

# How to Solve a Rubik's Cube (Easy Move Notation)

originated by: [NatK](#), [Anonymous](#), [Krystle](#), [Mimi](#) (see all)

Article

Edit

Discuss

View History

Like 162

The Rubik's Cube can be very frustrating and may seem next to impossible to restore to its original configuration. However, once you know a few algorithms, it is very easy to solve.

The method described in this article is the layer method: we first solve one face of the cube (first layer), then the middle layer, and finally the last layer.



## Video

Write An Article

Random Article

### Related wikiHow's

- [Solve a Rubik's Cube with the Layer Method](#)
- [Solve a 2X2X2 Rubik's Cube](#)
- [Solve a Rubik's Cube Using Commutators](#)
- [Make the "H" Pattern on a Rubik's Cube](#)

### Related Topics

[Hide all ads](#) - [Why?](#)

- [Introduction to Algorithms](#)
- [Word Search Puzzles](#)
- [Brain Teasers and Riddles](#)
- [Rubik's Cube](#)
- [Game of Sudoku](#)

### Featured Articles



[Relax](#)



[Decorate a Desk Lamp With Jelly Bracelets](#)



[Plan a Beer Drinking Trip](#)



[Juggle a Girlfriend and Video Gaming](#)

### Recent Changes

96

[Flickety](#) made an edit to [Prevent Your Voice Breaking when You're Almost Crying](#)  
*4 minutes ago*

[Girly15](#) left a message for [Daisy396](#)  
*4 minutes ago*

[Girly15](#) left a message for [Granger11](#)  
*3 minutes ago*

## Steps

### 1 Familiarize yourself with the **Notations**.

Ads by Google

**Cavity Protection** Clinically Proven Active Ingredient Fights Cavities & More. Try Now. [CrestProHealth.com/CavityProtection](http://CrestProHealth.com/CavityProtection)

### 2 Choose one face to start with. In the examples that will follow, the color for the first layer is white

Want to join in?

### Meet a Community Member



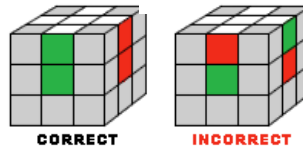
Meet [Lois Wade](#), who's been a member of the community since 2007. In addition to her flair for



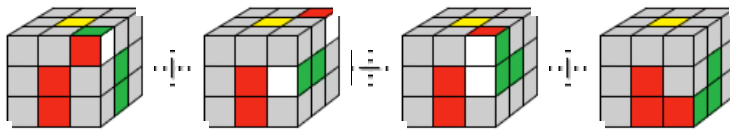
crafts projects, Lois enthusiastically patrols recent changes and encourages contributors.

### 3 First Layer

1. **Solve the cross** : place in their correct position the four edge pieces that contain white. You should be able to do this by yourself without needing algorithms. All four edge pieces can be placed in a maximum of 8 moves (5 or 6 in general).



2. **Place the cross at the bottom.**
3. **Solve the four corners of the first layer, one by one.** At the end of this step, the first layer should be complete, with a solid color (in this case, white) at the bottom. You should also be able to place the corners without needing algorithms. To get you started, here is an example of one corner being solved:



4. Your cube should now have the first layer complete and look like this (from the bottom side) :



### 4 Middle Layer

1. **Place the four edges of the middle layer, one by one.** Those edge pieces are the ones that do not contain yellow in our example. You need to know only **one algorithm** to solve the middle layer. The second algorithm is symmetrical to the first.
  - **If the edge piece is located in the last layer :**



- **If the edge piece is in the middle layer** but in the wrong place or with the wrong orientation, simply **use the same algorithm** to place any other edge piece in its position. Your edge piece will then be in the last layer, and you just have to use the algorithm again to position it properly in the middle layer.
2. Your cube should now have the first two layers complete and look like this (from the bottom side) :

### Join The Community

#### Things to Do

- collapse

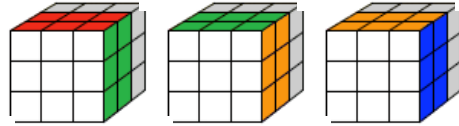
- Write an Article
- Request a New Article
- Answer a Request
- Login for more!

#### Places to Visit

+ expand

#### Follow Us On...



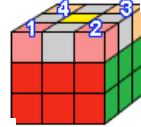


## 5 Last layer

1. **Permute the corners.** At this step, our goal is to place the corners of the last layer in their correct position, regardless of their orientation.

