

Nonlinear Grid Design, Part 2: Fractal Grids

Fractal sequences can be used as the basis of nonlinear grids. By their nature, fractal sequences do not repeat and so fractal grids do not tile seamlessly if repeated. However, many fractal grids appear to be regular yet with just enough difference to be interesting.

Morse-Thue Grids

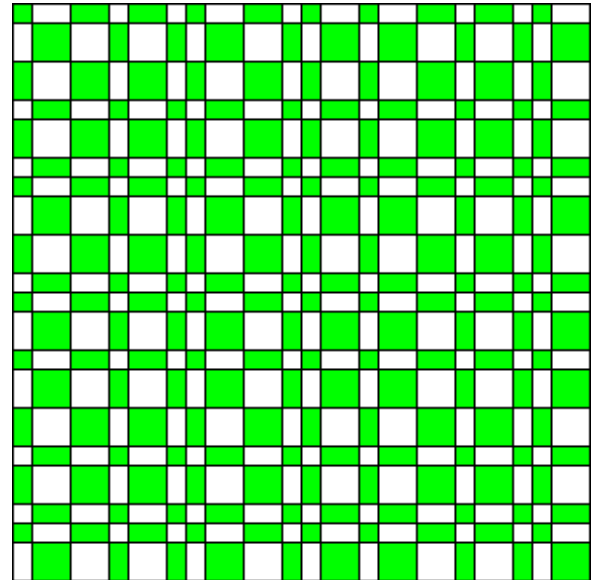
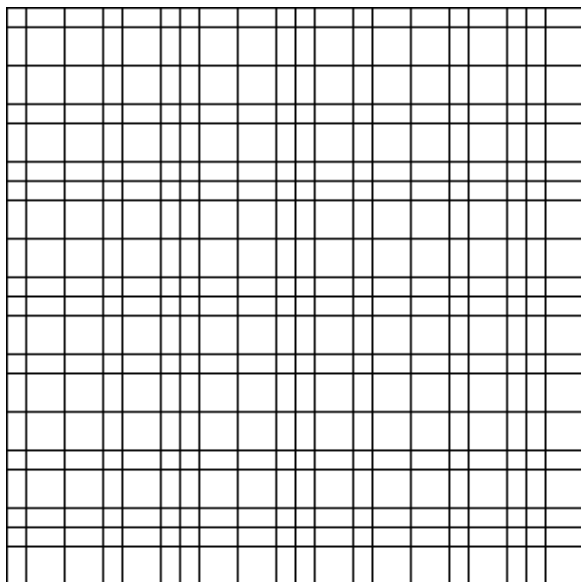
The most famous fractal sequence is the binary Morse-Thue sequence [1]. It goes like this:

0, 1, 1, 0, 1, 0, 0, 1, 1, 0, 0, 1, 0, 1, 1, 0, ...

In order to make this sequence suitable for widths and heights, 1 can be added to each value:

1, 2, 2, 1, 2, 1, 1, 2, 2, 1, 1, 2, 1, 2, 2, 1, ...

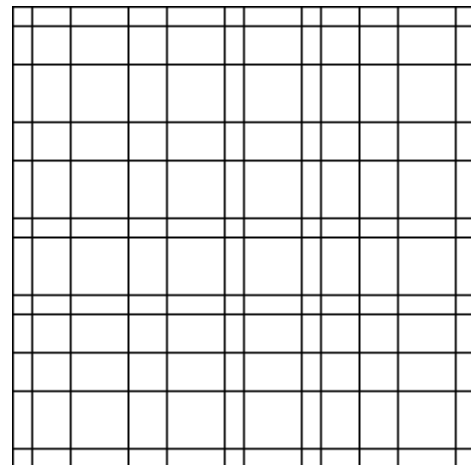
The resulting grid is

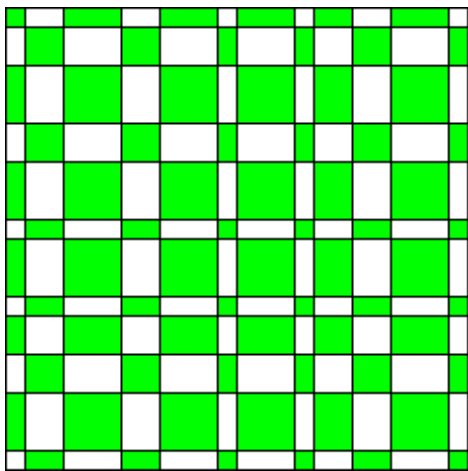


The Morse-Thue sequence can be generalized to base 3, base 4, and so on to give a greater variety of widths and heights. For example, the base-3 Morse-Thue sequence, incremented by 1, starts out as

