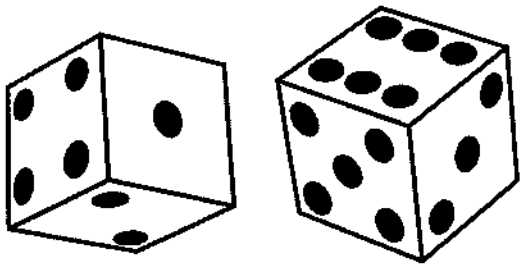
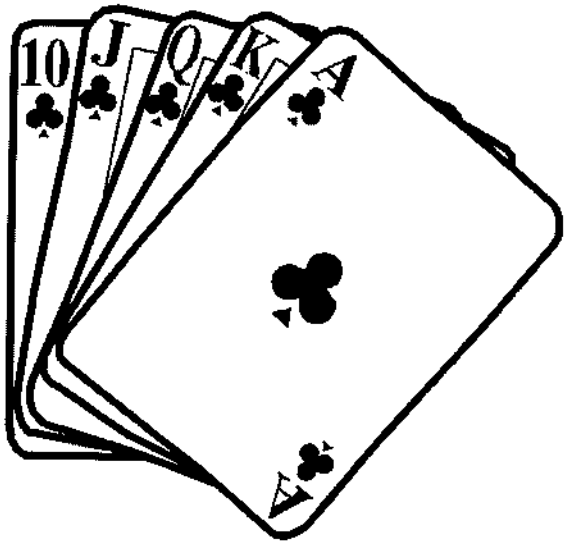
Probability

Unit 7b





Name:_____ **Period:**_____

NAME _____ DATE _____ PERIOD _____

Lesson 6 Reteach

Probability of Simple Events

The **probability** of an event is a ratio that compares the number of favorable outcomes to the number of possible outcomes, assuming each outcome is equally likely to occur.
The **theoretical probability** is the chance that some event *should* happen.

$$P(\text{event}) = \frac{\text{number of favorable outcomes}}{\text{number of possible outcomes}}$$

When an event is **impossible,** its theoretical probability is 0.
When an event is **certain,** its theoretical probability is 1.

When an event is **equally likely,** its theoretical probability is $\frac{1}{2}$.

The **complement** of a set is the set of all objects that do not belong to the given set. Two events are complementary if one or the other must happen, but they cannot happen at the same time. The sum of the probability of an event and its complement is 1.

Example **A bag contains 6 red marbles, 1 blue marble, and 3 yellow marbles. One marble is selected at random. Determine the theoretical probability of each outcome. Express each probability as a fraction and as a percent. Then describe the likelihood of the event. Write *impossible, unlikely, equally likely, likely,* or *certain.***

a. P**(yellow)**

$$P(\text{event}) = \frac{\text{number of favorable outcomes}}{\text{number of possible outcomes}}$$

$$= \frac{3}{10} \text{ or } 30\%$$

There is a 30% chance of choosing a yellow marble.

The event is unlikely.

b. P**(green)**

$$P(\text{event}) = \frac{\text{number of favorable outcomes}}{\text{number of possible outcomes}}$$

$$= \frac{0}{10} = 0 \text{ or } 0\%$$

There is a 0% chance of choosing a green marble.

The event is impossible.

Exercises

A bag contains 5 red marbles, 5 blue marbles, 6 green marbles, 8 purple marbles, and 1 white marble. One is selected at random. Determine the probability of each outcome. Express each probability as a fraction and as a percent. Then describe the likelihood of the event. Write *impossible, unlikely, equally likely, likely,* or *certain.*

1. P(white)
2. P(white, blue, or green)
3. P(red, blue, green, purple, or white)
4. P(not white)
5. P(not purple)
6. P(not red, blue, green, purple, or white)

Name _____ Date _____ Class _____

LESSON 10-5

Practice B

Making Decisions and Predictions

A sports store sells water bottles in different colors. The table shows the colors of the last 200 water bottles sold. The manager plans to order 1800 new water bottles.

