Chapter 14

Lesson 1

Name _____ Date _____

Conducting a Probability Experiment

NCTM Standards 5, 7, 8, 9

A probability experiment: How many heads?

1 If you flip one penny and one nickel at the same time, what are the possible outcomes?

Nickel \ Penny	H	T
h	hH	
t		

2 Perform the experiment. Flip the two coins 20 times. Record the number of heads for each flip in the table below.

Trial	1	2	3	4	5	6	7	8	9	10
Number of Heads										

Trial	11	12	13	14	15	16	17	18	19	20
Number of Heads										

3 Use fractions to describe your results.

0 heads: $\frac{\square}{20}$ 1 head: $\frac{\square}{\square}$ 2 heads: $\frac{\square}{\square}$

This table shows Alison's data for the same coin-flipping experiment.

Trial	1	2	3	4	5	6	7	8	9	10
Number of Heads	1	1	2	0	1	2	1	0	0	1

Trial	11	12	13	14	15	16	17	18	19	20
Number of Heads	1	1	1	2	0	1	0	1	1	2

Supply the missing question (Q) or answer (A).

4 **Q:** What are the possible outcomes? **A:** _____

5 **Q:** _____ **A:** **20 times**

_____

6 **Q:** In what fraction of all the trials did the outcome "two heads" occur? **A:** _____

7 **Q:** _____ **A:** $\frac{11}{20}$

_____

Make up a question and corresponding answer of your own.

8 **Q:** _____ **A:** _____

_____ _____

9 **Challenge** Write a question about the data in the table above for which this number sentence would be a reasonable answer.

Q: _____ **A:** $\frac{4}{20} + \frac{5}{20} = \frac{9}{20}$

_____

_____

Chapter 14

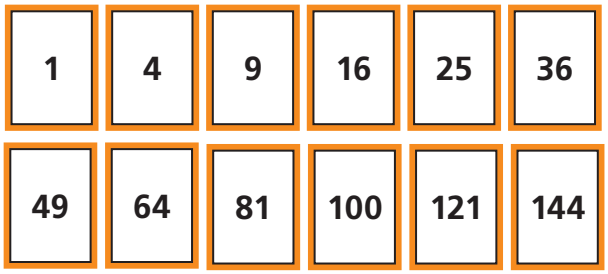
Lesson 2

Name _____ Date _____

Finding Probabilities

NCTM Standards 5, 7, 8, 9

Mika is going to draw 1 card at random from the following deck.



1 For each event listed at the right, write a fraction to describe the probability of this event happening.

Event	Probability
a Number is less than 40	$\frac{6}{12}$, or $\frac{1}{2}$
b Units digit is 1 or 9	
c Units digit is 2, 3, or 7	
d Number is greater than 50	
e Number is a multiple of 3	

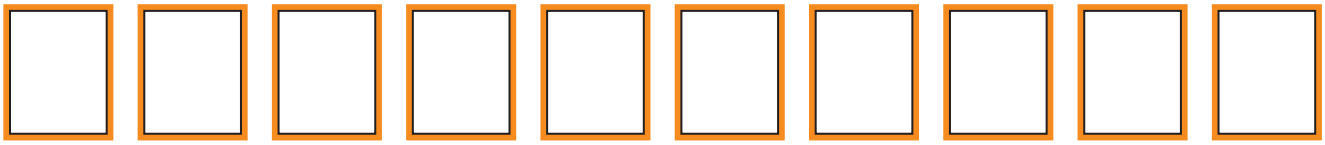
2 Make a deck of cards to match those above and conduct the experiment. Draw a card and record your result in the table below. Return the card to the deck and shuffle well. Repeat for a total of 20 draws.

Draw	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Card Drawn																				

3 Assign a probability for each event based on your experiment in Problem 2.

Event	Experimental Probability
a Number is less than 40	$\frac{\square}{20}$
b Units digit is 1 or 9	
c Units digit is 2, 3, or 7	
d Number is greater than 50	
e Number is a multiple of 3	

For another experiment, you will draw a card at random from a deck whose cards are numbered with the cubes of numbers from 1 to 10. Write the possible outcomes on these cards.



4 Complete the following statements and give reasons that correspond to this experiment.

a I am CERTAIN to draw _____.

Why? _____

b The probability is greater than $\frac{1}{2}$ that I will draw _____.

Why? _____

c The probability is less than $\frac{1}{2}$ that I will draw _____.

Why? _____

d It is IMPOSSIBLE that I will draw _____.

Why? _____

5 Imagine that you conduct this experiment. Write 2 questions about the probability of some event occurring. Then answer your question. (One example is given.)

Q: What is the probability that I will draw an even number? **A:** $\frac{5}{10}$, or $\frac{1}{2}$

Q: _____ **A:** _____

_____

Q: _____ **A:** _____

_____

6 **Challenge** Look at LAB p. 273. How well did the predicted probabilities (Problem 1) match the experimental probabilities (Problem 2)? Explain why you think they did or did not match.

_____

Chapter 14
Lesson 3

Name _____ Date _____

Sampling Experiments

NCTM Standards 1, 5, 6, 7, 8, 9

Five groups of fifth graders each pulled 20 counters from a bag one at a time, returning the counter to the bag each time.

Here are the results.

Groups	1	2	3	4	5
Red	8	11	8	12	9
Blue	7	5	6	4	8
Green	5	4	6	4	3

1. What fraction of the counters would you estimate are red? _____

2. What fraction of the counters would you estimate are blue? _____

3. What fraction of the counters would you estimate are green? _____

4. If there are 100 counters in the bag, what is the best guess we can make from our sample about how many are . . .

   . . . red? _____ . . . blue? _____ . . . green? _____

5. If there are 10 counters in the bag, what is the best guess we can make about how many are . . .

   . . . red? _____ . . . blue? _____ . . . green? _____

6. Based only on the results of this experiment, it is impossible to say, even approximately, how many blue counters are in the bag. Explain why this is impossible.

_____

_____

_____

7 A secret number of counters (maybe even zero) are put into a bag. All you know is that any counters that are now in the bag are all blue. Now you put 10 red counters, shake the bag well, and perform a sampling experiment. After 100 pulls, count the occurrences of each color.

a If you recorded picking a red counter 100 times, what number of blue counters would you estimate were in the bag? _____

b If you recorded picking a red counter 49 times, what number of blue counters would you estimate were in the bag?

_____

_____

_____

8 A bag contains a secret number (at least 10) yellow blocks. You take 10 blocks from the bag, mark each of them with a blue dot, and return them to the bag. You now perform a sampling experiment. After 100 pulls, you have recorded 49 with blue dots.

a How many blocks did you pull that are all yellow? _____

b About how many all-yellow blocks are in the bag? About how many blocks are in the bag? Tell why you think this is so. _____

_____

_____

_____

9 **Challenge** To figure out how many dolphins are living in a region, marine biologists tag some of the dolphins and release them again. Each time a dolphin swims by, they see whether it has a tag or not. Imagine that they have tagged exactly 20 dolphins. In the following weeks, they keep a count of the dolphins they see, and stop after 100 sightings. Of those 100 sightings, 32 were dolphins with tags. About how many dolphins are in the region? Explain.

_____

_____

_____

Chapter 14

Lesson 4

Name _____ Date _____

Another Sampling Experiment

NCTM Standards 5, 7, 8, 9

All 100 people in Littletown were asked to choose their favorite TV show (A, B, C, D, or N for "none"). You will use the Littletown data (on AM148: Littletown Data) to see how accurate an estimate you can get from a much smaller sample.

1. The Littletown data are arranged in a list to make it easy to choose a sample randomly. You will use a numbered decahedron to generate 20 sets of data points at random.

- ☑ Toss the decahedron to determine the tens digit of the data point you will choose.
- ☑ Toss the decahedron to determine the ones digit of the data point you will choose.
- ☑ Find this number in the data bank and note that participant's TV show preference.
- ☑ Record the list number and that person's preferred show in the table below.
- ☑ Repeat until you have recorded 20 different people and their shows. (If you get the same list number again, repeat the three steps above.)

Person	1	2	3	4	5	6	7	8	9	10
List Number										
TV Show										

Person	11	12	13	14	15	16	17	18	19	20
List Number										
TV Show										

2 Record the fraction of the sample that watched each show.

Show A: $\frac{\square}{20}$ Show B: $\frac{\square}{\square}$ Show C: $\frac{\square}{\square}$

Show D: $\frac{\square}{\square}$ N (none): $\frac{\square}{\square}$

3 Because your sample was chosen randomly, it is reasonable to assume that your proportions are similar to those of the total population.

Why should you not expect the fractions for each show to be exactly the same in the sample as in the total population?

_____

_____

4 Now use the entire population of Littletown and find the fractions that watched each show.

Show A: $\frac{\square}{100}$ Show B: $\frac{\square}{\square}$ Show C: $\frac{\square}{\square}$

Show D: $\frac{\square}{\square}$ N (none): $\frac{\square}{\square}$

5 **Challenge** Why are samples surveyed? Why not survey the total population every time?

_____

_____

Chapter 14

Lesson 5

Name _____ Date _____

Introducing Percents

NCTM Standards 1, 6, 7, 8, 9

Complete the following to match each picture.

Example

$\frac{1}{2}$ $\frac{50}{100}$ 50%

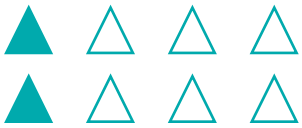
1

$\frac{3}{4}$ $\frac{\square}{100}$ _____%

2

$\frac{\square}{\square}$ $\frac{20}{100}$ _____%

3



$\frac{\square}{\square}$ $\frac{\square}{100}$ _____%

4

$\frac{\square}{\square}$ $\frac{\square}{100}$ _____%

5

$\frac{\square}{\square}$ $\frac{\square}{100}$ _____%

Solve the problems.

6 Alex got 90 out of 100 correct answers on a quiz.
What percent of the answers were correct? _____

7 Linh spelled 45 out of 50 words correctly on a spelling test.
What percent of the words were spelled correctly? _____

8 Nancy got $\frac{3}{4}$ of the answers correct on a science paper.
What percent of her answers were correct? _____

9 Chris got 82% of the words correct on a big spelling test.
There were 50 words on the test. How many did Chris get right? _____

10 Patrick got 86% of the answer correct on a social studies quiz.
There were 50 questions. How many did he get wrong? _____

Complete each box so that expressions in each group have the same value.

11 $\frac{25}{100}$ $\quad \frac{1}{\square}$ $\quad 0.\_\_\_\_$

$\_\_\_\_\%$ $\quad \frac{\square}{8}$ $\quad \frac{5}{\square}$

12 $0.\_\_\_\_$ $\quad \frac{\square}{2}$ $\quad \frac{15}{\square}$

$\frac{\square}{100}$ $\quad \_\_\_\_\%$ $\quad 0.\_\_\_\_$

13 $\frac{1}{5}$ $\quad \frac{\square}{10}$ $\quad \frac{\square}{100}$

$\_\_\_\_\%$ $\quad 0.\_\_\_\_$ $\quad \frac{3}{\square}$

14 $\_\_\_\_\%$ $\quad \frac{\square}{4}$ $\quad \frac{30}{\square}$

$\frac{\square}{100}$ $\quad 0.\_\_\_\_$ $\quad \frac{12}{\square}$

Use these figures to draw other figures.

15 If this square is 25% of a figure, draw a figure that could be 100%.

16 If this rectangle is 75% of a figure, draw a figure that could be 100%.

17 If this triangle is 50% of a figure, draw a figure that could be 150% of the figure.

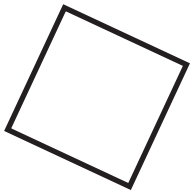
18 If this trapezoid is 20% of a figure, draw a figure that could be 80% of the figure.

19 Challenge If this square is 75% of a figure, draw a figure that could be 100% of the figure. Tell how you know.

_____

_____

_____



Chapter 14

Lesson 6

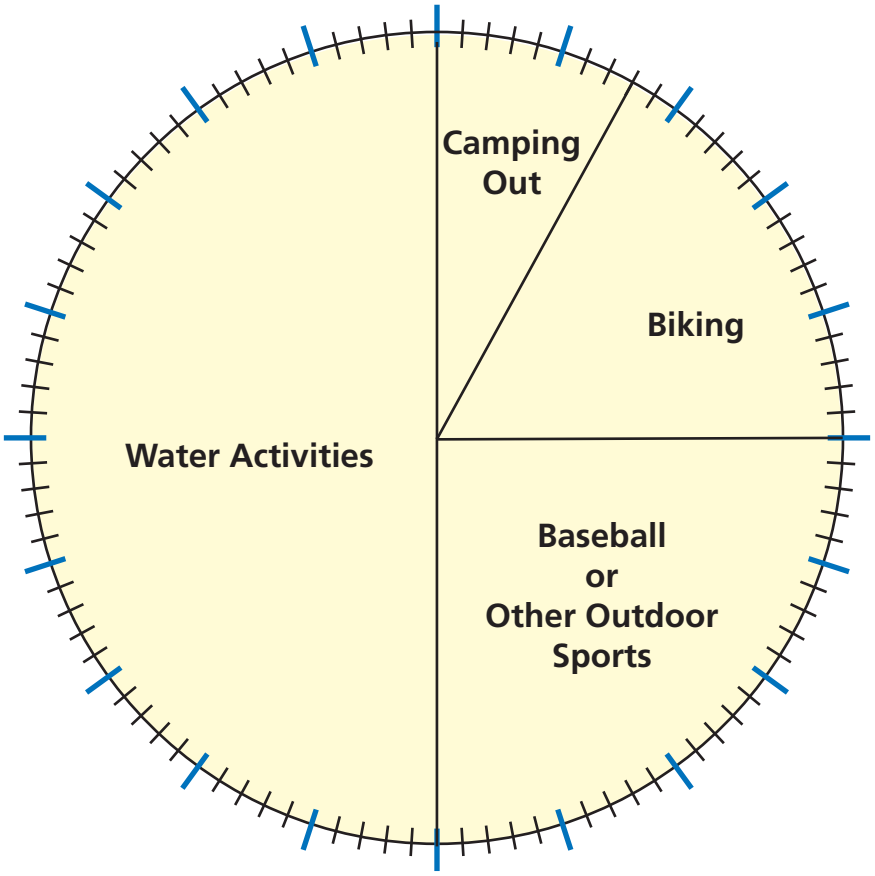
Name _____ Date _____

Circle Graphs

NCTM Standards 1, 5, 6, 7, 8, 9, 10

One hundred students were surveyed to find out what summer outdoor activity they liked best. Use the graph to help you answer the questions below.

FAVORITE SUMMER OUTDOOR ACTIVITY



1. Which did more students prefer: biking or camping out? _____

2. About how many students said they preferred water activities? _____

3. Which did more students prefer: biking and camping out or baseball and other outdoor sports? _____

4. True or False? Twenty-five students preferred biking. _____

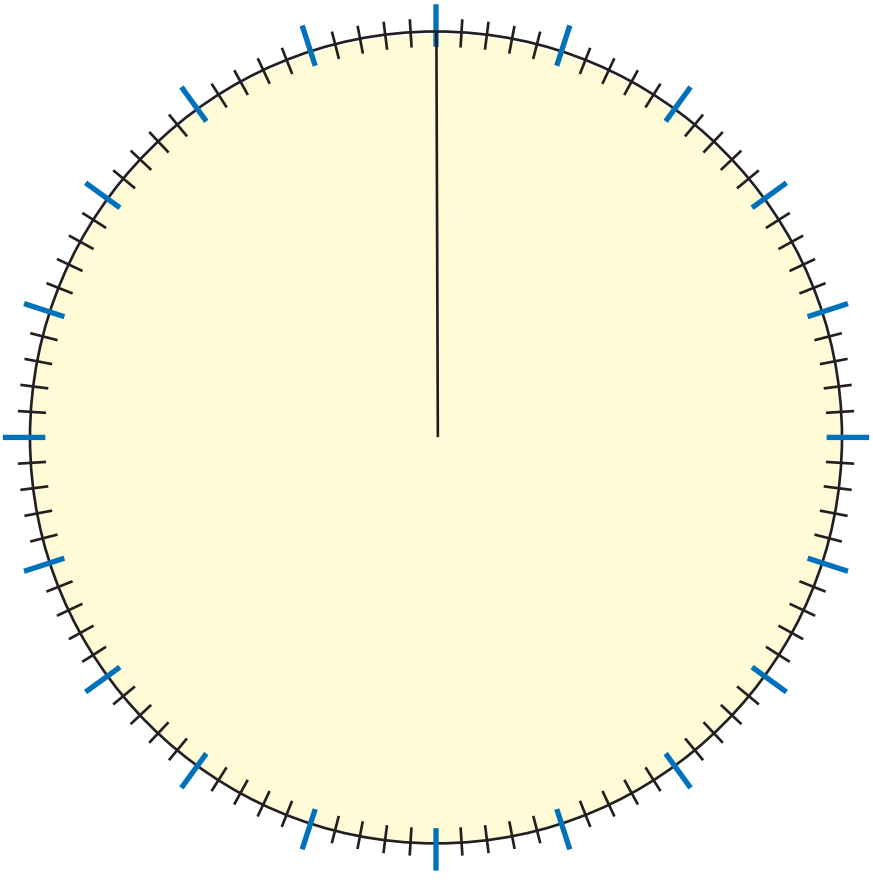
5. Name two activities that more than 20 students preferred.

   _____

6. What is the most popular summer outdoor activity? _____

7 The table below shows the results of a vote for class president taken in two fifth-grade classes. Use the data in the table and a ruler to construct a circle graph. Label each section of the graph. Give the graph a title.

VOTES FOR CLASS PRESIDENT			
Jamal	**Jenna**	**Kai**	**Lynne**
12	6	24	6



8 **Challenge** Label each section of the circle graph above with a percent. Check that they sum to 100%.

Chapter 14

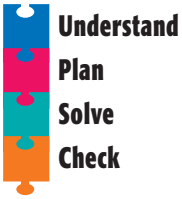
Lesson 7

Name _____ Date _____

Problem Solving Strategy

Make a Table

NCTM Standards 1, 5, 7, 8, 10



This is an alphabetical list of students in Mrs. Roger's class and their birthdays.

Ali	June 20	Kenny	March 20	Nancy	August 5
Carlos	July 7	Kim	April 28	Owen	February 21
Deb	July 1	Laura	August 25	Rosa	April 4
Devin	January 2	Lorenzo	July 17	Sam	November 8
Fran	June 29	Marie	November 12	Trina	September 8
Glenn	March 20	Mimi	September 12	Wayne	October 25
Katherine	March 23	Moses	June 29	William	December 2

1. Make a table that will help you answer these questions.

Use the table you made to answer these questions.

2. Which month has the least number of birthdays?

_____

3. What fraction of the class has a birthday in July?

_____

4. What fraction of the class has birthdays from January to December?

_____

5. What month has the most number of birthdays?

_____

Problem Solving Test Prep

Choose the correct answer.

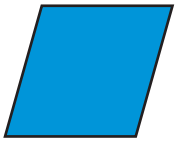
1 Which number makes the inequality true?

$831{,}492 < \blacksquare < 831{,}501$

A. 831,520 **C.** 831,499

B. 831,502 **D.** 831,399

2 Which is the only description of the figure that is **not** correct?



A. parallelogram, rhombus

B. quadrilateral, parallelogram

C. quadrilateral, rhombus

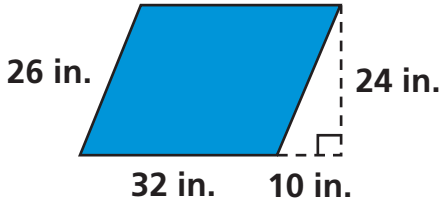
D. parallelogram, trapezoid

3 Juice boxes are packed in groups of 3. What is the greatest number of groups that can be made from 583 juice boxes?

A. 193 **C.** 195

B. 194 **D.** 196

4 What is the area of the figure?



A. 240 sq in. **C.** 768 sq in.

B. 260 sq in. **D.** 832 sq in.

Show What You Know

Solve each problem. Explain your answer.

5 Ty tossed two 1–6 number cubes. He added the numbers. He started a table to show the probability of each outcome. Copy and complete the table.

Outcome	Probability
2	$\frac{1}{36}$
3	$\frac{2}{36}$
4	$\frac{3}{36}$

6 Copy and complete the table of all possible outcomes for this experiment: Toss a coin and a 1–6 number cube. Name an event that has a probability of exactly $\frac{1}{4}$.

Outcome	Probability
Heads, 1	$\frac{1}{12}$
Heads, 2	$\frac{1}{12}$
Heads, 3	$\frac{1}{12}$

Chapter 14

Name _____ Date _____

Review/Assessment

NCTM Standards 1, 5, 6, 7, 8, 9, 10

Keaton flipped two coins ten times. This table shows the results of her trials. Lesson 1

Trial	1	2	3	4	5	6	7	8	9	10
Number of Tails	2	1	1	0	1	0	2	1	1	1

1. What are the possible outcomes? _____

2. In what fraction of all the trials did "1 tail" occur? _____

Nicholas is going to draw 1 card at random from the following deck. For each event, write a fraction to describe the probability of the event happening. Lesson 2

5	10	15	20	25	30
35	40	45	50	55	60

	Event	Probability
3	Number is less than 25	
4	Tens digit is 4	
5	Number is multiple of 5	

A group of students performed a sampling experiment with an unknown number of red, blue, and green counters. They pulled one counter from the bag, recorded the color, returned the counter to the bag, and continued the same way until they had pulled a counter 20 times. They pulled 5 red, 4 blue, and 11 green counters. Lessons 3 and 4

6. What fraction of the counters would you estimate are red? _____

7. What fraction of the counters would you estimate are blue? _____

8. What fraction of the counters would you estimate are green? _____

9. If we know that there are 100 counters in the bag, about how many would be reasonable to guess are

   red? _____ blue? _____ green? _____

Complete each box so that expressions in each group have the same value. Lesson 5

10	$\frac{3}{4}$	0.___	___%	11	$\frac{1}{\square}$	0.50	___%
12	$\frac{\square}{5}$	0.___	20%	13	$\frac{3}{10}$	___	___%

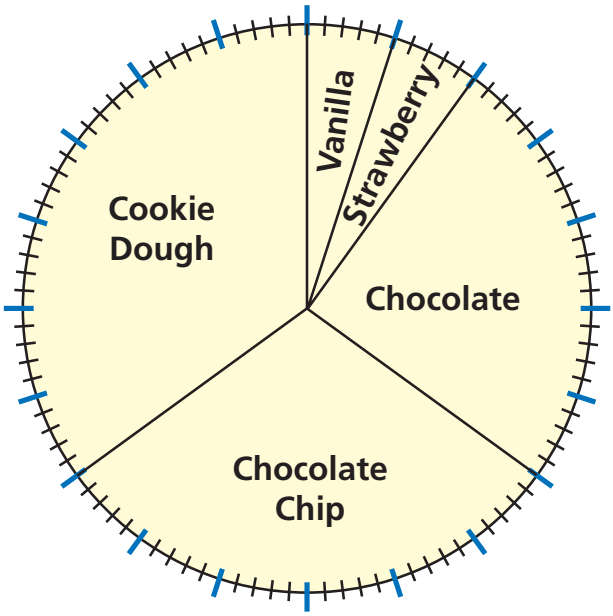
Solve the problems. Lesson 5

14 Fran spelled 35 out of 50 words correctly on a spelling test. What percent of the words were correctly spelled? ___

15 Josie got 94% of the answers correct on a science quiz. There were 100 questions. How many did she get correct? ___

One hundred students were surveyed to find out what their favorite ice cream flavor was. Use the circle graph to answer the questions. Lesson 6

FAVORITE ICE CREAM FLAVORS



16 What flavor is the most popular?

___

17 Name the two flavors that the fewest students preferred.

___

18 The students in Mr. Rubin's class each told their favorite school subject. This is what they said: Lesson 7

Abby—reading, **Max**—math, **Sophia**—writing, **James**—science, **Alex**—science, **Paul**—social studies, **Charles**—reading, **Ted**—reading, **Sarah**—math, **Jeanne**—science, **Teri**—writing, **Laura**—math, **Kirsten**—science, **Abe**—math, **Becka**—writing, **Ross**—social studies, **Ruby**—reading, **Michelle**—math, **LaVerne**—social studies, and **Will**—math

Make a table to help you answer this question: What fraction of the class chose Math?

___