

DIRECTIONS FOR SOLVING THE 5x5x5 (Professor) CUBE

These instructions can be used to solve a 5x5x5 cube, also known as the professor cube due to its difficulty. These directions are a graphical version of those given by [Jacob Davenport](#). I would appreciate any and all feedback or questions about the instructions; please see the end of this page for the e-mail address.

Purchasing Puzzles: If you are having troubles finding stores that sell cubes and similar puzzles, I have a list of [on-line sites](#) that may have what you're looking for.

My other cube pages



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[My directions for Solving the Rubik's Cube \(3x3x3\)](#) - these also apply to the 2x2x2



See [Denny's solution](#) for solving the 3x3x3 cube. This is a more detailed solution for the 3x3 than the one I provide (mirrored from the now missing <http://www.calormen.com/vpm/puzzlesolutions/rubikscube/>)



See [Denny's solution](#) for solving the 4x4x4 cube (mirrored from the now missing <http://www.calormen.com/vpm/puzzlesolutions/revenge/>)



[My directions for Solving the Square 1](#)



[My directions for Solving the Pyramix \(Pyramid\)](#)

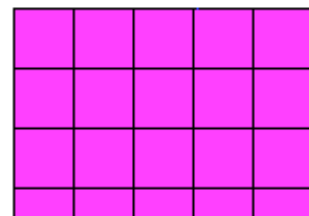
As a preview, the steps are:

- [1.](#) Solve the top points and crosses
- [2.](#) Solve the bottom points
- [3.](#) Solve the remaining points (on the sides)
- [4.](#) Complete the top and bottom crosses
- [5.](#) Complete the remaining crosses (on the sides)
- [6.](#) Associate wings with their appropriate edge pieces
- [7.](#) Solve the 3x3x3

KEY TO SYMBOLS FOR THE MOVES

The figures in this document represent a sample cube. Although the colors on your personal cube may be different than the figures, I feel that the colored figures will still be helpful in solving the cube. I

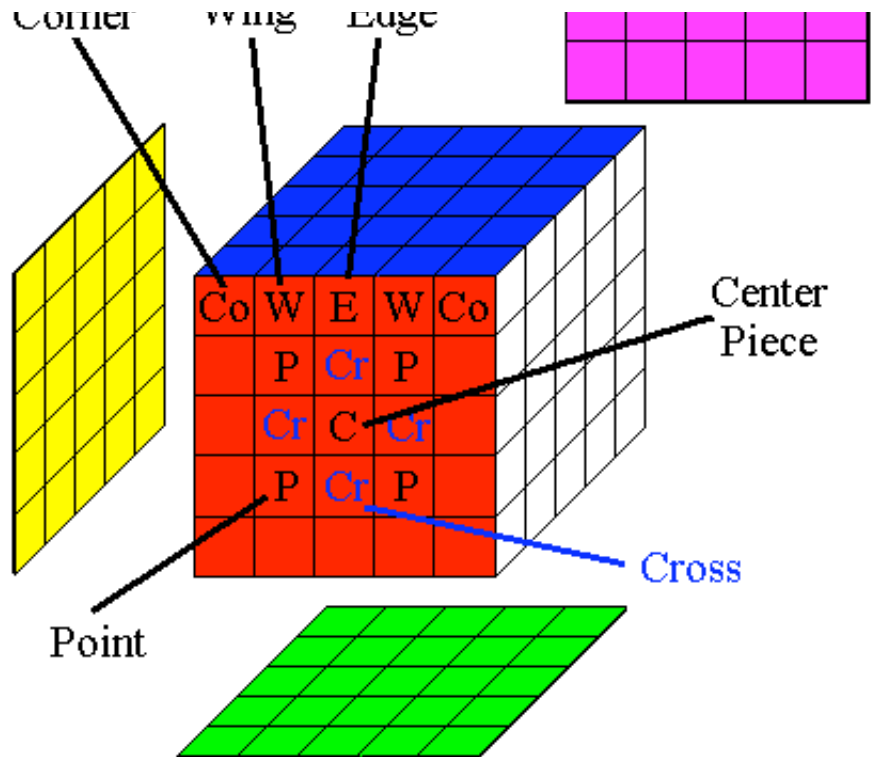
Key Cube



Corner Wing Edge

would suggest matching as many colors on your cube as possible to the figures, then making mental notes about which colors correspond between your cube. The diagrams show all six sides of the cube by pretending that **mirrors** are being held up so that you may see the "hidden" sides.

The directions for what parts of the cube to turn and when are given in a code that is *relative to the current positioning* of the cube. Each side descriptor refers to a side with respect to the figure the move is referenced to. This means that the front side can be a different color, depending on the diagram being used. See [Move 1](#) of my 3x3x3 Rubik's Cube page for instructive diagrams to illustrate the moves.



The Letters:

The side descriptors are:

- **U** for the top (Upper) side,
- **u** for the 2nd layer down from the top (just below the upper side),
- **L** for the left hand side
- **l** for the 2nd layer in from the left hand side
- **F** for the front side
- **f** for the 2nd layer in from the front side
- **R** for the right hand side
- **r** for the 2nd layer in from the right hand side
- **D** for the down (bottom) side
- **d** for the 2nd layer up from the down (bottom) side, and
- **H** for the horizontal center slice (between u and d).

The Numbers:

Since the lower case L: l looks like the number 1, a letter by itself means to turn the side clockwise one quarter turn. A letter with a 2 following it means to turn the side two turns (halfway around). A letter with an apostrophe (') means to turn the side counterclockwise one quarter turn (a -1 can be used in place of an apostrophe, but the apostrophe takes up less space).

- For example, U F2f2 D' L1 means to rotate the upper side clockwise one quarter turn, the front side and 2nd layer in from the front side clockwise twice (half way around), the down (bottom) side counterclockwise one quarter turn, and the left side and second layer in from the left side clockwise one quarter turn. Look directly at the specified side indicated to determine which direction is clockwise or counterclockwise.
- For the central horizontal side, look at the cube **through the top side** to determine the clockwise direction.

