# • Word Problems About Equal Groups

## Power Up

**count aloud**   Count up and down by 25s between 0 and 200.
Count up and down by 250s between 0 and 2000.

**mental math**

a. **Number Sense:** $3 \times 40$ plus $3 \times 5$

b. **Number Sense:** $4 \times 50$ plus $4 \times 4$

c. **Number Sense:** $4 \times 45$

d. **Number Sense:** $4 \times 54$

e. **Number Sense:** The parking lot has 560 spots. Two hundred spots are empty. How many spots are filled?

f. **Time:** One minute is 60 seconds. How many seconds are in three minutes?

g. **Geometry:** Altogether, ten squares have how many corners?

h. **Number Sense:** Start with 5, $\times$ 6, $+$ 2, $\div$ 4, $+$ 1, $\div$ 3[1]

**problem solving**

In her bedroom Cristi has three shelves: top, middle, and bottom. Cristi wants to put all her CDs on one shelf, all her books on another shelf, and all her trophies on another shelf. If Cristi does not put her trophies on the bottom shelf, how many different ways can Cristi organize her shelves?

**Focus Strategy: Draw a Picture or Diagram**

( **Understand** )  We are told that Cristi has three shelves and that she wants to put her CDs, books, and trophies on separate shelves. We are asked to find how many ways she can organize her shelves if she does not put her trophies on the bottom.

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[1] As a shorthand, we will use commas to separate operations to be performed sequentially from left to right. In this case, $5 \times 6 = 30$, then $30 + 2 = 32$, then $32 \div 4 = 8$, then $8 + 1 = 9$, then $9 \div 3 = 3$. The answer is 3.

**Plan** We can *draw a picture or diagram* of each arrangement Cristi can make.

**Solve** We know from the given information that the trophies will go on either the top or middle shelf. We first draw the arrangements with trophies on the top shelf. We make our drawings simple because we only need enough information to help us solve the problem.

| trophies | trophies |
|----------|----------|
| CDs | books |
| books | CDs |

Now we draw the arrangements with trophies on the middle shelf:

| CDs | books |
|----------|----------|
| trophies | trophies |
| books | CDs |

We have drawn all the possible arrangements. We look at our drawings and find there are **4 different ways Cristi can organize her shelves:**

| trophies | trophies | CDs | books |
|----------|----------|----------|----------|
| CDs | books | trophies | trophies |
| books | CDs | books | CDs |

**Check** We know that our answer is reasonable because each diagram shows how Cristi can arrange trophies, CDs, and books on different shelves without putting trophies on the bottom shelf. Drawing diagrams helped us visualize the problem and find all four possible arrangements.

## New Concept

Problems about combining use an addition formula. Problems about separating use a subtraction formula. Problems about **equal groups** use a multiplication formula. Here are three "equal groups" problems:

> At Lincoln School there are 4 classes of fifth graders with 30 students in each class. Altogether, how many students are in the four classes?

*The coach separated the 48 players into 6 teams with the same number of players on each team. How many players were on each team?*

*Monifa raked leaves and filled 28 bags. On each trip she could carry away 4 bags with leaves. How many trips did it take Monifa to carry away all the bags?*

There are three numbers in a completed "equal groups" problem: the number of groups, the number in each group, and the total number in all the groups. These numbers are related by multiplication. Here we show the multiplication formula written two ways:

Number of groups × Number in each group = Total

$$\begin{array}{r} \text{Number in each group} \\ \times\ \underline{\text{Number of groups}} \\ \text{Total} \end{array}$$

The number of groups is one factor, and the "in each" number is the other factor. The total number in all groups is the product.

In an "equal groups" problem, one of the numbers is missing. If the total is missing, we multiply to find the missing number. If the "in each" number or the number of groups is missing, we divide.

## Example 1

**At Lincoln School there are 4 classes of fifth graders with 30 students in each class. Altogether, how many students are in the 4 classes?**

This problem is about equal groups. We are given the number of groups (4 classes) and the number in each group (30 students). We write an equation.

Number of groups × Number in each group = Total

$$4 \times 30 = t$$

We multiply to find the missing number.

$$30 \times 4 = 120$$

We check whether the answer is reasonable. There are many more students in four classes than in one class, so 120 is reasonable. There are **120 students** in all 4 classes.

**Example 2**

**The coach separated 48 players into 6 teams with the same number of players on each team. How many players were on each team?**

This is an "equal groups" problem. The groups are teams. We translate the problem using a multiplication formula. We are given the number of groups (6 teams) and the total number of players (48 players). We are asked to find the number of players on each team. We write an equation.

$$\begin{array}{r} n \text{ players on each team} \\ \times\ 6 \text{ teams} \\ \hline 48 \text{ players on all 6 teams} \end{array}$$

We find the missing number, a factor, by dividing.

$$6\overline{)48}^{\,8}$$

There were **8 players** on each team.

**Justify** Is the answer reasonable? Why or why not?

**Example 3**

**Monifa raked leaves and filled 28 bags. On each trip she could carry away 4 bags with leaves. How many trips did it take Monifa to carry away all the bags?**

We translate the problem using a multiplication formula. The objects are bags, and the groups are trips. The missing number is the number of trips. We show two ways to write the equation.

$$\begin{array}{r} 4 \text{ bags in each trip} \\ \times\ n \text{ trips} \\ \hline 28 \text{ bags in all the trips} \end{array}$$

$$4n = 28$$

The missing number is a factor, which we find by dividing.

$$28 \div 4 = 7$$

Monifa took **7 trips** to carry away all 28 bags.

**Justify** Is the answer reasonable? Why or why not?

**Lesson Practice**

**Formulate** For problems **a–d,** write an equation and find the answer.

**a.** On the shelf were 4 cartons of eggs. There were 12 eggs in each carton. How many eggs were in all four cartons?

**b.** Thirty desks are arranged in 6 equal rows. How many desks are in each row?

**c.** Twenty-one books are stacked in piles with 7 books in each pile. How many piles are there?

**d.** If 56 zebras were separated into 7 equal herds, then how many zebras would be in each herd?

**e.** (**Formulate**) Write an "equal groups" word problem for this equation. Then answer the question in your word problem.

$$6 \times \$0.75 = t$$

## Written Practice

*Distributed and Integrated*

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

**\*1.** The coach separated the PE class into 8 teams with the same number
(21) of players on each team. If there are 56 students in the class, how many are on each team? Use a multiplication formula.

**\*2.** Tony opened a bottle containing 32 ounces of milk and poured
(16) 8 ounces of milk into a bowl of cereal. How many ounces of milk remained in the bottle?

**\*3.** The set of drums costs eight hundred dollars. The band has earned
(11) four hundred eighty-seven dollars. How much more must the band earn in order to buy the drums?

**\*4.** (**Represent**) Draw an oblique line.
(12)

**5.** (**Connect**) Write two multiplication facts and two division facts for the
(19) fact family 6, 7, and 42.

**6.** $8\overline{)72}$
(19)

**7.** $6n = 42$
(18)

**8.** $9\overline{)36}$
(19)

**9.** $6n = 48$
(18)

**10.** $56 \div 7$
(20)

**11.** $\dfrac{70}{10}$
(20)

**12.** Compare: $24 \div 4 \bigcirc 30 \div 6$
(4, 20)

**13.** 367
(17) × 8

**14.** $5.04
(17) × 7

**15.** 837
(17) × 9

**16.** 6 × 8 × 10
(18)

**17.** 7 × 20 × 4
(18)

**18.** $40 − $29.34
(13)

**19.** $r − 4568 = 6318$
(14)

**20.** $5003 − w = 876$
(14)

**21.** 268
(10) + $m$
687

**22.** $9.65
(13) $2.43
+ $1.45

**23.** 382
(6) 96
+ 182

*** 24.** ✏️ **Explain** If a dozen items are divided into two equal groups, how
(21) many will be in each group? Explain how you know.

**25.** **Conclude** What are the next three terms in this counting sequence?
(1)

..., 50, 60, 70, 80, 90, ____, ____, ____, ...

**26.** Use words to show how this problem is read: $\dfrac{10}{2}$
(20)

*** 27.** What number is the dividend in this equation?
(20)

$$60 ÷ 10 = 6$$

**28.** **Formulate** Below is a word problem about equal groups. Find the
(21) answer to the question. Then use the answer to rewrite the last sentence
as a statement instead of a question.

*The books arrived in 5 boxes. There were 12 books in each box.
How many books were in all 5 boxes?*

*** 29.** The fraction $\frac{1}{2}$ is equivalent to what decimal? What percent?
(Inv. 2)

**\*30.** This data table shows the land areas of various islands:
(4, 14)

**Islands and Their Areas**

| Name | Location | Area (square miles) |
|---|---|---|
| Attu | Pacific Ocean | 350 |
| Tobago | Caribbean Sea | 116 |
| Cayman Islands | Caribbean Sea | 100 |
| Tonga Islands | Pacific Ocean | 290 |
| Virgin Islands (UK) | Caribbean Sea | 59 |
| Virgin Islands (US) | Caribbean Sea | 134 |

**a.** Which island has the greatest area? The least area? What is the sum of the greatest and least areas?

**b.** The difference of the areas of which two islands is 250 square miles?

**c.** The sum of the areas of which three islands is equal to the area of Attu?

**Early Finishers**

*Real-World Connection*

Emma had one roll of 24 pictures developed and one roll of 12 pictures developed. She plans to use all of these pictures to fill six scrapbook pages. If Emma places an equal number of pictures on each of the six pages, how many pictures will go on each page? Write and solve a multiplication problem.

# • Division With and Without Remainders

## Power Up

**facts**          Power Up F

**count aloud**    Count up and down by 50s between 0 and 500.
                   Count up and down by 500s between 0 and 2000.

**mental
math**

a. **Number Sense:** $10 \times 5$

b. **Number Sense:** $10 \times 25$

c. **Number Sense:** $5 \times 50$ plus $7 \times 5$

d. **Number Sense:** $4 \times 56$

e. **Number Sense:** $3 \times 56$

f. **Money:** Lanna spent $1.50 for a notebook and 25¢ for an eraser. How much did she spend altogether?

g. **Time:** The driving time to the campsite is 180 minutes. If the family stops for 30 minutes to eat lunch, how long will it take them to reach the campsite?

