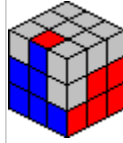
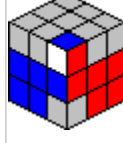
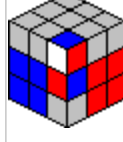


# CFOP

## CROSS

|                                                                                     |           |                                                                                     |                  |
|-------------------------------------------------------------------------------------|-----------|-------------------------------------------------------------------------------------|------------------|
|    | $R'$      |    | $R^2$            |
|   | $R F R^2$ |   | $R F R$          |
|  | $R' F R$  |  | $R' F R' B' R^2$ |
|  | $R' F R'$ |  | $R' F R' B'$     |
|  | $R F R'$  |  | $R F B' R'$      |

## F2L

|    |                                                                                     |                                |    |                                                                                   |                                                                                     |                                |                                                                                    |              |
|----|-------------------------------------------------------------------------------------|--------------------------------|----|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|--------------------------------|------------------------------------------------------------------------------------|--------------|
| A0 |    | R U2 R' U R U2 R' d R'<br>U' R |    | A1                                                                                |    | (y') R U R U R U' R'<br>U' R'  |                                                                                    |              |
| B1 |    | (y') R2 U' R2 U' R2 U'2<br>R2  |    | A2                                                                                |    | (y') R' U' R' U' R' U R<br>U R |                                                                                    |              |
| B2 |    | R U' R' F' U2 F                | T1 |  | R U R'                                                                              | T2                             |  | (y') R' U' R |
| C1 |    | R U2 R U R' U R U'2<br>R2      |    | C2                                                                                |    | R2 U2 R' U' R U' R' U2<br>R'   |                                                                                    |              |
| D1 |   | (y') R' U R' U' F' U F<br>R2   |    | D2                                                                                |   | R U' R U B U' B' R2            |                                                                                    |              |
| E1 |  | (y') R' U R2 B' R' B           |    | E2                                                                                |  | R U' R2 F R F'                 |                                                                                    |              |
| F1 |  | U F' U F R U R'                |    | F2                                                                                |  | U' R U' R' F' U' F             |                                                                                    |              |
| G1 |  | (y') U R' U R U2 R' U R        |    | G2                                                                                |  | U' R U' R' U2 R U' R'          |                                                                                    |              |
| H1 |  | U F' U' F U' R U R'            |    | H2                                                                                |  | U' R U R' U F' U' F            |                                                                                    |              |
| I1 |  | (y') U' R' U R                 |    | I2                                                                                |  | U R U' R'                      |                                                                                    |              |

|           |                                                                                     |                              |           |                                                                                     |                              |
|-----------|-------------------------------------------------------------------------------------|------------------------------|-----------|-------------------------------------------------------------------------------------|------------------------------|
| <i>J1</i> |    | $U F' U^2 F U' R U R'$       | <i>J2</i> |    | $U' R U^2 R' U F' U' F$      |
| <i>K1</i> |    | $R U' R' U^2 F' U' F$        | <i>K2</i> |    | $F' U F U^2 R U R'$          |
| <i>L1</i> |    | $U' R U' R' U R U R'$        | <i>L2</i> |    | $(y') U R' U R U' R' U' R$   |
| <i>M1</i> |    | $R U R B' R' B U^2 R'$       | <i>M2</i> |    | $(y') R' U' R' F R F' U^2 R$ |
| <i>N1</i> |   | $(y') R' U^2 R U R' U' R$    | <i>N2</i> |   | $R U^2 R' U' R U R'$         |
| <i>Q1</i> |  | $(y') U R' U' R U^2 R' U R$  | <i>Q2</i> |  | $U' R U R' U^2 R U' R'$      |
| <i>R1</i> |  | $U F' U F U' R U R'$         | <i>R2</i> |  | $U' R U' R' U F' U' F$       |
| <i>S1</i> |  | $(y') U R' U^2 R U^2 R' U R$ | <i>S2</i> |  | $U' R U^2 R' U^2 R U' R'$    |
| <i>U1</i> |  | $(y') U' R' U^2 R U' R' U R$ | <i>U2</i> |  | $U R U^2 R' U R U' R'$       |
| <i>V1</i> |  | $U^2 R U R' U R U' R'$       | <i>V2</i> |  | $(y') U^2 R' U' R U' R' U R$ |

