

LESSON
11-1

Practice C
Permutations and Combinations

Evaluate.

1. $\frac{7! - 4!}{(6 - 3)!}$

2. $\frac{6!}{3!(8 - 5)!}$

3. $\frac{5!4!}{9!}$

4. ${}_{10}C_5$

5. ${}_7P_4$

6. ${}_{10}C_9$

Compare. Write >, <, or =.

7. ${}_8P_3 \square {}_6C_3$

8. ${}_{12}C_9 \square {}_{12}C_7$

9. ${}_9P_5 \square {}_{10}P_5$

Solve.

10. The door code to get into a top-secret laboratory is 6 digits. The first 3 digits of the code are all odd and the last 3 digits are all even. Digits can be used more than once. How many possible codes are there to gain access to this laboratory?

11. In how many ways can a 3-digit number be formed using the numbers 0–9, if each digit is used only one time?

12. The principal of the high school selects 4 Merit Scholars to attend a Town Council meeting. If there are a total of 12 Merit Scholars at the school, in how many ways can the students be selected?

13. A board of trustees is made up of 10 people. The board is choosing a chairperson, a secretary, and a publicist. If they have already decided upon a chairperson, in how many ways can they choose a secretary and a publicist?

14. There are 8 marbles in a bag. If they are all different colors, in how many ways can 4 marbles be chosen?

15. A student in a biology laboratory has 7 plants to use in an experiment. One plant will act as the control, 3 will be subjected to Environment A, and 3 will be subjected to Environment B. In how many ways can the student choose the plants that will be subjected to Environment B?

16. Holly wants to choose 5 different decorative tiles out of 8. If she plans to place the 5 tiles in a row, end to end, in how many different ways can she arrange them, from left to right?

Reading Strategies

1. 2 possible solutions
2. 4 possible solutions
3. 4 possible solutions
4. 2 possible solutions

LESSON 11-1

Practice A

1. 12
2. 46,656
3. 120
4. 360
5. $\frac{1}{2}$
6. 210 ways
7. 90 ways
8. 24
9. 3
10. 20
11. 10
12. 1680
13. 6
14. 21 ways
15. 120 ways

Practice B

1. 8 T-shirts
2. 24 packages
3. 720
4. 720
5. 60,360
6. 90 ways
7. 2184 ways
8. 120
9. 3
10. 336
11. a. 91 ways
b. 462 ways
c. 2300 ways

Practice C

1. 836
2. 20
3. $\frac{1}{126}$
4. 252
5. 840
6. 10
7. >
8. <
9. <
10. 15,625 codes
11. 720 ways
12. 495 ways
13. 72 ways
14. 70 ways
15. 35 ways
16. 6720 ways

Reteach

1. 40,320
2. 120

3. 3,628,800
4. 120
5. 15,120
6. 15
7. a. Yes
b. 8
c. 6720

$$8. {}_6P_4 = \frac{6!}{(6-4)!} = 360$$

9. 10
10. 7

11. 126
12. a. No
b. 56

$$13. {}_6C_2 = \frac{6!}{(6-2)!2!} = 15$$

Challenge

1. 2160
2. 720
3. 2880
4. 1440
5. 479,001,600
6. 1,437,004,800
7. 48
8. 72

Problem Solving

1. a. $12 \times 11 \times 10 = 1320$
b. Permutation; possible answer: the order of the 3 numbers matters.
2. a. 720 codes
b. 5040 codes
c. 151,200 codes
3. a. 78 ways
b. Combination; possible answer: the order in which she chooses the locks does not matter.
4. Because order matters, *combination locks* represent permutations.
5. C
6. J

Reading Strategy

1. 6
2. 12
3. 5
4. 5
5. 6
6. 7
7. Combination
8. Permutation
9. Combination
10. Permutation
11. Combination

LESSON
11-2

Practice C

Theoretical and Experimental Probability

Solve.

1. A bowl contains 36 blue, 75 green, and 19 yellow jelly beans. What is the probability of randomly selecting a green jelly bean? _____
2. Two spinners numbered 1–6 are spun. If all numbers are equally likely, what is the probability that the result will be two even numbers? _____
3. Four quilters are preparing patches for a quilt. When finished, the quilt will contain 200 patches. The quilters' contributions thus far are in the table below.

