



Math Whiz Workbook: Core Reinforcement



Practice Workbook Overview & Orientation



Workbook Structure & Practice Guide

This practice workbook reinforces core concepts across six fundamental mathematics areas: fractions, percentages, ratios and proportions, linear equations, basic geometry, and descriptive statistics. Students should write their step-by-step reasoning in the dedicated workspace boxes. Parents and tutors can use the sequential solution guide to verify intermediate algebraic steps and diagnose common calculation errors.

1

Module 1: Fractions — Common denominators, cross-cancellation, and reciprocal division.

2

Module 2: Percentages & Conversions — Base-100 relationships and percentage of values.

3

Module 3: Rates, Ratios & Proportions — Cross-multiplication and scaling unit rates.

4

Module 4: Linear Equations — Inverse operations and variable isolation techniques.

5

Module 5: Perimeter & Area — Geometric polygon boundaries and surface regions.

6

Module 6: Descriptive Statistics — Data organization, mean, median, and mode calculation.



Practitioner Tip

Encourage learners to show full intermediate arithmetic rather than just the final answer. Identifying whether a miscalculation occurred during denominator unification or basic addition simplifies corrective guidance.





Arithmetic Foundations: Fractions & Percentages



Module 1: Fractions Practice

Solve each fraction exercise showing common denominator conversions or reciprocal multiplication.

- **Problem 1A:** Compute $2/3 + 1/4$. Find the least common denominator and simplify.
- **Problem 1B:** Compute $5/6 - 3/8$. Express the difference in simplest form.
- **Problem 1C:** Compute $(3/5) * (10/9)$. Simplify by canceling common factors before multiplying.
- **Problem 1D:** Compute $(7/12) / (14/15)$. Invert the divisor and compute the resulting fraction.



Common Mistake

Do not add numerators and denominators straight across (e.g., $2/3 + 1/4$ does NOT equal $3/7$). Addition and subtraction require equal fractional units (common denominators).

Problem 1A Workspace ($2/3 + 1/4$)

Problem 1B Workspace ($5/6 - 3/8$)

Problem 1C Workspace ($(3/5) * (10/9)$)

Problem 1D Workspace ($(7/12) / (14/15)$)



Module 2: Percentages & Conversions Practice

Apply base-100 definitions to complete fraction-to-percentage conversions and quantity evaluations.

- **Problem 2A:** Convert $4/5$ into an equivalent fraction with a denominator of 100, then state the percentage.
- **Problem 2B:** Convert 57% into a simplified fraction.
- **Problem 2C:** Find 30% of 45 using fractional multiplication ($30/100 * 45$).
- **Problem 2D:** An item originally priced at \$80 is discounted by 15%. Calculate the dollar savings and the final price.



Formula Anchor

A percent represents parts per 100.
To find P percent of Q, multiply Q by $(P / 100)$.

Problem 2A Workspace ($4/5$ to %)

Problem 2B Workspace (57% to fraction)

Problem 2C Workspace (30% of 45)

Problem 2D Workspace (15% discount on \$80)



Proportional Reasoning & Algebraic Equations



Module 3: Rates, Ratios & Proportions Practice

Standard

Set up proportional equalities and apply cross-multiplication to determine unknown rates and quantities.

- **Problem 3A:** A vehicle travels 165 miles in 3 hours. Compute the unit rate in miles per hour.
- **Problem 3B:** A school club maintains a student-to-tutor ratio of 7 to 2. If there are 28 students, how many tutors are needed?
- **Problem 3C:** Solve the proportion: $\frac{x}{20} = \frac{9}{15}$.
- **Problem 3D:** A runner covers 1 mile in 8 minutes. Set up and solve a proportion to find the miles covered in 36 minutes at that rate.



Cross-Multiplication Rule

If $\frac{a}{b} = \frac{c}{d}$, then $a * d = b * c$.

Ensure identical units occupy the corresponding numerators or denominators before solving.

Tip

Problem 3A Workspace (Unit rate: 165 mi / 3 hr)

Problem 3B Workspace (Ratio: $\frac{7/2}{28} = \frac{28/7}{x}$)

Problem 3C Workspace (Solve $\frac{x/3}{20} = \frac{9}{15}$)

Problem 3D Workspace (1 mi / 8 min = x mi / 36 min)



Module 4: Linear Equations Practice

Standard

Isolate the unknown variable using identical algebraic transformations on both sides of the equation.

