Scheduling Problem

Exploratory Data Analysis

*Agency data*

A table with text and numbers

AI-generated content may be incorrect.

|  |  |  |
| --- | --- | --- |
| Agency | Months off | Monthly Salary |
| The Peppermint Post | Dec-Aug | $ 9,997.00 |
| The Fudge Fable | Nov-Jul | $ 12,937.00 |
| Mallow & Mischief | Apr-Jan | $ 12,624.00 |
| The Chocolate Chortle | Aug-Apr | $ 12,794.00 |
| Whisker Licks | Mar-Nov | $ 13,342.00 |

|  |  |
| --- | --- |
| Parameter | Monthly Salary |
| Mean | $12338.80 |
| Max | $13342 |
| Min | $9997 |

Seasonality of Foot Traffic

Model Formulation

1. *Decision Variables  
   Decision variables are the variables in an optimization model whose values are to be determined in order to achieve the best outcome according to the objective function. These variables represent the decisions to be made within the constraints of the problem.*

*In this model “Workers Schedule” of Full time and Temporary, = $O$5:$O$10 are Decision Variables*

1. *Objective Function  
   The objective function is a mathematical expression that defines the goal of the optimization model. It is formulated in terms of the decision variables and is either maximized or minimized, depending on the nature of the problem.*

*Objective Function, Total =SUMPRODUCT(O5:O10,P5:P10)*

1. *Constraints  
   Constraints are mathematical expressions that represent the limitations or requirements of the optimization problem. They define the feasible region by restricting the values that the decision variables can take.*

*In the model the following Constraints are given:*

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1. *The Available should be equal or greater than Required*
2. *The Decision variables should be integers*
3. *The decision variables should be greater than or equal 0.*

Model Optimized for Min Costs to Cover Store Foot Traffic

* *A screenshot of the optimized final model :*
* *Explanation of the model and recommendation:*

*A table with numbers and a number on it

Description automatically generated*

*Foot traffic was cleared by the workers, but to minimize cost, the strategic model considered the average salary of the full-time workers and temporary ones to minimize the overall cost in an objective function, which was made through Excel Solver.*

*The Model is recommending hiring only one temporary agency. The Peppermint Post of 70 workers, and the Full-time workers 461. This will minimize the cost to*  $ 52,412,908.27 .

Model with Stipulations

1. *If the salary of the Full-time workers is reduced to 80%, then an amount of*  $ 10,062,707.65 *will be saved. Bringing the total minimum cost to*  $ 42,350,200.62 from $ 52,412,908.27.
2. *If all the temporary workers are cut off to do the same work with the Full-time worker maintaining the same cost then the average salary for the Full-time workers would need be raised from $* 9095.00 to $ 13,648.95 a total increase of $ 4,553.95.
3. *There are some seasonality trends in the foot traffic; it is the lowest in January, February, July, and August. The authority can do this with minimal foot traffic with Full-time workers, and in the remaining months, the authority can work with both full-time and temporary workers to reduce the workload on the Full-time workers.*