Expected Value

An automobile insurance company estimates the following loss probabilities for the next year on a $25,000 car:

| Loss   | Probability | Probability
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0.001</td>
<td>0.839</td>
</tr>
<tr>
<td>2500</td>
<td>0.01</td>
<td></td>
</tr>
<tr>
<td>12500</td>
<td>0.05</td>
<td></td>
</tr>
<tr>
<td>6250</td>
<td>0.1</td>
<td></td>
</tr>
<tr>
<td>2500</td>
<td>0.01</td>
<td></td>
</tr>
</tbody>
</table>

Let the random variable \( X \) be the payout on a single policy for the insurance company. (assuming at most one accident in the next year)

1. Calculate the expected payout for the insurance company.

\[
E(X) = 25000(0.001) + 12500(0.01) + 6250(0.05) + 2500(0.1) + 0(0.839)
\]

\[
= \#712.50
\]

2. Suppose the company sells only policies with $500 deductibles. Find the expected value taking into account the deductible.

\[
* \text{Let } Y = \begin{cases} 
X - 500 & \text{for } x > 0 \\
0 & \text{otherwise}
\end{cases}
\]

\[
E(Y) = 24500(0.001) + 12000(0.01) + 5750(0.05)
\]

\[
+ 2000(0.1)
\]

\[
= \#632
\]

3. How much should the company charge per policy to earn a profit of $250 per policy?

\[
632 + 250 = \#882
\]

* Let \( g(X) \) be a function of the random variable \( X \)

\[
E(g(X)) = \sum_{x: p(x) > 0} g(x) p(x)
\]