Unit 4: Algebraic Expressions & Properties — Coding an Arcade Game & Running the School Craft Booth

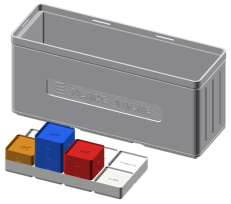
Evaluating Algebraic Expressions, Combining Like Terms, Distributive Property & Factoring with GCF

When Noah tried to code his first arcade game for the school STEM showcase, he almost deleted the whole project in frustration. To track a player's carnival tickets, he started writing one line of code for 1 ride, another line for 2 rides, and another for 3 rides. By twenty lines, his screen was a tangled mess. And when letters like x and g showed up in his math homework that same week, he complained that letters belonged in English class, not math.

Then his older sister showed him that a letter in code—and in algebra—isn't a mystery to be afraid of: it's just a labeled box that holds whatever number changes from turn to turn. Writing one short rule like 50 - 4r let the computer plug in any number of rides r and find the remaining tickets in a split second.

Across the gym at the craft booth, Maya was having the same trouble keeping track of custom soccer uniform bundles—where every player needed both a jersey and $7 shorts—and packing leftover stickers into identical gift bags without coming up short.

As Noah, Maya, and Zoe work through these lessons, their nervousness around letters in math fades away. They see how plugging numbers into a formula, sorting matching items into neat piles, and bundling or unbundling group orders makes their work shorter—and how substituting a test number on the SC-6 proves whether two algebraic expressions are truly equivalent.



Real-World Mathematical Context & Two-Method Mastery • Hands-On Models: Place Value & Prime Factor Blocks

UNIT 4 LESSONS — LEARN TWO TEXTBOOK WAYS FIRST, THEN CHECK YOUR WORK ON THE SC-6 CALCULATOR

SEC 4.1 (pp.37-38) Writing and Evaluating Algebraic Expressions

Textbook Ways: Way 1: Substitute in Parentheses & Follow PEMDAS | Way 2: Equal-Groups Bar / Place Value Model

Learn by Hand: An algebraic expression contains numbers, variables (letters representing unknown quantities), and operations. In an expression like 4x + 7, 4x and 7 are terms, 4 is the coefficient of x, and 7 is a constant. To evaluate an algebraic expression, substitute the given number for each variable and follow the Order of Operations (PEMDAS).

Check Your Work on the SC-6 Calculator:

4 ENTER 5 × 7 +

Press 4 [ENTER] 5 [×] 7 [+] to confirm 27.

SEC 4.2 (pp.39-40) Simplifying Expressions by Combining Like Terms

Textbook Ways: Way 1: Reorder & Add Coefficients (Properties) | Way 2: Sort by Variable Power Columns

Learn by Hand: Terms that have the exact same variable raised to the exact same exponent are called Like Terms (such as 4x and 2x, or $3x^2$ and $2x^2$). Constant terms (such as 5 and 3) are also like terms. To simplify an expression, use the Commutative and Associative Properties to group like terms together and add or subtract their coefficients.

Check Your Work on the SC-6 Calculator:

4 ENTER 2 + 5 ENTER 3 +

Group the x-terms (4+2=6) and constants (5+3=8) on paper first. On your SC-6, test x = 2 in both forms (20 [ENTER] 6 [ENTER] 2 [×] 8 [+]) and press [≠]—it flashes NO (not unequal, proving both match!).

SEC 4.3 (pp.41-42) The Distributive Property

Textbook Ways: Way 1: Multiply Each Term Inside $a(b + c) = ab + ac$ | Way 2: Split-Rectangle Area Model | Way 3: Repeated Addition of Rows

Learn by Hand: To multiply a sum or difference by a number, multiply each term inside the parentheses by the number outside the parentheses: a(b + c) = ab + ac and a(b - c) = ab - ac. Geometrically, a rectangle of height 3 and split width (x + 4) has two partial areas: 3(x) + 3(4) = 3x + 12.

Check Your Work on the SC-6 Calculator:

6 ENTER 1 0 × 6 ENTER 4 × +

Distribute 6(10 + 4) on paper first. On your SC-6, evaluate 10 [ENTER] 4 [+] 6 [×] (84 on Y) and 6 [ENTER] 10 [×] 6 [ENTER] 4 [×] [+] (84 on X), then press [≠]—it flashes NO to prove both forms are equal!

SEC 4.4 (pp.43-44) Factoring Expressions Using the GCF

Textbook Ways: Way 1: Factor Out the GCF Using Prime Factors | Way 2: Equal-Rows Area Model / Division Ladder

Learn by Hand: Factoring an expression means writing a sum or difference as a product—the exact reverse of the Distributive Property! To factor an expression completely, find the Greatest Common Factor (GCF) of its terms, write the GCF outside the parentheses, and divide each term by the GCF to find the terms inside.

Check Your Work on the SC-6 Calculator:

1 8 ENTER 2 4 GCF

Press 18 [ENTER] 24 [GCF] to confirm GCF = 6, giving 6(3x + 4), and test x = 2 in both forms with [≠] (flashes NO!).

HANDS-ON MODEL: PLACE VALUE BLOCKS

Section 4.1 — Practice A: Writing and Evaluating Algebraic Expressions

Key Vocabulary: algebraic expression • variable • term • coefficient • constant • evaluate • substitute

Name: _____ Date: _____ Score: ____ / 100

TEXTBOOK CONCEPT & HANDS-ON MODEL (PLACE VALUE BLOCKS)

Parts of an Expression: 4x + 7

4x + 7

Coefficient = 4
Variable = x
Constant = 7

2 Terms: 4x and 7

Substitute x = 5 into 4x + 7



4(5) + 7 = 20 + 7 = 27

Multiply 4(5) BEFORE adding 7 (PEMDAS)!

HOW THE TEXTBOOK & VISUAL MODEL WORK TOGETHER:

Textbook Concept: To evaluate an algebraic expression, substitute the given value for each variable in parentheses and follow PEMDAS.

Textbook Vocabulary: Identify terms (parts added), coefficients (number multiplied by a variable), and constants (numbers alone).

WATCH OUT: When substituting x into 4x + 7, 4x means 4 × x (multiply 4 × 5 = 20 first; do NOT write '45')!

WORKED EXAMPLE — 2 TEXTBOOK WAYS FOR DOUBLE POINTS (+20)

Problem: Evaluate 4x + 7 when x = 5.

WAY 1: Substitute with Parentheses & Follow PEMDAS

Replace x with (5) in 4x + 7: 4(5) + 7. Multiply first (4 × 5 = 20), then add 7: 20 + 7 = 27.

WAY 2: Equal-Groups Bar / Place Value Model (With Blocks)

Write 4x + 7 as four x-groups plus 7: (5 + 5 + 5 + 5) + 7 = 20 + 7 = 27.

Answer: 27

1 Way = +10 | 2 Ways = +20!

CHECK YOUR WORK ON THE SC-6 CALCULATOR — SECTION 4.1 PRACTICE A (SOLVE BY HAND FIRST, THEN VERIFY!)

Worked Example SC-6 Check Keystrokes:

4 ENTER 5 × 7 +

Substitute x = 5 into 4x + 7 on paper first. Then check on your SC-6:
Press 4 [ENTER] 5 [×] 7 [+] to confirm 27.

SECTION 4.1 PRACTICE A — KEY IDEAS & MULTI-METHOD PRACTICE

100-PT GOAL: Any 5 in 2 Ways (+20) OR All 10 in 1 Way (+10)!

1 **Evaluate 6x - 9 when x = 7.**

Starter Step 1: Substitute (7) in place of x in 6x - 9, multiply 6 × 7 first, and then subtract 9.

Way 1 (Paper Work):

Substitute in ( ):

____(___) ± ____ = _____

WARM-UP • [ ] +10 (1 Way) [ ] +20 (2 Ways) **Ans:** _____

2 **Evaluate 5n + 14 when n = 8.**

Starter Step 1: Substitute (8) in place of n in 5n + 14, multiply 5 × 8 first, and then add 14.

