2.1-6

$$P(\text{accepts first}) = P(9 \text{ or } 10 \text{ are chosen defective}) = \frac{\binom{90}{9}\binom{10}{1}}{\binom{100}{10}} + \frac{\binom{90}{10}\binom{10}{0}}{\binom{100}{10}} = 0.363$$

$$P(\text{accepts first}) = P(9 \text{ or } 10 \text{ are found defective}) = \frac{\binom{90}{9}\binom{10}{1}}{\binom{100}{10}} + \frac{\binom{90}{10}\binom{10}{0}}{\binom{100}{10}} = 0.738$$

2.1-9

(a) $P(A \cap B) = P(A) + P(B) - P(A \cup B) = 0.4 + 0.5 - 0.7 = 0.2$

(b) $P(A' \cup B') = P((A \cap B)') = 1 - P(A \cap B) = 0.8$

2.1-10

(a) $P(A \cup B) = P(A) + P(B) - P(A \cap B) = 0.6$

(b) $B = (A \cap B) \cup (A' \cap B)$ disjoint sets

$P(A' \cap B) = P(B) - P(A \cap B) = 0.2$

(c) $P(A' \cup B') = 1 - P(A \cap B) = 0.7$ (as in problem 2.1-9

2.2-2 A: 3 or 4 aces B: 2 or 3 or 4 aces

$$P(A|B) = \frac{P(A)}{P(B)}$$

$$P(A) = \frac{\binom{4}{3}\binom{48}{10} + \binom{4}{4}\binom{48}{9}}{\binom{48}{13}}, \quad P(B) = \frac{\binom{4}{2}\binom{48}{11} + \binom{4}{3}\binom{48}{10} + \binom{4}{4}\binom{48}{9}}{\binom{48}{13}}$$

Thus $P(A|B) = 0.1704$

2.2-3 $P(\text{spade, club, club, heart, spade}) = \frac{13}{52} \cdot \frac{13}{51} \cdot \frac{12}{50} \cdot \frac{13}{49} \cdot \frac{12}{48} = 0.0010144$

2.2-9 D: Defective, ND: Non-Defect., S: Signal, NS: No-Signal

(a) $P(D) = P(D \cap S) + P(D \cap NS) = 0.05 + 0.01 = 0.06$ (b) $P(ND) = 1 - P(D) = 0.94$

(c) $P(ND|S) = \frac{P(ND \cap S)}{P(S)} = \frac{0.02}{0.07} = \frac{2}{7}$ $P(S) = P(S \cap D) + P(S \cap ND)$

(d) $P(D|NS) = \frac{P(D \cap NS)}{P(NS)} = \frac{0.01}{0.93} = \frac{1}{93}$ $P(NS) = P(NS|D) + P(NS|ND)$

2.2-14 D: Disease TN: Test Negative TP: Test Positive

$P(D) = 0.10$, $P(TN|D) = 0.20$, $P(TP|D') = 0.10 \Rightarrow P(D') = 0.90$, $P(TP|D) = 0.80$

$$P(D|TP) = \frac{P(TP|D)\,P(D)}{P(TP|D)\,P(D) + P(TP|D')\,P(D')} = \frac{(0.80)(0.10)}{(0.80)(0.10) + (0.10)(0.90)} = 0.471$$