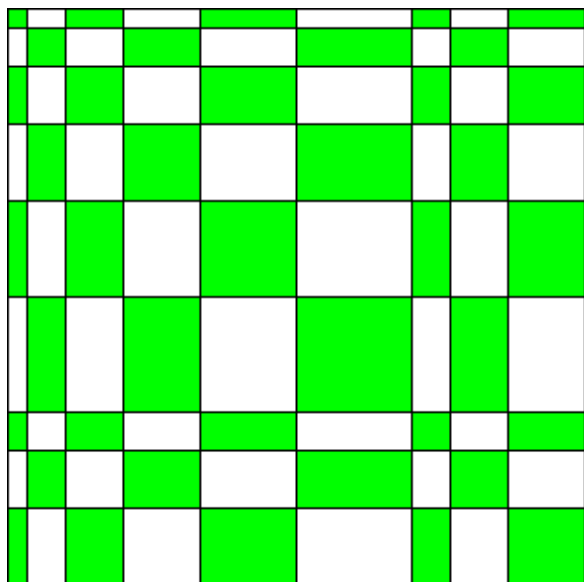
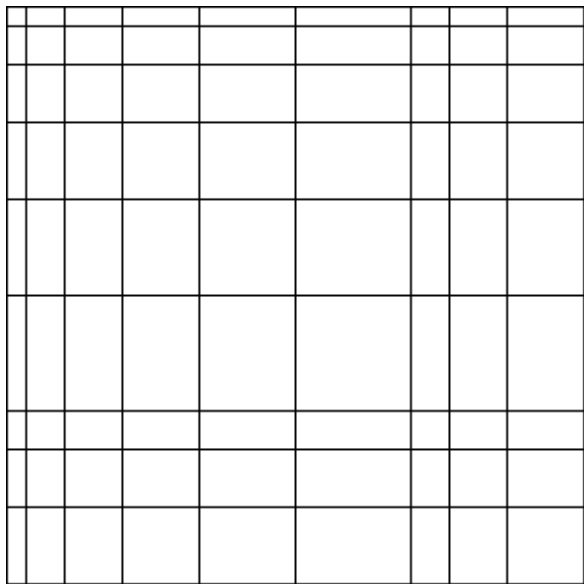
1, 2, 3, 2, 3, 1, 3, 1, 2, 2, 3, 1, 3, ...

and produces the grid





The base-6 Morse-Thue sequence produces this grid:

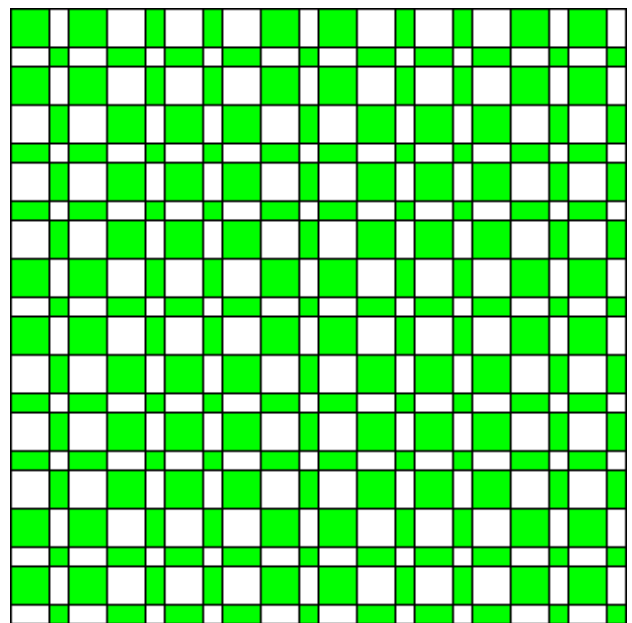
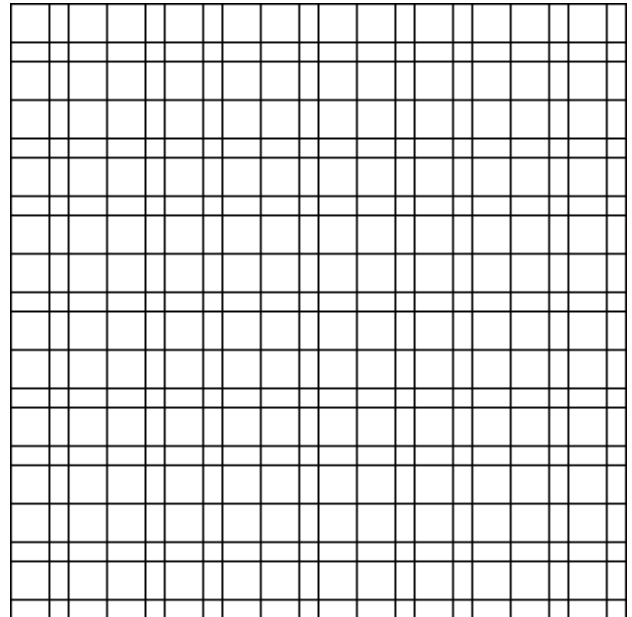


Rabbit Grids

Another binary fractal sequence is the rabbit sequence [2], which incremented by 1 starts out as

2, 1, 2, 2, 1, 2, 1, 2, 2, 1, 2, 2, 1, 2, 1, 2, ...

The grid for this sequence is



As with other sequence-based nonlinear grids, the horizontal and vertical sequences can be different.

The following pages contain examples of fractal grids with the sequences labeled as follows:

M2 base-2 Morse-Thue sequence

- M3 base-3 Morse-Thue sequence
- M4 base-4 Morse-Thue sequence
- R rabbit sequence

There are dozens of other fractal sequences that are suitable for making nonlinear grids. Go to the Web site given in Reference 3 and search for the keyword fractal.

References

1. *The Morse-Thue Sequence*, Ralph E. Griswold, 2002:

http://www.cs.arizona.edu/patterns/weavings/webdocs/gre_mt.pdf

2. *Fractal Sequences*, Ralph E. Griswold, 2002:

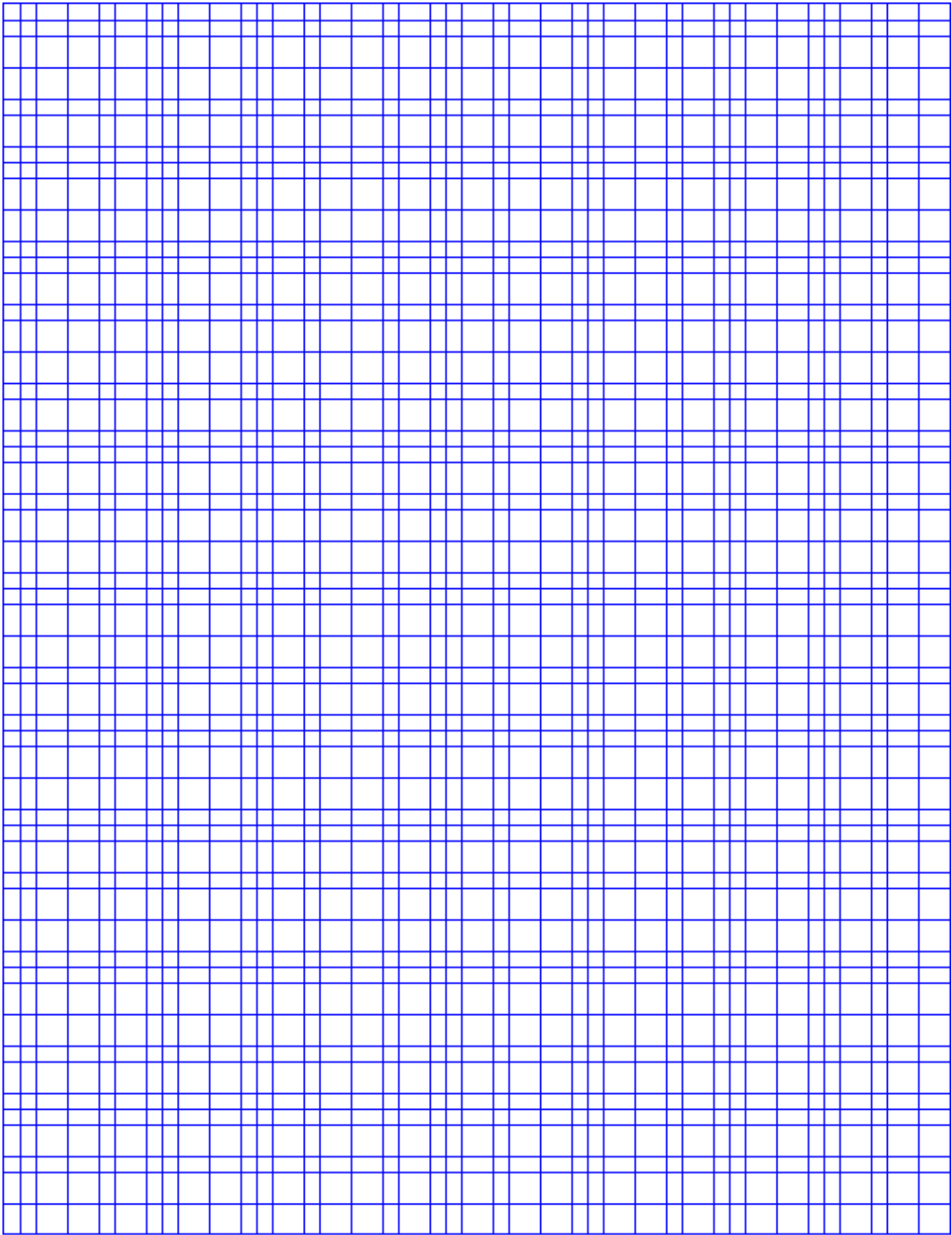
http://www.cs.arizona.edu/patterns/weavings/webdocs/gre_fctl.pdf

3. *On-Line Encyclopedia of Integer Sequences*:

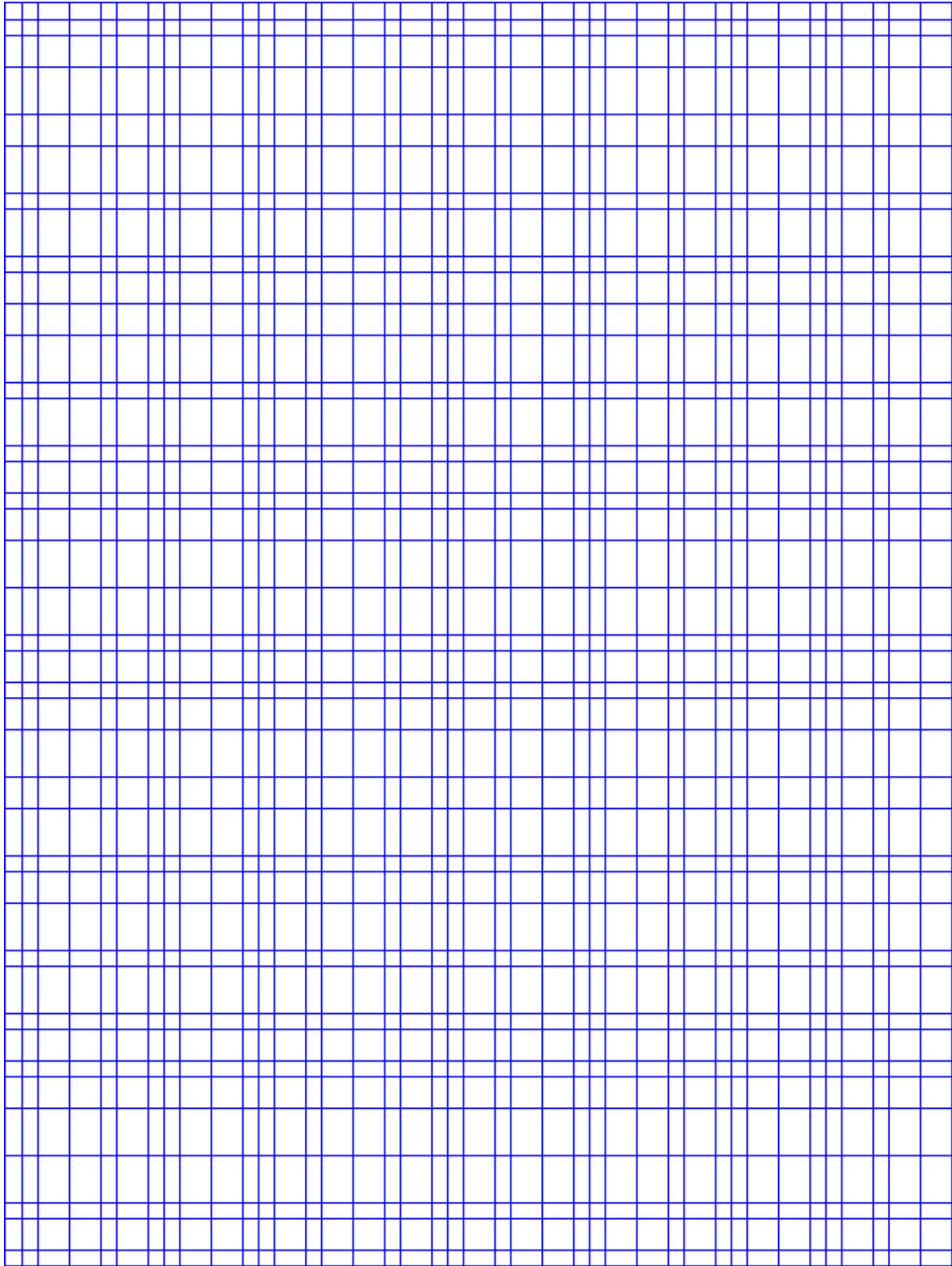
<http://www.research.att.com/~njas/sequences/>

