

6.1 Start Thinking

The result of basic operations with variables may be determined using several numbers and observing patterns. Choose any two numbers greater than 1 and designate the first to be the base and the other to be the power. (In the expression x^n , x is the base and n is the power.) Complete the table by performing each operation at least twice, using different numbers each time and describing any patterns you notice.

Operation	Example 1	Example 2	Pattern
$x^n + x^n$			
$x^n \cdot x^n$			
$\frac{x^n}{x^n}$			

6.1 Warm Up

Simplify.

1. 7^1

2. $(-1)^2$

3. $(1.2)^3$

4. $(1.4)^3 \cdot 2^4$

5. $(-3)(-1)$

6. $(-1) \cdot 1^4 \cdot (-4)^3$

6.1 Cumulative Review Warm Up

Graph the linear equation.

1. $y = 3$

2. $x = -2$

3. $x - 4y = 12$

4. $-3x - 7y = -14$

5. $2x + 7y = 1$

6. $6x - 8y = 32$

6.1 Practice A

In Exercises 1–6, evaluate the expression.

1. $(-3)^0$

2. 7^0

3. 3^{-5}

4. $(-5)^{-3}$

5. $\frac{3^{-2}}{9^0}$

6. $\frac{6^{-1}}{-5^0}$

In Exercises 7–18, simplify the expression. Write your answer using only positive exponents.

7. x^{-6}

8. z^0

9. $7x^{-4}y^0$

10. $12f^0g^{-9}$

11. $\frac{3^{-2}a^0}{b^{-2}}$

12. $\frac{6^0tu^{-5}}{2^5}$

13. $\frac{4^7}{4^4}$

14. $\frac{(-3)^6}{(-3)^3}$

15. $(-8)^3 \cdot (-8)^3$

16. $7^{-4} \cdot 7^4$

17. $(h^3)^4$

18. $(t^{-2})^6$

19. A camera lens magnifies an object 10^3 times. The length of an object is 10^{-4} centimeter. What is its magnified length?

In Exercises 20–22, simplify the expression. Write your answer using only positive exponents.

20. $(-2y)^5$

21. $(3d)^{-3}$

22. $\left(\frac{5}{b}\right)^{-3}$

In Exercises 23 and 24, simplify the expression. Write your answer using only positive exponents.

23. $\left(\frac{3x^2y^{-3}}{2x^{-3}y^2}\right)^3$

24. $\left(\frac{-6a^{-9}b^5}{2a^2b^{-4}}\right)^4$

In Exercises 25 and 26, evaluate the expression. Write your answer in scientific notation and standard form.

25. $(1.2 \times 10^7)(4 \times 10^{-2})$

26. $\frac{3.9 \times 10^8}{1.3 \times 10^3}$

6.1 Practice B

In Exercises 1–6, evaluate the expression.

1. 5^{-4}

2. $(-5)^{-4}$

3. $\frac{7^{-1}}{-8^0}$

4. $\frac{8^{-1}}{(-4)^0}$

5. $\frac{-2^{-4}}{3^{-3}}$

6. $\frac{6^{-2}}{(-1)^{-4}}$

In Exercises 7–21, simplify the expression. Write your answer using only positive exponents.

7. $\frac{7^{-2}m^0}{n^{-4}}$

8. $\frac{(-9)^0 j^{-1}k^{-4}}{2^0}$

9. $\frac{5^{-2}w^0}{y^{-10}}$

10. $\frac{t^{-5}}{8^{-2}s^{-3}}$

11. $\frac{3^{-2}a^{-1}}{9^{-1}b^{-2}c^0}$

12. $\frac{17x^0y^{-8}}{4^{-2}z^{-6}}$

13. $(p^6)^3$

14. $(q^{-4})^5$

15. $5^3 \cdot 5^{-7}$

16. $-4 \cdot (-4)^{-2}$

17. $\frac{x^7}{x^4} \cdot x^2$

18. $\frac{v^5 \cdot v^3}{v^2}$

19. $(-8t^2)^3$

20. $\left(-\frac{q^4}{5}\right)^{-3}$

21. $\left(\frac{1}{3h^5}\right)^{-4}$

In Exercises 22 and 23, simplify the expression. Write your answer using only positive exponents.

