2-96. a) $P = 0.13 \times 0.73 = 0.0949$

b) $P = 0.87 \times (0.27 + 0.17) = 0.3828$

2-108. Let A_i denote the event that the ith bit is a one.

a) By independence $P(A_1 \cap A_2 \cap ... \cap A_{10}) = P(A_1)P(A_2)...P(A_{10}) = (\frac{1}{2})^{10} = 0.000976$

b) By independence, $P(A_1' \cap A_2' \cap ... \cap A_{10}') = P(A_1')P(A_2')...P(A_{10}^c) = (\frac{1}{2})^{10} = 0.000976$

c) The probability of the following sequence is

$P(A_1' \cap A_2' \cap A_3' \cap A_4' \cap A_5' \cap A_6 \cap A_7 \cap A_8 \cap A_9 \cap A_{10}) = (\frac{1}{2})^{10}$, by independence. The number of sequences consisting of five "1"'s, and five "0"'s is $\binom{10}{5} = \frac{10!}{5!5!} = 252$. The answer is $252\left(\frac{1}{2}\right)^{10} = 0.246$

2-102. If A and B are mutually exclusive, then $P(A \cap B) = 0$ and $P(A)P(B) = 0.04$.
Therefore, A and B are <u>not</u> independent.

2-116. Because, $P(A|B)P(B) = P(A \cap B) = P(B|A)P(A)$,

$$P(B|A) = \frac{P(A|B)P(B)}{P(A)} = \frac{0.7(0.2)}{0.5} = 0.28$$

2-122. a) $P(D)=P(D|G)P(G)+P(D|G')P(G')=(.005)(.991)+(.99)(.009)=0.013865$

b) $P(G|D')=P(G \cap D')/P(D')=P(D'|G)P(G)/P(D')=(.995)(.991)/(1-.013865)=0.9999$

2-154. The tool fails if any component fails. Let F denote the event that the tool fails. Then, $P(F') = 0.99^{10}$ by independence and $P(F) = 1 - 0.99^{10} = 0.0956$

2-144. Let A_i denote the event that the ith order is shipped on time.

a) By independence, $P(A_1 \cap A_2 \cap A_3) = P(A_1)P(A_2)P(A_3) = (0.95)^3 = 0.857$

b) Let

$B_1 = A_1' \cap A_2 \cap A_3$

$B_2 = A_1 \cap A_2' \cap A_3$

$B_3 = A_1 \cap A_2 \cap A_3'$

Then, because the B's are mutually exclusive,

$$
\begin{aligned}
P(B_1 \cup B_2 \cup B_3) &= P(B_1) + P(B_2) + P(B_3) \\
&= 3(0.95)^2(0.05) \\
&= 0.135
\end{aligned}
$$

c) Let

$B_1 = A_1' \cap A_2' \cap A_3$

$B_2 = A_1' \cap A_2 \cap A_3'$

$B_3 = A_1 \cap A_2' \cap A_3'$

$B_4 = A_1' \cap A_2' \cap A_3'$

Because the B's are mutually exclusive,

$$
\begin{aligned}
P(B_1 \cup B_2 \cup B_3 \cup B_4) &= P(B_1) + P(B_2) + P(B_3) + P(B_4) \\
&= 3(0.05)^2(0.95) + (0.05)^3 \\
&= 0.00725
\end{aligned}
$$

2-154. The tool fails if any component fails. Let F denote the event that the tool fails. Then, $P(F') = 0.99^{10}$ by independence and $P(F) = 1 - 0.99^{10} = 0.0956$