PROBABILITY TOPICS: $HOMEWORK^*$

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Abstract

Probability: Homework is part of the collection coll0555 written by Barbara Illowsky and Susan Dean and provides a number of homework exercises related to Probability with contributions from Roberta Bloom.

Exercise 1

(Solution on p. 12.)

Suppose that you have 8 cards. 5 are green and 3 are yellow. The 5 green cards are numbered 1, 2, 3, 4, and 5. The 3 yellow cards are numbered 1, 2, and 3. The cards are well shuffled. You randomly draw one card.

• G = card drawn is green

- E = card drawn is even-numbered
- **a.** List the sample space.
- **b.** P(G) =
- c. P(G|E) =
- **d.** P(G AND E) =
- e. P(G OR E) =
- **f.** Are G and E mutually exclusive? Justify your answer numerically.

Exercise 2

Refer to the previous problem. Suppose that this time you randomly draw two cards, one at a time, and **with replacement**.

- $G_1 =$ first card is green
- $G_2 =$ second card is green
- **a.** Draw a tree diagram of the situation.
- **b.** $P(G_1 \text{ AND } G_2) =$
- c. P(at least one green) =
- **d.** $P(G_2 | G_1) =$
- e. Are G_2 and G_1 independent events? Explain why or why not.

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(Solution on p. 12.)

Refer to the previous problems. Suppose that this time you randomly draw two cards, one at a time, and **without replacement**.

- $G_1 =$ first card is green
- G_2 = second card is green
- a. Draw a tree diagram of the situation.
- **b.** $P(G_1 AND G_2) =$
- **c.** P(at least one green) =
- **d.** $P(G_2|G_1) =$
- e. Are G_2 and G_1 independent events? Explain why or why not.

Exercise 4

Roll two fair dice. Each die has 6 faces.

- a. List the sample space.
- **b.** Let A be the event that either a 3 or 4 is rolled first, followed by an even number. Find P(A).
- **c.** Let B be the event that the sum of the two rolls is at most 7. Find P (B).
- **d.** In words, explain what "P(A|B)" represents. Find P(A|B).
- e. Are A and B mutually exclusive events? Explain your answer in 1 3 complete sentences, including numerical justification.
- f. Are A and B independent events? Explain your answer in 1 3 complete sentences, including numerical justification.

Exercise 5

(Solution on p. 12.)

A special deck of cards has 10 cards. Four are green, three are blue, and three are red. When a card is picked, the color of it is recorded. An experiment consists of first picking a card and then tossing a coin.

- **a.** List the sample space.
- **b.** Let A be the event that a blue card is picked first, followed by landing a head on the coin toss. Find P(A).
- c. Let B be the event that a red or green is picked, followed by landing a head on the coin toss. Are the events A and B mutually exclusive? Explain your answer in 1 - 3 complete sentences, including numerical justification.
- **d.** Let C be the event that a red or blue is picked, followed by landing a head on the coin toss. Are the events A and C mutually exclusive? Explain your answer in 1 - 3 complete sentences, including numerical justification.

Exercise 6

An experiment consists of first rolling a die and then tossing a coin:

a. List the sample space.

- **b.** Let A be the event that either a 3 or 4 is rolled first, followed by landing a head on the coin toss. Find P(A).
- c. Let B be the event that a number less than 2 is rolled, followed by landing a head on the coin toss. Are the events A and B mutually exclusive? Explain your answer in 1 3 complete sentences, including numerical justification.

An experiment consists of tossing a nickel, a dime and a quarter. Of interest is the side the coin lands on.

- **a.** List the sample space.
- **b.** Let A be the event that there are at least two tails. Find P(A).
- c. Let B be the event that the first and second tosses land on heads. Are the events A and Bmutually exclusive? Explain your answer in 1 - 3 complete sentences, including justification.

