Module 11 Assignment - Quantitative Management Modeling

Julia Thacker

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```
library(lpSolveAPI)
library(lpSolve)
ap.lp<-make.lp(0,7)
set.objfn(ap.lp,c(775,800,800,800,800,775,750))
lp.control(ap.lp,sense='min')
```

```
## $anti.degen
## [1] "fixedvars" "stalling"
##
## $basis.crash
## [1] "none"
##
## $bb.depthlimit
## [1] -50
##
## $bb.floorfirst
## [1] "automatic"
##
## $bb.rule
## [1] "pseudononint" "greedy"       "dynamic"      "rcostfixing"
##
## $break.at.first
## [1] FALSE
##
## $break.at.value
## [1] -1e+30
##
## $epsilon
##       epsb       epsd      epsel     epsint epsperturb   epspivot
##      1e-10      1e-09      1e-12      1e-07      1e-05      2e-07
##
## $improve
## [1] "dualfeas" "thetagap"
##
## $infinite
## [1] 1e+30
##
## $maxpivot
## [1] 250
##
## $mip.gap
## absolute relative
```

```
##    1e-11    1e-11
##
## $negrange
## [1] -1e+06
##
## $obj.in.basis
## [1] TRUE
##
## $pivoting
## [1] "devex"    "adaptive"
##
## $presolve
## [1] "none"
##
## $scalelimit
## [1] 5
##
## $scaling
## [1] "geometric"   "equilibrate" "integers"
##
## $sense
## [1] "minimize"
##
## $simplextype
## [1] "dual"   "primal"
##
## $timeout
## [1] 0
##
## $verbose
## [1] "neutral"
```

Created an LP model with 7 decision variables that will minimize the total wage expenses.

```
set.type(ap.lp,c(1,2,3,4,5,6,7),"integer")
```

Set the type of the decision variables to integer.

```
add.constraint(ap.lp, c(1,1,1,1,1,0,0),">=",19)
add.constraint(ap.lp, c(0,1,1,1,1,1,0),">=",18)
add.constraint(ap.lp, c(0,0,1,1,1,1,1),">=",27)
add.constraint(ap.lp, c(1,0,0,1,1,1,1),">=",22)
add.constraint(ap.lp, c(1,1,0,0,1,1,1),">=",26)
add.constraint(ap.lp, c(1,1,1,0,0,1,1),">=",25)
add.constraint(ap.lp, c(1,1,1,1,0,0,1),">=",21)
```

Added 7 constraints to account for the minimum number of workers required on each day of the week.

```
print(ap.lp)
```

```
## Model name:
##            C1   C2   C3   C4   C5   C6   C7
## Minimize  775  800  800  800  800  775  750
## R1          1    1    1    1    1    0    0  >=  19
## R2          0    1    1    1    1    1    0  >=  18
## R3          0    0    1    1    1    1    1  >=  27
## R4          1    0    0    1    1    1    1  >=  22
## R5          1    1    0    0    1    1    1  >=  26
## R6          1    1    1    0    0    1    1  >=  25
## R7          1    1    1    1    0    0    1  >=  21
## Kind      Std  Std  Std  Std  Std  Std  Std
## Type      Int  Int  Int  Int  Int  Int  Int
## Upper     Inf  Inf  Inf  Inf  Inf  Inf  Inf
## Lower       0    0    0    0    0    0    0

solve(ap.lp)

## [1] 0

get.objective(ap.lp)

## [1] 25675
```

Solved the model. The total cost of the optimal solution is $25,675.

```
get.variables(ap.lp)

## [1]  5  1  5  0  8  4 10
```

The optimal solution suggests 5 workers for shift 1, 1 for shift 2, 5 for shift 3, 0 for shift 4, 8 for shift 5, 4 for shift 6, and 10 for shift 7.

This result means that there would be 18 workers on Sunday, 27 on Monday, 27 on Tuesday, 28 on Wednesday, 25 on Thursday, 21 on Friday, and 19 on Saturday.