

MATH 354 (3), Dr. Z. , Second Chance Club for Exam 1 Assignment

To qualify for membership in the Second Chance Club for Exam I, you must

- Complete this assignment to the best of your ability and email DrZlinear@gmail.com by the due date, Nov. 25, 2023, 8:00pm, Subject: sccI, with an attachment sccFirstLast.pdf
- Show up to the remote (WebEx) Marathon Review, on Dec. 17, 2023, 10:00am-1:00pm
- Pass a "basic skills" multiple-choice test given right after the Marathon review, 1:10pm-1:30p, Dec. 17, 2023 It would test your understanding of basic concepts.

1. A certain crayon company is planning to sell crayon boxes, with x_1 red crayons, x_2 green crayons, and x_3 yellow crayon. The profit that it can make, per box, is two cents for each red crayon, three cents for each green crayon and five cents for each yellow crayon.

Government regulations require that

- the number of red crayons plus the number of yellow crayons should not exceed the number of green crayons by more than 2
- the number of red crayons plus the number of green crayons should not exceed the number of yellow crayons by more than 4
- the number of green crayons plus the number of yellow crayons should not exceed the number of red crayons by more than 6

Set up a linear programming problem that would tell the company how many crayons of each kind to put in a box in order to maximize its profit. Express it in **standard form**.

2. Convert this problem into **canonical form**.

3. Express the **dual** of this problem.

4. Express both the problems in **2** and **3** in **matrix notation**

5. Indicate how to solve this problem using the **algebraic method** of section 1.5 . Since there are $\binom{6}{3} = 20$ possibilities for the set of basic variables, only list a few of them, but describe how you would do it.

6. Completely solve the problem in **2** using the **simplex algorithm**. Set up the initial tableau, and describe, in detail, every step.

7. Completely solve the (dual) problem in **3** using the **simplex algorithm**. Set up the initial tableau, and describe, in detail, every step.

- 8.** Verify that the **optimal objective value** is the same for both answers.
- 9.** Use the M -method (that is part of the simplex method) (no credit for other methods), to solve the following linear programming problem.

Maximize $z = x_1 + x_2$ subject to

$$2x_1 - x_2 \leq -28$$

$$x_1 + 3x_2 \leq 49$$

$$x_1 \geq 0 \quad , \quad x_2 \geq 0 \quad .$$

- 10.** Solve **9** using the graphical method, and make sure that you get the same answer.
- 11.** Solve **9** using the algebraic method of section 1.5, and make sure that you get the same answer.