Exercise 1 (20 points)
A company produces a diet which is to contain at least 80 units of carbohydrates and at least 80 units of protein. Food A contains 2 units of carbohydrates and 5 units of protein. Food B contains 4 units of carbohydrates and 2 unit of protein. Food A is sold for 15 SR per unit and Food B is sold for 30 SR per unit. How many units of each food should be sold in order to maximize revenue and what is the maximum revenue? Let $x =$ # of units of Food A sold and $y =$ # of units of Food B sold. Use the geometric approach to maximize revenue.

1. Linear Programming Problem (5 points): 

2. Set of Feasible Solutions (5 points):

3. Table (corner points) (5 points):

4. Conclusion (5 points):

Exercise 2 (20 points)
Using the dual and the simplex method, solve the following problem:
Minimize $Z = 400x_1 + 500x_2 + 1450x_3$ 
Subject to $x_1 + x_2 + 2x_3 \geq 21$; $x_1 + x_2 + 3x_3 \geq 24$; $x_1 + 2x_2 + 5x_3 \geq 36$.

1. Dual Problem (5 points):

2. Initial Tableau (5 points):

3. Final Tableau (5 points):

4. Conclusion (5 points):
Exercise 3 (20 points)
A company wishes to lease temporary office space for a period of 5 months. The rental fee is 5000 SR a month, payable in advance. The company wants to make a single payment, at the beginning of the rental period, to cover all rental fees for the 5-month period. The money is worth 9% compounded monthly.
(a) How much should the payment be? (2 decimal places) (10 points)

(b) Suppose after two months the rental fee increases to 6000 SR and the company decides to make another single payment to settle the balance. How much should this payment be? (2 decimal places) (10 points)

Exercise 4 (20 points)
In how many ways can 4 men and 2 women line up for a picture if a man is to be at each end?

Exercise 5 (20 points)
A coin is tossed 6 times, the resulting sequence of heads and tails is recorded. How many sequences have at most 3 heads?
Exercise 6 (20 points)
Urn I contains 3 Green, 2 Red and 1 White marbles, and Urn II contains 4 Green and 3 Red marbles. An urn is selected at random. Then a marble is randomly drawn from it and placed in the other urn from which we draw a marble.
(a) Set the tree diagram with the corresponding probabilities. (10 points)

(b) Find the probability that the second draw yields a white marble. (4 decimal places) (10 points)

Exercise 7 (20 points)
Let E and F be two events such that P(E/F) = 0.6, P(E \cap F) = 0.28, P(F/E) = 0.4. Are E and F independent? (Justify)

Exercise 8 (20 points)
In an article comparing mathematics examinations in some countries, a researcher found the results for the number of minutes allowed for each exam question as follow: France (10), Germany (15), Netherlands (11), Portugal (12), Scotland (5), US (6). How many standard deviations from the mean is the US examination? (2 decimal places)
**Exercise 9 (20 points)**
Consider two investment projects. In Project A, there is 20% chance to lose 18,500 SR, 65% to breakeven, 15% to make 250,000 SR. In Project B, there is 15% chance to lose 15,000 SR, 25% to breakeven, 60% to make 60,000 SR. If decision is based on expected value, in which project should we invest?

1. Distribution table for Project A: (4 points)

2. Expected Value for Project A: (4 points)

3. Distribution table for Project B: (4 points)

4. Expected Value for Project B: (4 points)

5. Conclusion: (4 points)
We should invest in Project____, because _____________________________________________________________

**Exercise 10 (20 points)**
In a production process, the probability of a defective unit is 0.05. A sample of 100 units is selected at random. Let X = Number of non-defective units.

(a) Find the expected number of non-defective units.

(b) Find the variance of X. (2 decimal places)

(c) Find the probability that at least 99 units are not defective. (3 decimal places)