

~ Section 7.4 ~ Division Properties of Exponents Packet

TLW Use division properties of exponents to evaluate and simplify expressions.

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TLW pet the dog on the head and tell him he 'is a good dog'.



Warm ups...

Change each number into scientific notation.

1. 524,000,000,000

2. 0.00000000214

3. 43.6

A quotient of powers with the same base can be found by writing the powers in a factored form and dividing out common factors.

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

Notice the relationship between the exponents in the original quotient and the exponent in the final answer:
 $5 - 3 = 2$.

A. $\frac{2^7}{2^2}$

$$\frac{2^7}{2^2} = 2^{7-2} \\ = 2^5 = 32$$

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

$$\frac{x^4}{x^3} = x^{4-3} \\ = x^1 = x$$

In examples A and B, show the answers by writing out the factors in the numerator and denominator to show the factors cancelling out.

DIVISION PROPERTIES OF EXPONENTS

- let a and b be numbers and let m and n be positive integers

QUOTIENT OF POWERS PROPERTY

- to divide powers having the same base, subtract the exponents

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

$$\frac{x^{18}}{x^{12}} = x^6$$

POSITIVE POWER OF A QUOTIENT PROPERTY

- to find a positive power of a quotient, multiply each base raised to that power

$$\left(\frac{a}{b}\right)^n = \frac{a^n}{b^n}$$

$$\left(\frac{2}{3}\right)^3 = \left(\frac{2}{3}\right) \cdot \left(\frac{2}{3}\right) \cdot \left(\frac{2}{3}\right) = \frac{8}{27}$$

NEGATIVE POWER OF A QUOTIENT PROPERTY

- to find a negative power of a quotient, take the reciprocal of the base raised to the opposite (positive) power

$$\left(\frac{a}{b}\right)^{-n} = \left(\frac{b}{a}\right)^n = \frac{b^n}{a^n}$$

$$\left(\frac{4}{3}\right)^{-2} = \left(\frac{3}{4}\right)^2 = \frac{3^2}{4^2} = \frac{9}{16}$$

Guided Practice

Simplify each expression. Use only positive exponents.

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

2. $\frac{5^6}{5^9}$ _____

3. $\frac{a^6}{a^{14}}$ _____

4. $\frac{c^{14}}{c^5}$ _____

5. $\frac{n^2}{m^3n}$ _____

6. $\frac{x^{12}}{x^9y^4}$ _____

7. $\frac{x^3y^{24}}{y^5}$ _____

8. $\frac{2^{10}}{2^{11}}$ _____

9. $\left(\frac{3}{5}\right)^3$ _____

10. $\left(\frac{-2}{3}\right)^3$ _____

11. $\left(\frac{1}{5}\right)^{-4}$ _____

12. $\left(\frac{4}{7}\right)^{-2}$ _____

$$13. \left(\frac{-2}{9}\right)^{-2} \underline{\hspace{2cm}}$$

$$14. \frac{a^{15}b^3}{a^{12}} \underline{\hspace{2cm}}$$

$$15. \left(\frac{4}{x^3}\right)^3 \underline{\hspace{2cm}}$$

$$16. \left(\frac{x^3}{y^7}\right)^2 \underline{\hspace{2cm}}$$

$$17. \frac{(!@\$)^0}{2} \underline{\hspace{2cm}}$$

$$18. \frac{a^2b^3}{a^4b^7} \underline{\hspace{2cm}}$$

$$19. \frac{x^{30}y^{12}}{x^{20}} \underline{\hspace{2cm}}$$

$$20. \frac{xyz}{xyz} \underline{\hspace{2cm}}$$

$$21. \left(\frac{x^4}{y^5}\right)^2 \underline{\hspace{2cm}}$$

$$22. \frac{a^3b^5}{a^{11}} \underline{\hspace{2cm}}$$

$$23. \frac{436}{(jan-drew)^0} \underline{\hspace{2cm}}$$

$$24. \frac{abcd}{abcd} \underline{\hspace{2cm}}$$

$$25. \frac{x^{35}y^{10}}{x^{20}y^4} \underline{\hspace{2cm}}$$

$$26. \left(\frac{3}{4}\right)^{-3} \underline{\hspace{2cm}}$$

$$27. \left(\frac{x^3}{y^5}\right)^0 \underline{\hspace{2cm}}$$



Name: _____

Date: _____

Period: _____

Division Properties of Exponents WS (1)

Red Shoes

SIMPLIFY EACH EXPRESSION. USE ONLY POSITIVE EXPONENTS.

