Scientific Notation

Any positive number can be written in **scientific notation**,

$$c \times 10^m, \text{ where } 1 \leq c < 10 \text{ and } m \text{ is an integer.}$$

Converting to and from Scientific Notation

(a) $2.375 \times 10^8 =$ $237,500,000$

(b) $0.000000349 =$ 3.49×10^{-7}

Using Scientific Notation

Simplify $\dfrac{(370{,}000)(4{,}500{,}000{,}000)}{18{,}000}$.

$$\frac{\left(3.7\times10^{5}\right)\left(4.5\times10^{9}\right)}{1.8\times10^{4}} = \qquad 9.25\times10^{10}$$

The calculator uses "9.25E10" to stand for 9.25×10^{10}.

Assignment:

In Exercises 57 and 58, write the number in scientific notation.

57. The mean distance from Jupiter to the Sun is about 483,900,000 miles.

58. The electric charge, in coulombs, of an electron is about $-0.000\ 000\ 000\ 000\ 000\ 000\ 16$.

In Exercises 59–62, write the number in decimal form.

59. 3.33×10^{-8}

60. 6.73×10^{11}

61. The distance that light travels in 1 year (*one light-year*) is about 5.87×10^{12} mi.

In Exercises 63 and 64, use scientific notation to simplify.

63. $\dfrac{(1.35 \times 10^{-7})(2.41 \times 10^{8})}{1.25 \times 10^{9}}$

64. $\dfrac{(3.7 \times 10^{-7})(4.3 \times 10^{6})}{2.5 \times 10^{7}}$

In Exercises 37–40, use the distributive property to write the factored form or the expanded form of the given expression.

37. $a(x^2 + b)$

38. $(y - z^3)c$

39. $ax^2 + dx^2$

40. $a^3z + a^3w$

In Exercises 47–52, simplify the expression. Assume that the variables in the denominators are nonzero.

47. $\dfrac{x^4y^3}{x^2y^5}$

48. $\dfrac{(3x^2)^2y^4}{3y^2}$

49. $\left(\dfrac{4}{x^2}\right)^2$

50. $\left(\dfrac{2}{xy}\right)^{-3}$

51. $\dfrac{(x^{-3}y^2)^{-4}}{(y^6x^{-4})^{-2}}$

52. $\left(\dfrac{4a^3b}{a^2b^3}\right)\left(\dfrac{3b^2}{2a^2b^4}\right)$