Name	Number of Patches
Lia	65
Brian	17
Elle	88
Len	6

- a. What is the probability that a randomly chosen patch will have been sewn by Elle? _____
- b. What is the probability that a randomly chosen patch will not have been sewn by Lia? _____
- c. What is the probability that a randomly chosen patch will have been sewn by Brian or Len? _____

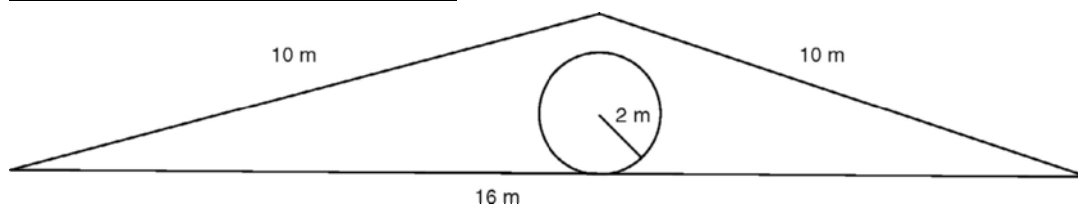
A hacker is trying to break into his school's computer system to change his F's to A's. The computer system access password is 5 digits.

4. If digits in the password are allowed to repeat, what is the probability that the hacker will guess the password correctly on the first try? _____
5. The hacker learns that the password does not contain any repeated digits. What is the new probability that he will randomly guess the password correctly? _____
6. If the password contains no repeated digits, what is the probability that the digits in the school password have a sum less than 10? _____

Use the diagram to find each probability.

7. That a random point is within the circle in the triangle

8. That a random point is NOT within the circle in the triangle



LESSON 11-2

Practice A

- 36 outcomes
- The sample space is blue, red, green, yellow.
- Certain
- Impossible
- $\frac{4}{7}$
- $\frac{1}{3}$
- $\frac{7}{10}$
- $\frac{1}{9}$
- $\frac{53}{100}$
- $\frac{83}{100}$
- $\frac{47}{100}$
- Yellow

Practice B

- $\frac{4}{11}$
- $\frac{1}{36}$
- $\frac{1}{15}$
- a. $\frac{2}{3}$
b. $\frac{1}{3}$
- $\frac{1}{35}$
- $\frac{9}{16}$
- $\frac{2}{19}$
- $\frac{12}{19}$
- $\frac{7}{19}$
- $\frac{14}{19}$

Practice C

- $\frac{15}{26}$
- $\frac{1}{4}$
- a. $\frac{1}{2}$
b. $\frac{111}{176}$
c. $\frac{23}{176}$

- $\frac{1}{100,000}$
- $\frac{1}{30,240}$
- 0
- $\frac{\pi}{12}$
- $1 - \frac{\pi}{12}$

Reteach

- a. (2, 1), (1, 2)
b. $\frac{1}{18}$
- a. (3, 1), (2, 2), (1, 3)
b. $\frac{1}{12}$
- a. (6, 3), (5, 4), (4, 5), (3, 6)
b. $\frac{1}{9}$
- a. 55
b. $\frac{8}{55}$
- a. 32
b. $\frac{32}{55}$
- a. 25
b. $\frac{5}{11}$

Challenge

- a. Possible answer: $\frac{17}{25} = 0.68$
b. Possible answer: 16.32 square units
c. 18.85 square units
d. Increase the number of random points in a simulation. Repeat the simulations a number of times and take the average of the results.
- The area derived from the simulation will vary but should be close to 50.24 square units.
- The area derived from the simulation will vary but should be close to 62.8 square units

LESSON
11-3

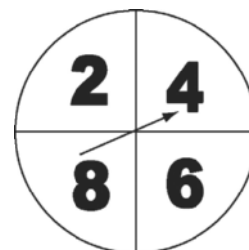
Practice C
Independent and Dependent Events

Find each probability.

- In cooking class, students are randomly choosing 1 of 3 different recipes. Two students choose the same recipe. _____
- Steven rolled a 1–6 number cube four times. The result was 4 odd numbers. _____

The spinner shown here is spun twice.

- The sum of the results is equal to or greater than 10 and the first spin lands on 4.
 - Explain why the events are dependent.



- Find the probability. _____
- The first spin lands on 6 and the sum of the results is less than or equal to 10.
 - Explain why the events are dependent.

- Find the probability. _____

The table shows the population distribution in Ireland in 1996 by age and gender.