Ralph E. Griswold
Department of Computer Science
The University of Arizona
Tucson, Arizona

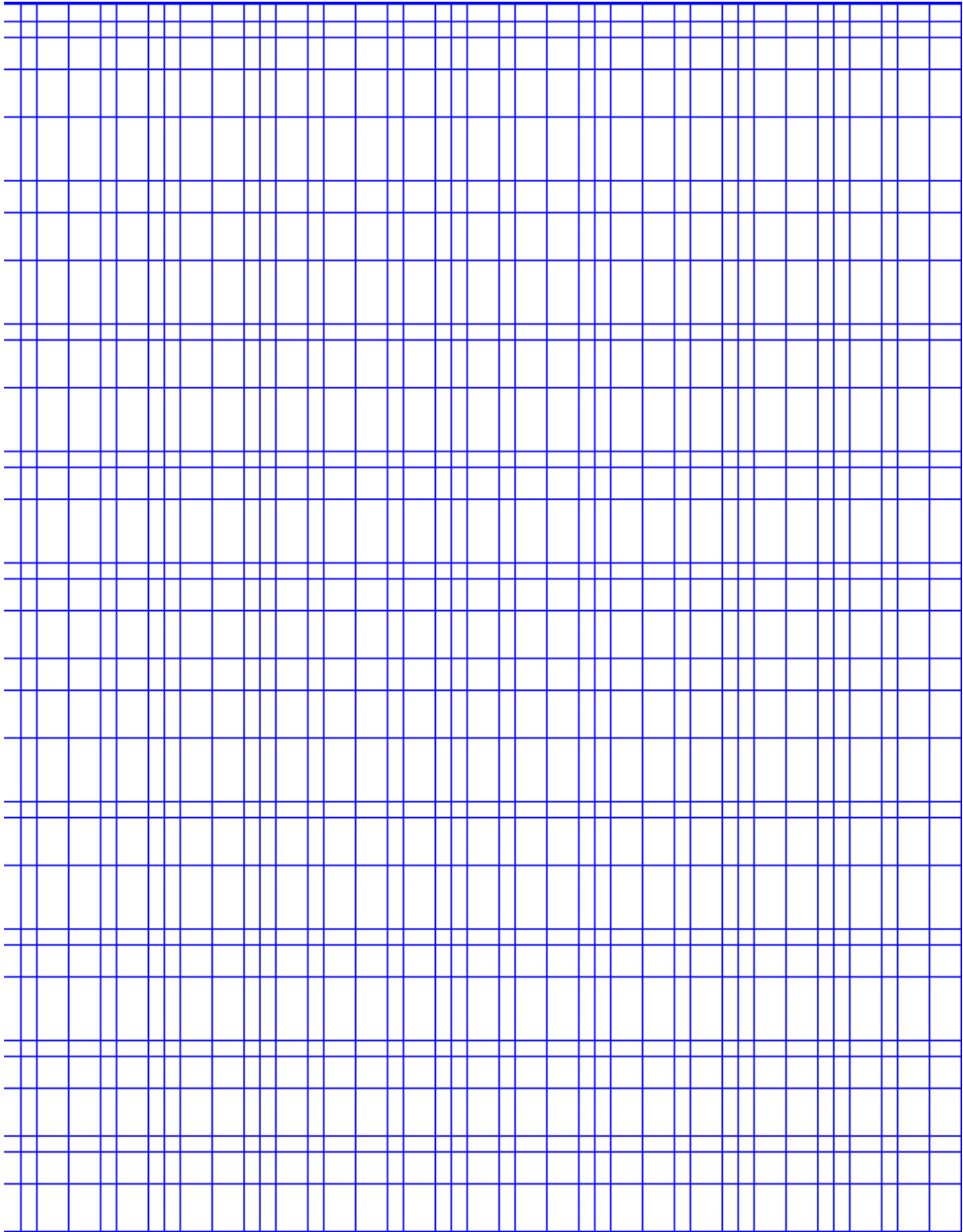
© 2004 Ralph E. Griswold



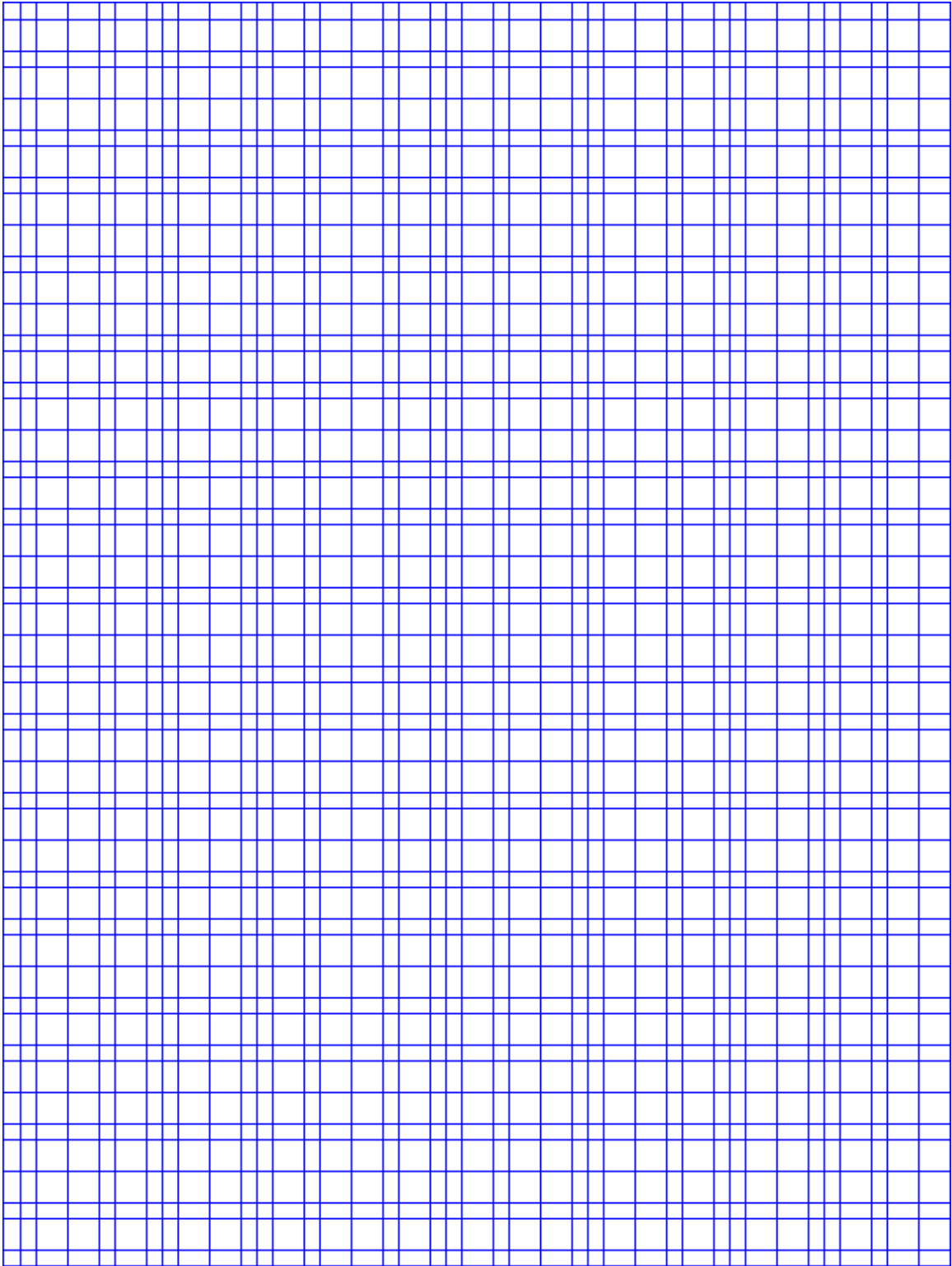
