

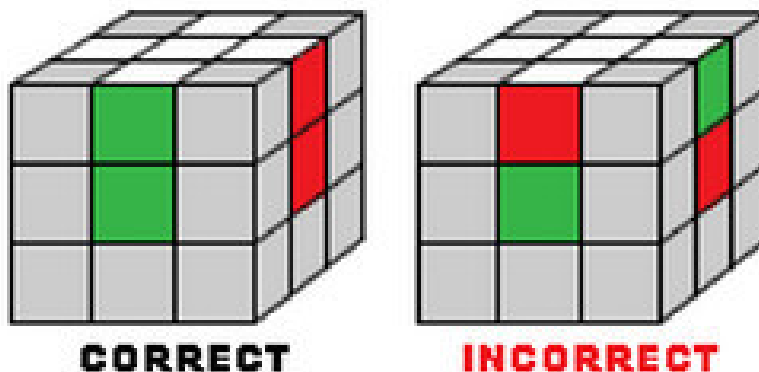
How to solve Rubik's 3x3 - Fastest 3x3 Rubik's formula

How to arrange a 6-sided Rubik's Cube, a 3x3 Rubik's Cube or a 4x4 Rubik's Cube will be easier if you know the rules of the Rubik's Cube. This article will tell you how to solve Rubik's cubes by layer, the most popular way to arrange Rubik's cubes. Please refer!

Putting a Rubik's Cube back into its original shape is quite a difficult task and may not be possible. However, once you understand a few algorithms, solving the Rubik's Cube becomes very easy. The method described in this article is a layered solution: first you will solve one side of the Rubik's Cube (the first layer), then the middle layer, and finally the bottom layer.

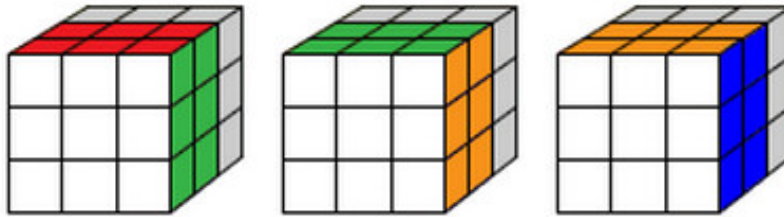
3x3 rubik's formula part 1: First floor

1. Familiarize yourself with the Legend section at the bottom of the page.
2. Choose a side to start with. In the example below, the color of the first floor will be white.
3. Cross formation. Find the side containing the white center and rotate it to the top. Arrange the four white edge pieces in the correct position. (You can do this yourself without an algorithm). All four edges need to be in place within at most eight steps (generally five or six steps).



Turn the cross face down to the bottom. Rotate the Rubik's cube 180° so that the cross is at the bottom.

4. Solve the four corner pieces of the first floor, one by one. You can also put the corner piece in the right position without the need for an algorithm. To get started, here's an example for lining up a corner in the right position:



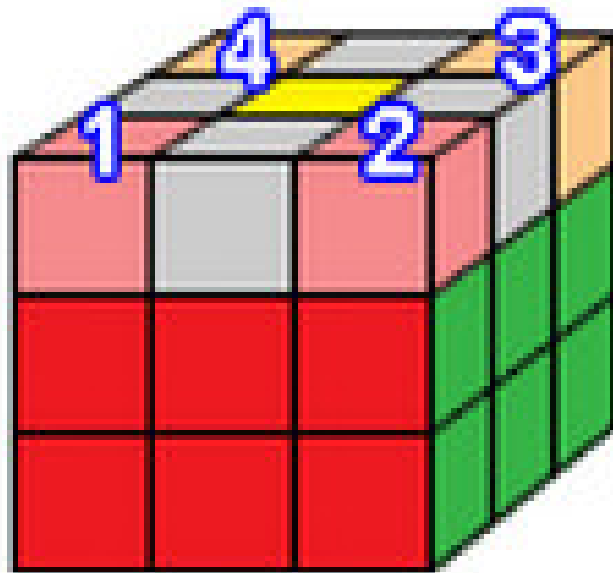
3x3 rubik's formula part 3: Last floor

1. Swap the positions of the corner pieces

At this step, our goal is to arrange the corner pieces of the last floor in the correct position, regardless of which direction they are facing.

