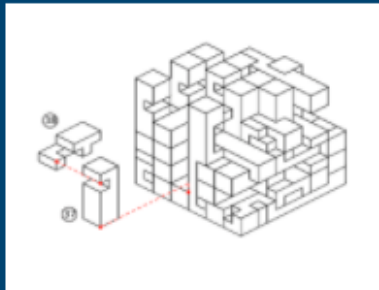
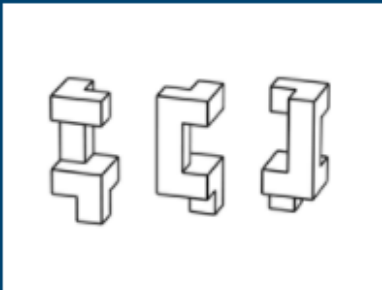


# Patterson Cube90 Puzzle



# Patterson Cube90 Puzzle

Pieces cut from  $16 \times 16 \text{ mm}^2$  square prisms

All cuts on  $8 \times 8 \times 8 \text{ mm}^3$  "cubelets"

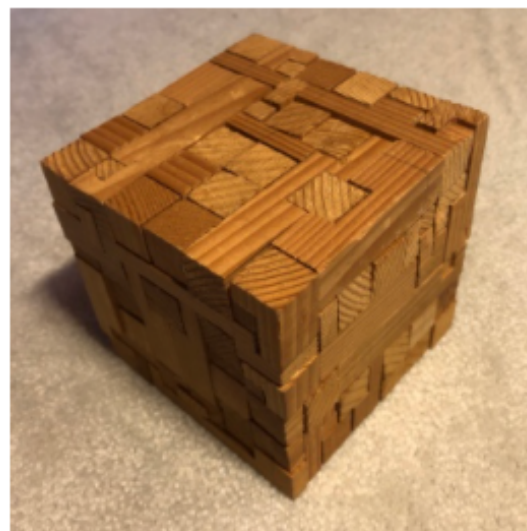
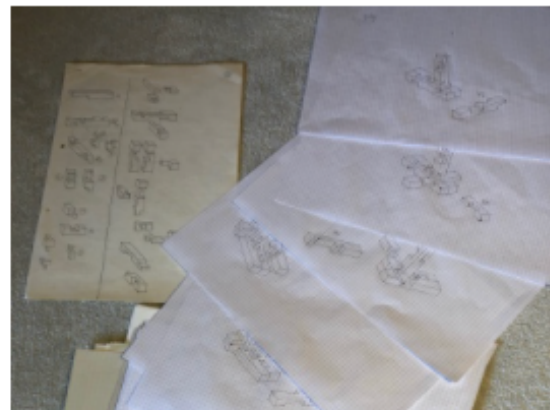
Designer:

Prof Bruce D Patterson, Switzerland

[bruce.patterson@bluewin.ch](mailto:bruce.patterson@bluewin.ch)



Inspired by the metal puzzle sculptures of Miguel Berrocal, in the 1980's, Bruce began assembling "cubelet-cut" wooden pieces, at first at random. After many modifications and adjustments, the result was this  $12 \times 12 \times 12$  cube with 90 pieces. Assembly / disassembly requires various types of internal movements, as documented by detailed drawings.



