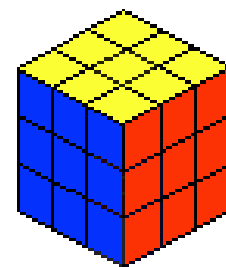
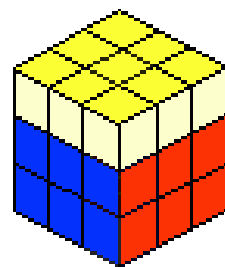
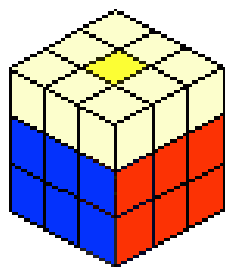
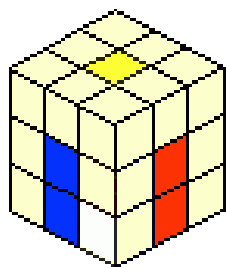


CFOP

三阶魔方还原公式

Cross F2l Oll Pll

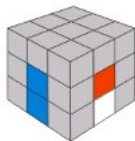
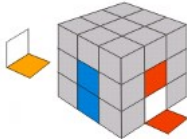
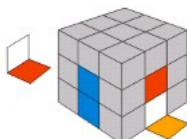


三阶魔方高级玩法教程----Cross 公式

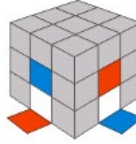
Cross: 底棱归位，又称之谓底层架十字，意思是底部十字还原。本教程依然推荐使用白色面做底面。

cross 这一步虽然是 CFOP 快速法的第一步，由于魔方的变化数太多，故这一步的情况也相应非常多，所以在讲解这一步的时候，我们重点是讲一些简单的技巧帮助大家开阔思维，帮助大家思考、判断能力，真正的学习是需要自己多动手、动脑，多加练习，多加总结，才能终有所成就。理论上，任何一种 case，都是可以在 8 步之内完成的，我们在练习的过程，也尽量要求 8 步内完成，8 步内完成，相信很容易就能做到。要做到快速完成 Cross，步骤尽量少还远远不够，我们还需要结合我们习惯用的手法来完成，只有做到步骤尽量少，配合手法很顺手，这样才能在最短时间内完成。下面给出一些高手练习的参考经验：

随意打乱魔方，不限定观察时间，观察并写出如何在 8 步内完成的公式，并验证完成，练习一段时间，满意后，开始练习，限定在 15 秒内，观察并写出如何在 8 步内完成的公式，并验证完成；练习满意后，同样限定在 15 秒内，快速观察并迅速记忆牢固如何在 8 步内完成，15 秒后凭记忆快速完成复原；上阶段练习满意后，进入另一个高要求阶段训练，用[标准打乱公式](#)打乱魔方，不仅在 15 秒，快速观察并迅速记忆牢固如何在 8 步内完成，同时快速拿起魔方，眼睛不看底层的四个白色棱块，双手快速完成，眼睛快速寻找第一组的 f2l。做到最后高要求阶段有相当的难度，需要循序渐进的练习，不可急于求成。正所谓水到渠成，瓜熟蒂落，功到自然成。

第一类：三缺一	 $R' F R$	 $R' u' R$ 或 $R u R'$	 $R u' R$ 或 $R' u R'$
第二类：二缺一 相对两个棱块需要复原			

	L R u' R L	L R u R L
--	-------------------	------------------

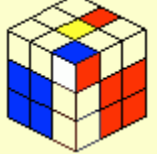
第三类：二缺二 相邻两个棱块需要复原			
	R' U R' F	R' F R'	F' R F R2

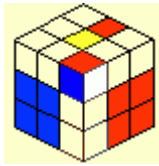
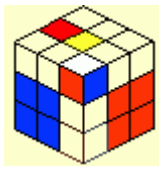
其他情况举例				
	R2' F	R' U R' F2	R F R	u F' R'

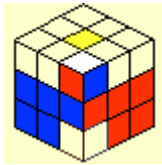
三阶魔方高级玩法教程----F2L 公式

初学 F2L，前期可以先掌握 F2L 的两个基本规律，先熟练掌握常见 F2L 的公式，不常见的转化成常见的，再逐步全部熟练掌握。然后再选择学习充分利用空角的技

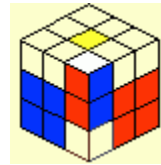
巧、最常用的 11 个非标态 f2l 转标态、熟悉 gan 的非标转标态手法、CubeLoop 的非标(上)(下)、Slot 在 BR 位置(上)(下)(注：slot 是指一组要复原的底角块和中棱块，BR 是位置是指右层和右层交叉的底层角块)、两组 F2L 同时进行、最后一组 F2L 同时顶层十字、常见 F2L 判断技巧等常见 F2L 高级复原教程。