Way 1 (Paper Work):

Substitute in ( ):

____(___) ± ____ = _____

WARM-UP • [ ] +10 (1 Way) [ ] +20 (2 Ways) **Ans:** _____

3 **Evaluate 40 - 3m when m = 9.**

Way 1 (Paper Work):

Substitute in ( ):

____(___) ± ____ = _____

CORE • [ ] +10 (1 Way) [ ] +20 (2 Ways) **Ans:** _____

4 **Evaluate x^2 + 11 when x = 6.**

Way 1 (Paper Work):

Substitute in ( ):

____(___) ± ____ = _____

CORE • [ ] +10 (1 Way) [ ] +20 (2 Ways) **Ans:** _____

5 **Evaluate $2y^2$ - 5 when y = 4.**

Way 1 (Show Paper Steps):

Way 2 (2nd Method / Check):

CORE • [ ] +10 (1 Way) [ ] +20 (2 Ways) **Ans:** _____

6 **Evaluate 7a + 3b when a = 4 and b = 9.**

Way 1 (Show Paper Steps):

Way 2 (2nd Method / Check):

CORE • [ ] +10 (1 Way) [ ] +20 (2 Ways) **Ans:** _____

7 **Evaluate (x + y) ÷ 4 when x = 19 and y = 13.**

Way 1 (Show Paper Steps):

Way 2 (2nd Method / Check):

CORE • [ ] +10 (1 Way) [ ] +20 (2 Ways) **Ans:** _____

8 **Evaluate 5k - 2.4 when k = 3.5.**

Way 1 (Show Paper Steps):

Way 2 (2nd Method / Check):

CORE • [ ] +10 (1 Way) [ ] +20 (2 Ways) **Ans:** _____

9 **Skate Park Rental: A skate park charges an $8 helmet fee plus $4.50 per hour. Write an algebraic expression for the total cost of h hours, and find the total cost for 4 hours.**

Way 1 (Show Paper Steps):

Way 2 (2nd Method / Check):

CHALLENGE • [ ] +10 (1 Way) [ ] +20 (2 Ways) **Ans:** _____

10 **Cube Display Case: The surface area of a cube with edge length s is given by the expression $6s^2$. What is the surface area of a cube with edge length s = 5 cm?**

Way 1 (Show Paper Steps):

Way 2 (2nd Method / Check):

CHALLENGE • [ ] +10 (1 Way) [ ] +20 (2 Ways) **Ans:** _____

HANDS-ON MODEL: PLACE VALUE BLOCKS

Section 4.1 — Practice B: Modeling Real Life (Writing and Evaluating Algebraic Expressions)

Textbook Ways: Substitute in Parentheses & Follow PEMDAS | Equal-Groups Bar / Place Value Model Name: _____ Date: _____ Score: ____ / 100

WORKED EXAMPLE — TWO-VARIABLE SCORE FORMULA (2 TEXTBOOK WAYS = +20 PTS DOUBLE)

Problem: In a game, each boss trophy (a) is worth $3a^2$ points and each gem (b) is worth 4b points. What is your total score if you collect 5 trophies and 6 gems?

WAY 1: Substitute into $3a^2 + 4b$ & Follow PEMDAS

Write $3(5)^2 + 4(6)$. Evaluate exponent first ($5^2 = 25$), multiply ($3 \times 25 = 75$ and $4 \times 6 = 24$), then add: $75 + 24 = 99$ points.

WAY 2: Find Each Item's Sub-Score Separately

1 trophy = $3(5\times5) = 75$ pts. 6 gems = $6 \times 4 = 24$ pts. Combine both sub-scores: $75 + 24 = 99$ points.

Watch-Out: Evaluate $5^2 = 25$ before multiplying by 3 (never multiply 3×5 first!).

WATCH OUT: When substituting x into 4x + 7, 4x means 4 × x (multiply 4 × 5 = 20 first; do NOT write '45')!

Answer: 99 points

CHECK YOUR WORK ON THE SC-6 CALCULATOR — SECTION 4.1 PRACTICE B (SOLVE BY HAND FIRST, THEN VERIFY!)

Worked Example SC-6 Check Keystrokes:

5 | x^2 | 3 | × | 4 | ENTER | 6 | × | +

Substitute t = 5 and b = 4 into $3t^2 + 6b$ on paper first. Then check on your SC-6:
Press 5 [x^2] 3 [×] (75 waits on Y), then 4 [ENTER] 6 [×] (24 on X), and [+] to confirm 99.

Noah used to freeze up whenever letters showed up inside math expressions like $6 + 5g$ or $16t^2$, convinced that algebra was way over his head. While coding the checkout screen for a bowling game ($6 shoe rental plus $5 per game g), he realized that the letter g wasn't a number he had to solve for—it was just an empty input box waiting for the player to type how many games they bowled! Once he drew parentheses around the slot—$6 + 5(\ )$—and dropped the number 4 inside, it turned right back into ordinary arithmetic he already knew how to do.

SECTION 4.1 PRACTICE B — MODELING REAL LIFE & APPLICATIONS

100-PT GOAL: Any 5 in 2 Ways (+20) OR All 10 in 1 Way (+10)!

1 **Bowling Alley: Bowling costs $6 for shoe rental plus $5 per game g. Write an expression for the total cost and find the cost of playing 4 games.**

Starter Step 1: Multiply the $5 per-game cost by g games and add the $6 shoe rental, then substitute g = 4.

Way 1 (Paper Work):

Substitute in ( ):

____(___) ÷ ____ = _____

WARM-UP • [ ] +10 (1 Way) [ ] +20 (2 Ways) **Ans:** _____

2 **Carnival Wristband: You start with 50 tickets and spend 4 tickets on each ride r. Write an expression for your remaining tickets and find how many are left after 9 rides.**

Starter Step 1: Start with 50 tickets and subtract 4 tickets per ride r, then substitute r = 9 rides.

Way 1 (Paper Work):

Substitute in ( ):

____(___) ÷ ____ = _____

WARM-UP • [ ] +10 (1 Way) [ ] +20 (2 Ways) **Ans:** _____

3 **Square Tile Patio Cost: Paving a square patio of side length s feet costs $8s^2 + 25$ dollars. What is the cost when s = 5 feet?**

Way 1 (Paper Work):

Substitute in ( ):

____(___) ÷ ____ = _____

CORE • [ ] +10 (1 Way) [ ] +20 (2 Ways) **Ans:** _____

4 **Kea Parrot Puzzle Box: In a New Zealand wildlife lab, a kea parrot earns $10w + 3d$ reward points for unlocking w wire latches and d sliding doors. Find its score when w = 7 and d = 4.**

Way 1 (Paper Work):

Substitute in ( ):

____(___) ÷ ____ = _____

CORE • [ ] +10 (1 Way) [ ] +20 (2 Ways) **Ans:** _____

5 **Falling Object Physics: A ball dropped from a tower falls $16t^2$ feet in t seconds. How far does it fall in 3 seconds?**

Way 1 (Show Paper Steps):

Way 2 (2nd Method / Check):

CORE • [ ] +10 (1 Way) [ ] +20 (2 Ways) **Ans:** _____

6 **Cube Surface Area: The surface area of a cube with edge length s is $6s^2$. What is the surface area when s = 4 inches?**

Way 1 (Show Paper Steps):

Way 2 (2nd Method / Check):

CORE • [ ] +10 (1 Way) [ ] +20 (2 Ways) **Ans:** _____

7 **Snack Stand Order: Popcorn costs $7 and drinks cost $4. Write an expression for p popcorns and d drinks, and find the total cost for 3 popcorns and 5 drinks.**

Way 1 (Show Paper Steps):

Way 2 (2nd Method / Check):

CORE • [ ] +10 (1 Way) [ ] +20 (2 Ways) **Ans:** _____

8 **Evaluate $1/2h(a + b)$ when h = 6, a = 11, and b = 15.**

Way 1 (Show Paper Steps):

Way 2 (2nd Method / Check):

CORE • [ ] +10 (1 Way) [ ] +20 (2 Ways) **Ans:** _____

9 **3D Print Batch Time: Printing k keycaps takes $12k + 15$ minutes (including 15 minutes for bed warm-up). How many minutes does a batch of 8 keycaps take?**

Way 1 (Show Paper Steps):

Way 2 (2nd Method / Check):

CHALLENGE • [ ] +10 (1 Way) [ ] +20 (2 Ways) **Ans:** _____

10 **Evaluate $2x^3 - 3y^2$ when x = 4 and y = 5.**

Way 1 (Show Paper Steps):

Way 2 (2nd Method / Check):

CHALLENGE • [ ] +10 (1 Way) [ ] +20 (2 Ways) **Ans:** _____

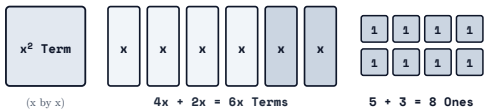
HANDS-ON MODEL: PLACE VALUE BLOCKS

Section 4.2 — Practice A: Simplifying Expressions by Combining Like Terms

Key Vocabulary: like terms • simplest form • Commutative Property • Associative Property • equivalent expressions Name: _____ Date: _____ Score: ____ / 100

TEXTBOOK CONCEPT & HANDS-ON MODEL (PLACE VALUE BLOCKS)

Combining Like Terms by Variable Power: $4x + 5 + 2x + 3 = 6x + 8$



(x by x) 4x + 2x = 6x Terms 5 + 3 = 8 Ones

Watch Out: 6x and 8 are unlike terms → NEVER combine into 14x!

