

A.10A Add and Subtract Polynomials of Degree One and Two

Definitions:

Algebraic expression – a generalization that is a combination of variables, numbers (constants and coefficients), and operators.

Polynomial expression – monomial or sum of monomials not including variables in the denominator or under a radical.

Monomial – one term expression. Ex: $-2.5x$, $\frac{3x}{7}$, $4x^2$, $2mn$

Binomial – two term expression. Ex: $4 - 2y$, $3a + 1$, $5x^2 - 2x$, $mn - pq$

Trinomial – three term expression. Ex: $x^2 + 2x + 1$, $a^2 - 2ab - 8b^2$

Degree –

Degree of term – sum of the powers on the variables in the term

Degree of a polynomial – same as the degree of the term in the polynomial with the highest degree.

First degree polynomial - polynomial whose highest degree term contains one variable with power of one.

Ex: $3x + 8$; the highest degree term is $3x$, and the power on x is one.

Ex: $-2x - 5y$; both terms are degree one with the power on x and y both equal to one.

Second degree polynomial – polynomial whose highest degree term contains one variable with a power of two, or two variables each having a power of one.

Ex: $3x^2 + x - 5$; the highest degree term is $3x^2$ and the one variable x has a power of two.

Ex: $x^2 - xy + 12y^2$; all three terms are degree two. The single variables x^2 and y^2 both have degree two. For the xy term both have a power of one which adds to a degree of two for the term.

Distribute - To multiply the term(s) on the outside of the parenthesis by all terms inside the parenthesis. Ex: $3(5x - 6) - 4(3x + 2)$ to distribute we would need to multiply the 3 by $5x$ and 3 by -6 then multiply -4 by $3x$ and -4 by 2 . Resulting in the following expression: $15x - 18 - 12x - 8$

Simplify – To condense an algebraic expression by grouping and combining similar terms.

$$\text{Ex: } 15x - 18 - 12x - 8$$

$$15x - 12x - 18 - 8$$

$$3x - 26$$

Simplify the following polynomials

1) $-3(3x + 5) + 2(9x - 6)$

Step 1: Distribute: $-9x - 15 + 18x - 12$

Step 2: Reorder: $-9x + 18x - 15 - 12$

Step 3: Simplify: $9x - 27$

2) $4.2(5x - 1) - 3.4(7x - 3)$

Step 1: Distribute: $21x - 4.2 - 23.8x + 10.2$

Step 2: Reorder: $21x - 23.8x - 4.2 + 10.2$

Step 3: Simplify: $-2.8x + 6$

3) $2(-5x + 3y) - 3(-6x + 4y)$

Step 1: Distribute: $-10x + 6y + 18x - 12y$

Step 2: Reorder: $-10x + 18x + 6y - 12y$

Step 3: Simplify: $8x - 6y$

4) $5(a - b) - 6(a + b)$

Step 1: Distribute: $5a - 5b - 6a - 6b$

Step 2: Reorder: $5a - 6a - 5b - 6b$

Step 3: Simplify: $-a - 11b$

5) $(9y - 7x + 15a) + 2(-3y + 8x - 8a) - 2(3x - y - 4a)$

Step 1: Distribute: $9y - 7x + 15a - 6y + 16x - 16a - 6x + 2y + 8a$

Step 2: Reorder: $15a - 16a + 8a - 7x + 16x - 6x + 9y - 6y + 2y$

Step 3: Simplify: $7a + 3x + 5y$

6) $-\frac{1}{2}(x + 1) + \frac{5}{3}(9x^2 - 6x + 3)$

Step 1: Distribute: $-\frac{1}{2}x - \frac{1}{2} + 15x^2 - 10x + 5$

Step 2: Reorder: $15x^2 - \frac{1}{2}x - 10x - \frac{1}{2} + 5$

Step 3: Simplify: $15x^2 - \frac{21}{2}x + \frac{9}{2}$

7) $-(3x^2 - 21x + 6) - 4(-x^2 + 6x - 4)$

Step 1: Distribute: $-3x^2 + 21x - 6 + 4x^2 - 24x + 16$

Step 2: Reorder: $-3x^2 + 4x^2 + 21x - 24x - 6 + 16$

Step 3: Simplify: $x^2 - 3x + 10$

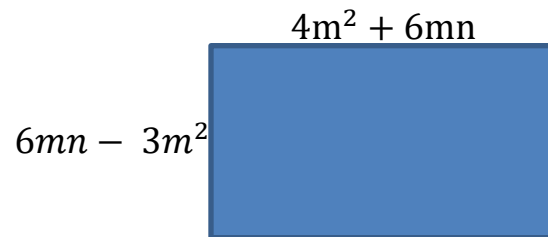
8) $2(3m^2 + 6mn - 7n^2) - (-m^2 + 5mn - 2n^2)$

Step 1: Distribute: $6m^2 + 12mn - 14n^2 + m^2 - 5mn + 2n^2$

Step 2: Reorder: $6m^2 + m^2 - 14n^2 + 2n^2 + 12mn - 5mn$

Step 3: Simplify: $7m^2 - 12n^2 + 7mn$

9) A rectangle has a length of $4m^2 + 6mn$ and a width of $6mn - 3m^2$. Find the expression for the perimeter of this rectangle.



To find the perimeter of a rectangle you add up all of the sides or follow the formula

$$P = 2l + 2w.$$

Step 1: Plug in: $P = 2(4m^2 + 6mn) + 2(6mn - 3m^2)$

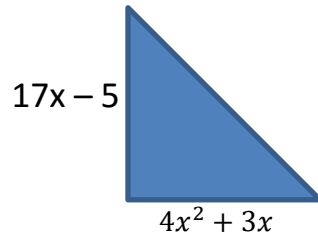
Step 2: Distribute: $P = 8m^2 + 12mn + 12mn - 6m^2$

Step 3: Reorder: $P = 8m^2 - 6m^2 + 12mn + 12mn$

Step 4: Simplify: $P = 2m^2 + 24mn$

Therefore the perimeter of the rectangle is $2m^2 + 24mn$.

- 10) If two sides of a triangle are $17x - 5$ and $4x^2 + 3x$ and the perimeter of the triangle is $13x^2 - 14x + 8$, what expression can be used to represent the length of the third side?



To find the perimeter of a triangle you need to add all three sides together.

$$P = s_1 + s_2 + s_3.$$

Step 1: Plug in: $13x^2 - 14x + 8 = 4x^2 + 3x + 17x - 5 + s_3$

Step 2: Simplify: $13x^2 - 14x + 8 = 4x^2 + 20x - 5 + s_3$

Step 3: Solve for s_3 :

$$\begin{array}{r} 13x^2 - 14x + 8 = 4x^2 + 20x - 5 + s_3 \\ -4x^2 - 20x + 5 \quad -4x^2 - 20x + 5 \\ \hline 9x^2 - 34x + 13 = s_3 \end{array}$$

Therefore, the third side is $9x^2 - 34x + 13$.