

**LESSON**

**7-1**

**Review for Mastery**

**Integer Exponents**

Remember that  $2^3$  means  $2 \times 2 \times 2 = 8$ . The base is 2, the exponent is positive 3. Exponents can also be 0 or negative.

	<b>Zero Exponents</b>	<b>Negative Exponents</b>	<b>Negative Exponents in the Denominator</b>
<b>Definition</b>	For any nonzero number $x$ , $x^0 = 1$ .	For any nonzero number $x$ and any integer $n$ , $x^{-n} = \frac{1}{x^n}$ .	For any nonzero number $x$ and any integer $n$ , $\frac{1}{x^{-n}} = x^n$ .
<b>Examples</b>	$6^0 = 1$ $\left(\frac{1}{2}\right)^0 = 1$	$5^{-3} = \frac{1}{5^3}$ $2^{-4} = \frac{1}{2^4}$	$\frac{1}{8^{-2}} = 8^2$ $\frac{1}{2^{-4}} = 2^4$
$0^0$ and $0^{-n}$ are undefined.			

**Simplify  $4^{-2}$ .**

$4^{-2}$

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

*Write without negative exponents.*

$\frac{1}{4 \cdot 4}$

*Write in expanded form.*

$\frac{1}{16}$

*Simplify.*

**Simplify  $x^2y^{-3}z^0$ .**

$x^2y^{-3}z^0$

$\frac{x^2z^0}{y^3}$

*Write without negative exponents.*

$\frac{x^2(1)}{y^3}$

$z^0 = 1$ .

$\frac{x^2}{y^3}$

*Simplify.*

**Fill in the blanks to simplify each expression.**

1.  $2^{-5}$

$2^{-5} = \frac{1}{2^{\square}}$

$\frac{1}{2^5} = \frac{1}{\square}$

= \_\_\_\_\_

2.  $10^{-3}$

$10^{-3} = \frac{1}{10}$

$\frac{1}{10^3} = \frac{1}{\square}$

= \_\_\_\_\_

3.  $\frac{1}{5^{-4}}$

$\frac{1}{5^{-4}} = 5^{\square}$

$5^{\square} = \square$

= \_\_\_\_\_

**Simplify.**

4.  $5y^{-4}$  \_\_\_\_\_

5.  $\frac{8}{a^{-3}}$  \_\_\_\_\_

6.  $9x^3y^{-2}$  \_\_\_\_\_

7.  $\frac{x^3}{x^{-1}y}$  \_\_\_\_\_

8.  $\frac{b^2}{a^{-1}b^3}$  \_\_\_\_\_

9.  $5x^{-4}y^2$  \_\_\_\_\_

**LESSON**

**7-1**

**Review for Mastery**

**Integer Exponents** *continued*

Evaluate  $a^{-3}b^4$  for  $a = 5$  and  $b = 2$ .

$$a^{-3}b^4$$

$$(5^{-3})(2^4) \quad \textit{Substitute.}$$

$$\frac{2^4}{5^3} \quad \textit{Write without negative exponents.}$$

$$\frac{16}{125} \quad \textit{Simplify.}$$

When evaluating, it is important to determine whether the negative is raised to the power.

Evaluate  $-x^{-2}$  for  $x = 10$ .

The negative is not raised to the power.

$$-x^{-2}$$

$$-10^{-2} \quad \textit{Substitute.}$$

$$-\frac{1}{10^2} \quad \textit{Write without negative exponents}$$

$$-\frac{1}{10 \cdot 10} \quad \textit{Write in expanded form.}$$

$$-\frac{1}{100} \quad \textit{Simplify.}$$

Evaluate  $(-x)^{-2}$  for  $x = 10$ .

The negative is raised to the power.

$$(-x)^{-2}$$

$$(-10)^{-2} \quad \textit{Substitute.}$$

$$\frac{1}{(-10)^2} \quad \textit{Write without negative exponents}$$

$$\frac{1}{(-10) \cdot (-10)} \quad \textit{Write in expanded form.}$$

$$\frac{1}{100} \quad \textit{Simplify.}$$

Evaluate each expression for the given value(s) of the variable(s).

