

# ALGEBRA I

Unit  
6

The collage features several worksheets with the following content:

- MONOMIALS**: Notes/Examples include "A monomial is a  $a$ " and "Examples: Monomials with the same...".
- ADDING & SUBTRACTING MONOMIALS**: Notes/Examples include "To add or subtract monomials, DO NOT CHANGE the variable part." and "Directions: Add or subtract." Example:  $1. 17x - 25x$ .
- POWERS OF MONOMIALS**: Notes/Examples include "To raise a monomial to a power, raise each coefficient and each variable to the power." and "Directions: Simplify." Example:  $1. (x^2)^5$ .
- DIVIDING MONOMIALS**: Notes/Examples include "To divide monomials, use the quotient rule." and "Directions: Find each quotient." Examples:  $1. \frac{x^3}{x^2}$ ,  $2. \frac{k^{12}}{k^2}$ ,  $3. \frac{m^3}{m^2}$ .
- NEGATIVE EXPONENTS**: Notes/Examples include "Negative exponents can be written using positive exponents." and "Directions: Rewrite each expression using positive exponents." Examples:  $1. x^{-5}$ ,  $4. w^7 \cdot w^{-9}$ ,  $6. 6x^9 - 3x^{-3}$ ,  $8. (8p^5)^{-2}$ .
- EXPONENTIAL FUNCTIONS**: Notes/Examples include "Exponential functions are defined by an equation of the form  $y = ab^{cx} + d$ ." and "If  $b > 1$ , the function is an increasing function and if  $b < 1$ , the function is a decreasing function." Example:  $y = 2(3)^x - 4$ .
- EXPONENTIAL GROWTH**: Notes/Examples include "Occurs when a quantity exponentially increases over time." and "Formula:  $A = P(1 + r)^t$ ". Example: "1. The original value of an investment is \$1400, and the value increases by 9% each year. Use an exponential growth function to find the value of the investment after 5 years."

## EXPONENTS & EXPONENTIAL FUNCTIONS

NOTES • HOMEWORK • QUIZZES • TEST

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## Unit 6 - Exponents & Exponential Functions: Sample Unit Outline

	<b>TOPIC</b>	<b>HOMEWORK</b>
<b>DAY 1</b>	Monomials: Add, Subtract, Multiply (Product Rule)	HW #1
<b>DAY 2</b>	Power Rule & Geometric Applications	HW #2
<b>DAY 3</b>	Quotient Rule	HW #3
<b>DAY 4</b>	<b>Quiz 6-1</b>	None
<b>DAY 5</b>	Negative Exponents	HW #4
<b>DAY 6</b>	Review of All Rules (Maze Activity)	HW #5
<b>DAY 7</b>	Scientific Notation	HW #6
<b>DAY 8</b>	<b>Quiz 6-2</b>	None
<b>DAY 9</b>	Graphing Exponential Functions	HW #7
<b>DAY 10</b>	Exponential Growth & Decay Applications	HW #8
<b>DAY 11</b>	Geometric Sequences	HW #9
<b>DAY 12</b>	<b>Quiz 6-3</b>	None
<b>DAY 13</b>	Simplifying Radicals: Square and Cube Roots	HW #10
<b>DAY 14</b>	Monomial Square Roots	HW #11
<b>DAY 15</b>	Unit 6 Review	Study for Test
<b>DAY 16</b>	<b>UNIT 6 TEST</b>	None

See sample images of the pages on the next page.

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

Topic: \_\_\_\_\_

Main Ideas/Questions Notes/Examples

**MONOMIALS**

- A monomial is a \_\_\_\_\_
- Examples: \_\_\_\_\_
- Monomials with \_\_\_\_\_

**ADDING & SUBTRACTING MONOMIALS**

- To add or subtract \_\_\_\_\_
  - DO NOT CHANGE \_\_\_\_\_
- Directions: Add or subtract.
- $17x - 25x$
  - $-15a^2bc + 6a^2bc$

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

Topic: \_\_\_\_\_ Class: \_\_\_\_\_

Main Ideas/Questions Notes/Examples

**Powers of Monomials**

To raise a monomial to a power, use the POWER RULE.

Directions: Simplify.

- $(x^2)^3$
- $(m^2n^4)^3$

Examples with \_\_\_\_\_

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

Topic: \_\_\_\_\_ Class: \_\_\_\_\_

Main Ideas/Questions Notes/Examples

**DIVIDING MONOMIALS**

To divide monomials, use the QUOTIENT RULE:

$$\frac{x^a}{x^b} = x^{a-b}$$

Directions: Find each quotient.