Exercise 8

Consider the following scenario:

- Let P(C) = 0.4
- Let P(D) = 0.5
- Let P(C|D) = 0.6
- **a.** Find P(C AND D).
- **b.** Are C and D mutually exclusive? Why or why not?
- c. Are C and D independent events? Why or why not?
- **d.** Find P(C OR D).
- e. Find P(D|C).

Exercise 9

(Solution on p. 12.) E and F mutually exclusive events. P(E) = 0.4; P(F) = 0.5. Find $P(E \mid F)$.

Exercise 10

J and K are independent events. P(J | K) = 0.3. Find P(J).

Exercise 11

U and V are mutually exclusive events. P(U) = 0.26; P(V) = 0.37. Find:

a. P(U AND V) =**b.** P(U | V) =

c. P(U OR V) =

Exercise 12

Q and R are independent events. P(Q) = 0.4; P(Q AND R) = 0.1. Find P(R).

Exercise 13

Y and Z are independent events.

- **a.** Rewrite the basic Addition Rule P(Y OR Z) = P(Y) + P(Z) P(Y AND Z) using the information that Y and Z are independent events.
- **b.** Use the rewritten rule to find P(Z) if P(Y OR Z) = 0.71 and P(Y) = 0.42.

Exercise 14

G and H are mutually exclusive events. P(G) = 0.5; P(H) = 0.3

- **a.** Explain why the following statement MUST be false: $P(H \mid G) = 0.4$.
- **b.** Find: P(H OR G).
- c. Are G and H independent or dependent events? Explain in a complete sentence.

(Solution on p. 12.)

(Solution on p. 12.)

(Solution on p. 12.)

(Solution on p. 12.)

The following are real data from Santa Clara County, CA. As of a certain time, there had been a total of 3059 documented cases of AIDS in the county. They were grouped into the following categories (Source: Santa Clara County Public H.D.):

	Homosexual/Bisexual	IV Drug User*	Heterosexual Contact	Other	Totals
Female	0	70	136	49	
Male	2146	463	60	135	
Totals					

Table I. Includes nonlosexual/bisexual IV diug use	Table 1: ³	* includes	homosexual	/bisexual	\mathbf{IV}	drug u	sers
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Suppose one of the persons with AIDS in Santa Clara County is randomly selected. Compute the following:

- **a.** P(person is female) =
- **b.** P(person has a risk factor Heterosexual Contact) =
- **c.** P(person is female OR has a risk factor of IV Drug User) =
- **d.** P(person is female AND has a risk factor of Homosexual/Bisexual) =
- e. P(person is male AND has a risk factor of IV Drug User) =
- **f.** P(female GIVEN person got the disease from heterosexual contact) =
- g. Construct a Venn Diagram. Make one group females and the other group heterosexual contact.

Exercise 16

Solve these questions using probability rules. Do NOT use the contingency table above. 3059 cases of AIDS had been reported in Santa Clara County, CA, through a certain date. Those cases will be our population. Of those cases, 6.4% obtained the disease through heterosexual contact and 7.4% are female. Out of the females with the disease, 53.3% got the disease from heterosexual contact.

- **a.** P(person is female) =
- **b.** P(person obtained the disease through heterosexual contact) =
- c. P(female GIVEN person got the disease from heterosexual contact) = $(1 + 1)^{-1}$
- d. Construct a Venn Diagram. Make one group females and the other group heterosexual contact. Fill in all values as probabilities.

Exercise 17

(Solution on p. 13.)

The following table identifies a group of children by one of four hair colors, and by type of hair.

Hair Type	Brown	Blond	Black	\mathbf{Red}	Totals
Wavy	20		15	3	43
Straight	80	15		12	
Totals		20			215



- a. Complete the table above.
- b. What is the probability that a randomly selected child will have wavy hair?

- c. What is the probability that a randomly selected child will have either brown or blond hair?
- **d.** What is the probability that a randomly selected child will have wavy brown hair?
- e. What is the probability that a randomly selected child will have red hair, given that he has straight hair?
- f. If B is the event of a child having brown hair, find the probability of the complement of B.
- g. In words, what does the complement of B represent?

