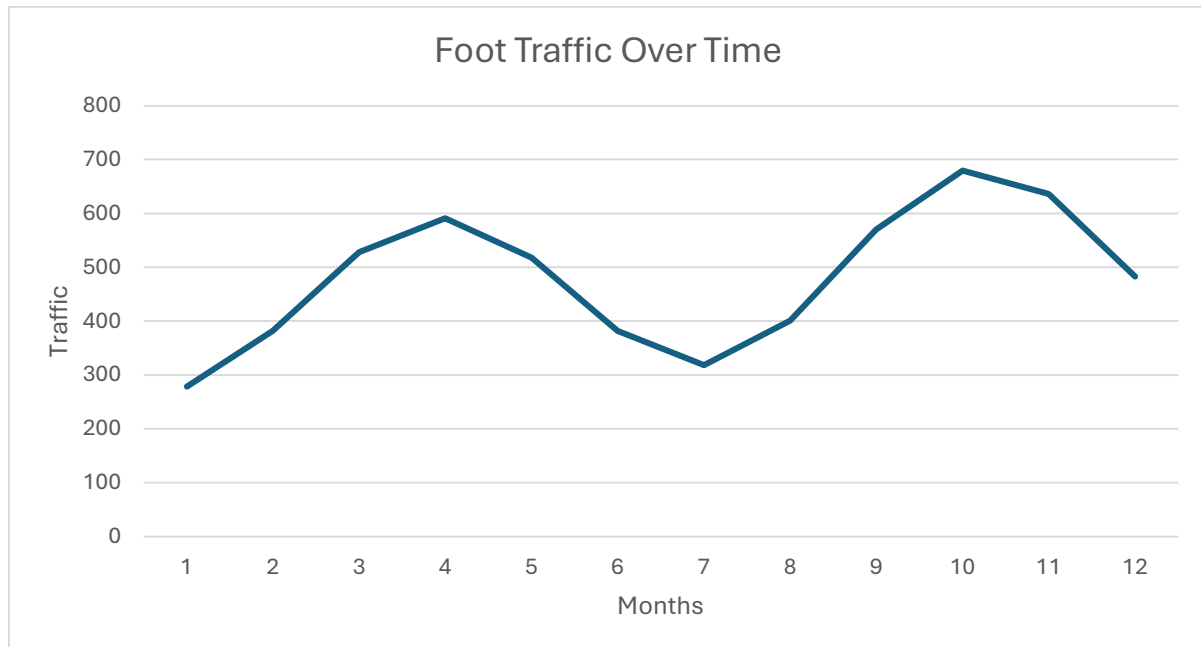


Module 08 – Scheduling Problem

Exploratory Data Analysis

Agency	Beginning Month	Service Duration	Monthly Salary
The Jellybean Treasury	10	2	9588
PopRocks & PixieDust	5	3	9797
Chewtopia	8	2	11103
The Fudge Fable	1	3	10350
Sweetie Spell	11	2	7974
Gumdrop Grotto	4	2	7734



Mean Salary

\$ 7,719.00

Model Formulation

Write the formulation of the model into here prior to implementing it in your Excel model. Be explicit with the definition of the decision variables, objective function, and constraints.

$$\text{MIN: } 19176X_1 + 29391X_2 + 22206X_3 + 31050X_4 + 15948X_5 + 15468X_6 + 92627.96X_7$$

