

• Division Algorithm

Power Up

facts

Power Up F

count aloud

Count up by 5s from 4 to 54. Count by 7s from 0 to 77.

mental math

a. **Money:** How many cents is 1 quarter? ... 2 quarters?
... 3 quarters?

b. **Number Sense:** 10×34

c. **Number Sense:** 5×34

d. **Fractional Parts:** $\frac{1}{2}$ of \$8

e. **Fractional Parts:** $\frac{1}{4}$ of \$8

f. **Fractional Parts:** $\frac{3}{4}$ of \$8

g. **Geometry:** If the distance around a square is 8 cm, what is the length of each side?

h. **Number Sense:** $5 \times 8, + 2, \div 6, \times 3, - 1, \div 2$

problem solving

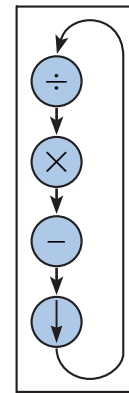
Choose an appropriate problem-solving strategy to solve this problem. Use each of the digits 5, 6, 7, 8, and 9 to complete this addition problem:

$$\begin{array}{r} \text{--} \\ + \text{--} \\ \text{--} \end{array}$$

New Concept

A *division algorithm* is a method for solving division problems whose answers have not been memorized. A division algorithm breaks large division problems into a series of smaller division problems that are easier to do. In each of the smaller problems we follow four steps: **divide, multiply, subtract, and bring down**. As we do each step, we write a number. Drawing a division chart like the one on the next page will help us remember the steps.

Division Chart



Step 1: Divide and write a number.

Step 2: Multiply and write a number.

Step 3: Subtract and write a number.

Step 4: Bring down the next digit.

Every time we bring down a digit, we divide again, even if the answer is zero. We continue to divide, multiply, subtract, and bring down until there are no digits left to bring down.

Example 1

Math Language

Name the dividend, the divisor, and the quotient.

The school bought 3 printers that cost the same amount for a total of \$852. What was the price of each printer?

We find the price of each printer by dividing. We begin by breaking the division problem into a smaller problem. Our first division problem in this example is $3 \overline{)8}$.

$$3 \overline{)852}$$

We divide and write “2” above the 8. The 2 will represent \$200. Then we multiply 2 by 3 and write “6” below the 8. We subtract and get 2. Then we bring down the next digit, which is 5.

$$\begin{array}{r} \$2 \\ 3 \overline{)852} \\ - 6 \downarrow \\ \hline 25 \end{array}$$

Now we begin a new division problem, $3 \overline{)25}$. The answer is 8, which we write above the 5. We multiply 8 by 3, which is 24. We write “24” below the 25. Then we subtract and bring down the 2.

$$\begin{array}{r} \$28 \\ 3 \overline{)852} \\ - 6 \downarrow \\ \hline 25 \\ - 24 \downarrow \\ \hline 12 \end{array}$$

We are ready to begin the last division problem, $3 \overline{)12}$. We divide and write “4” above the 2. Then we multiply and subtract. There are no digits to bring down. There is no remainder. The price of each printer was **\$284**.

$$\begin{array}{r} \$284 \\ 3 \overline{)852} \\ - 6 \\ \hline 25 \\ - 24 \\ \hline 12 \\ - 12 \\ \hline 0 \end{array}$$

We can check a division answer by multiplying. We multiply \$284 by 3 and get \$852. The three numbers of the multiplication should match the three numbers in the division.

$$\begin{array}{r} 21 \\ \$284 \\ \times \quad 3 \\ \hline \$852 \quad \text{check} \end{array}$$

Connect Why can we use multiplication to check division?

Example 2

A group of teachers is planning a field trip for 234 students. The students will travel on 5 school buses. Is it possible for each bus to carry the same number of students?

Since we cannot divide 2 by 5, we begin with the division $5 \overline{)23}$. We divide and write “4” above the 3 of 23. Then we multiply, subtract, and bring down.

$$\begin{array}{r} 4 \\ 5 \overline{)234} \\ - 20 \\ \hline 34 \end{array}$$

Now we begin the new division, $5 \overline{)34}$. We divide and write “6” above the 4. Then we multiply and subtract. Since there is no other number to bring down, we are finished dividing. The remainder is 4. Thus, the answer is 46 R 4. The remainder means that 234 students cannot be divided into 5 equal groups, so **each bus will not carry the same number of students.**

$$\begin{array}{r} 46 \text{ R } 4 \\ 5 \overline{)234} \\ - 20 \\ \hline 34 \\ - 30 \\ \hline 4 \end{array}$$

Checking a division answer with a remainder takes two steps. First we multiply. Then we add the remainder to the product we get. To check our answer to the division in the example above, we multiply 46 by 5 and then add 4.

$$\begin{array}{r} 46 \\ \times 5 \\ \hline 230 \\ + 4 \text{ remainder} \\ \hline 234 \text{ check} \end{array}$$

Example 3

Solve: $5n = 365$

Two numbers are multiplied, 5 and n . The product is 365. We can find an unknown factor by dividing the product by the known factor.

