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## Chapter 6 Review

$\qquad$ 1. At Kennett High School, $5 \%$ of athletes play both football and some other contact sport, $30 \%$ play football, and $40 \%$ play other contact sports. If there are 200 athletes, how many play neither football nor any other contact sport?
a. 20
b. 70
c. 80
d. 100
e. 130

Use the following table for questions 2-6: A survey of introductory statistics class in Autumn 2003 asked students their gender and whether or not they ate breakfast that morning of the survey. Results are as follows:

|  | Yes | No | Total |
| :---: | :---: | :---: | :---: |
| Male | 66 | 66 | 132 |
| Female | 125 | 74 | 199 |
| Total | 191 | 140 | 331 |

2. What is the probability that a randomly chosen student is female?
a. $132 / 331$
b. $199 / 331$
c. $125 / 331$
d. $125 / 199$
e. $125 / 331$
3. What is the probability that a randomly chosen student is a male or had breakfast?
a. $323 / 331$
b. $66 / 331$
c. $66 / 191$
d. $257 / 331$
e. $74 / 331$
4. What is the probability that a randomly chosen student ate breakfast, given that she was a female?
a. $125 / 331$
b. $125 / 191$
c. $125 / 199$
d. 199/331
e. $191 / 331$
5. For the students in this sample, are the events "Male" and "Ate Breakfast" disjoint? Justify.
6. For the students in this sample, are the events "Male" and "Ate Breakfast" independent? Justify.
7. Security procedures at the U.S. Capitol require that all bags - meaning briefcases, backpacks, shopping bags, any carrying bag, and purses - must be screened. Currently, it is reported that $95 \%$ of all bags that contain illegal items trigger the alarm. $12 \%$ of all the bags that do not contain illegal items trigger the alarm. If 3 out of every 1,000 bags entering the Capitol contain an illegal item, what is the probability that a bag triggers the alarm will contain an illegal item?
a. 0.0233
b. 0.0029
c. 0.9500
d. 0.1140
e. 0.1225
$\qquad$ 8. A recent survey revealed that $58 \%$ of all families eat turkey at holiday meals, $44 \%$ eat ham, and $16 \%$ have both. What is the probability that a randomly selected family had neither turkey nor ham at their holiday?
a. $14 \%$
b. $42 \%$
c. $56 \%$
d. $84 \%$
e. not enough information
$\qquad$ 9. For two independent events $A$ and $B, P(A)=0.4$ and $P(B)=0.5$. Which of the following is the value of $P(A \cup B)$ ?
a. 0.2
b. 0.4
c. 0.5
d. 0.7
e. 0.9
8. For a set of ten boxes, seven contain one blue marble and one red marble, while the other three contain one blue marble and three red marbles. You select a marble from a box at random. Which of the following is the probability that the marble is blue?
a. $\frac{10}{26}$
b. $\frac{0.5+0.25}{2}$
c. $(0.7+0.5)(0.3+0.25)$
d. $\quad(0.7)(0.5)(0.3)(0.25)$
e. $\quad(0.7)(0.5)+(0.3)(0.25)$
9. Given two events, A and B, if $\mathrm{P}(\mathrm{A})=0.37, \mathrm{P}(\mathrm{B})=0.41$, and the $\mathrm{P}(\mathrm{A}$ or B$)=0.75$, the two events are
a. independent, but not mutually exclusive
b. mutually exclusive, but not independent
c. mutually exclusive and independent
d. neither mutually exclusive nor independent
e. It cannot be determined from the given information if the two events are independent or mutually exclusive
10. The Safe Drinking Water Hotline routinely tracks requests for information about water quality. The table shows the source of some of its calls.

| Souree | Tetephone | E-nail |
| :--- | :---: | :---: |
| Laboratories | 44 | 3 |
| Citzens | 1875 | 118 |
| Consultants | 234 | 19 |
| Emvironngental Groups | 62 | 1 |
| Governmental Groups | 83 | 7 |
| Schools | 64 | 2 |
| Other | 369 | 14 |

