

## Math 8

Our Goal: To learn about the Quotient of Powers Property

Warm Up: Exponents review handout. Homework out please.

Today's Homework

- 10.3 Exercises, p.426: 1-21
- iready due today

Previous Homework

10.2 Exercises, p.420: 1-22

$$(-7)^4$$

$$(-7)(-7)(-7)(-7)$$

$$-2401$$

$$(2^5)$$

2 in. foam toy  
doubles every  
minute

after min	width
1	4
2	8
3	16
4	32
5	64

$$e^4 \cdot e^3$$

$$e^7$$

$$(e^4)^3$$

$$e^{12}$$

$$2^3 = 2 \times 2 \times 2$$

$$(2e)^3 = 2^3 e^3$$

$$= 8e^3$$

$$\frac{t^5}{t^2} = \frac{t \cdot t \cdot t \cdot \cancel{t} \cdot \cancel{t}}{\cancel{t} \cdot \cancel{t}} = t^3$$

Write the power as repeated multiplication.

1.  $5^4$

2.  $7^3$

3.  $6^7$

4.  $(-4)^3$

5.  $(-3)^5$

6.  $(-1)^3$

# Essential Question

How can you divide two powers that have the same base?

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

$$\frac{a^m}{a^n} = a^{\square}$$

**c.** Use your rule to simplify the quotients in the first column of the table. Does your rule give the results in the third column?

Quotient	Repeated Multiplication Form	Power
$\frac{2^4}{2^2}$		
$\frac{(-4)^5}{(-4)^2}$		
$\frac{7^7}{7^3}$		
$\frac{8.5^9}{8.5^4}$		
$\frac{10^8}{10^2}$		
$\frac{3^{12}}{3^4}$		
$\frac{(-5)^7}{(-5)^5}$		
$\frac{11^4}{11^1}$		

 **Key Idea****Quotient of Powers Property**

**Words** To divide powers with the same base, subtract their exponents.

**Numbers**  $\frac{4^5}{4^2} = 4^{5-2} = 4^3$

**Algebra**  $\frac{a^m}{a^n} = a^{m-n}$ , where  $a \neq 0$

Simplify.

1.  $\frac{2^2}{2} \cdot \frac{2^3}{2^2} \cdot \frac{2^4}{2^3}$

2.  $\frac{(-3)^7}{(-3)^4}$

4

Simplify the expression. Write your answer as a power.

1.  $\frac{5^7}{5^4} 5^3$

2.  $\frac{4^8}{4^4} 4^4$

3.  $\frac{2.5^5}{2.5^2} 2.5^3$

4.  $\frac{10.1^7}{10.1^3} 10.1^4$

5.  $\frac{(-5)^{12}}{(-5)^{10}} (-5)^3$

6.  $\frac{(-2)^7}{(-2)^6} (-2)^1$

a.  $\frac{2^6}{2^4}$

b.  $\frac{(-7)^9}{(-7)^3}$

c.  $\frac{h^7}{h^6}$

Simplify the expression. Write your answer as a power.

1.  $\frac{9^7}{9^4}$

2.  $\frac{4.2^6}{4.2^5}$

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

4.  $\frac{x^8}{x^3}$

Simplify  $\frac{3^4 \cdot 3^2}{3^3}$ . Write your answer as a power.

$$\frac{3^6}{3^3} = 3^3$$



Simplify  $\frac{a^{10}}{a^6} \cdot \frac{a^7}{a^4}$ . Write your answer as a power.

$$\frac{a^{17}}{a^{10}} \quad \textcircled{a^7}$$



Simplify the expression. Write your answer as a power.

5.  $\frac{2^{15}}{2^3 \cdot 2^5}$

$$\frac{2^{15}}{2^8}$$

$$2^7$$

6.  $\frac{d^5}{d} \cdot \frac{d^9}{d^8}$

$$\frac{d^4}{d^1} \cdot \frac{d^9}{d^8}$$

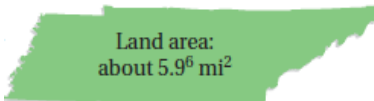
$$d^5$$

7.  $\frac{5^9}{5^4} \cdot \frac{5^5}{5^2}$

$$\frac{5^5}{5^2} \cdot \frac{5^5}{5^2}$$

$$5^8$$

The projected population of Tennessee in 2030 is about  $5 \cdot 5.9^8$ .  
Predict the average number of people per square mile in 2030.



$$\frac{5 \cdot 5.9^8}{5.9^6}$$

$\frac{\text{Pop.}}{\text{Area}}$

$$5 \cdot 5.9^2$$

8. The projected population of Alabama in 2030 is about  $2.25 \cdot 2^{21}$ . The land area of Alabama is about  $2^{17}$  square kilometers. Predict the average number of people per square kilometer in 2030.