

Cumulative Checks and Reviews Teacher Answer Guide

Use answers as routing evidence

Each entry gives the exact expected answer from the final Book 1 manuscript, a plausible wrong response, the likely misconception, and the smallest next move. Treat a misconception as a hypothesis until a second item confirms it.

Cumulative Recalculation Check — Chapters 1-2

1. Write 6,407.052 in expanded form.

Expected answer: $6,000 + 400 + 7 + 0.05 + 0.002$.

Plausible wrong response: Compares written digits, drops a placeholder zero, or rounds from the target digit itself.

Likely misconception: Place value is not being used to control comparison, form, or rounding.

Smallest next move: Align the place-value columns and circle the one digit that decides the result.

2. Compare: 0.7 ___ 0.699 .

Expected answer: $0.7 > 0.699$.

Plausible wrong response: Ignores placeholder zeros or places the decimal by visual guesswork.

Likely misconception: Decimal place value and magnitude are not being checked against an estimate.

Smallest next move: Write placeholder zeros, estimate the size, then calculate and compare the result with the estimate.

3. Round 18,746 to the nearest hundred.

Expected answer: 18,700.

Plausible wrong response: Compares written digits, drops a placeholder zero, or rounds from the target digit itself.

Likely misconception: Place value is not being used to control comparison, form, or rounding.

Smallest next move: Align the place-value columns and circle the one digit that decides the result.

4. List all factors of 30.

Expected answer: 1, 2, 3, 5, 6, 10, 15, 30.

Plausible wrong response: Lists multiples as factors, labels an odd number prime without testing, or swaps GCF and LCM.

Likely misconception: Factor structure or the choice between greatest common factor and least common multiple is insecure.

Smallest next move: Build complete factor pairs or short multiple lists, then name what the context is asking for.

5. Classify 91 as prime or composite and justify.

Expected answer: Composite: $91 = 7 \times 13$.

Plausible wrong response: Gives only a corrected value or repeats the claim without identifying the faulty reasoning.

Likely misconception: Factor structure or the choice between greatest common factor and least common multiple is insecure.

Smallest next move: Build complete factor pairs or short multiple lists, then name what the context is asking for.

6. Find the GCF of 24 and 36.

Expected answer: 12.

Plausible wrong response: Lists multiples as factors, labels an odd number prime without testing, or swaps GCF and LCM.

Likely misconception: Factor structure or the choice between greatest common factor and least common multiple is insecure.

Smallest next move: Build complete factor pairs or short multiple lists, then name what the context is asking for.

7. Find the LCM of 8 and 12.

Expected answer: 24.

Plausible wrong response: Lists multiples as factors, labels an odd number prime without testing, or swaps GCF and LCM.

Likely misconception: Factor structure or the choice between greatest common factor and least common multiple is insecure.

Smallest next move: Build complete factor pairs or short multiple lists, then name what the context is asking for.

8. Diagnostic: A student says $0.508 > 0.58$ because $508 > 58$. Identify the exact misconception.

Expected answer: The student is comparing decimal digits as whole numbers instead of aligning place values. Correct: $0.508 < 0.58$.

Plausible wrong response: Gives only a corrected value or repeats the claim without identifying the faulty reasoning.

Likely misconception: Decimal place value and magnitude are not being checked against an estimate.

Smallest next move: Write placeholder zeros, estimate the size, then calculate and compare the result with the estimate.

Cumulative Recalculation Check — Chapters 1-4

1. Order 0.405, 0.45, 0.504, 0.54 from least to greatest.

Expected answer: 0.405, 0.45, 0.504, 0.54.

Plausible wrong response: Ignores placeholder zeros or places the decimal by visual guesswork.

Likely misconception: Decimal place value and magnitude are not being checked against an estimate.

Smallest next move: Write placeholder zeros, estimate the size, then calculate and compare the result with the estimate.

2. Find the GCF of 28 and 42.

Expected answer: 14.

Plausible wrong response: Lists multiples as factors, labels an odd number prime without testing, or swaps GCF and LCM.

Likely misconception: Factor structure or the choice between greatest common factor and least common multiple is insecure.

Smallest next move: Build complete factor pairs or short multiple lists, then name what the context is asking for.

3. Simplify 18/24.

Expected answer: 3/4.

Plausible wrong response: Compares denominators alone, scales only one term, or stops simplifying before reaching the GCF.

Likely misconception: Fraction size or equivalence is being judged additively rather than multiplicatively.

Smallest next move: Use one common denominator, benchmark, or scale factor and apply it to both numerator and denominator.

4. Compare 5/6 and 7/9.

Expected answer: $5/6 > 7/9$ ($15/18 > 14/18$).

Plausible wrong response: Compares denominators alone, scales only one term, or stops simplifying before reaching the GCF.

Likely misconception: Fraction size or equivalence is being judged additively rather than multiplicatively.

Smallest next move: Use one common denominator, benchmark, or scale factor and apply it to both numerator and denominator.

5. Calculate $7.25 - 3.8$.

Expected answer: 3.45.

Plausible wrong response: Ignores placeholder zeros or places the decimal by visual guesswork.

Likely misconception: Decimal place value and magnitude are not being checked against an estimate.

Smallest next move: Write placeholder zeros, estimate the size, then calculate and compare the result with the estimate.

