Bellwork

1) $3^2 \bullet 3^6$

$3^8 = 6561$

2) $(5^4)^3$

5^{12}

244,140,625

3) $\dfrac{7^{12}}{7^4} = 7^8$

5,764,801

4) $(3x^3)^2$

$3^2x^6 = 9x^6$

5) $\dfrac{3^7 \bullet 3^4}{3^6} = \dfrac{3^{11}}{3^6} = 3^5 = 243$

6) $\dfrac{1}{x^9} \bullet \dfrac{x^{21}}{1} = \dfrac{x^{21}}{x^9}$

$= x^{12}$

7) $-(7x)^2$

$-(7^2x^2)$

$-(49x^2)$

$-49x^2$

8) $\left(\dfrac{-5}{x}\right)^2 \bullet \left(\dfrac{2x^4}{y^3}\right)^2$

$\dfrac{(-5)^2}{x^2} \bullet \dfrac{4x^8}{y^6}$

$\dfrac{100x^8}{x^2y^6} = \dfrac{100x^6}{y^6}$

9) $\left(+\frac{-4}{x}\right)^3$

$\frac{(-4)^3}{x^3} = \frac{-64}{x^3}$

10) $\left(\frac{x^3}{4}\right)^2 = \frac{x^6}{4^2} = \frac{x^6}{16}$

11) $\left[(2+d)^3\right]^3$

$(2+d)^9$

12) $\left[(2d)^7\right]^3$

$(2d)^{21}$

$2^{21}d^{21}$

$2{,}097{,}152d^{21}$

13) $\left(-20x^3\right)^2\left(-x^7\right)$

$(-20)^2x^6$

$(400x^6)(-1x^7)$

$-400x^{13}$

14) $\left(\frac{2x^3}{y}\right)^3 \cdot \frac{1}{6x^3}$

$\frac{8\cancel{2^3}^{4}\cancel{x^9}^{x^6}}{y^3} \cdot \frac{1}{\cancel{6}_{3}\cancel{x^3}} =$

$\frac{4x^6}{3y^3}$

Exponent of Zero

☺ By definition:

a raised to the zero power equals 1

$$a^0 = 1$$

Simplify the following.

$\boxed{5}^0 = 1$

$\boxed{(-3)}^0 = 1$

$-\boxed{7}^0 = -1$

$(-7)^0 = 1$

$2\boxed{m}^0 = 2$

$4^0 = 1$

$(4^0)^7 = (1)^7 = 1$

$3\boxed{(m^3n^2p)}^0 = 3$

$\dfrac{x^2y^{\cancel{3}}}{x^{\cancel{0}}y^{\cancel{3}}} = x^2$

$2^3 = 8$

$2^2 = 4$

$2^1 = 2$

$2^0 = 1$

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

$2^{-2} = .25 = \frac{1}{4}$

$2^{-3} = .125 = 1/8$

2^3 vs $2^{-3} \Rightarrow \frac{2^{-3}}{1}$

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

Pull

Negative Exponents

a^{-n} is the reciprocal of a^n.

$$a^{-n} = \frac{1}{a^n}, \; a \neq 0$$

Simplify the following with positive exponents only.

$7^{-3} = \frac{1}{7^3} = \frac{1}{343}$

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

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

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

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

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

Simplify the following with positive exponents only.

$\frac{m^{-3}}{4n^{-4}} = \frac{n^4}{4m^3}$

$\frac{-5^0}{10n^{-4}} = \frac{-1}{10n^{-4}} = \frac{-n^4}{10}$

$\left(\frac{x^2y^3}{x^{-1}y^1}\right)^2 = \left(\frac{x^3}{y^2}\right)^2 = \frac{x^6}{y^4}$

Fractional Exponents

$$b^{\frac{m}{n}} \longleftrightarrow \left(\sqrt[n]{b}\right)^m$$

Power

Index Number

Root

Base

Rewrite in radical form.

$x^{\frac{1}{2}}$ ← Power ← Root

$\left(\sqrt[2]{x}\right)^1 = \sqrt{x}$

$(4m)^{\frac{1}{3}}$ ← power ← Root

$\left(\sqrt[3]{4m}\right)^1 = \sqrt[3]{4m}$

$(x^3)^{\frac{1}{6}}$ ← power ← Root

$x^{\frac{1}{2}} = \sqrt{x}$

$\sqrt{36} = 6$

$\left(\sqrt[6]{x^3}\right)^1 = \sqrt[6]{x^3} = \sqrt[6]{(36)^3} = 6$

$(a^3b^5)^{\frac{1}{7}}$ ← power ← Root

$\left(\sqrt[7]{a^3b^5}\right)^1 =$

$\sqrt[7]{a^3b^5}$

Rewrite with fractional exponents

$\sqrt{2m}$

$\sqrt{n^2}$

$6\sqrt{\frac{a}{b}}$

$\sqrt{x^3yz^2}$

Assignment: Exponent Worksheet