GLENCOE MATHEMATICS

Mathematics

Applications and Concepts

Course 3

Interactive Chalkboard

CHAPTER 8
Probability

EXIT

Lesson 8-1 Contents

Example 1

A bag contains 5 blue marbles, 10 red marbles, and 10 yellow marbles. A marble is picked at random. What is the probability the marble is yellow?

There are 5 + 10 + 10 or 25 marbles in the bag.

$$P(\text{yellow}) = \frac{\text{yellow marbles}}{\text{total number of marbles}}$$ Definition of probability

$$= \frac{10}{25} \text{ or } \frac{2}{5}$$ There are 10 yellow marbles out of 25 marbles.

End of slide—
continued on
the next slide

Example 1

Answer: The probability the marble is yellow is $\frac{2}{5}$.

The probability can also be written as 0.4 or 40%.

Your Turn

A bag contains 3 green marbles, 7 purple marbles, and 15 black marbles. A marble is picked at random. What is the probability the marble is black?

Answer: $\frac{3}{5}$

End of slide

Example 2

A bag contains 5 blue marbles, 10 red marbles, and 10 yellow marbles. A marble is picked at random. What is the probability the marble is blue or red?

$$P(\text{blue or red}) = \frac{\text{blue marbles} + \text{red marbles}}{\text{total number of marbles}}$$ Definition of probability

$$= \frac{5 + 10}{25}$$ There are 5 blue marbles out of 10 red marbles.

$$= \frac{15}{25} \text{ or } \frac{3}{5}$$ Simplify.

Answer: The probability the marble is blue is $\frac{3}{5}$. The probability can also be written as 0.6 or 60%.

End of slide

Your Turn

A bag contains 3 green marbles, 7 purple marbles, and 15 black marbles. A marble is picked at random. What is the probability the marble is green or purple?

Answer: $\frac{2}{5}$

End of slide

Example 3

A bag contains 5 blue marbles, 10 red marbles, and 10 yellow marbles. A marble is picked at random. What is the probability the marble is white?

Answer: Since there are no white marbles, the probability is 0.

End of slide

Your Turn

A bag contains 3 green marbles, 7 purple marbles, and 15 black marbles. A marble is picked at random. What is the probability the marble is red?

Answer: 0

End of slide

Example 4

PHONE LISTINGS **One town has 10,000 phone numbers in use. Of these, 500 are not listed in the local phone book. What is the probability that the phone number you are looking for is listed in the phone book?**

10,000 – 500 or 9,500 phone numbers are listed.

$$P(\text{listed}) = \frac{\text{listed numbers}}{\text{total number of phone numbers}}$$ Definition of probability

$$= \frac{9,500}{10,000} \text{ or } \frac{19}{20}$$ There are 9,500 listed phone numbers.

Answer: The probability that the phone number you are looking for is listed is $\frac{19}{20}$.

End of slide

Your Turn

SCHOOL ATTENDANCE Oakdale Junior High School has a total enrollment of 670 students. Of these, 45 are absent today. Suppose a student's name is picked at random. What is the probability that the student picked is absent today?

Answer: $\frac{9}{134}$

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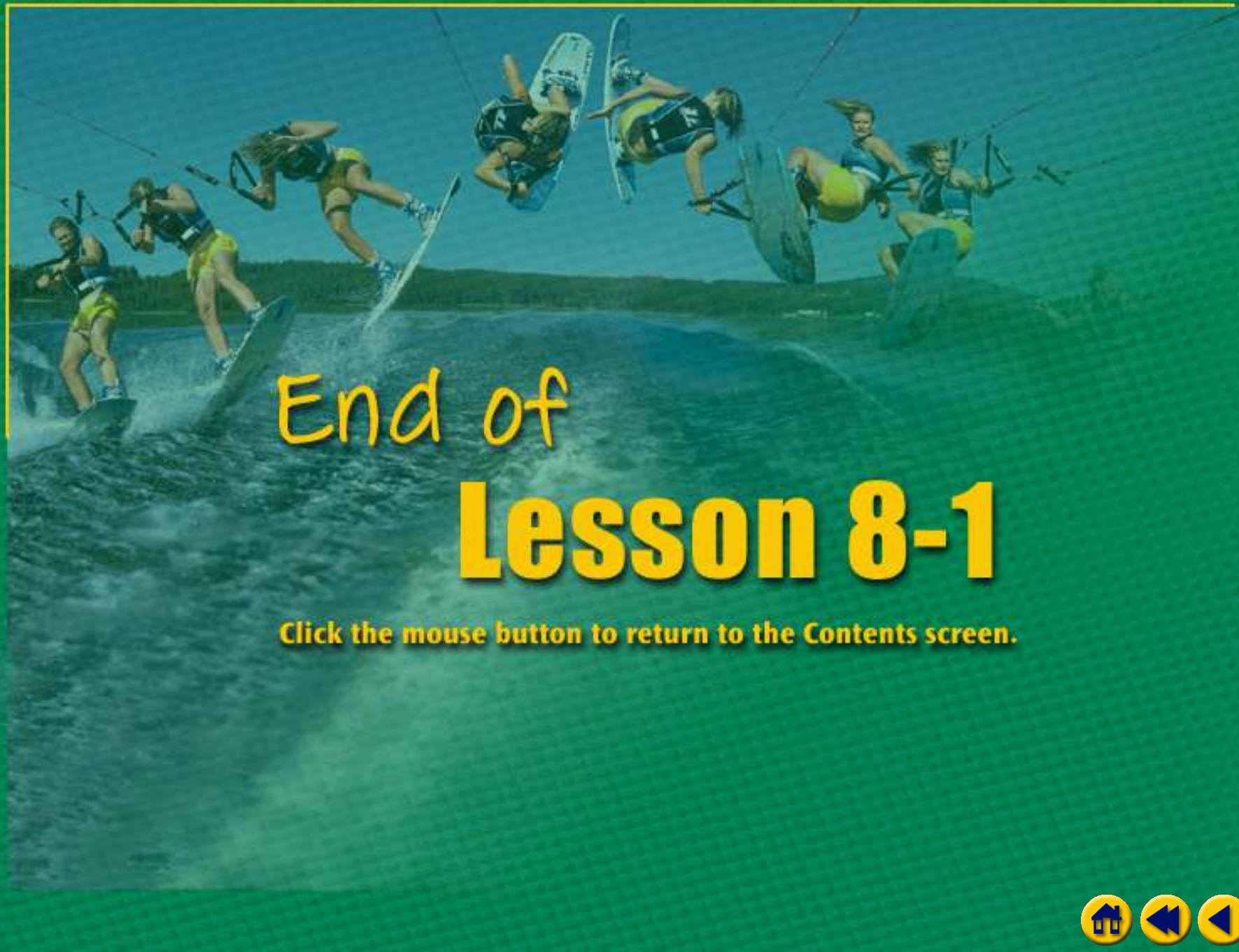
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Lesson 8-1
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Lesson 8-2 Contents

Example 1

BOOKS A flea market vendor sells new and used books for adults and teens. Today she has fantasy novels and poetry collections to choose from. Draw a tree diagram to determine the number of categories of books.

End of slide—
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the next slide

