

How to Solve a Square1 (AKA Cube21) Jacob Cole



http://mooretechnologies.com/~kevin/puzzles/square-1_t.jpg

This is the “easy” way...

For more methods, see Jaap’s Puzzle Page entry on the Square1:
<http://www.geocities.com/jaapsch/puzzles/square1.htm>

Notation:

A Square1 (or Cube21) is made out of 8 kite-shaped corners (60°), 8 triangular edge pieces (30°), and 2 congruent trapezoidal middle-layer pieces. Because of its construction, the Square1 can change into a variety of different shapes.

The cube is held with the middle layer in the middle, and either face on top. The middle layer can be moved at any time before or after an algorithm, as it can instantly be repositioned.

Normal cube face letters (U, R, L, F, B, and D) are used only to show orientation of cube and to represent pieces (e.g. The UFR corner is the corner on the upper layer, to the front-right). They don’t exactly make sense for annotating algorithms.

Many Square1’s have colors: F (holding label to front and right-side up) = Yellow, B = Blue, U = White, D = Green, R = Orange, L = Red.

If you don’t know your cube’s color orientation, solve the middle layer

($1\frac{1}{2}$ twists at max) and use it as a guide. Then put a corner in place to find U/D colors.



To write algorithms, you use “/” and ordered pairs. “/” means to twist the right half of the “cube” 180° along the direction of the middle layer’s split (you exchange halves of the top and bottom layers this way). The ordered pair contains numbers which tell how times you should rotate the top and bottom layers (respectively) 30° . Note: cube should be held with the middle layer’s split 15° clockwise of middle (looking from top). This either means that the small end of the trapezoid of the middle layer should be on your left, or the middle layer should be twisted 30° clockwise out of place.

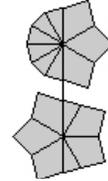
For example, $(1,2)/(3,0)/$ means to rotate the top layer $1 \times 30^\circ = 30^\circ$ and the bottom $2 \times 30^\circ = 60^\circ$, then do an interlayer twist (sort of like R2 in a normal cube), then twist the top layer $3 \times 30^\circ = 90^\circ$, and the bottom layer $0 \times 30^\circ = 0^\circ$ (not at all), and then do an interlayer twist.

How to solve:

Note: Throughout this tutorial, ignore the state of the middle layer. It can be fixed at any time, without harming the other layers, by doing $(6,0)/(6,0)/(6,0)$.

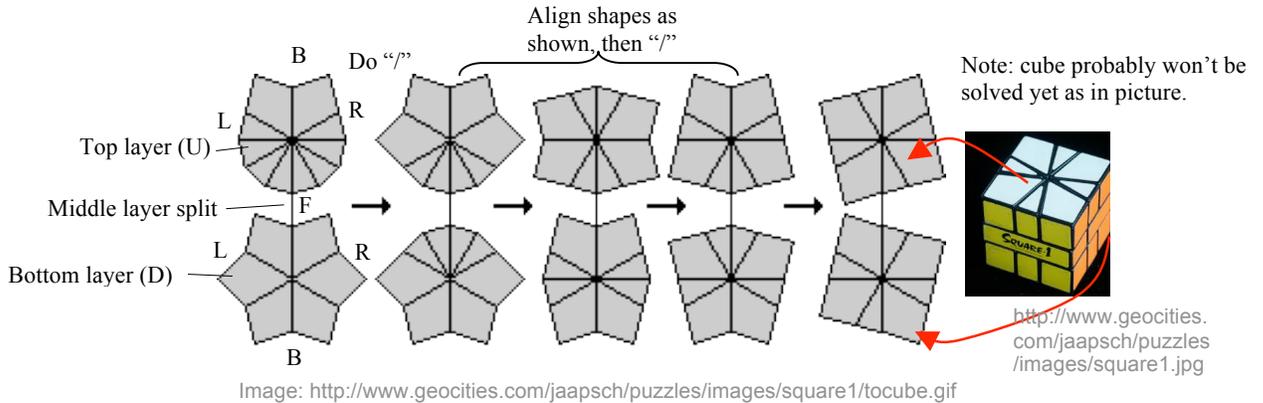
1) Turn into a cube

- a) Make 3 pairs edges intuitively
- b) Join pairs to form group of 6 edges
- c) Then, add the last 2 edges. This is a bit trickier and you may have to take one or more edges out of the current group to do this. A good position to recognize that on the right, in which you do $(6,0)$:



- d) Now, it is easy to turn it into a cube. Just do this algorithm. (Since it goes between shapes, I use diagrams for maximum clarity. From each position, rotate the top and bottom layers so that the proper parts align with the middle layer split, and then do an interlayer twist $(6,0)$):

In these diagrams, the layer with 8 edges is the top layer, and we see it from above. The bottom layer is "unfolded" from underneath the cube so that we can see it. They share the F face. See last step for picture. Note: middle layer may not be solved. To fix, see below.