HOW THE TEXTBOOK & VISUAL MODEL WORK TOGETHER:

Textbook Concept: Like terms have the exact same variable raised to the exact same power. Add or subtract their coefficients; keep the variable part unchanged.

Textbook Equivalence Check: Substitute a test value (such as $x = 2$ or $x = 10$) into both the original and simplified expressions to verify they match.

WATCH OUT: Combine only terms with the EXACT same variable and exponent — never combine $6x + 8$ into $14x$!

WORKED EXAMPLE — 2 TEXTBOOK WAYS FOR DOUBLE POINTS (+20)

Problem: Simplify the expression $4x + 5 + 2x + 3$.

WAY 1: Commutative & Associative Grouping

Reorder and group like terms: $(4x + 2x) + (5 + 3) = (4 + 2)x + 8 = 6x + 8$.

WAY 2: Sort by Place-Value / Variable Columns

Place x-terms in Column 1 ($4x + 2x = 6x$) and constants in Column 2 ($+5 + 3 = +8$) → $6x + 8$.

Answer: 6x + 8 1 Way = +10 | 2 Ways = +20!

CHECK YOUR WORK ON THE SC-6 CALCULATOR — SECTION 4.2 PRACTICE A (SOLVE BY HAND FIRST, THEN VERIFY!)

Worked Example SC-6 Check Keystrokes:

4 ENTER 2 + 5 ENTER 3 +

Group the x-terms (4+2=6) and constants (5+3=8) on paper first. On your SC-6, test x = 2 in both forms (20 [ENTER] 6 [ENTER] 2 [×] 8 [+]) and press [≠]—it flashes NO (not unequal, proving both match!).

SECTION 4.2 PRACTICE A — KEY IDEAS & MULTI-METHOD PRACTICE

100-PT GOAL: Any 5 in 2 Ways (+20) OR All 10 in 1 Way (+10)!

1 **Simplify the expression: $7x + 4 + 2x + 9$.**

Starter Step 1: Group the like x-terms ($7x + 2x$) together and the constant numbers ($4 + 9$) together, then add.

Way 1 (Paper Work):

Var Terms	Constants

WARM-UP • [ ] +10 (1 Way) [ ] +20 (2 Ways) **Ans:** _____

2 **Simplify the expression: $8x + 11 - 3x - 4$.**

Starter Step 1: Group the x-terms ($8x - 3x$) and constant terms ($11 - 4$), keeping the + or - sign in front of each term.

Way 1 (Paper Work):

Var Terms	Constants

WARM-UP • [ ] +10 (1 Way) [ ] +20 (2 Ways) **Ans:** _____

3 **Simplify the expression: $9y - y + 6$.**

Way 1 (Paper Work):

Var Terms	Constants

CORE • [ ] +10 (1 Way) [ ] +20 (2 Ways) **Ans:** _____

4 **Simplify the expression: $12a + 5 - 4a + 8$.**

Way 1 (Paper Work):

Var Terms	Constants

CORE • [ ] +10 (1 Way) [ ] +20 (2 Ways) **Ans:** _____

5 **Simplify the expression: $4x^2 + 3x + 2x^2 + 5x + 7$.**

Way 1 (Show Paper Steps): Way 2 (2nd Method / Check):

CORE • [ ] +10 (1 Way) [ ] +20 (2 Ways) **Ans:** _____

6 **Simplify the expression: $6n^2 + 9n - 2n^2 - 4n + 10$.**

Way 1 (Show Paper Steps): Way 2 (2nd Method / Check):

CORE • [ ] +10 (1 Way) [ ] +20 (2 Ways) **Ans:** _____

7 **Simplify the expression: $3.5x + 4.2 + 1.8x - 1.5$.**

Way 1 (Show Paper Steps): Way 2 (2nd Method / Check):

CORE • [ ] +10 (1 Way) [ ] +20 (2 Ways) **Ans:** _____

8 **Error Analysis: Leo simplified $5x + 3$ to $8x$. Explain why $5x$ and 3 cannot be combined, and prove they are not equivalent by substituting $x = 10$ into both expressions.**

Way 1 (Show Paper Steps): Way 2 (2nd Method / Check):

CORE • [ ] +10 (1 Way) [ ] +20 (2 Ways) **Ans:** _____

9 **Garden Border: A rectangular garden has two sides of length $(2x + 3)$ meters and two sides of length $(x + 5)$ meters. Write a simplified algebraic expression for its perimeter, and find the perimeter when $x = 10$.**

Way 1 (Show Paper Steps): Way 2 (2nd Method / Check):

CHALLENGE • [ ] +10 (1 Way) [ ] +20 (2 Ways) **Ans:** _____

10 **Pennant Frame: A triangular frame has side lengths of $(3x + 2)$ cm, $(2x + 7)$ cm, and $(4x - 1)$ cm. Write a simplified expression for its perimeter, and find the perimeter when $x = 5$.**

Way 1 (Show Paper Steps): Way 2 (2nd Method / Check):

CHALLENGE • [ ] +10 (1 Way) [ ] +20 (2 Ways) **Ans:** _____

HANDS-ON MODEL: PLACE VALUE BLOCKS

Section 4.2 — Practice B: Modeling Real Life (Simplifying Expressions by Combining Like Terms)

Textbook Ways: Reorder & Add Coefficients (Properties) | Sort by Variable Power Columns Name: _____ Date: _____ Score: ____ / 100

WORKED EXAMPLE — COMBINING x^2, x, AND CONSTANT TERMS (2 TEXTBOOK WAYS = +20 PTS DOUBLE)

Problem: Simplify the expression $3x^2 + 5x + 2x^2 - x + 6$.

WAY 1: Group Terms with the Same Variable & Exponent

Rewrite -x as -1x: $(3x^2 + 2x^2) + (5x - 1x) + 6 = (3 + 2)x^2 + (5 - 1)x + 6 = 5x^2 + 4x + 6$.

WAY 2: Sort into x^2, x, and Constant Columns

Combine $3 + 2 = 5$ in the x^2-column ($5x^2$), $5 - 1 = 4$ in the x-column ($4x$), and 6 in the ones column ($+6$) → $5x^2 + 4x + 6$.

Check with x = 2: Original = 12 + 10 + 8 - 2 + 6 = 34; Simplified = 5(4) + 4(2) + 6 = 34.

WATCH OUT: Combine only terms with the EXACT same variable and exponent — never combine $6x + 8$ into $14x$!

Answer: $5x^2 + 4x + 6$

CHECK YOUR WORK ON THE SC-6 CALCULATOR — SECTION 4.2 PRACTICE B (SOLVE BY HAND FIRST, THEN VERIFY!)

Worked Example SC-6 Check Keystrokes:

3 ENTER 2 + 5 ENTER 1 -

Combine the x^2-terms, x-terms, and constants on paper first. Check each coefficient sum on your SC-6 (3 [ENTER] 2 [+] = $5x^2$ and 5 [ENTER] 1 [-] = 4x), then test x = 2 in both expressions with [≠] (flashes NO!).

Looking at the expression $6x + 9 - 2x + 5$, Noah was tempted to mash everything together into 18x so there would only be one piece left. To check if that made sense, he set 6 sealed pouches of x tokens and 9 loose tokens on his desk, took away 2 pouches, and added 5 loose tokens. Immediately he laughed at his first guess: you can't dump loose single tokens into the pouch count! Sorting the pouches together ($6x - 2x = 4x$) and the loose tokens together ($9 + 5 = 14$) showed him why only 'like terms' can be combined into $4x + 14$.

SECTION 4.2 PRACTICE B — MODELING REAL LIFE & APPLICATIONS

100-PT GOAL: Any 5 in 2 Ways (+20) OR All 10 in 1 Way (+10)!

1 **Triangle Perimeter: A triangle has side lengths $(2x + 3)$, $(3x + 1)$, and $(4x + 5)$. Write and simplify an expression for its perimeter.**

Starter Step 1: Add all three side expressions together by grouping the x-terms ($2x + 3x + 4x$) and the constants ($3 + 1 + 5$).

Way 1 (Paper Work):

Var Terms	Constants

WARM-UP • [ ] +10 (1 Way) [ ] +20 (2 Ways) **Ans:** _____

2 **Rectangle Perimeter: A garden is $(3x + 4)$ feet long and $(x + 2)$ feet wide. Write and simplify an expression for its perimeter.**

Starter Step 1: Perimeter adds all 4 sides—double the length $2(3x + 4)$ and double the width $2(x + 2)$, then combine like terms.

