Algebra 2- Summer Packet 2025 – 2026

This summer packet focuses on one main concept learned in Algebra 1, factoring. Factoring is an essential concept that will be used throughout the school year in Algebra 2. It is important to have a strong foundation with all methods of factoring.

It is recommended that the packet is completed for the first day of school, so you can ask questions in class, if needed. It will be collected and graded as a homework assignment on the second day of class. An assessment of this material will be given on the third day of class.

Factoring is the process of rewriting a polynomial as a product of two or more polynomial factors.

Types of Factoring:

a) Greatest Common Factor (GCF)

b) Factor by Grouping

c) Factor in the form: $ax^2 + bx + c$ when $a = 1$

d) Factor in the form: $ax^2 + bx + c$ when $a > 1$

e) Factor the Difference of Two Squares

f) Factor Perfect Square Trinomials

g) Use factoring and the Zero Product Property to solve for the variable

NOTE: A polynomial expression that cannot be factored is called prime.

Greatest Common Factor

Example:	The *greatest common factor* (GCF) is the greatest monomial that divides into each term of the polynomial. To find the GCF:
$6y^3 + 27y^2 \rightarrow$ GCF: $3y^2$	1. Look at the coefficients. Determine the largest number that divides into each term.
Work: $\frac{6y^3}{3y^2} + \frac{27y^2}{3y^2}$	2. Look at the variables. A variable must be in all terms to be a GCF. If it is present in all terms, the GCF will be the variable with the smallest exponent.
Factored Form:	• After you have determined the GCF, you can factor by dividing each term by the GCF. In factored form, the GCF will go in front of the parentheses and the remaining factors will be left inside the parentheses.
$3y^2(2y+9)$	• You can always check your work by distributing. You will end with the original problem.

Practice:

1) $3x - 24$	2) $42x^3 + 18x^2 + 30x$	3) $6p^2 - 7$
4) $-12n^4 - 9n^3$	5) $50m^2 + 90m - 40$	6) $9t^2 + 3t$

Factor by Grouping

Example:	Factor by grouping is a method of factoring that can be used when there are four terms, using the following steps:
1. $x^3+4x^2+3x+12$	1. Group the terms into two pairs. Look for common factors when grouping in each pair.
2. $x^2(x+4)+3(x+4)$	2. Factor out the GCF from each binomial.
3. $(x^2+3)(x+4)$	3. Rewrite the polynomial in factored form by factoring out the common binomial.
4. $x^3+4x^2+3x+12$	4. Distribute to check your answer.

Practice:

7) $10m^3 + 8m^2 + 5m + 4$	8) $x^3 - 5x^2 + 3x - 15$	9) $32p^3 + 32p^2 + 24p + 24$
10) $24x^3 - 16x^2 + 6x - 4$	11) $28x^3 - 4x^2 - 35x + 5$	12) $6x^3 - 12x^2 + 7x - 14$

Factoring Trinomials (a = 1)

	Example:	Trinomial of the form: $ax^2 + bx + c$
$x^2 + bx + c$ $m \cdot n = c$ $m + n = b$ $(x + m)(x + n)$	$x^2 - 7x + 10$ $-5 \cdot -2 = 10$ $-5 + (-2) = -7$ $(x - 5)(x - 2)$	1. Always check for a GCF first when factoring a trinomial. 2. To factor trinomials in the form of $x^2 + bx + c$, find the two integers (factors) that multiply to "c" and add to "b". 3. Use these values to write the binomial factors. 4. Check your answer by distributing.

Practice:

13) $x^2 + 13x + 36$	14) $x^2 - 7x - 18$	15) $3p^2 - 36p + 105$
16) $x^2 - 13x + 30$	17) $6x^2 - 18x - 60$	18) $x^2 + 8x - 9$

Factoring Trinomials (a > 1)

$ax^2 + bx + c$ $m \cdot n = ac$ $m + n = b$ $ax^2 + mx + nx + c$ (factor by grouping)	Example: $5x^2 - 14x - 3$ $-15 \cdot 1 = -15$ $-15 + 1 = -14$ $5x^2 - 15x + x - 3$ $5x(x - 3) + 1(x - 3)$ $(5x + 1)(x - 3)$	Trinomial of the form: $ax^2 + bx + c$ 1. Always check for a GCF first when factoring a trinomial. 2. To factor trinomials in the form of $ax^2 + bx + c$, find the two integers (factors) that multiply to "a• c" and add to "b" . 3. Rewrite the polynomial by splitting the "bx" term using the two integers that you found in Step 2. 4. Factor by grouping. 5. Check your answer by distributing.

