

Strategy for simplifying matrices:

General strategy -

- Obtain zeroes where required first.
- After the required zeroes are obtained, divide each row by the necessary non-zero number to obtain a "1" as the first non-zero entry for each row. (Save this step until the last because it often involves the introduction of fractions.)

More detailed strategy -

- Use Row 1 to zero out the entries in Column 1 below the entry in Row 1 and Column 1. (For instance, zero out the entry in Row 2 and Column 1 by replacing Row 2 with the sum of a multiple of Row 1 plus a multiple Row 2. Choose the multiples so that the resulting Row 2 has a zero as its first entry.)
- Continue this process until the matrix has zeroes below the first non-zero entry in each row. That is, use Row 2 to zero out the entries below the first non-zero entry in Row 2; use Row 3 to zero out the entries below the first non-zero entry in Row 3, etc.
- At the last step, multiply each row with a non-zero entry by the reciprocal of its first non-zero entry.

Additionally -

- At each step in the process, check to see if all the entries in any row have a nontrivial common multiple. If so, divide the row by that common multiple. (This will keep the magnitude of the calculations minimal.)
- If any row contains all zeros, move that row to the bottom of the matrix.

Variation on the process -

- The matrix resulting from the above simplification will be in **echelon form**. To obtain a matrix in **reduced row echelon form**, use Row 2 to zero out the entries above and below the first non-zero entry in Row 2. Similarly, if necessary, use Row 3 to zero out the entries above the first non-zero entry in Row 3.