

NAME _____ DATE _____ PERIOD _____

12-1 Skills Practice**The Counting Principle**State whether the events are *independent* or *dependent*.

- finishing in first, second, or third place in a ten-person race **dependent**
- choosing a pizza size and a topping for the pizza **independent**
- Seventy-five raffle tickets are placed in a jar. Three tickets are then selected, one after the other, without replacing a ticket after it is chosen. **dependent**
- The 232 members of the freshman class all vote by secret ballot for the class representative to the Student Senate. **independent**

Solve each problem.

- A surveying firm plans to buy a color printer for printing its maps. It has narrowed its choice to one of three models. Each of the models is available with either 32 megabytes of random access memory (RAM), 64 megabytes of RAM, or 128 megabytes of RAM. From how many combinations of models and RAM does the firm have to choose? **9**
- How many arrangements of three letters can be formed from the letters of the word *MATH* if any letter will not be used more than once? **24**
- Allan is playing the role of Oliver in his school's production of *Oliver Twist*. The wardrobe crew has presented Allan with 5 pairs of pants and 4 shirts that he can wear. From how many possible costumes consisting of a pair of pants and a shirt does Allan have to choose? **20**
- The 10-member steering committee that is preparing a study of the public transportation needs of its town will select a chairperson, vice-chairperson, and secretary from the committee. No person can serve in more than one position. In how many ways can the three positions be filled? **720**
- Jeanine has decided to buy a pickup truck. Her choices include either a V-6 engine or a V-8 engine, a standard cab or an extended cab, and 2-wheel drive or 4-wheel drive. How many possible models does she have to choose from? **8**
- A mail-order company that sells gardening tools offers rakes in two different lengths. Customers can also choose either a wooden, plastic, or fiberglass handle for the rake. How many different kinds of rakes can a customer buy? **6**
- A Mexican restaurant offers chicken, beef, or vegetarian fajitas wrapped with either corn or flour tortillas and topped with either mild, medium, or hot salsa. How many different choices of fajitas does a customer have? **18**

Chapter 12

8

Glencoe Algebra 2

NAME _____ DATE _____ PERIOD _____

12-1 Practice**The Counting Principle**State whether the events are *independent* or *dependent*.

- choosing an ice cream flavor and choosing a topping for the ice cream **independent**
- choosing an offensive player of the game and a defensive player of the game in a professional football game **independent**
- From 15 entries in an art contest, a camp counselor chooses first, second, and third place winners. **dependent**
- Jillian is selecting two more courses for her block schedule next semester. She must select one of three morning history classes and one of two afternoon math classes. **independent**

Solve each problem.

- A briefcase lock has 3 rotating cylinders, each containing 10 digits. How many numerical codes are possible? **1000**
- A golf club manufacturer makes irons with 7 different shaft lengths, 3 different grips, 5 different lies, and 2 different club head materials. How many different combinations are offered? **210**
- There are five different routes that a commuter can take from her home to the office. In how many ways can she make a round trip if she uses a different route coming than going? **20**
- In how many ways can the four call letters of a radio station be arranged if the first letter must be W or K and no letters repeat? **27,600**
- How many 7-digit phone numbers can be formed if the first digit cannot be 0 or 1, and any digit can be repeated? **8,000,000**
- How many 7-digit phone numbers can be formed if the first digit cannot be 0, and any digit can be repeated? **9,000,000**
- How many 7-digit phone numbers can be formed if the first digit cannot be 0 or 1, and no digit can be repeated? **483,840**
- How many 7-digit phone numbers can be formed if the first digit cannot be 0, and no digit can be repeated? **544,320**
- How many 6-character passwords can be formed if the first character is a digit and the remaining 5 characters are letters that can be repeated? **118,813,760**
- How many 6-character passwords can be formed if the first and last characters are digits and the remaining characters are letters? Assume that any character can be repeated. **45,697,600**

Chapter 12

9

Glencoe Algebra 2

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NAME _____ DATE _____ PERIOD _____

12-2 Practice

Permutations and Combinations

Evaluate each expression.

- | | | |
|----------------------------|-----------------------------|---|
| 1. $P(8, 6)$ 20,160 | 2. $P(9, 7)$ 181,440 | 3. $P(3, 3)$ 6 |
| 4. $P(4, 3)$ 24 | 5. $P(4, 1)$ 4 | 6. $P(7, 2)$ 42 |
| 7. $C(8, 2)$ 28 | 8. $C(11, 3)$ 165 | 9. $C(20, 18)$ 190 |
| 10. $C(9, 9)$ 1 | 11. $C(3, 1)$ 3 | 12. $C(9, 3) \cdot C(6, 2)$ 1260 |

Determine whether each situation involves a *permutation* or a *combination*. Then find the number of possibilities.

