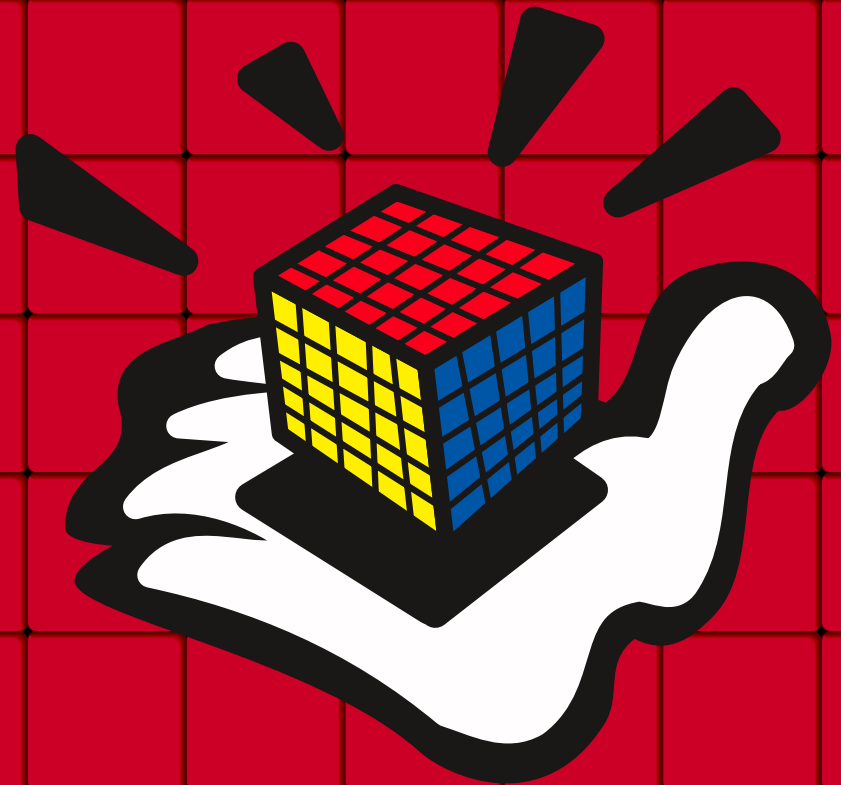




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SOLUTION HINTS BOOKLET

The Professor's Cube Solution Hints Booklet

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Professor's Cube - The Greatest Challenge

The Professor's Cube is the great big brother of the best selling, original Rubik's Cube and RUBIK'S Revenge.

The Professor's Cube presents a fascinating problem. You must mix up the puzzle with a few twists and turns and then try to match up the pieces until each face is a single colour. However, you are advised to read the first few sections of this booklet first.

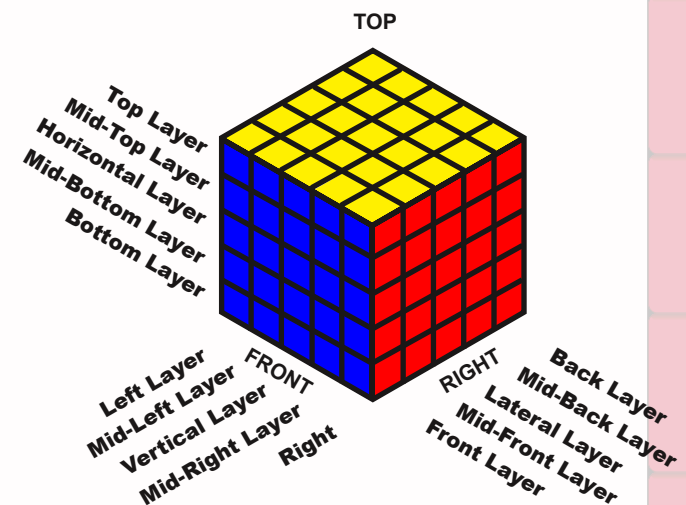
Try to solve the puzzle logically, but beware. The Professor's Cube has the charm of the original Cube, the devilry of RUBIK'S Revenge, and then some new surprises of its own.

With 6,198,327,054,929 times 1080 different combinations, the Professor's Cube is the greatest challenge of all.

Meet Your Professor's Cube

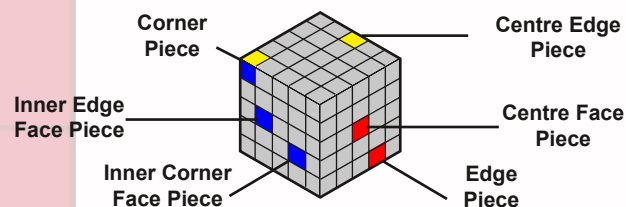
RUBIK'S Professor's Cube has 6 faces. Each face will be a single solid colour when the puzzle is solved.

The puzzle has 15 different layers and each can be turned independently of the others.



Meet Your Professor's Cube

The Professor's Cube is made of 98 smaller cube pieces. There are 54 Face Pieces. These have just a single colour and there are three different types: Centre Face (6); Inner Edge Face (24), and Inner Corner Face (24).



