Advanced Rubik's Cube notation

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Perform these moves on a 3D Rubik's Cube

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Rubik's Cube World Record - Patrick Ponce 4.69 (/ruwix.com/rubiks-cube-world-record-patrickponce-469/)

https://ruwix.com/the-rubiks-cube/notation/advanced/
Rubik's Cube Notation (/the-rubiks-cube/notation/) page I have presented how we mark the basic face, middle layer (slice) and cube rotations. Let's go further and discuss the advanced notation what you often meet while reading Rubik's Cube algorithms (https://ruwix.com/the-rubiks-cube/algorithm/).
Face rotations

We mark the 6 faces of the Rubik's Cube (https://ruwix.com/the-rubiks-cube/) with a letter according to our perspective as we hold the puzzle with one side facing us and an one parallel to the ground:

U: Up face clockwise
F (Front), U (Up), R (Right), B (Back), L (Left), D (Down).

F R U L B

D

U - a 90-degree clockwise rotation of the upper face

U

U' - a 90-degree counterclockwise rotation of the U face

U'

U2 - a half turn of the upper face

U2

Slice turns

M: Middle layer like left face clockwise
Middle layer rotations or slice turns are not simply the rotations of two opposite layers because these moves reposition the centre cubelets too.

**M** - Middle layer turn - in the same direction as an L turn between R and L.

**E** - Equatorial layer - direction as a D turn between U and D.

**S** - Standing layer - direction as an F turn between F and B.

Note the following correlation:

\[ M = L' \ R \ X' \]

**M** **E** **S**

Two layers at the same time

\[ d \ or \ Dw: \ the \ two \ bottom \ layers \ clockwise \]
Double turns are marked with the lowercase letter of the corresponding face: f, u, r, b, l, d. For example d means the clockwise rotation of the two bottom layers. Dw means the same move but this notation is mainly used by Japanese cubers. Rarely they mark these turns with 2D (the number comes ahead because D2 means a double D). Multiple-layer turns are necessary to solve higher order puzzles like the 4x4x4 Rubik's Revenge (https://ruwix.com/twisty-puzzles/4x4x4-rubiks-cube-rubiks-revenge/).

In some cases you might find Rubik's Cube algorithms with lowercase letters meaning the counterclockwise rotation of a face but this is rare.

d = D E

Whole cube reorientation
The entire cube rotations are not necessary to solve the cube (https://ruwix.com/the-rubiks-cube/how-to-solve-the-rubiks-cube-beginners-method/) but we still use them in algorithms to reorient the puzzle. These moves can also be executed in the two directions and double turns are also possible.

- **x** - rotate the entire cube on R (do an R move without holding the two other layers)
- **y** - rotate the entire cube on U
- **z** - rotate the entire cube on F

Whole cube rotations can be marked with either lower or uppercase letters.

**Big cube notation**

The notation of the Rubik's Cube applies to the big cubes too but the deep turns and inner slice turns
Big cubes allow deep turns and slices also come in.

2F - second inner front layer (inner slice)
F₂ - the two outer front layers together (deep turn)
3Fw - The three front layers together on a big cube (min 7x7x7)
3Fw₂ - 108 degree turn of the three front layers on a big cube
(in the case of the 4x4x4 cube we marked this with f and Fw)

Piece notation

FRU: front-right-up corner piece
There are three types of pieces on the Rubik's Cube: centre, edge and corner pieces.
There's only one centre piece belonging to every face so we mark these with the uppercase letter of the face it belongs to: F marks the front centre piece.
An edge piece is determined by the two faces it belongs to: FU - the front-up edge.
A corner piece is described by the three faces next to it: FRU front-right-up corner.

Finger trick notations

You can find brackets in the Rubik's algorithms because we group together fragments (triggers) that are easy to execute.
There's no officially adopted finger trick (/the-rubiks-cube/fingertricks/) notation but the DeeDubb (DW) notation for 3x3x3 cubes is widely used. This has been presented in the speedsolving.com forum.
Finger tricks are used in speedcubing (/the-rubiks-cube/speedcubing-speedsolving/) to reduce the solution time. The goal is to describe a Rubiks' Cube algorithm in the most comfortable
and efficient way to execute with the human hand. Taking down the hand off a side and repositioning always takes time so we're trying to execute more operations at the same time. The more overlapped moves and the less regrips, the faster you execute the operation. For this we use triggers which are short sequences of face turns which are easy and fast to execute. Usually you can see these fragments in brackets in the algorithms.