Way 1 (Paper Work):

Var Terms	Constants

WARM-UP • [ ] +10 (1 Way) [ ] +20 (2 Ways) **Ans:** _____

3 **Arcade Token Pouches: You have 6 pouches of x tokens plus 9 loose tokens, give away 2 pouches, and win 5 more loose tokens. Write and simplify an expression for your total tokens.**

Way 1 (Paper Work):

Var Terms	Constants

CORE • [ ] +10 (1 Way) [ ] +20 (2 Ways) **Ans:** _____

4 **Simplify $4x^2 + 7x + 3 + 2x^2 - 3x + 8$.**

Way 1 (Paper Work):

Var Terms	Constants

CORE • [ ] +10 (1 Way) [ ] +20 (2 Ways) **Ans:** _____

5 **Bake Sale Revenue: On Saturday you earn $(8c + 12)$ dollars and on Sunday you earn $(5c + 19)$ dollars. Write a simplified expression for your weekend total.**

Way 1 (Show Paper Steps): Way 2 (2nd Method / Check):

CORE • [ ] +10 (1 Way) [ ] +20 (2 Ways) **Ans:** _____

6 **Simplify $9x + 14 - 2x + 5$, then state the coefficient of x and the constant term.**

Way 1 (Show Paper Steps): Way 2 (2nd Method / Check):

CORE • [ ] +10 (1 Way) [ ] +20 (2 Ways) **Ans:** _____

7 **Simplify $(3/8)n + 4 + (1/8)n + 9$.**

Way 1 (Show Paper Steps): Way 2 (2nd Method / Check):

CORE • [ ] +10 (1 Way) [ ] +20 (2 Ways) **Ans:** _____

8 **Simplify $2.4y + 5.8 + 1.6y - 2.3$.**

Way 1 (Show Paper Steps): Way 2 (2nd Method / Check):

CORE • [ ] +10 (1 Way) [ ] +20 (2 Ways) **Ans:** _____

9 **Simplify $10m - 4m + 15 - 6$, then check your work by substituting $m = 5$ into both the original and simplified expressions.**

Way 1 (Show Paper Steps): Way 2 (2nd Method / Check):

CHALLENGE • [ ] +10 (1 Way) [ ] +20 (2 Ways) **Ans:** _____

10 **Simplify $5x^2 + 6x + 10 - 2x^2 - 6x - 3$.**

Way 1 (Show Paper Steps): Way 2 (2nd Method / Check):

CHALLENGE • [ ] +10 (1 Way) [ ] +20 (2 Ways) **Ans:** _____

HANDS-ON MODEL: PLACE VALUE BLOCKS

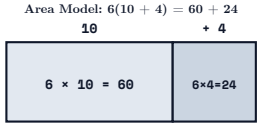
Section 4.3 — Practice A: The Distributive Property

Key Vocabulary: Distributive Property • area model • partial products • equivalent expressions

Name: _____ Date: _____ Score: ____ / 100

TEXTBOOK CONCEPT & HANDS-ON MODEL (PLACE VALUE BLOCKS)

Area Model: 6(10 + 4) = 60 + 24



Total Area: 6(14) = 60 + 24 = 84

Algebraic Distribution: a(b + c) = ab + ac

3 (2x + 5)
= 3(2x) + 3(5)
= 6x + 15

Multiply BOTH terms inside ( ) by 3!

HOW THE TEXTBOOK & VISUAL MODEL WORK TOGETHER:

Textbook Concept (Distributive Property): To multiply a sum or difference by a number, multiply EACH term inside parentheses: a(b + c) = ab + ac.

Textbook Area Model: A rectangle of height a and split width (b + c) has total area a(b + c), which equals the sum of the two sub-areas ab + ac.

WATCH OUT: Multiply the outside factor by EVERY term inside the parentheses: 3(2x + 5) = 6x + 15 (do not forget 3 × 5)!

WORKED EXAMPLE — 3 TEXTBOOK WAYS (ANY 2 WAYS = +20 PTS)

Problem: Evaluate 6(10 + 4) using the Order of Operations and using the Distributive Property.

WAY 1: Use the Distributive Property a(b + c) = ab + ac
Multiply 6 by each term inside the parentheses: 6(10 + 4) = 6(10) + 6(4) = 60 + 24 = 84.

WAY 2: Use the Order of Operations (Combine Width First)
Add inside the parentheses first: 6(10 + 4) = 6(14) = 84.

WAY 3: Split-Rectangle Area Model (Partial Products)
A 6-by-14 rectangle splits into a 6×10 section (60) and a 6×4 section (24): 60 + 24 = 84.

Answer: 84 1 Way = +10 | 2 Ways = +20!

CHECK YOUR WORK ON THE SC-6 CALCULATOR — SECTION 4.3 PRACTICE A (SOLVE BY HAND FIRST, THEN VERIFY!)

Worked Example SC-6 Check Keystrokes:

6 ENTER 1 0 × 6 ENTER 4 × +

Distribute 6(10 + 4) on paper first. On your SC-6, evaluate 10 [ENTER] 4 [+] 6 [×] (84 on Y) and 6 [ENTER] 10 [×] 6 [ENTER] 4 [×] [+] (84 on X), then press [≠]—it flashes NO to prove both forms are equal!

SECTION 4.3 PRACTICE A — KEY IDEAS & MULTI-METHOD PRACTICE

100-PT GOAL: Any 5 in 2 Ways (+20) OR All 10 in 1 Way (+10)!

1 Use the Distributive Property to find the two partial products and total of 7(20 + 3).

Starter Step 1: Multiply the outside factor 7 by EACH term inside parentheses—(7 × 20) + (7 × 3)—and add the products.

Way 1 (Paper Work):

Term 1 | Term 2

WARM-UP • [ ] +10 (1 Way) [ ] +20 (2 Ways) **Ans:** _____

2 Use the Distributive Property to simplify 4(x + 5).

Starter Step 1: Multiply the outside factor 4 by BOTH terms inside the parentheses: 4(x) + 4(5).

Way 1 (Paper Work):

Term 1 | Term 2

WARM-UP • [ ] +10 (1 Way) [ ] +20 (2 Ways) **Ans:** _____

3 Use the Distributive Property to simplify 6(3x + 4).

Way 1 (Paper Work):

Term 1 | Term 2

CORE • [ ] +10 (1 Way) [ ] +20 (2 Ways) **Ans:** _____

4 Use the Distributive Property to simplify 8(2y - 5).

Way 1 (Paper Work):

Term 1 | Term 2

CORE • [ ] +10 (1 Way) [ ] +20 (2 Ways) **Ans:** _____

5 Evaluate 9 × 43 mentally using the Distributive Property by splitting 43 into (40 + 3).

Way 1 (Show Paper Steps):

Way 2 (2nd Method / Check):

CORE • [ ] +10 (1 Way) [ ] +20 (2 Ways) **Ans:** _____

6 Simplify the expression: 3(4x + 2) + 5x.

Way 1 (Show Paper Steps):

Way 2 (2nd Method / Check):

CORE • [ ] +10 (1 Way) [ ] +20 (2 Ways) **Ans:** _____

7 Simplify the expression: 4(3n + 5) - 7.

Way 1 (Show Paper Steps):

Way 2 (2nd Method / Check):

CORE • [ ] +10 (1 Way) [ ] +20 (2 Ways) **Ans:** _____

8 Error Analysis: Mia wrote 5(x + 6) = 5x + 6. Explain her error and write the correct simplified expression.

Way 1 (Show Paper Steps):

Way 2 (2nd Method / Check):

CORE • [ ] +10 (1 Way) [ ] +20 (2 Ways) **Ans:** _____

9 Simplify 5(2x + 3) + 4x, and verify your simplified expression by evaluating both expressions when x = 2.

Way 1 (Show Paper Steps):

Way 2 (2nd Method / Check):

CHALLENGE • [ ] +10 (1 Way) [ ] +20 (2 Ways) **Ans:** _____

10 Team Lunch Order: Six teammates each order a sandwich costing x dollars and a smoothie costing $3.50. Write a factored expression and an expanded expression for the total cost, then find the total if each sandwich costs $6.50.

