Steps for Simplifying Exponential Expressions

Step 1 APPLY THE ZERO-EXPONENT RULE $$a^0 = 1$$	Change anything raised to the zero power into a 1.
Step 2 APPLY THE POWER RULE $$(a^m)^n = a^{m \cdot n}$$ $$(ab)^m = a^m b^m \quad \text{or} \quad \left(\frac{a}{b}\right)^m = \frac{a^m}{b^m}$$	Multiply the exponent outside the parenthesis with every exponent inside the parenthesis, remember that if there is no exponent shown, then the exponent is 1.
Step 3 APPLY THE NEGATIVE EXPONENT RULE $$a^{-m} = \frac{1}{a^m}$$ $$\frac{1}{a^{-m}} = a^m$$ $$\left(\frac{a}{b}\right)^{-m} = \left(\frac{b}{a}\right)^m$$	Powers with negative exponents in the numerator get moved to the denominator the exponents become positive. Powers with negative exponents in the denominator get moved to the numerator & the exponents become positive. *Note:* the order in which things are moved does not matter.
Step 4 APPLY THE PRODUCT RULE $$b^m b^n = b^{m+n}$$	To multiply two powers with the same base, you keep the base and add the exponents.
Step 5 APPLY THE QUOTIENT RULE $$\frac{b^m}{b^n} = b^{m-n}$$	If two powers have the same base in the numerator and denominator, subtract the exponents and put the power in the denominator in the numerator or denominator, depending on where the higher power was located. This will help avoid negative exponents and a repeat of Step 3.
Step 6 SIMPLIFY	Raise each coefficient (or number) to the appropriate power and then reduce any remaining fractions.

REMEMBER: An exponent applies **only** to the factor it is directly next to unless parentheses enclose other factors.

Example(s): $(-3)^2 = (-3)(-3) = 9$ $-3^2 = -9$

1.3 Exponents Practice

Simplify each expression so the final answer has no negative exponents, no parentheses and powers involving numbers are simplified.

1. $3 \cdot 4^3$

2. $4x^3 \cdot 2x^3$

3. $x^5 \cdot x^3$

4. $2x^3 \cdot 2x^2$

5. $\frac{6^5}{6^3}$

6. $\frac{x^4}{x^7}$

7. 8^0

8. $-(9x)^0$

9. $(y^4)^3$

10. $(x^2y)^4$

11. $\frac{6x^7}{2x^4}$

12. $\frac{8x^5}{4x^2}$

13. $(2cd^4)^2(cd)^5$

14. $(2fg^4)^4(fg)^6$

15. $\frac{x^5y^6}{xy^2}$

16. $\frac{x^2y^5}{xy^4}$

17. $\left(\frac{4x^5y}{16xy^4}\right)^3$

18. $\left(\frac{5x^3y}{20xy^5}\right)^4$

19. y^{-7}

20. 7^{-2}

21. $\frac{1}{x^{-5}}$

22. $\frac{1}{2^{-4}}$

23. $x^5 \cdot x^{-1}$

24. x^{-6}

25. $x^9 \cdot x^{-7}$

26. $(j^{-13})(j^4)(j^6)$

27. $\frac{x^{-1}}{x^{-8}}$

28. $\frac{52x^6}{13x^{-7}}$

29. $f^{-3}(f^2)(f^{-3})$

30. $\frac{x^{-4}}{x^{-9}}$

31. $\frac{24x^6}{12x^{-8}}$

32. $\frac{3x^2y^{-3}}{12x^6y^3}$

33. $(2x^3y^{-3})^{-2}$

34. $\frac{2x^4y^{-4}}{8x^7y^3}$

35. $(4x^4y^{-4})^3$

36. $5x^2y(2x^4y^{-3})$

37. $\left(\frac{-7a^2b^3c^0}{3a^3b^4c^3}\right)^{-4}$

38. $\left(\frac{-2a^3b^2c^0}{3a^2b^3c^7}\right)^{-2}$