# The 90 Pieces



①  
J0D0D0D099999



②  
4C8



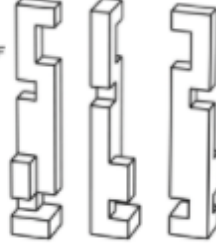
③  
C89C



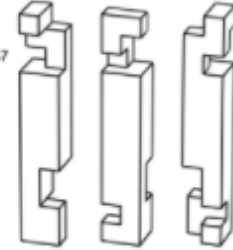
④  
10C



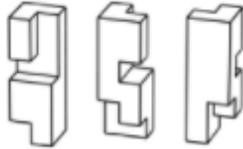
⑤  
C44C8CCCEE4F



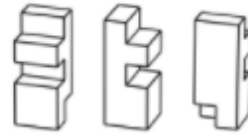
⑥  
6C8FFFFF6637



⑦  
EECFB9



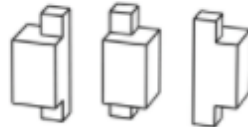
⑧  
CFCF7



⑨  
4C



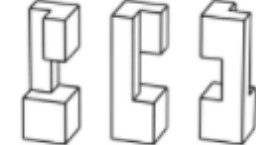
⑩  
8FFF8



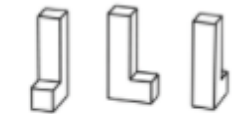
⑪  
8CF



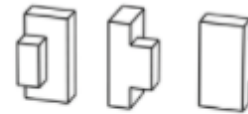
⑫  
DD4FF



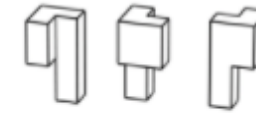
⑬  
8899



⑭  
CEEC



⑮  
EE88



⑯  
446



⑰  
44D



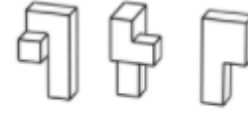
⑱  
62E88



⑲  
644F



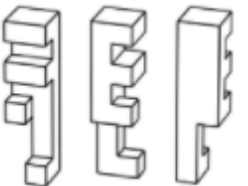
⑳  
CE88



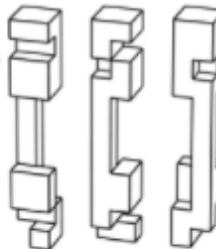
㉑  
64C



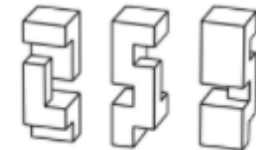
㉒  
FCFCE889



㉓  
FCBF444477C9

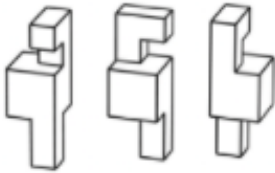


㉔  
FCE2FC



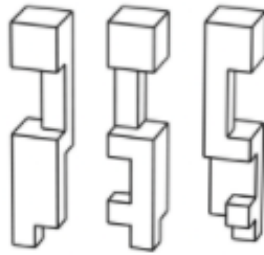
25

98FF11



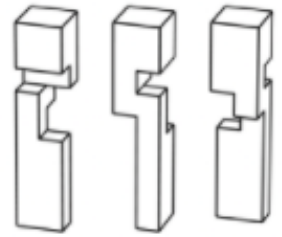
26

FF88F3372



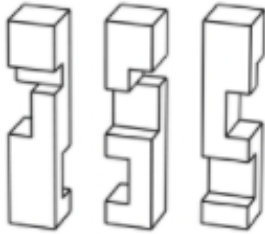
27

FFC623333



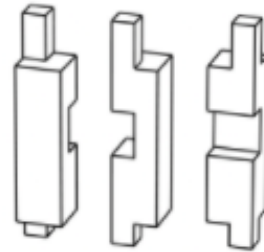
28

FFC99F33F



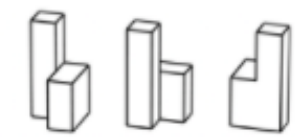
29

44FF33FFF4



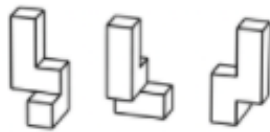
30

44DD



31

44C9



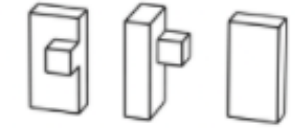
32

6F9



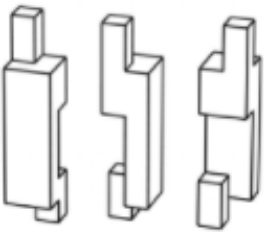
33

CDCC



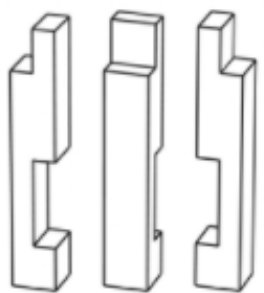
34

44FF333B8



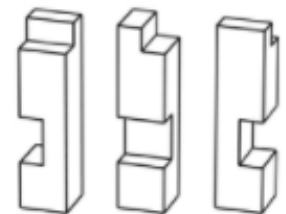
35

99FFFF6666FF



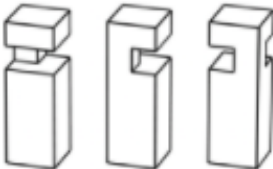
36

CFF99FF



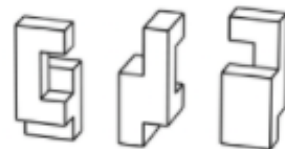
37

F4FFFF



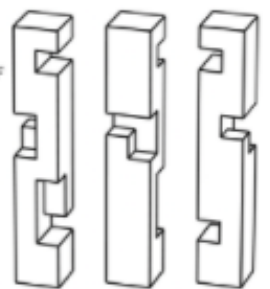
38

32EFC



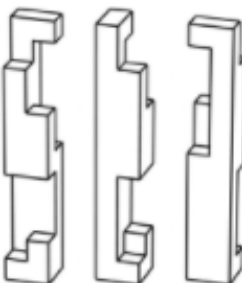
39

F6FF9DFEE6FF



40

C46677FCCCDF



41

4F1



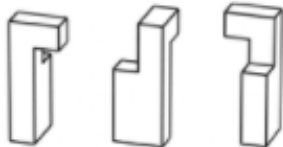
42

F6CF



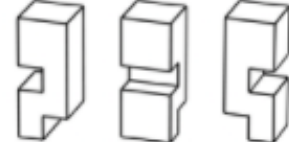
43

32666



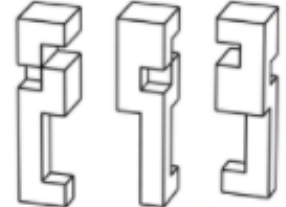
44

FF9F6

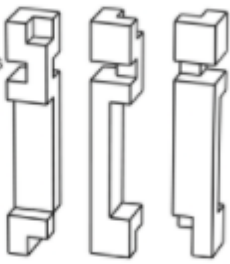


45

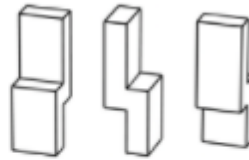
F6DF2223



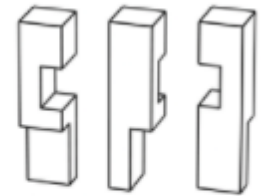
④⑥  
EF1FCCGCC76



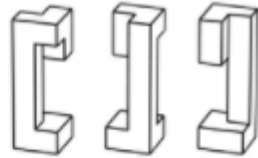
④⑦  
CCCF33



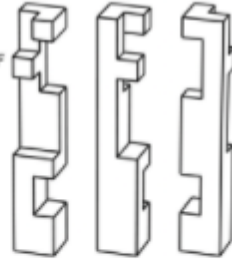
④⑧  
FF86FCCC



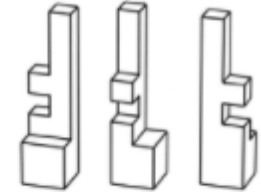
④⑨  
BA222F



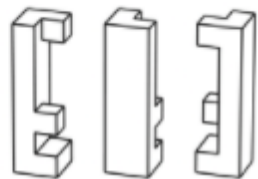
④⑩  
D464CCCF88FF



④⑪  
88C8CFF



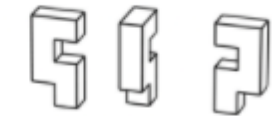
④⑫  
E66676F



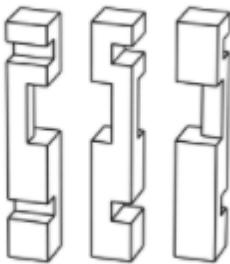
④⑬  
CE8



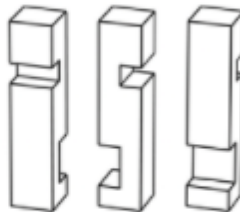
④⑭  
C4C8



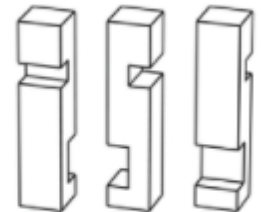
④⑮  
FCF222FFCF



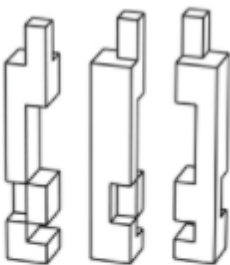
④⑯  
FFCFF33F



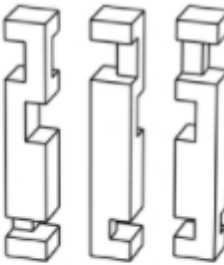
④⑰  
FFCFF33F



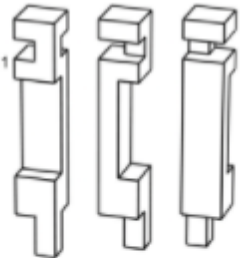
④⑱  
11F666DD6F



④⑲  
F11F66FFF4F



④⑳  
F1FCCCCFF11



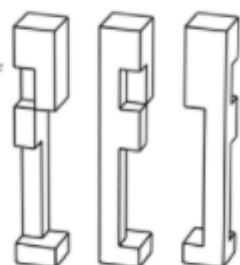
④㉑  
1FF1



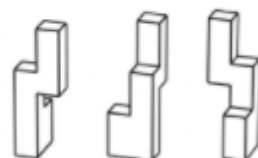
④㉒  
1FE23



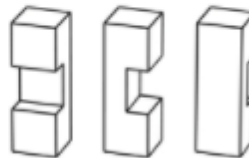
④㉓  
FFDD664444F



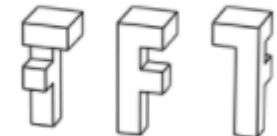
④㉔  
113266



④㉕  
FFCCFF

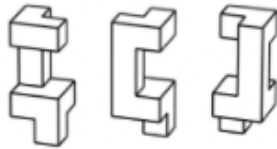


④㉖  
F4644



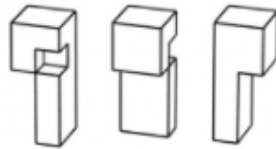
67

744F1



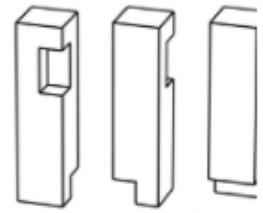
68

FE999



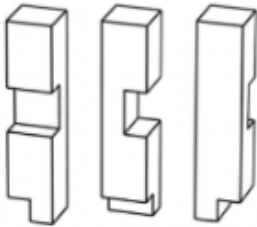
69

FEEFFFF3



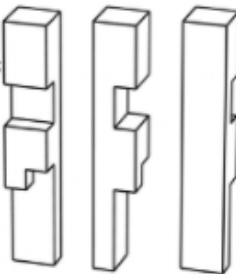
70

7CCFF9



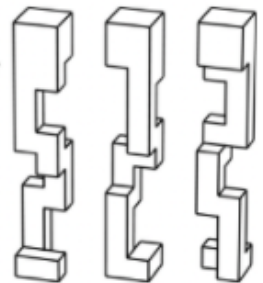
71

FFCCFFECCCC



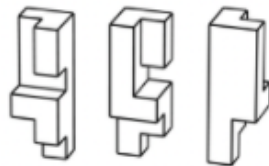
72

FF322398C447



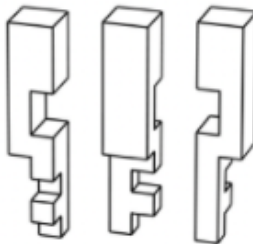
73

IDCF98



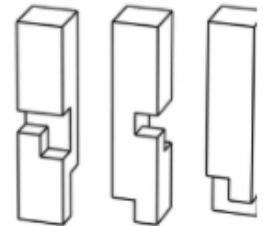
74

FFF66F9898



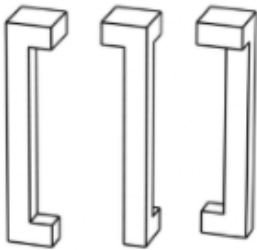
75

FFFFCEF73



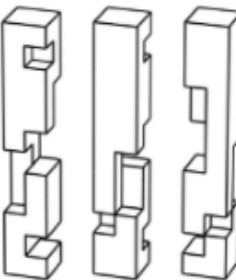
76

2222223



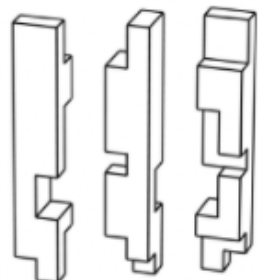
77

FEF7764DDB6F



78

33FF77366F31



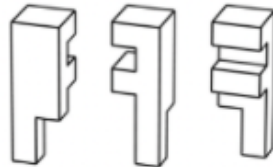
79

119



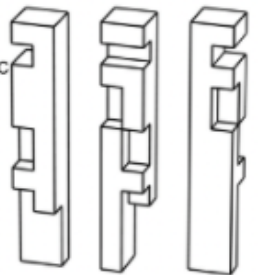
80

F3F322



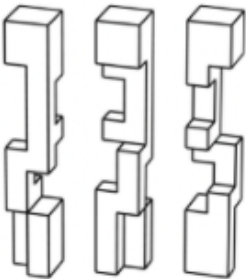
81

F9FBBDDFDCCC



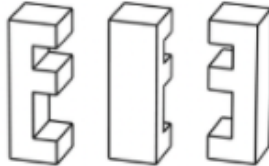
82

19326DDD



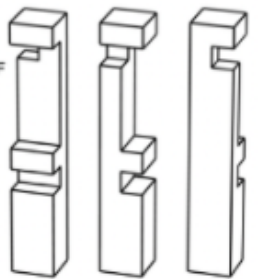
83

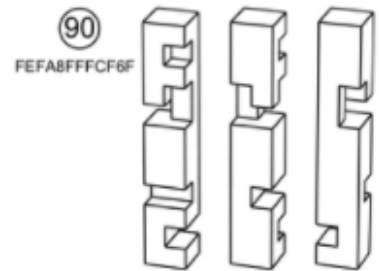
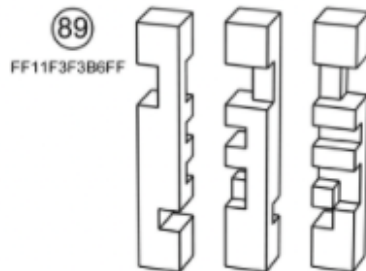
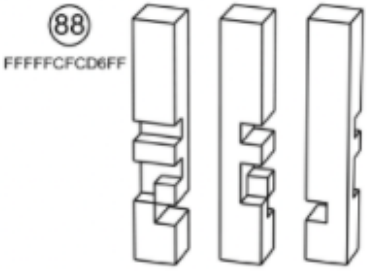
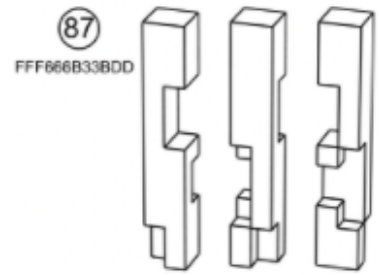
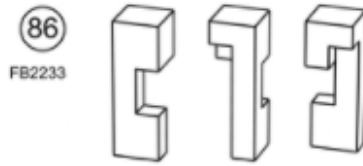
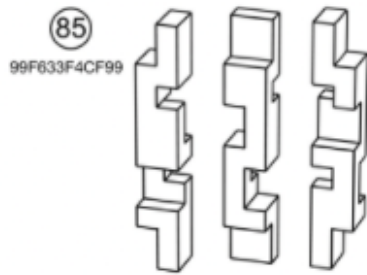
F6F66F



84

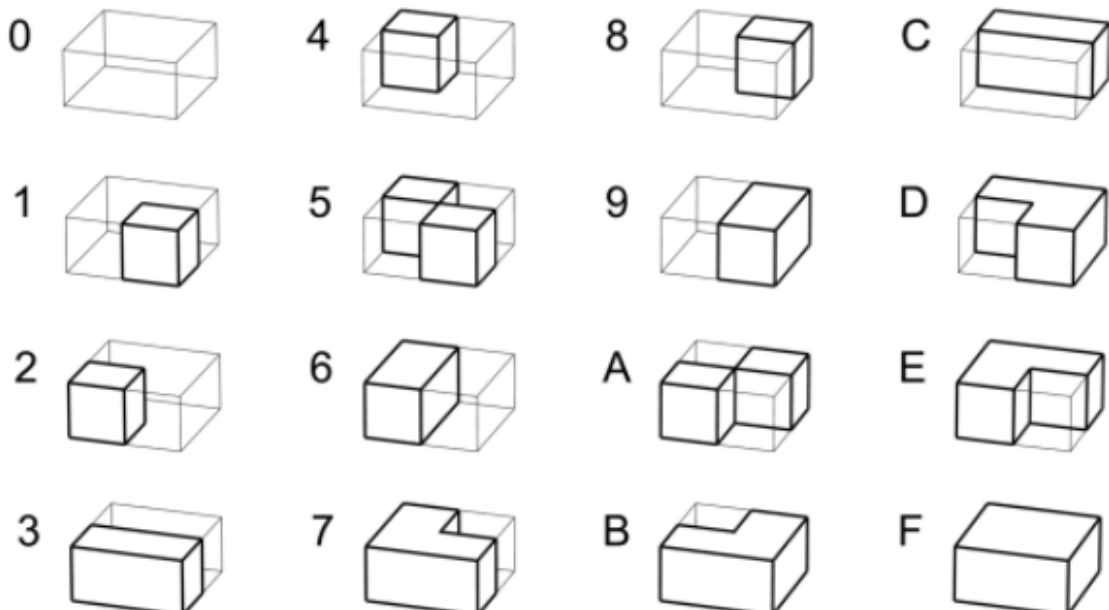
F8CCCCFCFFF



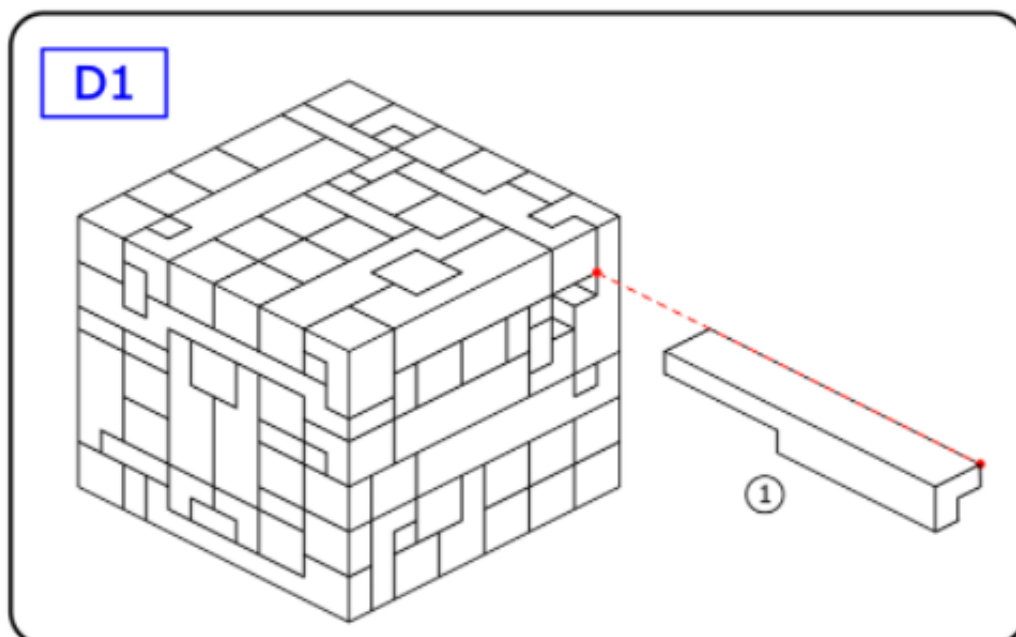
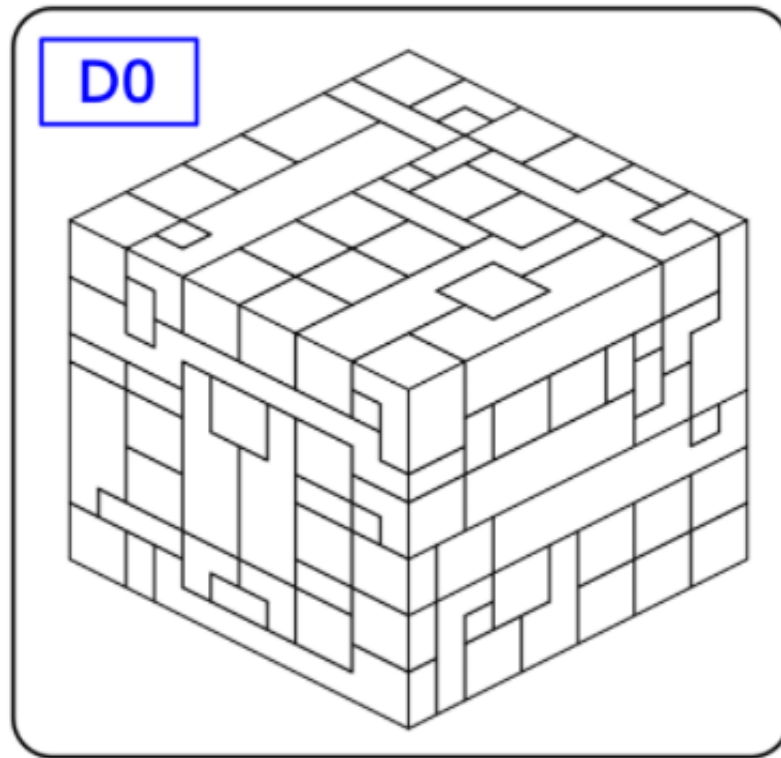


## Hexadecimal code

We consider each puzzle piece to consist of a number of cubelet layers, beginning at the top. Each layer contains 0 to 4 cubelets, distributed according to one of 16 patterns. As shown below, to each pattern, we assign a hexadecimal digit (0-9,A,B,C,D,E,F). Thus the form of a piece is encoded as a sequence of hexadecimal digits. Note that each sequence codes for a unique piece, but that each piece can have several different codes, depending on its orientation.