Way 1 (Show Paper Steps):

Way 2 (2nd Method / Check):

CHALLENGE • [ ] +10 (1 Way) [ ] +20 (2 Ways) **Ans:** _____

HANDS-ON MODEL: PLACE VALUE BLOCKS

Section 4.3 — Practice B: Modeling Real Life (The Distributive Property)

Textbook Ways: Multiply Each Term Inside a(b + c) = ab + ac | Split-Rectangle Area Model | Repeated Addition of Rows Name: _____ Date: _____ Score: ____ / 100

WORKED EXAMPLE — SIMPLIFYING A COMBO ORDER EXPRESSION (2 TEXTBOOK WAYS = +20 PTS DOUBLE)

Problem: Five friends each buy 2 tacos (x dollars each) and a $3 drink, and the group orders 4 extra tacos: 5(2x + 3) + 4x. Simplify the expression.

WAY 1: Distribute First, Then Combine Like Terms

Distribute 5 across (2x + 3): 5(2x) + 5(3) + 4x = 10x + 15 + 4x. Combine x-terms: (10x + 4x) + 15 = 14x + 15.

WAY 2: Equal-Group Rows (5 Groups of 2x + 3)

Five groups of (2x + 3) give 10x + 15. Add the 4 extra tacos (4x) → 14x + 15.

Check at x = $2: 5(2·2 + 3) + 4(2) = 35 + 8 = $43, and 14(2) + 15 = $43.

WATCH OUT: Multiply the outside factor by EVERY term inside the parentheses: 3(2x + 5) = 6x + 15 (do not forget 3 × 5)!

Answer: 14x + 15

CHECK YOUR WORK ON THE SC-6 CALCULATOR — SECTION 4.3 PRACTICE B (SOLVE BY HAND FIRST, THEN VERIFY!)

Worked Example SC-6 Check Keystrokes:

5 ENTER 2 × 4 + 5 ENTER 3 ×

Distribute 5(2x + 3) + 4x = 14x + 15 on paper first. Check the coefficients on your SC-6 (5 [ENTER] 2 [×] 4 [+] = 14; 5 [ENTER] 3 [×] = 15) and test x = 2 in both forms with [≠] (flashes NO!).

When Maya wrote 4(x + 7) for four soccer players each ordering an $x jersey and $7 shorts, she accidentally simplified it to 4x + 7—and couldn't figure out why her budget came up $21 short. Laying out four separate order cards on the craft booth table, she saw her mistake right away: all four players got the $x jersey AND all four players got the $7 shorts (4x + 28), whereas 4x + 7 only bought shorts for one kid! Better yet, she realized the same Distributive Property let her multiply 8 × $53 in her head without scratch paper by splitting $53 into 8($50 + $3) = $400 + $24 = $424.

SECTION 4.3 PRACTICE B — MODELING REAL LIFE & APPLICATIONS

100-PT GOAL: Any 5 in 2 Ways (+20) OR All 10 in 1 Way (+10)!

1 **Mental Math Ticket Split: Use the Distributive Property to find the cost of 8 tickets at $53 each by splitting 53 into 50 + 3.**

Starter Step 1: Write 8(50 + 3), then multiply (8 × 50) + (8 × 3) and add the two partial products.

Way 1 (Paper Work):

--- Term 1 | Term 2

WARM-UP • [ ] +10 (1 Way) [ ] +20 (2 Ways) Ans: _____

2 **Price Tag Trick: Use the Distributive Property to find the cost of 6 shirts at $9.90 each by writing $9.90 as ($10 - $0.10).**

Starter Step 1: Write 6($10 - $0.10), then multiply (6 × $10) - (6 × $0.10) and subtract.

Way 1 (Paper Work):

--- Term 1 | Term 2

WARM-UP • [ ] +10 (1 Way) [ ] +20 (2 Ways) Ans: _____

3 **Split Rectangle Garden: A rectangular garden is 7 feet wide. Its length is split into an x-foot herb bed and an 8-foot flower bed. Write the total area in factored form and expanded form.**

Way 1 (Paper Work):

--- Term 1 | Term 2

CORE • [ ] +10 (1 Way) [ ] +20 (2 Ways) Ans: _____

4 **Soccer Uniform Order: Nine players each buy a jersey for 2x dollars and shorts for $7. Write and simplify an expression for the team's total cost.**

Way 1 (Paper Work):

--- Term 1 | Term 2

CORE • [ ] +10 (1 Way) [ ] +20 (2 Ways) Ans: _____

5 **Coupon Discount: Four friends each buy a ticket priced at t dollars using a $3-off coupon. Write and expand an expression for the total paid, and find the total when t = $15.**

Way 1 (Show Paper Steps):

Way 2 (2nd Method / Check):

CORE • [ ] +10 (1 Way) [ ] +20 (2 Ways) Ans: _____

6 **Simplify 3(4x + 5) + 2x.**

Way 1 (Show Paper Steps):

Way 2 (2nd Method / Check):

CORE • [ ] +10 (1 Way) [ ] +20 (2 Ways) Ans: _____

7 **Simplify 4(2x + 3) + 5(x + 2).**

Way 1 (Show Paper Steps):

Way 2 (2nd Method / Check):

CORE • [ ] +10 (1 Way) [ ] +20 (2 Ways) Ans: _____

8 **Simplify (1/2)(6x + 10).**

Way 1 (Show Paper Steps):

Way 2 (2nd Method / Check):

CORE • [ ] +10 (1 Way) [ ] +20 (2 Ways) Ans: _____

9 **Rectangle Perimeter: A rectangle has length (2x + 5) and width (x + 3). Write and simplify an expression for its perimeter.**

Way 1 (Show Paper Steps):

Way 2 (2nd Method / Check):

CHALLENGE • [ ] +10 (1 Way) [ ] +20 (2 Ways) Ans: _____

10 **Evaluate 12(10 + 5) in two ways: using the Order of Operations and using the Distributive Property.**

Way 1 (Show Paper Steps):

Way 2 (2nd Method / Check):

CHALLENGE • [ ] +10 (1 Way) [ ] +20 (2 Ways) Ans: _____

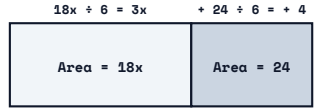
HANDS-ON MODEL: PRIME FACTOR TOWERS

Section 4.4 — Practice A: Factoring Expressions Using the GCF

Key Vocabulary: factoring an expression • greatest common factor (GCF) • factored form • expanded form Name: _____ Date: _____ Score: ____ / 100

TEXTBOOK CONCEPT & HANDS-ON MODEL (PRIME FACTOR TOWERS)

Factoring = Undoing the Distributive Property Using the GCF: $18x + 24 = 6(3x + 4)$



Factored Form: **6(3x + 4)**

Check: 6(3x)+6(4) = 18x + 24

6 Equal Rows of (3x + 4) Tiles | GCF(3, 4) = 1 → Factored Completely!

HOW THE TEXTBOOK & VISUAL MODEL WORK TOGETHER:

Textbook Concept (Factoring out the GCF): Find the GCF of all terms, write the GCF outside parentheses, and divide each term by the GCF: ab + ac = a(b + c).

Textbook Verification: Distribute your factored expression back out and check that the inside terms have no common factors left (GCF = 1).

WATCH OUT: Factor out the GREATEST common factor (GCF) so the terms left inside parentheses share no common factor > 1.

WORKED EXAMPLE — 2 TEXTBOOK WAYS FOR DOUBLE POINTS (+20)

Problem: Factor 18x + 24 completely using the GCF.

WAY 1: Find GCF & Divide Each Term

GCF(18, 24) = 6. Rewrite each term as a product with 6: 18x + 24 = 6(3x) + 6(4) = 6(3x + 4).

WAY 2: Equal-Rows Area Model / Division Ladder (With Blocks)

Arrange 18x + 24 into 6 equal rows of (3x + 4), or use a ladder: divide (18x + 24) by 2 → 3 → GCF = 6, leaving (3x + 4).

Answer: 6(3x + 4) 1 Way = +10 | 2 Ways = +20!

CHECK YOUR WORK ON THE SC-6 CALCULATOR — SECTION 4.4 PRACTICE A (SOLVE BY HAND FIRST, THEN VERIFY!)

Worked Example SC-6 Check Keystrokes:

1 8 ENTER 2 4 GCF

Find the GCF of 18 and 24 and factor on paper first. Check on your SC-6:
Press 18 [ENTER] 24 [GCF] to confirm GCF = 6, giving 6(3x + 4), and test x = 2 in both forms with [≠] (flashes NO!).

SECTION 4.4 PRACTICE A — KEY IDEAS & MULTI-METHOD PRACTICE

100-PT GOAL: Any 5 in 2 Ways (+20) OR All 10 in 1 Way (+10)!

1 **Factor the numerical expression 12 + 20 using the GCF.**

Starter Step 1: Find the Greatest Common Factor (GCF) of 12 and 20, write it outside parentheses, and divide both terms by that GCF.

