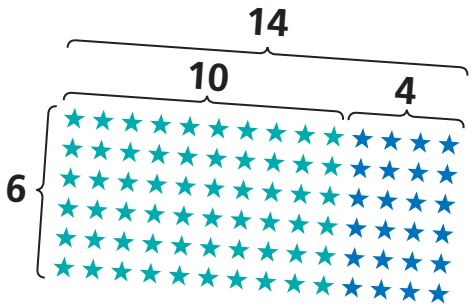
Chapter

12 Multiplication Strategies

Dear Student,

Multiplying larger numbers is easier when you break the numbers into smaller parts. For example, when finding **14** × **6**, you can think of breaking **14** into **10** and **4**.



Then you can multiply each part by **6**.

14 × **6** = **10** × **6** + **4** × **6**

Could you break **14** differently to multiply **14** by **6**? Could you use the same idea to multiply **27** by **13**?

In this chapter, you will be breaking numbers in different ways to make it easier to multiply large numbers.

Mathematically yours,
The authors of ***Think Math!***

Chapter 12

Lesson 1

EXPLORE
Multiplying Money

Use real or play coins to multiply the amount. Then write a multiplication sentence.

1.  × 4

2.  × 2

3.  × 3

4.  × 6

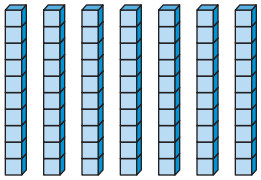
5. Make at least two problems using your own combinations of dimes, nickels, and pennies. You do not need to use all three kinds of coins each time.

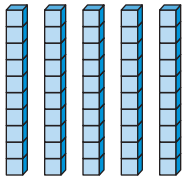
Chapter 12

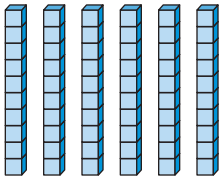
Lesson 3

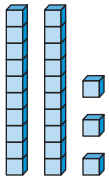
EXPLORE
Multiplying Blocks

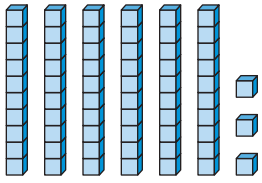
Each picture of base-ten blocks represents a number. Find that number, solve the multiplication problem, and write the matching number sentence. You may use blocks to help you.

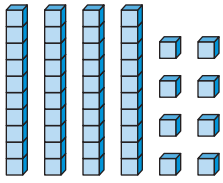
1  × 4

2  × 5

3  × 5

4  × 4

5  × 5

6  × 5

Chapter 12

Lesson 4

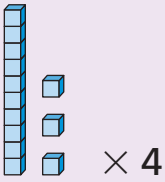
REVIEW MODEL
Using Models to Find Larger Products

You can find larger products by adding the products of two simpler multiplication problems.

Example Find 13×4.

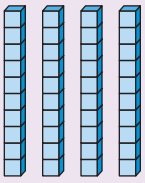
One Way

Use base-ten blocks.



$\times 4$

Step 1 Multiply the tens.



$10 \times 4 = \mathbf{40}$

Step 2 Multiply the ones.

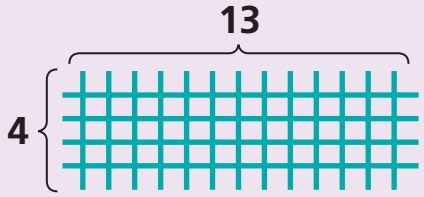
$3 \times 4 = \mathbf{12}$

Step 3 Add the two smaller products to find the larger product.

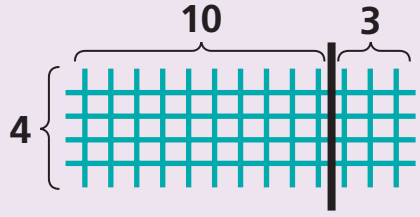
$\mathbf{40} + \mathbf{12} = 52$ So, $13 \times 4 = 52$.

Another Way

Draw intersecting lines.



Step 1 Separate the array into two simpler problems. (Breaking a number apart into a multiple of 10 and leftover ones can make it easier to find a solution.)



$10 \times 4 = \mathbf{40}$ $3 \times 4 = \mathbf{12}$

Step 2 Add the two smaller products to find the larger product.

