

Chapter 6 — Finding the Part, the Whole, or the Percent — Teacher Guide

Chapter at a glance

Lesson duration	4 lessons, 45–60 minutes each (see pacing table below)
Materials	Labeled part-percent-whole cards, percent bars, double number lines, 100-square grids, counters, sticky notes, context cards, the two chapter diagrams
Launch question	“What is 30% of 80? 24 is 30% of what number? 24 is what percent of 80? Same numbers — why three different answers?”
Key representation	The labeled part-percent-whole bar — keep one visible throughout instruction
Anticipated responses	Correct: labels which quantity is missing before choosing an operation. Partial: solves familiar missing-part problems but confuses missing-whole and missing-percent structures. Incorrect: multiplies every time regardless of which quantity is missing.
If the readiness check fails	Reteach percent-to-decimal conversion and the whole-and-part model from Chapters 2 and 5 before starting the Launch; do not skip the labeled three-slot diagram
Talk prompt	“Which of part, whole, and percent is missing?”
Exit ticket	5 items — find the part, find the whole, find the percent, explain why the operations differ, state a check (see Section 14)
Reteach / extend	Reteach: missing-part problems only, with the three-slot diagram. Extend: reverse problems (given the answer and one quantity, create the original question).

Purpose and pacing

Chapter 6 is the decision chapter for percent reasoning. Students should not be given a formula triangle as a substitute for understanding. Use the labeled part-percent-whole model first; introduce the compact formulas only after students can explain the relationship.

Lesson	Focus	Suggested time
Lesson 1	Readiness, launch, labels, and missing-part problems	45–60 minutes
Lesson 2	Missing-whole problems and inverse scaling	45–60 minutes
Lesson 3	Missing-percent problems, comparison, and error diagnosis	45–60 minutes
Lesson 4	Mixed practice, Tripwire, Exit Ticket, and targeted reteaching	50–65 minutes

Materials

Prepare labeled part-percent-whole cards, percent bars, double number lines, 100-square grids, counters, sticky notes, and context cards. Each context card should require students to identify the whole before choosing a calculation.

Teacher launch guidance

Place the three launch questions side by side. Ask students to circle the unknown in each problem. Then ask them to explain why the same numbers can be used in three different equations. The aim is to make the structure visible before the operation is selected.

Avoid saying “multiply for part, divide for whole, divide for percent” as an isolated chant. Require students to say what the quotient means. Division by the percent reconstructs a 100% whole; division by the whole creates a comparison ratio.

Teacher prompts

Purpose	Prompt
Identify the unknown	“Which of part, whole, and percent is missing?”
Identify the reference	“What represents 100%?”
Choose an operation	“Are you selecting a part, rebuilding a whole, or comparing two amounts?”
Check units	“Should the answer be students, dollars, or a percent?”
Check magnitude	“If the percent is 30%, should the part be smaller than the whole?”
Use inverse reasoning	“Can you put your answer back into the original relationship?”
Diagnose an error	“What quantity did the student treat as the whole?”

Differentiation

Students needing concrete support

Use benchmark percentages first. For missing parts, build equal groups or use a percent strip. For missing wholes, build the 30% or 20% section first and enlarge it to 100%. For missing percents, compare a part strip with the whole strip and locate the relationship on a number line.

Students needing language support

Use these frames:

- “The part is _____ because _____.”
- “The whole is _____ because it represents 100%.”
- “The percent is _____ because _____ out of the whole is selected.”
- “The missing quantity is _____, so I will _____.”
- “My check is valid because _____.”

Students ready to extend

Ask students to solve the same problem using a benchmark, an equation, and a double number line. Include decimals and percents greater than 100% where the context permits. Ask students to reverse a problem: given the answer and one quantity, create a valid original question.

Formative assessment

Record whether students can identify the labels, select the operation, preserve units, calculate, and check. A correct answer obtained through an unexplained procedure should be marked developing when the task assesses structure. The most important evidence is whether the student knows why the operation is multiplication or division.

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: Find 30% of 60. 18 is 30% of what number? 18 is what percent of 60? Name the unknown before choosing an operation.

Strategy Studio guidance: Expected ideas: $30\% \text{ of } 60 = 18$; $18 \div 0.30 = 60$; $18 \div 60 = 30\%$; the unknown position controls the structure. Use magnitude checks: a part should be smaller than the whole when the percent is below 100%.

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: $0.30 \times 60 = 18$. Altered: the unknown position changes the operation: $18 \div 0.30 = 60$ and $18 \div 60 = 0.30 = 30\%$. Non-routine: the tank capacity is 60 litres. Repair: 30% must be written as 0.30, and a part should be smaller than the whole when the percent is below 100%.

