
Ratio Reasoning Discovery

Tape Diagrams, Double Number Lines & Ratio Tables

Grade 6 | 3-Representation Bundle

CCSS: 6.RP.A.1 & 6.RP.A.3a

A comprehensive discovery-based resource that builds conceptual understanding of ratios and equivalent-ratio tables through three powerful visual models rarely combined in one resource: **tape diagrams**, **double number lines**, and **ratio tables**. Students explore part-to-part and part-to-whole relationships, build rate representations, and discover the linear pattern in coordinate plots of equivalent ratios.

- **Activity 1** — Tape Diagram Discovery (12 problems)
- **Activity 2** — Double Number Line Discovery (rate contexts)
- **Activity 3** — Ratio Tables & Coordinate Plane (10 tables)
- **Mixed-Representation Performance Task** with rubric
- **Vocabulary Foldable** — Frayer Model (7 key terms)
- **4 Exit Tickets** for formative assessment
- **CCSS Alignment Chart** mapping each activity
- **Complete Answer Keys** with worked solutions
- **Printable Templates** — tape diagrams, DNL, coordinate grids

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CCSS Alignment Chart

This resource aligns to the following Common Core State Standards for Mathematics, Grade 6, Ratios and Proportional Relationships domain. Every activity, problem, and assessment item has been mapped to one or both of the target standards below, ensuring complete coverage and systematic progression from conceptual introduction to independent application.

6.RP.A.1 — Understand the concept of a ratio and use ratio language to describe a ratio relationship between two quantities.

6.RP.A.3a — Make tables of equivalent ratios relating quantities with whole-number measurements, find missing values in the tables, and plot the pairs of values on the coordinate plane.

Component	6.RP.A.1	6.RP.A.3a	Focus
Activity 1: Tape Diagram Discovery	Primary	Supporting	Part-to-part & part-to-whole ratios
Activity 1: Problems 1-6	Primary	—	Identifying & expressing ratios
Activity 1: Problems 7-12	Primary	Supporting	Equivalent ratios via tape diagrams
Activity 2: Double Number Line Discovery	Primary	Primary	Rate contexts & equivalent ratios
Activity 2: Guided Examples	Primary	—	Building & reading DNLs
Activity 2: Independent Problems	Primary	Primary	Finding equivalent ratios via DNL
Activity 3: Ratio Tables	Supporting	Primary	Tables of equivalent ratios
Activity 3: Coordinate Plane	Supporting	Primary	Plotting ratio pairs, linear pattern
Performance Task	Primary	Primary	Choosing best representation
Exit Tickets 1-4	Primary	Primary	Formative assessment of all skills
Vocabulary Foldable	Primary	Supporting	Key terms & definitions

Key: "Primary" indicates the standard is the main focus of that component. "Supporting" indicates the standard is addressed but not the primary focus. "—" indicates the standard is not directly assessed in that specific component, though foundational understanding may be required.

Learning Targets

By the end of this unit, students will be able to demonstrate proficiency in the following learning targets. Each target is aligned to one or both of the CCSS standards (6.RP.A.1, 6.RP.A.3a). Students can use this page as a self-check: rate your understanding for each target before and after completing the activities using the 1-4 scale provided.

Aligned to 6.RP.A.1

Target	Before (1-4)	After (1-4)
I can understand the concept of a ratio and describe a ratio relationship between two quantities using ratio language (e.g., "For every 3 apples, there are 2 oranges").		
I can write a ratio in three forms: a:b, "a to b," and a/b.		
I can identify part-to-part and part-to-whole ratios in real-world contexts.		
I can determine whether two ratios are equivalent by using visual models.		
I can explain what a ratio means in the context of a given word problem.		

Aligned to 6.RP.A.3a

Target	Before (1-4)	After (1-4)
I can make a table of equivalent ratios relating quantities with whole-number measurements.		
I can find missing values in ratio tables using multiplicative reasoning.		
I can plot pairs of values from a ratio table on the coordinate plane.		
I can recognize that equivalent ratios form a straight line through the origin when graphed.		
I can use a tape diagram to solve ratio word problems.		
I can build and use a double number line to find equivalent ratios in rate contexts.		
I can choose the most appropriate representation (tape diagram, double number line, or ratio table) for a given ratio context and justify my choice.		