A previous year, the weights of the members of the **San Francisco 49ers** and the **Dallas Cowboys** were published in the *San Jose Mercury News*. The factual data are compiled into the following table.

${f Shirt}\#$	\leq 210	211-250	251-290	$290 \le$
1-33	21	5	0	0
34-66	6	18	7	4
66-99	6	12	22	5

Table 3

For the following, suppose that you randomly select one player from the 49ers or Cowboys.

- **a.** Find the probability that his shirt number is from 1 to 33.
- **b.** Find the probability that he weighs at most 210 pounds.
- c. Find the probability that his shirt number is from 1 to 33 AND he weighs at most 210 pounds.
- **d.** Find the probability that his shirt number is from 1 to 33 OR he weighs at most 210 pounds.
- e. Find the probability that his shirt number is from 1 to 33 GIVEN that he weighs at most 210 pounds.
- f. If having a shirt number from 1 to 33 and weighing at most 210 pounds were independent events, then what should be true about $P(\text{Shirt} \# 1-33 \mid \leq 210 \text{ pounds})$?

Exercise 19

(Solution on p. 13.)

Approximately 281,000,000 people over age 5 live in the United States. Of these people, 55,000,000 speak a language other than English at home. Of those who speak another language at home, 62.3% speak Spanish. (Source: http://www.census.gov/hhes/socdemo/language/data/acs/ACS-12.pdf)

Let: E = speak English at home; E' = speak another language at home; S = speak Spanish; Finish each probability statement by matching the correct answer.

Probability Statements	Answers
a. P(E') =	i. 0.8043
b. P(E) =	ii. 0.623
	continued on next page

c. $P(S \text{ and } E') =$	iii. 0.1957
d. P(S E') =	iv. 0.1219

Table 4

Exercise 20

The probability that a male develops some form of cancer in his lifetime is 0.4567 (Source: American Cancer Society). The probability that a male has at least one false positive test result (meaning the test comes back for cancer when the man does not have it) is 0.51 (Source: USA Today). Some of the questions below do not have enough information for you to answer them. Write "not enough information" for those answers.

Let: C = a man develops cancer in his lifetime; P = man has at least one false positive

- **a.** Construct a tree diagram of the situation.
- **b.** P(C) =
- c. P(P|C) =
- **d.** P(P|C') =
- e. If a test comes up positive, based upon numerical values, can you assume that man has cancer? Justify numerically and explain why or why not.

Exercise 21

(Solution on p. 13.)

In 1994, the U.S. government held a lottery to issue 55,000 Green Cards (permits for non-citizens to work legally in the U.S.). Renate Deutsch, from Germany, was one of approximately 6.5 million people who entered this lottery. Let G =won Green Card.

- a. What was Renate's chance of winning a Green Card? Write your answer as a probability statement.
- **b.** In the summer of 1994, Renate received a letter stating she was one of 110,000 finalists chosen. Once the finalists were chosen, assuming that each finalist had an equal chance to win, what was Renate's chance of winning a Green Card? Let F = was a finalist. Write your answer as a conditional probability statement.
- c. Are G and F independent or dependent events? Justify your answer numerically and also explain why.
- **d.** Are G and F mutually exclusive events? Justify your answer numerically and also explain why.

NOTE: P.S. Amazingly, on 2/1/95, Renate learned that she would receive her Green Card – true story!