Locate two adjacent corner tiles that have a different color than the color of the top layer (in our case, a color other than yellow).

Rotate the top layer until these two corners are on their correct colored side, facing you. For example, if two adjacent corner pieces are both red, you should rotate the top layer until they are on the red side of the Rubik's cube. Notice that on the other side, the two corners of the top floor will be the same color as that side (in our example, orange).



Determine whether the two front corner pieces are in the correct position, and swap them if necessary. In our example, the right side is green, and the left side is blue. Therefore, the right front corner will be green, and the left front corner will be blue. If not, you need to swap these two corners according to the following algorithm:

Đổi chỗ 1 và 2: $\uparrow\uparrow\uparrow \rightleftarrows \downarrow\downarrow\downarrow \curvearrowright \leftleftarrows \curvearrowleft \uparrow\uparrow\uparrow \leftleftarrows \downarrow\downarrow\downarrow \leftleftarrows \leftleftarrows \rightleftarrows \rightleftarrows$ (2.a)

Do the same with the two corners in the back. Rotate the Rubik's cube to bring the other side (orange) in front of you. Swap the two front corners if necessary.

As an alternative, if you find that both front and rear corner pairs need to be swapped, you can do this with a single algorithm (notice its similarity) with the previous algorithm):

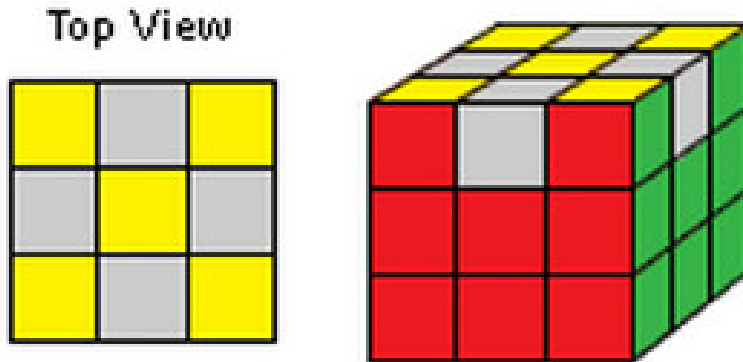
Đổi chỗ 1 với 2 và 3 với 4: $\uparrow\uparrow\uparrow \rightleftarrows \downarrow\downarrow\downarrow \curvearrowright \leftleftarrows \leftleftarrows \curvearrowleft \uparrow\uparrow\uparrow \leftleftarrows \downarrow\downarrow\downarrow$ (2.b)

2. Orient the corner tablet

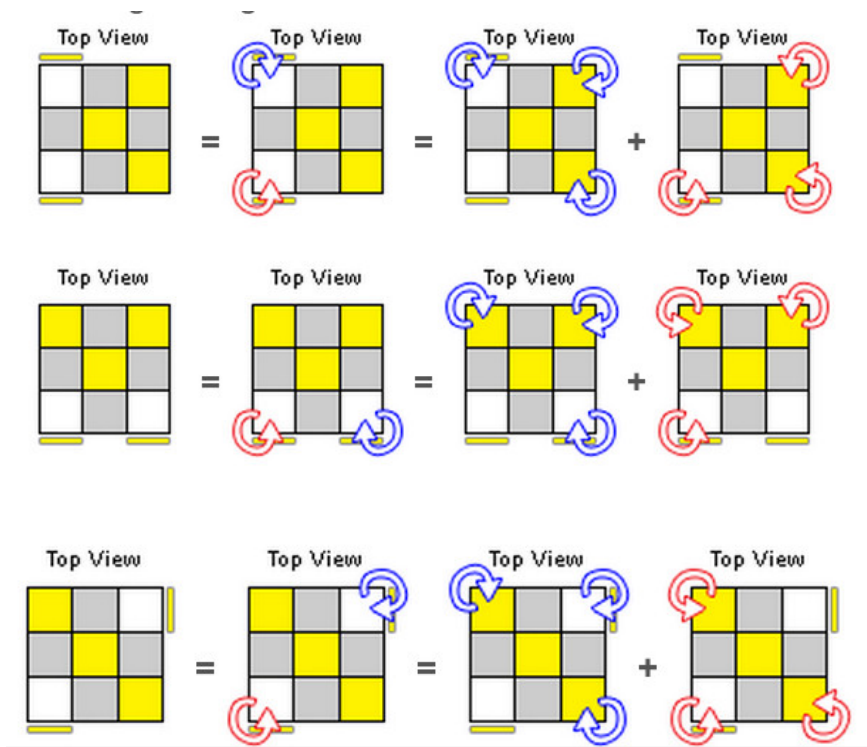
Determine the top color box of each corner (in our case, yellow). You only need to know a single algorithm to orient corner members:



The algorithm will cause the three corners to rotate around themselves at the same time (from the edge position to the top position). The blue arrow will show which three corners you are rotating, and in which direction (clockwise). If the yellow pill is in the correct position as shown in the picture and you have solved the algorithm once, you will get four yellow pills at the top:

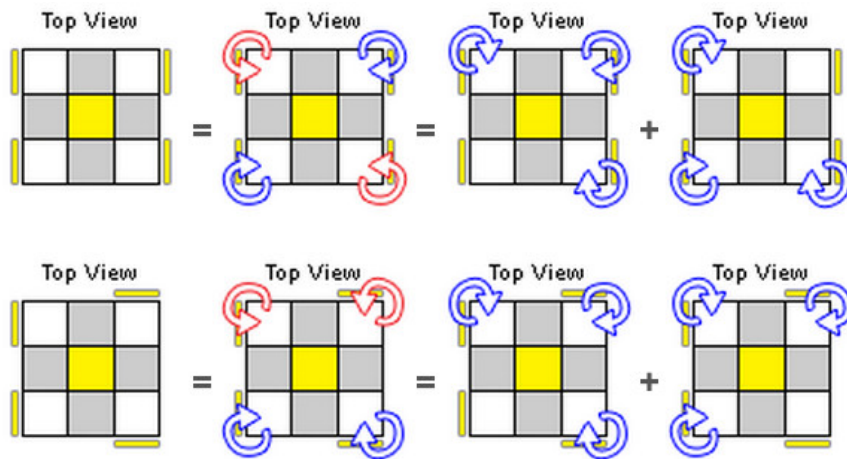


You can also use a symmetric algorithm (here the red arrow represents counterclockwise rotation):

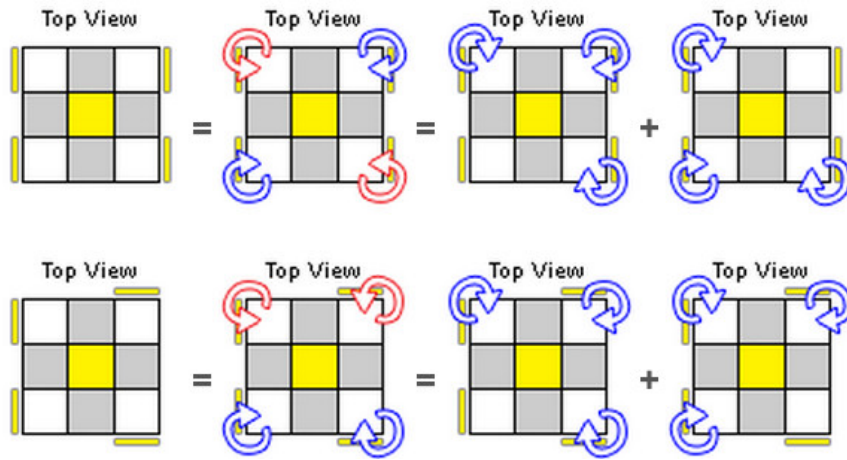


Note: solving one of these algorithms twice is equivalent to solving the other algorithm. In many cases, you need to solve the algorithm more than once:

The two corners are in the right direction:

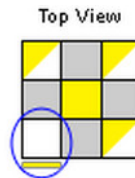


None of the corners are in the right direction:

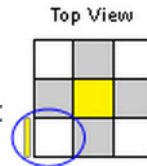


In general, apply (3.a) in the following cases:

Hai viên góc ở đúng hướng:



Không viên góc nào ở đúng hướng:

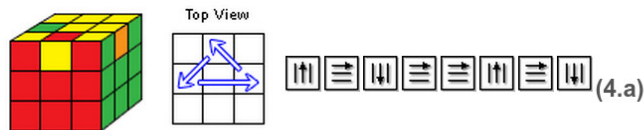


3. Swap the edges

You just need to know an algorithm for this step. You should check to see if one or more edges are in the correct position (at this point, their orientation is not important).