6. Calculate 0.6×0.35 .

Expected answer: 0.21.

Plausible wrong response: Ignores placeholder zeros or places the decimal by visual guesswork.

Likely misconception: Decimal place value and magnitude are not being checked against an estimate.

Smallest next move: Write placeholder zeros, estimate the size, then calculate and compare the result with the estimate.

7. Calculate $5.4 \div 0.9$.

Expected answer: 6.

Plausible wrong response: Ignores placeholder zeros or places the decimal by visual guesswork.

Likely misconception: Decimal place value and magnitude are not being checked against an estimate.

Smallest next move: Write placeholder zeros, estimate the size, then calculate and compare the result with the estimate.

8. Diagnostic: A student calculates $3.2 \times 0.4 = 12.8$. Explain the place-value error and correct it.

Expected answer: 0.4 is four tenths, so the product should be less than 3.2. $3.2 \times 0.4 = 1.28$.

Plausible wrong response: Gives only a corrected value or repeats the claim without identifying the faulty reasoning.

Likely misconception: Decimal place value and magnitude are not being checked against an estimate.

Smallest next move: Write placeholder zeros, estimate the size, then calculate and compare the result with the estimate.

Cumulative Recalculation Check — Chapters 1–6

1. Compare: -8 ___ -3 .

Expected answer: $-8 < -3$.

Plausible wrong response: Uses the slogan 'two negatives make a positive' for addition or reverses the number-line order.

Likely misconception: The sign rule is being applied without identifying the operation.

Smallest next move: Name the operation first, model one move on a number line, and then apply the matching rule.

2. Evaluate $|-11|$ and state the opposite of -11 .

Expected answer: $|-11| = 11$; opposite = 11.

Plausible wrong response: Uses the slogan 'two negatives make a positive' for addition or reverses the number-line order.

Likely misconception: The sign rule is being applied without identifying the operation.

Smallest next move: Name the operation first, model one move on a number line, and then apply the matching rule.

3. Calculate $-7 + 12$.

Expected answer: 5.

Plausible wrong response: Uses the slogan 'two negatives make a positive' for addition or reverses the number-line order.

Likely misconception: The sign rule is being applied without identifying the operation.

Smallest next move: Name the operation first, model one move on a number line, and then apply the matching rule.

4. Calculate $6 - (-9)$.

Expected answer: 15.

Plausible wrong response: Uses the slogan 'two negatives make a positive' for addition or reverses the number-line order.

Likely misconception: The sign rule is being applied without identifying the operation.

Smallest next move: Name the operation first, model one move on a number line, and then apply the matching rule.

5. Calculate $(-8)(-4)$.

Expected answer: 32.

Plausible wrong response: Uses the slogan 'two negatives make a positive' for addition or reverses the number-line order.

Likely misconception: The sign rule is being applied without identifying the operation.

Smallest next move: Name the operation first, model one move on a number line, and then apply the matching rule.

6. Calculate $42 \div (-6)$.

Expected answer: -7.

Plausible wrong response: Uses the slogan 'two negatives make a positive' for addition or reverses the number-line order.

Likely misconception: The sign rule is being applied without identifying the operation.

Smallest next move: Name the operation first, model one move on a number line, and then apply the matching rule.

7. Order -5, 2, -1, 0 from least to greatest.

Expected answer: -5, -1, 0, 2.

Plausible wrong response: Uses the slogan 'two negatives make a positive' for addition or reverses the number-line order.

Likely misconception: The sign rule is being applied without identifying the operation.

Smallest next move: Name the operation first, model one move on a number line, and then apply the matching rule.

8. Diagnostic: A student says $-6 + (-3) = 9$ because “two negatives make a positive.” Explain why the slogan does not apply.

Expected answer: “Two negatives make a positive” is a multiplication/division sign rule, not an addition rule. $-6 + (-3) = -9$.

Plausible wrong response: Gives only a corrected value or repeats the claim without identifying the faulty reasoning.

Likely misconception: The sign rule is being applied without identifying the operation.

Smallest next move: Name the operation first, model one move on a number line, and then apply the matching rule.

Cumulative Recalculation Check — Chapters 1–8

1. Write $3/8$ as a decimal.

Expected answer: 0.375.

Plausible wrong response: Compares denominators alone, scales only one term, or stops simplifying before reaching the GCF.

Likely misconception: Fraction size or equivalence is being judged additively rather than multiplicatively.

Smallest next move: Use one common denominator, benchmark, or scale factor and apply it to both numerator and denominator.

2. Which is greater: -0.4 or $-1/2$?

Expected answer: -0.4 is greater ($-0.4 > -0.5$).

Plausible wrong response: Compares denominators alone, scales only one term, or stops simplifying before reaching the GCF.

Likely misconception: Fraction size or equivalence is being judged additively rather than multiplicatively.

Smallest next move: Use one common denominator, benchmark, or scale factor and apply it to both numerator and denominator.

3. Order $-\frac{3}{4}$, 0.2, -0.6, $\frac{1}{2}$.

Expected answer: $-\frac{3}{4}$, -0.6, 0.2, $\frac{1}{2}$.

Plausible wrong response: Compares denominators alone, scales only one term, or stops simplifying before reaching the GCF.

Likely misconception: Fraction size or equivalence is being judged additively rather than multiplicatively.

