

(Stolen from ftp://softlib.cs.rice.edu/pub/miplib/mps_format)

MPS input format was originally introduced by IBM to express linear and integer programs in a standard way. The format is a fixed column format, so care must be taken that all information is placed in the correct columns as described below.

The following is not intended as a complete description of MPS format, but only as a brief introduction. For more information, the reader is directed to:

"Advanced Linear Programming," by Bruce A. Murtagh

"Computer Solutions of Linear Programs," by J.L. Nazareth

It may be useful to look at an example MPS file while reading this MPS information.

The following template is a guide for the use of MPS format:

```
-----
Field:      1          2          3          4          5          6
Columns:    2-3        5-12       15-22      25-36      40-47      50-61

      NAME      problem name

      ROWS

      type      name

      COLUMNS

      column    row    value    row    value
      name      name      name      name

      RHS

      rhs      row    value    row    value
      name      name      name      name

      RANGES

      range    row    value    row    value
      name      name      name      name

      BOUNDS

      type      bound    column    value
      name      name      name

      ENDATA
-----
```

NOTES:

A. In the ROWS section, each row of the constraint matrix must have a row type and a row name specified. The code for indicating row type is as follows:

type	meaning
E	equality
L	less than or equal
G	greater than or equal
N	objective
N	no restriction

B. In the COLUMNS section, the names of the variables are defined along with the coefficients of the objective and all the nonzero constraint matrix elements. It is not necessary to specify columns for slack or surplus variables as this is taken care of automatically.

C. The RHS section contains information for the right-hand side of the problem.

D. The RANGES section is for constraints of the form: $h \leq \text{constraint} \leq u$. The range of the constraint is $r = u - h$. The value of r is specified in the RANGES section, and the value of u or h is specified in the RHS section. If b is the value entered in the RHS section, and r is the value entered in the RANGES section, then u and h are thus defined:

row type	sign of r	h	u
G	+ or -	b	b + r
L	+ or -	b - r	b
E	+	b	b + r
E	-	b - r	b

E. In the BOUNDS section, bounds on the variables are specified. When bounds are not indicated, the default bounds ($0 \leq x < \text{infinity}$) are assumed. The code for indicating bound type is as follows:

type	meaning
LO	lower bound $b \leq x$
UP	upper bound $x \leq b$
FX	fixed variable $x = b$
FR	free variable
MI	lower bound $-\text{inf} < x$
BV	binary variable $x = 0 \text{ or } 1$

F. Sections RANGES and BOUNDS are optional as are the fields 5 and 6. Everything else is required. In regards to fields 5 and 6, consider the following 2 constraints:

```
const1: 2x + 3y < 6
const2: 5x + 8y < 20
```

Two ways to enter the variable x in the COLUMNS section are:

```
(Field: 2      3      4      5      6 )
1.      x  const1      2.0      const2      5.0
2.      x  const1      2.0
        x  const2      5.0
```

G. A mixed integer program requires the specification of which variables are required to be integer. Markers are used to indicate the start and end of a group of integer variables. The start marker has its name in field 2, 'MARKER' in field 3, and 'INTORG' in field 5. The end marker has its name in field 2, 'MARKER' in field 3, and 'INTEND' in field 5. These markers are placed in the COLUMNS section.