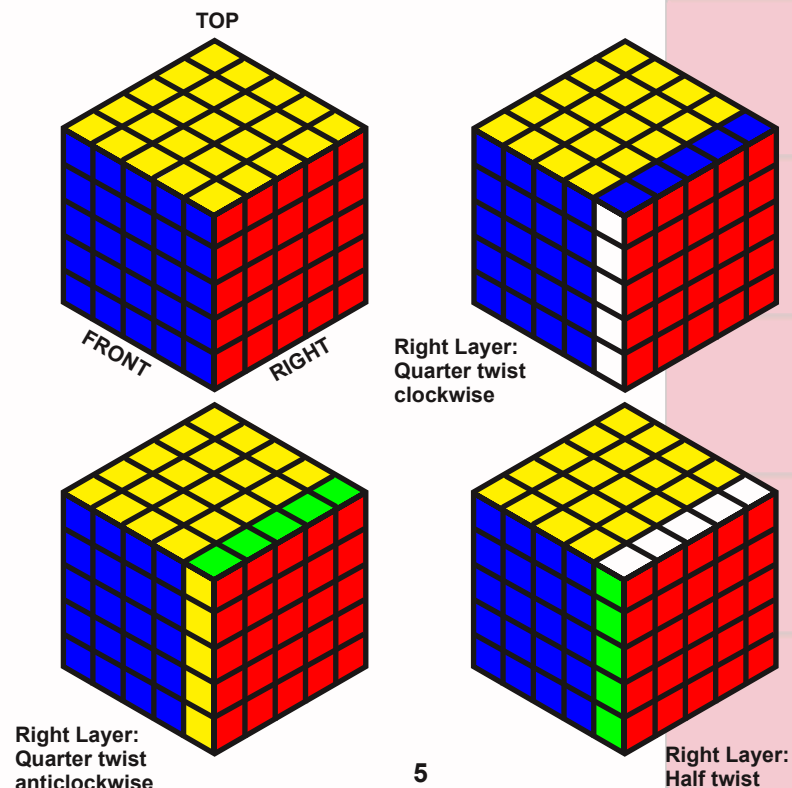
36 have two colours, of which 24 are Edge Pieces and 12 are Centre Edge Pieces. 8 have three colours - these are Corner Pieces.

When the puzzle is solved, Yellow is always opposite White; Blue is opposite Green, and Red is opposite Orange. Also, when the Yellow face is on top and Blue is to the front, Red is on the right.

Twisting Hints

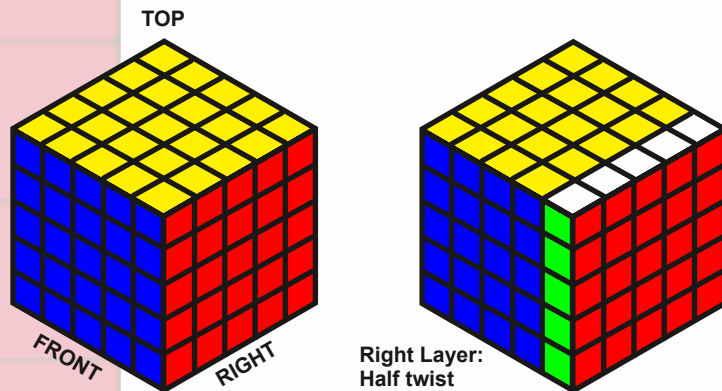
There are two kinds of twist that can be given to any layer: a quarter twist and a half twist.

A quarter twist rotates one layer of the puzzle 90° clockwise or anticlockwise. A half twist rotates one layer 180°. (Twisting a layer through three quarters is the same as twisting it one in the opposite direction.)

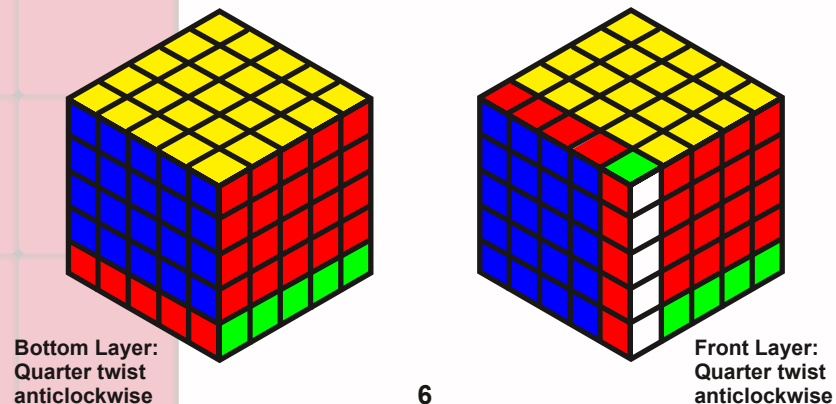


Twisting Hints

Think of the orientation. For example, moving the back right corner piece with a half twist will put it diagonally opposite and upside down.



If the same piece were instead moved by two quarter twists of two different layers, it would end in the same position but in a different orientation.



Twisting Hints

Whenever you make some moves, performing them backwards and in reverse order will return the puzzle to its original position.

Now try these exercises. In each, remember what layers you have moved and watch carefully to see how the pieces move.

Try a quarter twist of one layer, then a quarter twist of another that is at right angles to the first. Now do those two moves backwards to reassemble the Professor's Cube.

Next, try rotating 3 different layers, and then putting them back. Getting tricky, but if you managed it, try it a few times. Now try it with 4 moves. If you manage to reverse 4 moves, go for broke. Mess the puzzle up by making as many moves as you want. Now try solving it. There are some General Hints in the next section to guide you.

General Hints

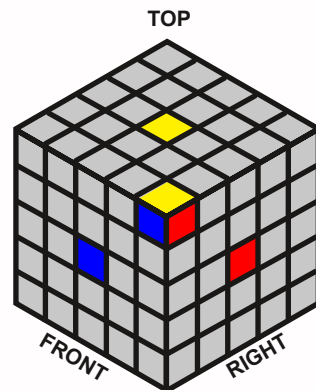
If you haven't jumbled your Professor's Cube up, now is the time to start.

Then, try to solve the puzzle logically.

As in Rubik's Cube, the centre face pieces determine which face is which colour. So they will determine which corner pieces go where. It is best to start from a corner piece.

Move a corner piece to the top layer so that it matches the colours of the adjacent centre face pieces, as here.

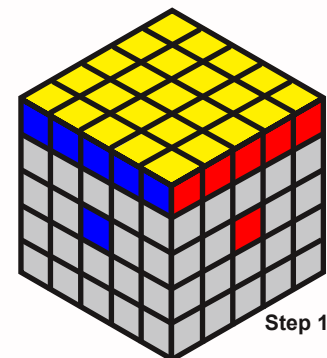
NB - Each type of piece can only move to a similar position, ie a centre edge piece can only ever move to a centre edge position.



