

Answer Key: Ratios, Rates, and Percents

Grade: 6 **Subject:** Mathematics **For teacher use only** Math

How to use this key

Answers are grouped by section and question number, with full worked steps. Accept any correct method that reaches the right value — alternate strategies (ratio tables, scale factors, or unit rates) are noted where they apply. Watch-for notes flag common misconceptions. A basic calculator is allowed, so grade the **reasoning and steps**, not just the arithmetic. Estimated grading time: ~5–7 min per packet.

Start Warm-Up: Retrieval ~1 min

1 Ratio: 6 apples to 9 oranges.

Ratio apples : oranges = **6 : 9**. Divide both by their GCF, 3: $6 \div 3 = 2$ and $9 \div 3 = 3$, so simplest form is **2 : 3**. Full credit for the original ratio, the " $\div 3$," and 2 : 3. Accept the forms 2 to 3 or $2/3$. *Watch:* order must be apples first (not 3 : 2).

2 Unit rate: 120 miles on 4 gallons.

$120 \div 4 =$ **30 miles per gallon**. Full credit for showing the division and the "per gallon" unit. *Alternate:* a ratio table halving $120 : 4 \rightarrow 60 : 2 \rightarrow 30 : 1$ also lands on 30 mpg.

Build Study the Math ~1 min

3 Fruit for 10 cups of yogurt (yogurt : fruit = 2 : 3).

From 2 cups of yogurt to 10 cups is $\times 5$, so multiply both by 5: $2 \times 5 = 10$ yogurt and $3 \times 5 =$ **15 cups of fruit**. *Alternate (unit rate):* fruit per cup of yogurt = $3 \div 2 = 1.5$, then $1.5 \times 10 = 15$ cups. Both correct.

Apply Use What You Know ~2–3 min

4 Match the forms (paint, blue : white, Table B).

4a. The ratio is already in simplest form: **3 : 5** (GCF of 3 and 5 is 1). As a fraction, **$3/5$** .

4b. White goes $5 \rightarrow 20$, which is $\times 4$, so blue = $3 \times 4 =$ **12 cups of blue** (the "?" is 12). Check: $12 : 20$ divides by 4 back to 3 : 5.

4c. Blue : white (3 : 5) is the part-to-part ratio — it compares one part (blue) to another part (white). Blue : total (3 : 8) is part-to-whole, because $3 + 5 = 8$ is the whole mixture. Full credit for naming 3 : 5 as part-to-part with a reason.

5 Best buy: 3 qt for \$4.50 vs. 5 qt for \$7.00.

5a. $\$4.50 \div 3 =$ **\$1.50 per quart**.

5b. $\$7.00 \div 5 =$ **\$1.40 per quart**.

5c. The **5-quart bottle** is the better buy because its unit price (\$1.40/qt) is **lower** than the 3-quart bottle's

(\$1.50/qt). Full credit requires both unit prices and choosing the 5-quart bottle with a "lower price per quart" reason.

Alternate: comparing total cost for a common amount (e.g., 15 quarts: $5 \times \$4.50 = \22.50 vs. $3 \times \$7.00 = \21.00) also shows the 5-quart is cheaper.

6 Error analysis: 6% tax on a \$25 shirt.

The mistake: The student treated "**6%**" as a **plain 6** (6 dollars, or 6 out of 25) instead of "**6 per 100.**" Percent means out of 100, so $6\% = 6/100 = 0.06$, not 6.

Correct work: Tax = 6% of \$25 = $0.06 \times 25 = \$1.50$.

Alternate correct method (ratio table): 6 out of 100 = ? out of 25. Since 25 is $100 \div 4$, divide 6 by 4 $\rightarrow$ \$1.50.

Accept either as the "fix." Full credit requires (1) naming that 6% is 6 per 100 (= 0.06), not 6, and (2) the correct tax of \$1.50.

7 Percent of a quantity: 40% of 300 students chose pizza.

7a. 40% of 300 = $0.40 \times 300 = 120$ **students.** *Alternate (ratio table):* 40 out of 100 = ? out of 300; 300 is 100×3 , so $40 \times 3 = 120$.

7b. Did not choose pizza = $300 - 120 = 180$ **students.** *Alternate:* $100\% - 40\% = 60\%$, and $0.60 \times 300 = 180$. Both correct.