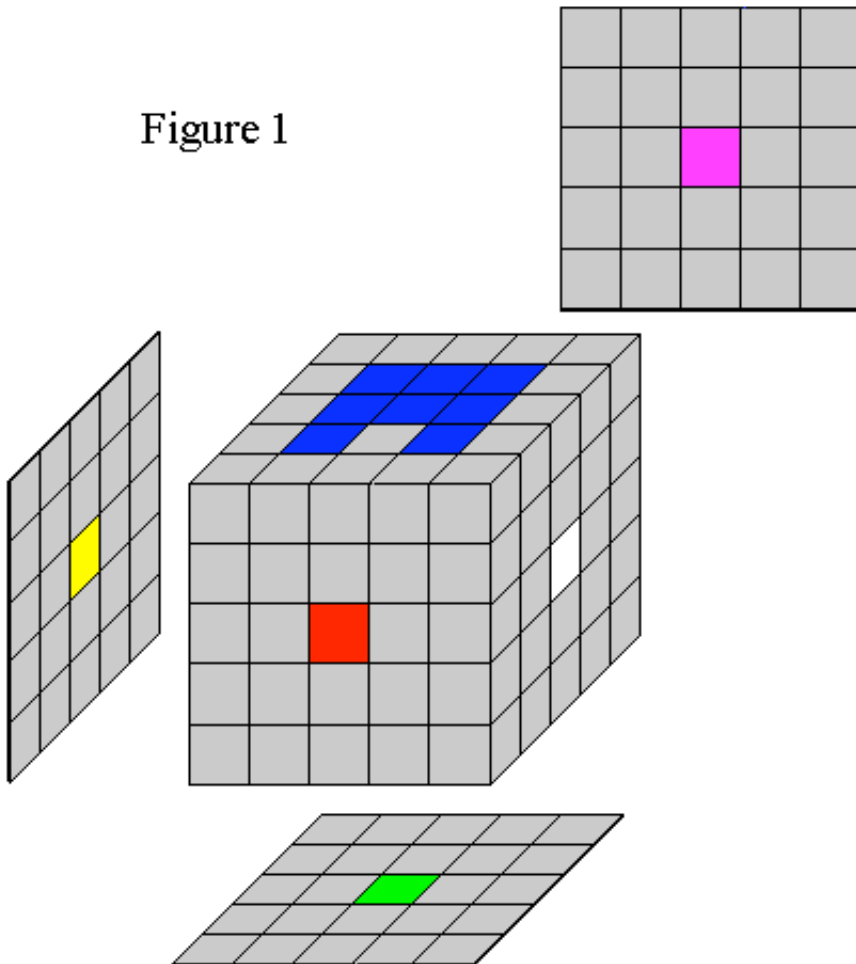
The Pieces (see the Key cube above):

- The piece in the center of each side is the center piece
- Next to each center is a "cross" piece since the cross pieces form a cross or + with the center piece
- Diagonally from each center piece are four "point" pieces
- Each side of the cube has five pieces along it: Corner, Wing, Edge, Wing, Corner

In the figures, any gray pieces represent pieces that don't matter and can be any color. To increase clarity, I have shown a lot of colored pieces. In most cases, the figures represent an example of the situation being described, while the colors don't have to match perfectly.

• Step 1: Solve the top points and crosses

Figure 1



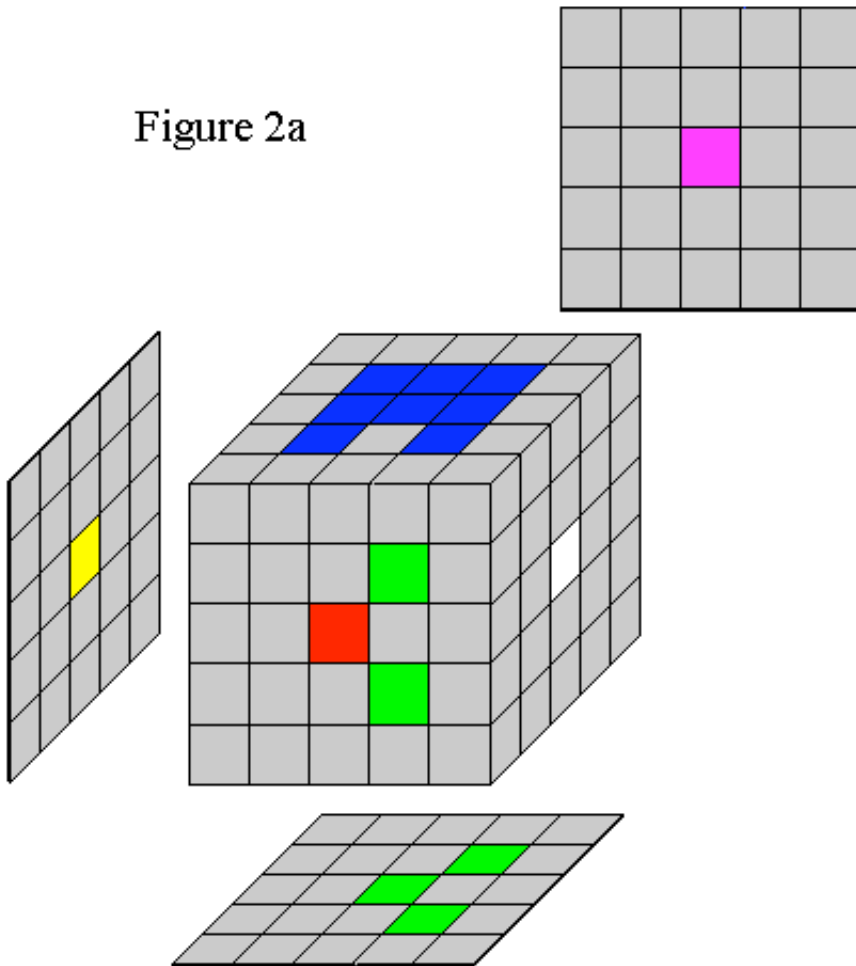
Pick a center piece to represent the first side of the cube solved (blue in these figures) and solve the points and crosses on that side. One cross may be left empty since it will be used as the "keyhole" later on.

• Step 2: Solve the bottom points

- Get the four green points on the down (bottom) face in place, using Move 2a and Move 2b as necessary.

2a. To move two points into position:

Figure 2a



Orient the cube as shown in Figure 2a, where the two points to be moved into place are on the right side of the front face while any green points already on the down face are on the right side of the down face, then perform Move 2a. You will need to rotate the front side and middle horizontal slice as necessary to place pieces into position.

Move 2a:
R'r' D2 Rr

- In words, rotate the Right side and 2nd layer in from the right side counterclockwise one turn, the down (bottom)side two turns (180 degrees) and the right side and 2nd layer in from the right side clockwise one quarter turn.

