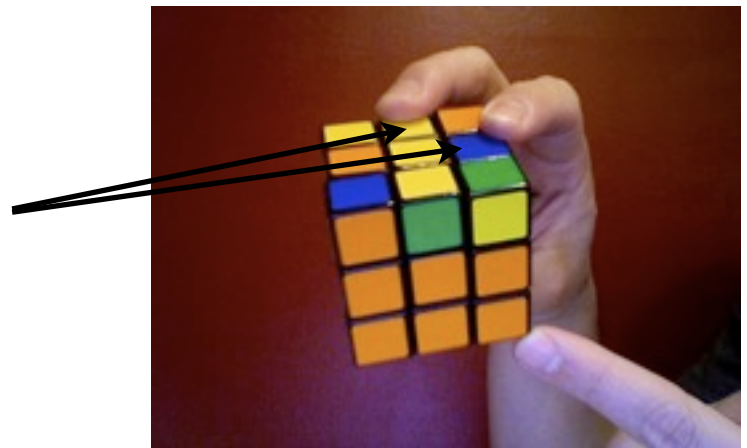
## THE THIRD LAYER (continued):

### The Middle Pieces:

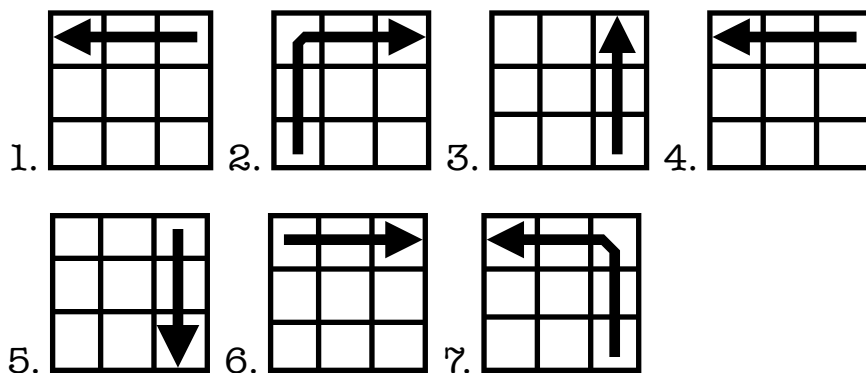
At this point, either all four middle pieces will already be in their proper positions, or only two will be. If all four aren't, rotate the third layer until you find the two **adjoining** middle pieces that are in their correct position. By **adjoining**, I mean as pictured in the photo to our immediate right.



Next, rotate the adjoining pieces so that they are to the back right, as depicted in this photo here:



And use this face to conduct the following series of moves to get the remaining pieces in their correct **positions**.



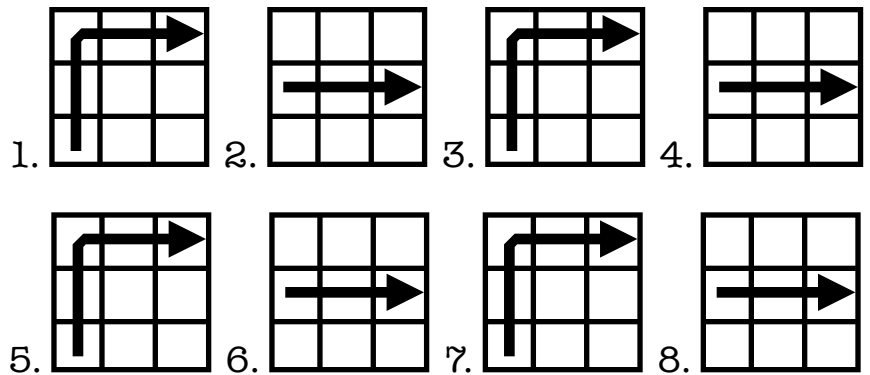
## THE THIRD LAYER (continued):



### Turning The Middle Pieces:

To turn the middle pieces from their correct position to their correct place:

First: Pick a face/color from which to execute these movements:



Next: Staying on that same face/color rotate the third layer to the next middle piece that needs turning and repeat the above movements.

