

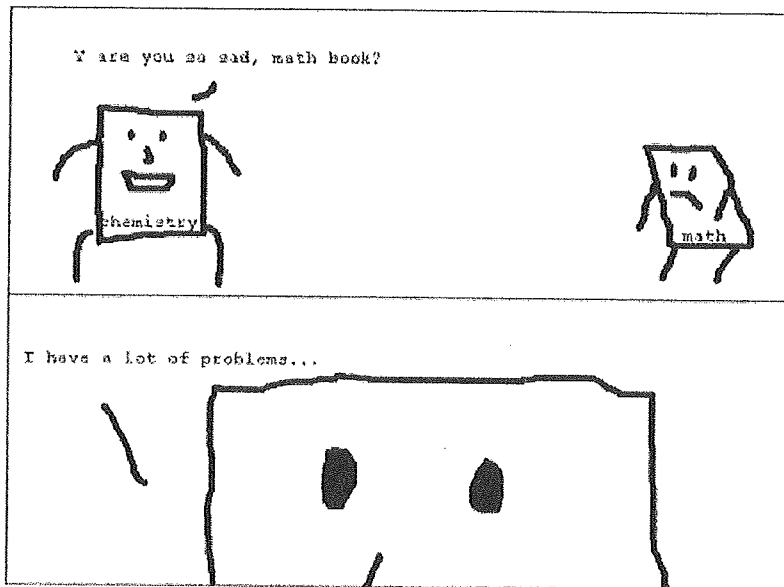
Name: \_\_\_\_\_

### Math 9 - Chapter 6: Polynomials

Date	Topic	Assignment	Complete	Signature
April 25	6.1 Modeling Polynomials	pg. 281, #1, 4-7, 11, 14, 15		
April 28	6.3 Gathering Like Terms 6.4 Adding Polynomials	pg. 288, #2, 5-8, 12, 14a pg. 294 #2, 5, 6, 7-9, 11, 13 and worksheet		
April 29	6.5 Subtracting Polynomials	pg. 306, #2, 7-11, 13, 15, 17 and worksheet		
April 30	6.7 Multiplying or Dividing a Polynomial by a Monomial	pg. 320, #3, 6-8, 10,12,13,17		
May 1	Binomial Expansion (FOIL)	Worksheet		
May 2	Chapter 6 Review	Review Sheet		
May 5	Chapter 6 Test			

# Chapter 6

## Polynomials



Name: \_\_\_\_\_

Block: \_\_\_\_\_

## 6.1 Modeling with Polynomials

---

### Definitions:

- Term –
- Constant –
- Coefficient –
- Polynomial –
- Monomial –
- Binomial –
- Trinomial –
- Degree of a term –
- Degree of a polynomial –

Ex: 1) How many terms in each expression? Identify the type of polynomial.

a)  $3x^5 - 2x^3$

b)  $2xyz$

c)  $3x^2 - x + 7$

Ex: 2) State the degree of each:

a)  $5x^3y^2z^5$

b)  $3x + 5$

c)  $2x^3y^2 + 5xy^2 - 3xyz^2$

### 6.3 Gathering Like Terms

---

*Definitions:*

- Like terms –

When we add or subtract like terms, this is also called simplifying.

Ex: 1) Simplify:

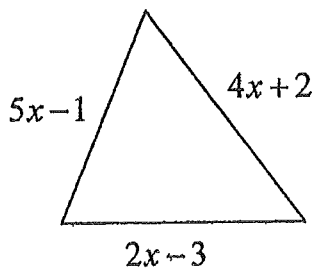
a)  $3x^2 + 2x + 4x^2 + x$

b)  $5x^3 + 3x^2 + 2y^2 - 3x^3 + 6x^2 - 3y^3$

c)  $2n - 5n^2 - 5n - 3n^2$

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

Ex: 2) Express the perimeter as a simplified expression.



## 6.4 Adding Polynomials

---

### Review: Identifying Parts of Polynomials

Ex: 1)  $2x^2 + 5x - 3$

- a) Number of terms:
- b) Degree:
- c) Variable(s):
- d) Coefficients:
- e) Constant:

Ex: 2) Which of the following are polynomials?

