

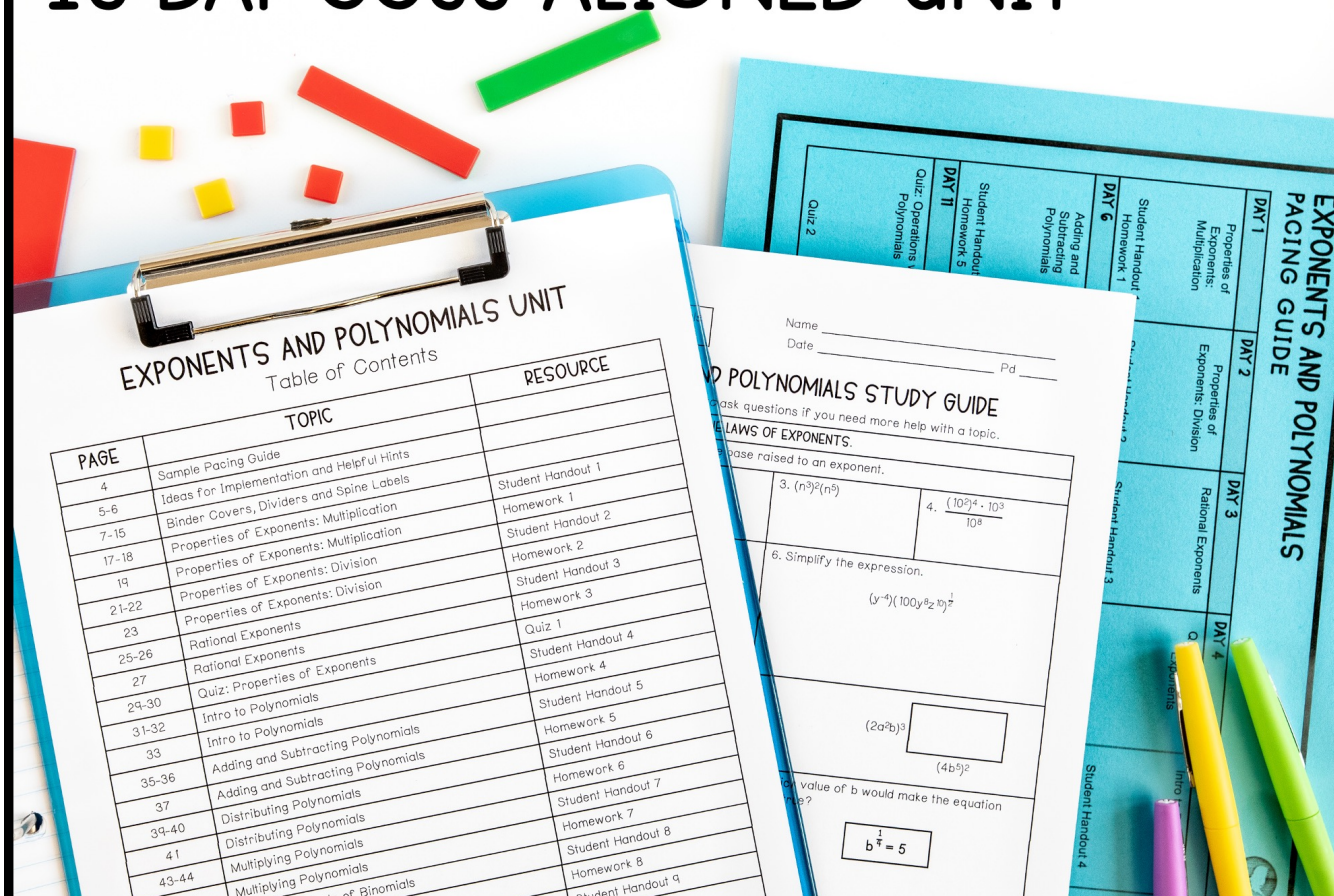
learning focus:

- ✓ add, subtract, multiply, and divide polynomials of degree one and degree two
- ✓ simplify expressions using laws of exponents
- ✓ rewrite a binomial as a difference of two squares

EXPONENTS & POLYNOMIALS UNIT

13 DAY CCSS-ALIGNED UNIT

**ALG
1**



A MANEUVERING THE MIDDLE® RESOURCE

EXPONENTS & POLYNOMIALS

**ALG
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a 13 day CCSS-aligned unit

CCSS: A.APR.1, A.SSE.2, N.RN.1, N.RN.2

**ready-to-go, scaffolded
student materials**

EXPONENTS AND POLYNOMIALS UNIT

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student friendly + real-world
application

graphic
organizers

Unit: Exponents and Polynomials
Student Handout 4

Name _____
Date _____ Pd _____

INTRO TO POLYNOMIALS

The word "polynomial" is made up of "poly" which means _____ and "nomial" which means _____, so its literal meaning is _____. In the tables below we'll discuss more specifically what makes something a polynomial and ways we can describe polynomials.