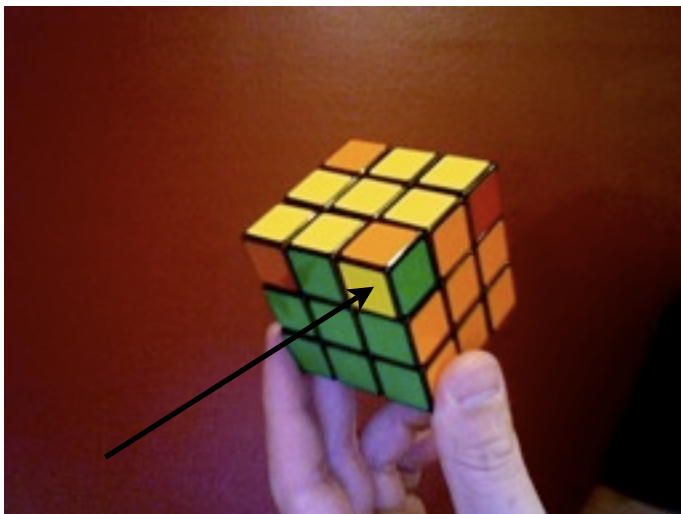
For example, in the picture above, both the **orange** middle piece and the **green** middle piece need to be rotated. If we were to begin this series of movements on the **orange** face, we would stay on **orange**, but would rotate the third layer to flip the **green** middle piece from the **orange** face.

Once all the middle pieces are in their correct position and place, your cube will look like this:

You are now ready to move on to the final stage; the third layer corner pieces.



## THE THIRD LAYER (continued):



This corner piece is in the correct position but not in the correct place.

### Third Layer Corner Pieces:

At this point, examine your cube. Hopefully you will find at least one corner piece in the correct position, and maybe even the correct place. If not, don't worry. The next series of moves you will repeat until all four corners are at least in their correct positions.

Note: When performing this next series of movements, you will think that you're messing up everything you've been creating to this point, **AND** if you do not follow these steps precisely correct, you will be right.

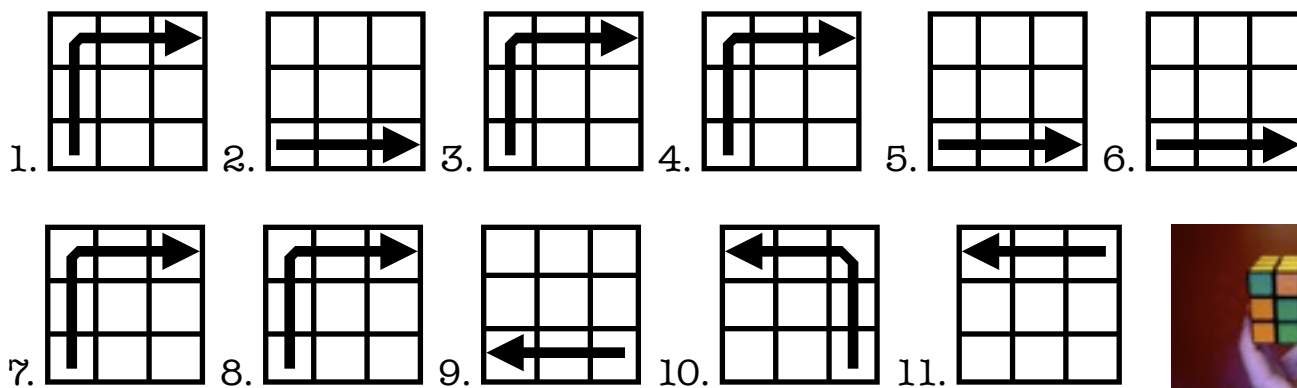
## THE THIRD LAYER (continued):

