2. A process manufactures microcircuits that are used in computers. Twelve percent of the circuits are defective. Assume that three circuits are installed in a computer. Denote a defective circuit by “D” and a good circuit by “G”.

a) Draw a tree diagram of this situation

b) What is the probability that all three circuits are good?

\[ 0.88 \cdot 0.88 \cdot 0.88 = \boxed{0.6815} \]

c) The computer will function so long as either two or three of the circuits are good. What is the probability that a computer will function?

\[ P(GGG) + P(GGD) + P(GDG) + P(DGG) \]
\[ = (0.88)^3 + (0.88)^2(0.12) + (0.88)(0.12)^2 + (0.12)^3 \]
\[ = \boxed{0.9603} \]

d) If we use a cutoff of 0.05, would it be unusual for all three circuits to be defective?

\[ P(DDD) = (0.12)^3 = 0.001728 < 0.05 \]

Since this probability is less than 0.05 we say it is unusual for all circuits to be defective.
Quiz 1

1. A poll was taken of 14,073 working adults aged 40-70 to determine their level of education. The participants were classified by sex and by level of education. The results were as follows.

<table>
<thead>
<tr>
<th>Education Level</th>
<th>Male</th>
<th>Female</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>High School or Less</td>
<td>3310</td>
<td>2860</td>
<td>6170</td>
</tr>
<tr>
<td>Bachelor's Degree</td>
<td>3067</td>
<td>3808</td>
<td>6875</td>
</tr>
<tr>
<td>Master's Degree</td>
<td>506</td>
<td>422</td>
<td>928</td>
</tr>
<tr>
<td>Ph.D.</td>
<td>50</td>
<td>50</td>
<td>100</td>
</tr>
<tr>
<td>Total</td>
<td>6933</td>
<td>7140</td>
<td>14,073</td>
</tr>
</tbody>
</table>

(a) If you randomly select one person from this group of adults, find the probability that this selected person has at least a Master’s Degree (that is, a Master’s Degree or a Ph.D.).

\[
\frac{928 + 100}{14,073} = \frac{1028}{14,073} = 0.0730
\]

(b) If you randomly select one person from this group of adults, find the probability that this selected person is female and has a Bachelor’s Degree.

\[
\frac{3,808}{14,073} = 0.2706
\]

(c) If you randomly select one person from this group of adults, find the probability that this selected person is female, given that the person has a Ph.D.

\[
\frac{50}{100} = 0.5
\]

(d) Are the events "being female" and "having a Ph.D" mutually exclusive? Explain why or why not.

No, you can be a female and have a Ph.D at the same time. There are 50 such people in this poll. (or you can show that \( P(\text{Female} \cap \text{Ph.D}) \neq 0 \)