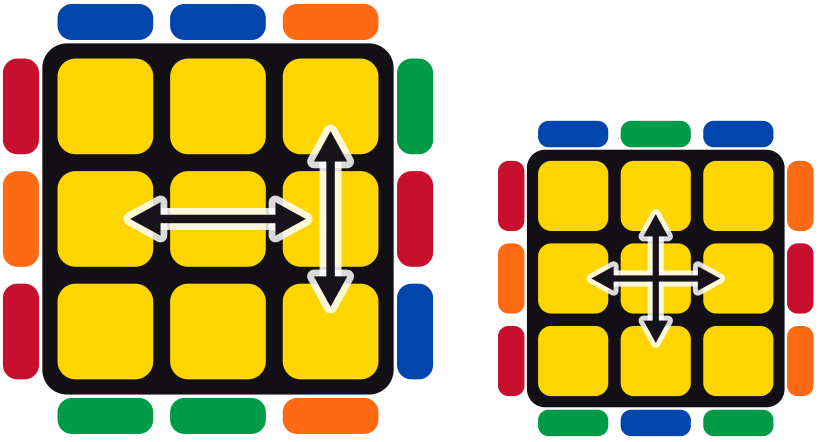
Cube Lab

PRINTABLE GUIDE

Full PLL

All 21 last-layer permutation cases.



1. 21 cases, grouped by what moves

REFERENCE

Full PLL (21)

The top is all yellow. Look at the sides for **headlights** (two matching corner stickers) and **bars** (three in a row). Arrows show where each piece goes.

Corners only 3



Aa-perm

`x R' U R' D2 R U' R' D2 R2 x'`

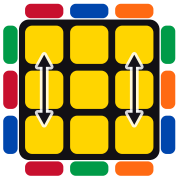
Headlights at the back and a solved 2×2 block at the front-left. Edges are all solved; three corners cycle.



Ab-perm

`x R2 D2 R U R' D2 R U' R x'`

Headlights on the right and a solved 2×2 block at the front-left. Edges are all solved; three corners cycle.

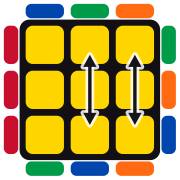


E-perm

`x' R U' R' D R U R' D' R U R' D R U' R' D' x`

No headlights and no 2-blocks on any side: every corner is wrong, but the edges are already in place.

Adjacent corner swap 10



F-perm

`R' U' F' R U R' U' R' F R2 U' R' U' R U R' U R`

A full bar on the left side, and no headlights on the other three sides.



Ga-perm

`R2 U R' U R' U' R U' R2 U' D R' U R D'`

Headlights on the left, and a 2-block on the front side at its right end (front-right corner).



Gb-perm

`R' U' R U D' R2 U R' U R U' R U' R2 D`

Headlights on the left, and a 2-block on the right side at its back end (back-right corner).



Gc-perm

`R2 U' R U' R U R' U R2 U D' R U' R' D`

Headlights on the left, and a 2-block on the back side next to the back-right corner.



Gd-perm

`R U R' U' D R2 U' R U' R' U R' U R2 D'`

Headlights on the left, and a 2-block on the right side next to the front-right corner.



Ja-perm

`x R2 F R F' R U2 r' U r U2 x'`

A full bar on the left side; the front shows a 2-block at its left end, touching the bar.



Jb-perm

`R U R' F' R U R' U' R' F R2 U' R'`

A full bar on the left side; the front shows a 2-block at its right end, away from the bar.



Ra-perm

`R U' R' U' R U R D R' U' R D' R' U2 R'`

Headlights on the left, and a 2-block on the front side right next to them (front-left corner).



Rb-perm

`R2 F R U R U' R' F' R U2 R' U2 R`

Headlights on the left, and a 2-block on the back side right next to them (back-left corner).



T-perm

`R U R' U' R' F R2 U' R' U' R U R' F'`

Headlights on the left, with a 2-block next to each headlight (front-left and back-left).

Edges only 4



H-perm

`M2 U M2 U2 M2 U M2`

Headlights on all four sides, and every edge belongs on the opposite side.



Ua-perm

`M2 U M U2 M' U M2`

A solved bar at the back and headlights on the other three sides; those three edges need to cycle anticlockwise (seen from above).



Ub-perm

`M2 U' M U2 M' U' M2`

A solved bar at the back and headlights on the other three sides; those three edges need to cycle clockwise (seen from above).



Z-perm

`M' U M2 U M2 U M' U2 M2`

Headlights on all four sides, and every edge belongs on a neighbouring side (two pairs of edges swap).

Diagonal corner swap 4



Na-perm

`R U R' U R U R' F' R U R' U' R' F R2 U' R' U2 R U' R'`

Every side shows a 2-block, always on the right half as you look at that side.



Nb-perm

`R' U R U' R' F' U' F R U R' F R' F' R U' R`

Every side shows a 2-block, always on the left half as you look at that side.



V-perm

`R' U R' U' R D' R' D R' U D' R2 U' R2 D R2`

No headlights anywhere, and a solved 2×2 block at the front-left.



Y-perm

`F R U' R' U' R U R' F' R U R' U' R' F R F'`

No headlights anywhere; a 2-block on the front side at the front-left corner and one on the right side at the back-right corner.