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

**problem
solving**

Choose an appropriate problem-solving strategy to solve this problem. Copy this subtraction problem and fill in the missing digits:

$$\begin{array}{r} 4\_6 \\ -\ \_1\_ \\ \hline 237 \end{array}$$

## New Concept

Division and multiplication are inverse operations. We can use division to find a missing factor. Then we can use multiplication to check our division. We show this below:

$$5\overline{)35}^{\,7} \qquad \begin{array}{r} 7 \\ \times\ 5 \\ \hline 35 \end{array} \text{ check}$$

Instead of writing a separate multiplication problem, we can show the multiplication as part of the division problem. After dividing to get 7, we multiply 7 by 5 and write the product under the 35. This shows that there are exactly 7 fives in 35.

$$\begin{array}{r} 7 \\ 5\overline{)35} \\ 35 \end{array}$$

Not all division problems have a whole-number quotient. Consider this question:

*If 16 pennies are divided among 5 children, how many pennies will each child receive?*

If we try to divide 16 into 5 equal groups, we find that there is no whole number that is an exact answer.

$$\begin{array}{r} ? \\ 5\overline{)16} \end{array}$$

To answer the question, we think, "What number of fives is close to but not more than 16?" We answer that question with the number 3. We write "3" above the box and multiply to show that 3 fives is 15. Each child will get 3 pennies.

$$\begin{array}{r} 3 \\ 5\overline{)16} \\ 15 \end{array}$$

Now we subtract 15 from 16 to show how many pennies are left over. The amount left over is called the **remainder.** Here the remainder is 1, which means that one penny will be left over.

$$\begin{array}{r} 3 \\ 5\overline{)16} \\ -15 \\ \hline 1 \end{array}$$

How we deal with remainders depends upon the question we are asked. For now, when we answer problems written with digits and division symbols, we will write the remainder at the end of our answer with the letter "R" in front, as shown at right.

$$\begin{array}{r} 3 \text{ R } 1 \\ 5\overline{)16} \\ -15 \\ \hline 1 \end{array}$$

**Discuss** How could we check that the answer is correct?

**Example 1**

**Fifty trading cards are to be placed in protective pages. Each page can display 8 cards. How many pages can be filled? What is the least number of pages that is needed to protect all the cards?**

We begin by rewriting the problem with a division box. We think, "What number of eights is close to but not more than 50?" We answer "6" and then multiply 6 by 8 to get 48. We subtract to find the amount left over and write this remainder at the end of the answer.

$$\begin{array}{r} 6 \text{ R } 2 \\ 8\overline{)50} \\ -48 \\ \hline 2 \end{array}$$

Now we interpret the answer. The number 6 means that **6 pages** can be filled, protecting 48 cards. The remainder 2 means that there are 2 extra cards. These 2 cards are placed on another page that is not filled, so **7 pages** are needed to protect all the cards.

### Example 2

**At an amusement park, 16 people are waiting in line for a water ride. Each boat holds 6 people.**

**a. What is the least number of boats that are needed for everyone to ride? How do you know?**

**b. If two boats arrive at the loading dock, how many people will have to wait for a ride?**

**c. If three boats arrive at the loading dock, how many boats can be completely filled?**

We divide 16 people into groups of 6 and then interpret the answer.

$$\begin{array}{r} 2 \text{ R } 4 \\ 6\overline{)16} \\ -12 \\ \hline 4 \end{array}$$

**a.** The answer 2 R 4 means 16 people can form 2 groups of 6 and there will be 4 extra people, so **3 boats** are needed for everyone to ride.

**b.** Two boats can carry 12 people, so **4 people** have to wait.

**c.** **Two boats** can be completely filled.

### Thinking Skill

**Discuss**

If you can divide a number by 4 without getting a remainder, can you divide the number by 2 without getting a remainder? Explain.

For some division problems, we can decide whether there will be a remainder before we begin dividing. Here we show three rows from a multiplication table. We show the rows for twos, fives, and tens. In each row all the numbers can be divided by the first number of the row without leaving a remainder.

|       | 1  | 2  | 3  | 4  | 5  | 4  | 7  | 8  | 9  | 10  |
|-------|----|----|----|----|----|----|----|----|----|-----|
| twos  | 2  | 4  | 6  | 8  | 10 | 12 | 14 | 16 | 18 | 20  |
| fives | 5  | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 | 50  |
| tens  | 10 | 20 | 30 | 40 | 50 | 60 | 70 | 80 | 90 | 100 |

**Verify** Are all the numbers in the "twos" row even or odd? Explain your answer.

**Verify** What do all the numbers in the "fives" row end in?

If a whole number ending in 5 or 0 is divided by 5, there will be no remainder. If a whole number divided by 5 does not end in 5 or 0, there will be a remainder.

**Verify** What do all the numbers on the "tens" row end in?

If a whole number ending in zero is divided by 10, there will be no remainder. If a whole number divided by 10 does not end in zero, there will be a remainder.

### Example 3

Without dividing, decide which two division problems below will have a remainder.

A $2\overline{)16}$     B $5\overline{)40}$     C $10\overline{)45}$     D $2\overline{)15}$

**Problem C** will have a remainder because 45 does not end in zero. Only numbers ending in zero can be divided by 10 without a remainder.

**Problem D** will have a remainder because 15 is not even. Only even numbers can be divided by 2 without a remainder.

### Lesson Practice

Divide. Write each answer with a remainder.

**a.** $5\overline{)23}$       **b.** $6\overline{)50}$       **c.** $37 \div 8$

**d.** $4\overline{)23}$       **e.** $7\overline{)50}$       **f.** $40 \div 6$

**g.** $10\overline{)42}$       **h.** $9\overline{)50}$       **i.** $34 \div 9$

**j.** **Analyze** Without dividing, decide which of these division problems will have a remainder.

$$10\overline{)60} \qquad 5\overline{)44} \qquad 2\overline{)18}$$

**k.** **Verify** Which of these numbers can be divided by 2 without a remainder?

$$25 \qquad 30 \qquad 35$$

### Written Practice

*Distributed and Integrated*

**\*1.** **Represent** Draw two horizontal lines, one above the other.
(12)

**Formulate** For problems **2–4,** write an equation and find the answer.

**\*2.** At a dinner party, each guest is to receive a bag of small gifts.
(21) How many gifts should be placed in each bag if there are 8 guests and 32 gifts altogether?

**\*3.** Julissa started a marathon, a race of approximately 26 miles. After
(16) running 9 miles, about how far did Julissa still have to run to finish the race?

**\*4.** **Estimate** The state of Rhode Island has 384 miles of shoreline.
(11) The state of Connecticut has 618 miles of shoreline. Is 1000 miles a reasonable estimate for the sum of the lengths of the shorelines? Explain why or not.

**5.** $56 \div 10$        **6.** $20 \div 3$        **7.** $7\overline{)30}$
(22)                 (22)               (22)

**8.** $3 \times 7 \times 10$             **9.** $2 \times 3 \times 4 \times 5$
(18)                      (18)

**10.**   $\$394$        **11.**   $678$        **12.**   $\$6.49$
(17)   $\times \quad 8$          (17)   $\times \quad 4$          (17)   $\times \quad 9$

**13.** $\dfrac{63}{7}$        **14.** $\dfrac{56}{8}$        **15.** $\dfrac{42}{6}$
(20)             (20)             (20)

**16.**   $\$4.08$        **17.**   $3645$        **18.**   $3904$
(17)   $\times \quad 7$          (17)   $\times \quad 6$          (17)   $\times \quad 4$

**19.** $8 \times 0 = 4n$           **20.** $c - 462 = 548$
(15, 18)                    (14)

**21.** $\$36.15 - \$29.81$         **22.** $963 + a = 6000$
(13)                     (10)

**\*23.** Use words to show how this problem is read: $4\overline{)12}$
(20)

**24.** **Verify** Think of an odd number. Multiply it by 2. If the product is
(2, 22) divided by 2, will there be a remainder? Explain your answer.

**25.** **Conclude** What are the next three terms in this counting sequence?
(1, 12)

$$50, 40, 30, 20, 10, \ldots$$

**26.** Mr. Watkins has 10 quarters. If he gives each of his 3 grandchildren
(22)   3 quarters, how much money will he have left?

**27.** Compare:  46,208  ◯  46,028
(7)

**\*28.** How many $\frac{1}{4}$ circles equal a half circle?
(Inv. 2)

**\*29.** The fraction $\frac{1}{4}$ is equivalent to:
(Inv. 2)
    **a.** what decimal?

    **b.** what percent?

**30.** Seventy-five chairs are to be placed in a large room and arranged in
(22)   rows of ten. How many chairs will be in the last row?

**Early Finishers**

*Real-World Connection*

The 129 fifth grade students plan to take a field trip to a local museum. An adult is required for every group of 9 students. How many adults must accompany the students? Write and solve an equation, and then explain your answer.

# • Recognizing Halves

## Power Up

| | |
|---|---|
| **facts** | Power Up D or E |
| **count aloud** | Count up by 5s from 1 to 51 (1, 6, 11, 16, …).<br>Count up and down by 3s between 0 and 36. |
| **mental math** | **a. Number Sense:** $10 \times 75$ |
| | **b. Number Sense:** $7 \times 30$ plus $7 \times 5$ |
| | **c. Number Sense:** $5 \times 35$ |
| | **d. Number Sense:** $6 \times 35$ |
| | **e. Money:** The bicycle's price is $280. Sales tax is $14.50. What is the total cost? |
| | **f. Measurement:** Twenty feet is 240 inches. How many inches is 20 feet plus 12 inches? |
| | **g. Number Sense:** The total attendance at the football game was 960. Before the game ended, 140 people had left. How many people remained at the end of the game? |
| | **h. Number Sense:** $6 \times 4, + 1, \div 5, + 1, \div 2$ |
| **problem solving** | Choose an appropriate problem-solving strategy to solve this problem. Behind curtains A, B, and C were three prizes: a car, a boat, and a pogo stick. One prize was behind each curtain. List all the possible arrangements of prizes behind the curtains. |

## New Concept

Many fractions equal one half. Here we show five fractions equal to one half:

$$\frac{1}{2} \qquad \frac{2}{4} \qquad \frac{3}{6} \qquad \frac{4}{8} \qquad \frac{5}{10}$$
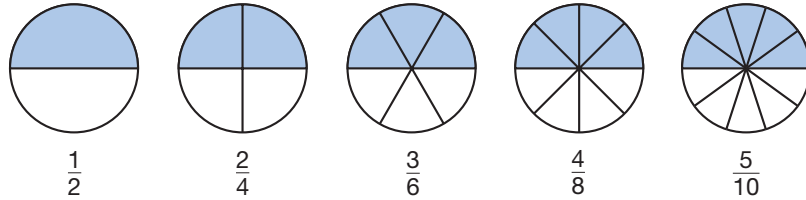
Notice that the numerator of each fraction is half the denominator.

$\frac{2}{4}$  Two is half of four.  $\frac{3}{6}$  Three is half of six.

$\frac{4}{8}$  Four is half of eight.  $\frac{5}{10}$  Five is half of ten.

A fraction is equal to one half if the numerator is half the denominator. A fraction is less than one half if the numerator is less than half the denominator. A fraction is greater than one half if the numerator is more than half the denominator.

### Example 1

Which fraction is *not* equal to $\frac{1}{2}$?

