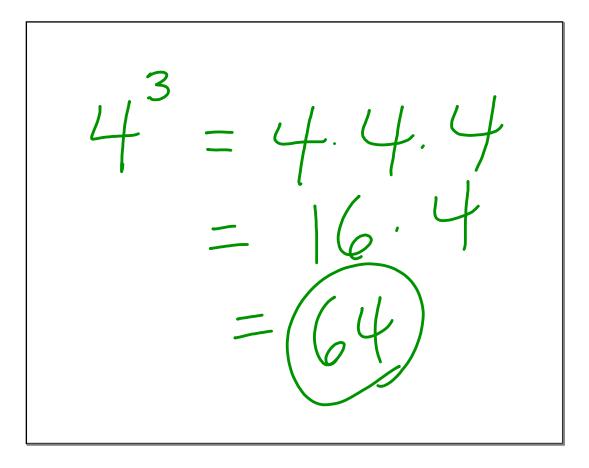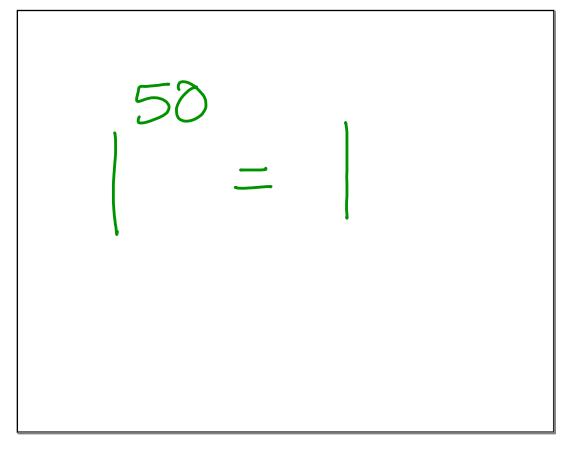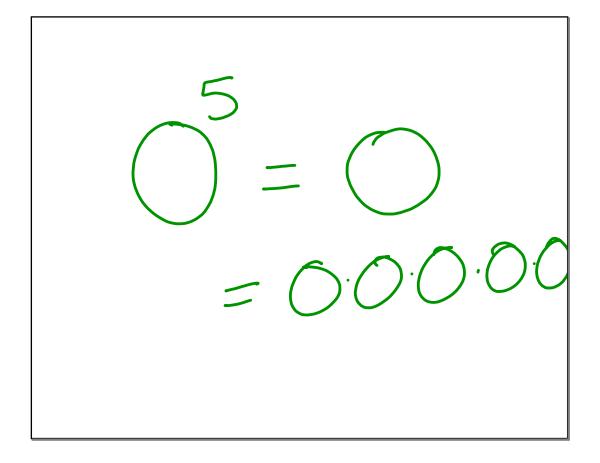Math 8

Our Goal: To learn properties of exponents

Warm Up: Exponent review

Today's Homework
10.2 Exercises, p.420: 1-22

Previous Homework
10.1 Exercises, p.414: 1-20

$$4^3 = 4 \cdot 4 \cdot 4$$
$$= 16 \cdot 4$$
$$= \boxed{64}$$

$$1^{50} = 1$$

$$0^5 = 0$$
$$= 0.0.0.0.0$$

Evaluate the expression.

1. 3^5 **2.** 5^4 **3.** 10^6

4. $(-4)^3$ **5.** $(-3)^2$ **6.** $(-2)^5$

Essential Question

How can you use inductive reasoning to observe patterns and write general rules involving properties of exponents?

Work with a partner.

a. Copy and complete the table.

