13.2 p.853 #3-27 all (skip 11), 32, 33, 36, 37

COUNTING PERMUTATIONS **Find the number of ways you can arrange (a) all of the letters in the given word and (b) 2 of the letters in the word.**

3. AT	**4.** TRY	**5.** GAME	**6.** CAT
7. WATER	**8.** ROCK	**9.** APRIL	**10.** FAMILY

FACTORIALS AND PERMUTATIONS **Evaluate the expression.**

12. 1!	**13.** 3!	**14.** 0!	**15.** 5!
16. 8!	**17.** 10!	**18.** 12!	**19.** 13!
20. ${}_5P_2$	**21.** ${}_7P_3$	**22.** ${}_9P_1$	**23.** ${}_6P_5$
24. ${}_8P_8$	**25.** ${}_{12}P_0$	**26.** ${}_{30}P_2$	**27.** ${}_{25}P_5$

32. MOVIES Six friends go to a movie theater. In how many different ways can they sit together in a row of 6 empty seats?

33. ★ MULTIPLE CHOICE You plan to visit 4 stores during a shopping trip. In how many orders can you visit these stores?

(A) 4 (B) 16 (C) 24 (D) 256

36. HISTORY EXAM On an exam, you are asked to list 5 historical events in the order in which they occurred. You guess the order of the events at random. What is the probability that you choose the correct order?

37. SPIRIT You make 6 posters to hold up at a basketball game. Each poster has a letter of the word TIGERS. You and 5 friends sit next to each other in a row. The posters are distributed at random. What is the probability that TIGERS is spelled correctly when you hold up the posters?

13.3 p.858 #3, 6-19 all, 23-26 all

3. COMBINATIONS How many combinations of 3 letters from the list A, B, C, D, E, F are possible?

COMBINATIONS Evaluate the expression.

6. ${}_5C_1$ **7.** ${}_8C_5$ **8.** ${}_9C_9$ **9.** ${}_8C_6$

10. ${}_{12}C_3$ **11.** ${}_{11}C_4$ **12.** ${}_{15}C_8$ **13.** ${}_{20}C_5$

14. ★ MULTIPLE CHOICE What is the value of ${}_{10}C_6$?

Ⓐ 7 Ⓑ 60 Ⓒ 210 Ⓓ 151,200

15. ★ MULTIPLE CHOICE You have the first season of your favorite television show on a set of DVDs. The set contains 13 episodes. You have time to watch 3 episodes. How many combinations of 3 episodes can you watch?

Ⓐ 286 Ⓑ 572 Ⓒ 1716 Ⓓ 589,680

★ SHORT RESPONSE In Exercises 16–19, tell whether the question can be answered using *combinations* or *permutations*. *Explain* your choice, then answer the question.

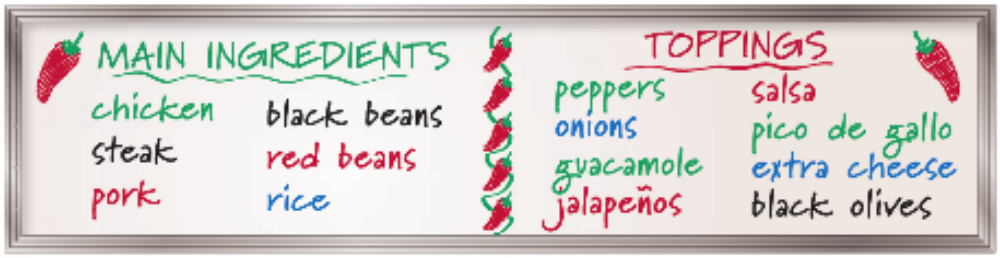
16. Four students from your class of 120 students will be selected to organize a fundraiser. How many groups of 4 students are possible?

17. Ten students are auditioning for 3 different roles in a play. In how many ways can the 3 roles be filled?

18. To complete an exam, you must answer 8 questions from a list of 10 questions. In how many ways can you complete the exam?