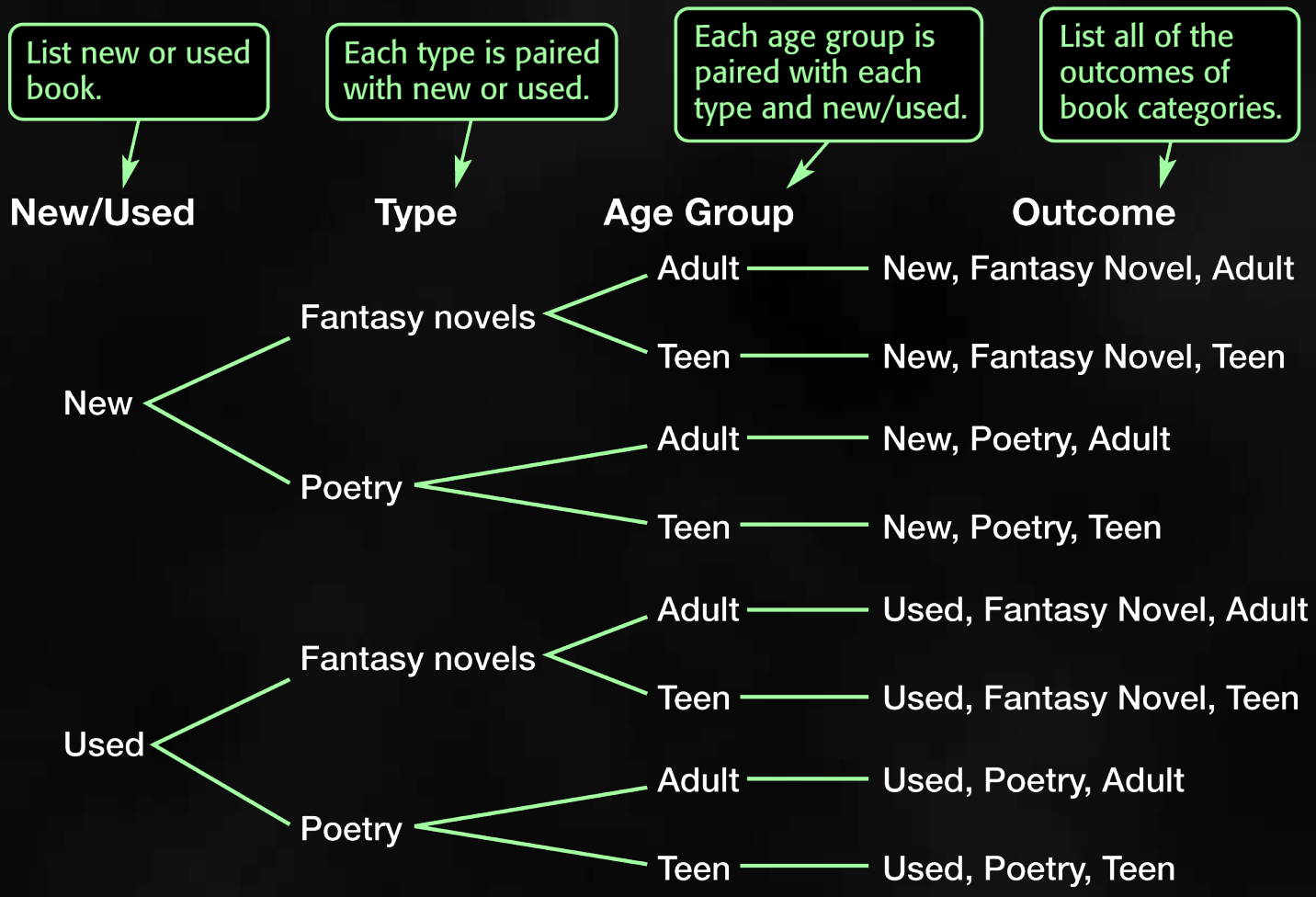
Example 1

List new or used book.

Each type is paired with new or used.

Each age group is paired with each type and new/used.

List all of the outcomes of book categories.



Answer: There are 8 different categories.

End of slide

Your Turn

FASHION A store has spring outfits on sale. You can choose either striped or solid pants. You can also choose green, pink, or orange shirts. Finally, you can choose either long-sleeved shirts or short-sleeved shirts. Draw a tree diagram to determine the number of possible outfits.

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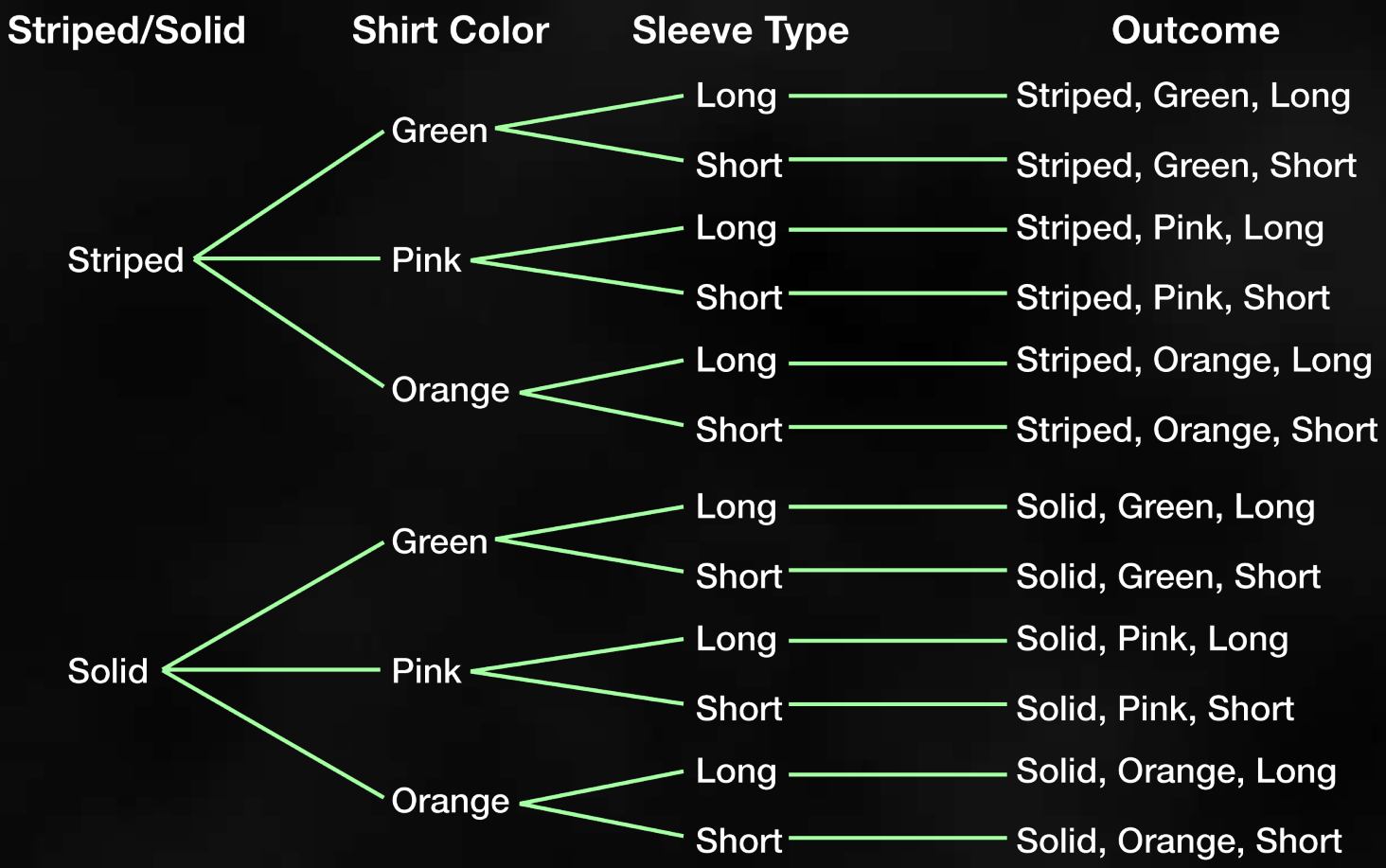
Your Turn



Answer: 12 different outfits

STOP! End of slide

Example 2

RESTAURANTS A manager assigns different codes to all the tables in a restaurant to make it easier for the wait staff to identify them. Each code consists of the vowel A, E, I, O, or U, followed by two digits from 0 through 9. How many codes could the manager assign using this method?

number of possible letters for the first place	x	number of possible numbers for the second place	x	number of possible numbers for the third place	=	number of possible codes
5	x	10	x	10	=	500

Answer: There are 500 possible codes.

End of slide

Your Turn

SCHOOLS A middle school assigns each student a code to use for scheduling. Each code consists of a letter, followed by two digits from 0 through 9. How many codes are possible?