Smallest next move: Use one common denominator, benchmark, or scale factor and apply it to both numerator and denominator.

4. Evaluate $18 \div 3 \times 2$.

Expected answer: 12.

Plausible wrong response: Works strictly left to right or treats multiplication as always before division.

Likely misconception: Operation tiers and left-to-right priority within a tier are being confused.

Smallest next move: Mark brackets and exponents first, then underline each same-tier operation in left-to-right order.

5. Evaluate $4 + 3 \times 5$.

Expected answer: 19.

Plausible wrong response: Works strictly left to right or treats multiplication as always before division.

Likely misconception: Operation tiers and left-to-right priority within a tier are being confused.

Smallest next move: Mark brackets and exponents first, then underline each same-tier operation in left-to-right order.

6. Evaluate $(4 + 3) \times 5$.

Expected answer: 35.

Plausible wrong response: Works strictly left to right or treats multiplication as always before division.

Likely misconception: Operation tiers and left-to-right priority within a tier are being confused.

Smallest next move: Mark brackets and exponents first, then underline each same-tier operation in left-to-right order.

7. Evaluate $2 + (6 - 1)^2$.

Expected answer: 27.

Plausible wrong response: Uses the slogan 'two negatives make a positive' for addition or reverses the number-line order.

Likely misconception: The sign rule is being applied without identifying the operation.

Smallest next move: Name the operation first, model one move on a number line, and then apply the matching rule.

8. Diagnostic: A student evaluates $24 \div 6 \times 2$ as 2. Identify the left-to-right error and correct the value.

Expected answer: Multiplication and division share priority and are done left to right: $24 \div 6 = 4$, then $4 \times 2 = 8$.

Plausible wrong response: Gives only a corrected value or repeats the claim without identifying the faulty reasoning.

Likely misconception: Operation tiers and left-to-right priority within a tier are being confused.

Smallest next move: Mark brackets and exponents first, then underline each same-tier operation in left-to-right order.

Cumulative Review A

1. Write 4,305.27 in expanded form.

Expected answer: $4,000 + 300 + 5 + 0.2 + 0.07$

Plausible wrong response: Compares written digits, drops a placeholder zero, or rounds from the target digit itself.

Likely misconception: Place value is not being used to control comparison, form, or rounding.

Smallest next move: Align the place-value columns and circle the one digit that decides the result.

2. Compare: 0.608 ____ 0.68

Expected answer: $0.608 < 0.68$

Plausible wrong response: Compares written digits, drops a placeholder zero, or rounds from the target digit itself.

Likely misconception: Place value is not being used to control comparison, form, or rounding.

Smallest next move: Align the place-value columns and circle the one digit that decides the result.

3. Order: 0.45, 0.405, 0.54, 0.504

Expected answer: 0.405, 0.45, 0.504, 0.54

Plausible wrong response: Compares written digits, drops a placeholder zero, or rounds from the target digit itself.

Likely misconception: Place value is not being used to control comparison, form, or rounding.

Smallest next move: Align the place-value columns and circle the one digit that decides the result.

4. List all factors of 24.

Expected answer: 1, 2, 3, 4, 6, 8, 12, 24

Plausible wrong response: Lists multiples as factors, labels an odd number prime without testing, or swaps GCF and LCM.

Likely misconception: Factor structure or the choice between greatest common factor and least common multiple is insecure.

Smallest next move: Build complete factor pairs or short multiple lists, then name what the context is asking for.

5. List the first five positive multiples of 9.

Expected answer: 9, 18, 27, 36, 45

Plausible wrong response: Lists multiples as factors, labels an odd number prime without testing, or swaps GCF and LCM.

Likely misconception: Factor structure or the choice between greatest common factor and least common multiple is insecure.

Smallest next move: Build complete factor pairs or short multiple lists, then name what the context is asking for.

6. Is 37 prime or composite?

Expected answer: Prime

Plausible wrong response: Lists multiples as factors, labels an odd number prime without testing, or swaps GCF and LCM.

Likely misconception: Factor structure or the choice between greatest common factor and least common multiple is insecure.

Smallest next move: Build complete factor pairs or short multiple lists, then name what the context is asking for.

7. Find the GCF of 18 and 30.

Expected answer: 6

Plausible wrong response: Lists multiples as factors, labels an odd number prime without testing, or swaps GCF and LCM.

Likely misconception: Factor structure or the choice between greatest common factor and least common multiple is insecure.

Smallest next move: Build complete factor pairs or short multiple lists, then name what the context is asking for.

8. Find the LCM of 6 and 8.

Expected answer: 24

Plausible wrong response: Lists multiples as factors, labels an odd number prime without testing, or swaps GCF and LCM.

Likely misconception: Factor structure or the choice between greatest common factor and least common multiple is insecure.

Smallest next move: Build complete factor pairs or short multiple lists, then name what the context is asking for.

9. Simplify 12/18.

Expected answer: $\frac{2}{3}$

Plausible wrong response: Compares denominators alone, scales only one term, or stops simplifying before reaching the GCF.

Likely misconception: Fraction size or equivalence is being judged additively rather than multiplicatively.

Smallest next move: Use one common denominator, benchmark, or scale factor and apply it to both numerator and denominator.