A $\frac{9}{18}$    B $\frac{10}{25}$    C $\frac{25}{50}$    D $\frac{50}{100}$

In each choice, the numerator is half the denominator, except for **B.**

### Example 2

**Anana ordered two pizzas for her family. The vegetarian pizza was sliced into twelfths, and the cheese pizza was sliced into eighths. The family ate all but five slices of vegetarian pizza and four slices of cheese pizza. Compare the fractional parts of the two pizzas that were not eaten:**

$$\frac{5}{12} \bigcirc \frac{4}{8}$$

The denominator of $\frac{5}{12}$ is 12, and half of 12 is 6. Since 5 is less than half of 12, $\frac{5}{12}$ is less than $\frac{1}{2}$. The other fraction, $\frac{4}{8}$, equals $\frac{1}{2}$. So $\frac{5}{12}$ is less than $\frac{4}{8}$.

$$\frac{5}{12} < \frac{4}{8}$$

There is less vegetarian pizza left than cheese pizza.

**Lesson Practice**

a. **Analyze** Think of a counting number. Double it. Then write a fraction equal to $\frac{1}{2}$ using your number and its double.

b. **Multiple Choice** Which of these fractions does *not* equal $\frac{1}{2}$?

**A** $\frac{7}{14}$      **B** $\frac{8}{15}$      **C** $\frac{9}{18}$      **D** $\frac{21}{42}$

c. Compare: $\frac{5}{8} \bigcirc \frac{5}{12}$      d. Compare: $\frac{12}{24} \bigcirc \frac{6}{12}$

**Written Practice**   *Distributed and Integrated*

**Formulate** For problems **1–4,** write an equation and find the answer.

**\*1.** It cost $3.48 to rent the movie. Leo gave the clerk $5.00. How much
(16) money should Leo get back?

**\*2.** **Justify** The veggie wrap cost $1.45, and the fruit salad cost $0.95.
(11) What was the cost of the veggie wrap and fruit salad together? Explain why your answer is reasonable.

**\*3.** A week is 7 days. How many days is 52 weeks?
(21)

**\*4.** **Justify** Sumiko, Hector, and Ariel have $24. They want to divide
(21) the money equally. How much money will each receive? Write a multiplication formula. Explain how you found the answer.

**5.** One half of the contents of a 20-ounce bag of snack mix is granola.
(Inv. 2) One fourth of the contents is raisins.

    a. How many ounces of granola are in the bag?

    b. How many ounces of raisins are in the bag?

**6.** Compare: $\frac{3}{10} \bigcirc \frac{3}{6}$
(23)

**7.** $40 \div 6$
(22)

**8.** $3\overline{)20}$
(22)

**9.** $60 = n \times 10$
(18)

**10.**   $\$3.08$
(17)   $\times \quad\quad 7$

**11.**   $2514$
(17)   $\times \quad\quad 3$

**12.**   $697$
(17)   $\times \quad\quad 8$

**13.** Use words to show how this problem is read: $7\overline{)35}$
(20)

**14.** $4 \times 3 \times 10$          **15.** $12 \times 2 \times 10$
(18)                                   (18)

**16.**   4035          **17.**       $m$          **18.**   $70.00
(14)   $-\quad s$      (14)   $-\ 1056$          (13)   $-\ \ 7.53$
─────              ──────                 ──────
      3587                 5694

**19.** $5.00 + $8.75 + $10.00 + $0.35
(13)

**20.** $6.25 + $0.85 + $4.00 + $d = $20.00
(10, 13)

**21.** (**Connect**) Write two multiplication facts and two division facts for the
(19)   fact family 7, 9, and 63.

**22.** Write the numbers 48, 16, and 52 in order from greatest to least.
(4)

**23.** (**Represent**) Draw two vertical lines side by side.
(12)

**24.** Use words to name the number 212,500.
(7)

**25.** (**Connect**) Write two addition facts and two subtraction facts for the
(8)   fact family 7, 9, and 16.

*  **26. Multiple Choice** Which fraction below does *not* equal $\frac{1}{2}$?
(23)
   **A** $\frac{10}{20}$          **B** $\frac{20}{40}$          **C** $\frac{40}{80}$          **D** $\frac{80}{40}$

*  **27.** The fraction $\frac{3}{4}$ is equivalent to what decimal?
(Inv. 2)

**28.** Chanisse has nine quarters in her coin purse. Write and solve a
(17)   multiplication equation that shows the value of the nine quarters.

**29.** Write an "equal groups" word problem for this equation. Then answer
(21)   the question in your problem.

$$3 \times 12 = p$$

**30.** What is the tenth term in this counting sequence?
(1)

$$8,\ 16,\ 24,\ 32,\ \ldots$$

# • Parentheses and the Associative Property

| | |
|---|---|
| **facts** | Power Up F |
| **count aloud** | Count up by 5s from 2 to 52. Count up and down by 3s between 0 and 36. |
| **mental math** | **a. Measurement:** Three feet equals 1 yard. How many feet is 12 yards? |
| | **b. Number Sense:** $8 \times 40$ plus $8 \times 2$ |
| | **c. Number Sense:** $7 \times 42$ |
| | **d. Number Sense:** $6 \times 42$ |
| | **e. Fractional Parts:** $\frac{1}{2}$ of 40 |
| | **f. Fractional Parts:** $\frac{1}{4}$ of 40 |
| | **g. Fractional Parts:** $\frac{1}{10}$ of 40 |
| | **h. Number Sense:** $6 \times 3, + 2, \div 2, - 2, \div 2$ |

**problem solving**

Choose an appropriate problem-solving strategy to solve this problem. Copy this subtraction problem and fill in the missing digits:

$$\begin{array}{r} \_4\_ \\ -\ 3\_2 \\ \hline 58 \end{array}$$

The **operations of arithmetic** are addition, subtraction, multiplication, and division. When there is more than one operation in a problem, **parentheses** can show us the order for doing the operations. Parentheses separate a problem into parts. We do the part inside the parentheses first. In the problem below, the parentheses tell us to add 5 and 4 before we multiply by 6.

$$6 \times ( 5 + 4 ) =$$
$$6 \times \quad 9 \quad = 54$$

**( Discuss )** What would the answer be if there were no parentheses?

## Example 1

**Melody drew 8 flowers. She painted 4 flowers blue. Then she painted 2 flowers red. How many flowers were not painted?**

It takes two steps to find the answer to this problem. The parentheses show us which step to take first. We add 4 and 2 to get 6. Then we subtract 6 from 8 and get 2.

$$8 - \underline{(4 + 2)} =$$
$$8 - \quad 6 \quad = 2$$

We find that **2 flowers** were not painted.

**( Justify )** Why can't we subtract 4 from 8 and then add 2 for an answer of 6?

## Example 2

**Compare: $2 \times (3 + 4) \bigcirc (2 \times 3) + 4$**

The numbers and operations on both sides are the same, but the order for doing the operations is different. We follow the proper order on both sides and find that the amount on the left is greater than the amount on the right.

$$2 \times \underbrace{(3 + 4)}\ \bigcirc\ \underbrace{(2 \times 3)} + 4$$
$$2 \times \quad 7 \quad \bigcirc \quad 6 \quad + 4$$
$$\mathbf{14} \quad > \quad \mathbf{10}$$

When performing the operations of arithmetic, we perform one operation at a time. If we have three numbers to add, we decide which two numbers to add first. Suppose we wish to find $4 + 5 + 6$. We may find $4 + 5$ first and then add 6, or we may find $5 + 6$ first and then add 4. Either way, the sum is 15.

$$(4 + 5) + 6 = 4 + (5 + 6)$$

Whichever way we group the addends, the result is the same. This property is called the **Associative Property of Addition.**

The Associative Property also applies to multiplication, but not to subtraction or division. Below we illustrate the **Associative Property of Multiplication.** Whichever way we group the factors, the product is the same.

$$(2 \times 3) \times 4\ \bigcirc\ 2 \times (3 \times 4)$$
$$6 \times 4\ \bigcirc\ 2 \times 12$$
$$24 \quad = \quad 24$$

Solve each problem by following the proper order of operations:

**a.** $6 - (4 - 2)$            **b.** $(6 - 4) - 2$

**c.** $(8 \div 4) \div 2$          **d.** $8 \div (4 \div 2)$

**e.** $12 \div (4 - 1)$        **f.** $(12 \div 4) - 1$

**g.** Name the four operations of arithmetic.

**Analyze** For each problem, write the proper comparison symbol, and state whether the Associative Property applies.

**h.** $(8 \div 4) \div 2 \bigcirc 8 \div (4 \div 2)$

**i.** $(8 - 4) - 2 \bigcirc 8 - (4 - 2)$

**j.** $(8 \times 4) \times 2 \bigcirc 8 \times (4 \times 2)$

## Written Practice

*Distributed and Integrated*

**\*1.** How much money is one half of a dollar plus one fourth of a dollar?
*(Inv. 2)*

**Formulate** For problems **2–4,** write an equation and find the answer.

**\*2.** How many horseshoes are needed to shoe 25 horses?
*(21)*

**3.** Inez removed some eggs from a carton of one dozen eggs. If nine eggs
*(16)* remained in the carton, how many eggs did Inez remove?

**\*4.** **Justify** The auditorium had nine hundred fifty-six seats. During
*(11)* a performance only four hundred ninety-eight seats were occupied. How many seats were not occupied? Explain how you solved the problem.

**5.** **Connect** Write two multiplication facts and two division facts for the
*(19)* fact family 5, 10, and 50.

**6.** Compare: $3 \times (4 + 5) \bigcirc (3 \times 4) + 5$
*(24)*

**7.** $30 - (20 + 10)$                             **8.** $(30 - 20) + 10$
*(24)*                                                       *(24)*

**\*9.** Compare: $4 \times (6 \times 5) \bigcirc (4 \times 6) \times 5$
(24)

**10.** $60 \div 7$
(22)

**11.** $50 \div 6$
(22)

**12.** $10\overline{)44}$
(22)

**13.** $\quad \$50.36$
(17) $\quad \underline{\times \qquad 4}$

**14.** $\quad 7408$
(17) $\quad \underline{\times \qquad 6}$

**15.** $\quad 4637$
(17) $\quad \underline{\times \qquad 9}$

**16.** $\qquad w$
(13, 14) $\underline{- \ \$9.62}$
$\qquad \$14.08$

**17.** $\quad 4730$
(14) $\underline{- \qquad j}$
$\qquad 2712$

**18.** $\quad \$30.00$
(13) $\underline{- \ \$ \ 0.56}$

**19.** $\$3.54 + \$12 + \$1.66$
(13)

**20.** $\$20 - \$16.45$
(13)

**21.** (**Connect**) Write two addition facts and two subtraction facts for the
(8) fact family 9, 5, and 14.

**22.** Which digit in 256 shows the number of hundreds?
(3)

**23.** The Dawson Company purchased 4 telephones for $35 each. This
(13, 17) addition problem shows one way to find the total cost. Change the
addition problem to a multiplication problem and find the total cost of
the 4 telephones.

$$\$35 + \$35 + \$35 + \$35$$

**\*24.** (**Predict**) What is the tenth term of this counting sequence?
(1)

$$3, 6, 9, 12, 15, \ldots$$

**\*25. Multiple Choice** When odd numbers are divided by 2, there is a
(22) remainder of 1. Which of these odd numbers can be divided by 5
without a remainder?

