

LESSON

7-3

Review for Mastery

Multiplication Properties of Exponents

You can multiply a power by a power by expanding each factor.

Simplify $(4^3)(4^5)$.

$$(4^3)(4^5)$$

$(4 \cdot 4 \cdot 4)(4 \cdot 4 \cdot 4 \cdot 4 \cdot 4)$ *Expand each factor.*

$$4^8$$

Count the number of factors.

The number of factors is the exponent.

Or you can use the **Product of Powers Property**:

$$a^m \cdot a^n = a^{m+n} \quad (a \neq 0, m \text{ and } n \text{ are integers.})$$

Simplify $(4^3)(4^5)$.

$$(4^3)(4^5)$$

$$4^{3+5}$$

$$4^8$$

Simplify $a^4 \cdot b^5 \cdot a^{-2}$.

$$a^{4+(-2)} \cdot b^5$$

$$a^2 \cdot b^5$$

$$a^2b^5$$

You can use the **Power of a Power Property** to find a power raised to another power.

$$(a^m)^n = a^{mn} \quad (a \neq 0, m \text{ and } n \text{ are integers.})$$

Simplify $(2^3)^2$.

$$(2^3)^2$$

$$2^{3 \cdot 2}$$

$$2^6$$

Simplify $(x^5)^4 \cdot y$.

$$x^{5 \cdot 4} \cdot y$$

$$x^{20}y$$

Simplify.

1. $2^3 \cdot 2^4$

2. $8^{-2} \cdot 5^3 \cdot 8^6$

3. $2^4 \cdot 3^5 \cdot 2^8 \cdot 3^{-2}$

4. $m^8 \cdot n^4 \cdot m^7$

5. $(6^4)^2$

6. $(4^{-3})^2$

7. $(5^{-3})^3 \cdot 4^0$

8. $(x^2)^{-4} \cdot y^{-3}$

9. $(u^5)^{-2} \cdot (v^3)^4$

LESSON
7-3

Review for Mastery

Multiplication Properties, of Exponents *continued*

In the **Power of a Power Property**, each factor is raised to that power.

$$(ab)^n = a^n b^n \quad (a \neq 0, b \neq 0, n \text{ is any integer.})$$

Simplify $(x^3 y^{-5})^2$.

$$(x^3 y^{-5})^2$$

$$x^{3 \cdot 2} \cdot y^{-5 \cdot 2}$$

$$x^6 y^{-10}$$

$$\frac{x^6}{y^{10}}$$

Use the Power of a Product Property.

Simplify.

Write with positive exponents.

Exponential expressions are simplified if:

- there are no negative exponents.
- the same base does not appear more than once in a product or a quotient.
- no powers, products or quotients are raised to powers.
- all fractions have been simplified.

Simplified				Not Simplified			
$\frac{x}{y}$	$a^2 b^3$	$\frac{m^3}{n^3}$	$\frac{2g}{3h^4}$	x^{-2}	$(y^2)^4$	$(st)^4$	$\frac{2d^4}{6}$

Tell if each expression is simplified. If not, simplify.

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

11. $(2h^3)^2$

12. $m^3 \cdot m^0$

Simplify.

13. $(-4x^5)^2$

14. $(s^4 t^3)^3$

15. $(-2x^{-4}y)^5$

11. 0; 5; 0; 1
 13. 4; 4; $81n^4$
 15. 3; 4; 12; 12; 3; t^{15}
 17. 1
 19. $64a^6b^{12}$

12. 2; -4; -8; 1; b^8
 14. 3; 3; $8x^3$
 16. b^{15}
 18. $\frac{1}{c^{16}}$

17. $\frac{9}{x^2y^4}$

18. $\frac{s^8}{r^6}$

19. $\frac{1}{a^3}$

20. $\frac{x^{18}}{y^{10}}$

21. $-\frac{j^6}{k^4}$

22. 4

23. 3

24. -2

22. 2.85×10^{12} square feet

Practice B

1. 3^6 or 729
 3. 2^9 or 512
 5. $\frac{r}{s^4}$
 7. $\frac{c^8}{b^2}$
 9. $\frac{1}{g^8}$

2. 2^9 or 512

4. $\frac{1}{q^7}$

6. $\frac{1}{j^4}$

8. h^{10}

10. 1

11. v^{14}

12. $\frac{1}{w^{13}}$

13. $\frac{1}{f^{18}}$

14. a^{16}

15. $81b^4$

16. $25k^2$

17. $-64m^3$

18. $\frac{1}{9p^2}$

19. $s^{20}t^9$

20. $a^{10}b^5$

21. $\frac{1}{x^{16}y^2}$

22. 1.31×10^2 or 131 vibrations

Practice C

1. 2^8 or 256
 3. 5^4 or 625
 5. x^6
 7. 2^8 or 256
 9. y^8
 11. $x^{21}y^5$
 13. $\frac{1}{gh}$
 15. j^6k^9

2. 6^5 or 7776

4. $\frac{1}{t^9}$

6. $s^{10}t^3$

8. 1

10. m^4n^4

12. $64x^3$

14. $-9b^2c^2$

16. $25d^6$

Review for Mastery

1. 2^7

2. $8^4 \cdot 5^3$

3. $2^{12} \cdot 3^3$

4. $m^{15}n^4$

5. 6^8

6. $\frac{1}{4^6}$

7. $\frac{1}{5^9}$

8. $\frac{1}{x^8y^3}$

9. $\frac{v^{12}}{u^{10}}$

10. yes

11. no; $4h^6$

12. no; m^3

13. $16x^{10}$

14. $s^{12}t^9$

15. $\frac{-32y^5}{x^{20}}$

Challenge

1. 0.00012

2. 0.00048

3. 0.00009

4. 0.0000108

5. 0.00012

6. 0.00048

7. 0.00009

8. 0.0000108

9. 0.00000036

10. 0.000006

11. Multiply the decimals in the same way as the whole numbers. Count the number of decimal places in each of the three numbers. Find the sum of those numbers. Move the decimal point that many places to the left.

Problem Solving

1. about 600,000,000

2. 3.46×10^{13} miles

3. about 3250 mi or 3.25×10^3 mi

4. 147,000 sq mi or 1.47×10^5 sq mi