2b. To move 1 point into position:

Figure 2b

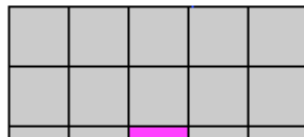
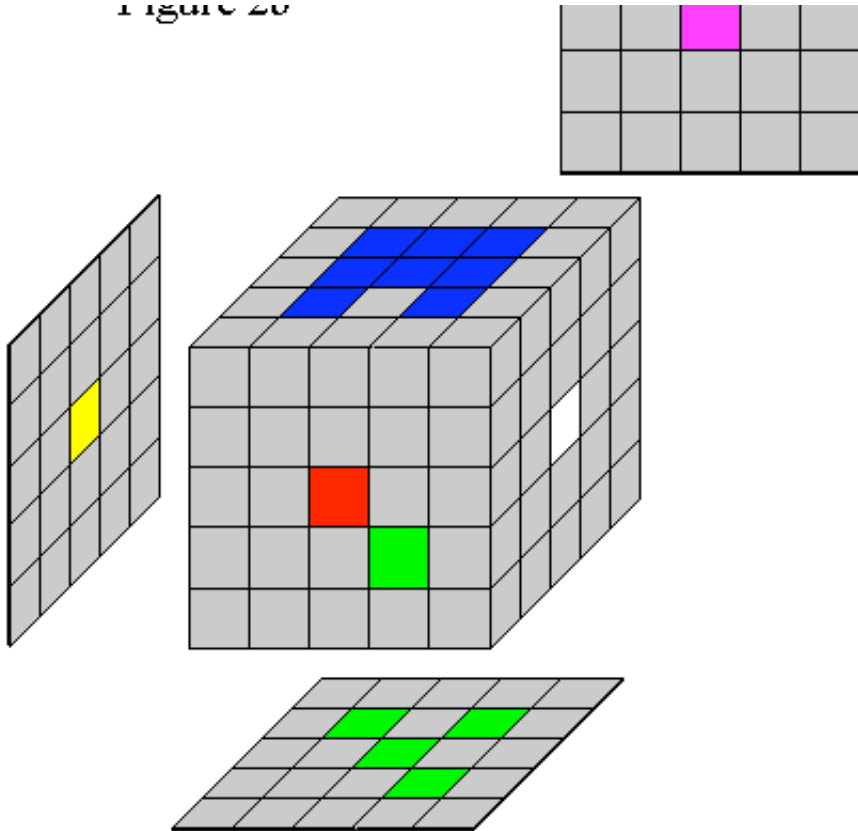


Figure 2b



Orient the cube as shown in Figure 2b, where the one point to be moved into place is on the right side of the front face while any green points already on the down face are on the right side of the down face, then perform Move 2b. You will need to rotate the front side and middle horizontal slice as necessary to place pieces into position.

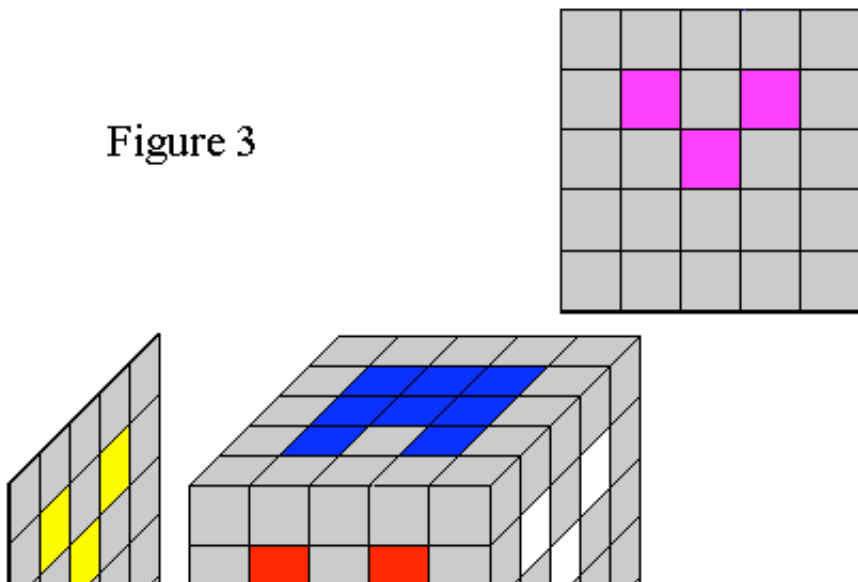
Move 2b:
 $R'r' D Rr$

• Step 3: Solve the remaining 16 points (on the sides)

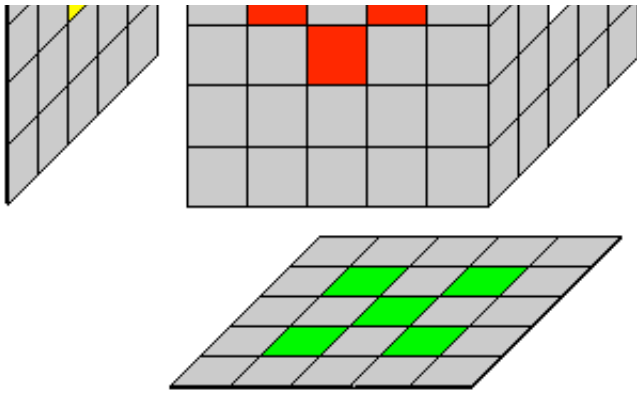
- Solve the remaining 16 points on the four sides. Accomplish this using Dd moves (bottom two layers) along with F (front side) moves.

