

Chapter 5 — Percent Means Out of 100 — Teacher Guide

Chapter at a glance

Lesson duration	4 lessons, 45–65 minutes each (see pacing table below)
Materials	100-square grids, strips divided into 100 sections, counters, percent cards, fraction and decimal cards, number lines from 0% to 150%, double number-line templates, the three chapter diagrams
Launch question	“35% of the questions correct, 35% off, grew by 35%, or ‘35% means 35’ — what does 35% mean in each?”
Key representation	The percent bar and double number line — keep one visible throughout instruction
Anticipated responses	Correct: names the whole in each situation and computes the amount separately. Partial: recognizes 35% as a relationship but can’t compute the amount without support. Incorrect: “35% means 35,” treating the percent as a whole-number amount.
If the readiness check fails	Reteach percent-as-hundredths and the hundred grid from Chapter 4 before starting the Launch; do not skip the concrete grid-building step
Talk prompt	“35 out of what? What is 100% here?”
Exit ticket	5 items — write a percent as fraction/decimal, estimate and find an exact percent, explain a value over 100%, explain why 80% of 50 isn’t 80, state a check method (see Section 14)
Reteach / extend	Reteach: benchmark percents only (10%, 25%, 50%, 75%, 100%), hundred grid and strip. Extend: decompose non-benchmark percents, interpret values above 200%.

Purpose and pacing

Chapter 5 prepares students for the three-part percent structures in Chapter 6. The key instructional move is to keep the whole visible. Do not allow students to calculate a percent amount before identifying what is being treated as 100%.

Lesson	Focus	Suggested time
Lesson 1	Readiness, launch, 100-	45–60 minutes

Lesson	Focus	Suggested time
	grid, and percent language	
Lesson 2	Percent bar, double number line, benchmarks, and values above 100%	45–60 minutes
Lesson 3	Worked examples, estimation, and misconception repair	45–55 minutes
Lesson 4	Worksheets B and C, Tripwire, Exit Ticket, and targeted reteaching	50–65 minutes

Materials

Prepare 100-square grids, strips divided into 100 sections, counters, percent cards, fraction and decimal cards, number lines from 0% to 150%, double number-line templates, and the chapter diagrams. Use two grids when modeling values greater than 100%.

Teacher launch guidance

Begin with 35% and ask “35 out of what?” Then change the context while keeping 35% constant. Students should notice that the relationship stays the same but the amount changes with the whole.

When a student says “80% is 80,” do not correct the statement only with a rule. Ask what the whole is, build the 100% reference, and compare 80% of 50 with 80% of 200. The contradiction should become visible.

Teacher prompts

Purpose	Prompt
Identify the reference	“What is 100% in this situation?”
Interpret the symbol	“What does the percent mean out of 100?”
Check size	“Should the answer be less than, equal to, or greater than the whole?”
Use a benchmark	“What is 50%, 25%, or 10% of the whole?”
Interpret above 100%	“How many wholes does this percent contain?”
Diagnose an error	“Did the student confuse a percent relationship with an amount?”
Connect forms	“How would you write this percent as a fraction or decimal?”

Differentiation

Students needing concrete support

Use 100-grid problems first. Restrict the first examples to 10%, 25%, 50%, 75%, and 100%. Then introduce non-benchmark values such as 35% and 62%. Keep the whole as a physical collection of counters or a labeled strip.

Students needing language support

Use the sentence frames:

- “The whole is _____, so 100% means _____.”
- “_____ % means _____ out of 100.”
- “The answer should be less than/equal to/greater than the whole because _____.”
- “The same percent gives a different amount because _____.”
- “I used _____ as a benchmark.”

Students ready to extend

Ask students to decompose percentages such as 35% into 25% + 10%, compare multiple methods for percent-of problems, interpret 250% in several contexts, and explain when a percent above 100% is meaningful or impossible under a stated constraint.

Formative assessment

Record whether each student can name the whole, translate a percent into a fraction or decimal, use a model, estimate, calculate, and explain the result. A correct multiplication answer without a named whole is incomplete evidence because Chapter 6 depends on distinguishing the part, whole, and percent.

Revision Support: Expected Ideas and Teacher Moves

Use this compact guide with the new Cumulative Connection and Strategy Studio tasks. Accept equivalent representations when the relationship, units, and reasoning are correct.

Cumulative Connection: Write 35% as a fraction and a decimal. Find 12 out of 20 as a percent. Explain the meaning of 1% and 100%. Estimate 18% of 50 without a calculator. Strategy Studio guidance: Expected ideas: can describe an amount greater than the reference whole; 12.5% can be of any whole when the quantities are scaled. Ask for the reference whole in every response.

