

LESSON
5-1 Problem Solving
Ratios and Proportions

A medicine for dogs indicates that the medicine should be administered in the ratio 0.5 tsp per 5 lb, based on the weight of the dog. Write the correct answer.

1. Jaime has a 60 lb dog. She plans to give the dog 12 teaspoons of medicine. Is she administering the medicine correctly?

2. Jaime also has a 15 lb puppy. She plans to give the puppy 1.5 teaspoons of medicine. Is she administering the medicine correctly?

Sports statistics can be given as ratios. Find the ratios for the given statistics. Reduce each ratio.

3. In 69 games, Darrel Armstrong of the Orlando Magic had 136 steals and 144 turnovers. What is his steals per turnover ratio?

4. In 69 games, Ben Wallace of the Detroit Pistons blocked 234 shots. What is his blocks per game ratio?

Choose the letter for the best answer.

5. There are 675 students and 30 teachers in the middle school. What is the ratio of teachers to students?
A $\frac{45}{2}$ **C** $\frac{1}{27}$
B $\frac{2}{45}$ **D** $\frac{27}{1}$
6. In a science experiment, out of a sample of seeds, 13 sprouted and 7 didn't. What is the ratio of seeds that sprouted to the number of seeds planted?
F $\frac{13}{7}$ **H** $\frac{13}{20}$
G $\frac{7}{13}$ **J** $\frac{7}{20}$
7. Many Internet services advertise their customer to modem ratio. One company advertises a 10 to 1 customer to modem ratio. Find a ratio that is equivalent to $\frac{10}{1}$.
A $\frac{40}{4}$ **C** $\frac{400}{4}$
B $\frac{2}{20}$ **D** $\frac{50}{10}$
8. A molecule of sulfuric acid contains 2 atoms of hydrogen to every 4 atoms of oxygen. Which combination of hydrogen and oxygen atoms could be sulfuric acid?
F 4 atoms of hydrogen and 6 atoms of oxygen
G 6 atoms of hydrogen and 10 atoms of oxygen
H 6 atoms of hydrogen and 12 atoms of oxygen
J 16 atoms of hydrogen and 8 atoms of oxygen

LESSON 5-1 Challenge

Mixing It Up

In a proportion, there are 4 terms.

The 1st and 4th are called **extremes**. $\frac{1\text{st (extreme)}}{2\text{nd (mean)}} = \frac{3\text{rd (mean)}}{4\text{th (extreme)}}$
The 2nd and 3rd are called **means**.

In the following exercises, you will explore some properties of proportions.

1. Explain why the ratios $\frac{6}{9}$ and $\frac{8}{12}$ are in proportion.

Both ratios are equivalent to $\frac{2}{3}$.

2. a. Rewrite the proportion $\frac{6}{9} = \frac{8}{12}$ by interchanging the means and extremes. Determine if the resulting statement is a proportion. Explain.

$\frac{9}{6} = \frac{12}{8}$; yes, since each ratio is equivalent to $\frac{3}{2}$

- b. Generalize these results by completing this statement:
If $\frac{a}{b} = \frac{c}{d}$, then it is also true that:

$$\frac{b}{a} = \frac{d}{c}$$

3. a. Consider changing each ratio of the proportion $\frac{6}{9} = \frac{8}{12}$ by addition. Determine if the ratios $\frac{6+9}{9}$ and $\frac{8+12}{12}$ are in proportion. Explain.

yes; each ratio is equivalent to $\frac{5}{3}$

- b. Generalize these results by completing this statement:
If $\frac{a}{b} = \frac{c}{d}$, then it is also true that:

$$\frac{a+b}{b} = \frac{c+d}{d}$$

- c. Determine if the ratios $\frac{6-9}{9}$ and $\frac{8-12}{12}$ are in proportion. Explain.

yes; each ratio is equivalent to $-\frac{1}{3}$

- d. Generalize these results. If $\frac{a}{b} = \frac{c}{d}$, then it is also true that:

$$\frac{a-b}{b} = \frac{c-d}{d}$$

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1. Jaime has a 60 lb dog. She plans to give the dog 12 teaspoons of medicine. Is she administering the medicine correctly?
no
2. Jaime also has a 15 lb puppy. She plans to give the puppy 1.5 teaspoons of medicine. Is she administering the medicine correctly?
yes

Sports statistics can be given as ratios. Find the ratios for the given statistics. Reduce each ratio.

