10-11-18

Aim: SWBAT rewrite expressions with negative exponents and evaluate negative exponents.

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Quiz Wednesday (Packet Pages 1 - 23)

Do Now: Packet Page 13

HW: Raising a Power to a Power
Simplify each expression.

1) $(y^2)^3$ y^6

2) $(v^9)^6$ v^{54}

3) $(h^4)^5$ h^{20}

4) $(n^4)^{11}$ n^{44}

5) $(p^2)^5$ p^{10}

6) $(z^3)^6$ z^{18}

7) $(2x^4)^5$ $2^5 \cdot (x^4)^5$ $32x^{20}$

8) $(-5f^5)^3$ $(-5)^3 \cdot (f^5)^3$ $-125f^{15}$

9) $(6m^5)^2$ $36m^{10}$

10) $(-2ab)^4$ $16a^4b^4$

11) $(-7k)^0$ 1 $k \neq 0$

12) $(6c^2d)^3$ $216c^6d^3$

13) $(x^{11}y^{10})^2$ $x^{22}y^{20}$

14) $(-3y^5x^{10})^5$ $-243y^{25}x^{50}$ $-243x^{50}y^{25}$

15) $\left(\frac{x^2}{y^4}\right)^3$ $\frac{x^6}{y^{12}}$

16) $\left(\frac{2a^5}{3b^3}\right)^2$ $\frac{4a^{10}}{9b^6}$

Complete each equation.

17) $(y^3)^{\square} = y^6$ $\square = 2$

18) $(2x^{11})^{\square} = 1$ $\square = 0$ $x \neq 0$

19) $(6p^3q^{\square})^2 = 36p^6q^{10}$ $\square = 5$

20) What is the difference between $x^4 \cdot x^3$ and $(x^4)^3$?
Explain your answer clearly, using the laws of exponents.

$x^4 \cdot x^3 = x^7$ → According to the Laws of Exponents, when we multiply monomials, if the bases are the same, we keep the base, and add the exponents.

$(x^4)^3 = x^{12}$ → According to the Laws of Exponents, when we raise a power to a power, we keep the base, and multiply the exponents.

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Do Now – Laws of Exponents – Multiplying & Power to a Power

Identify the base, the exponent and the power. Simplify each expression.

1) $(-11)^2$ Base -11 exponent 2 power $(-11)^2$ simplified 121

2) -11^2 Base 11 exponent 2 power 11^2 simplified -121

3) $5x^5$ Base x exponent 5 power x^5

$(5x)^5$

In each of the following, identify the mistake and write the correct answer.

4) $2^6 = 12$

multiplied by 6, 6 is the exponent

64

5) $(-3)^3 = 27$

should be negative

-27

6) $-9^2 = 81$

should be negative "opposite of 9^2"

-81

7) $14^0 = 0$

anything to the zero power is 1.

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Simplify. Write your answer as a POWER.

8) $x^5 \cdot x^2 \cdot x^1$

x^8

9) $wz^{11} \cdot w^3z^4$

w^4z^5

10) $4y^7 \cdot 7y^5$

$28y^{12}$

11) $-6m^4n^6 \cdot 5mn^{11}$

$-30m^5n^7$

12) $4x^2y^{-5} \cdot -2x^8y^3$

$-8x^{10}y^{-2}$

13) $(x^3)^4$

x^{12}

14) $(a^2b^4)^5$

$a^{10}b^{20}$

15) $(5xy^2)^3$

$125x^3y^6$

16) $(8m^5n^7)^2$

$64m^{10}n^{14}$

17) $(-3x^6)^3$

$-27x^{18}$

18) $(-2x^4y^2)^4$

$16x^{16}y^8$

19) $(4xy^7w^3)^3$

$64x^3y^{21}w^9$

$64w^9x^3y^{21}$

Aim: SWBAT rewrite expressions with negative exponents and evaluate negative exponents.

Fill in the chart.

Exponential Form	Product of same factor	Fraction form	Decimal form
10^5	$10 \cdot 10 \cdot 10 \cdot 10 \cdot 10$	$\frac{100000}{1}$	100000.0
10^4	$10 \cdot 10 \cdot 10 \cdot 10$	$\frac{10000}{1}$	10000.0
10^3	$10 \cdot 10 \cdot 10$	$\frac{1000}{1}$	1000.0
10^2	$10 \cdot 10$	$\frac{100}{1}$	100.0
10^1	10	$\frac{10}{1}$	10.0
10^0	1	1	1
10^{-1}	$\frac{1}{10}$	$\frac{1}{10}$	0.1
10^{-2}	$\frac{1}{10 \cdot 10}$	$\frac{1}{100}$	0.01
10^{-3}	$\frac{1}{10 \cdot 10 \cdot 10}$	$\frac{1}{1000}$	0.001

Look at the patterns in the table from the Do Now.

