BASIC STRUCTURAL MODELING PROJECT

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CONCEPTUAL SOLUTION REPORT APPENDICES

Version 1.00

Table of Contents

Appendix A – Structuring Process Example

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
5	1	0	0	0	0	0	1	0	0	0	1	0	0	1	0	0	0	0	0
6	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
10	1	0	0	0	0	1	0	0	0	0	1	0	0	1	1	0	0	0	0
11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0
13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	0	1
15	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0
16	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
18	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Figure A1 – Initial City Information

	1	2	3	4	14	6	7	8	9	10	11	12	13	5	15	16	17	18	19
1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
14	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	0	1
6	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
10	1	0	0	0	1	1	0	0	0	0	1	0	0	0	1	0	0	0	0
11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0
13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5	1	0	0	0	1	0	1	0	0	0	1	0	0	0	0	0	0	0	0
15	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0
16	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
18	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Figure A2 – Swap Columns 5 and 14, Swap Rows 5 and 14

	1	2	3	4	11	6	7	8	9	10	14	12	13	5	15	16	17	18	19
1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10	1	0	0	0	1	1	0	0	0	0	1	0	0	0	1	0	0	0	0
14	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0	1
12	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0
13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5	1	0	0	0	1	0	1	0	0	0	1	0	0	0	0	0	0	0	0
15	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0
16	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
18	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Figure A3 – Swap Columns 14 and 11, Swap Rows 14 and 11

	1	2	3	10	11	6	7	8	9	4	14	12	13	5	15	16	17	18	19
1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10	1	0	0	0	1	1	0	0	0	0	1	0	0	0	1	0	0	0	0
11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0	1
12	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0
13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5	1	0	0	0	1	0	1	0	0	0	1	0	0	0	0	0	0	0	0
15	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0
16	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
18	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Figure A4 – Swap Columns 4 and 10, Swap Rows 4 and 10

	2	1	3	10	11	6	7	8	9	4	14	12	13	5	15	16	17	18	19
2	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10	0	1	0	0	1	1	0	0	0	0	1	0	0	0	1	0	0	0	0
11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0	1
12	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0
13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5	0	1	0	0	1	0	1	0	0	0	1	0	0	0	0	0	0	0	0
15	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0
16	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
18	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Figure A5 – Swap Columns 1 and 2, Swap Rows 1 and 2

	11	1	3	10	2	6	7	8	9	4	14	12	13	5	15	16	17	18	19
11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10	1	1	0	0	0	1	0	0	0	0	1	0	0	0	1	0	0	0	0
2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1
12	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5	1	1	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0
15	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
16	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
18	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Figure A6 – Swap Columns 2 and 11, Swap Rows 2 and 11

	11	2	3	10	1	6	7	8	9	4	14	12	13	5	15	16	17	18	19
11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10	1	0	0	0	1	1	0	0	0	0	1	0	0	0	1	0	0	0	0
1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1
12	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5	1	0	0	0	1	0	1	0	0	0	1	0	0	0	0	0	0	0	0
15	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
16	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0
17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
18	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Figure A7 – Swap Columns 1 and 2, Swap Rows 1 and 2

	11	2	3	1	10	6	7	8	9	4	14	12	13	5	15	16	17	18	19
11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10	1	0	0	1	0	1	0	0	0	0	1	0	0	0	1	0	0	0	0
6	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1
12	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5	1	0	0	1	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0
15	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
16	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
18	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Figure A8 – Swap Columns 10 and 1, Swap Rows 10 and 1

	11	2	3	1	6	10	7	8	9	4	14	12	13	5	15	16	17	18	19
11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
10	1	0	0	1	1	0	0	0	0	0	1	0	0	0	1	0	0	0	0
7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
14	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1
12	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5	1	0	0	1	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0
15	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
16	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
18	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Figure A9 – Swap Columns 10 and 6, Swap Rows 10 and 6

	11	2	3	1	14	10	7	8	9	4	6	12	13	5	15	16	17	18	19
11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1
10	1	0	0	1	1	0	0	0	0	0	1	0	0	0	1	0	0	0	0
7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
6	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5	1	0	0	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0
15	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
16	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
18	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Figure A10 – Swap Columns 6 and 14, Swap Rows 6 and 14

	11	2	3	1	17	10	7	8	9	4	6	12	13	5	15	16	14	18	19
11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10	1	0	0	1	0	0	0	0	0	0	1	0	0	0	1	0	1	0	0
7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
12	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5	1	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	1	0	0
15	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
16	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
14	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1
18	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Figure A11 – Swap Columns 14 and 17, Swap Rows 14 and 17

	11	2	3	1	17	14	7	8	9	4	6	12	13	5	15	16	10	18	19
11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1
7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
6	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
12	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5	1	0	0	1	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0
15	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
16	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
10	1	0	0	1	0	1	0	0	0	0	1	0	0	0	1	0	0	0	0
18	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Figure A12 – Swap Columns 10 and 14, Swap Rows 10 and 14

	11	2	3	1	17	19	7	8	9	4	6	12	13	5	15	16	10	18	14
11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
12	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5	1	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1
15	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
16	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
10	1	0	0	1	0	0	0	0	0	0	1	0	0	0	1	0	0	0	1
18	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
14	1	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0

Figure A13 – Swap Columns 14 and 19, Swap Rows 14 and 19

	11	2	3	1	17	19	7	8	9	10	6	12	13	5	15	16	4	18	14
11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10	1	0	0	1	0	0	0	0	0	0	1	0	0	0	1	0	0	0	1
6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
12	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5	1	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1
15	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
16	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
18	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
14	1	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0

Figure A14 – Swap Columns 4 and 10, Swap Rows 4 and 10

	11	2	3	1	17	19	7	8	9	14	6	12	13	5	15	16	4	18	10
11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14	1	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0
6	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
12	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5	1	0	0	1	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0
15	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
16	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
18	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
10	1	0	0	1	0	0	0	0	0	1	1	0	0	0	1	0	0	0	0

