

Example—the ‘superflip’ configuration

Once you have mastered Rubik’s cube, then an interesting exercise is to generate the so-called ‘superflip’ configuration, in which all the corners are correctly solved, while all the edges are flipped.

For the impatient, the superflip sequence of 24 quarter-turn rotations (listed on Randelshofer’s website) is as follows. This converts the solved cube on the left into the configuration shown on the right.



Surprisingly, this sequence is actually equivalent to $\left\{ \left(\begin{matrix} \leftarrow & \rightleftharpoons \\ M & U' \end{matrix} \right)_4, [y], [x'] \right\}_3$

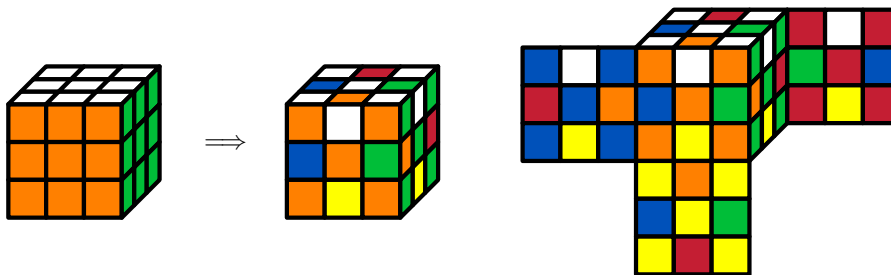


Figure 1: Two images of the superflip configuration.

The code for all this is given below—note that the facelet colours can be written in various ways. Note also the trailing % at the end of each line which is not inside a TikZ picture environment, and the value of placing each TikZ picture environment inside a minipage. Since the default width of a Rubik cube is 4cm (see §7 Fig 2 in rubikcube.pdf), then since the TikZ scale here is 0.5 then the required width of its minipage is equal to $0.5 \times 4\text{cm} = 2\text{cm}$.

```

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\newcommand{\Rubikbracket}[1]{\left(\mbox{#1}\right)}
\newcommand{\Rubikbrace}[1]{\left\{\mbox{#1}\right\}}

\begin{center}
\RubikU\RubikR\RubikR\RubikFp\RubikR\RubikDp\RubikL\RubikBp\RubikR%
\RubikUp\RubikR\RubikUp\RubikD\RubikFp\RubikU\RubikFp\RubikUp\RubikDp%
\RubikB\RubikLp\RubikFp\RubikBp\RubikDp\RubikLp
\end{center}

\medskip

{\noindent}Surprisingly, this sequence is actually equivalent to
\Rubikbrace{\Rubikbracket{\RubikM\RubikUp}4, \Rubiky, \Rubikxp}3

\bigskip
  
```

```

\begin{figure}[hbt]
\centering
\RubikCubeSolved
\begin{minipage}{2cm}
\begin{tikzpicture}[scale=0.5]
\DrawRubikCubeRU
\end{tikzpicture}
\end{minipage}
\hspace{5mm}$\Longrightarrow$\hspace{5mm}%
\RubikFaceUp {Y}{B}{Y} {R}{Y}{O} {Y}{G}{Y}%
\RubikFaceDown {W}{G}{W} {R}{W}{O} {W}{B}{W}%
\RubikFaceLeft {R}{Y}{R} {B}{R}{G} {R}{W}{R}%
\RubikFaceRight{O}{Y}{O} {G}{O}{B} {O}{W}{O}%
\RubikFaceFront{G}{Y}{G} {R}{G}{O} {G}{W}{G}%
\RubikFaceBack {B}{Y}{B}%
                {O}{B}{R}%
                {B}{W}{B}%
\begin{minipage}{2cm}
\begin{tikzpicture}[scale=0.5]
\DrawRubikCubeRU
\end{tikzpicture}
\end{minipage}
\hspace{1cm}%
\begin{minipage}{5cm}
\begin{tikzpicture}[scale=0.5]
\DrawRubikCubeFlat
\end{tikzpicture}
\end{minipage}
\caption{Two images of the superflip configuration.}
\end{figure}
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```

Using the rubikrotation package

This is just a note to show that if this file were run in conjunction with the `rubikrotation` package, using the \LaTeX commandline switch `--shell-escape`, then the above figure could be generated more simply by replacing

```

\RubikFaceUp {Y}{B}{Y} {R}{Y}{O} {Y}{G}{Y}%
\RubikFaceDown {W}{G}{W} {R}{W}{O} {W}{B}{W}%
\RubikFaceLeft {R}{Y}{R} {B}{R}{G} {R}{W}{R}%
\RubikFaceRight{O}{Y}{O} {G}{O}{B} {O}{W}{O}%
\RubikFaceFront{G}{Y}{G} {R}{G}{O} {G}{W}{G}%
\RubikFaceBack {B}{Y}{B}%
                {O}{B}{R}%
                {B}{W}{B}%

```

with the command

```
\RubikRotation{\superflip}%
```

ie, using instead the following code:

```

-----
\newcommand{\superflip}{U,R2,Fp,R,Dp,L,Bp,R,Up,R,Up,D,%
Fp,U,Fp,Up,Dp,B,Lp,Fp,Bp,Dp,Lp}

\begin{figure}[hbt]
\centering
\RubikCubeSolved%
\begin{minipage}{2cm}
\begin{tikzpicture}[scale=0.5]
\DrawRubikCubeRU
\end{tikzpicture}
\end{minipage}
\hspace{5mm}$\Longrightarrow$\hspace{5mm}%
\RubikRotation{\superflip}%
\begin{minipage}{2cm}
\begin{tikzpicture}[scale=0.5]
\DrawRubikCubeRU
\end{tikzpicture}
\end{minipage}
\hspace{1cm}%
\begin{minipage}{5cm}
\begin{tikzpicture}[scale=0.5]
\DrawRubikCubeFlat
\end{tikzpicture}
\end{minipage}
\caption{Two images of the superflip configuration.}
\end{figure}
-----

```

— END —