Additional Probability Problems

1. A survey has shown that 52% of the women in a certain community work outside the home. Of these women, 64% are married, while 86% of the women who do not work outside the home are married. Find the probability that a woman in the community is:

   a. married. (.7456)
   b. single woman working outside the home. (.1872)

2. A certain college student receives heavy sweaters from her aunt at the first sign of cold weather. Suppose the probability that a sweater is the wrong size is .47, the probability that it is a loud color is .59, and the probability that it is both the wrong size and a loud color is .31.

   a. Find the probability that the sweater is the correct size and not a loud color. (.25)
   b. Find the probability that the sweater is the correct size or not a loud color. (.69)

3. Voter support for political term limits is strong in many parts of the US. A poll conducted by the Field Institute in California showed support for term limits by a 2-1 margin. The results of this poll of 347 registered voters are given in the table:

<table>
<thead>
<tr>
<th></th>
<th>For (F)</th>
<th>Against (A)</th>
<th>No Opinion (N)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Republic (R)</td>
<td>.28</td>
<td>.10</td>
<td>.02</td>
</tr>
<tr>
<td>Democrat (D)</td>
<td>.31</td>
<td>.16</td>
<td>.03</td>
</tr>
<tr>
<td>Other (O)</td>
<td>.06</td>
<td>.04</td>
<td>.00</td>
</tr>
</tbody>
</table>

   Calculate the following probabilities:

   a. P(R). (.4)
   b. P(F). (.65)
   c. P(R and F). (.28)
   d. P(F|R). (.7)
   e. P(F|D). (.62)
   f. P(F|O). (.6)
   g. P(D|A). (.53)
   h. P(R|F). (.43)
4. In a genetics experiment, the researcher mated two Drosophila fruit flies and observed the traits of the offspring. The results are shown in the table.

<table>
<thead>
<tr>
<th>Eye Color</th>
<th>Wing Size</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal</td>
<td>Normal</td>
<td>140</td>
<td>6</td>
</tr>
<tr>
<td>Vermillion</td>
<td>Vermillion</td>
<td>3</td>
<td>151</td>
</tr>
</tbody>
</table>

Calculate the following probabilities:

a. normal eye color and normal wing size. (.47)
b. vermillion eyes. (.51)
c. either vermillion eyes or miniature wings or both. (.53)

6. In a color preference experiment, eight toys are placed in a container. The toys are identical except for color – two are red, and six are green. A child is asked to choose two toys at random. What is the probability that the child chooses the two red toys? (.0357)

7. “Whistle blowers” is the name given to employees who report corporate fraud, theft, and other unethical and perhaps criminal activities by fellow employees or by their employer. Although there is legal protection for whistle blowers, it has been reported that approximately 23% of those who reported fraud suffered reprisals such as demotion or poor performance ratings. Suppose the probability that an employee will fail to report a case of fraud is .69. Find the probability that a worker who observes a case of fraud will report it and will subsequently suffer some form of reprisal. (.0713)

8. A salesperson figures that the probability of her making a sale during the first contact with a client is .4 but improves to .55 on the second contact for selling the same item if the client did not buy during the first contact. Calculate the probabilities for these events:

a. the client will buy. (.73)
b. The client will not buy. (.27)

9. A man takes either a bus or the subway to work with probabilities .3 and .7, respectively. When he takes the bus, he is late 30% of the days. When he takes the subway, he is late 20% of the days. What is the probability that the man is late for work? (.23)

10. Suppose that P(A) is 0.3, P(B)=0.4, and P(A and B)=0.12. Calculate the following probabilities:

a. P(A|B). (.3)
b. P(B|A). (.4)
c. P(A or B). (.58)
11. A parts store sells both new and used parts. Sixty percent of the parts in stock are used. Sixty-one percent are used or defective. If 5% of the store’s parts are defective, what percentage are both used and defective? (.04)

<table>
<thead>
<tr>
<th></th>
<th>Men</th>
<th>Women</th>
<th>Boys</th>
<th>Girls</th>
</tr>
</thead>
<tbody>
<tr>
<td>Survived</td>
<td>332</td>
<td>318</td>
<td>29</td>
<td>27</td>
</tr>
<tr>
<td>Died</td>
<td>1360</td>
<td>104</td>
<td>35</td>
<td>18</td>
</tr>
</tbody>
</table>

