1. Intro. This program generates DLX3 data that finds all “reduced dissections” of an $m \times n$ rectangle into subrectangles.

The allowable subrectangles $[a\,..\,b] \times [c\,..\,d]$ have $0 \le a < b \le m$, $0 \le c < d \le n$; so there are $\binom{m+1}{2} \cdot \binom{n+1}{2}$ possibilities.

Furthermore we require that every $x \in (0\,..\,m)$ occurs at least once among the a’s; also that every $y \in (0\,..\,n)$ occurs at least once among the c’s. (Otherwise the dissection could be collapsed into a smaller one, by leaving out that coordinate value.)

[I hacked this program from MOTLEY-DLX, because I thought of that one first — although logically speaking, this one is simpler and I probably should have considered it earlier.]

```
#define maxd 36     /* maximum value for m or n */
#define encode(v) ((v) < 10 ? (v) + '0' : (v) − 10 + 'a')     /* encoding for values < 36 */
#include <stdio.h>
#include <stdlib.h>
  int m, n;     /* command-line parameters */
  main(int argc, char *argv[])
  {
    register int a, b, c, d, j, k;
    ⟨ Process the command line 2 ⟩;
    ⟨ Output the first line 3 ⟩;
    for (a = 0; a < m; a++)
      for (b = a + 1; b ≤ m; b++) {
        for (c = 0; c < n; c++)
          for (d = c + 1; d ≤ n; d++) {⟨ Output the line for [a . . b] × [c . . d] 4 ⟩}
      }
  }
```

2. ⟨ Process the command line 2 ⟩ ≡

```
  if (argc ≠ 3 ∨ sscanf(argv[1], "%d", &m) ≠ 1 ∨ sscanf(argv[2], "%d", &n) ≠ 1) {
    fprintf(stderr, "Usage:␣%s␣m␣n\n", argv[0]);
    exit(−1);
  }
  if (m > maxd ∨ n > maxd) {
    fprintf(stderr, "Sorry,␣m␣and␣n␣must␣be␣at␣most␣%d!\n", maxd);
    exit(−2);
  }
  printf("|␣redrect-dlx␣%d␣%d\n", m, n);
```

This code is used in section 1.

3. The main primary columns jk ensure that cell (j,k) is covered, for $0 \le j < m$ and $0 \le k < n$. And there are primary columns `x`a and `y`c for the at-least-once conditions.

I also include primary columns `x`ab and `y`cd; these are unrestricted, so they don't affect the number of solutions. They are, however, useful for compressing the output because they name the subrectangles of a solution.

⟨ Output the first line 3 ⟩ ≡

```
for (j = 0; j < m; j++)
  for (k = 0; k < n; k++) printf("␣%c%c", encode(j), encode(k));
for (a = 1; a < m; a++) printf("␣1:%d|x%c", n, encode(a));
for (c = 1; c < n; c++) printf("␣1:%d|y%c", m, encode(c));
for (a = 0; a < m; a++)
  for (b = a + 1; b ≤ m; b++) printf("␣0:%d|x%c%c", n, encode(a), encode(b));
for (c = 0; c < n; c++)
  for (d = c + 1; d ≤ n; d++) printf("␣0:%d|y%c%c", m, encode(c), encode(d));
printf("\n");
```

This code is used in section 1.

4. ⟨ Output the line for $[a \mathinner{..} b] \times [c \mathinner{..} d]$ 4 ⟩ ≡

```
for (j = a; j < b; j++)
  for (k = c; k < d; k++) printf("␣%c%c", encode(j), encode(k));
if (a) printf("␣x%c", encode(a));
if (c) printf("␣y%c", encode(c));
printf("␣x%c%c␣y%c%c\n", encode(a), encode(b), encode(c), encode(d));
```

This code is used in section 1.

5. Index.

REDRECT-DLX