Transfer Bridge Teacher Guidance

Use the four tasks to distinguish imitation from transfer. Ask students to name the relationship, keep units visible, compare representations, and explain or repair an error. Accept equivalent methods when the structure and interpretation are correct.

Expected guidance: Familiar: Altered: . Non-routine: 125% can mean 125 out of 100 of a reference amount, such as a final amount that is 1.25 times the original. Repair: the denominator is the reference whole.

Record whether the difficulty is classification, representation, operation, computation, units, interpretation, or checking. Do not assign more routine practice until the source of the error is identified.

Discussion and evidence note

Ask students to name the relationship before calculating, compare at least two representations when appropriate, and revise an explanation after hearing another strategy. Record whether the difficulty is classification, representation, operation, computation, units, or checking.

Answer Key

Ready-to-Learn Check

1. 25 out of 100 or one-fourth.
2. , 0.5.
3. $0.4 = 40\%$, so 0.4 is greater.
4. The whole.
5. 1.2.
6. 8.
7. 0.08 is eight hundredths; 0.8 is eight tenths.

Worksheet A

1. , **0.10**. Likely wrong answer: writes the decimal as 10 (treats the percent number as the decimal directly, without dividing by 100). Misconception: not translating percent to hundredths before converting. Next move: "10% means 10 out of how many? Write that as a decimal."
2. , **0.25**. Likely wrong answer: writes the decimal as 25. Misconception: same as #1 — skipping the $\div 100$ step. Next move: shade 25 squares on a hundred grid and read the decimal from it.
3. , **0.50**. Likely wrong answer: writes the decimal as 50. Misconception: same recurring error. Next move: "how many hundredths is 50%?"
4. , **0.75**. Likely wrong answer: writes the decimal as 75. Misconception: same recurring error. Next move: same hundred-grid check.
5. **1.20 and 1**. Likely wrong answer: says 120% is impossible, or writes the decimal as 12.0 (decimal misplaced). Misconception: percent restricted to values at or below 100.

Next move: "what does 100% represent? What would a little more than that look like?"

6. **8%, because 0.08 is eight hundredths**. Likely wrong answer: 80%. Misconception: tenths/hundredths confusion, carried over from Chapter 4. Next move: "how many hundredths are in 0.08? Compare it to 0.80 on a number line."
7. **35 squares shaded**. Likely wrong answer: shades 65 squares (shades the complement instead of the named percent). Misconception: confusing "35%" with "what's left after removing 35%." Next move: "does 35% mean the shaded part, or the unshaded part?"
8. **Mark 10%, 50%, 75%, and 100% at their named locations**. Likely wrong answer: spaces the four marks evenly along the bar, ignoring their actual values (for example, placing 10% a quarter of the way along). Misconception: treating the marks as four equally-spaced items instead of four different distances from 0. Next move: "is 10% closer to 0% or to 50%? Where exactly should it sit?"
9. **The entire cake**. Likely wrong answer: says "100 pieces" or "100 percent points," naming a count instead of the whole itself. Misconception: treating 100% as a literal count of 100 things rather than "all of the whole." Next move: "if the cake were cut into 4 pieces instead of 100, would 100% still mean the whole cake?"

10. **One whole plant height plus 20% more.** Likely wrong answer: “that’s impossible — a plant can’t be more than 100% of itself.” Misconception: percent restricted to a maximum of 100. Next move: “what if the plant is measured today and compared with how tall it was before?”
 11. **About 50 or 52; exact is 52.** Likely wrong answer: estimates using a benchmark far from 52%, such as rounding to 100% and estimating “close to 100.” Misconception: not selecting the nearest useful benchmark (50%). Next move: “which benchmark percent is 52% closest to?”
 12. **About 20, because 25% of 80 is 20.** Likely wrong answer: estimates using 50% instead of 25% as the nearby benchmark, giving “about 40.” Misconception: not selecting 25% as the closer benchmark to 24%. Next move: “is 24% closer to 25% or to 50%?”
 13. **47% is closer to 50%.** Likely wrong answer: picks 62%, reasoning that a larger number is “more correct” without measuring the actual distance from 50. Misconception: comparing raw size instead of distance from the benchmark. Next move: “how far is 47% from 50%? How far is 62%?”
 14. **A percent is a relationship to a specified whole; without the whole there is no amount.** Common flaw: states that the whole “matters” without explaining what goes wrong if it’s missing. Next move: ask for an example of the same percent giving two different amounts.
1. **6% = 0.06 = .** Likely wrong answer: 6 for the decimal, or left unsimplified. Misconception: not dividing by 100, or stopping before simplifying. Next move: “6% means 6 out of how many? What decimal is that?”
 2. **32% = 0.32 = .** Likely wrong answer: left unsimplified. Misconception: stopping before reducing to lowest terms. Next move: “what number divides evenly into both 32 and 100?”
 3. **85% = 0.85 = .** Likely wrong answer: left unsimplified. Misconception: same as #2. Next move: same simplifying check.
 4. **110% = 1.10 = .** Likely wrong answer: rejects the problem as impossible, or writes the decimal as 11.0. Misconception: percent restricted to 100 or below. Next move: “100% is one whole — what does 10% more look like?”
 5. **0.45 = 45% = .** Likely wrong answer: 4.5% (misplaces the decimal when converting). Misconception: place-value slip in the $\times 100$ step. Next move: “0.45 is how many hundredths?”
 6. **0.03 = 3% = .** Likely wrong answer: 30% (reads 0.03 as “3 tenths” instead of “3 hundredths”). Misconception: the recurring tenths/hundredths confusion. Next move: “how many hundredths are in 0.03? Compare it with 0.30 on a number line.”
 7. **= 70%.** Likely wrong answer: 7% (keeps the numerator as the percent, without scaling tenths to hundredths). Misconception: not recognizing that 7 tenths equals 70 hundredths. Next move: “7 tenths equals how many hundredths?”
 8. **= 15%.** Likely wrong answer: 3% (uses only the numerator) or 20% (uses only the denominator).