$\mathbf{40} + \mathbf{12} = 52$ So, $13 \times 4 = 52$.

Check for Understanding

Find the product. Use base-ten blocks or draw intersecting lines on your own paper if you wish.

1. $17 \times 3 = \blacksquare$

2. $16 \times 8 = \blacksquare$

Chapter 12

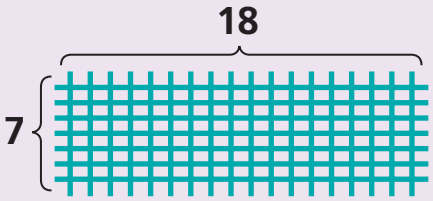
Lesson 5

REVIEW MODEL
Using Rectangles to Represent Arrays

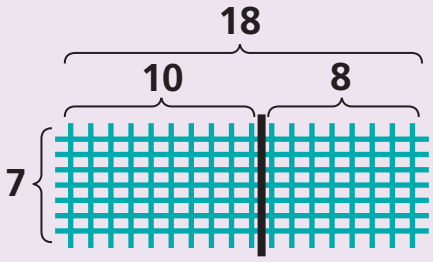
You can think about arrays of intersecting lines to help you multiply by a two-digit number.

Example Find 18 × 7.

You can think about an array with 7 horizontal lines and 18 vertical lines.

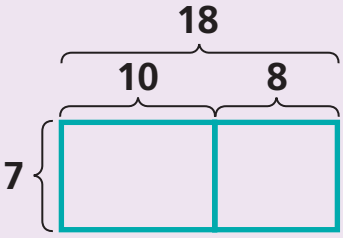


You can think about the best way to separate the array, so you have simpler problems to solve.



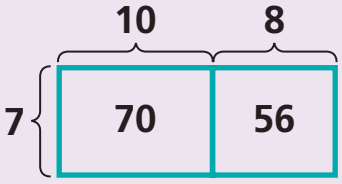
Then you can use a shortcut to record your solution and find the product.

Step 1 You can represent the array using a separated rectangle instead of drawing all the lines.



Step 2 You can record the number of intersections in each section.

$7 \times 10 = \mathbf{70}$
$7 \times 8 = \mathbf{56}$



Step 3 You can find the number of intersections in the complete array by adding the amounts in each section.

$\mathbf{70} + \mathbf{56} = 126$
So, $18 \times 7 = 126$.

Check for Understanding

Draw a diagram to help you find the product.