Exercise 22

Three professors at George Washington University did an experiment to determine if economists are more selfish than other people. They dropped 64 stamped, addressed envelopes with \$10 cash in different classrooms on the George Washington campus. 44% were returned overall. From the economics classes 56% of the envelopes were returned. From the business, psychology, and history classes 31% were returned. (Source: Wall Street Journal)

Let: R = money returned; E = economics classes; O = other classes

- **a.** Write a probability statement for the overall percent of money returned.
- **b.** Write a probability statement for the percent of money returned out of the economics classes.
- c. Write a probability statement for the percent of money returned out of the other classes.
- **d.** Is money being returned independent of the class? Justify your answer numerically and explain it.

e. Based upon this study, do you think that economists are more selfish than other people? Explain why or why not. Include numbers to justify your answer.

Exercise 23

(Solution on p. 13.)

The chart below gives the number of suicides estimated in the U.S. for a recent year by age, race (black and white), and sex. We are interested in possible relationships between age, race, and sex. We will let suicide victims be our population. (Source: The National Center for Health Statistics, U.S. Dept. of Health and Human Services)

Race and Sex	1 - 14	15 - 24	25 - 64	over 64	TOTALS
white, male	210	3360	13,610		22,050
white, female	80	580	3380		4930
black, male	10	460	1060		1670
black, female	0	40	270		330
all others					
TOTALS	310	4650	18,780		29,760

Table 5

NOTE: Do not include "all others" for parts (f), (g), and (i).

- a. Fill in the column for the suicides for individuals over age 64.
- **b.** Fill in the row for all other races.
- c. Find the probability that a randomly selected individual was a white male.
- d. Find the probability that a randomly selected individual was a black female.
- e. Find the probability that a randomly selected individual was black
- f. Find the probability that a randomly selected individual was male.
- g. Out of the individuals over age 64, find the probability that a randomly selected individual was a black or white male.
- h. Comparing "Race and Sex" to "Age," which two groups are mutually exclusive? How do you know?
- i. Are being male and committing suicide over age 64 independent events? How do you know?

The next two questions refer to the following: The percent of licensed U.S. drivers (from a recent year) that are female is 48.60. Of the females, 5.03% are age 19 and under; 81.36% are age 20 - 64; 13.61% are age 65 or over. Of the licensed U.S. male drivers, 5.04% are age 19 and under; 81.43% are age 20 - 64; 13.53% are age 65 or over. (Source: Federal Highway Administration, U.S. Dept. of Transportation)

Exercise 24

Complete the following:

- a. Construct a table or a tree diagram of the situation.
- **b.** P(driver is female) =
- **c.** P(driver is age 65 or over | driver is female) =
- **d.** P(driver is age 65 or over AND female) =
- e. In words, explain the difference between the probabilities in part (c) and part (d).
- **f.** P(driver is age 65 or over) =
- g. Are being age 65 or over and being female mutually exclusive events? How do you know

Suppose that 10,000 U.S. licensed drivers are randomly selected.

- **a.** How many would you expect to be male?
- **b.** Using the table or tree diagram from the previous exercise, construct a contingency table of gender versus age group.
- c. Using the contingency table, find the probability that out of the age 20 64 group, a randomly selected driver is female.

Exercise 26

Approximately 86.5% of Americans commute to work by car, truck or van. Out of that group, 84.6% drive alone and 15.4% drive in a carpool. Approximately 3.9% walk to work and approximately 5.3% take public transportation. (Source: Bureau of the Census, U.S. Dept. of Commerce. Disregard rounding approximations.)

- a. Construct a table or a tree diagram of the situation. Include a branch for all other modes of transportation to work.
- **b.** Assuming that the walkers walk alone, what percent of all commuters travel alone to work?
- c. Suppose that 1000 workers are randomly selected. How many would you expect to travel alone to work?
- d. Suppose that 1000 workers are randomly selected. How many would you expect to drive in a carpool?

Exercise 27

Explain what is wrong with the following statements. Use complete sentences.

- **a.** If there's a 60% chance of rain on Saturday and a 70% chance of rain on Sunday, then there's a 130% chance of rain over the weekend.
- **b.** The probability that a baseball player hits a home run is greater than the probability that he gets a successful hit.

