

QMM-6-Integer Programming

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```
library("lpSolve")
library("lpSolveAPI")

AP = read.lp("C:\\Users\\rajiv\\OneDrive\\Desktop\\AP_HUB_QMM6.lp")

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

colnames(DAY_AND_WORKERS) = c("Days_Of_The_Week", "Workers_Required")

as.table(DAY_AND_WORKERS)

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

Shift_DaysOff_Wage <- 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)

colnames(Shift_DaysOff_Wage) <- c("Shift", "Days_Off", "Wage")

as.table(Shift_DaysOff_Wage)

##   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

solve(AP)
```

```
## [1] 0
get.objective(AP)
## [1] 25675
get.variables(AP)
## [1] 2 4 5 0 8 1 13
```

From the above we can derive the following

$x_1=2$ which indicates that for shift1, 2 workers are assigned, like wise for shift 2 , shift 3, shift 4, shift 5, shift 6, shift 7 we can say that 4, 5, 0, 8, 1, 13 (where $x_2 = 4$, $x_3 = 5$, $x_4 = 0$, $x_5 = 8$, $x_6 = 1$, $x_7 = 13$) respectively have been assigned for all the shifts.

By using the variables from the lp model

```
Table =
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)

colnames(Table) = c("Shift1", "Shift2", "Shift3", "Shift4", "Shift5",
"Shift6", "Shift7")

row.names(Table) = c('Sunday', 'Monday',
'Tuesday', 'Wednesday', 'Thursday', 'Friday', 'Saturday')
```

Table

##	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
## Wednesday	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

The below table shows employees available each day based on the shift arrangement that reduces the overall wage cost.

```
rowSums(Table)
```

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