Rating Scale: 1 = I am just starting to learn this; 2 = I understand the basics but need more practice; 3 = I can do this independently; 4 = I can do this and explain it to others.

Activity 1

Tape Diagram Discovery

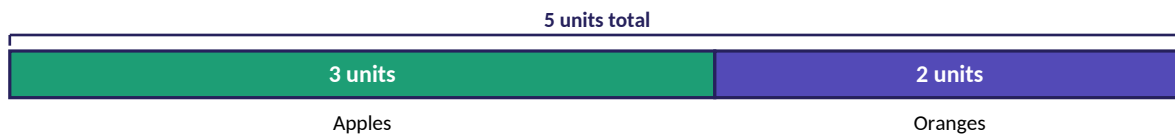
Students use pre-drawn tape diagrams to solve part-to-part and part-to-whole ratio word problems.

What is a Tape Diagram?

A tape diagram (also called a bar model) uses rectangular bars to represent the quantities in a ratio. Each equal-size section of the bar represents one unit of the ratio. Tape diagrams make the relationship between quantities visually explicit: you can see how many parts each quantity has, and you can use the diagram to find unknown values. When we know the total or one part, the diagram helps us determine the size of each unit, and from there we can calculate any quantity in the ratio.

Guided Example 1: Part-to-Part Ratio

A fruit basket contains apples and oranges in the ratio 3:2. This means for every 3 apples, there are 2 oranges. The tape diagram below shows this relationship, where each section represents one "unit" of the ratio.

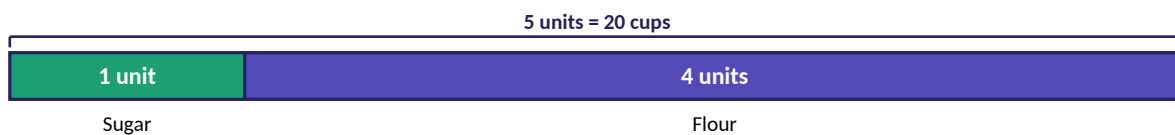


Question: If there are 15 apples, how many oranges are there?

Solution: The apples are 3 units = 15, so 1 unit = $15 \div 3 = 5$. The oranges are 2 units = $2 \times 5 = 10$. There are **10 oranges**.

Guided Example 2: Part-to-Whole Ratio

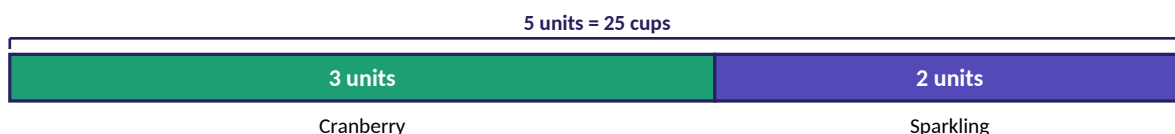
A recipe calls for sugar and flour in the ratio 1:4. The total amount of dry ingredients is 20 cups. This is a part-to-whole problem where we know the total and need to find each part.



Solution: 5 units = 20 cups, so 1 unit = 4 cups. Sugar = $1 \times 4 = 4$ cups. Flour = $4 \times 4 = 16$ cups. Check: $4 + 16 = 20$ cups total. The recipe uses **4 cups of sugar** and **16 cups of flour**.

Guided Example 3: Recipe Scaling

A punch recipe uses 3 cups of cranberry juice for every 2 cups of sparkling water. If you want to make 25 cups of punch total, how many cups of each do you need?



Independent Practice — Problems 1-12

Use tape diagrams to solve each problem. Draw the tape diagram in the space provided, label each part, find the value of one unit, then calculate the answer. Show all your work.

1. A classroom has red markers and blue markers in the ratio 3:5. If there are 40 markers total, how many are blue?

2. A recipe for trail mix calls for almonds and raisins in the ratio 2:3. If you use 10 cups of almonds, how many cups of raisins do you need?

