

Power Rule of Exponents

November 7, 2016

Mr. Collin



Reminder

- Those who had not submitted the textbook project need to submit the redo tomorrow
- If you are submitting the file electronically, it must be submitted before class starts



Announcements

- I will be here after school today
- We will have a mini-summative test next week on Wed/Thu



The Exponent Rules So Far

Product Rule: $x^a \cdot x^b = x^{a+b}$

Quotient Rule: $\frac{x^a}{x^b} = x^{a-b}$



Power Rule of Exponents

How can we simplify this:

$$(x^3)^4$$

$$(x \cdot x \cdot x)^4$$

$$(x \cdot x \cdot x) \cdot (x \cdot x \cdot x) \cdot (x \cdot x \cdot x) \cdot (x \cdot x \cdot x)$$

$$x^{12}$$



Power Rule of Exponents

Power Rule: $(x^a)^b = x^{ab}$



Let's Try One

Simplify the following:

$$(x^6)^3 = x^{18}$$



Now You Try

Simplify the following:

$$1) (m^4)^2 = m^8$$

$$2) (x^7)^3 = x^{21}$$

$$3) (k^{10})^3 = k^{30}$$

$$4) (r^9)^2 = r^{18}$$

$$5) (z^{-3})^{-2} = z^6$$

$$6) (w^6)^{-5} = w^{-30} = \frac{1}{w^{30}}$$



Power Rule

- If there is more than one variable inside the parentheses, raise them separately



Let's Try One

Simplify the following:

$$(2h^3k)^4$$

$$2^4 \cdot (h^3)^4 \cdot k^4 = 16h^{12}k^4$$



Now You Try

Simplify the following:

$$1) (g^4 h^3)^2 \quad g^8 h^6$$

$$2) (x^2 y^5)^3 \quad x^6 y^{15}$$

$$3) (m^1 n^4)^5 \quad m^5 n^{20}$$

$$4) (a^{-2} b)^5 \quad a^{-10} b^5 = \frac{b^5}{a^{10}}$$

$$5) (3p^{-3} q^2)^3 \quad 27 p^{-9} q^6 = \frac{27 q^6}{p^9}$$

$$6) (c^6 d^{-3})^{-3} \quad c^{-18} d^9 = \frac{d^9}{c^{18}}$$



Fractions and Exponents

So what happens if we take an exponent of a fraction?

$$\frac{(x^2)^3}{(y^5)^3} = \frac{x^6}{y^{15}}$$

$$\left(\frac{x^2}{y^5}\right)^3 = \frac{x^2}{y^5} \cdot \frac{x^2}{y^5} \cdot \frac{x^2}{y^5}$$



Exponents of Fractions

Power Rule of Fractions:

$$\left(\frac{x}{y}\right)^a = \frac{x^a}{y^a}$$



Now You Try

Simplify the following:

$$1) \left(\frac{c}{d^3}\right)^3$$

$$2) \left(\frac{3x}{y^5}\right)^2$$

$$3) \left(\frac{a^4}{b^{-2}}\right)^{-5}$$

$$4) \left(\frac{10m^7}{n}\right)^3$$

$$5) \left(\frac{a^4b}{c^3}\right)^6$$

$$6) \left(\frac{x^4}{yz^7}\right)^{-4}$$

Interest Rates

November 8, 2016

Mr. Collin



Warmup

Simplify the following:

$$1) (k^2)^7 \quad k^{14}$$

$$2) (a^4b^7)^3 \quad a^{12}b^{21}$$

$$3) \left(\frac{x^3}{y^5}\right)^8 \quad \frac{x^{24}}{y^{40}}$$

$$4) (w^3)^{-2} \quad \frac{1}{w^6}$$

$$5) (m^9n)^5 \quad m^{45}n^5$$

$$6) \left(\frac{c^6}{d^8}\right)^{-1} \quad \frac{d^8}{c^6}$$



Trade and Grade

- If you received a stamp, you will trade your homework with the person sitting next to you (or someone else near you)
- When you get another person's homework, write your name in the "Corrected By" line at the bottom



Trade and Grade

1) m^{20}

2) $x^{24}y^{16}$

3) a^3b^{12}

4) $\frac{c^{10}}{d^{20}}$

5) $9x^8$

6) z^{22}

7) 3.842×10^{16}

8) 6.3×10^{-15}

9) 4.81×10^{-6}

10) 3.1×10^{16}

11) $1/27$

12) $1/10000$

13) $1/17$

14) 1



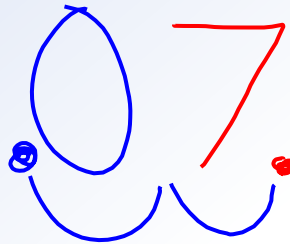
Trade and Grade

- If eight or more answers are correct and there is a stamp on the page, write “4” in the score box
- If seven or fewer answers are correct, then write “2” in the score box



Converting Percents

- Remember that to convert a percentage into a number, you need to move the decimal twice
- Example: What is 7% as a number?





