

Ratios, Rates, and Percents

Grade: 6 **Subject:** Mathematics **Time:** ~45 min core + ~15 min extension **Work mode:** Independent · pencil + packet Math

Start Here

This is a **paper math packet** about ratios, rates, and percents. Work by yourself with a pencil. **A calculator is not required, but a basic calculator is allowed** if you have one. **Show your work** — every answer should show the numbers you used, not just a final number. Everything you need (formulas, an example) is printed right here. If a question is hard, skip it, keep going, and come back. Circle or box your final answers.

Start Warm-Up: Retrieval 5 min

Bring back what you already know about ratios and rates.

1Ratio. A fruit bowl has **6 apples** and **9 oranges**. Write the ratio of **apples to oranges**, then write it again in **simplest form**. Show what you divided by.

2Unit rate. A car travels **120 miles** on **4 gallons** of gas. What is the unit rate in **miles per gallon**? Show the division you used.

Build Study the Math 5–10 min

What you need to know (with formulas)

A **ratio** compares two amounts. The ratio "6 apples to 9 oranges" can be written **6 to 9**, **6 : 9**, or **6/9**. To write a ratio in **simplest form**, divide both numbers by the same number (their greatest common factor): $6/9 \rightarrow$ divide both by 3 $\rightarrow$ **2 : 3**.

Equivalent ratios name the same comparison. You make one by multiplying (or dividing) **both** numbers by the same number. A **ratio table** lines up equivalent ratios in columns:

$$2 : 3 = 4 : 6 = 6 : 9 = 8 : 12 \text{ (each } \times 2, \times 3, \times 4 \dots)$$

A **rate** compares two amounts with **different units** (miles and gallons, dollars and pounds). A **unit rate** is a rate "per 1." To find it, **divide**:

$$\text{unit rate} = (\text{first amount}) \div (\text{second amount})$$

Example: $120 \text{ miles} \div 4 \text{ gallons} =$ **30 miles per gallon**. A **unit price** is a unit rate in dollars: $\text{dollars} \div \text{items} =$ **price for one**. The lower unit price is the "better buy."

Percent means "**per 100**," so a percent is a ratio out of 100 ($25\% = 25 \text{ out of } 100 = 25/100 = 0.25$). To turn a ratio into a percent, make an **equivalent ratio with 100 on the bottom** — this is a ratio-table method:

$$18/20 \rightarrow (\times 5 \text{ top and bottom}) \rightarrow 90/100 = 90\%$$

- **Percent of a number:** multiply. *percent (as a decimal) × whole*. Example: 15% of 40 = $0.15 \times 40 = 6$.
- You can also use a ratio table: 15 out of 100 is the same as ? out of 40.

Tip: keep the order the same in every ratio. If you write "apples : oranges," keep apples first every time.

Worked Example — a ratio table and a unit rate

A smoothie recipe mixes **2 cups of yogurt** for every **3 cups of fruit**. That is the ratio **2 : 3** (yogurt : fruit). To find other amounts that taste the same, multiply **both** numbers by the same factor. This makes a **ratio table**:

Ratio table for yogurt :
fruit = 2 : 3 (multiply
both by the same
number).

Yogurt (cups) 2 4 6 8
Fruit (cups) 3 6 9 12

Every column is **2 : 3** (4:6 divides to 2:3; 6:9 divides to 2:3; and so on). The **unit rate** of fruit per 1 cup of yogurt is $3 \div 2 = 1.5$ **cups of fruit per cup of yogurt**.

		both $\times 2$	$\div$ back to 2:3	both grow together
Yogurt (cups)	2	4	6	8
Fruit (cups)	3	6	9	12

Every column equals the ratio 2 : 3

Header cells are shaded with a pattern so the table reads clearly in black and white.

Figure 1. A ratio table for yogurt : fruit = 2 : 3. The top row is yogurt (2, 4, 6, 8) and the bottom row is fruit (3, 6, 9, 12). Moving right, both numbers are multiplied by the same growing amount, so every column simplifies back to 2 : 3. The header cells use a diagonal-line pattern (not color) so the figure reads clearly in grayscale.

3Using the worked example (yogurt : fruit = 2 : 3), how many cups of **fruit** go with **10 cups of yogurt**? Extend the ratio table or multiply both numbers by the same factor. Show your work.

Apply Use What You Know 20–25 min

Show the numbers you use in every item. A basic calculator is allowed.

4**Match the forms.** A paint mix uses **3 cups of blue** for every **5 cups of white**. The **same relationship** is shown three ways below: a ratio, a ratio table, and words. Study them, then answer 4a–4c.

Table B. Paint mix (blue :
white = 3 : 5).

Blue (cups) 3 6 9 ?

White (cups) 5 10 15 20

4a. Write the paint ratio blue : white in simplest form, and as a fraction.

4b. Fill in the missing "?" cup of blue that goes with 20 cups of white. Show how you scaled the ratio.

4c. In words: which is the "part-to-part" ratio, blue : white (3 : 5) or blue : total (3 : 8)? Explain in one sentence.

5Best buy (unit price). The same brand of juice comes two ways: a **3-quart bottle for \$4.50** and a **5-quart bottle for \$7.00**. Find each **unit price** (dollars per quart) and decide which is the better buy.

5a. Unit price of the 3-quart bottle. Show $\$4.50 \div 3$.

5b. Unit price of the 5-quart bottle. Show $\$7.00 \div 5$.

5c. Which bottle is the better buy? Circle it and write one sentence telling how you know.

6Error analysis. A student solved this problem: "A shirt costs \$25. The sales tax is 6%. How much is the tax?" Their work is shown in the box. **Find the mistake, explain it, and give the correct tax.**

Student's work:

6% means 6, so the tax is 6 out of 25.

So the tax is \$6.

What is wrong, and what is the correct tax?

7Multi-step percent of a quantity. A middle school has **300 students**. On a survey, **40%** chose pizza as their favorite lunch.

7a. How many students chose pizza? Show 0.40×300 (or use a ratio table: 40 out of 100 = ? out of 300).

7b. How many students did **not** choose pizza? Show your work.

Explain Justify Your Decision 5–10 min

Question 8. Two snack packs of the same crackers are on the shelf. Pack A holds **8 crackers for \$2.00**. Pack B holds **12 crackers for \$2.40**. **Which pack is the better buy, and why?** Write a **Claim** (your decision), **Evidence** (the unit prices you calculated), and **Reasoning** (why the unit-price method makes this a fair comparison).

Sentence stems you may use: "The better buy is Pack ____ because..." · "I found Pack A's price per cracker by... and Pack B's by..." · "Pack A costs ____ per cracker and Pack B costs ____ per cracker." · "Comparing unit prices is fair because..."

Claim (your decision)

Evidence (the numbers you used)

Reasoning (why the method is fair)

Close ACE Wrap-Up 5 min

Articulate

In your own words, explain how to make an **equivalent ratio** from a ratio you already have.

Connect

Point to one item in this packet where you found a **unit rate** or **unit price**. Give its number.

Extend

Give a **new** real-life example of a ratio or rate (a "per one" amount) that was *not* in this packet.

Continue Early Finisher optional · ~15 min

If you finish early (a challenge — no new materials needed):

Write and solve your own best-buy problem. On the back of this page: (1) invent two package sizes of the same item with different prices (use whole numbers that divide evenly); (2) find the **unit price** of each and name the better buy; and (3) explain why a shopper might still choose the pricier package anyway (think about how much they actually need). Show all your work.

Turn in: Hand in this whole packet with your name, class period, and date filled in. Make sure questions 1–8 and the ACE box are answered **with your work shown**. The early-finisher challenge is optional but turn it in too if you did it.

G06_MATH_Ratios_01 — Ratios, Rates, and Percents Student Packet