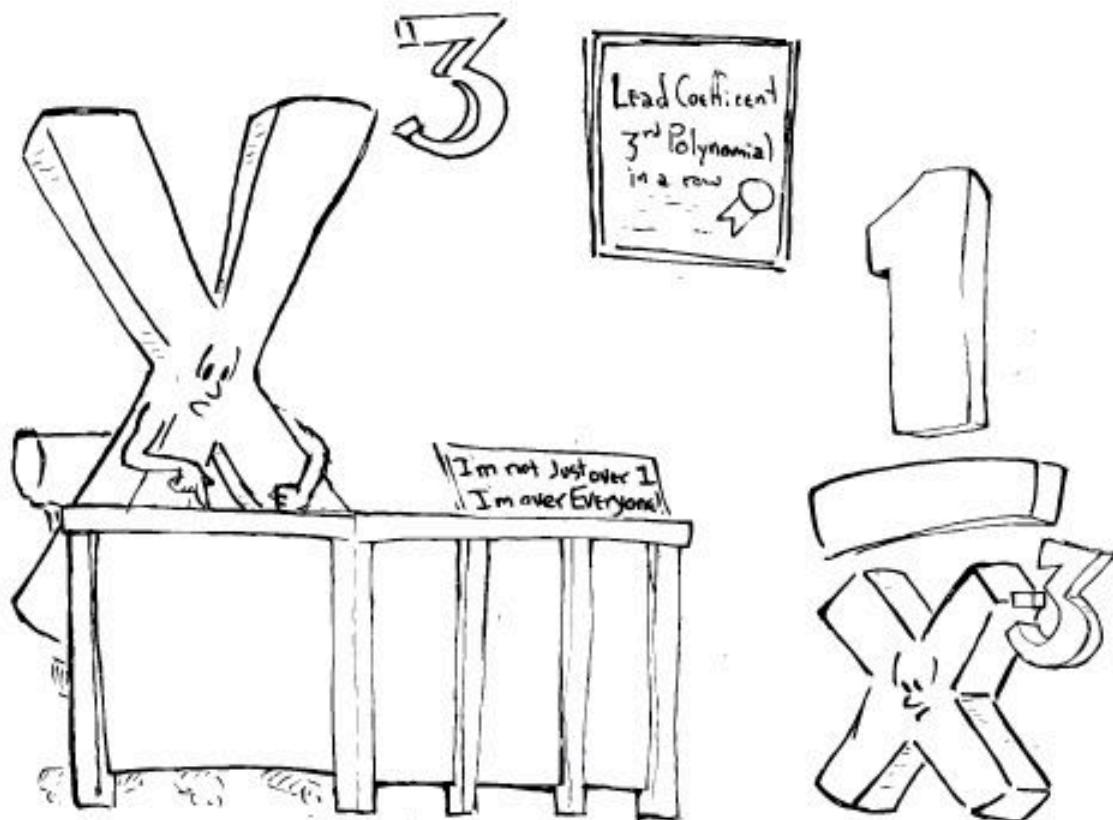


Unit 1 - Algebra

Chapter 3 - Polynomials WORKBOOK

MPM1D



Mark my words! You harness that negative power of yours,
and you can make it to the top just like me!

Chapter 3 Worksheet Checklist

Worksheet	Check ✓
3.2 – Work with Exponents	
3.3 – Exponent Laws Worksheet #1	
3.3 – Exponent Laws Worksheet #2	
Kuta – More Properties of Exponents (optional)	
3.4 – Communicate with Algebra	
3.5 – Collect Like Terms	
3.6 – Add and Subtract Polynomials	
3.7 – Distributive Property	
Chapter 3 Review - Polynomials	
Chapter 3 Practice Test	

Mark /10	0-2	3-5	6-8	9-10
Work completion for chapter 3	Little to know homework done throughout chapter.	Some homework completed. Solutions are unorganized or not shown in full.	Most homework completed. Solutions are clear and organized.	All homework completed accurately. Solutions are well organized and shown in full.

Mark /4	1	2	3	4
In Class Work for Chapter 3	Class time not used well for work completion. Inattentive during lessons. Need to improve at limiting distractions.	Some work completed during class. Sometimes distracted during lessons.	Works well during class. Minimal distractions. Good attention during lessons.	Always uses class time efficiently. Pays attention and contributes to lessons.