Worksheet B

1. **6% = 0.06 = .** Likely wrong answer: 6 for the decimal, or left

Misconception: not converting the whole fraction to a hundredths-based value. Next move: “what fraction with a denominator of 100 is equivalent to?”

9. **43.** Likely wrong answer: 40 or 45, from rounding 86 before calculating instead of after. *Misconception: rounding too early, losing precision. Next move: “half of 86 exactly — what is it?”*
10. **18.** Likely wrong answer: 24 (divides 72 by 3 instead of by 4, confusing 25% with one-third). *Misconception: mixing up the benchmark fraction for 25%. Next move: “25% is one-fourth — divide by 4, not 3.”*
11. **Estimate 100; exact $0.49 \times 200 = 98$.** Likely wrong answer: 9.8 for the exact value (a decimal-place slip in the multiplication). *Misconception: arithmetic error, not conceptual. Next move: “estimate first — is the exact answer close to 100?”*
12. **75% = ; $40 \div 4 \times 3 = 30$.** Likely wrong answer: 10 (finds one-fourth of 40 and stops, forgetting to multiply by 3). *Misconception: the unit-fraction-only error. Next move: “10 is one-fourth of 40 — what is three-fourths?”*
13. **70%, because 0.7 is 70 hundredths.** Likely wrong answer: 7%. *Misconception: the recurring tenths/hundredths confusion. Next move: “how many hundredths are in 0.7?”*
14. **Two wholes.** Likely wrong answer: “that’s impossible, percent can’t go past 100%.” *Misconception: percent restricted to a maximum of 100. Next move: “what would 300% mean? Does the pattern continue?”*
15. **The amount depends on the whole; for example, 80% of 50 is**

40, while 80% of 200 is 160.

Common flaw: states that “the whole matters” without giving a concrete example showing two different amounts from the same percent. Next move: ask for the student’s own pair of examples.

Worksheet C

1. **84%.** Likely wrong answer: 0.84% or 8.4% (misplaces the decimal when converting to a percent). *Misconception: arithmetic slip in the $\times 100$ step. Next move: “84 out of 100 — what percent is that directly?”*
2. **12%.** Likely wrong answer: 1.2% or 120% (misplaces the decimal or confuses the direction of scaling). *Misconception: same place-value slip as #1. Next move: “12 out of 100 — write that as a percent.”*
3. **1.25 times the original, or one whole plus 25% more.** Likely wrong answer: “the population grew by 125%,” confusing the new total with the amount of growth. *Misconception: not distinguishing the final amount (125%) from the change amount (25%). Next move: “does 125% describe the new total, or how much it grew?”*
4. **It is closest to 0%.** Likely wrong answer: 50%, from assuming any percent that isn’t 0 or 100 must be “in the middle.” *Misconception: not measuring the actual distance from each benchmark. Next move: “how far is 5% from 0%? How far is it from 50%?”*
5. **150% is 1.5 wholes.** *Common flaw: states that 150% is “more than one whole” without giving the precise multiple (1.5). Next move: ask for the exact decimal equivalent.*

