CURRICULUM RESOURCE SERIES

Mathematics Volume 3 Student Workbook

READ / PRACTICE / EXPLAIN

Name: _____ Date: _____

Original teaching resources. Select instruction by demonstrated skills, not age. This document is not an independently certified full-year grade-level curriculum.

Mathematics Course Volume 3 | Lessons 21-30

Continue Volumes 1 and 2. This volume contains ten original lessons with explicit explanations and four independent activities at each skill depth. Early Advanced, Developing and Extended routes are available to every learner regardless of age , including ages 5 through 12. Assign based on independent prerequisite mastery, not birthdays. For beginning readers, an adult may read directions without supplying the solution.

Daily routine: recall prerequisite facts, work through the example, solve at least three exercises independently, explain one solution, correct mistakes and revisit weak prerequisites. Print the webpage or copy the work into a notebook. This volume supplements, but does not yet complete, the full annual grade-specific program.

Lesson 21: Factors and Prime Numbers

Direct instruction and model: A factor divides a number without remainder. A prime number greater than 1 has exactly two positive factors, 1 and itself. The factors of 18 are 1,2,3,6,9,18. Eighteen is composite because it has more than two factors.

Early Advanced, hands-on and conceptual

- Use 12 counters to make equal rows of 2, 3 and 4. Draw each model.

- List the first five counting numbers that are even.

- Is 7+5 odd or even? Explain with pairs.

- Find all equal groups possible with six counters.

Developing Advanced, multistep application

- List every positive factor of 36.

- Classify 29,35,41,49 as prime or composite and justify.

- Find the greatest common factor of 18 and 30.

- Find the least common multiple of 6 and 8.

Extended Advanced, abstraction and proof

- Write the prime factorization of 420 using exponents.

- Find GCF and LCM of 72 and 90.

- Prove or disprove: the sum of two prime numbers is always even.

- Explain why the number 1 is neither prime nor composite.

Mastery check: use a new example to explain the central concept. Parent records independent, guided, or reteach. Save results privately.

Lesson 22: Fractions as Numbers and Operators

Direct instruction and model: Fractions represent equal parts, division and operations on quantities. For example, 3/4 of 28 = (28/4) x 3 = 21. To add 1/3 and 1/6, rewrite 1/3 as 2/6; the sum is 3/6 = 1/2.

Early Advanced, hands-on and conceptual

- Shade half of a rectangle divided into 2 equal parts.

- Shade 3 of 4 equal squares. Write the fraction.

- If 8 counters are shared equally between 2 children, how many each?

- Decide which is greater, 1/2 or 1/4, using a drawing.

Developing Advanced, multistep application

- Find 5/6 of 42.

- Compute 3/4 + 1/8 and simplify.

- Compute 7/10 - 2/5 and simplify.

- A ribbon is 3 meters long. You cut off 2/3 meter. How much remains?

Extended Advanced, abstraction and proof

- Compute 5/8 / 3/4 and simplify.

- Solve x - 7/12 = 5/6.

- A recipe uses 2/3 cup per batch. Find quantity for 3 1/2 batches.

- Explain why dividing by a fraction between 0 and 1 produces a larger positive quotient.

Mastery check: use a new example to explain the central concept. Parent records independent, guided, or reteach. Save results privately.

Lesson 23: Decimal Operations and Estimation

Direct instruction and model: Line up decimal place values for addition and subtraction. Multiplying decimal values uses ordinary products followed by place-counting: 1.2 x 0.3 = 0.36. Estimate to check your result.

Early Advanced, hands-on and conceptual

- Count 10 dimes as one dollar using an adult’s safe demonstration.

- Compare 50 cents and 75 cents.

- Solve 6+8, 12-5, 9+7.

- Write twelve as one ten and two ones.

Developing Advanced, multistep application

- Compute 7.85+4.70.

- Compute 12.6-8.37.

- Compute 2.4 x 3.

- Estimate 19.8+30.2, then compute exactly.

Extended Advanced, abstraction and proof

- Compute 3.75 x 0.24.

- Compute 18.72 / 0.6.

- A price rises from $48 to $54. Find percent increase.

