

Lesson 1.1 – Polynomials: Adding & Subtracting, Multiplying & Expanding

I. Warm-up: Combining Like Terms & Writing Algebraic Expressions

(See Background Knowledge pages 5-9 in the Red 9/10 textbook)

1. Simplify, where possible, by collecting like terms:

a. $3a + 4a = 7a$

b. $11b - b = 10b$

c. $5 + x + 2 = x + 7$

d. $2ab + 3ab = 5ab$

e. $3x^2 + 2x =$
no change

Writing Expressions in Math		
<i>Word</i>	<i>Meaning</i>	<i>Symbol</i>
sum	The result from adding two or more numbers together	+ (plus)
difference	The result from subtracting two or more numbers together	-- (minus)
product	The result from multiplying two or more numbers together	×, dot, (times) or juxtaposition
quotient	The result from dividing two or more numbers together	÷ obelus, or / slash, or tableau
mean	The sum of a set of number divided by the total amount of numbers	Overline bar

2. Write a mathematical expression for the following written expressions:

a. The sum of 6 and $a = 6 + a$

b. The difference between c and d , where $d > c = d - c$

c. The mean of p, q , and $r = \frac{p+q+r}{3}$

3. Convert the following phrases into mathematical form:

a. 18 more than a number $= x + 18$

b. 7 less than a number $= x - 7$

c. Double a number $= 2x$

d. Double the sum of a number and 7 $= 2(x + 7)$

II. Adding & Subtracting Polynomials

Recall the distributive property:

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

Expand and simplify the following:

a. $2(3x - 1) = 6x - 2$

b. $-3x(x + 2) = -3x^2 - 6x$

c. $3(x + 5) + 2(4 - x) = x + 23$

d. $y(3y - 1) - 3y(2y - 5) = 14y - 3y^2$

Multiply and simplify the following expressions.

1. $7(3x^2 + 6x + 5) - 7(3x^2 + 3x + 2) =$
 $(21x^2 + 42x + 35) + (-21x^2 - 21x - 14)$
 $= 21x + 21$

2. $(5x^2 + 4x + 7) + (2x^2 - 2x - 6) = 7x^2 + 2x + 1$

3. $2(9x + 1) - 9 = 18x + 2 - 9 = 18x - 7$

4. $3(9y + 3) - 3(5y + 3) = 12y$

5. $1 - 2(5 - (9y - 5)) = 18y - 19$

6. $2x^2 + 4 - [9(x^2 - 2) + 7] = 2x^2 + 4 - 9x^2 + 18 - 7 = 15 - 7x^2$

What are polynomials?

“poly” = many, “-nomial” = term

A polynomial can have constants, variables, and exponents, but never division by a variable.

Polynomials	Not Polynomials
$3x$	$3xy^{-2}$
$x - 2$	$\frac{2}{x + 2}$
$-6y^2 - \frac{7}{9}x$	$\frac{1}{x}$
$3xyz + 3xy^2z - 0.1xz - 200y + 0.5$	\sqrt{x}
$512v^5 + 99w^5$	
5	

III. Multiplying & Expanding Polynomials

(See Section 3A/3B pg. 50-53 in Red 9/10 Book)

Apply the distributive property on the product $(a + b)(c + d) = ac + ad + bc + bd$. This is called FOIL.

Expand and simplify:

a. $(x + 4)(x - 3) = x^2 + x - 12$

b. $(2x - 5)(-x + 3) = -2x^2 + 11x - 15$

c. $(x + 4)(x - 4) = x^2 - 16$

d. $(3x - 2)(3x + 2) = 9x^2 - 4$

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

f. $(3 - 4y)^2 = 9 - 24y + 16y^2$

g. $(x + 3)(x^2 + 2x + 4) = x^3 + 5x^2 + 10x + 12$

h. $(x + 1)(x - 3)(x + 2) = x^3 - 7x - 6$

FOIL Method

First – Outer – Inner – Last

$$(a + b)(c + d) = ac + ad + bc + bd$$

Differences of Squares Pattern

$$(a + b)(a - b) = a^2 - b^2$$

Perfect Square Pattern

$$(a + b)^2 = a^2 + 2ab + b^2$$

IV. Practice on Your Own

Multiply and simplify the following expressions.

1. $(4x - 6)(4x + 7) = 16x^2 + 4x - 42$

2. $(5x - 3)(5x + 3) = 25x^2 + 9$

3. $(5x + 6)^2 = 25x^2 + 60x + 36$

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

5. $(7x + 7)(2x - 6) = 14x^2 - 28x - 42$

6. $(x - 7)(x^2 + 5x + 2) = x^3 - 2x^2 - 33x - 14$

7. Given that

$$P(x) = 3x^3 - 5x - 4, \quad Q(x) = x^2 + 2x + 2, \quad R(x) = x^3 - 6$$

Then evaluate

a. $P + Q = 3x^3 + x^2 - 3x - 2$

b. $R(P + Q) = 3x^6 + x^5 - 3x^4 - 20x^3 - 6x^2 + 18x + 12$