

Transfer Rows and Accounting Activities

Initial Model:

$$\begin{array}{rllll} \text{Maximize } Z = & 3x_1 & + & 5x_2 & \\ \text{subject to:} & & & & \\ (1) & 1x_1 & & & \leq 4 \\ (2) & & & 2x_2 & \leq 12 \\ (3) & 3x_1 & + & 2x_2 & \leq 18 \end{array}$$

and

$$x_1 \geq 0 \quad x_2 \geq 0$$

where

x_1 = units of product 1 produced and sold at \$3 profit / unit

x_2 = units of product 2 produced and sold at \$5 profit / unit

Solution:

$Z = \$36$ total profit

$x_1 = 2$ units produced and sold

$x_2 = 6$ units produced and sold

U Add Transfer Rows

L to separate production and marketing activities

U Add Accounting Activities

L to track gross income, production costs, and net income

Add Transfer Rows:

$$\text{Maximize } Z = -3x_1 - 5x_2 + 6x_3 + 10x_4$$

subject to:

$$\begin{array}{rllll} (1) & 1x_1 & & & \leq 4 \\ (2) & & 2x_2 & & \leq 12 \\ (3) & 3x_1 & 2x_2 & & \leq 18 \\ (4)^* & 1x_1 & & -1x_3 & = 0 \\ (5)^* & & 1x_2 & & -1x_4 & = 0 \end{array}$$

and

$$x_1 \geq 0 \quad x_2 \geq 0 \quad x_3 \geq 0 \quad x_4 \geq 0$$

where

x_1 = units of product 1 produced at a cost of \$3 / unit

x_2 = units of product 2 produced at a cost of \$5 / unit

x_3 = units of product 1 sold at a price of \$6 / unit

x_4 = units of product 2 sold at a price of \$10 / unit

Solution:

$Z = \$36$ total profit

$x_1 = 2$ units produced

$x_2 = 6$ units produced

$x_3 = 2$ units sold

$x_4 = 6$ units sold

Add Accounting Activities:

$$\text{Maximize } Z = -3x_1 - 5x_2 + 6x_3 + 10x_4 + 0x_5 + 0x_6 + 0x_7$$

subject to:

$$\begin{array}{rcccccccc} (1) & & 1x_1 & & & & & & \leq 4 \\ (2) & & & 2x_2 & & & & & \leq 12 \\ (3) & & 3x_1 & 2x_2 & & & & & \leq 18 \\ (4) & & 1x_1 & & -1x_3 & & & & = 0 \\ (5) & & & 1x_2 & & -1x_4 & & & = 0 \\ (6)^* & & & & 6x_3 & 10x_4 & -1x_5 & & = 0 \\ (7)^* & & -3x_1 & -5x_2 & & & & 1x_6 & = 0 \\ (8)^* & & -3x_1 & -5x_2 & 6x_3 & 10x_4 & & & -1x_7 = 0 \end{array}$$

and

$$x_1 \geq 0 \quad x_2 \geq 0 \quad x_3 \geq 0 \quad x_4 \geq 0 \quad x_5 \geq 0 \quad x_6 \geq 0 \quad x_7 \geq 0$$

where

- x_1 = units of product 1 produced at a cost of \$3 / unit
- x_2 = units of product 2 produced at a cost of \$5 / unit
- x_3 = units of product 1 sold at a price of \$6 / unit
- x_4 = units of product 2 sold at a price of \$10 / unit
- x_5 = accounting activity measuring gross returns
- x_6 = accounting activity measuring total costs
- x_7 = accounting activity measuring net returns (profit)

Solution:

- $Z = \$36$ total profit
- $x_1 = 2$ units produced
- $x_2 = 6$ units produced
- $x_3 = 2$ units sold
- $x_4 = 6$ units sold
- $x_5 = 72$ gross returns (\$)
- $x_6 = 36$ total costs (\$)
- $x_7 = 36$ profit (\$)