- selecting a 4-person bobsled team from a group of 9 athletes
combination; 126
- an arrangement of the letters in the word *Canada*
permutation; 120
- arranging 4 charms on a bracelet that has a clasp, a front, and a back
permutation; 24
- selecting 3 desserts from 10 desserts that are displayed on a dessert cart in a restaurant
combination; 120
- an arrangement of the letters in the word *annually*
permutation; 5040
- forming a 2-person sales team from a group of 12 salespeople
combination; 66
- making 5-sided polygons by choosing any 5 of 11 points located on a circle to be the vertices
combination; 462
- seating 5 men and 5 women alternately in a row, beginning with a woman
permutation; 14,400
- STUDENT GROUPS** Farmington High is planning its academic festival. All math classes will send 2 representatives to compete in the math bowl. How many different groups of students can be chosen from a class of 16 students? **120**
- PHOTOGRAPHY** A photographer is taking pictures of a bride and groom and their 6 attendants. If she takes photographs of 3 people in a group, how many different groups can she photograph? **56**
- AIRLINES** An airline is hiring 5 flight attendants. If 8 people apply for the job, how many different groups of 5 attendants can the airline hire? **56**
- SUBSCRIPTIONS** A school librarian would like to buy subscriptions to 7 new magazines. Her budget, however, will allow her to buy only 4 new subscriptions. How many different groups of 4 magazines can she choose from the 7 magazines? **35**

12-2 Word Problem Practice

Permutations and Combinations

NAME _____ DATE _____ PERIOD _____

- WAITING IN LINE** When the 12 students in Mr. Jaybird's class go to lunch, they form a single file line. Does forming a line involve a permutation or a combination of the students?
A permutation
- ART** Isabel needs to select three different colors of construction paper to make a flag for a school project. She can choose from a selection of 15 different colors. In how many ways can she pick her colors?
455
- SUDOKU** A popular game called "Sudoku" involves square arrays of numbers. In a game of Sudoku, every entry is an integer between 1 and 9, inclusive. No number appears twice in any row or column.
- NAMES** Hannah is curious to know how many different 6 letter sequences she can make using each of the letters of her name exactly once. For example, "HANNAH," "AAHHNN," and "NAHNAH" are all possible sequences. How many total sequences are possible?
90

METEORITES For Exercises 5 and 6, use the following information.

Over the course of several years, Kendra managed to collect 7 meteorites. Each one is unique.

- For a school science fair, Kendra displays her meteorites in a row. How many ways are there to order the meteorites?
5040

- She decides to trade three of her meteorites for a telescope after the fair. How many ways can she pick out 3 meteorites from her collection?
35

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

For a game of Sudoku, how many different possibilities are there for the first row of numbers?

362,880

NAME _____ DATE _____ PERIOD _____

12-3 Practice

Probability

A bag contains 1 green, 4 red, and 5 yellow balls. Two balls are selected at random. Find the probability of each selection.

1. $P(2 \text{ red})$ $\frac{2}{15}$ 2. $P(1 \text{ red and } 1 \text{ yellow})$ $\frac{4}{9}$ 3. $P(1 \text{ green and } 1 \text{ yellow})$ $\frac{1}{9}$
 4. $P(2 \text{ green})$ 0 5. $P(2 \text{ red and } 1 \text{ yellow})$ 0 6. $P(1 \text{ red and } 1 \text{ green})$ $\frac{4}{45}$

A bank contains 3 pennies, 8 nickels, 4 dimes, and 10 quarters. Two coins are selected at random. Find the probability of each selection.

7. $P(2 \text{ pennies})$ $\frac{1}{100}$ 8. $P(2 \text{ dimes})$ $\frac{1}{50}$ 9. $P(1 \text{ nickel and } 1 \text{ dime})$ $\frac{8}{75}$
 10. $P(1 \text{ quarter and } 1 \text{ penny})$ $\frac{1}{10}$ 11. $P(1 \text{ quarter and } 1 \text{ nickel})$ $\frac{4}{15}$ 12. $P(2 \text{ dimes and } 1 \text{ quarter})$ 0

Henrico visits a home decorating store to choose wallpapers for his new house. The store has 28 books of wallpaper samples, including 10 books of WallPride samples and 18 books of Deluxe Wall Coverings samples. The store will allow Henrico to bring 4 books home for a few days so he can decide which wallpapers he wants to buy. If Henrico randomly chooses 4 books to bring home, find the probability of each selection.

