

Understanding ratios

Duration: 60–75 minutes

Unit: Unit 1 — Ratios and Proportional Relationships

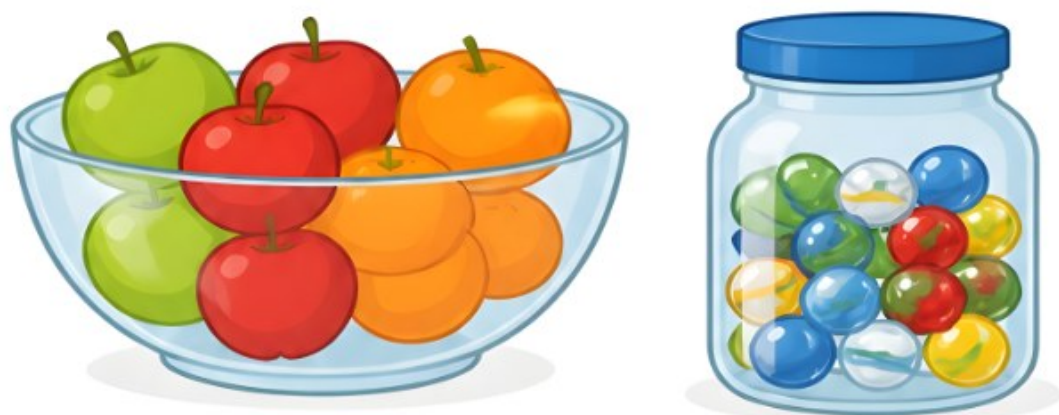
Grade: 6

CCSS Standard: 6.RP.A.1

Lesson: 01 — Understanding ratios

Learning objectives

Students will understand the concept of ratio as a comparison of two quantities. Students will write ratios in all three accepted notations — word form, colon form, and fraction form — and use ratio language to describe relationships between quantities in real-world contexts. Students will also distinguish between part-to-part and part-to-whole ratios and recognize that the order of quantities in a ratio determines its meaning.



Materials needed

Whiteboard or projector, printed practice activity, pencils, optional colored markers for highlighting quantity pairs, printed or projected images of fruit bowls or marble jars for warm-up, and student notebooks for ratio vocabulary entries.

Introduction to ratio

Prior knowledge

Before beginning this lesson, students should be comfortable with basic multiplication and division using whole numbers. They should be able to identify and count discrete quantities in a set, recognize that division compares two amounts, and read and write simple fractions. Familiarity with the idea that the order of numbers can change meaning — as in subtraction or division — will also support understanding of why ratio order matters. No prior exposure to ratios is assumed.



Key vocabulary

A **ratio** is a comparison of two quantities using division, showing how much of one quantity there is relative to another.

Ratio language refers to the specific phrases used to describe a ratio in spoken or written form, such as “for every ____, there are ____” or “the ratio of ____ to ____ is ____.”

The order of a ratio refers to which quantity is named first, which determines the meaning of the ratio entirely.

A **part-to-part ratio** compares one group to a separate group.

A **part-to-whole ratio** compares one group to the total of all groups combined.

Understanding ratios

Warm-up activity

Display the following situation on the board or projector:

“Your friend is making a fruit salad. She uses 4 apples and 6 oranges. How would you describe the relationship between the number of apples and the number of oranges?”



Give students about two minutes to write down their response in their own words. Then invite two or three students to share.

Listen for responses like “there are more oranges” or “there are 2 more oranges than apples.”

After a few responses, ask the class: “Does saying there are more oranges tell us exactly how many more for every apple? Is there a more precise way to describe this?” Allow students to discuss briefly before moving forward.

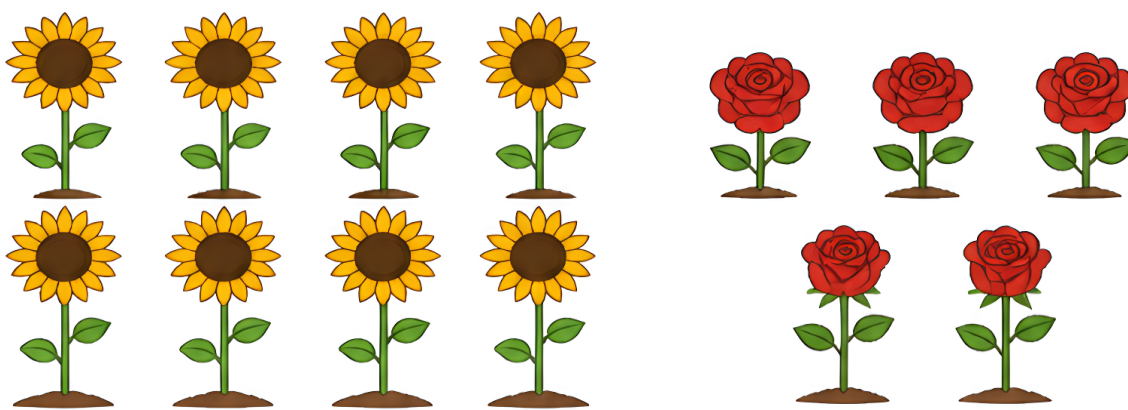
This warm-up surfaces the limitation of informal comparison language and creates a natural entry point for introducing ratio as a more precise mathematical tool.