1. **Locate two adjacent corners that share a color** other than the color of the top layer (other than yellow in our case).

2. **Turn the top layer until these two corners are on the correct color side, facing you.** For instance, if the two adjacent corners both contain red, turn the top layer until those two corners are on the red side of the cube. Note that on the other side, the two corners of the top layer will both contain the color of that side as well (orange in our example).



3. **Determine whether the two corners of the front side are in their correct position, and swap them if needed.** In our example, the right side is green, and the left side is blue. Therefore the front corner on the right must contain green, and the front corner on the left must contain blue. If it is not the case, you will need to swap those two corners with the following algorithm:

$$\text{Swap 1 and 2 : } \left[ \begin{matrix} \text{R} & \text{U} & \text{R}' & \text{U}' & \text{R} & \text{U} & \text{R}' & \text{U}' & \text{R} & \text{U} & \text{R}' & \text{U}' & \text{R} & \text{U} & \text{R}' & \text{U}' \end{matrix} \right] \text{ (2.a)}$$

4. **Do the same with the two corners at the back.** Turn the cube around to place the other side (orange) in front of you. Swap the two front corners if needed.

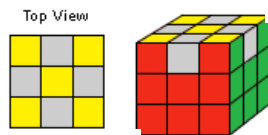
5. **As an alternative,** if you notice that both the front pair and the back pair of corners need to be swapped, you can do it with only one algorithm (note the huge similarity with the previous algorithm):

$$\text{Swap 1 with 2 and 3 with 4 : } \left[ \begin{matrix} \text{R} & \text{U} & \text{R}' & \text{U}' & \text{R} & \text{U} & \text{R}' & \text{U}' & \text{R} & \text{U} & \text{R}' & \text{U}' & \text{R} & \text{U} & \text{R}' & \text{U}' & \text{R} & \text{U} & \text{R}' & \text{U}' \end{matrix} \right] \text{ (2.b)}$$

2. **Orient the corners.** Locate each top color facelet of the corners (yellow in our case). You need to know only one algorithm to orient the corners :



The algorithm will rotate 3 corners on themselves at once (from the side to the top). The blue arrows show which 3 corners you are turning, and in which direction (clockwise). If the yellow stickers are the way shown on the pictures and you perform the algorithm once, you should end up with the four yellow stickers on top :



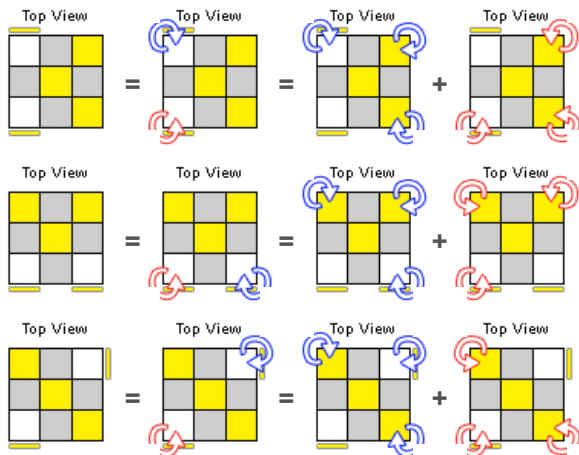
It is also convenient to use the symmetrical algorithm (here the red arrows are counter-clockwise turns):



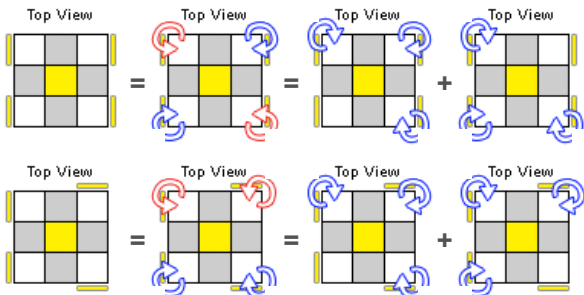
Note : performing twice one of these algorithms is equivalent to performing the other.

