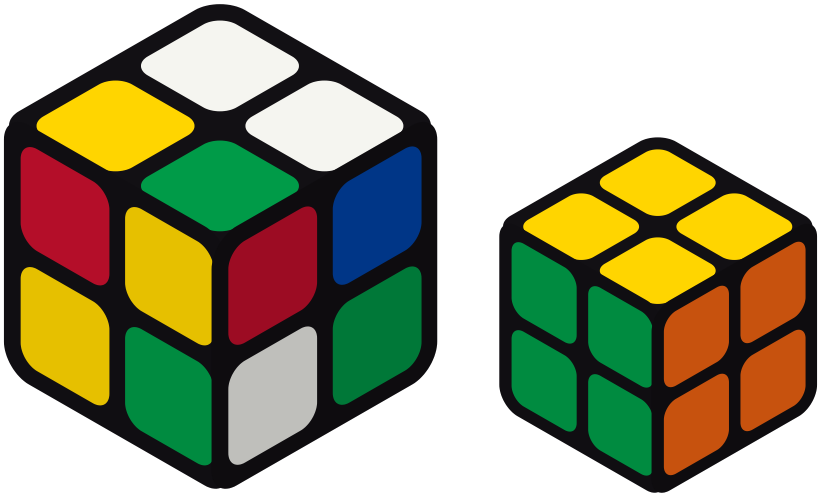
Cube Lab

PRINTABLE GUIDE

2x2 guide

The pocket cube: a beginner method, then Ortega.



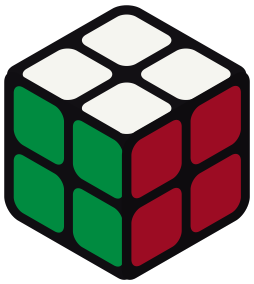
1. How a 2×2 is different
2. Beginner method
3. Ortega OLL
4. Ortega PBL

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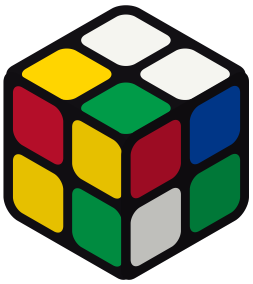
2X2

How a 2×2 is different

A 2×2 is a 3×3 with only the corners. It has 8 pieces and no centres or edges.



A solved 2×2



Scrambled

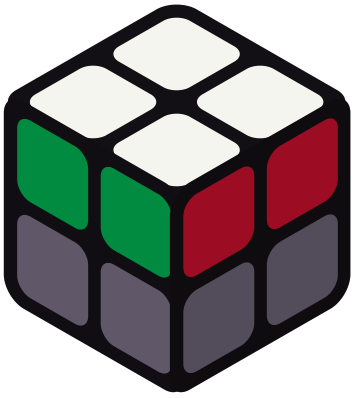
With no centres, nothing tells you which colour goes where. **The pieces decide.** Pick a white corner and build around it: the other corners have to match it.

If you can solve a 3×3 with the beginner method, you already know most of a 2×2: the first layer and the corner twist use the same moves. Only one step is new — swapping the top corners at the end.

2X2

Beginner: the first layer

Goal: white on top, and the top row of each side one colour. Just like the white corners on a 3×3, with white on top.



The white layer on top. The rest doesn't matter yet (grey).

The first corner: no moves

A 2×2 has no centres, so any white corner can be your first one. Hold the cube so that corner is on top at the back-left with white facing up. It's now in its spot — nothing to turn — and it decides where every other corner goes. (None of the corner moves touch the back-left corner, so it stays put.)

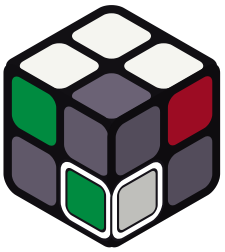
The other three go on top around it. Look at your first corner's left and back colours: the white corner that shares its left colour goes at the front-left, the one that shares its back colour goes at the back-right, and the one that shares neither goes at the front-right. The shared colour always goes on the same side as on the first corner.

The other three

Use the same cases as Step 2 of the 3×3: hold the corner's spot at the front-right of the top, turn the bottom until the corner is right under it, and do the moves for the way its white sticker faces. A 2×2 has no edges to worry about, so the moves are exactly the same.

Bottom layer, white facing right

Placed pieces come straight back



BEFORE

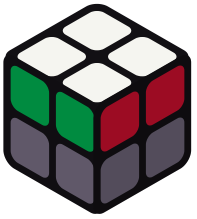
Looks like: A white corner is in the bottom layer. Its two other colours tell you where it goes: on top, where its two side colours match the corners already there. Once it's right under its spot, its white sticker faces right.

First: Keep white on top and turn the whole cube so the corner's spot is at the front-right. Then turn the bottom (`D`) until the corner is right under it.

```
R' D' R
```

Why it works: `R'` turns the right side down, `D'` turns the bottom, and `R` turns the right side back up: the corner rides up into its spot with white on top.

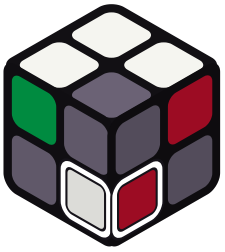
What moves along the way: The other top corners move for a moment and are back by the last move: whatever `R'` takes down, `R` brings straight back up. The bottom layer gets mixed up, which doesn't matter yet.



AFTER

Bottom layer, white facing you

Placed pieces come straight back



BEFORE

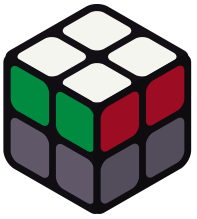
Looks like: A white corner is in the bottom layer. Its two other colours tell you where it goes: on top, where its two side colours match the corners already there. Once it's right under its spot, its white sticker faces you.

First: Keep white on top and turn the whole cube so the corner's spot is at the front-right. Then turn the bottom (`D`) until the corner is right under it.

```
F D F'
```

Why it works: The same idea from the front: `F` turns the front side down, `D` turns the bottom, and `F'` turns the front back up, bringing the corner into its spot with white on top.

What moves along the way: The other top corners move for a moment and are back by the last move: whatever `F` takes down, `F'` brings straight back up. The bottom layer gets mixed up, which doesn't matter yet.



AFTER

Bottom layer, white facing down

Placed pieces come straight back



BEFORE

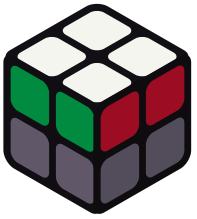
Looks like: A white corner is in the bottom layer. Its two other colours tell you where it goes: on top, where its two side colours match the corners already there. Once it's right under its spot, its white sticker faces the floor.

First: Keep white on top and turn the whole cube so the corner's spot is at the front-right. Then turn the bottom (`D`) until the corner is right under it.

`R' D2 R D R' D' R`

Why it works: White can't come straight up from underneath. `R' D2 R D` turns the corner round so white faces right, still right under its spot. Then `R' D' R` puts it in, the same as "white facing right".

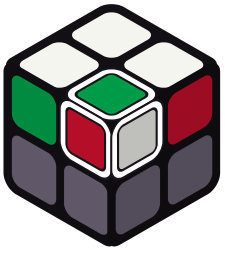
What moves along the way: The other top corners move for a moment and are back by the last move: each `R'` that takes them down is followed by an `R` that brings them back. The bottom layer gets mixed up, which doesn't matter yet.



AFTER

In its spot, but twisted

Placed pieces come straight back



BEFORE

Looks like: The white corner is on top in its own spot (it has the colours that spot needs), but white faces the side instead of up.

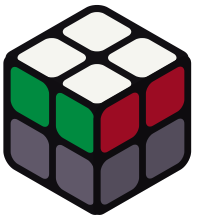
First: Keep white on top and turn the whole cube so the corner is at the front-right.

`R' D' R D R' D' R`

White facing right. Every position is in the table below.

Why it works: Take it out first, with the moves for the way white faces: `R' D' R` when white faces right, `F D F'` when it faces you. That drops it into the bottom layer. Turn the bottom to bring it back right under its spot, and white faces the same way as before: it's a bottom-layer case.

What moves along the way: The other top corners move for a moment and are back at the end of the three moves that take it out, and again by the last move.

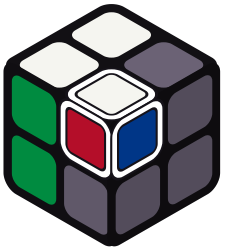


AFTER

WHERE IT IS	MOVES
White facing right	`R' D' R D R' D' R`
White facing you	`F D F' D' F D F'`

On top, in the wrong spot

Placed pieces come straight back



BEFORE

Looks like: A white corner is in the top layer, but in another corner's spot: it doesn't have the colours that spot needs.

First: Keep white on top and turn the whole cube so this corner is at the front-right. (This time you hold the corner there, not its spot.)

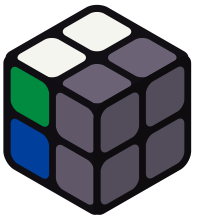
`R' D' R`

White up. Every position is in the table below.