13. $P(4 \text{ WallPride})$ $\frac{2}{195}$ 14. $P(2 \text{ WallPride and } 2 \text{ Deluxe})$ $\frac{153}{455}$
 15. $P(1 \text{ WallPride and } 3 \text{ Deluxe})$ $\frac{544}{1365}$ 16. $P(3 \text{ WallPride and } 1 \text{ Deluxe})$ $\frac{48}{455}$

For Exercises 17–20, use the table that shows the range of verbal SAT scores for freshmen at a small liberal arts college. If a freshman student is chosen at random, find each probability. Express as decimals rounded to the nearest thousandth.

Range	400–449	450–499	500–549	550–599	600–649	650+
Number of Students	129	275	438	602	620	412

17. $P(400\text{--}449)$ **0.052** 18. $P(550\text{--}599)$ **0.243** 19. $P(\text{at least } 650)$ **0.166**

Find the odds of an event occurring, given the probability of the event.

20. $\frac{4}{11}$ **4:7** 21. $\frac{12}{13}$ **12:1** 22. $\frac{5}{99}$ **5:94** 23. $\frac{1}{1000}$ **1:999**
 24. $\frac{5}{16}$ **5:11** 25. $\frac{3}{95}$ **3:92** 26. $\frac{9}{70}$ **9:61** 27. $\frac{8}{15}$ **8:7**

Find the probability of an event occurring, given the odds of the event.

28. 2:23 $\frac{2}{25}$ 29. 2:5 $\frac{2}{7}$ 30. 15:1 $\frac{15}{16}$ 31. 9:7 $\frac{9}{16}$
 32. 11:14 $\frac{11}{25}$ 33. 1000:1 $\frac{1000}{1001}$ 34. 12:17 $\frac{12}{29}$ 35. 8:13 $\frac{8}{21}$

NAME _____ DATE _____ PERIOD _____

12-3 Word Problem Practice

Probability

1. **ART** The letters "A", "R", and "T" are written on three different pieces of paper. The pieces of paper are then put in a bag and mixed up. Logan picks each letter without looking and places them side by side. What is the probability that the letters spell "ART"?

$\frac{1}{6}$

2. **AGE** There are 24 students in Miss Mason's third grade class, all born on different days. Eleven students are boys. In the morning, the classroom is empty. One student arrives followed by another. What is the probability that when the first two students arrive, one is a boy and the other a girl?

52%

3. **DICE** Jamal rolls two six-sided dice, one after the other. What is the probability that the second die shows a number larger than the first die?

$\frac{5}{12}$

4. **LANGUAGES** Noah cannot decide whether to learn French, German, Italian, Russian, or Chinese. He assigns each language a different number from 0 to 4. He then takes four fair coins and flips them. He decided to take the language corresponding to the number of coins that come up heads. Does Noah's method for choosing a language give each language the same chance of being chosen? Explain.

No. For example, the probability of getting 0 is 1 in 16 but the probability of getting 1 is 1 in 4.

ICE CREAM For Exercises 5–7, use the following information.

A survey of the students in Mr. Orr's fifth grade class asked each student to name their favorite flavor of ice cream. The results are shown in the table below.

Flavor	Number of Students
Vanilla	10
Chocolate	9
Butternut	5
Strawberry	4
Banana	1
Coffee	1

5. A student from Mr. Orr's class is selected at random. What is the probability that the student's favorite flavor of ice cream is chocolate?

$\frac{3}{10}$

6. A student from Mr. Orr's class is selected at random. What is the probability that the student's favorite flavor of ice cream is banana?

$\frac{1}{30}$

7. A student from Mr. Orr's class is selected at random. Is it more likely that the student prefers either butternut or strawberry or that the student prefers either chocolate or banana?

Chocolate or banana is more likely.

NAME _____ DATE _____ PERIOD _____

12-4 Skills Practice

Multiplying Probabilities

A die is rolled twice. Find each probability.

- $P(5, \text{ then } 6) = \frac{1}{36}$
- $P(\text{no } 2\text{s}) = \frac{25}{36}$
- $P(\text{two } 1\text{s}) = \frac{1}{36}$
- $P(\text{any number, then not } 5) = \frac{5}{6}$
- $P(4, \text{ then not } 6) = \frac{5}{36}$
- $P(\text{not } 1, \text{ then not } 2) = \frac{25}{36}$

A board game uses a set of 6 different cards. Each card displays one of the following figures: a star, a square, a circle, a diamond, a rectangle, or a pentagon. The cards are placed face down, and a player chooses two cards. Find each probability.

