L5 Negative Exponents

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Lesson 5 Negative Exponents

Negative Exponent Law:

$$a^{-n} = \frac{1}{a^n} \text{ or } \frac{1}{a^{-n}} = a^n$$

cross the line, change the sign

Shortcut for fractions with negative exponents:

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

Flip the fraction (reciprocal)
Switch sign of exponent.

Always simplify, leaving only positive exponents

Example 1

$\frac{2^2}{2^6} = \frac{2 \cdot 2}{2 \cdot 2 \cdot 2 \cdot 2 \cdot 2 \cdot 2}$

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

a.) 2^{-4} $\frac{1}{2^4}$ $\frac{1}{16}$

b.) $-2x^{-2}$ $-2 \cdot \frac{1}{x^2}$ $-\frac{2}{x^2}$

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

c.) $\left(-\frac{3}{4}\right)^{-3}$ $\left(-\frac{4}{3}\right)^{3}$ $-\frac{64}{27}$

* flip the fraction, exponent is positive

d.) 0.3^{-4} $\left(\frac{3}{10}\right)^{-4}$ $\left(\frac{10}{3}\right)^{4}$ $\frac{10000}{81}$

e.) $-(-2x)^{-3}$

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

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

Try

-3^{-3} $-\frac{1}{27}$

$-(-3x)^{-2}$ $-\frac{1}{(-3x)^2}$ $-\frac{1}{9x^2}$

Example 2
Simplify leaving only positive exponents

a.) $8^{-\frac{2}{3}}$

$\frac{1}{8^{\frac{2}{3}}}$ $\frac{1}{\sqrt[3]{8}^2}$ $\frac{1}{2^2}$ $\frac{1}{4}$

b.) $(x^3y^{-2}z)^{-4}$

$\left(\frac{x^3z}{y^2}\right)^{-4}$ $\left(\frac{y^2}{x^3z}\right)^4$ $\frac{y^8}{x^{12}z^4}$

c.) $\frac{-4x^{-5}y}{2x^2y^6}$ $\frac{-2y}{x^2x^5y^6}$ $\frac{-2}{x^7y^5}$ $\frac{y}{y\cdot y\cdot y\cdot y\cdot y\cdot y}$

c ii) $\frac{-6x^3y^{-2}}{12x^{-4}y^{-5}}$ $-\frac{1x^3x^4y^5}{2y^2}$ $-\frac{x^7y^3}{2}$

or subtract exp $-\frac{x^7y^3}{2}$

d.) $\frac{1}{5^{-1}}$ 5

e.) $x^{-3}y^{-2}$

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

f.) $\frac{2a^2b^{-2}}{3c^{-2}d^3}$

$\frac{2a^2c^2}{3b^2d^3}$

g.) $\frac{2^{-3}a^{-5}b^2}{c^{-4}}$

$\frac{b^2c^4}{2^3a^5}$

$\frac{b^2c^4}{8a^5}$

h.) $\frac{(x+y)^{-5}}{(x+y)^3}$

$(x+y)^{-5-3}$

$(x+y)^{-8}$

$\frac{1}{(x+y)^8}$

hii) $\frac{10x^2y^{-1}}{30x^7y^{-8}}$

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

$\frac{y^7}{3x^5}$

or

$\frac{1x^2y^8}{3x^7y}$

$\frac{y^7}{3x^5}$

*Be careful, do not move a negative number, only a negative exponent.
ie $-2 \neq \frac{1}{2}$