Figure A15 – Swap Columns 10 and 14, Swap Rows 10 and 14

	11	2	3	1	17	19	7	8	9	14	6	12	13	5	15	16	10	18	4
11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14	1	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0
6	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
12	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5	1	0	0	1	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0
15	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
16	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
10	1	0	0	1	0	0	0	0	0	1	1	0	0	0	1	0	0	0	0
18	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0

Figure A16 – Swap Columns 4 and 10, Swap Rows 4 and 10

	11	2	3	1	17	19	7	8	9	14	6	12	13	5	15	16	10	18	4
11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
19	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
7	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8	1	1	0	0	1	0	0	0	0	0	0	0	0	0	1	0	1	0	0
9	1	1	1	1	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0
14	1	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0
6	1	0	1	0	1	1	0	0	0	1	0	0	1	0	0	0	0	0	0
12	1	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
13	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5	1	1	0	1	1	1	1	0	0	1	0	0	0	0	1	0	0	0	1
15	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
16	1	1	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
10	1	1	0	1	1	1	1	0	0	1	1	0	1	0	1	0	0	0	0
18	1	0	0	0	0	0	1	0	1	1	0	0	0	1	0	0	0	0	0
4	1	1	0	1	1	1	1	0	0	1	1	0	0	0	1	0	1	0	0

Figure A17 – Inference Entries in Blue, New Data in Green

	11	2	3	1	17	13	7	8	9	14	6	12	19	5	15	16	10	18	4
11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8	1	1	0	0	1	0	0	0	0	0	0	0	0	0	1	0	1	0	0
9	1	1	1	1	0	1	0	0	0	0	0	0	0	1	0	0	0	0	0
14	1	0	0	0	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0
6	1	0	1	0	1	1	0	0	0	1	0	0	1	0	0	0	0	0	0
12	1	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
19	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
5	1	1	0	1	1	0	1	0	0	1	0	0	1	0	1	0	0	0	1
15	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
16	1	1	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
10	1	1	0	1	1	1	1	0	0	1	1	0	1	0	1	0	0	0	0
18	1	0	0	0	0	0	1	0	1	1	0	0	0	1	0	0	0	0	0
4	1	1	0	1	1	0	1	0	0	1	1	0	1	0	1	0	1	0	0

Figure A18 – Swap Columns 19 and 13, Swap Rows 19 and 13

	11	2	3	1	17	13	7	10	9	14	6	12	19	5	15	16	8	18	4
11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10	1	1	0	1	1	1	1	0	0	1	1	0	1	0	1	0	0	0	0
9	1	1	1	1	0	1	0	0	0	0	0	0	0	1	0	0	0	0	0
14	1	0	0	0	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0
6	1	0	1	0	1	1	0	0	0	1	0	0	1	0	0	0	0	0	0
12	1	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
19	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
5	1	1	0	1	1	0	1	0	0	1	0	0	1	0	1	0	0	0	1
15	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
16	1	1	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
8	1	1	0	0	1	0	0	1	0	0	0	0	0	0	1	0	0	0	0
18	1	0	0	0	0	0	1	0	1	1	0	0	0	1	0	0	0	0	0
4	1	1	0	1	1	0	1	1	0	1	1	0	1	0	1	0	0	0	0

Figure A19 – Swap Columns 8 and 10, Swap Rows 8 and 10

	11	2	3	1	17	13	7	15	9	14	6	12	19	5	10	16	8	18	4
11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
9	1	1	1	1	0	1	0	0	0	0	0	0	0	1	0	0	0	0	0
14	1	0	0	0	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0
6	1	0	1	0	1	1	0	0	0	1	0	0	1	0	0	0	0	0	0
12	1	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
19	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
5	1	1	0	1	1	0	1	1	0	1	0	0	1	0	0	0	0	0	1
10	1	1	0	1	1	1	1	1	0	1	1	0	1	0	0	0	0	0	0
16	1	1	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
8	1	1	0	0	1	0	0	1	0	0	0	0	0	0	1	0	0	0	0
18	1	0	0	0	0	0	1	0	1	1	0	0	0	1	0	0	0	0	0
4	1	1	0	1	1	0	1	1	0	1	1	0	1	0	1	0	0	0	0

Figure A20 – Swap Columns 10 and 15, Swap Rows 10 and 15

	11	2	3	1	17	13	7	15	5	14	6	12	19	9	10	16	8	18	4
11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
5	1	1	0	1	1	0	1	1	0	1	0	0	1	0	0	0	0	0	1
14	1	0	0	0	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0
6	1	0	1	0	1	1	0	0	0	1	0	0	1	0	0	0	0	0	0
12	1	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
19	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
9	1	1	1	1	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0
10	1	1	0	1	1	1	1	1	0	1	1	0	1	0	0	0	0	0	0
16	1	1	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
8	1	1	0	0	1	0	0	1	0	0	0	0	0	0	1	0	0	0	0
18	1	0	0	0	0	0	1	0	1	1	0	0	0	1	0	0	0	0	0
4	1	1	0	1	1	0	1	1	0	1	1	0	1	0	1	0	0	0	0

Figure A21 – Swap Columns 9 and 5, Swap Rows 9 and 5

	11	2	3	1	17	13	7	15	4	14	6	12	19	9	10	16	8	18	5
11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
4	1	1	0	1	1	0	1	1	0	1	1	0	1	0	1	0	0	0	0
14	1	0	0	0	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0
6	1	0	1	0	1	1	0	0	0	1	0	0	1	0	0	0	0	0	0
12	1	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
19	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
9	1	1	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1
10	1	1	0	1	1	1	1	1	0	1	1	0	1	0	0	0	0	0	0
16	1	1	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
8	1	1	0	0	1	0	0	1	0	0	0	0	0	0	1	0	0	0	0
18	1	0	0	0	0	0	1	0	0	1	0	0	0	1	0	0	0	0	1
5	1	1	0	1	1	0	1	1	1	1	0	0	1	0	0	0	0	0	0