- $P(\text{circle, then star, if no replacement occurs}) = \frac{1}{30}$
- $P(\text{diamond, then square, if replacement occurs}) = \frac{1}{36}$
- $P(2 \text{ polygons, if replacement occurs}) = \frac{25}{36}$
- $P(2 \text{ polygons, if no replacement occurs}) = \frac{2}{3}$
- $P(\text{circle, then hexagon, if no replacement occurs}) = 0$

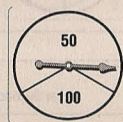
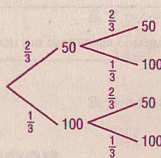
Determine whether the events are *independent* or *dependent*. Then find each probability.

- A mixed box of herbal teabags contains 2 lemon teabags, 3 orange-mango teabags, 3 chamomile teabags, and 1 apricot-ginger teabag. Kevin chooses 2 teabags at random to bring to work with him. What is the probability that he first chooses a lemon teabag and then a chamomile teabag? **dependent; $\frac{1}{12}$**
- The chart shows the selection of olive oils that Hasha finds in a specialty foods catalog. If she randomly selects one type of oil, then randomly selects another, different oil, what is the probability that both selections are domestic, first cold pressed oils? **dependent; $\frac{21}{820}$**

Type of Oil	Domestic	Imported
Pure	2	5
Cold Pressed	4	8
First Cold Pressed	7	15

For Exercises 14 and 15, two thirds of the area of the spinner earns you 50 points. Suppose you spin the spinner twice.

- Sketch a tree diagram showing all of the possibilities. Use it to find the probability of spinning 50 points, then 100 points. **$\frac{2}{9}$**



- What is the probability that you get 100 points on each spin? **$\frac{1}{9}$**

NAME _____ DATE _____ PERIOD _____

12-4 Practice

Multiplying Probabilities

A die is rolled three times. Find each probability.

- $P(\text{three } 4\text{s}) = \frac{1}{216}$
- $P(\text{no } 4\text{s}) = \frac{125}{216}$
- $P(2, \text{ then } 3, \text{ then } 1) = \frac{1}{216}$
- $P(\text{three different even numbers}) = \frac{1}{36}$
- $P(\text{any number, then } 5, \text{ then } 5) = \frac{1}{36}$
- $P(\text{even number, then odd number, then } 1) = \frac{1}{24}$

There are 3 nickels, 2 dimes, and 5 quarters in a purse. Three coins are selected in succession at random. Find the probability.

- $P(\text{nickel, then dime, then quarter, if no replacement occurs}) = \frac{1}{24}$
- $P(\text{nickel, then dime, then quarter, if replacement occurs}) = \frac{3}{100}$
- $P(2 \text{ nickels, then } 1 \text{ quarter, if no replacement occurs}) = \frac{1}{24}$
- $P(3 \text{ dimes, if replacement occurs}) = \frac{1}{125}$
- $P(3 \text{ dimes, if no replacement occurs}) = 0$

For Exercises 12 and 13, determine whether the events are *independent* or *dependent*. Then find each probability.

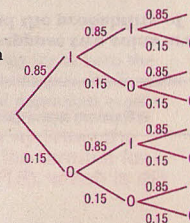
- Serena is creating a painting. She wants to use 2 more colors. She chooses randomly from 6 shades of red, 10 shades of green, 4 shades of yellow, 4 shades of purple, and 6 shades of blue. What is the probability that she chooses 2 shades of green? **dependent; $\frac{3}{29}$**
- Kershel's mother is shopping at a bakery. The owner offers Kershel a cookie from a jar containing 22 chocolate chip cookies, 18 sugar cookies, and 15 oatmeal cookies. Without looking, Kershel selects one, drops it back in, and then randomly selects another. What is the probability that neither selection was a chocolate chip cookie? **independent; $\frac{9}{25}$**
- METEOROLOGY** The Fadeeva's are planning a 3-day vacation to the mountains. A long-range forecast reports that the probability of rain each day is 10%. Assuming that the daily probabilities of rain are independent, what is the probability that there is no rain on the first two days, but that it rains on the third day? **$\frac{81}{1000}$**

RANDOM NUMBERS For Exercises 15 and 16, use the following information.

Anita has a list of 20 jobs around the house to do, and plans to do 3 of them today. She assigns each job a number from 1 to 20, and sets her calculator to generate random numbers from 1 to 20, which can reoccur. Of the jobs, 3 are outside, and the rest are inside.

- Sketch a tree diagram showing all of the possibilities that the first three numbers generated correspond to inside jobs or outside jobs. Use it to find the probability that the first two numbers correspond to inside jobs, and the third to an outside job. **0.108375**

- What is the probability that the number generated corresponds to an outside job three times in a row? **0.003375**



NAME _____ DATE _____ PERIOD _____

12-5 Practice

Adding Probabilities

An urn contains 7 white marbles and 5 blue marbles. Four marbles are selected without replacement. Find each probability.