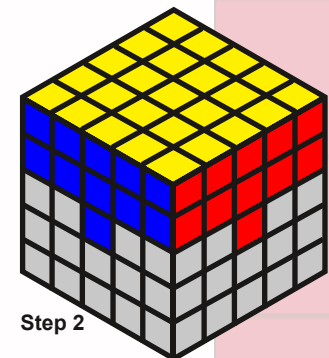
General Hints

Now that you can see which pieces must go where, try to build up on your chosen corner piece. You can do this in several ways. For example:

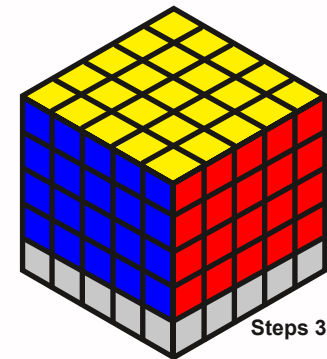
Layer by Layer:



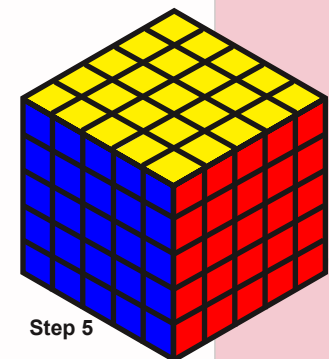
Step 1



Step 2



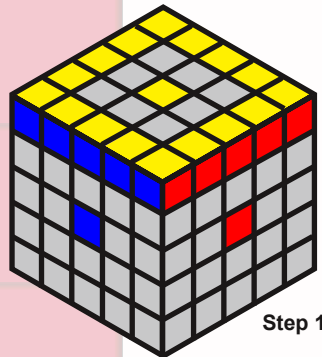
Steps 3 & 4



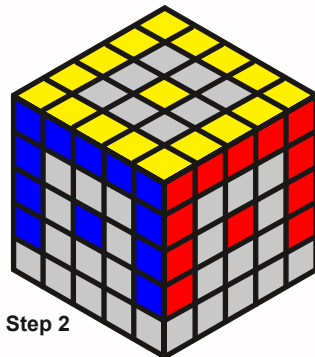
Step 5

General Hints

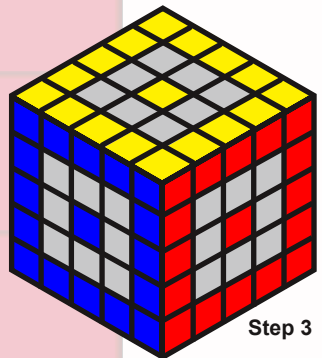
Corners, Edges, then Faces:



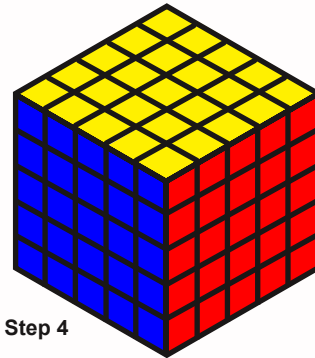
Step 1



Step 2



Step 3



Step 4

Some methods will prove more difficult than others, so try different ways. (There is one that avoids the problems the others may encounter.)

General Hints

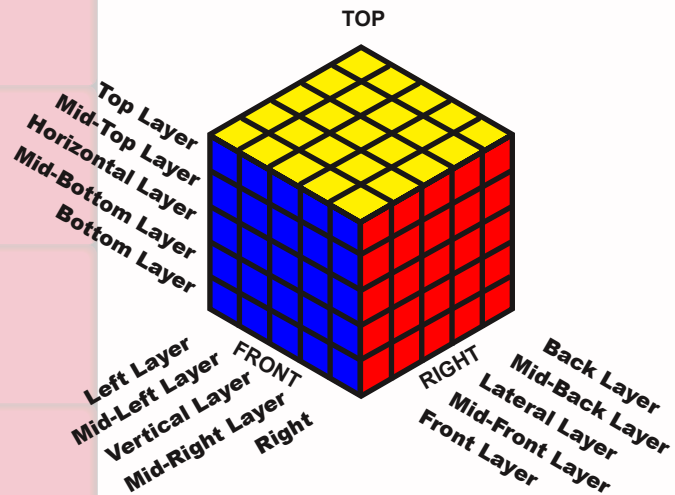
Whichever approach you use, you'll need different sequences: some that only affect inner corner face pieces; some that affect edge pieces; and so on.

Experiment with different sequences of twists to find out what they do. Try to find some that move pieces you have already positioned to one side and then put them back in place. You will often find that other pieces yet to be placed have either moved about or been reorientated. You should make a note of any effects that look useful so that you can repeat them to achieve a desired result.

To do this you'll need a system to record the moves and effects. Also, you will need to put numbered stickers onto your puzzle to differentiate between identical pieces. (This makes it easier to see what has moved where.) A system for recording your sequences is given in the next section.

Notation System

The layers of Rubik's Professor's Cube are as labelled here.



The front face is the one that is facing you when you start the sequence. Keep that face towards you throughout the sequence.

Notation System

Remember to look for sequences that do not disturb pieces already positioned: those pieces should end up where they started. Only record sequences that do this.

Movement of a layer is recorded by the layer's name and an arrow. The arrow gives the direction that the front or top edge of that layer is moved one quarter turn. Thus, for example:

Notation	Indicates:
Front ←	Front layer one quarter twist to left.
Back →	Back layer one quarter twist to right.
Top ←	Top layer one quarter twist to left.
Bottom ←	Bottom layer one quarter twist to left.
Left ↓	Left layer one quarter twist down.
Right ↑	Right layer one quarter twist up.
Mid-Left ↓	Mid-Left layer one quarter twist down.
Mid-Back ←	Mid-Back layer one quarter twist to left.
Lateral →	Lateral layer one quarter twist to right.

Notation System

Remember, the direction relates to the visible edge of that layer at the top or front.