- a)  $-5k^2 - 2$
- b)  $5 - k + j^2$
- c)  $\frac{-5}{k} - 2$
- d)  $\frac{1}{x^2+3x}$

Ex: 3) Simplify  $2x - 3x^2 + 5 - 4x + 6x^2$

### Adding Polynomials:

Ex: 1) Simplify  $(-2x^2 + 4x - 3) + (2x^2 - 4x - 1)$

Math 9 – Chapter 6: Polynomials

Ex: 2) Simplify:

a)  $(x^2 + 3x) + (2x^2 + 7x + 6)$

b)  $(2x^2 + xy + 1) + (x^2 - 2xy - 5)$

Ex:3 ) Simplify  $(4x^2 + 2xy - 8) + (-6x^2 - 4xy)$  using Algebra Tiles!!

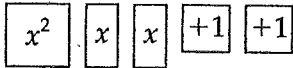
*Homework: pg. 294 #2, 5, 6, 7-9, 11, 13 and worksheet*

## 4.2 Adding Polynomials

MATHPOWER™ Nine, pp. 150–152

Green  $x^2$ -tiles and  $x$ -tiles and red 1-tiles are positive. White algebra tiles are negative.

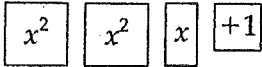
### Algebra Tile Representation



### Algebraic Expression

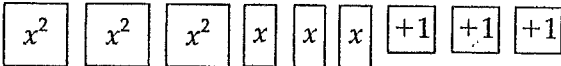
$$x^2 + 2x + 2$$

Add



$$2x^2 + x + 1$$

Result



$$3x^2 + 3x + 3$$

To add polynomials, collect like terms and add.

$$\begin{aligned} (x^2 + 3x - 3) + (2x^2 - x + 1) &= x^2 + 3x - 3 + 2x^2 - x + 1 \\ &= x^2 + 2x^2 + 3x - x - 3 + 1 \\ &= 3x^2 + 2x - 2 \end{aligned}$$

Model the expressions using algebra tiles or drawings on grid paper. Then, add.

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

---

2. 
$$\begin{array}{r} 2x^2 - x - 3 \\ + x^2 - x + 1 \\ \hline \end{array}$$

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

---

4. 
$$\begin{array}{r} x^2 - 3x + 2 \\ + (-2x^2) - x - 1 \\ \hline \end{array}$$

Simplify.

5.  $(3y + 4z + 6) + (2y - z - 4)$

---

6.  $2ab + 3bc + d + 2bc + 3ab - d$

---

7.  $x^2 - 2xy - y^2 + y^2 - 2xy + x^2$

---

8.  $s^2 + 4 + t + 3 + 2t^3 + 3s$

---

Add.

9. 
$$\begin{array}{r} 4a + b \\ + 2a + 2b - 3 \\ \hline \end{array}$$

10. 
$$\begin{array}{r} 4m^2 + 8mn + 2n^2 \\ + m^2 - 2mn + n^2 \\ \hline \end{array}$$

11. 
$$\begin{array}{r} 3r^2 - 8r + 4 \\ + r^2 - 2r + 5 \\ \hline \end{array}$$

12. 
$$\begin{array}{r} c^2 + 2ac + 4 \\ + 3c^2 + \quad \quad 6 + a^2 \\ \hline \end{array}$$

Simplify.

13.  $(4k^2 + 2k - 5) + (3 - k - 2k^2)$

---

14.  $(x^3 + 2y - 5) + (3x^3 - 4y + 7)$

---

15.  $(z^3x + 3z - 2) + (3z^3x - 4z + 6)$

---

### 6.5 Subtracting Polynomials

---

Subtracting polynomials is the same as adding them, with one small difference:

Ex: 1) Simplify:  $(4x - 5) - (2x + 1)$

Ex: 2) Simplify:

a)  $(7x + 2) - (3x - 3)$

b)  $(x^2 + 4x) - (x^2 + 2x)$

Ex:3 ) Simplify  $(3x^2 - 7x + 12) - (-4x^2 - 3x + 13)$

Ex: 4) Simplify  $(m^2 + 2mn - 6) - (3n^2 + 2mn - 5)$

*Homework: pg. 306 #2, 7-11, 13, 15, 17 and worksheet*

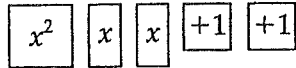


### 4.3 Subtracting Polynomials

MATHPOWER™ Nine, pp. 154–155

Green  $x^2$ -tiles and  $x$ -tiles and red 1-tiles are positive. White algebra tiles are negative.

