

### Internal Assessment 1

1. Hi-V produces three types of canned juice drinks, A, B, and C, using fresh strawberries, grapes, and apples. The daily supply is limited to 200 tons of strawberries, 90 tons of grapes, and 150 tons of apples. The cost per ton of strawberries, grapes, and apples is \$210, \$110, and \$100, respectively. Each ton makes 1500 lb of strawberry juice, 1200 lb of grape juice, and 1000 lb of apple juice. Drink A is a 1:1 mix of strawberry and apple juice. Drink B is 1:1:2 mix of strawberry, grape, and apple juice. Drink C is a 2:3 mix of grape and apple juice. All drinks are canned in 16-oz (1 lb) cans. The price per can is \$1.15, \$1.25, and \$1.20 for drinks A, B, and C. Develop an LP model to determine the optimal production mix of the three drinks.
2. Solve the LPP

$$\text{Maximize } z = 2x_1 + 4x_2$$

$$\begin{aligned} \text{subj. to } & x_1 + 2x_2 \leq 5 \\ & x_1 + x_2 \leq 4 \\ & x_1, x_2 \geq 0 \end{aligned}$$

3. Determine the dual to the problem of

$$\text{Maximize } z = x_1 - 2x_2 - 3x_3$$

$$\begin{aligned} \text{subject to } & x_2 + 2x_3 \geq 1 \\ & x_1 + 3x_3 \leq 2 \\ & 2x_1 - 3x_2 = 3 \\ & x_1, x_2 \geq 0, x_3 \text{ unrestricted} \end{aligned}$$

4. Verify that  $(0, 5\frac{2}{3}, 8\frac{1}{3}, \frac{1}{3})$  is an optimal point to the problem

$$\text{Minimize } 7x_1 + 11x_2 - 3x_3 - x_4$$

$$2x_1 + 2x_2 - x_3 - 3x_4 \geq 2$$

$$-x_1 + 5x_2 - 2x_3 + x_4 \geq 12$$

$$x_1 - 4x_2 + 3x_3 + 5x_4 \geq 4$$

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

Dual



and  $(3\frac{1}{2}, 2, 1\frac{1}{2})$  is an optimal point to dual.

5.

A bakery, using flour and sugar, makes cakes and pastries. Requirements and profits for making and selling a unit of each are as follows:

	<i>Flour (lb)</i>	<i>Sugar (lb)</i>	<i>Profit (\$)</i>
<i>Cake</i>	10	15	40
<i>Pastry</i>	3	2	9

The bakery has available  $b_1$  lb flour and  $b_2$  lb of sugar. Assuming that all items made can be sold, express the maximum profit attainable as a function of the ratio of  $b_1$  to  $b_2$ .