Writing and Evaluating Expressions

Apply the skill to decisions and designs

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: x is a signed batch adjustment (a negative number means removing batches). The rule $6x + 2$ gives a signed change in units. Find the output at $x = -2$ and how it changes when x increases by 1.

2. Packing rule: x is a signed batch adjustment (a negative number means removing batches). The rule $2x - 8$ gives a signed change in units. Find the output at $x = 4$ and how it changes when x increases by 1.

3. A game charges 7 tokens to start and 5 each round. Build a cost rule, then find costs for $0, 2, 4$ rounds.

4. Plan A costs $2(x + 3)$ dollars and plan B costs $2x + 3$ dollars. At $x = 4$, which costs less and by how much?

5. A balance model doubles a signed deposit x, then removes 6 dollars. Write the rule and find the output for $x = -3$.

6. A signed-balance rule is $y = -2x + 9$. A target is 15. Design the input x and check the target.

7. Locker-code rule: x is a signed batch adjustment (a negative number means removing batches). The rule $5x - 8$ gives a signed change in units. Find the output at $x = -2$ and how it changes when x increases by 1.

8. Token-count rule: a student evaluates $-3x + 14$ at $x = 3$ as $-3(3 + (14))$. Correct the grouping and find the value.

9. Tile-pack rule: write an expression for 4 times a number plus (-7). Evaluate it at $x = 5$.

10. Meter-offset rule: x is a signed batch adjustment (a negative number means removing batches). The rule $7x + 2$ gives a signed change in units. Find the output at $x = -1$ and how it changes when x increases by 1.

Answer Key

1. $6x + 2$; value -10. Increasing x by 1 changes the output by 6 units.
2. $2x - 8$; value 0. Increasing x by 1 changes the output by 2 units.
3. Rule $5x + 7$; outputs $7, 17, 27$.
4. A: 14; B: 11; B is 3 less.
5. $2x - 6$; value -12.
6. $x = -3$.
7. $5x - 8$; value -18. Increasing x by 1 changes the output by 5 units.
8. $-3x + 14$; value 5.
9. $4x - 7$; value 13.
10. $7x + 2$; value -5. Increasing x by 1 changes the output by 7 units.

Step-by-Step Solutions

Follow each calculation, then check your own work.

Problem 1

1. Substitute $x = -2$: $6(-2) + (2)$.
2. Multiply first: $6(-2) = -12$.
3. Add the constant: $-12 + (2) = -10$. At $x = -1$ the output is -4, a change of 6.

Problem 2

1. Substitute $x = 4$: $2(4) + (-8)$.
2. Multiply first: $2(4) = 8$.
3. Add the constant: $8 + (-8) = 0$. At $x = 5$ the output is 2, a change of 2.

Problem 3

1. At $x = 0$, $5(0) + 7 = 7$.
2. At $x = 2$, $5(2) + 7 = 17$.
3. At $x = 4$, $5(4) + 7 = 27$; reverse: $(27 - 7)/5 = 4$.

Problem 4

1. $2(4 + 3) = 2(7) = 14$.
2. $2(4) + 3 = 11$.
3. Difference $14 - 11 = 3$; the expressions are not equivalent.

Problem 5

1. Twice x is $2x$; removing 6 gives $2x - 6$.
2. At $x = -3$, $2(-3) = -6$.
3. Then $-6 - 6 = -12$. Doubling the entire difference would instead give -18.

Problem 6

1. Subtract the constant: $-2x = 15 - 9 = 6$.
2. Divide by -2: $x = 6/(-2) = -3$.
3. Check: $-2(-3) + 9 = 15$.

Problem 7

1. Substitute $x = -2$: $5(-2) + (-8)$.
2. Multiply first: $5(-2) = -10$.
3. Add the constant: $-10 + (-8) = -18$. At $x = -1$ the output is -13, a change of 5.

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: $20 + (-7) = 13$.

Problem 10

1. Substitute $x = -1$: $7(-1) + (2)$.
2. Multiply first: $7(-1) = -7$.
3. Add the constant: $-7 + (2) = -5$. At $x = 0$ the output is 2, a change of 7.

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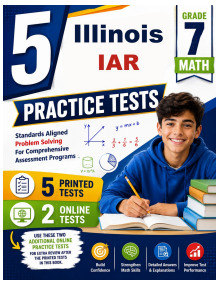

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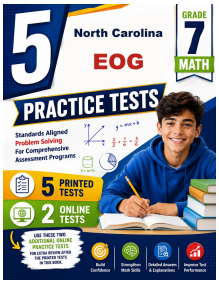

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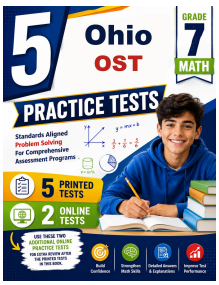

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