Figure A22 – Swap Columns 5 and 4, Swap Rows 5 and 4

	11	2	3	1	17	13	7	15	10	14	6	12	19	9	4	16	8	18	5
11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
10	1	1	0	1	1	1	1	1	0	1	1	0	1	0	0	0	0	0	0
14	1	0	0	0	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0
6	1	0	1	0	1	1	0	0	0	1	0	0	1	0	0	0	0	0	0
12	1	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
19	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
9	1	1	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1
4	1	1	0	1	1	0	1	1	1	1	1	0	1	0	0	0	0	0	0
16	1	1	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
8	1	1	0	0	1	0	0	1	1	0	0	0	0	0	0	0	0	0	0
18	1	0	0	0	0	0	1	0	0	1	0	0	0	1	0	0	0	0	1
5	1	1	0	1	1	0	1	1	0	1	0	0	1	0	1	0	0	0	0

Figure A23 – Swap Columns 4 and 10, Swap Rows 4 and 10

	11	2	3	1	17	13	7	15	19	14	6	12	10	9	4	16	8	18	5
11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
19	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
14	1	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0
6	1	0	1	0	1	1	0	0	1	1	0	0	0	0	0	0	0	0	0
12	1	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
10	1	1	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
9	1	1	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1
4	1	1	0	1	1	0	1	1	1	1	1	0	1	0	0	0	0	0	0
16	1	1	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
8	1	1	0	0	1	0	0	1	0	0	0	0	1	0	0	0	0	0	0
18	1	0	0	0	0	0	1	0	0	1	0	0	0	1	0	0	0	0	1
5	1	1	0	1	1	0	1	1	1	1	0	0	0	0	1	0	0	0	0

Figure A24 – Swap Columns 10 and 9, Swap Rows 10 and 9

	11	2	3	1	17	13	7	15	19	14	6	12	10	5	4	16	8	18	9
11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
19	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
14	1	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0
6	1	0	1	0	1	1	0	0	1	1	0	0	0	0	0	0	0	0	0
12	1	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
10	1	1	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
5	1	1	0	1	1	0	1	1	1	1	0	0	0	0	0	0	0	0	0
4	1	1	0	1	1	0	1	1	1	1	1	0	1	1	0	0	0	0	0
16	1	1	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
8	1	1	0	0	1	0	0	1	0	0	0	0	1	0	0	0	0	0	0
18	1	0	0	0	0	0	1	0	0	1	0	0	0	1	0	0	0	0	1
9	1	1	1	1	0	1	0	0	0	0	0	0	0	1	0	0	0	0	0

Figure A25 – Swap Columns 9 and 5, Swap Rows 9 and 5

	11	2	3	1	17	13	7	15	19	14	6	12	10	5	4	16	8	9	18
11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
19	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
14	1	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0
6	1	0	1	0	1	1	0	0	1	1	0	0	0	0	0	0	0	0	0
12	1	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
10	1	1	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
5	1	1	0	1	1	0	1	1	1	1	0	0	0	0	0	0	0	0	0
4	1	1	0	1	1	0	1	1	1	1	1	0	1	1	0	0	0	0	0
16	1	1	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
8	1	1	0	0	1	0	0	1	0	0	0	0	1	0	0	0	0	0	0
9	1	1	1	1	0	1	0	0	0	0	0	0	0	1	0	0	0	0	0
18	1	0	0	0	0	0	1	0	0	1	0	0	0	1	0	0	0	1	0

Figure A26 – Swap Columns 18 and 9, Swap Rows 18 and 9

	11	2	3	1	17	13	7	15	19	14	6	12	10	5	4	16	8	9	18
11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15	1	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
19	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0
14	1	0	0	0	1	1	0	0	1	0	0	0	0	0	0	0	0	0	0
6	1	0	1	0	1	1	0	0	1	1	0	0	0	0	0	0	0	0	0
12	1	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
10	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
5	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0
4	1	1	1	1	1	1	1	1	1	1	1	0	1	1	0	0	0	0	0
16	1	1	1	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
8	1	1	1	1	1	1	1	1	1	1	1	0	1	0	0	0	0	0	0
9	1	1	1	1	1	1	1	1	1	1	0	0	0	1	0	0	0	0	0
18	1	1	1	1	1	1	1	1	1	1	0	0	0	1	0	0	0	1	0

Figure A27 – New Inferred Data in Blue

	17	2	3	1	11	13	7	15	19	14	6	12	10	5	4	16	8	9	18
17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	0	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15	0	0	1	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0
19	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
14	1	0	0	0	1	1	0	0	1	0	0	0	0	0	0	0	0	0	0
6	1	0	1	0	1	1	0	0	1	1	0	0	0	0	0	0	0	0	0
12	0	0	1	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0
10	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
5	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0
4	1	1	1	1	1	1	1	1	1	1	1	0	1	1	0	0	0	0	0
16	0	1	1	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0
8	1	1	1	1	1	1	1	1	1	1	1	0	1	0	0	0	0	0	0
9	1	1	1	1	1	1	1	1	1	1	0	0	0	1	0	0	0	0	0
18	1	1	1	1	1	1	1	1	1	1	0	0	0	1	0	0	0	1	0

Figure A28 – Swap Columns 11 and 17, Swap Rows 11 and 17

	17	11	3	1	2	13	7	15	19	14	6	12	10	5	4	16	8	9	18
17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	0	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15	0	1	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
19	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
14	1	1	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0
6	1	1	1	0	0	1	0	0	1	1	0	0	0	0	0	0	0	0	0
12	0	1	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
10	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
5	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0
4	1	1	1	1	1	1	1	1	1	1	1	0	1	1	0	0	0	0	0
16	0	1	1	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0
8	1	1	1	1	1	1	1	1	1	1	1	0	1	0	0	0	0	0	0
9	1	1	1	1	1	1	1	1	1	1	0	0	0	1	0	0	0	0	0
18	1	1	1	1	1	1	1	1	1	1	0	0	0	1	0	0	0	1	0