With a half-twist, direction is irrelevant, so this is shown by replacing the arrow with a 2. So, **Front2** means that the front layer is rotated a half-twist.

You may want to twist two layers together. This should be recorded as, say:

Horizontal+Mid-Bottom ←

You may find it tricky to twist a mid-layer on its own. It's easier to twist it with the adjacent face layer and then turn the face layer back.

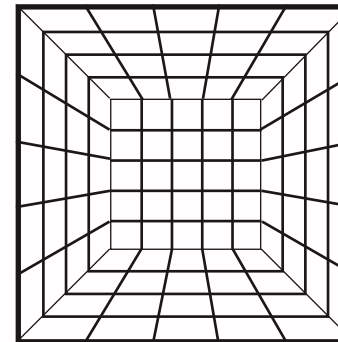
There is a reason for the way the puzzle is viewed. This enables you to see how the pieces already positioned are moved out of the way and where they go to. If you can see this clearly, you will find it much easier to remember the sequence.

Notation System

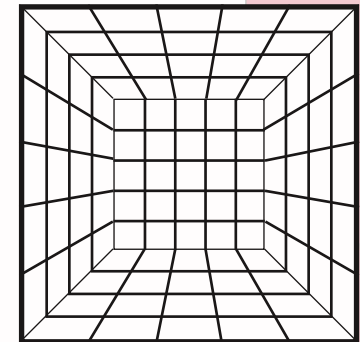
To note the start and finish positions, so that you can see what has happened after a sequence of moves, copy and use the diagrams below.

This is the one used in this booklet. It represents the view of the bottom face (and a false perspective of the sides) you would have if you tilt the puzzle away from you.

Start Position



End Position

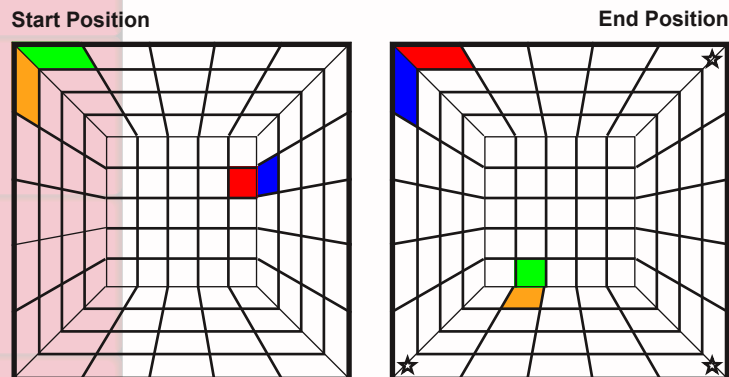


SEQUENCE:

Notation System

Just record the effect that is relevant. For example, suppose you find a sequence that moves one edge piece from the bottom layer to the mid-top layer while leaving the pieces in the top layer and the other edge pieces in the mid-top layer unchanged. This is the only important effect. You do not need to note what happens to the other pieces on the bottom, mid-bottom or horizontal layers. All you need to know is the start position of the piece that ended in the mid-top layer.

For example, your start and end position should simply be noted as here (along with your sequence of moves).



(Asterisked pieces remain unmoved.)

Notation System

For each sequence that you find, there will also be a Reverse, a Mirror, and a Reverse Mirror.

Suppose you have found a sequence that reads:

Mid-Left ↓; Bottom ←; Mid-Left ↑; Bottom2;
Mid-Left ↓; Bottom ←; Mid-Left ↑.

The Reverse is the sequence in reverse order with the direction of arrows also reversed, as here:

Mid-Left ↓; Bottom →; Mid-Left ↑; Bottom2;
Mid-Left ↓; Bottom →; Mid-Left ↑.

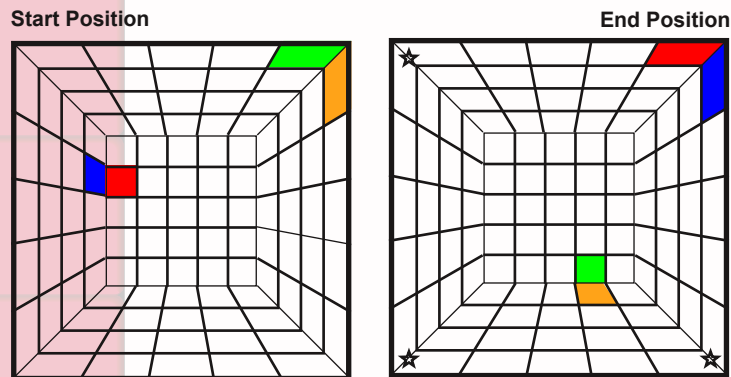
The start position of the Reverse is the end position of the original sequence, and the Reverse ends with the start position of the original. So, if you perform a sequence and then wish to put the puzzle back as it was, simply do the Reverse of the one you did to restore the original position.

Notation System

A mirror sequence is a left-right reflection of the original. This swaps any left and right layers and reverses all arrows pointing left or right. Arrows pointing up or down remain the same. The Mirror of the previous sequence is:

Mid-Right ↓; Bottom →; Mid-Right ↑; Bottom2;
Mid-Right ↓; Bottom →; Mid-Right ↑.

Start and end positions are reflections of those for the original sequence. For example, the diagrams here are the reflections of those on page 16.



Whenever you find a useful sequence, make sure you also record these other versions. If you have trouble finding your own sequences, some useful ones are given in the next section.

Professor's Cube Sequences

This section contains some general sequences that can handle a variety of situations. (There are other more specific sequences for you to find.)

The system of notation is as described in the previous section.

The start and end positions show the *bottom* face. (That is, the view you would have if you tilt the puzzle away from you.) Start and end positions for the Reverse and Mirror versions have been omitted for reasons of space.

Always hold the puzzle so that the piece you wish to move is in the appropriate start position.

Asterisked pieces remain unmoved as do all the other pieces of the puzzle.