Answer: 2,600

End of slide

Example 3

COMPUTERS **What is the probability that Liana will guess her friend's computer password on the first try if all she knows is that it consists of three letters?**

Find the number of possible outcomes. Use the Fundamental Counting Principle.

choices for the first letter	x	choices for the second letter	x	choices for the third letter	=	total number of outcomes
26	x	26	x	26	=	17,576

End of slide—continued on the next slide

Example 3

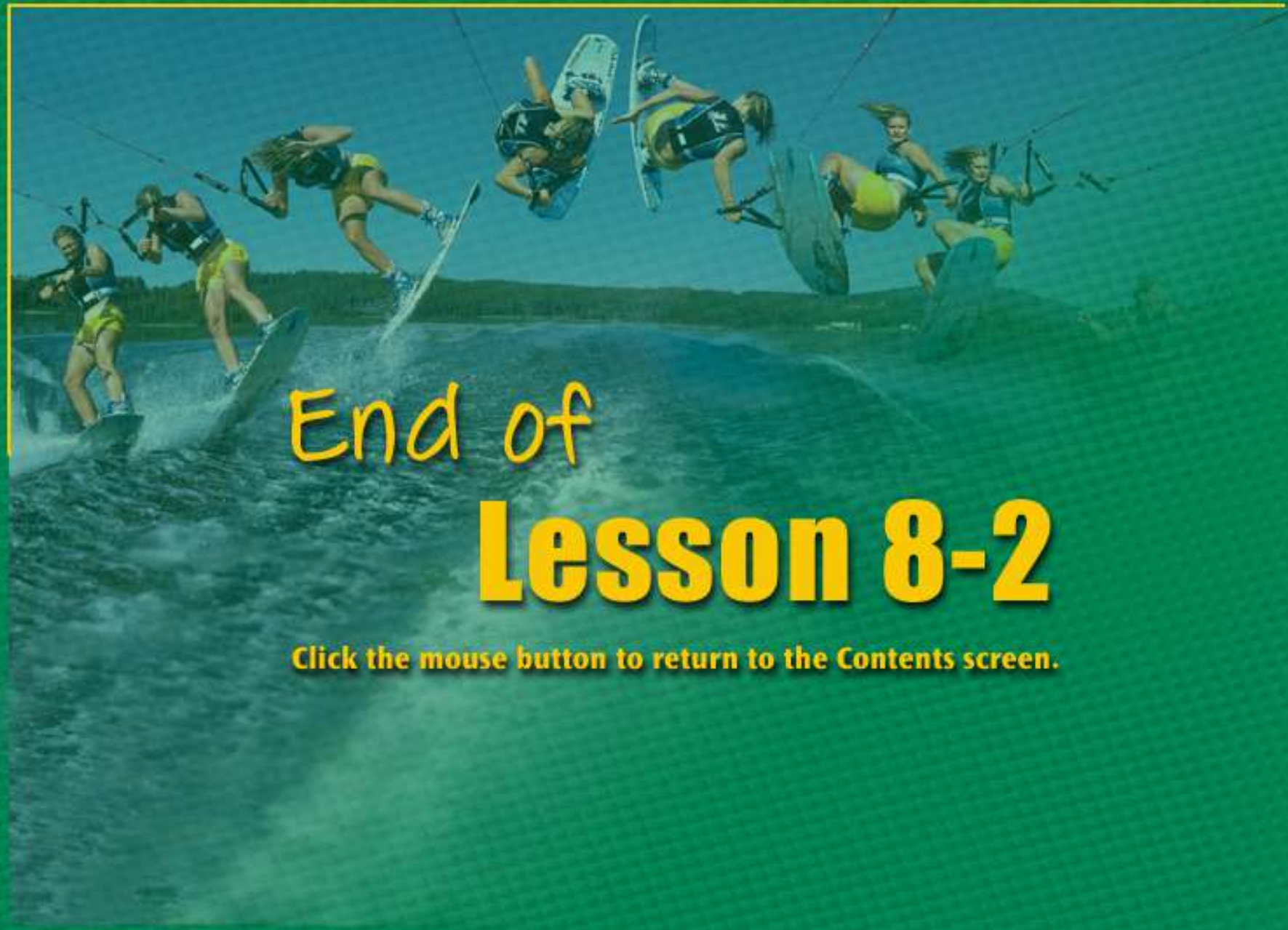
Answer: There are 17,576 possible outcomes. There is 1 correct password. So, the probability of guessing on the first try is $\frac{1}{17,576}$.

End of slide

Your Turn

LOCKER COMBINATIONS What is the probability that Shauna will guess her friend's locker combination on the first try if all she knows is that it consists of three digits from 0 through 9?

Answer: $\frac{1}{1,000}$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Lesson 8-3 Contents

Example 1

SOFTBALL There are 10 players on a softball team. In how many ways can the manager choose three players for first, second, and third base?

number of possible players for first base	x	number of possible players for second base	x	number of possible players for third base	=	total number of possible ways
10	x	9	x	8	=	720

Answer: There are 720 different ways the manager can pick players for first, second, and third base.

End of slide

Your Turn

STUDENT COUNCIL There are 15 students on student council. In how many ways can Mrs. Sommers choose three students for president, vice president, and secretary?

Answer: 2,730

End of slide

Example 2

Find the value of $P(7, 2)$.

$P(7, 2) = 7 \cdot 6$ or 42

7 things taken 2 at a time.

Answer: 42

End of slide

Your Turn

Find the value of $P(8, 4)$.

Answer: 1,680

End of slide

Example 3

Find the value of $P(13, 7)$.

$P(13, 7) = 13 \cdot 12 \cdot 11 \cdot 10 \cdot 9 \cdot 8 \cdot 7$ 13 things taken 7 at a time.

$= 8{,}648{,}640$

Answer: 8,648,640

End of slide

Your Turn

Find the value of $P(12, 5)$.

Answer: 95,040

End of slide

Example 4

MULTIPLE-CHOICE TEST ITEM **Consider all of the five-digit numbers that can be formed using the digits 1, 2, 3, 4, and 5 where no digit is used twice. Find the probability that one of these numbers picked at random is an even number.**

A 20% **B** 30% **C** 40% **D** 50%

Read the Test Item

You are considering all permutations of 5 digits taken 5 at a time. You wish to find the probability that one of these numbers picked at random is even.

End of slide—
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the next slide

Example 4

Solve the Test Item

Find the number of possible five-digit numbers. $P(5, 5) = 5!$

In order for a number to be even, the ones digit must be 2 or 4.

number of ways to pick the last digit	x	number of ways to pick the first four digits	=	number of permutations that are even
2	x	$P(4, 4)$	=	$2P(4, 4)$ or $2 \times 4!$

End of slide—continued on the next slide

Example 4

$$P(\text{even}) = \frac{\text{number of permutations that are even}}{\text{total number of permutations}}$$

$$= \frac{2 \times 4!}{5!}$$ Substitute.

$$= \frac{2 \cdot \cancel{4} \cdot \cancel{3} \cdot \cancel{2} \cdot \cancel{1}}{5 \cdot \cancel{4} \cdot \cancel{3} \cdot \cancel{2} \cdot \cancel{1}}$$ Definition of factorial

$$= \frac{2}{5} \text{ or } 40\%$$ Simplify.

The probability is 40%.

Answer: C

End of slide

Your Turn

MULTIPLE-CHOICE TEST ITEM Consider all of the five-digit numbers that can be formed using the digits 1, 2, 3, 4, and 5 where no digit is used twice. Find the probability that one of these numbers picked at random is an odd number.

A 30% **B** 40% **C** 50% **D** 60%

Answer: D

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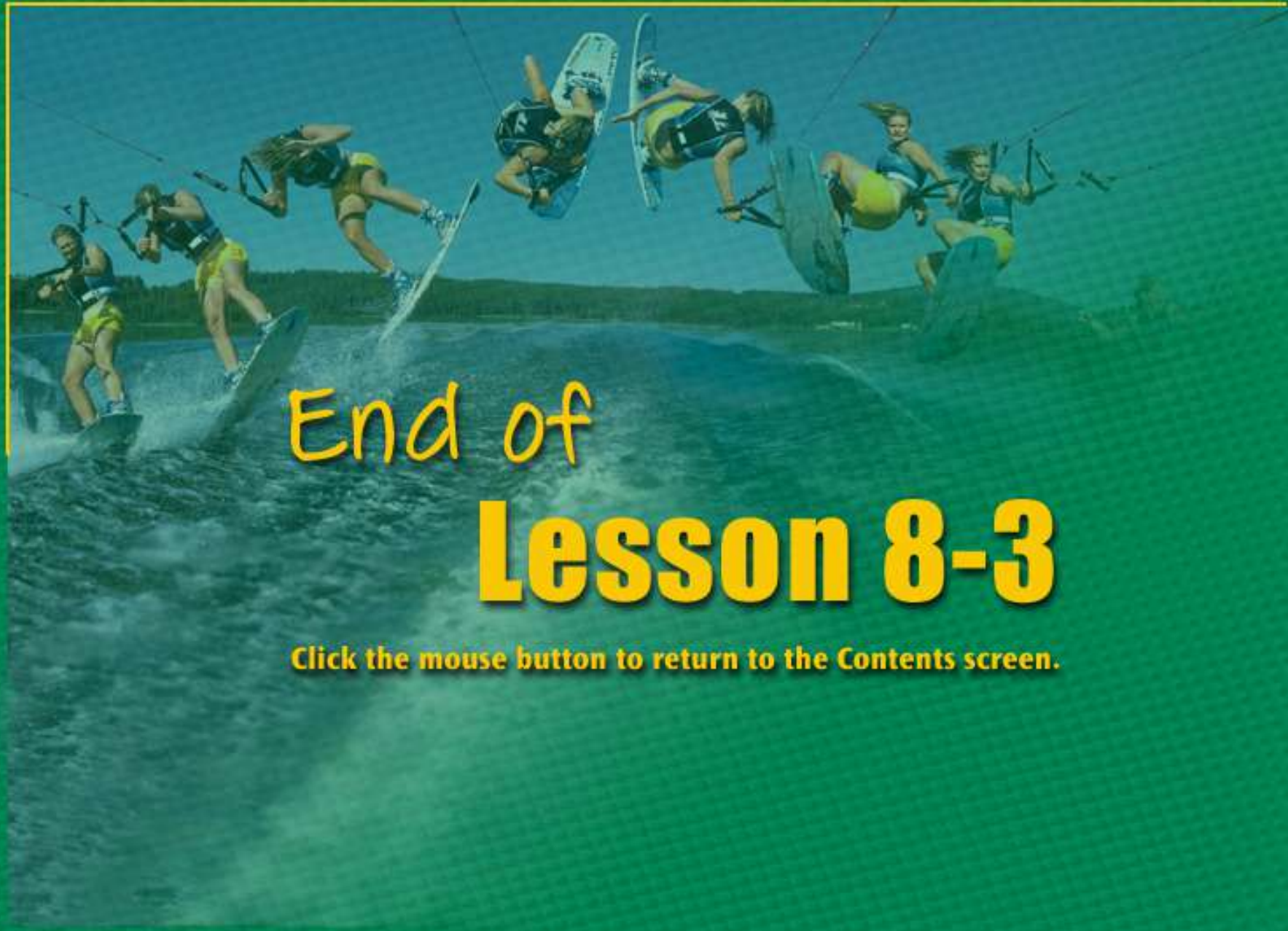
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Lesson 8-4 Contents

