1. (10 points) Answer the following questions about the Big Depot Hurricane Planning Game.

   (a) (5 points) Two common decisions for disaster planning were analyzed in this case study: to contract and reserve inventory in advance, and to allocate the reserved inventory. List three other important decisions to prepare and respond to a disaster (e.g., a hurricane) in an efficient and timely way. Explain why each decision is important in 2-3 sentences each.

   (b) (5 points) Demand uncertainty (size and location) was identified in this case study as an important logistics challenge when planning for a disaster. Discuss three other logistics challenges that could arise in disaster planning and response. Explain each of these challenges in 2-3 sentences each.

   (c) (optional, will not be graded) The game was solved in two phases. During the second phase, a decision support tool was provided. Such tool calculated the expected cost given a strategy, and allowed to study how this cost would change under different demand scenarios. List three advantages of using such decision support tools.

2. (10 points) A retailer in Atlanta sells notebooks during the school opening season. Each notebook costs the retailer $5 and sells for $8 each. At the end of the season, the notebooks are sold on promotion for $4 each and the retailer is sure they will be able to sell all of the remaining notebooks for that price. The retailer issues coupons worth $2 for the customers whose demand cannot be satisfied due to stockouts. The demand of notebooks follows a uniform distribution between 50 and 150, that is, \( f(x) = \frac{1}{100} \) for \( 50 \leq x \leq 150 \), and is zero otherwise.

   (a) (3 points) Find the optimal number of notebooks to order at the beginning of the season.

   (b) (2 points) What is the expected number of notebooks left for promotion sale?

   (c) (5 points) Solve part (a) assuming that the demand follows normal distribution with a mean of 100 notebooks and standard deviation of 30 notebooks.

3. (5 points) A local bakery is trying to determine the number of loaves of its most popular bread to bake for the following day. The ingredients for a single loaf cost $1.70, while the selling price is $2.50 per loaf. At the end of the day, any leftovers are sold to a neighboring animal shelter for $1.00 per loaf. The demand for this particular bread over the last 20 days has been observed as follows (units given in loaves):

<table>
<thead>
<tr>
<th>Day</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
<th>11</th>
<th>12</th>
<th>13</th>
<th>14</th>
<th>15</th>
<th>16</th>
<th>17</th>
<th>18</th>
<th>19</th>
<th>20</th>
</tr>
</thead>
<tbody>
<tr>
<td>Demand</td>
<td>8</td>
<td>10</td>
<td>13</td>
<td>5</td>
<td>8</td>
<td>11</td>
<td>11</td>
<td>13</td>
<td>15</td>
<td>12</td>
<td>10</td>
<td>10</td>
<td>9</td>
<td>9</td>
<td>12</td>
<td>12</td>
<td>8</td>
<td>7</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>

   Based only on this observation, how many loaves should they bake for the following day?
4. (Optional, will not be graded) A ski rental company expects the demand for its products to follow a normal distribution in each of the first six months of the year, with the following parameters:

<table>
<thead>
<tr>
<th>Month</th>
<th>Mean</th>
<th>Standard deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>January</td>
<td>1,200</td>
<td>500</td>
</tr>
<tr>
<td>February</td>
<td>1,000</td>
<td>350</td>
</tr>
<tr>
<td>March</td>
<td>500</td>
<td>200</td>
</tr>
<tr>
<td>April</td>
<td>300</td>
<td>150</td>
</tr>
<tr>
<td>May</td>
<td>200</td>
<td>125</td>
</tr>
<tr>
<td>June</td>
<td>150</td>
<td>80</td>
</tr>
</tbody>
</table>

(a) Assuming that the demands in each month are independent of each other, find the distribution of the overall demand in the six months.

(b) The amount of tax the company has to pay is based on the interval into which the total amount of skis sold \( D \) falls, as shown in the following table. Assuming independent demand as in part (a), find the expected tax to be paid.

<table>
<thead>
<tr>
<th>Interval</th>
<th>Tax</th>
</tr>
</thead>
<tbody>
<tr>
<td>( D \leq 2,500 )</td>
<td>$180</td>
</tr>
<tr>
<td>( 2,500 \leq D \leq 3,500 )</td>
<td>$250</td>
</tr>
<tr>
<td>( 3,500 \leq D \leq 4,500 )</td>
<td>$350</td>
</tr>
<tr>
<td>( D \geq 4,500 )</td>
<td>$425</td>
</tr>
</tbody>
</table>