22. $\left(\frac{5x^{-4}y^3}{2x^2y^0}\right)^2 \cdot \left(\frac{4xy}{y^3}\right)^2$

23. $\left(\frac{2a^0b^{-4}}{b^3}\right)^4 \cdot \left(\frac{a^3b^{-2}}{3b^4a^{-4}}\right)^3$

In Exercises 24 and 25, evaluate the expression. Write your answer in scientific notation and standard form.

24. $(4.3 \times 10^{-4})(6 \times 10^7)$

25. $\frac{1.2 \times 10^{-3}}{4.8 \times 10^{-10}}$

26. Find x and y when $b^x b^y = b^8$ and $b^{4x} b^{-2y} = b^2$. Explain how you found your answer.

6.1 Enrichment and Extension

Properties of Exponents

Simplify the expression. Write your answer using only positive exponents.

$$1. \left(\frac{-3mn^2p^{-6}}{4mn} \right) \cdot \left(\frac{9m^{-2}p^2}{16mn^4p^5} \right)^{-1}$$

$$2. xy^3z^{-4} \cdot x^{-5} \cdot xz^{-4}y^{-3} \cdot x^0z$$

$$3. \frac{-4(-3xy^{-3}z^4)^{-2}}{2x^{-5}yz^5}$$

$$4. \frac{\frac{-4mp^{-3}q^2}{25m^2p^4}}{\frac{16mpq^2}{15m^2p^{-2}}}$$

$$5. x^2y^3z^{-4} \cdot \frac{x^5yz^{-7}}{x^{-1}y^{-1}z^4}$$

$$6. \left((x^{-3}y)^{-2} \right)^3 \cdot (x^4y^{-2})^{-1}$$

$$7. \left(\left(\frac{-2ab^2c}{4a^{-5}b^{-3}c^6} \right)^3 \right)^{-2}$$

$$8. \left(\frac{\left(\frac{zx^2y^{-4}}{xy^5x^{-2}} \right)^{-2} \cdot \frac{-2}{x^{-6}y^7}}{\frac{4xyz^{-3}}{x^{-6}}} \right)^{-3}$$



Puzzle Time

Why Do Bees Have Sticky Hair?

Write the letter of each answer in the box containing the exercise number.

Simplify the expression. Write your answer using only positive exponents, when necessary.

1. $(-9)^0$

2. 4^{-2}

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

4. $\frac{8^{-3}}{4^0}$

5. $\frac{12^{-2}}{(-13)^0}$

6. $\frac{(9^{-2})}{(3^{-3})}$

7. $15x^0y^{-2}$

8. $21x^{-5}y^0$

9. $\frac{10^{-2}x^{-4}}{y^0}$

10. $\frac{3^{-4}x^0}{y^{-8}}$

11. $\frac{14x^0y^{-2}}{2^{-1}z^{-3}}$

12. $\frac{5^2y^{-10}}{5^{-1}z^0x^{-5}}$

13. $(x^7)^{-5}$

14. $9^{-12} \cdot 9^4$

15. $\frac{y^2 \cdot y^4}{y^3}$

16. $(-2x)^4$

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

18. $\left(\frac{1}{3y^3}\right)^{-3}$

Answers

E. $\frac{1}{3}$

A. $\frac{1}{512}$

H. $\frac{1}{9^8}$

N. $\frac{125x^5}{y^{10}}$

Y. $27y^9$

O. $\frac{21}{x^5}$

B. $-\frac{1}{216}$

S. $\frac{y^8}{81}$

H. $16x^4$

Y. $\frac{1}{144}$

E. $\frac{1}{100x^4}$

M. $\frac{121}{x^2}$

O. 1

C. y^3

V. $\frac{1}{x^{35}}$

E. $\frac{1}{16}$

T. $\frac{15}{y^2}$

H. $\frac{28z^3}{y^2}$

7	14	2	5		11	4	13	9		16	1	12	6	18	15	8	17	3	10
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