Example 1

TOURNAMENTS **Five teams are playing each other in a tournament. If each team plays every other team once, how many games are played?**

Method 1

Let *A*, *B*, *C*, *D*, and *E* represent the five teams.
First, list all of the possible permutations of *A*, *B*, *C*, *D*, and *E* taken two at a time. Then cross out the letter pairs that are the same as one another.

AB	*AC*	*AD*	*AE*	~~*BA*~~
BC	*BD*	*BE*	~~*CA*~~	~~*CB*~~
CD	*CE*	~~*DA*~~	~~*DB*~~	~~*DC*~~
DE	~~*EA*~~	~~*EB*~~	~~*EC*~~	~~*ED*~~

Team A playing Team B is the same as Team B playing Team A, so cross off one of them.

There are only 10 different games.

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Example 1

Method 2

Find the number of permutations of 5 teams taken 2 at a time.

$P(5, 2) = 5 \cdot 4$ or 20

Since order is not important, divide the number of permutations by the number of ways 2 things can be arranged.

$\frac{20}{2!} = \frac{20}{2 \cdot 1}$ or 10

Answer: There are 10 games that can be played.

End of slide

Your Turn

TOURNAMENTS Six teams are playing each other in a tournament. If each team plays every other team once, how many games are played?

Answer: 15

End of slide

Example 2

Find $C(8, 5)$.

$$C(8, 5) = \frac{P(8, 5)}{5!}$$

Definition of $C(8, 5)$

$$= \frac{8 \cdot 7 \cdot \overset{1}{\cancel{6}}\overset{1}{\cancel{2}} \cdot \cancel{5} \cdot \cancel{4}}{\underset{1}{\cancel{5}} \cdot \underset{1}{\cancel{4}} \cdot \underset{1}{\cancel{3}} \cdot \underset{1}{\cancel{2}} \cdot 1} \text{ or } 56$$

$P(8, 5) = 8 \cdot 7 \cdot 6 \cdot 5 \cdot 4$ and $5! = 5 \cdot 4 \cdot 3 \cdot 2 \cdot 1$

Answer: 56

End of slide

Your Turn

Find $C(6, 3)$.

Answer: 20

End of slide

Example 3

SCHOOL **An eighth grade teacher needs to select 4 students from a class of 22 to help with sixth grade orientation. Does this represent a combination or a permutation? How many possible groups could be selected to help out the new students?**

This is a combination problem since the order is not important.

$$C(22, 4) = \frac{P(22, 4)}{4!}$$

22 students taken 4 at a time.

$$= \frac{\overset{11}{\cancel{22}} \cdot \overset{7}{\cancel{21}} \cdot \overset{5}{\cancel{20}} \cdot 19}{\underset{1}{\cancel{4}} \cdot \underset{1}{\cancel{3}} \cdot \underset{1}{\cancel{2}} \cdot 1} \text{ or } 7{,}315$$

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the next slide

Example 3

Answer: There are 7,315 different groups of eighth grade students that could help the new students.

End of slide

Your Turn

SCHOOL A teacher needs to select 5 students from a class of 26 to help with parent teacher conferences. Does this represent a combination or a permutation? How many possible groups could be selected to help?

Answer: combination; 65,780

Example 4

SCHOOL An eighth grade teacher needs to select 4 students from a class of 22 to help with sixth grade orientation. One eighth grade student will be assigned to sixth grade classes on the first floor, another student will be assigned to classes on the second floor, another student will be assigned to classes on the third floor, and still another student will be assigned to classes on the fourth floor. Does this represent a combination or a permutation? In how many possible ways can the eighth graders be assigned to help with the sixth grade orientation?

Since it makes a difference which student goes to which floor, order is important. This is a permutation.

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the next slide

Example 4

$$P(22, 4) = 22 \cdot 21 \cdot 20 \cdot 19$$

Definition of $P(22, 4)$

$$= 175{,}560$$

Answer: There are 175,560 ways for the eighth grade students to be selected to help with sixth grade orientation.

End of slide

Your Turn

SCHOOL A teacher needs to select 5 students from a class of 26 to help with parent teacher conferences. One student will be assigned to fifth grade parents, another student will be assigned to sixth grade parents, another student will be assigned to seventh grade parents, another student will be assigned to eighth grade parents, and still another student will be assigned to ninth grade parents. Does this represent a combination or a permutation? In how many possible ways can the students be assigned to help with the parent teacher conferences?

Answer: permutation; 7,893,600

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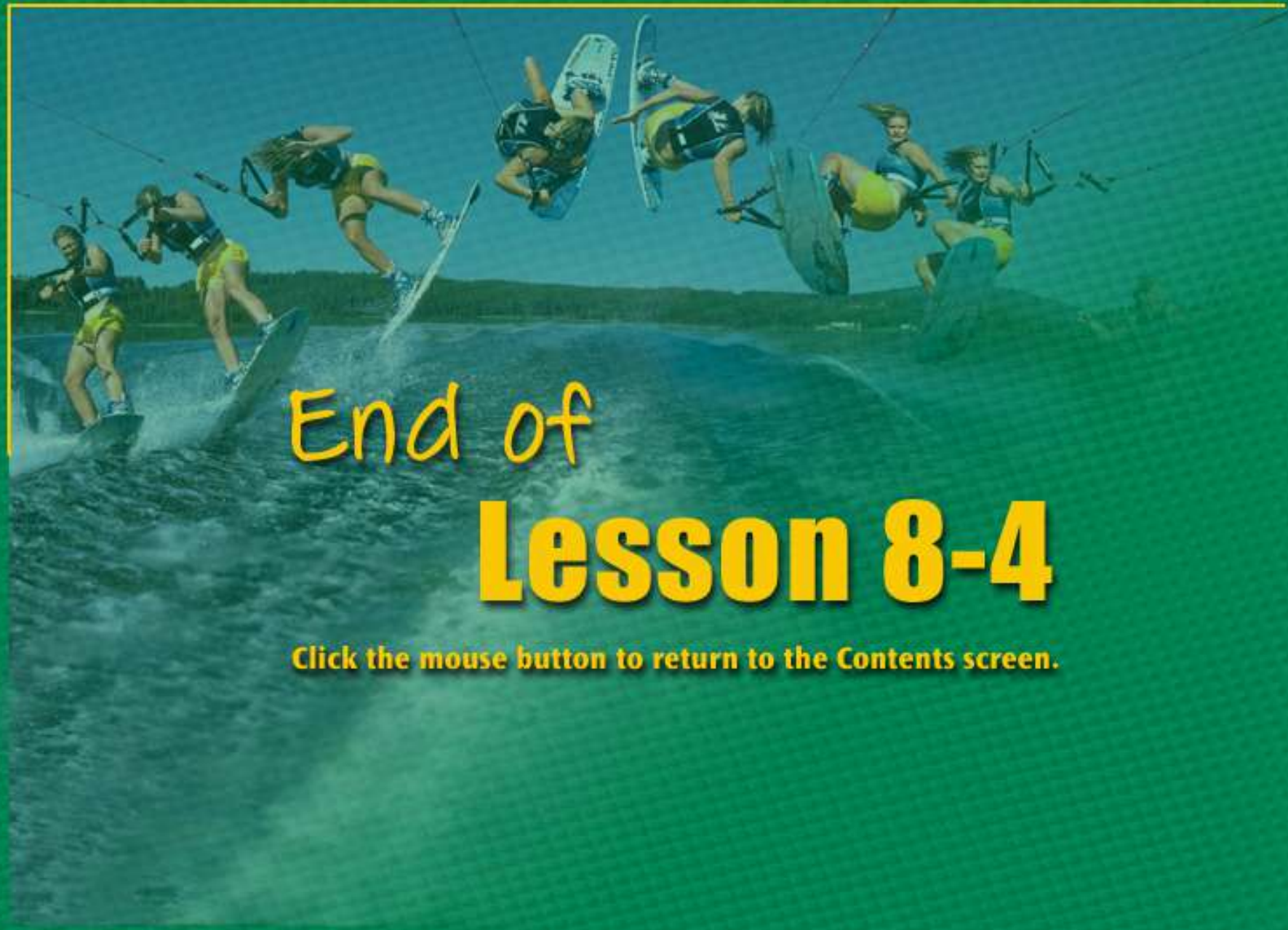
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Lesson 8-4
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Lesson 8-5 Contents

