

• Word Problems About a Fraction of a Group

Power Up

facts

Power Up F

mental math

- Money:** What coin has a value of 50% of 50¢?
- Number Sense:** $\frac{5}{10} + \frac{2}{10}$
- Number Sense:** $\frac{5}{10} - \frac{2}{10}$
- Number Sense:** An ant has 6 legs. Altogether, how many legs do 82 ants have? (*Think:* 6×82 .)
- Money:** One bag of apple chips costs 75¢. Ten bags of apple chips cost how much?
- Fractional Parts:** $\frac{1}{2}$ of 51
- Percent:** What is 25% of 24 hours?
- Calculation:** $10 \times 10, \div 2, - 1, \div 7, - 1, \div 3, - 2$

problem solving

Choose an appropriate problem-solving strategy to solve this problem. Renee counted boats on the lake. One half of the boats were sailboats. Four of the boats were rowboats. The remaining boats were motorboats. If there were 12 boats altogether, how many boats were motorboats?

New Concept

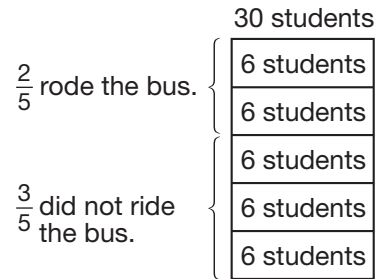
One type of “equal groups” problem is “fraction-of-a-group.” These problems take two steps to answer. Here is an example of a fraction-of-a-group problem:

This morning $\frac{2}{5}$ of Mrs. Raj’s 30 students rode the bus to school. How many students rode the bus?

Reading Math

We can use fractions in many ways. For example, we can use fractions to name part of a whole, part of a group or number, or part of a distance.

Making a diagram for a fraction problem can help us understand the problem. We draw a rectangle to stand for the whole group of 30 students. The denominator of the fraction in the problem is five, so we divide the rectangle into fifths. Dividing 30 by 5, we find that there are 6 students in each fifth. We label the two fifths $A\frac{2}{5}B$ that rode the bus. The rest $A\frac{3}{5}B$ did not ride the bus.



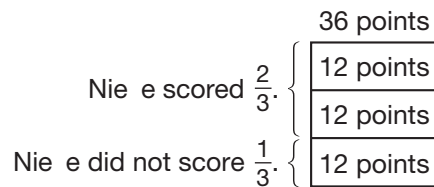
We count the number of students in two fifths of the whole and find that 12 students rode the bus.

Verify We can check the answer by adding the fractions. What is $\frac{2}{5} + \frac{3}{5}$?

Example 1

Nieve scored $\frac{2}{3}$ of her team's 36 points. How many points did she score?

We draw a rectangle to stand for the team's 36 points. The denominator of the fraction in the problem is 3, so we divide the rectangle into thirds. One third of 36 is 12. We write "12 points" in each third of the rectangle. Since Nieve scored *two* thirds of the points, she scored 12 plus 12 points, or **24 points**.

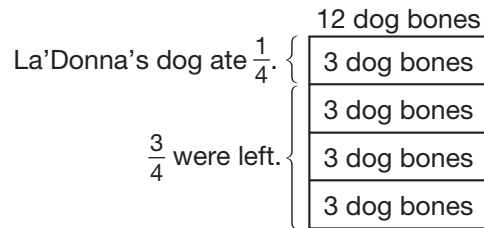


Justify Explain why the answer is correct.

Example 2

La'Donna's dog ate $\frac{1}{4}$ of a dozen dog bones. How many dog bones were left?

We draw a rectangle to stand for all 12 dog bones. We divide the rectangle into fourths. One fourth of 12 is 3, so we write "3 dog bones" in each of the four equal parts.

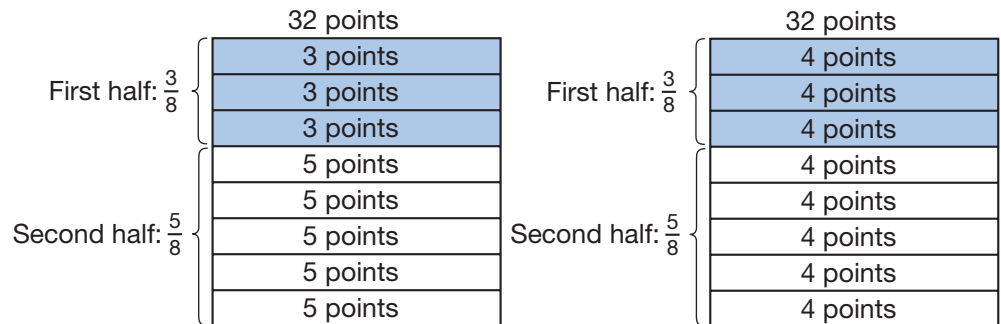


La'Donna's dog ate 3 of the dog bones, so **9 dog bones** were left.

