5.1 Getting Started

Objectives:
- Warm up to the ideas of the investigation.
- Review the laws of exponents.

In your notes:

Work on the **For You to Explore** problems p.399 #1-5

1. Copy and complete this table for the function $f(n) = 2^n$.

Input, n	Output, $f(n)$	
6	64	
5	32	
4	16	
3	8	
2	4	
1	2	
0	1	
−1	$\frac{1}{2}$	= 0.5
−2	$\frac{1}{4}$	= 0.25
−3	$\frac{1}{8}$	= 0.125

2. Solve each equation.

a. $2^3 \cdot 2^5 = 2^a$ $a=8$

b. $2^b \cdot 2^8 = 2^{14}$ $b=6$

c. $3^c \cdot 3^c = 3^{12}$ $c=6$

d. $(3^d)^2 = 3^8$ $3^{2d}=3^8$ $d=4$

e. $\frac{5^7}{5^f} = 5^6$ $f=1$

f. $3^g = 9^5$ $(3^2)^5$ $g=10$

g. $5^{3h} = 5^7$

$3h=7$

$h=2.\overline{3}$

h. $(5^k)^3 = 5^4$

$5^{3k}=5^4$

$3k=4$

$K=1\frac{1}{3}$

3. **Write About It** What are some rules of exponents? Give examples.

A *geometric sequence* is a list of numbers in which you get each term by multiplying the previous one by a constant. For example, the sequence below is a geometric sequence, since each term is three times as great as the previous term.

4, 12, 36, 108, 324, . . .

For Problems 4 and 5, find the missing terms in each geometric sequence.

4. a. 4, 8, 16, 32, 64, 128, . . .

b. 4, −8, 16, −32, 64, −128, . . .

c. $2, 2\sqrt{3}, 6, 6\sqrt{3}, 18, 18\sqrt{3}$

d. $a, 2a, 4a, 8a, 16a, 32a, \ldots$

e. $k, 3k, 9k, 27k, 81k, 243k$

$2\sqrt{3} \cdot \sqrt{3}$

5. a. 1, 2, 4, 8, 16, 32, . . . 6

b. 4, 2, 1, $\frac{1}{2}$, $\frac{1}{4}$, $\frac{1}{8}$, . . .

c. 2, 6, 18, 54, 162, 486

d. $1, \sqrt{3}, 3, 3\sqrt{3}, 9, 9\sqrt{3}, \ldots$

Homework: p.400 (6-9)

On Your Own

6. Decide whether each equation is true for all positive integers a, b, and c.

a. $a^b \stackrel{?}{=} b^a$ b. $a^{b+c} \stackrel{?}{=} a^b + a^c$ c. $a^{b+c} \stackrel{?}{=} a^b \cdot a^c$

d. $a^b \cdot a^c \stackrel{?}{=} a^{bc}$ e. $(a^b)^c \stackrel{?}{=} a^{bc}$ f. $(a^b)^c \stackrel{?}{=} a^{(b^c)}$

g. $\frac{a^b}{a^c} \stackrel{?}{=} a^{b-c}$ h. $(ab)^c \stackrel{?}{=} a(b^c)$

7. Determine whether each expression is equal to 2^{12}. Explain.

a. $2^{10} + 2^2$ b. $(2^4)(2^4)(2^4)$ c. $2^6 \cdot 2^6$

d. $2^9 + 2^3$ e. $(2^{10})(2^2)$ f. $2^{11} + 2^{11}$

g. $(2^4)(2^3)$ h. $4(2^{10})$

8. Copy and complete the table for the function $g(n) = 3^n$.

Input, n	Output, $g(n)$
5	243
4	81
3	27
2	
1	
0	
−1	
−2	
−3	

9. Problem 1 shows a table for $f(n) = 2^n$.
Exercise 8 shows a table for $g(n) = 3^n$.
Consider the function $h(n) = f(n) \cdot g(n)$.

a. Calculate $h(3)$.

b. Use the completed tables to calculate $h(0)$, $h(1)$, and $h(2)$.

c. Find a simple rule for $h(n)$.

1.

Input, n	Output, $f(n)$
6	64
5	32
4	16
3	8
2	■
1	■
0	■
−1	■
−2	■
−3	■

8.

Input, n	Output, $g(n)$
5	243
4	81
3	27
2	■
1	■
0	■
−1	■
−2	■
−3	■