Adding and Subtracting Linear Expressions

Explore ideas and representations

Name _____ **Date** _____ **Score** _____ / 10

QUICK REVIEW

Add or subtract matching variable coefficients and constants. A minus before parentheses changes every sign inside:
$(5x + 2) - (2x - 3) = 5x + 2 - 2x + 3 = 3x + 5$.

Worked example

Example: simplify $(7x + 9) + (4x - 3)$.

1. Remove the second parentheses with sign 1: $7x + 9 + (4)x + (-3)$.
2. Variable coefficient: $7 + (4) = 11$.
3. Constant: $9 + (-3) = 6$; result $11x + 6$.
Answer: $11x + 6$.

Practice Problems

Show your thinking.

1. Algebra tiles: simplify $(2x + 3) + (3x + 5)$.

2. Substitution table: rewrite $(3x - 2) - (2x + 5)$, then evaluate the rewritten expression at $x = 2$.

3. Missing constant: $(4x + 5) + (-x + 3) = 3x + k$. Find k, then write the simplified expression.

4. Identity test: decide whether $(5x + 2) - (3x - 2)$ and $2x + 4$ are equivalent for every x. Give algebra and a numerical check.

5. Check a claim: a student claims $(2x + 7) + (5x + 3) = 7x + 11$. Correct the constant term and verify at $x = 2$.

6. Workshop cost: a cost in dollars is modeled by $(3x + 4) - (4x - 1)$. Rewrite it to expose its coefficient and fixed amount, then find the cost at $x = 2$.

7. Locker-code rule: simplify $(7x - 5) + (-3x + 9)$.

8. Token-count rule: rewrite $(-4x + 6) - (9x - 2)$, then evaluate the rewritten expression at $x = 2$.

9. Tile-pack rule: $(5x - 8) + (-2x + 3) = 3x + k$. Find k, then write the simplified expression.

10. Meter-offset rule: decide whether $(8x + 1) - (-5x - 7)$ and $13x + 8$ are equivalent for every x. Give algebra and a numerical check.

Answer Key

1. $5x + 8$.
2. $x - 7$; value -5.
3. $k = 8$; $3x + 8$.
4. Yes; they are equivalent.
5. Correct form $7x + 10$; correct value 24, not 25.
6. $-x + 5$; cost \$3.00.
7. $4x + 4$.
8. $-13x + 8$; value -18.
9. $k = -5$; $3x - 5$.
10. Yes; they are equivalent.

Step-by-Step Solutions

Follow each calculation, then check your own work.

Problem 1

1. Remove the second parentheses with sign 1: $2x + 3 + (3)x + (5)$.
2. Variable coefficient: $2 + (3) = 5$.
3. Constant: $3 + (5) = 8$; result $5x + 8$.

Problem 2

1. Remove the second parentheses with sign -1: $3x - 2 + (-2)x + (-5)$.
2. Variable coefficient: $3 + (-2) = 1$.
3. Constant: $-2 + (-5) = -7$; result $x - 7$.
4. At $x = 2$: $1(2) + (-7) = -5$.

Problem 3

1. Remove the second parentheses with sign 1: $4x + 5 + (-1)x + (3)$.
2. Variable coefficient: $4 + (-1) = 3$.
3. Constant: $5 + (3) = 8$; result $3x + 8$.
4. The variable terms match, so the missing constant is $k = 8$.

Problem 4

1. Remove the second parentheses with sign -1: $5x + 2 + (-3)x + (2)$.
2. Variable coefficient: $5 + (-3) = 2$.
3. Constant: $2 + (2) = 4$; result $2x + 4$.
4. Numerical check at $x = 2$: both equal $2(2) + (4) = 8$.

Problem 5

1. Remove the second parentheses with sign 1: $2x + 7 + (5)x + (3)$.
2. Variable coefficient: $2 + (5) = 7$.
3. Constant: $7 + (3) = 10$; result $7x + 10$.
4. At $x = 2$, the correct value is $7(2) + (10) = 24$; the claim gives 25.

Problem 6

1. Remove the second parentheses with sign -1: $3x + 4 + (-4)x + (1)$.
2. Variable coefficient: $3 + (-4) = -1$.
3. Constant: $4 + (1) = 5$; result $-x + 5$.
4. The cost at $x = 2$ is $-1(2) + (5) = 3$ dollars.

Problem 7

1. Remove the second parentheses with sign 1: $7x - 5 + (-3)x + (9)$.
2. Variable coefficient: $7 + (-3) = 4$.
3. Constant: $-5 + (9) = 4$; result $4x + 4$.

Problem 8

1. Remove the second parentheses with sign -1: $-4x + 6 + (-9)x + (2)$.
2. Variable coefficient: $-4 + (-9) = -13$.
3. Constant: $6 + (2) = 8$; result $-13x + 8$.
4. At $x = 2$: $-13(2) + (8) = -18$.

Problem 9

1. Remove the second parentheses with sign 1: $5x - 8 + (-2)x + (3)$.
2. Variable coefficient: $5 + (-2) = 3$.
3. Constant: $-8 + (3) = -5$; result $3x - 5$.
4. The variable terms match, so the missing constant is $k = -5$.

Problem 10

1. Remove the second parentheses with sign -1: $8x + 1 + (5)x + (7)$.
2. Variable coefficient: $8 + (5) = 13$.
3. Constant: $1 + (7) = 8$; result $13x + 8$.
4. Numerical check at $x = 2$: both equal $13(2) + (8) = 34$.

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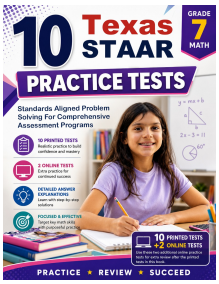

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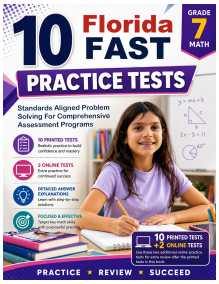

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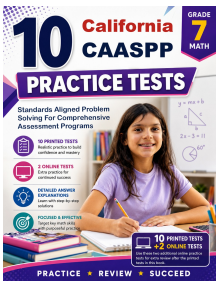

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