Water Bottles Sold

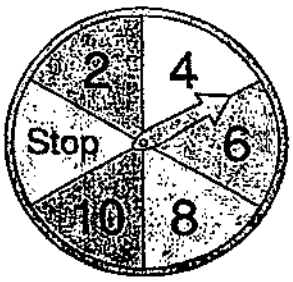
Color	Number
Red	30
Blue	50
Green	25
Yellow	10
Purple	10
Clear	75

1. How many red water bottles should the manager order? _____

2. How many green water bottles should the manager order? _____

3. How many clear water bottles should the manager order? _____

4. If the carnival spinner lands on 10, the player gets a large stuffed animal. Suppose the spinner is spun 30 times. Predict how many large stuffed animals will be given away. _____



Decide whether the game is fair.

5. Roll two fair number cubes labeled 1–6. Player A wins if both numbers are the same. Player B wins if both numbers are different.

_____

6. Roll two fair number cubes labeled 1–6. Add the numbers. Player A wins if the sum is 5 or less. Player B wins if the sum is 9 or more.

_____

7. Toss three fair coins. Player A wins if exactly one tail lands up. Otherwise, Player B wins.

_____

Name _____ Date _____ Class _____

LESSON 10-6

Practice B

The Fundamental Counting Principle

Employee identification codes at a company contain 2 letters followed by 2 numbers. All codes are equally likely.

1. Find the number of possible identification codes.

_____

2. Find the probability of being assigned the code MT49.

_____

3. Find the probability that an ID code of the company does not contain the letter A as the second letter of the code.

_____

4. Find the probability that an ID code of the company does not contain the number 2.

_____

5. Mrs. Sharpe is planning her dinners for next week. The choices for the entree are roast beef, turkey, or pork. The choices of carbohydrates are mashed potatoes, baked potatoes, or noodles. The vegetable choices are broccoli, spinach, or carrots. Make a tree diagram indicating the possible outcomes for each entree.

6. How many different meals could Mrs. Sharpe prepare?

_____

Find the probability for each of the following.

7. *P*(dinner with baked potato)

_____

8. *P*(dinner with noodles and carrots)

_____

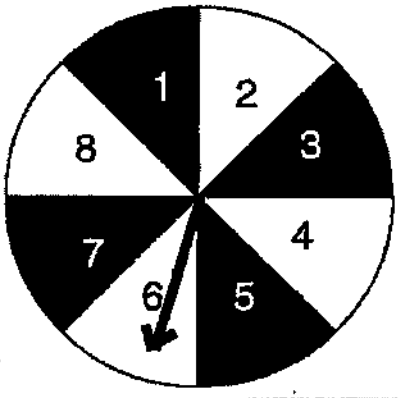
9. There are 10 gloves in a drawer, 6 leather and 4 cotton. Two gloves are drawn. What is the probability the gloves match?

_____

Name: _____ Date: _____

Probability: Independent Events

Below is a fair spinner. Find:



1. P(1) = _____
2. P(odd number) = _____
3. P(9) = _____
4. P(a number less than 9) = _____
5. P(4 or 5) = _____
6. P(2 and 7) = _____

---

7. A fair die is rolled once. Find P(even number) = _____
8. A fair die is rolled twice. Find P(6 and 6) = _____
9. A fair die is rolled three times. Find P(1 and 4 and 2) = _____

A fair coin is tossed once. Find:

10. P(one head) = _____
11. P(one head or one tail) = _____

A fair coin is tossed twice. Find:

12. P(a tail and a tail) = _____
13. P(a head and a tail) = _____

Find the probability of choosing the following from a deck of cards.

14. P(heart) = _____
15. P(picture card or a 7) = _____
16. P(4) = _____
17. P(odd numbered card) = _____

A card is chosen from a deck and replaced before the next card is chosen. Find:

18. P(Jack and 7) = _____
19. P(black card) = _____
20. P(red card and a 6 of clubs) = _____
21. P(Ace of spades and a 2) = _____
22. P(red king and 10) = _____
23. P(black 5 and an 8 of diamonds) = _____