Figure A29 – Swap Columns 2 and 11, Swap Rows 2 and 11

	17	11	3	2	1	13	7	15	19	14	6	12	10	5	4	16	8	9	18
17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15	0	1	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
19	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
14	1	1	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0
6	1	1	1	0	0	1	0	0	1	1	0	0	0	0	0	0	0	0	0
12	0	1	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
10	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
5	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0
4	1	1	1	1	1	1	1	1	1	1	1	0	1	1	0	0	0	0	0
16	0	1	1	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0
8	1	1	1	1	1	1	1	1	1	1	1	0	1	0	0	0	0	0	0
9	1	1	1	1	1	1	1	1	1	1	0	0	0	1	0	0	0	0	0
18	1	1	1	1	1	1	1	1	1	1	0	0	0	1	0	0	0	1	0

Figure A30 – Swap Columns 1 and 2, Swap Rows 1 and 2

	17	11	13	2	1	3	7	15	19	14	6	12	10	5	4	16	8	9	18
17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
1	0	1	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
3	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
15	0	1	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0
19	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14	1	1	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
6	1	1	1	0	0	1	0	0	1	1	0	0	0	0	0	0	0	0	0
12	0	1	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0
10	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
5	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0
4	1	1	1	1	1	1	1	1	1	1	1	0	1	1	0	0	0	0	0
16	0	1	0	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0
8	1	1	1	1	1	1	1	1	1	1	1	0	1	0	0	0	0	0	0
9	1	1	1	1	1	1	1	1	1	1	0	0	0	1	0	0	0	0	0
18	1	1	1	1	1	1	1	1	1	1	0	0	0	1	0	0	0	1	0

Figure A31 – Swap Columns 3 and 13, Swap Rows 3 and 13

	17	11	13	3	1	2	7	15	19	14	6	12	10	5	4	16	8	9	18
17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	0	1	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
2	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15	0	1	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
19	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14	1	1	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
6	1	1	1	1	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0
12	0	1	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
10	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
5	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0
4	1	1	1	1	1	1	1	1	1	1	1	0	1	1	0	0	0	0	0
16	0	1	0	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0
8	1	1	1	1	1	1	1	1	1	1	1	0	1	0	0	0	0	0	0
9	1	1	1	1	1	1	1	1	1	1	0	0	0	1	0	0	0	0	0
18	1	1	1	1	1	1	1	1	1	1	0	0	0	1	0	0	0	1	0

Figure A32 – Swap Columns 2 and 3, Swap Rows 2 and 3

	17	11	13	3	7	1	2	15	19	14	6	12	10	5	4	16	8	9	18
17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	0	1	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
2	0	1	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15	0	1	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
19	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14	1	1	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
6	1	1	1	1	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0
12	0	1	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
5	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0
4	1	1	1	1	1	1	1	1	1	1	1	0	1	1	0	0	0	0	0
16	0	1	0	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0
8	1	1	1	1	1	1	1	1	1	1	1	0	1	0	0	0	0	0	0
9	1	1	1	1	1	1	1	1	1	1	0	0	0	1	0	0	0	0	0
18	1	1	1	1	1	1	1	1	1	1	0	0	0	1	0	0	0	1	0

Figure A33 – Swap Columns 2 and 7, Swap Rows 2 and 7

	17	11	13	3	7	2	1	15	19	14	6	12	10	5	4	16	8	9	18
17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3	0	1	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
7	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	0	1	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	0	1	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
15	0	1	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
19	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14	1	1	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
6	1	1	1	1	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0
12	0	1	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
5	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0
4	1	1	1	1	1	1	1	1	1	1	1	0	1	1	0	0	0	0	0
16	0	1	0	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0
8	1	1	1	1	1	1	1	1	1	1	1	0	1	0	0	0	0	0	0
9	1	1	1	1	1	1	1	1	1	1	0	0	0	1	0	0	0	0	0
18	1	1	1	1	1	1	1	1	1	1	0	0	0	1	0	0	0	1	0

Figure A34 – Swap Columns 1 and 2, Swap Rows 1 and 2

	17	11	13	19	7	2	1	15	3	14	6	12	10	5	4	16	8	9	18
17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
19	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
2	0	1	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0
1	0	1	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0
15	0	1	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0
3	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6	1	1	1	1	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0
12	0	1	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0
10	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
5	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0
4	1	1	1	1	1	1	1	1	1	1	1	0	1	1	0	0	0	0	0
16	0	1	0	0	1	1	1	0	1	0	0	0	0	0	0	0	0	0	0
8	1	1	1	1	1	1	1	1	1	1	1	0	1	0	0	0	0	0	0
9	1	1	1	1	1	1	1	1	1	1	0	0	0	1	0	0	0	0	0
18	1	1	1	1	1	1	1	1	1	1	0	0	0	1	0	0	0	1	0

Figure A35 – Swap Columns 3 and 19, Swap Rows 3 and 19

	17	11	13	19	3	2	1	15	7	14	6	12	10	5	4	16	8	9	18
17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
19	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	0	1	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0
1	0	1	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0
15	0	1	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0
7	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6	1	1	1	1	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0
12	0	1	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0
10	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
5	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0
4	1	1	1	1	1	1	1	1	1	1	1	0	1	1	0	0	0	0	0
16	0	1	0	0	1	1	1	0	1	0	0	0	0	0	0	0	0	0	0
8	1	1	1	1	1	1	1	1	1	1	1	0	1	0	0	0	0	0	0
9	1	1	1	1	1	1	1	1	1	1	0	0	0	1	0	0	0	0	0
18	1	1	1	1	1	1	1	1	1	1	0	0	0	1	0	0	0	1	0