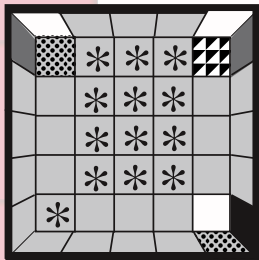
Professor's Cube Sequences

Three-Corner Shuttle

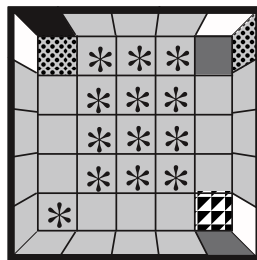
This shuttles a triangle of corner pieces one place clockwise around the bottom layer.

Left ↓; Bottom →; Left ↑; Front ←; Bottom →; Front →;
Left ↓; Bottom ←; Left ↑; Bottom ←.

Start Position



End Position



Reverse

Bottom →; Left ↓; Bottom →; Left ↑; Front ←;
Bottom ←; Front →; Left ↓; Bottom ←; Left ↑.

Mirror

Right ↓; Bottom ←; Right ↑; Front →; Bottom ←;
Front ←; Right ↓; Bottom →; Right ↑; Bottom →.

Reverse Mirror

Bottom ←; Right ↓; Bottom ←; Right ↑; Front →;
Bottom →; Front ←; Right ↓; Bottom →; Right ↑.

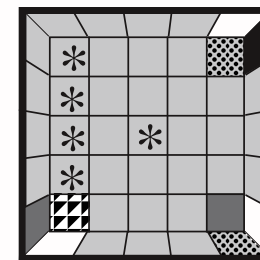
Professor's Cube Sequences

Three-Corner Flipper

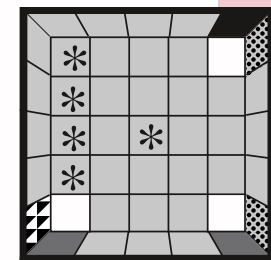
This flips three corner pieces on the bottom layer without changing their position.

Right ↓; Bottom ←; Right ↑; Bottom ←; Right ↓;
Bottom2; Right ↑; Bottom2.

Start Position



End Position



Reverse

Bottom2; Right ↓; Bottom2; Right ↑; Bottom →;
Right ↓; Bottom →; Right ↑.

Mirror

Left ↓; Bottom →; Left ↑; Bottom →; Left ↓;
Bottom2; Left ↑; Bottom2.

Reverse Mirror

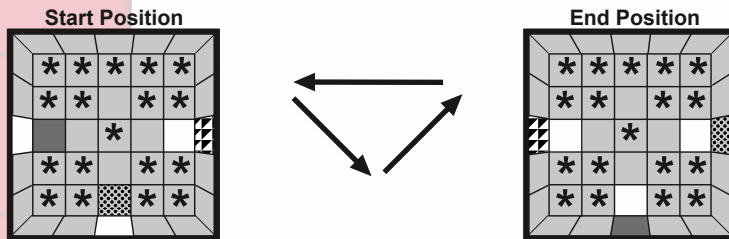
Bottom2; Left ↓; Bottom2; Left ↑; Bottom ←;
Left ↓; Bottom ←; Left ↑.

Professor's Cube Sequences

Centre Edge Shuttle 1

This shuttles three centre edge pieces around a face and flips two of them.

Vertical ↓ ; Bottom ← ; Vertical ↑ ; Bottom 2;
Vertical ↓ ; Bottom ← ; Vertical ↑ .



Mirror & Reverse

The Mirror and Reverse of this are the same.

Vertical ↓ ; Bottom → ; Vertical ↑ ; Bottom 2;
Vertical ↓ ; Bottom → ; Vertical ↑ .

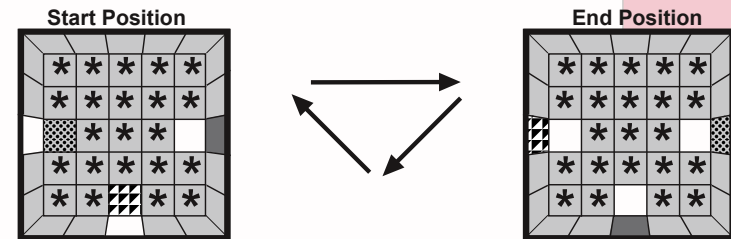
The two Centre Edge Shuttles can also be used to move a centre edge piece from the bottom layer to the horizontal layer. To do this, a face or two must first be twisted (and reversed at the end of the sequence). The Centre Edge Lifter on page 24 is an example of this.

Professor's Cube Sequences

Centre Edge Shuttle 2

This shuttles three centre edge pieces around a face and flips two of them.

Back ← ; Lateral ← ; Bottom → ; Back → ; Bottom ← ;
Lateral → ; Bottom → ; Back ← ; Bottom ← ; Back → .



Reverse

Back ← ; Bottom → ; Back → ; Bottom ← ; Lateral ← ;
Bottom → ; Back ← ; Bottom ← ; Lateral → ; Back → .

Mirror

Back → ; Lateral → ; Bottom ← ; Back ← ; Bottom → ;
Lateral ← ; Bottom ← ; Back → ; Bottom → ; Back ← .

Mirror Reverse

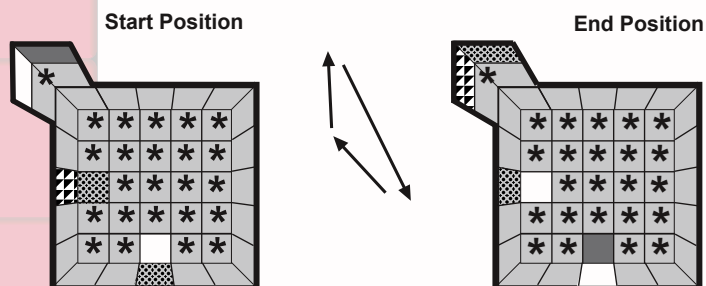
Back → ; Bottom ← ; Back ← ; Bottom → ; Lateral → ;
Bottom ← ; Back → ; Bottom → ; Lateral ← ; Back ← .