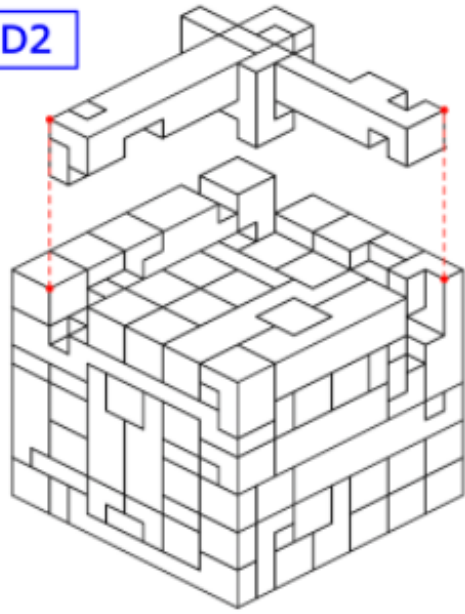


# Puzzle disassembly / assembly

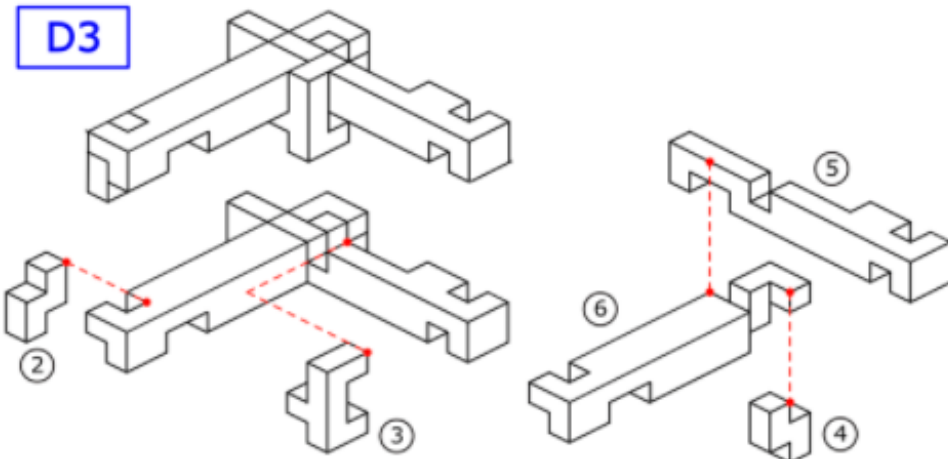




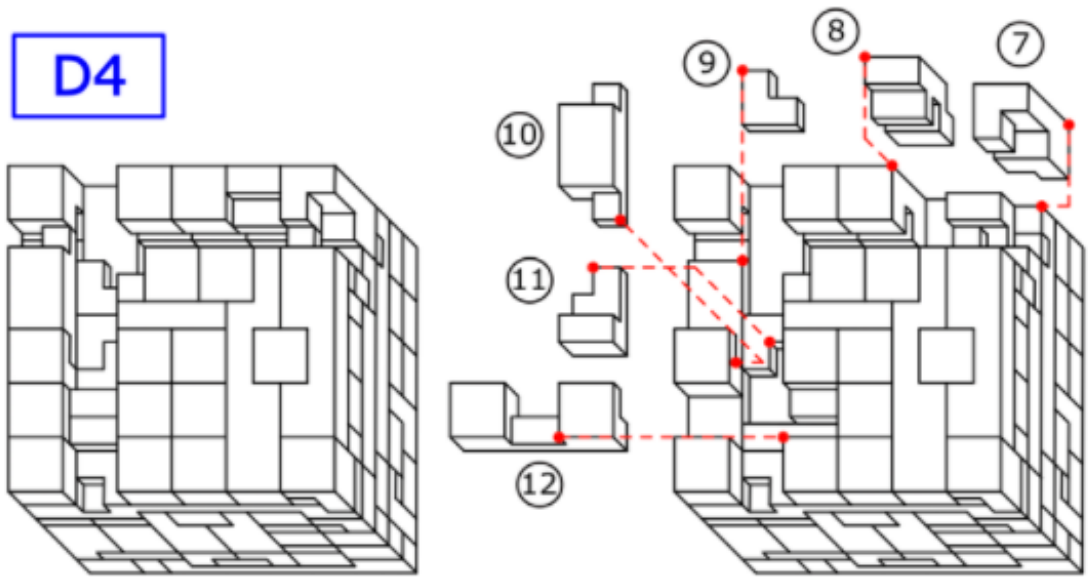
D2



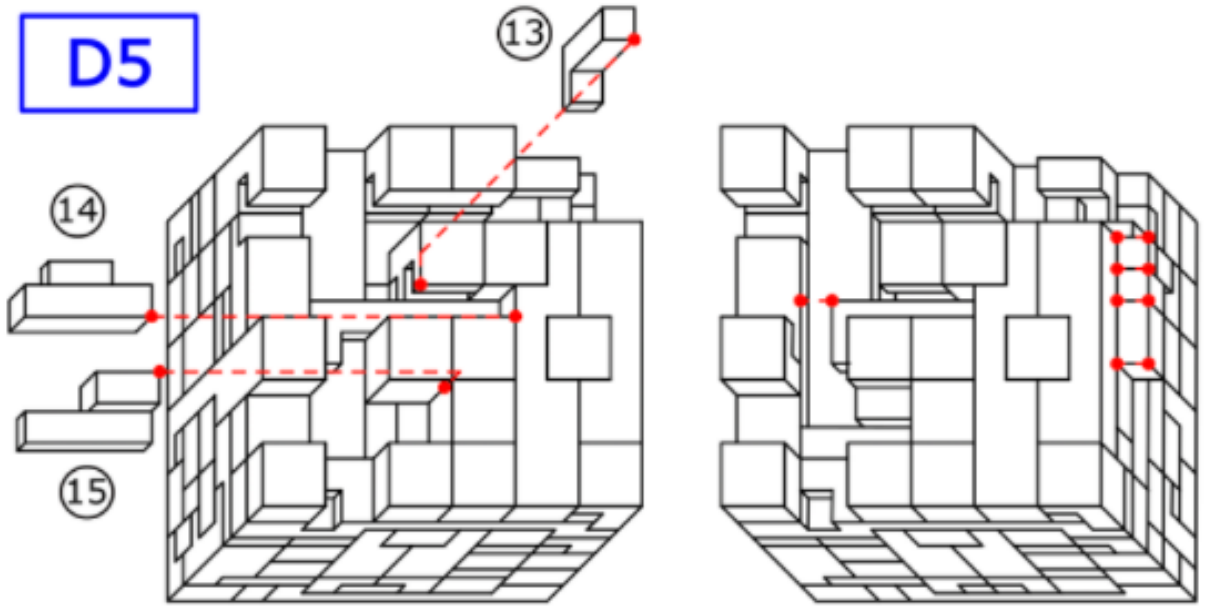
D3



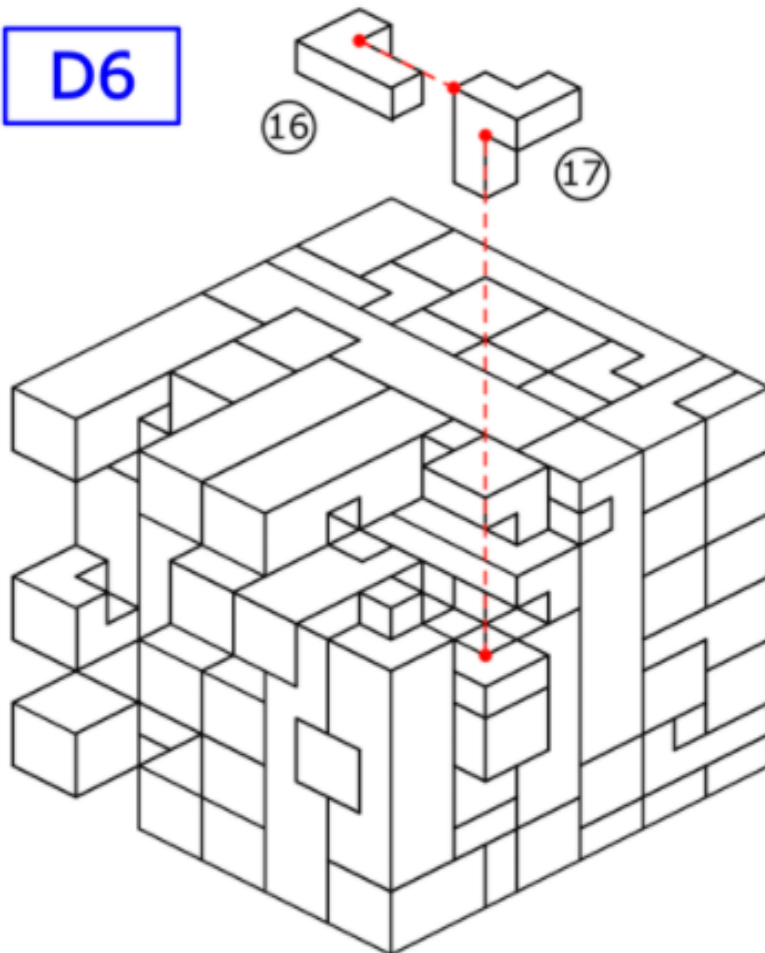
D4

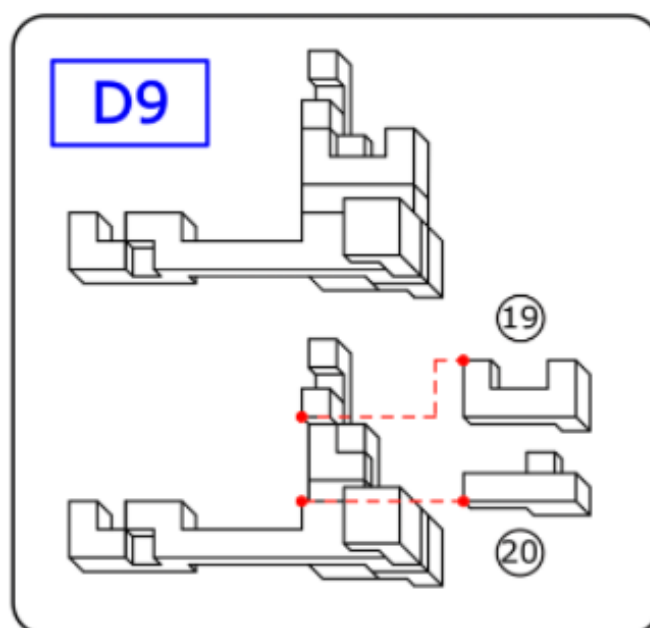
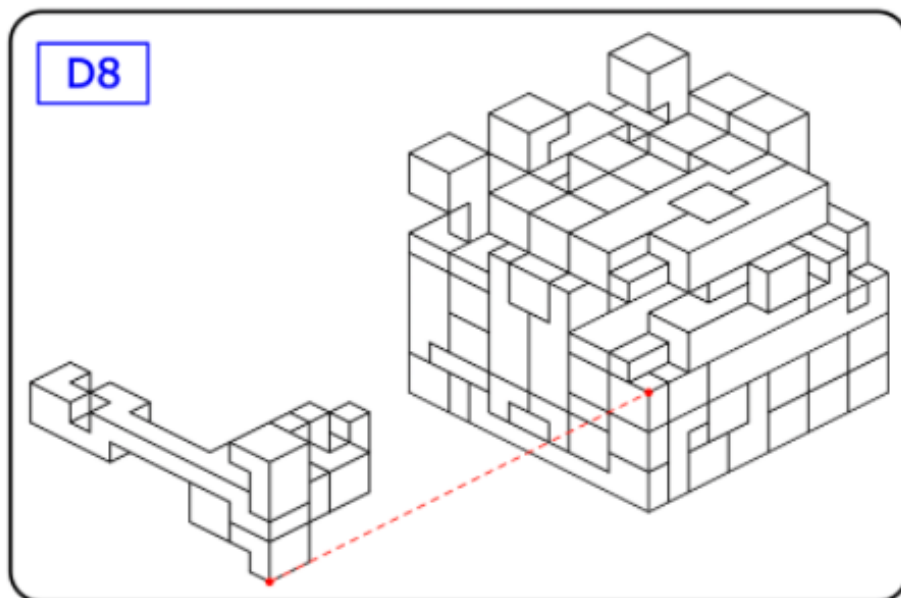
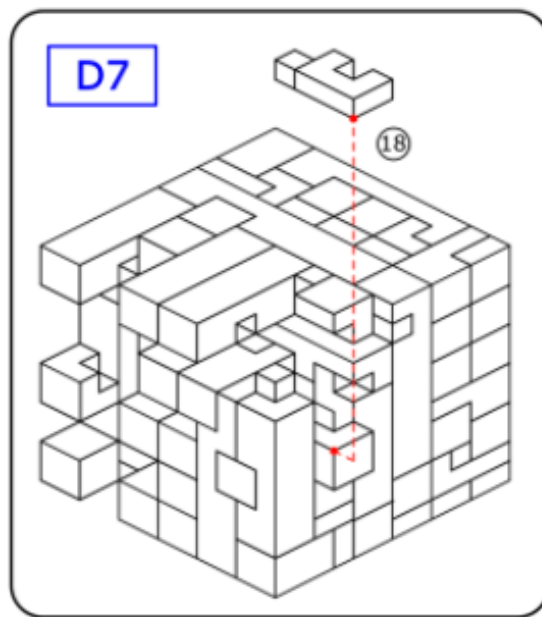


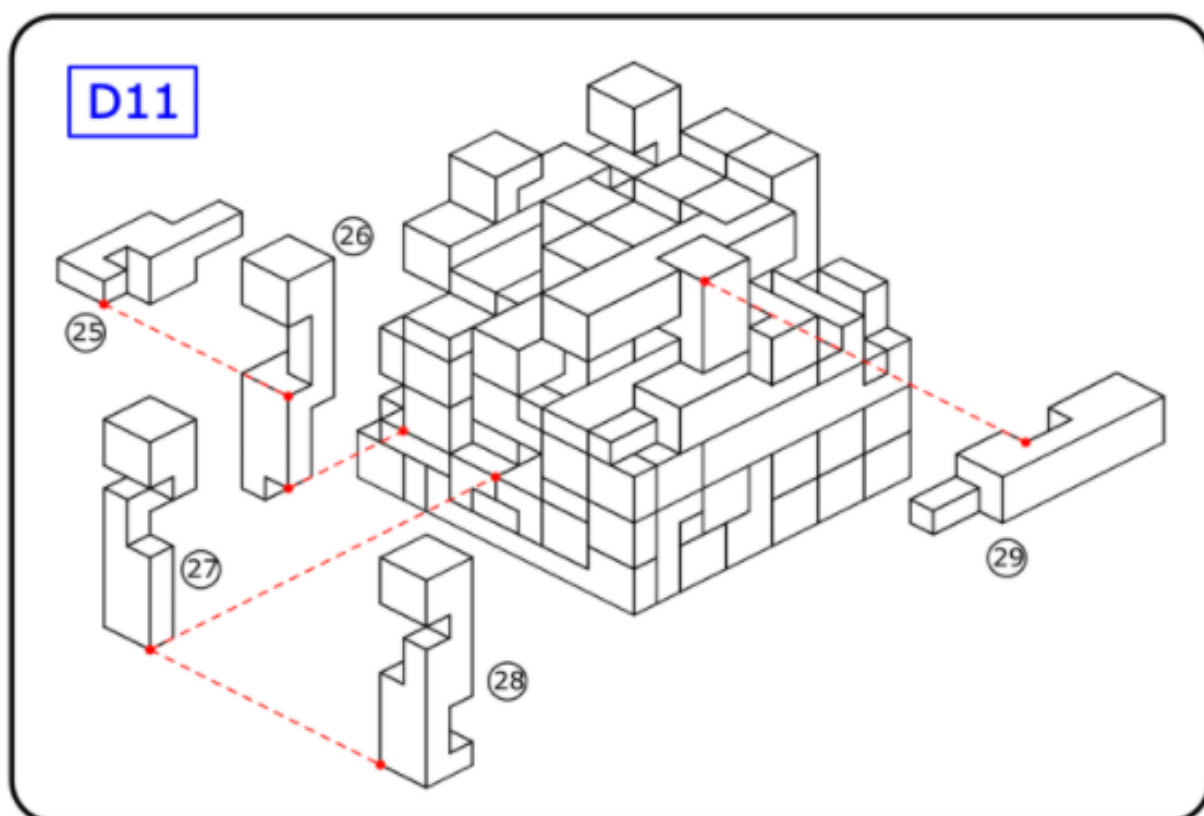
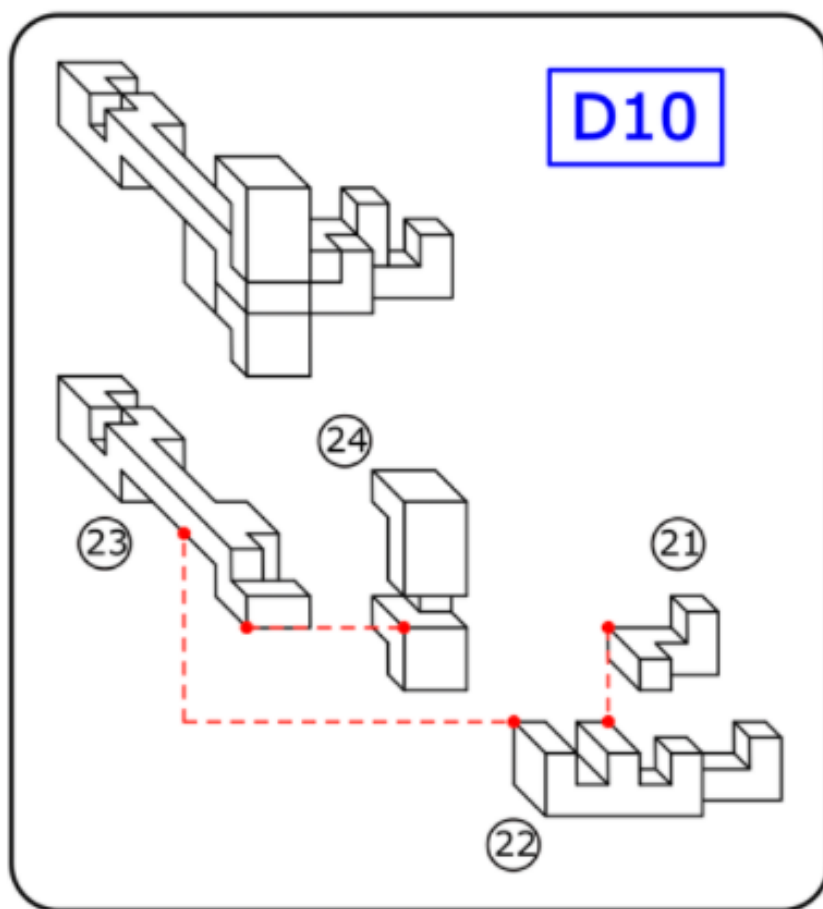
D5



