

Do Not  
Write on!

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Exponents Practice - Challenging Problems

Simplify.

1.  $\left(\frac{2r^3}{s}\right)^2 \left(\frac{s}{r^3}\right)^3$

$\left(\frac{2^2 r^6}{s^2}\right) \left(\frac{s^3}{r^9}\right) =$

$\frac{4r^6 s^3}{r^9 s^2} = \frac{4s}{r^3}$

2.  $2a^2(4a^{-2}b^3)^3$

$2a^2(4^{-3} \cdot a^6 b^{-9}) =$

$\frac{2a^2 \cdot a^6}{4^3 b^9} = \frac{2a^8}{64b^9}$

$\frac{2}{64} \cdot \frac{a^8}{b^9} = \frac{1}{32} \cdot \frac{a^8}{b^9} = \frac{a^8}{32b^9}$   
 $\frac{2}{64} = \frac{1}{32}$

3.  $\frac{8x^3y^{-5}}{2(4x)^{-1}y^2}$

$\frac{8x^3y^{-5}}{2(4x)^{-1}y^2} =$

$\frac{8x^3 \cdot (4x)^1}{2 \cdot y^5 \cdot y^2} =$

$\frac{4x^3 \cdot 4x^1}{y^7} = \frac{16x^4}{y^7}$

4.  $(-4b^{-3})\left(\frac{1}{6}b^2\right)(9b)^{-4}$

$(-4b^{-3})\left(\frac{1}{6}b^2\right)(9b^{-4})$

$\left(\frac{-4}{b^3}\right)\left(\frac{1}{6} \cdot \frac{b^2}{1}\right)\left(\frac{9}{b^4}\right) =$

$\frac{(-4)(9)(b^2)}{6b^3 \cdot b^4} = \frac{-36b^2}{6b^7} = \frac{-6}{b^5}$

$-6b^{-5} \Rightarrow \frac{-6}{b^5}$

5.  $\frac{(3y^3)(2y^2)^{-2}}{(y^4)^3}$

$\frac{(3y^3)(2y^2)^{-2}}{(y^4)^3} =$

$\frac{3y^3 \cdot 2^{-2} \cdot y^{-4}}{y^{12}} =$

$\frac{3y^3 y^{-4}}{2^2 y^{12}} = \frac{3y^{-1}}{2^2 y^{12}} = \frac{3}{2^2 y^{13}} = \frac{3}{4y^{13}}$

6.  $(8x^4y^{-3})\left(\frac{1}{2}x^{-5}y^2\right)$

$(8x^4y^{-3})\left(\frac{1}{2}x^{-5}y^2\right) =$

$\frac{8x^4}{y^3} \cdot \frac{1y^2}{2x^5} =$

$\frac{8}{1} \cdot \frac{1}{2} \cdot \frac{x^4}{x^5} \cdot \frac{y^2}{y^3} = \frac{8}{2} \cdot \frac{1}{x^1} \cdot \frac{1}{y^1} =$

$\frac{4}{xy}$

7.  $\left(\frac{4a^2b}{a^3b^2}\right)\left(\frac{5a^2b}{2b^4}\right)$

$\left(\frac{4a^2b}{a^3b^2}\right)\left(\frac{5a^2b}{2b^4}\right) =$

$\frac{4(1)(1) \cdot 5a^2(1)}{a^1 b^1 \cdot 2 b^3} =$

$\frac{4}{a} \cdot \frac{5a^2}{2b^3} = \frac{4 \cdot 5 \cdot a^2}{1 \cdot 2 \cdot a \cdot b \cdot b^3} =$

$\frac{10a^1}{b^4}$

8.  $(3y^3)^4(4y^2)^{-3}$

$(3y^3)^4(4y^2)^{-3} =$

$3^4 y^{12} \cdot 4^{-3} y^{-6} =$

$\frac{3^4 y^{12}}{4^3 y^6} = \frac{81y^6}{64}$

9.  $(2x^2y^{-5})(-6x^{-5}y^3)\left(\frac{1}{3}x^{-1}y^6\right)$

$(2x^2y^{-5})(-6x^{-5}y^3)\left(\frac{1}{3}x^{-1}y^6\right)$

$\frac{2x^2}{y^5} \cdot \frac{-6y^3}{x^5} \cdot \frac{1}{3} \cdot \frac{1}{x} \cdot \frac{y^6}{1}$

$\frac{2x^2 \cdot (-6)y^3 \cdot y^6}{y^5 \cdot x^5 \cdot 3 \cdot x} =$

$\frac{-12x^2 y^9}{3x^6 y^5} = \frac{-4y^4}{x^4}$

10.  $\left(\frac{3x^5y^4}{x^0y^{-3}}\right)^2$

$\left(\frac{3x^5y^4}{x^0y^{-3}}\right)^2 =$

$\frac{3^2 x^{10} y^8}{x^0 y^{-6}} =$

$x^0 y^{-6}$

$\frac{9x^{10} y^8 y^6}{1} =$

$9x^{10} y^{14}$

11.  $(4a^2b)^4\left(\frac{-a^3}{2b}\right)^2$

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

$4^4 \cdot a^8 \cdot b^4 \cdot \frac{(-1)^2 a^6}{2^2 b^2} =$

$\frac{256 a^8 b^4 \cdot 1 \cdot a^6}{4b^2} =$

$\frac{256 a^8 b^4 \cdot 1 \cdot a^6}{4b^2} =$

$64 a^{14} b^2$