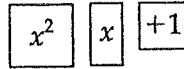
**Algebra Tile Representation**



**Algebraic Expression**

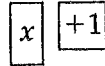
$$x^2 + 2x + 2$$

**Subtract**



$$x^2 + x + 1$$

**Result**



$$x + 1$$

To subtract polynomials, add the opposite or **additive inverse** of the polynomial that is being subtracted.

$$(3y^2 - 3y + 2) - (2y^2 + y + 2) = 3y^2 - 3y + 2 - 2y^2 - y - 2 = y^2 - 4$$

The additive inverse of  $2y^2 + y + 2$  is  $-2y^2 - y - 2$ .

*Write the additive inverse of each polynomial.*

1.  $x + 6$  \_\_\_\_\_
2.  $x^2 - x - 4$  \_\_\_\_\_
3.  $-2c + 3d + e$  \_\_\_\_\_
4.  $-4s^2 - s + 5$  \_\_\_\_\_

*Model the expressions using algebra tiles or drawings on grid paper. Then, subtract.*

5.  $(x + 4) - (x + 2)$   
\_\_\_\_\_
6.  $(x^2 + 3x + 2) - (x^2 + x + 1)$   
\_\_\_\_\_
7.  $(2x^2 - 3x - 2) - (x^2 - 2x - 1)$   
\_\_\_\_\_
8.  $(-2x^2 - 2x - 4) - (-x^2 - x - 3)$   
\_\_\_\_\_

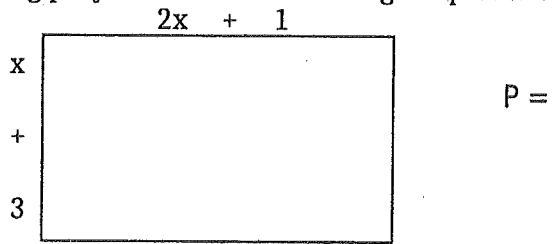
*Subtract.*

9.  $(x + 5) - (x + 2)$   
\_\_\_\_\_  
\_\_\_\_\_
10.  $(2x - 3) - (x - 3)$   
\_\_\_\_\_  
\_\_\_\_\_
11.  $(-2x - 4) - (-x - 2)$   
\_\_\_\_\_  
\_\_\_\_\_
12.  $(x^2 + 3x + 2) - (x^2 + 2x + 1)$   
\_\_\_\_\_  
\_\_\_\_\_
13.  $(3y^2 - y - 4) - (y^2 - 3)$   
\_\_\_\_\_  
\_\_\_\_\_
14.  $x^2 + 4x + 6$   
 $x^2 - 2x - 2$
15.  $-5f^2 - 2fg - g^2$   
 $f^2 + fg + g^2$
16.  $-3x^2 + 4x - 2$   
 $-2x^2 - x + 2$
17.  $2y^2 - 5y - 4$   
 $-y^2 - 3y - 2$

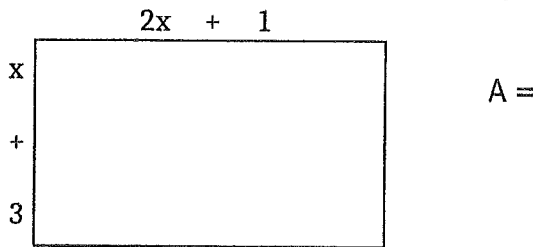
### 6.7 Multiplying a Monomial by a Polynomial

---

If adding polynomials is like finding the perimeter:



Then multiplying polynomials is like finding the area!



#### Multiplying a Monomial by a Monomial:

When doing these types of problems, we multiply or divide the coefficients, then use exponent laws for the variables.

