

Factoring Polynomials

Key Points:

- The greatest common factor, or GCF, can be factored out of a polynomial. Checking for a GCF should be the first step in any factoring problem.
 - **The Greatest Common Factor (GCF) of two numbers is the largest number that divides evenly into that number**
 - **For Example: 4 is the GCF of 16 and 20, because it is the largest number that can divide both 16 and 20**
 - **The Greatest Common Factor (GCF) of polynomials is the largest polynomial that divides evenly into the polynomials.**
 - **For Example: GCF of $4x + 20x^2y$ is $4x$**
- Trinomials with leading coefficient 1 can be factored by finding numbers that have a product of the third term and a sum of the second term.

A trinomial of the form $x^2 + bx + c$ can be written in factored form as $(x + p)(x + q)$ where $pq = c$ and $p + q = b$.

- Trinomials can be factored using a process called factoring by grouping.

Given a trinomial in the form $ax^2 + bx + c$, factor by grouping.

1. List factors of ac .
2. Find p and q , a pair of factors of ac with a sum of b .
3. Rewrite the original expression as $ax^2 + px + qx + c$.
4. Pull out the GCF of $ax^2 + px$.
5. Pull out the GCF of $qx + c$.
6. Factor out the GCF of the expression.

- Perfect square trinomials and the difference of squares are special products and can be factored using equations.

$$\begin{array}{lcl} a^2 + 2ab + b^2 & = & (a + b)^2 \\ & \text{and} & \\ a^2 - 2ab + b^2 & = & (a - b)^2 \end{array}$$

A difference of squares can be rewritten as two factors containing the same terms but opposite signs.

$$a^2 - b^2 = (a + b)(a - b)$$

Factoring Polynomials Video

- [Factoring a Greatest Common Factor \(GCF\)](#)
- [Factoring a Trinomial with Leading Coefficient 1](#)
- [Factoring a Trinomial by Grouping \(ac-method\)](#)
- [Factoring a Perfect Square Trinomial](#)
- [Factoring a Difference of Squares](#)

Practice Exercises

Follow the directions for each exercise below:

1. Find the greatest common factor: $81p + 9pq - 27p^2q^2$
2. Find the greatest common factor: $12x^2y + 4xy^2 - 18xy$
3. Find the greatest common factor: $88a^3b + 4a^2b - 144a^2$
4. Factor the polynomial: $2x^2 - 9x - 18$
5. Factor the polynomial: $8a^2 + 30a - 27$
6. Factor the polynomial: $d^2 - 5d - 66$
7. Factor the polynomial: $x^2 + 10x + 25$
8. Factor the polynomial: $y^2 - 6y + 9$
9. Factor the polynomial: $4h^2 - 12hk + 9k^2$
10. Factor the polynomial: $361x^2 - 121$

Answers:

1. $9p$
2. $2xy$
3. $4a^2$
4. $(2x + 3)(x - 6)$
5. $(4a - 3)(2a + 9)$
6. $(d + 6)(d - 11)$
7. $(x + 5)^2$
8. $(y - 3)^2$
9. $(2h - 3k)^2$
10. $(19x + 11)(19x - 11)$