Practice:

19) $10n^2 - 13n - 30$	20) $6x^2 + 13x - 5$	21) $48m^2 + 12m - 90$
22) $8x^2 - 2x - 1$	23) $24x^2 + 57x + 18$	24) $9d^2 + 64d + 7$

Factoring Difference of Two Squares

Example:	Trinomial of the form: $a^2 - b^2$
$25x^2 - 36$ Both 25 and 36 are perfect squares: $\sqrt{25x^2} = 5x$ $\sqrt{36} = 6$ $25x^2 - 36$ $(5x+6)(5x-6)$	1. Always check for a GCF first when factoring. 2. Make sure that both terms are perfect squares and that the polynomial is a difference (subtraction between the perfect squares). 3. Apply the formula: $a^2 - b^2 = (a + b)(a - b)$ 4. Check your answer by distributing.

Practice:

25) $a^2 - 121$	26) $12b^2 - 75$	27) $k^2 + 9$
28) $4x^2 - 1$	29) $50m^2 - 2$	30) $100x^2 + 16$

Factoring Perfect Square Trinomials

Example:	1. Always check for a GCF first when factoring.
$16x^2 + 40x + 25$ Both $16x^2$ and 25 are perfect squares: $\sqrt{16x^2} = 4x$ $\sqrt{25} = 5$ $4x \cdot 5 = 20x$ $20x \cdot 2 = 40x$ $(4x+5)^2$	2. Make sure that the polynomial is a perfect square trinomial: • The first term and last term are perfect squares. • The middle term will be twice the product of the square root of the first term and the last term. 3. Apply the formula: $a^2 + 2ab + b^2 = (a + b)^2$ $a^2 - 2ab + b^2 = (a - b)^2$ 4. Check your answer by distributing.

Practice:

31) $45k^2 - 30k + 5$	32) $16n^2 - 8n + 1$	33) $45b^2 + 150b + 125$
34) $2n^2 + 12n + 18$	35) $9x^2 + 78x + 169$	36) $25a^2 - 70a + 49$

Zero Product Property

Example:

$2x^2 - 11x - 21 = 0$

$2x^2 - 14x + 3x - 21 = 0$

$2x(x-7) + 3(x-7) = 0$

$(2x+3)(x-7) = 0$

$(2x+3) = 0 \quad (x-7) = 0$

$x = -\frac{3}{2}$ and $x = 7$

The zero product property states that if ab = 0, then a and/or b must be 0. This fact can be used to solve equations in factored form.

1. Make sure that the equation is equal to zero.
2. Factor the equation, if necessary.
3. Set each factor equal to zero and solve for the variable.

Practice:

37) $v(v + 10) = 0$	38) $(5n - 4)(n + 1) = 0$	39) $4x^2 + 12x + 9 = 0$
40) $x^2 + 11x + 28 = 0$	41) $15p^2 - 17p - 4 = 0$	42) $100x^2 - 9 = 0$

Mixed Practice

Factor completely.

43) $x^2 - 19x + 90$	44) $2x^3 + 3x^2 - 4x - 6$	45) $49x^2 + 14x + 1$
46) $35x^2 - 40x$	47) $3x^2 + 4x - 7$	48) $27x^2 - 75$
49) $9x^2 - 12x + 4$	50) $-x^2 - x + 6$	51) $2x^2 - 12x - 110$
52) $6x^3 + 3x^2 + 18x + 9$	53) $-2x^2 + 18$	54) $2x^2 + 10x + 8$

55) $9x^2 - 66x + 121$	56) $144x^2 - 121$	57) $9x^3 + 6x^2 + 6x + 4$
58) $6x^2 - 11x - 10$	59) $75x^2 - 3$	60) $15x^2 - 27x$

Solve by factoring.

61) $10x^2 - 25x + 6x - 15 = 0$	62) $3x^2 + 10x = 0$	63) $25x^2 - 169 = 0$
64) $3x^2 + 12x - 15 = 0$	65) $16x^2 - 8x + 1 = 0$	66) $4x^2 + 3x - 10 = 0$