$$\begin{aligned} 0X_1 + 0X_2 + 0X_3 + 1X_4 + 0X_5 + 0X_6 + 1X_7 &\geq 279 \text{ } \{ \text{January} \\ 0X_1 + 0X_2 + 0X_3 + 1X_4 + 0X_5 + 0X_6 + 1X_7 &\geq 382 \text{ } \{ \text{February} \\ 0X_1 + 0X_2 + 0X_3 + 1X_4 + 0X_5 + 0X_6 + 1X_7 &\geq 528 \text{ } \{ \text{March} \\ 0X_1 + 0X_2 + 0X_3 + 0X_4 + 0X_5 + 1X_6 + 1X_7 &\geq 591 \text{ } \{ \text{April} \\ 0X_1 + 1X_2 + 0X_3 + 0X_4 + 0X_5 + 1X_6 + 1X_7 &\geq 518 \text{ } \{ \text{May} \\ 0X_1 + 1X_2 + 0X_3 + 0X_4 + 0X_5 + 0X_6 + 1X_7 &\geq 382 \text{ } \{ \text{June} \\ 0X_1 + 1X_2 + 0X_3 + 0X_4 + 0X_5 + 0X_6 + 1X_7 &\geq 382 \text{ } \{ \text{July} \\ 0X_1 + 0X_2 + 1X_3 + 0X_4 + 0X_5 + 0X_6 + 1X_7 &\geq 401 \text{ } \{ \text{August} \\ 0X_1 + 0X_2 + 1X_3 + 0X_4 + 0X_5 + 0X_6 + 1X_7 &\geq 570 \text{ } \{ \text{September} \\ 1X_1 + 0X_2 + 0X_3 + 0X_4 + 0X_5 + 0X_6 + 1X_7 &\geq 680 \text{ } \{ \text{October} \\ 1X_1 + 0X_2 + 0X_3 + 0X_4 + 1X_5 + 0X_6 + 1X_7 &\geq 636 \text{ } \{ \text{November} \\ 0X_1 + 0X_2 + 0X_3 + 0X_4 + 1X_5 + 0X_6 + 1X_7 &\geq 483 \text{ } \{ \text{December} \end{aligned}$$

$X_i \geq 0$, integer for all i

Model Optimized for Min Costs to Cover Store Foot Traffic

Agency	Days On = 1, Days Off = 0												Workers Scheduled	Wages per Worker
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
The Jellybean Treasury	0	0	0	0	0	0	0	0	0	1	1	0	197	\$ 19,176.00
PopRocks & PixieDust	0	0	0	0	1	1	1	0	0	0	0	0	0	\$ 29,391.00
Chewtopia	0	0	0	0	0	0	0	1	1	0	0	0	87	\$ 22,206.00
The Fudge Fable	1	1	1	0	0	0	0	0	0	0	0	0	45	\$ 31,050.00
Sweetie Spell	0	0	0	0	0	0	0	0	0	0	1	1	0	\$ 15,948.00
Gumdrop Grotto	0	0	0	1	1	0	0	0	0	0	0	0	108	\$ 15,468.00
Full-Time Employees	1	1	1	1	1	1	1	1	1	1	1	1	483	\$ 92,627.96
Available	528	528	528	591	591	483	483	570	570	680	680	483		
Required	279	382	528	591	518	382	318	401	570	680	636	483	Total ->	\$ 53,516,694

This model recommends an optimal solution of the lowest possible cost for worker scheduling.

Model with Stipulation

Please copy the tab of your original model before continuing with the next part to avoid messing up your original solution.

Please do both of the following:

- 80% limit on full-time employees

Agency	Days On = 1, Days Off = 0												Workers Scheduled	Wages per Worker
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
The Jellybean Treasury	0	0	0	0	0	0	0	0	0	1	1	0	294	\$ 19,176.00
PopRocks & PixieDust	0	0	0	0	1	1	1	0	0	0	0	0	0	\$ 29,391.00
Chewtopia	0	0	0	0	0	0	0	1	1	0	0	0	184	\$ 22,206.00
The Fudge Fable	1	1	1	0	0	0	0	0	0	0	0	0	142	\$ 31,050.00
Sweetie Spell	0	0	0	0	0	0	0	0	0	0	1	1	97	\$ 15,948.00
Gumdrop Grotto	0	0	0	1	1	0	0	0	0	0	0	0	205	\$ 15,468.00
Full-Time Employees	1	1	1	1	1	1	1	1	1	1	1	1	386	\$ 92,627.96
Available	528	528	528	591	591	386	386	570	570	680	777	483		
Required	279	382	528	591	518	382	318	401	570	680	636	483	Total ->	\$ 54,605,038

With an 80% limitation implemented on full-time employees, the total cost increased from \$53,516,694 up to \$54,605,038. With this, a re-distribution of worker agencies scheduled occurred to compensate for this limit put into place.

	Full-Time Salary Per Month	October Usage
2.	\$ 7,719.00	\$ 6,691.79

3. *I would recommend that management implement seasonal hiring in peak months to offset the cost that is associated with annual employees. By utilizing these lower-cost alternatives, management can operate more efficiently.*