Comments:

3.2 – Work With Exponents Worksheet

MPM1D

1. What is the base of each power?

a) 5^2

b) 2^3

c) $(-3)^4$

d) -3^4

e) $\left(\frac{2}{3}\right)^2$

f) 2.1^2

2. Write each expression as a power (do not evaluate)

a) $6 \times 6 \times 6 \times 6 \times 6 \times 6 \times 6$

b) 9×9

c) $0.4 \times 0.4 \times 0.4$

d) $(-7)(-7)(-7)(-7)(-7)$

e) $(-1.3)(-1.3)(-1.3)(-1.3)$

f) $\left(\frac{2}{5}\right) \times \left(\frac{2}{5}\right) \times \left(\frac{2}{5}\right) \times \left(\frac{2}{5}\right)$

3. Write each power in expanded form, then evaluate

a) 3^4

b) 5^3

c) $(-2)^2$

d) -3^4

e) $\left(\frac{1}{4}\right)^2$

f) 0.4^3

4. Evaluate

a) 6^3

b) 2^7

c) -4^2

d) $(-2)^6$

e) 1^{12}

f) $\left(-\frac{4}{5}\right)^2$

5. Use the correct order of operations to evaluate each expression.

a) $2^4 + 3^2$

b) $6^3 - 6$

c) $(2 + 5)^2$

d) $(2^2 + 5^2)$

e) $6\left(\frac{1}{3}\right)^2$

f) $8^2 \div 2^4$

6. Evaluate each expression for the given values of the variables.

a) $2x^2 + 5$ for $x = 3$

b) $m^2 + m - 4$ for $m = 3$

c) $x^2 - y^2$ for $x = 7, y = 5$

7. Substitute the given values into each expression. Then, evaluate the expression. Round your answers to one decimal place where necessary.

