Chapter 6:

Simplify each. Write the answer with positive exponents only.

49. $5^0 + 4^1$

$= 1 + 4$

$= \boxed{5}$

50. $(3y^2)(-5y^3)$

$= 3 \cdot (-5) \cdot y^2 \cdot y^3$

$= \boxed{-15y^5}$

This step is not necessary. I'm just showing a way to break it down.

51. $(-4x^3y^5)^2$

method 1, distribute the exponent:

$= (-4)^2 \cdot (x^3)^2 \cdot (y^5)^2$

$= \boxed{16x^6y^{10}}$

method 2, $A^2 = A \cdot A$:

$= (-4x^3y^5) \cdot (-4x^3y^5)$

$= 16x^3 \cdot x^3 \cdot y^5 \cdot y^5$

$= \boxed{16x^6y^{10}}$

52. 2^{-4}

$= \frac{1}{2^4}$

$= \boxed{\frac{1}{16}}$

the negative in an exponent means "reciprocal." use this for #52 - 58

53. $\left(\frac{2}{11}\right)^{-2}$

$= \left(\frac{11}{2}\right)^2$

$= \frac{11^2}{2^2} = \boxed{\frac{121}{4}}$

54. $\left(\frac{2x}{w}\right)^{-4}$

$= \left(\frac{w}{2x}\right)^4$

$= \frac{w^4}{2^4x^4} = \boxed{\frac{w^4}{16x^4}}$

55. $p^{-7} \cdot p^6$

use the product rule of exponents

$= p^{-7+6}$

$= p^{-1} = \boxed{\frac{1}{p}}$

56. $h^{-8} \cdot h^{-5}$

$= h^{-8+(-5)}$

$= h^{-13} = \boxed{\frac{1}{h^{13}}}$

57. $\frac{x^{-8}}{x^{-4}}$

use the quotient rule of exponents

$= x^{-8-(-4)}$

$= x^{-8+4}$

$= x^{-4} = \boxed{\frac{1}{x^4}}$

58. $\frac{y}{y^{-5}}$

$= y^{1-(-5)}$

$= y^{1+5}$

$= \boxed{y^6}$

Scientific Notation is written with powers of 10.

Rewrite into scientific notation.

"Large" numbers have a positive power of 10; "Small" numbers (less than 1) have a negative power of 10.

59. 5,090,000 ← large

$= \boxed{5.09 \times 10^{6}}$

60. 0.00913 ← small

$= \boxed{9.13 \times 10^{-3}}$

Expand to its natural form.

61. 7.41×10^3 ← this will become a "large" number

$= \boxed{7{,}410}$

62. 2.83×10^{-4} ← this will become a "small" number.

$= \boxed{0.000283}$

Perform the indicated operation. Write the answer in proper scientific notation.

63. $(8.1 \times 10^7) \times (3.0 \times 10^{-3})$

64. $(2.0 \times 10^{-7}) \times (5.7 \times 10^4)$

we must ① multiply the coefficients, and ② add the powers of 10. If the resulting coeffient is 10 or more, we must adjust it to be a proper coefficient.

#63 multiply:

$$\begin{array}{r} 8.1 \\ \times\ 3 \\ \hline 24.3 \end{array}$$

$= 24.3 \times 10^{7+(-3)}$

$= 24.3 \times 10^{4}$ adjust the coefficient

$= 2.43 \times 10^{1} \times 10^{4}$

$= \boxed{2.43 \times 10^{5}}$

#64 multiply:

$$\begin{array}{r} 5.7 \\ \times\ 2 \\ \hline 11.4 \end{array}$$

$= 11.4 \times 10^{-7+4}$

$= 11.4 \times 10^{-3}$

$= 1.14 \times 10^{1} \times 10^{-3}$

$= \boxed{1.14 \times 10^{-2}}$

65. $\dfrac{9.0 \times 10^4}{4.5 \times 10^9}$

66. $\dfrac{3.6 \times 10^6}{2.4 \times 10^2}$

we must ① divide the coefficients, and ② subtract the powers of 10 (quotient rule). It is best to treat the coefficients as a fraction; first simplify the fraction.

#65 Coefficients:

$\dfrac{9.0}{4.5} = \dfrac{90}{45} = \dfrac{10}{5} = 2$

$= 2 \times 10^{4-9}$

$= \boxed{2.0 \times 10^{-5}}$

This coefficient doesn't need to be adjusted.

#66 coefficients:

$\dfrac{3.6}{2.4} = \dfrac{36}{24} = \dfrac{3}{2} = 1.5$

$$\begin{array}{r} 1.5 \\ 2\overline{)\,3.00} \\ -2 \\ \hline 10 \\ -10 \\ \hline 0 \end{array}$$

$= 1.5 \times 10^{6-2}$

$= \boxed{1.5 \times 10^{4}}$