Whenever we have a negative exponent, we need to rewrite it as a positive exponent. Only in scientific notation are negative exponents allowed.

To rewrite a negative exponent into a positive exponent, write the multiplicative inverse / reciprocal of the base, then write the positive exponent.

5^{-2} the base is 5, the multiplicative inverse of 5 is $\frac{1}{5}$, so 5^{-2} becomes $\frac{1}{5^2} \rightarrow \frac{1}{25}$.

$(-4)^{-4}$ the base is -4, the multiplicative inverse of -4 is $-\frac{1}{4}$, so $(-4)^{-4}$ becomes $\frac{1}{(-4)^4} \rightarrow \frac{1}{256}$.

$\left(\frac{1}{7}\right)^{-3}$ the base is $\frac{1}{7}$, the multiplicative inverse is $\frac{7}{1}$, so $\left(\frac{1}{7}\right)^{-3}$ becomes $7^3 \rightarrow 243$.

$5x^{-4}$ the base is x, the multiplicative inverse is $\frac{1}{x}$, so $5x^{-4}$ becomes $\frac{5}{x^4}$.

$(3y)^{-5}$ the base is $3y$, the multiplicative inverse is $\frac{1}{3y}$, so $(3y)^{-5}$ becomes $\frac{1}{(3y)^5}$.

$5 \cdot x^{-4}$

$5 \cdot \frac{1}{x^4}$

$\frac{5}{x^4}$

$\frac{1}{(3y)^5} \rightarrow \frac{1}{3^5 \cdot y^5} \rightarrow \frac{1}{243y^5}$

Classwork:

Write each answer as a simplified expression that is equivalent to the given one.

1) 76^{-4}

$\frac{1}{76^4}$

2) f^{-6}

$\frac{1}{f^6}$

3) $67 \cdot 287^{-1}$

$67 \cdot \frac{1}{287^1}$

$\frac{67}{287}$

4) 5^{-4}

$\frac{1}{5^4} \rightarrow \frac{1}{625}$

* 5) $\frac{1}{6^{-3}}$ 6^3

6) 8^{-3}

$\frac{1}{8^3} \rightarrow \frac{1}{512}$

7) $3a^{-4}$

$3 \cdot a^{-4}$

$3 \cdot \frac{1}{a^4}$

$\frac{3}{a^4}$

8) ab^{-1}

$a \cdot b^{-1}$

$a \cdot \frac{1}{b^1}$

$\frac{a}{b}$

9) $\left(\frac{9}{10}\right)^{-2}$

$\left(\frac{10}{9}\right)^2 \rightarrow \frac{100}{81}$

10) $(5x)^{-3}$

$\frac{1}{(5x)^3} \rightarrow \frac{1}{5^3 \cdot x^3}$

$\rightarrow \frac{1}{125x^3}$

11) $5^4 \cdot 5^{-3}$

5^1

5

12) $\frac{5}{x^{-4}}$

$5 \cdot \frac{1}{x^{-4}}$

$5x^4$

13) $\frac{x}{y^{-3}}$

$x \cdot \frac{1}{y^{-3}}$

$x \cdot y^3$

xy^3

14) $\frac{y^2}{y^{-2}}$

$y^2 \cdot \frac{1}{y^{-2}}$

$y^2 \cdot y^2$

y^4

15) $(x^5)^{-4}$

x^{-20}

$\frac{1}{x^{20}}$

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HW: Negative Exponents

Write each answer as a simplified expression that is equivalent to the given one.

1) 6859^{-2}

2) b^{-7}

3) $29 \cdot 796^{-1}$

4) 8^{-5}

5) $\frac{1}{7^{-3}}$

6) -4^{-3}

7) $5b^{-4}$

8) xy^{-1}

9) $\left(\frac{7}{10}\right)^{-3}$

10) $(10y)^{-3}$

11) $3^4 \cdot 3^{-3}$

12) $\frac{6}{x^{-4}}$

13) $\frac{x}{m^{-5}}$

14) $\frac{x^5}{x^{-2}}$

15) $(x^4)^{-3}$

Express each of the following in exponential form with a base of 3.

16) $81 = 3^4$

17) $27 =$

18) $9 =$

19) $1 =$

20) $\frac{1}{3} =$