a) $6s^2$

$s = 5$

b) πr^2

$r = 2.5$

c) $a^2 + b^2$

$a = 3, b = 4$

d) $\pi r^2 h$

$r = 2.3, h = 5.2$

e) $\frac{4}{3}\pi r^3$

$r = 1.5$

f) $x^2 - 2x - 24$

$x = -6$

3.3 – Exponent Laws Worksheet #1

MPM1D

1. Write each expression as a single power and then evaluate.

a) $7^2 \times 7^4$

b) $3^5 \times 3^3$

c) 5×5^2

d) $3^2 \times 3^4 \times 3^3$

e) $(-2)^2 \times (-2)^3$

f) $(-1)^3 \times (-1)^2 \times (-1)$

g) $0.5^3 \times 0.5^2$

h) $\left(\frac{1}{2}\right) \times \left(\frac{1}{2}\right)^3$

2. Write each expression as a single power and then evaluate.

a) $8^6 \div 8^4$

b) $5^5 \div 5^3$

c) $7^7 \div 7^2$

d) $4^8 \div 4^5 \div 4$

e) $(-9)^7 \div (-9)^6$

f) $0.1^6 \div 0.1^4$

g) $(-0.3)^4 \div (-0.3)$

h) $\left(\frac{2}{3}\right)^5 \div \left(\frac{2}{3}\right)^3$

3. Write each expression as a single power and then evaluate.

a) $(2^2)^4$

b) $(6^2)^2$

c) $(3^3)^2$

d) $[-2]^4]^3$

e) $[-1]^8]^6$

f) $[-1]^5]^7$

g) $(0.3^2)^2$

h) $\left[\left(\frac{2}{5} \right)^2 \right]^2$

4. Use the exponent laws to simplify each expression. Then, evaluate.

a) $4^3 \times 4^4 \div 4^5$

b) $8^7 \div 8^7 \times 8$

c) $\frac{9^6 \times 9^3}{9^7}$

d) $\frac{6^5 \times 6^2}{6 \times 6^3}$

e) $(2^4)^2 \times 2^3$

f) $\frac{\left(3^2 \right)^4 \times 3^3}{3^8}$

g) $0.2^6 \times 0.2^5 \div (0.2^2)^5$

h) $[(-4)^3]^4 \div [(-4)^2]^5$

5. Simplify.

a) $b^5 \times b^3$

b) $p^4 \times p$

c) $w^5 \div w^2$

d) $x^8 \div x^4$

e) $(m^5)^2$

f) $(k^2)^3 \times k^2$

g) $g^5 \times g^5 \div g^7$

h) $(a^6)^3 \div (a^5)^2$

5. Simplify

a) $4x^3 \cdot 2x^3$

b) $\frac{8x^{10}}{6x^2}$

c) $(3y^2)^3$

d) $\frac{(x^2)^4 \cdot 3x^5}{6x^{10}}$

3.3 – Exponent Laws Worksheet #2

MPM1D

Simplify the following expressions, and then evaluate where possible:

$$1. \quad (x^7)(x^3)(x^6)$$

$$5. \quad [(-1)^3]^3$$

$$2. \quad 5^9 \div 5^6$$

$$6. \quad 4^6 \div 4^9$$

$$3. \quad (x^3)^5$$

$$7. \quad 2n^4 \cdot 5n^4$$

$$4. \quad (y^3)^2 (y^5)$$

$$8. \quad \frac{x^4 x^7}{x^{11}}$$

$$9. \quad 9xy^2 \cdot 3x^5y^2$$

$$13. \quad \frac{10p^4}{6p^2}$$

$$10. \quad (2b^2)^4$$

$$14. \quad \frac{4y^4}{14yx^8}$$

$$11. \quad \frac{-3r^3}{3r}$$

$$15. \quad \frac{16yx^4}{6x^8y^2}$$

$$12. \quad 7v^3 \cdot 10u^3v^5 \cdot 2uv^3$$

$$16. \quad \frac{(8x^3)(4xy^3)}{2x^4 \cdot 14y^3}$$

17. Consider the expression $\frac{(-3m^2n)(4m^3n^2)}{(2m^4n^2)(3mn)}$

a) Substitute $m = 4$ and $n = -3$ into the expression and evaluate it:

b) Simplify the original expression using the exponent laws:

c) What are the advantages and disadvantages of the two methods?

18. Your job: Invent an expression containing exponents that, when simplified, is equal to:

$$2p^2q$$

- Show all the steps required to prove that your expression simplifies correctly.
- The simplification should include all three exponent laws if possible. (product, quotient and power of a power).
- You are free to introduce any variables or operations you wish, as long as your original expression simplifies to the above expression

More Properties of Exponents

Date_____ Period____

Simplify. Your answer should contain only positive exponents.

1) $(x^{-2}x^{-3})^4$

2) $(x^4)^{-3} \cdot 2x^4$

3) $(n^3)^3 \cdot 2n^{-1}$

4) $(2v)^2 \cdot 2v^2$

5) $\frac{2x^2y^4 \cdot 4x^2y^4 \cdot 3x}{3x^{-3}y^2}$

6) $\frac{2y^3 \cdot 3xy^3}{3x^2y^4}$

7) $\frac{x^3y^3 \cdot x^3}{4x^2}$

8) $\frac{3x^2y^2}{2x^{-1} \cdot 4yx^2}$

9) $\frac{x}{(2x^0)^2}$

10) $\frac{2m^{-4}}{(2m^{-4})^3}$

11) $\frac{(2m^2)^{-1}}{m^2}$

12) $\frac{2x^3}{(x^{-1})^3}$

$$13) \ (a^{-3}b^{-3})^0$$

$$14) \ x^4y^3 \cdot (2y^2)^0$$

$$15) \ ba^4 \cdot (2ba^4)^{-3}$$

$$16) \ (2x^0y^2)^{-3} \cdot 2yx^3$$

$$17) \ \frac{2k^3 \cdot k^2}{k^{-3}}$$

$$18) \ \frac{(x^{-3})^4 x^4}{2x^{-3}}$$

$$19) \ \frac{(2x)^{-4}}{x^{-1} \cdot x}$$

$$20) \ \frac{(2x^3z^2)^3}{x^3y^4z^2 \cdot x^{-4}z^3}$$

$$21) \ \frac{(2pm^{-1}q^0)^{-4} \cdot 2m^{-1}p^3}{2pq^2}$$

$$22) \ \frac{(2hj^2k^{-2} \cdot h^4j^{-1}k^4)^0}{2h^{-3}j^{-4}k^{-2}}$$

More Properties of Exponents

Date _____ Period ____

Simplify. Your answer should contain only positive exponents.