1. $P(4 \text{ white or } 4 \text{ blue}) = \frac{8}{99}$
2. $P(\text{exactly } 3 \text{ white}) = \frac{35}{99}$
3. $P(\text{at least } 3 \text{ white}) = \frac{14}{33}$
4. $P(\text{fewer than } 3 \text{ white}) = \frac{19}{33}$
5. $P(3 \text{ white or } 3 \text{ blue}) = \frac{49}{99}$
6. $P(\text{no white or no blue}) = \frac{8}{99}$

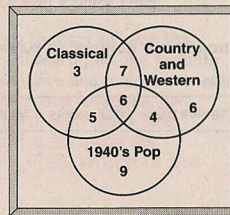
Jason and Maria are playing a board game in which three dice are tossed to determine a player's move. Find each probability.

7. $P(\text{two } 5\text{s}) = \frac{5}{72}$
8. $P(\text{three } 5\text{s}) = \frac{1}{216}$
9. $P(\text{at least two } 5\text{s}) = \frac{2}{27}$
10. $P(\text{no } 5\text{s}) = \frac{125}{216}$
11. $P(\text{one } 5) = \frac{25}{72}$
12. $P(\text{one } 5 \text{ or two } 5\text{s}) = \frac{5}{12}$

Determine whether the events are *mutually exclusive* or *inclusive*. Then find the probability.

13. A clerk chooses 4 CD players at random for floor displays from a shipment of 24 CD players. If 15 of the players have a blue case and the rest have a red case, what is the probability of choosing 4 players with a blue case or 4 players with a red case? **mutual. exclus.; $\frac{71}{506}$**
14. A department store employs 28 high school students, all juniors and seniors. Six of the 12 seniors are females and 12 of the juniors are males. One student employee is chosen at random. What is the probability of selecting a senior or a female? **inclusive; $\frac{4}{7}$**
15. A restaurant has 5 pieces of apple pie, 4 pieces of chocolate cream pie, and 3 pieces of blueberry pie. If Janine selects a piece of pie at random for dessert, what is the probability that she selects either apple or chocolate cream? **mutually exclusive; $\frac{3}{4}$**
16. At a statewide meeting, there are 20 school superintendents, 13 principals, and 6 assistant principals. If one of these people is chosen at random, what is the probability that he or she is either a principal or an assistant principal? **mutually exclusive; $\frac{19}{39}$**
17. An airline has one bank of 13 telephones at a reservations office. Of the 13 operators who work there, 8 take reservations for domestic flights and 5 take reservations for international flights. Seven of the operators taking domestic reservations and 3 of the operators taking international reservations are female. If an operator is chosen at random, what is the probability that the person chosen takes domestic reservations or is a male? **inclusive; $\frac{10}{13}$**

18. **MUSIC** Forty senior citizens were surveyed about their music preferences. The results are displayed in the Venn diagram. If a senior citizen from the survey group is selected at random, what is the probability that he or she likes only country and western music? What is the probability that he or she likes classical and/or country, but not 1940's pop? **$\frac{3}{20}$; $\frac{2}{5}$**



NAME _____ DATE _____ PERIOD _____

12-5 Word Problem Practice

Adding Probabilities

1. **PICK-UP** When Tina's parents pick her up from school, there is a $\frac{1}{5}$ chance that she will be in the library, a $\frac{1}{2}$ chance that she will be on the playground, and a $\frac{3}{10}$ chance that she will be in her classroom. What is the probability that when Tina's parents pick her up, she is found in her classroom or on the playground? **$\frac{4}{5}$**

2. **TRAVEL** John is randomly selected to be given a chance to win a new car. He must choose a red or yellow marble from a bag containing 1 red, 2 yellow, 10 green, and 12 blue marbles. What is the probability he will win the car? **$\frac{3}{25}$**

3. **DICE** Alexis rolls two identical dice. What is the probability that the sum of the numbers rolled is odd? What is the probability that the sum of the numbers rolled is greater than 7? What is the probability that the sum of the numbers rolled is odd or greater than 7?
 $P(\text{odd}) = \frac{1}{2}$; $P(>7) = \frac{5}{12}$;
 $P(\text{odd or } >7) = \frac{3}{4}$

4. **CLASSES** At Jackson High School, 56 of the eleventh graders take physics and 70 of them take biology. There are 400 eleventh graders in total at the school. An eleventh grader is chosen at random from among all the eleventh graders at the high school. The probability that the selected student takes physics and biology is $\frac{11}{40}$. How many students at the high school take physics or biology? **16**

PASSENGERS For Exercises 5 and 6, use the following information.

