

## Gr 9 Exponent Laws Review Worksheet

Simplify. Please show your thinking.

1)  $5^8 \cdot 5^7 = 5^{15}$

$8+7$

2)  $9^4 \cdot 9^0 = 9^4$

$4+0$

3)  $2^5 \cdot 2^0 \cdot 2^9 = 2^{14}$

$5+0+9$

4)  $7^5 \cdot 7^{10} = 7^{15}$

$5+10$

5)  $(3^{-1})^2 = 3^{-2}$

$(-1)(2)$

6)  $(4^3)^4 = 4^{12}$

$3 \times 4$

7)  $(3^{-3})^2 = 3^{-6}$

$(-3)(2)$

8)  $(3^2)^3 = 3^6$

$2 \times 3$

9)  $\frac{3^5}{3^{10}} = 3^{-5}$

$5-10$

10)  $\frac{7^2}{7^0} = 7^2$

$2-0$

11)  $\frac{3^7}{3^3} = 3^4$

$7-3$

12)  $\frac{10^6}{10} = 10^5$

$6-1$

$$13) \left(\frac{2}{4}\right)^{-1} = \boxed{\frac{2^{-1}}{4^{-1}}}$$

$$14) \frac{(2^2)^3}{2^{-1} \cdot 2^{-4}} = \frac{2^6}{2^{-5}} = \boxed{2^{11}}$$

-1 + (-4)      6 - (-5)

$$15) \left(\frac{2^4 \cdot 2^2}{2^{-1}}\right)^0 = \boxed{1}$$

$$16) \left(\frac{2^3}{2^{-2} \cdot 2^3}\right)^{-1} = \left(\frac{2^3}{2^1}\right)^{-1} = (2^2)^{-1} = \boxed{2^{-2}}$$

-2 + 3      3 - 1      2(-1)

\*anything to the power of zero equals 1

$$17) \left(\frac{2^4}{2^{-2} \cdot 2^3}\right)^{-2} = \left(\frac{2^4}{2^1}\right)^{-2} = (2^3)^{-2} = \boxed{2^{-6}}$$

-2 + 3      4 - 1      3(-2)

$$18) \frac{(2^3)^4}{2 \cdot 2^0} = \frac{2^{-12}}{2} = \boxed{2^{-13}}$$

1 + 0      -12 - 1

$$19) \left(\frac{2^{-4} \cdot 2^2}{2^0}\right)^2 = \left(\frac{2^{-2}}{2^0}\right)^2 = (2^{-2})^2 = \boxed{2^{-4}}$$

-4 + 2      -2 - 0      (-2)(2)

$$20) \frac{2 \cdot 2^3}{(2^0)^3} = \frac{2^4}{2^0} = \boxed{2^4}$$

1 + 3      4 - 0

$$21) \underbrace{8p^6 \cdot 8p^{-10}} = \boxed{64p^{-4}}$$

6 + (-10)

$$22) \underbrace{4m^0 \cdot 6m^6} = \boxed{24m^6}$$

0 + 6

$$23) 7n^{-2} \cdot n^{-9} = \boxed{7n^{-11}}$$

-2 + (-9)

$$24) 3n^{-5} \cdot 5n^3 \cdot 7n^{-1} = \boxed{105n^{-3}}$$

-5 + 3 + (-1)

$$\begin{array}{r} 3 \\ \times 5 \\ \hline 15 \\ \times 7 \\ \hline 105 \end{array}$$

2  
 $\times 2$   
 4  
 $\times 2$   
 8  
 $\times 2$   
 16  
 $\times 2$   
 32

$$25) (2x^9)^5 = 2^5 x^{45} = \boxed{32x^{45}}$$

$$26) (2x^3)^{-6} = \boxed{2^{-6} x^{-18}}$$

Leave as a power for now; I'll show you what to do with it later.