Way 1 (Paper Work):

GCF = _____

Factored: ____(_____ ± _____)

WARM-UP • [ ] +10 (1 Way) [ ] +20 (2 Ways) **Ans:** _____

2 **Factor 8x + 12 completely using the GCF.**

Starter Step 1: Find the GCF of 8x and 12, write it outside the parentheses, and divide both terms by that GCF.

Way 1 (Paper Work):

GCF = _____

Factored: ____(_____ ± _____)

WARM-UP • [ ] +10 (1 Way) [ ] +20 (2 Ways) **Ans:** _____

3 **Factor 15y - 25 completely using the GCF.**

Way 1 (Paper Work):

GCF = _____

Factored: ____(_____ ± _____)

CORE • [ ] +10 (1 Way) [ ] +20 (2 Ways) **Ans:** _____

4 **Factor 24x + 36 completely using the GCF.**

Way 1 (Paper Work):

GCF = _____

Factored: ____(_____ ± _____)

CORE • [ ] +10 (1 Way) [ ] +20 (2 Ways) **Ans:** _____

5 **Factor 32n - 48 completely using the GCF.**

Way 1 (Show Paper Steps):

Way 2 (2nd Method / Check):

CORE • [ ] +10 (1 Way) [ ] +20 (2 Ways) **Ans:** _____

6 **Factor 42a + 14 completely using the GCF.**

Way 1 (Show Paper Steps):

Way 2 (2nd Method / Check):

CORE • [ ] +10 (1 Way) [ ] +20 (2 Ways) **Ans:** _____

7 **Factor 36m - 60 completely using the GCF.**

Way 1 (Show Paper Steps):

Way 2 (2nd Method / Check):

CORE • [ ] +10 (1 Way) [ ] +20 (2 Ways) **Ans:** _____

8 **Error Analysis: Sam factored 24x + 36 as 6(4x + 6). Explain why his expression is not factored completely, and write the completely factored form.**

Way 1 (Show Paper Steps):

Way 2 (2nd Method / Check):

CORE • [ ] +10 (1 Way) [ ] +20 (2 Ways) **Ans:** _____

9 **Club Banner Width: A rectangular banner has an area of (28x + 42) square inches. Its height in inches is the greatest whole number that divides evenly into both 28 and 42. What are the height and width of the banner?**

Way 1 (Show Paper Steps):

Way 2 (2nd Method / Check):

CHALLENGE • [ ] +10 (1 Way) [ ] +20 (2 Ways) **Ans:** _____

10 **Square Garden Perimeter: A square garden has a total perimeter of (36x + 48) feet. What is the length of one side of the garden?**

Way 1 (Show Paper Steps):

Way 2 (2nd Method / Check):

CHALLENGE • [ ] +10 (1 Way) [ ] +20 (2 Ways) **Ans:** _____

HANDS-ON MODEL: PRIME FACTOR TOWERS

Section 4.4 — Practice B: Modeling Real Life (Factoring Expressions Using the GCF)

Textbook Ways: Factor Out the GCF Using Prime Factors | Equal-Rows Area Model / Division Ladder Name: _____ Date: _____ Score: ____ / 100

WORKED EXAMPLE — FINDING GARDEN DIMENSIONS BY FACTORING (2 TEXTBOOK WAYS = +20 PTS DOUBLE)

Problem: A rectangular garden has an area of (45x - 30) square feet. Factor the expression using the GCF to find possible dimensions of the garden.

WAY 1: Prime Factorization GCF Method

$45 = 3^2 \times 5$ and $30 = 2 \times 3 \times 5 \rightarrow$ GCF $= 3 \times 5 = 15$. Divide each term by 15: $45x - 30 = 15(3x - 2)$.

WAY 2: Step-by-Step Division Ladder

Divide $(45x - 30)$ by $5 \rightarrow 5(9x - 6)$; then factor out $3 \rightarrow 5 \cdot 3(3x - 2) = 15(3x - 2)$ (Width = 15 ft, Length = $3x - 2$ ft).

Check by distributing: $15(3x) - 15(2) = 45x - 30$.

WATCH OUT: Factor out the GREATEST common factor (GCF) so the terms left inside parentheses share no common factor > 1.

Answer: $15(3x - 2)$

CHECK YOUR WORK ON THE SC-6 CALCULATOR — SECTION 4.4 PRACTICE B (SOLVE BY HAND FIRST, THEN VERIFY!)

Worked Example SC-6 Check Keystrokes:

4 5 ENTER 3 0 GCF 4 5 ↑↓ ÷

Factor 45x - 30 by hand first. Then check on your SC-6:
Press 45 [ENTER] 30 [GCF] to confirm GCF = 15, divide $45 \div 15 = 3$ and $30 \div 15 = 2$ for $15(3x - 2)$, and test $x = 2$ with [≠] (flashes NO!).

At the end of the craft fair, Maya had $(16x + 24)$ stickers to pack into the greatest possible number of identical gift bags, and the word 'factor the expression' on her worksheet sounded intimidating. Then she noticed that packing identical bags was just the uniform-bundle problem from the day before running in reverse! Instead of multiplying the number of bags into the parentheses, she pulled out the Greatest Common Factor of 16 and 24 (which is 8) to write $8(2x + 3)$—showing 8 identical gift bags with $(2x + 3)$ stickers inside each bag.

SECTION 4.4 PRACTICE B — MODELING REAL LIFE & APPLICATIONS 100-PT GOAL: Any 5 in 2 Ways (+20) OR All 10 in 1 Way (+10)!

1 **Identical Gift Bags: You have $(16x + 24)$ stickers to divide equally into the greatest possible number of identical gift bags. Factor the expression to find the number of bags and the contents of each bag.**

Starter Step 1: Find the GCF of 16 and 24 to get the greatest number of bags, then divide 16x and 24 by that GCF.

Way 1 (Paper Work):

GCF = _____

Factored: ____(_____ ± _____)

WARM-UP • [ ] +10 (1 Way) [ ] +20 (2 Ways) **Ans:** _____

2 **Rectangular Solar Array: A solar panel array has area $(21x + 35)$ square meters and width 7 meters. What is the length of the array?**

Starter Step 1: Factor out the width 7 from $(21x + 35)$ by dividing both 21x and 35 by 7 to find the length.

Way 1 (Paper Work):

GCF = _____

Factored: ____(_____ ± _____)

WARM-UP • [ ] +10 (1 Way) [ ] +20 (2 Ways) **Ans:** _____

3 **Square Perimeter: A square has a perimeter of $(20x + 36)$ inches. What is the length of one side of the square?**

Way 1 (Paper Work):

GCF = _____

Factored: ____(_____ ± _____)

CORE • [ ] +10 (1 Way) [ ] +20 (2 Ways) **Ans:** _____

4 **Equilateral Triangle Side: An equilateral triangle has a perimeter of $(18y - 27)$ centimeters. What is the length of one side?**

Way 1 (Paper Work):

GCF = _____

Factored: ____(_____ ± _____)

CORE • [ ] +10 (1 Way) [ ] +20 (2 Ways) **Ans:** _____

5 **Factor $40x + 64$ completely using the GCF.**

Way 1 (Show Paper Steps):

Way 2 (2nd Method / Check):

CORE • [ ] +10 (1 Way) [ ] +20 (2 Ways) **Ans:** _____

6 **Club Uniform Kits: Every player on a team receives an identical kit of shirts and hats, and the team's total cost is $(36s + 54)$ dollars. Write the expression in factored form to find the greatest possible number of players and the cost of one kit.**

Way 1 (Show Paper Steps):

Way 2 (2nd Method / Check):

CORE • [ ] +10 (1 Way) [ ] +20 (2 Ways) **Ans:** _____

7 **Factor $12x + 18y + 30$ completely using the GCF.**

Way 1 (Show Paper Steps):

Way 2 (2nd Method / Check):

CORE • [ ] +10 (1 Way) [ ] +20 (2 Ways) **Ans:** _____

8 **Classroom Desk Rows: A classroom has $(35d - 14)$ square feet of desk space arranged in 7 equal rows. Write an expression for the desk space in each row.**

Way 1 (Show Paper Steps):

Way 2 (2nd Method / Check):

CORE • [ ] +10 (1 Way) [ ] +20 (2 Ways) **Ans:** _____

9 **Combine like terms in $10x + 18 + 14x + 18$, and then factor the result completely.**

Way 1 (Show Paper Steps):

Way 2 (2nd Method / Check):

CHALLENGE • [ ] +10 (1 Way) [ ] +20 (2 Ways) **Ans:** _____

10 **Factor $27x - 18$ completely, and check by evaluating both expressions when $x = 2$.**

Way 1 (Show Paper Steps):

Way 2 (2nd Method / Check):

CHALLENGE • [ ] +10 (1 Way) [ ] +20 (2 Ways) **Ans:** _____

SUMMATIVE QUIZ: 10 ITEMS × 10 PTS = 100

Unit 4 Mastery Quiz: Algebraic Expressions & Properties

Directions: Show all paper steps in each box (+6 pts work, +4 pts answer). Name: _____ Date: _____ Score: ____ / 100

ASSESSMENT BREAKDOWN: #1–#6 CORE FLUENCY (60 PTS) • #7–#9 REAL-LIFE APPLICATIONS (30 PTS) • #10 ERROR ANALYSIS (10 PTS)

Standards Assessed: CCSS 6.EE.A.2–4 • TEKS 6.7A–D • FL MA.6.AR.1.1–4 • MathCounts & UIL Algebraic Evaluation & Factoring

1 CORE FLUENCY (SEC 4.1) • 10 PTS

Evaluate $3x^2 - 4y$ when $x = 4$ and $y = 5$.