In some cases, you will need to perform the algorithm more than once :

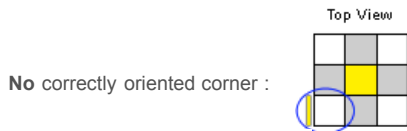
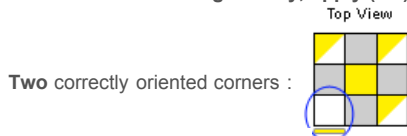
- **2 correctly oriented corners :**



- **no correctly oriented corner :**

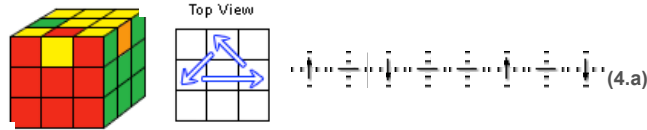


Or more generally, apply (3.a) in those cases :



3. **Permute the edges.** You will need to know only one algorithm for this step. Check whether one or several edges are already in the correct position (the orientation does not matter at this point).

- If all the edges are in their correct positions, you are done for this step.
- If one edge only is correctly positioned, use the following algorithm :



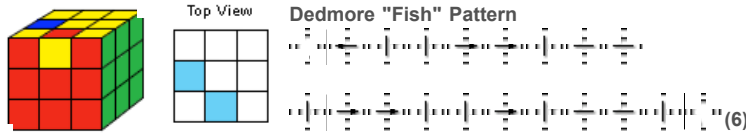
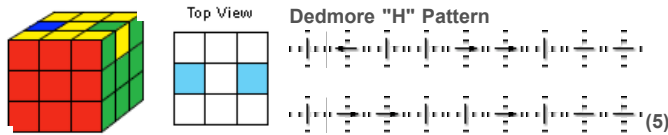
or its symmetrical :



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

- If all four edges are incorrectly positioned, perform one of the two algorithms once from any side. You will then have only one edge correctly positioned.

4. Orient the edges. You will need to know two algorithms for that last step :



Note the DOWN, LEFT, UP, RIGHT, sequence to most of the Dedmore "H" and "Fish" algorithms.

Note you really have only one algorithm to remember since :

$$(6) = (R U R' U') (R U R' U') (R U R' U') (R U R' U') (R U R' U') (R U R' U') (5)$$

If all four edges are flipped, perform the "H" pattern algorithm from any side, and you will have to perform that algorithm one more time to solve the cube.

6 Congratulations! Your cube should now be solved.

Ads by Google

**Proactiv® Official Site** Now Faster & Gentler Than Ever. Only \$19.95 and 2 Free Bonuses!  
Proactiv.com/NewProactiv

**RealAge® Official Site** You still haven't taken the free test to learn your biological age?  
RealAge.com

**Online Debt Settlement** Review Your Debt Settlement Options Online. Calculate Your Savings!  
FreedomPlus.com

## Tips

- **Know the colors of your cube.** You must know which color is opposite which, and the order of the colors around each face. For instance, if white is on top and red in front, then you must know that blue is on the right, orange in the back, green on the left and yellow at the bottom.

Ads by Google

**Mother's Day Gifts** Unique Gifts For Mom & Grandmother Personalized Free For Mother's Day!  
www.PersonalizationMall.com

- **For the color to start with,** you can either always start with the same color to help you with knowing where each color goes, or try to be efficient by choosing a color for which it is easier to solve the cross.
- **Practice!** Spend some time with your cube to learn how to move pieces around. This is especially important when you are learning to solve the first layer.
- **To solve the cross efficiently,** first locate all four edges and try to think ahead about how to move them into position without actually doing it. With practice and experience, this will teach you ways to solve it in fewer moves. And in a competition, participants are given 15 seconds to inspect their cube before the timer starts.
- **Try to figure out how the algorithms work.** While executing the algorithm, try to follow key pieces around to see where they go. Try to find pattern in the algorithms. For instance :
  - In the algorithms (2.a) and (2.b) used to permute corners of the last/top layer, you execute 4 moves (at the end of which all first/bottom layer and middle layer cubies are back in the first/bottom and middle layers), then turn the upper layer, and then execute the reverse of the first four moves. therefore this algorithm does not affect the first/bottom and middle layers.
  - For the algorithms (4.a) and (4.b), note you are turning the top layer in the same direction that you need to turn the three edges.
  - For the algorithm (5), Dedmore "H" Pattern, a way to remember the algorithm is to follow the path of the flipped edge on the top right and the pair of corners around it for the first half of the algorithm. And then for the other half of the algorithm, follow the other flipped edge and pair of corners. You'll notice that you perform 5 moves (7 moves if counting half turns as 2 moves), then half turn the top layer, then reverse those first five moves, and finally half turn the top layer again.
- **Progress further.** Once you know all the algorithms, you may want to find faster ways to solve the Rubik's:
  - Solve the first layer corner along with its middle layer edge in one move.<sup>[1]</sup>
  - Learn algorithms to orient the last layer corners in the five cases where two (3.a/b) algorithms are necessary.
  - Learn algorithms to permute the last layer edges in the two cases where no edge is correctly positioned.
  - Learn the algorithm for the case where all last layer edges are flipped.
- **Progress even further.** For the last layer, if you want to solve the cube fast, you will need to do the last four steps two by two. For instance, permute and orient the corners in one step, then permute and orient the edges in one step. Or you can choose to orient all corners and edges in one step, then permute all corners and edges in one step.<sup>[2]</sup>
- The layer method is just one of many methods out there. For instance, the Petrus method, which solves the cube in fewer moves, consists in building a 2×2×2 block, then expanding it to a 2×2×3, correcting edge orientation, building a 2×3×3 (two layers solved), positioning the remaining corners, orienting those corners, and finally positioning the remaining edges.<sup>[3]</sup>
- **For those interested in speed cubing,** or those who simply don't like how hard it is to turn pieces, it is a good idea to buy a DIY kit. The pieces of [speedcubes](#) have rounder inner corners and DIY kits allow you to adjust the tension, making it a lot easier to move pieces. Consider also lubricating your cube with a silicon based lubricant.

