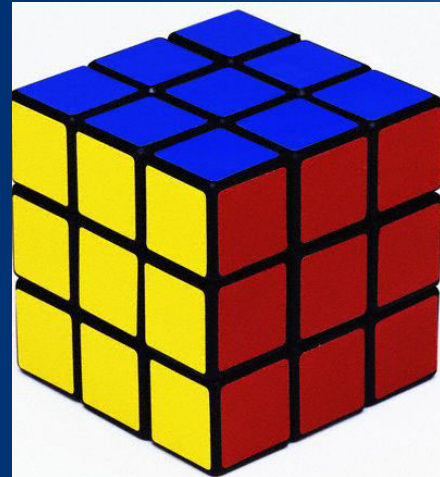


# How to Solve a Rubik's Cube Using Algorithms



# Algorithms

Algorithm: sequence of moves used to solve specific portion of Rubik's cube

What to know before you start:

F: side the Faces you

U: top of cube, Up side

L: Left side

R: Right side

B: Botton

Edge: block with two colors

Corners: block with three colors

F: turn front side 90° clockwise(right)

F': turn front side 90° counter clockwise(left)

U: turn top side 90° clockwise(left)

U': ^counterclockwise(Right)

D: turn bottom row 90° right(counter)

D': turn 90° left(clockwise)

2: turn 180°(turn twice)

L: turn left column up 90°

L': turn left column down 90°

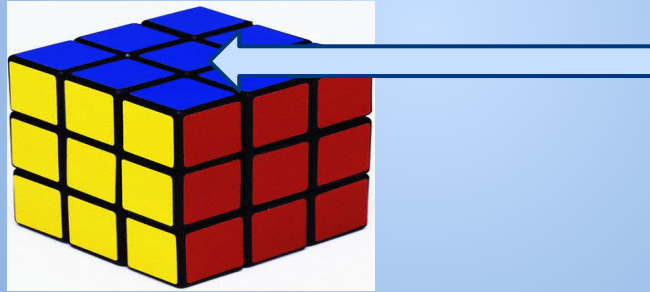
R: turn right column up 90°

R': turn right column down 90°

# How to solve a rubik's cube

Step 1: pick a center color to start with

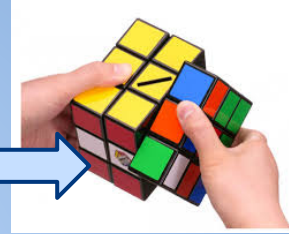
Step 2: have that center color on top



Step 3: find an edge piece that has the color you chose to start with

Step 4: once you found an edge piece, put it on the bottom

(Say you started with white, the white piece would be on the bottom)



Step 5: twist the bottom row so that the same block of the piece you started with is lined up with its corresponding center color

Step 6: rotate outside row up or down until the color you started with is with its colors center piece

Step 7: repeat step 6 until all the 4 edges of that color are in the same grid as its center color

( you may have to use an algorithm to solve the 4 edges)

# First Layer

\*starting with white\*

Flip Edge:  $F' U L' U R' D'$   
 $R' 2D' 2L'$

Corners:

White on Left:  $D'_{(L)} R' D_{(R)} R$

White on Right:  $R' D'_{(L)} R$

White on Bottom:  $R' 2D_{(2R)} R D_{(R)}$

On top but not coordinated correctly:  $R' D'_{(L)} R D_{(R)}$

# Middle Layer

- 1.) Put the solved side(white) on the bottom. The color that is now on top(yellow) is the new color you will solve.
- 2.) Find an edge that doesn't have yellow on it.
- 3.) Line the color that is now facing you with it's center color. If lined properly, the middle vertical middle column should all be one color.

Edge Belongs on the Left:  $U'_{(R)} L' \uparrow U_{(L)} L \downarrow U_{(L)} F_{(R)} U'_{(R)} F'_{(L)}$

Edge Belongs on the Right:  $U_{(L)} R \uparrow U'_{(R)} R \downarrow U'_{(R)} F'_{(L)} U_{(L)} F_{(R)}$

# Last Layer

Getting the Cross:

From Dot: (Hold dot in any position):  $F_{(R)} R \updownarrow U_{(L)} R' \updownarrow U'_{(R)} F'_{(L)}$

From L (Hold L in top left):  $F_{(R)} R \updownarrow U_{(L)} R' \updownarrow U'_{(R)} F'_{(R)}$

From Bar (Hold bar horizontally):  $F_{(R)} R \updownarrow U_{(L)} R' \updownarrow U'_{(R)} F'_{(L)}$



# Positioning the Cross

Two colors are across from each other  
(Hold so one of the colors faces you):

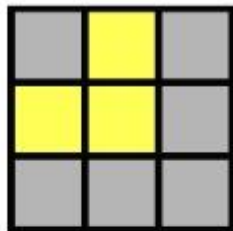
$R\uparrow U_{(R)} R'\downarrow U_{(R)} R\uparrow 2U_{(R)} R'\downarrow$

Two colors are adjacent to each other  
(Hold so one of the colors is to your right and the other is  
in the back):

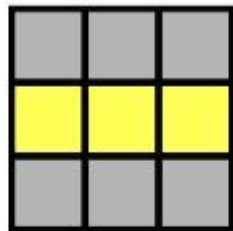
$R\uparrow U_{(R)} R'\downarrow U_{(R)} R\uparrow 2U_{(R)} R'\downarrow U_{(R)}$



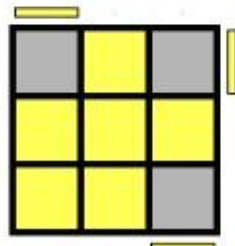
$FURU'R'F'$



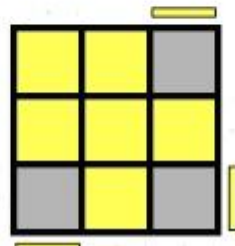
$FRUR'U'F'$



$RUR'URU^2R'U^2$

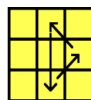
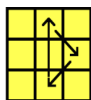


$R'U'RUR'U^2RU^2$

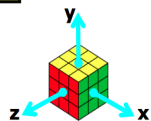
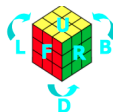


$(RUR'U')(R'F)(R^2U')(R'URU)R'F'$

$R^2UFB'R^2F'BUR^2$



$R^2U'FB'R^2F'BU'R^2$



# Positioning Corners

If NO corners are positioned:  $U_{(R)} R \uparrow U'_{(L)} L \uparrow U_{(R)} R' \downarrow U'_{(L)} L \downarrow$

Hold the solved corner in the top right:  $U_{(R)} R \uparrow U'_{(L)} L' \uparrow U_{(R)} R' \downarrow U'_{(L)} L \downarrow$

(Repeat until all four corners are positioned correctly)

## Orienting Corners (FINAL STEP)

Hold unsolved corners in the top right corner:  $R' D' R D$   
(Repeat until all four corners are oriented correctly)

[http://www.sciencebuddies.org/science-fair-projects/project\\_ideas/Math\\_p024.shtml#summary](http://www.sciencebuddies.org/science-fair-projects/project_ideas/Math_p024.shtml#summary)

<http://www.instructables.com/id/How-To-Solve-The-Rubiks-Cube-1/step1/null/>

<https://www.youtube.com/watch?v=tYmtdFM1Zwk>

<http://www.kungfoomanchu.com/guides/andy-klise-3x3x3-beginners-guide.pdf>