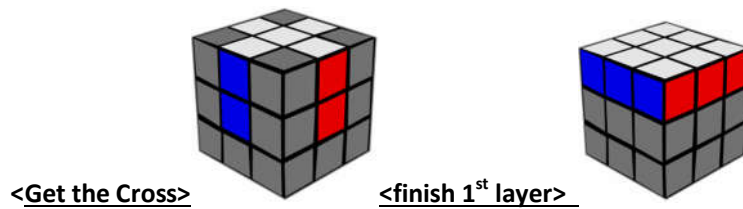


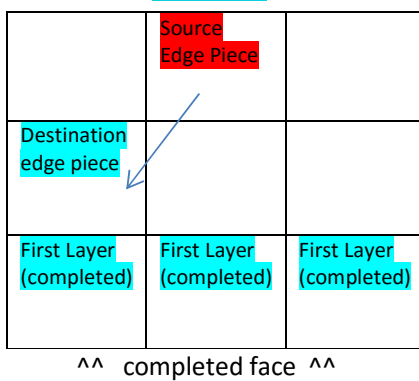
## Minimum knowledge required to solve 3x3x3



(knowledge of how to do this is assumed)

**Second Layer** (old method from “Mastering Rubik’s Cube” by Don Taylor)

(side view)



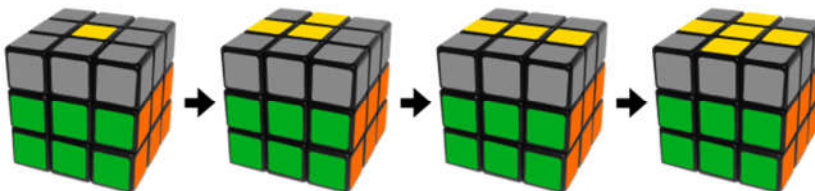
- If source edge piece is flipped: **F U2 R U' R' U2 F'**
- If source edge piece is not flipped:
  - Move Source Edge Piece to Right (**U'**)
  - Then **F U2 R U R' U2 F'**

(of course, once you get serious about cubing, you will probably want to learn [F2L](#))

### 3<sup>rd</sup> Layer

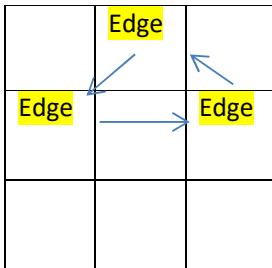
Flip (orient) Edges:

**F R U R' U' F'** - repeat until cross on top



Permute Edges ([Ua](#) permutation – one of the 21 [PLLs](#)):

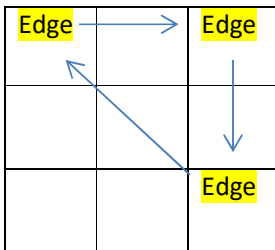
(top view)



**R2 U' R' U' R U R U' R**

Permute Corners ([Aa](#) permutation – one of the 21 [PLLs](#)):

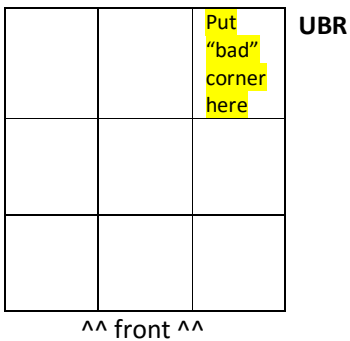
(top view)



**x R' U R' D2 R U' R' D2 R2**

**Orient Corners:**

(top view)



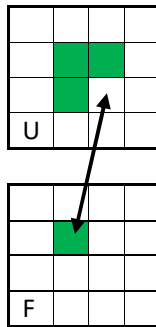
- Repeat **R D R' D'** until correct colour is on top.
- Rotate the top layer to place next bad corner into the UBR position
- Repeat **R D R' D'** until correct colour is on top etc

(don't worry about cube being "corrupted" during the process – it will come good at the end ! )

## Solving the Centers

Make sure you are absolutely familiar with the colours on your cube – You need to know where each center is supposed to go.

## Additional information required for solving 4x4x4

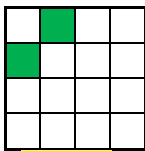


**(R'r') F (Rr)**

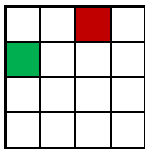
## Dedge Pairing

The following 4 algorithms are for pairing-up dedges and storing them in the top layer.

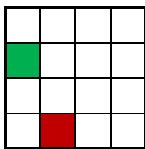
The diagrams represent the configuration of the front face.



