PLEASE DO NOT WRITE ON THIS HANDOUT!

COMPLETE PROBLEMS 1 – 7, 9 – 11, 13, 14, 16 ON A SEPARATE SHEET OF PAPER. MAKE SURE TO HAVE PROPER HEADING WHICH INCLUDES:

YOUR FIRST & LAST NAME
ASSIGNMENT TITLE: "LESSON 4.3"
CLASS PERIOD

Exercises

Lesson 4.3

Mastering Concepts and Skills

1. **Breakfast every day?** Students in an urban school pg 277 were curious about how many children regularly eat breakfast. They conducted a survey, asking, "Do you eat breakfast regularly?" All 595 students in the school responded to the survey. The resulting data are summarized in the two-way table.[6]

		Gender		
		Male	Female	Total
Eats breakfast regularly	Yes	190	110	300
	No	130	165	295
	Total	320	275	595

Suppose we select a student from the school at random. Define event F as getting a female student and event B as getting a student who eats breakfast regularly.

(a) Find $P(B^C)$. Interpret this value in context.

(b) Find P(female and doesn't eat breakfast regularly).

(c) Find $P(F \text{ or } B^C)$.

2. **Is this your card?** A standard deck of playing cards (with jokers removed) consists of 52 cards in four suits—clubs, diamonds, hearts, and spades. Each suit has 13 cards, with denominations ace, 2, 3, 4, 5, 6, 7, 8, 9, 10, jack, queen, and king. The jack, queen, and king are referred to as "face cards." Imagine that we shuffle the deck thoroughly and deal one card. Let's define events F: getting a face card and H: getting a heart. The two-way table summarizes the sample space for this chance process.

		Card		
		Face card	Nonface card	Total
Suit	Heart	3	10	13
	Nonheart	9	30	39
	Total	12	40	52

(a) Find $P(H^C)$. Interpret this value in context.

(b) Find P(face card and not a heart).

(c) Find $P(H^C \text{ or } F)$.

3. **Casualties of the *Titanic*** In 1912 the *Titanic* struck an iceberg and sank on its first voyage. Some passengers got off the ship in lifeboats, but many died. The following two-way table gives information about adult passengers who survived and who died, by class of travel.

		Class		
		First	Second	Third
Survived	Yes	197	94	151
	No	122	167	476

Suppose we randomly select one of the adult passengers who rode on the *Titanic*. Define event D as getting a person who died and event F as getting a passenger in first class.

(a) Find $P(F^C)$.

(b) Find P(not a passenger in first class and survived).

(c) Find P(not a passenger in first class or survived).

4. **Python nests** How is the hatching of water python eggs influenced by the temperature of the snake's nest? Researchers randomly assigned newly laid eggs to one of three water temperatures: hot, neutral, or cold. Hot duplicates the extra warmth provided by the mother python, and cold duplicates the absence of the mother.

		Nest temperature		
		Cold	Neutral	Hot
Hatching status	Hatched	16	38	75
	Didn't hatch	11	18	29

Suppose we select one of the eggs at random. Define events C as getting an egg that was assigned to cold water temperature and H as getting an egg that hatched.

(a) Find $P(H)$.

(b) Find P(not cold water temperature and hatched).

(c) Find $P(H^C$ or $C)$.

5. **Phone choices** According to the National Center for Health Statistics, in December 2012, 60% of U.S. households had a traditional landline telephone, 89% of households had cell phones, and 51% had both.[7] Suppose we randomly selected a household in December 2012. What's the probability that the household has a traditional landline telephone or a cell phone?

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6. **Facebook or Instagram?** A December 2013 Pew Research Center poll of adults who use the Internet found that 71% of online adults use Facebook, 17% use Instagram, and 16% use both.[8] Suppose we randomly select a person who responded to this poll. What's the probability that he or she uses Facebook or Instagram?

7. **Mac or PC?** A recent census at a major university revealed that 60% of its students mainly used Macs. The rest mainly used PCs. At the time of the census, 67% of the school's students were undergraduates. The rest were graduate students. In the census, 23% of respondents were graduate students who said that they used Macs as their main computers. Suppose we select a student at random from among those who were part of the census. What's the probability that this person is a graduate student or mainly uses a Mac?

8. **Gender and political party** In March 2015, 57% of the voting members of the U.S. House of Representatives were Republicans and the rest were Democrats. Nineteen percent of the House members were women, and 36% of the House members were men who identified themselves as Democrats.[9] Suppose we select a representative at random. What is the probability that this person is male or a Democrat?

9. **Dropping the landline?** Refer to Exercise 5.

(a) Construct a Venn diagram to represent the outcomes of this chance process using the events T: has a traditional landline phone and C: has a cell phone.

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(b) Find the probability that the household has a cell phone only.

10. **Friend or follower?** Refer to Exercise 6.

(a) Construct a Venn diagram to represent the outcomes of this chance process using the events F: uses Facebook and I: uses Instagram.

(b) Find the probability that the person uses Facebook but not Instagram.

11. **Mac world** Refer to Exercise 7.