Ex: 1)  $3(5x) =$

2)  $2a(3b) =$

3)  $-y(5y^2) =$

4)  $(2xy)(2x^2y) =$

#### Multiplying a Monomial by a Polynomial:

Ex:

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

2)  $-2x(x - 1)$

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

Math 9 – Chapter 6: Polynomials

**Dividing Polynomials by Monomials:**

When dividing polynomials by monomials, we *divide each term* by the divisor.

Ex: 1)  $(3a^2 - 9) \div 3$

Ex: 2)  $(12x^3 - 16x^2 + 4) \div (-4x)$

## 5.5 Binomial Products

MATHPOWER™ *Nine*, pp. 193–194

To expand a binomial product, use the distributive property. Multiply each term in the first binomial by each term in the second binomial. You can remember this method with the acronym FOIL, which stands for First terms, Outside terms, Inside terms, and Last terms.

$$\begin{aligned}(2x + 1)(3x + 2) &= 2x(3x + 2) + 1(3x + 2) \\ &= 6x^2 + 4x + 3x + 2 \\ &= 6x^2 + 7x + 2\end{aligned}$$

$$\begin{aligned}(2x + 1)(3x + 2) &= \overbrace{(2x + 1)(3x + 2)}^{\text{FOIL}} \\ &= 6x^2 + 4x + 3x + 2 \\ &= 6x^2 + 7x + 2\end{aligned}$$

Express each area as a product and in expanded form. Let G represent green tiles and R represent red tiles.

1. 

G	G	G
G	R	R

 \_\_\_\_\_  
\_\_\_\_\_

2. 

G	G	G	G	G	G
G	R	R	R	R	R
G	R	R	R	R	R

 \_\_\_\_\_  
\_\_\_\_\_

Expand.

3.  $2(x + 4)$  \_\_\_\_\_  
\_\_\_\_\_

4.  $y(2x - 3)$  \_\_\_\_\_  
\_\_\_\_\_

5.  $2b(3b - 2)$  \_\_\_\_\_  
\_\_\_\_\_

6.  $4a(2a^2 - 5)$  \_\_\_\_\_  
\_\_\_\_\_

Find the product.

7.  $(a + 3)(a + 2)$  \_\_\_\_\_

8.  $(2 + k)(3 + k)$  \_\_\_\_\_

9.  $(x - 1)(x - 2)$  \_\_\_\_\_

10.  $(c - 5)(c - 3)$  \_\_\_\_\_

11.  $(2 - q)(3 - q)$  \_\_\_\_\_

12.  $(y - 4)(y + 6)$  \_\_\_\_\_

13.  $(t + 5)(t - 1)$  \_\_\_\_\_

14.  $(3 - b)(4 + b)$  \_\_\_\_\_

Expand.

15.  $(6v + 3)(v + 1)$  \_\_\_\_\_

16.  $(5 + 2x)(2 + x)$  \_\_\_\_\_

17.  $(y - 5)(2y - 2)$  \_\_\_\_\_

18.  $(5 - 2n)(3 - n)$  \_\_\_\_\_

19.  $(m + 4)(3m - 2)$  \_\_\_\_\_

20.  $(4g - 3)(g + 4)$  \_\_\_\_\_

21.  $(2y + 3)(3y + 2)$  \_\_\_\_\_

22.  $(5h - 1)(2h - 3)$  \_\_\_\_\_

23.  $(3 - 2s)(2 - 3s)$  \_\_\_\_\_

24.  $(4 + 2p)(3 - 4p)$  \_\_\_\_\_

Multiply.

25.  $(x + 0.4)(x - 2)$  \_\_\_\_\_

26.  $(c - 1.5)(-c + 5)$  \_\_\_\_\_

27.  $(d - 0.6)(3d - 1.2)$  \_\_\_\_\_

28.  $(5s + 0.2)(2s + 0.3)$  \_\_\_\_\_

29.  $3(x + 2)(x + 3)$  \_\_\_\_\_

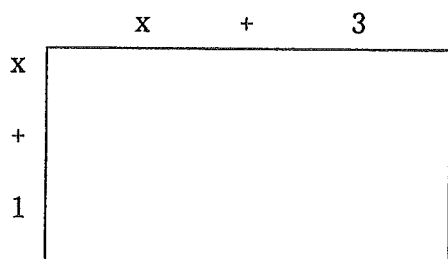
30.  $-2(y - 3)(-y + 2)$  \_\_\_\_\_

31.  $0.2(x + 1)(x + 2)$  \_\_\_\_\_

**Binomial Products**

---

Find an expression for the area of the example below.