1. $19 \times 6 = \blacksquare$

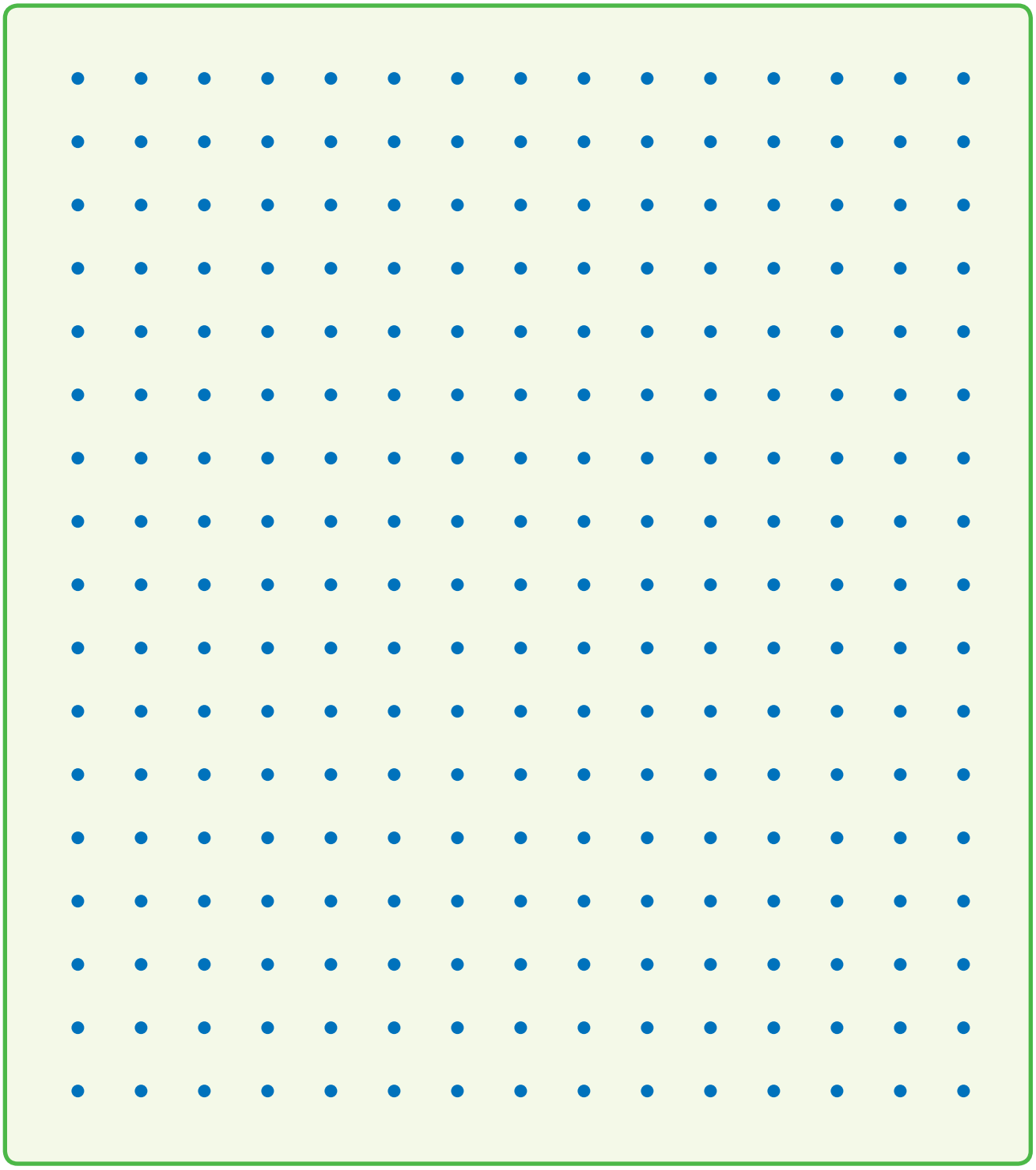
2. $27 \times 5 = \blacksquare$

Chapter 12

Lesson 6

EXPLORE
Separating Arrays

This array shows 15 × 17. Use straws to separate the array and find the number of dots in the array.

