Factoring Expressions

Explore ideas and representations

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. Algebra tiles: factor out the greatest common integer factor from $6x + 10$.

2. Substitution table: rewrite $6x + 15$, then evaluate the rewritten expression at $x = 2$.

3. Missing constant: $12x - 8 = 12x + k$. Find k, then write a factored form.

4. Identity test: decide whether $10x + 15$ and $5(2x + 3)$ are equivalent for every x. Give algebra and a numerical check.

5. Check a claim: a student claims $6x + 24 = 6x + 25$. Correct the constant term and verify at $x = 2$.

6. Workshop cost: a total cost is $21x + 14$ 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 $x = 2$.

7. Locker-code rule: factor out the greatest common integer factor from $10x - 6$.

8. Token-count rule: rewrite $12x + 15$, then evaluate the rewritten expression at $x = 2$.

9. Tile-pack rule: $28x + 4 = 28x + k$. Find k, then write a factored form.

10. Meter-offset rule: decide whether $15x - 10$ and $5(3x - 2)$ are equivalent for every x. Give algebra and a numerical check.

Answer Key

1. $2(3x + 5)$.
2. $3(2x + 5)$; value 27.
3. $k = -8$; $4(3x - 2)$.
4. Yes; they are equivalent.
5. Correct form $6(x + 4)$; correct value 36, not 37.
6. 7 groups, each $3x + 2$ dollars; total \$56.00 at $x = 2$.
7. $2(5x - 3)$.
8. $3(4x + 5)$; value 39.
9. $k = 4$; $4(7x + 1)$.
10. Yes; they are equivalent.

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 $6x + 10$.

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. In the factored form at $x = 2$: $3(2(2) + (5)) = 3(9) = 27$.

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. The variable terms match, so the missing constant is $k = -8$.

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. Numerical check at $x = 2$: both equal $10(2) + (15) = 35$.

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. At $x = 2$, the correct value is $6(2) + (24) = 36$; the claim gives 37.

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. Each group costs $3(2) + (2) = 8$ dollars. All 7 groups cost $7(8) = 56$ dollars.

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 $10x - 6$.

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. In the factored form at $x = 2$: $3(4(2) + (5)) = 3(13) = 39$.

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. The variable terms match, so the missing constant is $k = 4$.

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. Numerical check at $x = 2$: both equal $15(2) + (-10) = 20$.

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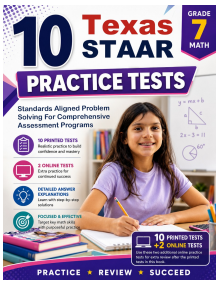

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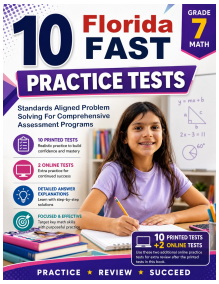

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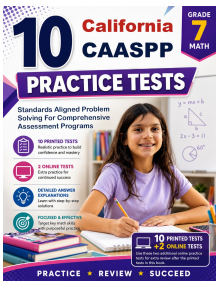

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