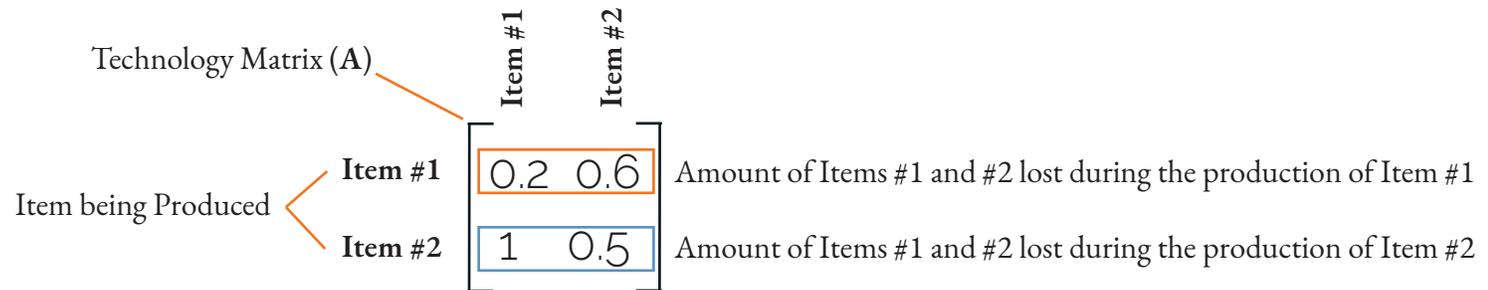


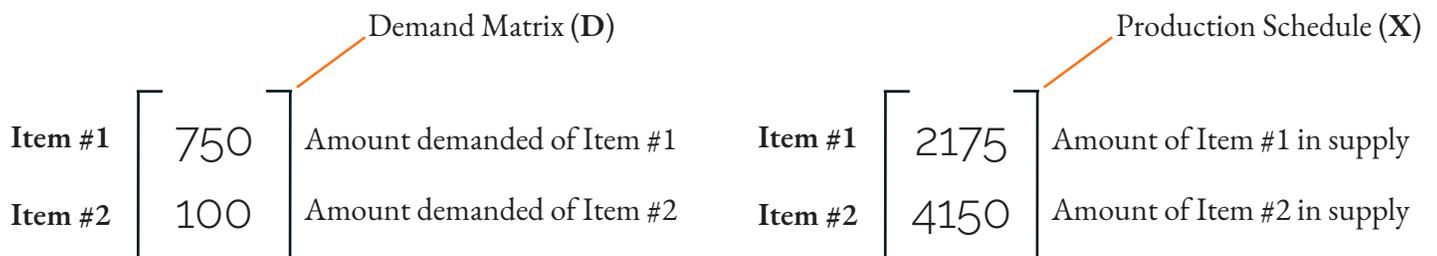
Linear Economic Model Equations: Cheat Sheet

How it Works

Assume you own a company that makes two products. However, during the production of these items, you lose some of the product in the process. For instance, while making 1 unit of Item #1, you lose 0.2 units of Item #1 and 0.6 units of Item #2. While making 1 unit of Item #2, you lose 1 unit of Item #1 and 0.5 units of Item #2. This information allows you to form a technology matrix (**A**), which shows the amounts of Items #1 and #2 lost during the production of those items.



The demand matrix (**D**) shows the number of units demanded by the consumer. It consists of only one column and each row corresponds to each item. The number in Row 1 refers to Item #1, Row 2 to Item #2, and so on. The production schedule (**X**) shows the number of units of each item you have to start with. It also consists of only one column and works exactly like the demand matrix.



Formulas

If you multiply **A** (how much of each item you lose during the production of 1 unit) by **X** (how much of each item you're using), you'll have the total amount of each item *lost* during production. To figure out how much you actually made, subtract the total amount lost (**AX**) from the amount you started with (**X**). What results is the demand (**D**). This gives you the equation **X - AX = D**.

This process can be expanded to any number of items. If you made 3 items, your technology matrix would be 3 x 3, and the demand and technology matrices would each be 3 x 1.

Because **X** appears twice, use the Identity Matrix (**I**) and the distributive property of multiplication to eliminate one of the **X**'s. Remember that any matrix times **I** equals itself.

To find Demand (**D**)

$$\mathbf{X} - \mathbf{AX} = \mathbf{D}$$

$$(\mathbf{I} - \mathbf{A})\mathbf{X} = \mathbf{D}$$

To find the Production Schedule (**X**)

$$(\mathbf{I} - \mathbf{A})\mathbf{X} = \mathbf{D}$$

$$(\mathbf{I} - \mathbf{A})^{-1}(\mathbf{I} - \mathbf{A})\mathbf{X} = (\mathbf{I} - \mathbf{A})^{-1}\mathbf{D}$$

$$\mathbf{X} = (\mathbf{I} - \mathbf{A})^{-1}\mathbf{D}$$

To isolate **X**, multiply both sides by the inverse of **(I - A)**. This will eliminate **(I - A)** on the left side of the equation because anything multiplied by its inverse equals **I**.

tl;dr MEMORIZE THESE