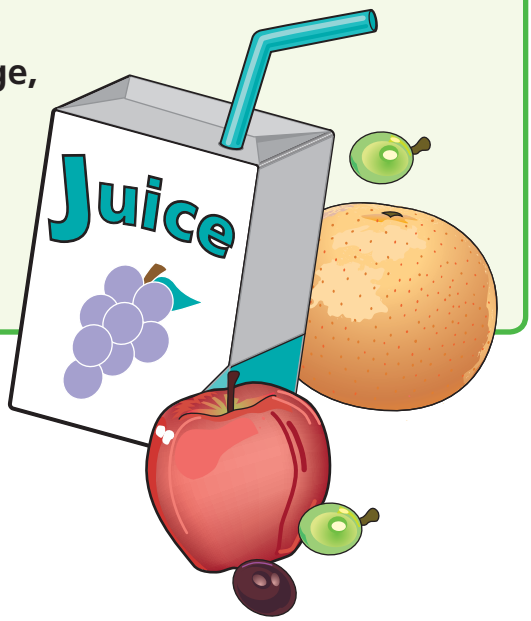


Chapter 12

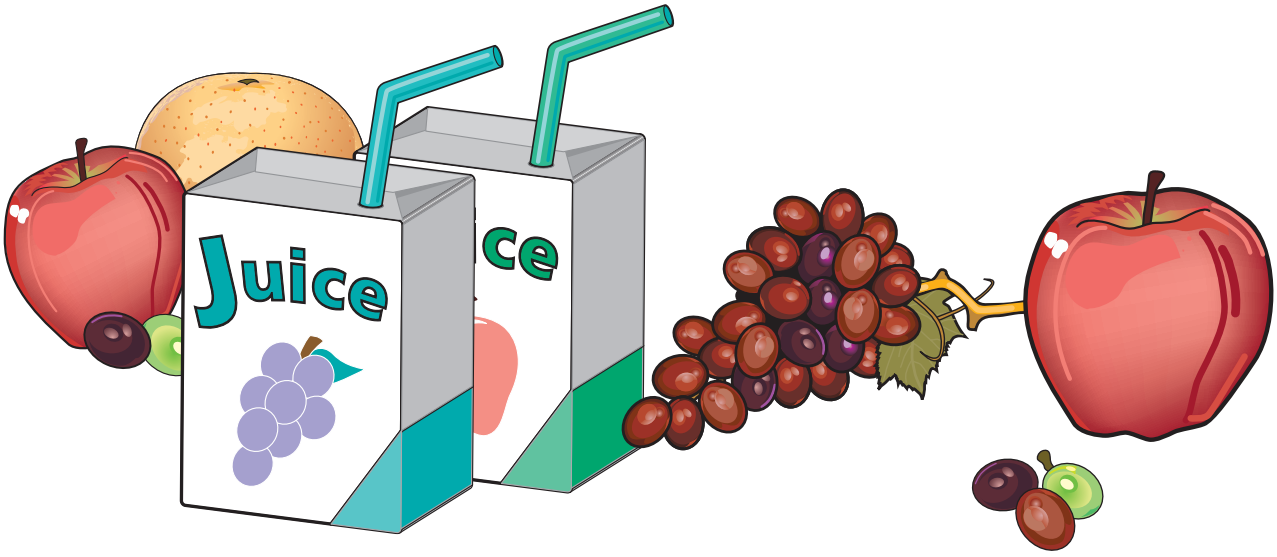
Lesson 8

EXPLORE
Division Situation

A crate of 96 juice boxes was delivered to the cafeteria. It contained apple, orange, grape, pineapple, cranberry, and tomato juice. If there was an equal number of each type of juice, how many grape juice boxes were delivered?



Solve the problem and write a number sentence to match. Then write the related number sentences. Use tiles, grid paper, or draw a picture to help you. Be prepared to explain your solution.



Chapter 12

Lesson 9

REVIEW MODEL

Problem Solving Strategy

Work Backward

Hector wants his new friend to guess his age. He tells his friend that he multiplied his age by 5, and then added 8 to the result. His final answer was 83. What is Hector's age?

$\_\_\_ \times 5 + 8 = 83$

Strategy: Work Backward

Read to Understand

What do you know from reading the problem?

When Hector multiplies his age by 5 and adds 8, he gets 83.

Plan

How can you solve this problem?

You can use the strategy *work backward.*

Solve

How can you use this strategy?

You can start with Hector's final answer of 83.
Next, subtract the 8 he added:

$83 - 8 = 75$.

Then solve $5 \times \blacksquare = 75$ to find his age.

$5 \times 15 = 75$ So, Hector is 15 years old.

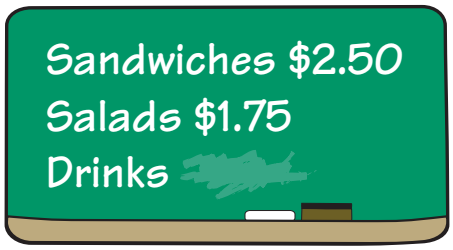
Check

Look back at the problem. Did you answer the question that was asked? Does the answer make sense?

Problem Solving Practice

Use the strategy *work backward.*

1. Omar paid $14 for 4 sandwiches and 2 drinks. What was the cost of each drink?



2. Yvette sold a fourth of her doll collection at the garage sale. She sold 20 dolls. How many dolls did Yvette have before the garage sale?

Problem Solving Strategies

- ✔ Act It Out
- ✔ Draw a Picture
- ✔ Guess and Check
- ✔ Look for a Pattern
- ✔ Make a Graph
- ✔ Make a Model
- ✔ Make an Organized List
- ✔ Make a Table
- ✔ Solve a Simpler Problem
- ✔ Use Logical Reasoning
- ✔ **Work Backward**
- ✔ Write a Number Sentence

Mixed Strategy Practice

Use any strategy to solve. Explain.

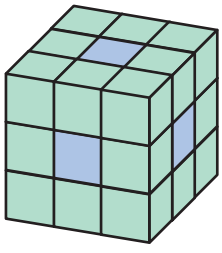
3. Jorge has 36 strawberries divided equally into 4 containers. How many strawberries are in 2 containers?

