1. Problem 9.10, page 275 in the text.

2. A certain basketball player takes 30 shots in a game. Suppose the player is a 60% shooter (meaning 60% of their shots go in). What is the expected number of times that this player will hit two shots in a row, in such a game? Hint: let X_1 equal 1 if the first two shots go in, and 0 otherwise. Let X_2 equal 1 if the second and third shots go in, and 0 otherwise. And so on. Then let $X = X_1 + X_2 + ...$, and compute $E(X)$.

3. You pay \$6 to play a game where a fair die is rolled. You lose if the die lands on an even number, you receive \$9 if the die lands on a 1 or a 3, and you receive \$12 if it lands on a 5.

   (a) Find the probability mass function for your payoff X (meaning how much you receive minus the \$6 put in to play).

   (b) What are your expected winnings (meaning how much you receive minus the \$6 put in to play) from this game?

4. You pay \$5 to play the following game. You toss an unfair coin, with P(heads)= 1/3. If the coin lands heads, you choose two marbles at random from a jar containing 3 red marbles and 2 blue marbles. If the coin lands tails, you choose two marbles from a jar containing 4 red marbles and 2 blue marbles. You are then awarded \$15 if you end up with two red marbles; otherwise, you receive \$0.

   (a) Find the probability mass function for your payoff X (meaning how much you receive minus the \$5 put in to play).

   (b) What are your expected winnings (meaning how much you receive minus the \$5 put in to play) from this game?

5. Show that, for μ a real number and σ a positive number, the function

$$f_{\mu,\sigma}(x) = \frac{1}{\sigma\sqrt{2\pi}} e^{-(x-\mu)^2/(2\sigma^2)}$$

   is a pdf, by showing that

$$\int_{-\infty}^{\infty} f_{\mu,\sigma}(x)\, dx = 1.$$

   You may use the fact, which was shown in a homework exercise, that

$$\int_{-\infty}^{\infty} e^{-x^2/2}\, dx = \sqrt{2\pi}.$$

   Hint: in the integral you're trying to evaluate, make the substitution $u = (x - \mu)/\sigma$.