If all the edges are in the correct position, you have completed this step.

If only one edge is in the correct position, use the following algorithm:



• Hoặc là thuật toán đối xứng của nó:

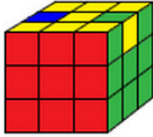


Note: solving one of these algorithms twice is equivalent to solving the other algorithm.

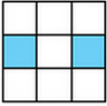
If all four edges are in the correct position, you can proceed to solve either algorithm at once from any side. You will have a single edge in the correct position.

4. Orient the edge pieces



You need to use two algorithms for this final step:

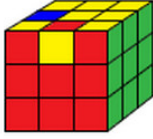


Top View

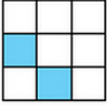


Dạng Dedmore hình chữ "H"





(5)



Top View



Dạng Dedmore hình "Con cá"



(6)

It should be noted that DOWN, LEFT, UP, RIGHT, is the order of most "H" and "Fish" Dedmore-like algorithms. You only need to remember a single algorithm:

$$(6) = \left[\begin{array}{c} \curvearrowright \\ \downarrow \end{array} \right] \left[\begin{array}{c} \uparrow \\ \uparrow \end{array} \right] + (5) + \left[\begin{array}{c} \downarrow \\ \downarrow \end{array} \right] \left[\begin{array}{c} \curvearrowright \end{array} \right]$$

If all four edges are turned upside down, you should solve the "H" shape from any side, and you will need to perform this algorithm again to solve the Rubik's Cube.

Congratulations! You have solved the Rubik's cube.

Part 4: Notes

1. This is the key to all annotations used in the article.

The pieces to assemble a Rubik's cube are called Cubes, and the colored patches on the Rubik's cube are called colored squares.

Rubik's cube has three types:

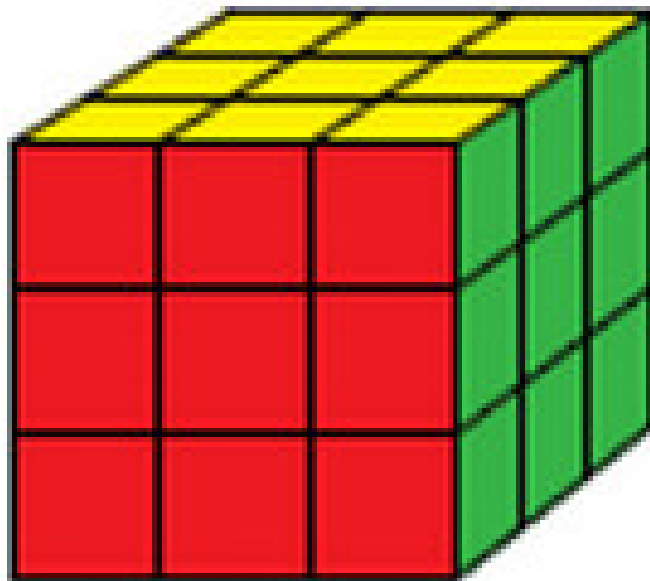
1. The middle cube (or center cube), is located in the middle of each face of the Rubik's cube. There are six pills in total, each pill will have a colored box.
2. The corner piece (or corner piece), is located at the corner of the Rubik's cube. There are eight tablets in total, each with three colored squares.
3. The edge piece (or side piece), lies between each pair of adjacent corner pieces. There are a total of 12 pills and each pill has two colored boxes.

Not all Rubik's cubes have the same color. The color used for illustration in the article is called BOY (because the Blue - Blue, Orange - Orange, and Yellow faces are all in clockwise order).