Example 1

The two spinners below are spun. What is the probability that both spinners will show a number greater than 6?

$$P(\text{first spinner is greater than 6}) = \frac{3}{10}$$

$$P(\text{second spinner is greater than 6}) = \frac{3}{10}$$

End of slide–
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the next slide

Example 1

$$P(\text{both spinners are greater than 6}) = \frac{3}{10} \cdot \frac{3}{10} \text{ or } \frac{9}{100}$$

Answer: $\frac{9}{100}$

End of slide

Your Turn

The two spinners below are spun. What is the probability that both spinners will show a number less than 4?

Answer: $\frac{3}{16}$

STOP! End of slide

Example 2

POPULATION Use the information below. What is the probability that a student picked at random will be an eighth-grade girl?

Cross River Middle School	
Demographic Group	Fraction of the Population
Grade 6	$\frac{4}{10}$
Grade 7	$\frac{3}{10}$
Grade 8	$\frac{3}{10}$
Boys	$\frac{4}{9}$
Girls	$\frac{5}{9}$

End of slide—continued on the next slide

Example 2

$$P(\text{8th grade}) = \frac{3}{10}$$

$$P(\text{girl}) = \frac{5}{9}$$

$$P(\text{8th grade and girl}) = \frac{\cancel{3}^{1}}{\cancel{10}_{2}} \cdot \frac{\cancel{5}^{1}}{\cancel{9}_{3}} \text{ or } \frac{1}{6}$$

Answer: The probability that the two events will occur is $\frac{1}{6}$.

End of slide

Your Turn

POPULATION Use the information below. What is the probability that a student picked at random will be a sixth grade boy?

Monterey Middle School	
Demographic Group	Fraction of the Population
Grade 6	$\frac{2}{9}$
Grade 7	$\frac{4}{9}$
Grade 8	$\frac{1}{3}$
Boys	$\frac{7}{10}$
Girls	$\frac{3}{10}$

Answer: $\frac{7}{45}$

End of slide

Example 3

There are 4 red, 8 yellow, and 6 blue socks in a drawer. Once a sock is selected, it is not replaced. Find the probability that two blue socks are chosen.

Since the first sock is not replaced, the first event affects the second event. These are dependent events.

$$P(\text{first sock is blue}) = \frac{6}{18}$$

6 ← number of blue socks

18 ← total number of socks

$$P(\text{second sock is blue}) = \frac{5}{17}$$

5 ← number of blue socks after one blue sock is removed

17 ← total number of socks after one blue sock is removed

End of slide—
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Example 3

$$P(\text{two blue socks}) = \frac{\cancel{6}^{1}}{\cancel{18}_{3}} \cdot \frac{5}{17} \text{ or } \frac{5}{51}$$

Answer: $\frac{5}{51}$

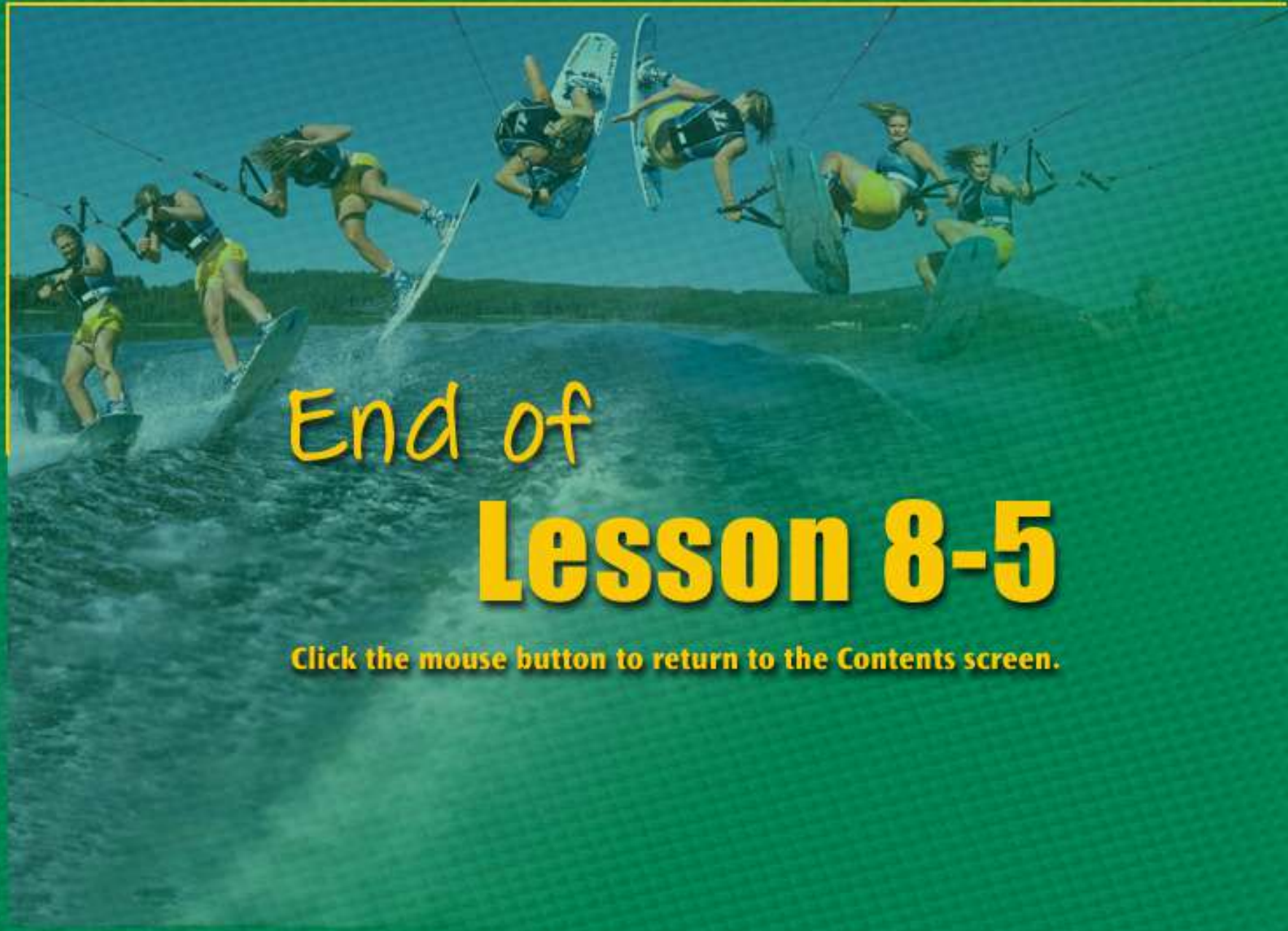
End of slide

Your Turn

There are 6 green, 9 purple, and 3 orange marbles in a bag. Once a marble is selected, it is not replaced. Find the probability that two purple marbles are chosen.

Answer: $\frac{4}{17}$

End of slide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Lesson 8-6 Contents

Example 1

Nikki is conducting an experiment to find the probability of getting various results when three coins are tossed. The results of her experiment are given below. According to the experimental probability, is Nikki more likely to get all heads or no heads on the next toss?