    **A** 23         **B** 25         **C** 27         **D** 29

**26.** (**Represent**) Draw two vertical lines.
(12)

**27.** (**Connect**) Write two multiplication facts and two division facts for the
(19) fact family 7, 8, and 56.

**28.** Compare: $(8 + 4) + 2 \bigcirc 8 + (4 + 2)$
*(24)*

**Conclude** Based on your answer, does the Associative Property apply to addition?

**29. a.** What number is half of 14?
*(2, 23)*

**b.** Write a fraction equal to $\frac{1}{2}$ using 14 and its half.

**30.** **Multiple Choice** When Maisha woke up in the morning, the
*(10)* temperature was 65°F. The high temperature for that day was 83°F at 4:09 p.m.

Which equation can be used to find the number of degrees the temperature increased after Maisha woke up?

**A** $65 + d = 83$ **B** $83 + 65 = d$ **C** $d + 83 = 65$ **D** $83 + d = 65$

**Early Finishers**

*Real-World Connection*

James has 9 storage boxes on each of 5 shelves. Each box contains 6 items. How many items are there altogether? Explain how using the Associative Property of Multiplication can make the problem easier to solve.

# • Listing the Factors of Whole Numbers

## Power Up

**count aloud**    Count up by 5s from 3 to 53 (3, 8, 13, 18, ...). Count by 7s from 0 to 77. (A calendar can help you start.)

**mental math**

   a. **Measurement:**  10 × 10 cm

   b. **Measurement:**  10 × 100 cm

   c. **Number Sense:**  6 × 24

   d. **Fractional Parts:**  $\frac{1}{2}$ of 12 inches

   e. **Fractional Parts:**  $\frac{1}{4}$ of 12 inches

   f. **Fractional Parts:**  $\frac{1}{10}$ of 60 minutes

   g. **Time:**  What day of the week is 8 days after Sunday?

   h. **Number Sense:**  6 × 2, − 2, × 2, + 1, ÷ 3

**problem solving**    Choose an appropriate problem-solving strategy to solve this problem. Hamdi was thinking of a two-digit even number. Hamdi hinted that you say the number when counting by 3s and when counting by 7s, but not when counting by 4s. Of what number was Hamdi thinking?

## New Concept

The **factors** of a number are all the whole numbers that can divide it without leaving a remainder. For example, the factors of 6 are 1, 2, 3, and 6 because each of these numbers divides 6 without leaving a remainder.

## Activity

### Grouping by Factors

The factors of 6 are 1, 2, 3, and 6. This means we can separate 6 items into equal groups of 1, 2, 3, or 6.



6 groups of 1          3 groups of 2          2 groups of 3          1 group of 6
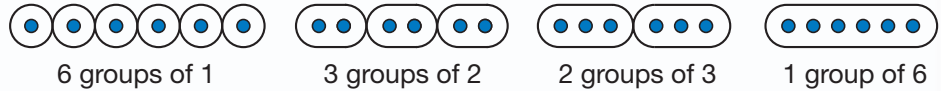
We cannot separate 6 items into equal groups of 4 or 5, so 4 and 5 are not factors of 6.



Draw sets of 12 dots. Illustrate the factors of 12 by making equal groups and labeling each group as shown in the examples above.

### Example 1

**Math Language**

When a number is **divisible** by 2, it has 2 as a factor.

**List the factors of 20.**

We look for all the whole numbers that divide 20 without leaving a remainder. Which numbers can be put into this box to give us an answer without a remainder?

$$\boxed{?}\,\overline{)20}$$

One way to find out is to start with 1 and to try each whole number up to 20. If we do this, we find that the numbers that divide 20 evenly are **1, 2, 4, 5, 10,** and **20.** These are the factors of 20. All other whole numbers leave a remainder.

We can cut our search for factors in half if we record the quotient when we find a factor.

$$1\overline{)20}^{\,20} \qquad \text{Both \textbf{1} and \textbf{20} are factors.}$$

$$2\overline{)20}^{\,10} \qquad \text{Both \textbf{2} and \textbf{10} are factors.}$$

$$4\overline{)20}^{\,5} \qquad \text{Both \textbf{4} and \textbf{5} are factors.}$$

## Example 2

**List the factors of 23.**

The only factors of 23 are **1** and **23.** Every number greater than 1 has at least two factors: the number 1 and itself.

**Math Language**

A counting number that has exactly two factors—1 and itself—is called a **prime number.**

Sometimes we can discover some factors of a number just by looking at one or two of its digits. For example, a factor of every even number is 2, and any whole number ending in 0 or 5 has 5 as a factor. Since 20 is even and ends in zero, we know that both 2 and 5 are factors of 20.

## Example 3

**Which of these numbers is *not* a factor of 30?**

  **A** 2       **B** 3       **C** 4       **D** 5

We see that 30 is an even number ending in zero, so 2 and 5 are factors. We also quickly see that 30 can be divided by 3 without a remainder. The only choice that is not a factor of 30 is **C.**

**Discuss** How could we use divisibility rules to help us answer the question?

## Example 4

**Which factors of 9 are also factors of 18?**

The factors of 9 are 1, 3, and 9. The factors of 18 include all these numbers and also 2, 6, and 18. We say that 1, 3, and 9 are the common factors of 9 and 18 because they are factors of both 9 and 18.

**Analyze** What is the greatest common factor of 9 and 18?

## Lesson Practice

**List** Write the factors of each of these numbers:

**a.** 4       **b.** 3       **c.** 6       **d.** 5

**e.** 8       **f.** 11       **g.** 9       **h.** 12

**i.** 1       **j.** 14       **k.** 2       **l.** 15

**m. Multiple Choice** Two is *not* a factor of which of these numbers?

  **A** 236       **B** 632       **C** 362       **D** 263

**n. Multiple Choice** Five is *not* a factor of which of these numbers?

  **A** 105       **B** 150       **C** 510       **D** 501

**o. Multiple Choice** Which of these numbers is *not* a factor of 40?

**A** 2 **B** 5 **C** 6 **D** 10

## Written Practice

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

**\*1.** At the tree farm, 9 rows of trees with 24 trees in each row were planted.
(21) How many trees were planted?

**\*2.** **Explain** The haircut cost $6.75. Mila paid for it with a $10 bill.
(16) How much money should she get back? Explain why your answer is reasonable.

**\*3.** Dannell bought four cartons of milk for $1.12 each. Altogether, how
(17) much did Dannell spend?

**\*4.** **List** Write the factors of 13.
(25)

**5.** Which factors of 10 are also factors of 30?
(25)

**6.** Compare: $4 \times (6 \times 10)$ ◯ $(4 \times 6) \times 10$
(24)

**7.** **Verify** Which property of multiplication is illustrated in problem **6?**
(24)

**8.** $6 \times (7 + 8)$            **9.** $(6 \times 7) + 8$
(24)                                                 (24)

**10.** **Connect** Write two multiplication facts and two division facts for the
(19) fact family 10, 12, and 120.

**\*11.** $9n = 54$                                 **12.** $55 \div 8$
(18)                                             (22)

**13.**    1234         **14.**    $5.67         **15.**    987
(17)    $\times \quad 5$      (17)    $\times \quad 8$      (17)    $\times \quad 6$

**\*16.** $w - \$13.55 = \$5$                   **\*17.** $2001 - r = 1002$
(13, 14)                                                   (14)

**\*18.** $4387 + 124 + 96$
(6)

**\*19.** $3715 + 987 + 850$
(6)

**\*20.** $\$6.75 + \$8 + \$1.36 + p = \$20$
(10, 13)

**\*21.** (**Analyze**) How much money is $\frac{1}{2}$ of a dollar plus $\frac{1}{4}$ of a dollar plus $\frac{1}{10}$ of
(Inv. 2) a dollar?

**22.** (**Represent**) Use words to name the number 894,201.
(7)

**23.** Which number is the divisor in this equation? $6\overline{)42}$ with quotient $7$
(20)

**24.** (**Predict**) What is the tenth term in this counting sequence?
(1)

$$5, 10, 15, 20, \ldots$$

**25.** (**Verify**) Think of a whole number. Multiply it by 2. Is the answer odd
(2, 15) or even?

**26. Multiple Choice** Two is *not* a factor of which of these numbers?
(25)

    **A** 456         **B** 465         **C** 654         **D** 564

**27.** (**Verify**) Which property of addition is illustrated by this equation?
(24)

$$(6 + 7) + 8 = 6 + (7 + 8)$$

**28.** Write a multiplication equation that shows the number of
(18) blocks used to build this figure.
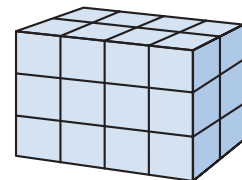
**\*29.** The fraction $\frac{1}{10}$ is equivalent to what decimal?
(Inv. 2)

**30.** The relationship between yards and feet is shown in the table.
(1)

| Number of Yards | 1 | 2 | 3 | 4 |
|---|---|---|---|---|
| Number of Feet | 3 | 6 | 9 | 12 |

    **a.** (**Generalize**) Write a rule that describes how to find the number of feet for any number of yards.

    **b.** (**Predict**) How many feet are equal to twenty yards?

# •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:** $10 \times 34$

    **c.** **Number Sense:** $5 \times 34$

    **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:

$$\begin{array}{r} \_\,\_ \\ +\,\_\,\_ \\ \hline \_\,\_ \end{array}$$

## 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.
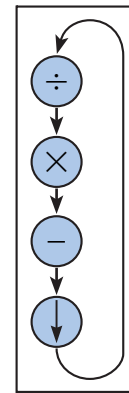
**Step 1:** Divide and write a number.

**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**

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

**Math Language**

Name the dividend, the divisor, and the quotient.

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.

$$\begin{array}{r} 2\,1 \\ \$284 \\ \times \quad 3 \\ \hline \$852 \quad \text{check} \end{array}$$

**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.

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

**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.**

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

**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.**

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

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

**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:

$$\begin{array}{r} 12 \text{ R } 3 \\ 6\overline{)75} \end{array}$$
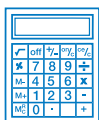
Find each missing factor. Check each answer using a calculator. Then explain how you used the calculator to check your answer.