What is the probability that a request comes from a school given that it is an e-mail request?
a. $\frac{1}{62}$
b. $\frac{1}{63}$
c. $\frac{1}{82}$
d. $\frac{1}{117}$
e. $\frac{64}{90,123}$
13. In a certain community, $20 \%$ of cable subscribers also subscribe to the company's broadband service for their Internet connection. You would like to design a simulation to estimate the probability that one of six randomly selected subscribers has the broadband service. Using digits 0 through 9 , which of the following assignments would be appropriate to model this situation?
a. Assign even digits to broadband subscribers and odd digits to cable-only subscribers
b. Assign 0 and 1 to broadband subscribers and $2,3,4,5,6,7,8$, and 9 to cable-only subscribers
c. Assign 0,1 , and 2 to broadband subscribers and $3,4,5,6,7,8$, and 9 to cable-only subscribers
d. Assign 1, 2, 3, 4, 5, and 6 to broadband subscribers and 7, 8, 9, and 0 to cable-only subscribers
e. Assign $0,1,2$ to broadband subscribers; $3,4,5$ and 6 to cable only subscribers; ignore digits 7,8 , and 9

Use the following scenario for questions 14-18: Suppose that a small electronics store has 3 sales associates (A, B, and C). Over the last month, $50 \%$ of the sales were made by associate A, $30 \%$ by associate B, and $20 \%$ by associate C. When a sale is made, the associate will also try to sell the buyer extended warranty. During the same period, associate A sold an extended warranty to $35 \%$ of his buyers, associate B sold an extended warranty to $45 \%$ of her buyers, and associate C sold an extended warranty to only $10 \%$ of his buyers.
14. Express the given information in a tree diagram.
15. What is the probability that a randomly selected customer bought an extended warranty?
16. Given that a buyer bought an extended warranty, what $i$ the probability that is was from associate C ?
17. What is the probability that a randomly selected buyer bought from associate A but did not buy an extended warranty?
18. Given that a buyer did not buy an extended warranty, what is the probability that the buyer was not working with associate B?
19. Suppose that Dr. Gemma wants to choose a random sample of 6 teachers from the entire faculty. To do this, he writes each teacher's name on a piece of paper and mixes them up in a large grocery bag. Just as he is about to select the first name, a thoughtful statistics teacher suggests that he should stratify by department. He agrees and divides the faculty into 5 departments: Math (13 teachers), Science (12 teachers), English (18 teachers), Social Studies ( 10 teachers), and Other ( 37 teachers). However, since he already mixed up the names, he didn't want to have separate them all again. Instead, he will select names one at a time from the bag until he gets 1 Math, 1 Science, 1 English, 1 Social Studies and 2 Others. This means, however, that he may need to select more than 6 names (e.g. he may get more than 1 math teachers before he gets members from all the other departments). Design a simulation that could be used to estimate the average number of draws needed to get the desired sample. Clearly show your work by marking on or above the digits provided below. Only perform one trial (in other words, only do steps 1-5).

| 19223 | 95734 | 05756 | 28713 | 96479 | 12513 | 42544 | 82853 | 73676 | 47150 | 99400 | 01927 |
| :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- |
| 37754 | 42648 | 82425 | 36290 | 45467 | 71709 | 77558 | 00095 | 32863 | 29485 | 82226 | 90053 |