$$27) (3x^8)^2 = 3^2 x^{16} = \boxed{9x^{16}}$$

$$28) (3b^0)^{-3} = 3^{-3} b^0 = \boxed{3^{-3}}$$

← equals 1

$$29) \frac{8b^8}{2 \cdot 16b^0} = \frac{1b^8}{2} = \boxed{\frac{b^8}{2}}$$

$$30) \frac{5n^7}{9n^8} = \boxed{\frac{5n^{-1}}{9}}$$

8-0

7-8

$$31) \frac{4r^5}{3r^9} = \boxed{\frac{4r^{-4}}{3}}$$

$$32) \frac{8x^6}{8x^2} = \boxed{x^4}$$

5-9

6-2

← Leave as improper fraction.

$$33) \left( \frac{b^9}{b^8 b^{-5}} \right)^{-2} = \left( \frac{b^9}{b^3} \right)^{-2} = (b^6)^{-2} = \boxed{b^{-12}}$$

$$34) \frac{x^3 \cdot (x^6)^{-2}}{x^0} = \frac{x^3 \cdot x^{-12}}{x^0} = \boxed{x^{-9}}$$

8+(-5)    9-3    6(-2)

3+(-12)-0

$$35) \frac{x^7}{x \cdot (x^{-1})^{10}} = \frac{x^7}{x \cdot x^{-10}} = x^{16}$$

$$36) \left( \frac{(b^9 b^8)^0}{b^9} \right)^3 = \left( \frac{b^0}{b^9} \right)^3 = (b^{-9})^3 = \boxed{b^{-27}}$$

7 - (1+(-10))  
 7 - (-9)

0-9    -9(3)



$$37) \frac{x^0}{(x^{-4}y^3)^6 \cdot x^{-3}} = \frac{x^0}{x^{-24}y^{18} \cdot x^{-3}} = \frac{x^0}{x^{-27}y^{18}}$$

$$x: -24 + (-3) \quad x: 0 - (-27)$$

$$y: 0 - 18$$

$$= \boxed{x^{27}y^{-18}}$$

$$38) \frac{(m^{-3}n^9)^0 \cdot m^4}{m^{10}n^{-1}} = \frac{m^0n^0 \cdot m^4}{m^{10}n^{-1}} = \frac{m^4n^0}{m^{10}n^{-1}} \quad \begin{matrix} 4-10 \\ 0-(-1) \end{matrix}$$

$$= \boxed{m^{-6}n^1}$$

$$39) \frac{x^8y^{-2}}{(x^0y^2)^3 \cdot y^4} = \frac{x^8y^{-2}}{x^0y^6 \cdot y^4} = \frac{x^8y^{-2}}{x^0y^{10}}$$

$$= \boxed{x^8y^{-12}}$$

$$40) \frac{(uv^4)^0 \cdot u^{-3}}{u^{10}v^{10}} = \frac{u^0v^0 \cdot u^{-3}}{u^{10}v^{10}} = \frac{u^{-3}v^0}{u^{10}v^{10}}$$

$$= \boxed{u^{-13}v^{-10}}$$

$$41) \frac{x^7y^{-3} \cdot x^{-8}y^{-2}z^0}{(x^{-4}y^8z^7)^{-3}} = \frac{x^{-1}y^{-5}z^0}{x^{12}y^{-24}z^{-21}}$$

$$= \boxed{x^{-13}y^{19}z^{21}}$$

$$42) \left( \frac{x^3z^7 \cdot x^6y^{-6}}{y^{-7}z^8} \right)^{-2} = \left( \frac{x^9y^{-6}z^7}{y^{-7}z^8} \right)^{-2}$$

$$= (x^9y^1z^{-1})^{-2}$$

$$= \boxed{x^{-18}y^{-2}z^2}$$

$$43) \frac{(m^4n^7p^{-7})^{-9}}{m^8n^{10}p^9 \cdot m^{10}p^{-5}} = \frac{m^{-36}n^{-63}p^{63}}{m^{18}n^{10}p^4}$$

$$= \boxed{m^{-54}n^{-73}p^{59}}$$

$$44) \frac{(m^2p^{-7})^5}{m^2p^8 \cdot p^7q^0} = \frac{m^{10}p^{-35}}{m^2p^{15}q^0}$$

$$= m^8p^{-50}q^0$$

$$= \boxed{m^8p^{-50}}$$