**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
(16)  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.** $\dfrac{123}{3}$
*(26)*

**11.** $\dfrac{576}{6}$
*(26)*

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

**13.** $609 \times 8$
*(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)*

$$3 \times 40 \bigcirc 3 \times 4 \times 10$$
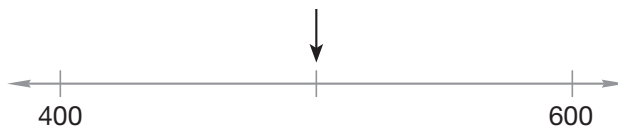
**21.** $8 \times 90 = 8 \times 9 \times n$
*(18)*

**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.

# • Reading Scales

## Power Up

**facts**            Power Up F

**count aloud**      Count by 12s from 12 to 60.

**mental math**

a. **Time:** How many months are in 2 years? … 3 years? … 4 years?

b. **Time:** How many days are in 2 weeks? … 3 weeks? … 4 weeks?

c. **Number Sense:** $10 \times 24$

d. **Number Sense:** $6 \times 24$

e. **Fractional Parts:** $\frac{1}{2}$ of 100¢

f. **Fractional Parts:** $\frac{1}{4}$ of 100¢

g. **Fractional Parts:** $\frac{3}{4}$ of 100¢

h. **Number Sense:** $6 \times 6, - 1, \div 5$

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

$$\begin{array}{r} \_\_ \\ -\ \_\_ \\ \hline \_\_ \end{array}$$

## New Concept

**Thinking Skill**

**Connect**

Name some real-world examples of number lines that have been adapted for different measuring situations.

Number lines can be horizontal, vertical, or even curved. It is not necessary to show every whole number on a number line. Some number lines show only even numbers or numbers we say when counting by 5s. The locations of unlabeled numbers must be figured out.

One use of a number line is as a **scale** for measuring temperature. Two commonly used temperature scales are the **Fahrenheit** (F) scale and the **Celsius** (C) scale. On the Fahrenheit scale, water freezes at 32°F and boils at 212°F. The Celsius scale is a **centigrade** scale, meaning there are one hundred gradations, or **degrees,** between the freezing and boiling points of water. On the Celsius scale, water freezes at 0°C and boils at 100°C.
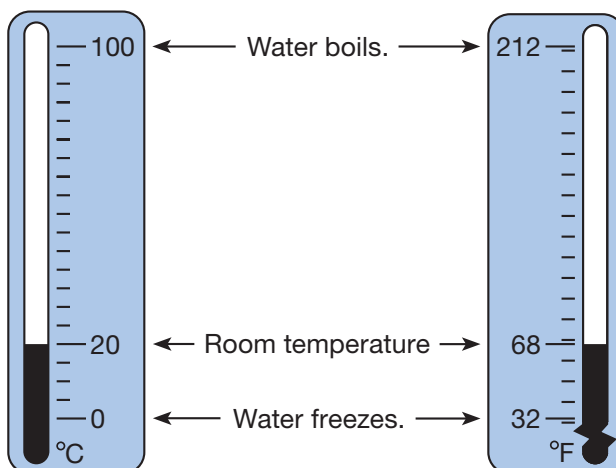
**At 6:00 a.m. the temperature was 21°C. The thermometer shows the noon temperature. How many degrees did the temperature increase from 6:00 a.m. to noon?**

This thermometer indicates the temperature in degrees Celsius which is abbreviated "°C." On the scale, only every 10° is labeled. There are five spaces between every 10°. That means every space equals 2°. One space up from 30° is 32°. The thermometer shows a temperature of 32°C.
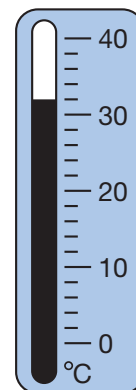
$$32 - 21 = 11$$

The temperature rose **11°C.**

**To what number on this scale is the arrow pointing?**
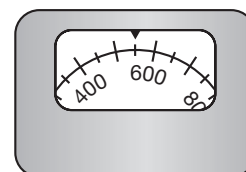
As we move along the curve toward the right, we see that the numbers grow larger. The arrow points to a location past the 400 mark and near the 600 mark. Halfway between the 400 and 600 marks is a long mark that stands for 500. The arrow points halfway between the 500 and 600 marks, so it points to **550.**

**Example 3**

**Draw a horizontal number line from 0 to 500 with only zero and hundreds marked and labeled.**

We draw a horizontal number line and make marks for 0, 100, 200, 300, 400, and 500. These marks should be evenly spaced. We then label the marks. Our number line should look like this:



**Estimate** Is the point for 276 closer to 200 or 300?

**Lesson Practice**

a. **Represent** Draw a number line from 0 to 100 with only zero and tens marked and labeled.

b. On the Celsius scale, what temperature is five degrees less than the freezing point of water?

c. **Represent** Points A and B on this number line indicate two numbers. Write the two numbers and use a comparison symbol to show which is greater and which is less.
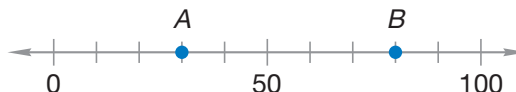


**Written Practice** *Distributed and Integrated*

**Formulate** For problems **1–4,** write an equation and find the answer.

**\*1.** On the first 3 days of their trip, the Smiths drove 408 miles, 347 miles,
(11) and 419 miles. Altogether, how far did they drive in 3 days?

**2.** T'Wan is 5 feet tall. One foot is equal to 12 inches. How many inches
(17) tall is T'Wan?

**3.** Fifteen minutes after the store opened, only seven autographed
(16) footballs remained in the store. If customers had purchased
27 autographed footballs during the first 15 minutes, how many
autographed footballs were in the store when it opened?

**\*4.** Gabriella sold 9 cups of lemonade for $0.15 each. How much money
(17) did Gabriella collect by selling lemonade?

**5.** Colvin's age is half of Mahmood's age. If Mahmood is 12 years old,
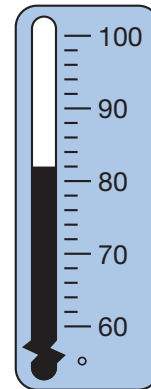(2) then how old is Colvin?

**6.** $864 \div 5$
(26)

**\*7.** $\$2.72 \div 4$
(26)

**8.** $608 \div 9$
(26)

**9.** $378 \div (18 \div 3)$
(24, 26)

**\*10.** The thermometer shows the high temperature for a day.
(27) The low temperature of the day was 13° lower. What was
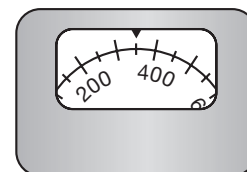the low temperature for that day?

**\*11.** $\$52.60$
(17) $\times \quad 7$

**12.** $3874$
(17) $\times \quad 6$

**13.** $9063$
(17) $\times \quad 8$

**14.** To what number on this scale is the arrow pointing?
(27)

**15.** $386 + 4287 + 672 + m = 5350$
(10)

**16.** ( Represent )  Draw a horizontal number line from 0 to 50 with only zero
(12) and tens marked and labeled.

**17. Multiple Choice**  The number 78 is between which of these pairs of
(4) numbers?

    **A** 60 and 70     **B** 70 and 80     **C** 80 and 90     **D** 0 and 10

**18.** **List** Write the factors of 30.
(25)

**19.** When three hundred ninety-seven is subtracted from four hundred five,
(5, 9) what is the difference?

**\*20.** **Multiple Choice** In Khadija's class there is one more boy than there
(2) are girls. Which could *not* be the number of students in Khadija's
class?

   **A** 25          **B** 27          **C** 28          **D** 29

**21.** On the Celsius scale, what temperature is ten degrees below the
(27) freezing point of water?

**22.** **Conclude** What are the next three terms in this counting sequence?
(1)

        …, 160, 170, 180, ____, ____, ____, …

**23.** Which digit in 537 shows the number of hundreds?
(3)

**24.** **Represent** Use words to name 327,040.
(7)

**\*25.** **Represent** To what number is the arrow pointing?
(27)
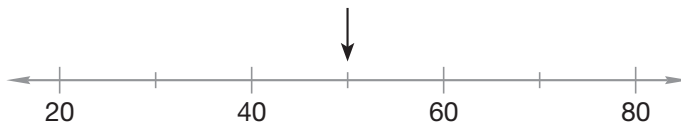


**26.** Show three ways to write "24 divided by 3" with digits and division
(20) symbols.

**27.** **Evaluate** Here is Madeline's answer to a division         $\frac{14 \text{ R } 2}{7\overline{)100}}$
(26) problem. Show how to check the division. Is Madeline's
answer correct? Why or why not?

**28.** Compare: $12 \div (6 \div 2) \bigcirc (12 \div 6) \div 2$
(20, 24)

Does the Associative Property apply to division?

**\*29.** The fraction $\frac{3}{10}$ is equivalent to what decimal?
(Inv. 2)

**30.** The relationship between centimeters and millimeters is shown in the table.
<sub>(1)</sub>

| Number of Centimeters | 1 | 2 | 3 | 4 |
|---|---|---|---|---|
| Number of Millimeters | 10 | 20 | 30 | 40 |

a. **Generalize** Write a rule that describes how to find the number of centimeters for any number of millimeters.

b. **Predict** How many centimeters represent the same distance as 100 millimeters?

**Early Finishers**

*Real-World Connection*

The thermometer shows the starting temperature of water in a wading pool. If the temperature drops 2° every hour, what will the water temperature be after six hours?

# • Measuring Time and Elapsed Time

**facts**   Power Up D or E

**count aloud**   Count by 12s from 12 to 72. Count by 5s from 2 to 52.

**mental math**

  a. **Number Sense:** $100 \times 25$

  b. **Number Sense:** $7 \times 25$

  c. **Fractional Parts:** $\frac{1}{2}$ of 40

  d. **Fractional Parts:** $\frac{1}{4}$ of 40

  e. **Fractional Parts:** $\frac{3}{4}$ of 40

  f. **Fractional Parts:** $\frac{1}{10}$ of 40

  g. **Fractional Parts:** $\frac{9}{10}$ of 40

  h. **Number Sense:** $7 \times 7, +1, \div 5, \div 5$

**problem solving**

Choose an appropriate problem-solving strategy to solve this problem. Half of the students in the room were girls. Half of the girls had brown hair. Half the brown-haired girls wore ponytails. If 4 brown-haired girls were wearing ponytails, how many students were in the room?

We measure the passage of time by the movement of Earth. A **day** is the length of time it takes Earth to spin around on its axis once. We divide a day into 24 equal parts called **hours.** Each hour is divided into 60 equal lengths of time called **minutes,** and each minute is divided into 60 **seconds.**

Besides spinning on its axis, Earth also moves on a long journey around the sun. The time it takes to travel around the sun is a **year.** It takes Earth about $365\frac{1}{4}$ days to travel once around the sun. To make the number of days in every year a whole number, we have three years in a row that have 365 days each. These years are called **common years.** Then we have one year that has 366 days. A year with 366 days is called a **leap year.**

A year is divided into 12 **months.** The month February has 28 days in common years and 29 days in leap years. Four months have 30 days each. All the rest have 31 days each. Seven days in a row is called a **week.** We may refer to a calendar to see which day of the week a particular day of the month falls on.

To identify longer spans of time, we may use the terms **decade, century,** and **millennium.** A decade is a period of ten years, and a century is a period of 100 years. A millennium is a period of 1000 years.