Result	Number of Tosses
all heads	6
two heads	32
one head	30
no heads	12

Answer: Based on the results so far, no heads is more likely.

End of slide

Your Turn

Marcus is conducting an experiment to find the probability of getting various results when four coins are tossed. The results of his experiment are given below. According to the experimental probability, is Marcus more likely to get all heads or no heads on the next toss?

Result	Number of Tosses
all heads	6
three heads	12
two heads	20
one head	7
no heads	5

Answer: all heads

End of slide

Example 2

Nikki is conducting an experiment to find the probability of getting various results when three coins are tossed. The results of her experiment are given below. How many possible outcomes are there for tossing three coins if order is important?

Result	Number of Tosses
all heads	6
two heads	32
one head	30
no heads	12

Answer: There are $2 \cdot 2 \cdot 2$ or 8 possible outcomes.

End of slide

Your Turn

Marcus is conducting an experiment to find the probability of getting various results when four coins are tossed. The results of his experiment are given below. How many possible outcomes are there for tossing four coins if order is important?

Result	Number of Tosses
all heads	6
three heads	12
two heads	20
one head	7
no heads	5

Answer: 16

End of slide

Example 3

Nikki is conducting an experiment to find the probability of getting various results when three coins are tossed. The results of her experiment are given below. Is the theoretical probability greater for tossing all heads or no heads? What is the theoretical probability of each?

Result	Number of Tosses
all heads	6
two heads	32
one head	30
no heads	12

End of slide—
continued on
the next slide

Example 3

Answer: The theoretical probability of all heads is $\frac{1}{2} \cdot \frac{1}{2} \cdot \frac{1}{2} = \frac{1}{8}$.

The theoretical probability of no heads is $\frac{1}{2} \cdot \frac{1}{2} \cdot \frac{1}{2} = \frac{1}{8}$.

The theoretical probabilities are the same.

End of slide

Your Turn

Marcus is conducting an experiment to find the probability of getting various results when four coins are tossed. The results of his experiment are given below. Is the theoretical probability greater for tossing all heads or no heads? What is the theoretical probability of each?

Result	Number of Tosses
all heads	6
three heads	12
two heads	20
one head	7
no heads	5

Answer: same; $\frac{1}{16}$

End of slide

Example 4

MARKETING **Eight hundred adults were asked whether they were planning to stay home for winter vacation. Of those surveyed, 560 said that they were. What is the experimental probability that an adult planned to stay home for winter vacation?**

There were 800 people surveyed and 560 said that they were staying home.

Answer: The experimental probability is $\frac{560}{800}$ or $\frac{7}{10}$.

End of slide

Your Turn

MARKETING Five hundred adults were asked whether they were planning to stay home for New Year's Eve. Of those surveyed, 300 said that they were. What is the experimental probability that an adult planned to stay home for New Year's Eve?

Answer: $\frac{3}{5}$

Example 5

MATH TEAM Over the past three years, the probability that the school math team would win a meet is $\frac{3}{5}$. Is this probability experimental or theoretical? Explain.

Answer: This is an experimental probability since it is based on what happened in the past.

End of slide

Your Turn

SPEECH AND DEBATE Over the past three years, the probability that the school speech and debate team would win a meet is $\frac{4}{5}$. Is this probability experimental or theoretical? Explain.

Answer: Experimental; it is based on actual results.

Example 6

MATH TEAM **Over the past three years, the probability that the school math team would win a meet is $\frac{3}{5}$. If the team wants to win 12 more meets in the next 3 years, how many meets should the team enter?**

This problem can be solved using a proportion.

3 out of 5 meets were wins → $\frac{3}{5} = \frac{12}{x}$ ← 12 out of x meets should be wins.

Solve the proportion.

End of slide—continued on the next slide

Example 6

$$\frac{3}{5} = \frac{12}{x}$$

Write the proportion.

$$3 \cdot x = 5 \cdot 12$$

Find the cross products.

$$3x = 60$$

Multiply.

$$\frac{3x}{3} = \frac{60}{3}$$

Divide each side by 3.

$$x = 20$$

Answer: They should enter 20 meets.

End of slide

Your Turn

SPEECH AND DEBATE Over the past three years, the probability that the school speech and debate team would win a meet is $\frac{4}{5}$. If the team wants to win 20 more meets in the next 3 years, how many meets should the team enter?

Answer: 25 meets

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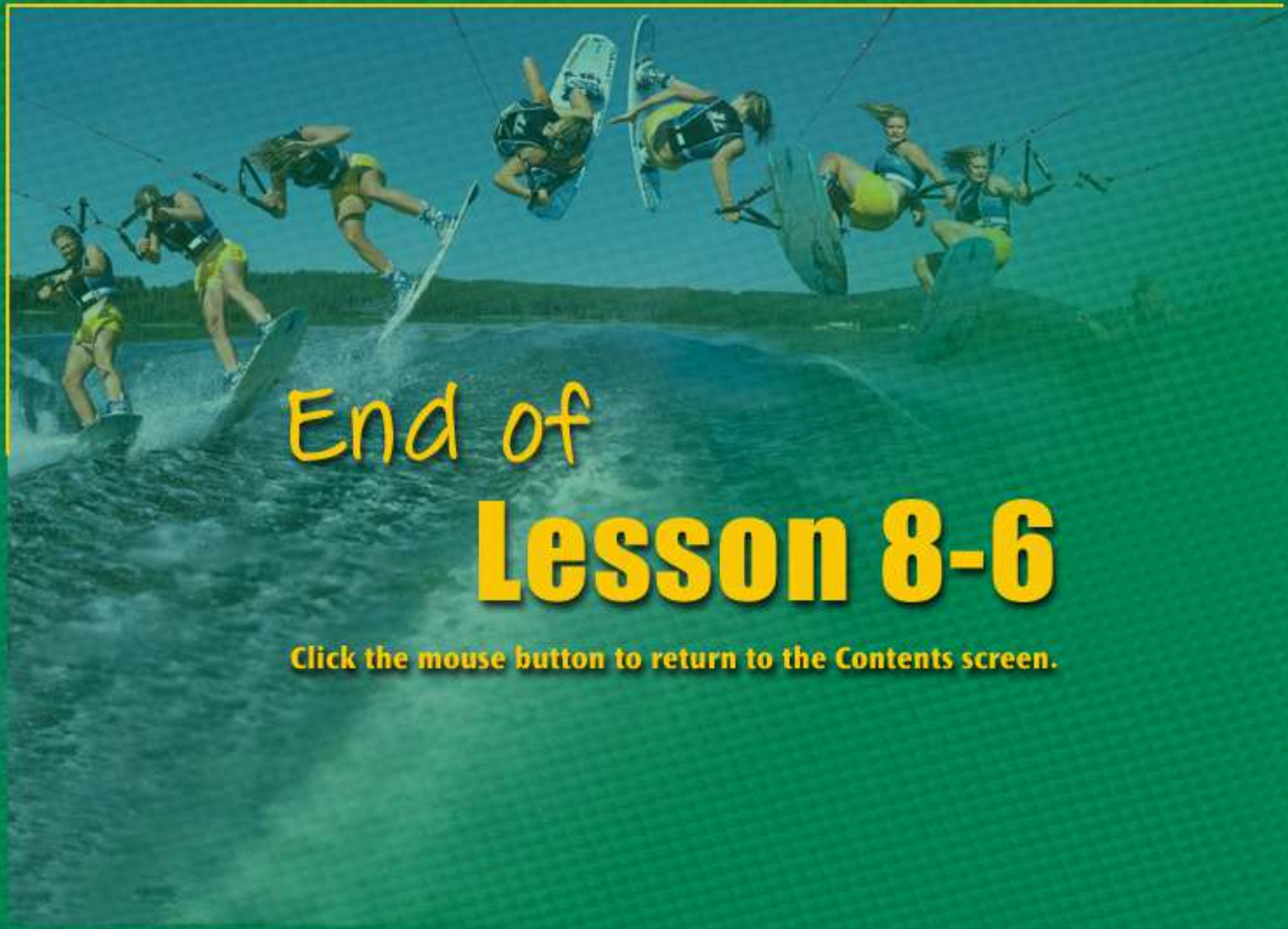
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Lesson 8-7 Contents

Example 1

To determine which school lunches students like most, every twentieth student to walk into the cafeteria is surveyed. Describe the sample.

Answer: Since the population is the students entering the cafeteria, the sample is a systematic random sample. It is an unbiased sample.

End of slide

Your Turn

To determine which CDs customers like most, every tenth customer to walk into the music store is surveyed. Describe the sample.

