LESSON 55

• Multiplying by Three-Digit Numbers

Power Up

facts

Power Up F

mental math

a. **Time:** Soccer practice started at 4:15 p.m. It ended 1 hour 20 minutes later. What time did soccer practice end?

b. **Percent:** How many hours is 50% of a day?

c. **Percent:** How many hours is 25% of a day?

d. **Measurement:** Five feet six inches is how many inches?

e. **Geometry:** Each side of the triangle is $3\frac{1}{3}$ inches long. What is the perimeter of the triangle?

f. **Percent:** Mason deposited 25% of $40 into a savings account. How much is 25% of $40?

g. **Number Sense:** $7\frac{1}{8} + 1\frac{7}{8}$

h. **Calculation:** $6 \times 8, + 1, \div 7, + 2, \div 3, + 1, \div 2$

problem solving

Choose an appropriate problem-solving strategy to solve this problem. Anthony has $19 to spend at the school's book fair. Fiction books are $3 each, science books are $4 each, and art books are $5 each. How many of each kind of book can he buy with $19? What are the combinations of books that would cost exactly $12? If Anthony buys four times as many fiction books as science books, how much money will he spend in all?

New Concept

When we multiply by a three-digit number, we actually multiply three times; we multiply by the hundreds, we multiply by the tens, and we multiply by the ones. We demonstrate this on the next page with the multiplications for finding 234×123.

Thinking Skill

Generalize

Would we use the same multiplication algorithm if we were multiplying by ten digits? Why or why not?

$$\begin{array}{r} 234 \\ \times\ 123 \end{array} \text{ is the same as } \begin{array}{r} 234 \\ \times\ 100 \\ \hline 23{,}400 \end{array} \text{ plus } \begin{array}{r} 234 \\ \times\ 20 \\ \hline 4680 \end{array} \text{ plus } \begin{array}{r} 234 \\ \times\ 3 \\ \hline 702 \end{array}$$

$$23{,}400 + 4680 + 702 = 28{,}782$$

We do not need to separate a three-digit multiplication problem into three problems before we start. We may do all the multiplication within the same problem.

Example 1

Multiply: $\begin{array}{r} 234 \\ \times\ 123 \end{array}$

$$\begin{array}{r} 234 \\ \times\ 123 \\ \hline 702 \\ 4680 \\ 23400 \\ \hline 28782 \end{array}$$

← We first multiply 234 by the 3 of 123.

← Then we multiply by the 20 of 123.

← Then we multiply by the 100 of 123.

} The zeros need not be written.

← We add the three partial products to find the total product.

We should know how to perform pencil-and-paper computations with many digits. However, most people would use a calculator to do arithmetic that would be time consuming to do by hand.

Explain Describe or demonstrate how we could perform the multiplication with a calculator.

Example 2

A restaurant served 356 glasses of juice during brunch. The capacity of each glass was 250 milliliters. About how many milliliters of juice did the restaurant serve during brunch?

The word "about" in the question means we can estimate. To estimate a product, we may get closer to the exact product by rounding one factor up and the other factor down. We round 250 milliliters up to 300 milliliters and 346 glasses down to 300 glasses.

$$300 \times 300 = 90{,}000$$

The restaurant served about **90,000 mL** of juice.

Analyze About how many liters of juice did the restaurant serve? Explain how you know. (*Hint:* 1000 milliliters = 1 liter).

Lesson Practice

Find each product:

a. $\begin{array}{r} 346 \\ \times\ 354 \end{array}$ **b.** $\begin{array}{r} 487 \\ \times\ 634 \end{array}$ **c.** $\begin{array}{r} 403 \\ \times\ 768 \end{array}$

d. Use compatible numbers to find the product.

$$\begin{array}{r} 705 \\ \times\ 678 \\ \hline \end{array}$$

e. **Estimate** What is a reasonable estimate for the quotient of 739 ÷ 18? Explain your answer.

Written Practice

Distributed and Integrated

1. (49) **Explain** Cruz bought a fruit plate for $4.65 and a drink for $1.90. He paid for the food with a $10 bill. How much should he get back in change? Explain why your answer is reasonable.

2. (46) **Represent** Draw a diagram to illustrate and solve this problem:

There are 276 pages in the book. If Navarro has read three fourths of the book, how many pages has he read?

3. (35) The Loire River in Europe is 26 miles shorter than the Ubangi River in Africa. The Loire River is 634 miles long. Find the length of the Ubangi River by writing and solving an equation.

***4.** (52) Which digit in 98,765,432 is in the ten-millions place?

5. (47) Amanda can jump across a rug that is 2 yards 3 inches long. How many inches is 2 yards 3 inches? (A yard is 36 inches.)

***6.** (Inv. 3, 37) **Represent** Draw a circle and shade all but one third of it. What percent of the circle is shaded?

***7.** (52) **Represent** Use digits to write six hundred seventy-nine million, five hundred forty-two thousand, five hundred.

8. (54) $60\overline{)\$7.20}$

9. (54) $70\overline{)850}$

10. (54) $80\overline{)980}$

11. (55)
$$\begin{array}{r} 234 \\ \times\ 123 \\ \hline \end{array}$$

12. (51)
$$\begin{array}{r} \$3.75 \\ \times\ \ 26 \\ \hline \end{array}$$

13. (55)
$$\begin{array}{r} 604 \\ \times\ 789 \\ \hline \end{array}$$

***14.** (53) Each side of this square is 10 mm long. Use a formula to find the perimeter of the square.

Use mental math to answer problems **15–20.**

15. (29) 400×800

16. (29) 60×500

17. (29) 900×90

18. (6)
$$\begin{array}{r} 300 \\ 400 \\ +\ 500 \\ \hline \end{array}$$

19. (9)
$$\begin{array}{r} 6000 \\ -\ 2000 \\ \hline \end{array}$$

20. (54) $\frac{400}{20}$

21. (41) $6\frac{5}{11} + 5\frac{4}{11}$

22. (43) $3\frac{2}{3} - 3$

23. (41, 43) $7\frac{2}{3} - \left(3\frac{1}{3} - 3\right)$

Use this information to answer problems **24** and **25:**

The Arroyo High School stadium can seat 3000 fans. Two thousand, one hundred fifty ticket-holding fans came to the first game. Arroyo won by a score of 35 to 28. Tickets to watch the game cost $2 each.

24. (21, Inv. 5) Altogether, the fans who came to the first game paid how much money for tickets?

25. (16, Inv. 5) At the second game all but 227 seats were filled with fans. How many fans came to the second game?

***26.** (52) **Represent** The crowd lining the parade route was estimated to be 1,200,000. Write this number in expanded notation.

27. (36) **Represent** Draw an isosceles triangle.

28. (21) If a dollar's worth of dimes is divided into five equal groups, how many dimes would be in each group?

***29.** (44) **Estimate** A young gecko is $5\frac{7}{8}$ inches long. Record the length of the gecko to the nearest inch.

30. (54) **Estimate** What is a reasonable estimate for the quotient of $689 \div 19$? Explain your answer.

Early Finishers

Real-World Connection

Several park employees gathered data and found that 673 people entered the park in one day. Based on this data, predict how many people will enter the park in a year if it is open six days a week throughout the year.