1) The probability distribution below is for the random variable $X$ = number of mice caught in traps during a single night in small apartment building.

<table>
<thead>
<tr>
<th>$X$</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>$P(X)$</td>
<td>0.12</td>
<td>0.20</td>
<td>0.31</td>
<td>0.14</td>
<td>0.16</td>
<td>0.07</td>
</tr>
</tbody>
</table>

a) Describe $P(X \geq 2)$ in words and find its value.

Probability that 2 or more mice get caught in traps during a single night:

$$P(X \geq 2) = P(2) \cdot P(3) \cdot P(4) \cdot P(5) = 0.68$$

b) Express the event "trapping at least one mouse" in terms of $X$ and find its probability.

$$P(X \geq 1) = 1 - P(0) = 0.88$$
2) Joe the barber charges $32 for a shave and haircut and $20 for just a haircut. Based on experience, he determines that the probability that a randomly selected customer comes in for a shave and haircut is 0.85, the rest of his customers come in for just a haircut. Let \( J \) = what Joe charges a randomly-selected customer.

a) Give the probability distribution for \( J \).

<table>
<thead>
<tr>
<th>( J )</th>
<th>20</th>
<th>32</th>
</tr>
</thead>
<tbody>
<tr>
<td>( P(J) )</td>
<td>0.15</td>
<td>0.85</td>
</tr>
</tbody>
</table>

b) Find and interpret the mean of \( J \), \( \mu_J \). (SHOW YOUR WORK!)

\[
\mu_J = 20(0.15) + 32(0.85) = $30.20
\]

Over the long run, Joe can expect to make $30.20 per customer.

c) Find and interpret the standard deviation of \( J \), \( \sigma_J \). (SHOW YOUR WORK!)

\[
\sigma_J = \sqrt{\sum (X_i - \mu_J)^2 p_i}
\]

\[
\sigma_J = \sqrt{(20 - 30.20)^2 (0.15) + (32 - 30.20)^2 (0.85)} \approx $4.28
\]

On average, the cost per customer differs or varies from mean $4.28.