Professor's Cube Sequences

Centre Edge Lifter

This shuttles three centre edge pieces, lifting one from the bottom layer into the horizontal layer.

Front ←; Left ↓; Vertical ↓; Bottom →; Left ↑; Bottom ←;
Vertical ↑; Bottom →; Left ↓; Bottom ←; Left ↑; Front →.



Reverse

Front ←; Left ↓; Bottom →; Left ↑; Bottom ←; Vertical ↓;
Bottom →; Left ↓; Bottom ←; Vertical ↑; Left ↑; Front →.

Mirror

Front →; Right ↓; Vertical ↓; Bottom ←; Right ↑; Bottom →;
Vertical ↑; Bottom ←; Right ↓; Bottom →; Right ↑; Front ←.

Mirror Reverse

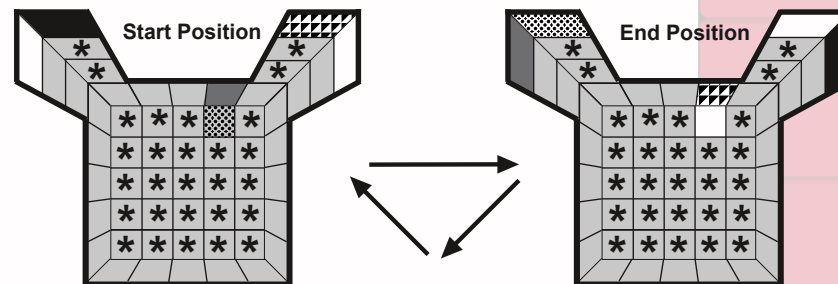
Front →; Right ↓; Bottom ←; Right ↑; Bottom →; Vertical ↓;
Bottom ←; Right ↓; Bottom →; Vertical ↑; Left ↑; Front ←.

Professor's Cube Sequences

High-Edge Shuttle

By shuttling a triangle of edge pieces clockwise around the front layer, this moves an edge piece from the bottom layer into the mid-top layer.

Left ↓; Bottom →; Left ↑; Mid-Top ←;
Left ↓; Bottom →; Left ↑; Mid-Top →.



Reverse

Mid-Top ←; Left ↓; Bottom ←; Left ↑;
Mid-Top →; Left ↓; Bottom →; Left ↑.

Mirror

Right ↓; Bottom →; Right ↑; Mid-Top →;
Right ↓; Bottom ←; Right ↑; Mid-Top ←.

Reverse Mirror

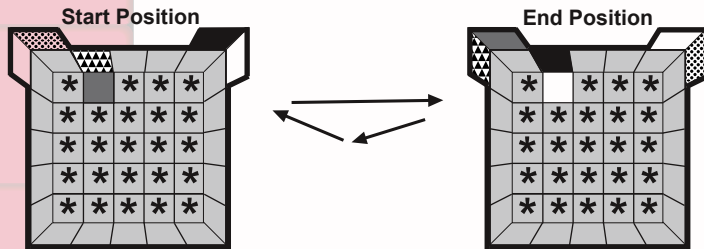
Mid-Top →; Right ↓; Bottom →; Right ↑;
Mid-Top ←; Right ↓; Bottom ←; Right ↑.

Professor's Cube Sequences

Low-Edge Shuttle

This shuttles a triangle of edge pieces clockwise around the front layer, moving an edge piece from the bottom layer to the mid-bottom layer.

Left ↓ ; Bottom ← ; Left ↑ ; Mid-Bottom ← ;
Left ↓ ; Bottom → ; Left ↑ ; Mid-Bottom → .



Reverse

Mid-Bottom ← ; Left ↓ ; Bottom ← ; Left ↑ ;
Mid-Bottom → ; Left ↓ ; Bottom → ; Left ↑ .

Mirror

Right ↓ ; Bottom → ; Right ↑ ; Mid-Bottom → ;
Right ↓ ; Bottom ← ; Right ↑ ; Mid-Bottom ← .

Reverse Mirror

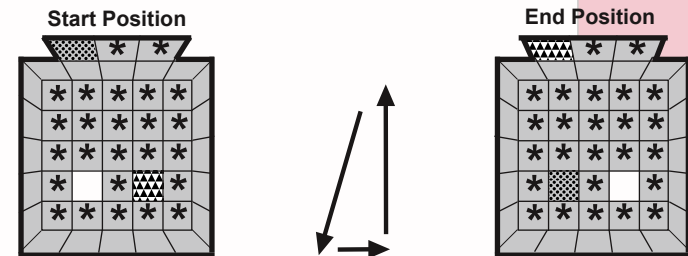
Mid-Bottom → ; Right ↓ ; Bottom → ; Right ↑ ;
Mid-Bottom ← ; Right ↓ ; Bottom ← ; Right ↑ .

Professor's Cube Sequences

Inner Corner Face Lifter

This shuttles three inner corner face pieces, lifting one from the bottom face to the front face.

Mid-Left ↓ ; Mid-Right ↓ ; Bottom ← ; Mid-Right ↑ ;
Bottom → ; Mid-Left ↑ ; Bottom ← ; Mid-Right ↓ ;
Bottom → ; Mid-Right ↑ .



Reverse

Mid-Right ↓ ; Bottom ← ; Mid-Right ↑ ; Bottom → ;
Mid-Left ↓ ; Bottom ← ; Mid-Right ↓ ; Bottom → ;
Mid-Left ↑ ; Mid-Right ↑ .

Mirror

Mid-Left ↓ ; Mid-Right ↓ ; Bottom → ; Mid-Left ↑ ;
Bottom ← ; Mid-Right ↑ ; Bottom → ; Mid-Left ↓ ;
Bottom ← ; Mid-Left ↑ .