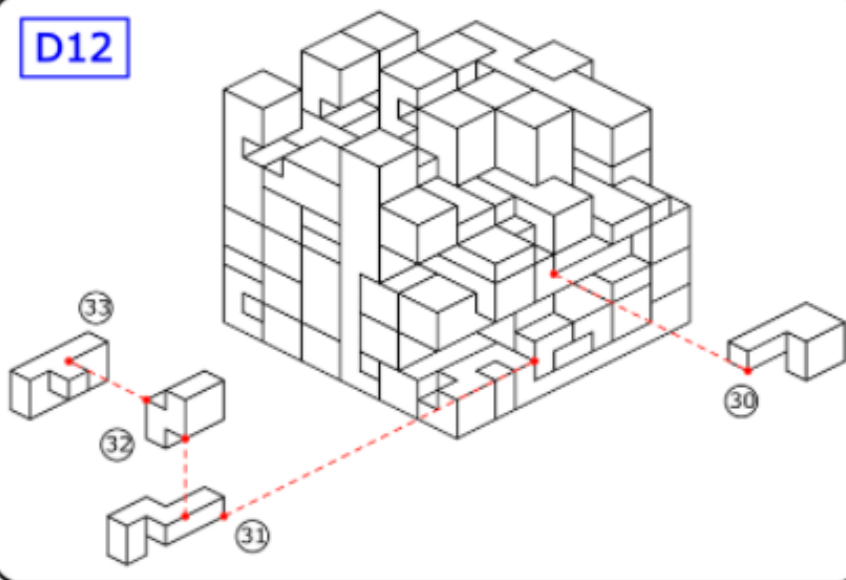
D6



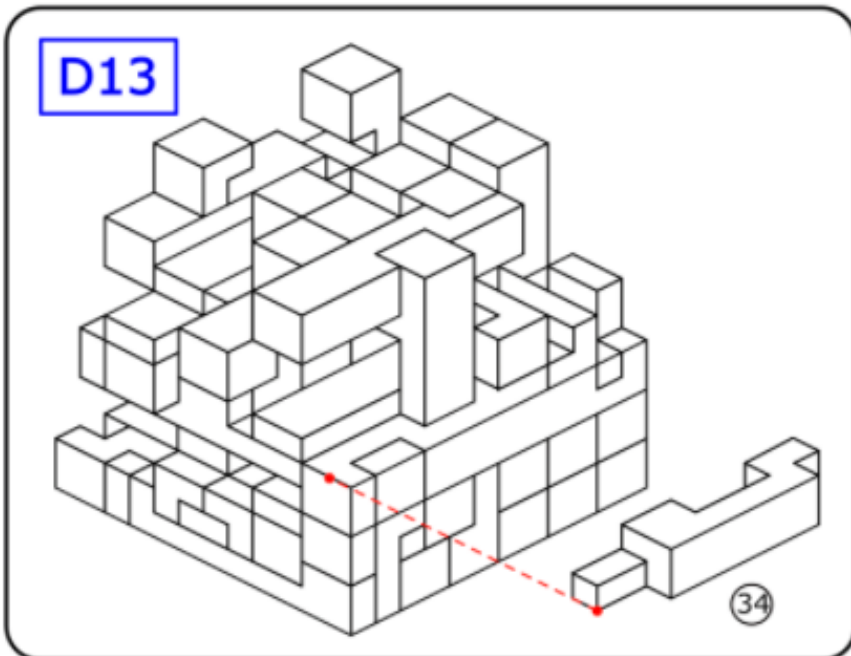




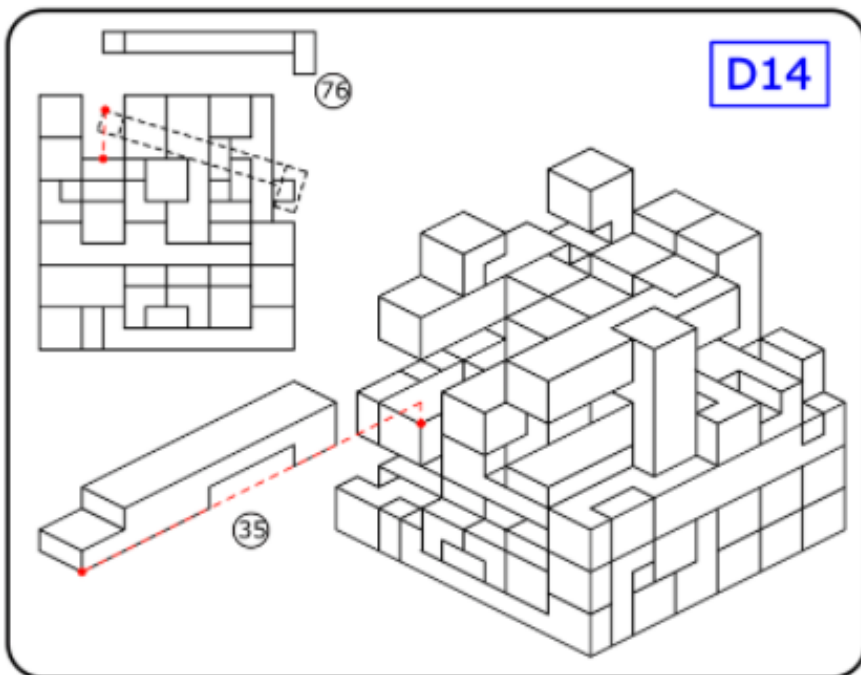
D12



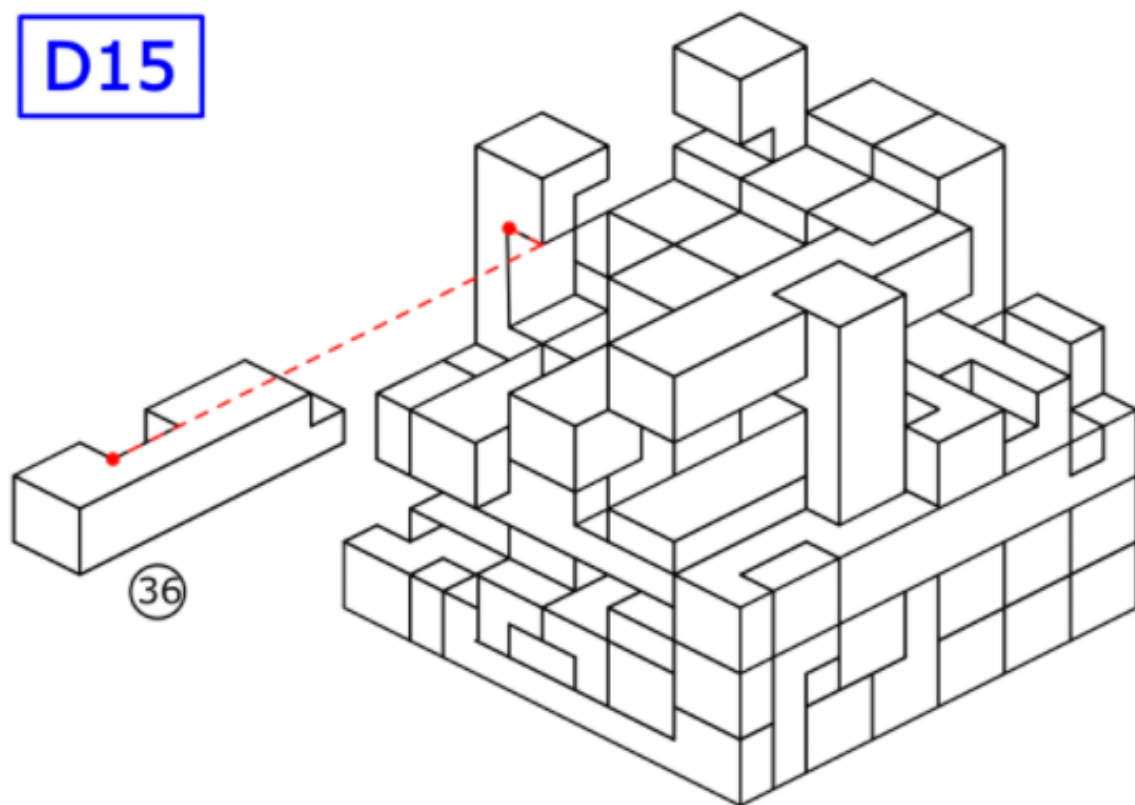
D13



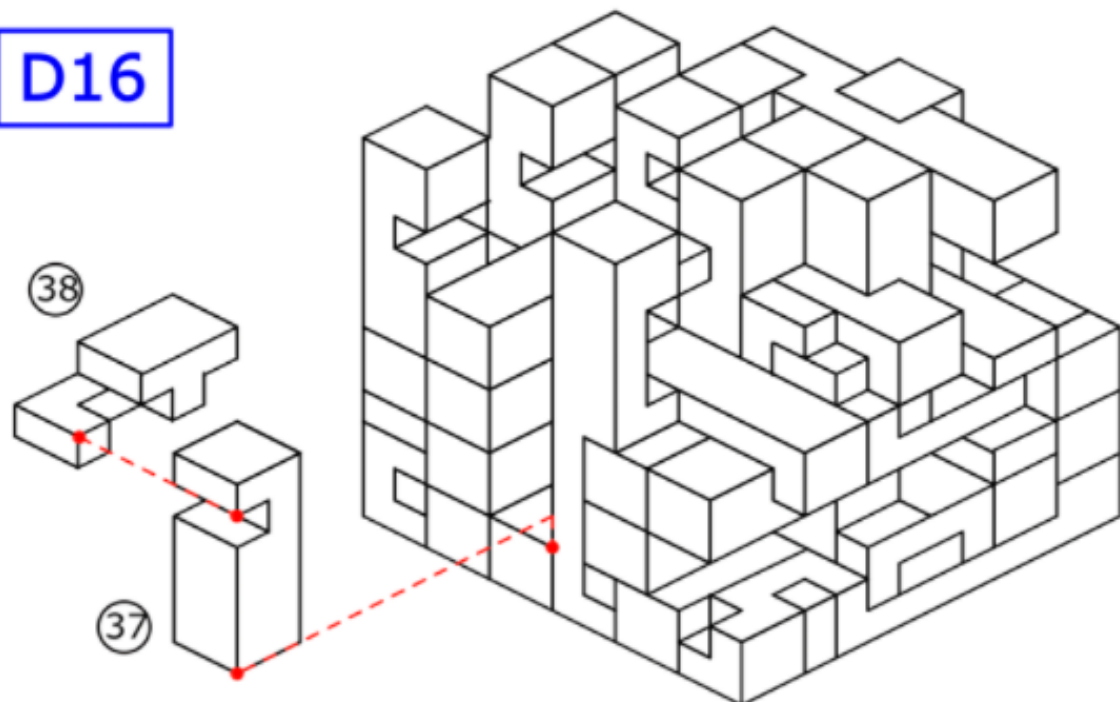
D14



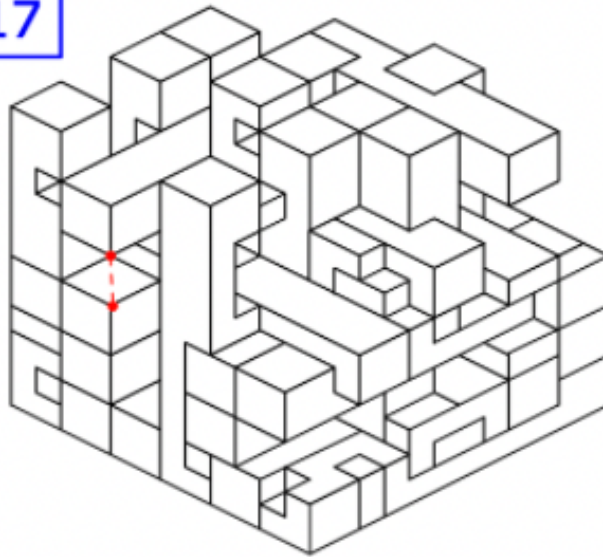
D15



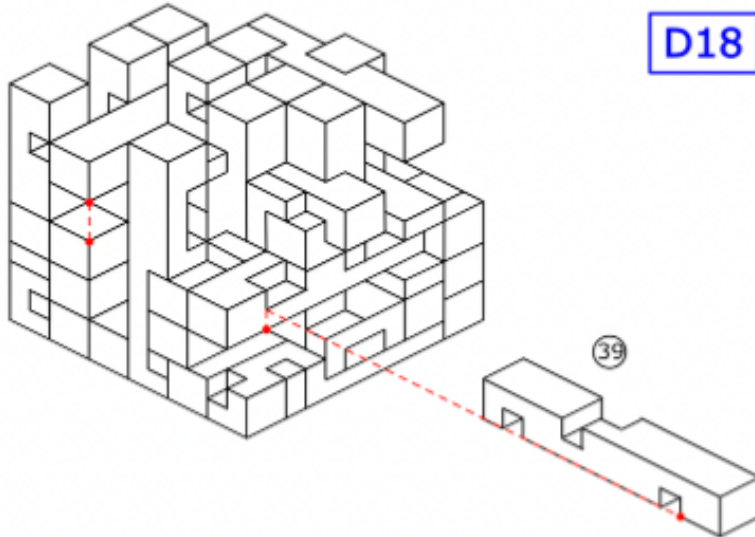
D16