There are **22** movements to rotate or move the corner pieces. If you already have a corner piece in the proper position place it **here**:

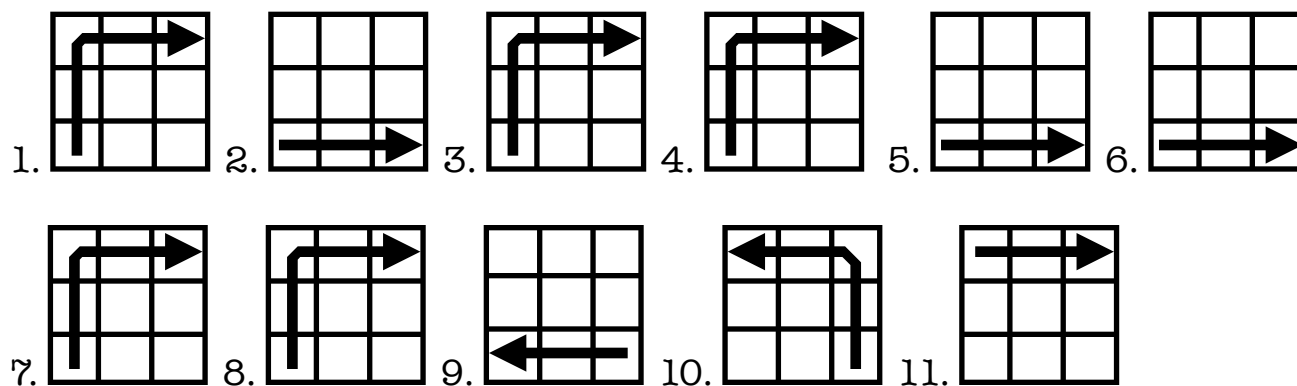
And use this face to complete all of the following 22 movements: (which are broken down into two sets of 11 movements.)



### The **22** Corner Swapping Movements:



Note: If you do the first 11 steps correctly you will see an inverted **L** pattern like the one here made of the **orange** squares.



Repeat this series of movements until all four corner pieces are in their correct positions.

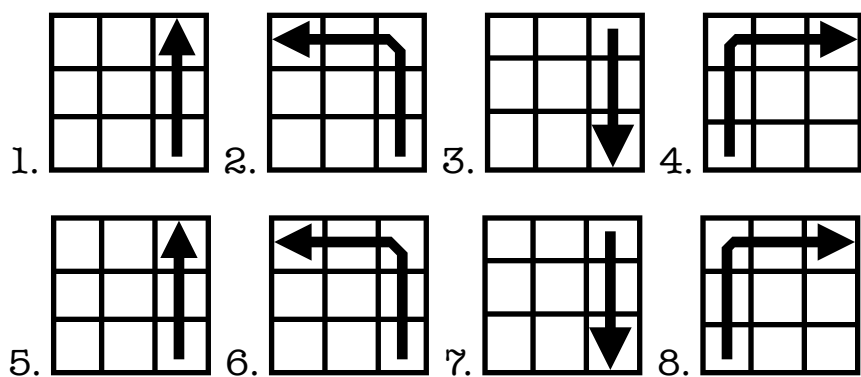
## THE THIRD LAYER (continued):



### Rotating the Corner Pieces into Place:

For the final series of movements you will again pick one color/face and stay on that same face to complete or turn all of the corners needed to be turned.

For example in the photo here, I'd pick the **blue** face to conduct this series of movements. The series would turn the upper right corner piece.



When conducting this series, focus **only** on the upper right corner piece. Repeat this series of eight movements until the upper right corner piece is rotated to its correct place. (All of the other pieces will seem to be messed up. Don't worry.)



Once that right corner piece is in its correct place, rotate the third layer to the next corner piece needed rotating, staying on the same face (the **blue** face in this example).

The cube will look messed up until the last corner piece is rotated. And when it is, you're done.

You're welcome.