1) $(x^{-2}x^{-3})^4$

2) $(x^4)^{-3} \cdot 2x^4$

$\frac{1}{x^{20}}$

$\frac{2}{x^8}$

3) $(n^3)^3 \cdot 2n^{-1}$

$2n^8$

4) $(2v)^2 \cdot 2v^2$

$8v^4$

5) $\frac{2x^2y^4 \cdot 4x^2y^4 \cdot 3x}{3x^{-3}y^2}$

$8x^8y^6$

6) $\frac{2y^3 \cdot 3xy^3}{3x^2y^4}$

$\frac{2y^2}{x}$

7) $\frac{x^3y^3 \cdot x^3}{4x^2}$

$\frac{x^4y^3}{4}$

8) $\frac{3x^2y^2}{2x^{-1} \cdot 4yx^2}$

$\frac{3xy}{8}$

9) $\frac{x}{(2x^0)^2}$

$\frac{x}{4}$

10) $\frac{2m^{-4}}{(2m^{-4})^3}$

$\frac{m^8}{4}$

11) $\frac{(2m^2)^{-1}}{m^2}$

$\frac{1}{2m^4}$

12) $\frac{2x^3}{(x^{-1})^3}$

$2x^6$

13) $(a^{-3}b^{-3})^0$

1

14) $x^4y^3 \cdot (2y^2)^0$

 x^4y^3

15) $ba^4 \cdot (2ba^4)^{-3}$

 $\frac{1}{8b^2a^8}$

16) $(2x^0y^2)^{-3} \cdot 2yx^3$

 $\frac{x^3}{4y^5}$

17) $\frac{2k^3 \cdot k^2}{k^{-3}}$

 $2k^8$

18) $\frac{(x^{-3})^4 x^4}{2x^{-3}}$

 $\frac{1}{2x^5}$

19) $\frac{(2x)^{-4}}{x^{-1} \cdot x}$

 $\frac{1}{16x^4}$

20) $\frac{(2x^3z^2)^3}{x^3y^4z^2 \cdot x^{-4}z^3}$

 $\frac{8x^{10}z}{y^4}$

21) $\frac{(2pm^{-1}q^0)^{-4} \cdot 2m^{-1}p^3}{2pq^2}$

 $\frac{m^3}{16p^2q^2}$

22) $\frac{(2hj^2k^{-2} \cdot h^4j^{-1}k^4)^0}{2h^{-3}j^{-4}k^{-2}}$

 $\frac{h^3j^4k^2}{2}$

3.4 – Communicate With Algebra Worksheet

MPM1D

1. Identify the coefficient and variable part for each term

Term	Coefficient	Variable
a) $2y$		
b) $-3x$		
c) mn		
d) $\frac{1}{2}x^2$		
e) $-w^2$		
f) $-0.4gh^3$		

2. $7x^2 + 3xy + 4y^2$ is a:

- A) monomial B) binomial C) trinomial D) term

3. Classify each polynomial by the number of terms.

- a) $-2x$ b) $6y^2 + 2y - 1$ c) $a - \frac{1}{2}b$

d) $3u^2 - uv + 2v^2$ e) $3k^2 - \frac{1}{2}k$ f) $m + 0.2n - 0.3 + mn$

4. The degree of $4u - 5u^2 + 9$ is:

- A) 1 B) 2 C) 3 D) 4

5. State the degree of each term.

a) $5x^2$

b) $-6y$

c) -3

d) u^2v^4

e) $\frac{1}{3}x^2y^3$

f) $0.2a^2b$

6. State the degree of each polynomial.

a) $3x - 4$

b) $y^2 + 3y - 1$

c) $m - 2m^3$

d) $a^3b^2 - 8a^2b^5$

e) $2x^2y^4 - \frac{2}{5}xy^3$

7. In a TV trivial show, a contestant receives 500 points for a correct answer and loses 200 points for an incorrect answer. Let c represent the number of correct answers and i represent the number of incorrect answers. Which expression describes a contestant's total points?