Reverse Mirror

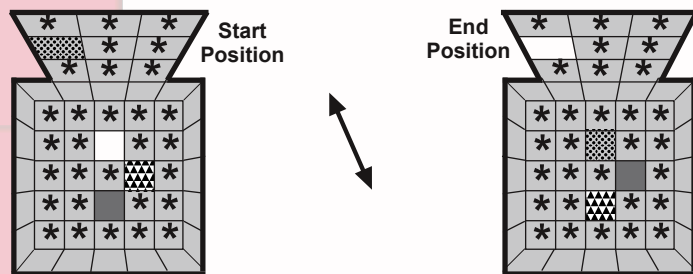
Mid-Left ↓ ; Bottom → ; Mid-Left ↑ ; Bottom ← ;
Mid-Right ↓ ; Bottom → ; Mid-Left ↓ ; Bottom ← ;
Mid-Left ↑ ; Mid-Right ↑ .

Professor's Cube Sequences

Inner Edge Face Lifter

This swaps two pairs of inner edge face pieces, lifting one from the bottom face into the front face.

Mid-Left \uparrow ; Mid-Right2; Top \rightarrow ;
Vertical 2; Mid-Front 2; Vertical 2; Mid-Front 2;
Top \leftarrow ; Mid-Right 2; Mid-Left \downarrow .



Mirror

Mid-Right \uparrow ; Mid-Left2; Top \leftarrow ;
Vertical 2; Mid-Front 2; Vertical 2; Mid-Front 2;
Top \rightarrow ; Mid-Right 2; Mid-Left \downarrow .

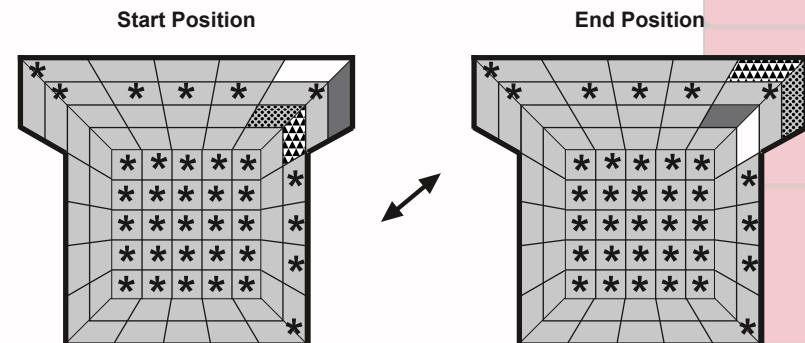
Each of these two sequences reverses itself.

Professor's Cube Sequences

Mid-Swapper

This swaps two edge pieces between the front mid-top and mid-bottom layers.

Front2; Mid-Bottom \leftarrow ; Front2; Mid-Bottom2;
Front2; Mid-Bottom \rightarrow ; Front2.



Mirror

Front2; Mid-Bottom \rightarrow ; Front2; Mid-Bottom2;
Front2; Mid-Bottom \leftarrow ; Front2.

In both cases the reverse is the same as the sequence.

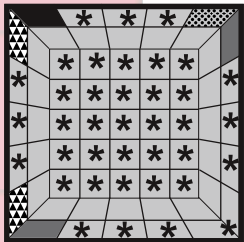
Professor's Cube Sequences

Mid-Shuttle

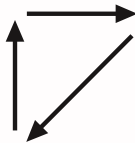
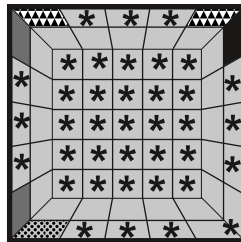
This shuttles a triangle of edge pieces clockwise around the mid-bottom layer.

Back \leftarrow ; Bottom2 ; Left \downarrow ; Bottom \leftarrow ; Left \uparrow ;
 Mid-Bottom \leftarrow ; Left \downarrow ; Bottom \rightarrow ; Left \uparrow ;
 Mid-Bottom \rightarrow ; Bottom2 ; Back \rightarrow .

Start
Position



End
Position



Reverse

Back \leftarrow ; Bottom2 ; Mid-Bottom \leftarrow ; Left \downarrow ;
 Bottom \leftarrow ; Left \uparrow ; Mid-Bottom \rightarrow ; Left \downarrow ; Bottom \rightarrow ;
 Left \uparrow ; Bottom2 ; Back \rightarrow .

Professor's Cube Sequences

Mirror

Back \rightarrow ; Bottom2 ; Right \downarrow ; Bottom \rightarrow ; Right \uparrow ;
 Mid-Bottom \rightarrow ; Right \downarrow ; Bottom \leftarrow ; Right \uparrow ;
 Mid-Bottom \leftarrow ; Bottom2 ; Back \leftarrow .

Reverse Mirror

Back \rightarrow ; Bottom2 ; Mid-Bottom \rightarrow ; Right \downarrow ;
 Bottom \rightarrow ; Right \uparrow ; Mid-Bottom \leftarrow ; Right \downarrow ;
 Bottom \leftarrow ; Right \uparrow ; Bottom2 ; Back \leftarrow .

With this sequence, as with any that shuttles three pieces, performing it twice is the same as doing the Reverse once.

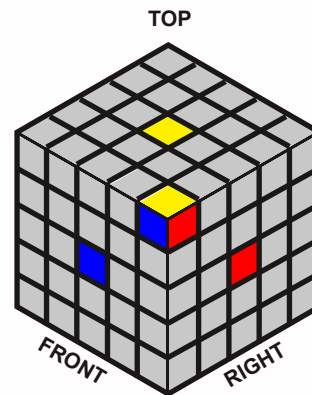
You should try and solve the puzzle for yourself using the sequences provided. They are all you need - plus a little imagination.

If you are still having trouble, a full solution guide is given in the next section.

Solving the Professor's Cube

Once you start twisting, it's easy to get the Professor's Cube completely muddled. Don't worry - it can always be put right from any state. The following steps will help you solve the puzzle.

