Algebra 1: Unit 3 Notes

Name:

Lesson 1: Integer Exponents

What is a power?

A PRODUCT (multiply) FROM THE BASE USED AS A FACTOR (EXPONENT) TIMES.

6^2 ← EXPONENT

6 ← BASE

A FACTOR: a number that divides evenly into another number

Types of Exponents

- POSITIVE EXPONENTS
- EXPONENT OF ZERO
- NEGATIVE EXPONENT
- :

$3^5 = 3\times3\times3\times3\times3$

$3^4 = 3\times3\times3\times3$

$3^3 = 3\times3\times3$

$3^2 = 3\times3$

$3^1 = 3$

$3^0 =$

any base with an exponent of zero is 1

reciprocal: FLIP POWER

Practice Set Level 1

FLIP POWER

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

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

$2^{-3} = \frac{1}{2^3} = \frac{1}{8}$

$2^{-4} = \frac{1}{2^4} = \boxed{\frac{1}{16}}$

$x^{-4} = \boxed{\frac{1}{x^4}}$

Practice Set Level 2

FLIP POWER

$\frac{1}{3^{-1}} = 1\cdot3^1 = \boxed{3}$

$\frac{1}{4^{-1}} = 1\cdot4^1 = \boxed{4}$

$\frac{2}{3^{-1}} = 2\cdot3^1 = \boxed{6}$

$\frac{2}{4^{-1}} = 2\cdot4^1 = \boxed{8}$

$\frac{y}{x^{-2}} = \boxed{y\cdot x^2} =$

Practice Set Level 3

FLIP

$\left(\frac{1}{2}\right)^{-1} = \left(\frac{2}{1}\right)^1 = \boxed{2}$

$\left(\frac{1}{2}\right)^{-2} = \left(\frac{2}{1}\right)^2 = \boxed{4}$

$\left(\frac{2}{5}\right)^{-2} = \left(\frac{5}{2}\right)^2 = \boxed{\frac{25}{4}}$

$\left(\frac{2}{3}\right)^{-3} = \left(\frac{3}{2}\right)^3 = \boxed{\frac{27}{8}}$

$\frac{5}{2}\cdot\frac{5}{2}$

Practice Set Level 4

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

$\frac{3^{-2}}{4^{-1}} = \frac{4^1}{3^2} = \frac{4}{9}$

$\frac{2^{-3}}{3} = \frac{1}{3\cdot2^3} = \frac{1}{3\cdot8} = \boxed{\frac{1}{24}}$

$\frac{2^{-2}}{4^2} = \frac{1}{4^2\cdot2^2} = \frac{1}{16^4}$

$= \frac{1}{64}$

$\frac{y^{-3}}{x^{-2}} =$

Practice Set Level 5

$\frac{2x^{-1}}{3y^{-1}} = \frac{2y^1}{3x^1} = \boxed{\frac{2y}{3x}}$

$\frac{3^{-2}x}{4^{-1}y} = \frac{4x}{3^2y} = \boxed{\frac{4x}{9y}}$

$\frac{2x^{-3}}{3y} = \boxed{\frac{2}{3x^3y}}$

$\frac{(2x)^{-2}}{(3y)^2} = \frac{(2x)^2(3y)^2}{} = \frac{1}{4x^2 9y^2} = \boxed{\frac{1}{36x^2y^2}}$

$\frac{2xy^{-3}}{(3z)^{-2}} =$

$2xy^{-3}\cdot(3z)^2$

$2xy^{-3}\cdot9z^2$

$\boxed{\frac{18xz^2}{y^3}}$

Name:

Three Exponent Rules!

$\left(\frac{1}{2}\right)^{5}\cdot\left(\frac{1}{2}\right)^{2}=\left(\frac{1}{2}\right)^{5+2}=\left(\frac{1}{2}\right)^{7}$

$\left(2^{4}\right)^{5}=2^{4\cdot5}=2^{20}$

$\frac{3^{6}}{3^{2}}=3^{6-2}=3^{4}$ (top − bottom)

1 When multiplying powers with the same base,.... ADD EXPONENTS

$3^{3}\cdot3^{-7}=3^{3+-7}=3^{-4}=\frac{1}{3^{4}}=\frac{1}{81}$ keep base

2 When a power IS the base of another power,... MULTIPLY EXPONENTS

$\left(5^{-7}\right)^{4}\quad 5^{-7\cdot4}\rightarrow5^{-28}\rightarrow\frac{1}{5^{28}}$

3 When two powers with the same base are divided,... SUBTRACT EXPONENTS

$\frac{12^{3}}{12^{6}}=12^{3-6}=12^{-3}=\frac{1}{12^{3}}$

Examples: *Simplify as a power using exponent properties with* ***positive*** *exponents.*

1. $\left(-4x^{5}y^{2}\right)^{3}$

$-4^{1\cdot3}\ x^{5\cdot3}\ y^{2\cdot3}$

$-4^{3}\ x^{15}\ y^{6}$

$-64x^{15}y^{6}$

2. $\left(3^{-4}\right)^{3}$

$3^{1}\cdot3^{4}$

3^{1+4}

$3^{5}=3\cdot3\cdot3\cdot3\cdot3$

$3^{5}=243$

3. $\frac{5^{0}}{2^{-3}}$

$1\cdot2^{3}=2\cdot2\cdot2=8$

4. $\left(6x^{-3}y^{2}\right)^{-2}$

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

$6^{-2}x^{6}y^{-4}\rightarrow\frac{x^{6}}{6^{2}y^{4}}\rightarrow\frac{x^{6}}{36y^{4}}$

5. $\left(\frac{3a^{5}b^{-7}}{-3db^{-4}}\right)^{4}$

$\frac{3}{-3}\ a^{5-1}\ b^{-7+4}=-1a^{4}b^{-3}$

Simplify inside first

$\left(-1a^{4}b^{-3}\right)^{4}\rightarrow-1^{4}a^{16}b^{-12}$

$\frac{1a^{16}}{b^{12}}$

$-1\cdot-1\cdot-1\cdot-1$

6. $\left(\frac{2x^{5}y^{-2}}{x^{-3}}\right)^{3}\cdot\left(\frac{x^{0}y^{-5}}{3xy^{-7}}\right)^{2}$

$2x^{5--3-2}\ y\ \frac{1}{3}x^{0-1-5--7}y$

$\left(2x^{8}y^{-2}\right)^{3}\quad\left(\frac{1}{3}x^{-1}y^{2}\right)^{2}$

$2^{3}x^{8\cdot3-2\cdot3}y^{\ }\quad\left(\frac{1}{3}\right)^{2}x^{-2}y^{2\cdot2}$

$8x^{24}y^{-6}\ \frac{1}{9}x^{-2}y^{4}$

$x^{24+-2}\ y^{-6+4}$

$x^{22}\quad y^{-2}\rightarrow\frac{8x^{22}}{9y^{2}}$