19. In how many ways can 5 people sit in a car that holds 5 passengers?

23. **RESTAURANT** You are ordering a burrito with 2 main ingredients and 3 toppings. The menu below shows the possible choices. How many different burritos are possible?



24. **WORK SCHEDULE** You work 3 evenings each week at a bookstore. Your supervisor assigns you 3 evenings at random from the 7 possibilities. What is the probability that your schedule this week includes working on Friday?

25. ★ **SHORT RESPONSE** On a television game show, 9 members of the studio audience are randomly selected to be eligible contestants.

a. Six of the 9 eligible contestants are randomly chosen to play a game on the stage. How many combinations of 6 players from the group of eligible contestants are possible?

b. You and your two friends are part of the group of 9 eligible contestants. What is the probability that all three of you are chosen to play the game on stage? *Explain* how you found your answer.

26. **REPRESENTATIVES** Your teacher chooses 2 students at random to represent your homeroom. The homeroom has a total of 30 students, including your best friend. What is the probability that you and your best friend are chosen? What is the probability that you are chosen first and your best friend is chosen second? Which event is more likely to occur?

13.4a p.864 #3-19 all, 28-34 all

PROBABILITY OF A OR B **In Exercises 3–6, you roll a number cube. Tell whether the events *A* and *B* are *mutually exclusive* or *overlapping*. Then find *P*(*A* or *B*).**

3. **Event *A*:** Roll a 6.
   Event *B*: Roll a prime number.

4. **Event *A*:** Roll an even number.
   Event *B*: Roll a 5.

5. **Event *A*:** Roll an odd number.
   Event *B*: Roll a number less than 5.

6. **Event *A*:** Roll a multiple of 3.
   Event *B*: Roll an even number.

7. **ERROR ANALYSIS** A bag contains 7 yellow marbles, 4 red marbles, and 5 blue marbles. *Describe* and correct the error in finding the probability that you randomly draw a yellow or blue marble.

$$P(\text{yellow or blue}) = P(\text{yellow}) \cdot P(\text{blue})$$
$$= \frac{7}{16} \cdot \frac{5}{16} = \frac{35}{256}$$

8. ★ **MULTIPLE CHOICE** A bag contains tiles with the numbers 1–10 on them. You randomly choose a tile from the bag. What is the probability that you choose an even number or a number less than 5?

   (A) 0.7 (B) 0.8 (C) 0.9 (D) 1

PROBABILITY OF A AND B **In Exercises 9–12, tell whether the events *A* and *B* are *dependent* or *independent*. Then find *P*(*A* and *B*).**

9. You roll two number cubes.
   Event *A*: You roll a 2 first.
   Event *B*: You roll a 5 second.

10. You write each of the letters of the word BIOLOGY on pieces of paper and place them in a bag. You randomly draw one letter, do not replace it, then randomly draw a second letter.
    Event *A*: The first letter is O.
    Event *B*: The second letter is B.

11. You flip a coin and roll a number cube.
    Event *A*: The coin shows heads.
    Event *B*: The number cube shows 2.

12. A box contains 3 milk chocolates, 3 white chocolates, and 4 dark chocolates. You choose a chocolate at random, eat it, then choose a second chocolate at random.
    Event *A*: You choose a dark chocolate.
    Event *B*: You choose a dark chocolate.

13. ★ **MULTIPLE CHOICE** A vase holds 7 red roses and 5 pink roses. You randomly choose a rose, place it in a different vase, then randomly choose another rose. What is the approximate probability that both the first and second roses are red?

Ⓐ 0.29 Ⓑ 0.32 Ⓒ 0.34 Ⓓ 0.37

CHESS PIECES In Exercises 14–17, consider a bag that contains all of the chess pieces in a set, as shown in the diagram.

