

4.6 Negative Exponents and Scientific Notation

Name _____

Rewrite each expression using positive exponents only.	
1. x^{-2}	2. a^{-5}
3. 2^{-3}	4. 5^{-2}
5. $(5x)^{-2}$	6. $(2a)^{-4}$
7. $5x^{-2}$	8. $3y^{-5}$
Write each of the following as a decimal.	
9. 5^{-1}	10. 10^{-1}
11. 5×10^{-1}	12. 2×10^{-3}
13. 54×10^2	14. 32×10^4
Answers: 1. $\frac{1}{x^2}$; 3. $\frac{1}{2^3} = \frac{1}{8}$; 5. $\frac{1}{25x^2}$; 7. $\frac{5}{x^2}$; 9. 0.2; 11. 0.5 13. 5,400	

Write each number in scientific notation.	
15. 7,700,000	16. 186,000
17. 0.0023	18. 0.00048
19. 358	20. 14
<p>21. The average distance from earth to the sun is about 93,000,000 miles. Write this number in scientific notation.</p> <p>93,000,000 =</p>	<p>22. The diameter of an atom is about 0.0000000001 meters. The diameter of a bacteria is about 0.0000005 meters. Write these numbers in scientific notation.</p> <p>0.0000000001 =</p> <p>0.0000005 =</p>
Convert the following scientific numbers to standard form.	
23. 1.45×10^{-7}	24. 3.7×10^{-5}
25. 5.4×10^5	26. 3.02×10^3
Answers: 15. 7.7×10^6 ; 17. 2.3×10^{-3} ; 19. 3.58×10^2 ; 21. 9.3×10^7 ; 23. 0.000000145; 25. 540,000	

Simplify. Write your final answer using positive exponents only.

27. $x^5 \cdot x^2$

28. $x^3 \cdot x^{12}$

29. $x^5 \cdot x^{-2}$

30. $x^7 \cdot x^{-6}$

31. $x^{-7} \cdot x^{-6}$

32. $x^{-2} \cdot x^{-8}$

33. $\frac{x^7}{x^3}$

34. $\frac{x^5}{x^2}$

35. $\frac{x^{-7}}{x^3}$

36. $\frac{x^{-4}}{x^5}$

37. $\frac{x^{-7}}{x^{-5}}$

38. $\frac{x^{-10}}{x^{-2}}$

Answers: 27. x^7 ; 29. x^3 ; 31. $\frac{1}{x^{13}}$; 33. x^4 ; 35. $\frac{1}{x^{10}}$; 37. $\frac{1}{x^2}$

Simplify. Write your answers using positive exponents only.

39. $(x^{-2})^3$

40. $(x^{-5})^2$

41. $(x^{-2})^{-5}$

42. $(x^{-3})^{-7}$

43. $(2x^4)(5x^{-3})$

44. $(4x^5)(8x^{-2})$

45. $(5x^4y^{-1})(4x^{-3}y^{-2})$

46. $(2x^7y^{-2})(7x^{-5}y^{-5})$

47. $\frac{15x^{-7}}{10x^3}$

48. $\frac{12x^{-5}}{16x^4}$

49. $\frac{9x^2y^{-1}}{12x^{-3}y^2}$

50. $\frac{8a^4b^{-5}}{12a^{-1}b^8}$

Answers: 39. $\frac{1}{x^6}$; 41. x^{10} ; 43. $10x$; 45. $\frac{20x}{y^3}$; 45. $\frac{3}{2x^{10}}$; 49. $\frac{3x^5}{4y^3}$

Simplify. Write your answers using positive exponents only.

51. $\left(\frac{x}{3}\right)^{-2}$

52. $\left(\frac{5}{y}\right)^{-3}$

53. $\left(\frac{x^{-3}}{5}\right)^{-2}$

54. $\left(\frac{x^{-5}}{2}\right)^{-3}$

55. $\frac{(3x^{-4}y)^2}{15x^3y^{-2}}$

56. $\frac{(5x^{-3}y^3)^3}{15x^4y^{-1}}$

57. $(2x^{-3}y)(3xy^{-2})^2$

58. $(5x^2y^{-3})(2x^3y^{-3})^2$

Answers: 51. $\frac{9}{x^2}$; 53. $25x^6$; 55. $\frac{3y^4}{5x^{11}}$; 57. $\frac{18}{xy^3}$