20. A laboratory test for the detection of a certain disease gives a positive result 5 percent of the time for people who do not have the disease. The test gives a negative result 0.3 percent of the time for people who have the disease. Large-scale studies have shown that the disease occurs in about 2 percent of the population.
a) What is the probability that a person selected at random would test positive for this disease? Show your work.
b) What is the probability that a person selected at random who tests positive for the disease does not have the disease? Show your work.
21. According to a recent national survey of college students, $55 \%$ admitted to having cheated at some time during the last year. What is the probability that for two randomly selected college students, one or the other would have cheated during the past year?
a. 0.5500
b. 0.7975
c. 0.3025
d. 0.2475
e. 0.2025
22. The Correcto Publishing Company claims that its publications will have errors only twice every 100 pages. What is the approximate probability that Anne will read 235 pages of a 790 -page book published by Correcto before finding an error?
a. $0.02 \%$
b. $2 \%$
c. $5 \%$
d. $16 \%$
e. $30 \%$
23. Over time, a student analyzes her ability to guess correctly after narrowing down multiple choice answers in a 5 -selection question. She discovers that if she narrows her answer set to 2 or 3 choices, her probability of getting the right answer is 0.8 , but if she still has 4 or 5 choices left, her probability of choosing a correct answer decreases drastically to 0.1 . Assuming that in general she can narrow her choices down to 2 or 3 choices $70 \%$ of the time, what is the probability that she will answer a question correctly any time she must guess? Justify your answer.
24. Kumar tosses a fair coin six times and happens to get heads all six times. He knows that in the long run the coin will only come up heads half the time, so he figures that the next toss is due to come up tails. Which of the following is the best assessment of Kumar's reasoning?
a. Kumar is wrong. Successive tosses of a fair coin are independent of each other. The six prior tosses are irrelevant to the next toss.
b. Kumar is wrong. The fact that he got heads six times in a row shows that the coin is "locked" into a streak. It is likely the streak will continue.
c. Kumar is right. The proportion of tosses that come up heads is too high after these six tosses, so the law of large numbers requires that tails start to show up in quantities that will allow the proportion to settle down to 0.5 . Another head will make this process even harder.
d. Kumar is right. The probability of getting seven heads in a row is very small, so it is likely he will get tails on the next toss.
e. Kumar is right. It is likely he will get tails on most of the next four tosses. This way he will have only six or seven heads out of ten tosses, which is a reasonable number.
25. Given two events $A$ and $B$, if the probability that $A$ occurs is 0.3 , the probability that $B$ occurs is 0.4 and the probability that $A$ or $B$ occurs is 0.55 , then the $\mathrm{P}(\mathrm{A} \mid \mathrm{B})$ is
a. $\quad 0.120$
b. 0.220
c. 0.375
d. 0.500
e. 0.700
26. Suppose that a completely randomized experiment was performed to compare two drugs given to stroke victims. After one year, 38 of 50 subjects had survived using drug A while only 35 of 50 had survived using drug B. Is drug A really better or could a difference of 3 or more people occurred due to randomization variability? A simulation was conducted assuming the two drugs were equally effective and the response variable was the difference in the number of survivors ( $\mathrm{A}-\mathrm{B}$ ). What can you conclude based on the results of the 100 trials shown below?

27. A certain genetic abnormality is present in $1 \%$ of all gerbils. A test for this abnormality correctly identifies its presence $98 \%$ of this time. It correctly identifies its absence $95 \%$ of the time. If a gerbil is selected at random from the population, what is the probability the test will show the presence of the abnormality?
a. 0.98
b. 0.95
c. 0.0593
d. 0.0495
e. 0.01
28. A lottery has a winner every day. The winning number is chosen randomly each day, and the probability of winning on any one day is 0.03 . Alice plans to buy a lottery ticket every day for 500 days, and Bob plans to by a ticket everyday for 5,000 days. Which of the following is the best assessment of how the law of large numbers applies to this situation?
a. Alice will probably have a higher proportion of wins than Bob
b. Bob will probably have a higher proportion of wins than Alice
c. The difference between Alice's proportion of wins and Bob's proportion of wins will probably be close to 0.03
d. Alice will probably have a proportion of wins closer to 0.03 than Bob
e. Bob will probably have a proportion of wins closer to 0.03 than Alice.
29. Suppose your teacher's stash of calculators contains 3 defective calculators and 17 good calculators. You select two calculators from the box for you and your friend to use on the AP Statistics exam. What calculations would you use to determine the probability that one of the calculators drawn will be defective?
a. $\frac{17}{20}+\frac{3}{19}$
b. $\left(\frac{17}{20}\right)\left(\frac{3}{20}\right)+\left(\frac{3}{20}\right)\left(\frac{2}{20}\right)$
c. $\left(\frac{17}{20}\right)\left(\frac{3}{19}\right)$
d. $\left(\frac{17}{20}\right)\left(\frac{3}{19}\right)+\left(\frac{3}{20}\right)\left(\frac{17}{19}\right)$
e. $\left(\frac{17}{20}\right)\left(\frac{11}{19}\right)\left(\frac{3}{18}\right)\left(\frac{2}{17}\right)$
30. The United States Youth Soccer Association estimates that $2 \%$ of those youths who play travel or select soccer, programs designed to develop soccer skills beyond a recreational level, try out for their state's Olympic Development Program (ODP). Of those who try out, $93 \%$ go on to play in college, while only $81 \%$ of those who don't try out end up playing in college. Of those who try our for ODP and go on to play in college, $5 \%$ receive some scholarship money to play. This is compared to $2 \%$ of those who don't try out for the ODP and go on to play in college.
a) Ryan's coach has encouraged him to try out for ODP. Ryan wants to know the chances of getting some money to play in college if he tries out. Determine the probability that Ryan would get money to play in college if he tried out.
b) What is the probability that a player selected at random got a college scholarship?
c) Given that a college player chosen at random receives scholarship money to play, what is the probability that the player did not try out for ODP?
31. Based on concerns over the eating habits and fitness level of school-aged children, the school board of a large district decided to offer healthy choices in the school cafeterias. They randomly selected students from all grade levels and provided them with proposed menus for the healthier lunches. Students were asked if they would purchase these lunches. The results of the survey are summarized in the table below by grade level.

