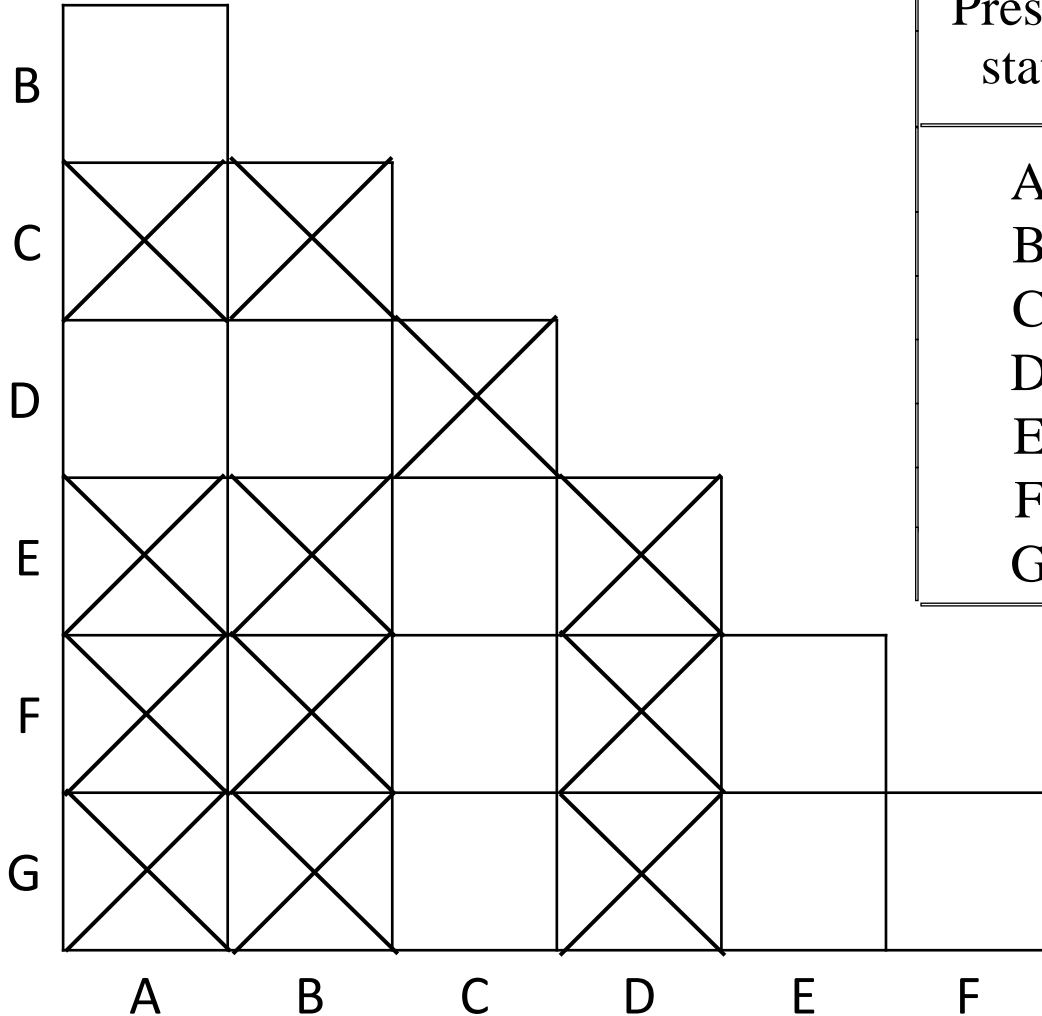# Implication Chart Exercise

Use the implication chart method to minimize our previous partitioning example.  Then rewrite the new state table.
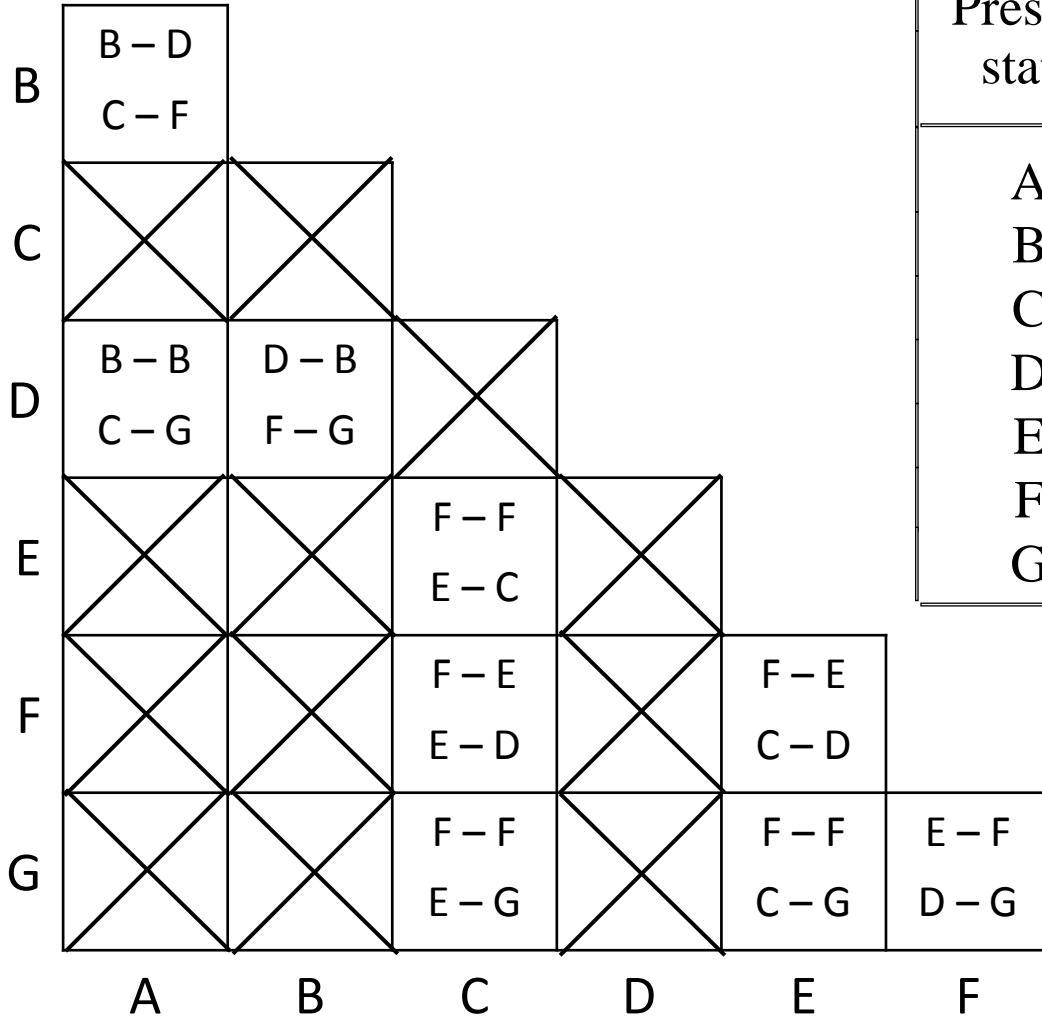
| Present state | Next state | | Output $z$ |
| --- | --- | --- | --- |
| | $w = 0$ | $w = 1$ | |
| A | B | C | 1 |
| B | D | F | 1 |
| C | F | E | 0 |
| D | B | G | 1 |
| E | F | C | 0 |
| F | E | D | 0 |
| G | F | G | 0 |

# Implication Chart Exercise



| Present state | Next state | | Output |
|:---:|:---:|:---:|:---:|
| | $w = 0$ | $w = 1$ | $z$ |
| A | B | C | 1 |
| B | D | F | 1 |
| C | F | E | 0 |
| D | B | G | 1 |
| E | F | C | 0 |
| F | E | D | 0 |
| G | F | G | 0 |

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# Initial Setup



| Present state | Next state | | Output $z$ |
|---|---|---|---|
| | $w = 0$ | $w = 1$ | |
| A | B | C | 1 |
| B | D | F | 1 |
| C | F | E | 0 |
| D | B | G | 1 |
| E | F | C | 0 |
| F | E | D | 0 |
| G | F | G | 0 |

| | A | B | C | D | E | F |
|---|---|---|---|---|---|---|
| B | B – D <br> C – F | | | | | |
| C | ✕ | ✕ | | | | |
| D | B – B <br> C – G | D – B <br> F – G | ✕ | | | |
| E | ✕ | ✕ | F – F <br> E – C | ✕ | | |
| F | ✕ | ✕ | F – E <br> E – D | ✕ | F – E <br> C – D | |
| G | ✕ | ✕ | F – F <br> E – G | ✕ | F – F <br> C – G | E – F <br> D – G |