Name_____
Date_____

Math 7: Probability
Independent and Dependent Events

I. Describe each of the following as "Dependent" or "Independent".

A. Select a card. Replace it. Select another card. _____

B. Choose a necklace and put it on. Choose another necklace _____

C. Choose a shirt from your closet with your eyes closed. Choose another shirt with your eyes closed. _____

D. Spin a spinner. Spin it again. _____

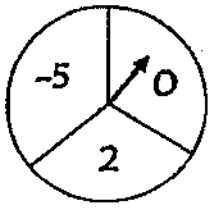
E. Roll a die. Then toss a coin. _____

F. Select a card. Do not replace it. Select another card. _____

G. Play rock-paper-scissors with a friend. _____

II. Using the spinner shown to answer the following questions.

A. Make a tree diagram and sample space that show all possible outcomes for spinning the spinner twice.



B. Using the sample space, list all possible *products*.

C. If the spinner is spun twice, what is the probability of spinning a product that is a positive number?

D. If the spinner is spun twice, what is the probability of spinning a product that is a negative number?

E. If the spinner is spun twice, what is the probability of spinning a product that is neither a positive nor a negative number?

III. Independent/Dependent Probability Practice

1. In a bag of marbles, you have 7 green, 5 purple, and 12 orange. You randomly choose a marble from the bag, put it back, and then choose another.

   This is an example of _____ events.

   Find the following:

   A. P(green, green)

   B. P(purple, purple)

   C. P(orange, orange)

   D. P(green, purple)

   E. P(purple, orange)

   F. P(red, green)

   G. P(green, orange)

2. In a bag of marbles, you have 7 green, 5 purple, and 12 orange. You randomly choose a marble from the bag, leave it out, and then choose another.

   This is an example of _____ events.

   Find the following:

   A. P(green, green)

   B. P(purple, purple)

   C. P(orange, orange)

   D. P(green, purple)

   E. P(purple, orange)

   F. P(red, green)

   G. P(green, orange

IV. Mixed Probability Practice

3. Larry, Moe, and Curly are going to a baseball game. Suppose they randomly sit in 3 seats next to each other and one of the seats is next to an aisle. What is the probability that Moe will have an aisle seat?

4. How many different arrangements are there of a 3-digit area code if numbers are not allowed to repeat?

5. How many different arrangements are there of a 3-digit area code if numbers are allowed to repeat?

NAME _____ DATE _____ PERIOD ____

12-1 Skills Practice

Counting Outcomes

Draw a tree diagram to determine the number of outcomes.

1. A hat comes in black, red, or white, and medium or large.

2. You have a choice of peach or vanilla yogurt topped with peanuts, granola, walnuts, or almonds.

Use the Fundamental Counting Principle to find the number of possible outcomes.

3. A test consists of 5 true-false questions.

4. A number cube is rolled, and a dime and penny are tossed.

5. Canned beans are packed in 3 sizes and 7 varieties.

6. There are 5 choices for each of 6 multiple-choice questions on a history quiz.

Name _____ Date _____

Practice Worksheet 13-1

Counting Using Tree Diagrams

For each situation, make a tree diagram to show all the outcomes in the sample space. Give the total number of outcomes.

1. choosing chocolate or vanilla ice cream and choosing strawberry or apple pie

2. rolling a die and flipping a coin

3. choosing rolls, muffins, or fruit salad and choosing scrambled eggs, sliced ham, chicken or turkey casserole

4. choosing a red, blue, or white sweater and choosing a black, blue, or gray pair of slacks