Write the word **ratio** on the board without defining it yet — that definition will emerge from the problem disparador below.

Problem disparador

Display the following scenario from the lesson content on the board and read it aloud together as a class:

“A school garden has 8 sunflowers and 5 roses. A student says: ‘There are more sunflowers than roses.’ Her classmate says: ‘For every 8 sunflowers, there are 5 roses.’ Which statement gives more mathematical information — and why does that difference matter?”



Ask students to think quietly for one minute, then discuss with a partner. After partner talk, open the conversation to the whole group.

Guide students toward recognizing that the first statement only tells us which quantity is larger, while the second statement tells us the exact relationship — how many of one thing there are for every specific amount of the other.

Write both statements on the board side by side and draw attention to the phrase “for every.”

Statement 1

“There are more sunflowers than roses.”

Statement 2

“For every 8 sunflowers, there are 5 roses.”

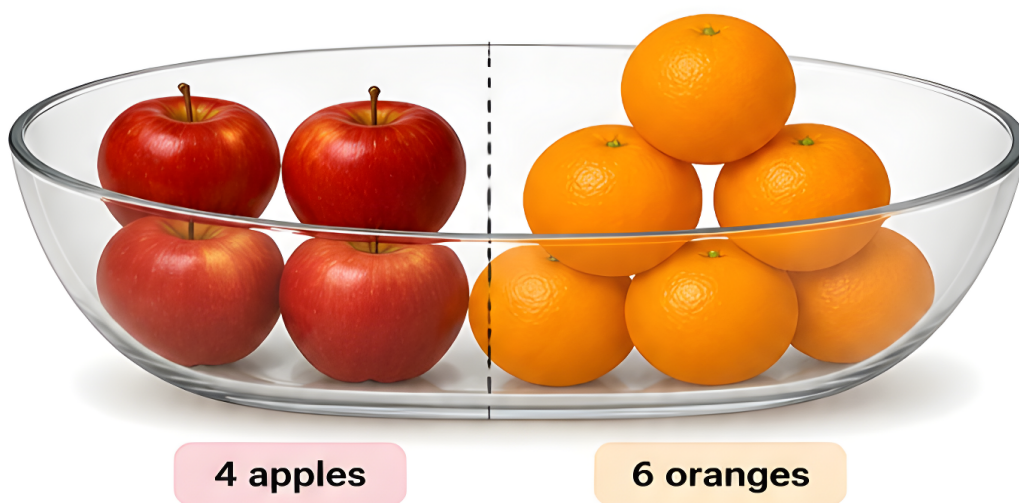
Tell students: “That phrase — **for every** — is a key piece of ratio language. Today we are going to learn exactly what a ratio is, how to write one, and how to use this kind of precise language.”

Understanding ratios

Introduction

Before we begin, think back to what you noticed in the warm-up and the problem disparador: when we describe and compare quantities, the words we choose can change the meaning.

In mathematics, we use precise comparison language. Today we are going to explore one important way to compare quantities — **ratios**.



Think-aloud

I want to describe the relationship between these two groups of fruit.
I could say there are more oranges — but that only tells me about size.
Instead, I want to express how they relate to each other.
So I ask: for every 4 apples, how many oranges are there?
The answer is 6.
That comparison — 4 and 6 — is a ratio.

Let's write this ratio in three different ways.

4 to 6

=

4 : 6

=

$\frac{4}{6}$

These three are all different ways to write the exact same ratio.
Each one says the same thing: for every 4 apples, there are 6 oranges.