10. Write an equivalent fraction for $\frac{3}{5}$.

Expected answer: Example: $\frac{6}{10}$

Plausible wrong response: Compares denominators alone, scales only one term, or stops simplifying before reaching the GCF.

Likely misconception: Fraction size or equivalence is being judged additively rather than multiplicatively.

Smallest next move: Use one common denominator, benchmark, or scale factor and apply it to both numerator and denominator.

11. Which is greater: $\frac{2}{3}$ or $\frac{3}{4}$?

Expected answer: $\frac{3}{4}$

Plausible wrong response: Compares denominators alone, scales only one term, or stops simplifying before reaching the GCF.

Likely misconception: Fraction size or equivalence is being judged additively rather than multiplicatively.

Smallest next move: Use one common denominator, benchmark, or scale factor and apply it to both numerator and denominator.

12. Write $\frac{9}{4}$ as a mixed number.

Expected answer: $2\frac{1}{4}$

Plausible wrong response: Compares denominators alone, scales only one term, or stops simplifying before reaching the GCF.

Likely misconception: Fraction size or equivalence is being judged additively rather than multiplicatively.

Smallest next move: Use one common denominator, benchmark, or scale factor and apply it to both numerator and denominator.

13. Add $4.6 + 2.35$.

Expected answer: 6.95

Plausible wrong response: Ignores placeholder zeros or places the decimal by visual guesswork.

Likely misconception: Decimal place value and magnitude are not being checked against an estimate.

Smallest next move: Write placeholder zeros, estimate the size, then calculate and compare the result with the estimate.

14. Subtract $8.2 - 3.75$.

Expected answer: 4.45

Plausible wrong response: Ignores placeholder zeros or places the decimal by visual guesswork.

Likely misconception: Decimal place value and magnitude are not being checked against an estimate.

Smallest next move: Write placeholder zeros, estimate the size, then calculate and compare the result with the estimate.

15. Multiply 2.4×0.5 .

Expected answer: 1.2

Plausible wrong response: Ignores placeholder zeros or places the decimal by visual guesswork.

Likely misconception: Decimal place value and magnitude are not being checked against an estimate.

Smallest next move: Write placeholder zeros, estimate the size, then calculate and compare the result with the estimate.

16. Divide $4.8 \div 0.6$.

Expected answer: 8

Plausible wrong response: Ignores placeholder zeros or places the decimal by visual guesswork.

Likely misconception: Decimal place value and magnitude are not being checked against an estimate.

Smallest next move: Write placeholder zeros, estimate the size, then calculate and compare the result with the estimate.

17. Compare: -7 ____ -3

Expected answer: $-7 < -3$

Plausible wrong response: Uses the slogan 'two negatives make a positive' for addition or reverses the number-line order.

Likely misconception: The sign rule is being applied without identifying the operation.

Smallest next move: Name the operation first, model one move on a number line, and then apply the matching rule.

18. Evaluate $|-12|$.

Expected answer: 12

Plausible wrong response: Uses the slogan 'two negatives make a positive' for addition or reverses the number-line order.

Likely misconception: The sign rule is being applied without identifying the operation.

Smallest next move: Name the operation first, model one move on a number line, and then apply the matching rule.

19. Calculate $-8 + 5$.

Expected answer: -3

Plausible wrong response: Uses the slogan 'two negatives make a positive' for addition or reverses the number-line order.

Likely misconception: The sign rule is being applied without identifying the operation.

Smallest next move: Name the operation first, model one move on a number line, and then apply the matching rule.

20. Calculate $6 - (-4)$.

Expected answer: 10

Plausible wrong response: Uses the slogan 'two negatives make a positive' for addition or reverses the number-line order.

Likely misconception: The sign rule is being applied without identifying the operation.

Smallest next move: Name the operation first, model one move on a number line, and then apply the matching rule.

21. Calculate -5×7 .

Expected answer: -35

Plausible wrong response: Uses the slogan 'two negatives make a positive' for addition or reverses the number-line order.

Likely misconception: The sign rule is being applied without identifying the operation.

Smallest next move: Name the operation first, model one move on a number line, and then apply the matching rule.

22. Calculate $-36 \div (-6)$.

Expected answer: 6

Plausible wrong response: Uses the slogan 'two negatives make a positive' for addition or reverses the number-line order.

Likely misconception: The sign rule is being applied without identifying the operation.

Smallest next move: Name the operation first, model one move on a number line, and then apply the matching rule.

23. Write 0.75 as a simplified fraction.

Expected answer: $\frac{3}{4}$

Plausible wrong response: Compares unlike forms directly or assumes every non-terminating decimal is irrational.

Likely misconception: Equivalent forms and the definition of a rational number are not secure.

Smallest next move: Convert both values to the same form or write the number as a fraction before deciding.

24. Which is greater: -0.4 or $-\frac{1}{2}$?

Expected answer: -0.4

Plausible wrong response: Compares unlike forms directly or assumes every non-terminating decimal is irrational.

Likely misconception: Equivalent forms and the definition of a rational number are not secure.

Smallest next move: Convert both values to the same form or write the number as a fraction before deciding.

25. Evaluate $5 + 3 \times 4$.

Expected answer: 17

Plausible wrong response: Works strictly left to right or treats multiplication as always before division.

Likely misconception: Operation tiers and left-to-right priority within a tier are being confused.