Answer: This is an unbiased, systematic random sample.

Example 2

To determine what sports teenagers like, the student athletes on the girls' field hockey team are surveyed. Describe the sample.

Answer: Teenagers on the field hockey team are more likely to choose field hockey. This is a biased sample. The sample is a convenience sample because the people are easily accessed.

End of slide

Your Turn

To determine what restaurant teenagers like, the teenagers eating at Pete's Diner are surveyed. Describe the sample.

Answer: This is a biased convenience sample.

Example 3

BOOKS **The student council is trying to decide what types of books to sell at its annual book fair to help raise money for the eighth-grade trip. It surveys 40 students at random. The books they prefer are in the table. What percent of the students prefer mysteries?**

Book Type	Number of Students
mystery	12
adventure novel	9
sports	11
short stories	8

12 out of 40 students prefer mysteries.

$12 \div 40 = 0.30$

Answer: 30% of the students prefer mysteries.

End of slide

Your Turn

PENS The student shop sells pens. It surveys 50 students at random. The pens they prefer are in the table. What percent of the students prefer gel pens?

Type	Number
gel pens	22
ball point	8
glitter pens	10
roller balls	10

Answer: 44%

End of slide

Help Extra Examples

Example 4

BOOKS The student council is trying to decide what types of books to sell at its annual book fair to help raise money for the eighth-grade trip. It surveys 40 students at random. The books they prefer are in the table. If 220 books are to be sold at the book fair, how many should be mysteries?

Book Type	Number of Students
mystery	12
adventure novel	9
sports	11
short stories	8

Find 30% of 220.

$0.30 \times 220 = 66$

End of slide

Answer: About 66 books should be mysteries.

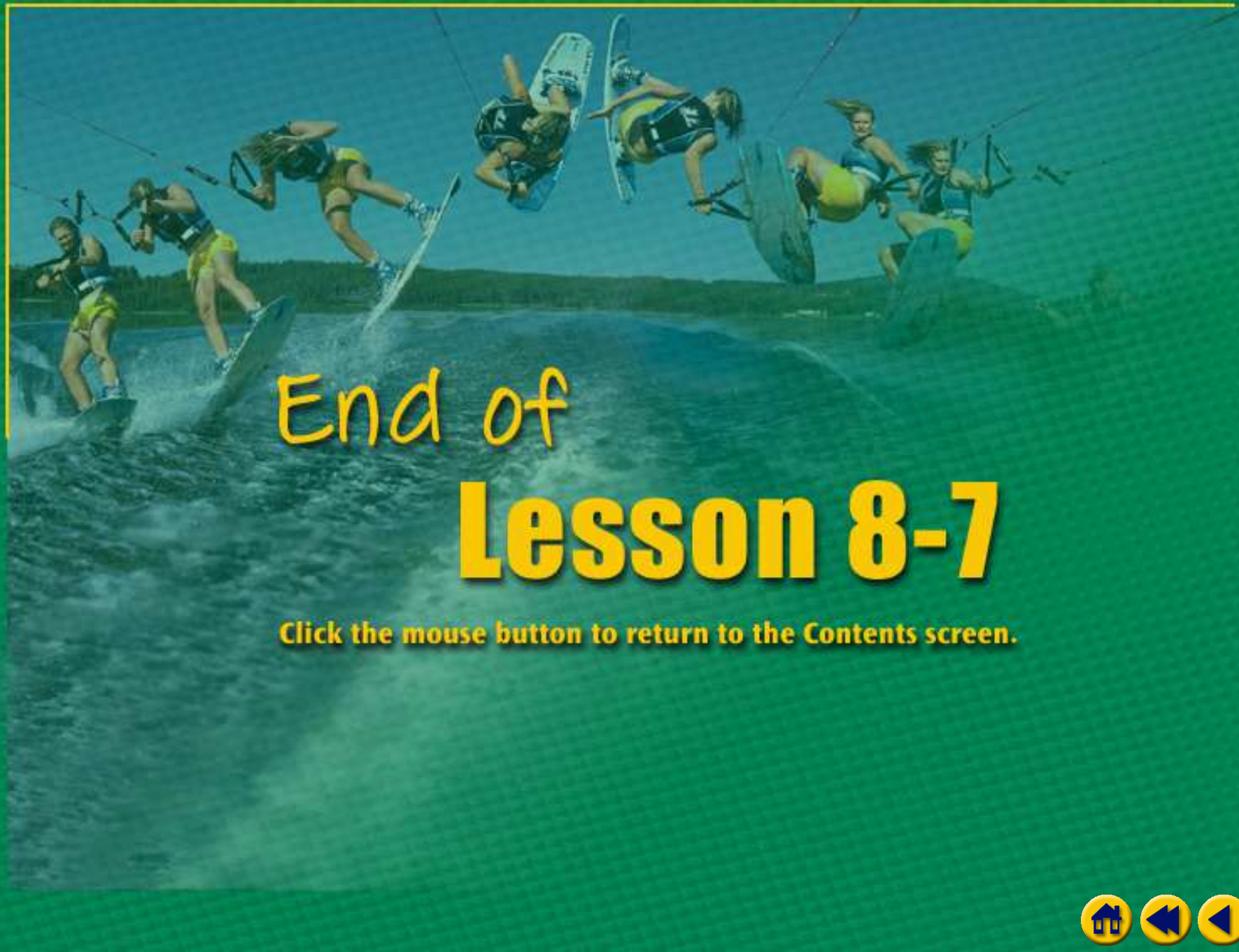
Your Turn

PENS The student shop sells pens. It surveys 50 students at random. The pens they prefer are in the table. If 300 pens are to be sold at the student shop, how many should be gel pens?

Type	Number
gel pens	22
ball point	8
glitter pens	10
roller balls	10

Answer: 132

End of slide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Extra Examples

Explore online information about the information introduced in this chapter.

Click on the **Connect** button to launch your browser and go to the *Mathematics: Applications and Concepts, Course 3* Web site. At this site, you will find extra examples for each lesson in the Student Edition of your textbook. When you finish exploring, exit the browser program to return to this presentation. If you experience difficulty connecting to the Web site, manually launch your Web browser and go to **www.msmath3.net/extra_examples**.

Find the area of each figure.

1. triangle: base, 10 in.; height, 15 in.
2. circle: diameter, 14 m

Find the volume of each solid. Round to the nearest tenth if necessary.

3. rectangular prism: length, 3 yd; width, 5 yd; height, 7 yd
4. cone: diameter, 9 ft; height, 5 ft
5. Find the surface area of a rectangular prism that is 15 cm long, 20 cm wide, and 25 cm tall.
6. **Standardized Test Practice** Find the sum using the correct precision.

   15.326 + 6.76

Find the area of each figure.

1. triangle: base, 10 in.; height, 15 in. 75 in^2
2. circle: diameter, 14 m 153.9 m^2

Find the volume of each solid. Round to the nearest tenth if necessary.

3. rectangular prism: length, 3 yd; width, 5 yd; height, 7 yd 105 yd^3
4. cone: diameter, 9 ft; height, 5 ft 106 ft^3
5. Find the surface area of a rectangular prism that is 15 cm long, 20 cm wide, and 25 cm tall. 2,350 cm^2
6. **Standardized Test Practice** Find the sum using the correct precision.

   15.326 + 6.76 22.09

The students in a class listed their favorite color. The results are shown in the table at the right. Write each probability as a fraction, a decimal, and a percent.

Favorite Color	Number of Students
Yellow	6
Blue	8
Green	4
Black	2

1. *P*(Yellow)

2. *P*(*not* Green or Black)

3. *P*(*not* Blue)

4. **Standardized Test Practice** For which of the spinners is $P(\text{black}) = \frac{3}{4}$ true?

A

B

C

D

The students in a class listed their favorite color. The results are shown in the table at the right. Write each probability as a fraction, a decimal, and a percent.

Favorite Color	Number of Students
Yellow	6
Blue	8
Green	4
Black	2

1. *P*(Yellow)

   $\frac{3}{10}$, 0.30, 30%

2. *P*(*not* Green or Black)

   $\frac{7}{10}$, 0.70, 70%

3. *P*(*not* Blue)

   $\frac{3}{5}$, 0.60, 60%

4. **Standardized Test Practice** For which of the spinners is $P(\text{black}) = \frac{3}{4}$ true?

A

B

C

D

Draw a tree diagram to determine the number of outcomes.

