
# Ratio and Rate

# Information

## Common core icons

This icon indicates a slide where the Standards for Mathematical Practice are being developed. Details of these are given in the Notes field.


Slides containing examples of mathematical modeling are marked with this stamp.

This icon indicates an opportunity for discussion or group work.

The **Standards for Mathematical Practice** outlined in the Common Core State Standards for Mathematics describe varieties of expertise that mathematics educators at all levels should seek to develop in their students.

These are:

**1) Make sense of problems and persevere in solving them.**

**2) Reason abstractly and quantitatively.**

**3) Construct viable arguments and critique the reasoning of others.**

**4) Model with mathematics.**

**5) Use appropriate tools strategically.**

**6) Attend to precision.**

**7) Look for and make use of structure.**

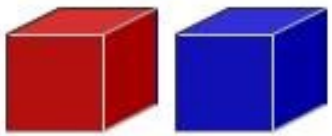
**8) Look for and express regularity in repeated reasoning.**

This icon indicates that the slide contains activities created in Flash. These activities are not editable.

This icon indicates teacher's notes in the Notes field.

# Stacking blocks

Press the blocks to add more blocks to the piles and see how the ratios change.



# Writing ratios

Ratios can be written in three different ways. For example, if there is 1 raccoon for every 4 trash cans, then the ratio of raccoons to trashcans can be written…

**as a fraction:** $\frac{1}{4}$

**with a colon:** 1:4

**or in words:** 1 to 4

**What do you notice about the order of the terms in each example?**

# Ratio

A **ratio** compares the sizes of parts or quantities to each other.

# Ratio vs. proportion

It is easy to confuse **ratio** with **proportion**.