What about  $(x+2)(x+4)$ ? Find a pattern.

Another way to think of this is:

Ex: 1) Expand and simplify:

a)  $(x+5)(x+1)$

b)  $(x - 8)(x + 2)$

c)  $(y - 8)(y - 3)$

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

e)  $(3x - 4)(2x - 5)$

1. For each of the following, determine A) the coefficients B) the degree C) the number of terms and D) the variables

a)  $-4x^2y$

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

2. From the list, identify terms that are like  $2w^2$ . Explain how you know they are like terms.

- $-5w, -6w^2, -2, 4w, 3w^2, -w, 11w, 2$

3. Simplify each polynomial.

- a)  $3a^2 - 2a - 4 + 2a - 3a^2 + 5$       b)  $7z - z^2 + 3 + z^2 - 7$   
 c)  $d^2 + 3d + 1 + 4d^2 + 2$       d)  $-6x^2 + 10x - 4 + 4 - 12x - 7x^2$   
 e)  $(y^2 + 6y) + (-7y^2 + 2y)$       f)  $(5n^2 + 5) + (-1 - 3n^2)$

4. Add these polynomials.

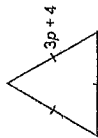
- a)  $(x - 5) + (2x + 2)$       b)  $(t^2 + 3b) + (t^2 - 3b)$

5. a) For each shape below, write the perimeter as a sum of polynomials and in simplest form.

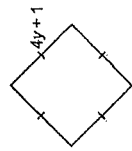
i)



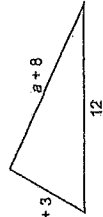
ii)



iii)



iv)



6. The sum of two polynomials is  $4r + 5 - 3r^2$ . One polynomial is  $-8 - 2r^2 + 2r$ , what is the other polynomial?

7. The difference between two polynomials is  $(5x + 3)$ . One of the two polynomials is  $(4x + 1 - 3x^2)$ . What is the other polynomial?

6. Subtract.

- a)  $(m - 5m - 7) - (-6m + 2m + 1)$   
 b)  $(2a + 3b - 3a^2 + b^2) - (-a^2 + 8b^2 + 3a - b)$   
 c)  $(xy - x - 5y + 4y^2) - (6y^2 + 9y - xy)$

7. Determine each product.

a)  $4(3a + 2)$

b)  $(d^2 + 2d)(-3)$

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

d)  $(-2n^2 + n - 1)(6)$

e)  $-3(-5m^2 + 6m + 7)$

8. Determine each quotient.

a)  $(16v + 16) \div (8)$

b)  $(25k^2 - 15k) \div (5)$

c)  $(20 - 8z) \div (-4)$

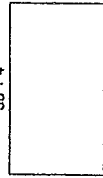
d)  $(18x^2 - 6x + 6) \div (6)$

e)  $(7 - 7y + 14y^2) \div (-7)$

9. Write the multiplication sentence modelled by each rectangle.

a)  $\frac{3d+4}{4y+6}$

b)



c)



10. Multiply.

a)  $v(3v + 1)$

b)  $3c(5c + 2)$

c)  $(8 + 4y)(6y)$

d)  $5p(-5 - 2p)$

e)  $(7k - 3)(-m)$

f)  $(-1 - 10r)(-r)$

11. Divide.

a)  $(6x + 3) \div 3$

b)  $(14w - 7) \div -7$

c)  $(-15 - 10g) \div 5$

d)  $(8z^2 + 4z) \div 2z$

e)  $(12c^2 - 6c) \div 3c$

f)  $(9xy - 6x) \div -3x$

12. Expand the following using FOIL.

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

b)  $(2a - 5)(3a + 1)$

c)  $2(7 - v)(-v + 3)$

d)  $(x + 0.5)(x - 0.3)$

BONUS

1.  $2x(3x - 1)(x + 5) - (x + 2)^2$

2. Find the area