Understanding the pattern

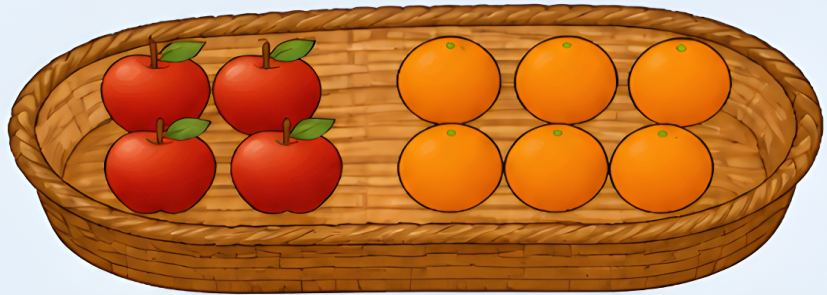
Ask students: “What would happen if I reversed the order and said 6 to 4 instead?” Give students a moment to think before responding. Confirm that reversing the order creates a different ratio — now oranges are being compared to apples, not apples to oranges. Emphasize this on the board by writing both ratios clearly labeled.

Apples to oranges:

4 to 6

Oranges to apples:

6 to 4



Now transition into direct instruction by telling students: “There are three things we need to master today. First, we will learn the three ways to write any ratio. Second, we will learn the specific language used to describe ratios. Third, we will practice applying both of these to real situations.”

Direct instruction — the three notations

Walk students through each of the three ratio notations using the fruit bowl example, referencing the clear structure from the lesson content. Write these on the board as you speak.

1. The word form

4 to 6

Read as: “4 to 6”

2. The colon form

4 : 6

Read as: “4 to 6”

3. The fraction form

$\frac{4}{6}$

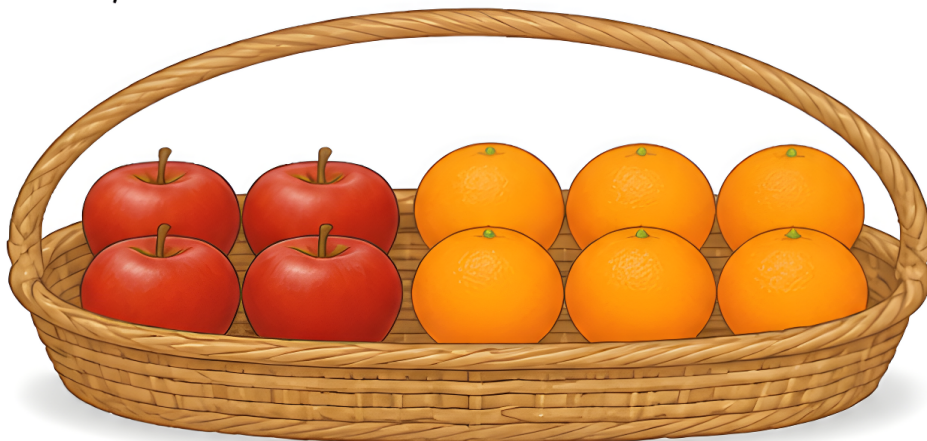
Read as: “4 to 6”

The word form — “4 to 6” — is the most natural and readable. The colon form — 4 : 6 — is the most commonly used in mathematical notation. The fraction form — $\frac{4}{6}$ — looks like a fraction, and while it is written like one, remind students that a ratio is not always the same as a fraction. A ratio compares any two quantities, while a fraction specifically represents a part of a whole. In this lesson, ratios are used as comparisons between two separate quantities.

Understanding ratio language

Tell students: “Whenever you write a ratio, you must know which quantity is being named first. The question always tells you. If the question asks for apples to oranges, apples come first. If it asks for oranges to apples, oranges come first.

Write a sample question on the board: “What is the ratio of oranges to apples?” Model identifying that oranges are named first, so the ratio is 6 to 4, written as 6:4 or $\frac{6}{4}$.



Direct instruction — ratio language

Now shift attention to the language used to describe ratios. Explain that mathematicians use specific phrases to communicate ratios clearly and without ambiguity. Write the following structures on the board as models for students to copy into their notebooks:

“For every ___, there are ___.”

“The ratio of ___ to ___ is ___.”

“For each ___, there are ___.”

Return to the fruit bowl: “Using ratio language, I can say: for every 4 apples, there are 6 oranges. Or: the ratio of apples to oranges is 4 to 6.”

Ask students to try forming the reversed ratio in their own words. Listen for: “For every 6 oranges, there are 4 apples.” Confirm and reinforce that the ratio language must match the written order of the ratio.

Direct instruction – part-to-part and part-to-whole

Look at the jar below. It has 3 red candies and 5 green candies, for a total of 8 candies.



We can write ratios in two different ways, depending on what we are comparing.

Let's explore the difference between part-to-part and part-to-whole ratios.

1. Part-to-part ratio

Compare the red candies to the green candies.
The part-to-part ratio is:

Red to green is 3 to 5.
 $3 : 5$

Quick check!

