

# REVIEW: Product of Powers Property

Name \_\_\_\_\_

## Key Concept and Vocabulary

### Product of Powers Property

To multiply powers with the same base, add their exponents.

Numbers:  $2^3 \cdot 2^4 = 2^{3+4} = 2^7$

Algebra:  $a^m \cdot a^n = a^{m+n}$



## Visual Model

$$2^3 \cdot 2^4 = (2 \cdot 2 \cdot 2) \cdot (2 \cdot 2 \cdot 2 \cdot 2) = 2^7$$

$$(-4)^2 \cdot (-4)^3 = [(-4) \cdot (-4)] [(-4) \cdot (-4) \cdot (-4)] = (-4)^5$$

## Skill Examples

- $5^2 \cdot 5^5 = 5^{2+5} = 5^7$
- $(-3)^8 \cdot (-3)^2 = (-3)^{8+2} = (-3)^{10}$
- $(7^2)^3 = 7^2 \cdot 7^2 \cdot 7^2 = 7^{2+2+2} = 7^6$
- $(y^3)^4 = y^3 \cdot y^3 \cdot y^3 \cdot y^3 = y^{3+3+3+3} = y^{12}$
- $(3x)^3 = 3x \cdot 3x \cdot 3x$   
 $= (3 \cdot 3 \cdot 3) \cdot (x \cdot x \cdot x)$   
 $= 3^{1+1+1} \cdot x^{1+1+1}$   
 $= 3^3 \cdot x^3$   
 $= 27x^3$

## Application Example

- A gigabyte of computer storage space is  $2^{30}$  bytes. A computer has a total storage space of 128 gigabytes. How many bytes of total storage space does the computer have? Write your answer as a power.

Notice that 128 can be written as a power,  $2^7$ .

$$\begin{aligned} \text{Total number of bytes} &= \text{Number of bytes in a gigabyte} \cdot \text{Number of gigabytes} \\ &= 2^{30} \cdot 2^7 \\ &= 2^{30+7} \\ &= 2^{37} \end{aligned}$$



The computer has  $2^{37}$  bytes of total storage space.

## PRACTICE MAKES PURR-FECT™

Check your answers at [BigIdeasMath.com](http://BigIdeasMath.com).

Simplify the expression. Write your answer as a power.

- |                                       |                                       |                                    |
|---------------------------------------|---------------------------------------|------------------------------------|
| 7. $8^3 \cdot 8^6 = 8^9$              | 8. $3^4 \cdot 3^2 = 3^6$              | 9. $6^7 \cdot 6^5 = 6^{12}$        |
| 10. $(-5)^3 \cdot (-5)^7 = (-5)^{10}$ | 11. $(-10)^6 \cdot (-10)^2 = (-10)^8$ | 12. $(-2)^4 \cdot (-2)^5 = (-2)^9$ |
| 13. $(9^4)^3 = 9^{12}$                | 14. $(4^5)^3 = 4^{15}$                | 15. $(12^3)^2 = 12^6$              |
| 16. $(z^3)^3 = z^9$                   | 17. $(n^5)^2 = n^{10}$                | 18. $(w^2)^4 = w^8$                |

Simplify the expression.

- |                      |                      |                      |
|----------------------|----------------------|----------------------|
| 19. $(9y)^2 = 81y^2$ | 20. $(3b)^4 = 81b^4$ | 21. $(2a)^5 = 32a^5$ |
|----------------------|----------------------|----------------------|

- ARTIFACT** A display case for the artifact is in the shape of a cube. Each side of the display case is four times the side length of the artifact. Write and simplify an expression for the volume of the case.  $V = (4s)^3 = 64s^3$