- On an airplane flight, some passengers travel with carry-on luggage while others travel with a suitcase. Some passengers travel with carry-on luggage and a suitcase. Everyone travels with some form of luggage.
5. On one flight, there was no passenger with both carry-on luggage and a suitcase. On this flight are the events of picking a passenger with carry-on luggage and picking a passenger with a suitcase mutually exclusive? **Yes**
 6. On another flight, there are 120 passengers. Of those 120 passengers, 80 have carry-on luggage and 70 have a suitcase. What is the probability that a passenger has both carry-on luggage and a suitcase? **$\frac{1}{4}$**

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NAME _____ DATE _____ PERIOD _____

12-6 Practice

Statistical Measures

Find the variance and standard deviation of each set of data to the nearest tenth.

- [47, 61, 93, 22, 82, 22, 37]
673.1, 25.9
- [10, 10, 54, 39, 96, 91, 91, 18]
1228.6, 35.1
- [1, 2, 2, 3, 3, 3, 4, 4, 4, 4, 5, 5, 5, 5, 5]
1.6, 1.2
- {1100, 725, 850, 335, 700, 800, 950}
49,150.0; 221.7
- {3.4, 7.1, 8.5, 5.1, 4.7, 6.3, 9.9, 8.4, 3.6}
4.7, 2.2
- {2.8, 0.5, 1.9, 0.8, 1.9, 1.5, 3.3, 2.6, 0.7, 2.5}
0.8, 0.9

7. HEALTH CARE Eight physicians with 15 patients on a hospital floor see these patients an average of 18 minutes a day. The 22 nurses on the same floor see the patients an average of 3 hours a day. As a hospital administrator, would you quote the mean, median, or mode as an indicator of the amount of daily medical attention the patients on this floor receive? Explain. **Either the median or the mode; they are equal and higher than the mean, which is lowered by the smaller amount of time the physicians spend with the patients.**

For Exercises 8–10, use the frequency table that shows the percent of public school teachers in the U. S. in 1999 who used computers or the Internet at school for various administrative and teaching activities.

Activity	Percent Using Computer or Internet
Create instructional materials	39
Administrative record keeping	34
Communicate with colleagues	23
Gather information for planning lessons	16
Multimedia classroom presentations	8
Access research and best practices for teaching	8
Communicate with parents or students	8
Access model lesson plans	6

Source: National Assessment of Educational Progress

- Find the mean, median, and mode of the data. **17.75%, 12%, 8%**
- Suppose you believe teachers use computers or the Internet too infrequently. Which measure would you quote as the “average?” Explain. **Mode; it is lowest.**
- Suppose you believe teachers use computers or the Internet too often. Which measure would you quote as the “average?” Explain. **Mean; it is highest.**

For Exercises 11 and 12, use the frequency table that shows the number of games played by 24 American League baseball players between opening day, 2001 and September 8, 2001.

No. of Games	Frequency
141	4
140	3
139	4
138	5
137	2
136	3
135	3

Source: Major League Baseball

- Find the mean, median, mode, and standard deviation of the number of games played to the nearest tenth.
138.2, 138; 138, 2.0
- For how many players is the number of games within one standard deviation of the mean? **14**

NAME _____ DATE _____ PERIOD _____

12-6 Word Problem Practice

Statistical Measures

1. SPORTS The table below shows the number of times some teams in the National Football League have won the Super Bowl.

NFL Team	Number of Super Bowl Victories
New England	3
Baltimore	2
Kansas City	1
St. Louis	1
Denver	2
Green Bay	1
Dallas	5
San Francisco	5
Oakland	2
Pittsburgh	5
Miami	2
Washington	3
NY Giants	2
NY Jets	1
Chicago	1

Source: www.pubquizhelp.34sp.com

Which statistical measure represents the team(s) with the least Super Bowl victories? **the mode**

- SALARIES** The median salary in a small company is \$10.20 per hour. What percentage of the employees at the company earns more than \$10.20 per hour? **50%**
- RANDOM GENERATORS** Samuel has written a computer program to generate a random selection of the following two-digit numbers.
25, 67, 54, 99, 41, 87, 90, 18, 32
Find the mean, median, and mode of this data. **57; 54; none**

4. HEIGHTS The following table lists the heights of some of the great NBA players.

Player	Height (In Inches)
Kareem Abdul-Jabbar	86
Larry Bird	81
Shaquille O'Neal	85
Wilt Chamberlain	85
Michael Jordan	78

Source: www.sidwell.edu

Find the mean and standard deviation of the data in the table. Round your answer to the nearest hundredth.
83; 3.0

METEORS For Exercises 5–8, use the following information.