1. White is opposite yellow;
2. Blue is opposite green;
3. Orange is opposite red;

2. This article uses two different views of the Rubik's cube:

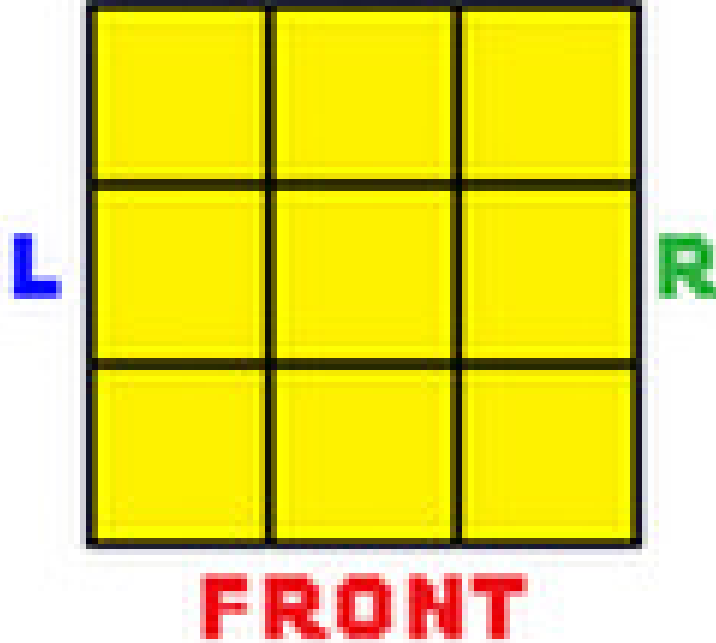
3D view, showing the three sides of a Rubik's cube: the front (red), the top (yellow), and the right side (green). In Step 4, algorithm (1.b) is illustrated with an image showing the left side of the Rubik's cube (blue), the front face (red), and the top face (yellow).



FRONT

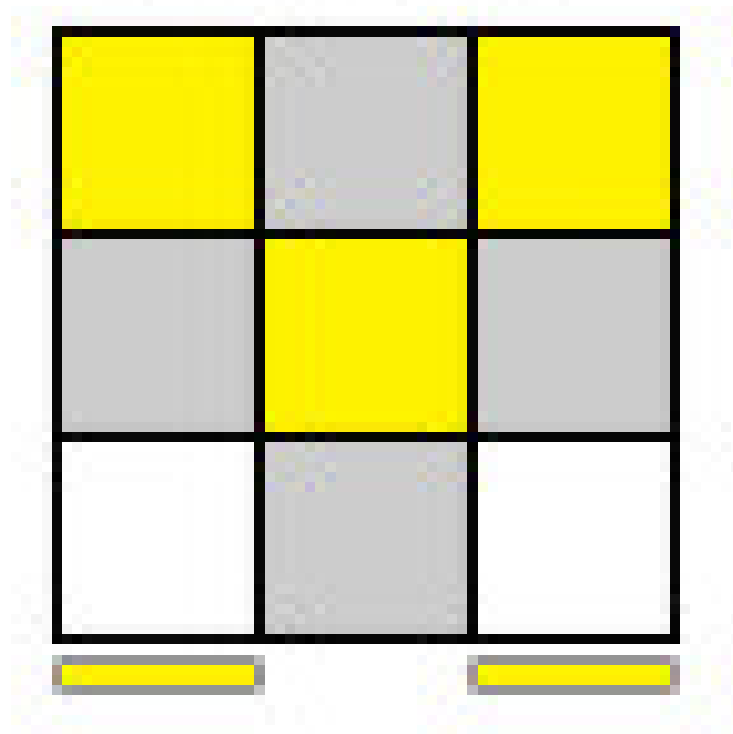
Top view, showing only the top surface of the Rubik's cube (yellow). The front is at the bottom (red).

Top View



3. For a top-down view, each small bar represents the position of an important color box. In the picture, the yellow box of the back top corner is on the top surface (yellow), while the yellow box of the front top corner is both on the front of the Rubik's cube.