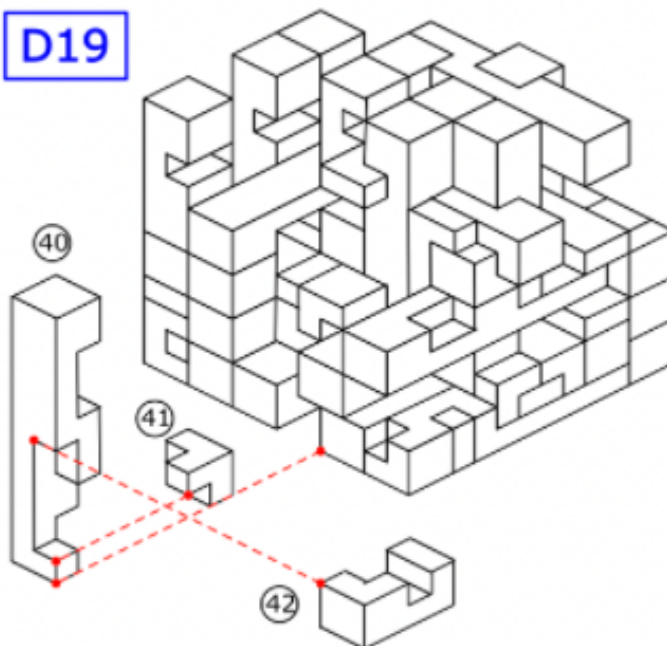
D17



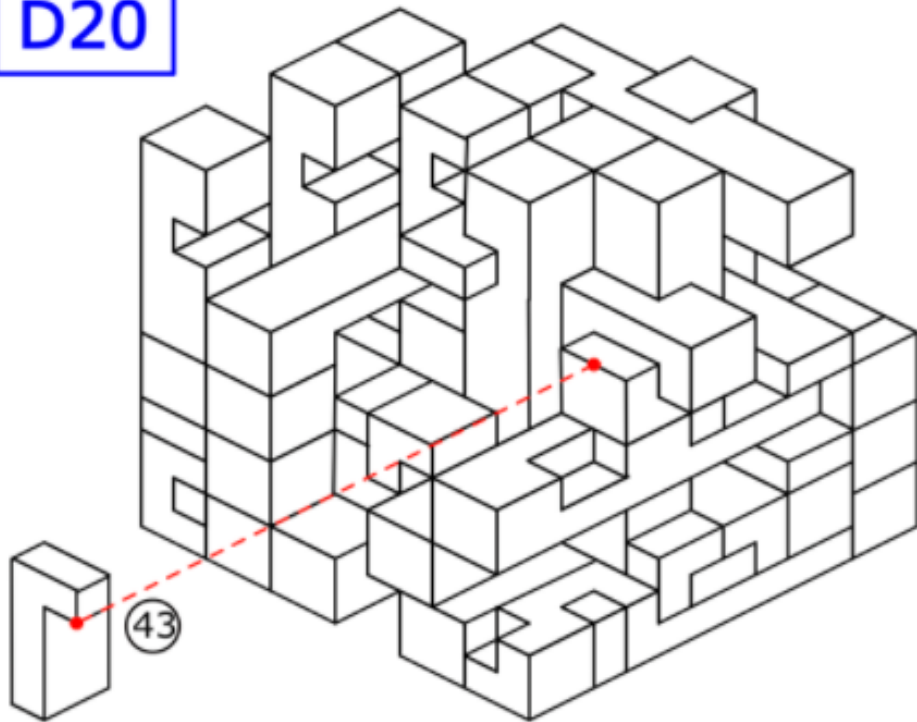
D18



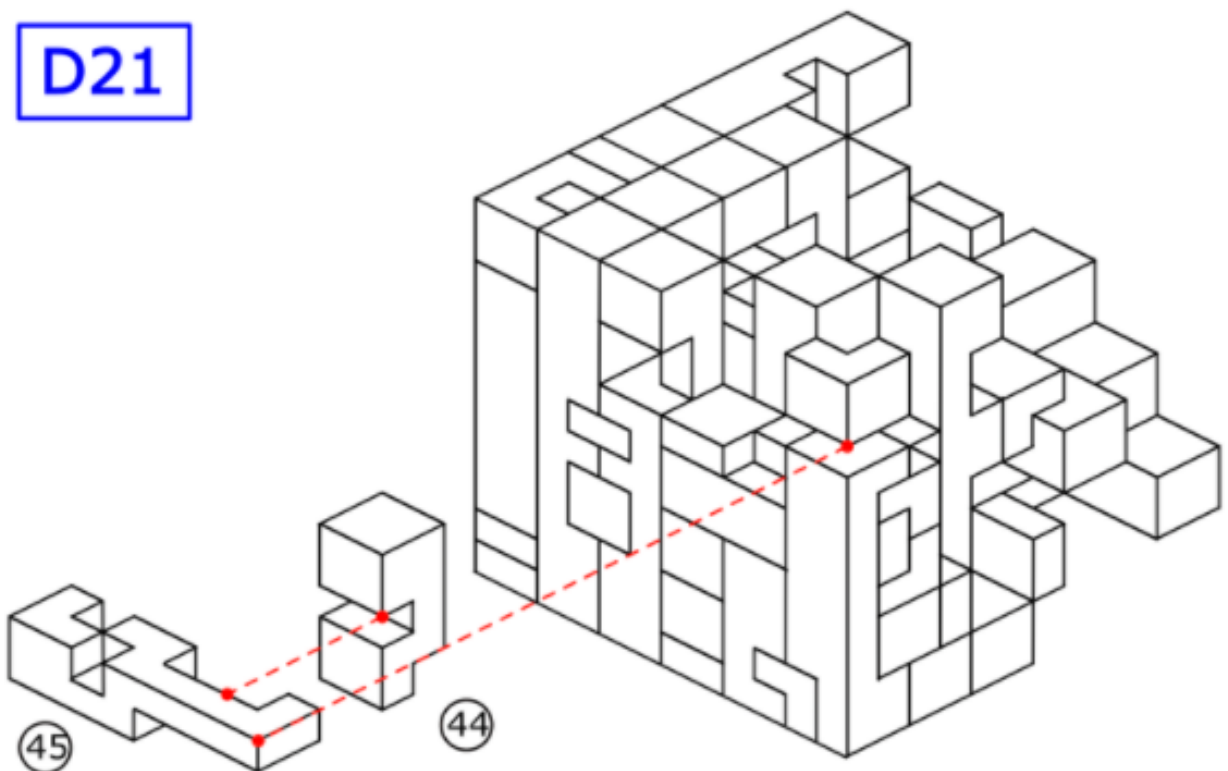
D19



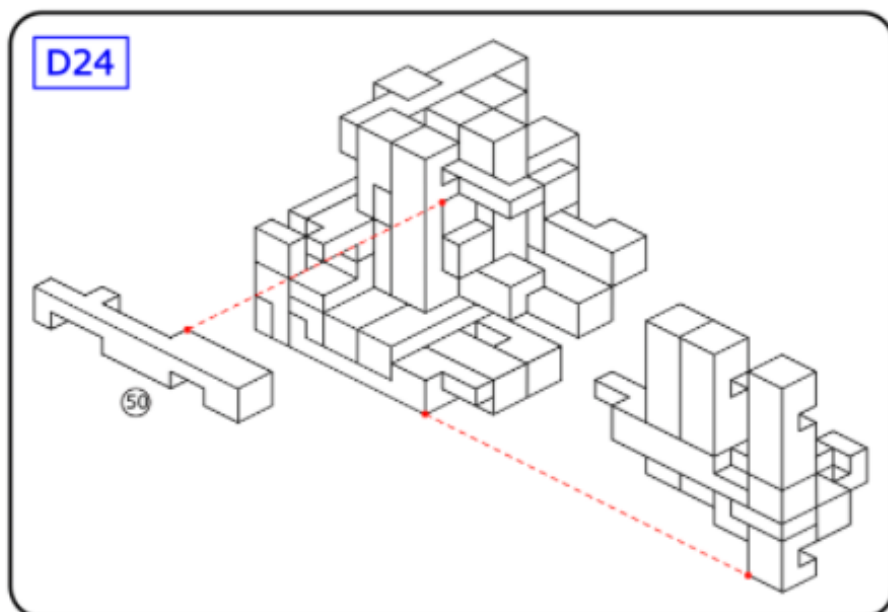
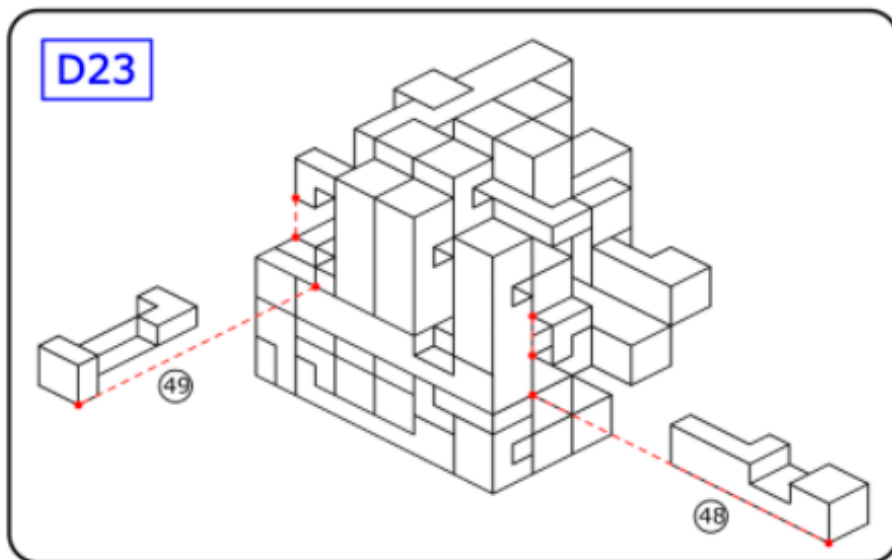
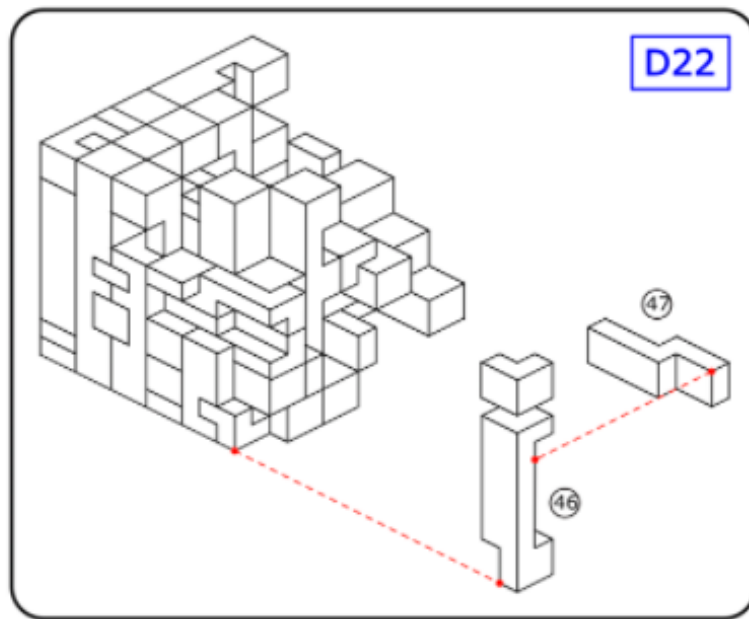
D20

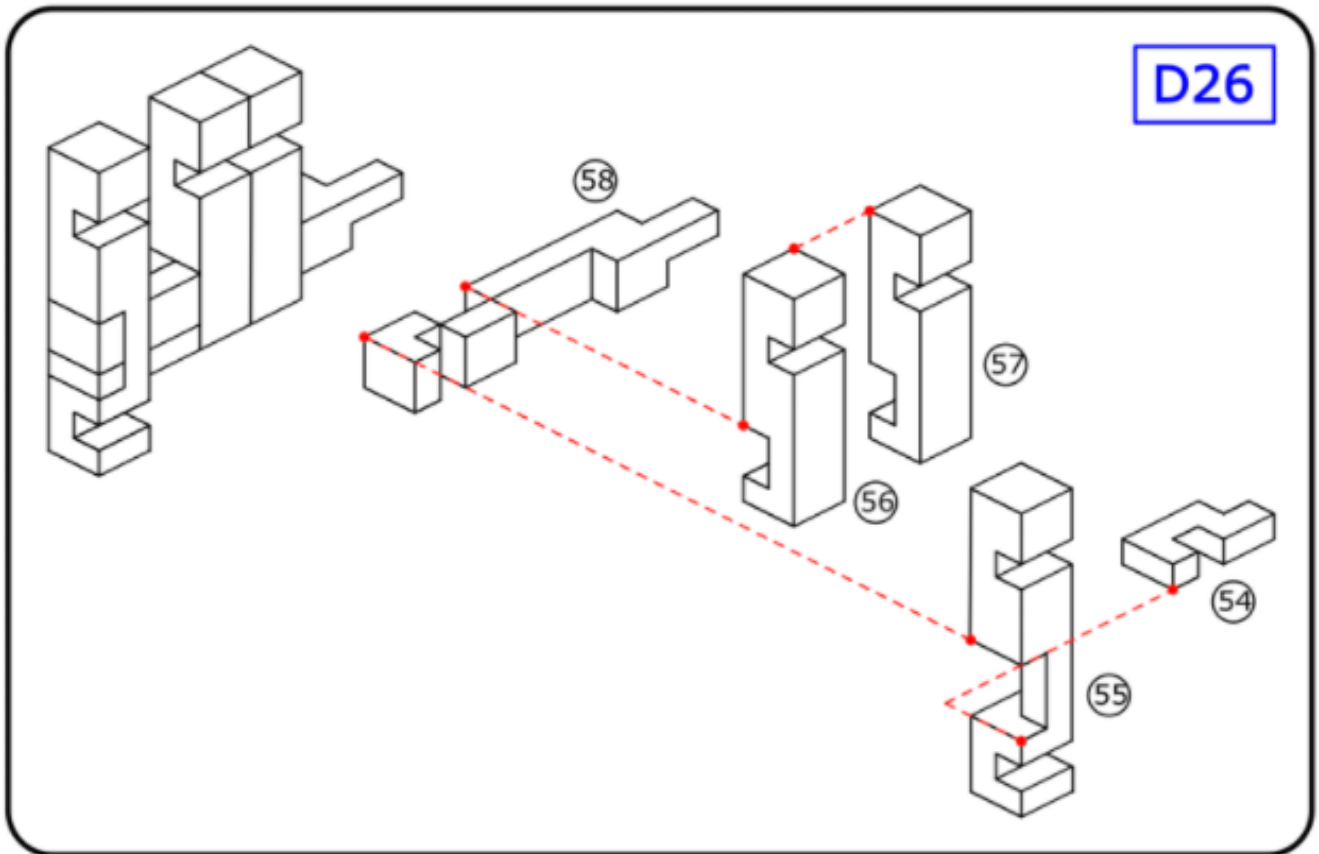
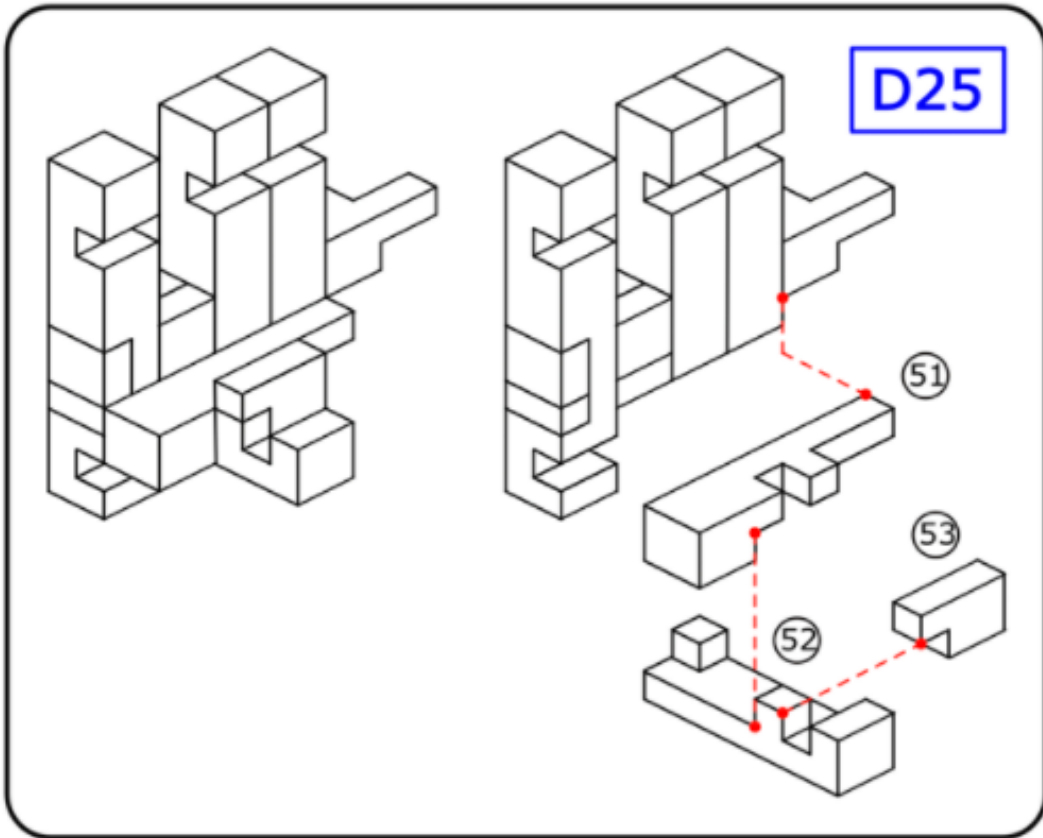