Arlene stayed up late one night to watch the Perseid meteor shower. She recorded the number of meteors she saw every ten minutes starting at 1 A.M. and going until 4 A.M. Her data are shown below.
8, 7, 8, 12, 17, 15, 22, 28, 29, 31, 28, 23, 29, 28, 25, 23, 15, 12

- What is the mean of this data set?
20
- What is the median of this data set?
22.5
- What is the mode of this data set?
28
- What is the standard deviation of this data set? Round your answer to the nearest hundredth.
8.05

NAME _____ DATE _____ PERIOD _____

12-7 Skills Practice

The Normal Distribution

Determine whether the data in each table appear to be *positively skewed*, *negatively skewed*, or *normally distributed*.

1.

Miles Run	Track Team Members
0-4	3
5-9	4
10-14	7
15-19	5
20-23	2

normally distributed

2.

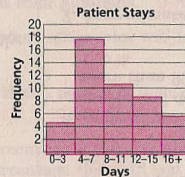
Speeches Given	Political Candidates
0-5	1
6-11	2
12-17	3
18-23	8
24-29	8

negatively skewed

For Exercises 3 and 4, use the frequency table that shows the average number of days spent on the surgical ward of a hospital last year.

Days	Number of Patients
0-3	5
4-7	18
8-11	11
12-15	9
16+	6

3. Make a histogram of the data.



4. Do the data appear to be *positively skewed*, *negatively skewed*, or *normally distributed*? Explain.

Positively skewed; the histogram is high at the left and has a tail to the right.

DELIVERY For Exercises 5-7, use the following information.

The time it takes a bicycle courier to deliver a parcel to his farthest customer is normally distributed with a mean of 40 minutes and a standard deviation of 4 minutes.

- About what percent of the courier's trips to this customer take between 36 and 44 minutes? **68%**
- About what percent of the courier's trips to this customer take between 40 and 48 minutes? **47.5%**
- About what percent of the courier's trips to this customer take less than 32 minutes? **2.5%**

TESTING For Exercises 8-10, use the following information.

The average time it takes sophomores to complete a math test is normally distributed with a mean of 63.3 minutes and a standard deviation of 12.3 minutes.

- About what percent of the sophomores take more than 75.6 minutes to complete the test? **16%**
- About what percent of the sophomores take between 51 and 63.3 minutes? **34%**
- About what percent of the sophomores take less than 63.3 minutes to complete the test? **50%**

NAME _____ DATE _____ PERIOD _____

12-7 Practice

The Normal Distribution

Determine whether the data in each table appear to be *positively skewed*, *negatively skewed*, or *normally distributed*.

1.

Time Spent at a Museum Exhibit	Frequency
0-25	27
26-50	46
51-75	89
75-100	57
100+	24

normally distributed

2.

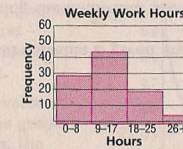
Average Age of High School Principals	Number
31-35	3
36-40	8
41-45	15
46-50	32
51-55	40
56-60	38
60+	4

negatively skewed

For Exercises 3 and 4, use the frequency table that shows the number of hours worked per week by 100 high school seniors.

Hours	Number of Students
0-8	30
9-17	45
18-25	20
26+	5

3. Make a histogram of the data.



4. Do the data appear to be *positively skewed*, *negatively skewed*, or *normally distributed*? Explain.

Positively skewed; the histogram is high at the left and has a tail to the right.

TESTING For Exercises 5-10, use the following information.

The scores on a test administered to prospective employees are normally distributed with a mean of 100 and a standard deviation of 15.

- About what percent of the scores are between 70 and 130? **95%**
- About what percent of the scores are between 85 and 130? **81.5%**
- About what percent of the scores are over 115? **16%**
- About what percent of the scores are lower than 85 or higher than 115? **32%**
- If 80 people take the test, how many would you expect to score higher than 130? **2**
- If 75 people take the test, how many would you expect to score lower than 85? **12**
- TEMPERATURE** The daily July surface temperature of a lake at a resort has a mean of 82° and a standard deviation of 4.2°. If you prefer to swim when the temperature is at least 77.8°, about what percent of the days does the temperature meet your preference? **84%**

NAME _____ DATE _____ PERIOD _____

12-9 Skills Practice**Binomial Experiments**

Find each probability if a coin is tossed 4 times.

1. $P(4 \text{ heads})$ $\frac{1}{16}$ 2. $P(0 \text{ heads})$ $\frac{1}{16}$
 3. $P(\text{exactly } 3 \text{ heads})$ $\frac{1}{4}$ 4. $P(\text{exactly } 2 \text{ heads})$ $\frac{3}{8}$
 5. $P(\text{exactly } 1 \text{ head})$ $\frac{1}{4}$ 6. $P(\text{at least } 3 \text{ heads})$ $\frac{5}{16}$

Find each probability if a die is rolled 3 times.