First, position the top 8 points along the 4 sides:

Figure 3



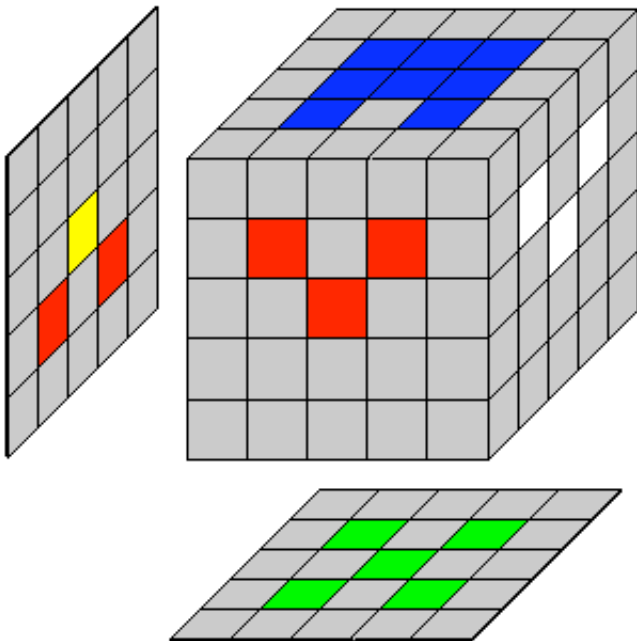
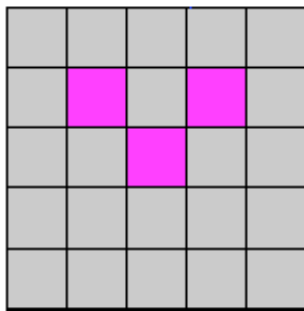
Rotate Dd freely to get Points next to their centers, then F to put the points up to the upper layers, yielding Figure 3. Now use Moves 3a and 3b as



needed.

3a. If the upper layer already has correctly placed points:

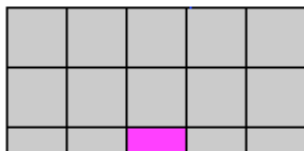
Figure 3a

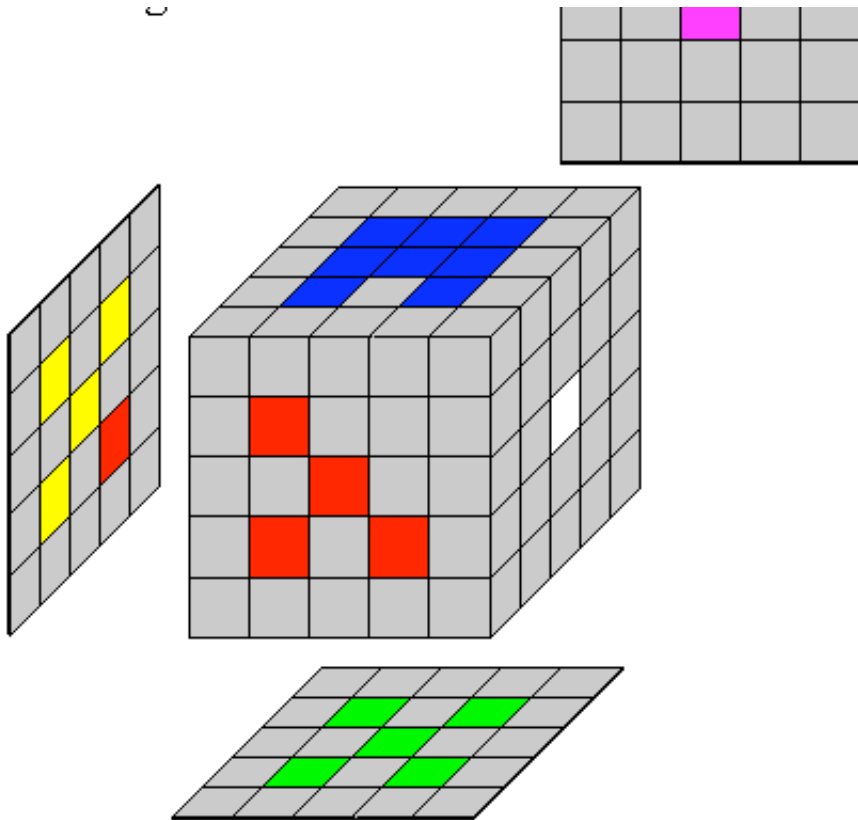


Move 3a:
F2 Dd F2 D'd'

3b. If a face has 3 solved points:

Figure 3b





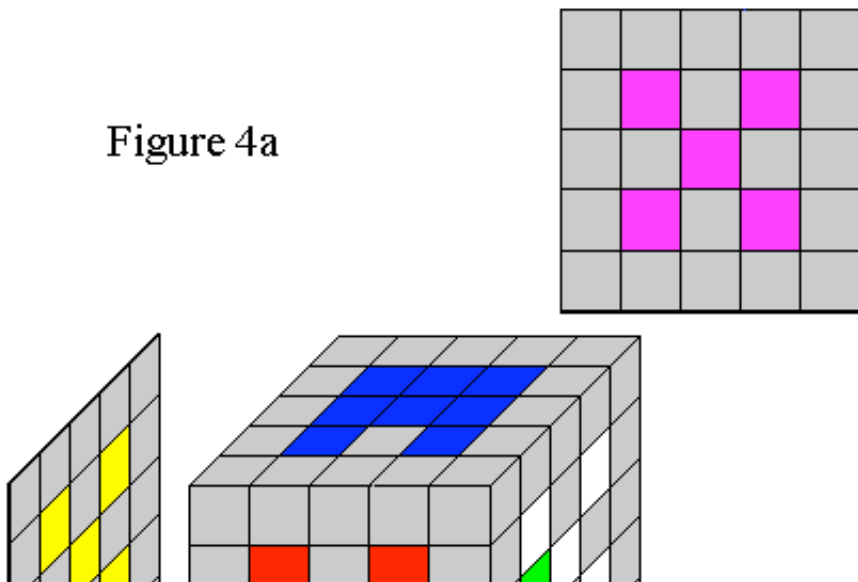
Move 3b:
Dd F D'd'

• Step 4: Complete the top and bottom crosses

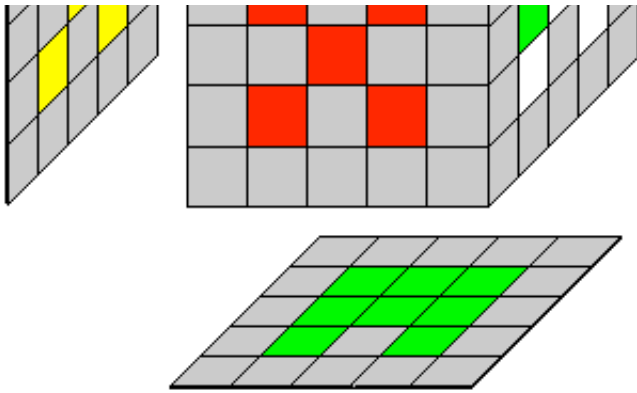
- Complete the Blue and Green crosses. Pretend the cube is a 3x3x3, ignoring the outside edges. Insert pieces into the bottom via the keyhole using Move 4a. During this process, it's all right if the horizontal center pieces move around.
- When the bottom is completed, finish the top using Move 4b to get the last piece into position.

