11. A mutual fund company offers its customers several different funds: a money-market fund, three different bond funds (short, intermediate, and long-term), two stock funds (moderate and high-risk), and a balanced fund. Among customers who own shares in just one fund, the percentages of customers in the different funds are as follows:

<table>
<thead>
<tr>
<th>Fund Type</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Money-market</td>
<td>20%</td>
</tr>
<tr>
<td>Short bond</td>
<td>15%</td>
</tr>
<tr>
<td>Intermediate bond</td>
<td>10%</td>
</tr>
<tr>
<td>Long bond</td>
<td>5%</td>
</tr>
<tr>
<td>High-risk stock</td>
<td>18%</td>
</tr>
<tr>
<td>Moderate-risk stock</td>
<td>25%</td>
</tr>
<tr>
<td>Balanced</td>
<td>7%</td>
</tr>
</tbody>
</table>

A customer who owns shares in just one fund is randomly selected.

a. What is the probability that the selected individual owns shares in the balanced fund?

b. What is the probability that the individual owns shares in a bond fund?

c. What is the probability that the selected individual does not own shares in a stock fund?
12. Consider randomly selecting a student at a certain university, and let $A$ denote the event that the selected individual has a Visa credit card and $B$ the analogous event for a MasterCard. Suppose $P(A) = 0.5$, $P(B) = 0.4$ and $P(A \cap B) = 0.25$.

a. Compute the probability that the selected individual has at least one of the two types of cards (i.e., the probability of the event $A \cup B$).

b. What is the probability the selected individual has neither type of card?

c. Describe, in terms of $A$ and $B$, the event that the selected student has a Visa card but not a MasterCard, and then calculate the probability of this event.
13. A computer consulting firm presently has bids out on three projects. Let $A_i = \{\text{awarded project } i\}$ for $i = 1, 2, 3$, and suppose that

\[
P(A_1) = 0.22 \\
P(A_2) = 0.25 \\
P(A_3) = 0.28 \\
P(A_1 \cap A_2) = 0.11 \\
P(A_1 \cap A_3) = 0.05 \\
P(A_2 \cap A_3) = 0.07 \\
P(A_1 \cap A_2 \cap A_3) = 0.01
\]

Express in words each of the following events, and then compute the probability of each event.

a. $A_1 \cup A_2$

b. $A_1' \cap A_2'$ \[\text{[Hint:} (A_1 \cup A_2)' = A_1' \cap A_2'\]\n
c. $A_1 \cup A_2 \cup A_3$

d. $A_1' \cap A_2' \cap A_3'$

e. $A_1' \cap A_2' \cap A_3$

f. $(A_1' \cap A_2') \cup A_3$
14. A utility company offers a lifeline rate to any household whose electricity usage falls below 240 kWh during a particular month. Let $A$ denote the event that a randomly selected household in a certain community does not exceed the lifeline usage during January, and let $B$ be the analogous event for the month of July ($A$ and $B$ refer to the same household).

Suppose

$P(A) = 0.8$

$P(B) = 0.7$

$P(A \cup B) = 0.9$

Compute the following.

a. $P(A \cap B)$

b. The probability that the lifeline usage amount is exceeded in exactly one of the two months. Describe this event in terms of $A$ and $B$.

15. Consider the type of clothes dryer (gas or electric) purchased by each of five different customers at a certain store.

a. If the probability that at most one of these purchases an electric dryer is 0.428, what is the probability that at least two purchase an electric dryer?

b. If $P$(all five purchase gas) = 0.116 and $P$(all five purchase electric) = 0.005, what is the probability that at least one of each type is purchased?
19. Human visual inspection of solder joints on printed circuit boards can be very subjective. Part of the problem stems from the numerous types of solder defects (e.g., pad nonwetting, knee visibility, voids) and even the degree to which a joint possesses one or more of these defects. Consequently, even highly trained inspectors can disagree on the disposition of a particular joint. In one batch of 10,000 joints, inspector A found 724 that were judged defective, inspector B found 751 such joints, and 1159 of the joints were judged defective by at least one of the inspectors. Suppose that one of the 10,000 joints is randomly selected.

a. What is the probability that the selected joint was judged to be defective by neither of the two inspectors?

b. What is the probability that the selected joint was judged to be defective by inspector B but not by inspector A?
20. A certain factory operates three different shifts. Over the last year, 200 accidents have occurred at the factory. Some of these can be attributed at least in part to unsafe working conditions, whereas the others are unrelated to working conditions. The accompanying table gives the percentage of accidents falling in each type of accident-shift category.

<table>
<thead>
<tr>
<th>Shift</th>
<th>Unsafe conditions</th>
<th>Unrelated to conditions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Day</td>
<td>10%</td>
<td>35%</td>
</tr>
<tr>
<td>Swing</td>
<td>8%</td>
<td>20%</td>
</tr>
<tr>
<td>Night</td>
<td>5%</td>
<td>22%</td>
</tr>
</tbody>
</table>

Suppose one of the 200 accident reports is randomly selected from a file of reports, and the shift and type of accident are determined.

a. What are the simple events?

b. What is the probability that the selected accident was attributed to unsafe conditions?

c. What is the probability that the selected accident did not occur on the day shift?
21. An insurance company offers four different deductible levels - none, low, medium, and high - for its homeowner's policyholders and three different levels - low, medium, and high - for its automobile policyholders. The accompanying table gives proportions for the various categories of policyholders who have both types of insurance. For example, the proportion of individuals with both low homeowner's deductible and low auto deductible is 0.06 (6% of all such individuals).

<table>
<thead>
<tr>
<th>Homeowner's</th>
<th>Auto</th>
<th>N</th>
<th>L</th>
<th>M</th>
<th>H</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low</td>
<td>.04</td>
<td>.06</td>
<td>.05</td>
<td>.03</td>
<td></td>
</tr>
<tr>
<td>Medium</td>
<td>.07</td>
<td>.10</td>
<td>.20</td>
<td>.10</td>
<td></td>
</tr>
<tr>
<td>High</td>
<td>.02</td>
<td>.03</td>
<td>.15</td>
<td>.15</td>
<td></td>
</tr>
</tbody>
</table>

Suppose an individual having both types of policies is randomly selected.

a. What is the probability that the individual has a medium auto deductible and a high homeowner's deductible?

b. What is the probability that the individual has a low auto deductible? A low homeowner's deductible?

c. What is the probability that the individual is in the same category for both auto and homeowner's deductibles?

d. Based on your answer in part (c), what is the probability that the two categories are different?

e. What is the probability that the individual has at least one low deductible level?

f. Using the answer in part (e), what is the probability that neither deductible level is low?
22. The route used by a certain motorist in commuting to work contains two intersections with traffic signals. The probability that he must stop at the first signal is .4, the analogous probability for the second signal is .5, and the probability that he must stop at least one of the two signals is .6. What is the probability that he must stop

a. At both signals?

b. At the first signal but not at the second one?

c. At exactly one signal?