Writing and Evaluating Expressions

Spot mistakes, reason, and work backward

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

QUICK REVIEW

An expression names a calculation but has no equals sign to solve. Substitute values and follow parentheses, multiplication, then addition. "Three times a number, then add 4" is $3x + 4$. At $x = -2$, $3(-2) + 4 = -6 + 4 = -2$.

Worked example

Example: write an expression for 3 times a number plus (4). Evaluate it at $x = -2$.

1. Substitute $x = -2$: $3(-2) + (4)$.
2. Multiply first: $3(-2) = -6$.
3. Add the constant: $-6 + (4) = -2$.
Answer: $3x + 4$; value -2.

Practice Problems

Show your thinking.

1. Number machine: a student evaluates $5x + 2$ at $x = -2$ as $5(-2 + (2))$. Correct the grouping and find the value.

2. Packing rule: a student evaluates $2x - 7$ at $x = 4$ as $2(4 + (-7))$. Correct the grouping and find the value.

3. A rule $4x + 7$ gives output 23. Recover x by undoing the operations.

4. A student says $2(x + 3) = 2x + 3$. Use $x = 3$ to disprove it.

5. Which words match $2x - (5)$: subtract 5 from twice x, or double the difference $x - (5)$? Verify at $x = -3$.

6. A student says output 14 for $y = -2x + 8$ means $x = 3$. Use substitution to repair the sign.

7. Locker-code rule: a student evaluates $5x - 8$ at $x = -2$ as $5(-2 + (-8))$. Correct the grouping and find the value.

8. Token-count rule: write an expression for -3 times a number plus (14). Evaluate it at $x = 3$.

9. Tile-pack rule: the rule is $4x - 7$ units for x batches. Find the output for 5 batches and the change if one batch is added.

10. Meter-offset rule: a student evaluates $7x + 2$ at $x = -1$ as $7(-1 + (2))$. Correct the grouping and find the value.

Answer Key

1. $5x + 2$; value -8.
2. $2x - 7$; value 1.
3. $x = 4$.
4. A: 12; B: 9; B is 3 less.
5. $2x - 5$; value -11.
6. $x = -3$.
7. $5x - 8$; value -18.
8. $-3x + 14$; value 5.
9. $4x - 7$; value 13. One more batch adds 4 units.
10. $7x + 2$; value -5.

Step-by-Step Solutions

Follow each calculation, then check your own work.

Problem 1

1. Substitute $x = -2$: $5(-2) + (2)$.
2. Multiply first: $5(-2) = -10$.
3. Add the constant: $-10 + (2) = -8$.

Problem 2

1. Substitute $x = 4$: $2(4) + (-7)$.
2. Multiply first: $2(4) = 8$.
3. Add the constant: $8 + (-7) = 1$.

Problem 3

1. Set the rule equal to its given output: $4x + 7 = 23$.
2. Subtract 7 from both sides: $4x = 16$. Divide by 4: $x = 4$.
3. Check by substitution: $4(4) + 7 = 23$.

Problem 4

1. $2(3 + 3) = 2(6) = 12$.
2. $2(3) + 3 = 9$.
3. Difference $12 - 9 = 3$; the expressions are not equivalent.

Problem 5

1. Twice x is $2x$; removing 5 gives $2x - 5$.
2. At $x = -3$, $2(-3) = -6$.
3. Then $-6 - 5 = -11$. Doubling the entire difference would instead give -16.

Problem 6

1. Test the proposed input: $-2(3) + 8 = 2$, not 14.
2. Subtract the constant: $-2x = 14 - 8 = 6$.
3. Divide by -2: $x = 6/(-2) = -3$.
4. Check: $-2(-3) + 8 = 14$.

Problem 7

1. Substitute $x = -2$: $5(-2) + (-8)$.
2. Multiply first: $5(-2) = -10$.
3. Add the constant: $-10 + (-8) = -18$.

Problem 8

1. Substitute $x = 3$: $-3(3) + (14)$.
2. Multiply first: $-3(3) = -9$.
3. Add the constant: $-9 + (14) = 5$.

Problem 9

1. Substitute $x = 5$: $4(5) + (-7)$.
2. Multiply first: $4(5) = 20$.
3. Add the constant: $20 + (-7) = 13$. At $x = 6$ the output is 17, a change of 4.

Problem 10

1. Substitute $x = -1$: $7(-1) + (2)$.
2. Multiply first: $7(-1) = -7$.
3. Add the constant: $-7 + (2) = -5$.

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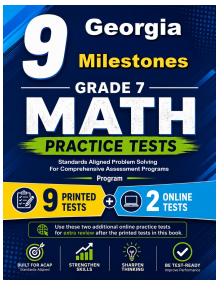

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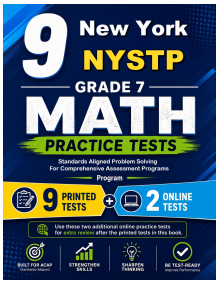

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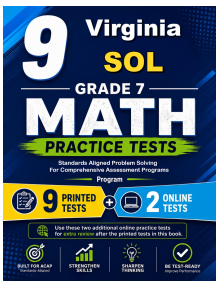

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