- **Problem 4A:** Solve for x : $3x + 7 = 28$.
- **Problem 4B:** Solve for y : $5y - 12 = 2y + 9$.
- **Problem 4C:** Solve for m : $\frac{m}{4} + 6 = 11$.
- **Problem 4D:** Solve for k : $4(k - 3) = 2k + 8$. Expand parentheses first.



Equality Invariance

Whatever operation is applied to the left side must be applied to the right side. Check answers by substituting the calculated root back into the original statement.

Note

Problem 4A Workspace ($3x + 7 = 28$)

Problem 4B Workspace ($5y - 12 = 2y + 9$)

Problem 4C Workspace ($\frac{m}{4} + 6 = 11$)

Problem 4D Workspace ($4(k - 3) = 2k + 8$)



Applied Measurement & Descriptive Statistics



Module 5: Perimeter & Area Practice

Determine perimeter boundaries and 2D area measurements for geometric figures.

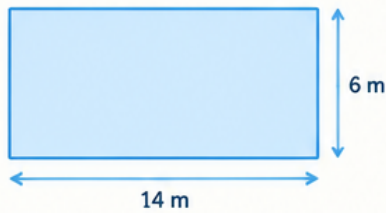
- Problem 5A: A rectangular garden has a length of 14 meters and a width of 6 meters. Calculate both its perimeter and area.
- Problem 5B: A right triangle has legs of length 9 cm and 12 cm, with a hypotenuse of 15 cm. Find its perimeter and area (Area = $0.5 \times \text{base} \times \text{height}$).
- Problem 5C: A square has an area of 64 square feet. Find the length of one side and its total perimeter.



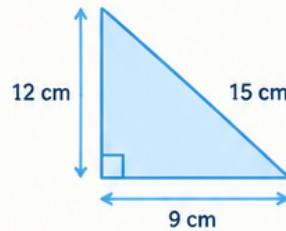
Dimensional Units

Perimeter measures linear distance (units: cm, m, ft).
Area measures surface coverage and must be stated in square units (units: cm^2 , m^2 , ft^2).

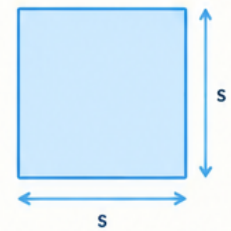
Rectangle (14 m by 6 m)



Right Triangle (legs 9 cm, 12 cm; hyp 15 cm)



Square (area = 64 sq ft)



Problem 5A Workspace (Rectangle 14m by 6m)

Problem 5B Workspace (Triangle legs 9cm, 12cm; hyp 15cm)

Problem 5C Workspace (Square Area = 64 sq ft)



Module 6: Descriptive Statistics Practice

Calculate statistical central tendencies (mean, median, and mode) for provided datasets.

- Dataset A: {12, 18, 15, 24, 18, 21, 11}. Calculate the mean, median, and mode.
- Dataset B: {74, 88, 92, 60, 85, 92, 78, 83}. Calculate the mean, median, and mode.



Median Rule Check

Always arrange items in ascending sequence first. If the count N is odd, take the center element. If N is even, take the arithmetic average of the two central numbers.

1 Step 1: Order Data

Sort data from lowest to highest value to establish accurate median positions and detect repeat frequencies.



2 Step 2: Sum and Divide for Mean

Calculate the arithmetic sum of all values, then divide by the total number of entries N.



3 Step 3: Locate Center and Frequency

Select the middle value (or midpoint of two centers) for the median. Identify the value(s) with highest occurrence for the mode.

Dataset A Working Space (Mean, Median, Mode)

Dataset B Working Space (Mean, Median, Mode)



Comprehensive Step-by-Step Solution Guide



Step-by-Step Solution Guide: Modules 1 to 3

Complete verified solutions and algebraic derivations for Modules 1, 2, and 3.

Module 1: Fraction Operations

- ✓ Sol 1A: $2/3 + 1/4 = (8/12) + (3/12) = 11/12$.
- ✓ Sol 1B: $5/6 - 3/8 = (20/24) - (9/24) = 11/24$.
- ✓ Sol 1C: $(3/5) * (10/9) = (3 * 10) / (5 * 9) = 30/45 = 2/3$ (divided numerator and denominator by 15).
- ✓ Sol 1D: $(7/12) / (14/15) = (7/12) * (15/14) = (7 * 15) / (12 * 14) = 105/168 = 5/8$ (cancel 7 with 14 to get 1/2; cancel 15 with 12 by 3 to get 5/4; $1/2 * 5/4 = 5/8$).

