

**Lesson Summary**

**EXPONENTIAL NOTATION FOR WHOLE NUMBER EXPONENTS:** Let  $m$  be a nonzero whole number. For any number  $a$ , the expression  $a^m$  is the product of  $m$  factors of  $a$ , i.e.,

$$a^m = \underbrace{a \cdot a \cdot \dots \cdot a}_{m \text{ times}}$$

The number  $a$  is called the *base*, and  $m$  is called the *exponent* or *power* of  $a$ .

When  $m$  is 1, “the product of one factor of  $a$ ” just means  $a$ , i.e.,  $a^1 = a$ . Raising any nonzero number  $a$  to the power of 0 is defined to be 1, i.e.,  $a^0 = 1$  for all  $a \neq 0$ .

**Problem Set**

- Complete the table by filling in the blank cells. Use a calculator when needed.

Exponential Form	Expanded Form	Standard Form
$3^5$		
	$4 \times 4 \times 4$	
$(1.9)^2$		
$\left(\frac{1}{2}\right)^5$		

- Why do whole numbers raised to an exponent get greater, while fractions raised to an exponent get smaller?
- The powers of 2 that are in the range 2 through 1,000 are 2, 4, 8, 16, 32, 64, 128, 256, and 512. Find all the powers of 3 that are in the range 3 through 1,000.
- Find all the powers of 4 in the range 4 through 1,000.
- Write an equivalent expression for  $n \times a$  using only addition.
- Write an equivalent expression for  $w^b$  using only multiplication.
  - Explain what  $w$  is in this new expression.
  - Explain what  $b$  is in this new expression.
- What is the advantage of using exponential notation?
- What is the difference between  $4x$  and  $x^4$ ? Evaluate both of these expressions when  $x = 2$ .