10.  $x^2y^0$  for  $x = -2$  and  $y = 5$

\_\_\_\_\_

11.  $a^3b^3$  for  $a = 4$  and  $b = 2$

\_\_\_\_\_

12.  $\frac{z^3}{y^{-2}}$  for  $z = 2$  and  $y = 5$

\_\_\_\_\_

13.  $-a^3b^{-4}$  for  $a = 2$  and  $b = -1$

\_\_\_\_\_

14.  $\frac{n^{-2}}{m^{-4}}$  for  $m = 6$  and  $n = 2$

\_\_\_\_\_

15.  $(-u)^2v^{-6}$  for  $u = 2$  and  $v = 2$

\_\_\_\_\_

## Review for Mastery

1.  $5; 2 \cdot 2 \cdot 2 \cdot 2 \cdot 2; \frac{1}{32}$
2.  $10 \cdot 10 \cdot 10; \frac{1}{1000}$
3.  $4; 4; 5 \cdot 5 \cdot 5 \cdot 5; 625$
4.  $\frac{5}{y^4}$
5.  $8a^3$
6.  $\frac{9x^3}{y^2}$
7.  $\frac{x^4}{y}$
8.  $\frac{a}{b}$
9.  $\frac{5y^2}{x^4}$
10. 4
11. 512
12. 200
13. -8
14. 324
15.  $\frac{1}{16}$

## Challenge

1. 1; 1; 1; 1; 1; 1; 1; 1; 1; 1
2. 2; 4; 8; 6; 2; 4; 8; 6; 2
3. 3; 9; 7; 1; 3; 9; 7; 1; 3
4. 4; 6; 4; 6; 4; 6; 4; 6; 4
5. 5; 5; 5; 5; 5; 5; 5; 5; 5
6. 6; 6; 6; 6; 6; 6; 6; 6; 6
7. 7; 9; 3; 1; 7; 9; 3; 1; 7
8. 8; 4; 2; 6; 8; 4; 2; 6; 8
9. 9; 1; 9; 1; 9; 1; 9; 1; 9
10. 0; 0; 0; 0; 0; 0; 0; 0; 0
11. For all  $n$ ,  $1^n$  has 1 as its units digit.
12. The pattern is 2, 4, 8, and 6, for  $n = 1, 2, 3$ , and 4 and then repeats.
13. The pattern is 3, 9, 7, and 1, for  $n = 1, 2, 3$ , and 4 and then repeats.
14. For all  $n > 0$ ,  $5^n$  has 5 as its units digit.
15. If you divide  $n$  by 4, then the units digit is 7, 9, 3, or 1, depending on whether the remainder is 1, 2, 3, or 0, respectively.

## Problem Solving

1.  $\frac{4}{25}$  or  $0.16 \text{ mm}^2$
2.  $\frac{3}{8}$  and  $\frac{3}{4}$  oz
3. 3.142
4.  $42\frac{2}{3}$  liters

5. B
6. H
7. C

## Reading Strategies

1. 6
2. 0
3.  $8^{-3}$
4.  $\frac{1}{b^7}$
5. 32
6.  $\frac{1}{32}$
7. 1
8.  $\frac{1}{1,000,000}$
9. -64
10.  $-\frac{1}{64}$
11.  $\frac{1}{t^4}$
12.  $\frac{c^2}{d^3}$
13.  $\frac{8}{x^5}$
14. 12

## LESSON 7-2

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### Practice A

1. 0.01
2. 1000
3. 1
4. 0.00001
5. 0.1
6. 10,000,000
7. 5; 5
8. 4; -4
9. 3; -3
10. 226,000
11. 0.00528
12. 0.0476283
13. 482,000
14. 0.029
15. 60,000
16.  $4.5 \times 10^3$
17.  $6.56 \times 10^6$
18.  $2 \times 10^{-5}$
19.  $2.03 \times 10^{-3}$
20.  $7.2 \times 10^{-3}; 9.1 \times 10^{-3}; 4.7 \times 10^3;$   
 $9.2 \times 10^3; 2.4 \times 10^4; 6.13 \times 10^4$
21.  $1.1 \times 10^{-3}; 4.1 \times 10^{-2}; 5.6 \times 10^{-2};$   
 $4.2 \times 10^8; 4.5 \times 10^8; 9.2 \times 10^8$
22.  $7.39 \times 10^6$
23. 40,000 sq mi
24. 290,000,000
25. 5,980,000 sq mi

### Practice B

1. 0.001
2. 100,000
3. 0.0001
4. 1
5. 10,000,000
6. 10