基本形态		01、y' (U' R' U R)		02、(U R U' R')
基本规律 之 切位相连		03、(R U R')		04、y' (R' U' R)
		05、U' (R U R' U) (R U R')		06、(U' R U' R' U) y' (R' U' R)
基本规律 之		07、y' (U R' U' R) (U'2 R' U R)		08、U' (R U R' U2) (R U' R')

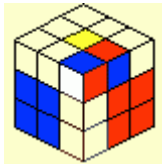
同向相连		09、 $y' U R' U^2 (R U'^2 R' U R)$		10、 $U' (R U'^2 R' U^2) (R U' R')$
基本规律 之 底色切位		11、 $y' U' (R' U^2) (R U') (R' U R)$		12、 $U (R U'^2) (R' U R U') R'$
		13、 $U^2 (R U R' U) (R U' R')$		14、 $y' (R' U R U'^2) (R' U' R)$
	15、 $U' (R U'^2 R' U) (R U R')$		16、 $U' (R U' R') U^2 (R U' R')$	
	17、 $y' U (R' U' R U') y (R U R')$		18、 $U' (R U R' U) y' (R' U' R)$	



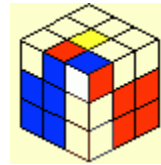
19、 (R U R' U') 2 (R U R')



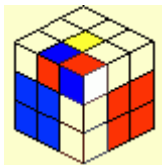
20、 (R U' R' U) y' (R' U R)



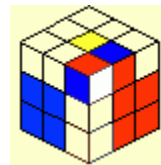
21、 U' R U2 R' U y' (R' U' R)



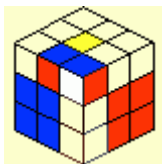
22、 y' U (R' U R U') (R' U' R)



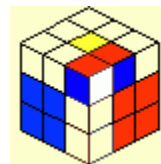
23、 (R U' R' U) 2 U (R U' R')



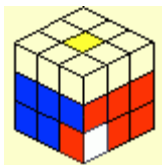
24、 U' (R U' R' U) (R U R')



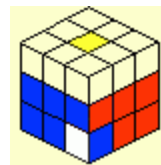
25、 (R U R') U2 (R U' R' U) (R U' R')



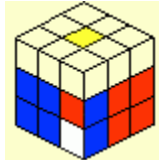
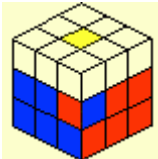
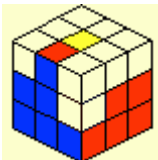
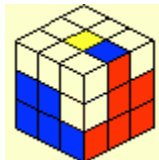
26、 (R U' R' U2) y' (R' U' R)

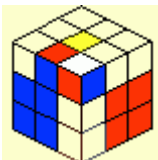
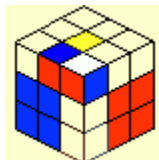
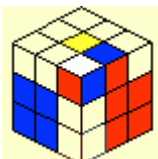
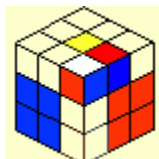


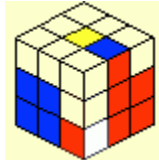
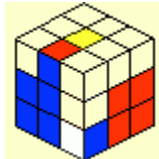
27、 (R U' R' U) (R U'2) (R' U R U' R')



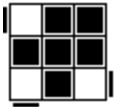
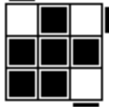
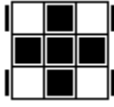
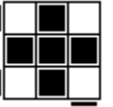
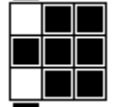
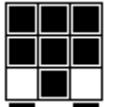
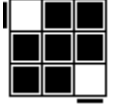
28、 (R U R' U') (R U'2 R' U') (R U R')

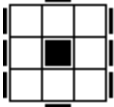
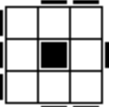
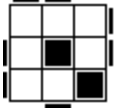
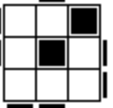
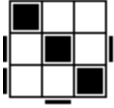
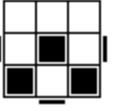
	29、 $R^2 y (R U R' U') y' (R' U R')$		30、 $(R U' R) y U (R U' R') F^2$
	31、 $(R U^2 R' U) 2 y' (R' U' R)$		
	32、 $U (R U' R' U') y (L' U L)$ 和 $y' (R U) (R U R U') (R' U' R')$		33、 $(U' F' U F) (U R U' R')$ 和 $(R' U' R' U') (R' U) (R U R)$

