Unit 9 · Polynomials Cheat Sheet

Unit 9 focus: vocabulary, classifying, adding and subtracting polynomials

1 KEY VOCABULARY

term	Numbers and variables joined by multiplication.	$5x^2$
like terms	Same variables with the same exponents.	$3x^2,\ -x^2$
degree	The largest exponent of the polynomial.	$x^3 + x$: 3
leading coefficient	The number in front of the highest-degree term.	$-4x^3 + 1$: -4
standard form	Terms written from highest to lowest degree.	$2x^2 - x + 7$

2 NAME IT

Polynomial	Degree	Terms	Name
-6	0	1	constant monomial
$4x - 1$	1	2	linear binomial
$x^2 + 3x - 2$	2	3	quadratic trinomial
$5x^3$	3	1	cubic monomial

3 ADDING

Remove the parentheses and combine like terms.

Example: $(2x^2 + 5x - 1) + (x^2 - 3x + 4)$
Group: $(2x^2 + x^2) + (5x - 3x) + (-1 + 4)$
Combine: $3x^2 + 2x + 3$

Answer: $3x^2 + 2x + 3$

4 SUBTRACTING

Change EVERY sign in the second polynomial, then add.

Example: $(4x^2 - x + 6) - (x^2 + 2x - 3)$
Change signs: $4x^2 - x + 6 - x^2 - 2x + 3$
Combine: $3x^2 - 3x + 9$

Answer: $3x^2 - 3x + 9$

5 STANDARD FORM

Write the terms from the highest exponent to the lowest. The first term tells you the degree and leading coefficient.

Example: Write $7 - 2x^3 + 5x$ in standard form.
Order: $-2x^3 + 5x + 7$
Read it: degree 3, leading coefficient -2

Answer: $-2x^3 + 5x + 7$

6 QUICK REMINDERS & COMMON MISTAKES

✓ Do remember

- Only like terms combine: same variable AND same exponent.
- When adding, exponents stay the same.
- Subtracting: change every sign in the second polynomial.

✘ Common mistakes

- $x^2 + x^2 \neq x^4$: it is $2x^2$
- $-(x^2 - 3)$: is $-x^2 + 3$, not $-x^2 - 3$
- $3x + 2x^2$: cannot be combined

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More practice: multiplying, special products and dividing by a monomial

1 DISTRIBUTING A MONOMIAL

Multiply the monomial by EVERY term. Multiply the numbers and add the exponents.

Example: $2x(3x^2 - 4x + 1)$
Each term: $2x \cdot 3x^2 - 2x \cdot 4x + 2x \cdot 1$
Simplify: $6x^3 - 8x^2 + 2x$
Answer: $6x^3 - 8x^2 + 2x$

2 FOIL TWO BINOMIALS

First, Outer, Inner, Last, then combine like terms.

Example: $(x + 4)(2x - 3)$
F, O, I, L: $2x^2 - 3x + 8x - 12$
Combine: $2x^2 + 5x - 12$
Answer: $2x^2 + 5x - 12$

3 SPECIAL PRODUCTS

Name	Pattern	Example
Square of a sum	$(a + b)^2 = a^2 + 2ab + b^2$	$(x + 3)^2 = x^2 + 6x + 9$
Square of a difference	$(a - b)^2 = a^2 - 2ab + b^2$	$(x - 5)^2 = x^2 - 10x + 25$
Sum times difference	$(a + b)(a - b) = a^2 - b^2$	$(2x + 3)(2x - 3) = 4x^2 - 9$

⚠ $(x + 3)^2$ is NOT $x^2 + 9$: do not forget the middle term.

4 DIVIDING BY A MONOMIAL

Divide EVERY term by the monomial. Divide the numbers and subtract the exponents.

Example: $\frac{15x^4 - 10x^2}{5x^2}$
Each term: $\frac{15x^4}{5x^2} - \frac{10x^2}{5x^2}$
Simplify: $3x^2 - 2$
Answer: $3x^2 - 2$

5 AREA AND PERIMETER

Area multiplies the sides; perimeter adds all four sides.

Example: A rectangle is $x + 5$ by $x + 2$.
Area: $(x + 5)(x + 2) = x^2 + 7x + 10$
Perimeter: $2(x + 5) + 2(x + 2) = 4x + 14$
Answer: A $= x^2 + 7x + 10$**, P** $= 4x + 14$

6 CHECK YOURSELF

- Did I combine ONLY like terms?
- Did I change every sign when subtracting?
- Did I multiply every term by every term?
- Is my answer in standard form?
- Quick check: plug in $x = 1$ on both sides.