Assignment Module 11

Riba Khan

2022-11-20

#loading the library and uploading the lp file.

```
AP_HUB <- read.lp("AP_HUB.lp")
print(AP_HUB)
```

```
## Model name:
##             x1   x2   x3   x4   x5   x6   x7
## Minimize   775  800  800  800  800  775  750
## Sunday       0    1    1    1    1    1    0  >=  18
## Monday       0    0    1    1    1    1    1  >=  27
## Tuesday      1    0    0    1    1    1    1  >=  22
## Wednesday    1    1    0    0    1    1    1  >=  26
## Thursday     1    1    1    0    0    1    1  >=  25
## Friday       1    1    1    1    0    0    1  >=  21
## Saturday     1    1    1    1    1    0    0  >=  19
## 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
```

the estimate of number of workers needed each day of the week

```
Number_of_workers_and_days <- matrix(c("Sunday","Monday","Tuesday","Wednesday
",
                                       "Thursday", "Friday","Saturday",
                                       18,27,22,26,25,21,19),
                                     ncol = 2, byrow = F)
```

#setting up the coloumn names

```
colnames(Number_of_workers_and_days) <- c("Days","Workers_Required")
as.table(Number_of_workers_and_days)
```

```
##   Days      Workers_Required
## A Sunday    18
## B Monday    27
## C Tuesday   22
## D Wednesday 26
## E Thursday  25
## F Friday    21
## G Saturday  19
```

#Package handlers at AP are guaranteed a five-day work week with two consecutive days off. #The base wage for the handlers is $750 per week. Workers working on Saturday or Sunday receive an #additional $25 per day.

#The possible shifts and salaries for package handlers are:

#creating a table by entering the necessary information

```
Shift_and_Wages <- matrix(c(1,2,3,4,5,6,7,
                                "Sunday and Monday","Monday and Tuesday",
                              "Tuesday and Wednesday","Wednesday and Thursday",
                              "Thursday and Friday","Friday and Saturday",
                              "Saturday and Sunday",
                              "$775","$800","$800","$800","$800","$775","$750")
,
                            ncol = 3, byrow = F)
```

#setting up the coloumn names and creating a table

```
colnames(Shift_and_Wages) <- c("Shift", "Days_Off", "Wage")
as.table(Shift_and_Wages)
```

```
##   Shift Days_Off               Wage
## A 1     Sunday and Monday      $775
## B 2     Monday and Tuesday     $800
## C 3     Tuesday and Wednesday  $800
## D 4     Wednesday and Thursday $800
## E 5     Thursday and Friday    $800
## F 6     Friday and Saturday    $775
## G 7     Saturday and Sunday    $750
```

#solving the problem

```
solve(AP_HUB)
```

```
## [1] 0
```

```
get.objective(AP_HUB)
```

```
## [1] 25675
```

ANSWER:The total cost is $25675.

#let x1, x2, x3, x4, x5, x6, x7 represents the number of workers required for #all the seven shifts respectively

```
get.variables(AP_HUB)
```

```
## [1]  2  4  5  0  8  1 13
```

#From the above, we can derive:-

#x1 = 2, which implies 2 workers are needed for Shift 1

#x2 = 4, which implies 4 workers are needed for Shift 2.

#x3 = 5, implies 5 workers are needed for Shift 3.

#x4 = 0, implies 0 workers are needed for Shift 4.

#x5 = 8, implies 8 workers are needed for Shift 5.

#x6 = 1, implies 1 worker are needed for Shift 6.

#x7 = 13, implies 13 workers are needed for Shift 7.

#the workers availabe for each day is

```
Workers_Available_each_day <- matrix(c(0,4,5,0,8,1,0,0,0,5,0,8,1,13,2,0,0,0,
                                       8,1,13,2,4,0,0,8,1,13,2,4,5,0,0,1,13,2
,
                                       3,4,0,0,0,13,2,4,5,0,8,0,0),
                                     ncol=7,byrow=TRUE)
```

#setting up the coloumn names

```
colnames(Workers_Available_each_day)<- c("Shift1", "Shift2", "Shift3",
                                         "Shift4", "Shift5", "Shift6", "Shift7
")

row.names(Workers_Available_each_day) <- c('Sunday', 'Monday', 'Tuesday','Wed
nesda','Thursday','Friday','Saturday')
Workers_Available_each_day
```

```
##          Shift1 Shift2 Shift3 Shift4 Shift5 Shift6 Shift7
## Sunday        0      4      5      0      8      1      0
## Monday        0      0      5      0      8      1     13
## Tuesday       2      0      0      0      8      1     13
## Wednesda      2      4      0      0      8      1     13
## Thursday      2      4      5      0      0      1     13
## Friday        2      3      4      0      0      0     13
## Saturday      2      4      5      0      8      0      0
```

```
#showing number of workers available each day
rowSums(Workers_Available_each_day)
```

```
##   Sunday   Monday  Tuesday Wednesda Thursday   Friday Saturday
##       18       27       24       28       25       22       19
```

#We got the optimal solution.