	34、 $y' (R' U^2) (R U R' U' R)$		35、 $(R U R') U^2 (R U R' U') (R U R')$
	36、 $(R U^2 R') (U' R U R')$		37、 $(R U R' U) (R U^2 R' U) y' (R' U R)$

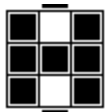
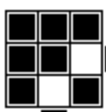
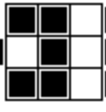
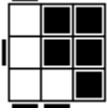
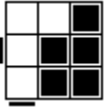
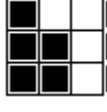
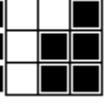
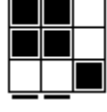
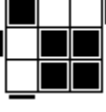
	38、 $y' (R' U) (RU') (R' U R)$		39、 $(R U R' U') (R U R')$
	40、 $(R U' R' U) (R U' R')$		41、 $y' (R' U' R U) (R' U' R)$

三阶魔方高级玩法教程-----OLL 公式

点+系列		01、 $(R\ U^2)\ R'\ U'(R\ U'\ R')$		02、 $(R\ U)\ (R'\ U)\ (R\ U^2\ R')$ 和 $U'\ (R'\ U^2)\ R\ U\ (R'\ U\ R)$
		03、 $(R\ U\ R'\ U)\ (R\ U'\ R'\ U)\ (R\ U^2\ R')$ 和 $(R\ U^2)\ (R'\ U'\ R\ U'\ U')\ (R\ U'\ R')$		04、 $R\ U^2\ (R'^2\ U')\ (R^2\ U')\ (R'^2\ U'^2\ R)$
		05、 $(r\ U\ R'\ U')(r'\ F\ R\ F')$		06、 $(R\ U\ R'\ U\ R\ U^2\ R')U\ (R\ U^2\ R'\ U'\ R\ U'\ R')$
		07、 $F'\ (r\ U\ R'\ U')(r'\ F\ R)$		

点系列		08、 $(R\ U^2)(R'^2\ F\ R\ F')U^2(R'\ F\ R\ F')$		09、 $(F\ R\ U\ R'\ U'\ F')(f\ R\ U\ R'\ U'\ f')$
		10、 $(f\ R\ U\ R'\ U'\ f')U'\ (F\ R\ U\ R'\ U'\ F')$		11、 $(f\ R\ U\ R'\ U'\ f')\ y\ (F\ R\ U\ R'\ U'\ F')$
		12、 $(R\ U\ R'\ U)(R'\ F\ R\ F')U^2(R'\ F\ R\ F')$		13、 $F(R\ U\ R'\ U)\ y'\ (R'\ U^2)(R'\ F\ R\ F')$

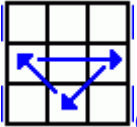
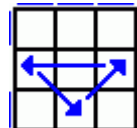
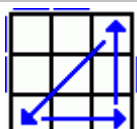
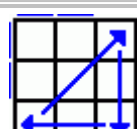
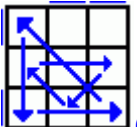
		14、 $r' (R U R U' R' U') r (R'^2 F R F')$		15、 $r' (R U R U' R' U') r^2 (R'^2 U R U') r'$
一系列		16、 $f (R U R' U')^2 f'$		17、 $(R' U' R U' R' U) y' (R' U R B)$
		18、 $(r U r')(U R U' R')^2 (r U' r')$		19、 $(R U' U')(R'^2 U')(R U' R' U^2)(F R F')$
7 系列		20、 $(r U' r' U') (r U r') y' (R' U R)$		21、 $(R' F R U R' F' R) y' (R U' R')$
		22、 $(r' U' r)(R' U' R U)(r' U r)$		23、 $(r U r') (R U R' U')(r U' r')$
T 系列		24、 $(R U R' U')(R' F R F')$		25、 $F(R U R' U') F'$

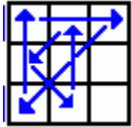
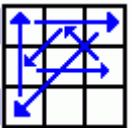
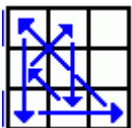
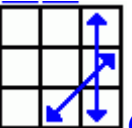
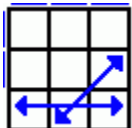
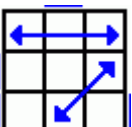
		26、 $(RUR'U'r)(R'URU')r'$		27、 $(rUR'U')(r'R U)(RU'R')$
1+2 点系列		28、 $(rU'r'U'r)y(RUR'f')$		29、 $(R'FRUR'U')(F'UR)$
		30、 $(R'U'R U)y(rUR'U')r'R$		31、 $(R'U')(R'FRF')(UR)$
6 系列		32、 $(R'U'F)(URU'R'F'R)$		33、 $(RUB'U')(R'URBR')$
		34、 $x'U'F'R'FRU$		35、 $f(RUR'U')f'$
田系列		36、 $F(RU'R'U')(RU'R'F')$		37、 $RU'^2(R'^2FRF')(RU'^2R')$

