Upload one jupyter notebook that includes your pyomo code and states solutions for each of the following problems. Please use compact formulation for both problems.

**PROBLEM 1a – 40 points**

A farmer in Egypt owns 50 acres of land. He is going to plant each acre with cotton or corn. Each acre planted with cotton yields $400 profit; each with corn yields $200 profit. The labor and fertilizer used for each acre are given in the table below.

| Resource | Cotton | Corn |
|---|---|---|
| Labor (number of workers) | 5 | 3 |
| Fertilizer (tons) | 6 | 2 |

Resources available include 150 workers and 200 tons of fertilizer. Formulate this problem to decide how much should the farmer plant of each to maximize his profit, knowing he can only plant one plant per acre, he can't plant partial acres. Use concrete model with "initialize" option.

**PROBLEM 1b – 40 points**

Now assume there are 8 different type of products the farmer can plant (data is in hw2_p1b_data.csv), but he still has the same available land, workers, and fertilizer. What is the optimum solution now? How much will his total profit improve with these extra options? Use abstract model, loading provided data and instantiating the model with this data.

**PROBLEM 2 – 40 points**

Sinclair Pharmaceuticals operates two chemical plants which produce antibiotics; the Ohio Valley plant, which produces 5000 boxes per month, and the Lakeview plant, which can produce 7000 boxes per month. Sinclair sells its meds to three different stores: Grand Rapids (demand = 3000 boxes per month), Blue Ridge (demand = 5000 boxes per month), and Sunset (demand = 4000 boxes per month). The costs of shipping between the respective plants and stores is shown in the table below:

| Plant/Store | Grand Rapids | Blue Ridge | Sunset |
|---|---|---|---|
| Ohio Valley | 50 | 40 | 100 |
| Lakeview | 75 | 50 | 75 |

Formulate this problem to decide what is the optimal shipping plan, knowing that only full boxes can be sent (no partially loaded boxes). Use concrete model with "initialize" option for sets and parameters.

**PROBLEM 2b – 40 points**

Now use the provided data (hw2_p2b_xx.csv) to scale the problem to 12 plants and 57 stores. What is the minimum cost to satisfy all 57 stores' demand? Use abstract model, loading provided data and instantiating the model with this data.