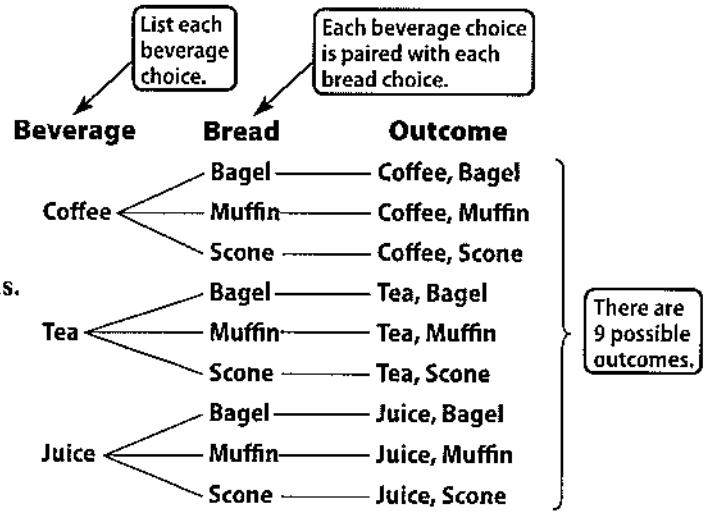
NAME _____ DATE _____ PERIOD _____

Lesson 8 Reteach

Probability of Compound Events

A **compound event** consists of two or more simple events. The probability of a compound event is the fraction of outcomes in the sample space for which the compound event occurs.

Example 1 **How many different combinations of beverage and bread can be made from 3 beverage choices and 3 bread choices? Draw a tree diagram to find the number of different combinations.**



Example 2 **An ice cream parlor allows you to build a sundae for $3. You are given a choice of chocolate, vanilla, or strawberry ice cream; sprinkles or nuts; and chocolate or caramel topping. What is the probability of randomly selecting vanilla ice cream with nuts and either chocolate or caramel topping?**

Make a list of the possible outcomes.

Chocolate w/sprinkles & chocolate topping	Vanilla w/sprinkles & chocolate topping	Strawberry w/sprinkles & chocolate topping
Chocolate w/nuts & chocolate topping	Vanilla w/nuts & chocolate topping	Strawberry w/nuts & chocolate topping
Chocolate w/sprinkles and caramel topping	Vanilla w/sprinkles and caramel topping	Strawberry w/sprinkles and caramel topping
Chocolate w/nuts and caramel topping	Vanilla w/nuts and caramel topping	Strawberry w/nuts and caramel topping

There are 2 possible outcomes for vanilla, nuts, and either chocolate or caramel topping. So, the probability of randomly selecting vanilla ice cream with nuts and either chocolate or caramel topping is $\frac{2}{12}$ or $\frac{1}{6}$.

Exercises

For each situation, draw a tree diagram to find the number of outcomes.

1. A closet has a red top, a blue top, and a white top, and pants and a skirt.
2. Three pennies are flipped.
3. A dresser has 4 shirts and 3 pants. If each shirt and pair of pants is a different color, what is the probability of randomly picking a blue shirt and black pants?
4. A nickel and a dime are flipped. What is the probability of getting tails, then heads?

NAME _____ DATE _____ PERIOD _____

Lesson 7 Reteach

Theoretical and Experimental Probability

The **theoretical probability** is the chance that some event *should* happen.
The **experimental probability** is what *actually* happens when an experiment is repeated a number of times.

$$P(\text{event}) = \frac{\text{number of favorable outcomes that have happened}}{\text{number of outcomes that have happened}}$$

Example 1 **Ten marbles are selected from a bag of colored marbles. The results are shown in the table at the right. Find the experimental probability of selecting a red marble.**

Outcome	Frequency
Red	4
Blue	2
Yellow	4

$$P(\text{red}) = \frac{\text{number of favorable outcomes that have happened}}{\text{number of outcomes that have happened}}$$

$$= \frac{4}{10} \text{ or } 40\%$$

To make a prediction about an event that will happen in the future, take a sample or survey of all the outcomes. Then use the experimental probability to predict how often that event will happen again.

Example 2 **The chart to the right shows the number of people wearing different types of shoes in Mr. Thompson's English class. Suppose that there are 300 students in the cafeteria. Predict how many would be wearing low-top sneakers. Explain your reasoning.**

Shoes	Number of Students
Low-top sneakers	12
High-top sneakers	7
Sandals	3
Boots	8

Out of 12 + 7 + 3 + 8 or 30 students, 12 wore low-top sneakers.
So, you would expect $\frac{12}{30}$ or $\frac{2}{5}$ or 40% of students to wear low-top sneakers.

Use the percent proportion to find 40% of 300.

$$\left.\begin{matrix}\text{part} \longrightarrow \\ \text{whole} \longrightarrow\end{matrix}\ \frac{n}{300} = \frac{40}{100}\right\} \text{percent}$$

$$100 \cdot n = 40 \cdot 300$$

$100n = 12{,}000$ Find the cross products.

