```
using JuMP, MosekTools

m = Model(Mosek.Optimizer)

A = [
578.25 142.857142857143 96 181.2 160 226.8 0 0 0 0 97.5609756097561
16.6666666666667 4.44444444444444 28 0 74.8898678414097
98.2142857142857 46.4553571428571 8.92857142857143 12.5 37.5 0 0 0 0 0
0 0 0 0 0 0;
55.5 25 60 29.4 30 46.8 5.55555555555556 5.29411764705882
6.41025641025641 8.01282051282051 15.2439024390244 8.33333333333333
2.77777777777778 8 14.5454545454545 57.2687224669603 71.4285714285714
33.7857142857143 17.8571428571429 62.5 187.5 324 54 297 283.5 54 26 70
70 84.7058823529412 91.7647058823529 40.6451612903226;
16.5 3.57142857142857 0 78 0 86.4 0 0 0 1.6025641025641
3.04878048780488 0 0.555555555555556 4 0 0 71.4285714285714
33.7857142857143 89.2857142857143 50 150 72 6 66 63 12 6 27.5 27.5
38.8235294117647 24.7058823529412 16.4516129032258;
18.75 8.57142857142857 0 7.2 6 0 4.77777777777778 4.76470588235294
16.3461538461538 7.21153846153846 11.890243902439 12.5
1.61111111111111 14 1.45454545454545 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0;
0 0 0 0 0 0 4914 2311.41176470588 36830.7692307692 1040.86538461538
330.182926829268 22.5 161.666666666667 237.6 318.545454545455
21.1453744493392 822.321428571429 388.958035714286 1084.82142857143
1046.25 3138.75 3.6 0.6 3.3 3.15 0.6 0.6 2.25 2.25 8.47058823529412
7.41176470588235 94.0645161290323;]

b = [910; 322; 362.8744; 196; 5250]

c = [5.4; 2.4; 2.93; 2.17; 8.9; 4.2; 1.35; 1.83; 0.95; 3.18; 5.5;
2.45; 2.75; 1.95; 2.85; 8.4; 6.1; 3.63; 7.45; 2.85; 6.65; 11.1; 3.35;
22; 9.75; 4.15; 3.35; 7.16; 7.9; 6.6; 9.63; 6.91 ]


@variable(m, x[1:32] >= 0, Int)
@constraint(m, x .<= 2)  # Ensures each variable is chosen at most
twice
@constraint(m,  A*x .>= b)
@constraint(m, sum(x[1:6]) >= 1)
@constraint(m, sum(x[7: 15]) >= 1)
@constraint(m, sum(x[16:21]) >= 1)
@constraint(m, sum(x[22:32]) >= 1)
@objective(m, Min, c'*x)
print(m)

optimize!(m)

Problem
  Name                   :
```

```
  Objective sense        : minimize
  Type                   : LO (linear optimization problem)
  Constraints            : 41
  Affine conic cons.     : 0
  Disjunctive cons.      : 0
  Cones                  : 0
  Scalar variables       : 32
  Matrix variables       : 0
  Integer variables      : 32

Optimizer started.
Mixed integer optimizer started.
Threads used: 8
Presolve started.
Presolve terminated. Time = 0.00, probing time =  0.00
Presolved problem: 32 variables, 8 constraints, 137 non-zeros
Presolved problem: 32 general integer, 0 binary, 0 continuous
Clique table size: 0
BRANCHES RELAXS   ACT_NDS  DEPTH    BEST_INT_OBJ
BEST_RELAX_OBJ       REL_GAP(%)  TIME
0        0        1        0        6.7660000000e+01     NA
NA          0.0
0        2        1        0        5.8860000000e+01
5.6938367386e+01     3.26        0.0
Cut generation started.
0        2        1        0        5.8860000000e+01
5.6938367386e+01     3.26        0.0
0        3        1        0        5.8860000000e+01
5.7339568929e+01     2.58        0.0
0        4        1        0        5.8860000000e+01
5.7400050085e+01     2.48        0.0
Cut generation terminated. Time = 0.00
0        7        1        0        5.8000000000e+01
5.7408010835e+01     1.02        0.0
Presolve started.
Presolve terminated. Time = 0.00, probing time =  0.00
Presolved problem: 4 variables, 3 constraints, 12 non-zeros
Presolved problem: 4 general integer, 0 binary, 0 continuous
Clique table size: 0
BRANCHES RELAXS   ACT_NDS  DEPTH    BEST_INT_OBJ
BEST_RELAX_OBJ       REL_GAP(%)  TIME
0        18       1        0        5.8000000000e+01
5.7408011728e+01     1.02        0.0
6        30       2        0        5.8000000000e+01
5.7408011728e+01     1.02        0.0
An optimal solution satisfying the relative gap tolerance of 1.00e-
02(%) has been located.
The relative gap is 0.00e+00(%).
An optimal solution satisfying the absolute gap tolerance of 0.00e+00
```

```
has been located.
The absolute gap is 0.00e+00.

Objective of best integer solution : 5.800000000000e+01
Best objective bound               : 5.800000000000e+01
Initial feasible solution objective: Undefined
Construct solution objective       : Not employed
User objective cut value           : Not employed
Number of cuts generated           : 13
  Number of Gomory cuts            : 4
  Number of CMIR cuts              : 9
Number of branches                 : 10
Number of relaxations solved       : 38
Number of interior point iterations: 12
Number of simplex iterations       : 24
Time spend presolving the root     : 0.00
Time spend optimizing the root     : 0.02
Mixed integer optimizer terminated. Time: 0.03

Optimizer terminated. Time: 0.05


solution_summary(m)

MOSEK error 2950 (MSK_RES_ERR_NO_DUAL_FOR_ITG_SOL): No dual
information is available for the integer solution.

* Solver : Mosek

* Status
  Result count       : 1
  Termination status : OPTIMAL
  Message from the solver:
  "Mosek.MSK_SOL_STA_INTEGER_OPTIMAL"

* Candidate solution (result #1)
  Primal status      : FEASIBLE_POINT
  Dual status        : NO_SOLUTION
  Objective value    : 5.80000e+01
  Objective bound    : 5.80000e+01
  Relative gap       : 0.00000e+00

* Work counters
  Solve time (sec)   : 4.70000e-02
  Simplex iterations : 24
  Barrier iterations : 12
  Node count         : 10

value.(x[1:6]) # grains
```

```
6-element Vector{Float64}:
 2.0
 2.0
 0.0
 2.0
 0.0
 0.0
```

```
value.(x[7:15]) # vegetables
```

```
9-element Vector{Float64}:
 2.0
 2.0
 2.0
 0.0
 2.0
 2.0
 0.0
 2.0
 0.0
```

```
value.(x[16:21]) # dairy
```

```
6-element Vector{Float64}:
 0.0
 0.0
 0.0
 0.0
 0.0
 1.0
```

```
value.(x[22:32]) # proteins
```

```
11-element Vector{Float64}:
 0.0
 1.0
 0.0
 0.0
 0.0
 0.0
 0.0
 0.0
 0.0
 0.0
 0.0
```

```
objective_value(m)
```

```
58.0
```