With white facing you, do `F D F'` instead. Then it's in the bottom layer: turn the whole cube so the corner's spot is at the front-right. Then turn the bottom (`D`) until the corner is right under it. Now it's a bottom-layer case: use the moves for the way its white faces.

Why it works: Take it out with the moves for the way white faces: `R' D' R` when white faces up or right, `F D F'` when it faces you. That drops it into the bottom layer, and from there it's a bottom-layer corner: hold its own spot at the front-right, turn the bottom until it's right under it, and use its case.

What moves along the way: Nothing you've placed stays out: the spot it leaves was the wrong spot, and the other top corners are back at the end of the three moves.



AFTER

WHERE IT IS	MOVES
White up	`R' D' R`
White facing right	`R' D' R`
White facing you	`F D F'`

TIP

Check a corner fits before you put it in: its two side colours must match the corners already on top next to it.

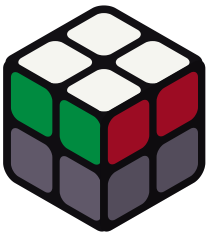
ANOTHER WAY

You can also build this layer on the **bottom**: hold your first corner underneath, put each next corner right above its spot at the front right, and do `R U R'` (white facing right), `F' U' F` (white facing you) or `R U2 R' U' R U R'` (white facing up). The Solve page does it this way if you choose "Build the first layer: On the bottom".

ONE MOVE FOR EVERYTHING

Or use one move for every corner: repeat `R' D' R D` until it goes in (1, 3 or 5 goes from the bottom; 2 or 4 when it's twisted in its spot). It's easier to remember but takes more turns. The Solve page does it that way if you choose "The first-layer corners: Repeat one move until it's in".

Then turn it over

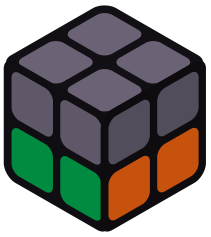


BEFORE

Turn the whole cube over

White goes to the bottom, yellow comes up. Then do the last layer.

z2



AFTER

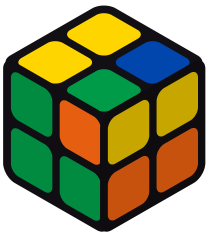
2×2

Beginner: the last layer

Now the top. On a 2×2 you do the two corner steps of the 3×3 **the other way round**: first make the top all yellow, then put the corners in their places.

Make the top yellow

Hold a corner whose yellow isn't on top at the **front right**. Do `R' D' R D` until its yellow faces up (two or four times). Then turn **only the top** to bring the next one there, and repeat. The bottom gets messy in between and comes back when the last corner is done — the same as Step 7 of the 3×3.

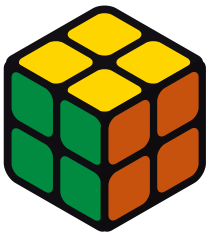


BEFORE

Two corners to twist

Twist the front-right corner (two goes), turn the top, twist the next one (four goes), turn the top back.

(R' D' R D) ×2 U (R' D' R D) ×4 U'

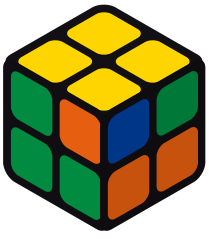


AFTER

Swap the corners

Look at the sides of the top layer for **headlights**: two top corners on one side with the same colour. Hold that side on the **left** and do `R U2 R' U' R U2 L' U R' U' L`. It swaps the two corners on the right and keeps the top yellow.

- Headlights on **one** side: hold them on the left, do the algorithm once.
- Headlights on **every** side: the corners are already in place.
- **No** headlights anywhere: do the algorithm once from any side. Now there are headlights — start again.

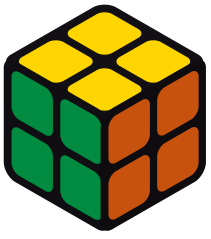


BEFORE

Headlights on the left

The two left corners already match. This swaps the two on the right.

R U2 R' U' R U2 L' U R' U' L



AFTER

Then turn the top to line it up with the bottom. Solved!

> **ANOTHER WAY**
>
> The 3×3's corner cycle `U R U' L' U R' U' L` works on a 2×2 too, turning the top between goes. But it moves three corners, so fixing a swap that way takes about four goes. The headlights swap needs one go, or two if there are no headlights to start with.

> **TIP**
>
> This is a slow way, but it only adds one algorithm. When you want to go faster, learn Ortega.