4a. To insert a piece into the bottom:

Figure 4a



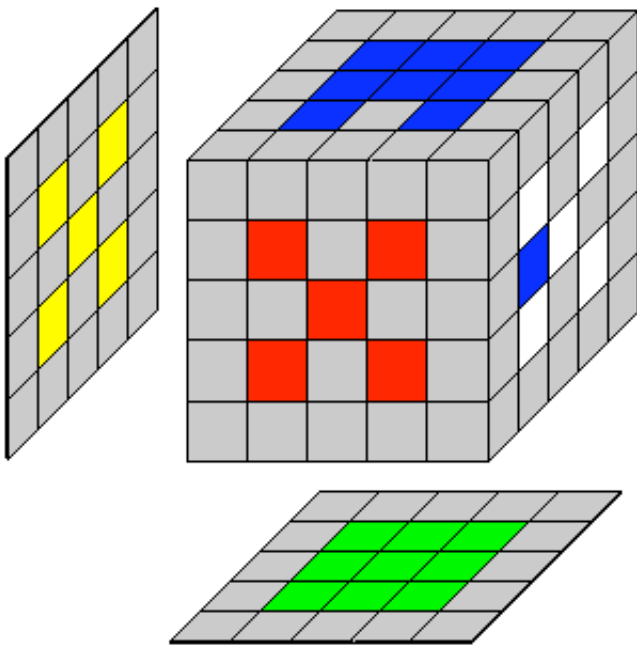
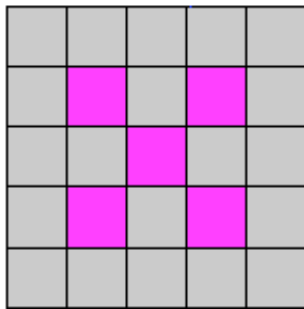
Move the piece to the right hand side by rotating H (the central, horizontal slice), then rotate the right hand side, bottom, and top until it looks like Figure 4a. Now perform move 4a.



Move 4a:
 $H' F'f H Ff$

4b. To complete the top (fill in the keyhole):

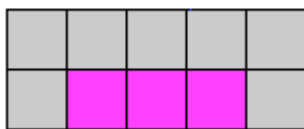
Figure 4b

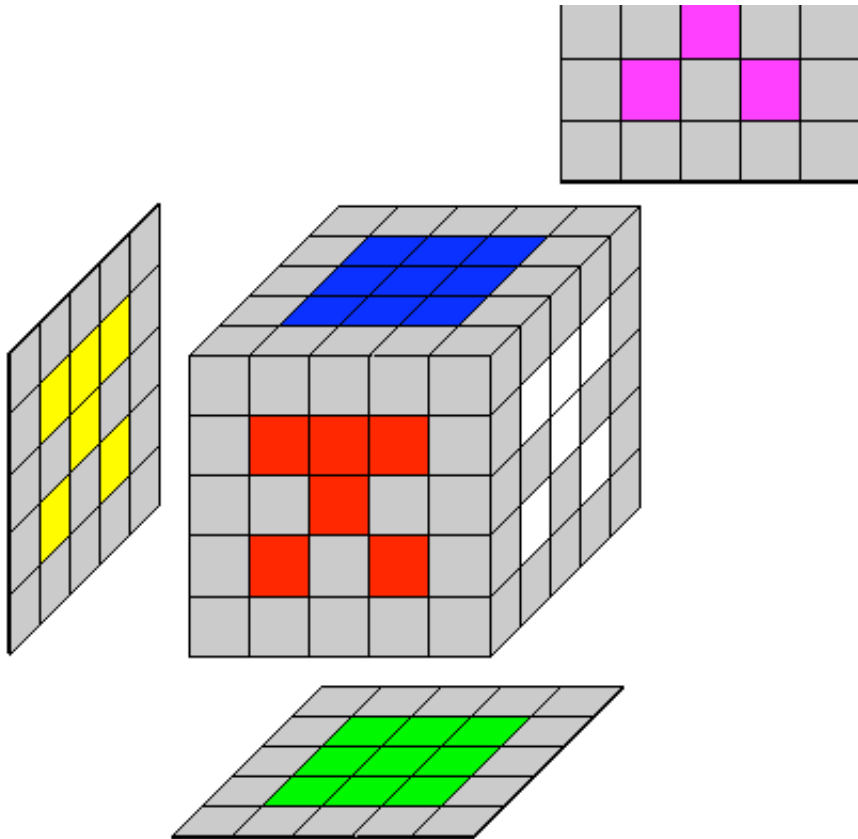


Move 4b:
 $Ff H' F'f H' Ff H F'f$
 H

• **Step 5: Complete the 16 remaining crosses**

Figure 5



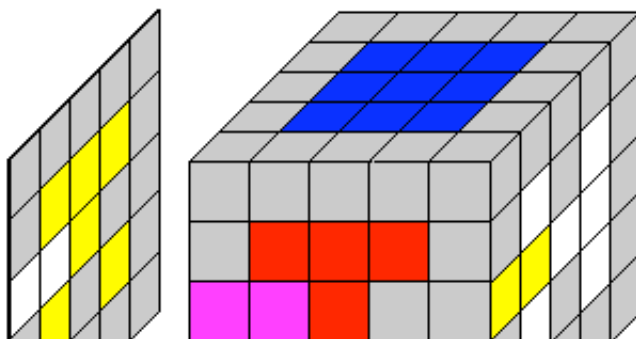
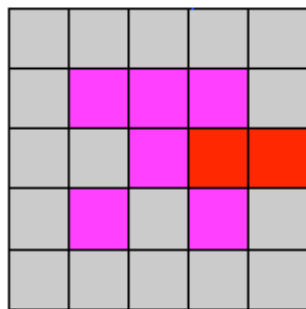


First complete the upper cross piece of each side using H and F moves, giving the cube in Figure 5.