	King	Queen	Bishop	Rook	Knight	Pawn
Black	1	1	2	2	2	8
White	1	1	2	2	2	8

14. You choose one piece at random. Find the probability that you choose a black piece or a queen.

15. You choose one piece at random, replace it, then choose a second piece at random. Find the probability that you choose a rook, then a bishop.

16. You choose one piece at random, do not replace it, then choose a second piece at random. Find the probability that you choose a king, then a pawn.

17. **ERROR ANALYSIS** *Describe* and correct the error in finding the probability that you randomly choose a pawn and a second pawn, without replacement.

$$P(\text{pawn and pawn}) = P(\text{pawn}) \cdot P(\text{pawn})$$

$$= \frac{16}{32} \cdot \frac{16}{32} = \frac{1}{4}$$

In Exercises 18 and 19, use the following information. Two mutually exclusive events for which one or the other must occur are called *complementary* events. If events A and B are complementary events, then $P(A) + P(B) = 1$.

18. WEATHER A local meteorologist reports that there is a 70% chance of rain tomorrow. What is the probability that it will *not* rain tomorrow?

19. BASKETBALL You make 31% of your attempted 3-point shots. What is the probability that you miss your next attempted 3-point shot?

In Exercises 28 and 29, the spinner shown has sections with equal area. *(p. 843)*

28. You flip a coin and spin the spinner. How many possible outcomes are in the sample space? List the possible outcomes.

29. You roll a number cube and spin the spinner. How many possible outcomes are in the sample space? List the possible outcomes.

Evaluate the expression.

30. ${}_5P_3$ *(p. 851)*

31. ${}_{15}P_0$ *(p. 851)*

32. ${}_{15}C_0$ *(p. 856)*

33. ${}_5C_3$ *(p. 856)*

34. ELECTIVES Your school offers 10 elective courses each semester. You have time in your schedule for 2 of these courses. How many combinations of 2 elective courses can you choose? *(p. 856)*

13.7 p.883 #3, 4, 5, 6, 8, 9, 11, 12, 14, 17, 18, 19, 20 a&b, 21 a&b, 23, 24, 25

STEM-AND-LEAF PLOTS **Make a stem-and-leaf plot of the data.**

3. 17, 31, 42, 33, 38, 20, 24, 30, 39, 38, 35, 20, 55

4. 2, 8, 17, 7, 14, 20, 32, 5, 33, 6, 6, 8, 11, 9

5. 121, 124, 133, 111, 109, 182, 105, 127, 156, 179, 142

6. 1.23, 1.05, 1.11, 1.29, 1.31, 1.19, 1.45, 1.22, 1.19, 1.35

STEM-AND-LEAF PLOT **In Exercises 8 and 9, consider the back-to-back stem-and-leaf plot that shows data sets *A* and *B*.**

8. ★ **MULTIPLE CHOICE** What is the median of data set *A*?

Ⓐ 21 Ⓑ 32

Ⓒ 33 Ⓓ 34

9. ★ **MULTIPLE CHOICE** What is the range of data set *B*?

Ⓐ 18 Ⓑ 19

Ⓒ 20 Ⓓ 21

Set *A*					Set *B*			
	1	1	1	2				
4	3	3	2	3	1	2	2	
	2	0		4	1	1	3	4
				5	0	1		

Key: 2 | 3 | 1 = 32, 31

HISTOGRAMS **Make a histogram of the data.**

11. 55, 82, 94, 75, 61, 69, 77, 98, 81, 83, 75, 90, 51

12. 12, 0, 22, 31, 14, 7, 7, 45, 31, 28, 21, 25, 25, 18

14. 111, 109, 224, 657, 284, 120, 119, 415, 180, 105, 208, 108

17. HEIGHTS The heights (in inches) of players on a boys' basketball team are as follows: 80, 76, 81, 69, 81, 78, 74, 68, 78, 74, 81, 72, 69, 81, 70. Make a stem-and-leaf plot of the heights.

