## Tableau datatype

* m by n+1 matrix
* Two arrays containing indices (array m (fin (m + n)) and array n (fin (m + n)), for row and column variables (or isomorphic representation)
* Set of restricted variables (variables that are restricted to be nonnegative)

A tableau is a representation of a subset of **ℚm+n** i.e the set

x\_1 = a\_11 \* y\_1 + a\_12 \* y\_2 + … + c, x\_2 = …

## Tableau predicates

Set – the subset of **ℚm+n** that satisfies the tableau

Flat – the affine subset corresponding to the tableau (i.e. ignore any nonnegativity assumptions)

Unbounded variable – Predicate for a variable being unbounded in the solution set.

* Prove that variable is unbounded if it is a column variable in a tableau where every negative entry in the column is in a row owned by an unrestricted variable. (note that this is slightly different from the definition given in Nelson thesis).

Maximised variable – predicate takes a solution as an argument; and says whether a variable is maximised in this solution.

Equal – two variables are equal in every solution (should this be flat or solution set?)

* Prove tableau conditions for this, for when both variables are row variables (the rows of the tableau are the same), and for when one is a row variable, and the other is a column variable.

## Tableau functions (computable)

Pivot – swap a row and column variable.

* Prove set and flat remains the same after pivot, provided pivot element is nonzero
* Prove expression for updated element
  + Prove condition for nonnegativity of final column (constant term in affine sum).
  + Prove condition for improving objective function.
  + Pivot element has to be nonzero for this function to make sense.

of\_col – find an element of the flat given the solution for the column variables

* Prove this is in the flat
* Prove when this solution satisfies nonegativity

Sample point – solution given by setting all column variables to zero

* Not necessarily in the set. Prove it is in the set provided the last column is nonnegative for restricted rows.

Add/delete a row (takes an affine sum as argument)

* Prove projection of tableau with extra row equals old tableau set.
* Prove new variable equal to affine sum

Add/delete a column - Prove projection of tableau with extra column is superset of tableau without extra column.

Algorithm F