$= 120$ Mentally divide each side by 100.

Out of 300 students, you would expect about 120 students to wear low-top sneakers.

Exercises

From a survey of 100 drivers, 37 said they drove cars, 43 said they drove trucks, 12 said they drove vans, and 8 said they drove motorcycles. Out of 5000 drivers, predict how many will drive the following vehicle(s).

1. car
2. truck
3. van or motorcycle
4. car or truck
5. truck or van
6. van or truck or car

Name _____ Date _____

Practice Worksheet 13-3

Theoretical and Experimental Probability

1. Find the theoretical probability of rolling an even number with a die.

2. Find the theoretical probability that a family of four children will be all girls.

3. Find the theoretical probability of choosing a winning three-digit number in a lottery.

4. Jessica tosses two coins four times. Twice both coins came up heads.

   a. What is the experimental probability of getting two heads?

   b. What is the theoretical probability of getting two heads?

   c. What is the theoretical probability of getting two tails?

   d. What is the theoretical probability of getting a head and a tail?

5. Suppose you have a child's play cube with one of the following letters on each face: A, B, C, D, E, or F. You toss the cube.

   a. What is the theoretical probability of turning up an A, B, or C?

   b. If you toss two identical cubes, what is the theoretical probability of turning up an A, A?

6. Suppose you have a bag containing two red marbles, two blue marbles, and two white marbles. You choose a marble without looking.

   a. What is the theoretical probability that you will choose a white or a blue marble?

   b. What is the theoretical probability that you will choose a red marble or a white marble?

Two dice are rolled. Find each theoretical probability.

7. a sum of 8

8. a sum less than 5

9. a sum of 12

Name_____

Date_____

Math 7: Probability
Permutations

DO NOW

1. In a certain part of a state, only the letter J, K, L, M, & N can be used to form a 2 -letter beginning for a license plate. How many different 2-letter beginnings are possible?

2. How many have 2 different letters?

3. How many have the same 2 letters?

LESSON

1. For a school-wide game show, each class chooses one contestant & alternate. How many ways can you choose a contestant from your class?

2. Once a contestant is chosen, how many choices are there for an alternate from your class?

3. Using the counting principle, find the number of ways to choose two students from your class.

4. A class selects Raquel as the contestant and Matt as the alternate. To represent this they write (Raquel, Matt). What, then, do you think (Matt, Raquel) represents?

DEFINITION

Permutation: _____

5. In how many ways can 3 students line up?

6. In how many ways can 5 students line up?

Number of choices: ____ ____ ____ ____ ____

Spot in Line: *first* *second* *third* *fourth* *fifth*

7. Suppose you have to write thank-you notes to seven people. In how many ways can you choose the order in which to write the notes?

 # choices: ____ ____ ____ ____ ____ ____ ____

Thank You # *1* *2* *3* *4* *5* *6* *7*

Calculator Application

factorial:

8. Many CD players can shuffle the order in which the songs play. Your favorite CD has 9 songs.
   a. Write the symbolic factorial expression for the number of different orders in which the songs could play.

   b. Evaluate the factorial expression.

PRACTICE

Evaluate the following:

1. $6!$ 2. $12!$ 3. $9!$ 4. $\frac{8!}{5!}$ 5. $\frac{12!}{3!}$ 6. $3! \cdot 7!$

Solve.

7. In how many ways can all the letters of the word MATH be arranged?	8. In how many ways can you arrange seven friends for a photo?
9. A certain type of luggage has room for three initials. How many 3-letter arrangements of letters are possible?	10. A bicycle rack has room for six bicycles. There are 10 students that ride their bicycles to school. How many different arrangements of bicycles are possible?
11. In how many ways can a president, vice president, and a treasurer be elected from a group of 15 candidates running for office?	12. A roller coaster has room for ten people. The people sit single file, one after the other. How many different arrangements are possible for 10 passengers on the roller coaster?

Name _____ Date _____

Practice Worksheet 13-7

Permutations

Find the value of each expression.

1. 6!

2. 9!

