

**2.3****2**

$$\begin{aligned}
 P(A) &= .5 \\
 P(A \cap B^C) &= .4 \\
 &= P(A)P(B^C) && \text{A and B are assumed to be independent} \\
 &\Rightarrow \\
 .4 &= .5 * (1 - P(B)) \\
 1 - \frac{.4}{.5} &= P(B) \\
 .2 &= P(B)
 \end{aligned}$$

**6**

$$\begin{aligned}
 P(A \cap B) &= P(A)P(B|A) \\
 P(A) &= .056 \\
 P(B|A) &= .027 \\
 &\Rightarrow \\
 P(A \cap B) &= .056 * .027 \\
 &= .001512
 \end{aligned}$$

**10****a** .3**b** .2**c**

$$\begin{aligned}
 P(A|B) &= \frac{P(A \cap B)}{P(B)} \\
 &= \frac{.1}{.3} \\
 &= \bar{.3}
 \end{aligned}$$

**d**

$$\begin{aligned}
 P(A|B) &= \frac{P(A \cap B)}{P(B)} \\
 &= \frac{.1}{.2} \\
 &= .5
 \end{aligned}$$

e

$$\begin{aligned}
 P(A^c|B) &= \frac{P(A^c \cap B)}{P(B)} \\
 &= \frac{.2}{.3} \\
 &= .\bar{6}
 \end{aligned}$$

f

$$\begin{aligned}
 P(A^c|B) &= \frac{P(A^c \cap B)}{P(B)} \\
 &= \frac{.1}{.2} \\
 &= .5
 \end{aligned}$$

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a

$$\begin{aligned}
 P(A \cap B) &= P(A)P(B) \\
 &= .2 * .4 \\
 &= .08
 \end{aligned}$$

b

$$\begin{aligned}
 P(S \cap T) &= P(S \cap T) \\
 &= \frac{.3}{.2} \\
 &= .06
 \end{aligned}$$

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$$\begin{aligned}
 P(\text{Black car} | \text{Small car}) &= \frac{P(\text{Black car} \cap \text{Small car})}{P(\text{Small car})} \\
 P(\text{Small car}) &= \frac{340}{750} \\
 &= .45 \\
 P(\text{Black car} \cap \text{Small car}) &= \frac{71}{750} \\
 &= .094 \\
 &\Rightarrow \\
 P(\text{Black car} | \text{Small car}) &= \frac{.094}{.45} \\
 &= .21
 \end{aligned}$$

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**a**

$$P(G \cap C) = P(G)P(C|G) = .7 * .005 = .0035$$

**b**

$$\begin{aligned} P(C) &= P(G \cap C) + P(M \cap C) + P(P \cap C) \\ &= P(G)P(C|G) + P(M)P(C|M) + P(P)P(C|P) \\ &= .7 * .005 + .2 * .01 + .1 * .025 \\ &= .008 \end{aligned}$$

**c**

$$\begin{aligned} P(G|C) &= \frac{P(G \cap C)}{P(C)} \\ &= \frac{.0035}{.008} \\ &= .4375 \end{aligned}$$

**34**

$$P(A^C) = .1, P(B^C) = .05, P(C^c) = .1, P(D^c) = .2$$

$$\begin{aligned} P(\text{sub 1}) &= P(A \cap B) \\ &= P(A)P(B) \\ &= (1 - P(A^C)) * (1 - P(B^C)) \\ &= (.9)(.95) \\ &= .855 \end{aligned}$$

$$\begin{aligned} P(\text{sub 2}) &= 1 - (1 - .1)(1 - .2) \\ &= .980 \end{aligned}$$

$$\begin{aligned} P(\text{system}) &= 1 - (1 - .980)(1 - .855) \\ &= .997 \end{aligned}$$