12. a. If 1 passenger is randomly selected, what is the probability that this person survived, given that the selected person is a man? (.196)
b. If 1 passenger is randomly selected, what is the probability that this person is woman or girl? (.21)
c. If 1 passenger is randomly selected, what is the probability that this person is a survivor and a woman? (.143)

13. Of 18 fast food restaurants in a city, seven are in violation of sanitary standards, eight are in violation of safety standards, and four are in violation of both. If a fast food restaurant is chosen at random, what is the probability that it is in compliance of both safety and sanitary standards? (.3889)

14. The probability that A occurs is 0.3, the probability that B does not occur is 0.6, and the probability that either A or B occurs is 0.5. Find
a. The probability that A does not occur. (.7)
b. The probability that both A and B occur. (.2)
c. The probability that A occurs and B does not occur. (.1)

15. A business employs 600 men and 400 women. Five percent of the men and 10% of the women have been working there for more than 20 years. If an employee is selected by chance, what is the probability that the length of employment is more than 20 years? (.07)

16. A box contains four red and three blue poker chips. What is the probability when three are selected that all three will be red? (.1143)

17. Over the last several years the distribution of grades, A, B, C, D, and F in statistics classes have been 0.08, 0.26, 0.50, 0.10, 0.06, respectively. What is the probability that a randomly selected student from these classes attained a grade of C or better? (.84)

18. Records show that the probability that it rains in our town on a single day is 0.35. If rain on different days constitutes independent events, find the probability that
a. Rains on neither of two given days. (.4225)
b. Rains on both of two given days. (.1225)
c. Rains on exactly one of the two given days. (.4550)
19. Of the patients examined at a local clinic, 0.20 had high blood pressure, 0.40 had excessive weight, and 0.10 had both. If one of these patients is selected at random, what is the probability that he has at least one of these characteristics? (.5)

20. Three flower seeds are randomly selected from a package that contains six seeds for yellow flowers, six seeds for red flowers, and three seeds for white flowers.
   a. What is the probability that all three seeds will produce yellow flowers? (.0440)
   b. What is the probability that the three seeds selected are all for the same flower color? (.0902)

21. An eight-cylinder engine (8 spark plugs) has two spark plugs that need to be replaced.
   a. If one spark plug is replaced randomly, what is the probability that one of the bad ones is replaced? (.25)
   b. If two are replaced randomly, what is the probability that both bad ones are replaced? (.0357)
   c. If three are replaced randomly, what is the probability that both bad ones are replaced? (.1071)

22. If the probability that I will be alive in 15 years is 0.7 and the probability that you will be alive in 15 years is 0.9, what is
   a. The probability that we are both alive in 15 years? (.63)
   b. The probability that neither of us is alive in 15 years? (.03)

23. The probability that a married man drinks tea is 0.4 and the probability that a married woman drinks tea is 0.6. The probability that the man drinks tea, given that his wife does, is 0.5. Find
   a. The probability that they both drink tea. (.3)
   b. The probability that the wife drinks tea given that her husband does. (.75)
   c. The probability that neither drink tea. (.3)

24. In our college it is known that ¾ of the students are under 21 years of age. Also, 3/5 of the students are female and ½ of all students are female and under 21. If one student is selected at random, what is the probability that this student is male and over 21? (.15)

25. Suppose that when a job candidate comes to interview for a job at K Industries, the probability that the candidate will want the job (A) after the interview is 0.88. Also, the probability that K Industries will want the candidate (B) is 0.45.
   a. If the P(AB) = 0.92, find the probability P(A and B). (.414)
   b. Find the probability P(B|A). (.4705)

26. Bob has an alarm which rings at the appointed time with a probability 0.7. If the alarm rings, it will wake him in time to make his morning class with a probability 0.8. If the alarm does not ring, he will wake in time to make his morning class with probability 0.2. What is the probability that Bob wakes in time to make his morning class? (.62)
27. A city council consists of 10 members. Four are Republicans, three are Democrats, and three are Independents. If a committee of three is to be selected, find the probability of selecting the following.

   a. All Republicans. (.0333)
   b. One of each party. (.3)
   c. Two Democrats and one Independent. (.075)