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

- 0.30.
- 24.
- The whole.
- Less than 80.
- 0.75 and 75%.
- Multiplication.
- Division: $24 \div 0.30$.

Worksheet A

- Part 8, whole 80, percent 10%, missing part.** Likely wrong answer: labels the whole as missing instead of the part. Misconception: not recognizing that "what is 10% of 80?" already states both the percent and the whole. Next move: "which number in the sentence is being asked for?"
- Part 20, whole 80, percent 25%, missing part.** Likely wrong answer: same mislabeling as #1. Misconception: same. Next move: same check.
- Part 20, whole 50, percent 40%, missing part.** Likely wrong answer: same mislabeling. Misconception: same. Next move: same check.
- Part 20, percent 25%, missing whole.** Likely wrong answer: labels the part as missing instead of the

whole. Misconception: not recognizing "20 is 25% of what number?" names the part (20) and asks for the whole. Next move: "which number do we already know, and which are we solving for?"

- Part 15, percent 30%, missing whole.** Likely wrong answer: same mislabeling as #4. Misconception: same. Next move: same check.
- Part 12, whole 48, missing percent.** Likely wrong answer: labels the percent as known and something else as missing. Misconception: not recognizing "12 is what percent of 48?" gives both part and whole. Next move: "which quantity has no numeral attached to it in the sentence?"
- Part 9, whole 30, missing percent.** Likely wrong answer: same mislabeling as #6. Misconception: same. Next move: same check.
- $0.10 \times 80 = 8$.** Likely wrong answer: 800 (multiplies by 10 instead of 0.10, forgetting to convert the percent to hundredths). Misconception: skipping the percent-to-decimal conversion. Next move: "10% as a decimal is what number?"

9. **20 ÷ 0.25 = 80.** Likely wrong answer: 5 (multiplies 20×0.25 instead of dividing). Misconception: multiplying regardless of which quantity is missing — the chapter's central error. Next move: "is the whole bigger or smaller than the part? Does multiplying or dividing get you there?"
 10. **12 ÷ 48 = 0.25 = 25%.** Likely wrong answer: $48 \div 12 = 4 = 400\%$ (divides in the wrong order). Misconception: part and whole reversed in the division. Next move: "which number is being compared with which?"
 11. **Multiply when the part is missing and the percent and whole are known; divide when the whole or percent is missing.** Common flaw: states the rule without connecting it to what each operation accomplishes. Next move: ask what dividing by the percent actually reconstructs.
 12. **Answers vary but should substitute the result into part = percent × whole.** Common flaw: checks the arithmetic again using the same method instead of substituting back into the original relationship. Next move: ask for a check that doesn't repeat the original steps.
- Misconception: same as #1. Next move: same decimal check.
 3. **90.** Likely wrong answer: 3.6 (multiplies 18×0.20 instead of dividing). Misconception: multiplying regardless of which quantity is missing. Next move: "is 18 the part or the whole? What operation rebuilds the whole?"
 4. **40.** Likely wrong answer: 25.6 (multiplies 32×0.80 instead of dividing). Misconception: same as #3. Next move: same check.
 5. **30%.** Likely wrong answer: 3.33 or 333% (divides $90 \div 27$ instead of $27 \div 90$, reversing part and whole). Misconception: part/whole order reversed. Next move: "which number is being compared with which?"
 6. **70%.** Likely wrong answer: reverses the division, giving an answer greater than 100% when it shouldn't be. Misconception: same as #5. Next move: same check.
 7. **70%.** Likely wrong answer: 0.7 left as a decimal, without converting to a percent. Misconception: forgetting the final $\times 100$ step. Next move: "does the question ask for a decimal or a percent?"
 8. **80.** Likely wrong answer: 7.2 (multiplies 24×0.30 instead of dividing). Misconception: multiplying regardless of which quantity is missing — the chapter's central error. Next move: "is 24 the whole, or part of it?"
 9. **Division reverses the scaling by the known percent and reconstructs 100%.** Common flaw: states that "you divide" without explaining what the division accomplishes. Next move: ask what 100% represents in this problem.

Worksheet B

1. **18.** Likely wrong answer: 1.8 (misplaces the decimal, computing as if the percent were 1.5% instead of 15%). Misconception: place-value slip converting the percent to a decimal. Next move: "15% as a decimal is what number? Multiply carefully."
2. **27.** Likely wrong answer: 2.7 (same decimal-placement slip).