Ireland's Population in 1996					
Age Group	0–20	21–40	41–60	61–80	Over 80
Males (in thousands)	620.4	526.8	405.3	212.0	33.0
Females (in thousands)	588.3	527.6	400.8	246.3	60.3

Find each probability.

- A randomly selected person is no more than 20 years old, given that the person is male. _____
- A randomly selected person is female, given that the person is over 80 years old. _____

A bag contains 3 red marbles, 7 yellow marbles, 5 green marbles, and 2 blue marbles. Determine whether the events are independent or dependent, and find each probability.

- A red marble is chosen at random and replaced, and then the SAME red marble is chosen at random again. _____
- A yellow marble and then a blue marble are chosen at random without replacement. _____

Problem Solving

- a. $P(N) = \frac{94}{564} \approx 0.17$
b. $P(N \text{ or } \textit{through}) = \frac{94 + 282}{564} \approx 0.67$
c. $1 - P(N) = 1 - 0.17 \approx 0.83$
- a. $\frac{76}{608} = 0.125$
b. $\frac{76 + 380}{608} = 0.75$
c. $1 - 0.125 = 0.875$
- Experimental; possible answer: the probabilities are based on actual data.
- C
- H

Reading Strategy

- $n = 3, t = 6$
- $n = 2, t = 8$
- $n = 8, t = 16$
- $n = 4, t = 12$
- Rolling a 1, 2, 4, 5, or 6
- a. Selecting a black marble or a white marble
b. $P(\text{not red}) = 1 - P(\text{red}) = 1 - \frac{10}{37} = \frac{27}{37}$

LESSON 11-3

Practice A

- a. $\frac{1}{2}$
b. $\frac{1}{2}$
c. $\frac{1}{4}$
- $\frac{1}{8}$
- $\frac{1}{4}$
- $\frac{1}{216}$
- $\frac{15}{56}$
- 0.032
- 0.032
- 0.27
- Dependent
- $\frac{2}{7}$

Practice B

- $\frac{3}{50}$
- $\frac{1}{9}$
- a. The events are dependent because $P(\text{sum} \geq 6)$ is different when it is known that a black 3 occurred.
b. $\frac{1}{9}$
- a. The events are dependent because $P(\text{sum} = 8)$ is different when it is known that the white cube shows an even number.
b. $\frac{1}{12}$
- 0.52
- 0.09
- 0.12
- Independent; $\frac{15}{121}$
- Dependent; $\frac{3}{43}$

Practice C

- $\frac{1}{9}$
- $\frac{1}{16}$
- a. Because $P(\text{sum} \geq 10)$ is different when it is known that the first spin lands on 4.
b. $\frac{1}{8}$
- a. Because $P(6)$ is different when it is known that the sum of both spins is less than or equal to 10.
b. $\frac{1}{8}$
- 0.35
- 0.65
- Independent; $\frac{3}{289}$
- Dependent; $\frac{7}{136}$

Reteach

- a. $\frac{1}{6}$
b. $\frac{1}{6}$
c. $\frac{1}{36}$

LESSON
11-4

Practice C
Compound Events

Cards numbered 1–25 are placed in a bag and one is drawn at random. Find each probability.

- Drawing an odd number or a multiple of 7. _____
- Drawing an even number or a perfect square. _____

A drug company is testing the side effects of different doses of a new drug on three different groups of volunteers.

Group	Volunteers	Daily Amount (mg)
A	353	150
B	467	200
C	310	250

- If a volunteer is chosen randomly, what is the probability that this person receives the highest amount per day? _____
- If a volunteer is chosen randomly, what is the probability that this person receives more than 150 mg per day? _____
- If a volunteer is chosen randomly, what is the probability that this person does NOT receive 200 mg per day? _____

Mr. Rodney’s English class is made up of 28 students. He has 6 ESL students, 10 remedial students, and 5 advanced learners. ESL students make up $\frac{1}{5}$ of the remedial students and $\frac{3}{5}$ of the advanced learners.

- What is the probability that a student is ESL and remedial? _____
- What is the probability that a student is ESL and an advanced learner? _____
- What is the probability that a student is remedial and NOT ESL? _____

Solve.

- A student is collecting a population of laboratory mice to be used in an experiment. He finds that of the 236 mice in the lab, 173 mice are female and 99 have pink eyes. Just 10 of the pink-eyed mice are male. What is the probability that a mouse is female or has pink eyes?