28. How many different tests can be made from a test bank of 20 questions if the test consists of 5 questions? (15504)

29. Wake Up cereal comes in two types, crispy and crunchy. If a researcher has 10 boxes of each, how many ways can she select 3 boxes of each for a quality control test? (14400)

30. A package contains 12 resistors, 3 of which are defective. If four are selected, find the probability of getting the following.

   a. No defective resistors. (.2545)
   b. One defective resistor. (.5091)

31. Ninety percent of the trees planted by a landscaping firm survive. What is the probability that eight or more of the ten trees they just planted will survive? (.9298)

32. The survival rate during a risky operation for patients with no other hope of survival is 80%. What is the probability that exactly four of the next five patients survive this operation? (.4096)

33. A basketball player has a history of making 80% of the foul shots taken during games. What is the probability that he will miss three of the next five foul shots he takes? (.0512)

34. One-fourth of a certain breed of rabbits are born with long hair. What is the probability that in a litter of six rabbits, exactly three will have long hair? (.1318)

35. Gerald Kushel, Ed.D., was interviewed by *Bottom Line/Personal* on the secrets of successful people. To study success, Kushel questioned 1200 people, among whom were lawyers, artists, teachers, and students. He found that 15% enjoy neither their jobs nor their personal lives, 80% enjoy their jobs but not their
personal lives, and 4% enjoy both their jobs and their personal lives. Determine the percentage (or probability) of the people interviewed who

a. enjoy either their jobs or their personal lives. (.85)
b. enjoy their personal lives but not their jobs. (.01)

36. The U.S. National Center for Education Statistics publishes information about school enrollment in Digest of Education Statistics. The following table provides enrollment in public and private schools by level. Frequencies are in thousands of students.

<table>
<thead>
<tr>
<th>School</th>
<th>Public</th>
<th>Private</th>
</tr>
</thead>
<tbody>
<tr>
<td>Elementary</td>
<td>26,951</td>
<td>3,600</td>
</tr>
<tr>
<td>High School</td>
<td>12,215</td>
<td>1,400</td>
</tr>
<tr>
<td>College</td>
<td>9,612</td>
<td>2,562</td>
</tr>
</tbody>
</table>

a. Determine the probability of being enrolled in a private college. (.0455)
b. Determine the probability of being enrolled in an elementary school. (.5423)
c. Determine the probability of being enrolled in a private school if enrolled in high school. (.1028)

37. Suppose that P(A) = .4, P(B) = .5 and the probability that either A or B occurs is .7. Find the probability that A occurs given that B occurs. (.4)

38. Records of student patients at a dentist’s office concerning fear of visiting the dentist suggest the following proportions.

<table>
<thead>
<tr>
<th>School</th>
<th>Elementary</th>
<th>Middle</th>
<th>High</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fear</td>
<td>.12</td>
<td>.08</td>
<td>.05</td>
</tr>
<tr>
<td>No Fear</td>
<td>.28</td>
<td>.25</td>
<td>.22</td>
</tr>
</tbody>
</table>

Find the following probabilities of a randomly selected student.

a. Student is fearful (.25)
b. Student attends middle school (.33)
c. Student is fearful and attends middle school (.08)
d. Student is fearful, given that he/she attends middle school (.24)

39. The following table shows the results of a survey in which workers ages 25 to 64 were asked if they have at least one month’s income set aside for emergencies.

<table>
<thead>
<tr>
<th>Income Level</th>
<th>Men</th>
<th>Women</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 1 month’s income</td>
<td>17</td>
<td>16</td>
</tr>
<tr>
<td>≥ 1 month’s income</td>
<td>85</td>
<td>87</td>
</tr>
</tbody>
</table>
a. Find the probability that a male worker has one month’s income or more set aside for emergencies. (.4146)
b. Given that a worker is male, find the probability that the worker has less than one month’s income. (.1667)
c. Given that a worker has one month’s income or more, find the probability that the worker is a female. (.5058)

40. A college has an undergraduate enrollment of 3500. Of these, 860 are business majors and 1800 are women. Of the business majors, 425 are women. If a college newspaper conducts a poll and selects students at random to answer a survey, find the probability that a selected student is a woman or a business major. (.6386)