Extended Puzzle Tests

sud2sat Input:

```
4.....8.5.3..........7......2.....6.....8.4......1.......6.3.7.5..2.....1.4......
```

sat2sud Output:

```
417 369 825
632 158 947
958 724 316
825 437 169
791 586 432
346 912 758
289 643 571
573 291 684
164 875 293
```

minisat Statistics:

```
WARNING: for repeatability, setting FPU to use double precision
============================[ Problem Statistics ]=============================
|                                                                             |
|   Number of variables:          729                                         |
|   Number of clauses:           6079                                         |
|   Parse time:                  0.00 s                                       |
|   Simplification time:         0.00 s                                       |
|                                                                             |
============================[ Search Statistics ]==============================
| Conflicts |          ORIGINAL         |          LEARNT          | Progress |
|           |    Vars  Clauses Literals |    Limit  Clauses Lit/Cl |          |
===============================================================================
===============================================================================
restarts              : 1
conflicts             : 7              (1023 /sec)
decisions             : 26             (0.00 % random) (3801 /sec)
propagations          : 1309           (191374 /sec)
conflict literals     : 40             (18.37 % deleted)
Memory used           : 23.00 MB
CPU time              : 0.00684 s

SATISFIABLE
```

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sud2sat Input:

```
48.3...........71.2.......7.5....6....2..8............1.76...3.....4......5....
```

sat2sud Output:

```
487 312 695
593 684 271
126 597 384
```

```
735 849 162
914 265 837
268 731 549
851 476 923
379 128 456
642 953 718
```

minisat Statistics:

```
WARNING: for repeatability, setting FPU to use double precision
============================[ Problem Statistics ]=============================
|                                                                             |
|   Number of variables:          729                                         |
|   Number of clauses:            6025                                        |
|   Parse time:                   0.00 s                                      |
|   Eliminated clauses:           0.00 Mb                                     |
|   Simplification time:          0.00 s                                      |
|                                                                             |
===========================[ Search Statistics ]==============================
| Conflicts |          ORIGINAL         |          LEARNT          | Progress |
|           |    Vars  Clauses Literals |    Limit  Clauses Lit/Cl |          |
===============================================================================
===============================================================================
restarts              : 1
conflicts             : 19              (2160 /sec)
decisions             : 36              (0.00 % random) (4092 /sec)
propagations          : 1957            (222462 /sec)
conflict literals     : 102             (6.42 % deleted)
Memory used           : 23.00 MB
CPU time              : 0.008797 s

SATISFIABLE
```

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sud2sat Input:

```
.6.5.1.9.1...9..539....7....4.8...7.......5.8.817.5.3.....5.2............76..8...
```

sat2sud Output:

```
863 521 794
127 496 853
954 387 621
645 839 172
739 142 568
281 765 439
498 653 217
512 974 386
376 218 945
```

minisat Statistics:

```
WARNING: for repeatability, setting FPU to use double precision
============================[ Problem Statistics ]==============================
|                                                                              |
|   Number of variables:          729                                          |
|   Number of clauses:            4814                                         |
|   Parse time:                   0.00 s                                       |
|   Eliminated clauses:           0.00 Mb                                      |
|   Simplification time:          0.00 s                                       |
|                                                                              |
============================[ Search Statistics ]==============================
| Conflicts |          ORIGINAL         |          LEARNT          | Progress |
|           |    Vars  Clauses Literals |    Limit  Clauses Lit/Cl |          |
===============================================================================
===============================================================================
restarts              : 1
conflicts             : 3                   (455 /sec)
decisions             : 11                  (0.00 % random) (1668 /sec)
propagations          : 951                 (144244 /sec)
conflict literals     : 11                  (0.00 % deleted)
Memory used           : 23.00 MB
CPU time              : 0.006593 s

SATISFIABLE
```

---

sud2sat Input:

```
3...8.......7....51..............36...2..4....7..........6.13..452...........8..
```

sat2sud Output:

```
354 186 927
298 743 615
167 952 483
481 527 369
932 614 578
576 398 241
729 865 134
845 231 796
613 479 852
```

minisat Statistics:

```
WARNING: for repeatability, setting FPU to use double precision
============================[ Problem Statistics ]============================
|                                                                            |
|   Number of variables:          729                                        |
|   Number of clauses:           6073                                        |
|   Parse time:                  0.00 s                                      |
|   Simplification time:         0.00 s                                      |
|                                                                            |
============================[ Search Statistics ]=============================
| Conflicts |          ORIGINAL         |          LEARNT         | Progress |
|           |    Vars  Clauses Literals |    Limit  Clauses Lit/Cl |          |
==============================================================================
==============================================================================
restarts              : 1
conflicts             : 9                 (2375 /sec)
decisions             : 27                (0.00 % random) (7124 /sec)
propagations          : 1382              (364644 /sec)
conflict literals     : 105               (7.89 % deleted)
Memory used           : 23.00 MB
CPU time              : 0.00379 s

SATISFIABLE
```

Second Task

- Modification:
  - Within the simple rules, I disabled the following rule: "There is at least one number in each entry".
    - This rule will be re-enabled (uncommented) in the submission.
    - I disabled this rule as the extended rule "There is at most one number in each entry" is a tighter constraint and should provide identical solutions.

sud2sat Input:

```
3...8.......7....51..............36...2..4....7..........6.13..452..........8..
```

sat2sud Output:

```
354 186 927
298 743 615
167 952 483
481 527 369
932 614 578
576 398 241
729 865 134
845 231 796
613 479 852
```

minisat Statistics:

```
WARNING: for repeatability, setting FPU to use double precision
===========================[ Problem Statistics ]===============================
|                                                                              |
|   Number of variables:           729                                         |
|   Number of clauses:            6009                                         |
|   Parse time:                   0.01 s                                       |
|   Eliminated clauses:           0.00 Mb                                      |
|   Simplification time:          0.00 s                                       |
|                                                                              |
===========================[ Search Statistics ]===============================
| Conflicts |          ORIGINAL         |          LEARNT          | Progress |
|           |    Vars  Clauses Literals |    Limit  Clauses Lit/Cl |          |
===============================================================================
===============================================================================
restarts              : 1
conflicts             : 6                (610 /sec)
decisions             : 25               (0.00 % random) (2540 /sec)
propagations          : 1140             (115818 /sec)
conflict literals     : 39               (13.33 % deleted)
Memory used           : 23.00 MB
CPU time              : 0.009843 s

SATISFIABLE
```

- However, our modified run of hardPuzzle4 took us ~3x as much time to complete
  compared to the unmodified run.

- Compared to our unmodified run:

    - 0.01 seconds to parse
    - 64 less clauses
    - 3 less conflicts
    - 2 less decisions
    - 242 less propagations
    - 66 less conflict literals