3. $P(6, 3)$

4. $P(9, 8)$

5. $P(10, 1)$

6. $P(8, 8)$

7. How many different ways can seven people be seated in one row of seven people?

8. Suppose that eight students out of ten qualify for the cheerleading squad. In how many ways can you choose the squad?

9. In how many ways can a president, vice-president, secretary, and treasurer be chosen from a club with 12 members?

10. In how many ways can five books be arranged on a shelf?

11. In how many ways can a phone number be created if there are ten ways that the first three digits can be arranged and then each of the remaining four digits can be any digit from 0-9 as long as no digit is repeated in the group of four.

12. How many different four-letter words can be made from the alphabet if the first two letters come from the first half of the alphabet and the second two letters come from the second half of the alphabet?

Name _____ Date _____

Practice Worksheet 13-6

Probability of Two Events

Tell whether the events are independent or dependent. Explain.

1. rolling a die and then rolling a second die

2. choosing two cards from a deck so that they make a "pair" (the number value is the same)

3. selecting a compact disc from a storage case and then selecting a second disc without replacing the first

Find each probability.

4. Two dice are rolled. Find the probability that an even number is rolled on one die and an odd number is rolled on the second die.

5. Two coins are tossed in order. What is the probability of getting a head on the first coin and then getting a tail on the second coin?

6. Suppose you have a bag containing two red marbles, two blue marbles, and two white marbles. You choose two marbles without looking.

   a. What is the probability that you will choose a red marble and then a blue marble without replacing the red one?

   b. What is the probability that you will choose two red marbles in a row without replacing the first one?

7. A coin purse contains 10 pennies, 5 nickels, 3 dimes, and 2 quarters. Two coins are selected without the first one being replaced. Find P(quarter, then nickel).

8. A coin purse contains 10 pennies, 5 nickels, 3 dimes, and 2 quarters. Two coins are selected without the first one being replaced. Find P(nickel, then nickel).

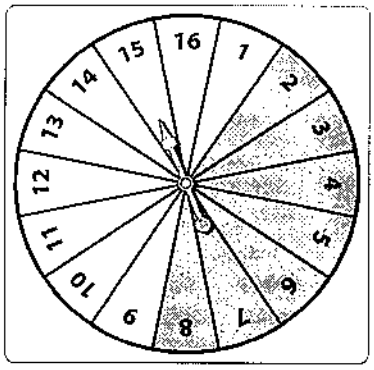
9. Two dice are rolled. Find the probability that a multiple of three is rolled on one die and an even number is rolled on the second die.

NAME _____ DATE _____ PERIOD _____

Lesson 6 Homework Practice

Probability of Simple Events

A spinner like the one shown is used in a game. Determine the probability of each outcome if the spinner is equally likely to land on each section. Express each probability as a fraction and as a percent. Then describe the likelihood of the event. Write *impossible, unlikely, equally likely, likely,* or *certain.*



1. *P*(15)

2. *P*(even)

3. *P*(greater than 10)

4. *P*(perfect square)

A hat contains 8 orange, 20 purple, 9 pink, and 3 brown slips of paper. A slip of paper is selected without looking. Determine the probability of each outcome if it is equally likely to select each slip of paper. Express each probability as a fraction and as a percent. Then describe the likelihood of the event. Write *impossible, unlikely, equally likely, likely,* or *certain.*

5. *P*(pink)

6. *P*(purple)

7. *P*(orange)

8. *P*(not brown)

9. *P*(not purple)

10. *P*(not pink)

11. *P*(blue)

12. *P*(brown)

13. *P*(not orange)

A spinner labeled 1–8 was spun. The table shows the frequency of each number the spinner landed on. Determine the probability of each outcome if it is equally likely that the spinner landed on each section. Express each probability as a fraction and as a percent. Then describe the likelihood of the event. Write *impossible, unlikely, equally likely, likely,* or *certain.*

Number	1	2	3	4	5	6	7	8
Frequency	6	14	11	14	15	8	5	7

14. *P*(4)

15. *P*(3 or 5)

16. *P*(not 1)

17. *P*(prime)

18. *P*(odd)

19. *P*(not 4 or 7)

