<table>
<thead>
<tr>
<th>Exercise</th>
<th>Your Score</th>
<th>Out of</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
<td>5</td>
</tr>
<tr>
<td>2</td>
<td></td>
<td>6</td>
</tr>
<tr>
<td>3</td>
<td></td>
<td>6</td>
</tr>
<tr>
<td>4</td>
<td></td>
<td>6</td>
</tr>
<tr>
<td>5</td>
<td></td>
<td>6</td>
</tr>
<tr>
<td>6</td>
<td></td>
<td>6</td>
</tr>
<tr>
<td>7</td>
<td></td>
<td>6</td>
</tr>
<tr>
<td>8</td>
<td></td>
<td>12</td>
</tr>
<tr>
<td>9</td>
<td></td>
<td>17</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td><strong>70</strong></td>
</tr>
</tbody>
</table>
**Exercise 1.** [5 points] A small business predicts its revenue growth by a straight-line method with a slope of 50,000 SR per year. In its fifth year, it had a revenue of 330,000 SR. Find an equation that describes the relationship between the revenue, $R$, and the number of years, $T$, since it opened for business.

**Exercise 2.** [6 points] Over a period of time, the manufacturer of a caramel-center candy bar found that 3.1% of the bars were rejected for imperfections.

(a) [2 points] If $x$ candy bars are made in a year, how many would the manufacturer expect to be rejected?

(b) [4 points] This year, annual consumption of the candy is projected to be six hundred million bars. Approximately, how many bars will have to be made if rejections are taken into consideration?

**Exercise 3.** [6 points] The demand function for a publisher’s line of cookbooks is $p = 6 - 0.003q$, where $p$ is the price (in Saudi Riyals) per unit when $q$ units are demanded (per day) by consumers. Find the level of production that will maximize the manufacturer’s total revenue, and determine this maximum revenue.
Exercise 4. [6 points] A company pays its salespeople on a basis of a certain percentage of the first 100,000 SR in sales, plus a certain percentage of any amount over 100,000 SR in sales. If one salesperson earned 8,500 SR on sales of 175,000 SR and another salesperson earned 14,800 SR on sales of 280,000 SR, find the two percentages.

Exercise 5. [6 points] Solve the nonlinear system
\[
\begin{align*}
    x - 1 &= \frac{y^2}{y - 1} \\
    x &= \frac{1}{y - 1}
\end{align*}
\]
Exercise 6. [6 points] Find the equilibrium point if the supply and demand equations of a product are \[
\begin{align*}
q - 10p + 10 &= 0 \\
pq &= 60
\end{align*}
\]

Exercise 7. [6 points] A produce grower is purchasing fertilizer containing three nutrients \(A\), \(B\), and \(C\). The minimum weekly requirements are 100 units of \(A\), 200 of \(B\), and 300 of \(C\). There are two popular blends of fertilizer on the market. Blend I, costing 10 SR a bag, contains 2 units of \(A\), 6 of \(B\), and 4 of \(C\). Blend II, costing 8 SR a bag, contains 2 units of \(A\), 2 of \(B\), and 12 of \(C\). Formulate the linear programming problem to minimize cost \(Z\) (do NOT solve it).
Exercise 8. [12 points] Use the geometric (graphical) approach to maximize \( Z = x + y \)
subject to
\[
\begin{align*}
  x - y &\geq -4 \\
  y - x &\geq -4 \\
  x + y &\leq 6 \\
  x &\geq 0 \\
  y &\geq 0
\end{align*}
\]

Feasible Region: [2 points]

<table>
<thead>
<tr>
<th>Corner points</th>
<th>Value at ( Z = x + y )</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>[5 points]</td>
</tr>
</tbody>
</table>

Conclusion: [5 points]
Exercise 9. [17 points] Use the dual and simplex method to solve the following problem:

Minimize \( Z = 20x_1 + 6x_2 + 15x_3 \) subject to

\[
\begin{align*}
3x_1 + x_2 + 2x_3 & \geq 2 \\
2x_1 + 2x_2 + 3x_3 & \geq 3 \\
2x_1 + x_2 + x_3 & \geq 5 \\
x_1 & \geq 0, x_2 \geq 0, x_3 \geq 0
\end{align*}
\]

(1) Dual Problem:

[4 points]

(2) Initial Tableau:

[1 point]

(3) Final Tableau:

[4 points]

(4) Solution of the Dual Problem:

[4 points]

(5) Solution of the Initial Problem:

[4 points]