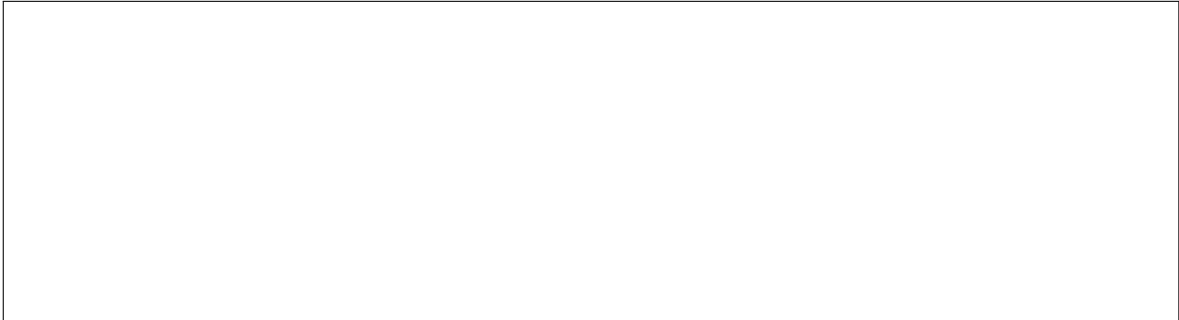


- Suppose

$$c_{i,j} = \text{cost of producing one type } i \text{ hat at factory } j \quad \text{for } i \in H \text{ and } j \in F$$

- If we produce $x_{i,j}$ hats of type i at factory j (for $i \in H$ and $j \in F$), then the total cost is



Problem 3. Let $M = \{1, 2, 3\}$ and $N = \{1, 2, 3, 4\}$. Write the following as compactly as possible using summation notation and “for” statements.

$$\textcircled{*} \left[\begin{array}{l} \text{Let } y_1 = \text{amount of product 1 produced} \\ y_2 = \text{amount of product 2 produced} \\ y_3 = \text{amount of product 3 produced} \\ y_4 = \text{amount of product 4 produced} \end{array} \right] \quad \left. \begin{array}{l} \text{Let } y_i = \text{amount of product } i \\ \text{produced for } i \in N \end{array} \right\}$$

$$\textcircled{**} \left[\begin{array}{l} a_{1,1}y_1 + a_{1,2}y_2 + a_{1,3}y_3 + a_{1,4}y_4 = b_1 \\ a_{2,1}y_1 + a_{2,2}y_2 + a_{2,3}y_3 + a_{2,4}y_4 = b_2 \\ a_{3,1}y_1 + a_{3,2}y_2 + a_{3,3}y_3 + a_{3,4}y_4 = b_3 \end{array} \right] \quad \left. \begin{array}{l} \sum_{j \in N} a_{i,j} y_j = b_i \\ \text{for } i \in M \end{array} \right\}$$

Explanation:

We can rewrite $\textcircled{*}$ using a for statement:

$$\boxed{\text{Let } y_i = \text{amount of product } i \text{ produced for } i \in N}$$

To rewrite $\textcircled{**}$, first, we can rewrite the 3 equations in 1 line using a for statement:

$$a_{i,1}y_1 + a_{i,2}y_2 + a_{i,3}y_3 + a_{i,4}y_4 = b_i \quad \text{for } i \in M$$

Then, we can rewrite the left-hand sides of these equations using a \sum :

$$\boxed{\sum_{j \in N} a_{i,j} y_j = b_i \quad \text{for } i \in M}$$