4. Leticia used nickels and dimes to pay for a toy that cost $1.00. If she used 2 more nickels than dimes, how many dimes did she use?

5. If a butterfly flaps its wings about 400 times a minute, about how many times will it flap its wings in 3 minutes? How many times in 5 minutes?

6. The Ferris wheel at the amusement park has 20 cars. Each car can hold up to 8 people. What is the largest number of people that can ride the Ferris wheel at one time?

7. The box shown at right is made up of green and blue centimeter cubes. All six sides look the same. How many blue centimeter cubes were used to make the box?



Chapter 12 Vocabulary

Choose the best vocabulary term from Word List A for each sentence.

1. The direction that goes from top to bottom is ___?___.
2. A(n) ___?___ is an operation on a number.
3. A(n) ___?___ for an array is the line from an upper corner toward the opposite lower corner.
4. The ___?___ is where two lines cross.
5. The number that results from dividing is the ___?___.
6. A rectangular arrangement that shows objects in rows and columns is called a(n) ___?___.
7. A number that is multiplied by another number is called a(n) ___?___.
8. The ___?___ is the result of multiplication.

Word List A

- array
- column
- diagonal
- dividend
- divisor
- factor
- horizontal
- intersection
- output
- pattern
- product
- quotient
- rule
- shorthand notation
- sum
- vertical

Complete each analogy using the best term from Word List B.

9. Toast is to bread as output is to ___?___.
10. Vertical is to column as horizontal is to ___?___.

Word List B

- array
- input
- row
- rule

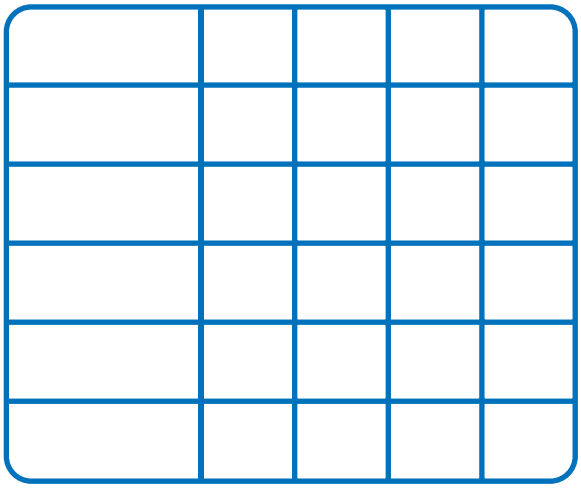
Talk Math

Discuss with a partner what you have learned about multiplication. Use the vocabulary terms *factor*, *product*, and *sum*.

11. How can you separate a number to multiply?
12. How can you use base-ten blocks to multiply two numbers?
13. How can you use shorthand notation instead of an array to multiply?

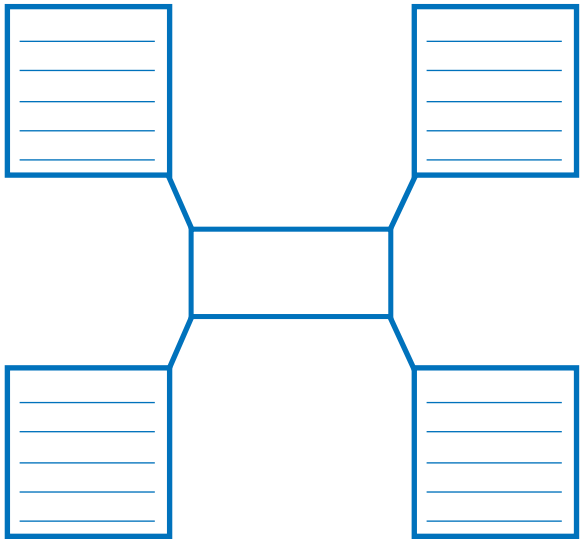
Analysis Chart

14 **Create an analysis chart for the terms *dividend, divisor, factor, product, quotient,* and *sum.* Use what you know and what you have learned about operations with whole numbers.**



Word Web

15 **Create a word web using the term *rule*. Include similar words you know and what you have learned about math rules.**



PATTERN A *pattern* can be many things. It can be a design that repeats. You see patterns like that on wallpaper, gift wrap, and clothing. A *pattern* can also be a model or a guide for making something. A tailor uses that type of *pattern,* because it shows the shape and size of the pieces of cloth to cut out. A clothing *pattern* is a sort of "rule" to follow for making a piece of clothing.