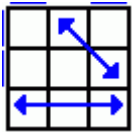
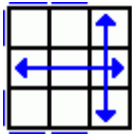
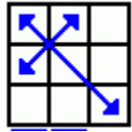
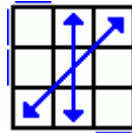
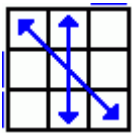
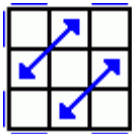
		38、 $(r' U^2)(R U R' U) r$		39、 $(r U^2)(R' U' R U') r'$
2 系列		40、 $r' U' R U' R' U^2 r$		41、 $r U R' U R U^2 r'$
		42、 $r' (R^2 U)(R' U R) U^2 (R' U R') r$		43、 $r (R'^2 U')(R U' R') U^2 (R U' R) r'$
		44、 $(R' U' R) y' x' (R U' R' F)(R U R')$		45、 $(R U R' U)(R' F R F') (R U^2 R')$
L 系列		46、 $(r U^2)(R' U' R U R' U')(R U' r')$		47、 $B' (R' U' R U)^2 B$
		48、 $r' U^2(R U R' U')(R U R' U) r$		49、 $F(R U R' U')^2 F'$

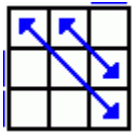
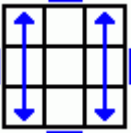
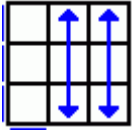
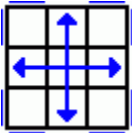
		50、 $R' F R^2 B' R'^2 F' R^2 B R'$		51、 $R B' R'^2 F R^2 B R'^2 F' R$
L+2 点系列		52、 $(R^2 U R' B')(R U' R'^2 U)(R B R')$		53、 $(R U R' U')(R U' R' F') U' (F R U R')$
		54、 $(R' U R U'^2 R' U') \gamma (L' U L U F)$		55、 $(R U' R' U^2 R U) \gamma (R U' R' U' F')$
		56、 $(R U R' U)(R U' R' U')(R' F R F')$		57、 $(R' U' R U')(R' U R U)(R B' R' B)$

三阶魔方高级玩法教程-----PLL 公式

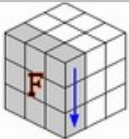
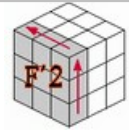
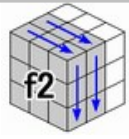
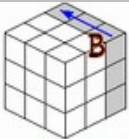
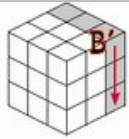
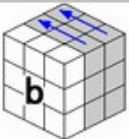
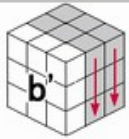
三棱换 或 三角换	 (11 步)	01、 $(R^2 U)(R U R' U')(R' U')(R' U R')$
	 (11 步)	02、 $(R U' R)(U R U R)(U' R' U' R^2)$
	 (09 步)	03、 $(l U' R)D^2(R' U R)D^2 R^2$
	 (10 步)	04、 $x' R^2 D^2(R' U' R)D^2(R' U R')$
三棱换	 (12 步)	05、 $(R'^2 u' R U' R)(U R' u)(R^2 f R' f')$