[ ] Work (+6) [ ] Ans (+4) **Ans:** _____

2 CORE FLUENCY (SEC 4.2) • 10 PTS

Write an algebraic expression for: '8 less than the product of 5 and n.'

[ ] Work (+6) [ ] Ans (+4) **Ans:** _____

3 CORE FLUENCY (SEC 4.3) • 10 PTS

Combine like terms to simplify: $7x + 9 + 4x - 3$.

[ ] Work (+6) [ ] Ans (+4) **Ans:** _____

4 CORE FLUENCY (SEC 4.4) • 10 PTS

Use the Distributive Property to expand: $6(3x + 4)$.

[ ] Work (+6) [ ] Ans (+4) **Ans:** _____

5 CORE FLUENCY (SEC 4.4) • 10 PTS

Simplify by expanding and combining like terms: $4(2x + 3) + 5x$.

[ ] Work (+6) [ ] Ans (+4) **Ans:** _____

6 CORE FLUENCY (SEC 4.4) • 10 PTS

Factor the expression completely using the GCF: $24x + 36$.

[ ] Work (+6) [ ] Ans (+4) **Ans:** _____

7 REAL LIFE (SEC 4.1) • 10 PTS

The surface area of a cube with edge length s is $6s^2$. Find the surface area when $s = 5$ cm.

[ ] Work (+6) [ ] Ans (+4) **Ans:** _____

8 REAL LIFE (SEC 4.2) • 10 PTS

Museum admission costs $12 plus $4 per planetarium show s. Write an expression and find the total cost for 3 shows.

[ ] Work (+6) [ ] Ans (+4) **Ans:** _____

9 REAL LIFE (SEC 4.4) • 10 PTS

A rectangular garden has width 5 meters and length $(2x + 7)$ meters. Write an expanded expression for its area.

[ ] Work (+6) [ ] Ans (+4) **Ans:** _____

10 ERROR ANALYSIS (SEC 4.4) • 10 PTS

Noah simplified $5(2x + 3)$ as $10x + 3$, and then combined $10x + 3 = 13x$. Identify both algebraic errors and write the true simplified expression.

[ ] Work (+6) [ ] Ans (+4) **Ans:** _____

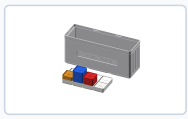
Unit 4: Algebraic Expressions & Properties — Practice A & B Complete Key

Big Ideas Math Grade 6 — Chapter 3 / Chapter 5 (Algebraic Expressions) • Concept → Blocks (When Applicable: Place Value & Prime Factor Blocks) → Calculator

1. Concept (Stack Approach): Algebraic expressions are recipes of operations waiting for an input value. Evaluating an expression means pushing the substituted value onto the stack and executing inner terms first.

2. Blocks (Place Value & Prime): Treat 1, x, and x^2 as distinct Place Value columns so unlike terms are never combined, and use Prime Factor blocks to factor out the GCF.

3. Calculator (SC-6): Substitute a test value (e.g., x = 5) into both original and simplified expressions on Y and X, then press |≠| (flashes NO when equivalent).



SEC 4.1 (pp.37-38): WRITING AND EVALUATING ALGEBRAIC EXPRESSIONS

Methods: W1: Substitute in Parentheses & Follow PEMDAS | W2: Equal-Groups Bar / Place Value Model

PRACTICE A (p.37): KEY IDEAS (#1-#10) — ExA: 27		PRACTICE B (p.38): REAL LIFE (#1-#10) — ExB: 99 points	
A1: 33 **((6 × 7) - 9)** Check: 6 [ENT] 7 [×] 9 [-]	**A2: 54** **((5 × 8) + 14)** Check: 5 [ENT] 8 [×] 14 [+]	**B1: 5g + 6; $26** **((5 × 4) + 6)** Check: 5 [ENT] 4 [×] 6 [+]	**B2: 50 - 4r; 14 tickets** **(50 - (4 × 9))** Check: 50 [ENT] 4 [ENT] 9 [×] [-]
A3: 13 **(40 - (3 × 9))** Check: 40 [ENT] 3 [ENT] 9 [×] [-]	**A4: 47** **(6^2 + 11)** Check: 6 [x^2] 11 [+]	**B3: $225** **(($5^2$ × 8) + 25)** Check: 5 [x^2] 8 [×] 25 [+]	**B4: 82 points** **((10 × 7) + (3 × 4))** Check: 10 [ENT] 7 [×] 3 [ENT] 4 [×] [+]
A5: 27 **((4^2 × 2) - 5)** Check: 4 [x^2] 2 [×] 5 [-]	**A6: 55** **((7 × 4) + (3 × 9))** Check: 7 [ENT] 4 [×] 3 [ENT] 9 [×] [+]	**B5: 144 feet** **(3^2 × 16)** Check: 3 [x^2] 16 [×]	**B6: 96 in²** **(4^2 × 6)** Check: 4 [x^2] 6 [×]
A7: 8 **((19 + 13) ÷ 4)** Check: 19 [ENT] 13 [+] 4 [÷]	**A8: 15.1** **((5 × 3.5) - 2.4)** Check: 5 [ENT] 3.5 [×] 2.4 [-]	**B7: 7p + 4d; $41** **((7 × 3) + (4 × 5))** Check: 7 [ENT] 3 [×] 4 [ENT] 5 [×] [+]	**B8: 78** **(A = 1/2((11 + 15) × 6))** Check: 11 [ENT] 15 [+] 6 [g][TRI]
A9: 8 + 4.50h; $26 **((4.50 × 4) + 8)** Check: 4.50 [ENT] 4 [×] 8 [+]	**A10: 150 cm²** **(5^2 × 6)** Check: 5 [x^2] 6 [×]	**B9: 111 minutes (1 hr 51 min)** **((12 × 8) + 15)** Check: 12 [ENT] 8 [×] 15 [+]	**B10: 128 - 75 = 53** **((4^3 × 2) - (5^2 × 3))** Check: 4 [x^3] 2 [×] 5 [x^2] 3 [×] [-]

SEC 4.2 (pp.39-40): SIMPLIFYING EXPRESSIONS BY COMBINING LIKE TERMS

Methods: W1: Reorder & Add Coefficients (Properties) | W2: Sort by Variable Power Columns