1. Two number cubes are rolled.
2. Four kinds of candy come in either red, blue, or yellow wrappers.

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

3. A month of the year is picked at random and a quarter is flipped.
4. A 4-digit code is created using the numbers 0–6.
5. A university gives each student an ID number with 2 letters (A–Z) followed by 3 digits (0–9). How many possible ID numbers are there?
6. **Standardized Test Practice** Lindsey and Barbara are going to a pizza shop. They can order a pepperoni, sausage, Canadian bacon, or hamburger pizza. The pizzas can be made with thin, regular, or thick crust. How many different pizzas can they order?

A 3 B 4 C 12 D 64

Draw a tree diagram to determine the number of outcomes.

1. Two number cubes are rolled. 36 outcomes
2. Four kinds of candy come in either red, blue, or yellow wrappers. 12 outcomes

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

3. A month of the year is picked at random and a quarter is flipped. 24 outcomes
4. A 4-digit code is created using the numbers 0–6. 2,401 outcomes
5. A university gives each student an ID number with 2 letters (A–Z) followed by 3 digits (0–9). How many possible ID numbers are there? 676,000 possible ID numbers
6. **Standardized Test Practice** Lindsey and Barbara are going to a pizza shop. They can order a pepperoni, sausage, Canadian bacon, or hamburger pizza. The pizzas can be made with thin, regular, or thick crust. How many different pizzas can they order?

A 3 B 4 C 12 D 64

Find each value.

1. $P(10, 5)$
2. $P(32, 3)$
3. $7!$
4. $5!$
5. Kimberly is going shopping. She plans to stop at 4 different stores before she goes home. In how many orders can she stop at the stores?
6. **Standardized Test Practice** How many 9-digit social security numbers can be made if no digit can be repeated and the first digit is always 4?

A 45 B 81 C 6,561 D 362,880

Click the mouse button or press the Space Bar to display the answers.

Find each value.

1. $P(10, 5)$ 30,240
2. $P(32, 3)$ 29,760
3. $7!$ 5,040
4. $5!$ 120

5. Kimberly is going shopping. She plans to stop at 4 different stores before she goes home. In how many orders can she stop at the stores? 24

6. **Standardized Test Practice** How many 9-digit social security numbers can be made if no digit can be repeated and the first digit is always 4?

A 45 B 81 C 6,561 D 362,880

Find each value.

1. $C(8, 4)$

2. $C(16, 3)$

Determine whether each situation is a *permutation* or a *combination*.

3. choosing 5 places in a tournament

4. choosing 3 people from your class to go to the mall with you

5. Five points are located on a circle. How many line segments can be drawn with these points as end points?

6. **Standardized Test Practice** Which situation is represented by $C(52, 5)$?

   A. the number of ways to select a 5-card hand from a deck of 52

   B. the number of ways to order the first 5 cards from a deck of 52

   C. the number of ways to arrange 5 cards in a row from a deck of 52

   D. the number of ways to arrange the 5's from a deck of 52 cards

Find each value.

1. $C(8, 4)$ 70

2. $C(16, 3)$ 560

Determine whether each situation is a *permutation* or a *combination*.

3. choosing 5 places in a tournament permutation

4. choosing 3 people from your class to go to the mall with you combination

5. Five points are located on a circle. How many line segments can be drawn with these points as end points? 10

6. **Standardized Test Practice** Which situation is represented by $C(52, 5)$?

   A the number of ways to select a 5-card hand from a deck of 52

   B the number of ways to order the first 5 cards from a deck of 52

   C the number of ways to arrange 5 cards in a row from a deck of 52

   D the number of ways to arrange the 5's from a deck of 52 cards

A day of the week is picked at random and a number cube is tossed. Find each probability.

1. *P*(begins with "S" and 4)
2. *P*(Wednesday and 3)

A bag of pencils has 3 red, 5 blue, and 8 yellow pencils. Find each probability if each pencil selected is not returned to the bag.

3. *P*(red then blue)
4. *P*(2 yellows)

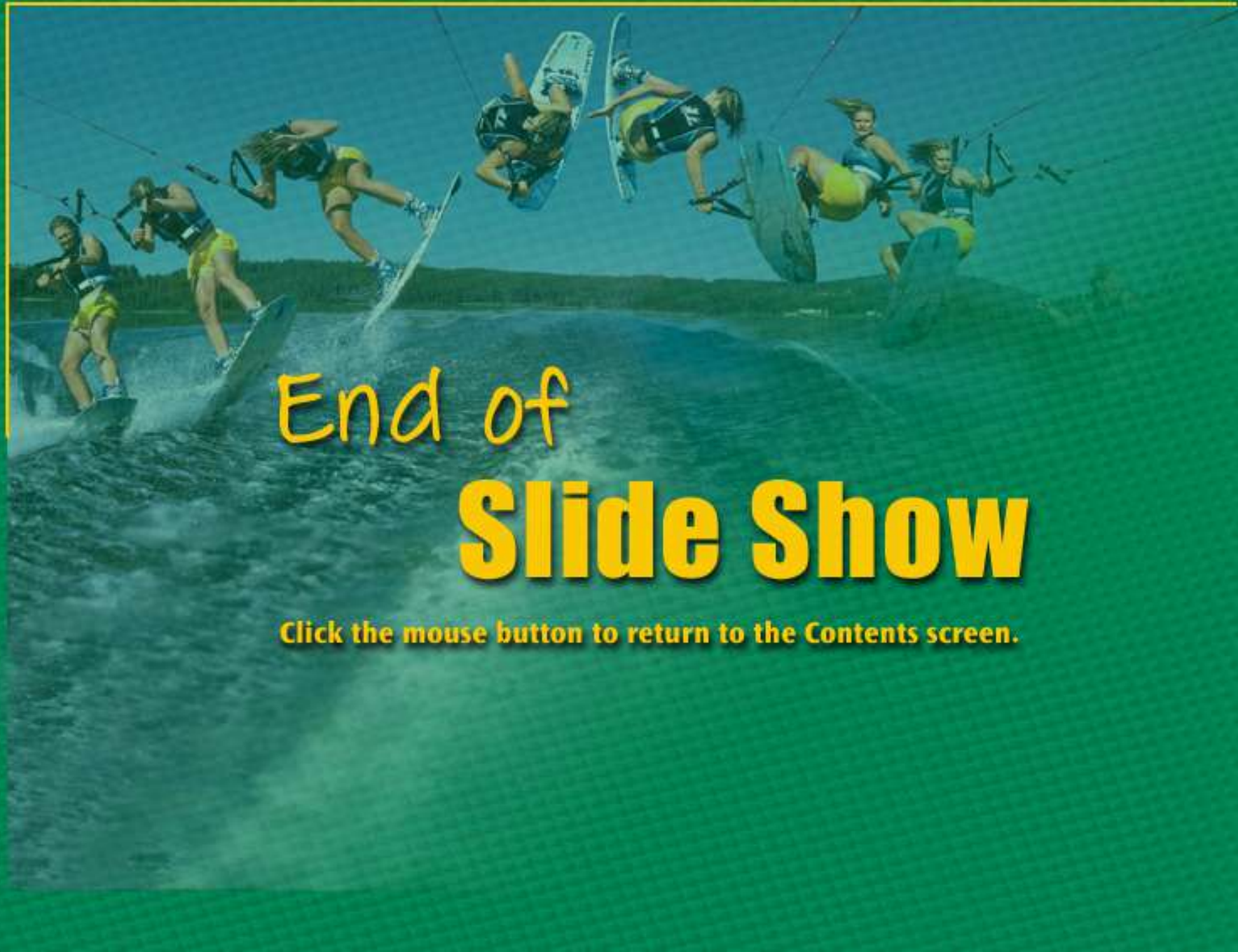
5. Jordan makes 75% of his basketball free throws. What is the probability that he will make 4 free throws in a row? Write your answer as a percent.
6. **Standardized Test Practice** Josh flips a coin and draws a card from a deck of 52. What is the probability that he will get heads and a seven?

A day of the week is picked at random and a number cube is tossed. Find each probability.

1. *P*(begins with "S" and 4) $\frac{1}{21}$
2. *P*(Wednesday and 3) $\frac{1}{42}$

A bag of pencils has 3 red, 5 blue, and 8 yellow pencils. Find each probability if each pencil selected is not returned to the bag.

3. *P*(red then blue) $\frac{1}{16}$
4. *P*(2 yellows) $\frac{7}{30}$
5. Jordan makes 75% of his basketball free throws. What is the probability that he will make 4 free throws in a row? Write your answer as a percent. 32%
6. **Standardized Test Practice** Josh flips a coin and draws a card from a deck of 52. What is the probability that he will get heads and a seven? $\frac{1}{26}$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