

Monday, Sep 09, 2024

1. LP1: Consider the following linear program.

$$\begin{aligned} \max \quad & 5x + 3y \\ \text{subject to } & 5x - 2y \geq 0 \\ & x + y \leq 7 \\ & x \leq 5 \\ & x \geq 0 \\ & y \geq 0 \end{aligned}$$

Plot the feasible region and identify the optimal solution.

2. LP2: Duckwheat is produced in Kansas and Mexico and consumed in New York and California. Kansas produces 15 shnupells of duckwheat and Mexico 8. Meanwhile, New York consumes 10 shnupells and California 13. The transportation costs per shnupell are \$4 from Mexico to New York, \$1 from Mexico to California, \$2 from Kansas to New York, and \$3 and from Kansas to California. Write a linear program that decides the amounts of duckwheat (in shnupells and fractions of a shnupell) to be transported from each producer to each consumer, so as to minimize the overall transportation cost.
3. LP3: A cargo plane can carry a maximum weight of 100 tons and a maximum volume of 60 cubic meters. There are three materials to be transported, and the cargo company may choose to carry any amount of each, upto the maximum available limits given below.
 1. Material 1 has density 2 tons/cubic meter, maximum available amount 40 cubic meters, and revenue \$1,000 per cubic meter.
 2. Material 2 has density 1 ton/cubic meter, maximum available amount 30 cubic meters, and revenue \$1,200 per cubic meter.
 3. Material 3 has density 3 tons/cubic meter, maximum available amount 20 cubic meters, and revenue \$12,000 per cubic meter.

Write a linear program that optimizes revenue within the constraints.

4. LP4: Convert the following linear programming to standard form 1.

$$\begin{aligned} & \min 3x_1 - x_2 \\ & -x_1 + 6x_2 - x_3 + x_4 \geq -3 \\ & 7x_2 + x_4 = 5 \\ & x_3 + x_4 \leq 2 \\ & -1 \leq x_2 \\ & x_3 \leq 5 \\ & -2 \leq x_4 \leq 2 \end{aligned}$$