Math Name: KEY to odd problems with work shown

Zero and Negative exponents Properties Period: _____

Simplify. Your answer should contain only positive exponents.

1) $-\frac{2a^4}{(-2a^3)^2 \cdot 2a}$

$-\frac{2a^4}{(-2a^3)^2 \cdot 2a}$ Write the original problem

$\frac{-2a^4}{(-2)^2 \cdot a^{3 \cdot 2} \cdot 2a^1}$ A power to a power can MULTIPLY exponents

$\frac{-2a^4}{8 \cdot a^{6+1}}$ Multiplying powers with the same base can ADD exponents

$\frac{-2a^4}{8 \cdot a^7}$ Simplify

$\frac{-1}{4a^3}$ Dividing powers with the same base can SUBTRACT exponents

3) $-\frac{x^{-4} \cdot 2x^0 \cdot x^{-2}}{(x^0)^3}$

$-\frac{x^{-4} \cdot 2x^0 \cdot x^{-2}}{(x^0)^3}$ Write the original problem

$-\frac{2 \cdot 1}{x^4 \cdot x^2 (1)^3}$ negative exponent property, and zero exponent property

$-\frac{2}{x^{4+2}}$ Multiplying powers with the same base can ADD exponents

$\frac{-2}{x^6}$ Simplify

5) $\frac{(-2r^0)^{-3}}{-r^3 \cdot -r^2}$

$\frac{(-2r^0)^{-3}}{-r^3 \cdot -r^2}$ Write the original problem

$\frac{1}{-1 \cdot -1 r^3 \cdot r^2 \cdot (-2 \cdot 1)^3}$ negative exponent property, and zero exponent property

$\frac{1}{r^{3+2} \cdot -8}$ Multiplying powers with the same base can ADD exponents

$\frac{-1}{8r^5}$ Simplify

7) $\left(\frac{a^2 \cdot (2a^0)^0}{-a^{-4}}\right)^0$

$\left(\frac{a^2 \cdot (2a^0)^0}{-a^{-4}}\right)^0$	Write the original problem
1	zero exponent property

9) $\left(-\frac{2m^2 \cdot -m^{-3}}{m}\right)^4$

$\left(-\frac{2m^2 \cdot -m^{-3}}{m}\right)^4$	Write the original problem
$\left(\frac{-1 \cdot -2m^2}{m^1 \cdot m^3}\right)^4$	negative exponent property
$\left(\frac{2m^2}{m^{1+3}}\right)^4$	Multiplying powers with the same base can ADD exponents
$\left(\frac{2m^2}{m^4}\right)^4$	Simplify
$\frac{2^{1 \cdot 4} m^{2 \cdot 4}}{m^{4 \cdot 4}}$	A power to a power can MULTIPLY exponents
$\frac{2^4 m^8}{m^{16}}$	Simplify
$\frac{16}{m^8}$	Dividing powers with the same base can SUBTRACT exponents

11) $\frac{(2v^3)^{-2}}{(-2v \cdot 2v^3)^2}$

$\frac{(2v^3)^{-2}}{(-2v \cdot 2v^3)^2}$	Write the original problem
$\frac{1}{(-2 \cdot 2 \cdot v^{1+3})^2 \cdot (2v^3)^2}$	negative exponent property
$\frac{1}{(-4 \cdot v^4)^2 \cdot (2v^3)^2}$	Simplify
$\frac{1}{(-4)^{1 \cdot 2} \cdot v^{4 \cdot 2} \cdot (2)^{1 \cdot 2} \cdot v^{3 \cdot 2}}$	A power to a power can MULTIPLY exponents
$\frac{1}{16 \cdot 4 \cdot v^8 \cdot v^6}$	Simplify
$\frac{1}{64 \cdot v^{8+6}}$	Multiplying powers with the same base can ADD exponents
$\frac{1}{64v^{14}}$	Simplify

13) $\frac{2v^3 \cdot v}{(2v)^4}$

$\frac{2v^3 \cdot v}{(2v)^4}$	Write the original problem
$\frac{2v^3 \cdot v^1}{(2)^{1 \cdot 4} \cdot v^{1 \cdot 4}}$	A power to a power can MULTIPLY exponents
$\frac{2v^3 \cdot v^1}{16 \cdot v^4}$	Simplify
$\frac{2v^{3+1}}{16 \cdot v^4}$	Multiplying powers with the same base can ADD exponents
$\frac{2v^4}{16 \cdot v^4}$	Simplify
$\frac{1}{8}$	Dividing powers with the same base can SUBTRACT exponents

15) $\frac{v^2 \cdot 2u^3 v^2}{(-v)^4}$

$\frac{v^2 \cdot 2u^3 v^2}{(-v)^4}$	Write the original problem
$\frac{2 \cdot u^3 \cdot v^2 \cdot v^2}{(-1)^4 \cdot v^{1 \cdot 4}}$	A power to a power can MULTIPLY exponents
$\frac{2 \cdot u^3 \cdot v^2 \cdot v^2}{1 \cdot v^4}$	Simplify
$\frac{2 \cdot u^3 \cdot v^{2+2}}{v^4}$	Multiplying powers with the same base can ADD exponents
$\frac{2 \cdot u^3 \cdot v^4}{v^4}$	Simplify
$2u^3$	Dividing powers with the same base can SUBTRACT exponents