- A group of 4 friends buys a CD of computer screen savers. If there are a total of 12 screen savers on the CD, what is the probability that at least 2 of the friends will choose the same screen saver for their computer?

2. $\frac{13}{40}$

3. $\frac{1}{3}$

c. $\frac{2}{52}$

4. $\frac{5}{6}$

5. $\frac{2}{3}$

d. $\frac{7}{13}$

6. $\frac{7}{8}$

7. $\frac{29}{40}$

4. a. $\frac{13}{52}$

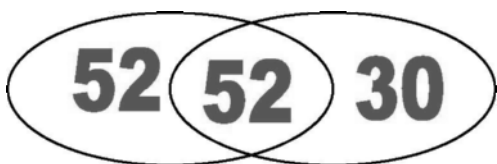
8. $\frac{4}{5}$

9. $\frac{67}{110}$ or 0.61

b. $\frac{12}{52}$

c. $\frac{3}{52}$

d. $\frac{11}{26}$



10. 0.81

Practice C

1. $\frac{14}{25}$

2. $\frac{3}{5}$

3. $\frac{31}{113}$ or 0.27

4. $\frac{777}{1130}$ or 0.69

5. $\frac{663}{1130}$ or 0.59

6. 0.07

7. 0.11

8. 0.29

9. $\frac{183}{236}$ or 0.78

10. 0.43

Reteach

1. a. $\frac{10}{13}$

b. $\frac{1}{13}$

c. $\frac{11}{13}$

2. a. $\frac{1}{13}$

b. $\frac{1}{13}$

c. $\frac{2}{13}$

3. a. $\frac{26}{52}$

b. $\frac{4}{52}$

Challenge1. Given: $P(A) = 0.25$, $P(A \text{ or } B) = 0.35$,
 $P(A \text{ and } B) = 0.05$. Determine: $P(B)$

2. 15%

3. a. $\frac{1}{4} = \frac{2s}{5s+6}$

b. 16 songs

c. $\frac{7}{8}$

4. The probability of the shaded area is subtracted from the sum of the probabilities of the individual sets.

5. $P(A \text{ or } B \text{ or } C) = P(A) + P(B) + P(C) - P(A \text{ and } B) - P(A \text{ and } C) - P(B \text{ and } C) + P(A \text{ and } B \text{ and } C)$ **Problem Solving**

1. a. The total number of male students; 44

b. The total number of students in favor of the change; 54

c. $54 - 20 = 34$

e. $\frac{44}{100} + \frac{54}{100} - \frac{34}{100} = \frac{64}{100} = 0.64$

2. a. $100 - 44 = 56$ b. $100 - 54 = 46$

c. The number of females who are opposed to the change; 36

d. $\frac{56}{100} + \frac{46}{100} - \frac{36}{100} = \frac{66}{100} = 0.66$

3. $\frac{27}{100} + \frac{54}{100} - \frac{18}{100} = \frac{63}{100} = 0.63$

LESSON
11-5

Practice C
Measures of Central Tendency and Variation

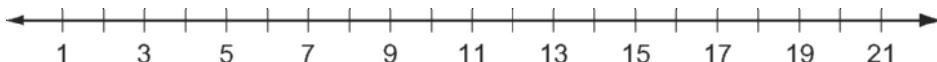
Write a data set to satisfy the given conditions.

1. Median = 8; mode = 4

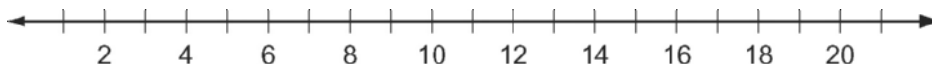
2. Mean = 10; median = 12

Make a box-and-whisker plot of the data. Find the interquartile range.

3. 21, 20, 4, 5, 5, 20, 20, 13, 1, 1, 13, 7, 13, 17, 7, 17, 9, 9



4. 10, 16, 3, 18, 18, 10, 8, 2, 9, 3, 7, 7, 8, 8, 18, 13, 7, 13



Find the variance and standard deviation.

5. { 13, 7, 16, 22, 26, 11, 12, 19, 9 }

6. { 4, 7, 28, 6, 1, 1, 10, 15, 48, 3, 4, 5 }

7. { 15, 5, 12, 8, 19, 11, 7, 10, 9, 13, 17, 5 }

8. { 37, 29, 33, 30, 23, 28, 20, 35, 19, 21 }

Solve.