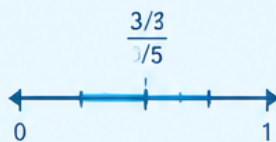
Module 2: Percents and Decimals

- ✓ Sol 2A: $4/5 = (4 * 20) / (5 * 20) = 80/100 = 80\%$.
- ✓ Sol 2B: $57\% = 57/100$ (prime factors: $57 = 3 * 19$; already in simplest form).
- ✓ Sol 2C: $30\% \text{ of } 45 = (30/100) * 45 = 0.30 * 45 = 13.5$ (or $1350/100 = 27/2$).
- ✓ Sol 2D: Discount = $0.15 * \$80 = \12 . Final sale price = $\$80 - \$12 = \$68$.

Module 3: Rates and Proportions

- ✓ Sol 3A: Unit Rate = $165 \text{ miles} / 3 \text{ hours} = 55 \text{ miles per hour}$.
- ✓ Sol 3B: Ratio $7/2 = 28/T \rightarrow 7T = 56 \rightarrow T = 8$ tutors.
- ✓ Sol 3C: $x/20 = 9/15 \rightarrow 15x = 180 \rightarrow x = 12$.
- ✓ Sol 3D: $1 \text{ mi} / 8 \text{ min} = x/36 \text{ min} \rightarrow 8x = 36 \rightarrow x = 36/8 = 4.5 \text{ miles}$.

$$\frac{2}{3} + \frac{1}{4} = \frac{11}{12}$$



Verification Milestone

Review whether simplified fraction answers match intermediate cancellations. Tutors should check whether the student reduced fractions before or after multiplication.



Step-by-Step Solution Guide: Modules 4 to 6

Complete verified solutions and algebraic derivations for Modules 4, 5, and 6.

Module 4: Algebraic Equations

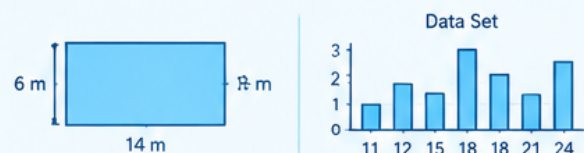
- ✓ Sol 4A: $3x + 7 = 28 \rightarrow$ subtract 7: $3x = 21 \rightarrow$ divide by 3: $x = 7$.
- ✓ Sol 4B: $5y - 12 = 2y + 9 \rightarrow$ subtract $2y$: $3y - 12 = 9 \rightarrow$ add 12: $3y = 21 \rightarrow$ divide by 3: $y = 7$.
- ✓ Sol 4C: $(m / 4) + 6 = 11 \rightarrow$ subtract 6: $m / 4 = 5 \rightarrow$ multiply by 4: $m = 20$.
- ✓ Sol 4D: $4(k - 3) = 2k + 8 \rightarrow$ expand: $4k - 12 = 2k + 8 \rightarrow$ subtract $2k$: $2k - 12 = 8 \rightarrow$ add 12: $2k = 20 \rightarrow$ divide by 2: $k = 10$.

Module 5: Geometry and Measurement

- ✓ Sol 5A: Perimeter = $2 * (14 + 6) = 2 * 20 = 40 \text{ m}$. Area = $14 * 6 = 84 \text{ m}^2$.
- ✓ Sol 5B: Perimeter = $9 + 12 + 15 = 36 \text{ cm}$. Area = $(9 * 12) / 2 = 108 / 2 = 54 \text{ cm}^2$.
- ✓ Sol 5C: Side length $s = \sqrt{64} = 8 \text{ ft}$. Perimeter = $4 * 8 = 32 \text{ ft}$.

Module 6: Statistics

- ✓ Sol 6A: Ordered: {11, 12, 15, 18, 18, 21, 24}. Sum = 119; $N = 7$. Mean = $119 / 7 = 17$. Median (4th item) = 18. Mode = 18 (frequency 2).
- ✓ Sol 6B: Ordered: {60, 74, 78, 83, 85, 88, 92, 92}. Sum = 652; $N = 8$. Mean = $652 / 8 = 81.5$. Median = average of 83 and 85: $(83 + 85) / 2 = 84$. Mode = 92 (frequency 2).



Mastery Confirmation

Once learners complete both solution sets with over 80% accuracy without consulting prompts, progress to timed mixed drills.