Is this a part-to-part ratio or a part-to-whole ratio?



Part-to-part



Part-to-whole

2. Part-to-whole ratios

Now compare each color to the total number of candies in the jar (8).

Red to total is 3 to 8.

$3 : 8$

Green to total is 5 to 8.

$5 : 8$

Quick check!

Is this a part-to-part ratio or a part-to-whole ratio?



Part-to-part



Part-to-whole

Both types are valid ratios. The difference is what you are comparing.

- **Part-to-part** compares two separate groups to each other.
- **Part-to-whole** compares one group to the entire collection.

Important note: ratios describe patterns, not exact counts

A ratio of $2 : 3$ does not mean there are exactly 2 of one thing and 3 of another. It describes a **pattern**. There could be 4 and 6, or 10 and 15.

This idea comes up in practice question eight and is a common misconception.

Guided practice — working through the first example

The first example from the practice activity (reference Practice Activities, Q1): “A school supply store has 6 blue pens and 9 red pens on the counter. Write the ratio of blue pens to red pens in all three forms, then write a sentence using ratio language.”

Work through this problem together with the class. Begin by identifying which quantity comes first — the question asks for blue to red, so blue pens are named first with a value of 6, and red pens are named second with a value of 9.



1 Word form

Write the word form together:

6 to 9

2 Colon form

Write the colon form:

6 : 9

3 Fraction form

Write the fraction form:

$\frac{6}{9}$

4 Ratio language

Construct the ratio language sentence together:

“For every 6 blue pens, there are 9 red pens.”

Ask the class:

“What would the ratio of red to blue look like?”

Give students thirty seconds to write the answer before sharing.

Confirm: 9 to 6, or 9:6, or $\frac{9}{6}$, with the language:

“For every 9 red pens, there are 6 blue pens.”

Guided practice — working through more complex examples

The second guided example (reference Practice Activities, Q5):

“A parking lot contains 24 SUVs and 16 sedans. Write the ratio of SUVs to sedans in all three notations, and the ratio of sedans to SUVs in all three notations. Explain in one sentence why these two ratios are different.”



Have students attempt this independently for two minutes before sharing out. As students work, circulate and check that they are identifying which quantity is named first.

After the two minutes, walk through the solution together.

SUVs to sedans

- 24 to 16, written as:

24 to 16

24:16

$\frac{24}{16}$

Sedans to SUVs

- 16 to 24, written as:

16 to 24

16:24

$\frac{16}{24}$

For the explanation, ask a student to share their sentence. Listen for the key idea: the two ratios are different because they name the quantities in opposite orders, so each one tells us a different relationship. Accept varied phrasings as long as they convey that reversing the order changes the meaning.

Then connect to the part-to-whole idea by asking:

“Could we write a ratio comparing just the SUVs to the total vehicles in the lot?”

Invite students to calculate the total ($24 + 16 = 40$) and write the part-to-whole ratio:

Total vehicles

$$24 + 16 = 40$$

Part-to-whole ratio (SUVs to total)

24 to 40, written as: $24:40$

Independent practice

Students now complete the practice activity questions independently or in pairs. Assign questions two through four for students who need more scaffolded practice, and questions nine through fifteen for students who are ready to work with multi-ingredient contexts, tables, and more complex explanations.

As students work, circulate and use the following guiding questions to prompt thinking without giving away answers.



Guiding questions to prompt thinking

- When a student writes a ratio in the wrong order, ask:
“Which quantity did the question name first?”
- When a student gives an answer like Sofia's in question eight — claiming a ratio of 5:3 means exactly 5 and 3 — ask:
“Could there be 10 goldfish and 6 guppies in the tank? Would the ratio still be 5:3?”
- When a student struggles with part-to-whole in question nine or twelve, ask:
“How many total parts are there? Now compare just one ingredient to that total.”

Watch carefully for students who reverse the ratio without noticing, who confuse fraction form with actual fractions, or who believe that a ratio fixes an exact count. These are the three most common errors in this lesson and should be addressed during whole-group debrief after independent work time.

Closure and exit ticket

Bring the class back together for a five-minute whole-group debrief. Ask three students to share one thing they learned about ratios today.

Then display the original problem disparador again — the sunflowers and roses scenario — and ask: “Now that you know what a ratio is, can you write the ratio of sunflowers to roses in all three forms and describe it using ratio language?”

Take responses from the class and confirm: 8 to 5, written as 8:5 and $\frac{8}{5}$, with the language “for every 8 sunflowers, there are 5 roses.”



Exit ticket

Ask each student to answer the following independently on a half-sheet of paper.