A) $500c + 200i$

B) $500c - 200i$

C) $500i + 200c$

D) $500i - 200c$

8. Substitute the given values and evaluate each expression.

a) $3x + 5$ if $x = 5$

b) $4y + 4$ if $y = -2$

c) $a^2 + 2b - 7$ if $a = 4, b = 1$

d) $2m^2 - 3n + 8$ if $m = -2, n = 5$

9. Meredith has a summer job at a fitness club. She earns a \$5 bonus for each student membership and a \$7 bonus for each adult membership she sells.

a) Write a polynomial expression that describes Meredith's total bonus.

b) Identify the variable and the coefficient of each term and explain what they mean.

Term	Variable	Coefficient	Meaning

c) How much will Meredith's bonus be if she sells 12 student memberships and 10 adult memberships?

10. An arena charges \$25 for gold seats, \$18 for red seats, and \$15 for blue seats.

a) Write an expression that describes the total earnings from seat sales.

b) Identify the variable and the coefficient of each term and explain what they mean.

Term	Variable	Coefficient	Meaning

c) How much will the arena earn if it sells 100 gold seats, 200 blue seats, and 250 red seats?

11. On a multiple-choice test, you earn 2 points for each correct answer and lose 1 point for each incorrect answer.

a) Write an expression for a student's total score.

b) Maria answered 15 questions correctly and 3 incorrectly. Find Maria's total score.

3.5 – Collect Like Terms

MPM1D

1. Which polynomial contains no like terms?

- A) $2x + 5 - 3x + 2xy$
- B) $3x^2 + 3xy + 3$
- C) $4 - 9x + 9y + 3$
- D) $-4a^3 + 5b - 2a^2 + 7b$

2. Classify each pair of terms as either like or unlike.

- | | | |
|----------------------|-----------------------------|--------------------------------|
| a) $2x$ and $-5x$ | b) $3y$ and $3z$ | c) $-x^2$ and $\frac{1}{2}x^2$ |
| d) $4a^2$ and $3a^3$ | e) $2ab$ and $3a^2$ | f) $5x^2y$ and $-2xy^2$ |
| g) $3uv$ and $2vu$ | h) $9p^2q^3$ and $-4q^3p^2$ | |

3. Simplify where possible

- | | | | |
|--------------|--------------|-------------------|------------------|
| a) $3x + 6x$ | b) $2m + 5n$ | c) $5h + 8h + 2h$ | d) $7u + 4u + u$ |
|--------------|--------------|-------------------|------------------|

4. Simplify if possible

- | | | | |
|--------------|-------------|--------------|------------|
| a) $4k - 2k$ | b) $8n - n$ | c) $3z - 7z$ | d) $p - 6$ |
|--------------|-------------|--------------|------------|

5. Simplify by collecting like terms.

a) $3x + 5 + 2x + 1$

b) $2k + 3m + 4m + 6k$

c) $8n + 5 - 3n - 2$

6. Simplify

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

b) $2x^2 + 7x + 4x^2 + x$

c) $7m + 6m^2 - 2m + m^2$

d) $3k - 5 + 8 - k + 1 - 4k$

e) $-3u + 2 - u^2 - 5 + 3u + 2u^2 - 3$

7. Simplify

a) $2a^2 - 3ab - 6 + 4b^2 + 7 + 5ab - 3b - 2a^2$

b) $3mn + 6m^2 - n^2 + 3 - m^2 - 3mn + 2n^2 - 4$

8. The length of a rectangular field is three times its width.

a) Write an expression for the perimeter of the field.

b) Find the perimeter if the field is 300 m wide.

c) Find the length and width of the field if the perimeter is 1600 m.

9 (extension).

a) An equilateral triangle has an unknown side length, x . Write a simplified expression for its perimeter.

b) A right isosceles triangle has two sides equal to x . Which triangle, the equilateral triangle in part a) or the right isosceles triangle, has the greater perimeter? Use algebraic reasoning.

