START HERE

Solve the conference cube

A beginner guide to rebuilding all six pictures, including the centre squares.

The cube uses ordinary 3 x 3 mechanics. Solve the edges and corners first, then rotate any misaligned centres using the final section. If only your centres are wrong, go straight to page 9.



SOLVED REFERENCE - FOLD THIS NET INTO A CUBE

S - UNSW Space opposite N - Nightjar

C - Cobra opposite M - Satellites

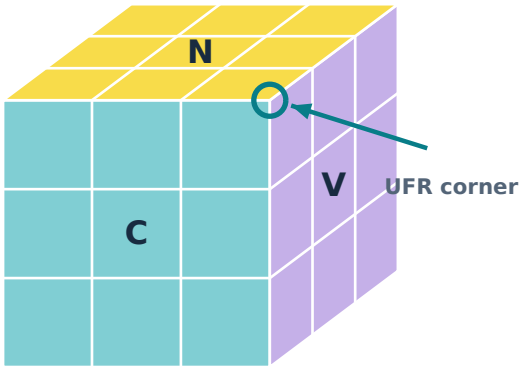
V - Viper opposite T - Conference

The letters identify pictures in our diagrams. They are not move instructions. For example, S means a piece of the UNSW Space picture; R in a move sequence means turn the right face.

BEFORE YOU TURN

Read the moves

One letter means turn one outer layer. Read each sequence from left to right.



U - Up / top

D - Down / bottom

F - Front / facing you

B - Back / away from you

R - Right

L - Left

A plain letter, such as R, means a 90-degree clockwise turn as if looking directly at that face. R' means 90 degrees anticlockwise. R2 means 180 degrees. On the bottom or back face, imagine moving your head to look at that face before deciding clockwise.

Example

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

Right clockwise; top clockwise; right anticlockwise; top anticlockwise.

Turn a face or turn the whole cube?

A move letter turns one layer. A regrip turns the whole cube in your hands to choose a new front face. Regrip only when the instructions say to; keep the same grip throughout a move sequence.

Edges, corners and centres

Edge: two picture fragments on one piece. Corner: three fragments. Centre: one fragment, always on the same face. UFR is the corner where the Up, Front and Right faces meet. DFR is the equivalent bottom corner.

> **The working orientation for pages 3-8**
>
> Keep UNSW Space (S) on the bottom and Nightjar (N) on top. You may choose different front faces as instructed. Any colour in a diagram is only a visual aid; use the picture letter and the reference net.

Some Space fragments are completely black. Use the other stickers on the same physical piece to identify it. Black fragments are not interchangeable.

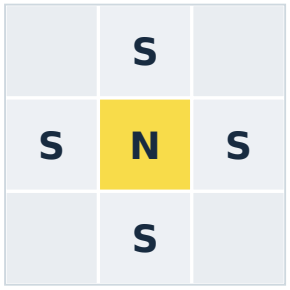
STEP 1

Build the Space cross

Hold Nightjar on top and UNSW Space on the bottom. Ignore centre angles for now.

Make a daisy on the top

Find the four edge pieces that contain a fragment of the Space picture. Bring their Space stickers to the top face around the Nightjar centre. Corners do not matter yet.



Top view: the daisy

Build one petal at a time. Before turning a side face to lift a petal, turn U to put an empty top edge above that face. This protects petals you have already placed.

Useful ways to lift a petal

1. Space sticker faces down: hold that edge at the bottom-front, then turn F2 to bring Space to the top.
2. Space sticker is in the middle belt: hold it at front-right. If Space faces front, use R. If Space faces right, use F'. Clear the destination top slot first.
3. Space sticker faces sideways in the top or bottom layer: turn that side face a quarter turn to put the edge in the middle belt. Then use the previous case. Move other petals out of the way first.

Send each petal to the bottom

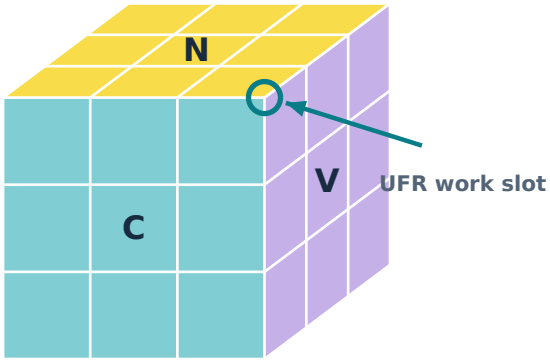
1. Choose a Space petal on top. Turn U until its side-facing fragment belongs to the same picture as the centre directly below it.
2. Turn that side face 180 degrees. The Space fragment moves to the bottom, with its other fragment on the correct side face.
3. Repeat for the other three petals. The bottom now has a Space cross and all four side edge stickers belong to their correct pictures.