For example instead of doing $R U F'$ we can simply do a $R d R'$ avoiding the regrip.

This notation is based on describing three things: the finger, the puzzle piece and the grip of the fingers on the cube.

**The fingers** are marked with: $T$ (thumb), $I$ (index), $M$ (middle), $R$ (ring), $P$ (pinkie), $W$ (wrist move).

**The piece notation** is the same as described above on this page.

**Grip notation** describes how to hold the cube.

Ex. $TF$ - right thumb on F, other fingers on the opposite side. $TU$ - right thumb on up, the rest of the
fingers on down.
The left thumb is marked with lowercase t.
An example: \{M-R4, T-R3\} R2 U S'(I2) U2' S(I1) U R2

Comments

32 comments

Pearl Lee
with badmephistos pll guide, im having trouble with the x' and x moves. pls help..

Like · Reply · Jun 18, 2016 10:52am

Jonathan Caballero ·
San Jose del Monte, Bulacan
(Using Orange in Front, Yellow on Top, Blue at Right)
X Move - White(F), Orange(T), Blue(R)
Y Move - Green(F), Yellow(T), Orange(R)
Z Move - Orange(F), Green(T), Yellow(R)

Like · Reply · 4 · Jul 11, 2016 1:40am · Edited

Bjørn-Erlend Meistad ·
Bakketun Folkehøgskole
Jonathan Caballero
Your Y move is
Your Y move is incorrect. You described a Y'. After a Y turn the cube would look like this: Blue(F), Yellow(T), Red(R)

Carlyle Jerald
Works at SJK (c) St. Philip, Tamparuli
Jonathan Caballero thanks dude. this is really helpful

Harrison Getches
Head Chef at The Krusty Krab
what does ]| mean? I found it on some two look olls

Reynell Eisen Mateo
Nothing

Harrison Getches
Head Chef at The Krusty Krab
please help

Gabriel Hudson Mello
I.T.I - Instituto Tecnologico de Informatica
Amazing, I was getting really confused with this notations and this is just a miracle
For example d means the clockwise rotation of the two bottom layers. Dw means the same move but this notation is mainly used by Japanese cubers.

Using that logic a fw is the same as a f or a F S or a Y I or a Y L M or a Y' r or a Y' R M' and so on... i could go on with the X and Z rotations too, but the point is that a fw is most likely a "bad" way of saying f 😊
Hello I'm new to rubik's. Could it be that the widget rotations M & M' must be interpreted from a left view angle and the E & E' from a down view angle? I have no problems with clock & counterclock rotations of S & S'. Thanks

Like · Reply · Oct 11, 2016 10:42am

Gabriel Fuertes · I.E.S.L.G

Yes. Feels odd to me too. It's like this, don't ask me why:
M ~ x'
E ~ y'
S ~ z

Like · Reply · Feb 10, 2017 6:58pm

Nico Ibabao · Bayugan National Comprehensive High School (BNCHS)

Sir I'm having problem in y2 pass help me.

Like · Reply · 1 · Oct 15, 2016 7:09pm

Vincent Lantang · SMP Terpadu Widya Duta

turn ur upsite layer twice with the midle layer and bottom layer

Like · Reply · Jan 4, 2017 9:32am

Brandon J. Mlejnek

What does (Ff)2 mean?

Like · Reply · Oct 17, 2016 6:18am

Bruno Curfs · Universiteit Utrecht

From the above, F means a quarter turn
of the front face. And f means the double turn 
F S carried out 
together. Also, for any 
formula/algorithm X of 
more than one letter, 
(X)2 = X X. Combining 
this, we get (F f)2 = F f 
F f = (F F S)2 = (F2 
S)2 = F4 S2 (because 
F and S are 
independent) = S2. 
Note. The equality sign 
does not mean the 
same actions, but the 
same results. 
Apparently, the author 
of (F f)2 found this 
procedure quicker or 
easier than S2, as S2 
does not describe what 
you need to DO, only 
what the result is of 
your turns. For 
instance S2 = y2 F2 
B2, but it's awkward. 
So, perhaps (F f)2 is 
an easier way of doing 
S2. S2 can be done in 
many ways. Here is 
another S2 = (F2 f2) = 
(f2 F2), but the single 
turns F and f are 
easier and perhaps 
quicker. 
-- 
These are my five 
cents.