Figure A36 – Swap Columns 7 and 3, Swap Rows 7 and 3

	17	11	13	19	3	7	1	15	2	14	6	12	10	5	4	16	8	9	18
17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
19	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	0	1	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0
15	0	1	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0
2	0	1	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0
14	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6	1	1	1	1	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0
12	0	1	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0
10	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
5	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0
4	1	1	1	1	1	1	1	1	1	1	1	0	1	1	0	0	0	0	0
16	0	1	0	0	1	1	1	0	1	0	0	0	0	0	0	0	0	0	0
8	1	1	1	1	1	1	1	1	1	1	1	0	1	0	0	0	0	0	0
9	1	1	1	1	1	1	1	1	1	1	0	0	0	1	0	0	0	0	0
18	1	1	1	1	1	1	1	1	1	1	0	0	0	1	0	0	0	1	0

Figure A37 – Swap Columns 2 and 7, Swap Rows 2 and 7

	17	11	13	19	3	7	2	15	1	14	6	12	10	5	4	16	8	9	18
17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
19	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3	0	1	1	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
7	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	0	1	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0
15	0	1	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0
1	0	1	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0
14	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6	1	1	1	1	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0
12	0	1	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0
10	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
5	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0
4	1	1	1	1	1	1	1	1	1	1	1	0	1	1	0	0	0	0	0
16	0	1	0	0	1	1	1	0	1	0	0	0	0	0	0	0	0	0	0
8	1	1	1	1	1	1	1	1	1	1	1	0	1	0	0	0	0	0	0
9	1	1	1	1	1	1	1	1	1	1	0	0	0	1	0	0	0	0	0
18	1	1	1	1	1	1	1	1	1	1	0	0	0	1	0	0	0	1	0

Figure A38 – Swap Columns 1 and 2, Swap Rows 1 and 2

	17	11	13	19	14	7	2	15	1	3	6	12	10	5	4	16	8	9	18
17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
19	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
2	0	1	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0
15	0	1	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0
1	0	1	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0
3	0	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6	1	1	1	1	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0
12	0	1	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0
10	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
5	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0
4	1	1	1	1	1	1	1	1	1	1	1	0	1	1	0	0	0	0	0
16	0	1	0	0	0	1	1	0	1	1	0	0	0	0	0	0	0	0	0
8	1	1	1	1	1	1	1	1	1	1	1	0	1	0	0	0	0	0	0
9	1	1	1	1	1	1	1	1	1	1	0	0	0	1	0	0	0	0	0
18	1	1	1	1	1	1	1	1	1	1	0	0	0	1	0	0	0	1	0

Figure A39 – Swap Columns 3 and 14, Swap Rows 3 and 14

	17	11	13	19	14	3	2	15	1	7	6	12	10	5	4	16	8	9	18
17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
19	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3	0	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	0	1	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0
15	0	1	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0
1	0	1	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0
7	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
6	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0
12	0	1	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0
10	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
5	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0
4	1	1	1	1	1	1	1	1	1	1	1	0	1	1	0	0	0	0	0
16	0	1	0	0	0	1	1	0	1	1	0	0	0	0	0	0	0	0	0
8	1	1	1	1	1	1	1	1	1	1	1	0	1	0	0	0	0	0	0
9	1	1	1	1	1	1	1	1	1	1	0	0	0	1	0	0	0	0	0
18	1	1	1	1	1	1	1	1	1	1	0	0	0	1	0	0	0	1	0

Figure A40 – Swap Columns 7 and 3, Swap Rows 7 and 3

	17	11	13	19	14	3	7	15	1	2	6	12	10	5	4	16	8	9	18
17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
19	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3	0	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
15	0	1	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0
1	0	1	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0
2	0	1	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0
6	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0
12	0	1	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0
10	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
5	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0
4	1	1	1	1	1	1	1	1	1	1	1	0	1	1	0	0	0	0	0
16	0	1	0	0	0	1	1	0	1	1	0	0	0	0	0	0	0	0	0
8	1	1	1	1	1	1	1	1	1	1	1	0	1	0	0	0	0	0	0
9	1	1	1	1	1	1	1	1	1	1	0	0	0	1	0	0	0	0	0
18	1	1	1	1	1	1	1	1	1	1	0	0	0	1	0	0	0	1	0

Figure A41 – Swap Columns 2 and 7, Swap Rows 2 and 7

	17	11	13	19	14	3	7	15	2	1	6	12	10	5	4	16	8	9	18
17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
19	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3	0	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
15	0	1	0	0	0	1	1	0	0	0	0	1	0	0	0	0	0	0	0
2	0	1	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0
1	0	1	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0
6	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0
12	0	1	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0
10	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
5	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0
4	1	1	1	1	1	1	1	1	1	1	1	0	1	1	0	0	0	0	0
16	0	1	0	0	0	1	1	0	1	1	0	0	0	0	0	0	0	0	0
8	1	1	1	1	1	1	1	1	1	1	1	0	1	0	0	0	0	0	0
9	1	1	1	1	1	1	1	1	1	1	0	0	0	1	0	0	0	0	0
18	1	1	1	1	1	1	1	1	1	1	0	0	0	1	0	0	0	1	0

Figure A42 – Swap Columns 1 and 2, Swap Rows 1 and 2

	17	11	13	19	14	3	7	12	2	1	6	15	10	5	4	16	8	9	18
17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
19	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3	0	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
12	0	1	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0
2	0	1	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0
1	0	1	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0
6	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0
15	0	1	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0
10	1	1	1	1	1	1	1	0	1	1	1	1	0	0	0	0	0	0	0
5	1	1	1	1	1	1	1	0	1	1	0	1	0	0	0	0	0	0	0
4	1	1	1	1	1	1	1	0	1	1	1	1	1	1	0	0	0	0	0
16	0	1	0	0	0	1	1	0	1	1	0	0	0	0	0	0	0	0	0
8	1	1	1	1	1	1	1	0	1	1	1	1	1	0	0	0	0	0	0
9	1	1	1	1	1	1	1	0	1	1	0	1	0	1	0	0	0	0	0
18	1	1	1	1	1	1	1	0	1	1	0	1	0	1	0	0	0	1	0

