Factoring Expressions

Spot mistakes, reason, and work backward

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

QUICK REVIEW

Factoring reverses distribution. Take the greatest common positive integer factor from every term. $12x + 18 = 6(2x + 3)$ because $12/6 = 2$ and $18/6 = 3$. Check by multiplying back.

Worked example

Example: factor out the greatest common integer factor from $28x - 21$.

1. The greatest common positive integer factor is 7 because $\gcd(28, 21) = 7$.
2. Divide each term: $28x/7 = 4x$ and $-21/7 = -3$.
3. Factored form: $7(4x - 3)$; distributing gives $28x - 21$.
Answer: $7(4x - 3)$.

Practice Problems

Show your thinking.

1. Sign repair: a student claims $6x + 10 = 6x + 11$. Correct the constant term and verify at $x = 2$.

2. Recover coefficients: an equivalent form of $6x + 15$ has coefficient q on x and constant r. Find (q, r) and then factor it.

3. Calculator audit: a calculator reports 16 for $12x - 8$ when $x = 2$. Verify by rewriting first; report any error.

4. Rebuild the form: $10x + 15 = 10x + k$. Find k, then write a factored form.

5. Explain equivalence: decide whether $6x + 24$ and $6(x + 4)$ are equivalent for every x. Give algebra and a numerical check.

6. Evaluation: rewrite $21x + 14$, then evaluate the rewritten expression at $x = 2$.

7. Locker-code rule: a student claims $10x - 6 = 10x - 5$. Correct the constant term and verify at $x = 2$.

8. Token-count rule: an equivalent form of $12x + 15$ has coefficient q on x and constant r. Find (q, r) and then factor it.

9. Tile-pack rule: a calculator reports 60 for $28x + 4$ when $x = 2$. Verify by rewriting first; report any error.

10. Meter-offset rule: $15x - 10 = 15x + k$. Find k, then write a factored form.

Answer Key

1. Correct form $2(3x + 5)$; correct value 22, not 23.
2. $(q, r) = (6, 15)$; $3(2x + 5)$.
3. No error; $4(3x - 2)$ evaluates to 16.
4. $k = 15$; $5(2x + 3)$.
5. Yes; they are equivalent.
6. $7(3x + 2)$; value 56.
7. Correct form $2(5x - 3)$; correct value 14, not 15.
8. $(q, r) = (12, 15)$; $3(4x + 5)$.
9. No error; $4(7x + 1)$ evaluates to 60.
10. $k = -10$; $5(3x - 2)$.

Step-by-Step Solutions

Follow each calculation, then check your own work.

Problem 1

1. The greatest common positive integer factor is 2 because $\gcd(6, 10) = 2$.
2. Divide each term: $6x/2 = 3x$ and $10/2 = 5$.
3. Factored form: $2(3x + 5)$; distributing gives $6x + 10$.
4. At $x = 2$, the correct value is $6(2) + (10) = 22$; the claim gives 23.

Problem 2

1. The greatest common positive integer factor is 3 because $\gcd(6, 15) = 3$.
2. Divide each term: $6x/3 = 2x$ and $15/3 = 5$.
3. Factored form: $3(2x + 5)$; distributing gives $6x + 15$.

Problem 3

1. The greatest common positive integer factor is 4 because $\gcd(12, 8) = 4$.
2. Divide each term: $12x/4 = 3x$ and $-8/4 = -2$.
3. Factored form: $4(3x - 2)$; distributing gives $12x - 8$.
4. Check the factored form: $4(3(2) + (-2)) = 4(4) = 16$.

Problem 4

1. The greatest common positive integer factor is 5 because $\gcd(10, 15) = 5$.
2. Divide each term: $10x/5 = 2x$ and $15/5 = 3$.
3. Factored form: $5(2x + 3)$; distributing gives $10x + 15$.
4. The variable terms match, so the missing constant is $k = 15$.

Problem 5

1. The greatest common positive integer factor is 6 because $\gcd(6, 24) = 6$.
2. Divide each term: $6x/6 = 1x$ and $24/6 = 4$.
3. Factored form: $6(x + 4)$; distributing gives $6x + 24$.
4. Numerical check at $x = 2$: both equal $6(2) + (24) = 36$.

Problem 6

1. The greatest common positive integer factor is 7 because $\gcd(21, 14) = 7$.
2. Divide each term: $21x/7 = 3x$ and $14/7 = 2$.
3. Factored form: $7(3x + 2)$; distributing gives $21x + 14$.
4. In the factored form at $x = 2$: $7(3(2) + (2)) = 7(8) = 56$.

Problem 7

1. The greatest common positive integer factor is 2 because $\gcd(10, 6) = 2$.
2. Divide each term: $10x/2 = 5x$ and $-6/2 = -3$.
3. Factored form: $2(5x - 3)$; distributing gives $10x - 6$.
4. At $x = 2$, the correct value is $10(2) + (-6) = 14$; the claim gives 15.

Problem 8

1. The greatest common positive integer factor is 3 because $\gcd(12, 15) = 3$.
2. Divide each term: $12x/3 = 4x$ and $15/3 = 5$.
3. Factored form: $3(4x + 5)$; distributing gives $12x + 15$.

Problem 9

1. The greatest common positive integer factor is 4 because $\gcd(28, 4) = 4$.
2. Divide each term: $28x/4 = 7x$ and $4/4 = 1$.
3. Factored form: $4(7x + 1)$; distributing gives $28x + 4$.
4. Check the factored form: $4(7(2) + (1)) = 4(15) = 60$.

Problem 10

1. The greatest common positive integer factor is 5 because $\gcd(15, 10) = 5$.
2. Divide each term: $15x/5 = 3x$ and $-10/5 = -2$.
3. Factored form: $5(3x - 2)$; distributing gives $15x - 10$.
4. The variable terms match, so the missing constant is $k = -10$.

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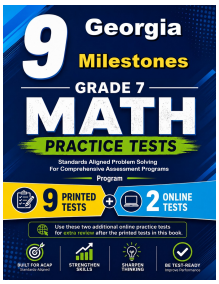

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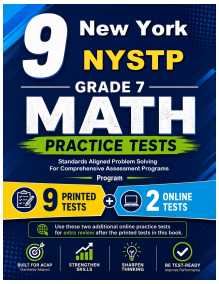

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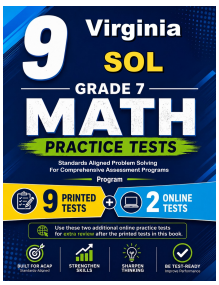

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