

Simplifying Algebraic Expressions Using Properties of Exponents

Problems

Simplify each algebraic expression using the properties of exponents.

1. $(x^8)^3 = x^{8*3} = x^{24}$

2. $\left(\frac{a^3}{b^6}\right)^5 = \frac{a^{3*5}}{b^{6*5}} = \frac{a^{15}}{b^{30}}$

3. $\left(\frac{z^4}{z^3}\right)^2 = \frac{z^8}{z^6} = z^{8-6} = z^2$

4. $(4x^8z^4)^9 = 4^9x^{8*9}z^{4*9} = 262144x^{72}z^{36}$

5. $\left(\frac{4b^7}{5t^3}\right)^6 = \frac{4^6b^{7*6}}{5^6t^{3*6}} = \frac{4096b^{42}}{15625t^{18}}$

6. $\left(\frac{3x^4z^5}{9r^9p^{11}}\right)^4 = \frac{3^4x^{4*4}z^{5*4}}{9^4r^{9*4}p^{11*4}} = \frac{81x^{16}z^{20}}{6561r^{36}p^{44}} = \frac{x^{16}z^{20}}{81r^{36}p^{44}}$

7. $\left(\frac{4a^8b^3c^7}{6a^3b^7c^{12}}\right)^2 = \frac{4^2a^{8*2}b^{3*2}c^{7*2}}{6^2a^{3*2}b^{7*2}c^{12*2}} = \frac{16a^{16}b^6c^{14}}{36a^6b^{14}c^{24}} = \frac{4}{9}a^{16-6}b^{6-14}c^{14-24} =$

$$\frac{4}{9}a^{10}b^{-8}c^{-10} = \frac{4a^{10}}{9b^8c^{10}}$$

8. $\frac{(x^5y^4)^2}{(x^2y)^5} = \frac{x^{5*2}y^{4*2}}{x^{2*5}y^5} = \frac{x^{10}y^8}{x^{10}y^5} = x^{10-10}y^{8-5} = x^0y^3 = 1y^3 = y^3$

$$9. \left(\frac{a^{-8}}{2a^5}\right)^3 = \frac{a^{-8*3}}{2^3 a^{5*3}} = \frac{a^{-24}}{8a^{15}} = \frac{1}{8} a^{-24-15} = \frac{1}{8} a^{-39} = \frac{1}{8a^{39}}$$

$$10. \left(\frac{4x^3y^9}{2y^3}\right)^4 * \left(\frac{3x^8}{x^6y^4}\right)^2 = \frac{4^4 x^{3*4} y^{9*4}}{2^4 y^{3*4}} * \frac{3^2 x^{8*2}}{x^{6*2} y^{4*2}} = \frac{256x^{12}y^{36}}{16y^{12}} * \frac{9x^{16}}{x^{12}y^8} =$$

$$\frac{256*9x^{12+16}y^{36}}{16x^{12}y^{12+8}} = \frac{2304x^{28}y^{36}}{16x^{12}y^{20}} = 144x^{28-12}y^{36-20} = \mathbf{144x^{16}y^{16}}$$