> **Checkpoint**
>
> Check both stickers of every cross edge. A Space cross alone is not enough: the four side stickers must also match their faces. A rotated centre picture is fine at this stage.

STEP 2

Complete the first layer

Keep Space on the bottom. Insert the four corners around its cross.



Choose a corner containing Space. Its other two pictures tell you which bottom corner it belongs in. Regrip the whole cube so that destination is DFR.

Turn U until the chosen corner is directly above its destination at UFR. Its Space sticker may point in any direction.

Insert the corner

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

Repeat the complete four-move block until the chosen corner is solved.

Check only after all four moves. The corner may move away and come back during the repetitions.

1. Stop when that corner is at DFR with Space facing down and its other two fragments on their correct faces.
2. Choose another Space corner. Regrip to put its destination at DFR, position the piece above it with U, and repeat.

If a corner is already in the bottom

If it is in the wrong place or twisted, hold that corner at DFR and do the four-move block once to lift it into the top layer. Then set up and insert it correctly.

> **Checkpoint**
>
> All eight pieces surrounding the Space centre are now in their correct positions. The bottom row of every side picture is also correct. The centre square itself may still be rotated; leave it for later.

Do not judge a first-layer corner from its Space fragment alone. Match the other two fragments to their picture faces as well.

STEP 3

Solve the middle belt

Keep Space on the bottom and Nightjar on top.

1. Find a top-layer edge with no Nightjar fragment. Turn U until its side-facing fragment matches the picture of a side centre. Hold that matching side at the front.
2. Look at the edge's top-facing fragment. Its picture belongs either on your right or on your left. Use the corresponding sequence below.

Insert the top-front edge to the RIGHT

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

Insert the top-front edge to the LEFT

```
U' L' U L U F U' F'
```

3. Repeat until the four middle-belt edges are correct. Regrip and align the top-front edge before every insertion.

No suitable edge on top?

A middle edge is probably in the wrong slot or flipped. Put that slot at front-right and perform the right-insertion sequence to eject its edge to the top. Then solve it normally. Use the left sequence for a front-left slot.

> **Checkpoint**
>
> The bottom two layers are now correct. Only the top layer and the six centre orientations can remain wrong. On the top layer, every remaining edge and corner contains a Nightjar fragment.

Why the logos still look slightly wrong

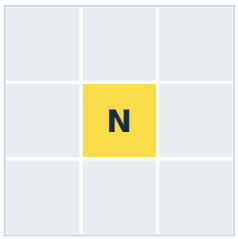
Ordinary solving fixes the positions and orientations of all edges and corners, but does not track the angle of each centre. It is normal for a rotated centre square to interrupt an otherwise correctly assembled picture.

STEP 4

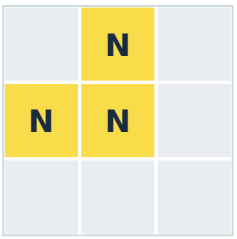
Make the Nightjar cross

Look only at which top-face edge stickers belong to Nightjar. Ignore corners.

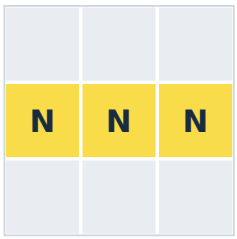
Keep Nightjar on top. The four edge positions on that face form one of these patterns. Grey squares and corner stickers do not matter.



Dot



L: back + left



Line: left + right

For an L: hold its Nightjar edges at BACK and LEFT

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

This turns the correctly held L directly into a cross.

For a line: hold its Nightjar edges LEFT to RIGHT

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

This turns the correctly held line directly into a cross.

For a dot: do the L sequence once. Inspect the result, hold the resulting line left-to-right, then use the line sequence. If the cross is already present, continue to page 7.

> **Turn the whole cube to set up the pattern**
>
> Keep Nightjar on top, but regrip around the vertical axis to put the L or line in the illustrated orientation. Do not tip Nightjar onto a side face.

A legal cube at this stage has 0, 2 or 4 Nightjar edges pointing up. If you see 1 or 3, first recheck that the fragments really belong to Nightjar.

STEP 5

Put the top pieces in place

Keep Nightjar on top. Its corner stickers do not need to face upwards yet.

A. Match the four top edges to their side pictures

Turn U and inspect the side-facing stickers of the cross. Find a position where at least two match their side pictures. If all four match, skip to part B.

Swap the FRONT and RIGHT top edges

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

If the two wrong edges are adjacent, regrip so they are front and right. The two correct edges will be back and left. Then do this sequence once.

If the two wrong edges are opposite: do the sequence once from any front. Then turn U again to find two matching edges, regrip so the correct pair is back and left, and do the sequence again. Finally align U if needed.