OLL

|    |  |                                  |    |  |                                    |
|----|--|----------------------------------|----|--|------------------------------------|
| 01 |  | R U'2 R'2 F R F' U2 R' F R F'    | 02 |  | F R U R' U' F' f R U R' U' f'      |
| 03 |  | r' R2 U R' U r U2 r' U r R'      | 04 |  | F U R U' R' F' U' F R U R' U' F'   |
| 05 |  | r' U2 R U R' U r                 | 06 |  | r U'2 R' U' R U' r'                |
| 07 |  | r U R' U R U'2 r'                | 08 |  | r' U' R U' R' U2 r                 |
| 09 |  | R' U' R (y' x') R U' R' F R U R' | 10 |  | R U R' U R' F R F' R U2 R'         |
| 11 |  | r' R2 U R' U R U'2 R' U r R'     | 12 |  | F R U R' U' F' U F R U R' U' F'    |
| 13 |  | r U' r' U' r U r' F' d R         | 14 |  | R' F R U R' F' R F U' F'           |
| 15 |  | r' U' r R' U' R U r' U r         | 16 |  | R B R' L U L' U' R B' R'           |
| 17 |  | R U R' U R' F R F' U2 R' F R F'  | 18 |  | R U'2 R'2 F R F' U2 r R' U R U' r' |
| 19 |  | r' R U R U R' U' r R'2 F R F'    | 20 |  | r' R U R U R' U' r2 R'2 U R U' r'  |
| 21 |  | R U2 R' U' R U R' U' R U' R'     | 22 |  | R U2 R'2 U' R2 U' R'2 U'2 R        |
| 23 |  | R2 D' R U2 R'D R U2 R            | 24 |  | (x') R U R'D R U' R' D'            |
| 25 |  | F' r U R' U' r' F R              | 26 |  | R U'2 R' U' R U' R'                |
| 27 |  | R' U2 R U R' U R                 | 28 |  | r U R' U' r' R U R U' R'           |
| 29 |  | r U R' U' R r'2 F R F' r R'      | 30 |  | R2 U R' B' R U' R'2 U I U I'       |
| 31 |  | R' U' F U R U' R' F' R           | 32 |  | R U B' U' R' U R B R'              |
| 33 |  | R' U' R' F R F' U R              | 34 |  | R' U' R U F R B' R' F' B           |
| 35 |  | R U'2 R'2 F R F' R U'2 R'        | 36 |  | F R U' R' U' R U R' F'             |
| 37 |  | R' U' R U' R' U R U I U' R' U    | 38 |  | R U R' U R U' R' U' R' F R F'      |

|    |  |                                     |    |  |                                  |
|----|--|-------------------------------------|----|--|----------------------------------|
| 39 |  | R B' R' U' R U B U' R'              | 40 |  | R' F R U R' U' F' U R            |
| 41 |  | R U' R' U2 R U (y) R U'<br>R' U' F' | 42 |  | R' U R U'2 R' U' F' U F U<br>R   |
| 43 |  | B' U' R' U R B                      | 44 |  | f R U R' U' f'                   |
| 45 |  | F R U R' U' F'                      | 46 |  | R U R' U' R' F R F'              |
| 47 |  | F' L' U' L U L' U' L U F            | 48 |  | F R U R' U' R U R' U' F'         |
| 49 |  | R B' R'2 F R2 B R'2 F' R            | 50 |  | r' U r2 U' r'2 U' r2 U r'        |
| 51 |  | f R U R' U' R U R' U' f'            | 52 |  | R' U' R U' R' d R' U R B         |
| 53 |  | r' U' R U' R' U R U' R'<br>U2 r     | 54 |  | r U R' U R U' R' U R U'2 r'      |
| 55 |  | R U'2 R'2 U' R U' R' U2 F<br>R F'   | 56 |  | F R U R' U' R F' r U R' U'<br>r' |
| 57 |  | R U R' U' r R' U R U' r'            |    |  |                                  |

## PLL

|     |                                                                                     |                                                       |
|-----|-------------------------------------------------------------------------------------|-------------------------------------------------------|
| n01 |    | R' U R' U' R' U' R' U R U R2                          |
| n02 |    | R'2 U' R' U' R U R U R U' R                           |
| n03 |    | (x) R2 D2 R U R' D2 R U' R                            |
| n04 |    | (x) R' U R' D2 R U' R' D2 R2                          |
| n05 |    | U R' U' R U' R U R U' R' U R U R2 U' R' U             |
| n06 |  | r2 R'2 U' r2 R'2 U2 r2 R'2 U' r2 R'2                  |
| n07 |  | (x') R U' R' D R U R' u'2 R' U R D R' U' R            |
| n08 |  | R U R' U' R' F R2 U' R' U' R U R' F'                  |
| n09 |  | R' U R' U' (y x2) R' U R' U' R2 (y x) R' U' R U R     |
| n10 |  | (z) R U R' U' R U2 (x' z') R U R' U' (x) U' R' U R U2 |
| n11 |  | R' U2 R U'2 R' F R U R' U' R' F' R2 U'                |
| n12 |  | (x') R' U' F' U R' U' (x) U R' U' R' U R B R'2        |

|     |                                                                                     |                                                |
|-----|-------------------------------------------------------------------------------------|------------------------------------------------|
| n13 |    | $R U R' F' R U R' U' R' F R^2 U' R' U'$        |
| n14 |    | $R' U^2 R U R' U^2 L U' R U L'$                |
| n15 |    | $F R U' R' U' R U R' F' R U R' U' R' F R F'$   |
| n16 |    | $R U R' (y') R^2 u' R U' R' U R' u R^2$        |
| n17 |    | $R^2 u' R U' R U R' u R^2 f R' f'$             |
| n18 |    | $R^2 u R' U R' U' R u' R^2 b' R b$             |
| n19 |   | $R' d' F R^2 u R' U R U' R u' R^2$             |
| n20 |  | $(z) U' R D' R^2 U R' U' D R D' R^2 U R' D R'$ |
| n21 |  | $(z) R' U R' D R^2 U' R U D' R' D R^2 U' R D'$ |
| n22 |  | $R^2 u' R U' R U R' u R^2 f R' f' U$           |
| n23 |  | $R^2 u R' U R' U' R u' R^2 b' R b U'$          |
| n24 |  | $R' U' (y) F R^2 u R' U R U' R u' R^2 U$       |
| n25 |  | $R U R' (y') R^2 u' R U' R' U R' u R^2 U'$     |