**Example 1**

**A century is how many decades?**

A century is 100 years. A decade is 10 years. Since 10 tens equals 100, a century is **10 decades.**

**Example 2**

**According to this calendar, June 8, 2014 is what day of the week?**

June 8, 2014 is a **Sunday,** the second Sunday of the month.

| JUNE 2014 | | | | | | |
|---|---|---|---|---|---|---|
| S | M | T | W | T | F | S |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 8 | 9 | 10 | 11 | 12 | 13 | 14 |
| 15 | 16 | 17 | 18 | 19 | 20 | 21 |
| 22 | 23 | 24 | 25 | 26 | 27 | 28 |
| 29 | 30 | | | | | |

**Thinking Skill**

**Verify**

What do the letters at the top of each column represent?

The time of day can be shown by a clock. A clock can be either **digital** or **analog.** Analog clocks show time with hands that point to places on a circular number line. An analog clock actually contains two number lines in one. One number line is the hour scale. It has 12 marks, usually numbered, that show the hours of the day. The other number line is the minute scale. It has 60 smaller marks, usually unnumbered, that show the minutes of the hour. The two scales are wrapped into a circle so that the ends are joined. A full day is 24 hours long, but most clocks show only 12 hours.

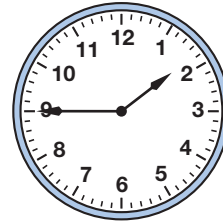We sometimes refer to the time of day using fractions of an hour.

A quarter hour is 15 minutes.

A quarter after 2 is 2:15.

A quarter past 1 is 1:15.

A quarter to 4 is 3:45.

Half past 7 is 7:30.

The 24 hours of a day are divided into **a.m.** hours and **p.m.** hours. The time 12:00 a.m. is called *midnight* and is the beginning of each day. The time 12:00 p.m. is called *noon* and is the midpoint of each day. The 12 hours before noon are the "a.m." hours. The 12 hours after noon are the "p.m." hours. When stating the time of day, we will use the labels "a.m." and "p.m." to prevent confusion.

## Example 3

**The clock shows the time that Rick's first morning class ends. He woke up two hours before this time. His lunch period begins three hours after this time. What time did Rick wake up? What time does Rick's lunch period begin?**
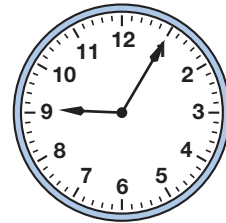
The clock shows 5 minutes after the ninth hour. The proper form is hour, colon, two digits for the minutes, and then a.m. or p.m. The time indicated is 9:05 a.m. To find the time two hours earlier, we count back two hours to **7:05 a.m.** In three hours the time will be after noon, so the a.m. will switch to p.m. The time will be **12:05 p.m.**

**Elapsed time** is the amount of time between a starting time and an ending time. For example, if you start your homework at 4:00 p.m. and finish at 5:15 p.m., then 1 hour and 15 minutes elapsed between the time you started and the time you ended.

## Example 4

**Raven and her friends attended a movie that was 2 hours and 5 minutes long and ended at 9:20 p.m. What time did the movie begin?**

In this problem, we are given the ending time and the elapsed time. We are asked for the beginning time. Two hours before 9:20 p.m. is 7:20 p.m., and 5 minutes before 7:20 p.m. is **7:15 p.m.,** which is when the movie began.

**a.** Four centuries is how many years?

**b.** According to the calendar in Example 2, what is the date of the third Thursday in June 2014?

**c.** A leap year has how many days?

**d.** What is the name for $\frac{1}{10}$ of a century?

**e.** Write the time that is 2 minutes after eight in the evening.

**f.** Write the time that is a quarter to nine in the morning.

**g.** Write the time that is 20 minutes after noon.

**h.** Write the time that is 30 minutes after midnight.

**i.** Write the time that is a quarter after nine in the morning.

**j.** If it is morning, what time is shown by the clock?

**k.** What time would be shown by the clock 2 hours later? 2 hours earlier?

**l.** The movie started at 3:15 p.m. and ended at 5:00 p.m. How long was the movie?
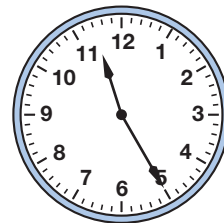
## Written Practice

*Distributed and Integrated*

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

**1.** After Anastacia paid Beatrice $600 for rent, she had $1267 remaining.
(16) How much money did Anastacia have before paying rent?

**2.** Mae-Ying had $1873. She earned $200 more for babysitting. How
(11) much money did she then have?

**\*3.** **Explain** Dan separated 52 cards into 4 equal piles. How many
(21) cards were in each pile? Write a multiplication pattern. Explain how you found your answer.

**4.** One half of a decade is how many years?
(28)

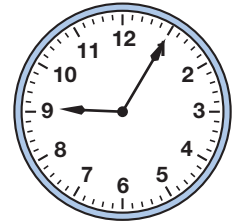**\*5.** **Analyze** Which factors of 18 are also factors of 24?
(25)

**6.** $\dfrac{543}{3}$
(26)

**7.** $\dfrac{\$6.00}{8}$
(26)

**8.** $528 \div (28 \div 7)$
(24, 26)

**9.** $6w = 696$
(18)

**10.** It is evening. What time is shown by this clock? What will
(28)  the time be in three hours?



**11.** Write the time that is half past noon.
(28)

**12.** How much money is $\dfrac{1}{2}$ of a dollar plus $\dfrac{5}{10}$ of a dollar?
(Inv. 2)

**13.** According to this calendar, May 10, 2042 is what day of
(28)  the week?

| \_MAY 2042\_ | | | | | | |
|---|---|---|---|---|---|---|
| S | M | T | W | T | F | S |
|  |  |  |  | 1 | 2 | 3 |
| 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| 11 | 12 | 13 | 14 | 15 | 16 | 17 |
| 18 | 19 | 20 | 21 | 22 | 23 | 24 |
| 25 | 26 | 27 | 28 | 29 | 30 | 31 |

**14.** What is the largest three-digit even number that has the digits
(2)  5, 6, and 7?

**15.**
(6)
$$\begin{array}{r} 4387 \\ 2965 \\ + 4943 \\ \hline \end{array}$$

**16.**
(13)
$$\begin{array}{r} \$63.75 \\ - \$46.88 \\ \hline \end{array}$$

**17.**
(14)
$$\begin{array}{r} 4010 \\ - \quad f \\ \hline 563 \end{array}$$

**18.**
(17)
$$\begin{array}{r} 3408 \\ \times \quad 7 \\ \hline \end{array}$$

**19.**
(17)
$$\begin{array}{r} \$3.56 \\ \times \quad 8 \\ \hline \end{array}$$

**20.**
(17)
$$\begin{array}{r} 487 \\ \times \quad 9 \\ \hline \end{array}$$

**21.** What time is 5 minutes before nine in the morning?
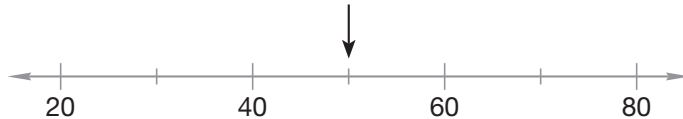(28)

**22.** **Connect** Write two multiplication facts and two division facts for the
(19)  fact family 10, 2, and 20.

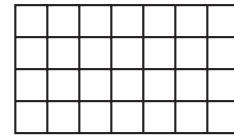**23.** Show how to check this division answer. Is the answer correct?

$$\begin{array}{r} 22 \text{ R } 2 \\ 9\overline{)200} \end{array}$$

**(26)**

**24.** **Conclude** What are the next three terms in this counting sequence?

**(1)**

..., 400, 500, 600, 700, ____, ____, ____, ...

**25.** **Represent** To what number is the arrow pointing?

**(27)**



**26.** Which multiplication fact shows the number of small squares in this rectangle?

**(13)**



**27.** How many centuries equal a millennium?

**(28)**

**\*28.** How many quarter circles equal a whole circle?

**(Inv. 2)**

**29. a.** **Analyze** How many minutes are in an hour?

**(23, 28)**

**b.** How many minutes are in half an hour?

**c.** Use the numbers in the answers to parts **a** and **b** to write a fraction equal to one half.

**\*30.** **Multiple Choice** During their retirement, Tanisha's grandparents plan to visit every state in the United States except for Alaska and Hawaii. So far they have visited 29 of those states.

**(10)**

Which equation can be used to find how many states Tanisha's grandparents still have to visit?

**A** $n + 29 = 50$　　**B** $n = 29 + 48$　　**C** $29 + n = 48$　　**D** $n + 48 = 29$

# • Multiplying by Multiples of 10 and 100

## Power Up

| | |
|---|---|
| **facts** | Power Up F |
| **count aloud** | Count by 12s from 12 to 60. |

**mental math**

**a. Time:** How many days are in a common year? … a leap year?

**b. Time:** What time is 10 minutes after 1:55 p.m.?

**c. Money:** The cost is $43 for one person. What is the cost for 6 people?

**d. Fractional Parts:** $\frac{1}{2}$ of 50

**e. Fractional Parts:** $\frac{1}{10}$ of 50

**f. Fractional Parts:** $\frac{5}{10}$ of 50

**g. Measurement:** One yard is 3 feet. How many feet is 35 yards?

**h. Number Sense:** $9 \times 9, -1, \div 2, +2, \div 6$

**problem solving**

Choose an appropriate problem-solving strategy to solve this problem. Copy this multiplication problem and fill in the missing digits:

$$\begin{array}{r} 36 \\ \times\ \_\_ \\ \hline \_\_2 \end{array}$$

## New Concept

The **multiples** of a number are the answers we get when we multiply the number by 1, 2, 3, 4, and so on. **Multiples of 10** all end in zero.

$$10, 20, 30, 40, 50, 60, \ldots$$

Thinking Skill

Connect

Will the same factors be common to all multiples of 10? Give an example to support your answer.

Any multiple of 10 can be written as a number times 10.

$$20 = 2 \times 10$$
$$30 = 3 \times 10$$
$$40 = 4 \times 10$$

**Multiples of 100** all end with at least two zeros.

$$100, 200, 300, 400, 500, 600, \ldots$$

Any multiple of 100 can be written as a number times 100.

$$200 = 2 \times 100$$
$$300 = 3 \times 100$$
$$400 = 4 \times 100$$

Analyze Which factors are common to 10, 100, and 1000?

When we multiply by a multiple of 10, we may multiply by the digit(s) in front of the zero and then multiply by 10. We will show this by multiplying 25 by 30.

The problem: $25 \times 30 =$

We think: $25 \times 3 \times 10 =$

We multiply 25 by 3: $75 \times 10 =$

Then we multiply 75 by 10: $75 \times 10 = 750$

Notice that the last step placed a zero after the 75. When we multiply by a multiple of 10, we may multiply by the digit(s) in front of the zero and then place a zero on the end of that answer.

