Expanding Binomials

***TERMINOLOGY***

Polynomial – an algebraic expression made up of terms that are added and subtracted.

Term – the product of a numerical coefficient and one or more variables.

Monomial – a polynomial with **one** term.

Binomial – a polynomial with **two** terms.

Trinomial – a polynomial with **three** terms.

## Review of Expanding

Expanding - the process of multiplying terms together and collecting like terms to simplify.

Distributive Property – multiply the terms i.e. *a ( b + c ) = ab + ac*

Example: Simplify the following.

 1. $12x+3y-13x+5y$ 2. $\left(3x+4y\right)- \left(5x-6y\right)$

 =12*x –* 13*x +* 3*y +* 5*y* place like terms together

 = -*x* + 8*y* add / subtract like terms = (3*x* + 4*y*) – 1(5*x* – 6*y*) negative sign is a negative 1

 = (3*x* + 4*y*) – 5*x* + 6*y* distributive property

 = 3*x* + 4*y* – 5*x* + 6*y* remove brackets

 = -2*x* + 10*y*  collect like terms

***MULTIPLYING BINOMIALS***

Distributive property

**F**

**O**

**I**

**L**

 *ac+ab+bc+bd*

F first term

O outside terms

I inside terms

L last terms

Examples

|  |  |  |  |
| --- | --- | --- | --- |
| 1. (*x* + 2) (*x* + 4)*x*2  + 4*x* + 2*x* + 8*x*2 + 6*x* + 8
 | 1. (*x* – 2) (*x* + 4)*x*2 + 4*x* – 2*x* – 8*x*2 + 2*x* – 8
 | 1. (*x* – 2)( *x* – 4)*x*2 - 4*x* – 2*x* – 8*x*2 - 6*x* – 8
 | 1. (*x* – 3)2(*x* – 3) (*x* – 3)*x*2 - 3*x* - 3*x* + 9
 |

5. State an ***expression*** for the **area** of the shape given below.

|  |  |  |  |
| --- | --- | --- | --- |
|  | Area = length x widthA = (x)(x)A = x2 |  | A = length x widthA = (3*x* – 1) (2*x* – 3)A = 6*x*2 – 9*x* – 2*x* + 3A = 6*x*2 – 11*x* + 3 |

Two Special Products

There are **two special cases** of binomial products which **DO NOT** require the use of the distributive property or FOIL to simplify.

1. **Squaring a Binomial**

|  |  |  |
| --- | --- | --- |
| Expand and simplify | (x – 2)2(x – 2)(x – 2)x2 – 2x – 2x + 4x2 – 4x + 4 | (4x + 3)2(4x + 3)(4x + 3)16x2 + 12x + 12x + 916x2 + 24x + 9 |

In general:

 *a2 + 2ab + b2*

**always**

2 x 1st term x 2nd term

1st term squared

2nd term squared

1. **Difference of Squares**

|  |  |  |
| --- | --- | --- |
| Expand and simplify | (x + 3)(x – 3)x2 – 3x + 3x – 9x2 – 9 | (4x + 2)(4x – 2) 16x2 – 8x + 8x – 416x2 – 4 |

In general

 *a2 – b2*

1st term squared

2nd term squared

always

**MINUS**

***EXAMPLES***

Simplify each of the following.

|  |  |  |  |
| --- | --- | --- | --- |
| 1. (x + 4)2x2 + 8x + 16
 | 1. (x – 5)(x + 5)x2 – 25
 | 1. (2x + 3)(2x – 3)4x2 – 9
 | 1. (3x – 7)29x2 -42x + 49
 |