Lesson 14. Production Process Models, Revisited

Example 1. Yobro Co. produces three types of high-end organic, bio-diverse, fair-trade, non-harmful-to-animals household cleaners: standard, pine, and lemon. Each gallon of raw soap produces a_s gallons of standard, a_p gallons of pine, and a_ℓ gallons of lemon. Each gallon of standard can be converted directly into b_{sp} gallons of pine at a cost of c_{sp} per gallon. Separately, each gallon of standard can also be converted into $b_{s\ell}$ gallons of lemon at a cost of $c_{s\ell}$ per gallon. Raw soap costs c_r per gallon. Standard, pine, and lemon sell for v_s, v_p, and v_ℓ per gallon, respectively. Suppose that Yobro wants to satisfy demand for d_s gallons of standard, d_p of pine, and d_ℓ gallons of lemon.

 a. Write a linear program that determines the number of gallons of each type of cleaner Yobro should make in order to maximize profit. Make sure to

- define the input parameters,
- define the decision variables, and
- briefly explain the objective function and constraints that you write.

b. YoBro just tweeted that they have created an additional process that converts standard to pine and lemon simultaneously. With this process, each gallon of standard converts to f_{sp} gallons of pine and $f_{s\ell}$ gallons of lemon at a cost of $c_{sp\ell}$ per gallon. How do you change the linear program you just wrote to account for this new process?