This can be shown when we write a problem vertically. We may write the numbers so that the multiple of 10 is on the bottom and the zero "hangs out" to the right. Here we write 25 times 30 vertically. We multiply 25 by 3. Then we bring down the zero (multiply by 10) and find that $25 \times 30$ is 750.

$$\begin{array}{r} {\scriptstyle 1} \\ 25 \\ \times\ 30 \\ \hline 750 \end{array}$$

We may use a similar method to multiply by multiples of 100. When we multiply by a multiple of 100, we can write the problem so that *two* zeros "hang out" to the right. We show this by multiplying 25 by 300.

We write the problem with 300 on the bottom and its zeros out to the right. We multiply 25 by 3 hundreds and get 75 hundreds. We write 7500.

$$\begin{array}{r} {\scriptstyle 1} \\ 25 \\ \times\ 300 \\ \hline 7500 \end{array}$$

## Example 1

**Last season, a college basketball player played an average of 40 minutes per game and played 37 games. How many minutes did that player play last season?**

We write the problem so that the multiple of 10 is on the bottom. We let the zero "hang out" to the right. Then we multiply.

The basketball player played **1480 minutes.**

$$\begin{array}{r} 2 \\ 37 \\ \times\ \ 40 \\ \hline 1480 \end{array}$$

## Example 2

**Shandra sold ten tickets to the school play to friends and relatives for $3.75 per ticket. How much money did Shandra collect from ticket sales?**

When multiplying whole numbers by 10, we may simply attach a zero. The zero shifts all other digits one place to the left. However, when multiplying dollars and cents by 10, attaching a zero does not shift the other digits from their places:

$3.750 is the same as $3.75

This is because the decimal point sets the place values, and attaching a zero does not change the position of the decimal point. When multiplying dollars and cents by whole numbers, we position the decimal point in the answer so that there are two digits to the right of the decimal point.

$$\begin{array}{r} \$3.75 \\ \times\ \ \ \ \ 10 \\ \hline \$37.50 \end{array}$$

Shandra collected **$37.50** from ticket sales.

We can check our answer using a calculator and the inverse operation. What equation can we use to check our answer?

**Lesson Practice**   Multiply:

**a.** $34 \times 20$        **b.** $50 \times 48$

**c.** $34 \times 200$       **d.** $500 \times 36$

**e.** $55 \times 30$        **f.** $1.25 \times 30$

**g.** $55 \times 300$      **h.** $1.25 \times 300$

**i.** $60 \times 45$        **j.** $2.35 \times 40$

**k.** $400 \times 37$      **l.** $1.43 \times 200$

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

**1.** Laura, Lesley, and Trinh equally shared a box of 1 dozen pencils. How
(21) many pencils did each girl receive?

**2.** Barak had $841 before he had to pay a $75 fee. After paying the fee,
(16) how much money did he have?

**3.** The sheet of stamps had 10 rows of stamps with 10 stamps in each
(13) row. How many stamps were on the sheet?

***4.** **Analyze** What year came one century after Texas became the 28th
(28) state in 1845?

**5.** **List** Write the factors of 60.
(25)

**6.** $37 \times 60$
(29)

**7.** $37 \times 6 \times 10$
(18, 29)

**8.** $50 \times 46$
(29)

**9.** $60 \times \$0.73$
(29)

**10.** $50 \times (1000 - 200)$
(24, 29)

**11.** What is the place value of the 5 in 356?
(3)

**12.** Joaquin works part-time at a deli. Each day Monday through
(28) Friday, Joaquin must report to work 30 minutes before noon. At
what time must Joaquin report to work on those days?

**13.** **Analyze** How much money is $\frac{1}{2}$ of a dollar plus $\frac{3}{4}$ of a dollar plus $\frac{3}{10}$ of
(Inv. 2) a dollar?

**14.** What is the product of thirty-eight and forty?
(5, 29)

**15.** Use words to name the number 944,000.
(7)

**16.**
(6)

$$4637$$
$$2843$$
$$+\ 6464$$

**17.**
(9)

$$4618$$
$$-\ 2728$$

**18.**
(13)

$$\$60.00$$
$$-\ \$\ 7.63$$

**19.** $364 \div 10$
(26)

**\*20.** $7w = 364$
(18)

**21.** $\dfrac{364}{7}$
(26)

**\*22.** (Verify) Think of a whole number. Multiply it by 2. Now add 1. Is the
(2, 15) final answer odd or even?

**23.** According to this calendar, what was the date of the
(28) third Sunday in May 1957?

| MAY 1957 | | | | | | |
|---|---|---|---|---|---|---|
| S | M | T | W | T | F | S |
| | | | 1 | 2 | 3 | 4 |
| 5 | 6 | 7 | 8 | 9 | 10 | 11 |
| 12 | 13 | 14 | 15 | 16 | 17 | 18 |
| 19 | 20 | 21 | 22 | 23 | 24 | 25 |
| 26 | 27 | 28 | 29 | 30 | 31 | |

**24. Multiple Choice** The number 356 is between which pair of numbers?
(4)
    **A** 340 and 350    **B** 350 and 360    **C** 360 and 370    **D** 370 and 380

**25.** (Conclude) What are the next three terms in this counting sequence?
(1)
$$\ldots, 600, 700, 800, \underline{\hspace{1em}}, \underline{\hspace{1em}}, \underline{\hspace{1em}}, \ldots$$

**\*26. a. Multiple Choice** Which of these numbers has both 2 and 5 as
(25) factors?

    **A** 205        **B** 502        **C** 250        **D** 202

  **b.** (Verify) Explain your thinking.

**27.** Show how to check this division answer. Is the answer
(26) correct?

$$7\overline{)300} \quad 43 \text{ R } 1$$

**28. a.** Compare: $12 - (6 - 2)\ \bigcirc\ (12 - 6) - 2$
(24)

  **b.** Does the Associative Property apply to subtraction?

**\*29.** Five tenths of a circle equals what decimal part of a circle?
(Inv. 2)

**30.** The cost of a 28-ounce jar of peanut butter at various stores is shown
(4, 13)  in this table:

**The Cost of Peanut Butter**
**(28 oz)**

| Type of Store | Cost |
| --- | --- |
| Convenience | $5.89 |
| Supermarket | $4.19 |
| Neighborhood | $5.49 |
| Grocery | $4.35 |

**a.** Order the costs from greatest to least.

**b.** Which two stores have a cost difference of $1.30?

**Early Finishers**

*Real-World Connection*

Eva had 30 rolls of dimes. Each roll has fifty dimes. How many dimes does Eva have? What is the value of the 30 rolls of dimes? Show how you solved the problem.

# • Interpreting Pictures of Fractions, Decimals, and Percents

## Power Up

**facts**          Power Up D or E

**count aloud**    Count by 12s from 12 to 72.

**mental math**
a. **Time:** How many months are in two years? … three years? … four years?

b. **Time:** What time is 14 minutes after 3:10 p.m.?

c. **Number Sense:** $35 + 47$

d. **Number Sense:** $370 + 50$

e. **Measurement:** One yard is 36 inches. How many inches is 4 yards?

f. **Measurement:** One foot is 12 inches. How many inches is $\frac{1}{2}$ of a foot?

g. **Measurement:** How many inches is $\frac{1}{4}$ of a foot?

h. **Number Sense:** $4 \times 7, -1, \div 3, + 1, \times 10$

**problem solving**
Choose an appropriate problem-solving strategy to solve this problem. Marquise flipped a coin three times. It landed heads up twice and tails up once, but not necessarily in that order. List the possible orders of the three coin flips.

## New Concept

**Thinking Skill**

**Discuss**

How can we check the answer?

A picture can help us understand the meaning of a fraction. This circle is divided into six equal parts. One of the parts is shaded. So $\frac{1}{6}$ of the circle is shaded.
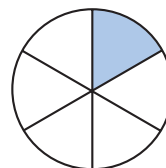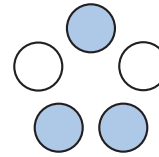
Five of the six parts are not shaded. So $\frac{5}{6}$ of the circle is not shaded.

**Example 1**

**What fraction of this group of circles is shaded?**

We see a group of five circles. Three of the five circles are shaded. So $\frac{3}{5}$ of the group is shaded.

**Example 2**

**What fraction of this circle is *not* shaded? What decimal part *is* shaded?**

The circle is divided into four equal parts. One part is shaded and three parts are not shaded. The fraction that is not shaded is $\frac{3}{4}$.

One fourth is shaded. Our fraction manipulatives show that $\frac{1}{4}$ is **0.25** as a decimal. This number is reasonable because $\frac{1}{4}$ of a dollar is a quarter, which is 0.25 of a dollar.
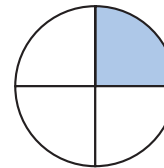
Fractions and **percents** are two ways to describe parts of a whole. A whole is 100 percent, which we abbreviate as 100%. So half of a whole is half of 100%, which is 50%.

All of this rectangle is shaded.          Half of this rectangle is shaded.

100% of this rectangle is shaded.          50% of this rectangle is shaded.

Thinking about cents as part of a dollar can help us understand decimals and percents. Just as one cent is one hundredth of a whole dollar (0.01), one percent is one hundredth of a whole.

$\frac{1}{2}$ of a dollar is $0.50.          $\frac{1}{4}$ of a dollar is $0.25.          $\frac{1}{10}$ of a dollar is $0.10.

$\frac{1}{2}$ of a dollar is 50¢.          $\frac{1}{4}$ of a dollar is 25¢.          $\frac{1}{10}$ of a dollar is 10¢.

$\frac{1}{2}$ of a whole is 50%.          $\frac{1}{4}$ of a whole is 25%.          $\frac{1}{10}$ of a whole is 10%.

## Example 3

**What percent of this square is shaded?**
**What decimal part is shaded?**

One half of the square is shaded. The whole square is 100%, so one half of the square is **50%.** When we think of money, we think of $\frac{1}{2}$ of a dollar as $0.50. We can apply how we think of money to the square above: **0.50** (fifty hundredths) of the square is shaded. Our fraction manipulatives show us that $\frac{1}{2}$ equals 0.5 (five tenths). Both 0.50 and 0.5 name the shaded part because 50 hundredths is equivalent to 5 tenths.
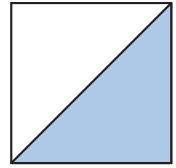
## Example 4

**Three quarters plus a dime is what percent of a dollar?**

Three quarters plus a dime is 85¢, which is 85 hundredths of a dollar. This amount is **85%** of one dollar.

**Lesson Practice**  Refer to the shapes to answer problems **a–i.**

  **a.** What fraction of the triangle is shaded?

  **b.** What percent of the triangle is shaded?

  **c.** What decimal part of the triangle is shaded?

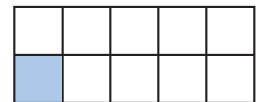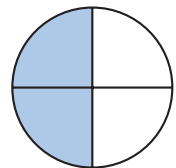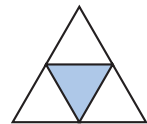  **d.** What are two fractions that name the shaded part of this circle?