Smallest next move: Mark brackets and exponents first, then underline each same-tier operation in left-to-right order.

26. Evaluate $18 \div 3 \times 2$.

Expected answer: 12

Plausible wrong response: Works strictly left to right or treats multiplication as always before division.

Likely misconception: Operation tiers and left-to-right priority within a tier are being confused.

Smallest next move: Mark brackets and exponents first, then underline each same-tier operation in left-to-right order.

27. Evaluate 2^3 .

Expected answer: 8

Plausible wrong response: Multiplies the base by the exponent or ignores brackets around a negative base.

Likely misconception: The base and exponent are not being interpreted before evaluation.

Smallest next move: Identify the complete base, expand one power as repeated multiplication, and compare signs.

28. Simplify $2^3 \times 2^2$.

Expected answer: $2^5 = 32$

Plausible wrong response: Multiplies the base by the exponent or ignores brackets around a negative base.

Likely misconception: The base and exponent are not being interpreted before evaluation.

Smallest next move: Identify the complete base, expand one power as repeated multiplication, and compare signs.

29. Evaluate $\sqrt{81}$.

Expected answer: 9

Plausible wrong response: Halves the radicand or gives an estimate outside consecutive perfect-square bounds.

Likely misconception: Square root is not connected to equal factors and benchmark squares.

Smallest next move: Write the nearest perfect square below and above, then place the root between their square roots.

30. Estimate $\sqrt{30}$.

Expected answer: Between 5 and 6; approximately 5.5

Plausible wrong response: Halves the radicand or gives an estimate outside consecutive perfect-square bounds.

Likely misconception: Square root is not connected to equal factors and benchmark squares.

Smallest next move: Write the nearest perfect square below and above, then place the root between their square roots.

Cumulative Review B

1. Round 58,746 to the nearest hundred.

Expected answer: 58,700

Plausible wrong response: Compares written digits, drops a placeholder zero, or rounds from the target digit itself.

Likely misconception: Place value is not being used to control comparison, form, or rounding.

Smallest next move: Align the place-value columns and circle the one digit that decides the result.

2. Compare: 7.09 ____ 7.9

Expected answer: $7.09 < 7.9$

Plausible wrong response: Compares written digits, drops a placeholder zero, or rounds from the target digit itself.

Likely misconception: Place value is not being used to control comparison, form, or rounding.

Smallest next move: Align the place-value columns and circle the one digit that decides the result.

3. Order: $\frac{1}{2}$, 0.45, $\frac{3}{5}$, 0.08

Expected answer: 0.08, 0.45, $\frac{1}{2}$, $\frac{3}{5}$

Plausible wrong response: Orders the surface forms without converting them to a common form.

Likely misconception: Fractions and decimals are not being treated as names for comparable values.

Smallest next move: Convert every value to decimals or equivalent fractions, then order on one number line.

4. Is 3,456 divisible by 8?

Expected answer: Yes. 456 is divisible by 8, so 3,456 is divisible by 8.

Plausible wrong response: Orders the surface forms without converting them to a common form.

Likely misconception: Fractions and decimals are not being treated as names for comparable values.

Smallest next move: Convert every value to decimals or equivalent fractions, then order on one number line.

5. Is 5,724 divisible by 9?

Expected answer: Yes. Digit sum = 18, which is divisible by 9.

Plausible wrong response: Lists multiples as factors, labels an odd number prime without testing, or swaps GCF and LCM.

Likely misconception: Factor structure or the choice between greatest common factor and least common multiple is insecure.

Smallest next move: Build complete factor pairs or short multiple lists, then name what the context is asking for.

6. Find GCF of 42 and 56.

Expected answer: 14

Plausible wrong response: Lists multiples as factors, labels an odd number prime without testing, or swaps GCF and LCM.

Likely misconception: Factor structure or the choice between greatest common factor and least common multiple is insecure.

Smallest next move: Build complete factor pairs or short multiple lists, then name what the context is asking for.

7. Find LCM of 9 and 12.

Expected answer: 36

Plausible wrong response: Lists multiples as factors, labels an odd number prime without testing, or swaps GCF and LCM.

Likely misconception: Factor structure or the choice between greatest common factor and least common multiple is insecure.

Smallest next move: Build complete factor pairs or short multiple lists, then name what the context is asking for.

8. Simplify $24/36$.

Expected answer: $2/3$

Plausible wrong response: Compares denominators alone, scales only one term, or stops simplifying before reaching the GCF.

Likely misconception: Fraction size or equivalence is being judged additively rather than multiplicatively.

Smallest next move: Use one common denominator, benchmark, or scale factor and apply it to both numerator and denominator.

9. Write $2 \frac{3}{5}$ as an improper fraction.

Expected answer: $13/5$

Plausible wrong response: Compares denominators alone, scales only one term, or stops simplifying before reaching the GCF.

Likely misconception: Fraction size or equivalence is being judged additively rather than multiplicatively.

Smallest next move: Use one common denominator, benchmark, or scale factor and apply it to both numerator and denominator.

10. Which is greater: $5/6$ or $7/8$?

Expected answer: $7/8$

Plausible wrong response: Compares denominators alone, scales only one term, or stops simplifying before reaching the GCF.

Likely misconception: Fraction size or equivalence is being judged additively rather than multiplicatively.