## Notations

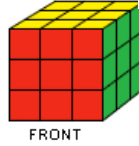
- **The pieces that compose the Rubik's Cube are called *Cubies*, and the color stickers on the Cubies are called *Facelets*.** There are three types of Cubies :
  - the **centers** (or center pieces), at the center of each face of the Cube. There are 6 of them, each have 1 Facelet.
  - the **corners** (or corner pieces), at the corners of the Cube. There are 8 of them, and each have 3 Facelets.
  - the **edges** (or edge pieces), between each pair of adjacent corners. There are 12 of them and

each have 2 Facelets.

- **Not all cubes have the same color schemes.** The cube used for the illustrations is such that :
  - White opposes yellow;
  - Blue opposes green;
  - Orange opposes red;
  - Color scheme is BOY (because the Blue, Orange and Yellow faces are in clockwise order).

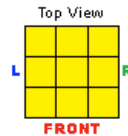
● **This article uses two different views for the Cube :**

- **The 3D View**, showing three sides of the Cube : The front (red), the top (yellow) and the right side (green). In step 4, the algorithm (1.b) is illustrated with a picture showing the left side of the cube (blue), the front (red) and top (yellow).



3D View

- **The Top View**, showing only the top of the cube (yellow). The front side is at the bottom (red).



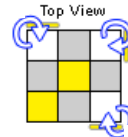
Top View

- **For the top view, each bar indicates on which side the important facelet is located.** On the picture, the yellow facelets of the top back corners are on the top (yellow) side, while the yellow facelets of the top front corners are both located on the front side of the cube.



Showing Yellow Facelets

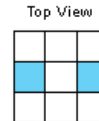
- **When a facelet is grey**, it means that its color is not important for the situation considered.
- **The arrows (blue or red)**, show what the algorithm will do. In the case of the algorithm (3.a) for instance, it will rotate the three corners on themselves as shown. If the yellow facelets are as drawn on the picture, at the end of the algorithm they will be on top.



algorithm (3.a)

- **The axis of the rotation** is the big diagonal of the cube (from one corner to the corner all the way on the other side of the cube).
- **Blue arrows** are used for clockwise turns (algorithm (3.a)).
- **Red arrows** are used for counter-clockwise turns (algorithm (3.b), symmetrical to (3.a)).

- **For the top view, the light blue facelets indicate that an edge is incorrectly oriented.** On the picture, the edges on the left and right are both incorrectly oriented. Which means that if the top face is yellow, the yellow facelets for those two edges are not on the top, but on the side.



Showing Incorrectly Oriented Edges

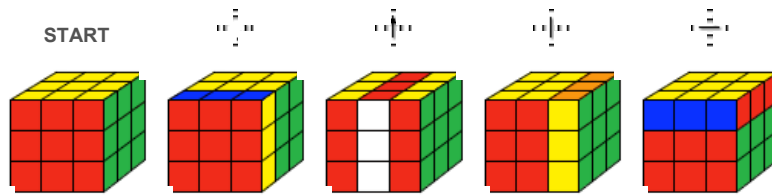
- **For the move notations**, it is important to always look at the cube from the *front* side.