10. **Answers should match 40% of 70 equals 28.** *Common flaw: the context describes a different relationship than the equation given. Next move: check that the context's numbers actually produce 28 when 40% of 70 is calculated.*
11. **Answers should state that 28 is 40% of 70.** *Common flaw: swaps which number is the part and which is the whole in the created context. Next move: verify by computing $28 \div 70$.*
12. **Answers should state that 28 compared with 70 is 40%.** *Common flaw: creates a context matching a different one of the three problem types. Next move: check which quantity is unknown in the student's context.*

Worksheet C

1. **120 tickets.** *Likely wrong answer: 213.3 (multiplies 160 by 75 instead of by 0.75, forgetting to convert the percent). Misconception: skipping the percent-to-decimal step. Next move: "75% as a decimal is what number?"*
2. **180 students.** *Likely wrong answer: 16.2 (multiplies 54×0.30 instead of dividing). Misconception: multiplying regardless of which quantity is missing. Next move: "is 54 the part or the whole here?"*
3. **75%.** *Likely wrong answer: 133% (divides $24 \div 18$ instead of $18 \div 24$, reversing part and whole). Misconception: part/whole order reversed. Next move: "which number is being compared with which?"*
4. **The whole is missing, so divide: $8 \div 0.20 = 40$.** *Likely wrong answer: agrees with the student's multiplication (8×0.20), which is exactly the error stated in the problem. Misconception: multiplying regardless of which quantity is missing. Next move: "does multiplying by 20% make a number bigger or smaller? Should the answer here be bigger or smaller than 8?"*
5. **$12 \div 40 = 0.30 = 30\%$.** *Likely wrong answer: $40 \div 12 \approx 3.33 = 333\%$ (reverses part and whole). Misconception: same reversed-division error. Next move: same check as #3.*
6. **$360 \div 0.45 = 800$.** *Likely wrong answer: 162 (multiplies 360×0.45 instead of dividing). Misconception: multiplying regardless of which quantity is missing. Next move: "is \$360 the whole goal, or part of it?"*
7. **$0.30 \times 80 = \$24$.** *Likely wrong answer: \$2,400 (multiplies by 30 instead of 0.30, forgetting to convert the percent). Misconception: skipping the percent-to-decimal step. Next move: "30% as a decimal is what number?"*
8. **$27 \div 36 = 0.75 = 75\%$.** *Likely wrong answer: $36 \div 27 \approx 1.33 = 133\%$ (reverses part and whole). Misconception: same reversed-division error as #3 and #5. Next move: same check.*
9. **Answers vary but must identify the missing quantity.** *Common flaw: writes three problems that all happen to have the same missing quantity, rather than one of each type. Next move: check that a missing part, a missing whole, and a missing percent are each represented.*
10. **All use part = percent $\times$ whole; the operation changes according to the unknown.** *Common flaw: describes the three problems as*

unrelated rather than as the same relationship solved for different unknowns. Next move: ask the student to write all three using the same equation, with a different letter unknown each time.

11. **\$1,500. The number of hours (6) and the number of volunteers (12) were not needed to find the goal.** *Likely wrong answer: works the 6 hours or 12 volunteers into the calculation somehow (for example, dividing \$450 by 12). Misconception: assuming every number in a word problem must be used. Next move: "what does the question actually ask for? Which numbers answer that?"*
12. **Answers vary; must describe a situation where 75 is the whole, 0.60 (60%) is the percent, and 45 is the part, with each meaning stated.** *Common flaw: gives a context but doesn't label which number plays which role. Next move: ask the student to finish three sentences — "75 is __," "60% means __," "45 is __."*

Extend Your Thinking

1. 60% remains.

2. The second number is larger by a factor of 4 because 25% is one-fourth.
3. 60% is twice 30%, so it is 36.
4. Answers vary; for example, "12 is 20% of what number?" and "24 is 40% of what number?" both have the same missing whole, 60, even though the parts (12 and 24) differ. A valid pair must produce the same missing whole when solved.
5. If part is smaller than whole, $\text{part} \div \text{whole}$ is between 0 and 1, so the percent is between 0% and 100%.
6. In a context with growth or comparison, a value can be more than 100%; labels must identify the reference whole.

Tripwire and Exit Ticket

Tripwire: $12 \div 0.40 = 30$;

check $0.40 \times 30 = 12$.

Exit Ticket: 28;

80;

75%;

The first has missing part, the second missing whole, and the third missing percent;

Checks may use substitution, units, or magnitude.