D21

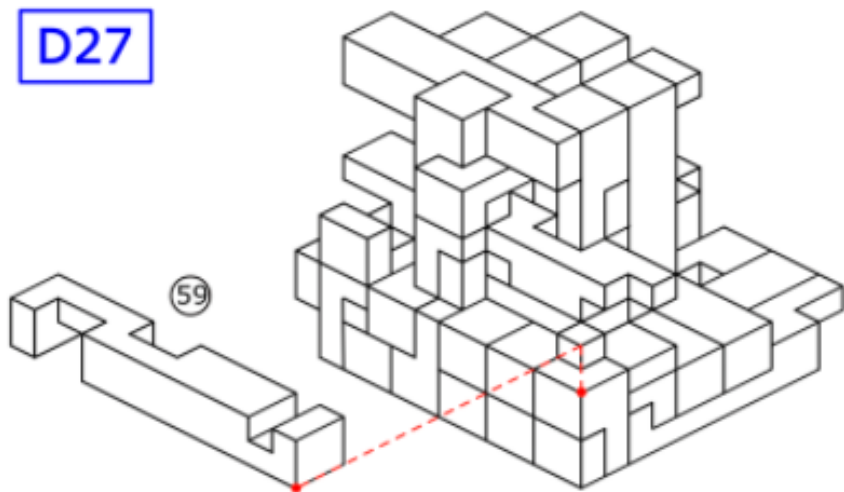




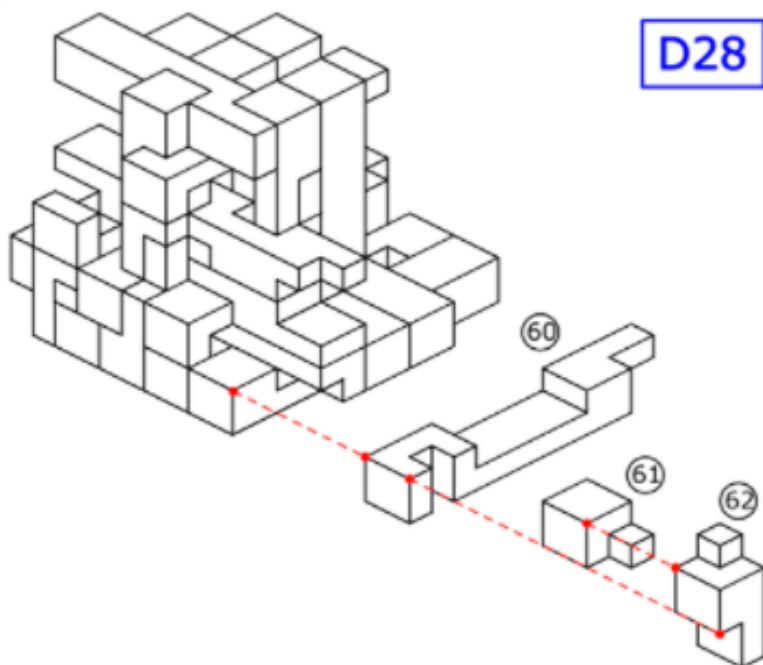




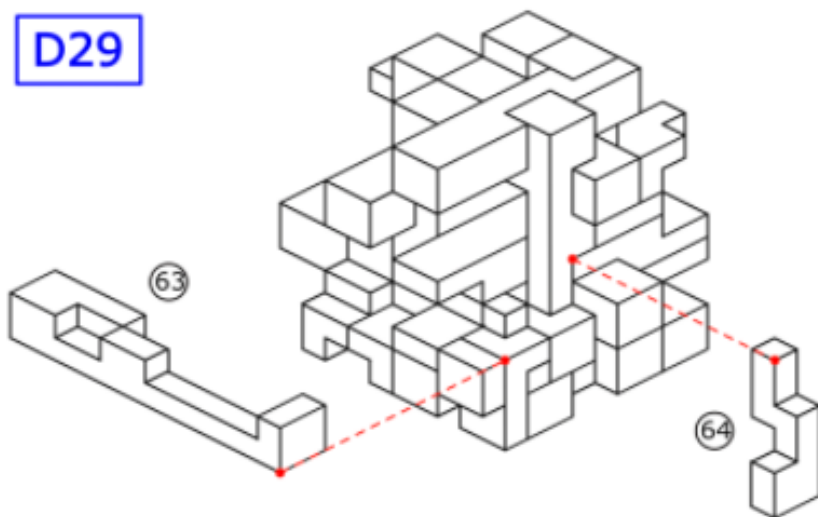
D27



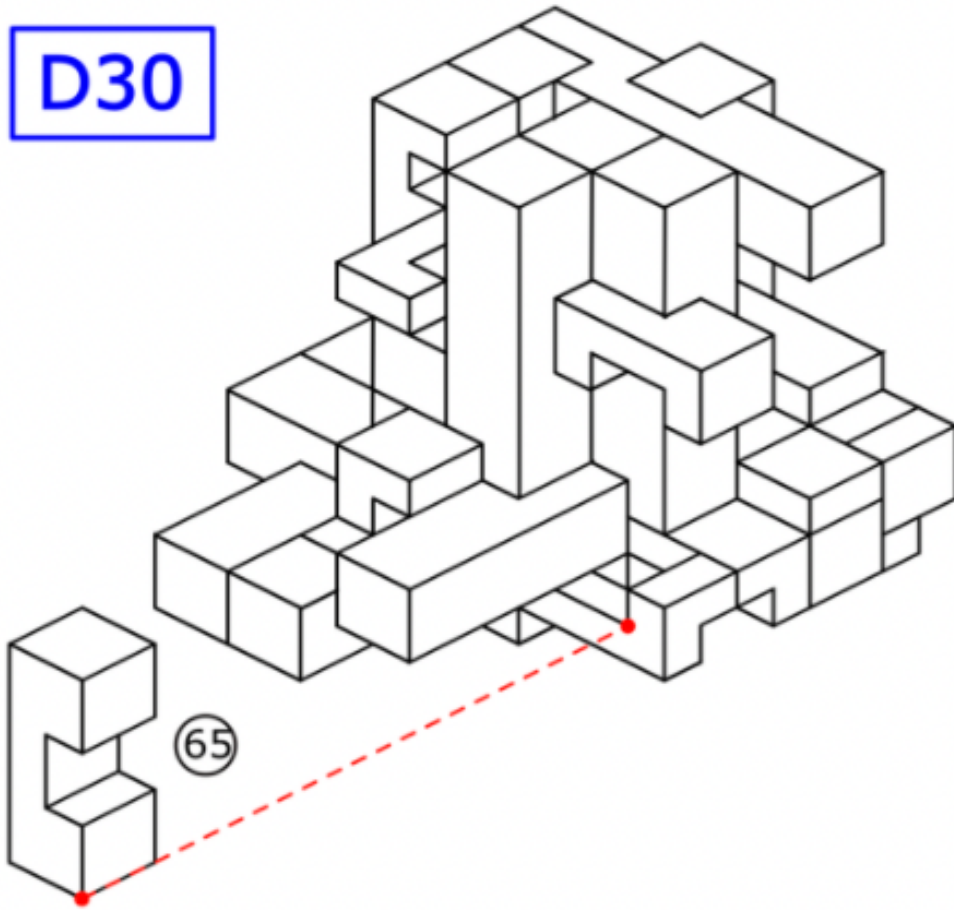
D28



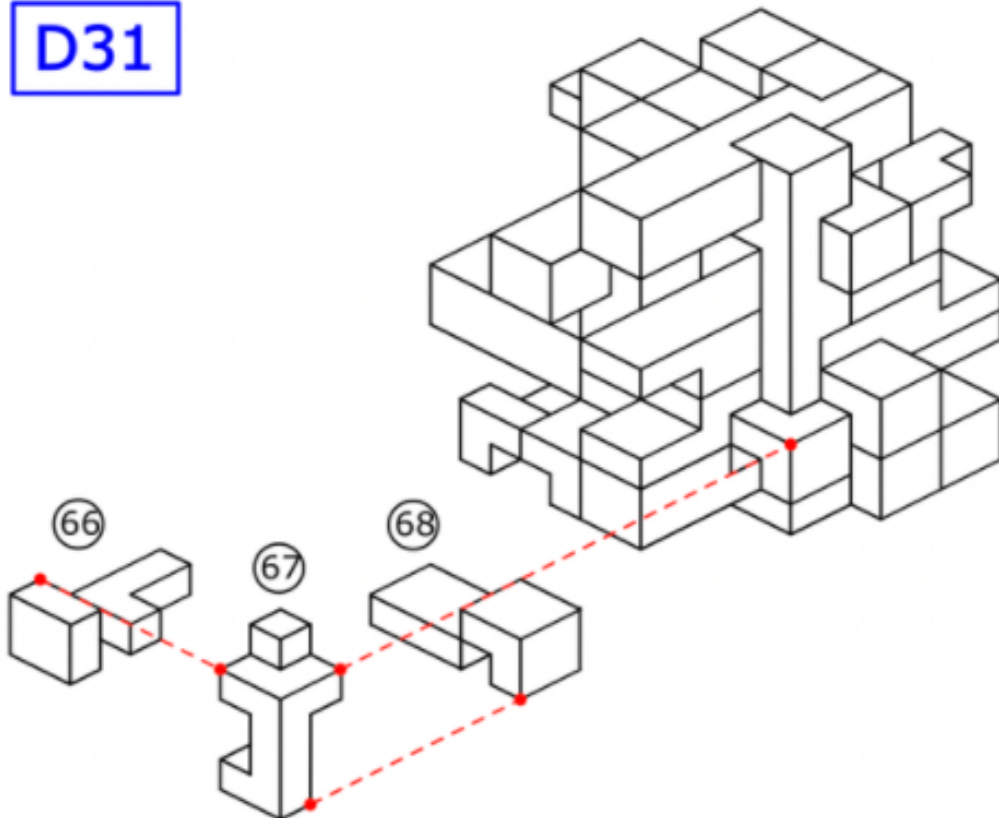
D29

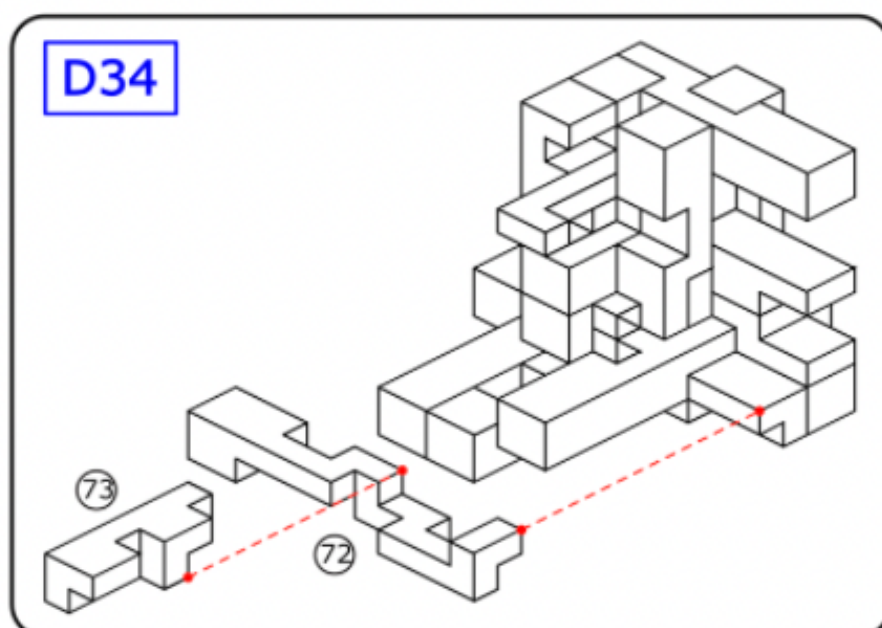
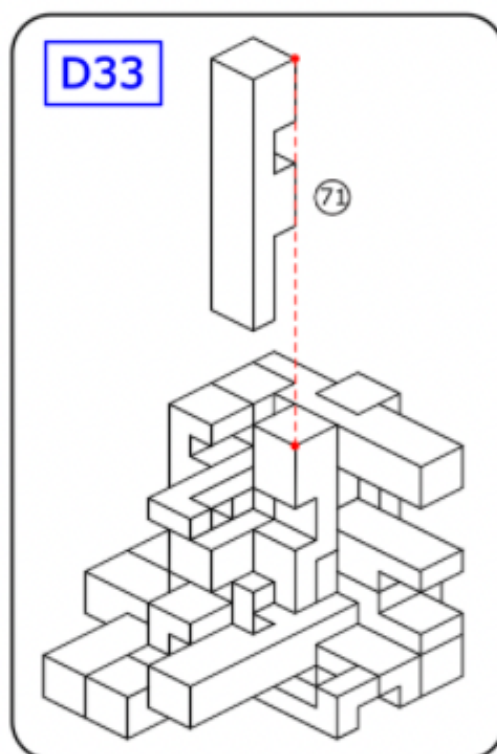