Now You Try

Convert each of the following percentages into a number

1) 17% 0.17

2) 2% 0.02

3) 51% 0.51

4) 4.3% 0.043

5) 129% 1.29

6) 0.6% 0.006



Interest Rates

Let's say you make an investment of \$10,000 that earns you 10% per year. What will it be worth in 5 years?

0.1

$$10000 \times 1.1 \times 1.1 \times 1.1 \times 1.1 \times 1.1 = \$16,105.10$$

$$10000 \times 1.1^5$$



Interest Rates

- When you take interest of interest, that is called **compounding**
- In the second year, you earn more than \$1,000 because now you are taking 10% of \$11,000 instead of \$10,000



Interest Rates

We can make a formula for this.

$$A = P(1 + r)^y$$

Amount → *Principal (Starting Amount)* → *Rate (As a Number)* ← *Years*



Let's Try One Together

You buy a certificate of deposit (called a CD) that has a 3% annual interest rate. If you spend \$6,000 on a four-year CD, what will it be worth when it matures?

$$A = P(1+r)^4 = 6000(1.03)^4$$
$$\$6753.05$$



Now You Try

You take out a student loan for \$12,000. The interest rate of the loan is 8% and you do not pay it back for four years. What will you owe after four years?

\$16,325.87

Roots

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Mr. Collin



Warmup

- 1) What will a \$5,000 investment be worth in four years if it has an interest rate of 6%? $\$6,312.38$
- 2) How much will you owe on a \$12,000 student loan with 7% interest rate if you don't pay for six years? $\$18,008.76$



Trade and Grade

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Trade and Grade

1) \$2,856.49

2) \$9,367.58

3) \$11,256.80

4) \$3,283.64

5) 4.11×10^{14}

6) 8.08×10^{-7}

7) 4.5×10^5

8) 6×10^8

9) 1.003×10^{17}

10) 8.8×10^{19}



Trade and Grade

- If eight or more answers are correct and there is a stamp on the page, write “4” in the score box
- If seven or fewer answers are correct, then write “2” in the score box



Square Roots

- The inverse of addition is subtraction
- The inverse of multiplication is division
- What is the inverse of squaring?

Square Root



Square Roots

- What is 5^2 ? 25
- So, to find the square root of 25, we ask, “what number do I have to square to get 25?” 5



Square Roots

We write square roots like so:

$$\sqrt{25} = 5$$



Let's Try Some Together

Let's find the following square roots:

$$\sqrt{100}$$

10

$$\sqrt{\frac{1}{4}}$$

$\frac{1}{2}$

$$\sqrt{-4}$$

Undefined



Now You Try

Find the following square roots:

1) $\sqrt{16}$ 4 2) $\sqrt{81}$ 9 3) $\sqrt{9}$ 3

4) $\sqrt{\frac{4}{9}}$ $\frac{2}{3}$ 5) $\sqrt{-25}$ Undefined 6) $\sqrt{1}$ 1



Cube Roots

- Just like square roots mean what number squared equals the number, we can find cube roots
- What is 2^3 ? 8
- What is the cube root of 8? 2



Cube Roots

- Cube roots look very similar to square roots:

$$\sqrt[3]{8}$$

- It isn't wrong to write a square root like $\sqrt[2]{4}$ but it is usually not done



Higher Roots

- We don't have to stop at 3
- What is 2^4 ? 16
- So we can find the fourth root of 16:

$$\sqrt[4]{16}$$



Let's Try Some Together

Let's find the following:

$$\sqrt[3]{27}$$

3

$$\sqrt[3]{-64}$$

-4

$$\sqrt[4]{10000}$$

10

$$\begin{array}{r} -4x - 4x - 4 \\ \hline 16x - 4 \end{array}$$



Now You Try

Find the following roots:

1) $\sqrt[3]{1000}$

2) $\sqrt[5]{32}$ 2

3) $\sqrt[3]{-1}$ -1

4) $\sqrt[4]{81}$
10
3

5) $\sqrt[3]{125}$
5

6) $\sqrt[6]{1000000}$
10



Rules of Roots

Let's look at some rules of roots:

$$\sqrt[a]{x^b} = x^{\frac{b}{a}}$$



Let's Try Some

Let's simplify the following:

$$\sqrt[5]{x^5} = X$$

$$\sqrt[3]{m^6}$$

$$\sqrt{x^1} = X^{1/2}$$

$$X^{5/5} = X^1$$

$$m^{6/3} = (m^2)$$