Smallest next move: Use one common denominator, benchmark, or scale factor and apply it to both numerator and denominator.

11. Calculate $6.75 + 0.9$.

Expected answer: 7.65

Plausible wrong response: Ignores placeholder zeros or places the decimal by visual guesswork.

Likely misconception: Decimal place value and magnitude are not being checked against an estimate.

Smallest next move: Write placeholder zeros, estimate the size, then calculate and compare the result with the estimate.

12. Calculate $12.05 - 4.8$.

Expected answer: 7.25

Plausible wrong response: Ignores placeholder zeros or places the decimal by visual guesswork.

Likely misconception: Decimal place value and magnitude are not being checked against an estimate.

Smallest next move: Write placeholder zeros, estimate the size, then calculate and compare the result with the estimate.

13. Calculate 3.2×1.4 .

Expected answer: 4.48

Plausible wrong response: Ignores placeholder zeros or places the decimal by visual guesswork.

Likely misconception: Decimal place value and magnitude are not being checked against an estimate.

Smallest next move: Write placeholder zeros, estimate the size, then calculate and compare the result with the estimate.

14. Calculate $7.2 \div 0.9$.

Expected answer: 8

Plausible wrong response: Ignores placeholder zeros or places the decimal by visual guesswork.

Likely misconception: Decimal place value and magnitude are not being checked against an estimate.

Smallest next move: Write placeholder zeros, estimate the size, then calculate and compare the result with the estimate.

15. Order: -4, 2, -9, 0, 5.

Expected answer: -9, -4, 0, 2, 5

Plausible wrong response: Uses the slogan 'two negatives make a positive' for addition or reverses the number-line order.

Likely misconception: The sign rule is being applied without identifying the operation.

Smallest next move: Name the operation first, model one move on a number line, and then apply the matching rule.

16. Calculate $-6 + (-5)$.

Expected answer: -11

Plausible wrong response: Uses the slogan 'two negatives make a positive' for addition or reverses the number-line order.

Likely misconception: The sign rule is being applied without identifying the operation.

Smallest next move: Name the operation first, model one move on a number line, and then apply the matching rule.

17. Calculate $-8 - (-5)$.

Expected answer: -3

Plausible wrong response: Uses the slogan 'two negatives make a positive' for addition or reverses the number-line order.

Likely misconception: The sign rule is being applied without identifying the operation.

Smallest next move: Name the operation first, model one move on a number line, and then apply the matching rule.

18. Calculate $-4 \times (-6)$.

Expected answer: 24

Plausible wrong response: Uses the slogan 'two negatives make a positive' for addition or reverses the number-line order.

Likely misconception: The sign rule is being applied without identifying the operation.

Smallest next move: Name the operation first, model one move on a number line, and then apply the matching rule.

19. Calculate $32 \div (-4)$.

Expected answer: -8

Plausible wrong response: Uses the slogan 'two negatives make a positive' for addition or reverses the number-line order.

Likely misconception: The sign rule is being applied without identifying the operation.

Smallest next move: Name the operation first, model one move on a number line, and then apply the matching rule.

20. Write 0.125 as a simplified fraction.

Expected answer: $\frac{1}{8}$

Plausible wrong response: Compares unlike forms directly or assumes every non-terminating decimal is irrational.

Likely misconception: Equivalent forms and the definition of a rational number are not secure.

Smallest next move: Convert both values to the same form or write the number as a fraction before deciding.

21. Write $\frac{5}{8}$ as a decimal.

Expected answer: 0.625

Plausible wrong response: Compares unlike forms directly or assumes every non-terminating decimal is irrational.

Likely misconception: Equivalent forms and the definition of a rational number are not secure.

Smallest next move: Convert both values to the same form or write the number as a fraction before deciding.

22. Order: -0.5 , $\frac{1}{4}$, $-\frac{3}{4}$, 0.

Expected answer: $-\frac{3}{4}$, -0.5 , 0, $\frac{1}{4}$

Plausible wrong response: Compares unlike forms directly or assumes every non-terminating decimal is irrational.

Likely misconception: Equivalent forms and the definition of a rational number are not secure.

Smallest next move: Convert both values to the same form or write the number as a fraction before deciding.

23. Evaluate $30 - 12 \div 3 \times 2$.

Expected answer: 22

Plausible wrong response: Works strictly left to right or treats multiplication as always before division.

Likely misconception: Operation tiers and left-to-right priority within a tier are being confused.

Smallest next move: Mark brackets and exponents first, then underline each same-tier operation in left-to-right order.

24. Evaluate $2 + (6 - 1)^2$.

Expected answer: 27

Plausible wrong response: Works strictly left to right or treats multiplication as always before division.

Likely misconception: Operation tiers and left-to-right priority within a tier are being confused.

Smallest next move: Mark brackets and exponents first, then underline each same-tier operation in left-to-right order.

25. Evaluate $-6 + 4 \times (-3)$.

Expected answer: -18

Plausible wrong response: Works strictly left to right or treats multiplication as always before division.

Likely misconception: Operation tiers and left-to-right priority within a tier are being confused.

Smallest next move: Mark brackets and exponents first, then underline each same-tier operation in left-to-right order.

26. Evaluate 10^4 .

Expected answer: 10,000

Plausible wrong response: Multiplies the base by the exponent or ignores brackets around a negative base.