M2 x M2



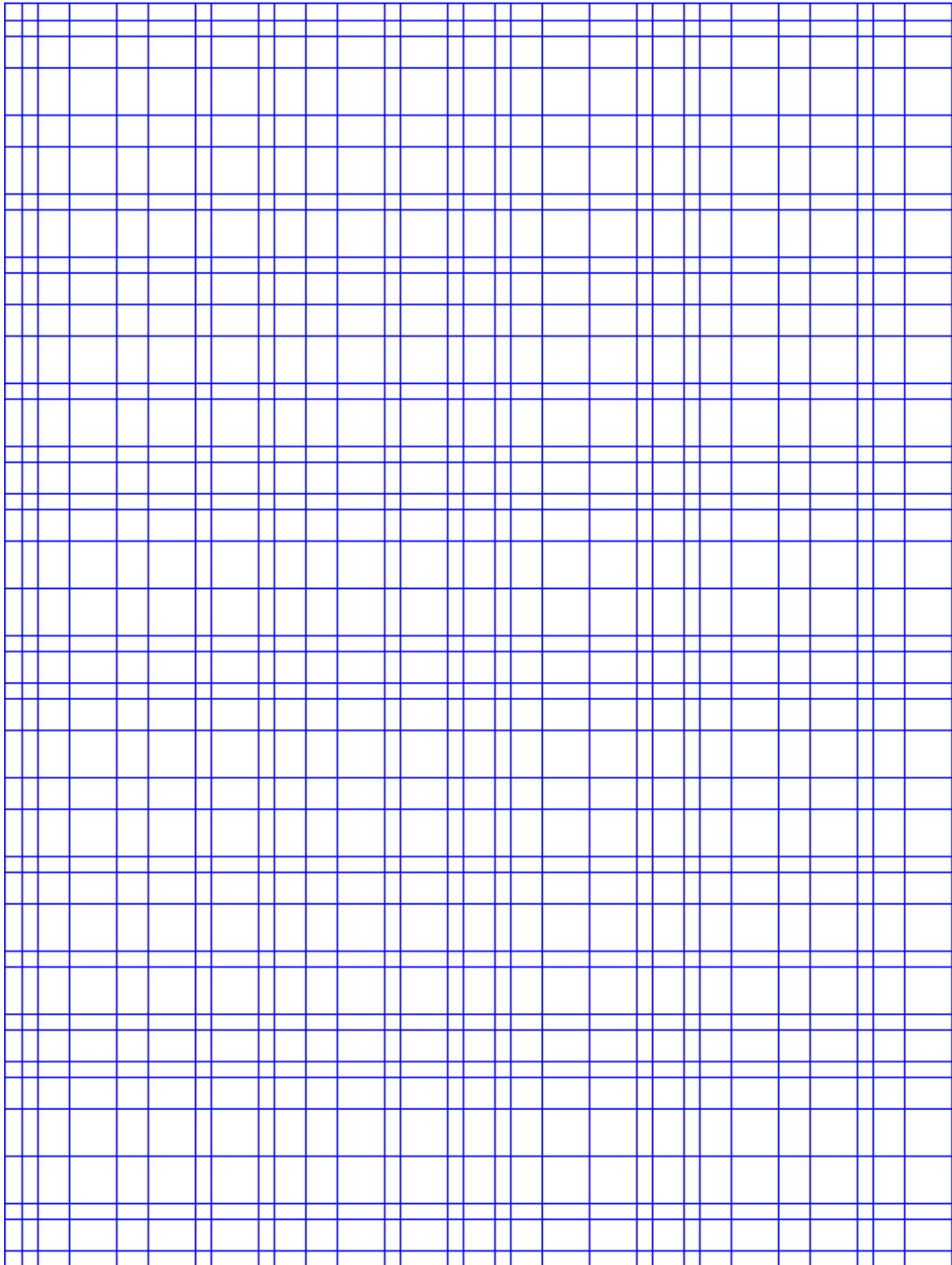
M2 x M3



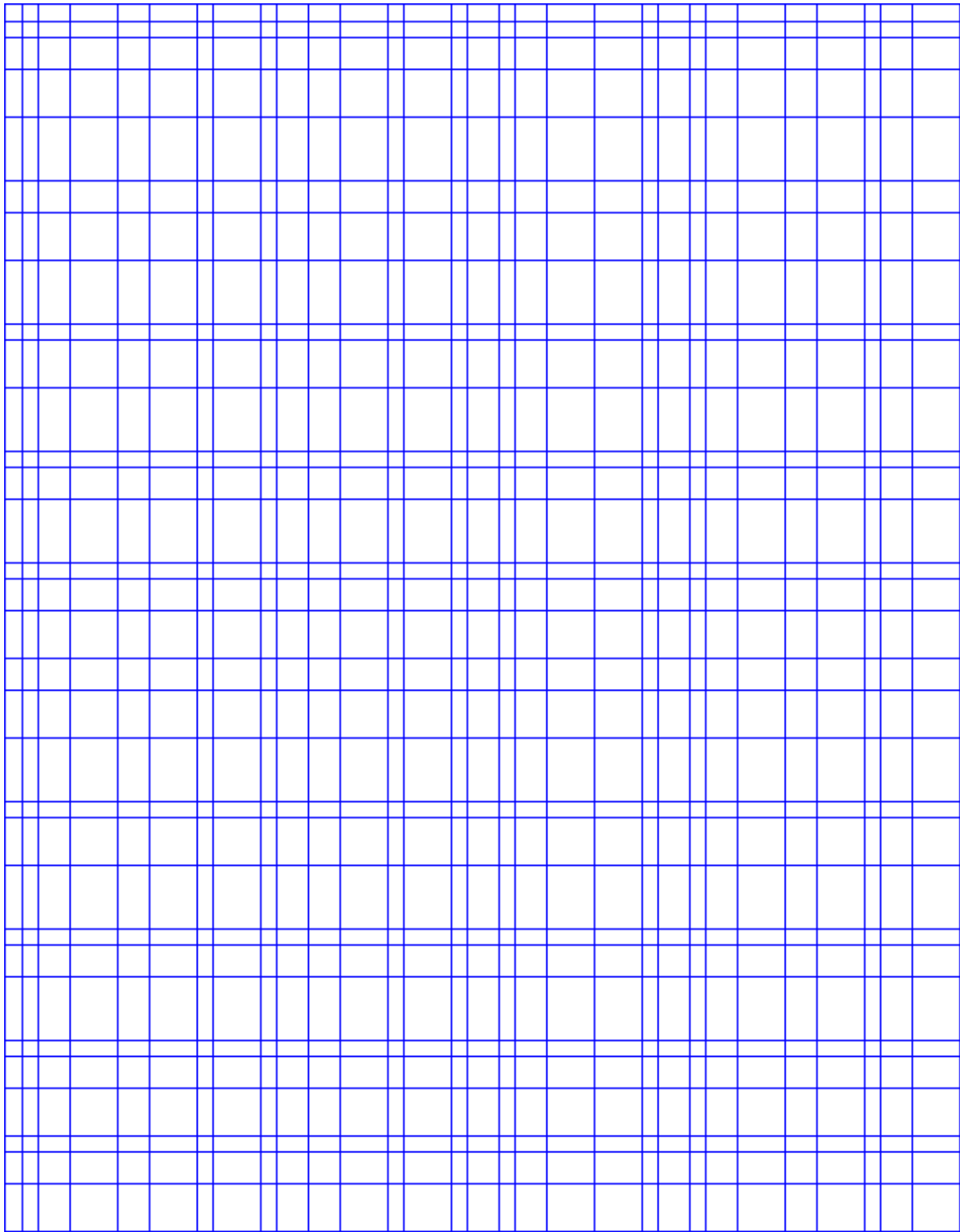
