Dcurran3\_11

2022-11-17

Objective Function

775x1 + 800x2 + 800x3 + 800x4 + 800x5 + 775x6 + 750x7 = MINIMIZE

where:

x1 = Workers Shift 1 (off Sun/Mon) x2 = Workers Shift 2 (off Mon/Tue) x3 = Workers Shift 3 (off Tue/Wed) x4 = Workers Shift 4 (off Wed/Thur) x5 = Workers Shift 5 (off Thur/Fri) x6 = Workers Shift 6 (off Fri/Sun) x7 = Workers Shift 7 (off Sat/Sun)

subject to:

Constraints

x2 + x3 + x4 + x5 + x6 >= 18 (Sun)  
 x3 + x4 + x5 + x6 + x7 >= 27 (Mon)

x1 + x4 + x5 + x6 + x7 >= 22 (Tues) x1 + x2 + x5 + x6 + x7 >= 26 (Wed) x1 + x2 + x3 + x6 + x7 >= 25 (Thu) x1 + x2 + x3 + x4 + x7 >= 21 (Fri) x1 + x2 + x3 + x4 + x5 >= 19 (Sat)

library(lpSolveAPI)  
lprec <- make.lp(0, 7)  
set.objfn(lprec, c(775, 800, 800, 800, 800, 775, 750))  
lp.control(lprec, 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"

add.constraint(lprec, c(0,1,1,1,1,1,0), ">=", 18)  
add.constraint(lprec, c(0,0,1,1,1,1,1), ">=", 27)  
add.constraint(lprec, c(1,0,0,1,1,1,1), ">=", 22)  
add.constraint(lprec, c(1,1,0,0,1,1,1), ">=", 26)  
add.constraint(lprec, c(1,1,1,0,0,1,1), ">=", 25)  
add.constraint(lprec, c(1,1,1,1,0,0,1), ">=", 21)  
add.constraint(lprec, c(1,1,1,1,1,0,0), ">=", 19)  
  
solve(lprec)

## [1] 0

get.objective(lprec)

## [1] 25175

get.variables(lprec)

## [1] 1.3333333 4.0000000 6.3333333 0.0000000 7.3333333 0.3333333 13.0000000

x1 = 1.33 x2 = 4 x3 = 6.33 x4 = 0 x5 = 7.33 x6 = .33 x7 = 13

x1 = 2 Shift 1 x2 = 4 Shift 2 x3 = 7 Shift 3 x4 = 0 Shift 4 x5 = 8 Shift 5 x6 = 1 Shift 6 x7 = 13 Shift 7

We will want to employ 35 workers. As a quick check to above, we can look at shift 1 (employees off Sunday and Monday). On shift one there are two employees off so we need 33 shifts covered. We see that Sunday needs a minimum of 18 so we are safe to have 2 on shift 1. This logic can be applied to the other days and we will find that we have met the minimum staffing needs for each day.

With this schedule plan, we will have a minimum cost of $25,175.