2X2

Ortega: face, then OLL

Ortega solves a 2×2 in three looks: one face, the opposite face, then both layers at once.

1. **Make the white face** on the bottom. Only the white stickers matter: the sides can be mixed up. This is quick and you do it by feel.
2. **OLL:** make the top all yellow with one of the seven algorithms below.
3. **PBL:** put both layers in order at once (next lesson).

Look at the top. Turn it until it matches one of these pictures (yellow stickers shown, others grey). Then do that algorithm.



Sune

`R U R' U R U2 R'`

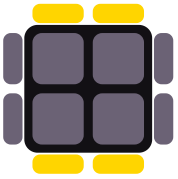
One corner up, at the front-left; the front-right corner shows yellow at the front.



Anti-Sune

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

One corner up, at the back-right; the front-right corner shows yellow on the right.



H

`R2 U2 R U2 R2`

No corners up; yellow headlights at the front and back.



Pi

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

No corners up; yellow headlights on the left only.



U (headlights)

`F R U R' U' F'`

Two corners up on the right; yellow headlights on the left.



T (chameleon)

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

Two corners up on the right; the left corners show yellow at the front and back.



L (bowtie)

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

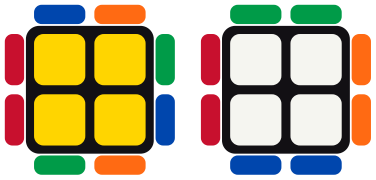
Two corners up diagonally opposite each other.

2X2

Ortega: PBL

Now the top is all yellow and the bottom all white. Look at each layer: does it have a pair of matching corners side by side (a **bar**), or none?

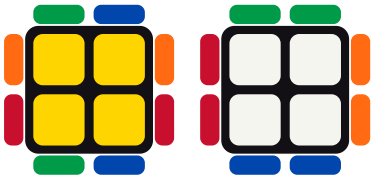
Each case below fixes both layers in one go. Turn the top first so the bars line up with the picture.



Top: headlights · Bottom: solved

`R U2 R' U' R U2 L' U R' U' L`

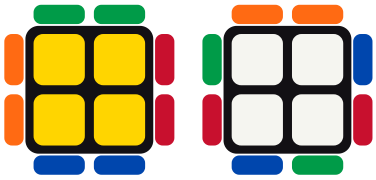
Top has headlights on one side: hold them on the left. Bottom already solved.



Top: diagonal · Bottom: solved

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

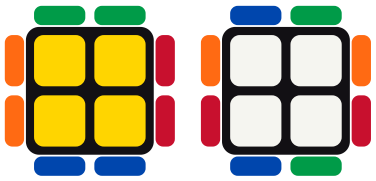
Top has no headlights. Bottom already solved.



Top: solved · Bottom: headlights

`R U' F U2 F' U R F2 R2`

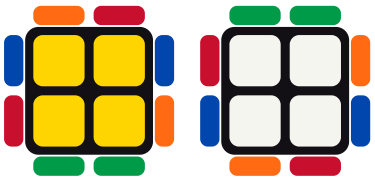
Top solved. Bottom has headlights on one side: hold them at the front.



Top: solved · Bottom: diagonal

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

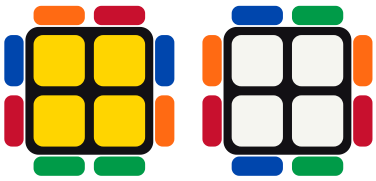
Top solved. Bottom has no headlights.



Both: headlights

`R2 U' B2 U2 R2 U' R2`

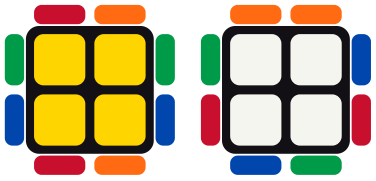
Headlights on top and on the bottom: hold both at the front.



Top: headlights · Bottom: diagonal

`R U' R F2 R' U R'`

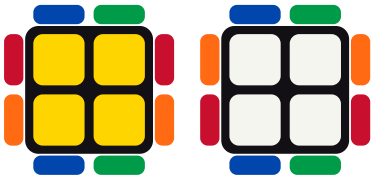
Top has headlights (hold them at the front); the bottom has none.



Top: diagonal · Bottom: headlights

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

Top has no headlights; the bottom does (hold them at the front).



Both: diagonal

`R2 F2 R2`

No headlights on top or on the bottom.

TIP

If a layer is already solved, put it on the bottom and solve the top with the matching case.