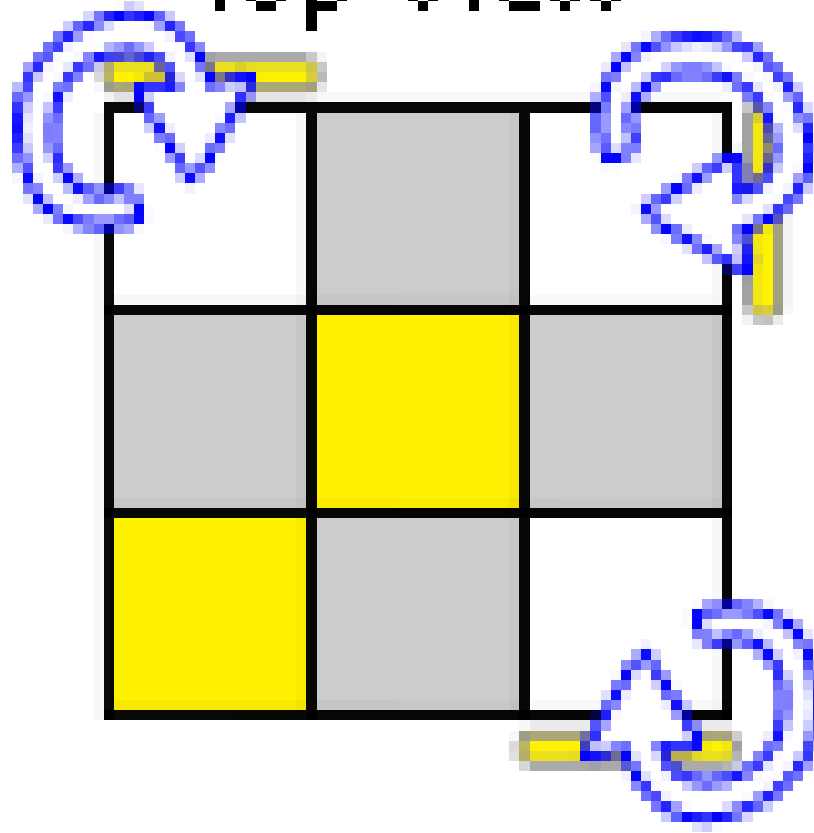
Top View



4. If the color box is gray, it means its color is not important at that time.

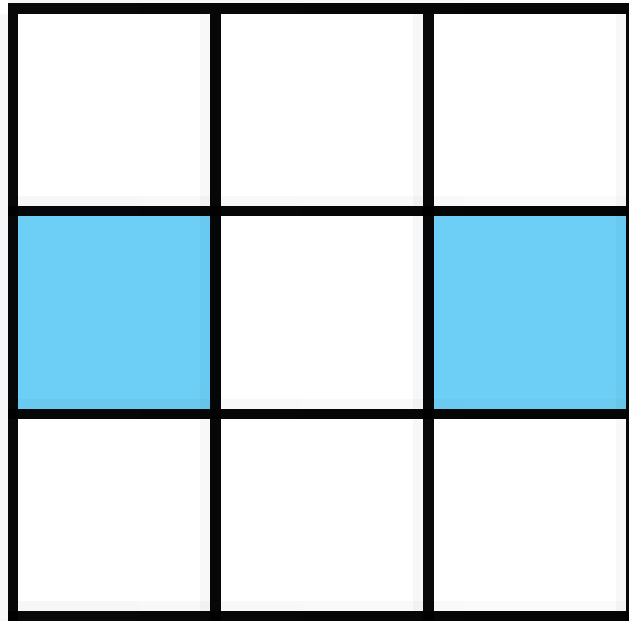
5. Arrows (blue or red) show the effect of the algorithm. For example, for algorithm (3.a), it will help the three corners rotate around themselves as shown in the figure. If the yellow cells are in the same position as in the drawing, when the algorithm finishes, they will be on top.

Top View



1. The axis of rotation is the large diagonal of the Rubik's cube (from one corner to the other corner of the Rubik's cube).
2. The blue arrow is used to represent the clockwise rotation direction (algorithm (3.a)).
3. The red arrow is used to represent the counterclockwise rotation direction (algorithm (3.b), symmetrical to (3.a)).
6. Viewed from above, the light blue box shows that an edge is oriented incorrectly. In the picture, the left and right edges are both oriented incorrectly. This means that if the top tile is yellow, the yellow tiles of these two edge tiles will not be on the top, but on the side.

Top View

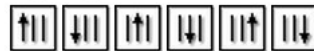


7. For step instructions, it is important that you always look at the Rubik's cube from the front.

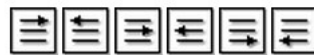
- Hướng xoay của mặt trước.



