

Completed

Investigating Polynomials (pp. 1 of 3)

Vocabulary

Polynomial – a monomial or sum of monomials

A polynomial can be classified according to how many "terms" it has.

Category	Sample	Definition
monomial	$\frac{5}{2}x^2y^3$	One term
binomial	$4x^2 - 9x$	<u>two</u> terms
trinomial	$2x^2 + 3x + 1$	<u>three</u> terms
polynomial	$3a^4b + 7bc^2 + 6cd - 8$	<u>four</u> or <u>more</u> terms

Degree of a Polynomial – the highest degree of its terms

Sample	Degree of each term	Degree of Polynomial
$\frac{5}{2}x^2y^3$	5	5
$4x^2 - 9x$	2, 1	2
$2x^2 + 3x + 1$	2, 1, 0	2
$3a^4b + 7bc^2 + 6cd - 8$	5, 3, 2, 0	5

Operations To simplify polynomials with addition, subtraction, and multiplication:

- Clear grouping symbols using properties of algebra (distributive)
- Combine like terms using properties of algebra (commutative, associative).

Sample Problems

1) $(-4x^2 - 3xy + 5y^2) + 2(3x^2 - 3xy - 5y^2)$

$$\begin{array}{ccccccc} -4x^2 & - & 3xy & + & 5y^2 & + & 6x^2 & - & 6xy & - & 10y^2 \\ \text{mm} & & \text{..y} & & \text{mm} & & \text{mm} & & \text{..y} & & \text{..y} \end{array}$$

$$\boxed{2x^2 - 9xy - 5y^2}$$

2) $(3x^2 + 6xy - 7y^2) - (-x^2 + 5xy - 2y^2)$

$$3x^2 + 6xy - 7y^2 + x^2 - 5xy + 2y^2$$

$$\boxed{4x^2 + 1xy - 5y^2}$$

Investigating Polynomials (pp. 2 of 3)

Perform the indicated polynomial operations. Simplify answers, and classify each answer by its degree and number of terms.

3) $3xy^2(5x^2y - 6xy^3)$

$$15x^3y^3 - 18x^2y^5$$

7th degree
 binomial

4) $(x+8)(x-3)$

$$x^2 - 3x + 8x - 24$$

$$x^2 + 5x - 24$$

2nd degree
 trinomial

5) $(x+4)^2$

$$(x+4)(x+4)$$

$$x^2 + 4x + 4x + 16$$

$$x^2 + 8x + 16$$

2nd degree
 trinomial

6) $(2x+3)(2x-3)$

$$4x^2 - 6x + 6x - 9$$

$$4x^2 - 9$$

2nd degree
 binomial

Applications:

- 7) A rectangle has a width represented by $4x + 5$ and a length represented by $3x + 2$. What expression can be used to represent the area of the rectangle?

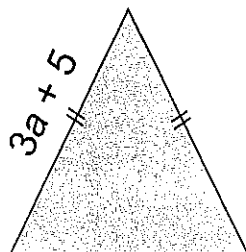
$$A = l \cdot w$$

$$A = (3x+2)(4x+5)$$

$$= 12x^2 + 15x + 8x + 10$$

$$= 12x^2 + 23x + 10$$

- 8) The diagram below shows an isosceles triangle. Find the expression that represents the perimeter of the triangle.



$P =$ sum of all sides

$$P = (3a+5) + (3a+5) + (3a^2+2a-1)$$

$$= 3a^2 + 8a + 9$$

Investigating Polynomials (pp. 3 of 3)

Practice Problems

Simplify the following polynomials.

$$1. 2(4x^2 + 3xy - 7y^2) + (2x^2 - 5xy - 3y^2) = 8x^2 + 6xy - 14y^2 + 2x^2 - 5xy - 3y^2$$

$$= 10x^2 + xy - 17y^2$$

$$2. (5m^2 - 2mp - 6p^2) - 2(-3m^2 + 5mp - p^2)$$

$$= 5m^2 - 2mp - 6p^2 + 6m^2 - 10mp + 2p^2 = 11m^2 - 12mp - 4p^2$$

$$3. 2x(x+5) - x(3-x)$$

$$= 2x^2 + 10x - 3x + x^2 = 3x^2 + 7x$$

$$4. 5a^2b(7ab^2 + 3a - 4b)$$

$$= 35a^3b^3 + 15a^3b - 20a^2b^2$$

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

$$= -12x^2 + 3xy + 8xy - 2y^2 = -12x^2 + 11xy - 2y^2$$

$$6. (2x + 1)^2$$

$$= (2x + 1)(2x + 1) = 4x^2 + 2x + 2x + 1 = 4x^2 + 4x + 1$$

$$7. (5x + 4)(5x - 4) = 25x^2 - 20x + 20x - 16 = 25x^2 - 16$$

$$8. (2n - 3)(n^2 + 5n - 1) = 2n^3 + 10n^2 - 2n - 3n^2 - 15n + 3 = 2n^3 + 7n^2 - 17n + 3$$

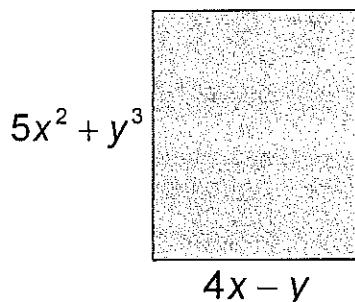
9. The height of a triangle is represented by the expression $(x + 2)$. The base is represented by $(2x - 8)$. Find the expression that can be used to represent the area of the triangle.

$$A = \frac{1}{2}bh$$

$$A = \frac{1}{2}(2x - 8)(x + 2) = (x - 4)(x + 2) = x^2 + 2x - 4x - 8$$

$$= x^2 - 2x - 8$$

10. The width and length of a rectangle are given in the diagram below. Find the expression that can be used to represent the area of the rectangle.



$$A = l \cdot w$$

$$A = (4x - y)(5x^2 + y^3)$$

$$= 20x^3 + 4xy^3 - 5x^2y - y^4$$