18. SURVEY A survey asked people how many 8 ounce glasses of water they drink in one day. The results are below. Make a histogram of the data.

3, 0, 9, 1, 4, 2, 11, 5, 3, 6, 0, 5, 7, 8, 5, 2, 9, 6, 10, 2, 4

19. MEMORY A survey asked people how many phone numbers they have memorized. The results are shown in the table.

Phone numbers	1–5	6–10	11–15	16–20	21–25
Frequency	88	85	50	28	14

a. Make a histogram of the data.

b. What is the probability that a person surveyed, chosen at random, has 11–25 phone numbers memorized?

20. ★ EXTENDED RESPONSE The back-to-back stem-and-leaf plot shows the numbers of days the House of Representatives and the Senate spent in session each year from 1996 to 2004.

Days in Session

House					Senate		
		9	0	11			
		3	2	12			
7	5	3	2	13	2	3	
			2	14	1	3	9
				15	3		
				16	2	7	
				17	3		

Key: 2 | 14 | 1 = 142, 141

a. What was the median number of days the House of Representatives spent in session? the Senate?

b. What is the range of the number of days the House of Representatives spent in session? the Senate?

21. MAYFLOWER The known ages (in years) of adult male passengers on the *Mayflower* at the time of its departure are listed below.

21, 34, 29, 38, 30, 54, 39, 20, 35, 64, 37, 45, 21, 25, 55, 45, 40, 38, 38, 21, 21, 20, 34, 38, 50, 41, 48, 18, 32, 21, 32, 49, 30, 42, 30, 25, 38, 25, 20

a. Make a stem-and-leaf plot of the ages.

b. Find the median age and range of the ages.

Find the mean, median, and mode(s) of the data. *(p. 918)*

23. Ages of family members (in years): 62, 35, 51, 28, 22, 25, 16, 58, 30, 14

24. Minutes of exercise each day: 35, 20, 25, 20, 0, 30, 45, 40, 20, 30, 35, 0

25. Hours worked per week: 10, 9, 11, 12, 8, 15, 20, 9, 16, 14, 15, 12

13.6 p.877 #3-14 all, 19, 20, 24

MEASURES OF CENTRAL TENDENCY **Find the mean, median, and mode(s) of the data.**

3. 1, 1, 1, 2, 3, 3, 5, 5, 6

4. 9, 10, 12, 15, 16

5. 13, 16, 19, 20, 22, 25, 30, 31

6. 14, 15, 15, 14, 14, 16, 18, 15

7. 5.52, 5.44, 3.60, 5.76, 3.80, 7.22

8. 300, 320, 341, 348, 360, 333

9. ★ **MULTIPLE CHOICE** What is the median of the data set?

0.7, 0.3, 0.7, 0.8, 0.9, 0.4, 1.0, 1.6, 1.2

Ⓐ 0.7 Ⓑ 0.8 Ⓒ 0.9 Ⓓ 1.0

10. **ERROR ANALYSIS** *Describe* and correct the error in finding the median of the data set.

7 4 6 2 4 6 8 8 3

The median is 4.

MEASURES OF DISPERSION **Find the range and mean absolute deviation of the data. Round to the nearest hundredth, if necessary.**

11. 30, 35, 20, 85, 60

12. 111, 135, 115, 120, 145, 130

13. 30, 45, 52, 48, 100, 45, 42, 45

14. 505, 510, 480, 550, 495, 500

19. ★ **SHORT RESPONSE** The weights (in pounds) of ten pumpkins are 22, 21, 24, 24, 5, 24, 5, 23, 24, and 24.

a. What is the range of the pumpkin weights?

b. Find the mean, median, and mode(s) of the pumpkin weights.

c. Which measure of central tendency best represents the data? *Explain.*

20. **POPULATION** The population densities (in people per square mile) for each of the 10 most densely populated states in 2003 were 719.0, 418.5, 315.6, 563.6, 820.6, 1164.6, 406.5, 279.3, 275.9, and 1029.9.