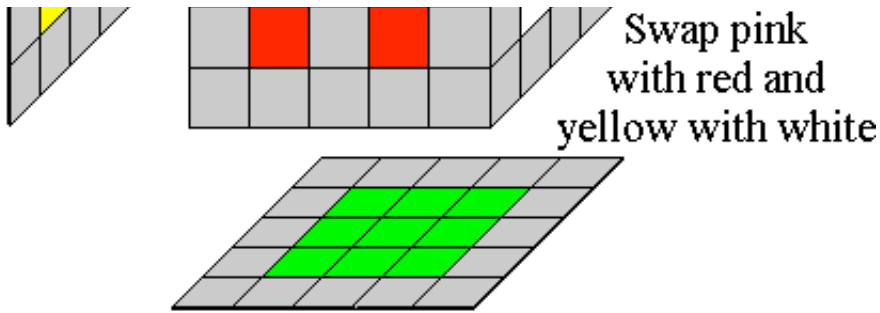
- Now use Move 5a to rotate eight of the equator pieces (swapping between opposite faces) or Move 5b to rotate between adjacent pieces.
- At times you will have the situation of having to swap only two Crosses with each other, rather than doing two swaps at the same time. Move 5c will succeed in swapping the two pieces.

5a. To exchange the location of eight of the equator pieces (Useful for symmetrically scrambled cubes):

Figure 5a

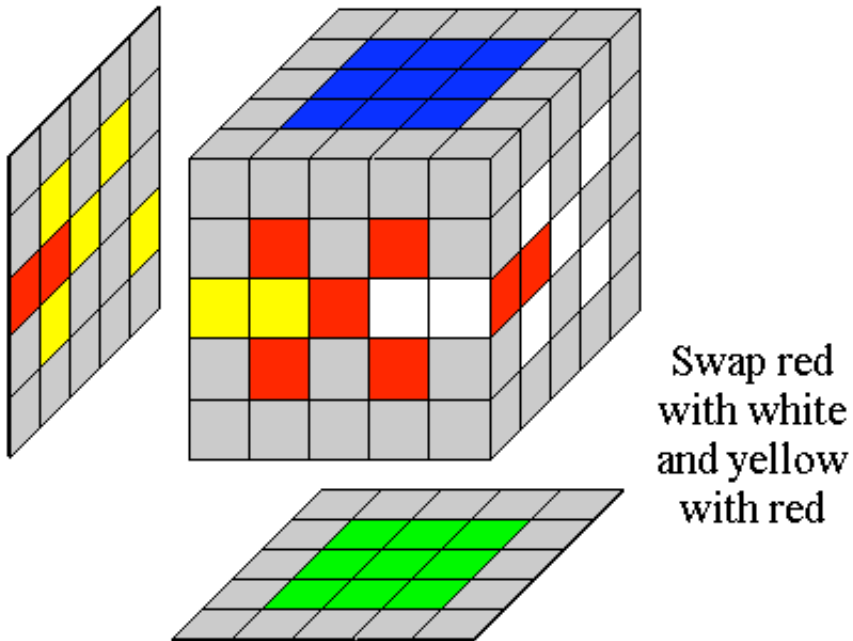
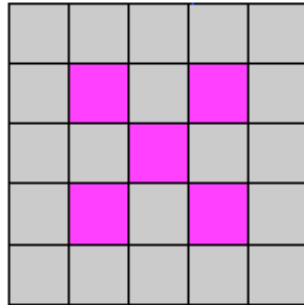


Move 5a:
F2f2 H F2f2 H'



5b. To swap adjacent pieces (more useful for highly scrambled cubes):

Figure 5b



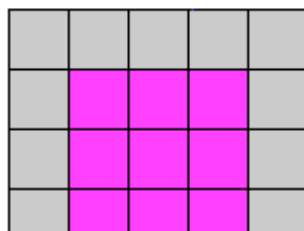
Move 5b:

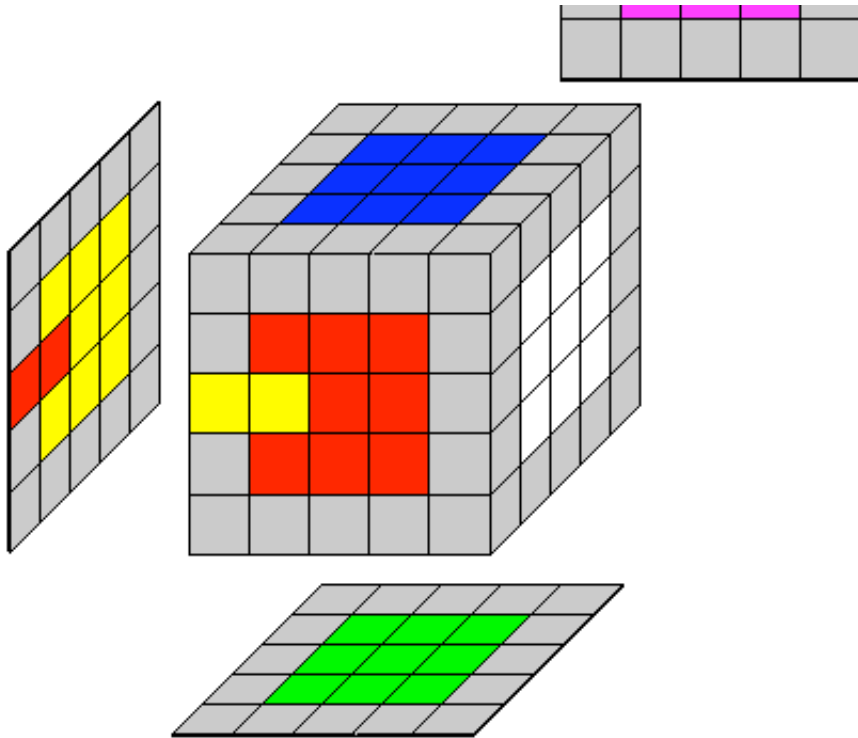
$H L2l2 H' L1 H' L1$

$H' L2l2 H L1 H L1$

5c. If only two pieces remain to be swapped:

Figure 5c



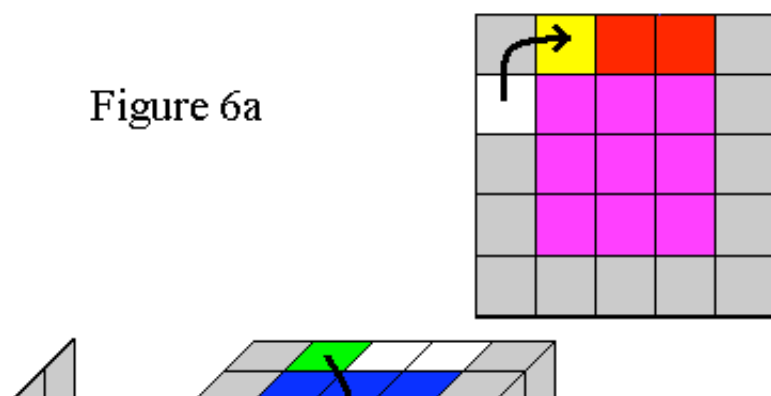


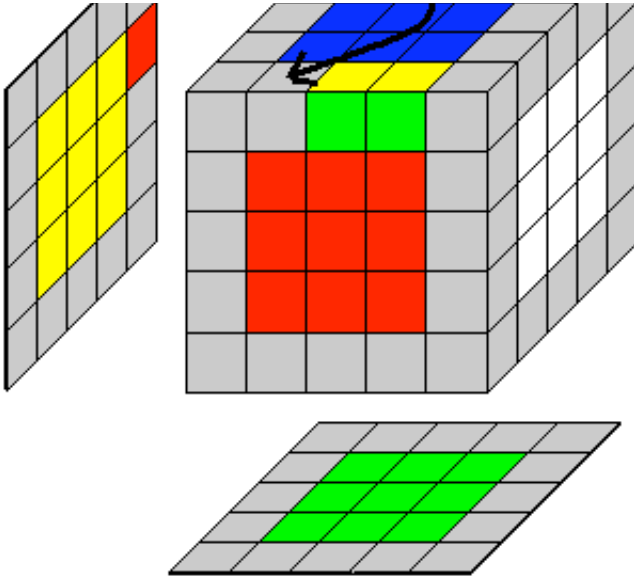
Move 5c:
 $U'u' R'$ then Move 5b
 then $R Uu$

• Step 6: Associate wings with their appropriate edge pieces

- Use Move 6 to join wings with their appropriate edge piece. When doing this move, be sure that a wing from the left side does not already match its neighboring edge. If it does, place a different wing piece on the left side so as to not mess it up.
- This process will take quite some time. After you have associated a few of the wings and edges, begin to pay attention to the movement of the piece from the back-left of the cube to the back-top of the cube, trying to align the piece with the top back edge.
- About 50% of the time you will get a "Parity Problem", meaning that you'll have either two or four wings left to position. Move 6a will not work in this situation, since it moves three pieces. Instead, use [Move 6d](#) to fix the parity problem.
- Moves 6b and 6c are other useful moves for orienting pieces during this process

6a. To associate two wings with their appropriate edges:

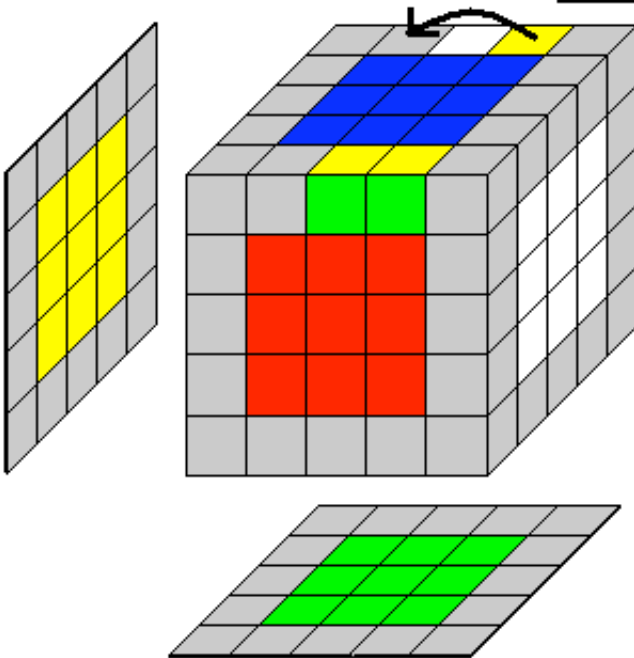
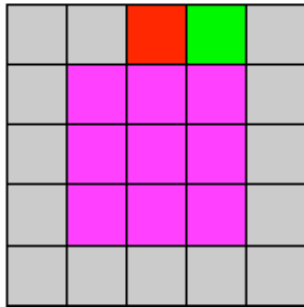




Move 6a:
 $L1 F' L F L' F$

6b. To move a wing from one side of the back to the other :

Figure 6b

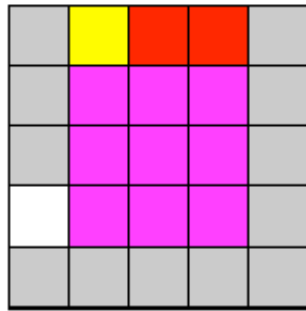


Move 6b:
 $B L' D' B2$

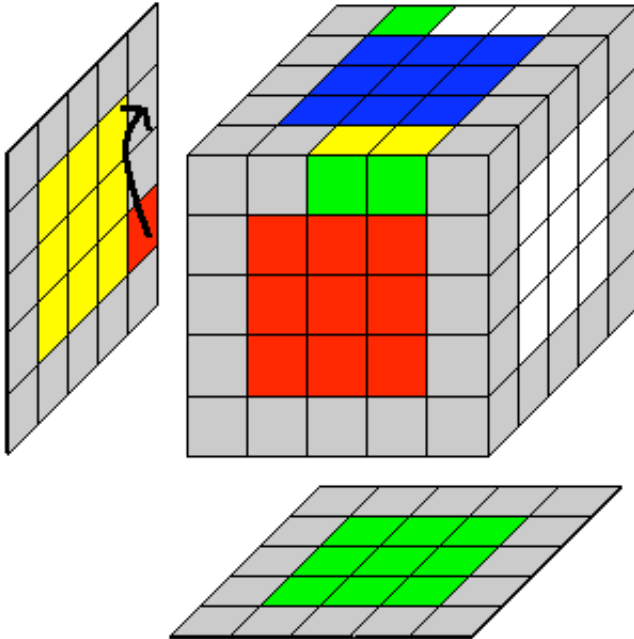
Remember, B means the back side and D means the down side

6c. To move a wing up to position it for Move 6a:

Figure 6c



Move red/white
wing up

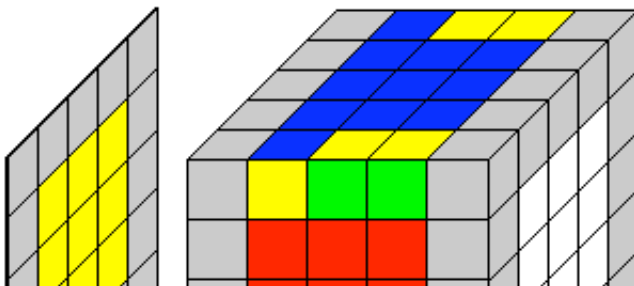
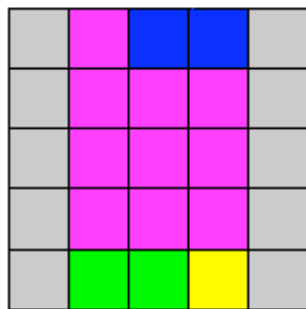


Move 6c:
B' R' B L' D' B2 R B

This is B' R' then Move 6b then
R B

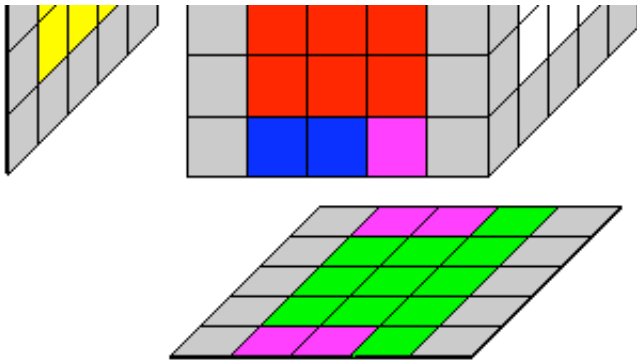
6d. To fix a Parity Error situation:

Figure 6d



Move 6d:
Rr U2 Rr U2 Rr U2
Rr U2 Rr U2

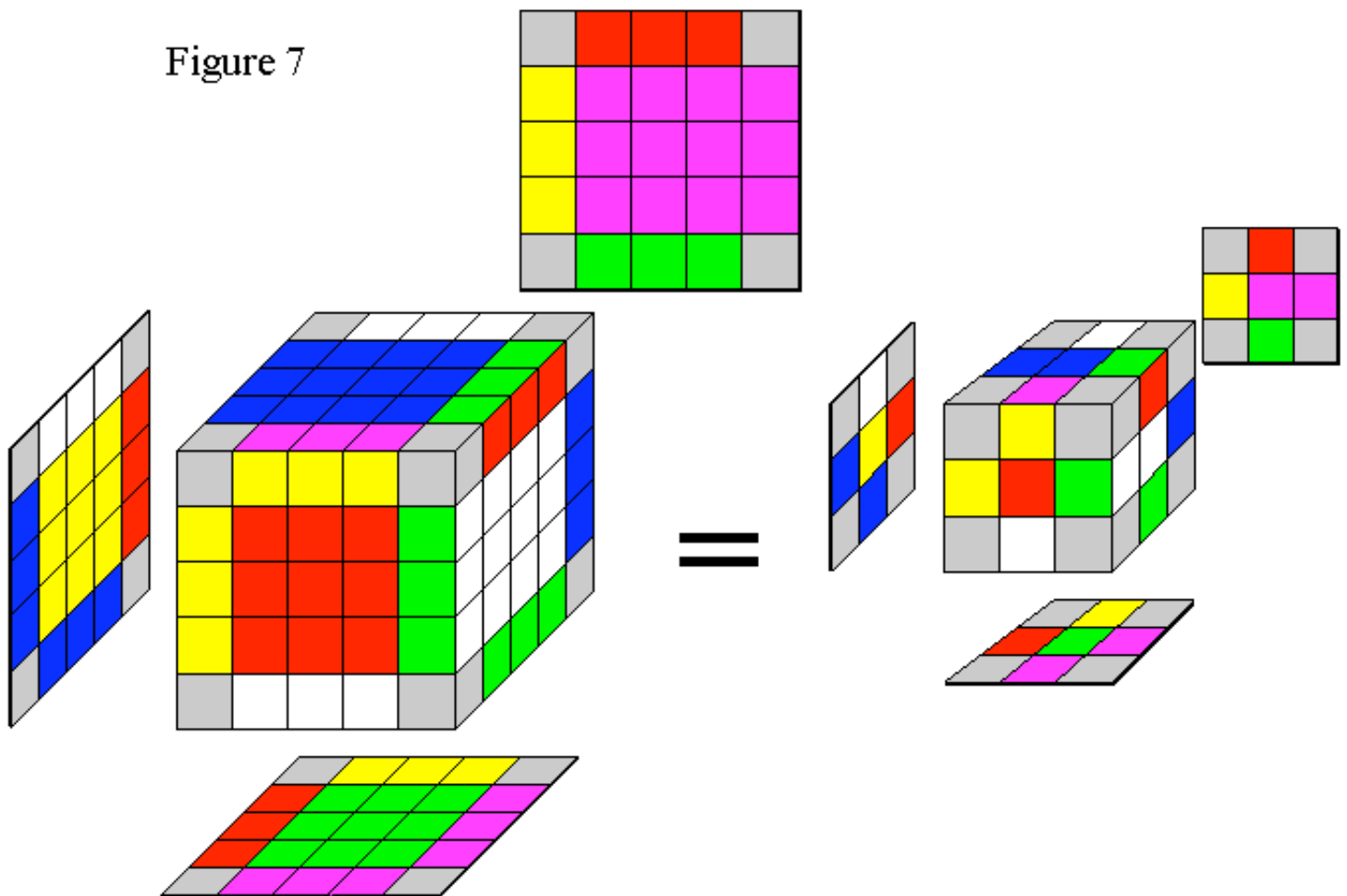
This is simply Rr U2 five



times.

• Step 7: Solve the 3x3x3

Figure 7



Use your favorite [3x3x3 solution](#) to solve the cube, since the edges and wings act like the single edge pieces of the 3x3x3, the corners directly correspond to the corners, and the centers, crosses, and points correspond to the center pieces of the 3x3x3, as shown in Figure 7.

I hope you have found these directions to be clear and complete, yet concise. If these directions help you to

solve the cube, I would enjoy hearing from you. If you have any questions, I would be happy to help you in any way possible.

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