3. In 69 games, Darrel Armstrong of the Orlando Magic had 136 steals and 144 turnovers. What is his steals per turnover ratio?

$$\frac{17}{18}$$

4. In 69 games, Ben Wallace of the Detroit Pistons blocked 234 shots. What is his blocks per game ratio?

$$\frac{78}{23}$$

Choose the letter for the best answer.

5. There are 675 students and 30 teachers in the middle school. What is the ratio of teachers to students?

A $\frac{45}{2}$

C $\frac{1}{27}$

B $\frac{2}{45}$

D $\frac{27}{1}$

6. In a science experiment, out of a sample of seeds, 13 sprouted and 7 didn't. What is the ratio of seeds that sprouted to the number of seeds planted?

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7. Many Internet services advertise their customer to modem ratio. One company advertises a 10 to 1 customer to modem ratio. Find a ratio that is equivalent to $\frac{10}{1}$.

A $\frac{40}{4}$

C $\frac{400}{4}$

B $\frac{2}{20}$

D $\frac{50}{10}$

8. A molecule of sulfuric acid contains 2 atoms of hydrogen to every 4 atoms of oxygen. Which combination of hydrogen and oxygen atoms could be sulfuric acid?

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LESSON 5-1 Reading Strategies

Comparing Information

A **ratio** is a comparison between two quantities. In the rectangles below, you can compare shaded regions to unshaded regions.

2 of the 4 regions are shaded.

2 of the 4 regions are shaded.



The comparison can be shown in 3 ways:

2 to 4, 2:4, $\frac{2}{4}$

Ratios that are equal are called **equivalent ratios**.

$$\frac{2}{4} = \frac{1}{2}$$

$$\frac{4}{8} = \frac{1}{2}$$

Two-fourths and four-eighths are equivalent ratios. They are both equal to one-half.

Other equivalent ratios can be found by multiplying:

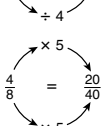
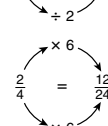
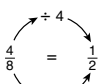
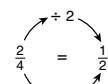
$$\frac{2}{4} = \frac{12}{24}$$

$$\frac{4}{8} = \frac{20}{40}$$

4 of the 8 regions are shaded.



4 to 8, 4:8, $\frac{4}{8}$



1. Write a ratio for the number of shaded triangles to unshaded triangles.

1 to 3, 1:3, or $\frac{1}{3}$

2. Write the same ratio two other ways.

1:3, 1 to 3, $\frac{1}{3}$

Find two ratios that are equivalent to the given ratio.

3. $\frac{4}{12}$ Possible answers: $\frac{1}{3}$, $\frac{12}{36}$

4. $\frac{3}{9}$ Possible answers: $\frac{1}{3}$, $\frac{9}{27}$

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LESSON 5-1 Puzzles, Twisters & Teasers

Testing Your Wit

Draw lines to match equivalent ratios. To solve the riddle, fill in the corresponding letters in the spaces below.

1. $\frac{12}{16}$ E
2. $\frac{16}{9}$ N
3. $\frac{2}{6}$ W
4. $\frac{16}{72}$ R
5. $\frac{4}{10}$ T
6. $\frac{21}{7}$ S
7. $\frac{6}{9}$ E
8. $\frac{5}{11}$ H
9. $\frac{65}{15}$ S
10. $\frac{7}{14}$ A

What's the hardest thing about taking tests?

$\frac{T}{1}$ $\frac{H}{2}$ $\frac{E}{8}$ $\frac{A}{4}$ $\frac{N}{5}$ $\frac{S}{10}$ $\frac{W}{7}$ $\frac{E}{3}$ $\frac{R}{9}$ $\frac{S}{6}$



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