  **e.** What percent of the circle is shaded?

  **f.** What decimal part of the circle is shaded?

  **g.** What fraction of this rectangle is shaded?

  **h.** What percent of the rectangle is shaded?

  **i.** What decimal part of the rectangle is shaded?

In the tables below, find the percent of a dollar represented by the number of coins stated and write the value as a decimal number.

| Number of Quarters | Percent of a Dollar | Value |
|---|---|---|
| 4 quarters | j. | |
| 3 quarters | k. | |
| 2 quarters | l. | |
| 1 quarter | m. | |

| Number of Dimes | Percent of a Dollar | Value |
|---|---|---|
| 10 dimes | n. | |
| 9 dimes | o. | |
| 8 dimes | p. | |
| 7 dimes | q. | |
| 6 dimes | r. | |
| 5 dimes | s. | |
| 4 dimes | t. | |
| 3 dimes | u. | |
| 2 dimes | v. | |
| 1 dime | w. | |

## Written Practice

*Distributed and Integrated*

**Formulate** For problems **1–4,** write an equation and find the answer.

**1.** On a 100-point math quiz, 36 points can be earned by correctly completing division problems. How many points can be earned by completing other kinds of problems?
(16)

**\*2.** The first month of the year is January, which has 31 days. After January, how many days are left in a common year?
(16, 28)

**3.** Each quart of juice could fill 4 cups. How many quarts of juice were needed to fill 28 cups?
(21)

**4.** Lorena used five $0.45 stamps to mail the heavy envelope. What was the total value of the stamps on the envelope?
(21)

**\*5.** **Represent** Draw two vertical lines that stay the same distance apart.
(12)

**6.** Which factors of 25 are also factors of 50?
(25)

**7. a.** What fraction of this triangle is shaded?
<sub>(30)</sub>

   **b.** What fraction of the triangle is not shaded?
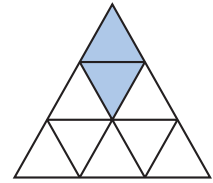
**8.** What number is the denominator in the fraction $\frac{2}{3}$?
<sub>(20)</sub>

**\*9.** Write the time that is a quarter to eight in the morning.
<sub>(28)</sub>

**10.**
<sub>(13, 14)</sub>
$$\begin{array}{r} w \\ -\ \$19.46 \\ \hline \$28.93 \end{array}$$

**11.**
<sub>(9)</sub>
$$\begin{array}{r} 3010 \\ -\ 1342 \\ \hline \end{array}$$

**12.**
<sub>(6)</sub>
$$\begin{array}{r} 28 \\ 54 \\ 75 \\ 91 \\ +\ 26 \\ \hline \end{array}$$

**13.**
<sub>(29)</sub>
$$\begin{array}{r} 764 \\ \times\ \ \ 30 \\ \hline \end{array}$$

**14.**
<sub>(29)</sub>
$$\begin{array}{r} \$9.08 \\ \times\ \ \ \ \ 60 \\ \hline \end{array}$$

**15.** $6\overline{)\$7.44}$
<sub>(26)</sub>

**16.** $362 \div 10$
<sub>(22)</sub>

**17.** $4\overline{)898}$
<sub>(26)</sub>

**18.** $\$42.37 + \$7.58 + \$0.68 + \$15$
<sub>(13)</sub>

**19.** $(48 \times 6) - 9$
<sub>(24)</sub>

**20.** $6 \times 30 \times 12$
<sub>(18)</sub>

**21.** From February 1 to September 1 is how many months?
<sub>(28)</sub>

**22.** What is the sum of six hundred five and five hundred ninety-seven?
<sub>(5, 6)</sub>

**23. Multiple Choice** Which of these numbers is between 360 and
<sub>(4)</sub>
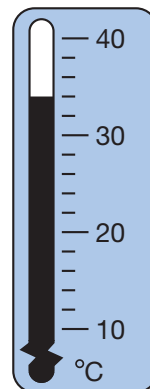370?

   **A** 356      **B** 367      **C** 373      **D** 381

**24.** (**Conclude**) What are the next three terms in this counting sequence?
<sub>(1)</sub>

$$\ldots, 250, 260, 270, 280, \underline{\phantom{00}}, \underline{\phantom{00}}, \underline{\phantom{00}}, \ldots$$

**\* 25.** The high temperature one summer day in Madrid,
(27)   Spain is shown on the thermometer. What was the high
       temperature that day?

**26.** What year came one decade after the Louisiana Purchase treaty was
(28)   signed in 1803?

**\* 27.** Two quarters is what
(30)
    **a.** decimal part of a dollar?

    **b.** percent of a dollar?

**28.** ( **Justify** )  Show how to check this division answer. Is the answer
(26)   correct?

$$100 \div 7 = 14 \text{ R } 2$$

**29.** ( **Explain** )  Compare. Explain how you can answer the comparison
(4, 26)  without dividing.

$$100 \div 4 \bigcirc 100 \div 5$$

**30.** ( **Formulate** )  Write a word problem to represent the equation $2n = 20$.
(Inv. 1)  Then solve the equation.

**Early Finishers**

*Real-World Connection*

Rosa volunteers at a community garden in Washington, D.C. The
garden is divided into ten equal parts. Five of the parts are sections
for vegetables, two of the parts are sections for berries, and three
of the parts are sections for flowers. Draw a diagram of the garden
showing the ten equal parts. Mark sections to show the different types
of items planted in the garden. Inside each section, write the amount
of space that the section occupies as a fraction, as a decimal, and as
a percent.

*Focus on*
# • Fractions: Thirds, Fifths, and Eighths

Recall from Investigation 2 that we can use fractions to describe part of a group.

**Example**

Visit www. SaxonMath.com/ Int5Activities for a calculator activity.

**One third of the 24 students participated in the spelling bee. How many students participated in the spelling bee?**

We see the word "third," so we divide the group of students into three equal parts. The number in one part represents the number of students who participated since one third equals one part.

$$3\overline{)24}\phantom{}^{\textstyle 8}$$

We find that **8 students** participated in the spelling bee.

Use this information to answer problems **1–8:**

> *Students were given two hours to finish a 120-question survey. One third of the questions on the survey were true/false. One fifth of the questions were fill-in-the-blank. One eighth of the questions were short answer. The rest of the questions were multiple choice. Stephanie answered half of the questions in the first hour.*

1. How many questions did Stephanie answer in the first hour?

2. How many questions were true/false?

3. How many questions were fill-in-the-blank?

4. How many questions were short answer?

5. How many questions were multiple choice?

6. Did the multiple-choice questions make up more than or less than $\frac{1}{3}$ of the questions on the test?

7. **Explain** Together, did the true/false and fill-in-the-blank questions make up more than or less than half of the survey? How do you know?

8. **Explain** Together, did the true/false and short-answer questions make up more than or less than half of the survey? How do you know?

## Activity

### *Using Fraction Manipulatives*

Materials needed:
- fraction manipulatives from Investigation 2 **(Lesson Activities 24, 25,** and **26)**
- fraction manipulatives from **Lesson Activities 27, 28,** and **29**
- scissors

**Model** Use all your fraction manipulatives (halves, thirds, fourths, fifths, eighths, and tenths) to complete problems **9–17.**

**9.** Show that four eighths equals one half.

**10.** Show that a fifth equals two tenths.

**11.** How many eighths equal a fourth?

**12.** Is two fifths more or less than one half?

**13.** Two fifths of a circle is what decimal part of a circle?

**14.** Three fifths of a circle is what decimal part of a circle?

**15.** Four eighths of a circle is what decimal part of a circle?

**16.** Can you make half of a circle using only thirds?

**17.** Can you make half of a circle using only fifths?

**18.** **Explain** If you had fraction pieces for sevenths, do you think you could make half a circle using only sevenths? Why or why not?

**19.** **Analyze** Sarah has a half circle, a quarter circle, and an eighth of a circle. How much more does she need to have a whole circle?

**20.** What single fraction piece equals $\frac{2}{8}$?

**21.** **Explain** If you had one half of a circle made from eighths, could you take away three eighths? Explain why or why not.

**22.** What fraction is $\frac{1}{2}$ of $\frac{1}{2}$?

**23.** What fraction is $\frac{1}{2}$ of $\frac{1}{4}$?

**24.** What fraction is $\frac{1}{2}$ of $\frac{1}{5}$?

**25.** What fraction do you suppose is $\frac{1}{2}$ of $\frac{1}{3}$?

**Model** Use your fraction manipulatives to illustrate these additions and subtractions. Write a complete equation for each.

**26.** $\dfrac{1}{5} + \dfrac{2}{5}$

**27.** $\dfrac{3}{8} + \dfrac{5}{8}$

**28.** $\dfrac{2}{3} - \dfrac{1}{3}$

**29.** $\dfrac{5}{8} - \dfrac{2}{8}$

Compare. Use your fraction manipulatives to solve problems **30–33.**

**30.** $\dfrac{1}{8} + \dfrac{1}{5} \bigcirc \dfrac{1}{2}$

**31.** $\dfrac{1}{8} + \dfrac{1}{8} \bigcirc \dfrac{1}{2}$

**32.** $\dfrac{1}{3} + \dfrac{1}{3} \bigcirc \dfrac{1}{2}$

**33.** $\dfrac{1}{3} + \dfrac{1}{3} + \dfrac{1}{5} + \dfrac{1}{8} \bigcirc 1$

**34.** Arrange these fractions in order from least to greatest:

$$\dfrac{1}{2},\ \dfrac{1}{8},\ \dfrac{1}{5},\ \dfrac{1}{3},\ \dfrac{1}{10},\ \dfrac{1}{4}$$

**35.** Arrange these decimals in order from least to greatest:

$$0.3,\ 0.125,\ 0.10,\ 0.50,\ 0.25,\ 0.20$$

Refer to your manipulatives to answer these questions about percents.

**36.** One third of a circle is what percent of a circle?

**37.** Three fifths of a circle is what percent of a circle?

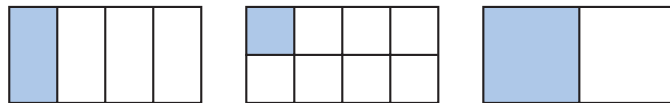**38.** Four eighths of a circle is what percent of a circle?
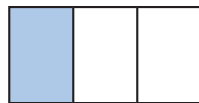
Compare:

**39.** $\dfrac{2}{3} \bigcirc 50\%$

**40.** $\dfrac{2}{5} \bigcirc 50\%$

**Investigate Further**

These figures were sorted into a group by a common characteristic:



This figure does not belong in the group:



Draw a figure that belongs in the group. Explain how you found your answer and why it is reasonable.