PROBLEM

In the University of Ruhuna, Science faculty. Consist with six departments. Those departments are Physics department, Chemistry department, Mathematics department, Botany department and Zoology department and Computer Science department. There is a cleaning sector of the University, and fourteen cleaners are allowed to the science faculty.

We were able to calculate the following details about the departments.

- Department of Mathematics have five lecture halls, one washroom, the computer labs and eighteen lecturer's rooms. We calculate total 16 hours and 30 minutes are allowed for a single cleaner.

- Department of Chemistry have three lecture halls, one washroom, seven chemical labs, and nineteen Lecturer's rooms. We calculate total 14 hours and 15 minutes are allowed for a Single cleaner.

- Department of botany have one lecture hall, one washroom, 4 botany labs, 13 lecturer's rooms and we calculate total 10 hours and 45 minutes are allowed for a single cleaner.

- Department of Computer Science have 5 lecture halls, one washroom, 2 computer labs, 21 lecturer's rooms. We calculate total 13 hours and 30 minutes are allowed for a single cleaner.

- Department of Physics have 3 lecture halls, one washroom, 5 physics labs and 16 lecturer's rooms. We calculate total 12 hours and 30 minutes are allowed for a single cleaner.

- Department of Zoology have one lecture hall, one washroom, 3 labs and 14 lecturer's room, we calculate total 10 hours and 15 minutes an allowed for a single cleaner

Maximum 8 hours for one worker. Working hours split to 7:00 a.m. to 12.00 p.m. & 1.00 pm. To 4.00 p.m. Entire workload of each department should be covered at the end of the day.

Following table shows the summarization of daily workout of a single cleaner.

Department	Hours					
	Lecture hall	**Washrooms**	**Labs**	**Lecture rooms**	**Gardening**	**Total hours**
Mathematics	5h 15min	45 min	1h	5h	4h	16h
Botany	1h	45 min	3h	4h	3h	10h 45min
Chemistry	3h	45 min	3h 30 min	5h 30min	1h 30min	14h 15min
Computer Science	4h	45 min	1h 30min	6h	1h	13h 30min
Physics	3h	45 min	3h	4h 30min	1h 30min	12h 45min
Zoology	1h	45 min	2h	4h	2h 30min	10h 15min

Structure of Linear Programming Model

Here we are planning to minimize the number of cleaners is assigned to each department.

Modeling the equation.

d i = Department

$i = 1 \longrightarrow$ Department of Mathematics

$i = 2 \longrightarrow$ Department of Botany

$i = 3 \longrightarrow$ Department of Chemistry

$i = 4 \longrightarrow$ Department of Computer Science

$i = 5 \longrightarrow$ Department of Physics

$i = 6 \longrightarrow$ Department of Zoology

W j = Number of cleaners

$j = 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14$

Objective function

$$\mathbb{Z} = \sum_{w=1}^{14} \sum_{d=1}^{6} x_{wd}$$

X (w, d) = { 1; cleaner assigned to a department to a department
2; otherwise

Y (w, d) = Number of hours for cleaning; $0 \leq y\ (w, d) \leq 8$

Constraints

01. One department should have at least one cleaner.

$$\sum_{d \epsilon D} x(w, d) \geq 1 \quad ; \quad \forall w \in W$$

02. One cleaner should be assigned at least the department.

$$\sum_{w \in W} x(w, d) \geq 2 \quad ; \quad \forall d \in D$$

03. If any single cleaner assigned for each department, one cleaner can work maximum 8 hours.

$$y\ (w\varepsilon, dj) \leq 8\ x_{(w,d)} \qquad i = 1,2,3, \dots ,14$$

$$j = 1,2, \dots ,14$$

04. One cleaner can work maximum 8 hours.

$$\sum_{d=1}^{6} y(i, d) \leq 8 \qquad i = 1,2,3, \dots .14$$

05. The following Constraint shows about how many human hours should be covered in that department.

$$\sum_{w=1}^{14} y(w, j) \geq \propto$$

$\propto$ = Total hours assigned for a cleaner for clean a department.

$Y_{1,1} + Y_{2,1} + Y_{3,1} + Y_{4,1} + Y_{5,1} + Y_{6,1} + Y_{7,1} + Y_{8,1} + y_{9,1} + Y_{10,1} + Y_{11,1} + Y_{12,1} + Y_{13,1} + Y_{14,1} \geq 16.5$

$Y_{1,2} + Y_{2,2} + Y_{3,2} + Y_{4,2} + Y_{5,2} + Y_{6,2} + Y_{7,2} + Y_{8,2} + Y_{9,2} + Y_{10,2} + Y_{11,2} + Y_{12,2} + Y_{13,2} + Y_{14,2} \geq 10.75$

$Y_{1,3} + Y_{2,3} + Y_{3,3} + Y_{4,3} + Y_{5,3} + Y_{6,3} + Y_{7,3} + Y_{8,3} + Y_{9,3} + Y_{10,3} + Y_{11,3} + Y_{12,3} + Y_{13,3} + Y_{14,3} \geq 14.25$

$Y_{1,4} + Y_{2,4} + Y_{3,4} + Y_{4,4} + Y_{5,4} + Y_{6,4} + Y_{7,4} + Y_{8,4} + Y_{9,4} + Y_{10,4} + Y_{11,4} + Y_{12,4} + Y_{13,4} + Y_{14,4} \geq 13.50$

$Y_{1,5} + Y_{2,5} + Y_{3,5} + Y_{4,5} + Y_{5,5} + Y_{6,5} + Y_{7,5} + Y_{8,5} + Y_{9,5} + Y_{10,5} + Y_{11,5} + Y_{12,5} + Y_{13,5} + Y_{14,5} \geq 12.75$

$Y_{1,6} + Y_{2,6} + Y_{3,6} + Y_{4,6} + Y_{5,6} + Y_{6,6} + Y_{7,6} + Y_{8,6} + Y_{9,6} + Y_{10,6} + Y_{11,6} + Y_{12,6} + Y_{13,6} + Y_{14,6} \geq 10.25$