3.6 – Add and Subtract Polynomials

MPM1D

1. $(2x - 7) + (3x + 8)$ simplified is:

- A) $5x - 15$
- B) $5x - 1$
- C) $5x + 1$
- D) $6x - 56$

2. Simplify by removing brackets and collecting like terms

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

d) $(5 - 3d) + (d - 6)$ e) $(4k - 3) + (5 + k) + (5k + 3)$

3. $(3x - 5) - (x - 4)$ simplified is:

- A) $2x - 1$
- B) $2x + 1$
- C) $2x - 9$
- D) $2x + 9$

4. Simplify

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

b) $(8x + 5) - (x + 5)$

c) $(6m + 4) - (2m + 1)$

d) $(4v - 9) - (8 - 3v)$

e) $(9 - 6w) - (-6w - 8)$

f) $(5h + 9) - (-5h + 6)$

5. Simplify

a) $(7x - 9) + (x - 4)$

b) $(8c - 6) - (c + 7)$

c) $(3p^2 - 8p + 1) + (9p^2 + 4p - 1)$

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

$$\text{e)} (4x - 3) + (x + 8) - (2x - 5)$$

$$\text{f)} (2uv^2 - 3v) - (v + 3u) + (4uv^2 - 9u)$$

6. A women's basketball team gives their players a bonus of \$100 on top of their base salary for every 3-point basket. Data for some of the team's players are given.

Player	Base Salary (\$1000s)	3-Point Baskets
Gomez	50	25
Henreid	40	20
Jones	100	44

a) Find a simplified expression for the total earnings for these three players.

b) Find the total earnings for these three players.

7. A swimming pool manufacturer installs rectangular pools whose length is twice the width, plus 5 m.

a) Draw a diagram of the pool and label the length and width using algebraic expressions.

b) Find a simplified algebraic expression that represents the perimeter of the pool.

c) What is the perimeter if the width of the pool is 6 m?

3.7 – Distributive Property

MPM1D

1. Which expression shows $-3(x + 5)$ expanded?

- A) $-3x + 15$
- B) $-3x + 5$
- C) $-3x - 8$
- D) $-3x - 15$

2. Expand using the distributive property

a) $4(x + 2)$ b) $5(k - 3)$ c) $-2(y + 1)$

d) $-8(2 - d)$ e) $5(2t - 3)$ f) $-(4y - 5)$

3. Expand

a) $y(y - 4)$ b) $r(r + 5)$ c) $x(2x - 5)$

d) $q(-4q + 8)$ e) $z(-3z + 2)$ f) $m(-m - 5)$

4. Expand

a) $2b(3b - 5)$ b) $-4w(3w - 1)$

c) $2x(-4x + 3)$ d) $(4k + 7)(-3k)$

5. Expand using distributive property

a) $(n - 5) \times 4$

b) $(7m + 6)(-4)$

c) $(7 + c)(3c)$

d) $(4k + 7)(-3k)$

6. Expand

a) $2(a^2 + 5a + 3)$

b) $4x(x^2 + x - 3)$

c) $-5y(3y^2 - 7y - 2)$

d) $(2y^2 + 3y - 1)(4y)$

7. Expand and Simplify

a) $3(x + 2) + 4(x - 5)$

b) $-4(y + 1) + 2(2y - 3)$

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

d) $4(w - 2) - 2(2w + 7)$

8. Expand and Simplify

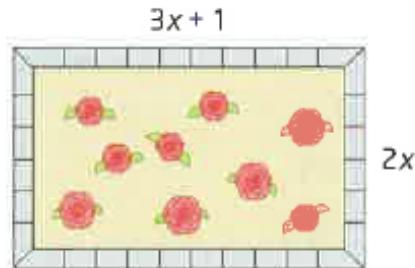
a) $3[x + 2(x - 4)]$

b) $3[2k - (2 + k)]$

c) $2[-h - 2(h - 1)]$

9. A garden has dimensions as shown:

a) Write a simplified expression to represent the perimeter.



b) Write a simplified expression for the area.

10. Expand and simplify

a) $3(y - 2) - 2(4 - 2y) + (6 - 7y)$

b) $4k(k - 3) - 2(k^2 - 3k + 4) - (k^2 - 5)$

c) $\frac{1}{3}(3a + 2) + \frac{1}{4}(4a - 2)$

d) $\frac{1}{2}(x - 2y) + \frac{1}{3}(3y - 2x)$