B. Put the four corners in their home positions

A top corner is in its home position when its three pictures are the same three pictures as the centres around that corner. It may still be twisted.

Cycle the other three top corners

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

If one corner is in its home position, hold it at UFR. Do the sequence and inspect; repeat if necessary. The held corner stays in place.

If no corner is in its home position: do the sequence once from any front. Find the corner now in its home position, hold it at UFR, and continue. If all four are already in place, move on.

> **Checkpoint**
>
> All four top edges are correct, and each top corner belongs to its current location. Only corner twists and centre angles remain. Do not turn U between checks in part B, because that moves the corners away from their home locations.

STEP 6

Turn the last corners

This step temporarily disturbs the lower layers. Follow the complete procedure.

1. Keep Nightjar on top. Regrip once so that a corner whose Nightjar sticker does not face up is at UFR. From here, keep the same front face until this entire step is finished.

Twist the corner at UFR

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

Repeat the complete block until that corner's Nightjar sticker faces up.

This normally takes two or four repetitions. Always finish the final D move before checking.

2. Turn U only to bring the next twisted top corner into the same UFR work slot. Do not rotate the whole cube to bring it there.
3. Repeat the four-move block until that corner's Nightjar sticker faces up. Continue, using U between corners, until every top corner has Nightjar facing up.
4. Finally turn U to align the top layer with its side pictures. The lower layers should now be restored.

> **Keep going while the lower layers look scrambled**
>
> The lower-layer disruption cancels when all last-layer corners have been handled. Do not repair the lower layers halfway through, change the front face, or stop in the middle of a four-move block.

Ordinary solve complete

All edges and corners should now be correct. Every outer picture fragment is in place, but some centre squares may be rotated. Use pages 9-10 to finish those centres.

If a non-centre fragment still does not fit, revisit its piece identity and the previous steps. Centre corrections cannot repair a misplaced edge or corner.

STEP 7 / CENTRE TOOLKIT

Finish the pictures

Use this section only after every edge and corner is solved.

Compare each centre square with its surrounding picture. Classify it as correct, upside-down (180 degrees), or sideways (90 or 270 degrees). No fixed global front face is needed now: judge each centre against its own ring of eight correct fragments.

A - Turn ONE centre 180 degrees

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

Do the six-move block TWICE.

Hold the target centre on top. After both blocks, every other piece and centre is restored.

B - Turn TWO ADJACENT centres a quarter turn

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

Do the six-move block THREE TIMES.

Hold the two targets on TOP and RIGHT. Both centres turn 90 degrees clockwise, each viewed directly face-on. Every other piece and centre is restored.

C - Turn TWO OPPOSITE centres a quarter turn

```
U R L F2 B2 R' L'
D' R L F2 B2 R' L'
```

Do both lines ONCE, as one continuous 14-move sequence.

Hold the targets on TOP and BOTTOM. The top centre turns 90 degrees clockwise; the bottom turns 90 degrees anticlockwise, each viewed face-on.

> **Three rules for every centre sequence**
>
> Regrip the whole cube to choose the target faces before starting. Keep that grip throughout the sequence. Finish all repetitions before checking: the rest of the cube is restored only at the end.

STEP 7 / COMPLETE PROCEDURE

Any centre pattern, solved

You only need the three sequences on page 9. Their directions do not need memorising.

1. Count the sideways centres. On an otherwise solved legal cube, there are 0, 2, 4 or 6. Choose any two. If they are adjacent use B; if opposite use C.
2. Complete algorithm B or C, including every repetition shown on page 9. Each chosen centre will now be either correct or upside-down. Either outcome is useful.
3. Repeat with the remaining sideways centres until none remain. Do not pair an already correct or upside-down centre at this stage.
4. Fix every upside-down centre with A. Regrip to put each target on top, then perform both blocks. All six pictures are now complete.

Why this procedure always works

A quarter turn changes a sideways centre into either a correct or an upside-down centre. Pairing removes two sideways centres at a time; the final half-turn corrections act on one centre at a time. There is no need to undo your ordinary solve.

> **Example: two adjacent centres both lean clockwise**
>
> Put them on top and right, then do B. They both become upside-down. Use A on each in turn. If a centre instead becomes correct after B, simply leave it alone.

If something does not add up

Only one sideways centre? Recheck the other five and the outer pieces. An isolated 90-degree error cannot occur after a legal ordinary solve.
Pieces scrambled after a centre sequence? Check the grip, primes and repetition count. Repeat B's six-move block three times; perform C's full two-line sequence once.
Blank patch difficult to identify? Inspect all stickers on the same physical piece against the reference net.

READ THE CENTRE AGAINST ITS SURROUNDING PICTURE



Correct



Sideways



Upside-down

KEEP THIS PAGE HANDY

Move reference

Use the setup instructions on the relevant page before applying a sequence.