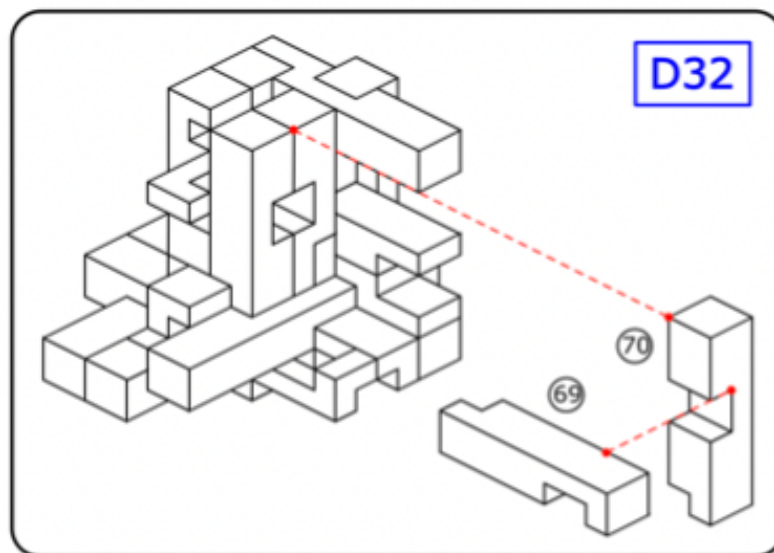


D30

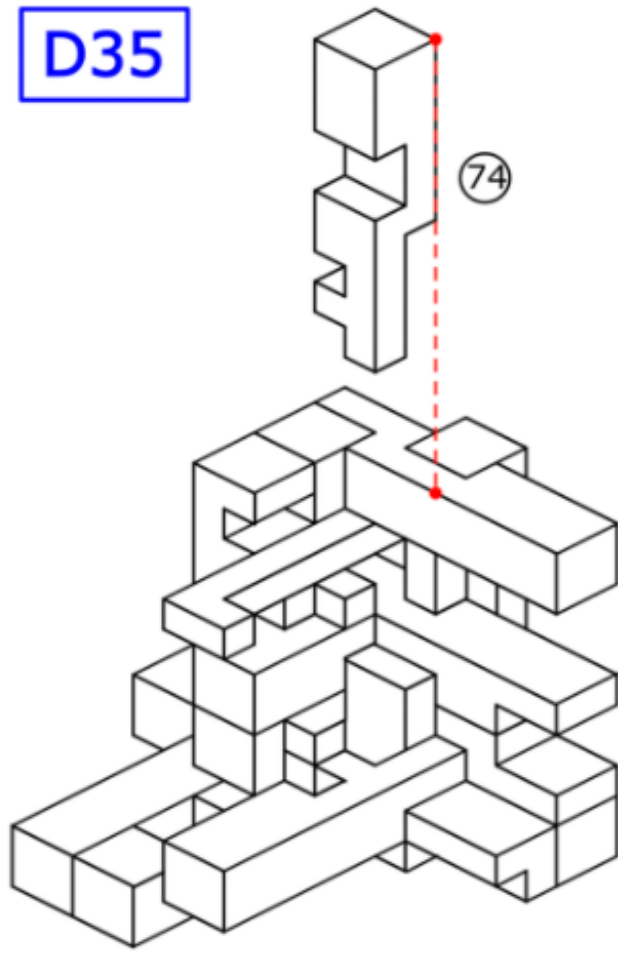


D31

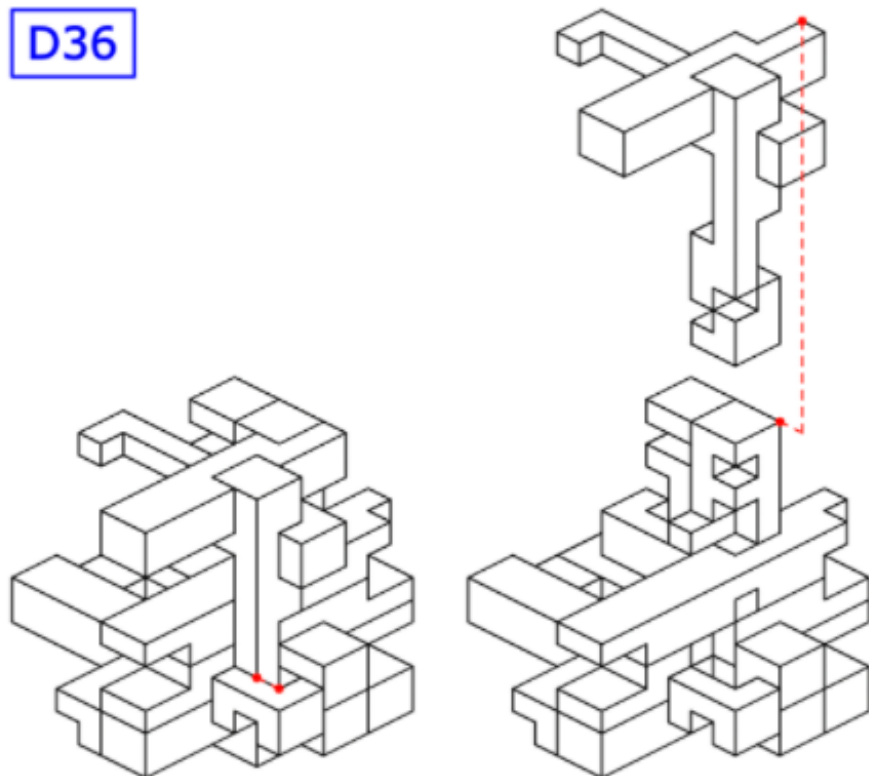




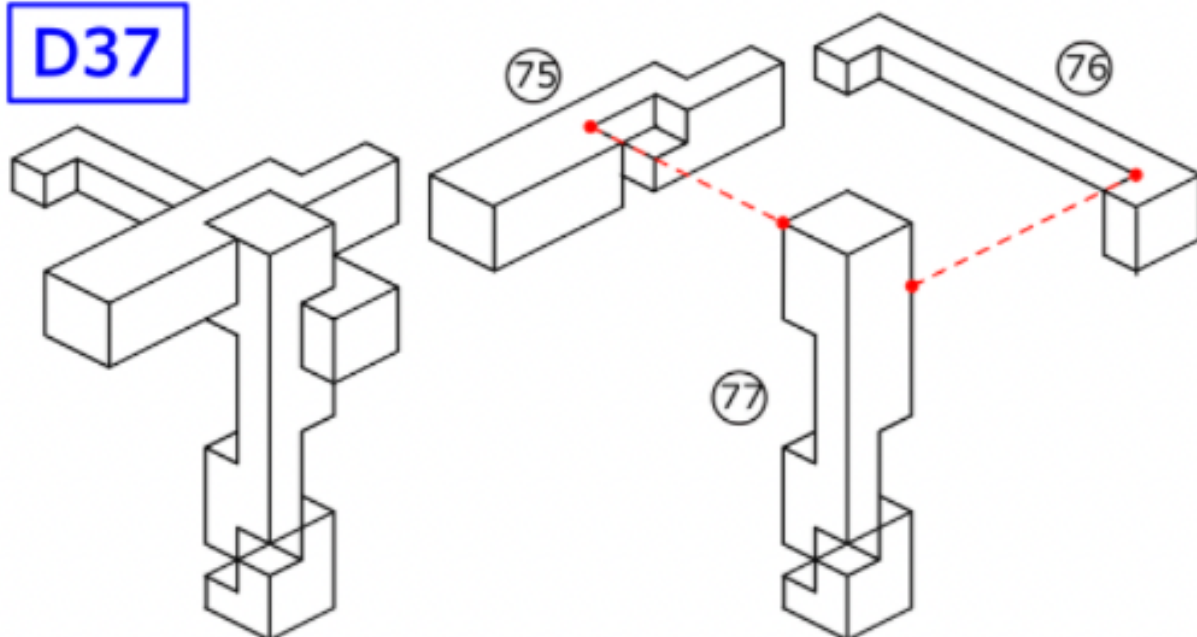
D35



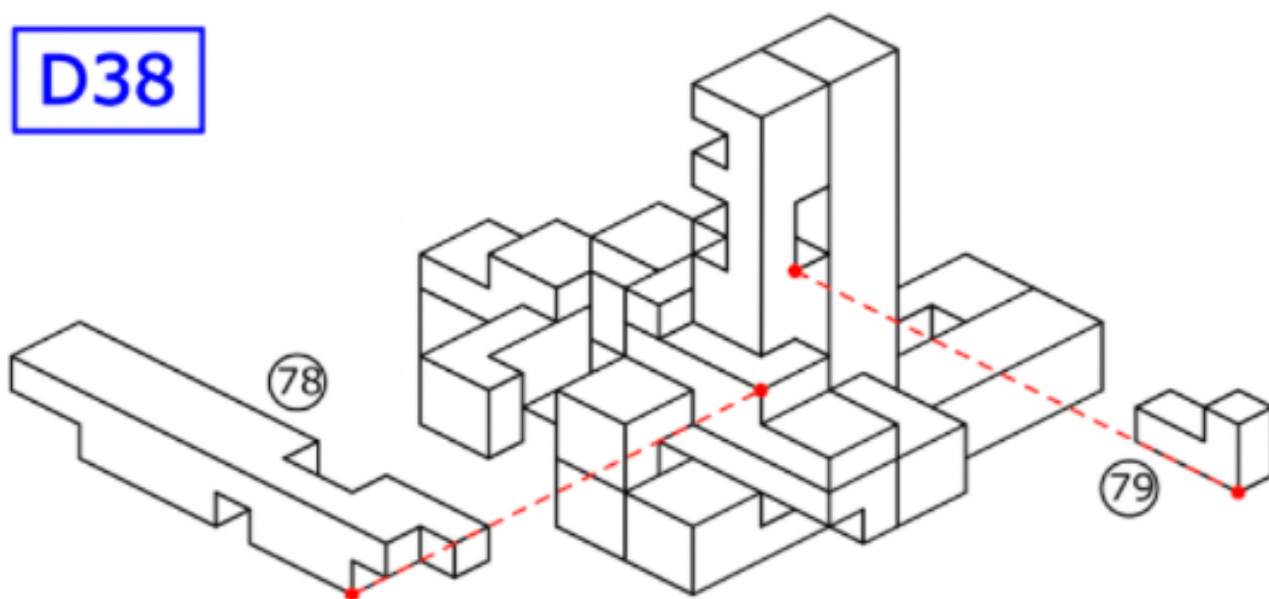
D36

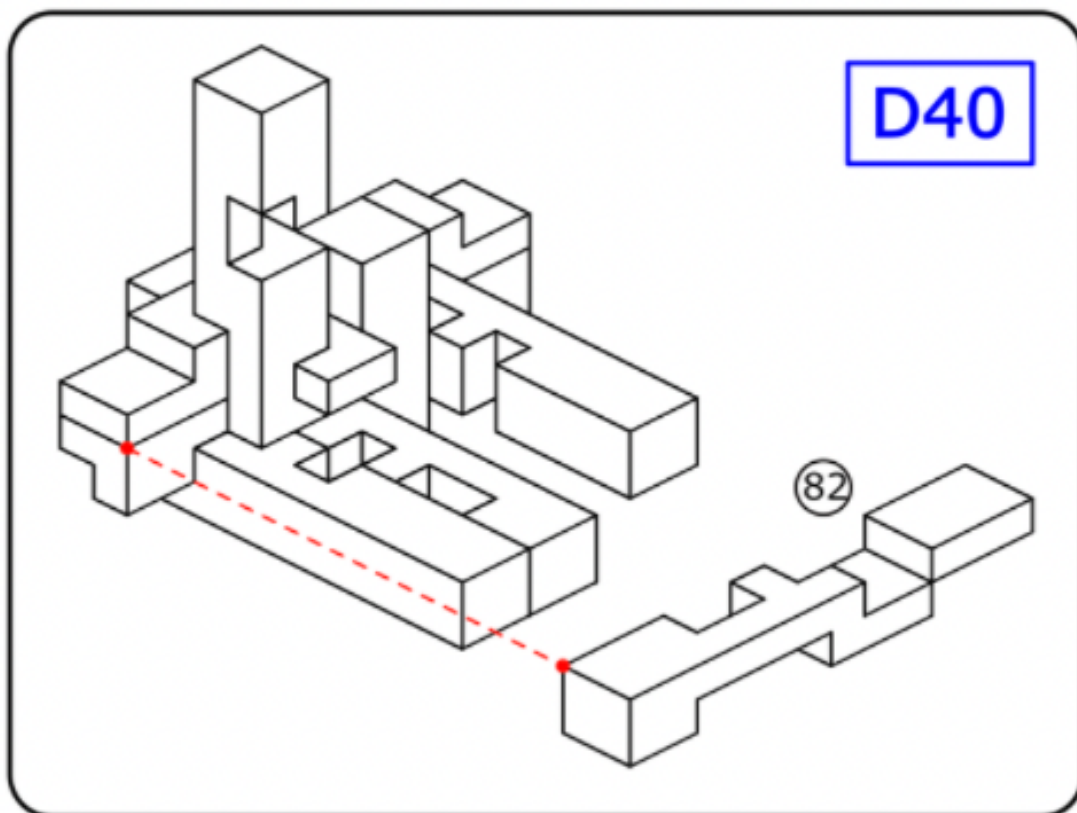
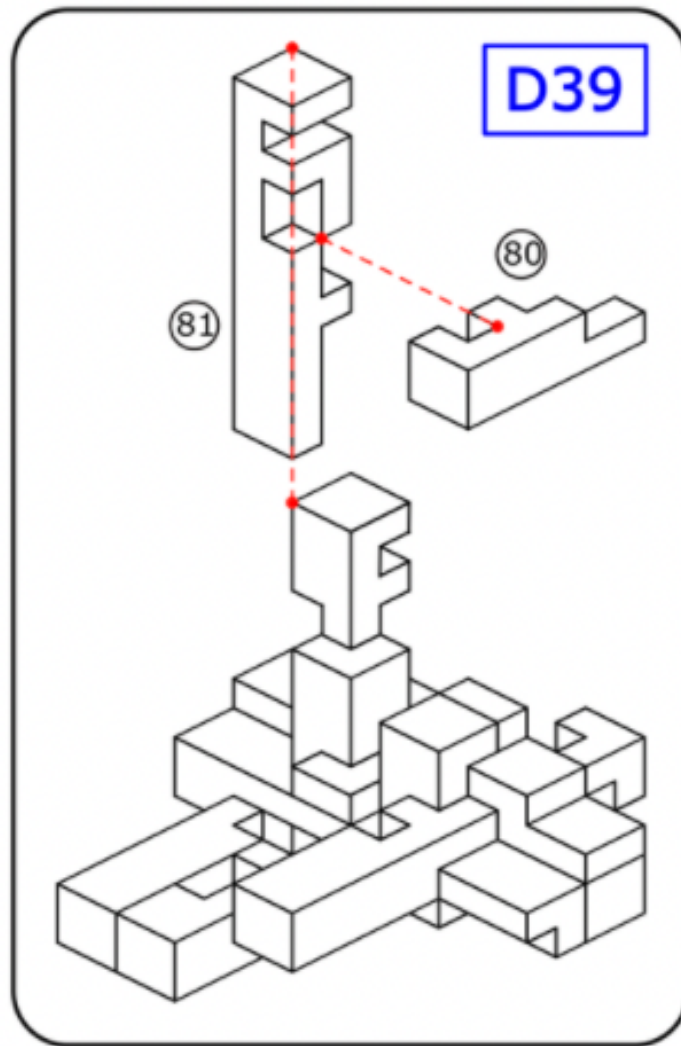