7. $P(\text{exactly one } 2)$ $\frac{25}{72}$ 8. $P(\text{exactly two } 2\text{s})$ $\frac{5}{72}$
 9. $P(\text{exactly three } 2\text{s})$ $\frac{1}{216}$ 10. $P(\text{at most one } 2)$ $\frac{25}{27}$

A town that presents a fireworks display during its July 4 celebration found the probability that a family with two or more children will watch the fireworks is $\frac{3}{5}$. If 5 of these families are selected at random, find each probability.

11. $P(\text{exactly } 3 \text{ families watch the fireworks})$ $\frac{216}{625}$ 12. $P(\text{exactly } 2 \text{ families watch the fireworks})$ $\frac{144}{625}$
 13. $P(\text{exactly } 5 \text{ families watch the fireworks})$ $\frac{243}{3125}$ 14. $P(\text{no families watch the fireworks})$ $\frac{32}{3125}$
 15. $P(\text{at least } 4 \text{ families watch the fireworks})$ $\frac{1053}{3125}$ 16. $P(\text{at most } 1 \text{ family watches the fireworks})$ $\frac{272}{3125}$

One section of a standardized English language test has 10 true/false questions. Find each probability when a student guesses at all ten questions.

17. $P(\text{exactly } 8 \text{ correct})$ $\frac{45}{1024}$ 18. $P(\text{exactly } 2 \text{ correct})$ $\frac{45}{1024}$
 19. $P(\text{exactly half correct})$ $\frac{63}{256}$ 20. $P(\text{all } 10 \text{ correct})$ $\frac{1}{1024}$
 21. $P(0 \text{ correct})$ $\frac{1}{1024}$ 22. $P(\text{at least } 8 \text{ correct})$ $\frac{7}{128}$

Chapter 12

66

Glencoe Algebra 2

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NAME _____ DATE _____ PERIOD _____

12-9 Practice**Binomial Experiments**

Find each probability if a coin is tossed 6 times.

1. $P(\text{exactly } 3 \text{ tails})$ $\frac{5}{16}$ 2. $P(\text{exactly } 5 \text{ tails})$ $\frac{3}{32}$
 3. $P(0 \text{ tails})$ $\frac{1}{64}$ 4. $P(\text{at least } 4 \text{ heads})$ $\frac{11}{32}$
 5. $P(\text{at least } 4 \text{ tails})$ $\frac{11}{32}$ 6. $P(\text{at most } 2 \text{ tails})$ $\frac{11}{32}$

The probability of Chris making a free throw is $\frac{2}{3}$. If she shoots 5 times, find each probability.

7. $P(\text{all missed})$ $\frac{1}{243}$ 8. $P(\text{all made})$ $\frac{32}{243}$
 9. $P(\text{exactly } 2 \text{ made})$ $\frac{40}{243}$ 10. $P(\text{exactly } 1 \text{ missed})$ $\frac{80}{243}$
 11. $P(\text{at least } 3 \text{ made})$ $\frac{64}{81}$ 12. $P(\text{at most } 2 \text{ made})$ $\frac{17}{81}$

When Tarin and Sam play a certain board game, the probability that Tarin will win a game is $\frac{3}{4}$. If they play 5 games, find each probability.

13. $P(\text{Sam wins only once})$ $\frac{405}{1024}$ 14. $P(\text{Tarin wins exactly twice})$ $\frac{45}{512}$
 15. $P(\text{Sam wins exactly } 3 \text{ games})$ $\frac{45}{512}$ 16. $P(\text{Sam wins at least } 1 \text{ game})$ $\frac{781}{1024}$
 17. $P(\text{Tarin wins at least } 3 \text{ games})$ $\frac{459}{512}$ 18. $P(\text{Tarin wins at most } 2 \text{ games})$ $\frac{53}{512}$

19. SAFETY In August 2001, the American Automobile Association reported that 73% of Americans use seat belts. In a random selection of 10 Americans in 2001, what is the probability that exactly half of them use seat belts? **about 7.5%**

HEALTH For Exercises 20 and 21, use the following information.

In 2001, the American Heart Association reported that 50 percent of the Americans who receive heart transplants are ages 50–64 and 20 percent are ages 35–49.

20. In a randomly selected group of 10 heart transplant recipients, what is the probability that at least 8 of them are ages 50–64? $\frac{7}{128}$
 21. In a randomly selected group of 5 heart transplant recipients, what is the probability that 2 of them are ages 35–49? $\frac{128}{625}$

Chapter 12

67

Glencoe Algebra 2