- Explain why an estimate of 7.5 is unreasonable for 0.75 x 0.2.

Mastery check: use a new example to explain the central concept. Parent records independent, guided, or reteach. Save results privately.

Lesson 24: Ratio Tables and Proportional Reasoning

Direct instruction and model: Equivalent ratios represent the same relationship. If two notebooks cost $6, each costs $3 and six notebooks cost $18, assuming constant unit price. Proportionality requires checking the rate.

Early Advanced, hands-on and conceptual

- Build groups of two red blocks and one blue block.

- Complete 2,4,6,8,__,__.

- If 3 bags each contain 4 apples, how many apples?

- Explain why 2+2+2 equals 3 groups of 2.

Developing Advanced, multistep application

- Five notebooks cost $15. Find the cost for eight notebooks at the same unit price.

- Solve 7/9=x/45.

- Simplify 18:30.

- A jogger travels 12 miles in 3 hours. Find average miles per hour.

Extended Advanced, abstraction and proof

- Decide whether the table (x,y): (2,6), (4,12), (7,21) is proportional. Identify rate.

- Find the constant of proportionality in y=2.5x.

- A scale is 1:50,000. Convert 4.5 cm on the map to kilometers.

- Explain why a fixed starting fee plus a per-mile charge is not a proportional relationship.

Mastery check: use a new example to explain the central concept. Parent records independent, guided, or reteach. Save results privately.

Lesson 25: Expressions, Equations and Equality

Direct instruction and model: An equation states two expressions have equal values. To solve 4x+9=29, subtract 9 to get 4x=20, then divide by 4: x=5. Check: 4(5)+9=29.

Early Advanced, hands-on and conceptual

- Solve 3+?=9 using counters.

- Solve ?-5=7 using counters.

- Write two different addition expressions equal to 10.

- Which is true: 5+4=6+3 or 5+4=6+4?

Developing Advanced, multistep application

- Solve x+38=91.

- Solve 7x=84.

- Evaluate 5a-2 when a=6.

- Solve 4x+7=35 and check.

Extended Advanced, abstraction and proof

- Solve 3(2x-1)=4x+13.

- Simplify 5(2a-3)-2(a+4).

- Solve x/3 + 5 = 12.

- Explain why an equation can have infinitely many solutions, using a correct example.

Mastery check: use a new example to explain the central concept. Parent records independent, guided, or reteach. Save results privately.

Lesson 26: Coordinate Graphs and Linear Functions

Direct instruction and model: An ordered pair (x,y) gives horizontal and vertical coordinates. For y=2x+1, x=0,1,2 yields y=1,3,5. The slope is 2, and the y-intercept is 1.

Early Advanced, hands-on and conceptual

- Draw a 5-5 grid and label rows and columns.

- Move a toy two steps right and one step up; describe its position.

- Complete pattern 1,3,5,7,__,__.

- Find the missing number in 4,8,12,__,__.

Developing Advanced, multistep application

- Plot (1,2), (3,4) and (5,6) on a first-quadrant grid.

- For y=3x+2, find outputs for x=0,1,2,4.

- Find distance between (2,3) and (8,3).

- Describe a real situation with a fixed starting amount and equal increases.

Extended Advanced, abstraction and proof

- Find slope between (-1,4) and (3,12).

- Write the equation of a line with slope -2 and y-intercept 5.

- Solve intersection of y=x+4 and y=3x-2.

- Explain why a vertical line is not the graph of a function y of x.

Mastery check: use a new example to explain the central concept. Parent records independent, guided, or reteach. Save results privately.

Lesson 27: Geometric Measurement and Area

Direct instruction and model: Rectangle area is length times width; rectangle perimeter is twice length plus twice width. A triangle’s area is half its base times perpendicular height. Units for area are squared.

Early Advanced, hands-on and conceptual

- Identify square, circle, triangle and rectangle.

- Measure a pencil in centimeters with an adult.

- Draw a rectangle taller than it is wide.

- Identify sides and corners of a triangle.

Developing Advanced, multistep application

- Find area and perimeter of a 13 cm by 5 cm rectangle.

- Find triangle area when base is 14 cm and height 8 cm.

- Convert 2.75 meters to centimeters.