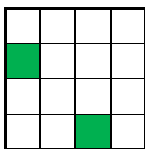
**R U' R' (D'd') L' U L (Dd)**



**U' F' U F (D'd') L' U L (Dd)**

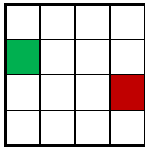


**D F D' F' (D'd') L' U L (Dd)**

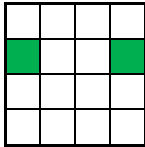


**R' D R (D'd') L' U L (Dd)**

The following cases are for solving the last 4 dedges. They leave the solved dedge in the middle layers, instead of storing it in the top:



**R U R' F R' F' R** ...then immediately proceed the case below:



**(Dd) R U R' F R' F' R (D'd')**

## 4x4x4 Parity fixes\*

### A) Flip single edge (Fix Orientation):

pure version:

**r2 B2 U2 l U2 r' U2 r U2 F2 r F2 l' B2 r2**

*Inverse: r2 B2 l F2 r' F2 U2 r' U2 r U2 l' U2 B2 r2*

fast version:

**(Rr)2 B2 U2 (Ll) U2 (Rr)' U2 (Rr) U2 F2 (Rr) F2 (Ll)' B2 (Rr)2**

*Inverse: (Rr)2 B2 (Ll) F2 (Rr)' F2 U2 (Rr)' U2 (Rr) U2 (Ll)' U2 B2 (Rr)2*

(The fast version, although faster, has the side effect of messing up the last layer, so it is best executed immediately after F2L)

### B) Swap Pair of Opposite Edges (Fix Permutation):

**r2 U2 r2 (U2u2) r2 u2**

*Inverse: u2 r2 (U2u2) r2 U2 r2*

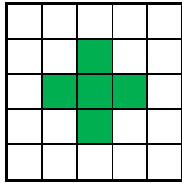
Memorize the above two algs and you can solve any 4x4. These same algorithms can also be used on larger cubes.

\*Note: in the notation for 4x4x4 cubes, a lowercase letter refers to an *inner* slice and uppercase letter refers to an *outside* slice.

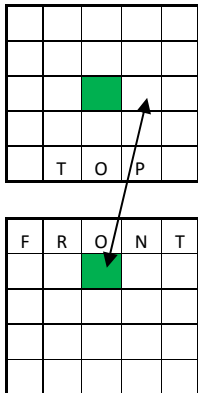
## Additional knowledge for solving 5x5x5

### Solving the centers

1. Form a cross with the edge-centers



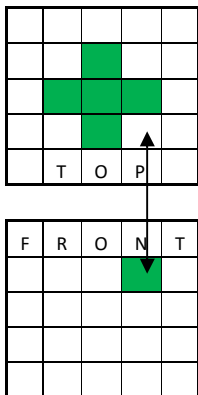
Place desired edge-center in Fu position and apply algorithm below to fill the Ur position.



**$(R'r') F (Rr)$**

Repeat this process to assemble the entire cross as shown above

2. Solve the Corner-Centers

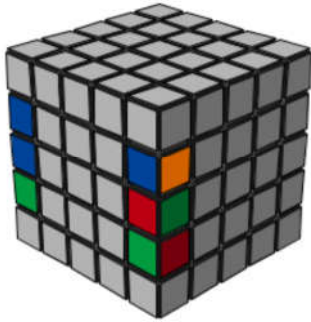


**$(Rr) U (R'r') U (Rr) U^2 (R'r')$**

If desired corner-centre is on bottom face (instead of front face) do this:

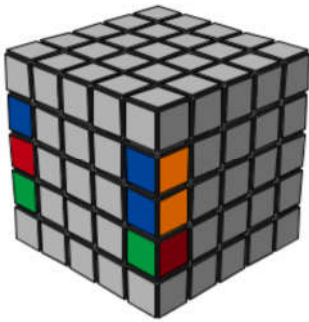
**$(R2r2) U (R2r2) U (R2r2) U^2 (R2r2)$**

Simple Match/Flip



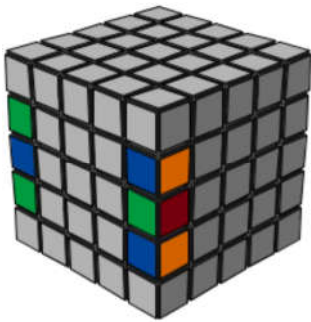
**(Dd) R U R' F R' F' R (D'd')**

(The next case is the mirror of above:)



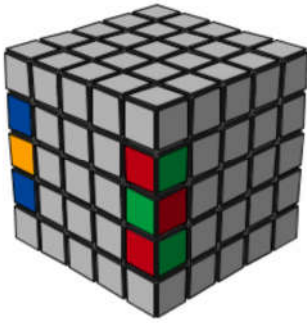
**(D'd') L' U' L F' L FL' (Dd)**

Double wing-swap



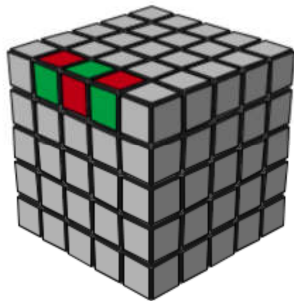
**(U2u2) (R2r2) F2 u2 F2 (R2r2) (U2u2)**

Double edge-flip



**(U'u') (Dd) R U R' F R' F' R (D'd') (Uu)**

Single Edge-Flip (Parity)



**(R2r2) B2 U2 (Li) U2 (R'r') U2 (Rr) U2 F2 (Rr) F2 (L'i') B2 (R2r2)**

This is the same as the parity algorithm used for the 4x4x4