

4.9: Chapter 4 Exercises

? Chapter 4 Exercises

1. The number of M&M candies for each color found in a case were recorded in the table below.

Blue	Brown	Green	Orange	Red	Yellow	Total
481	371	483	544	372	369	2,620

What is the probability of selecting a red M&M?

- An experiment is to flip a fair coin three times. Write out the sample space for this experiment.
- An experiment is to flip a fair coin three times. What is the probability of getting exactly two heads?
- In the game of roulette, there is a wheel with spaces marked 0 through 36 and a space marked 00. Compute the probability of winning if you pick the number 30 and it comes up on the wheel.
- A raffle sells 1,000 tickets for \$35 each to win a new car. What is the probability of winning the car?
- Compute the probability of rolling a sum of two dice that is more than 7.
- Compute the probability of rolling a sum of two dice that is a 7 or a 12.
- A random sample of 500 people's marital status and biological sex from the 2010 United States Census are recorded in the following contingency table.

Count of Marital Status	Column Labels		
Row Labels	Female	Male	Grand Total
Divorced	21	17	38
Married/spouse absent	5	9	14
Married/spouse present	92	100	192
Never married/single	93	129	222
Separated	1	2	3
Widowed	20	11	31
Grand Total	232	268	500

- Compute the probability that a randomly selected person is single.
 - Compute the probability that a randomly selected person is not single.
 - Compute the probability that a randomly selected person is single or male.
 - Compute the probability that a randomly selected person is divorced or widowed.
 - Given that randomly selected person is male, what is the probability they are single?
 - Are the events divorced and male mutually exclusive?
 - Are the events divorced and male independent? Verify using statistics.
- The probability that a consumer entering a retail outlet for microcomputers and software packages will buy a computer of a certain type is 0.15. The probability that the consumer will buy a particular software package is 0.10. There is a 0.05 probability that the consumer will buy both the computer and the software package. What is the probability that the consumer will buy the computer or the software package?
 - A fitness center owner kept track of members over the last year. They recorded if the person stretched before they exercised, and whether they sustained an injury. The following contingency table shows their results. Select one member at random and find the following.

	Injury	No Injury	Total

Stretched	52	270	322
Did Not Stretch	21	57	78
Total	73	327	400

- $P(\text{No Injury})$
- $P(\text{Injury} \cap \text{Stretch})$
- Compute the probability that a randomly selected member stretched or sustained an injury.
- Compute the probability that a randomly selected member stretched given that they sustained an injury.
- $P(\text{Injury} \mid \text{Did Not Stretch})$

11. Giving a test to a group of students, the grades and if they were business majors are summarized below. One student is chosen at random. Give your answer as a decimal out to at least 4 places.

	A	B	C	Total
Business Majors	4	5	13	22
Non-business Majors	18	10	19	47
Total	22	15	32	69

- Compute the probability that the student was a non-business major or got a grade of C.
- Compute the probability that the student was a non-business major and got a grade of C.
- Compute the probability that the student was a non-business major given they got a C grade.
- Compute the probability that the student did not get a B grade.
- Compute $P(B \cup \text{Business Major})$.
- Compute $P(C \mid \text{Business Major})$.

12. A poll showed that 48.7% of Americans say they believe that Marilyn Monroe had an affair with JFK. What is the probability of randomly selecting someone who does not believe that Marilyn Monroe had an affair with JFK.

13. Your favorite basketball player is an 81% free throw shooter. Find the probability that they do not make their next free throw shot.

14. A report for a school's computer web visits for the past month obtained the following information. Find the percentage that visited none of these three sites last month. Hint: Draw a Venn Diagram.

- 37% visited Facebook.
- 42% visited LinkedIn.
- 29% visited Google.
- 27% visited Facebook and LinkedIn.
- 19% visited Facebook and Google.
- 19% visited LinkedIn and Google.
- 14% visited all three sites.

15. The smallpox data set provides a sample of 6,224 individuals from the year 1721 who were exposed to smallpox in Boston.

	Inoculated	Not Inoculated	Total
Lived	238	5136	5374
Died	6	844	850

Total	244	5980	6224
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Fenner F. 1988. Smallpox and Its Eradication (History of International Public Health, No. 6). Geneva: World Health Organization. ISBN 92-4-156110-6.

a) Compute the relative frequencies.

	Inoculated	Not Inoculated	Total
Lived			
Died			
Total			1

b) Compute the probability that a person was inoculated.

c) Compute the probability that a person lived.

d) Compute the probability that a person died or was inoculated.

e) Compute the probability that a person died if they were inoculated.

f) Given that a person was not inoculated, what is the probability that they died?

