

10-09-18

Aim: SWBAT use the laws of exponents to simplify expressions (monomials).

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Do Now: Packet Page 5

HW: Using Exponents

Write each product using exponents:

- 1) $4 \cdot 4 \cdot 4 \cdot 4$ 2) $t \cdot t \cdot t \cdot t \cdot t \cdot t \cdot t$ 3) $4.3 \cdot 4.3 \cdot 4.3$ 4) $-5 \cdot -5$
 4^4 t^7 4.3^3 $(-5)^2$

Express each of the following as a standard numeral:

- 5) 3^5 6) $(-4)^3$ 7) $(1.5)^2$ 8) $(\frac{1}{5})^3$ 9) 125^0
 243 -64 2.25 $\frac{1}{125}$ 1

Determine whether each sentence is true or false.

- 10) $2^{10} > 10^2$ 11) $9^8 > 8^9$ 12) $2^4 = 4^2$ 13) $2^3 \neq 3^2$
 $1024 > 100$ $43,046,721 > 134,217,728$ $16 = 16$ $8 \neq 9$
TRUE **FALSE** **TRUE** **TRUE**

Evaluate each expression:

- 14) x^3 if $x = -6$ 15) $4r^3$ if $r = 3$ 16) $(xy)^3$ if $x = \frac{1}{5}$ and $y = 10$
 $(-6)^3$ $4 \cdot (3)^3$ $(\frac{1}{5} \cdot 10)^3$
 $-6 \cdot -6 \cdot -6$ $4 \cdot 3 \cdot 3 \cdot 3$ $(2)^3$
-216 108 8

- 17) Write an expression with (-1) as its base that will produce a positive product. $\frac{(-1)^4}{(-1)^5}$
**** any even exponent**
 18) Write an expression with (-1) as its base that will produce a negative product. $\frac{(-1)^4}{(-1)^5}$
**** any odd exponent**
 19) Tim wrote 16 as $(-2)^4$. Is he correct? Explain why or why not.

$(-2)^4$
 $-2 \cdot -2 \cdot -2 \cdot -2$
8

Yes, Tim is correct because when you evaluate $(-2)^4$ it equals 16.

Rewrite each of the following numbers in exponential notation using a **base** of 2.

- 20) 8 21) 32 22) 128
 2^3 2^5 2^7

Do Now - Exponents

Answer the following.

1) 6^5 6 is the base 5 is the exponent 6^5 is the power

2) The exponent tells you the number of times the base is to be multiplied

Write in exponential notation.

3) y to the fifth power y^5

4) $4 \cdot 4 \cdot 4 \cdot 4 \cdot 4$ 4^5

5) 7 cubed 7^3

6) 9 squared 9^2

7) $x \cdot x \cdot x \cdot y \cdot y$ $x^3 y^2$

Evaluate.

8) $12^0 =$ 1

9) $1^{12} =$ 1

10) $(-3)^3 =$ -27

11) $-3^2 =$ -9

Evaluate step-by-step if $a = 4$ and $b = -3$.

12) $2a^3$ 128

$$\begin{aligned} & 2 \cdot (4)^3 \\ & 2 \cdot 4 \cdot 4 \cdot 4 \\ & 128 \end{aligned}$$

13) ab^2 36

$$\begin{aligned} & 4 \cdot (-3)^2 \\ & 4 \cdot -3 \cdot -3 \\ & 36 \end{aligned}$$

14) What is $3^2 \cdot 3^3$? Write the number in standard form. Show work.

$$\begin{aligned} & 3^2 \cdot 3^3 \\ & 3 \cdot 3 \cdot 3 \cdot 3 \cdot 3 \\ & \boxed{243} \end{aligned}$$

Rewrite each as a product of the same factor.

15) $x^3 y^5$

$$x \cdot x \cdot x \cdot y \cdot y \cdot y \cdot y \cdot y$$

16) $ab^5 \cdot a^2 b^2$

$$a \cdot b \cdot b \cdot b \cdot b \cdot b \cdot a \cdot a \cdot b \cdot b$$

17) $(m^2 n^4)(mn)$

$$m \cdot m \cdot n \cdot n \cdot n \cdot n \cdot m \cdot n$$

AIM: SWBAT use the Laws of Exponents to simplify expressions (monomials).

Laws of Exponents

Ex. I: $x^3 \cdot x^4 = x \cdot x \cdot x \cdot x \cdot x \cdot x \cdot x$ Why? How else can we write this? x^7

Try: they both show 7 x's being multiplied

1) $x^7 \cdot x^4 = x^{11}$ 2) $m^8 \cdot m^2 = m^{10}$ 3) $7^3 \cdot 7^5 = 7^8$

Multiplication of Monomials (The bases MUST be the same)

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

If the bases are the same: KEEP the bases and ADD the exponents.

Simplify each of the following using the laws of exponents. Write as powers.

1) $2^3 \cdot 2^4$ 2) $4^8 \cdot 4^{-3}$ 3) $10^5 \cdot 10^1 \cdot 10^3$ 4) $x^2y^1 \cdot x^3y^5$ 5) $x^9 \cdot x^5 \cdot x^1$
 2^7 4^5 10^9 x^5y^6 x^{15}

6) $14^a \cdot 14^b$ 7) $a^{23} \cdot a^8$ 8) $5^{94} \cdot 5^{78}$ 9) $(-3)^9 \cdot (-3)^5$ 10) $(-72)^{10} \cdot (-72)^{13}$
 14^{a+b} a^{31} 5^{172} $(-3)^{14}$ $(-72)^{23}$

Ex. II: $2x^3 \cdot 4x^5 = 2 \cdot x \cdot x \cdot x \cdot 4 \cdot x \cdot x \cdot x \cdot x \cdot x$ How else can we write this? $8x^8$

When multiplying monomials:

1st) Multiply the coefficients

2nd) Add the exponents of like bases

Simplify the following. Write as powers.