3. The ratio of boys to girls in a band class is 5:3. If there are 40 students total, how many boys are in the class?

Activity 2

Double Number Line Discovery

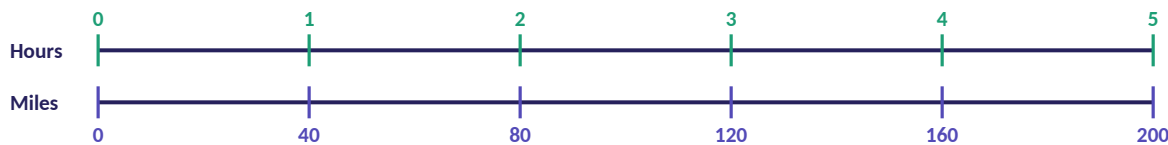
Students build double number lines from real-world rate contexts and use them to find equivalent ratios.

What is a Double Number Line?

A double number line consists of two parallel number lines that show corresponding values of two quantities in a ratio or rate relationship. The top line shows values of one quantity, and the bottom line shows the corresponding values of the other quantity. Tick marks on each line are aligned vertically so you can read off equivalent ratios directly. Double number lines are especially powerful for rate contexts because they show how the two quantities change together — as one quantity increases, the other increases proportionally. They also make it easy to find intermediate values and to scale up or down from a known ratio.

Guided Example: Miles Per Hour

A car travels at a constant speed of 40 miles per hour. We can represent this rate on a double number line. The top line shows time (hours), and the bottom line shows distance (miles). At each hour, the car has traveled 40 more miles.



Question: How far does the car travel in 3 hours?

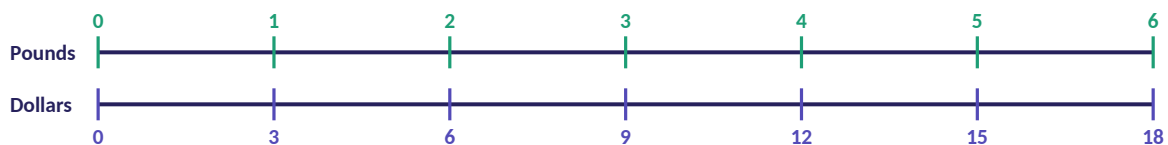
Solution: Find 3 on the top (hours) line. Read down to the bottom (miles) line: 120 miles. We can also calculate: 3 hours x 40 miles/hour = **120 miles**.

Question: How long does it take to travel 100 miles?

Solution: We need to find where 100 falls on the bottom line. Since $80 < 100 < 120$, the time is between 2 and 3 hours. Using the unit rate: 100 miles / 40 miles per hour = **2.5 hours**.

Guided Example: Dollars Per Pound

Apples cost \$3 per pound. We can build a double number line with pounds on top and cost on the bottom.



Question: How much do 5 pounds of apples cost?

Solution: Find 5 on the top line, read down: \$15. Check: $5 \times \$3 = \$15$.

Question: If you have \$12, how many pounds can you buy?

Solution: Find \$12 on the bottom line, read up: 4 pounds. Check: $\$12 / \$3 = 4$ pounds.

Independent Practice — Rate Context Problems

For each problem, build a double number line in the space provided. Label both lines, mark tick marks at equal intervals, and use your number line to answer the questions. Show your work.

1. A train travels at 60 miles per hour. Build a double number line showing hours and miles. How far does the train travel in 4 hours? How long does it take to travel 180 miles?

2. Rice costs \$2 per pound at the grocery store. Build a double number line. How much does 7 pounds of rice cost? If you have \$10, how many whole pounds can you buy?

Activity 3

Ratio Tables & Coordinate Plane

Students complete 10 ratio tables with whole-number measurements, find missing values, then plot the pairs on the coordinate plane and observe the linear pattern.

What is a Ratio Table?

A ratio table organizes pairs of quantities that form equivalent ratios. Each row represents one equivalent ratio, and you move between rows by multiplying or dividing both columns by the same number. This preserves the ratio relationship. Ratio tables are powerful because they make the multiplicative structure explicit: to get from one row to the next, you apply the same operation to both quantities. When the pairs from a ratio table are plotted on a coordinate plane, they form a straight line through the origin — this is because all equivalent ratios share the same unit rate (slope), connecting ratio reasoning to linear functions.

Guided Example: Lemonade Recipe

A lemonade recipe uses 2 cups of lemon juice for every 3 cups of water. We can build a ratio table showing the equivalent ratios for different batch sizes.

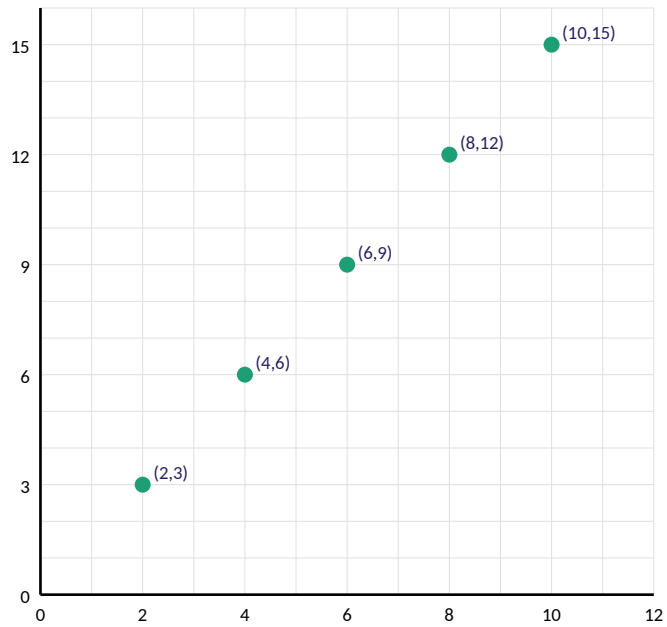
Lemon Juice (cups)	Water (cups)
2	3
4	6
6	9
8	12
10	15

How we built this table: Each row is found by multiplying both quantities by the same factor. Row 2: multiply by 2 ($2 \times 2 = 4$, $3 \times 2 = 6$). Row 3: multiply by 3 ($2 \times 3 = 6$, $3 \times 3 = 9$). Row 4: multiply by 4. Row 5: multiply by 5. We can also go between any two rows: from Row 3 to Row 2, divide both by 1.5. The key principle is that **both quantities must be multiplied or divided by the same number** to maintain an equivalent ratio.

Plotting on the Coordinate Plane

When we plot the (lemon juice, water) pairs from the ratio table on a coordinate plane, something remarkable happens: all the points lie on a straight line that passes through the origin (0, 0). This is because every equivalent ratio has the same unit rate ($3/2 = 1.5$), which is the slope of the line. This pattern holds for ALL ratio tables — equivalent ratios always form a line through the origin.

Lemon Juice vs. Water (Equivalent Ratios)



Vocabulary Foldable — Frayer Models

The Frayer Model is a graphic organizer that helps students build deep understanding of vocabulary terms by examining them from four perspectives: definition, examples, non-examples, and characteristics. For each term, fill in all four quadrants. Use your experience from the activities to provide specific, accurate content. These pages can be cut out and assembled into a foldable booklet.

Ratio

Definition	Examples
A comparison of two quantities by division. Can be written as $a:b$, a to b , or a/b .	3:2 (apples to oranges), 5 to 4 (boys to girls), $2/3$ (cups of sugar to cups of flour)
Non-Examples	Characteristics
$3 + 2$ (this is addition, not a comparison by division), $5 - 4$ (subtraction, not a ratio)	Compares two quantities; order matters ($a:b$ is different from $b:a$); can be simplified; both quantities must be positive in Grade 6 contexts

Equivalent Ratio

Definition	Examples
Two ratios that express the same relationship. Found by multiplying or dividing both quantities by the same non-zero number.	2:3 and 4:6 (multiply both by 2), 10:15 and 2:3 (divide both by 5), 1:4 and 3:12
Non-Examples	Characteristics
2:3 and 3:2 (reversed order, not equivalent), 2:3 and 4:5 (different relationships)	Same unit rate; same position on a double number line; form the same point when reduced; all appear on the same line through the origin when graphed

Exit Ticket 1: Tape Diagrams

Name: _____ Date: _____

1. A snack mix has peanuts and raisins in the ratio 4:1. Draw a tape diagram and use it to find how many raisins are in a mix that has 20 peanuts.

2. The ratio of red beads to blue beads on a necklace is 2:5. If there are 35 beads total, how many are blue? Use a tape diagram to solve.

3. Explain in your own words: How does a tape diagram help you find an unknown quantity in a ratio problem?

Mixed-Representation Performance Task

This performance task assesses your ability to choose the BEST representation for a given ratio context and justify your choice. There is not always one "right" answer, but some representations are more efficient or more appropriate than others depending on the situation. Your justification is as important as your answer — it shows your understanding of when and why each model is useful.

Task 1: Choose the Best Representation

Scenario A:

A recipe for salad dressing calls for 3 tablespoons of olive oil for every 1 tablespoon of vinegar. You want to make enough dressing for a large party using 15 tablespoons of olive oil.

Which representation (tape diagram, double number line, or ratio table) would you use to find how much vinegar you need? Explain why your choice is the best for this situation.

Scenario B:

A car is traveling on the highway at a constant speed of 55 miles per hour. You need to figure out how far the car will travel in 3.5 hours and also how long it will take to travel 220 miles.

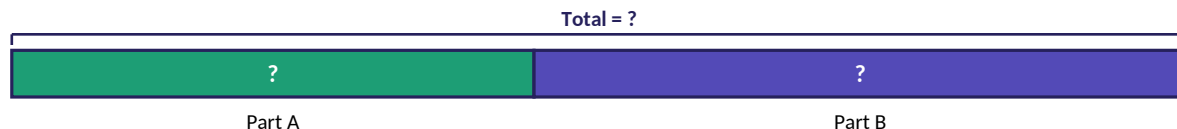
Which representation would you use? Explain why your choice is the best for this situation.

Templates — Blank Tape Diagrams

Use these blank tape diagram templates for additional practice problems, warm-ups, or differentiated instruction. Each template provides space for a two-part ratio. Students should label each section, identify the value of one unit, and solve.

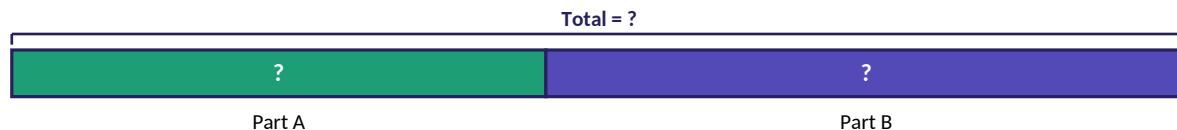
Blank Tape Diagram Template 1

Ratio ____ : ____ Total or Known Value: _____



Blank Tape Diagram Template 2

Ratio ____ : ____ Total or Known Value: _____



FULL RESOURCE AT A GLANCE

PREVIEW

Ratio Reasoning Discovery - Grade 6 | 3-Representation Bundle

A 79-page Grade 6 ratio resource built around tape diagrams, double number lines, and ratio tables.

Aligned to CCSS 6.RP.A.1 and 6.RP.A.3a, with teacher guidance, student practice, assessment, templates, and answer keys.

ACTIVITY 1 - TAPE DIAGRAM DISCOVERY

- 12 core problems using part-to-part and part-to-whole ratios.
- 3 guided examples, including ratio meaning, totals, and recipe scaling.
- 6 challenge problems extending the tape-diagram reasoning.

ACTIVITY 2 - DOUBLE NUMBER LINE DISCOVERY

- 8 core rate-context problems with double number lines.
- Guided examples for speed, price, and page-rate contexts.
- 6 challenge problems involving comparison, combined rates, maps, and mixtures.

ACTIVITY 3 - RATIO TABLES & COORDINATE PLANE

- 10 ratio tables with missing values to complete.
- Coordinate-plane plotting to observe the linear pattern through the origin.
- 6 challenge problems connecting ratios, unit rates, and graph behavior.

TEACHER SUPPORT & ASSESSMENT

- Teacher overview, recommended pacing, differentiation guidance, and math-talk prompts.
- Learning targets and student self-assessment.
- 4 exit tickets, a mixed-representation performance task, and a 20-point rubric.
- 4 Think-Pair-Share activities for mathematical discussion.

STUDENT TOOLS & PRINTABLES

- 7-term Frayer Model vocabulary foldable covering core ratio vocabulary.
- Blank tape diagram templates, blank double number lines, and coordinate-plane grid paper.
- Visual models support ratio reasoning, scaling, unit rate, and equivalent-ratio thinking.

COMPLETE ANSWER KEYS

- Worked solutions for Activities 1-3.
- Solutions for all challenge problems.
- Performance-task answer guidance and rubric.
- Exit-ticket answers and explanations.

79

Pages

3

Core Activities

7

Vocab Terms

4

Exit Tickets

3

Templates