# First Pass

Implication chart (rows B–G, columns A–F):

Row B (vs A): B−D, C−F

Row D: (vs A) B−B, C−G; (vs B) D−B, F−G

Row E: (vs C) F−F, E−C

Row G: (vs C) F−F, E−G; (vs E) F−F, C−G
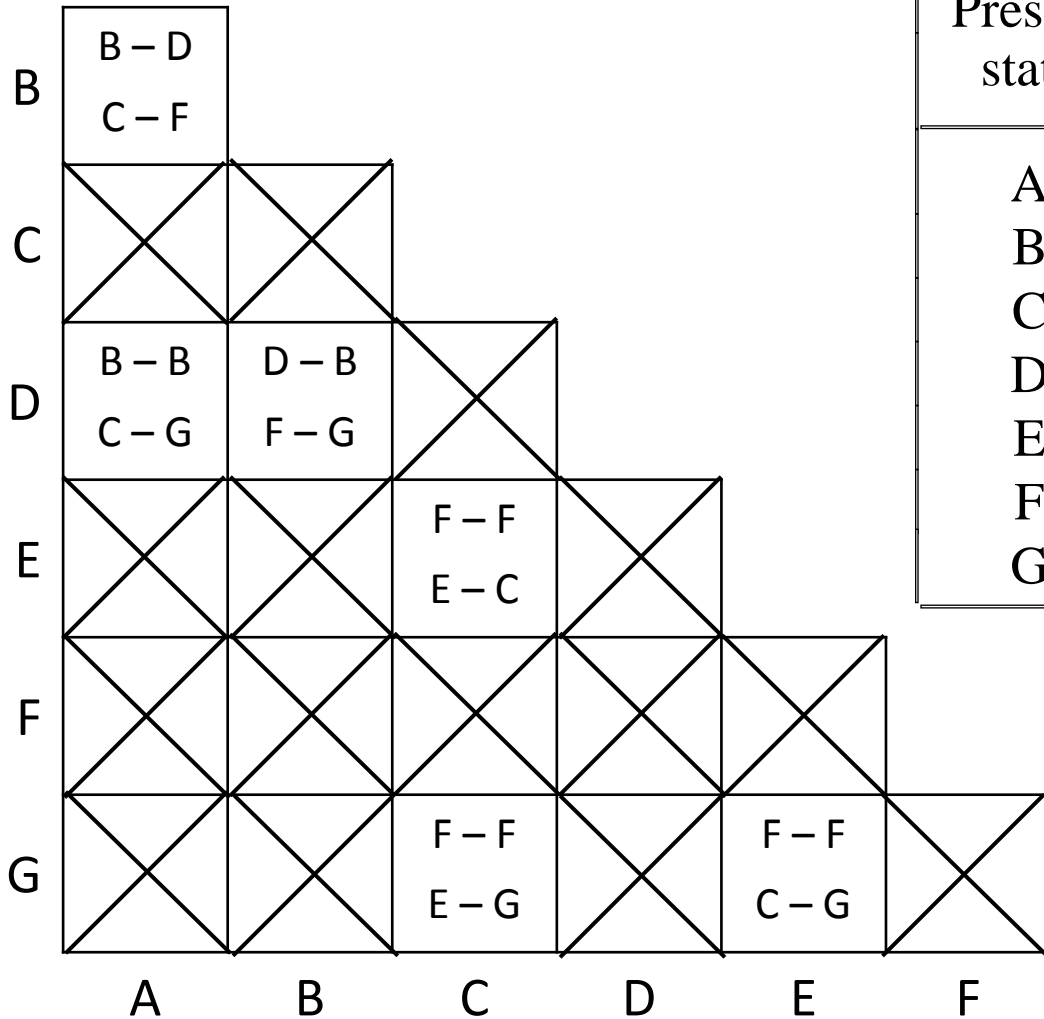
| Present state | Next state | | Output $z$ |
| --- | --- | --- | --- |
| | $w = 0$ | $w = 1$ | |
| A | B | C | 1 |
| B | D | F | 1 |
| C | F | E | 0 |
| D | B | G | 1 |
| E | F | C | 0 |
| F | E | D | 0 |
| G | F | G | 0 |

