2.4.12 $P(\text{No. of heads} \geq 2 \mid \text{No. of heads} \leq 2) =$

$P(\text{No. of heads} \geq 2 \text{ and No. of heads} \leq 2)/P(\text{No. of heads} \leq 2)$

$= P(\text{No. of heads} = 2)/P(\text{No. of heads} \leq 2)$

$= (3/8)/(7/8) = 3/7$

2.4.2 $P(A|B) + P(B|A) = 0.75 = \frac{P(A \cap B)}{P(B)} + \frac{P(A \cap B)}{P(A)} = \frac{10P(A \cap B)}{4} + 5P(A \cap B)$, which implies that $P(A \cap B) = 0.1$.

2.4.22 Let K_i be the event that the ith key tried opens the door, $i = 1, 2, \ldots, n$. Then P(door opens first time with 3rd key) = $P(K_1^C \cap K_2^C \cap K_3) = P(K_1^C) \cdot P(K_2^C \mid K_1^C) \cdot P(K_3 \mid K_1^C \cap K_2^C) =$

$$\frac{n-1}{n} \cdot \frac{n-2}{n-1} \cdot \frac{1}{n-2} = \frac{1}{n}.$$

2.4.30 Let B be the event that a red chip is ultimately drawn from Urn I. Let A_{RW}, for example, denote the event that a red is transferred from Urn I and a white is transferred from Urn II. Then $P(B) = P(B \mid A_{RR})P(A_{RR}) + P(B \mid A_{RW})P(A_{RW}) + P(B \mid A_{WR})P(A_{WR}) + P(B \mid A_{WW})P(A_{WW}) =$

$$\frac{3}{4}\left(\frac{3}{4}\cdot\frac{2}{4}\right)+\frac{2}{4}\left(\frac{3}{4}\cdot\frac{2}{4}\right)+1\left(\frac{1}{4}\cdot\frac{2}{4}\right)+\frac{3}{4}\left(\frac{1}{4}\cdot\frac{2}{4}\right)=\frac{11}{16}.$$

2.4.6 $P(A \cup B) = 0.8$ and $P(A \cup B) - P(A \cap B) = 0.6$, so $P(A \cap B) = 0.2$. Also, $P(A \mid B) = 0.6 = \dfrac{P(A \cap B)}{P(B)}$, so $P(B) = \dfrac{0.2}{0.6} = \dfrac{1}{3}$ and $P(A) = 0.8 + 0.2 - \dfrac{1}{3} = \dfrac{2}{3}$.