Product	Repeated Multiplication Form	Power
$2^2 \cdot 2^4$		
$(-3)^2 \cdot (-3)^4$		
$7^3 \cdot 7^2$		
$5.1^1 \cdot 5.1^6$		
$(-4)^2 \cdot (-4)^2$		
$10^3 \cdot 10^5$		
$\left(\frac{1}{2}\right)^5 \cdot \left(\frac{1}{2}\right)^5$		

b. INDUCTIVE REASONING Describe the pattern in the table. Then write a *general rule* for multiplying two powers that have the same base.

$$a^m \cdot a^n = a^{\boxed{}}$$

Work with a partner. Write the expression as a single power. Then write a *general rule* for finding a power of a power.

a. $(3^2)^3 = (3 \cdot 3)(3 \cdot 3)(3 \cdot 3) = \boxed{}^{\boxed{}}$

b. $(2^2)^4 = \boxed{}$

c. $(7^3)^2 = \boxed{}$

d. $(y^3)^3 = \boxed{}$

e. $(x^4)^2 = \boxed{}$

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Work with a partner. Write the expression as the product of two powers. Then write a *general rule* for finding a power of a product.

a. $(2 \cdot 3)^3 = (2 \cdot 3)(2 \cdot 3)(2 \cdot 3) = \boxed{}^{\boxed{}} \cdot \boxed{}^{\boxed{}}$

b. $(2 \cdot 5)^2 = $

c. $(5 \cdot 4)^3 = $

d. $(6a)^4 = $

e. $(3x)^2 = $

Simplify the expression. <u>Write your answer as a power.</u>

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

2^7

2. $7^5 \cdot 7^7$

3. $\left(\frac{1}{2}\right)^2 \cdot \left(\frac{1}{2}\right)^5$

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

5. $x^5 \cdot x^{11}$

$x^5 \cdot x^{11}$
x^{5+11}
$\boxed{x^{16}}$

6. $y^3 \cdot y$

$y^3 \cdot y^1$
$y^{3+1} = y^4$

$$3^4 \cdot 3^{10} \neq 9^{14}$$

$$3^4 \cdot 3^{10} = 3^{14}$$

$$t^8 \cdot t^4 \cdot t^1$$

$$\boxed{4} + \boxed{3}$$

$$2 \cdot 2$$

$$(2 \cdot 2 \cdot 2 \cdot 2) \cdot (2 \cdot 2 \cdot 2)$$

$$2^{\boxed{7}}$$

🔑 Key Ideas
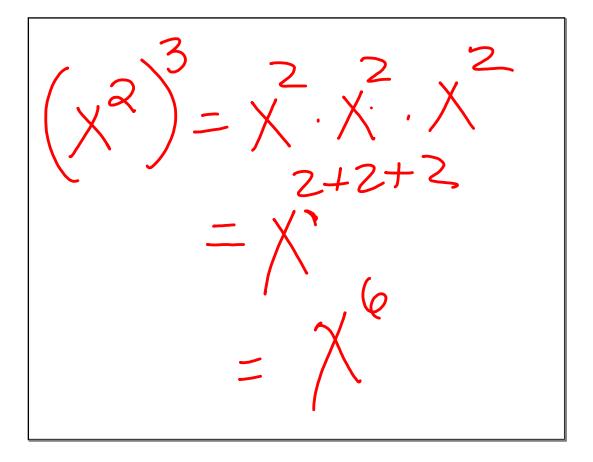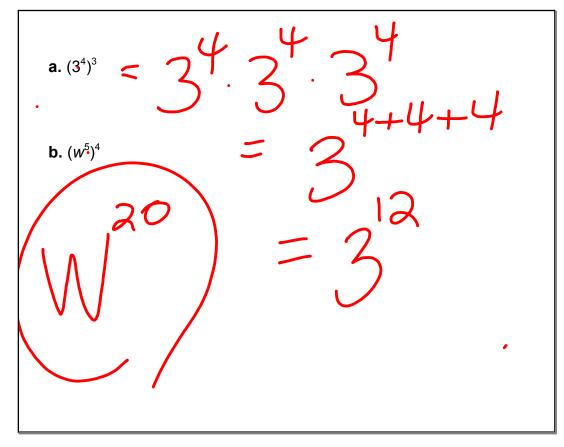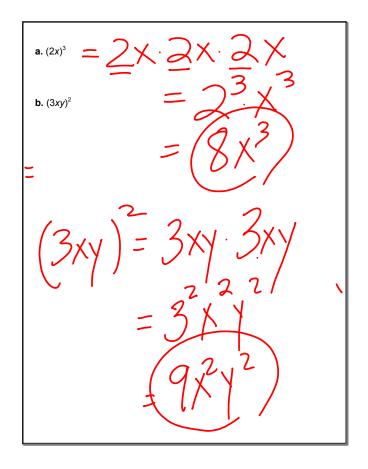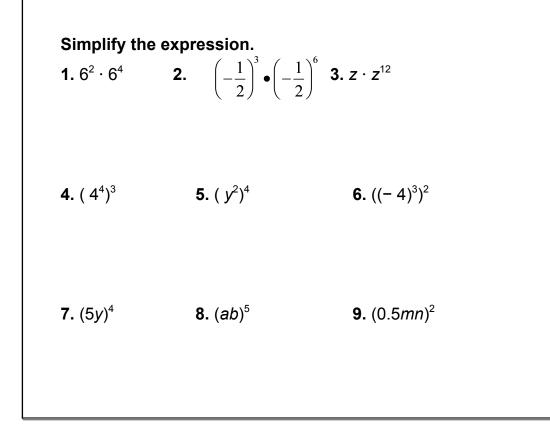
Product of Powers Property