|  | $K-5$ | $6-8$ | $9-12$ | Total |
| ---: | :---: | :---: | :---: | :---: |
| Yes | 6,231 | 5,964 | 3,493 | 15,688 |
| No | 2,016 | 1,912 | 3,939 | 7,867 |
|  | 8,247 | 7,676 | 7,432 | 23,555 |

What is the probability that a high school student selected at random would not plan to purchase the proposed healthier lunches?
a. 0.1672
b. 0.3339
c. 0.5300
d. 0.5007
e. 0.9447
32. Given two events, A and B , if $\mathrm{P}(\mathrm{A})=0.43, \mathrm{P}(\mathrm{B})=0.26$, and $\mathrm{P}(\mathrm{A} \cup \mathrm{B})=0.68$, then the two events are
a. mutually exclusive but not independent
b. independent but not mutually exclusive
c. mutually exclusive and independent
d. neither mutually exclusive nor independent
e. Not enough information is given to determine whether A and B are mutually exclusive or independent

Use the following information for the next 6 questions.

|  | Orderedon appetizer | Didnotorderon appetizer |
| :--- | :--- | :--- |
| Ordereda dessert | 30 | 44 |
| Didnotordera dessert | 12 | 24 |

33. What percentage of the people served by the waiter ordered dessert?
a. $38 \%$
b. $42 \%$
c. $49 \%$
d. $67 \%$
e. $74 \%$
34. What perentage of the people served by the waiter ordered an appetizer?
a. $38 \%$
b. $42 \%$
c. $49 \%$
d. $67 \%$
e. $74 \%$
35. What percentage of the people served by the waiter ordered either a dessert or an appetizer, but not both?
a. $44 \%$
b. $49 \%$
c. $51 \%$
d. $56 \%$
e. $64 \%$
36. Which o fthe following is the second most likely to occur?
a. Order dessert, but no appetizer
b. Order an appetizer, but no dessert
c. Order both an appetizer and dessert
d. Order an appetizer
e. Does not order dessert
37. What percentage of people served by the waiter who ordered dessert also ordered an appetizer?
a. $27 \%$
b. $38 \%$
c. $41 \%$
d. $68 \%$
e. $78 \%$
38. What percentage of people served by the waiter who didn't order an appetizer ordered dessert?
a. $40 \%$
b. $55 \%$
c. $60 \%$
d. $65 \%$
e. $92 \%$

Use the following information for the next 3 problems.

The following table represents the election results of a ballot proposal:

|  | Freshman | Sophomore | Junior | Senior |
| :--- | :--- | :--- | :--- | :--- |
| Yes | 210 | 100 | 110 | 130 |
| No | 165 | 210 | 245 | 140 |

39. Which of the following ordered presents the approval percentages from highest to lowest?
a. Freshman, Sophomore, Junior, Senior
b. Freshman, Senior, Sophomore, Junior
c. Senior, Freshman, junior, Sophomore
d. Senior, Sophomore, Freshman, Junior
e. Sophomore, Senior, Junior, Freshman
40. What percent of the "yes" votes were sophomores?
a. $13 \%$
b. $21 \%$
c. $29 \%$
d. $47 \%$
e. $86 \%$
41. Which class had an approval percentage closet to the overall school approval percentage?
a. Freshman
b. Sophomore
c. Junior
d. Senior
e. Not enough information in the table to determine the answer