1 Try these multiple choice questions.

The next two questions refer to the following probability tree diagram which shows tossing an unfair coin FOLLOWED BY drawing one bead from a cup containing 3 red (*R*), 4 yellow (*Y*) and 5 blue (*B*) beads. For the coin, $P(H) = \frac{2}{3}$ and $P(T) = \frac{1}{3}$ where H = "heads" and T = "tails".

(Solution on p. 13.)





Exercise 28 Find P(tossing a Head on the coin AND a Red bead)

A. $\frac{2}{3}$ B. $\frac{5}{15}$ C. $\frac{6}{36}$ D. $\frac{5}{36}$

Exercise 29 Find P(Blue bead).

A. $\frac{15}{36}$ B. $\frac{10}{36}$ C. $\frac{10}{12}$ D. $\frac{6}{36}$

The next three questions refer to the following table of data obtained from www.baseball-almanac.com¹ showing hit information for 4 well known baseball players. Suppose that one hit from the table is randomly selected.

NAME	Single	Double	Triple	Home Run	TOTAL HITS
Babe Ruth	1517	506	136	714	2873
Jackie Robinson	1054	273	54	137	1518
Ty Cobb	3603	174	295	114	4189
Hank Aaron	2294	624	98	755	3771
TOTAL	8471	1577	583	1720	12351

 $^{1} http://cnx.org/content/m16836/latest/www.baseball-almanac.com$

(Solution on p. 13.)

(Solution on p. 13.)

Table 6

Exercise 30

Find P(hit was made by Babe Ruth).

Α. B. $\frac{20}{12351}$ C. $\frac{^{+}583}{12351}$ D. $\frac{4189}{12351}$

Exercise 31

Find P(hit was made by Ty Cobb | The hit was a Home Run)

	4189
А.	12351
Β.	<u>114</u>
<u> </u>	1738
U.	$\frac{1120}{4189}$
D	114
р.	12351

Exercise 32

Are the hit being made by Hank Aaron and the hit being a double independent events?

- **A.** Yes, because P(hit by Hank Aaron | hit is a double) = P(hit by Hank Aaron)
- **B.** No, because P(hit by Hank Aaron | hit is a double) \neq P(hit is a double)
- **C.** No, because P(hit is by Hank Aaron | hit is a double) \neq P(hit by Hank Aaron)
- **D.** Yes, because P(hit is by Hank Aaron | hit is a double) = P(hit is a double)

Exercise 33

Given events G and H: P(G) = 0.43; P(H) = 0.26; P(H and G) = 0.14

A. Find P(H or G)

- **B.** Find the probability of the complement of event (H and G)
- **C.** Find the probability of the complement of event (H or G)

Exercise 34

Given events J and K: P(J) = 0.18; P(K) = 0.37; P(J or K) = 0.45

A. Find P(J and K)

- **B.** Find the probability of the complement of event (J and K)
- C. Find the probability of the complement of event (J or K)

Exercise 35

(Solution on p. 14.) United Blood Services is a blood bank that serves more than 500 hospitals in 18 states. According to their website, http://www.unitedbloodservices.org/humanbloodtypes.html, a person with type O blood and a negative Rh factor (Rh-) can donate blood to any person with any bloodtype. Their data show that 43% of people have type O blood and 15% of people have Rh- factor; 52%of people have type O or Rh- factor.

A. Find the probability that a person has both type O blood and the Rh-factor**B.** Find the probability that a person does NOT have both type O blood and the Rh- factor.

Exercise 36

At a college, 72% of courses have final exams and 46% of courses require research papers. Suppose that 32% of courses have a research paper and a final exam. Let F be the event that a course has a final exam. Let R be the event that a course requires a research paper.

(Solution on p. 14.)

(Solution on p. 13.)

(Solution on p. 13.)

(Solution on p. 14.)

(Solution on p. 13.)

(Solution on p. 13.)

