Chapter 25

Word problems reasoning and checking

Learn the ideas below, follow each worked example, then attempt the practice before checking the answers.

25.1 Reading and modelling a problem

Read the whole problem before calculating. Identify what is known, what is required and what the units mean. Choose a diagram, table, bar model or equation to represent the relationships. Operation words give clues, but the meaning of the situation determines the operation.

Worked example A library has 240 books. After donating 35, it buys 58. The model is $240 - 35 + 58$, giving 263 books. The final question asks for the new total, so both changes must be included.

25.2 Multi step problems

Break a complex problem into smaller questions. Keep intermediate values exact when possible and label what each one represents. Follow the actual sequence of events. In fraction and percentage problems, decide whether each action uses the original whole or a new remainder.

Worked example A class of 36 has $\frac{2}{3}$ attending a trip. Of those attending, $\frac{3}{4}$ choose lunch. Attending = 24; choosing lunch = 18.

Applying both fractions to 36 separately would answer a different question.

25.3 Working backwards

When a final value is known, reverse each operation in the opposite order. Undo addition with subtraction, multiplication with division, and vice versa. For percentage changes, undo the multiplier by division. Check by running the original process forwards.

Worked example A number is multiplied by 4, then 7 is added, producing 51. Work backwards: 51 − 7 = 44, then 44 ÷ 4 = 11. Forward check: 11 × 4 + 7 = 51.

25.4 Logical reasoning and systematic lists

Use constraints to rule out impossible choices. Make an organised list so cases are neither missed nor repeated. A counterexample disproves a general claim. A few supporting examples alone do not prove a statement for all numbers. Explain the reason behind a pattern when possible.

Worked example To list two digit numbers using 2, 4 and 6 without repetition, organise by tens digit: 24, 26, 42, 46, 62, 64. There are 3 choices for the tens digit and 2 remaining choices for the ones, so 6 numbers.

25.5 Checking reasonableness and exactness

Estimate before calculating. Check with an inverse operation, a different method or substitution. Track units and signs. Decide whether the answer should be a whole number, fraction, decimal or rounded measurement. State any assumption that materially affects the answer.

Worked example A calculation says 48 students need 4 buses holding 15 each. Check capacity: 4 × 15 = 60, while 3 × 15 = 45 is too few. The quotient 48 ÷ 15 = 3.2 must round up for buses.

25.6 Presenting a complete solution

Show the equation or method, meaningful intermediate steps and a final statement with units. Use = only between equal values and ≈ for rounded values. Keep enough precision until the final step. A clear explanation lets another learner follow and check the reasoning.

Worked example A 96 rupee bill is shared equally by 5 friends. Share = 96 ÷ 5 = 19.20 rupees each. Check: 5 × 19.20 = 96. The answer includes the currency and uses two decimal places.

Chapter 25 practice

Work in your notebook. Show your method and include units where needed.

1. A shop has 125 boxes, sells 48 and receives 37. How many remain?
2. A tank has 80 L. After $\frac{3}{8}$ is used, how much remains?
3. A number divided by 3 and then increased by 8 gives 20. Find it.
4. How many 24 seat buses are needed for 130 people?
5. A learner claims every prime is odd. Give a counterexample.

Answers with methods

1. 125 − 48 + 37 = 114 boxes.

2. Used = $\frac{3}{8}$ × 80 = 30 L. Remaining = 50 L.

3. Work backwards: 20 − 8 = 12, then 12 × 3 = 36. Check: 36 ÷ 3 + 8 = 20.

4. 130 ÷ 24 = 5 remainder 10, so 6 buses are required.

5. 2 is prime and even, so the claim is false.

Common mistake to avoid

An answer can be arithmetically correct but unsuitable for the context. You cannot order 3.2 buses or report a negative length for a physical object.