Figure A43 – Swap Columns 15 and 12, Swap Rows 15 and 12

	17	11	13	19	14	3	7	12	2	15	6	1	10	5	4	16	8	9	18
17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
19	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0
12	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0
2	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0
15	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0
6	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0
1	1	1	1	1	1	1	1	0	1	1	0	0	0	0	0	0	0	0	0
10	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0
5	1	1	1	1	1	1	1	1	1	1	0	1	0	0	0	0	0	0	0
4	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0
16	1	1	1	1	1	1	1	0	1	0	0	1	0	0	0	0	0	0	0
8	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0
9	1	1	1	1	1	1	1	1	1	1	0	1	0	1	0	0	0	0	0
18	1	1	1	1	1	1	1	1	1	1	0	1	0	1	0	0	0	1	0

Figure A44 – Swap Columns 1 and 15, Swap Rows 1 and 15; Inference Performed, New Data Added in Blue

	17	11	13	19	14	3	7	12	2	15	1	6	10	5	4	16	8	9	18
17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
19	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0
12	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0
2	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0
15	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0
1	1	1	1	1	1	1	1	0	1	1	0	0	0	0	0	0	0	0	0
6	1	1	1	1	1	1	0	0	0	0	1	0	0	0	0	0	0	0	0
10	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0
5	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	1	0	0
4	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0
16	1	1	1	1	1	1	1	0	1	0	1	0	0	0	0	0	0	0	0
8	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0
9	1	1	1	1	1	1	1	1	1	1	1	0	0	1	0	0	0	0	0
18	1	1	1	1	1	1	1	1	1	1	1	0	0	1	0	0	0	1	0

Figure A45 – Swap Columns 6 and 1, Swap Rows 6 and 1

	17	11	13	19	14	3	7	12	2	15	1	6	10	8	4	16	5	9	18
17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
19	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0
12	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0
2	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0
15	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0
1	1	1	1	1	1	1	1	0	1	1	0	0	0	0	0	0	0	0	0
6	1	1	1	1	1	1	0	0	0	0	1	0	0	0	0	0	0	0	0
10	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0
8	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0
4	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	1	0	0
16	1	1	1	1	1	1	1	0	1	0	1	0	0	0	0	0	0	0	0
5	1	1	1	1	1	1	1	1	1	1	1	0	0	1	0	0	0	0	0
9	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	1	0	0
18	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	1	1	0

Figure A46 – Swap Columns 5 and 8, Swap Rows 5 and 8

	17	11	13	19	14	3	7	12	2	15	1	6	10	8	5	16	4	9	18
17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
19	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0
12	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0
2	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0
15	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0
1	1	1	1	1	1	1	1	0	1	1	0	0	0	0	0	0	0	0	0
6	1	1	1	1	1	1	0	0	0	0	1	0	0	0	0	0	0	0	0
10	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0
8	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0
5	1	1	1	1	1	1	1	1	1	1	1	0	0	1	0	0	0	0	0
16	1	1	1	1	1	1	1	0	1	0	1	0	0	0	0	0	0	0	0
4	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	0	0	0	0
9	1	1	1	1	1	1	1	1	1	1	1	0	0	0	1	0	0	0	0
18	1	1	1	1	1	1	1	1	1	1	1	0	0	0	1	0	0	1	0

Figure A47 – Swap Columns 4 and 5, Swap Rows 4 and 5

	17	11	13	19	14	3	7	12	2	15	1	6	10	8	5	18	4	9	16
17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
19	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0
12	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0
2	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0
15	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0
1	1	1	1	1	1	1	1	0	1	1	0	0	0	0	0	0	0	0	0
6	1	1	1	1	1	1	0	0	0	0	1	0	0	0	0	0	0	0	0
10	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0
8	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0
5	1	1	1	1	1	1	1	1	1	1	1	0	0	1	0	0	0	0	0
18	1	1	1	1	1	1	1	1	1	1	1	0	0	0	1	0	0	1	0
4	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	0	0	0	0
9	1	1	1	1	1	1	1	1	1	1	1	0	0	0	1	0	0	0	0
16	1	1	1	1	1	1	1	0	1	0	1	0	0	0	0	0	0	0	0

Figure A48 – Swap Columns 16 and 18, Swap Rows 16 and 18

	17	11	13	19	14	3	7	12	2	15	1	6	10	8	5	9	4	18	16
17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
19	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0
12	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0
2	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0
15	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0
1	1	1	1	1	1	1	1	0	1	1	0	0	0	0	0	0	0	0	0
6	1	1	1	1	1	1	0	0	0	0	1	0	0	0	0	0	0	0	0
10	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0
8	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0
5	1	1	1	1	1	1	1	1	1	1	1	0	0	1	0	0	0	0	0
9	1	1	1	1	1	1	1	1	1	1	1	0	0	0	1	0	0	0	0
4	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	0	0	0	0
18	1	1	1	1	1	1	1	1	1	1	1	0	0	0	1	1	0	0	0
16	1	1	1	1	1	1	1	0	1	0	1	0	0	0	0	0	0	0	0

Figure A49 – Swap Columns 18 and 9, Swap Rows 18 and 9

	17	11	13	19	14	3	7	12	2	15	1	6	10	8	5	9	18	4	16
17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
19	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0
12	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0
2	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0
15	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0
1	1	1	1	1	1	1	1	0	1	1	0	0	0	0	0	0	0	0	0
6	1	1	1	1	1	1	0	0	0	0	1	0	0	0	0	0	0	0	0
10	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0
8	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0
5	1	1	1	1	1	1	1	1	1	1	1	0	0	1	0	0	0	0	0
9	1	1	1	1	1	1	1	1	1	1	1	0	0	0	1	0	0	0	0
18	1	1	1	1	1	1	1	1	1	1	1	0	0	0	1	1	0	0	0
4	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	0	1	0	0
16	1	1	1	1	1	1	1	0	1	0	1	0	0	0	0	0	0	0	0

Figure A50 – Swap Columns 4 and 18, Swap Rows 4 and 18; Final System Structure and Information

Boolean Algebra

Boolean algebra operates on two distinct constant values: zero (0) and one (1). There are a number of operators associated with these values in Boolean algebra. These operators are:

- complementation ' (monadic operation)
- addition + (binary operation)
- multiplication · (binary operation)

These operations conform to the following laws:

- commutative laws: $a + b = b + a, \quad a \cdot b = b \cdot a$
- distributive laws: $a \cdot (b + c) = (a \cdot b) + (a \cdot c), \quad a + (b \cdot c) = (a + b) \cdot (a + c)$
- identity laws: $a + 0 = a, \quad a \cdot 1 = a$
- complement laws: $a + {'a} = 1, \quad a \cdot {'a} = 0$

Warfield augmented Boolean algebra by adding the concept of order to the two Boolean constants. The addition of order to Boolean algebra supports the addition of the following new Boolean operators:

- Less than operator: $0 < 1$
- Greater than operator: $1 > 0$
- Less than or equal to: $0 \leq 1$
- Greater than or equal to: $1 \leq 0$
- Boolean subtraction: 1 - 1

When this new concept of Boolean order is used with matrix operations, the following Boolean matrix operations are added:

- Matrix subtraction: subtract one matrix from another
- Matrix ordering: one matrix less than, greater than, or equal to, another Boolean matrix

Boolean recursion equations and Boolean inequalities are sets of Boolean equations that are used to analyze and evaluate systems. Solution techniques associated with these types of equation sets will be presented later in this document.

Mathematical Sets

A set is a well-defined collection of objects. Each object in a set is called a member or element of the set. Sets may be formed in two ways: **extension** and **intension**. The first way to create a set is to explicitly list all of the elements in the set, which is known as set formation by extension. The second way to create a set is to provide a rule, or set of rules, that describe the set members. This is called set formation by intension.

Given $X = \{1, 2, 3, 4, 5, 6, 7, 8, 9, 10\}$
Set X is formed by **extension**.

Given $Y = \{10, 20, 30, 40, 50, 60, 70, 80, 90, 100\}$
Each indexed element of set Y is 10 times the corresponding indexed element of set X.
Set Y is formed by **intension**.

A set formed by intension is called well-defined if the rules and criteria for set formation provide the ability to determine if any given element is either included in the set or excluded from the set. If a set is not well-defined, then empirical procedures may be used to create a variable grade of membership that is assigned to each element in the set. The variable grade of membership is called the element weight. In any specific situation, an element-weight trigger value may be assigned to indicate when the element is considered part of the set. The element weights run from one (1), for full membership, to zero (0) for no membership. Fuzzy sets are sets that contain elements with unequal weights. The sets that will be considered in this report are mostly well-defined.

Well-defined sets may be indexed using an index set if the number of elements in the set is known. Sets may be interrelated in a number of ways, including**: subset, power set, proper subset, complement, union, and intersection**. Sets that are not interrelated are called disjoint, and they have no elements in common.

- Set *Z* is a **subset** of set *W* if every element in set *Z* is also a member of set *W*. Any set may be a subset of itself.
- The set of all subsets of *Z* is called the **power set** of *Z*.
- Given: sets *Z* and *W,*
  set *Z* is not equal to set *W*
  set *Z* is a subset of set *W*
  Then *Z* is a **proper subset** of *W*
- The **complement** of set *X* with respect to set *Y*, is the set of all elements in set *Y* that are not contained in set *X*.
- The **union** of set *Z* and set *W* consists of all elements that are members of set *Z*, or set *W*, or both set *Z* and set *W*.
- The **intersection** of set *X* and set *Y* consists of all elements that are members of both set *X* and set *Y*.

A vector set is ordered using the set indices as a structuring mechanism. When a set is ordered using the set indices, it is called a vector set, or just a vector. A Cartesian product (of sets *A* and *B*) consists of the set $A \cdot$ set *B* of ordered pairs (a, b), where *a* is an element of *A* and *b* is an element of *B*. The Cartesian product is also a set. Once a vector set has been defined, then the Cartesian product of any given vector set, with itself, may be defined. For example:

- $X = \{1, 2, 3\}$, set *X* is defined by extension.
- Cartesian product set $Y = X \cdot X = \{(1, 1), (1, 2), (1, 3), (2, 1), (2, 2), (2, 3), (3, 1), (3, 2), (3, 3)\}$, set *Y* (the Cartesian product of Set *X* times Set *X*) is defined by intension.
- Set $W = \{(1, 1), (2, 2), (3, 3)\}$, is a subset of *Y*.

A partition (Π) on set *Z* is a collection of disjoint, nonempty subsets of *Z* whose set union is *Z*. For example, consider $Z = \{A, B, C, D, E, F\}$. Some possible partitions of set *Z* are:

- Π_1 = [A, B, C; D; E, F} (i.e., three partition blocks: A, B, C; D; and E, F)
- Π_2 = [A; B, C; D; E, F} (i.e., four partition blocks: A; B, C; D; and E, F)
- Π_3 = [A, B, C, D; E, F] (i.e., two partition blocks: A, B, C, D; and E, F)
- Π_4 = [A, B, C, D, E, F] (i.e., one partition block: A, B, C, D, E, F)
- Π_5 = [A, B; C, D; E, F] (i.e., three partition blocks: A, B; C, D; E, F)
- Π_6 = [A; B; C; D; E; F] (i.e., six partition blocks: A; B; C; D; E; F)
- Π_7 = [A, B; C, D; E, F] (i.e., three partition blocks – A, B; C, D; E, F)

The concepts of **equality, product**, **sum**, and **order** are included in partition algebra.

- If every block in one set partition on Z is also a block in another set partition on Z, then the set partitions are **equal**. As an example:
  Π_5 = [A, B; C, D; E, F]
  Π_7 = [A, B; C, D; E, F]
  Π_5 is **equal** to Π_7.