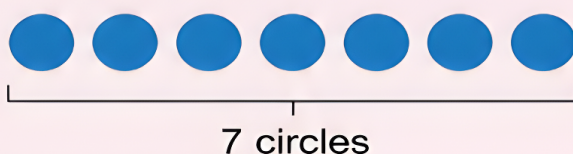
- 1 A teacher writes “3:7” on the board and says it means there are exactly 3 red tiles and 7 blue tiles. Is the teacher’s statement correct?
- 2 Write the ratio of blue tiles to red tiles in all three forms.
- 3 Write a sentence using ratio language to describe the ratio of red tiles to the total.

Collect exit tickets to assess which students have internalized the three notations, the importance of order, and the distinction between fixed counts and proportional relationships. Use this data to form small groups for the following day’s lesson on equivalent ratios.

Common misconception — reversing the order without realizing it

The most frequent error in this lesson is writing the ratio in the wrong order. Students often reverse the quantities, particularly when a problem describes two groups and asks for one specific ratio. For example, when told there are 4 stars and 7 circles and asked for the ratio of stars to circles, many students write 7 to 4 because 7 is the larger number or because they read “circles” last and unconsciously place it first.

Example: There are 4 stars and 7 circles.
What is the ratio of stars to circles?



Correct ratio: 4 to 7

To address this misconception, return to the question itself every time a ratio is written. Ask students to underline the two quantities in the order they appear in the question and then write the ratio using that same order.

Practice this habit on practice question two, where four answer options are presented. The correct answer is 4 to 7, and the three distractors all represent variations of the reversed ratio. Use this question during whole-group debrief to slow the class down and explicitly model how reading the question determines the order, not the size of the numbers.

Practice question 2: There are 4 stars and 7 circles.
What is the ratio of stars to circles?

- (A) 7 to 4
- (B) 4 to 7 (correct answer)
- (C) 7 to 11
- (D) 11 to 7

A useful phrase to repeat throughout the lesson:

“The question tells you who goes first.” Post this on the board as a reminder for the entire lesson.

Common misconception – a ratio fixes an exact count

A second significant misconception is the belief that a ratio of 5:3 means there are exactly 5 of one thing and 3 of another — no more, no less. This is the error Sofia makes in practice question eight, and it reveals a fundamental misunderstanding of what a ratio represents.

Clarify this by returning to the definition: a ratio describes a proportional relationship, not a fixed count. A ratio of 5:3 could describe 5 goldfish and 3 guppies, or 10 and 6, or 15 and 9, or any quantities that follow the same 5-to-3 pattern.

Visual example

Draw two rows of circles on the board, one row with 5 and one with 3. Then draw another pair of rows with 10 and 6. Ask: “Are both groups following the same ratio?” Students should confirm yes.

First group: 5 to 3

Goldfish 
Guppies 

Second group: 10 to 6

Goldfish 
Guppies 

This idea also connects to practice question fourteen, where students must reason about whether doubling every ingredient in a paint mixture changes any of the ratios. The answer is no — because ratios describe patterns of relationship, not absolute amounts.

Key takeaway

Reinforce this early and often, as it becomes central in the next lesson on equivalent ratios.

Common misconception — confusing ratio form with fraction meaning

A third misconception arises from the fraction form of a ratio. When students see $4/6$, they often interpret it as “four out of six” — a fraction meaning 4 parts of a 6-part whole. While this interpretation is sometimes valid for part-to-whole ratios, it is not always correct when the ratio is part-to-part.

Address this by being explicit: “When we write a ratio in fraction form, it looks like a fraction, but it does not always mean part of a whole. In a ratio, both quantities may be completely separate groups.”

Use the apples and oranges example: $4/6$ does not mean 4 apples out of 6 total fruits — it means 4 apples for every 6 oranges. There could be 10 fruits total, not 6.



This means: **4 apples** for every **6 oranges**.

The groups are separate. There could be 10 fruits total, not 6.

Differentiation and connections

For additional support

Provide a sentence frame for ratio language on a reference card:

For every ____ [first quantity],
there are ____ [second quantity].

Also offer a two-column graphic organizer where students write the first quantity in one column and the second in the other before writing the ratio.

First quantity	Second quantity

For extension

Challenge students to create their own real-world scenario with three ingredients, write all possible part-to-part and part-to-whole ratios, and explain the meaning of each one using complete sentences.

Example idea:

Smoothie with strawberries, bananas, and yogurt.



This lesson connects directly to the next lesson on equivalent ratios and builds the foundational language for all future work in proportional reasoning, unit rates, and percent throughout sixth grade.