M2 x M4



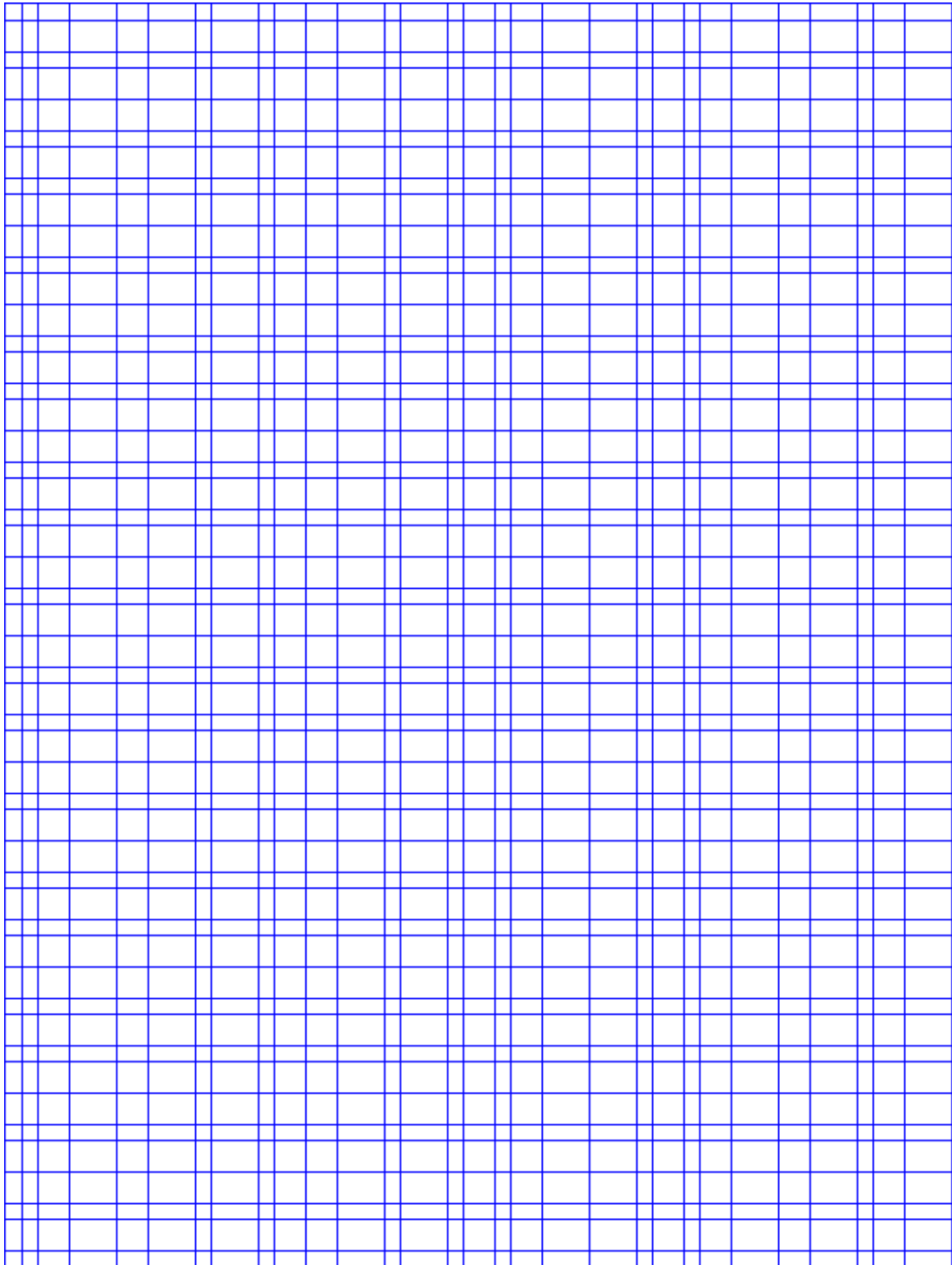
M2 x R



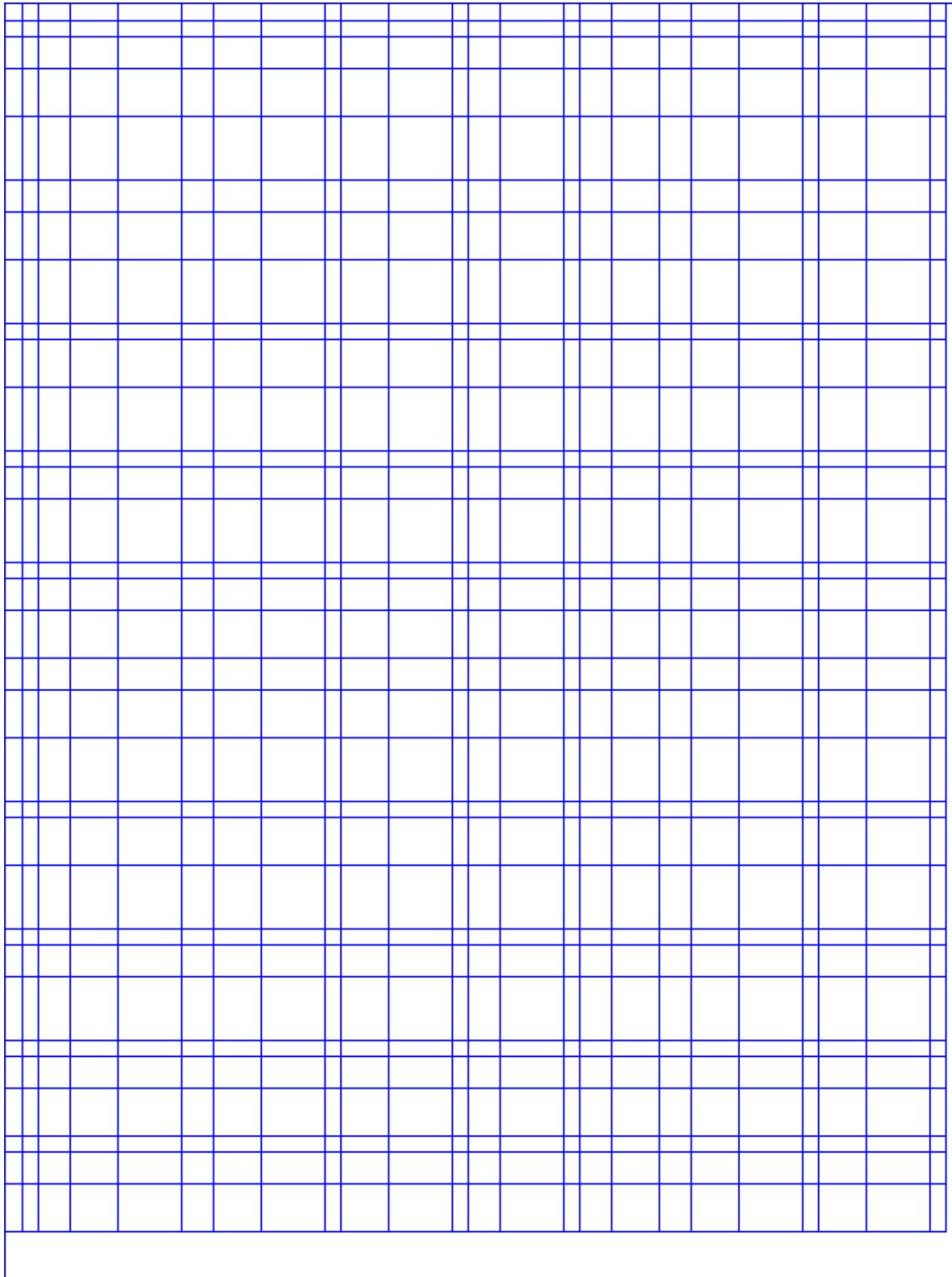