First-layer corner

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

Repeat complete blocks; page 4.

Middle edge to right

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

Match top-front edge first; page 5.

Middle edge to left

```
U' L' U L U F U' F'
```

Match top-front edge first; page 5.

Top cross: L

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

L at back + left; page 6.

Top cross: line

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

Line left to right; page 6.

Top edges

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

Wrong edges front + right; page 7.

Top corner positions

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

Home corner at UFR; page 7.

Top corner twists

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

Keep fixed front; move U between corners; page 8.

One centre: 180 degrees

```
(U R L U2 R' L') x 2
```

Target on top; page 9.

Adjacent centres: 90 degrees

```
(U' R2 U2 R' U2 R2) x 3
```

Targets top + right; page 9.

Opposite centres: 90 degrees

```
See full two-line sequence on page 9.
```

Targets top + bottom; page 9.

Plain letter = clockwise; prime (') = anticlockwise; 2 = half turn. Clockwise is always judged looking directly at the face being turned.

Further help and acknowledgements

Artwork supplied by UNSW Canberra Space. The guide uses standard 3 x 3 solving techniques with original instructions and diagrams. The optional online guides below provide additional demonstrations.

SolveTheCube - beginner demonstrations

Walter Randelshofer - centre sequences A and B

Herbert Kociemba - centre sequence C and centre-twist cases

WORKED EXAMPLES / FIRST LAYERS

Follow a real piece

These are legal positions generated by the same model as the animated guide. Yellow outlines follow the selected piece.

Insert a first-layer corner - page 4

The highlighted Space-Cobra-Viper corner begins at UFR. In this case, one complete block inserts it at DFR.

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



Start: Space points right at UFR.



After R U: keep the same grip.



After all four moves: corner inserted.

Insert a middle edge to the right - page 5

The highlighted Cobra-Viper edge starts at top-front. Its Cobra fragment already matches the front centre.

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



Start: top-front edge is ready.



After four moves: continue the sequence.



After eight moves: edge inserted.

WORKED EXAMPLES / LAST LAYER

Finish Nightjar carefully

Keep Nightjar on top and Space underneath. The side logos may look upside-down in this working grip; their fragments should still join.

Turn a horizontal line into the Nightjar cross - page 6

The yellow outlines identify Nightjar edge stickers. Initially only the left and right top edges face upwards.

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



Start: Nightjar line left-to-right.



After F R U: the sequence is incomplete.



After six moves: all four edges face up.

Orient two last-layer corners - page 8

This legal example needs two twist blocks, U, four twist blocks, then U'. Keep the same front throughout.

```
(R' D' R D) x 2  |  U  |  (R' D' R D) x 4  |  U'
```



Start: two top corners are twisted.



After 2 blocks + U: lower layers look wrong.



After the final U': lower layers recover.

WORKED EXAMPLES / CENTRE PICTURES

Keep going to the end

Centre corrections temporarily disturb the rest of the cube. Check the result only after every block is complete.

A - Correct one upside-down centre - page 9

Only the Space centre is upside-down. The yellow outline marks that centre through the sequence.

```
(U R L U2 R' L') x 2
```



Start: the Space centre is 180 degrees out.



After one block: keep going.



After both blocks: all pictures are correct.

B - Correct two adjacent sideways centres - page 9

Space is on top and Conference on the right. In this example both centres need a clockwise quarter turn.

```
(U' R2 U2 R' U2 R2) x 3
```



Start: the two centres are sideways.



After one block: two blocks remain.



After all three blocks: both centres align.

WORKED EXAMPLES / REGRIPS

Turn the whole cube

A regrip changes which picture is on top. It does not scramble any picture. A face-turn move changes just one layer.

Set up the working grip - page 2

Roll the whole cube 180 degrees around the front-to-back axis. Space moves from top to bottom; Nightjar moves to the top.



Start: Space on top, Cobra front.



Halfway: every piece moves together.



Finish: Nightjar top, Space bottom.

C - Check opposite centres from both sides - page 9

The two rows below show the same cube before and after C. The lower row is a different camera view, not an extra physical turn during the sequence.

```
U R L F2 B2 R' L' D' R L F2 B2 R' L'
```

BEFORE

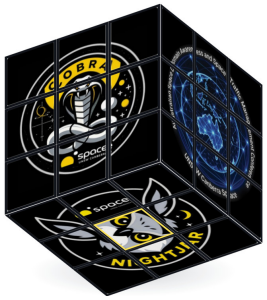


Before: Space centre on top

AFTER THE COMPLETE 14-MOVE SEQUENCE



After: Space centre aligned



Before: Nightjar underneath



After: Nightjar aligned