Explain Justify Your Decision (Q8) ~1–2 min

8 Pack A (8 crackers, \$2.00) vs. Pack B (12 crackers, \$2.40) — better buy?

Model answer. Claim: **Pack B** is the better buy. Evidence: Pack A: $\$2.00 \div 8 = \0.25 **per cracker.** Pack B: $\$2.40 \div 12 = \0.20 **per cracker.** Reasoning: Comparing the **price for one cracker** (the unit price) is fair because the packs hold different numbers of crackers, so their total prices cannot be compared directly. Pack B costs less per cracker ($\$0.20 < \0.25), so it is the better buy.

Note: Full credit requires both unit prices (\$0.25 and \$0.20) and a reason that explains why per-cracker price is the fair comparison. A student who only says "Pack B has more crackers" or "Pack B is cheaper total" without unit prices earns partial credit. (Comparing total cost for a common count — e.g., 24 crackers: $3 \times \$2.00 = \6.00 vs. $2 \times \$2.40 = \4.80 — is an acceptable alternate.)

Justification scoring rubric (3 points)

Score	Claim	Evidence	Reasoning
3	Correct pack named (Pack B).	Both unit prices computed correctly (\$0.25 and \$0.20) with the numbers shown.	Clearly explains why comparing price per cracker is a fair comparison when pack sizes differ.
2	Correct pack named.	One unit price computed, or both with a minor arithmetic slip.	Reasoning present but incomplete or missing the "different sizes $\rightarrow$ compare per one" link.
1	Pack named with weak or no support.	Evidence largely missing or incorrect.	Little or flawed reasoning.
0	No/incorrect claim.	No evidence.	No reasoning.

Close ACE ~1 min

ACE Articulate / Connect / Extend.

Articulate: Accept any correct plain-language method: "multiply (or divide) *both* numbers of the ratio by the same number; the result names the same comparison." Reject multiplying only one number.

Connect: Valid items where a unit rate or unit price was used include Q2, Q5a, Q5b, or Q8. Any of these earns credit if correctly named. (Q3 uses a ratio table / unit rate too.)

Extend: Any genuine ratio or "per one" rate not in the packet — e.g., heartbeats per minute, pages read per hour, cost per pound of bananas, students per teacher. More than one answer is defensible.

Challenge Early Finisher (optional)

EF Write and solve your own best-buy problem.

Answers vary. A complete response has: (1) two package sizes of one item with different prices; (2) a correct **unit price** for each (dollars $\div$ items) and the lower one named as the better buy; and (3) a sensible reason a shopper might still buy the pricier package — e.g., they only need a small amount and would waste the rest, the bigger package will not fit or will spoil, or they cannot afford the larger total even though it is cheaper per item. *Sample:* 6 pens for \$3.00 $\rightarrow$ \$0.50 each; 10 pens for \$4.00 $\rightarrow$ \$0.40 each; the 10-pack is the better buy, but a student who needs only 6 pens might still buy the 6-pack.

Watch Common misconceptions

- **Additive vs. multiplicative reasoning.** To make equivalent ratios, students may *add* the same number to both parts instead of *multiplying*. In Q3, going 2 $\rightarrow$ 10 cups of yogurt is $\times 5$, not "+8," so fruit becomes $3 \times 5 = 15$, not $3 + 8 = 11$. Reinforce scaling both parts by the same factor.
- **Part-part vs. part-whole ratios.** In Q4, blue : white (3 : 5) compares two parts, while blue : total (3 : 8) compares a part to the whole ($3 + 5 = 8$). Students often mix these up; always ask "is this part to part, or part to whole?"
- **The percent base ("percent of what?").** The Q6 error: treating 6% as a plain 6 instead of 6 **per 100** (0.06), and taking it "of 25." Percent is always out of 100 and always "of" a whole. In Q7, 40% is of the 300 students. Always identify the base before multiplying.
- **Reversing ratio order.** Writing apples : oranges as 3 : 2 instead of 2 : 3 (Q1), or blue : white as 5 : 3. Keep the stated order in every equivalent ratio.
- **Stopping too soon / picking the wrong "better."** In a best buy (Q5, Q8), the **lower** unit price wins; a bigger number of items or a bigger bottle is not automatically the better deal. Confirm students compared price per one.

Teacher follow-up based on likely errors

If many students miss Q6, do a quick 5-minute review that "percent means per 100," turning several percents into decimals and fractions over 100. If Q3 or Q4b shows additive reasoning (answers like $3 + 8 = 11$), model the scale-factor method and a ratio table side by side. If Q4c is missed, re-anchor part-to-part vs. part-to-whole with a quick color-mix example. The Q8 justifications reveal who can explain *why* unit price is the fair comparison — a good discussion starter next class.