Likely misconception: The base and exponent are not being interpreted before evaluation.

Smallest next move: Identify the complete base, expand one power as repeated multiplication, and compare signs.

27. Evaluate $(-3)^2$.

Expected answer: 9

Plausible wrong response: Multiplies the base by the exponent or ignores brackets around a negative base.

Likely misconception: The base and exponent are not being interpreted before evaluation.

Smallest next move: Identify the complete base, expand one power as repeated multiplication, and compare signs.

28. Evaluate -3^2 .

Expected answer: -9

Plausible wrong response: Multiplies the base by the exponent or ignores brackets around a negative base.

Likely misconception: The base and exponent are not being interpreted before evaluation.

Smallest next move: Identify the complete base, expand one power as repeated multiplication, and compare signs.

29. Simplify $5^6 \div 5^2$.

Expected answer: $5^4 = 625$

Plausible wrong response: Halves the radicand or gives an estimate outside consecutive perfect-square bounds.

Likely misconception: Square root is not connected to equal factors and benchmark squares.

Smallest next move: Write the nearest perfect square below and above, then place the root between their square roots.

30. Estimate $\sqrt{70}$.

Expected answer: Between 8 and 9; approximately 8.4

Plausible wrong response: Halves the radicand or gives an estimate outside consecutive perfect-square bounds.

Likely misconception: Square root is not connected to equal factors and benchmark squares.

Smallest next move: Write the nearest perfect square below and above, then place the root between their square roots.

Cumulative Review C

1. A student says 0.7 is less than 0.65 because $65 > 7$. Explain the mistake.

Expected answer: $0.7 = 0.70$, so $0.70 > 0.65$. The student compared the written digits instead of place value.

Plausible wrong response: Gives only a corrected value or repeats the claim without identifying the faulty reasoning.

Likely misconception: Place value is not being used to control comparison, form, or rounding.

Smallest next move: Align the place-value columns and circle the one digit that decides the result.

2. A teacher has 36 pencils and 48 erasers. Make identical bags with no leftovers. Greatest number of bags?

Expected answer: 12 bags (GCF of 36 and 48).

Plausible wrong response: Lists multiples as factors, labels an odd number prime without testing, or swaps GCF and LCM.

Likely misconception: Factor structure or the choice between greatest common factor and least common multiple is insecure.

Smallest next move: Build complete factor pairs or short multiple lists, then name what the context is asking for.

3. Two bells ring every 8 and 12 minutes. When will they ring together again?

Expected answer: 24 minutes (LCM of 8 and 12).

Plausible wrong response: Lists multiples as factors, labels an odd number prime without testing, or swaps GCF and LCM.

Likely misconception: Factor structure or the choice between greatest common factor and least common multiple is insecure.

Smallest next move: Build complete factor pairs or short multiple lists, then name what the context is asking for.

4. A student says $\frac{1}{8}$ is greater than $\frac{1}{4}$ because $8 > 4$. Explain.

Expected answer: $\frac{1}{4}$ is greater than $\frac{1}{8}$. A larger denominator means smaller equal pieces when numerators match.

Plausible wrong response: Gives only a corrected value or repeats the claim without identifying the faulty reasoning.

Likely misconception: Fraction size or equivalence is being judged additively rather than multiplicatively.

Smallest next move: Use one common denominator, benchmark, or scale factor and apply it to both numerator and denominator.

5. Which recipe uses more milk: $\frac{3}{4}$ cup or $\frac{2}{3}$ cup?

Expected answer: $\frac{3}{4}$ cup.

Plausible wrong response: Compares denominators alone, scales only one term, or stops simplifying before reaching the GCF.

Likely misconception: Fraction size or equivalence is being judged additively rather than multiplicatively.

Smallest next move: Use one common denominator, benchmark, or scale factor and apply it to both numerator and denominator.

6. A runner finishes in 12.48 s. Another in 12.5 s. Who is faster?

Expected answer: 12.48 s is faster because the smaller time wins.

Plausible wrong response: Ignores placeholder zeros or places the decimal by visual guesswork.

Likely misconception: Decimal place value and magnitude are not being checked against an estimate.

Smallest next move: Write placeholder zeros, estimate the size, then calculate and compare the result with the estimate.

7. A student calculates $4.8 \times 6.2 = 297.6$. Explain and correct.

Expected answer: $4.8 \times 6.2 = 29.76$. The student placed the decimal one place too far right.

Plausible wrong response: Gives only a corrected value or repeats the claim without identifying the faulty reasoning.

Likely misconception: Decimal place value and magnitude are not being checked against an estimate.

Smallest next move: Write placeholder zeros, estimate the size, then calculate and compare the result with the estimate.

8. The temperature is -9°C and rises 14°C . New temperature?

Expected answer: 5°C .

Plausible wrong response: Uses the slogan 'two negatives make a positive' for addition or reverses the number-line order.

Likely misconception: The sign rule is being applied without identifying the operation.

Smallest next move: Name the operation first, model one move on a number line, and then apply the matching rule.

9. A bank balance is $-\$42$ and a $\$30$ deposit is made. New balance?

Expected answer: $-\$12$.

Plausible wrong response: Uses the slogan 'two negatives make a positive' for addition or reverses the number-line order.

