List the outcomes comprising the specified event.

1) Three board members for a nonprofit organization will be selected from a group of five people. The board members will be selected by drawing names from a hat. The names of the five possible board members are Allison, Betty, Charlie, Dave, and Emily. The possible outcomes can be represented as follows.

ABC  ABD  ABE  ACD  ACE
ADE  BCD  BCE  BDE  CDE

Here, for example, ABC represents the outcome that Allison, Betty, and Charlie are selected to be on the board. List the outcomes that comprise the following event.

\[ A = \text{event that Betty and Emily are selected} \]

Find the indicated probability.

2) If you flip a coin three times, the possible outcomes are HHH HHT HTH HTT THH THT TTH TTT. What is the probability of getting at least two tails?

3) If two balanced die are rolled, the possible outcomes can be represented as follows.

(1, 1) (2, 1) (3, 1) (4, 1) (5, 1) (6, 1)
(1, 2) (2, 2) (3, 2) (4, 2) (5, 2) (6, 2)
(1, 3) (2, 3) (3, 3) (4, 3) (5, 3) (6, 3)
(1, 4) (2, 4) (3, 4) (4, 4) (5, 4) (6, 4)
(1, 5) (2, 5) (3, 5) (4, 5) (5, 5) (6, 5)
(1, 6) (2, 6) (3, 6) (4, 6) (5, 6) (6, 6)

Determine the probability that the sum of the dice is 11.

4) A committee of three people is to be formed. The three people will be selected from a list of five possible committee members. A simple random sample of three people is taken, without replacement, from the group of five people. If the five people are represented by the letters A, B, C, D, E, the possible outcomes are as follows.

ABC
ABD
ABE
ACD
ACE
ADE
BCD
BCE
BDE
CDE

Determine the probability that C and D are both included in the sample.
Describe the specified event in words.

5) The age distribution of students at a community college is given below.

<table>
<thead>
<tr>
<th>Age (years)</th>
<th>Number of students (f)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Under 21</td>
<td>4946</td>
</tr>
<tr>
<td>21–25</td>
<td>4808</td>
</tr>
<tr>
<td>26–30</td>
<td>2673</td>
</tr>
<tr>
<td>31–35</td>
<td>2036</td>
</tr>
<tr>
<td>36–40</td>
<td>612</td>
</tr>
<tr>
<td>Over 40</td>
<td>425</td>
</tr>
</tbody>
</table>

A student from the community college is selected at random. The events A and B are defined as follows.

A = event the student is between 21 and 40 inclusive
B = event the student is over 25

Describe the event (A or B) in words.

A) The event the student is between 21 and 25 inclusive
B) The event the student is 21 or over
C) The event the student is between 24 and 25 inclusive
D) The event the student is between 25 and 40 inclusive

6) When a quarter is tossed four times, 16 outcomes are possible.

HHHH  HHTH  HHTH  HHTT
HHHT  HTHT  HTTH  HTTT
THHH  THHT  THTH  THTT
TTHH  TTHT  TTTH  THTT

Here, for example, HTTH represents the outcome that the first toss is heads, the next two tosses are tails, and the fourth toss is heads. The events A and B are defined as follows.

A = event exactly two tails are tossed
B = event the first toss is heads

Describe the event (A or B) in words.

A) Event that exactly two tails are tossed or the first toss is heads or both
B) Event that exactly two tails are tossed and the first toss is heads
C) Event that exactly two tails are tossed or the first toss is heads but not both
D) Event that the first toss is heads or the last two tosses are tails or both
Determine the number of outcomes that comprise the specified event.

7) The age distribution of students at a community college is given below.

<table>
<thead>
<tr>
<th>Age (years)</th>
<th>Number of students (f)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Under 21</td>
<td>2183</td>
</tr>
<tr>
<td>21–25</td>
<td>2077</td>
</tr>
<tr>
<td>26–30</td>
<td>1069</td>
</tr>
<tr>
<td>31–35</td>
<td>825</td>
</tr>
<tr>
<td>Over 35</td>
<td>203</td>
</tr>
</tbody>
</table>

A student from the community college is selected at random. The events A and B are defined as follows.

A = event the student is between 21 and 35 inclusive  
B = event the student is 26 or over

Determine the number of outcomes that comprise the event (A & B).

A) 2097  B) 1894  C) 6068  D) 4174

Determine whether the events are mutually exclusive.

8) Three board members for a nonprofit organization will be selected from a group of five people.

The board members will be selected by drawing names from a hat. The names of the five possible board members are Allison, Betty, Charlie, Dave, and Emily. The possible outcomes can be represented as follows.

ABC  ABD  ABE  ACD  ACE  
ADE  BCD  BCE  BDE  CDE

Here, for example, ABC represents the outcome that Allison, Betty, and Charlie are selected to be on the board. The events A, B, and C are defined as follows.

A = event that Dave and Allison are both selected  
B = event that more than one man is selected  
C = event that fewer than two women are selected

Is the collection of events A, B, and C mutually exclusive?

A) Yes  B) No
9) The number of hours needed by sixth grade students to complete a research project was recorded with the following results.