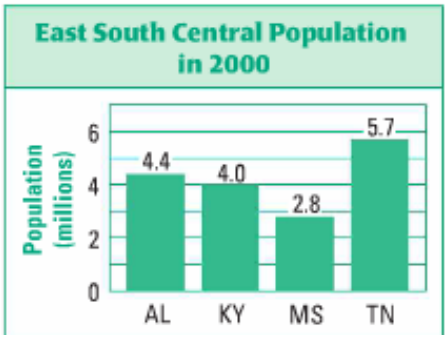
a. Find the mean, median, and mode(s) of the data set.

b. Which measure of central tendency best represents the data? *Explain.*

24. **POPULATION** The bar graph shows the populations of Alabama, Kentucky, Mississippi, and Tennessee (the East South Central states) according to the U.S. Census of 2000. *(p. 933)*

a. What was the total population of the four states?

b. How much greater was the population of Tennessee than the population of Kentucky?



13.8 p.889 #3, 4, 5, 8, 9, 11, 12, 13, 15, 16, 17, 18

BOX-AND-WHISKER PLOTS **Make a box-and-whisker plot of the data.**

3. 1, 7, 0, 7, 2, 6, 3, 6, 0, 7, 8

4. 10, 1, 7, 5, 1, 8, 5, 4, 6, 5, 9, 12

5. 52, 20, 24, 45, 35, 32, 39, 42, 23, 64

8. ★ **MULTIPLE CHOICE** About what percent of the data are greater than 20?

Ⓐ 25% Ⓑ 50% Ⓒ 75% Ⓓ 100%

9. ★ **MULTIPLE CHOICE** About what percent of the data are less than 15?

Ⓐ 25% Ⓑ 50% Ⓒ 75% Ⓓ 100%

OUTLIERS **Make a box-and-whisker plot of the data. Identify any outliers.**

11. Hours worked per week: 15, 15, 10, 12, 22, 10, 8, 14, 18, 22, 18, 15, 12, 11, 10

12. Prices of MP3 players: $124, $95, $105, $110, $95, $124, $300, $190, $114

13. Annual salaries: $30,000, $35,000, $48,000, $68,500, $32,000, $38,000

15. SEAWAY The average sailing times to the Atlantic Ocean from several ports on the St. Lawrence Seaway are shown on the map. Make a box-and-whisker plot of the sailing times.

16. BASEBALL STATISTICS In 2004, Ichiro Suzuki scored 101 runs. The numbers of runs he scored against different opposing teams are listed below. Make a box-and-whisker plot of the numbers of runs scored.

Runs scored: 18, 8, 4, 8, 2, 8, 0, 9, 0, 4, 2, 5, 9, 1, 2, 1, 2, 11, 7

17. RETAIL SALES The retail sales (in billions of dollars) of the nine U.S. states with the highest retail sales in 2002 are listed below.

California: $153.1	Florida: $118.2	Georgia: $38.4
Illinois: $52.4	New Jersey: $35.8	New York: $54.7
Ohio: $50.7	Pennsylvania: $49.9	Texas: $107.0

a. Make a box-and-whisker plot of the retail sales.

b. Which states, if any, had retail sales in 2002 that can be considered outliers?

18. ★ SHORT RESPONSE The stem-and-leaf plot shows the ages of the first 43 presidents of the United States when they first took the oath of office.

4	2 3 6 6 7 8 9 9
5	0 0 1 1 1 1 2 2 4 4 4 4 4 5 5 5 5 6 6 6 7 7 7 7 8
6	0 1 1 1 2 4 4 5 8 9

Key: 4 | 2 = 42 years

a. Make a box-and-whisker plot of the ages.

b. Ronald Reagan was the oldest United States president, and Theodore Roosevelt was the youngest. Can either of these presidents' ages be considered outliers? *Explain* why or why not.