POLYNOMIALS

- A polynomial is _____
- A polynomial can be _____
- A polynomial can be _____

Based on the definition above, sort the letters into a polynomial. If the expression does not represent a polynomial, write the reason for not being a polynomial.

A. $12x^{-3}$
B. $6xy^5 - 2x^3 + 4$
C. $-3x + \frac{x}{y} - 11y$
D. $5x^2 - 1.2x + 3$
E. $\frac{9 + x}{2}$

DEGREE OF A POLYNOMIAL

- The _____ of a polynomial is the highest power of the variable in the polynomial.
- The standard form of a polynomial is written in descending order of the degree of the terms.

Based on the definitions above and your knowledge of exponents, label the parts of the polynomial.

Rewrite each of the polynomials in standard form.

1. $15 + 4x^5 + 7x^2$

Standard: _____
Degree: _____

CLASSIFYING POLYNOMIALS

A polynomial is classified by the number of _____ it has in its most simplified form.

- 1 term is a _____ (Ex: _____)
- 2 terms is a _____ (Ex: _____)
- 3 terms is a _____ (Ex: _____)

Determine if each expression is a polynomial. If not, explain why.

EXPRESSION	POLYNOMIAL?
$5x^2 - 14x + 15$	
$x^{-5} + 14$	
$x - 2$	
18	
$\frac{x^7 + 5}{x}$	

Algebra tiles can be helpful in visualizing polynomials. Sketch a model of the polynomial below.

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

5. Mateo wrote a binomial on the board. Each statement is true or false.

- a. Mateo's expression must have a degree of two.
- b. Mateo's expression must have a coefficient of two.
- c. Mateo's expression must have two terms.

Summarize today's lesson:

Unit: Exponents and Polynomials
Homework 4

Name _____
Date _____ Pd _____

INTRO TO POLYNOMIALS

Six students wrote expressions in their algebra class. Use the clues to determine which student wrote each of the expressions shown below. Write the student's name under their expression.

CLUE #1

Reanna's expression is a binomial degree three.

CLUE #2

Denver's expression is a binomial degree one.

CLUE #3

Lois' expression is a monomial degree two.

CLUE #4

Edgar's expression is not a polynomial.

CLUE #5

Amalia's expression is a trinomial degree four.

CLUE #6

Ricardo's expression is a trinomial degree two.

1. $-3x^2$	2. $2x^3 + 15$	3. $4x^2 + 5x - 13$
4. $x + 2$	5. $-x^4 - 2x + 3$	6. $4x^3 - 11$

Use your knowledge of polynomials to answer 7 and 8.

7. Write the polynomial in standard form that is represented by the algebra tiles.

8. Sketch a model using algebra tiles of the polynomial shown below.

$-3x^2 + 4x + 5$

grade level
modeling

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streamline your planning
process with unit overviews

EXPONENTS AND POLYNOMIALS OVERVIEW



STANDARDS

A.APR.1 Understand that polynomials form a system analogous to the integers, namely, they are closed under the operations of addition, subtraction, and multiplication; add, subtract, and multiply polynomials.

A.SSE.2 Use the structure of an expression to identify ways to rewrite it.

N.RN.1 Explain how the definition of the meaning of rational exponents follows from extending the properties of integer exponents to those values, allowing for a notation for radicals in terms of rational exponents. For example, we define $5^{1/3}$ to be the cube root of 5 because we want $(5^{1/3})^3 = 5(1/3)^3$ to hold, so $(5^{1/3})^3$ must equal 5.

N.RN.2 Rewrite expressions involving radicals and rational exponents using the properties of exponents.