- A. Find the probability that a course has a final exam or a research project.
- **B.** Find the probability that a course has NEITHER of these two requirements.

(Solution on p. 14.)

In a box of assorted cookies, 36% contain chocolate and 12% contain nuts. Of those, 8% contain both chocolate and nuts. Sean is allergic to both chocolate and nuts.

A. Find the probability that a cookie contains chocolate or nuts (he can't eat it).

B. Find the probability that a cookie does not contain chocolate or nuts (he can eat it).

Exercise 38

(Solution on p. 14.)

A college finds that 10% of students have taken a distance learning class and that 40% of students are part time students. Of the part time students, 20% have taken a distance learning class. Let D = event that a student takes a distance learning class and E = event that a student is a part time student

- **A.** Find P(D and E)
- **B.** Find $P(E \mid D)$
- C. Find P(D or E)
- **D.** Using an appropriate test, show whether D and E are independent.
- E. Using an appropriate test, show whether D and E are mutually exclusive.

Exercise 39

(Solution on p. 14.)

When the Euro coin was introduced in 2002, two math professors had their statistics students test whether the Belgian 1 Euro coin was a fair coin. They spun the coin rather than tossing it, and it was found that out of 250 spins, 140 showed a head (event H) while 110 showed a tail (event T). Therefore, they claim that this is not a fair coin.

- **A.** Based on the data above, find P(H) and P(T).
- **B.** Use a tree to find the probabilities of each possible outcome for the experiment of tossing the coin twice.
- C. Use the tree to find the probability of obtaining exactly one head in two tosses of the coin.
- **D.** Use the tree to find the probability of obtaining at least one head.

Exercise 40

A box of cookies contains 3 chocolate and 7 butter cookies. Miguel randomly selects a cookie and eats it. Then he randomly selects another cookie and eats it also. (How many cookies did he take?)

- **A.** Draw the tree that represents the possibilities for the cookie selections. Write the probabilities along each branch of the tree.
- **B.** Are the probabilities for the flavor of the SECOND cookie that Miguel selects independent of his first selection? Explain.
- C. For each complete path through the tree, write the event it represents and find the probabilities.
- **D.** Let S be the event that both cookies selected were the same flavor. Find P(S).
- E. Let T be the event that both cookies selected were different flavors. Find P(T) by two different methods: by using the complement rule and by using the branches of the tree. Your answers should be the same with both methods.
- **F.** Let U be the event that the second cookie selected is a butter cookie. Find P(U).

**Exercises 33 - 40 contributed by Roberta Bloom

Solutions to Exercises in this Module

Solution to Exercise (p. 1)

a. {G1, G2, G3, G4, G5, Y1, Y2, Y3}
b. ⁵/₈
c. ²/₃
d. ²/₈
e. ⁶/₈
f. No

Solution to Exercise (p. 2)

b. $\left(\frac{5}{8}\right)\left(\frac{4}{7}\right)$ **c.** $\left(\frac{5}{8}\right)\left(\frac{3}{7}\right) + \left(\frac{3}{8}\right)\left(\frac{5}{7}\right) + \left(\frac{5}{8}\right)\left(\frac{4}{7}\right)$ **d.** $\frac{4}{7}$ **e.** No

Solution to Exercise (p. 2)

a. {GH,GT,BH,BT,RH,RT}
b. ³/₂₀
c. Yes
d. No

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Solution to Exercise (p. 3)
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a. {(HHH), (HHT), (HTH), (HTT), (THH), (THT), (TTT), (TTT)}
b. ⁴/₈
c. Yes
Solution to Exercise (p. 3)
0
Solution to Exercise (p. 3)
a. 0
b. 0
c. 0.63

Solution to Exercise (p. 3)

b. 0.5

Solution to Exercise (p. 4) The completed contingency table is as follows:

	Homosexual/Bisexual	IV Drug User*	Heterosexual Contact	Other	Totals
Female	0	70	136	49	255
Male	2146	463	60	135	2804
Totals	2146	533	196	184	3059

