

5.1 Expand Binomials

A Monomials

Monomial => one term expression in algebra with a numeric coefficient and variables that are multiplied together.

Examples: x , $-2x$, $\frac{1}{2}x$

Example 1. Find if each of the following expression is or is not a monomial.

- a) $2x$ b) $-x$ c) x d) $-5x$ e) 7 f) $\frac{2}{3}x$

B Multiply monomials

- The product of two or more monomials is also a monomial.
- The numeric coefficient is equal with the product of all numeric coefficients of each monomial.
- For each variable apply the exponent rule

$$x^n x^m = x^{n+m}.$$

Example 2. Multiply the following monomials.

- a) $(-2)(3)$ b) $(-x)(5)$
c) $(-2)(4x)$ d) $(5x)(-x)$
e) $(-2x)(3x)$ f) $(-2x)^2$

C Binomials

Binomial => sum or difference of two monomials

Examples: $2x + 3$, $-x + 5$, $-7 - 6x$, $\frac{2}{3} - \frac{3}{4}x$

Example 3. Find if each of the following expression is or is not a binomial.

- a) $4x$ b) $2x - 7$ c) $3x + 7 + x^2$ d) $x + \frac{1}{3}$ e) $x^2 + 1$

D The distributive property

The distributive property states that for real numbers a, b, and c:

$$a(b + c) = ab + ac$$

Example:

$$-2x(3x - 4) = (-2x)(3x) + (-2x)(-4) = -6x^2 + 8x$$

E Multiplying a monomial by a binomial

To multiply a monomial and a binomial use the distributive property.

Example 4. Multiply the following monomials and binomials.

a) $3(x + 1)$

b) $-2(x - 3)$

c) $(-x)(x - 3)$

d) $(2x)(4 - 2x)$

F Combining like terms

The like terms differ only on the numeric coefficients.

To combine like terms use the distributive property: $ax + bx = (a + b)x$

Examples:

- 2 and -5 are like terms and $2 - 5 = -3$
- $3x$ and $-2x$ are like terms and $3x - 2x = x$
- x^2 and $2x^2$ are like terms and $x^2 + 2x^2 = 3x^2$

Example 5. For each case, combine the like terms.

a) $-6 + 7$

b) $-2 + x - 1$

c) $x - 2 + 3x$

d) $2x - 3 + x^2 - 4x + 7$

G Multiplying binomials. The FOIL method

FOIL stands for First, Outside, Inside, and Last.

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

Example 6. Use the FOIL method to multiply binomials.

a) $(x + 1)(x + 2)$

b) $(2x - 1)(3x + 2)$

c) $(3 - 2x)(3 + 4x)$

d) $(2x - 3)^2$

H Multiplying binomials. The grid method

$(3 - x)(x - 8) =$	<table style="margin: auto;"> <tr> <td></td> <td style="text-align: center;">x</td> <td style="text-align: center;">-8</td> <td></td> </tr> <tr> <td style="text-align: center;">3</td> <td style="border: 1px solid black; width: 40px; height: 40px;"></td> <td style="border: 1px solid black; width: 40px; height: 40px;"></td> <td></td> </tr> <tr> <td style="text-align: center;">$-x$</td> <td style="border: 1px solid black; width: 40px; height: 40px;"></td> <td style="border: 1px solid black; width: 40px; height: 40px;"></td> <td></td> </tr> </table>		x	-8		3				$-x$				$=$
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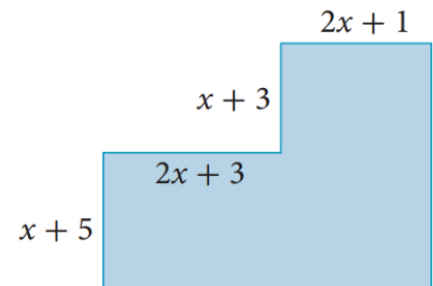
Example 7. Use the matrix method to multiply binomials.

a) $(x - 2)(x - 2)$

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

c) $(3x - 4)^2$

Example 8. Write an expression, in simplified form, for the area of this shape.



Notes: Textbook Pages 234-238

Homework: Textbook Pages 238 #3, 7, 11

Name

Simplify the following expressions:

1. $(2)(-3)$

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

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

4. $(-x)(4x)$

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

6. $(-3)^2$

7. $(-2x)^2$

8. $(2x)(3 - 4x)$

9. $(2 + x)(x - 3)$

10. $(2x - 3)(x + 4)$

11. $(x - 2)^2$

12. $(2x - 1)^2$