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

2. $\frac{5^4 \cdot 3^3}{5^6 \cdot 3^2}$ _____

3. $\frac{a^{26}}{a^{11}}$ _____

4. $\frac{c^{24}}{c^{15}}$ _____

5. $\frac{2^{20}}{2^{17}}$ _____

6. $\frac{x^{20}}{x^{19}y^4}$ _____

7. $\frac{x^{13}y^2}{y^5}$ _____

8. $\frac{4^{14}}{4^{15}}$ _____

9. $\left(\frac{2}{5}\right)^3$ _____

10. $\left(\frac{-3}{2}\right)^3$ _____

11. $\left(\frac{1}{5}\right)^4$ _____

12. $\left(\frac{3}{7}\right)^{-2}$ _____

13. $\left(\frac{4}{9}\right)^{-2}$ _____

14. $\frac{a^{14}b^{30}}{a^{19}}$ _____

15. $\left(\frac{5}{x^4}\right)^3$ _____

16. $\left(\frac{x^3}{y^7}\right)^{20}$ _____

17. $\frac{18(!@\$)^0}{2}$ _____

18. $\frac{a^{12}b^3}{a^4b^{17}}$ _____

19. $\frac{(jorts)^0}{8}$ _____

20. $\frac{(xyz)^0}{xyz}$ _____

21. $\left(\frac{x^{10}}{y^5}\right)^2$ _____

Name: _____

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Division Exponents WS (2)

Brown Sweater

SIMPLIFY EACH EXPRESSION. USE ONLY POSITIVE EXPONENTS.

1. $\left(\frac{1}{7}\right)^2$ _____

2. $\frac{6^4 \cdot 2^3}{6^5 \cdot 2^2}$ _____

3. $\left(\frac{b^6}{a^{11}}\right)^2$ _____

4. $\left(\frac{a^2 b^{12}}{a^{34} b^{13}}\right)^0$ _____

5. $\frac{n^2}{m^3 n^5}$ _____

6. $\frac{xy^3 z^4}{x^9 y^4}$ _____

7. $\frac{(-2x^7 y^{-4})^0}{-36x^{-2} y^{-3}}$ _____

8. $\frac{100^{19}}{100^{18}}$ _____

9. $\left(\frac{1}{2}\right)^{-5}$ _____

10. $\left(\frac{-4}{11}\right)^2$ _____

11. $\frac{(-3x^2)^2}{18x^2}$ _____

12. $\left(\frac{12}{x^3}\right)^2$ _____

13. $\left(\frac{x^8 y^{12}}{y^7}\right)^2$ _____

14. $\frac{x^3 y^4 z^7}{x^3 y^7 z^2}$ _____

15. $\frac{a^2 b^{-3}}{a^4 b^7}$ _____

Name: _____

Date: _____

Period: _____

Division Exponents WS (3)

Orange Tie

SIMPLIFY EACH EXPRESSION. USE ONLY POSITIVE EXPONENTS.

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

2. $\frac{56^4 \cdot 2^3}{56^4 \cdot 2^2}$ _____

3. $\left(\frac{a^{16}}{a^{11}}\right)^2$ _____

4. $(200)\left(\frac{a^2b^{12}}{a^{34}b^{13}}\right)^0$ _____

5. $\frac{m^{-8}n^2}{8m^3n^5}$ _____

6. $\frac{xy^3z^4}{x^9y^4z^{-7}}$ _____

7. $\frac{(-6x^7y^{-8})^0}{x^{-2}y^{-3}}$ _____

8. $\frac{400^{109}}{400^{108}}$ _____

9. $\left(\frac{1x^{-2}}{3}\right)^{-5}$ _____

10. $\left(\frac{-12}{7y^9}\right)^2$ _____

11. $\left(\frac{x^4y}{5x}\right)^4$ _____

12. $\left(\frac{6}{7}\right)^{-2}$ _____

13. $\left(\frac{645x^8y^{12}}{900x^0y^7}\right)^0$ _____

14. $\left(\frac{4m^{-5}}{mn^{-2}}\right)^3$ _____

15. $\frac{a^7b^{-9}}{a^4b^{-7}}$ _____