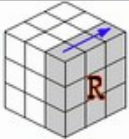
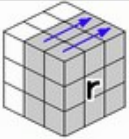
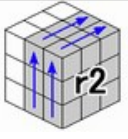
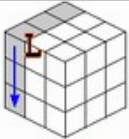
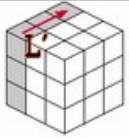
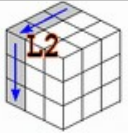
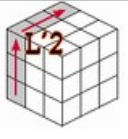
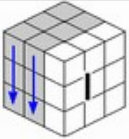
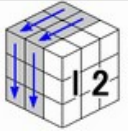
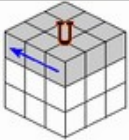
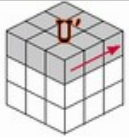
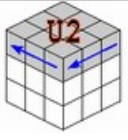
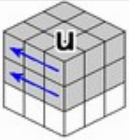
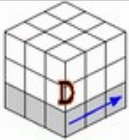
且 三角换	 (13步)	06、 $(R\ U\ R')y'(R2'\ u'\ R\ U')(R'\ U\ R'\ u\ R2)$
	 (12步)	07、 $(R2\ u)(R'\ U\ R'\ U')(R\ u')(R2'\ F'\ U\ F)$
	 (12步)	08、 $(R'\ d'\ F)(R2\ u)(R'\ U)(R\ U'\ R\ u'\ R'2)$
邻角换 且 邻棱换	 (14步)	09、 $(R\ U\ R'\ F')(R\ U\ R'\ U')(R'\ F\ R2\ U'\ R'\ U')$
	 (13步)	10、 $z\ (U'\ R\ D')(R2\ U\ R'\ U'\ R2\ U)\ z'\ (R\ U')$
	 (14步)	11、 $(R'\ U2)(R\ U2')(R'\ F)(R\ U\ R'\ U')(R'\ F'\ R2\ U')$

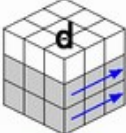
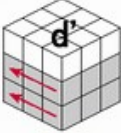
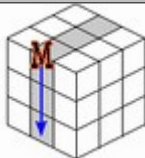
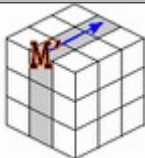
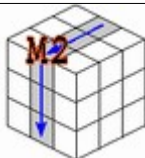
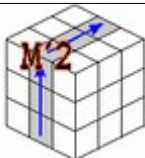
	 (14步)	12、 $(R\ U'^2\ R'\ U^2)\ (R\ B'\ R'\ U')\ (R\ U\ R\ B\ R'^2\ U)$ 和 $x'(R^2\ u'\ R'\ u)R^2\ x'\ y'(R'\ U\ R'\ U')R^2$
	 (14步)	13、 $(R\ U\ R'\ U')\ (R'\ F)\ (R^2\ U'\ R'\ U')\ (R\ U\ R'\ F')$
	 (17步)	14、 $F(R\ U'\ R'\ U')\ (R\ U\ R'\ F')\ (R\ U\ R'\ U')\ (R'\ F\ R\ F')$
	 (19步)	15、 $z\ (U'\ R\ D')\ (R^2\ U\ R'\ U')z'\ (R\ U\ R')z\ (R^2\ U\ R')z'\ (R\ U')$
	 (15步)	16、 $L\ U'\ R\ U'^2\ r'\ F\ r\ R'\ U'\ R\ U'^2\ r'\ F\ R'\ F$
平行线	 (17步)	17、 $(U\ R'\ U')\ (R\ U'\ R)\ (U\ R\ U')\ (R'\ U\ R\ U)\ (R^2\ U')\ (R'\ U)$

	 (18步)	18、 $(R' U R' U') y x^2 (R' U R' U' R^2) y x (R' U' R U R)$
	 (15步)	19、 $L x' (R U R')(D R U')(r' R' F) r D' r' F'$ 和 $(R' U R' U')B' D B' D' B^2 R' (B' R B R)$
	 (18步)	20、 $U'(R' U R U') R'^2 F' z R' F R D z' x (U R' U' R^2)$
四棱交换	 (07步)	21、 $M'^2 U' M'^2 U^2 M'^2 U' M'^2$

常见三阶魔方公式字母符号说明表

	顺时针 90度	逆时针 90度	顺时针 180度	逆时针 180度
前层 F (front)				
				
后层 B (back)				
				

右层 R (right)				
				
左层 L (left)				
				
上层 U (up)				
				
下层 D (down)				

				
				
整个魔方以 R 的方向转动	整个魔方以 R' 的方向转动			
				
整个魔方以 U 的方向转动	整个魔方以 U' 的方向转动			
				
整个魔方以 F 的方向转动	整个魔方以 F' 的方向转动			

其他说明

1、 x (整个魔方以 R 的方向转动), y (整个魔方以 U 的方向转动), z (整个魔方以 F 的方向转动);

2、斜体是用右拇指转动, 下划线用左食指, 公式中的括号一般是为了方便记忆而加上的符号, 括号里面的公式一般是一组常见的基本手法, 在记忆整个公式中, 可把括号里面的公式浓缩成一个符号来记忆。

3、 $()^2$ 的意思是括号里面的公式连续做两遍。

补充说明: 假设你的魔方现在黄色面在上, 白色面在下, 蓝色面在前, X 的意思就是把魔方翻转成蓝色面在上, 白色面在前, 结合右图的图示再好好体会一下 xyz 是怎么翻转魔方的。