6. **The whole was omitted; 80% of 50 is $0.8 \times 50 = 40$.** Likely wrong answer: agrees that 80% of 50 is 80 — exactly the error given in the problem. Misconception: treating the percent number as the answer itself, regardless of the whole. Next move: “what is 100% of 50? Can 80% of something be more than the whole?”
7. **25% of \$60 is \$15; the new price after a reduction would be \$45.** Likely wrong answer: gives \$15 as the final sale price, reporting the discount amount instead of the price after the discount. Misconception: confusing the change amount with the final amount. Next move: “is \$15 the amount taken off, or the amount left to pay?”
8. **75% of 24 is $\times 24 = 18$ students.** Likely wrong answer: 6 (finds one-fourth of 24 and stops, forgetting to multiply by 3). Misconception: the unit-fraction-only error. Next move: “6 is one-fourth of the class — how many is three-fourths?”
9. **120% of 5 km is $1.2 \times 5 = 6$ km.** Likely wrong answer: 5.2 km (adds 0.2 to 5 instead of multiplying by 1.2), or rejects the problem since “you can’t run more than 100% of a plan.” Misconception: treating the percent increase as an amount to add directly rather than a scaling factor, or restricting percent to 100. Next move: “120% means how many times the planned distance?”
10. **Answers vary but must include correct equivalent forms and a valid use.** Common flaw: the benchmark table includes an internally inconsistent entry (for example, pairing 20% with the decimal 0.02). Next move: check every row converts correctly before using the table.
11. **0.35 and 35% are the same value; both are greater than (which is approximately 33.33%).** Likely wrong answer: treats 0.35 and 35% as if they were different amounts, and picks only one as “the greatest.” Misconception: not recognizing that a decimal and its equivalent percent are literally the same value. Next move: “does converting 0.35 to a percent change the amount, or only the label?”
12. **Answers vary; the whole and the meaning of more than one whole must be stated.** Common flaw: names a percent greater than 100% but never identifies what quantity is being compared with the original whole. Next move: ask “125% more than what, exactly?”
13. **340 people. The number of weeks (2) and the number of researchers (6) were not needed to find how many people preferred the design.** Likely wrong answer: works the 2 weeks or 6 researchers into the calculation somehow (for example, dividing 340 by 6). Misconception: assuming every number in a word problem must be used. Next move: “what does the question actually ask for? Which number answers that?”
14. **Answers vary; must describe a situation where 60 is the whole, 27 is the part, and 45% is the relationship between them, with each meaning stated explicitly.** Common flaw: gives a context but only labels one or two of the three quantities. Next move: ask the student to finish three sentences — “60 is __,” “27 is __,” “45% means __.”

Extend Your Thinking

1. The whole is different: 1% of 500 is 5, while 1% of 50 is 0.5.
 2. $35\% = 25\% + 10\%$; for 200, $50 + 20 = 70$. Or $0.35 \times 200 = 70$.
 3. No, if the whole is the comparison quantity and the percent is 80%, the first is less than the second.
 4. It can mean 2.5 times the original, one whole plus 150% more, or a measured amount compared with a smaller reference.
 5. Answers vary but must distinguish $10\% = 0.10$ from $1\% = 0.01$.
 6. 50% is half the whole, so 49% and 51% should be near half.
2. A class has 18 students and 6 are absent. Is the absence rate 6%, 18%, or another percent? Identify the whole first.
 3. A student says 125% is impossible because percent cannot exceed 100. Give a context in which 125% makes sense.
 4. Write a percent problem whose answer is exactly 12.5%. Then write a different problem with the same answer but a different whole.

Revision Layer: Cumulative Connection

Use these short retrieval items before beginning the new work. Show a representation when it helps, keep units visible, and explain one answer to a partner.

1. Write 35% as a fraction and a decimal.
2. Find 12 out of 20 as a percent.
3. Explain the meaning of 1% and 100%.
4. Estimate 18% of 50 without a calculator.

Revision Layer: Strategy Studio

These tasks deliberately vary the numbers, representation, unknown, or context. Do not choose a method from the chapter title alone.

1. Show 35% as a hundred-grid description, a fraction, and a decimal.

Talk, Compare, Revise

Work with a partner. Each person explains one strategy. Identify one feature both strategies preserve, one feature that differs, and one sentence you would revise to make the reasoning clearer.

Student Self-Check

Before the exit ticket, complete these sentences: I identified the relationship by _____. The representation that made the structure clearest was _____. My answer is reasonable because _____.

Tripwire and Exit Ticket

Tripwire: the claim is false; 80% of 50 is 40 and 80% of 200 is 160.

Exit Ticket: $35\% = 0.35$;

32% of 150 is about 45 and exactly 48;

125% is 1.25 times the original;

60% of 40 is 24;

checks may use a benchmark, percent bar, double number line, or estimate.