- Find the missing angle of a triangle with angles 50 degrees and 65 degrees.

Extended Advanced, abstraction and proof

- Find volume and surface area of a 3 x 4 x 5 cm rectangular prism.

- Find circumference and area of a circle with radius 4 cm, using pi=3.14.

- A square’s side doubles. By what factor does its area change?

- Explain why a right triangle with legs 9 and 12 has hypotenuse 15.

Mastery check: use a new example to explain the central concept. Parent records independent, guided, or reteach. Save results privately.

Lesson 28: Data, Sampling, Mean and Median

Direct instruction and model: A mean is the sum divided by number of values. A median is the middle ordered value. For 2,4,4,10, mean=5, median=4. Outliers can change the mean more than the median.

Early Advanced, hands-on and conceptual

- Draw a picture graph of 3 red, 5 blue and 2 green blocks.

- Find the most common color.

- Count 10 objects and group into two categories.

- Explain what each picture symbol means in your chart.

Developing Advanced, multistep application

- For 3,5,5,7,10 find mean, median, mode and range.

- Draw a bar graph with labels for counts 3,7,4.

- Explain why surveying only two friends cannot represent an entire city.

- What is the probability of drawing red from a bag with 3 red and 2 blue counters?

Extended Advanced, abstraction and proof

- For 2,3,3,4,18 find mean and median and explain difference.

- Design a nonbiased way to survey local reading habits without collecting children’s identifying information.

- A fair coin is flipped three times. Find probability of exactly three heads.

- Explain why correlation alone does not establish causation.

Mastery check: use a new example to explain the central concept. Parent records independent, guided, or reteach. Save results privately.

Lesson 29: Percent and Practical Financial Reasoning

Direct instruction and model: Percent means per hundred. 12% of $50 is 0.12 x 50 = $6. A 12% discount gives a sale price of $44. Always check whether a percent is an increase or decrease.

Early Advanced, hands-on and conceptual

- Count 5 pennies and 2 nickels with an adult; find total cents.

- Which costs more, $2 or $1.50?

- If you save $1 each week for four weeks, how much?

- Explain the difference between a need and a want using fictional examples.

Developing Advanced, multistep application

- Find 25% of 96.

- A $60 item is discounted 15%. Find final price.

- Find 8% sales tax on $50.

- A bank balance has $75; $28 is spent. Find new balance.

Extended Advanced, abstraction and proof

- A population grows from 240 to 282. Find percent change.

- A $120 item is discounted 20%, then taxed 8% on discounted price. Find total.

- Compute simple interest on $600 at 5% annually for 3 years.

- Explain how percentage points differ from percent change.

Mastery check: use a new example to explain the central concept. Parent records independent, guided, or reteach. Save results privately.

Lesson 30: Independent Math Assessment

Direct instruction and model: Solve unfamiliar problems without looking at models. Check answers by substitution, estimation or inverse operations. Errors indicate which prerequisite to reteach.

Early Advanced, hands-on and conceptual

- Solve 8+9, 15-8, 3-4 and 16/4 using drawings.

- Shade three fourths of an equally divided shape.

- Count forward by 5 from 5 through 40.

- Draw a rectangle and label its four sides.

Developing Advanced, multistep application

- Compute 438+267, 96/8, 3/4+1/8 and 35% of 80.

- Find area of a 9 cm by 7 cm rectangle.

- Solve 5x+8=43.

- Explain why one calculation is reasonable.

Extended Advanced, abstraction and proof

- Solve 4(x-3)=2x+10.

- Calculate 7/8 - 1/3, 18% of 250 and slope through (2,5),(6,13).

- For data 2,4,6,8,30 compute mean and median; discuss outlier effect.

- Write one new word problem using ratios and solve it.

Mastery check: use a new example to explain the central concept. Parent records independent, guided, or reteach. Save results privately.

Volume 3 Assessment and Next Steps

Complete Lesson 30 before opening the parent’s answer key. Assess mathematical reasoning separately from handwriting and reading mechanics. Learners who demonstrate mastery may move ahead; those needing reinforcement receive new problems and another independent check. Consult the 36-week curriculum map for longer-term sequence.

Return to the Academy .