# Second Pass



| Present state | Next state | | Output $z$ |
|:---:|:---:|:---:|:---:|
| | $w = 0$ | $w = 1$ | |
| A | B | C | 1 |
| B | D | F | 1 |
| C | F | E | 0 |
| D | B | G | 1 |
| E | F | C | 0 |
| F | E | D | 0 |
| G | F | G | 0 |

The implication chart on the left:

Row B (column A): (X through cell)
Row C (columns A, B): (X through cells)
Row D (column A): B − B, C − G; (columns B, C): X
Row E (column C): F − F, E − C
Row F (columns A, B, C, D): X
Row G (column C): F − F, E − G; (column E): F − F, C − G; (column F): X

Columns: A   B   C   D   E   F

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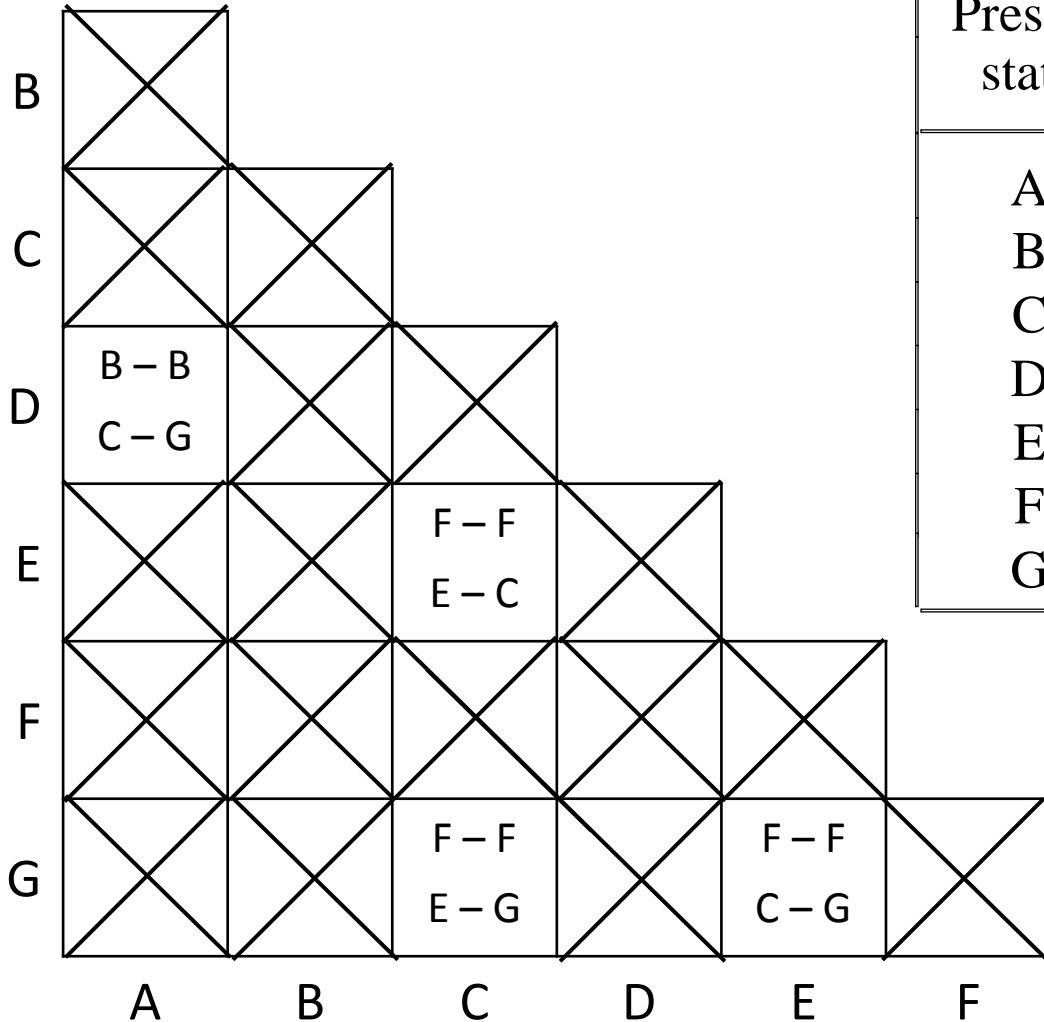
