

Agenda

1) DO NOW

2) Explore: Laws of Exponents- Division

5.1: Objective: To simplify **Quotients** Using Laws of Exponents

3) Explore: Laws of Exponents- Power of Zero

5.2: Objective: To simplify Expressions Involving the Exponent **Zero** and Negative Exponents

4) Explore: Laws of Exponents- Negative Powers

5.2: Objective: To simplify Expressions Involving the Exponent **Zero** and **Negative Exponents**

5) Group Practice

6) Extra Practice

*HW p. 213 #9 -19 odd, 23, 25, 29
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Ch 5 - Rational Expressions

5.1: Quotients of Monomials

Objective: To simplify quotients Using Laws of Exponents

DO NOW:

Directions:

Apply Laws of Exponents to simplify the following expressions.

a) $(4x^3y^5z)(2xy^3z)$

b) $(-2p^4q^2r)^4$

c) $(3pqr)(-2p^4q^2r)^4$

Laws of Exponents Continued: **Division**

1) **Make a guess!** What is half of 2^{20} ?

- a) 1^{10} b) 1^{20} c) 20 d) 2^{10} e) 2^{19}

2) Simplify the following fractions.
Re-Write them using exponents.

$$a) \frac{x^6}{x^9} = \frac{\text{X} \cdot \text{X} \cdot \text{X} \cdot \text{X} \cdot \text{X} \cdot \text{X}}{\text{X} \cdot \text{X} \cdot \text{X} \cdot \text{X} \cdot \text{X} \cdot \text{X} \cdot \text{X} \cdot \text{X} \cdot \text{X}} =$$

$$b) \frac{x^9}{x^6} = \frac{\text{X} \cdot \text{X} \cdot \text{X} \cdot \text{X} \cdot \text{X} \cdot \text{X} \cdot \text{X} \cdot \text{X} \cdot \text{X}}{\text{X} \cdot \text{X} \cdot \text{X} \cdot \text{X} \cdot \text{X} \cdot \text{X}} =$$

Based on the previous, what do you think the following will simplify to?

$$c) \frac{x^7}{x^2}$$

$$d) \frac{x^2}{x^7}$$

<p><i>Rules :</i> <i>if $a > b$</i> <i>if $a < b$</i></p> $\frac{x^a}{x^b}$

5.2: Zero and Negative Exponents

Objective: To simplify Expressions Involving the Exponent
Zero and Negative Exponents

Simplify the following using your **NEW**
knowledge of exponents.

$$1) \frac{x^3}{x^3} =$$

$$2) \frac{x^4}{x^4} =$$

$$3) \frac{2^5}{2^5} =$$

$$4) \frac{321^{59}}{321^{59}} =$$

$$5) 2^0 =$$

$$6) 100,000^0 =$$

$$7) (546x^3y^7)^0 =$$

What can you conclude about anything raised to the power of
zero?

$$x^0 =$$

Explore Negative Exponents:

Use a calculator if necessary to write each expression as **an integer** or a **fraction**.

$2^3 =$

$2^{-3} =$

$\frac{1}{2^{-3}} =$

$2^2 =$

$2^{-2} =$

$\frac{1}{2^{-2}} =$

$2^1 =$

$2^{-1} =$

$\frac{1}{2^{-1}} =$

$3^2 =$

$4^2 =$

$5^2 =$

$6^2 =$

$3^{-2} =$

$4^{-2} =$

$5^{-2} =$

$6^{-2} =$

$\frac{1}{3^{-2}} =$

$\frac{1}{4^{-2}} =$

$\frac{1}{5^{-2}} =$

$\frac{1}{6^{-2}} =$

So a negative exponent does what . . . ?

$x^{-n} =$

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

$\left(\frac{x}{y}\right)^{-n} =$

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Properties of Exponents (Do in Groups)

Simplify. Your answer should contain only positive exponents.

5) $2k^4 \cdot 4k$

6) $2x^3y^{-3} \cdot 2x^{-1}y^3$

19) $(2x^4y^{-3})^{-1}$

23) $\frac{3n^4}{3n^3}$

27) $\frac{4x^0y^{-2}z^3}{4x}$

30) $\frac{3x^3y^{-1}z^{-1}}{x^{-4}y^0z^0}$

Extra: Practice Worksheet for Law of Exponents

Use the laws of exponents you discovered in your investigation to simplify each of the following expressions with positive exponents.

1. $3^3 \cdot 3^4$

11. 3^{-4}

2. $x^8 \cdot x^5$

12. $\frac{8^5}{8^2}$

3. $3x^3 \cdot 4x^2$

13. 27^0

4. $x^2y^4 \cdot x^5y^{12}$

14. $\frac{12x^5}{4x^2}$

5. $(5^2)^3$

15. $\frac{2x^6y^5}{16x^4y}$

6. $(x^4)^5$

16. $\frac{3^5}{3^7}$

7. $(2x)^3$

17. $\frac{4x^5y^2}{20x^3y^4}$

8. $(x^4y^5)^3$

18. $\frac{12xy^2}{3x^4y^2}$

9. $(3x^4y^3z^5)^3$

19. $\left(\frac{2x^4}{3x}\right)^3$

10. $(2x^3)^4(-3x^2y^3)^2$

20. $\frac{18x^{-5}y^4}{12x^{-3}y^{-3}}$

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Practice Worksheet for Law of Exponents
Answer Key

Use the laws of exponents you discovered in your investigation to simplify each of the following expressions with positive exponents.

1. $3^3 \bullet 3^4$ 2187

11. 3^{-4} $\frac{1}{81}$

2. $x^8 \bullet x^5$ x^{13}

12. $\frac{8^5}{8^2}$ 512

3. $3x^3 \bullet 4x^2$ $12x^5$

13. 27^0 1

4. $x^2y^4 \bullet x^5y^{12}$ x^7y^{16}

14. $\frac{12x^5}{4x^2}$ $3x^3$

5. $(5^2)^3$ 15,625

15. $\frac{2x^6y^5}{16x^4y}$ $\frac{x^2y^4}{8}$

6. $(x^4)^5$ x^{20}

16. $\frac{3^3}{3^7}$ $\frac{1}{9}$

7. $(2x)^3$ $8x^3$

17. $\frac{4x^5y^2}{20x^3y^4}$ $\frac{x^2}{5y^2}$

8. $(x^4y^5)^3$ $x^{12}y^{15}$

18. $\frac{12xy^2}{3x^4y^2}$ $\frac{4}{x^3}$

9. $(3x^4y^3z^5)^3$ $27x^{12}y^9z^{15}$

19. $\left(\frac{2x^4}{3x}\right)^3$ $\frac{8x^9}{27}$

10. $(2x^3)^4(-3x^2y^3)^2$ $144x^{16}y^6$

20. $\frac{18x^{-5}y^4}{12x^{-3}y^{-3}}$ $\frac{3y^7}{2x^2}$