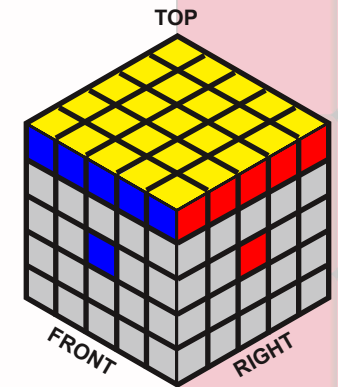
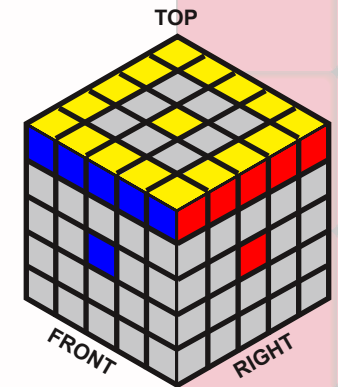
1. Select any face as your 'top' face. Then move one corner piece into position so that it matches the centre pieces of the adjacent faces as in the diagram.
2. Find a second piece that's a side-by-side match and twist it into place.



NB - Of two identically coloured edge pieces, only one can be placed in a particular position with the colours correctly orientated.

Solving the Professor's Cube

3. Position all edge and corner pieces of the top face. If you have trouble, use the sequences. (Shuttles can all be used if you turn the puzzle so that your top face becomes the relevant face in the sequence diagrams.)
4. Position the face pieces of the top layer. Face Lifter sequences may be used.



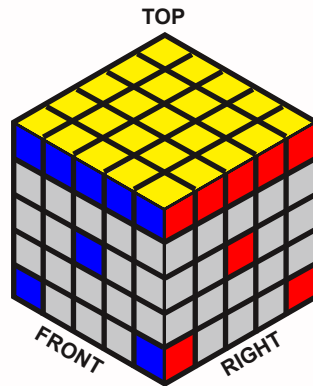
NB - When using Lifters, you may first need to twist faces to align the pieces to be moved. Note these so you can reverse them after.

Solving the Professor's Cube

5. Next, and most importantly, position the remaining corners and centre edge pieces.

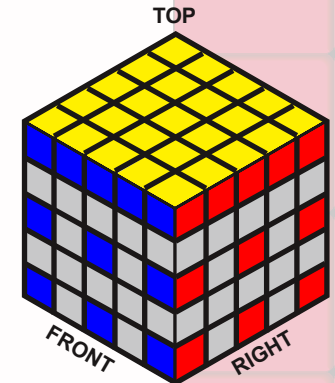
6. Start by using the Three-Corner Shuttle to correctly position the corner pieces. If two seem to be correctly placed, turn the layer so one of the other two is correctly placed. The Three-Corner Shuttle will then position the other three. If the two that need to be swapped are diagonally opposite, you will need to use the Three-Corner Shuttle twice.

7. Once the corner pieces are in the right positions, use the Three-Corner Flipper to orientate them correctly.

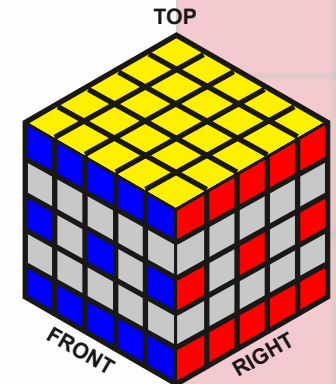


Solving the Professor's Cube

8. Next use the Centre Edge Lifter to correctly position and orientate the centre edge pieces in the horizontal layer. Then use Centre Edge Shuttles to position and orientate the centre edge pieces of the bottom face.

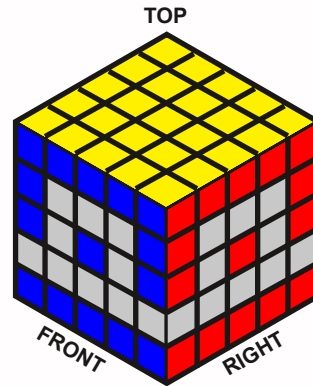


9. Use the Low-Edge and/or High-Edge Shuttles to drop the edge pieces into their correct positions on the bottom face. If a piece you want is already in the bottom face, use one of the shuttles to remove it.

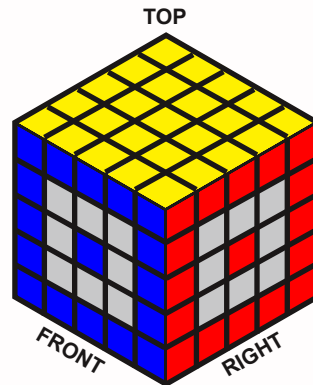


Solving The Professor's Cube

10. Use the Mid-Swapper to correctly position the edge pieces of the mid-top layer. If a piece you want is already in that layer, use the Swapper to remove it.)

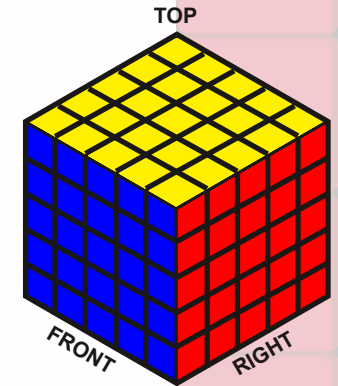


11. Turn the mid-bottom layer so that only one edge piece is correctly positioned. Then use the Mid-Shuttle to correctly position and orientate the other three. If two diagonally opposite edge pieces need to be swapped, you will need to use the Shuttle twice.

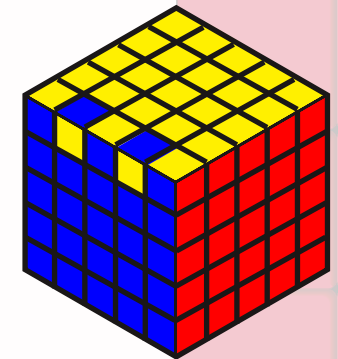


Solving The Professor's Cube

12. Finally, complete the remaining centre faces by using the Inner Edge Lifter and Inner Corner Lifter.



Once you've mastered the puzzle, try solving it layer by layer from the top down. There's a fifty-fifty chance you'll either solve it or reach the position shown here. From this, see if you can find the shortest sequence to solve the puzzle.



There are also a variety of patterns that can be made. The challenge is far from over.