PRACTICE A (p.39): KEY IDEAS (#1-#10) — ExA: 6x + 8		PRACTICE B (p.40): REAL LIFE (#1-#10) — ExB: 5x² + 4x + 6	
A1: 9x + 13 **(7 + 2; 4 + 9)** Check: 7 [ENT] 2 [+]; 4 [ENT] 9 [+]	**A2: 5x + 7** **(8 - 3; 11 - 4)** Check: 8 [ENT] 3 [-]; 11 [ENT] 4 [-]	**B1: 9x + 9** **((3 + 1) + 5)** Check: 2 [ENT] 3 [+] 4 [+] 3 [ENT] 1 [+] 5 [+]	**B2: 8x + 12** **((4 + 2) × 2)** Check: 3 [ENT] 1 [+] 2 [×] 4 [ENT] 2 [+] 2 [×]
A3: 8y + 6 **(9 - 1)** Check: 9 [ENT] 1 [-]	**A4: 8a + 13** **(12 - 4; 5 + 8)** Check: 12 [ENT] 4 [-]; 5 [ENT] 8 [+]	**B3: 4x + 14** **(9 + 5)** Check: 6 [ENT] 2 [-] 9 [ENT] 5 [+]	**B4: 6x² + 4x + 11** **(3 + 8)** Check: 4 [ENT] 2 [+] 7 [ENT] 3 [-] 3 [ENT] 8 [+]
A5: 6x² + 8x + 7 **(4+2=6; 3+5=8)** Check: Mental / Table Check	**A6: 4n² + 5n + 10** **(6-2=4; 9-4=5)** Check: Mental / Table Check	**B5: 13c + 31** **(12 + 19)** Check: 8 [ENT] 5 [+] 12 [ENT] 19 [+]	**B6: 7x + 19 (coeff = 7, constant = 19)** **(14 + 5)** Check: 9 [ENT] 2 [-] 14 [ENT] 5 [+]
A7: 5.3x + 2.7 **(3.5 + 1.8; 4.2 - 1.5)** Check: 3.5 [ENT] 1.8 [+]; 4.2 [ENT] 1.5 [-]	**A8: 53 != 80; 5x + 3 is already in simplest form** Check: Mental / Table Check	**B7: (1/2)n + 13** **(4 + 9)** Check: [.] 3 [.] 8 [ENT] [.] 1 [.] 8 [+] 4 [ENT] 9 [+]	**B8: 4y + 3.5** **(5.8 - 2.3)** Check: 2.4 [ENT] 1.6 [+] 5.8 [ENT] 2.3 [-]
A9: 6x + 16; 76 meters **(2+2+1+1=6x; 3+3+5+5=16)** Check: Mental / Table Check	**A10: 9x + 8; 53 cm** **(3+2+4=9x; 2+7-1=8)** Check: Mental / Table Check	**B9: 6m + 9 (both equal 39 at m=5)** **(((10 - 4) × 5) + (15 - 6))** Check: 10 [ENT] 4 [-] 5 [×] 15 [ENT] 6 [-] [+]	**B10: 3x² + 7** **(10 - 3)** Check: 5 [ENT] 2 [-] 10 [ENT] 3 [-]

SEC 4.3 (pp.41-42): THE DISTRIBUTIVE PROPERTY

Methods: W1: Multiply Each Term Inside a(b + c) = ab + ac | W2: Split-Rectangle Area Model | W3: Repeated Addition of Rows

PRACTICE A (p.41): KEY IDEAS (#1-#10) — ExA: 84		PRACTICE B (p.42): REAL LIFE (#1-#10) — ExB: 14x + 15	
A1: 140 + 21 = 161 **((7 × 20) + (7 × 3))** Check: 7 [ENT] 20 [×] 7 [ENT] 3 [×] [+]	**A2: 4x + 20** **(4 × 5)** Check: 4 [ENT] 5 [×]	**B1: 8(50 + 3) = 400 + 24 = $424** **((8 × 50) + (8 × 3))** Check: 8 [ENT] 50 [×] 8 [ENT] 3 [×] [+]	**B2: 6(10 - 0.10) = $60.00 - $0.60 = $59.40** Check: 6 [ENT] 10 [×] 6 [ENT] 0.10 [×] [-]
A3: 18x + 24 **(6×3=18; 6×4=24)** Check: Mental / Table Check	**A4: 16y - 40** **(8×2=16; 8×5=40)** Check: Mental / Table Check	**B3: 7(x + 8) = 7x + 56** **(7 × 8)** Check: 7 [ENT] 8 [×]	**B4: 9(2x + 7) = 18x + 63** **(9 × 7)** Check: 9 [ENT] 2 [×] 9 [ENT] 7 [×]
A5: 387 **((9 × 40) + (9 × 3))** Check: 9 [ENT] 40 [×] 9 [ENT] 3 [×] [+]	**A6: 17x + 6** **(3×4+5=17; 3×2=6)** Check: Mental / Table Check	**B5: 4(t - 3) = 4t - 12 ($48 at t = $15)** **((4 × 15) - (4 × 3))** Check: 4 [ENT] 15 [×] 4 [ENT] 3 [×] [-]	**B6: 14x + 15** **(3 × 5)** Check: 3 [ENT] 4 [×] 2 [+] 3 [ENT] 5 [×]
A7: 12n + 13 **(4×3=12; 20-7=13)** Check: Mental / Table Check	**A8: 5x + 30 (She forgot to multiply 6 by 5)** **(5 × 6)** Check: 5 [ENT] 6 [×]	**B7: 13x + 22** **((4 × 3) + (5 × 2))** Check: 4 [ENT] 2 [×] 5 [+] 4 [ENT] 3 [×] 5 [ENT] 2 [×] [+]	**B8: 3x + 5** **(10 ÷ 2)** Check: 6 [ENT] 2 [÷] 10 [ENT] 2 [÷]
A9: 14x + 15 (Both equal 43 when x = 2) **(5×2+4=14; 5×3=15)** Check: Mental / Table Check	**A10: 6(x + 3.50) = 6x + 21; $60 total** **(6 × 3.50)** Check: 6 [ENT] 3.50 [×] → 6x+21	**B9: 2(2x + 5) + 2(x + 3) = 6x + 16** **((2 × 5) + (2 × 3))** Check: 2 [ENT] 2 [×] 2 [+] 2 [ENT] 5 [×] 2 [ENT] 3 [×] [+]	**B10: 12(15) = 180 and 120 + 60 = 180** **(12 × 15)** Check: 12 [ENT] 15 [×]

SEC 4.4 (pp.43-44): FACTORING EXPRESSIONS USING THE GCF

Methods: W1: Factor Out the GCF Using Prime Factors | W2: Equal-Rows Area Model / Division Ladder

PRACTICE A (p.43): KEY IDEAS (#1-#10) — ExA: 6(3x + 4)		PRACTICE B (p.44): REAL LIFE (#1-#10) — ExB: 15(3x - 2)	
A1: 4(3 + 5) **(GCF(12, 20))** Check: 12 [ENT] 20 [GCF] → 4	**A2: 4(2x + 3)** **(GCF(8, 12))** Check: 8 [ENT] 12 [GCF] → 4	**B1: 8(2x + 3) → 8 bags** **(GCF(16, 24))** Check: 16 [ENT] 24 [GCF]	**B2: 7(3x + 5) → length = 3x + 5 m** **(GCF(21, 35))** Check: 21 [ENT] 35 [GCF]
A3: 5(3y - 5) **(GCF(15, 25))** Check: 15 [ENT] 25 [GCF] → 5	**A4: 12(2x + 3)** **(GCF(24, 36))** Check: 24 [ENT] 36 [GCF] → 12	**B3: 4(5x + 9) → side = 5x + 9 in** **(GCF(20, 36))** Check: 20 [ENT] 36 [GCF]	**B4: 3(6y - 9) → side = 6y - 9 cm** **(GCF(18, 27))** Check: 18 [ENT] 27 [GCF]
A5: 16(2n - 3) **(GCF(32, 48))** Check: 32 [ENT] 48 [GCF] → 16	**A6: 14(3a + 1)** **(GCF(42, 14))** Check: 42 [ENT] 14 [GCF] → 14	**B5: 8(5x + 8)** **(GCF(40, 64))** Check: 40 [ENT] 64 [GCF]	**B6: 18(2s + 3) → 18 player kits** **(GCF(36, 54))** Check: 36 [ENT] 54 [GCF]
A7: 12(3m - 5) **(GCF(36, 60))** Check: 36 [ENT] 60 [GCF] → 12	**A8: 12(2x + 3) (4 and 6 still share a factor of 2)** **(GCF(4, 6))** Check: 4 [ENT] 6 [GCF] → 2 left!	**B7: 6(2x + 3y + 5)** **(GCF(GCF(12, 18), 30))** Check: 12 [ENT] 18 [GCF] 30 [GCF]	**B8: 7(5d - 2) → 5d - 2 per row** **(GCF(35, 14))** Check: 35 [ENT] 14 [GCF]
A9: Height = 14 in.; Width = (2x + 3) in. **(GCF(28, 42))** Check: 28 [ENT] 42 [GCF] → 14	**A10: (9x + 12) feet** **(36 ÷ 4; 48 ÷ 4)** Check: 36 [ENT] 4 [÷]; 48 [ENT] 4 [÷]	**B9: 24x + 36 = 12(2x + 3)** **(GCF((10 + 14), (18 + 18)))** Check: 10 [ENT] 14 [+] 18 [ENT] 18 [+] [GCF]	**B10: 9(3x - 2); at x=2 both equal 36** **(GCF(27, 18))** Check: 27 [ENT] 18 [GCF]

UNIT 04 MASTERY QUIZ KEY (p.115 • TEKS 6.7A-D): Q1: 28 Q2: 5n - 8 Q3: 11x + 6 Q4: 18x + 24 Q5: 13x + 12

Quiz Q6-Q10 Answers: Q6: 12(2x + 3) Q7: 150 cm² Q8: 12 + 4s; $24 Q9: 10x + 35 Q10: 5·3=15; keep 10x + 15