1) Place pieces on proper layers

- a) Place corners on proper layers.
 - i) Pair up 2 corners (they should be separated by an edge; the Square1 should remain a cube, except middle layer can change).
 - ii) Pair up other 2 corners (of the same color as those in step i)).
 - iii) Join the 2 pairs. Note: Ensure that the corners are on the proper layer. They are wrong if, when placed above the proper colors of the middle layer, the L, R, F, or B stickers appear to be switched. In that case, do $(6,6)$
 - iv) Throughout this step, the Square1 should remain a cube, except for the middle layer.

- b) **(optional here):** Solve middle layer (may have to be done again later; can be solved at any time). Use: $(6,0)/(6,0)/(6,0)$

- c) Place edges on proper layers
(Algorithms from <http://www.geocities.com/jaapsch/puzzles/square1.htm>):

- i) Use the following 7 algorithms (**only the first one is necessary**, but the others make it far easier).
- (1) **UB, DF: (0,-1)/(-3,0)/(4,1)/(-4,-1)/(3,0)/(0,1)**
 - (2) UF, UB, DF, DB: (1,0)/(-1,-1)/(0,1).
 - (3) UB, UL, DR, DB: (1,0)/(-3,0)/(-1,-1)/(4,1)/(-1,0)
 - (4) UB, UR, DL, DB: (1,0)/(0,3)/(-1,-1)/(0,-3)/(0,1)
 - (5) UF, UR, DF, DB: (1,0)/(0,-3)/(0,3)/(2,-1)/(-3,0)/(0,1)
 - (6) UF, UR, UB, DF, DB, DL: UR, UB, UL, DF, DR, DB: (0,-1)/(1,4)/(-1,-4)/(-3,0)/(4,1)/(-1,0), or apply sequence 3 and then sequence 2.
 - (7) All edges wrong: do moves (1,0)/(-1,-1)/(-2,-2)/(-1,-1)/(0,1), or apply sequence 3 twice.
- d) Position corners
- i) Use
 - (1) (**only one necessary**) Swaps UFL-UBR, DFR-DBR: $/(3,0)/(-3,0)/(3,0)/(3,0)/(6,0)/$
 - (2) Swaps UFR-UBR, DFL-DBR (the 1st sequence upside-down): $/(0,-3)/(0,3)/(0,-3)/(0,-3)/(0,6)/$
 - ii) If you need to swap only 2 corners, give the layer a quarter-turn, this will make it need 2 swaps, and the second can undo the damage to the bottom layer.
- e) Position edges
- i) Use
 - (1) (**only necessary**) Swap UR-UB, DR-DB: $(0,2)/(0,-3)/(1,1)/(-1,2)/(0,-2)$
 - (2) Swap UF-UB, DF-DB: (1,0)/(5,-1)/(-5,1)/(5,0)
 - ii) **Fix parity**. Use (3,0)/(3,3)/(-1,0)/(2,-4)/(4,-2)/(0,-2)/(-4,2)/(1,-5)/(3,0)/(3,3)/ to swap UF-UB.
- f) Solve middle layer if not already done. Use: $/(6,0)/(6,0)/(6,0)$

W00t! You just solved a Square1! Try it blindfolded now!

Algorithms – In Brief:

Place edges on proper layers

(1) **UB, DF**: $(0,-1)/(-3,0)/(4,1)/(-4,-1)/(3,0)/(0,1)$

Position corners

(2) **UFL-UBR, DFR-DBR**: $/(3,0)/(-3,0)/(3,0)/(3,0)/(6,0)/$

Position edges

(3) **UR-UB, DR-DB**: $(0,2)/(0,-3)/(1,1)/(-1,2)/(0,-2)$

(4) **UF-UB, DF-DB (optional)**: $(1,0)/(5,-1)/(-5,1)/(5,0)$

(5) **UF-UB (parity)**: $(3,0)/(3,3)/(-1,0)/(2,-4)/(4,-2)/(0,-2)/(-4,2)/(1,-5)/(3,0)/(3,3)/$