- $\frac{x^7}{x^3}$
- $\frac{k^{12}}{k^5}$
- $\frac{m^3}{m^7}$
- $\frac{a^4b^5}{a^2b^3}$
- $\frac{p^4q^6}{p^2q^4}$
- $\frac{x^8y^3z^2}{x^3y^2z}$

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

Topic: \_\_\_\_\_ Class: \_\_\_\_\_

Main Ideas/Questions Notes/Examples

**Negative Exponents**

Negative exponents can be rewritten using positive exponents using the NEGATIVE EXPONENT RULE:

$$x^{-a} = \frac{1}{x^a}$$

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

Topic: \_\_\_\_\_ Class: \_\_\_\_\_

Main Ideas/Questions Notes/Examples

**EXPONENTIAL FUNCTIONS**

Exponential functions are defined by an equation of the form  $y = ab^{cx+d}$ .

- If  $b > 1$ , the function is an \_\_\_\_\_ and is \_\_\_\_\_.
- If  $b < 1$ , the function is an \_\_\_\_\_ and is \_\_\_\_\_.

**ASYMPTOTE**

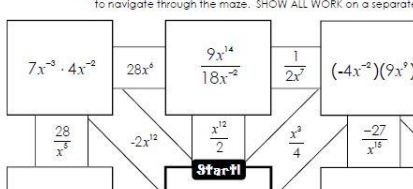
Directions: Classify as an exponential growth or decay, create a table of values and graph, then identify its key characteristics.

1.  $y = 2^x$

Growth / Decay

**Exponent Rules Maze**

Directions: Simplify the following monomials using the exponent rules to navigate through the maze. SHOW ALL WORK on a separate sheet of paper.



**EXPONENT RULES**

Name	Rule	Examples
<b>ADDING &amp; SUBTRACTING MONOMIALS</b>	<b>COMBINE LIKE TERMS!!!</b> (DO NOT CHANGE common variables and exponents!)	1. $9x^2y - 10x^2y = -x^2y$ 2. Subtract $61w$ from $81w$
<b>PRODUCT RULE</b>	$x^a \cdot x^b = x^{a+b}$	1. $h^2 \cdot h^6 = h^8$ 2. $(-2a^2b) \cdot (7a^3b) = -14a^5b^2$
<b>POWER RULE</b>	$(x^a)^b = x^{a \cdot b}$	1. $(x^2)^3 = x^6$ 2. $(-2m^5)^2 \cdot m^3 = 4m^{13}$ 3. $\frac{27x^9}{42x} = \frac{9x^8}{14}$

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

Topic: \_\_\_\_\_

Main Ideas/Questions Notes/Examples

**Exponential Growth**

Occurs when a quantity grows by a constant factor over time.

Formula:  $y = a(1+r)^t$

**Examples**

- The original value of an investment grows each year. Use an exponential function to find the value after 25 years.
- The cost of tuition at a college grows each year. Use an exponential function to find the cost after 10 years.
- The number of student athletes at a school grows at a rate of 8% per year. Use an exponential function to find the number of athletes after 5 years.
- Annual sales for a company grow 5% per year. Use an exponential function to find the sales after 12 years.
- The population of a small town grows 2% per year. Use an exponential function to find the population after 20 years.
- In 1985, there were 285 cell phone subscribers. In 2008, there were 185 million subscribers. Use an exponential function to find the number of subscribers in 2010.

Name: \_\_\_\_\_ Unit 6: Exponents & Exponential Functions

Date: \_\_\_\_\_ Bell: \_\_\_\_\_ Homework 11: Monomials

Simplify the following radicals. SHOW ALL WORK!

- |                          |                          |
|--------------------------|--------------------------|
| 1. $\sqrt{k^2}$          | 2. $\sqrt{m^2}$          |
| 3. $\sqrt{4a^2}$         | 4. $\sqrt{25x^2}$        |
| 5. $\sqrt{32x^2}$        | 6. $\sqrt{300y^2}$       |
| 7. $\sqrt{84w}$          | 8. $\sqrt{128c^3}$       |
| 9. $\sqrt{24a^2b^4}$     | 10. $\sqrt{81u^4v}$      |
| 11. $\sqrt{75p^2q^2}$    | 12. $\sqrt{100x^2y}$     |
| 13. $\sqrt{40m^4n^3}$    | 14. $\sqrt{96c^2d^2}$    |
| 15. $\sqrt{27ab^3}$      | 16. $\sqrt{56m^4n^3p^3}$ |
| 17. $\sqrt{150a^2b^2c}$  | 18. $\sqrt{45x^2y^2z^2}$ |
| 19. $\sqrt{72a^2b^2c^2}$ | 20. $\sqrt{98x^2y^2z^2}$ |