17) $\frac{(2x^2y^2)^3 \cdot 2y^3}{2x^3y^{-2}}$

$\frac{(2x^2y^2)^3 \cdot 2y^3}{2x^3y^{-2}}$	Write the original problem
$\frac{(2x^2y^2)^3 \cdot 2y^3y^2}{2x^3}$	negative exponent property
$\frac{2^{1\cdot3} \cdot x^{2\cdot3}y^{2\cdot3} \cdot 2y^3y^2}{2x^3}$	A power to a power can MULTIPLY exponents
$\frac{8 \cdot x^6y^6 \cdot y^3y^2}{x^3}$	Simplify
$\frac{8 \cdot x^6y^{6+3+2}}{x^3}$	Multiplying powers with the same base can ADD exponents
$\frac{8 \cdot x^6y^{11}}{x^3}$	Simplify
$8x^3y^{11}$	Dividing powers with the same base can SUBTRACT exponents

19) $\frac{(2xy^{-1})^{-3} \cdot (-2y^{-4})^{-1}}{2x^0}$

$\frac{(2xy^{-1})^{-3} \cdot (-2y^{-4})^{-1}}{2x^0}$	Write the original problem
$\frac{2^{1\cdot-3} \cdot x^{1\cdot-3} \cdot y^{-1\cdot-3} \cdot (-2)^{-1} \cdot y^{-4\cdot-1}}{2x^0}$	A power to a power can MULTIPLY exponents
$\frac{2^{-3} \cdot x^{-3} \cdot y^3 \cdot (-2)^{-1} \cdot y^4}{2x^0}$	Simplify
$\frac{y^3 \cdot y^4}{2^3 \cdot 2 \cdot -2 \cdot x^3}$	negative exponent property, and zero exponent property
$\frac{y^3 \cdot y^4}{-32x^3}$	Simplify
$\frac{y^{3+4}}{-32x^3}$	Multiplying powers with the same base can ADD exponents
$\frac{y^7}{-32x^3}$	Simplify

21) $\left(\frac{a}{-2a^{-1}b^{-1}\cdot 2a^{-3}b^{4}}\right)^{-3}$

$\left(\frac{a}{-2a^{-1}b^{-1}\cdot 2a^{-3}b^{4}}\right)^{-3}$	Write the original problem
$\frac{a^{1\cdot -3}}{(-2)^{1\cdot -3}\cdot a^{-1\cdot -3}\cdot b^{-1\cdot -3}\cdot 2^{1\cdot -3}\cdot a^{-3\cdot -3}\cdot b^{4\cdot -3}}$	A power to a power can MULTIPLY exponents
$\frac{a^{-3}}{(-2)^{-3}\cdot a^{3}\cdot b^{3}\cdot 2^{-3}\cdot a^{9}\cdot b^{-12}}$	Simplify
$\frac{(-2)^{3}\cdot 2^{3}\cdot b^{12}}{a^{3}\cdot b^{3}\cdot a^{9}\cdot a^{3}}$	negative exponent property
$\frac{-64\cdot b^{12}}{a^{3}\cdot b^{3}\cdot a^{9}\cdot a^{3}}$	Simplify
$\frac{-64\cdot b^{12}}{a^{3+9+3}\cdot b^{3}}$	Multiplying powers with the same base can ADD exponents
$\frac{-64\cdot b^{12}}{a^{15}\cdot b^{3}}$	Simplify
$\frac{-64b^{9}}{a^{15}}$	Dividing powers with the same base can SUBTRACT exponents

23) $\left(\frac{x^{3}y^{-3}}{2x^{0}\cdot 2x^{3}y^{2}}\right)^{4}$

$\left(\frac{x^{3}y^{-3}}{2x^{0}\cdot 2x^{3}y^{2}}\right)^{4}$	Write the original problem
$\frac{x^{3\cdot 4}\cdot y^{-3\cdot 4}}{2^{1\cdot 4}\cdot x^{0\cdot 4}\cdot 2^{1\cdot 4}\cdot x^{3\cdot 4}\cdot y^{2\cdot 4}}$	A power to a power can MULTIPLY exponents
$\frac{x^{12}\cdot y^{-12}}{256\cdot x^{0}\cdot x^{12}\cdot y^{8}}$	Simplify
$\frac{x^{12}}{256\cdot x^{12}\cdot y^{8}\cdot y^{12}}$	negative exponent property, and zero exponent property
$\frac{x^{12}}{256\cdot x^{12}\cdot y^{8+12}}$	Multiplying powers with the same base can ADD exponents
$\frac{x^{12}}{256\cdot x^{12}\cdot y^{20}}$	Simplify
$\frac{1}{256y^{20}}$	Dividing powers with the same base can SUBTRACT exponents