Name_____ Math 7, Period_____
Date_____ Probability Homework

1. In a bag of marbles, you have 3 red, 5 blue, and 12 yellow. You randomly choose a marble from the bag, put it back, and then choose another. Find the following:
   A. P(red, red)
   B. P(blue, blue)
   C. P(yellow, yellow)
   D. P(red, yellow)
   E. P(yellow, blue)
   F. P(yellow, blue)
   G. P(red, orange)

2. In a bag of marbles, you have 3 red, 5 blue, and 12 yellow. You randomly choose a marble from the bag, leave it out, and then choose another. Find the following:
   A. P(red, red)
   B. P(blue, blue)
   C. P(yellow, yellow)
   D. P(red, yellow)
   E. P(yellow, blue)
   F. P(yellow, red)
   G. P(red, orange)

3. On a cold winter day in Boston, the temperature was –9° F in the morning and then rose to 14° F in the afternoon. What is the difference in temperature?

4. There are 11 girls and 8 boys in a class. About what percent of the students are boys?

5. Use the number line for parts A and B.

Part A Place a dot on the number line to show the approximate position of each number. Label each dot with its number.

$\frac{3}{8}$ $1\frac{2}{3}$ 1.81 0.29

Part B Explain in words how you decided where to place each of the dots.

12-1

NAME _____ DATE _____ PERIOD ____

Practice

Counting Outcomes

Draw a tree diagram to determine the number of possible outcomes.

1. A coin is tossed and one of the vowels A, E, I, O, and U is chosen at random.

2. Peanut butter comes in smooth or chunky and in small, regular, and family-size containers.

Use the Fundamental Counting Principle to find the number of possible outcomes.

3. A month of the year is picked at random and a coin is tossed.
4. A quarter and a dime are tossed and a number cube is rolled.
5. There are 8 true-false questions on a science quiz.

GIFT BASKETS For Exercises 6–9, use the following information.

Gina made gift baskets to sell at her electronics store. Each basket had a CD of either classical or jazz music, a DVD of a comedy or an action film, a video game or a financial software package, and a small, medium, or large T-shirt with her store's logo. An equal number of baskets of each possible combination were made.

6. How many different basket combinations were there?
7. Find the number of combinations that had a video game.
8. If a basket was chosen randomly, what is the probability that the basket contained an action film?
9. What is the probability of choosing a basket with classical music and a large T-shirt?

NAME _____ DATE _____ PERIOD _____

Lesson 8 Homework Practice

Probability of Compound Events

Find the total number of outcomes in each situation.

1. Joan randomly dials a seven-digit phone number.

2. First-year students at a school must choose one each of 5 English classes, 4 history classes, 5 math classes, and 3 physical education classes.

3. One card each is drawn from four different standard decks of cards.

4. A store offers running shoes with either extra stability or extra cushioning from four different manufacturers.

5. A winter sweater comes in wool or fleece, with a zipper or a crew neck, and in three colors.

6. One spinner can land on red, green, blue, or yellow and another can land on right foot, left foot, right hand, or left hand. Each spinner is spun once.

Find each probability.

7. A number cube is rolled. What is the probability of rolling a four or lower?

8. A number cube is rolled. What is the probability of getting a five or higher?

9. An eight-sided die is rolled and a coin is tossed. What is the probability of landing on an even number and getting heads?

10. A coin is tossed and a card is drawn from a standard deck of cards. What is the probability of landing on heads and choosing a heart?

11. How many fruit smoothies are possible from 6 choices of fruit, 4 choices of milk, and 3 sizes?

12. A school's class rings can include a student's initials in an engraved monogram on the ring. How many different monograms are possible from 2 sizes, 5 type styles, and 3 border styles?

13. The table shows the features you can choose for a pay-as-you go phone plan.
    a. How many phone plans have national long distance?
    b. How many customized phone plans include 100 minutes per month talking time and paging capabilities?

