# Diya

Diyawants to start work in the coffeeindustry in Kerala. She plans eventually to grow coffee plants on that land and make coffee with them. Diya knows that this is a big undertaking and that it will require more capital than she has at the present.

Therefore, Diya is planning to start small. This is necessitated by both her lack of capital and her inexperience in coffee making on a large scale.To begin, Diya is going to use $15,000 in savings to finance the initial purchase of coffee beans from which she will make her first batch of coffee.She is also thinking about going to the State Bank of India and asking for a loan.She has decided to make the preliminary planning horizon two years and would like to estimate the profit over that period.Her most immediate task is to decide how much of the $15,000 should be allocated to purchasing coffeebeans for the first year and how much to purchasing coffeebeans for the second year. In addition, each year she must decide how much she should allocate to purchasing coffeebeans to make her favorite Arabica Coffee and how much to purchasing coffeebeans to make the more popular Robusta Coffee that seems to have been capturing the attention of a wider market during the last few years in India.

In the first year, each bag of Arabica coffee requires $0.9 worth of coffee beans, and each bag of Robusta coffee uses $0.80 worth of coffee beans. For the second year, the costs of the coffeebeans per bag are $0.85 and $0.95, respectively.

Diya expects that her Arabica Coffee will sell for $9.00 a bag in the first year and for $9.5 in the second year, while her Robusta coffee price remains the same in both years at $7.5 a bag.

Besides the decisions about the amounts of coffeebeans purchased in the two years, Diya must make estimates of the sales levels for the two coffees during the two years. The local coffee-making association has told her that marketing is the key to success in any coffee business; generally, demand is directly proportional to the amount of effort spent on marketing. Thus, since Diya cannot afford to do any market research about sales levels due to her lack of capital, she is pondering how much money she should spend to promote each coffee each year.  
 The coffee-making association has given her a rule of thumb that relates estimated demand to the amount of money spent on advertising. For instance, they estimate that for each dollar spent in the first year promoting the Arabica Coffee, a demand for five bags will be created; and for each dollar spent in the second year, a demand for seven bags will result.

Similarly, for each dollar spent on advertising for the Robusta Coffee in the first year, up to six bags can be sold; and for each dollar spent in the second year, up to ten bags can be sold.

The initial funds for the advertising will come from the $15,000 savings. Assume that the cash earned from coffee sales in the first year is available in the second year.

A personal concern Diya has is that she maintains a proper balance of coffee products so that she will be well positioned to expand her marketing capabilities. Thus, in her mind it is important to ensure that the number of bags of Arabica Coffee sold each year falls in the range between 45% and 70% of the overall number of bags sold.

Question:Diya needs help to decide how many coffee beans to buy, how much money to spend on advertising, and how much profit she can expect to earn over the two-year period. Develop a mathematical model and then solve the model to help her.