25) $\frac{(-m^4p^{-4}q^4 \cdot -2mp^2q^2)^{-3}}{(-2m^0p^3)^{-4}}$

$\frac{(-m^4p^{-4}q^4 \cdot -2mp^2q^2)^{-3}}{(-2m^0p^3)^{-4}}$ Write the original problem

$\frac{(-1)^{1\cdot-3} \cdot m^{4\cdot-3} \cdot p^{-4\cdot-3} \cdot q^{4\cdot-3} \cdot (-2)^{1\cdot-3} \cdot m^{1\cdot-3} \cdot p^{2\cdot-3} \cdot q^{2\cdot-3}}{(-2)^{1\cdot-4} \cdot m^{0\cdot-4} \cdot p^{3\cdot-4}}$ A power to a power can MULTIPLY exponents

$\frac{(-1)^{-3} \cdot m^{-12} \cdot p^{12} \cdot q^{-12} \cdot (-2)^{-3} \cdot m^{-3} \cdot p^{-6} \cdot q^{-6}}{(-2)^{-4} \cdot m^0 \cdot p^{-12}}$ Simplify

$\frac{(-2)^4 \cdot p^{12} \cdot p^{12}}{(-1)^3 \cdot (-2)^3 \cdot 1 \cdot m^{12} \cdot m^3 \cdot p^6 \cdot q^{12} \cdot q^6}$ negative exponent property, and zero exponent property

$\frac{2 \cdot p^{12} \cdot p^{12}}{m^{12} \cdot m^3 \cdot p^6 \cdot q^{12} \cdot q^6}$ Simplify

$\frac{2 \cdot p^{12+12}}{m^{12+3} \cdot p^6 \cdot q^{12+6}}$ Multiplying powers with the same base can ADD exponents

$\frac{2 \cdot p^{24}}{m^{15} \cdot p^6 \cdot q^{18}}$ Simplify

$\frac{2p^{18}}{m^{15}q^{18}}$ Dividing powers with the same base can SUBTRACT exponents

27) $\left(\frac{nm^{-4}p^3}{-2m^{-4}n^3p^0 \cdot m^2p^{-1}}\right)^{-2}$

$\left(\frac{nm^{-4}p^3}{-2m^{-4}n^3p^0 \cdot m^2p^{-1}}\right)^{-2}$ Write the original problem

$\frac{n^{1\cdot-2} \cdot m^{-4\cdot-2} \cdot p^{3\cdot-2}}{(-2)^{1\cdot-2} \cdot m^{-4\cdot-2} \cdot n^{3\cdot-2} \cdot p^{0\cdot-2} \cdot m^{2\cdot-2} \cdot p^{-1\cdot-2}}$ A power to a power can MULTIPLY exponents

$\frac{n^{-2} \cdot m^8 \cdot p^{-6}}{(-2)^{-2} \cdot m^8 \cdot n^{-6} \cdot p^0 \cdot m^{-4} \cdot p^2}$ Simplify

$\frac{(-2)^2 \cdot m^8 \cdot m^4 \cdot n^6}{m^8 \cdot n^2 \cdot 1 \cdot p^2 \cdot p^6}$ negative exponent property, and zero exponent property

$\frac{4 \cdot m^8 \cdot m^4 \cdot n^6}{m^8 \cdot n^2 \cdot p^2 \cdot p^6}$ Simplify

$\frac{4 \cdot m^{8+4} \cdot n^6}{m^8 \cdot n^2 \cdot p^{2+6}}$ Multiplying powers with the same base can ADD exponents

$\frac{4 \cdot m^{12} \cdot n^6}{m^8 \cdot n^2 \cdot p^8}$ Simplify

$\frac{4m^4n^4}{p^8}$ Dividing powers with the same base can SUBTRACT exponents

29) $\frac{(-2q^4)^{-4}}{2qm^2p^4 \cdot -pm^4q^3}$

$\frac{(-2q^4)^{-4}}{2qm^2p^4 \cdot -pm^4q^3}$	Write the original problem
$\frac{(-2)^{1 \cdot -4} \cdot q^{4 \cdot -4}}{2qm^2p^4 \cdot -pm^4q^3}$	A power to a power can MULTIPLY exponents
$\frac{(-2)^{-4} \cdot q^{-16}}{2qm^2p^4 \cdot -pm^4q^3}$	Simplify
$\frac{1}{-1 \cdot 2 \cdot (-2)^4 \cdot m^2 \cdot m^4 \cdot p^4 \cdot p \cdot q^3 \cdot q \cdot q^{16}}$	negative exponent property, and zero exponent property
$\frac{1}{-32 \cdot m^2 \cdot m^4 \cdot p^4 \cdot p \cdot q^3 \cdot q \cdot q^{16}}$	Simplify
$\frac{1}{-32 \cdot m^{2+4} \cdot p^{4+1} \cdot q^{3+1+16}}$	Multiplying powers with the same base can ADD exponents
$\frac{1}{-32m^6p^5q^{20}}$	Simplify