BIG IDEAS

- Exponent properties and laws
- Polynomials can be added, subtracted, and multiplied
- Special products of binomials

ESSENTIAL QUESTION

- What are the properties of exponents?
- How do rational exponents relate to radicals?
- How can algebra tiles be used to represent operations with polynomials?
- What are the steps to add and subtract polynomials?
- What determines if two binomials are factors of a polynomial?
- Why is simplifying expressions important?



key vocabulary



vertical alignment



sample
pacing
calendar

EXPONENTS AND POLYNOMIALS PACING GUIDE



DAY 1	DAY 2	DAY 3	DAY 4	DAY 5
Properties of Exponents: Multiplication Student Handout 1 Homework 1	Properties of Exponents: Division Student Handout 2 Homework 2	Rational Exponents Student Handout 3 Homework 3	Quiz: Properties of Exponents	Intro to Polynomials Student Handout 4 Homework 4
DAY 6	DAY 7			
Adding and Subtracting Polynomials Student Handout 5 Homework 5	Distributing Polynomials Student Handout 6 Homework 6			
DAY 11	DAY 12			
Quiz: Operations with Polynomials	Exponents and Polynomials Study Guide Review			

EXPONENTS AND POLYNOMIALS OVERVIEW



TOPIC	TEACHING TIPS
Properties of Exponents	<ul style="list-style-type: none">This is a link to an "Exponents Battleship" game that could be used as a fun practice for your students. https://www.quia.com/ba/53930.htmlTest students' knowledge of exponent properties by having students create their own expressions that simplify to a given exponent. For example, "Create an expression using both multiplication and division properties of exponents that simplifies to x^2."When teaching rational exponents, reinforce the property of the rational exponent by saying "power over root" or consider writing the visual shown at the right.<div>$a^{\frac{p}{q}} = \sqrt[q]{a^p}$</div>Practicing simplifying expressions can often seem "dry." Consider mixing it up by allowing your students to write with dry erase markers on small dry erase boards, or even on their desk. Be sure the marker will erase from your specific desks, first. The desks we had always did, and students thought it was great that they were allowed to write on them.If students are simplifying an algebraic expression using properties of exponents, they can always check their solution by plugging in a value (other than one) for the variable in the original and simplified expression and confirming the two expressions yield the same result.
Operations with Polynomials	<ul style="list-style-type: none">Plan to spend time familiarizing students with algebra tiles. Before using tiles for the first time, consider posing the question, "If we know that this tile represents an x, what would a tile that represents x^2 look like?"Consider extending the use of algebra tiles to further conceptualize adding, subtracting and multiplying polynomials.Be sure that your students have a strong understanding of both identifying/combining like terms and integer rules to help avoid most common mistakes with polynomial operations.When teaching special products, consider having a "timed race" challenge to encourage students to use patterns learned to multiply special cases of binomials.The lesson on dividing polynomials is included to reinforce the concept of multiplying polynomials. Dividing polynomials is not included in the standards, therefore use teacher discretion as to whether to include it in the unit.

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teaching
ideas



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unit study guide + assessments



quizzes



editable unit test

Unit: Exponents and Polynomials
Quiz 1

Name _____
Date _____ Pd _____

QUIZ: PROPERTIES OF EXPONENTS
Show all work as you answer each question below. Record your solutions in the box at the right.

1. Which of the following expressions is equivalent to $(x^5)^{-2}$?

a. x^3 b. $\frac{1}{x^{-10}}$
c. $\sqrt{x^5}$ d. x^{-10}


2. A cylinder has a volume of $20x^6y^4$ units³ and an area of $5x^3y^2$ units², which of the following is the height of the cylinder? (Hint: $V = Bh$)

a. $100x^3y^6$ b. $4x^3y^2$
c. $15x^3y^2$ d. $4x^3y^2$

For 3-5, simplify the expressions.

3. $(2fg)^3$ 4. $(x^5)^3$

6. A summer camp is building a rectangular wooden sign to post at the entrance of the camp. The dimensions of the sign are shown below. Write an expression for the area of the sign.



Unit: Exponents and Polynomials
Review

Name _____
Date _____ Pd _____

EXPONENTS AND POLYNOMIALS STUDY GUIDE
Solve each problem below. Be sure to ask questions if you need more help with a topic.

I CAN SIMPLIFY EXPRESSIONS USING THE LAWS OF EXPONENTS.

In 1-4, rewrite the expression as a single base raised to an exponent.

1. $x^7 \cdot x^3$ 2. $\frac{4^9}{4^3}$

5. Simplify the expression.

$\frac{8m^6n^2}{4m^{-3}} \cdot \frac{12(mn)^3}{n^2}$

7. Write an expression to represent the perimeter of the rectangle with the dimensions shown.

8. The expression $(x^{14})(x^{-5})^4$ is equivalent to x^n . What is the value of n ?

I CAN ADD AND SUBTRACT POLYNOMIALS.

10. Simplify the expression.

$(-9x^2 - 5x + 10) + (12x - x^2)$

ALGEBRA 1 CURRICULUM

EXPONENTS & POLYNOMIALS

UNIT SIX: ANSWER KEY

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answer keys
included

