

Topic 7

Equivalent Ratios

ratio

a relationship in which for every x units of one quantity there are y units of another quantity. The quantities x and y are the **terms of the ratio**.



You use ratios to make comparisons. The ratio of the number of circles to the number of squares can be written in three ways.

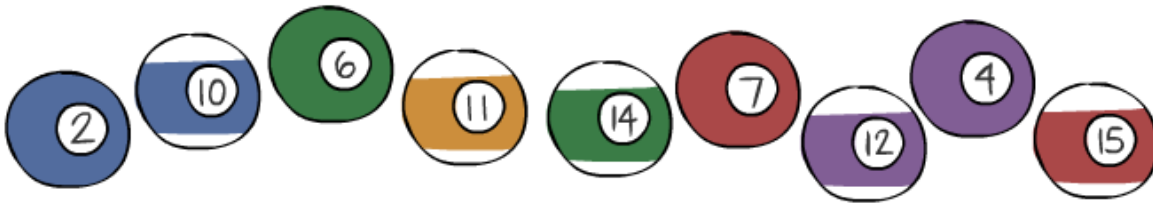
2 to 1

2 : 1

$\frac{2}{1}$

Example #1

Write each ratio in three ways.



a. the number of solid-colored balls to the number of striped balls

b. the number of even-numbered balls to the number of odd-numbered balls

Got It? #1

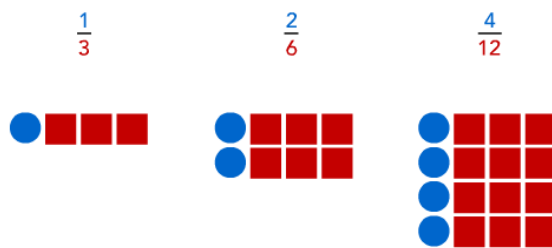
Write the ratio of the number of pins left standing to the number of pins knocked down in three different ways.

Equivalent ratios

ratios that express the same relationship.

How to find equivalent ratios

by multiplying or dividing each term of the ratio by the same nonzero number.



The ratios $\frac{1}{3}$, $\frac{2}{6}$, and $\frac{4}{12}$ are equivalent.

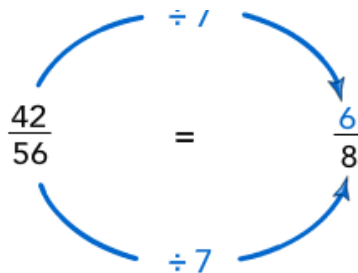
Example #2

You volunteer at an animal shelter and need to order supplies. You know that the ratio of kitten supplies to adult cat supplies for each category is equivalent. Complete the table.

The ratio $\frac{\text{number of bags of kitten food}}{\text{number of bags of adult cat food}}$ is equivalent

to the ratio $\frac{\text{number of bags of kitten treats}}{\text{number of bags of adult cat treats}}$.

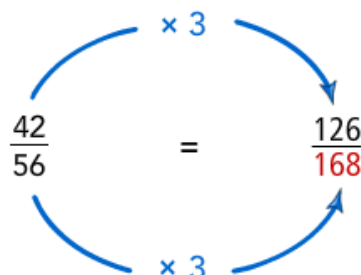
Find the ratio equivalent to $\frac{42}{56}$ with a denominator of 8.



The ratio $\frac{\text{number of cans of kitten food}}{\text{number of cans of adult cat food}}$ is equivalent

to the ratio $\frac{\text{number of bags of kitten treats}}{\text{number of bags of adult cat treats}}$.

Find the ratio equivalent to $\frac{42}{56}$ with a numerator of 126.



| SUPPLY | KITTEN | ADULT CAT |
|---------------|--------|-----------|
| Food (bags) | 6 | 8 |
| Treats (bags) | 42 | 56 |
| Food (cans) | 126 | |

| SUPPLY | KITTEN | ADULT CAT |
|---------------|--------|-----------|
| Food (bags) | 6 | 8 |
| Treats (bags) | 42 | 56 |
| Food (cans) | 126 | 168 |

Got It? #2

Find a ratio equivalent to $\frac{12}{15}$ with lesser terms.

Equivalent ratios have the same simplest form. To write a ratio in simplest form, first write it as a fraction. Then divide the numerator and the denominator by their greatest common factor (GCF).

When the two terms of a ratio have the same unit of measure, the units cancel out.

$$\frac{30 \text{ min}}{1 \text{ hr}} = \frac{30 \text{ min}}{60 \text{ min}} = \frac{\cancel{1} \text{ min}}{\cancel{2} \text{ min}} = \frac{1}{2}$$

1 hr = 60 mins.

The diagram illustrates the simplification of the ratio $\frac{30 \text{ min}}{1 \text{ hr}}$. A callout box states $1 \text{ hr} = 60 \text{ mins.}$ This is used to convert the denominator to minutes, resulting in $\frac{30 \text{ min}}{60 \text{ min}}$. Two blue curved arrows, each labeled $\div 30$, indicate that both the numerator and denominator are divided by 30. This leads to the simplified fraction $\frac{1 \text{ min}}{2 \text{ min}}$, where the units 'min' are crossed out. The final result is $\frac{1}{2}$.

Example #3

You make a banner 6 ft long to hang behind the desk at the animal shelter. Your friend makes a banner 6 yd long to hang on the outside of the building. Write the ratio of the length of your banner to the length of your friend's banner as a fraction in simplest form.

Method 1

Convert yards to feet.

$$\begin{aligned}\frac{6 \text{ ft}}{6 \text{ yd}} &= \frac{6 \text{ ft}}{6 \text{ yd} \times \frac{3 \text{ ft}}{1 \text{ yd}}} && \text{There are 3 feet in 1 yard.} \\ &= \frac{6 \text{ ft}}{18 \text{ ft}} \\ &= \frac{6 \text{ ft} \div 6}{18 \text{ ft} \div 6} && \text{Divide by the GCF.} \\ &= \frac{1 \text{ ft}}{3 \text{ ft}} \\ &= \frac{1}{3}\end{aligned}$$

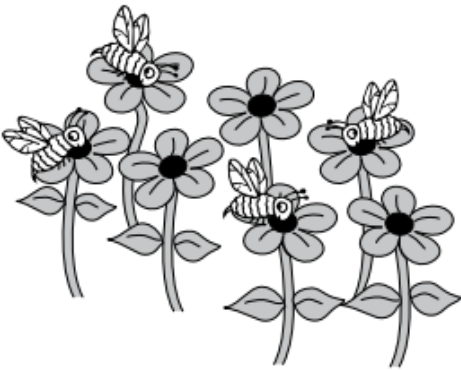
Got It? #3

- 1 A kitten weighs 12 oz. A puppy weighs 3 lb. Write the ratio of the kitten's weight to the puppy's weight as a fraction in simplest form.

PRACTICE

Do you know **HOW**?

1. Write the ratio of the number of bees to the number of flowers in three different ways.



2. Find a ratio equivalent to $\frac{63}{77}$ with lower terms.

3. A baby boy weighs 7 lb 8 oz. A five-year-old boy weighs 48 lb. Write the ratio of the baby's weight to the boy's weight as a fraction in simplest form.

Do you **UNDERSTAND**?

4. **Vocabulary** How can the terms of a ratio be used to write an equivalent ratio?

5. **Reasoning** Two students each write a ratio comparing the two shapes in the group. Can both students be correct? Explain.

$$\frac{6}{4} \qquad \frac{2}{3}$$