<table>
<thead>
<tr>
<th>Hours</th>
<th>Number of students (f)</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>15</td>
</tr>
<tr>
<td>5</td>
<td>11</td>
</tr>
<tr>
<td>6</td>
<td>19</td>
</tr>
<tr>
<td>7</td>
<td>6</td>
</tr>
<tr>
<td>8</td>
<td>9</td>
</tr>
<tr>
<td>9</td>
<td>16</td>
</tr>
<tr>
<td>10+</td>
<td>2</td>
</tr>
</tbody>
</table>

A student is selected at random. The events A, B, and C are defined as follows.

A = event the student took more than 9 hours
B = event the student took less than 6 hours
C = event the student took between 7 and 9 hours inclusive

Is the collection of events A, B, and C mutually exclusive?
A) Yes  B) No

Find the indicated probability by using the special addition rule.

10) A percentage distribution is given below for the size of families in one U.S. city.

<table>
<thead>
<tr>
<th>Size</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>46.9</td>
</tr>
<tr>
<td>3</td>
<td>21.9</td>
</tr>
<tr>
<td>4</td>
<td>18.8</td>
</tr>
<tr>
<td>5</td>
<td>8.1</td>
</tr>
<tr>
<td>6</td>
<td>2.8</td>
</tr>
<tr>
<td>7+</td>
<td>1.5</td>
</tr>
</tbody>
</table>

A family is selected at random. Find the probability that the size of the family is at most 3.
Round approximations to three decimal places.

11) The distribution of B.A. degrees conferred by a local college is listed below, by major.

<table>
<thead>
<tr>
<th>Major</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>English</td>
<td>2073</td>
</tr>
<tr>
<td>Mathematics</td>
<td>2164</td>
</tr>
<tr>
<td>Chemistry</td>
<td>318</td>
</tr>
<tr>
<td>Physics</td>
<td>856</td>
</tr>
<tr>
<td>Liberal Arts</td>
<td>1358</td>
</tr>
<tr>
<td>Business</td>
<td>1676</td>
</tr>
<tr>
<td>Engineering</td>
<td>868</td>
</tr>
</tbody>
</table>

9313

What is the probability that a randomly selected degree is in English or Mathematics?
Find the indicated probability by using the general addition rule.

12) Let A and B be events such that \( P(A) = \frac{1}{7} \), \( P(A \text{ or } B) = \frac{1}{2} \), and \( P(A \text{ and } B) = \frac{1}{11} \). Determine \( P(B) \).

13) Of the 98 people who answered "yes" to a question, 9 were male. Of the 96 people who answered "no" to the question, 8 were male. If one person is selected at random from the group, what is the probability that the person answered "yes" or was male?

Use the general multiplication rule to find the indicated probability.

14) Among the contestants in a competition are 36 women and 28 men. If 5 winners are randomly selected, what is the probability that they are all men?

15) Two cards are selected without replacement from a standard deck of 52 cards. What is the probability that both cards are the same color (i.e., either both black or both red)?

Determine whether the events are independent.

16) An auto insurance company was interested in investigating accident rates for drivers in different age groups. The following contingency table was based on a random sample of drivers and classifies drivers by age group and number of accidents in the past three years.

<table>
<thead>
<tr>
<th>Age Group</th>
<th>Under 25</th>
<th>25-45</th>
<th>Over 45</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>A_1 ( G_1 )</td>
<td>103</td>
<td>147</td>
<td>280</td>
<td>530</td>
</tr>
<tr>
<td>A_2 ( G_2 )</td>
<td>51</td>
<td>59</td>
<td>70</td>
<td>180</td>
</tr>
<tr>
<td>A_3 ( G_3 )</td>
<td>26</td>
<td>14</td>
<td>25</td>
<td>65</td>
</tr>
<tr>
<td>Total</td>
<td>180</td>
<td>220</td>
<td>375</td>
<td>775</td>
</tr>
</tbody>
</table>

Suppose that one of the drivers is selected at random. Are the events \( G_1 \) and \( A_3 \) independent?

A) No  B) Yes
17) When a coin is tossed three times, eight equally likely outcomes are possible.

HHH  HHT  HTH  HTT
THH  THT  TTH  TTT

Let
A = event the first two tosses are the same
B = event the last two tosses are the same.

Are A and B independent events?
A) Yes  B) No

18) When a balanced die is rolled twice, 36 equally likely outcomes are possible. Let

A = event the sum of the two rolls is 8
B = event the first roll comes up 3.

Are A and B independent events?
A) No  B) Yes

Use Bayes' rule to find the indicated probability.

19) Two stores sell a certain product. Store A has 31% of the sales, 1% of which are of defective items, and store B has 69% of the sales, 4% of which are of defective items. The difference in defective rates is due to different levels of pre-sale checking of the product. A person receives a defective item of this product as a gift. What is the probability it came from store B?

Solve the problem.

20) A musician plans to perform 5 selections. In how many ways can she arrange the musical selections?

21) How many ways can an IRS auditor select 4 of 9 tax returns for an audit?

22) There are 10 members on a board of directors. If they must elect a chairperson, a secretary, and a treasurer, how many different slates of candidates are possible?

23) A poker hand consists of 5 cards dealt from an ordinary deck of 52 playing cards. How many different hands are there consisting of four hearts and one spade?

Use counting rules to determine the probability.

24) In a card game, each player is dealt 4 cards from an ordinary deck of 52 playing cards. Determine the probability of being dealt a hand containing three cards of one denomination and one of another.