ALGEBRA 1

Core Practice Workbook

20 Essential Problems · 5 Core Units

Concept Review · Worked Examples · Practice Problems · Answer Key

Name: _____

Date: _____

Score: _____ / 20

CONTENTS

UNIT 1

VARIABLES & EXPRESSIONS

■ CONCEPT REVIEW

A variable is a letter that represents an unknown value. An algebraic expression combines variables, numbers, and operations.

Key Terms & Formulas:

• Variable: a symbol (usually a letter) representing an unknown

• Coefficient: the number multiplied by a variable (e.g., 3 in 3x)

• Constant: a fixed number with no variable

• Term: a single number, variable, or product of both

■ WORKED EXAMPLE

Q: Evaluate 4x + 7 when x = 3.

A: 4(3) + 7 = 12 + 7 = 19

■ PRACTICE PROBLEMS

Q1.

Evaluate the expression 5a - 2b when a = 4 and b = 3.

Answer: _____

Q2.

Write an algebraic expression for "seven less than three times a number n."

Answer: _____

Q3.

Identify all the terms, coefficients, and constants in the expression: 6x + 4y - 9.

Answer: _____

Q4.

Simplify by combining like terms: 3x + 5 + 7x - 2.

Answer: _____

UNIT 2

SOLVING ONE-STEP EQUATIONS

■ CONCEPT REVIEW

Use inverse operations to isolate the variable. Whatever you do to one side, do to the other.

Key Terms & Formulas:

• Inverse operation: the opposite operation (+/- or x/÷)

• Solution: the value that makes the equation true

• Isolate: get the variable alone on one side

■ WORKED EXAMPLE

Q: Solve: x + 9 = 14.

A: x = 14 - 9 = 5

■ PRACTICE PROBLEMS

Q5.

Solve for x: x - 13 = 7.

Answer: _____

Q6.

Solve for y: 4y = -28.

Answer: _____

Q7.

Solve for n: n/6 = 5.

Answer: _____

Q8.

Solve for x: x + (-4) = -11.

Answer: _____

UNIT 3

SOLVING TWO-STEP EQUATIONS

■ CONCEPT REVIEW

Reverse the order of operations: first undo addition/subtraction, then undo multiplication/division.

Key Terms & Formulas:

• Two-step equation: requires exactly two operations to solve

• Order of operations (reverse): undo +/- first, then x/÷

■ WORKED EXAMPLE

Q: Solve: 2x + 5 = 13.

A: 2x = 8 --> x = 4

■ PRACTICE PROBLEMS

Q9.

Solve for x: 3x - 7 = 14.

Answer: _____

Q10.

Solve for y: -2y + 10 = 4.

Answer: _____

Q11.

A number is multiplied by 5 and then 8 is added, giving 43. Write and solve the equation.

Answer: _____

Q12.

Solve for x: (x + 3)/4 = 5.

Answer: _____

UNIT 4

INEQUALITIES

■ CONCEPT REVIEW

Solve like equations, but flip the inequality sign when multiplying or dividing by a negative number.

Key Terms & Formulas:

• < less than, > greater than, <= less than or equal, >= greater than or equal

• Flip rule: multiply/divide both sides by negative -> flip the sign

• Graph: open circle (< >) vs. closed circle (<= >=)

■ WORKED EXAMPLE

Q: Solve: -3x < 12.

A: Divide by -3 and flip: x > -4

■ PRACTICE PROBLEMS

Q13.

Solve and graph on a number line: x + 5 > 9.

Answer: _____

Q14.

Solve: -5x >= 20.

Answer: _____

Q15.

Solve: 2x - 3 < 7.

Answer: _____

Q16.

Write an inequality for "a number decreased by 4 is at most 10," then solve.

Answer: _____

UNIT 5

LINEAR EQUATIONS & SLOPE

■ CONCEPT REVIEW

Slope-intercept form: y = mx + b, where m is slope and b is the y-intercept.

Key Terms & Formulas:

• Slope (m) = rise/run = (y2 - y1)/(x2 - x1)

• y-intercept (b): where the line crosses the y-axis (x = 0)

• x-intercept: where the line crosses the x-axis (y = 0)

■ WORKED EXAMPLE

Q: Find the slope of the line through (1, 3) and (4, 9).

A: m = (9-3)/(4-1) = 6/3 = 2

■ PRACTICE PROBLEMS

Q17.

Find the slope and y-intercept of the line y = -3x + 7.

Answer: _____

Q18.

Write the equation of a line with slope 2 that passes through the point (0, -5).

Answer: _____

Q19.

Find the slope of the line passing through (-2, 1) and (4, 13).

Answer: _____

Q20.

A line passes through (3, 5) with slope 1/2. Write its equation in slope-intercept form.

Answer: _____

ANSWER KEY & SOLUTIONS

Check your work carefully. Review the solution steps for any question you missed.

Q1 — 14

Solution: Substitute: 5(4) - 2(3) = 20 - 6 = 14

Q2 — 3n - 7

Solution: "Three times a number n" = 3n. "Seven less than" means subtract 7: 3n - 7

Q3 — Terms: 6x, 4y, -9; Coefficients: 6 and 4; Constant: -9

Solution: Terms: 6x, 4y, -9 | Coefficients: 6, 4 | Constant: -9

Q4 — 10x + 3

Solution: Combine x-terms: 3x + 7x = 10x. Combine constants: 5 - 2 = 3. Result: 10x + 3

Q5 — x = 20

Solution: Add 13 to both sides: x = 7 + 13 = 20

Q6 — y = -7

Solution: Divide both sides by 4: y = -28 / 4 = -7

Q7 — n = 30

Solution: Multiply both sides by 6: n = 5 x 6 = 30

Q8 — x = -7

Solution: Add 4 to both sides: x = -11 + 4 = -7

Q9 — x = 7

Solution: Step 1: Add 7 to both sides: 3x = 21. Step 2: Divide by 3: x = 7

Q10 — y = 3

Solution: Step 1: Subtract 10: -2y = -6. Step 2: Divide by -2: y = 3

Q11 — n = 7

Solution: Equation: 5n + 8 = 43. Step 1: 5n = 35. Step 2: n = 7

Q12 — x = 17

Solution: Step 1: Multiply both sides by 4: x + 3 = 20. Step 2: Subtract 3: x = 17

Q13 — x > 4 (open circle at 4, arrow to the right)

Solution: Subtract 5 from both sides: x > 4. Graph: open circle at 4, shaded to the right.

Q14 — x <= -4

Solution: Divide both sides by -5 and FLIP the sign: x <= -4

Q15 — x < 5

Solution: Step 1: Add 3: 2x < 10. Step 2: Divide by 2: x < 5

Q16 — n <= 14

Solution: Inequality: n - 4 <= 10. Add 4: n <= 14

Q17 — Slope = -3; y-intercept = 7

Solution: The equation is in slope-intercept form y = mx + b. So m = -3 and b = 7.

Q18 — y = 2x - 5

Solution: The point (0, -5) is the y-intercept, so b = -5. Using y = mx + b: y = 2x - 5

Q19 — m = 2

Solution: m = (13 - 1) / (4 - (-2)) = 12 / 6 = 2

Q20 — y = (1/2)x + 7/2 (or y = 0.5x + 3.5)

Solution: Use point-slope: 5 = (1/2)(3) + b --> 5 = 3/2 + b --> b = 7/2. Equation: y = (1/2)x + 7/2