Factoring Expressions

Apply the skill to decisions and designs

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. Material order: a total cost is $6x + 10$ dollars. Factor out the greatest number of identical groups. Give the cost rule for one group, then use the groups to find the total at $x = 2$.

2. Two design formulas: decide whether $6x + 15$ and $3(2x + 5)$ are equivalent for every x. Give algebra and a numerical check.

3. Packing total: rewrite $12x - 8$, then evaluate the rewritten expression at $x = 2$.

4. Cost components: an equivalent form of $10x + 15$ has coefficient q on x and constant r. Find (q, r) and then factor it.

5. Invoice check: a calculator reports 36 for $6x + 24$ when $x = 2$. Verify by rewriting first; report any error.

6. Unknown adjustment: $21x + 14 = 21x + k$. Find k, then write a factored form.

7. Locker-code rule: a total cost is $10x - 6$ dollars. Factor out the greatest number of identical groups. Give the cost rule for one group, then use the groups to find the total at $x = 2$.

8. Token-count rule: decide whether $12x + 15$ and $3(4x + 5)$ are equivalent for every x. Give algebra and a numerical check.

9. Tile-pack rule: rewrite $28x + 4$, then evaluate the rewritten expression at $x = 2$.

10. Meter-offset rule: an equivalent form of $15x - 10$ has coefficient q on x and constant r. Find (q, r) and then factor it.

Answer Key

1. 2 groups, each $3x + 5$ dollars; total \$22.00 at $x = 2$.
2. Yes; they are equivalent.
3. $4(3x - 2)$; value 16.
4. $(q, r) = (10, 15)$; $5(2x + 3)$.
5. No error; $6(x + 4)$ evaluates to 36.
6. $k = 14$; $7(3x + 2)$.
7. 2 groups, each $5x - 3$ dollars; total \$14.00 at $x = 2$.
8. Yes; they are equivalent.
9. $4(7x + 1)$; value 60.
10. $(q, r) = (15, -10)$; $5(3x - 2)$.

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. Each group costs $3(2) + (5) = 11$ dollars. All 2 groups cost $2(11) = 22$ dollars.

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 $6x + 15$.
4. Numerical check at $x = 2$: both equal $6(2) + (15) = 27$.

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. In the factored form at $x = 2$: $4(3(2) + (-2)) = 4(4) = 16$.

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 $10x + 15$.

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. Check the factored form: $6(1(2) + (4)) = 6(6) = 36$.

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. The variable terms match, so the missing constant is $k = 14$.

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. Each group costs $5(2) + (-3) = 7$ dollars. All 2 groups cost $2(7) = 14$ dollars.

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 $12x + 15$.
4. Numerical check at $x = 2$: both equal $12(2) + (15) = 39$.

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. In the factored form at $x = 2$: $4(7(2) + (1)) = 4(15) = 60$.

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 $15x - 10$.

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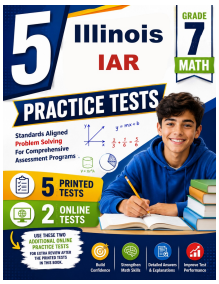

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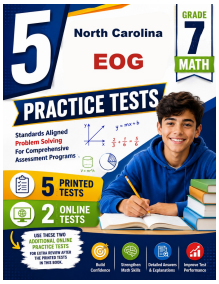

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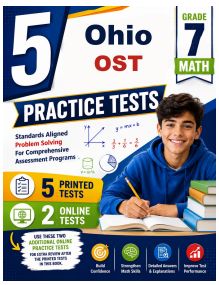

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