- Suppose

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

- 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.

(*)
$$\left[\begin{aligned} \text{Let } y_1 &= \text{amount of product 1 produced} \\ y_2 &= \text{amount of product 2 produced} \\ y_3 &= \text{amount of product 3 produced} \\ y_4 &= \text{amount of product 4 produced} \end{aligned}\right\}$$

Let y_i = amount of product i produced for $i \in N$

(**)
$$\left[\begin{aligned} a_{1,1}y_1 + a_{1,2}y_2 + a_{1,3}y_3 + a_{1,4}y_4 &= b_1 \\ a_{2,1}y_1 + a_{2,2}y_2 + a_{2,3}y_3 + a_{2,4}y_4 &= b_2 \\ a_{3,1}y_1 + a_{3,2}y_2 + a_{3,3}y_3 + a_{3,4}y_4 &= b_3 \end{aligned}\right\}$$

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

<u>Explanation:</u>

We can rewrite (*) using a for statement:

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

To rewrite (**), first, we can rewrite the 3 equations in 1 line using a for statement:

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

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

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