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

Numbers $4^2 \cdot 4^3 = 4^{2+3} = 4^5$ **Algebra** $a^m \cdot a^n = a^{m+n}$

Power of a Power Property

Words To find a power of a power, multiply the exponents.

Numbers $(4^6)^3 = 4^{6 \cdot 3} = 4^{18}$ **Algebra** $(a^m)^n = a^{mn}$

Power of a Product Property

Words To find a power of a product, find the power of each factor and multiply.

Numbers $(3 \cdot 2)^5 = 3^5 \cdot 2^5$ **Algebra** $(ab)^m = a^m b^m$

a. $2^4 \cdot 2^5$

b. $-5 \cdot (-5)^6 =$

c. $x^3 \cdot x^7 =$

$$\left(x^2\right)^3 = x^2 \cdot x^2 \cdot x^2$$

$$= x^{2+2+2}$$

$$= x^6$$

a. $(3^4)^3$ $= 3^4 \cdot 3^4 \cdot 3^4$

$= 3^{4+4+4}$

b. $(w^5)^4$

$= 3^{12}$

w^{20}

a. $(2x)^3$ $= 2x \cdot 2x \cdot 2x$

$= 2^3 \cdot x^3$

b. $(3xy)^2$

$= 8x^3$

$(3xy)^2 = 3xy \cdot 3xy$

$= 3^2 x^2 y^2$

$= 9x^2y^2$

Simplify the expression.

1. $6^2 \cdot 6^4$ **2.** $\left(-\dfrac{1}{2}\right)^3 \bullet \left(-\dfrac{1}{2}\right)^6$ **3.** $z \cdot z^{12}$

4. $(4^4)^3$ **5.** $(y^2)^4$ **6.** $((-4)^3)^2$

7. $(5y)^4$ **8.** $(ab)^5$ **9.** $(0.5mn)^2$

Details ⊗

Local Disk (C:)
Local Disk

Free Space: 16GB

Total Space: 64GB

A gigabyte (GB) of computer storage space is 2^{30} bytes. The details of a computer are shown. How many bytes of total storage space does the computer have?
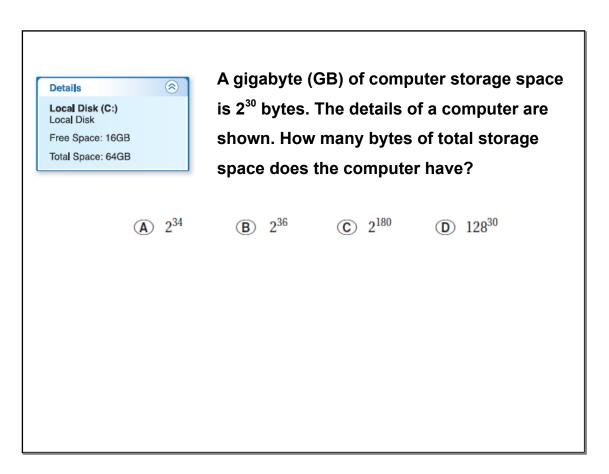
Ⓐ 2^{34} Ⓑ 2^{36} Ⓒ 2^{180} Ⓓ 128^{30}

Exit Ticket: Simplify.

$5^3 \cdot 5^4$

$(-3x)^3$