D37

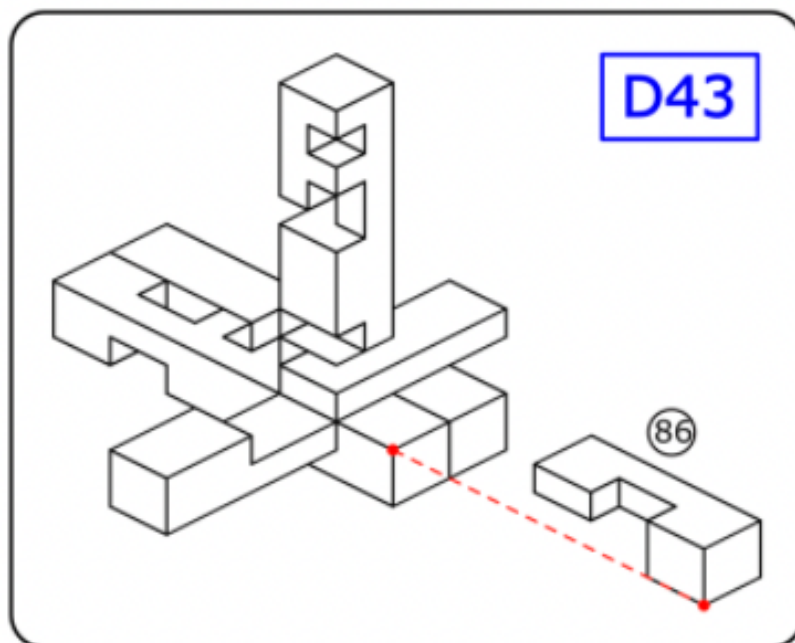
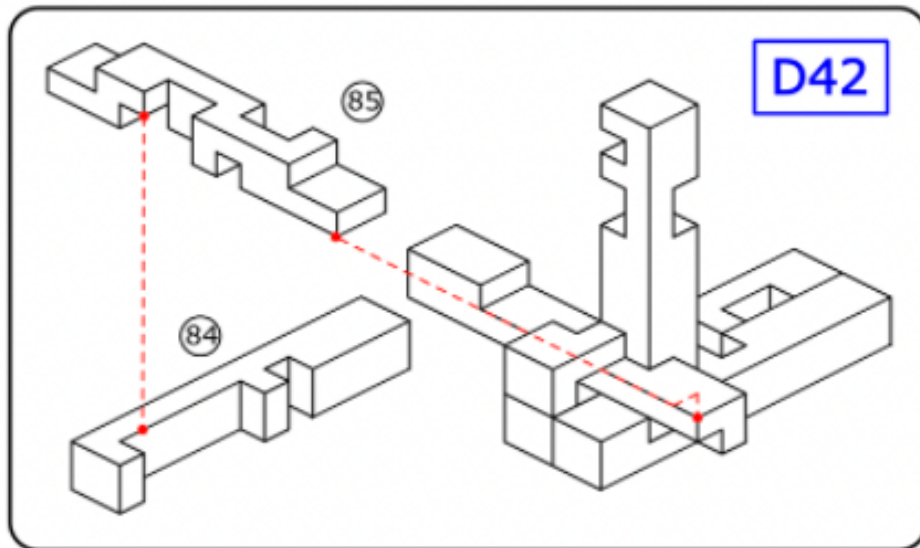
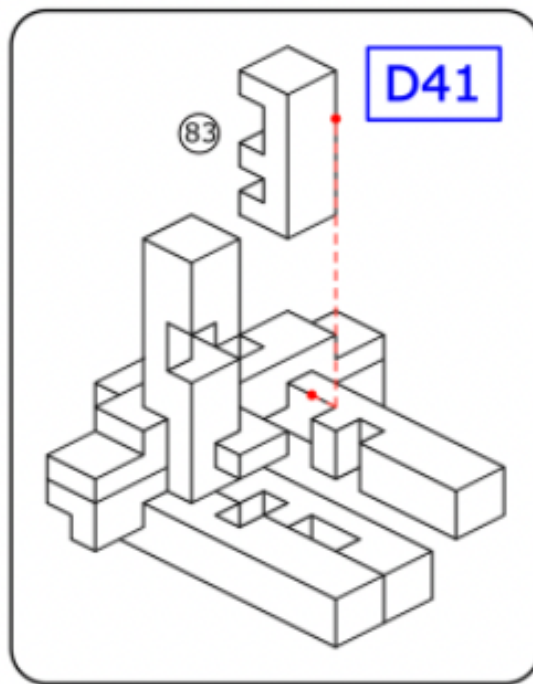


D38

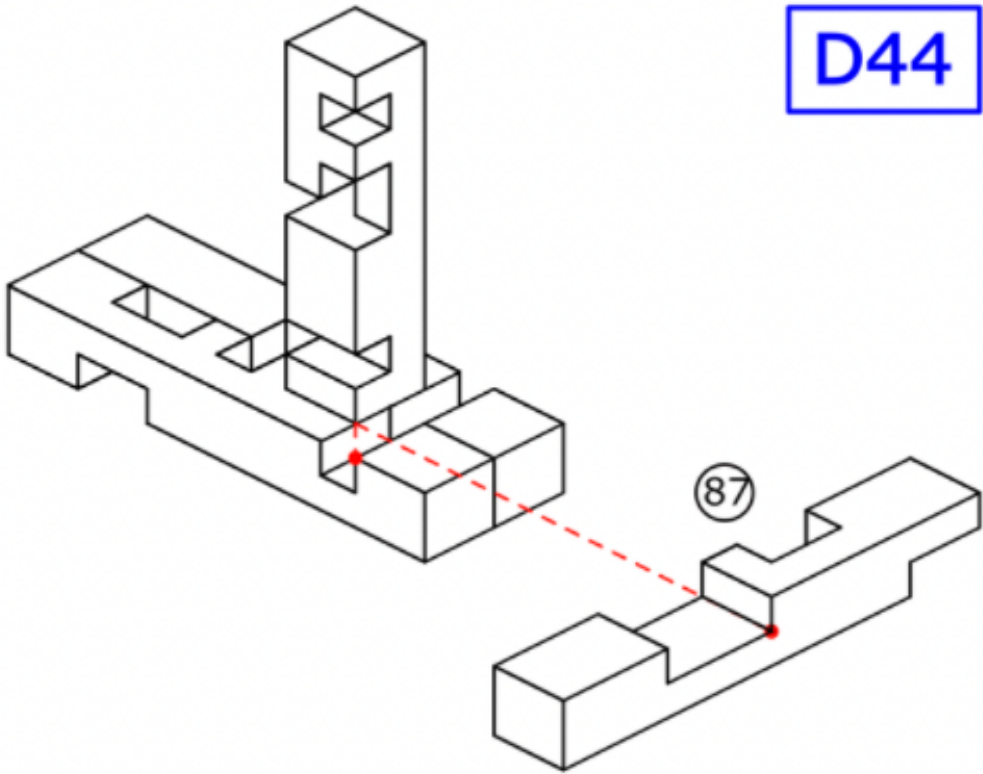




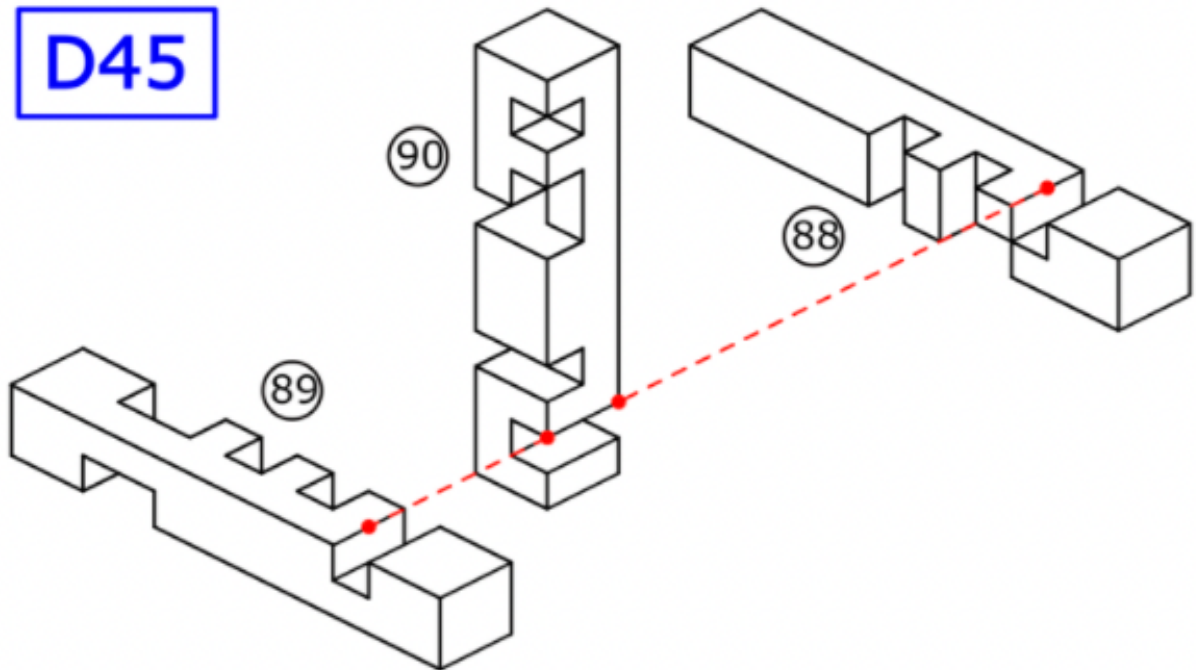




D44



D45



# Piece summary

piece	hexadec code	cubelets	piece	hexadec code	cubelet	piece	hexadec code	cubelets
1	DDDDDD099999	31	31	44C9	6	61	1FF1	10
2	4C8	4	32	6F9	8	62	1FE23	11
3	C89C	7	33	CDCC	9	63	FFDD6644444F	27
4	1DC	6	34	44FF333B8	20	64	113266	9
5	C44C8CCCEE4F	24	35	99FFFF6666FF	36	65	FFCCFF	20
6	6C8FFFFFFF6637	34	36	CFFF99FF	26	66	F4644	9
7	EECFB9	17	37	F4FFFF	21	67	744F1	10
8	CFCF7	15	38	32EFC	12	68	FE999	13
9	4C	3	39	F6FF9DFEE6FF	39	69	FEFFFFFF3	28
10	8FFF8	14	40	C46677FCCCDF	30	70	FFCCFFFF9	30
11	8CF	7	41	4F1	6	71	FFFCCFFCCCC	35
12	DD44FF	16	42	F6CF	12	72	FF322398C447	24
13	8889	5	43	32666	9	73	DDCF98	15
14	CEEC	10	44	FF9F6	16	74	FFF66F9898	26
15	EE88	8	45	F6DF2223	18	75	FFFFCEF73	30
16	446	4	46	EF1FCCCCC76	29	76	F22222223	14
17	44D	5	47	CCCC33	14	77	FEF7764DDB6F	35
18	62E88	8	48	FF66FCCC	22	78	33FF77366F31	31
19	644F	8	49	BA222F	12	79	119	4
20	CE88	7	50	D464CCCCF66FF	29	80	F3F322	14
21	64C	5	51	888C8CFF	16	81	F9FBBDDDFDCCC	35
22	FCFCE889	19	52	E66676F	18	82	FF9119326DDD	28
23	FCBF444477C9	27	53	CE8	6	83	F6F66F	18
24	FCE2FC	16	54	C4C8	6	84	F8CCCCFCFFFF	35
25	98FF11	13	55	FCF222FFFCFF	35	85	99F633F4CF99	29
26	FF888F3372	23	56	FFCFFF33F	30	86	FB2233	13
27	FFC623333	21	57	FFCFFF33F	30	87	FFF666833BDD	34
28	FFC99F33F	26	58	11FF6666DD6F	30	88	FFFFFCFD6FF	41
29	44FF33FFF4	27	59	F11F66FFFF4F	35	89	FF11F3B6FF	35
30	44DD	8	60	F1FCCCCFF11	29	90	FEFABFFFCF6F	38

Note that summing all 90 cubelet numbers yields 1728. Since this is equal to  $12 \times 12 \times 12$ , we are guaranteed that the Cube90 puzzle is solidly packed, i.e., with no internal cavities.

Bruce D Patterson  
 October, 2021  
 Herschmettlen, Switzerland