- $\begin{matrix} & \uparrow & \\ \cdot & \cdot & \cdot \\ \cdot & \cdot & \cdot \\ \cdot & \cdot & \cdot \end{matrix}$ : Rotation of the front side.

- $\begin{matrix} \cdot & \cdot & \cdot & \cdot & \cdot & \cdot \\ \cdot & \cdot & \cdot & \cdot & \cdot & \cdot \\ \cdot & \cdot & \cdot & \cdot & \cdot & \cdot \\ \cdot & \cdot & \cdot & \cdot & \cdot & \cdot \end{matrix}$ : Rotation of one of the three vertical rows.

- $\begin{matrix} \cdot & \cdot & \cdot & \cdot & \cdot & \cdot \\ \cdot & \cdot & \cdot & \cdot & \cdot & \cdot \\ \cdot & \cdot & \cdot & \cdot & \cdot & \cdot \\ \cdot & \cdot & \cdot & \cdot & \cdot & \cdot \end{matrix}$ : Rotation of one of the three horizontal rows.

A few examples of moves :



## Video

## Related wikiHows

- [How to Solve a Rubik's Cube with the Layer Method](#)
- [How to How to Solve a 2X2X2 Rubik's Cube](#)
- [How to Solve a Rubik's Cube Using Commutators](#)
- [How to Make the "H" Pattern on a Rubik's Cube](#)
- [How to Make Awesome Rubik's Cube Patterns](#)
- [How to Make a Speedcube](#)

## Sources and Citations

- [Speedcubing.com](#) - algorithms, videos, cube solvers, world records and ranking.
- [Beginner Solution to the Rubik's Cube](#)
- [Solving the cross](#) tips and examples.
- [Solution for solving the Rubik's Cube](#) step by step illustrated method.
- [Petrus Method](#) illustrated with java animations.

1. ↑ <http://www.speedcubing.com/f2l.html> (Algorithms > First two layers)
2. ↑ <http://www.speedcubing.com/finallayer.html> (Algorithms > Final layer)
3. ↑ <http://lar5.com/cube/>



## Articles for You to Write

Here is a list of suggested articles that have not yet been written. You can help by researching and writing one of these articles. To get started writing one of these articles, click on the red link of a title below.

- [How to Complete a Rubik's Cube](#)
- [How to Work Rubik's Cube](#)
- [How to Write Algorithms](#)

## Article Info

Last edited:  
July 25, 2010 by [Lucky10222](#)

### Featured Article

Categories:  
[Featured Articles](#) | [Rubik's Cube](#)

Recent edits by: [Rubikcube12311](#), [Ibkhayyat](#), [Kiki 155](#) ([see all](#))

## Article Tools

Share this Article:

162

- [Discuss](#)  
 [Print](#)  
 [Email](#)  
 [Watch](#)  
 [Edit](#)  
 [Send fan mail to authors](#)

+ [Embed this: Republish this entire article on your blog or website.](#)

Thanks to all authors for creating a page that has been read 1,313,229 times.

Was this article accurate?

- [Yes](#)  
 [No](#)



the how to manual that you can edit

- [Home](#)
- [About wikiHow](#)
- [Help](#)
- [Terms of Use](#)
- [RSS](#)
- [Site map](#)

Search

### Explore Categories

- |   |   |   |  |
|---|---|---|--|
| <a href="#">Arts and Entertainment</a>  | <a href="#">Cars and Other Vehicles</a> | <a href="#">Computers and Electronics</a> | <a href="#">Education and Communications</a> |
| <a href="#">Family Life</a>             | <a href="#">Finance and Business</a>    | <a href="#">Food and Entertaining</a>     | <a href="#">Health</a>                       |
| <a href="#">Hobbies and Crafts</a>      | <a href="#">Holidays and Traditions</a> | <a href="#">Home and Garden</a>           | <a href="#">Other</a>                        |
| <a href="#">Personal Care and Style</a> | <a href="#">Pets and Animals</a>        | <a href="#">Philosophy and Religion</a>   | <a href="#">Relationships</a>                |
| <a href="#">Sports and Fitness</a>      | <a href="#">Travel</a>                  | <a href="#">wikiHow</a>                   | <a href="#">Work World</a>                   |
| <a href="#">Youth</a>                   |   |   |  |



wikiHow is a carbon neutral website



All text shared under a Creative Commons License.



Powered by Mediawiki.