Module 08 – Scheduling Problem

Exploratory Data Analysis

In this section, you should perform some data analysis on the data provided to you. Please format your findings in a visually pleasing way and please be sure to include these cuts:

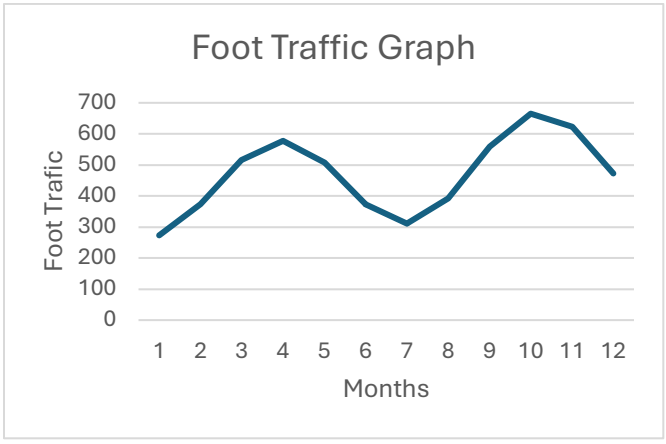
Months	Workers Required
1	273
2	374
3	516
4	578
5	507
6	373
7	311
8	393
9	558
10	665
11	622
12	472

Temp Agency	Months Off	Wage
The Chewy Charm	10	8080
Marzipan Manor	10	7777
Gumdrop Grotto	7	9297
Sweetie Spell	10	6702
Whimsy Whoppers	10	7209
Candycap Cove	9	8344

Run summary statistics on the sample of Full-Time employee salaries. Record the Mean to use in our model (avg has been rounded up)

Average
6354.00

- *Make a line graph showing foot traffic over the next 12 months. Call out any seasonality or trend you may see.*



Some seasonal trends that I noticed from this Foot Traffic Graph is the two peaks in month 4 and month 10, as well as two dips in month 7 and month 12. So it's looking like at the beginning of the year theirs a rise in the foot traffic, a mid-year drop, a second rise later in the year and another drop towards the end of the year.

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.

Min: $8{,}080X_1 + 7{,}777X_2 + 9{,}297X_3 + 6{,}702X_4 + 7{,}209X_5 + 8{,}344X_6$

- **$0X_1 + 0X_2 + 0X_3 + 0X_4 + 0X_5 + 1X_6 >= 273$ } month 1**
- **$0X_1 + 0X_2 + 0X_3 + 0X_4 + 0X_5 + 1X_6 >= 374$ } month 2**
- **$0X_1 + 1X_2 + 0X_3 + 0X_4 + 0X_5 + 0X_6 >= 516$ } month 3**
- **$0X_1 + 1X_2 + 0X_3 + 0X_4 + 0X_5 + 0X_6 >= 578$ } month 4**
- **$0X_1 + 0X_2 + 1X_3 + 0X_4 + 0X_5 + 0X_6 >= 507$ } month 5**
- **$0X_1 + 0X_2 + 1X_3 + 0X_4 + 0X_5 + 0X_6 >= 373$ } month 6**
- **$0X_1 + 0X_2 + 1X_3 + 0X_4 + 0X_5 + 0X_6 >= 311$ } month 7**
- **$1X_1 + 0X_2 + 0X_3 + 0X_4 + 0X_5 + 0X_6 >= 393$ } month 8**
- **$1X_1 + 0X_2 + 0X_3 + 0X_4 + 0X_5 + 0X_6 >= 558$ } month 9**
- **$0X_1 + 0X_2 + 0X_3 + 1X_4 + 0X_5 + 0X_6 >= 665$ } month 10**
- **$0X_1 + 0X_2 + 0X_3 + 1X_4 + 0X_5 + 0X_6 >= 622$ } month 11**
- **$0X_1 + 0X_2 + 0X_3 + 0X_4 + 0X_5 + 1X_6 >= 472$ } month 12**

$X_1, X_2, X_3, X_4, X_5, X_6 >= 0$

$X_1, X_2, X_3, X_4, X_5, X_6$ = Integers

Model Optimized for Min Costs to Cover Store Foot Traffic

Implement your formulation into Excel and be sure to make it neat. This section should include:

	Months												Workers	Wages per
Temp Agency	1	2	3	4	5	6	7	8	9	10	11	12	Scheduled	Worker
The Chewy Charm	0	0	0	0	0	0	0	1	1	0	0	0	0	$ 8,080
Marzipan Manor	0	0	1	1	0	0	0	0	0	0	0	0	578	$ 7,777
Gumdrop Grotto	0	0	0	0	1	1	1	0	0	0	0	0	507	$ 9,297
Sweetie Spell	0	0	0	0	0	0	0	0	0	1	1	0	665	$ 6,702
Whimsy Whoppers	0	0	0	0	0	0	0	1	1	0	0	0	558	$ 7,209
Candycap Cove	1	1	0	0	0	0	0	0	0	0	0	1	472	$ 8,344
Available	472	472	578	578	507	507	507	558	558	665	665	472		
Required	273	374	516	578	507	373	311	393	558	665	622	472	Total -->	$21,626,505

- *My model is recommending the best way to minimize cost while ensuring that the required "foot-traffic" or "workers working" are met. It chooses the temp agencies based on availability and wages, ensuring that staffing levels align with the requirements without adding unnecessary excess of labor. By doing this the model is showing us the best way to maintain efficiency with a total wage cost of $21,626,505.*

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:

1. *Unfortunately, leadership wishes to have a reduction in workforce. While the monthly salary for full time employees is cheaper than temporary workers, there are other costs associated with full time employees that they wish to cut. Add a constraint to your model that takes your first model's recommended number of full-time employees and constrains it to be only 80% of it. Add a text explanation of the change in the optimal value as well as any other changes noticed between the models.*

2. *Alternatively, leadership would like to see what the average monthly salary for an employee would need to be to cut out all temporary workers as they believe that will help negate excess spending. Convert your model (or do the math out yourself) to figure out what monthly salary you would need to pay your full-time employees to only have full-time workers at the same optimal cost as the original model.*

3. *Considering trends and seasonality of this business, what would you recommend leadership to do? Feel free to play with the model and recommend something else.*