Justify Explain why the answer is correct.

Example 3

A fifth grade basketball team scored 32 points in their first game of the season. The team scored $\frac{5}{8}$ of those points in the second half of the game. Which diagram shows the number of points the team scored in the first half of the game?



Dividing 32 points into 8 equal parts means there are 4 points in each part. Since $\frac{5}{8}$ of the points were scored in the second half, we know that $\frac{3}{8}$ were scored in the first half. The **diagram on the right** matches the given information.

Lesson

Represent Illustrate and solve fraction problems **a–c**.

- Two fifths of the 30 students in the class played in the band. How many students played in the band?
- Susan practiced playing the trumpet for $\frac{3}{4}$ of an hour. For how many minutes did Susan practice playing the trumpet?
- Three fifths of the 30 students were girls. How many boys were there?

Written Practice

Distributed and Integrated

- Walking at a steady rate, Ebony walked 11 miles in 3 hours. Write a mixed number that shows how many miles she walked each hour.

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

*2. The theater had 625 seats. If 139 seats were empty, how many seats were filled?
(16)

3. This line segment is 4 centimeters long. How many millimeters long is it?
(44)



4. Seven thousand passengers arrived on 8 ships. If each ship carried an equal number of passengers, how many passengers were on each ship?
(21)

5. What year was two centuries before 1976?
(28, 35)

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

Nguyet was voted “Most Valuable Player” for scoring $\frac{2}{3}$ of her team’s 48 points. How many points did Nguyet score?

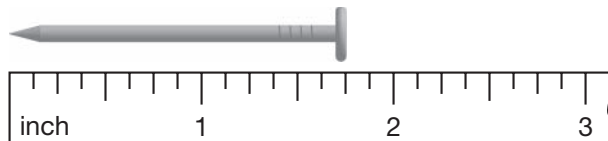
7. Compare: $\frac{1}{4}$ of 60 \bigcirc $\frac{1}{3}$ of 60
(30)

8. Round 256 to the nearest hundred.
(33)

*9. **Represent** Draw a rectangle. Shade all but two fifths of it. What percent of the rectangle is not shaded?
(30)

10. A late movie on television ended at 3 minutes before midnight. At what time did the movie end?
(28)

11. How many inches long is this nail?
(44)



12. $3\frac{3}{7} + 2 + \frac{2}{7}$
(43)

13. $2\frac{2}{5} - 1$
(43)

14. $3\frac{2}{3} - \frac{1}{3}$
(43)

15. $6\frac{5}{12} - \left(4 + 1\frac{4}{12}\right)$
(41, 43)

16. $1396 + 727 + 854 + 4685$
(6)

17. $\$20 - (\$15.37 - \$12)$
(13, 24)

18. $97 + w = 512$
(10)

19. 938×800
(29)

20. $54 \times 7 \times 60$
(18, 29)

21. $9n = 5445$
(26, 34)

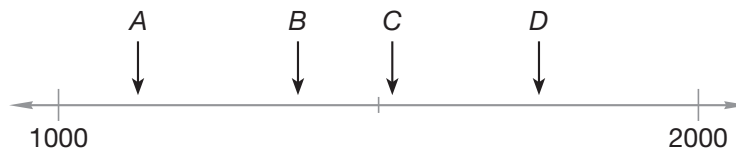
22. $3205 \div 10$
(34)

23. $4826 + 4826 + 4826 + 4826$
(13, 17)

24. A whole circle is divided into fifths. Each fifth is what percent of the whole circle?
(43)



* 25. **Connect** Which arrow could be pointing to 1375 on the number line below?
(12, 27)



26. A recipe to make 48 bran muffins requires 3 cups of bran. Gianna would like to halve the recipe and make only 24 muffins. Which quotient below represents the amount of bran Gianna should use to make 24 muffins?
(40, 43)

$$\begin{array}{r} 1 \text{ R } 1 \\ 2 \overline{)3} \\ \underline{-2} \\ 1 \end{array} \qquad \begin{array}{r} 1\frac{1}{2} \\ 2 \overline{)3} \\ \underline{-2} \\ 1 \end{array}$$

27. The word *rectangle* comes from the Latin terms for “right corner.” In what way is a rectangle a “right corner” polygon?
(32, 45)



28. **Multiple Choice** Which of these numbers is divisible by both 2 and 9?
(22, 42)

- A 234 B 456 C 567 D 245

* 29. Some caterpillars are $1\frac{3}{4}$ inches long. Is $1\frac{3}{4}$ inches closer to 1 inch or 2 inches?
(44)

* 30. **Estimate** Lake Superior is 350 miles long. Lake Huron is 206 miles long. What is a reasonable estimate of how much longer Lake Superior is than Lake Huron? Explain your answer.
(33)