1) $5x^2 \cdot -2xy^2$ 2) $6x^5y^3 \cdot 4x^6y^1$ 3) $-3x^{-2} \cdot 4x^7$ 4) $-10x^7yw^2 \cdot -9xy^5w^1$
 $-10x^3y^2$ $24x^{11}y^4$ $-12x^5$ $90x^8y^6w^3$
 $90w^3x^8y^6$
 5) $6^5 \cdot 4^9 \cdot 4^3 \cdot 6^{14}$ **6) $2^4 \cdot 8^2$ 7) Simplify $a(a+b)$
 $4^{12} \cdot 6^{19}$ $8^2 = 64$ $2^4 \cdot 2^6$ $a^2 + ab$
 $64 = 2^6$ 2^{10}

8) Simplify $(a+b)(a+b)$ using the distributive property.

★ $a^2 + 1ab + 1ab + b^2$
 $a^2 + 2ab + b^2$

Name _____ Date _____

Practice Worksheet 4-9

Multiplying Powers

Find each product.

1. $2^4 \cdot 2^5$ 2^9

3. $6^2 \cdot 6^4 \cdot 6$ 6^7

5. $k \cdot k^6 \cdot k^3$ k^{10}

7. $(3x^2)(-2xy)$ $-6x^3y$

9. $(-2)(5kp^2)(k^2p)$ $-10k^3p^3$

11. $(x^2y)(-4x^6y^3)$ $-4x^8y^4$

13. $(-x^2z)(-xyz)$ x^3yz^2

15. $4a \cdot 3b \cdot 7c^2$ $84abc^2$

17. $(\frac{1}{2}a^4)(6a^3)$ $3a^7$

19. $x^3(x^4y^2)$ x^7y^2

21. $(a^2b^2)(a^3b)$ a^5b^3

23. $5wz^2 \cdot 8w^4z^3$ $40w^5z^5$

25. $(3h^2)(-2h^3)(-h)$ $6h^6$

27. $(m^3p^2)(-2mp^2)(mp)$ $-2m^5p^5$

2. $10^3 \cdot 10^3$ 10^6

4. $x^4 \cdot x^2 \cdot x^5$ x^{11}

6. $e \cdot e^5 \cdot e^7$ e^{13}

8. $x \cdot y \cdot z \cdot x \cdot y \cdot x \cdot z$ $x^3y^2z^2$

10. $(4xyz)(-10x^3y^2)$ $-40x^4y^3z$

12. $(-5a^2m^7)(-3a^5m)$ $15a^7m^8$

14. $(-2n^2)(y^4)(-3n)$ $6n^3y^4$

16. $(9a^3)(-4ab^3)$ $-36a^4b^3$

18. $(\frac{2}{3}b^3)(9b^2)$ $6b^5$

20. $(-5r^2s)(-3rs^4)$ $15r^3s^5$

22. $(2n^3)(-6n^4)$ $-12n^7$

24. $(c^2d)(-10c^3d)$ $-10c^5d^2$

26. $(14rt)(5r)(t^2)$ $70r^2t^3$

28. $(-w^2z)(-wz)(5z^3)$ $5w^3z^5$

HW: Multiplying Monomials

Express each result as a **power**. Do not evaluate.

1) $x^{12} \cdot x^9 =$ _____ 2) $10^4 \cdot 10^{-3} \cdot 10 =$ _____ 3) $23^a \cdot 23^b =$ _____

4) $3^3 \cdot 3^7 \cdot 3 =$ _____ 5) $5^9 \cdot 5^{-6} =$ _____ 6) $5^3 \cdot 25 =$ _____

7) $y^7 \cdot y^8 =$ _____ 8) $9^3 \cdot 9^6 \cdot 9^{12} =$ _____ 9) $b^4 \cdot b^4 =$ _____

10) $x \cdot x =$ _____ 11) $10^7 \cdot 10^{-3} =$ _____ 12) $3^4 \cdot 9 =$ _____

13) $3^7 \cdot 9^2 =$ _____ 14) $5^4 \cdot 5^0 =$ _____ 15) $4^0 \cdot 4^3 =$ _____

Simplify each of the following using the Laws of Exponents.

16) $2x \cdot x^4 =$ _____ 17) $2x^4 \cdot 5x^5 =$ _____ 18) $3x^2 \cdot 4x^3 =$ _____

19) $9x^5y^3 \cdot -3x^4y =$ _____ 20) $x(x + y) =$ _____ 21) $(x + y)(x + y) =$ _____

22) Write eleven squared using exponents. _____

23) Write x^5 as a product of the same factor. _____

24) Write $y \cdot y \cdot y \cdot y \cdot y \cdot y \cdot y \cdot y$ using exponents _____

25) The term "cubed" indicates an exponent of _____.

26) Any number to the zero power, except 0, equals _____.

27) $0^0 =$ _____

28) $1^7 =$ _____

29) Evaluate $(-2)^3$

30) Evaluate $(-2)^2$

31) Evaluate $(4)^3$

32) Evaluate $2^{-4} \cdot 2^6$