- The **product** of two partitions on a set is another partition on the set. The members, element 1 and element 2, of set Z, are in the same block of the product partition only if they are in the same block in both of the argument partitions. As examples:
  Π_1 = [A, B, C; D; E, F}

Π_5 = [A, B; C, D; E, F]

$\Pi_1\Pi_5$ = A, B; C; D; E, F

Π_2 = [A; B, C; D; E, F}

Π_6 = [A; B; C; D; E; F]

$\Pi_2\Pi_6$ = A; B; C; D; E; F

Π_4 = [A, B, C, D, E, F]

Π_3 = [A, B, C, D; E, F]

$\Pi_4\Pi_3$ = A, B, C, D; E, F

- The **sum** of two partitions on a set is another partition on the set. The members, element 1 and element 2, of set Z are in the same block of the sum partition only if there exists a sequence $x_1, x_2, \ldots, x_m$, such that element1 = x_1, element2 = x_m and all pairs of the form $x_1, x_2, x_3 \ldots, x_{m-1}$ are in a single block in either argument partition one or argument partition two. As an example, for:

  Π_1 = {a, b; c, e, g; d; f, h, j; i}

  Π_2 = {a, b, d; c, g; e, f, h, I; j}

  The first block of the sum is a, b, d. That block is composed of two blocks in Π_1 (a b, and d) and one block in Π_2 (a b d). The second block of the sum is c, e, f, g, h, i, and j. That block is composed of the other blocks from argument partitions Π_1 and Π_2 that are not in a single block.

  The sum of Π_1 and Π_2 is: $\Pi_1 + \Pi_2 = \Pi_3$ = {a, b, d; c, e, f, g, h, i, j}

- Partitions on a set may be **ordered** in value using the following definitions. A partition is less than or equal to another partition on the same set only if every block in the first partition is contained in some block of the second partition. Given two partitions Π_1 and Π_2, Π_1 is less than or equal to Π_2 only if the product of Π_1 and Π_2 is equal to Π_1 and the sum of Π_1 and Π_2 is equal to Π_2. The product of Π_1 and Π_2 is always less than or equal to the sum of Π_1 and Π_2.

If the partition of set *A* ($\Pi(A)$) consists of a single block, it contains all members of set *A,* and is called the **identity** partition (Π_I).

- The **product of identity partition** with any other partition Π is equal to Π.

The **zero** partition of a set (Π_Z) consists of a partition that has as many blocks as it has elements.

- The **sum of the zero partition**, Π_Z, and any other partition Π is equal to Π.

Binary Relations

A **binary relation** *R(A, B)* is a subset of the Cartesian product of vector set A and vector set B. A binary relation *R(A, A)* is a subset of the Cartesian product of vector set *A* with itself, or *A* X *A*. A binary relation *R(B, B)* is a subset of the Cartesian product of vector set *B* with itself, or *B* X *B*. For example:

Set B_1 = {1, 2, 3}

Set B_2 = {4, 5, 6}

Some binary relations on sets B_1 X B_2 are:

$R_1 (B_1, B_2)$ = {(1, 4), (1, 6), (2, 4), (3, 6)}

$R_2 (B_1, B_2)$ = {(1, 5), (2, 6), (3, 4)}

$R_3 (B_1, B_2)$ = {(2, 5), (3, 5)}

$R_4 (B_1, B_2)$ = {(3, 4)}

The **complement** (') of the binary relation, R_1, is composed of all of the elements that are not part of R_1.

The complement of R_1 = 'R_1 = {(1, 5), (2, 5), (2, 6), (3, 4), (3, 5)}

The **transpose** (R^T) of R_1 is produced by exchanging the order in every element pair.

The transpose of $R_1 = R^T{}_1$ = {(4, 1), (6, 1), (4, 2), (6, 3)}

A **binary relation,** *R(W, W)* on set *W* may have the following properties (where w_1 and w_2 are elements of *W*):

reflexivity: w_1Rw_1
irreflexivity: $w_1'Rw_1$
symmetry: if w_1Rw_2, then w_2Rw_1
asymmetry: if w_1Rw_2, then $w_2'Rw_1$
antisymmetry: if w_1Rw_2 and w_2Rw_1, then $w_1 = w_2$
Note that the notation w_iRw_j means that (w_i, w_j)

If a binary relation, R, is reflexive and transitive, and R and the complement of R are antisymmetric, then R is called an **order**.

If the complement of R is not antisymmetric and all other conditions are met, then R is called a **partial order**.

If a binary relation is a partial order, and also identifies a greatest lower bound and a least upper bound, then this partial order is a **lattice**. For example : (page 218)

Let A consist of the binary vector set $\{a_i\} = \{(u_i, v_i, w_i)\}$, where:
$a_0 = (0, 0, 0)$
$a_1 = (0, 0, 1)$
$a_2 = (0, 1, 0)$
$a_3 = (0, 1, 1)$
$a_4 = (1, 0, 0)$
$a_5 = (1, 0, 1)$
$a_6 = (1, 1, 0)$
$a_7 = (1, 1, 1)$

Define binary relation, R, on set A X A using the following two conditions:
(1) a_iRa_j if and only if $u_i \leq u_j$, $v_i \leq v_j$, $w_i \leq w_j$, where, by definition $0 < 1$, $0 = 0$ and $1 = 1$
(2) a_i can participate in R if and only if a_i is a solution of the Boolean recursion equation set:

$$\begin{aligned} u &= u \\ v + u &= v \\ w + v + u &= w \end{aligned}$$

The only elements that can participate in R are the elements of subset $A_1 = \{a_0, a_1, a_3$ and $a_7\}$. Applying condition (1), it is seen that the binary relation defined by the two conditions is

$$R = \{(a_0, a_0), (a_0, a_1), (a_0, a_3), (a_0, a_7), (a_1, a_1), (a_1, a_3), (a_1, a_7), (a_3, a_3), (a_3, a_7), (a_7, a_7)\}$$

This relation is not a partial order for the set A, since it is not reflexive. However, if it is reinterpreted as a binary relation on A_1 X A_1, it is both a partial order and a lattice.

In this way, a set of Boolean recursive equations can constrain a binary relation to a subspace that is both a partial order, and a lattice.