

Practice Problem on Modeling.

The Research and Development Division of a company has been developing four possible new product lines. Management must now make a decision as to which of these four products actually will be produced and at what levels.

A substantial cost is associated with beginning the production of any product, as given in the first row of the following table. Management's objective is to find the product mix that maximizes the total profit (total net revenue minus start-up costs).

| | Product | | | |
|------------------|----------|----------|----------|----------|
| | 1 | 2 | 3 | 4 |
| Start-up cost | \$50,000 | \$40,000 | \$70,000 | \$60,000 |
| Marginal revenue | \$70 | \$60 | \$90 | \$80 |

Let decision variables x_1, x_2, x_3, x_4 be the production levels of products 1, 2, 3, and 4, respectively. Management has imposed the following policy constraints on those variables:

1. No more than two of the products can be produced.
2. Product 3 can be produced only if at least one of products 1 and 2 is produced.
3. Either $5x_1 + 3x_2 + 6x_3 + 4x_4 \leq 6000$
or $4x_1 + 6x_2 + 3x_3 + 5x_4 \leq 6000$

Formulate an integer program for this problem.

