Factoring Polynomials Practice

Use this key to check answers and read the explanations.

1. For $18x^5$ and $30x^3$, what is the greatest common monomial factor over the integers, written with a positive coefficient?

A. $6x^3$
B. $6x^5$
C. $3x^3$
D. $12x^3$

Correct answer: A. $6x^3$
The greatest common factor of 18 and 30 is 6. Both terms contain x^3, which is the smaller power of x.

2. What polynomial remains after factoring $4y^2$ out of $12y^4 - 20y^3 + 8y^2$?

A. $3y - 5 + 2y^2$
B. $3y^2 - 5y + 8$
C. $3y^2 - 5y + 2$
D. $3y^4 - 5y^3 + 2y^2$

Correct answer: C. $3y^2 - 5y + 2$
Divide each term by $4y^2$ to get $3y^2$, $-5y$, and 2. Multiplying those terms by $4y^2$ recovers the original polynomial.

3. Which product equals $49x^2 - 121$?

A. $(7x - 11)^2$
B. $(7x - 11)(7x + 11)$
C. $(7x + 11)^2$
D. $(49x - 11)(x + 11)$

Correct answer: B. $(7x - 11)(7x + 11)$
The two squares are $(7x)^2$ and 11^2. Multiplying their difference and sum cancels the middle terms and gives $49x^2 - 121$.

4. Which product equals $x^2 - 13x + 36$?

A. $(x - 3)(x - 12)$
B. $(x + 4)(x + 9)$
C. $(x - 6)^2$
D. $(x - 4)(x - 9)$

Correct answer: D. $(x - 4)(x - 9)$
The constants -4 and -9 multiply to 36 and add to -13. Their sum gives the coefficient of x when the factors are expanded.

5. Which product equals $x^2 - 5x - 24$?

A. $(x + 8)(x - 3)$
B. $(x - 8)(x + 3)$
C. $(x - 6)(x + 4)$
D. $(x - 8)(x - 3)$

Correct answer: B. $(x - 8)(x + 3)$
The constants must have opposite signs because their product is negative. The pair -8 and 3 gives product -24 and sum -5.

6. Which product equals $16x^2 - 56x + 49$?

A. $(4x - 7)^2$
B. $(4x + 7)^2$
C. $(4x - 7)(4x + 7)$
D. $(8x - 7)^2$

Correct answer: A. $(4x - 7)^2$
The outer terms are $(4x)^2$ and 7^2. The middle term is twice $4x$ times -7, which is $-56x$, so the trinomial is $(4x - 7)^2$.

7. Which factored form matches $6x^3 - 9x^2 + 4x - 6$?

A. $(2x^2 + 3)(3x - 2)$
B. $(3x^2 + 2)(2x + 3)$
C. $(3x^2 - 2)(2x - 3)$
D. $(3x^2 + 2)(2x - 3)$

Correct answer: D. $(3x^2 + 2)(2x - 3)$
The first two terms give $3x^2(2x - 3)$. The last two give $2(2x - 3)$. Taking out their shared binomial gives the product.

8. Which product equals $6x^2 + x - 12$?

A. $(6x - 4)(x + 3)$
B. $(3x + 4)(2x - 3)$
C. $(3x - 4)(2x + 3)$
D. $(3x - 3)(2x + 4)$

Correct answer: C. $(3x - 4)(2x + 3)$
Split x into $9x - 8x$. The groups factor as $3x(2x + 3) - 4(2x + 3)$, giving $(3x - 4)(2x + 3)$.

9. A learner proposes $(4x - 3)(2x + 5)$ as a factorization of $8x^2 + 16x - 15$. What does expanding the proposed product show?

A. Its middle term is 14x, so the proposal is incorrect.
B. Its middle term is 16x, so every term matches.
C. Its leading term is $6x^2$, so the proposal is incorrect.
D. Its constant term is +15, so the proposal is incorrect.

Correct answer: A. Its middle term is 14x, so the proposal is incorrect.
The cross products are 20x and −6x. Adding them gives 14x, while the leading and constant terms match the original expression.

10. For $x > 0$, a rectangle has area $6x^2 + 19x + 10$ square units. One side is $3x + 2$ units. Which expression gives the length of the other side?

A. $2x - 5$
B. $2x + 2$
C. $3x + 5$
D. $2x + 5$

Correct answer: D. $2x + 5$
The area factors as $(3x + 2)(2x + 5)$. The second factor gives the missing side because the area is the product of the two side lengths.

11. Which gives the complete factorization of $18x^3 - 50x$ over the integers?

A. $2x(3x - 5)^2$
B. $2x(9x^2 - 25)$
C. $2x(3x - 5)(3x + 5)$
D. $x(3x - 5)(3x + 5)$

Correct answer: C. $2x(3x - 5)(3x + 5)$
Taking out 2x leaves $9x^2 - 25$. This difference of squares splits into $3x - 5$ and $3x + 5$, so the factoring continues after removing the common factor.

12. Which rewrite of $10x^3 - 15x^2 - 4x + 6$ preserves the expression and exposes the same binomial in both groups?

A. $5x^2(2x - 3) + 2(2x - 3)$
B. $5x^2(2x - 3) - 2(2x - 3)$
C. $5x^2(2x - 3) - 2(2x + 3)$
D. $5x^2(2x + 3) - 2(2x - 3)$

Correct answer: B. $5x^2(2x - 3) - 2(2x - 3)$
Taking $5x^2$ from the first two terms leaves $2x - 3$. Taking -2 from $-4x + 6$ leaves the same binomial because -2 times -3 gives $+6$.

13. Which gives the complete factorization of $81x^4 - 16$ over the integers?

A. $(3x - 2)^2(9x^2 + 4)$
B. $(9x^2 - 4)(9x^2 + 4)$
C. $(3x - 2)(3x + 2)(9x^2 - 4)$
D. $(3x - 2)(3x + 2)(9x^2 + 4)$

Correct answer: D. $(3x - 2)(3x + 2)(9x^2 + 4)$
The first split gives $(9x^2 - 4)(9x^2 + 4)$. The difference splits again into $3x - 2$ and $3x + 2$. The sum $9x^2 + 4$ is positive for every real x, so it has no integer-coefficient linear factor.

14. For each integer $n \geq 1$, a school plans $15n^2 - 8n + 1$ seats. Every row has the same number of seats, and there must be more rows than seats per row. Which pair gives a matching layout?

A. $5n - 1$ rows and $3n - 1$ seats per row
B. $3n - 1$ rows and $5n - 1$ seats per row
C. $5n + 1$ rows and $3n + 1$ seats per row
D. $15n - 1$ rows and $n - 1$ seats per row

Correct answer: A. $5n - 1$ rows and $3n - 1$ seats per row
The total factors as $(5n - 1)(3n - 1)$. The factor $5n - 1$ exceeds $3n - 1$ by $2n$, so it must represent the rows in this layout.

15. Which gives the complete factorization of $30x^4 + 22x^3 - 24x^2$ over the integers?

A. $2x^2(5x + 3)(3x - 4)$
B. $2x^2(15x^2 + 11x - 12)$
C. $2x^2(5x - 3)(3x + 4)$
D. $x^2(5x - 3)(3x + 4)$

Correct answer: C. $2x^2(5x - 3)(3x + 4)$
Removing $2x^2$ leaves $15x^2 + 11x - 12$. Split $11x$ into $20x - 9x$, then group to get $(5x - 3)(3x + 4)$. Each binomial is linear, and its coefficients have greatest common factor 1.