Phone	Features	Calling Area	Monthly Talk Time
Brand A; Brand B	e-mail only; paging only; deluxe: paging and e-mail	local only; local and regional; national long distance	30 min; 60 min; 100 min

NAME_____ DATE _____ PERIOD _____

Lesson 7 Homework Practice

Theoretical and Experimental Probability

The table shows the results of an experiment in which a spinner was spun 50 times. Find the experimental probability of each outcome.

Number	Frequency	Number	Frequency
1	𝍸	9	𝍸
2	𝍸	10	𝍸
3	𝍸	11	𝍸
4	𝍸	12	𝍸
5	𝍸	13	𝍸
6	𝍸	14	𝍸
7	𝍸	15	𝍸
8	𝍸	16	𝍸

1. P(less than 4)
2. P(10 or 11)
3. P(multiple of 4)
4. P(not 10)

The table on the right shows the type and number of businesses in Wilsonville. If there are 625 businesses in the nearby town of Newberry, predict how many of each type of business there would be in Newberry.

Business Type	Number
Grocery Store	10
Retail Store	54
Copy Shop	6
Restaurant	40
Car Dealership	5
Pet Shop	10

5. grocery stores
6. retail stores
7. restaurants
8. pet shops and copy shops

The table shows the results of a survey conducted by a local restaurant of some of its customers. The customers were asked what new menu item they would prefer to see added to the menu from the choices provided.

Restaurant Survey			
Item	Chicken Carbonara	Beef Tips	Shrimp Scampi
Number of Responses	42	28	30

9. What is the probability of beef tips being the preferred new menu item?
10. Out of a similar group of 250 customers, predict how many would choose beef tips as their preferred new menu item?
11. Out of a similar group of 375 customers, predict how many more customers will prefer chicken carbonara to shrimp scampi?
12. Melinda purchased a snack-size roll of candy tarts, and found that only $\frac{1}{8}$ of them were grape-flavored. Suppose Melinda later buys a king-size roll of candy tarts that contains 40 pieces. How many of that roll can she expect to be grape-flavored?

A soccer coach is dividing his players into groups of five. Kate, Jocilyn, Monty, Giorgianna, and Henry are in one group. Each one of their names is written on a separate piece of paper. The coach draws a name each week (and then replaces it for the next week) to find the group leader.

13. Predict the number of times that Giorgianna's name will be drawn in 32 weeks. Round to the nearest whole number.
14. Kate's name was actually drawn 8 times during the 32-week period. What was the experimental probability that Kate's name was drawn, and how does it compare to the theoretical probability?

Name _____ Class _____ Date _____

Practice 11-2 Permutations

Use a calculator, paper and pencil, or mental math to evaluate each factorial.

1. $6!$	**2.** $12!$	**3.** $9!$	**4.** $\frac{8!}{5!}$	**5.** $\frac{12!}{3!}$
_____	_____	_____	_____	_____
6. ${}_9P_5$	**7.** ${}_8P_2$	**8.** ${}_{10}P_8$	**9.** ${}_5P_5$	**10.** ${}_{15}P_6$
_____	_____	_____	_____	_____

Solve.

11. In how many ways can all the letters of the word WORK be arranged?

_____

12. In how many ways can you arrange seven friends in a row for a photo?

_____

13. A disk jockey can play eight songs in one time slot. In how many different orders can the eight songs be played?

_____

14. Melody has nine bowling trophies to arrange in a horizontal line on a shelf. How many arrangements are possible?

_____

15. At a track meet, 42 students entered the 100-m race. In how many ways can first, second, and third places be awarded?

_____

16. In how many ways can a president, a vice president, and a treasurer be chosen from a group of 15 people running for office?

_____

17. A car dealer has 38 used cars to sell. Each day two cars are chosen for advertising specials. One car appears in a television commercial and the other appears in a newspaper advertisement. In how many ways can the two cars be chosen?

_____

18. A bicycle rack outside a classroom has room for six bicycles. In the class, 10 students sometimes ride their bicycles to school. How many different arrangements of bicycles are possible for any given day?

_____

19. A certain type of luggage has room for three initials. How many different 3-letter arrangements of letters are possible?

_____

20. A roller coaster has room for 10 people. The people sit single file, one after the other. How many different arrangements are possible for 10 passengers on the roller coaster?

_____

Probability Notes Section:

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