Likely misconception: The sign rule is being applied without identifying the operation.

Smallest next move: Name the operation first, model one move on a number line, and then apply the matching rule.

10. A student says $-8 + (-3) = 11$ because two negatives make a positive. Explain.

Expected answer: -11 . The multiplication/division sign slogan does not apply to addition.

Plausible wrong response: Gives only a corrected value or repeats the claim without identifying the faulty reasoning.

Likely misconception: The sign rule is being applied without identifying the operation.

Smallest next move: Name the operation first, model one move on a number line, and then apply the matching rule.

11. A student says $-0.8 > -0.3$ because $0.8 > 0.3$. Explain.

Expected answer: -0.3 is greater because it lies farther right on the number line.

Plausible wrong response: Gives only a corrected value or repeats the claim without identifying the faulty reasoning.

Likely misconception: Equivalent forms and the definition of a rational number are not secure.

Smallest next move: Convert both values to the same form or write the number as a fraction before deciding.

12. Order: $-3/4$, 0.2 , -0.6 , $1/2$.

Expected answer: $-3/4$, -0.6 , 0.2 , $1/2$.

Plausible wrong response: Compares unlike forms directly or assumes every non-terminating decimal is irrational.

Likely misconception: Equivalent forms and the definition of a rational number are not secure.

Smallest next move: Convert both values to the same form or write the number as a fraction before deciding.

13. A student evaluates $24 \div 6 \times 2$ as 2. Explain the mistake.

Expected answer: $24 \div 6 \times 2 = 4 \times 2 = 8$; $\times$ and $\div$ have equal priority and go left to right.

Plausible wrong response: Gives only a corrected value or repeats the claim without identifying the faulty reasoning.

Likely misconception: Operation tiers and left-to-right priority within a tier are being confused.

Smallest next move: Mark brackets and exponents first, then underline each same-tier operation in left-to-right order.

14. Compare $4 + 3 \times 5$ and $(4 + 3) \times 5$.

Expected answer: $4 + 3 \times 5 = 19$; $(4 + 3) \times 5 = 35$.

Plausible wrong response: Works strictly left to right or treats multiplication as always before division.

Likely misconception: Operation tiers and left-to-right priority within a tier are being confused.

Smallest next move: Mark brackets and exponents first, then underline each same-tier operation in left-to-right order.

15. A student says $4^3 = 12$. Explain.

Expected answer: $4^3 = 4 \times 4 \times 4 = 64$, not 4×3 .

Plausible wrong response: Gives only a corrected value or repeats the claim without identifying the faulty reasoning.

Likely misconception: The base and exponent are not being interpreted before evaluation.

Smallest next move: Identify the complete base, expand one power as repeated multiplication, and compare signs.

16. Explain the difference between -5^2 and $(-5)^2$.

Expected answer: $-5^2 = -25$, while $(-5)^2 = 25$; brackets change the base.

Plausible wrong response: Gives only a corrected value or repeats the claim without identifying the faulty reasoning.

Likely misconception: The base and exponent are not being interpreted before evaluation.

Smallest next move: Identify the complete base, expand one power as repeated multiplication, and compare signs.

17. A square garden has area 144 m^2 . Find the side length.

Expected answer: 12 m.

Plausible wrong response: Halves the radicand or gives an estimate outside consecutive perfect-square bounds.

Likely misconception: Square root is not connected to equal factors and benchmark squares.

Smallest next move: Write the nearest perfect square below and above, then place the root between their square roots.

18. Estimate $\sqrt{90}$. Explain your reasoning.

Expected answer: Between 9 and 10; approximately 9.5.

Plausible wrong response: Gives only a corrected value or repeats the claim without identifying the faulty reasoning.

Likely misconception: Square root is not connected to equal factors and benchmark squares.

Smallest next move: Write the nearest perfect square below and above, then place the root between their square roots.

19. A student says $\sqrt{64} = 32$. Explain the mistake.

Expected answer: $\sqrt{64} = 8$ because $8 \times 8 = 64$; square root does not mean halve.

Plausible wrong response: Gives only a corrected value or repeats the claim without identifying the faulty reasoning.

Likely misconception: Square root is not connected to equal factors and benchmark squares.

Smallest next move: Write the nearest perfect square below and above, then place the root between their square roots.

20. A student says every decimal is rational. Is that always true? Explain.

Expected answer: No. Terminating and repeating decimals are rational; non-terminating, non-repeating decimals are irrational.

Plausible wrong response: Gives only a corrected value or repeats the claim without identifying the faulty reasoning.

Likely misconception: Equivalent forms and the definition of a rational number are not secure.

Smallest next move: Convert both values to the same form or write the number as a fraction before deciding.

Final Tripwire Check

Evaluate: $24 \div 6 \times 2 - 3^2 + \sqrt{49}$.

Expected answer: 6. Evaluate $3^2 = 9$ and $\sqrt{49} = 7$; then $24 \div 6 \times 2 = 4 \times 2 = 8$ from left to right; finally $8 - 9 + 7 = 6$.

Plausible wrong response: 0 or -4 after combining division and multiplication in the wrong order.

Likely misconception: Equal-priority operations are not being completed from left to right.

Smallest next move: Mark exponents and roots first, then draw a left-to-right arrow under $\div$ and $\times$.