# Third Pass
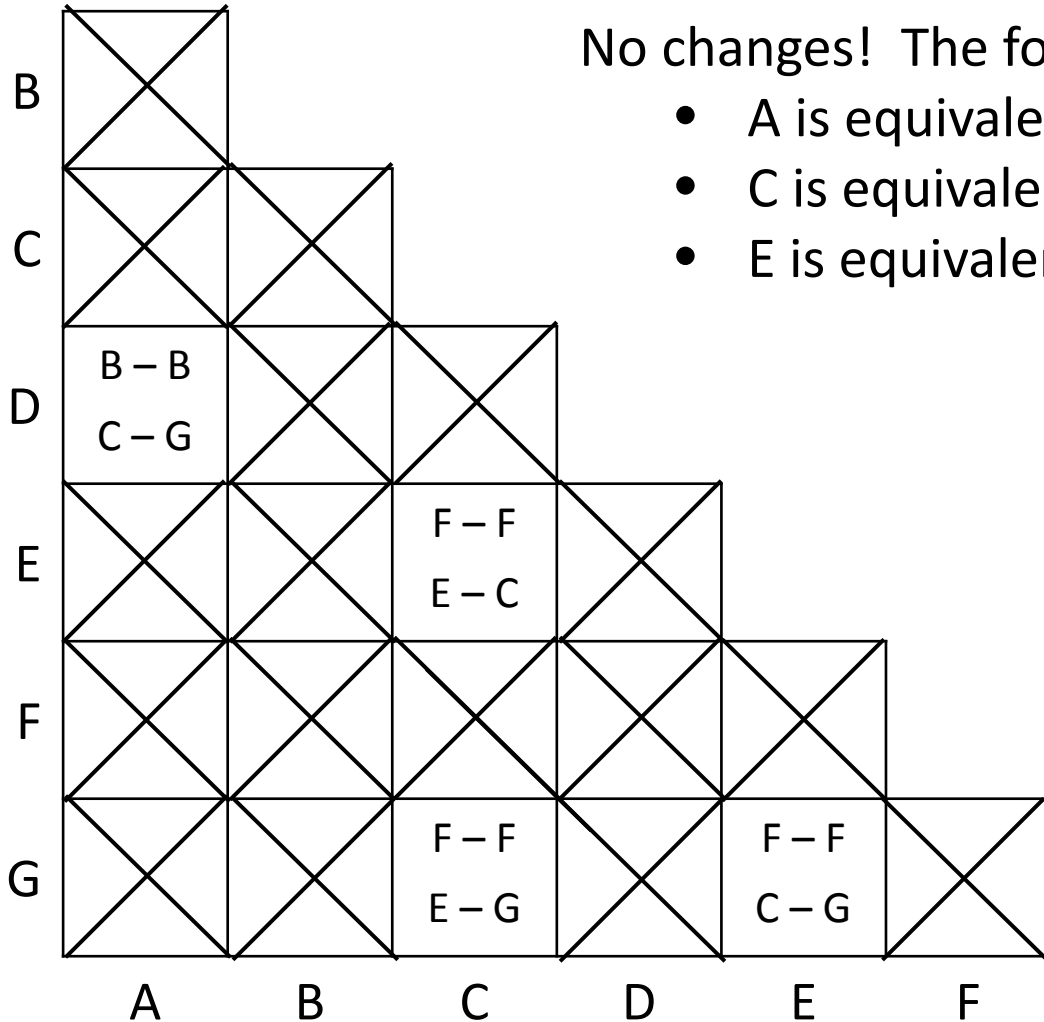


No changes!  The following must be true:
- A is equivalent to D
- C is equivalent to E and G
- E is equivalent to G (matches above)

# Final State Table

Applying this info:
- A is equivalent to D
- C is equivalent to E and G
- E is equivalent to G (matches above)

| Present state | Next state | | Output z |
|---|---|---|---|
| | $w = 0$ | $w = 1$ | |
| A | B | C | 1 |
| B | D | F | 1 |
| C | F | E | 0 |
| D | B | G | 1 |
| E | F | C | 0 |
| F | E | D | 0 |
| G | F | G | 0 |

| Present state | Next state | | Output z |
|---|---|---|---|
| | w = 0 | w = 1 | |
| A(D) | B | C | 1 |
| B | A | F | 1 |
| C(EG) | F | C | 0 |
| F | C | A | 0 |