9. The probability distribution for the number of children per family in a particular suburb of Chicago is shown below.

Find the expected number of children per family in this region.

Number of Children, n	1	2	3	4
Probability	0.27	0.28	0.35	0.10

10. A chemist weighs samples obtained from a production run. The weights of the samples are 13 g, 14 g, 65 g, 11 g, 15 g, 14 g, 14 g, 12 g, 13 g, 15 g, 14 g, and 12 g.

a. Find the mean of the data.

b. Find the standard deviation.

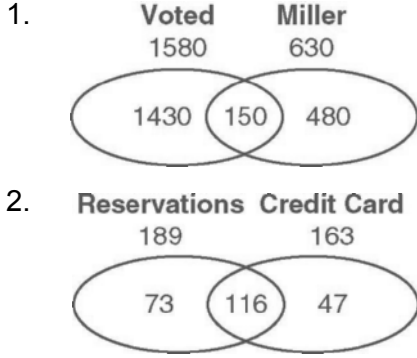
c. Identify any outliers.

d. Describe how any outlier affects the mean and the standard deviation.

4. C

5. J

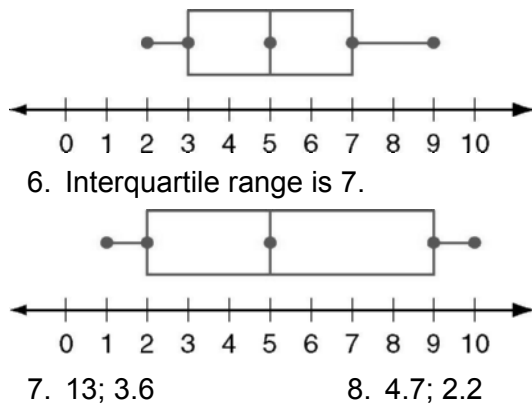
Reading Strategy



LESSON 11-5

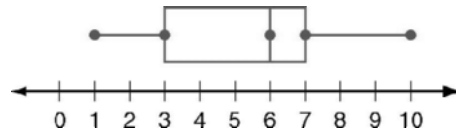
Practice A

- 1. a. 5.25
b. 5
c. 2, 5
- 2. a. 9
b. 9.5
c. 11
- 3. 6.07 4. 2.05
- 5. Interquartile range is 4.

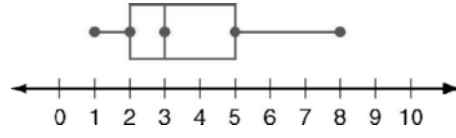


Practice B

- 1. a. 10.5
b. 11.5
c. None
- 2. a. 8.6
b. 9
c. 9
- 3. Interquartile range is 4.



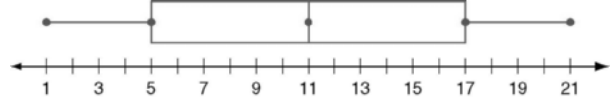
4. Interquartile range is 3.



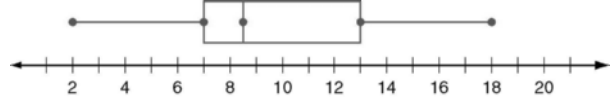
- 5. 6.8; 2.6 6. 278; 16.7
- 7. 9.3; 3.0 8. 8.4; 2.9
- 9. 7.01
- 10. a. 45.1
b. 13.1
c. 88
d. The mean increases from ≈ 41.2 to ≈ 45.1 , and the standard deviation increases from ≈ 2.1 to ≈ 13.1 .

Practice C

- 1. Possible answer: $\{4, 4, 8, 9, 10\}$
- 2. Possible answer: $\{3, 6, 12, 14, 15\}$
- 3. Interquartile range is 12.



4. Interquartile range is 6.



- 5. 35.1; 5.9 6. 176.2; 13.3
- 7. 18.6; 4.3 8. 37.6; 6.1
- 9. 2.28
- 10. a. 17.7
b. 14.3
c. 65
d. The mean increases from ≈ 13.4 to ≈ 17.7 , and the standard deviation increases from ≈ 1.2 to ≈ 14.3 .

Reteach

- 1. 5
- 2. Expected value = $x_1p_1 + x_2p_2 + x_3p_3 + x_4p_4 + x_5p_5$
- 3. ≈ 6.9 4. 3