**Unit 6 Test Study Guide**  
(Exponents & Exponential Functions)

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

Date: \_\_\_\_\_ Per: \_\_\_\_\_

Topic 1: Exponential Rules

PRODUCT RULE	POWER RULE	QUOTIENT RULE	NEGATIVE EXPONENT RULE
$x^a \cdot x^b = x^{a+b}$	$(x^a)^b = x^{a \cdot b}$	$\frac{x^a}{x^b} = x^{a-b}$	$x^{-a} = \frac{1}{x^a}$

WHAT ABOUT ADDING AND SUBTRACTING MONOMIALS?

Topic 2: Simplifying Monomials

Simplify each expression completely. Final answer should contain only positive exponents.

- $6ab - 8ab$
- $-2xy^2 - 4xy + 6xy^2$
- Subtract  $-6b^4$  from  $8b^4$ .
- $-7n^4 \cdot 5n^2$
- $(5v^4)^2 \cdot 2v^3 \cdot v$
- $(-a^6b^2) + 9a^6b^2$
- $(-2y^4) \cdot (xy^3)^2 - 13x^2y^{10}$
- $\frac{p^2q^2r^2}{p^2s^2r^2}$
- $\frac{(-3x^6)^2}{5x^3 \cdot 3x^2}$
- $\left(\frac{4x^2y^2}{6xy}\right)^2$
- $\frac{7k^{-8} \cdot 3k^{-2}}{6k^2}$
- $\frac{-9m^8}{27n^{10}}$
- $\frac{a^{12}b^{-3}}{(ab)^{-4}}$
- $\frac{3}{4}m^4n^6 \cdot m^4n^6 - \left(\frac{1}{2}m^4n^6\right)^2$
- $(-4y^2)^2 \cdot (xy^3)^2 + 7x^2y^{10}$

Name: \_\_\_\_\_ Algebra I Unit 6 Test

Date: \_\_\_\_\_ Per: \_\_\_\_\_ Exponents & Exponential Functions

1. Simplify:  $-7a^2b - 2a^2b$

- A.  $-9$   
B.  $-9a^2b$   
C.  $-5a^2b$   
D.  $-5$

2. Simplify:  $2xy + 10x^2 - 9xy$

- A.  $10x^2 - 7$   
B.  $10x^2 + 11x^2y^2$   
C.  $10x^2 + 11xy$   
D.  $10x^2 - 7xy$

3. Simplify:  $p^2 \cdot p^6$

- A.  $p^8$   
B.  $2p^8$   
C.  $p^{12}$   
D.  $2p^{12}$

4. Simplify:  $(xy^3) \cdot (xy)^4$

- A.  $x^5y^7$   
B.  $x^4y^{12}$   
C.  $x^5y^7$   
D.  $x^5y^{12}$

5. Simplify:  $(3x^2y^3)^2$

- A.  $3x^4y^5$   
B.  $9x^4y^5$   
C.  $9x^4y^6$   
D.  $27x^4y^6$

6. Simplify:  $(-4c^2d)^2$

- A.  $8c^4d^2$   
B.  $16c^4d^2$   
C.  $-16c^4d^2$   
D.  $-8c^4d^2$

7. Simplify:  $(5ab) \cdot (-2a^2b)^3$

- A.  $-30a^6b^4$   
B.  $-30a^7b^4$   
C.  $-40a^6b^4$   
D.  $-40a^7b^4$

8. Simplify:  $(3x^2y) \cdot (6xy^{-3})$

- A.  $\frac{18}{xy^2}$   
B.  $\frac{18x}{y^2}$   
C.  $\frac{9}{xy^2}$   
D.  $9xy^2$

9. Simplify:  $(-a^2b^3)^2 \cdot (4a^2b^2) + 9a^2b^6$

- A.  $5a^7b^8$   
B.  $5a^{14}b^{16}$   
C.  $13a^7b^8$   
D.  $13a^{14}b^{16}$

10. Simplify:  $\frac{3x^4y}{12x^3y^2}$

- A.  $4x^2y$   
B.  $\frac{4}{x^2y}$   
C.  $\frac{x^2y}{4}$   
D.  $\frac{y}{4x}$