**Ratio** compares the sizes of parts to each other.

**Proportion** compares the sizes of parts to the whole.

**What is the ratio of white rats to black rats?**

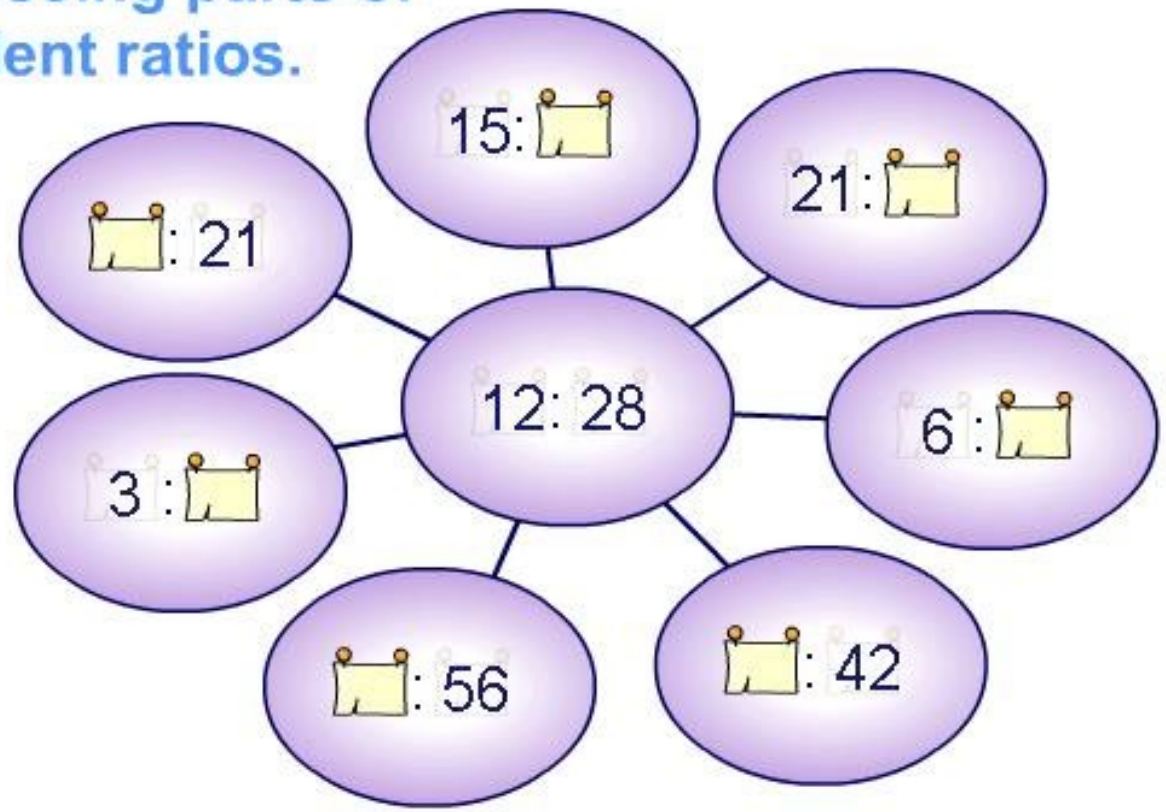
$\div 3$ $= 3 : 6$ $= 1 : 2$ $\div 3$

**What proportion of the rats are white?**

$$= \frac{3}{9} = \frac{1}{3}$$

# Equivalent ratio diagrams

Figure out the missing parts of these equivalent ratios.




2-part ratios

3-part ratios

# Simplifying ratios with units

## How can we simplify the ratio 90¢ to $3?

Be careful! When a ratio is expressed in different units, we must write the ratio in the same units before simplifying.

## How many cents are in $3?

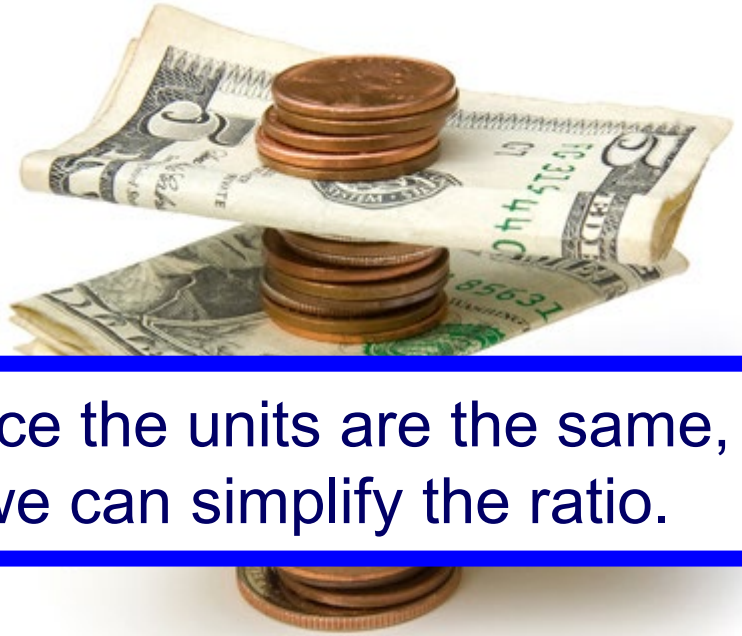
$3 = 300¢

So the ratio is 90¢ to 300¢.

90 to 300

÷ 30 ÷ 30

= 3 to 10



Once the units are the same, we can simplify the ratio.

# Simplifying ratios with units

**How can we simplify the ratio 1 hour : 30 minutes : 2,700 seconds?**

First, write the ratio using the same units. In this example, it is easiest to convert all three parts of the ratio into minutes.