M3 x M3



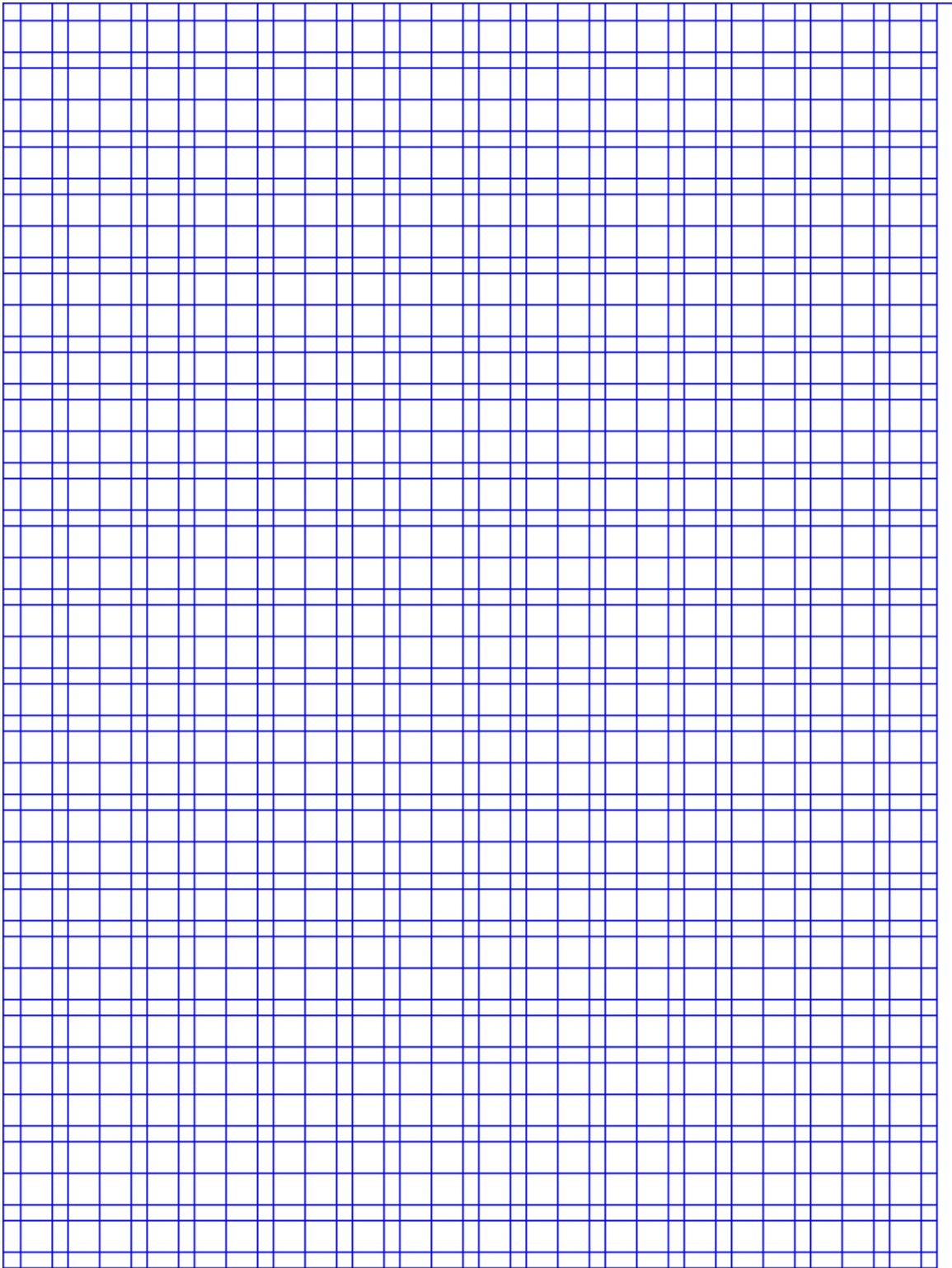
M3 x M4



M3 x R



M4 x R



$R \times R$