Some proportions require more algebra to solve.

IPLE B | Solve $\frac{306}{24} = \frac{x+50}{20}$.

olution

$\frac{306}{24} = \frac{x+50}{20}$ Original proportion.

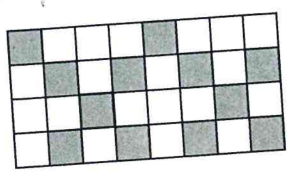
$20 \cdot \frac{306}{24} = x + 50$ Multiply both sides by 20.

$255 = x + 50$ Multiply and divide on the left side.

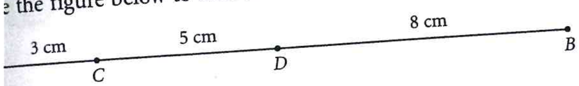
$205 = x$ Subtract 50 from both sides.

RCISES

k at the rectangle at right. Find the ratio of the shaded area to area of the whole figure. Find the ratio of the shaded area to unshaded area. $\frac{3}{8}, \frac{3}{5}$

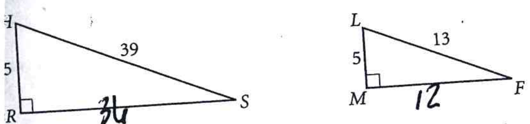


e the figure below to find these ratios: $\frac{AC}{CD}$, $\frac{CD}{BD}$, and $\frac{BD}{BC}$. $\frac{AC}{CD} = \frac{3}{5}, \frac{CD}{BD} = \frac{5}{8}, \frac{BD}{BC} = \frac{8}{13}$



Warm-up 1-9
a11-10

onsider these triangles.



36
12

15
36
39
90

30

14) $\frac{10\frac{1}{2}}{4} = \frac{x}{12}$
$x = 31.8$ mi

a. Find the ratio of the perimeter of $\triangle RSH$ to the perimeter of $\triangle MFL$. $\frac{3}{1}$

b. Find the ratio of the area of $\triangle RSH$ to the area of $\triangle MFL$. $\frac{9}{1}$

15) $\frac{34}{152} = \frac{x}{9}$
$x = 2.01$

xercises 4–12, solve the proportion.

$\frac{7}{21} = \frac{a}{18}$ $a = 6$

5. $\frac{10}{b} = \frac{15}{24}$ $b = 16$

6. $\frac{20}{13} = \frac{60}{c}$ $c = 39$

$\frac{4}{5} = \frac{x}{7}$ $x = 5.6$

8. $\frac{2}{y} = \frac{y}{32}$ $y = \pm 8$

9. $\frac{14}{10} = \frac{x+9}{15}$ $x = 12$

$\frac{10}{10+z} = \frac{35}{56}$ $z = 6$

11. $\frac{d}{5} = \frac{d+3}{20}$ $d = 1$

12. $\frac{y}{y+2} = \frac{15}{21}$ $y = 5$

17) $\frac{8+10+13+[illegible]}{x} = \frac{170}{130}$

x = 80

. Solve this proportion for x. Assume $c \neq 0$ and $z \neq 0$.

$\frac{x}{c} = \frac{b}{z}$ $x = \frac{bc}{z}$

STANDARDS

ENT	PROCESS
Number	✔ Problem Solving
Algebra	Reasoning
Geometry	Communication
Measurement	✔ Connections
Data/Probability	✔ Representation

LESSON OBJECTIVES

- Learn or review the meanings of *ratio* and *proportion*
- Practice solving proportions
- Use ratios and proportions to solve word problems
- Develop reading comprehension, problem-solving skills, and cooperative behavior

Cross multiplication is often learned as a rote skill with little understanding; press these students to explain their reasoning, and encourage them to separate the steps until they can justify the shortcut.

▸ EXAMPLE B

Ask students to solve the proportion before reading the solution in their books. You can then begin to assess their algebra skills. For example, students might mistakenly reduce the 50 and 20, changing the right side to $\frac{x+5}{2}$. Others might first reasonably reduce $\frac{306}{24}$ to $\frac{51}{4}$.

SHARING IDEAS

As students present their ideas, repeatedly emphasize the variety of ways in which proportions can be solved. One reason why some students panic during standardized mathematics tests is that they can't remember "the right way" to solve a familiar-looking problem.

You might want to have students work on the exercises and present some of the solutions before closing the lesson.

Assessing Progress

You can assess students' intuition about and ability to work with ratios and proportions.

Closing the Lesson

A **proportion** is a statement of the equality of two **ratios.** Variables representing unknown quantities may be involved. You can find values of those variables in various ways, often including multiplying both sides of the equation by denominators.

BUILDING UNDERSTANDING

You might supplement the exercises with some based on exercises students will encounter later in studying similarity.