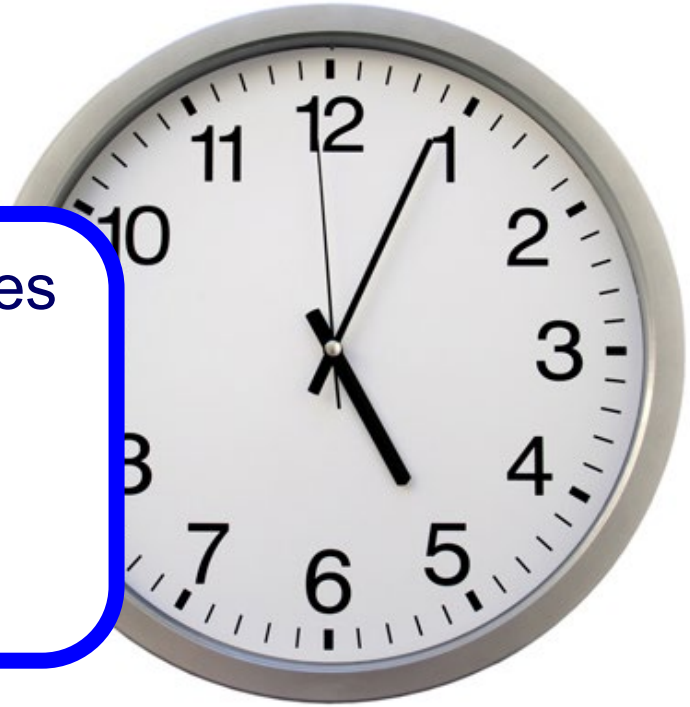
**How can we convert hours and seconds into minutes?**

60 minutes : 30 minutes : 45 minutes

60 : 30 : 45

÷ 15 ÷ 15 ÷ 15

= 4 : 2 : 3



# Brain stretch

Do you understand ratios?
Challenge yourself with these tricky ratio problems!

Press **start** to begin.

start

# Rate

Rate is used to describe measurements like miles per hour, words per minute or dollars per pound.

**Based on this, can you suggest a definition for rate?**

**Rate** is used to compare quantities that have different units.

Imagine that a car drives 93 miles in 3 hours.

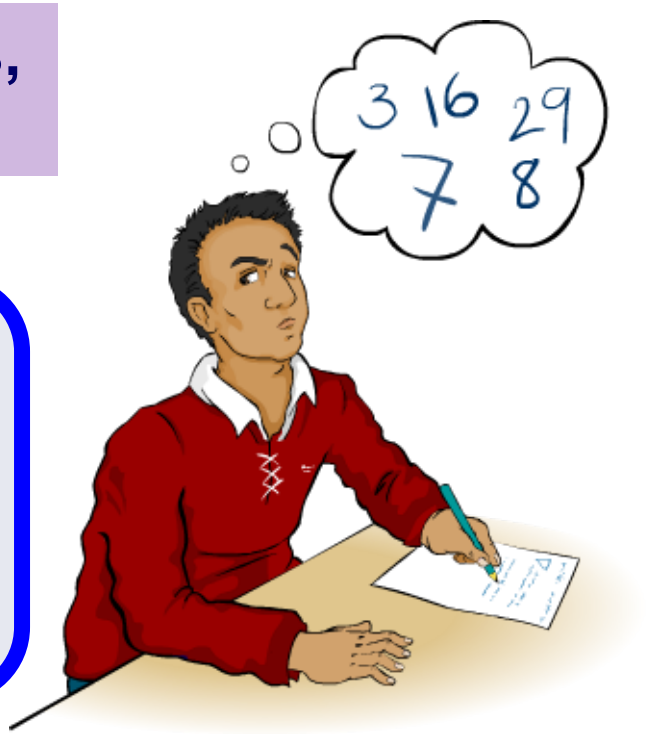
$$\text{rate} = \frac{\text{miles}}{\text{hours}} = \frac{93 \text{ miles}}{3 \text{ hours}}$$

The rate is 93 miles per 3 hours.

# Unit rate

When a rate comparison is to one unit, it is called a **unit rate**.

**If the car traveled 93 miles in 3 hours, what is its unit rate?**




Divide both terms by the second term.

$$\frac{93 \text{ miles} \div 3}{3 \text{ hours} \div 3} = \frac{31}{1}$$

The unit rate is 31 miles per 1 hour, or 31 miles per hour (mph).

# Find the better deal

We can use unit rate to compare prices and find the best deal.

# Vocabulary quiz

## Match each term with its definition.

| | |
|---|---|
| ratio | a rate comparison in which the second quantity is one unit |
| proportion | a comparison of two quantities |
| rate | a comparison between quantities with different units |
| unit rate | a comparison of parts to a whole |