Questuion3:

Return to the “Two-Products, Three-Machine” problem from Homework #1. Assume that the sales team has landed more contracts and now the minimum market requirement is 100 for both products. The maximum is still the same. What happens when you run and why? Now (and this is the important part of this question), assume that you want to give this model to the VP of Sales and the VP will want to try out many different market minimums and maximums. Set up the model so that it always runs and provides the VP with valuable information. Note that we are not changing the underlying constraints—so the plant stays the same. But, your model needs to run. Assume that the VP is not all that technically savvy and will not hesitate to call you with urgent tech support calls—and you don’t want to be bugged with urgent tech support calls. (This is a problem about good ***model*** design, but not look & feel—don’t work on a GUI). (I want you to think about this problem)

**Why the model does not work any more?**

In the updated problem, the minimum market requirement for both products has increased to 100 units. And optimization model returns infeasible answer. The underlying cause of this infeasibility can be traced back to Machine 3's constraints, which even at the minimum required production levels of 100 units for both products, the total output from Machine 3 amounts to 350 units (100 units of Product A \* 2 + 100 units of Product B \* 1.5), which exceeds the machine's capacity constraint of 336 units. This excess in the required output results in the model infeasible under the existing setup and constraints. The optimization model hence fails to find a solution that satisfies all constraints, making it impossible to meet the new market demands with the current capacity and operational constraints of the manufacturing setup.

A screenshot of a computer program

Description automatically generated

**Explanation for the optimization algorithm:**

This optimization model designed to assist the VP in analyzing and determining the optimal production schedule for two products across three machines, in alignment with market demand constraints. By inputting the minimum and maximum market constraints for each product, the model is executed to find the optimal production levels that maximize profitability while adhering to the machine capacity constraints.

In the event the specified market constraints lead to an infeasible scenario—where the production requirements cannot be met within the existing machine capacity—the algorithm is engineered to report back with precise details on which machine constraint is violated and at what output level. The code is structured that can be easily convert to a dashboard in the future.