

Practice 8-3**Multiplication Properties of Exponents****Simplify each expression.**

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|---------------------------------------|----------------------------------|-------------------------------------|
| 1. $(3d^{-4})(5d^8)$ | 2. $(-8m^4)(4m^8)$ | 3. $n^{-6} \cdot n^{-9}$ |
| 4. $a^3 \cdot a$ | 5. $3^8 \cdot 3^5$ | 6. $(3p^{-15})(6p^{11})$ |
| 7. $p^7 \cdot q^5 \cdot p^6$ | 8. $(-1.5a^5b^2)(6a)$ | 9. $(-2d^3e^3)(6d^4e^6)$ |
| 10. $\frac{1}{b^{-7} \cdot b^5}$ | 11. $p^5 \cdot q^2 \cdot p^4$ | 12. $\frac{1}{n^7 \cdot n^{-5}}$ |
| 13. $(8d^4)(4d^7)$ | 14. $x^{-9} \cdot x^3 \cdot x^2$ | 15. $2^3 \cdot 2^2$ |
| 16. $r^7 \cdot s^4 \cdot s \cdot r^3$ | 17. $b^7 \cdot b^{13}$ | 18. $(7p^4)(5p^9)$ |
| 19. $2^8 \cdot 2^{-9} \cdot 2^3$ | 20. $(6r^4s^3)(9rs^2)$ | 21. $4^3 \cdot 4^2$ |
| 22. $m^{12} \cdot m^{-14}$ | 23. $s^7 \cdot t^4 \cdot t^8$ | 24. $(-3xy^6)(3.2x^5y)$ |
| 25. $5^{-7} \cdot 5^9$ | 26. $\frac{1}{h^7 \cdot h^3}$ | 27. $\frac{1}{t^{-5} \cdot t^{-3}}$ |
| 28. $f^5 \cdot f^2 \cdot f^0$ | 29. $r^6 \cdot r^{-13}$ | 30. $5^{-6} \cdot 5^4$ |

Simplify each expression. Write each answer in scientific notation.

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| 31. $(7 \times 10^7)(5 \times 10^{-5})$ | 32. $(3 \times 10^8)(3 \times 10^4)$ | 33. $(9.5 \times 10^{-4})(2 \times 10^{-5})$ |
| 34. $(4 \times 10^9)(4.1 \times 10^8)$ | 35. $(7.2 \times 10^{-7})(2 \times 10^{-5})$ | 36. $(5 \times 10^7)(4 \times 10^3)$ |
| 37. $(6 \times 10^{-6})(5.2 \times 10^4)$ | 38. $(4 \times 10^6)(9 \times 10^8)$ | 39. $(6.1 \times 10^9)(8 \times 10^{14})$ |
| 40. $(2.1 \times 10^{-4})(4 \times 10^{-7})$ | 41. $(1.6 \times 10^5)(3 \times 10^{11})$ | 42. $(9 \times 10^{12})(0.3 \times 10^{-18})$ |
| 43. $(4 \times 10^9)(11 \times 10^3)$ | 44. $(5 \times 10^{13})(9 \times 10^{-9})$ | 45. $(7 \times 10^6)(4 \times 10^9)$ |
| 46. $(6 \times 10^{-8})(12 \times 10^{-7})$ | 47. $(6 \times 10^{15})(3.2 \times 10^2)$ | 48. $(5 \times 10^8)(2.6 \times 10^{-16})$ |
49. In 1990, the St. Louis metropolitan area had an average of 82×10^{-6} g/m³ of pollutants in the air. How many grams of pollutants were there in 2×10^3 m³ of air?
50. Light travels approximately 5.87×10^{12} mi in one year. This distance is called a light-year. Suppose a star is 2×10^4 light-years away. How many miles away is that star?
51. The weight of 1 m³ of air is approximately 1.3×10^3 g. Suppose that the volume of air inside of a building is 3×10^6 m³. How much does the air inside the building weigh?
52. Light travels 1.18×10^{10} in. in 1 second. How far will light travel in 1 nanosecond or 1×10^{-9} s?