2.27 The sample space is {*SS, SR, SL, RS, RR, RL, LS, LR, LL*}. Let *A* be the event of at least one vehicle turning left and *B* be the event that at least one vehicle turns. Assuming equally likely outcomes, we have

$$P(A|B) = \frac{P(AB)}{P(B)} = \frac{P(A)}{P(B)} = \frac{P(SL \cup RL \cup LS \cup LR \cup LL)}{1 - P(SS)} = \frac{5/9}{8/9} = \frac{5}{8}.$$

2.34 **a.** $P(A \cup B) \le 1$

i.e., $P(A) + P(B) - P(AB) \le 1$

i.e., $P(AB) \ge P(A) + P(B) - 1$

b. *P*(exactly one of the events occurs)

$$= P(A\bar{B} \cup B\bar{A}) = P(A\bar{B}) + P(B\bar{A})$$

$$= [P(A) - P(AB)] + [P(B) - P(AB)] = P(A) + P(B) - 2P(AB)$$

2.35 **a.** Let A_i = event that i^{th} resistor has resistance between 9.5 and 10.5 ohms, $i = 1, 2$. Then

$P(A_i) = 1 - 0.05 - 0.10 = 0.85$, and

P(both have actual values between 9.5 and 10.5)

$$= P(A_1A_2) = P(A_1)P(A_2) = (0.85)(0.85) = 0.7225.$$

b. Let E_i = event that i^{th} resistor has resistance in excess of 10.5 ohms, $i = 1, 2$. Then

P(at least one has an actual value greater than 10.5)

$$= P(E_1E_2 \cup E_1\bar{E}_2 \cup \bar{E}_1E_2) = P(E_1)P(E_2) + P(E_1)P(\bar{E}_2) + P(\bar{E}_1)P(E_2)$$

$$= (0.1)(0.1) + 2(0.1)(0.9) = 0.19 \text{ or}$$

P(at least one has an actual value greater than 10.5)

$$= 1 - P(\bar{E}_1\bar{E}_2) = 1 - (0.9)^2 = 0.19.$$

2.37 Let C_i = event that relay *i* closes properly, $i = 1, 2$. Then

P(current flows in series system) = *P*(both relays are closed)

$$= P(C_1C_2) = P(C_1)P(C_2) = (0.9)(0.9) = 0.81$$

P(current flows in parallel system) = *P*(at least one of the relays is closed)

$$= P(C_1 \cup C_2) = P(C_1) + P(C_2) - P(C_1C_2)$$

$$= 0.9 + 0.9 - (0.9)(0.9) = 0.99$$

2.38 Let D = defective, and L_i = the line from which the motor came, $i = 1,2$.

$$P(L_1|D) = \frac{P(L_1)P(D|L_1)}{P(D|L_1)P(L_1) + P(D|L_2)P(L_2)}$$

$$= \frac{(0.5)(0.10)}{(0.10)(0.5) + (0.15)(0.5)} = 0.40$$

2.39 Let F denote the event that a worker fails to learn the skill correctly.

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

$$= \frac{(0.70)(0.20)}{(0.20)(0.70) + (0.10)(0.30)} = 0.8235$$

2.43 $P(A)P(B|A)P(C|AB) = P(A) \cdot \frac{P(AB)}{P(A)} \cdot \frac{P(ABC)}{P(AB)} = P(ABC)$