Valeria Santoni

Module 08 – Scheduling Problem

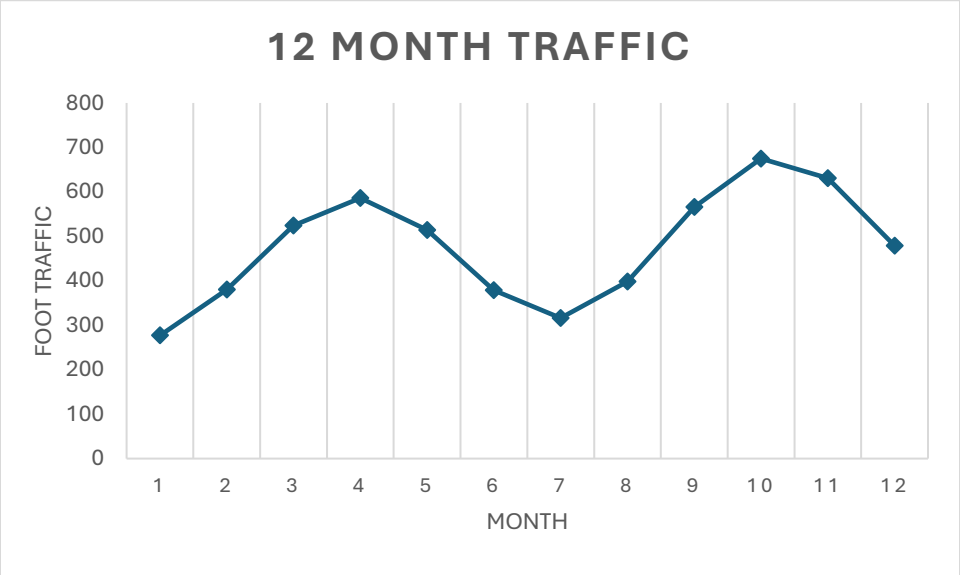
Exploratory Data Analysis

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:

- *Make a table (similar to the textbook example) showing the temporary agency data*
- *Run summary statistics on the sample of Full-Time employee salaries. Record the Mean to use in our model*
- *Make a line graph showing foot traffic over the next 12 months. Call out any seasonality or trend you may see.*

Full Time	Monthly Salary	Yearly
Mean	$ 5,656	$ 67,872
Max	$ 7,912	$ 94,940
Min	$ 3,643	$ 43,714

Agency	Months on	Wage
Licorice Lagoon	8-10	$ 7,290
Bite-Sized Dreams	1-3	$ 6,128
PopRocks & PixieDust	4-7	$ 6,489
The Gummy Gazette	11-1	$ 7,566
Snickerdoodle Street	5-7	$ 7,070
Full-Time	1-12	$ 5,656



Model Formulation

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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: $21{,}870X_1+18{,}384X_2+19{,}467X_3+22{,}698X_4+21{,}210X_5+67{,}872X_6$

Workers required each day:

$0x_1+1x_2+0x_3+1x_4+0x_5+1x_6>=277$} January
$0x_1+1x_2+0x_3+0x_4+0x_5+1x_6>=380$} February
$0x_1+1x_2+0x_3+0x_4+0x_5+1x_6>=524$} March
$0x_1+0x_2+1x_3+0x_4+0x_5+1x_6>=486$} April
$0x_1+0x_2+1x_3+0x_4+1x_5+1x_6>=516$} May
$0x_1+0x_2+1x_3+0x_4+1x_5+1x_6>=379$} June
$0x_1+0x_2+0x_3+0x_4+1x_5+1x_6>=316$} July
$1x_1+0x_2+0x_3+0x_4+0x_5+1x_6>=398$} August
$1x_1+0x_2+0x_3+0x_4+0x_5+1x_6>=566$} September
$1x_1+0x_2+0x_3+0x_4+0x_5+1x_6>=675$} October
$0x_1+0x_2+0x_3+1x_4+0x_5+1x_6>=631$} November
$0x_1+0x_2+0x_3+1x_4+0x_5+1x_6>=479$} December

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:

- *A screenshot of your optimized final model (formatted nicely, of course)*
- *A text explanation of what your model is recommending*

	Days On=1, Days Off=0												Workers Schedule	Wages per Worker
Shift	January	February	March	April	May	June	July	August	September	October	November	December		
Licorice Lagoon	0	0	0	0	0	0	0	1	1	1	0	0	161	$ 21,870
Bite-Sized Dreams	1	1	1	0	0	0	0	0	0	0	0	0	10	$ 18,384
PopRocks & PixieDust	0	0	0	1	1	1	0	0	0	0	0	0	0	$ 19,467
The Gummy Gazette	1	0	0	0	0	0	0	0	0	0	1	1	117	$ 22,698
Snickerdoodle Street	0	0	0	0	1	1	1	0	0	0	0	0	0	$ 21,210
Full-time employees	1	1	1	1	1	1	1	1	1	1	1	1	514	$ 67,872
Available	641	524	524	514	514	514	514	675	675	675	631	631		
Required	277	380	524	486	514	379	316	398	566	675	631	479	Total->	$41,246,784

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.*

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	Days On=1, Days Off=0														
Shift	January	February	March	April	May	June	July	August	Septembe	October	Novembe	December	Workers Schedule	Wages per Worker	
Licorice Lagoon	0	0	0	0	0	0	0	1	1	1	0	0	264	$ 21,870	
Bite-Sized Dreams	1	1	1	0	0	0	0	0	0	0	0	0	113	$ 18,384	
PopRocks & PixieDust	0	0	0	1	1	1	0	0	0	0	0	0	103	$ 19,467	
The Gummy Gazette	1	0	0	0	0	0	0	0	0	0	1	1	220	$ 22,698	
Snickerdoodle Street	0	0	0	0	1	1	1	0	0	0	0	0	0	$ 21,210	
Full-time employees	1	1	1	1	1	1	1	1	1	1	1	1	411	$ 67,872	411
Available	744	524	524	514	514	514	411	675	675	675	631	631			
Required	277	380	524	486	514	379	316	398	566	675	631	479	Total->	$42,745,125	

2. ***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.*** I would recommend leadership to analyze patterns from the monthly data (such as fluctuations in available and required workers) and adjust staffing strategies accordingly. I would also identify months where the required workers significantly exceed the available workers (e.g., high demand during busy months). For instance, months like March, April, May, and November often coincide with higher demand due to holidays or summer activities. Low Seasons: Months like January and February could be off-peak, requiring fewer workers.