

MSMS 206 : Practical 02

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Question : Solve the following linear programming problem.

$$\begin{aligned} \text{Minimize } z &= 2x_1 + x_2 + 4x_3 \\ \text{subject to } & -2x_1 + 4x_2 \leq 4, \\ & x_1 + 2x_2 + x_3 \geq 5, \\ & 2x_1 + 3x_3 \leq -2, \\ & x_1, x_2, x_3 \geq 0. \end{aligned}$$

```
library(lpSolve)
```

```
coeff <- c(2, 1, 4)

constraint_mat <- matrix(data = c(-2, 4, 0,
                                   1, 2, 1,
                                   2, 0, 1),
                         nrow = 3, ncol = 3, byrow = TRUE)

constraint_direction <- c("<=", ">=", "<=")

constraint_RHS <- c(4, 5, -2)
```

```
sol <- lp(direction = "min",
          objective.in = coeff,
          const.mat = constraint_mat,
          const.dir = constraint_direction,
          const.rhs = constraint_RHS)
```

```
sol

## Error: no feasible solution found
```

```
sol$status

## [1] 2
```



Solution status = 2 implies there is no feasible solution.



Question : Solve the following linear programming problem.

$$\begin{aligned}
 &\text{Maximize } z = 3x_1 + 5x_2 + 4x_3 \\
 &\text{subject to } \begin{aligned}
 &2x_1 + 3x_2 \leq 8, \\
 &2x_2 + 5x_3 \leq 10, \\
 &3x_1 + 2x_2 + 4x_3 \leq 15, \\
 &x_1, x_2, x_3 \geq 0.
 \end{aligned}
 \end{aligned}$$

```

coeff <- c(3, 5, 4)

constraint_mat <- matrix(data = c(2, 3, 0,
                                0, 2, 5,
                                3, 2, 4),
                        nrow = 3, ncol = 3, byrow = TRUE)

constraint_direction <- c("<=", "<=", "<=")

constraint_RHS <- c(8, 10, 15)

```

```

sol <- lp(direction = "max",
  objective.in = coeff,
  const.mat = constraint_mat,
  const.dir = constraint_direction,
  const.rhs = constraint_RHS)

```

```

sol

## Success: the objective function is 18.65854

```

```

sol$status

## [1] 0

```



The optimal value of the objective function is

```

sol$objval

## [1] 18.65854

```



The optimal solution of the linear programming problem is

```

sol$solution

## [1] 2.170732 1.219512 1.512195

```