In math, *patterns* also follow a rule. A math *pattern* can be an ordered set of numbers or figures.

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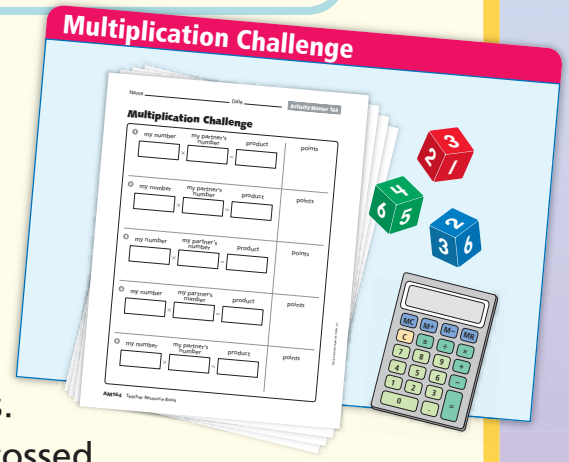
GAME

Multiplication Challenge

Game Purpose
To multiply with factors to 18

Materials
- 3 number cubes
- Activity Master 164: Multiplication Challenge
- Activity Master 165: Multiplication Table: Factors to 18 or a calculator
- Base-ten blocks or counters (optional)



How To Play The Game

1. This is a game for 2 players. Each player will need a copy of Activity Master 164 and Activity Master 165. You may use a calculator instead of Activity Master 165.

2. Take turns tossing the 3 number cubes.
   - Find the sum of the 3 numbers you tossed.
   - Record that number on Activity Master 164.
   - Then record the other player's number.

3. By yourself, multiply the numbers. Record the product.

4. Together, decide what the correct product is. Each player with a correct product gets one point.

5. Repeat steps 2 to 4 until you have completed 5 problems.

6. Check your answers using the multiplication table or a calculator. You might have to adjust your score. The player who has more correct answers wins.

GAME

Factor Tic-Tac-Toe

Game Purpose

To practice strategies for multiplying with two-digit numbers

Materials

- Activity Master 166, 167, 168, or 169: Factor Tic-Tac-Toe gameboards
- Two-color counters
- Calculator

How To Play The Game

1. This is a game for 2 players. Choose your *Factor Tic-Tac-Toe* gameboard. Decide who will use each color of counter.
2. Player 1 chooses a number on the gameboard. Player 2 chooses a different number.
3. Each player finds the product of the two numbers. Record your work on a separate sheet of paper.
4. Use the calculator to check your answers. If your answer is correct, place a counter over the number you chose to multiply. Both players, only one player, or neither players may be able to place a counter.
5. Repeat steps 2 to 4. Take turns being the first player to choose a number. The first player to get 3 counters in a row, column, or diagonal wins.
6. Play again. Use the same gameboard, or choose a different one. Play as many games as time allows.

CHALLENGE

Use each number in the box one time to complete the problems. Then solve each problem. When you are finished, each problem will make sense. Each answer will be a whole number. *Hint:* Decide which problems can be solved by dividing. Do those first.

24	33	6	8	7	7
9	91	85	64	168	

1. A train has ■ cars. Each car carries ■ passengers. There are between 250 and 300 passengers. How many passengers does the train carry in all?

2. A juice carton holds ■ ounces. Each serving of juice is ■ ounces. The number of servings is the same as the number of ounces in each serving. How many servings can be made from a full carton?

3. Tammy's Toy Store sells bags of marbles. There are ■ marbles in each bag. There are ■ bags in the store. There are between 550 and 650 marbles in the store. How many marbles are in the store?

4. Roberto rode his bicycle ■ miles last week. He rode every day except Thursday. He rode the same number of miles each day. The number of miles he rode each day was greater than 20. How many miles did he ride each day?

5. There are ■ students in the school band. They march in rows of ■ students. How many rows of students are there?

6. The library received ■ cartons of books. There are ■ books in each carton. If there are fewer than 150 books, how many books are in the cartons?