

## Lesson 8. Production Process Models

**Example 1.** Midville Manufacturing assembles heavy-duty handling carts. Each cart consists three components: wheels, steering yokes, and carrying platforms. These components are first assembled separately. Then each steering yoke is equipped with 4 wheels to form the front-end subassembly. Finally, front-end subassemblies are combined with 1 carrying platform and 8 additional wheels to complete the cart.

Components, subassemblies, and finished carts require the following amounts of assembly time, and can be sold at the following prices:

Index	Item	Assembly time per unit (hrs)	Price per unit (\$)
1	Wheels	0.06	120
2	Steering yokes	0.07	40
3	Carrying platform	0.04	75
4	Front-end subassembly	0.12	400
5	Finished carts	0.32	700

There are 1150 hours of assembly time available.

Write a linear program that determines a production plan for Midville Manufacturing that maximizes its revenue.

**Example 2.** The Simplex Company produces 3 products: A, B, and C. These products can be sold in unlimited quantities at the following unit prices:

Product	A	B	C
Price	10	50	100

The production requirements are as follows. Producing one unit of product A requires 1 hour of labor. Producing one unit of product B requires 2 hours of labor plus 2 units of A. Producing one unit of product C requires 3 hours of labor plus 1 unit of B. In addition, any units of product A used to produce product B cannot be sold, and any units of product B used to produce product C cannot be sold. A total of 40 hours of labor are available. Formulate a linear program to maximize the company's revenues.

**Example 3.** Alvin Fine produces three perfumes from raw material. Thirty thousand ounces of raw material is available. Each ounce of raw material can be transformed into 0.4 ounces of perfume 1, 0.3 ounces of perfume 2, and 0.2 ounces of perfume 3, while 0.1 ounces is lost as waste material. Each ounce of perfume 1 can be further processed into 0.6 ounces of perfume 2, 0.3 ounces of perfume 3, and 0.1 ounces of waste material. Alvin Fine has been contracted to produce at least 4000 ounces of perfume 1, 8000 ounces of perfume 2, and 10000 ounces of perfume 3. Because of its environmental initiatives it wishes to minimize waste material. Formulate a linear program that determines how much perfume to produce while minimizing waste.