(a) Construct a Venn diagram to represent the outcomes of this chance process using the events G: is a graduate student and M: mainly uses a Mac.

(b) Find $P(G^C \cap M^C)$. Interpret this value in context.

12. **Gender and the Republican Party** Refer to Exercise 8.

(a) Construct a Venn diagram to represent the outcomes of this chance process using the events M: is male and D: is a Democrat.

(b) Find $P(M^C \cap D^C)$. Interpret this value in context.

Applying the Concepts

13. **Middle school values** Researchers carried out a survey of fourth-, fifth-, and sixth-grade students in Michigan. Students were asked whether good grades, athletic ability, or being popular was most important to them. This two-way table summarizes the survey data.[10]

		Grade			
		4th grade	5th grade	6th grade	Total
Most important	Grades	49	50	69	168
	Athletic	24	36	38	98
	Popular	19	22	28	69
	Total	92	108	135	335

Suppose we select one of these students at random. What's the probability that:

(a) The student is a sixth grader or a student who rated good grades as important?

(b) The student is not a sixth grader and did not rate good grades as important?

14. **Mobile systems** The Pew Research Center asked a random sample of 2024 adult cell-phone owners from the United States their age and which type of cell phone they own: iPhone, Android, or other (including non-smartphones). The two-way table summarizes the data.

		Age			
		18–34	35–54	55+	Total
Type of cell phone	iPhone	169	171	127	467
	Android	214	189	100	503
	Other	134	277	643	1054
	Total	517	637	870	2024

Suppose we select one of the survey respondents at random. What's the probability that:

(a) The person is not age 18 to 34 and does not own an iPhone?

(b) The person is age 18 to 34 or owns an iPhone?

15. **Disks of four colors** A jar contains 36 disks: 9 each of four colors—red, green, blue, and yellow. Each set of disks of the same color is numbered from 1 to 9. Suppose you draw one disk at random from the jar. Define events B: get a blue disk, and E: get a disk with the number 8.

(a) Make a two-way table that describes the sample space in terms of events B and E.

(b) Find $P(\text{B})$ and $P(\text{E})$.

(c) Write the event "blue eight" in symbolic form. Then find the probability of this event.

(d) Explain why $P(\text{B} \cup \text{E}) \neq P(\text{B}) + P(\text{E})$. Then use the general addition rule to compute $P(\text{B} \cup \text{E})$.

16. **Jack of hearts?** Shuffle a standard deck of playing cards and deal one card. (Refer to Exercise 2 for the make-up of a deck of cards.) Define events J: get a jack, and R: get a red card.

(a) Make a two-way table that describes the sample space in terms of events J and R.

(b) Find $P(\text{J})$ and $P(\text{R})$.

(c) Write the event "red jack" in symbolic form. Then find the probability of this event.

(d) Explain why $P(\text{J} \cup \text{R}) \neq P(\text{J}) + P(\text{R})$. Then use the general addition rule to compute $P(\text{J} \cup \text{R})$.

Extending the Concepts

17. **Mutually exclusive versus complementary** Classify each of the following statements as true or false. Justify your answer.

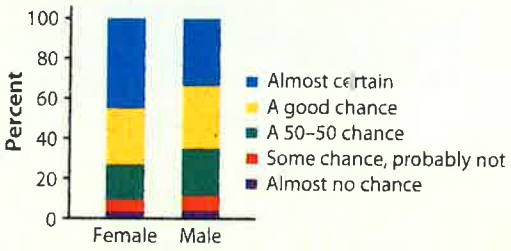
(a) If one event is the complement of another event, the two events are mutually exclusive.

(b) If two events are mutually exclusive, one event is the complement of the other.

18. **Who goes here?** At a large university, 49% of the students are female, 69% live in the dorms, and 42% are in-state residents. Further, 34% of the students are females who live in the dorms, 19% are females who are in-state residents, and 16% are in-state residents who live in the dorms. Finally, 7% of the students are females who live in the dorms and are in-state residents. Pick a student at random from this university. What's the probability that the chosen student is a male who does not live in the dorm and is not an in-state resident? (*Hint*: It might be helpful to make a Venn diagram with three circles.)

Recycle and Review

19. **Wedding bells?** (2.1) A national survey interviewed several thousand teens in grades 7 through 12. One question was "What do you think are the chances you will be married in the next 10 years?" Here is a segmented bar chart of the responses by gender.[11] Use the graph to discuss if there is an association between gender and responses to this question.



20. **Mean Facebook friends** (3.2, 3.3, 3.5) Karla, a senior at Springfield High School, wants to estimate the mean number of Facebook friends that students at the school have. To gather data, she makes an announcement one morning on the school's P.A. system asking students to find her during the 12th-grade lunch period and report the number of Facebook friends they have on a slip of paper.

(a) Identify a possible source of bias in Karla's data collection method. Is Karla's method likely to overestimate or underestimate the mean number of Facebook friends students at this school have?

(b) Describe an unbiased sampling method that Karla could use to obtain a better estimate.