1) The objective of Goldmine National Park (GNP) is to make as much money from tourists as possible. GNP offers (L)uxury hotel rooms and (T)ent cabins.

It is known that potential customers are either (S)tudents, (M)iddle class, or (R)ich with equal probability. A marketing study found that the willingness to pay of each consumer type for each accommodation type is:

<table>
<thead>
<tr>
<th></th>
<th>Tent Cabin</th>
<th>Luxury</th>
</tr>
</thead>
<tbody>
<tr>
<td>Students</td>
<td>$76</td>
<td>$110</td>
</tr>
<tr>
<td>Middle Class</td>
<td>$101</td>
<td>$200</td>
</tr>
<tr>
<td>Rich</td>
<td>$149</td>
<td>$702</td>
</tr>
</tbody>
</table>

The net payoff is the customer's utility minus what they pay.

We neglect the cost to provide each type of accommodation, and just assume that GNPs payoff is revenue.

We will design a pricing plan for Tent cabins and Luxury rooms that maximizes revenue. We assume the following:

- Customers of all three types choose the option that maximizes their net payoff (the difference between the willingness to pay and the price). However, if both accommodation types result in a negative net payoff for a consumer, that consumer will not buy either option.
- There are equal numbers of each type of consumer.
- There are no capacity constraints on either Tent Cabins and Luxury rooms.

a) Assume that GNP's web site cannot tell what type of consumer is looking at it. You must present two prices, \( p_T \) and \( p_L \) to all consumers who visit your site. What pair of prices maximizes your average revenue per potential customer?

   Hint: Choose a desired mapping (e.g. Students+ Middle class \( \rightarrow \) Tent, Rich to Luxury), and choose the prices necessary to support that mapping. Try all possible mapping and see which one gives the best average revenue, assuming each customer that arrives is rich with chance 1/3, middle class with chance 1/3, and student with chance 1/3.

b) Now suppose that every time a consumer comes to your website, you are able to infer their type (by geography, browsing habits, etc.) with 100% confidence. What pricing plan(s) would you present to each consumer type to maximize revenue. How much more revenue does it generate?

c) Suppose now that every time a customer visits your site, your tracking system presents you with a most likely consumer type. With chance 0.9, the consumer is actually of the type your system says. With chance 0.1, the consumer is one of the other types, and it is equally to be each of the remaining 2 types.
For example, if your system says “rich,” the consumer is actually rich with chance 0.9, middle class with chance 0.05, and student with chance 0.05.

Your system claims someone is either rich, middle class, or student equally often (1/3) of the time for each. Design the prices that should be presented to a consumer whenever your tracking system claims they are rich, middle class, or student. Do you lose some revenue compared to having a perfect ability to discriminate between customers?