16. A certain virus infects one in every 400 people. A test used to detect the virus in a person is positive 90% of the time if the person has the virus and 8% of the time if the person does not have the virus. (This 8% result is called a false positive.) Let A be the event "the person is infected" and B be the event "the person tests positive."

a) Find the probability that a person has the virus given that they have tested positive, i.e. find $P(A|B)$.

b) Find the probability that a person does not have the virus given that they test negative, i.e. find $P(A^C|B^C)$.

17. A store purchases baseball hats from three different manufacturers. In manufacturer A's box there are 12 blue hats, 6 red hats, and 6 green hats. In manufacturer B's box there are 10 blue hats, 10 red hats, and 4 green hats. In manufacturer C's box, there are 8 blue hats, 8 red hats, and 8 green hats. A hat is randomly selected. Given that the hat selected is green, what is the probability that it came from manufacturer B's box? Hint: Make a table with the colors as the columns and the manufacturers as the rows.

18. The following table represents food purchase amounts and whether the customer used cash or a credit/debit card. One customer is chosen at random. Give your answer as a decimal out to at least 4 places.

	Less than \$10	\$10-\$49	\$50 or More	Total
Cash Purchase	11	10	18	39
Card Purchase	17	6	19	42
Total	28	16	37	81

a) Compute the probability that the customer's purchasing method was a cash purchase or the customer spent \$10-\$49.

b) Compute the probability that the customer's purchasing method was cash purchase and the customer spent \$10-\$49.

c) Compute the probability that the customer's purchasing method was a cash purchase given they spent \$10-\$49.

d) Compute the probability that the customer spent less than \$50.

e) What percent of cash purchases were for \$50 or more?

19. The probability of stock A rising is 0.3; and of stock B rising is 0.4. What is the probability that neither of the stocks rise, assuming that these two stocks are independent?

20. You are going to a Humane Society benefit dinner, and need to decide before the dinner what you want for salad, main dish, and dessert. You have 2 salads to choose from, 3 main dishes, and 5 desserts. How many different meals are available?

21. How many different phone numbers are possible in the area code 503, if the first number cannot start with a 0 or 1?
22. You are opening a screen-printing business. You can have long sleeves or short sleeves, three different colors, five different designs, and four different sizes. How many different shirts can you make?
23. The California license plate has one number followed by three letters followed by three numbers. How many different license plates are possible?
24. Calculate the following.
 - a) ${}_9P_4$
 - b) ${}_{10}P_6$
 - c) ${}_{10}C_5$
 - d) ${}_{20}C_4$
 - e) $8!$
 - f) $5!$
25. The PSU's Mixed Me club has 30 members. You need to pick a president, treasurer, and secretary from the 30. How many different ways can you do this?
26. How many different 4-digit personal identification numbers (PIN) are there if repeats are not allowed?
27. A baseball team has a 20-person roster. A batting order has nine people. How many different batting orders are there?
28. How many ways can you choose 4 cookies from a cookie jar containing 25 cookies of all the same type?
29. A computer generates a random password for your account (the password is not case sensitive). The password must consist of 8 characters, each of which can be any letter or number. How many different passwords could be generated?
30. How many unique tests can be made from a test bank of 20 questions if the test consists of 8 questions, order does not matter?
31. A typical PSU locker is opened with correct sequence of three numbers between 0 and 49 inclusive. A number can be used more than once, for example 8-8-8 is valid. How many possible locker combinations are there?
32. In the game of Megabucks, you get six numbers from 48 possible numbers without replacement. Megabucks jackpots start at \$1 million and grow until someone wins. What is the probability of matching all 6 numbers in any order?

Answer to Odd Numbered Exercises

- 1) 0.1420
- 3) 0.375
- 5) 0.001
- 7) 0.1944
- 9) 0.2
- 11) a) 0.8696 b) 0.2754 c) 0.5938 d) 0.7826 e) 0.4638 f) 0.5909
- 13) 0.19
- 15) a)

	Inoculated	Not Inoculated	Total
Lived	0.0382	0.8252	0.8634
Died	0.0010	0.1356	0.1366
Total	0.0392	0.9608	1

- b) 0.0392 c) 0.8643 d) 0.1748 e) 0.026 f) 0.141

- 17) 0.2222
- 19) 0.42
- 21) 8,000,000
- 23) 138,240,000
- 25) 24,360
- 27) 60,949,324,800
- 29) 2,821,109,907,456
- 31) 125,000

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