D605 Task 1
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A:IDENTIFICATION OF BUSINESS NEED
In Scenario 1, ABC Logsitic's goal is to maximize profit while maintaining customer profit. Because the company is looking to find a maximized value, this is an optimization problem. In the scenario below, I will propose a plan to optimize profit and minimize costs with the constraint of not lowering customer satisfaction.

A1:EXPLANATION OF OPTIMIZATION APPROACH
The business need I have identified is the need to optimize the routes of the delivery trucks. This will save on fuel and will reduce the number of needed drivers and trucks. It will also improve a secondary goal of being environmentally friendly and reduce the carbon footprint of deliveries.

A2:LINEARITY
ABC Logstic's goals are **linear** in nature because the relationships for solving this problem can be expressed by linear equations. For example, the distance between delivery points and the total cost can be modeled by linear equations.

A3:TYPE OF OPTIMIZATION PROBLEM
As mentioned above, optimizing the routes is a linear programming problem and is specifically a **Mixed-Integer Linear Programming (MILP) problem**. There are continuous variables, such as fuel costs, and there are integer variables, such as the truck assignments. It could also be counted as a network optimizing problem because the solution involves optimizing routes similar to a network.

B:IDENTIFY COMPONENTS OF OPTIMIZATION APPROACH
The primary objective of this optimization is to increase profits by increasing efficiency of delivery routes. By minimizing costs of fuel and the number of trucks/drivers needed for delivery, we can best maximize profits by minimizing costs. Secondarily, we can reduce the carbon footprint of deliveries by optimizing the routes of vehicles.

The decision variables are:

- Which delivery assignments are given to which trucks
- The order of stops for a given truck
- The type and capacity of each truck

Two constraints:

1. The capacity of each truck has a maximal value
2. Time windows for when customers are expecting their deliveries

B1:EXPLANATION OF ENDPOINT CONSIDERATIONS
There are three end goals we are looking to either maintain or improve:

1. This optimization should improve the efficiency of the truck fleet
2. This optimization should maintain customer satisfaction
3. This optimization should reduce the carbon footprint (by improving efficiency of the fleet)

C:OPTIMIZATION METHOD RECOMMENDATION

I recommend network optimization for this task as it optimizes the flow of goods and finds the shortest paths for deliveries.

Sources

No sources were used besides WGU official course materials.