1. (1.27)
A person with $2 in her pocket bets $1, even money, on the flip of a coin, and she continues to bet $1 as long as she has any money.

Draw a tree diagram to show the various things that can happen during the first four flips of the coin. After the fourth flip of the coin, in how many of the cases will she be

a) exactly even;
b) exactly $2 ahead?

2. (2.50)
In a group of 200 college students, 138 are enrolled in a course in psychology, 115 are enrolled in a course in sociology, and 91 are enrolled in both.

How many of these students are not enrolled in either course? (Hint: Draw a suitable Venn diagram and fill in the numbers associated with the various regions.)

3. (3.69)
Given the values of the joint probability distribution of $X$ and $Y$ shown in the table

<table>
<thead>
<tr>
<th>$y$</th>
<th>$-1$</th>
<th>1</th>
</tr>
</thead>
<tbody>
<tr>
<td>-1</td>
<td>0.125</td>
<td>0.5</td>
</tr>
<tr>
<td>0</td>
<td>0</td>
<td>0.25</td>
</tr>
<tr>
<td>1</td>
<td>0.125</td>
<td>0</td>
</tr>
</tbody>
</table>

Find

a) The marginal distribution of $X$;
b) The marginal distribution of $Y$;
c) The conditional distribution of $X$ given $Y = -1$.

4. (4.8)
Find the expected value of the random variable $X$ whose probability density is given by

$$f(x) = \begin{cases} 
  x & 0 < x < 1 \\
  2 - x & 1 \leq x < 2 \\
  0 & \text{elsewhere}
\end{cases}$$

5. (4.69)
The amount of time it takes a person to be served at a given restaurant is a random variable with the probability density

$$f(x) = \begin{cases} 
  \frac{1}{4} e^{-\frac{x}{4}} & x > 0 \\
  0 & \text{elsewhere}
\end{cases}$$

Find the mean and the variance of this variable.
6. (5.42.a)
If 40 percent of the mice used in an experiment will become very aggressive within 1 minute after having been administered an experimental drug, find the probability that exactly six of 15 mice that have been administered the drug will become very aggressive within 1 minute, using the formula for the binomial distribution.

7. (5.59.a)
An expert sharpshooter missed the target 5 percent of the time. Find the probability that she will miss the target for the second time on the fifteenth shot using the formula for the negative binomial distribution.

8. (6.10)
Find the probabilities that the value of a random variable will exceed 4 if it has a gamma distribution with
a) $\alpha = 2$ and $\beta = 3$

b) $\alpha = 3$ and $\beta = 4$

9. (7.1)
If a probability density of $X$ is given by

$$f(x) = \begin{cases} 2xe^{-x^2} & x > 0 \\ 0 & \text{elsewhere} \end{cases}$$

and $Y = X^2$, find
a) The distribution function of $Y$;  
b) The probability density of $Y$.

10. (7.22)
If the joint probability density of $X_1$ and $X_2$ is given by

$$f(x_1, x_2) = \frac{x_1x_2}{36}$$

for $x_1 = 1, 2, 3$ and $x_2 = 1, 2, 3$, find
a) The probability distribution of $X_1X_2$;

b) The probability distribution of $X_1/X_2$. 