We divide 365 by 5 and find that n is **73**.

$$\begin{array}{r} 73 \\ 5 \overline{)365} \\ \underline{-35} \\ 15 \\ \underline{-15} \\ 0 \end{array}$$

Example 4

Three students collected aluminum cans and were paid \$8.85 by a recycling center for those cans. The income is to be divided equally. What amount of money should each student receive?

We divide \$8.85 by 3. We place the decimal point in the quotient directly above the decimal point in the dividend. We find that each student should receive **\$2.95**.

We can check our answer using a calculator. By multiplying \$2.95 and 3, we see that the dividend is \$8.85.

$$\begin{array}{r} \$2.95 \\ 3 \overline{) \$8.85} \\ \underline{-6} \\ 28 \\ \underline{-27} \\ 15 \\ \underline{-15} \\ 0 \end{array}$$

Verify Explain why the answer is reasonable.

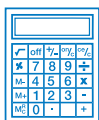
Lesson Practice

Divide:

- a. $4 \overline{) \$5.56}$ b. $9 \overline{) 375}$ c. $3 \overline{) \$4.65}$ d. $5 \overline{) 645}$
 e. $7 \overline{) \$3.64}$ f. $7 \overline{) 365}$ g. $10 \overline{) 546}$ h. $4 \overline{) \$4.56}$

- i. **Connect** Show how to check this division answer:

$$\begin{array}{r} 12 \text{ R } 3 \\ 6 \overline{) 75} \end{array}$$



Find each missing factor. Check each answer using a calculator. Then explain how you used the calculator to check your answer.

- j. $3x = 51$ k. $4y = 92$ l. $6z = 252$


Written Practice

Distributed and Integrated

Formulate For problems 1–3, write an equation and find the answer.

1. The bicycle tire cost \$2.98. Jen paid for the tire with a \$5 bill. How much should she get back in change?

2. Sarita sent 3 dozen muffins to school for a party. How many muffins did she send?
(21)

3.  **Justify** When three new students joined the class, the number of students increased to 28. How many students were in the class before the new students arrived? Explain how you found your answer.
(11)

*4. a. **Analyze** What is the smallest two-digit even number?
(2, 23)

b. What is half of the number in part a?

c. Use the answers to parts a and b to write a fraction equal to $\frac{1}{2}$.

5. Which factors of 8 are also factors of 16?
(25)

6. $5 \overline{)375}$
(26)

7. $4 \overline{)365}$
(26)

8. $6m = 234$
(18)

9. $\$4.32 \div 6$
(26)

10. $\frac{123}{3}$
(26)

11. $\frac{576}{6}$
(26)

12. $\$7.48 \times 4$
(17)

13. 609×8
(17)

14. $7 \times 8 \times 10$
(18)


*15. $7 \times 8 \times 0$
(15, 18)

16. $9374 - m = 4938$
(14)

17. $\$10 - \6.24
(13)

18. $l + 427 + 85 = 2010$
(10)

19. $\$12.43 + \$0.68 + \$10$
(13)

20.  **Explain** Compare. Explain how you can answer the comparison without multiplying.
(4, 18)

$$3 \times 40 \bigcirc 3 \times 4 \times 10$$

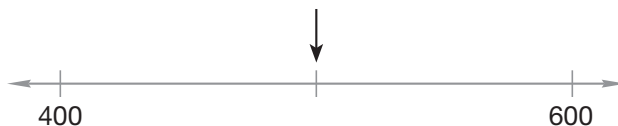
21. $8 \times 90 = 8 \times 9 \times n$
(18)

22. **Connect** Write two multiplication facts and two division facts for the fact family 8, 9, and 72.
(19)

23. A checkerboard has 64 squares. The squares are in 8 equal rows. How many squares are in each row?
(21)

*24. How much money is $\frac{3}{4}$ of a dollar plus $\frac{3}{10}$ of a dollar?
(Inv. 2)

25. **Connect** What number is halfway between 400 and 600?
(12)



26. This equation shows that 7 is a factor of 91. Which other factor of 91 is shown by this equation?
(25)

$$\begin{array}{r} 13 \\ 7 \overline{)91} \end{array}$$

27. What is the sum of three hundred forty-seven and eight hundred nine?
(5, 6)

*28. **Evaluate** Here is Todd's answer to a division problem. Show how to check the answer. Is Todd's answer correct? Why or why not?
(22)

$$\begin{array}{r} 16 \text{ R } 3 \\ 4 \overline{)75} \end{array}$$

*29. **Multiple Choice** Which of these numbers is *not* a factor of 15?
(25)

A 1

B 2

C 3

D 5

30. Write a word problem to represent the equation $3n = 24$. Then solve the equation.
(Inv. 1)

Early Finishers

Real-World Connection

Three friends worked together doing yard work each Saturday for three weeks. They earned \$24.75 the first Saturday and \$19.75 the second Saturday. On the third Saturday, they earned twice as much as they had earned the week before. If the friends share their earnings equally, how much will each friend get? Show your work.