1. Assuming that

$$\begin{aligned}\Pr(A) &= 0.31, \quad \Pr(B) = 0.33, \quad \Pr(C) = 0.37 \\ \Pr(A \cap B) &= 0.11, \quad \Pr(A \cap C) = 0.13, \quad \Pr(B \cap C) = 0.12 \\ & \text{and } \Pr(A \cap B \cap C) = 0.05\end{aligned}$$

find

(a)
$$\Pr\left[\overline{A \cap B} \cap (B \cup C)\right]$$

(b)
$$\Pr[(A \cap \overline{B}) \cup (A \cap B \cap \overline{C})]$$

2. Each of three players is randomly (and independently of the rest, i.e. from a *complete* and newly shuffled deck of 52) dealt 7 cards. What is the probability that *at least one* of them gets *exactly* 4 spades? None of them gets exactly 4 spades?

3. When a die is rolled 12 times, what is the probability of getting

(a) exactly 3 sixes,

(b) at least 2 sixes,

(c) exactly 1 six and 7 small values ('small' means *fewer* than four dots),

(d) 2 pairs and 2 quadruplets of identical values (eg. 241552412525)?

4. If A, B, C and D are mutually *independent*, and $\Pr(A) = 0.47$, $\Pr(B) = 0.21$, $\Pr(C) = 0.83$ and $\Pr(D) = 0.55$, find

(a)
$$\Pr[(A \cup \bar{B} \cup C) \cap (A \cup \bar{C} \cup \bar{D})]$$

(b) and, also
$$\Pr[(A \cap \bar{C}) \cup (\bar{B} \cap D) \cup (\bar{A} \cap D)]$$

5. Suppose you pay \$5 to play the following game: 4 coins are tossed and you lose your \$5 if fewer than 2 heads appear, you get your \$5 back when 2 or 3 heads appear, and collect \$25 (your \$5 back plus an extra \$20) for four heads. Find the expected value and standard deviation of your *net* win. What is the probability that after 3 rounds of this game you will be winning (net) more than \$15?