 Table 7: * includes homosexual/bisexual IV drug users

a. $\frac{255}{3059}$ b. $\frac{196}{3059}$ c. $\frac{718}{3059}$ d. 0 e. $\frac{463}{3059}$ f. $\frac{136}{196}$

Solution to Exercise (p. 4)

b. $\frac{43}{215}$ c. $\frac{120}{215}$ d. $\frac{20}{215}$ e. $\frac{12}{172}$ f. $\frac{115}{215}$

Solution to Exercise (p. 5)

a. iii
b. i
c. iv
d. ii

Solution to Exercise (p. 6)

a. P (G) = 0.008
b. 0.5
c. dependent
d. No

Solution to Exercise (p. 7)

22050c. $\overline{29760}_{330}$ d. $\frac{29760}{2000}$ e. $\frac{19760}{3720}$ f. $\frac{29760}{5010}$ g. $\overline{6020}$ h. Black females and ages 1-14 i. No Solution to Exercise (p. 8) **a.** 5140 **c.** 0.49 Solution to Exercise (p. 9) С Solution to Exercise (p. 9) Α Solution to Exercise (p. 10) В Solution to Exercise (p. 10) В Solution to Exercise (p. 10) С Solution to Exercise (p. 10) **A.** P(H or G) = P(H) + P(G) - P(H and G) = 0.26 + 0.43 - 0.14 = 0.55 **B.** P(NOT (H and G)) = 1 - P(H and G) = 1 - 0.14 = 0.86**C.** P(NOT (H or G)) = 1 - P(H or G) = 1 - 0.55 = 0.45

Solution to Exercise (p. 10)

A. P(J or K) = P(J) + P(K) - P(J and K); 0.45 = 0.18 + 0.37 - P(J and K) ; solve to find P(J and K) = 0.10

B. P(NOT (J and K)) = 1 - P(J and K) = 1 - 0.10 = 0.90

C. P(NOT (J or K)) = 1 - P(J or K) = 1 - 0.45 = 0.55

Solution to Exercise (p. 10)

- **A.** P(Type O or Rh-) = P(Type O) + P(Rh-) P(Type O and Rh-)0.52 = 0.43 + 0.15 - P(Type O and Rh-); solve to find P(Type O and Rh-) = 0.066% of people have type O Rh- blood
- **B.** P(NOT (Type O and Rh–)) = 1 P(Type O and Rh–) = 1 0.06 = 0.9494% of people do not have type O Rh– blood

Solution to Exercise (p. 10)

A. P(R or F) = P(R) + P(F) - P(R and F) = 0.72 + 0.46 - 0.32 = 0.86**B.** P(Neither R nor F) = 1 - P(R or F) = 1 - 0.86 = 0.14

Solution to Exercise (p. 11)

Let C be the event that the cookie contains chocolate. Let N be the event that the cookie contains nuts. **A.** P(C or N) = P(C) + P(N) - P(C and N) = 0.36 + 0.12 - 0.08 = 0.40**B.** P(neither chocolate nor nuts) = 1 - P(C or N) = 1 - 0.40 = 0.60

Solution to Exercise (p. 11)

A. P(D and E) = P(D|E)P(E) = (0.20)(0.40) = 0.08

- **B.** P(E|D) = P(D and E) / P(D) = 0.08/0.10 = 0.80
- **C.** P(D or E) = P(D) + P(E) P(D and E) = 0.10 + 0.40 0.08 = 0.42
- **D.** Not Independent: P(D|E) = 0.20 which does not equal P(D) = .10
- E. Not Mutually Exclusive: P(D and E) = 0.08; if they were mutually exclusive then we would need to have P(D and E) = 0, which is not true here.

Solution to Exercise (p. 11)

A. P(H) = 140/250; P(T) = 110/250 **C.** 308/625

D. 504/625