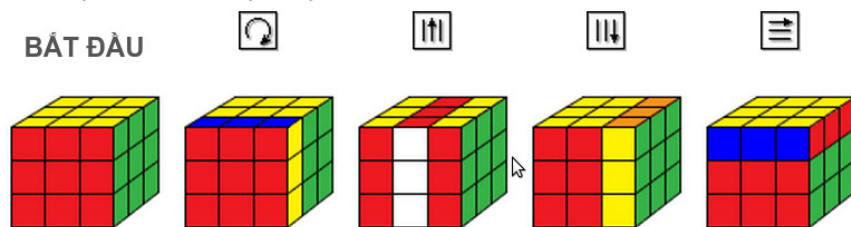
- Hướng xoay của một trong ba cột dọc:



- Hướng xoay của một trong ba cột ngang:



Some examples of steps:



Tips for solving Rubik's 3x3

Practice. You should spend some time with your Rubik's cube to learn how to rotate it in multiple directions. This is especially important when you are learning how to solve the first level.

Know the color of your Rubik's cube. You need to know which color is opposite which color, and the order of all the colors around them. For example, if white is on top and red is on the front, you need to know that blue is on the right, orange is on the back, green is on the left, and yellow is on the bottom.

For people who like to spin Rubik's cubes quickly, or those who don't like the difficult feeling of having to rotate Rubik's cubes, you can buy a Do-It-Yourself (DIY) Rubik's Set. Rubik's cubes have more rounded inner corners, and the DIY kit will allow you to adjust the tightness, making it easier for you to move the Rubik's cube. You should consider lubricating your Rubik's cube with a silicone-based lubricant.

You can start with the same colors as in the article to help you better understand the position of each color, or try to choose colors that make it easier for you to line up the cross.

Position the four edges and try to think ahead about how to move them into the right position without having to actually do this. With practice and experience, this method will teach you how to solve them in just a few steps. And in competition, participants have 15 seconds to examine their Rubik's cube before starting the timer.

Understand how the algorithm works. When solving the algorithm, you should try to follow the key pieces of the Rubik's cube to see where they move. Try to find the pattern in the algorithm. For example:

1. In the algorithms (2.a) and (2.b) used to permute the corners of the top layer, you proceed in four steps (after completion, all bottom and middle layers of the Rubik's cube will return to middle layer), then flip the top side down, and do the first four steps in reverse. Therefore, this algorithm does not affect the first/bottom and middle layers.
2. For algorithms (4.a) and (4.b), you should remember that you are rotating the top layer in the same direction as you need to rotate the three edges.
3. For algorithm (5), the "H" shaped Dedmore form, one way to remember this algorithm is to trace the path of the overturned edge piece on the top right face and the pair of corner pieces around it in half. the beginning of the algorithm solving process. Then, in the second half of the process, you should keep track of the overturned edge piece and the remaining pair of corner pieces. You'll notice that you've taken five steps (seven steps if you include the two-step half-rotation), next, half-rotate the top face, and reverse the first five steps, finally is to rotate the top half of the face again.

Further. Once you have mastered all the algorithms, you can look for a faster way to solve the Rubik's cube:

1. Solve the corner of the first layer along with the edge of the middle layer in one step.
2. Learn the algorithm to orient the corner of the last floor in five cases where two algorithms are needed (3.a/b).
3. Learn the algorithm to permute the corner members of the last floor in two cases when there are not any edges in the correct position.
4. Learn the algorithm for the case where all edges of the last layer are reversed.

The method of solving a Rubik's cube by layers is just one of countless methods available in the world. For example, the Petrus method, which helps solve a Rubik's cube in fewer steps, involves completing a $2 \times 2 \times 2$ Rubik's cube, then expanding to a $2 \times 2 \times 3$ Rubik's cube, adjusting the direction of the edge, form a $2 \times 3 \times 3$ block

(two levels have been solved), put the remaining corner pieces in the correct position, orient them, and finally arrange the remaining edge pieces in the correct position.

Further. For the last level, if you want to solve the Rubik's cube quickly, you need to divide the last four steps into two steps to proceed. For example, permute and orient corner members in one step, then permute and orient edges in one step. Or you can choose to orient every corner and edge in one step, and transpose every corner and edge in one step.

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