Lecture

In [1]:
```
using JuMP

m = Model()

@variables m begin
    r>=0
    g>=0
end

@constraints m begin
    r + g <= 8
    r >= 1
    g >= 1
    r <= 5
    g <= 6
end

@objective(m, Max, 3r+2g)

solve(m)

println(getobjectivevalue(m))
writeLP(m, "costs.lp")
```

```
21.0
```

In [2]:
```
;less "costs.lp"
```

```
Maximize
 obj: 3 VAR1 + 2 VAR2
Subject To
 c1: 1 VAR1 + 1 VAR2 <= 8
 c2: 1 VAR1 >= 1
 c3: 1 VAR2 >= 1
 c4: 1 VAR1 <= 5
 c5: 1 VAR2 <= 6
Bounds
 0 <= VAR1 <= +inf
 0 <= VAR2 <= +inf
General
End
```

In [3]:
```
;glpsol --cpxlp costs.lp --ranges costs.sen
```

```
GLPSOL: GLPK LP/MIP Solver, v4.60
Parameter(s) specified in the command line:
 --cpxlp costs.lp --ranges costs.sen
Reading problem data from 'costs.lp'...
5 rows, 2 columns, 6 non-zeros
13 lines were read
GLPK Simplex Optimizer, v4.60
5 rows, 2 columns, 6 non-zeros
Preprocessing...
1 row, 2 columns, 2 non-zeros
Scaling...
 A: min|aij| =  1.000e+00  max|aij| =  1.000e+00  ratio =  1.000e+00
Problem data seem to be well scaled
Constructing initial basis...
Size of triangular part is 1
*     0: obj =   5.000000000e+00 inf =   0.000e+00 (2)
*     2: obj =   2.100000000e+01 inf =   0.000e+00 (0)
OPTIMAL LP SOLUTION FOUND
Time used:   0.0 secs
Memory used: 0.0 Mb (40416 bytes)
Write sensitivity analysis report to 'costs.sen'...
```

In [4]:
```
;less "costs.sen"
```

```
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Problem:
Objective:  obj = 21 (MAXimum)

   No. Row name     St      Activity         Slack   Lower bound       Activity      Obj coef  Obj value at Limiting
                                          Marginal   Upper bound          range         range   break point variable
------ ------------ -- ------------- ------------- -------------  ------------- ------------- ------------- ------------
     1 c1           NU       8.00000             .          -Inf        6.00000      -2.00000      17.00000 c3
                                           2.00000       8.00000       11.00000          +Inf      27.00000 c5

     2 c2           BS       5.00000      -4.00000       1.00000        2.00000      -1.00000      16.00000 c4
                                                 .          +Inf        5.00000          +Inf          +Inf

     3 c3           BS       3.00000      -2.00000       1.00000              .      -2.00000      15.00000 c1
                                                 .          +Inf        6.00000       1.00000      24.00000 c4

     4 c4           NU       5.00000             .          -Inf        2.00000      -1.00000      18.00000 c5
                                           1.00000       5.00000        7.00000          +Inf      23.00000 c3

     5 c5           BS       3.00000       3.00000          -Inf        1.00000      -2.00000      15.00000 c1
                                                 .       6.00000        7.00000       1.00000      24.00000 c4

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Problem:
Objective:  obj = 21 (MAXimum)

   No. Column name  St      Activity      Obj coef   Lower bound       Activity      Obj coef  Obj value at Limiting
                                          Marginal   Upper bound          range         range   break point variable
------ ------------ -- ------------- ------------- -------------  ------------- ------------- ------------- ------------
     1 VAR1         BS       5.00000       3.00000             .        2.00000       2.00000      16.00000 c4
                                                 .          +Inf        5.00000          +Inf          +Inf

     2 VAR2         BS       3.00000       2.00000             .        1.00000              .      15.00000 c1
                                                 .          +Inf        6.00000       3.00000      24.00000 c4

End of report
```

In [ ]: