


6.1 Explain – Properties of Exponents Day 2 - Notes

Essential Question: How can you write general rules involving properties of exponents?

Main Ideas/ Questions	Notes/Examples
What You Will Learn	<ul style="list-style-type: none"> Use the properties of exponents. Solve real-life problems involving exponents.

STAAR Algebra 1 Reference Materials



PROPERTIES OF EXPONENTS

Product of powers (Multiplying... $a^m a^n = a^{(m+n)}$ ADD exponents)

Quotient of powers (Dividing... $\frac{a^m}{a^n} = a^{(m-n)}$ subtract exponents)

Power of a power (one variable - 2 exponents $(a^m)^n = a^{mn}$ Multiply exponents)

Rational exponent $a^{\frac{m}{n}} = \sqrt[n]{a^m}$

Negative exponent "cross the line, change the sign" $a^{-n} = \frac{1}{a^n}$

learning this next time! 😊

Power of a Power Property

rule:

To raise a power to a power....

- Multiply exponent to exponent.

What it looks like: $(x^2)^3$

What it means: $x^2 \cdot x^2 \cdot x^2$

What it is: $x^{2 \cdot 3} = x^6$

Practice: Simplify the expression. Write your answer using only positive exponents.

1. $(q^5)^3$
 $= q^5 \cdot q^5 \cdot q^5$
 $= q^{15}$

2. $(a^{-4})^2$
 $= a^{-4} \cdot a^{-4}$
 $= a^{-8}$
 $= \frac{1}{a^8}$

3. $(x^3)^3$
 $= x^3 \cdot x^3 \cdot x^3$
 $= x^9$

4. $(x)(x^2)^4$
 $x \cdot x^2 \cdot x^2 \cdot x^2 \cdot x^2$
 $= x^9$

Power of a Product and a Quotient Property

Practice: Simplify the expression. Write your answer using only positive exponents.

4. $(-4d)^4$
 $= (-4)^4 d^4$
 $= 256d^4$

5. $(-3f)^{-3}$
 $= (-3)^{-3} f^{-3}$
 $= \frac{1}{(-3)^3 f^3}$
 $= \frac{1}{27f^3}$

6. $(\frac{4}{x})^{-3}$
 $= \frac{4^{-3}}{x^{-3}}$
 $= \frac{x^3}{4^3}$
 $= \frac{x^3}{64}$

7. $(\frac{x^3}{y})^2$
 $x^6 \cdot x^3 \cdot x^3$
 $\frac{x^6}{y^2}$

8. $(\frac{3x^2}{y^3z})^2$
 $\frac{3^2 x^4}{y^6 z^2} = \frac{9x^4}{y^6 z^2}$

6.1 Explain – Properties of Exponents Day 2 - Notes

Application

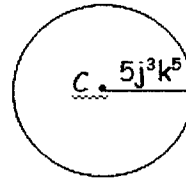
9. Find the area of a square with a side length of $3r^2t$ units. $A = s^2$

$$A = (3r^2t)^2$$

$$= 3^2 r^4 t^2$$

$$= 9r^4 t^2$$

10. Find the area of the circle. Leave in terms of π . $A = \pi r^2$

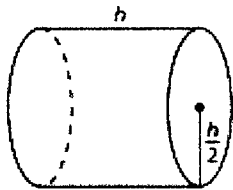


$$A = \pi (5j^3k^5)^2$$

$$= \pi 5^2 j^6 k^{10}$$

$$= 25\pi j^6 k^{10}$$

11. Which expression is equivalent to the volume of the cylinder shown, where r is the radius and h is the height? $V = \pi r^2 h$



Volume = ?

$$V = \pi \left(\frac{h}{2}\right)^2 h$$

$$= \pi \left(\frac{h^2}{4}\right) h$$

$$= \pi \frac{h^3}{4}$$

$\pi h^3 2^{-2}$ $\pi h 4^{-1}$

$\frac{\pi h^2}{4}$

$\frac{\pi h^3}{4}$

$\frac{\pi h^3}{2}$

Putting it all Together

Simplify. Your answer should contain only positive exponents.

12. $(x^4)^{-3} \cdot 2x^4$

$$x^{-12} \cdot 2x^4 = \frac{2x^4}{x^{12}} = \frac{2}{x^8}$$

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

$$= \frac{2m^{-4}}{8m^{-12}} = \frac{m^{12}}{4m^4} = \frac{m^8}{4}$$

14. $x^4 y^3 \cdot (2y^2)^0$

$$= x^4 y^3$$

15. $\frac{(2x^2 y^4 \cdot 4x^2 y^4 \cdot 3x)^0}{3x^{-3} y^2}$

$$= \frac{24x^5 y^8 \cdot x^3}{3y^2}$$

$$= \frac{8x^8 y^8}{y^2}$$

$$= \frac{8x^8 y^6}{y^4}$$

16. $\frac{(2x^3 z^2)^3}{x^3 y^4 z^2 \cdot x^{-4} z^3}$

$$= \frac{8x^9 z^6 \cdot x^4}{x^3 y^4 z^5}$$

$$= \frac{8x^{13} z^6}{x^3 y^4 z^5} = \frac{8x^{10} z}{y^4}$$

6.1**Properties of Exponents - Day 2**

In Exercises 1–6, evaluate the expression.

1. 5^{-4}

2. $(-5)^{-4}$

3. $\frac{7^{-1}}{-8^0}$

4. $(p^6)^3$

5. $(q^{-4})^5$

6. $5^3 \cdot 5^{-7}$

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

18. $\frac{x^7}{x^4} \cdot x^2$

9. $\frac{v^5 \cdot v^3}{v^2}$

10. $(-8t^2)^3$

11. $\left(\frac{q^4}{5}\right)^{-3}$

12. $\left(\frac{1}{3h^5}\right)^{-4}$

In Exercises 13–18, simplify the expression. Write your answer using only positive exponents.

13. $(-2y)^5$

14. $(3d)^{-3}$

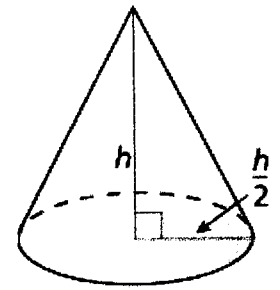
15. $\left(\frac{5}{b}\right)^{-3}$

16. $\left(\frac{3x^2y^{-3}}{2x^{-3}y^2}\right)^3$

17. $\left(\frac{-6a^{-9}b^5}{2a^2b^{-4}}\right)^4$

18. $\left(\frac{5x^{-4}y^3}{2x^2y^0}\right)^2 \cdot \left(\frac{4xy}{y^3}\right)^2$

19. Which expressions are equivalent to the volume of the cone, where r is the radius and h is the height? $V = \frac{1}{3}\pi r^2 h$



$$\frac{\pi h^3}{12} \quad \frac{\pi r^3}{3} \quad \frac{\pi h^2}{6}$$

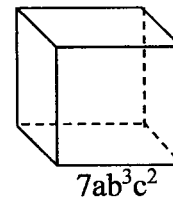
20. The area of the rectangular computer chip is $112a^3b^2$ square microns. If the width is $8ab$ microns, then what is the length?

In Exercises 21 and 22, rewrite the expression as a power of a product.

21. $8a^3b^3$

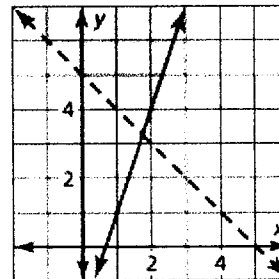
22. $81x^4y^8$

23. Find the volume of the following cube. Use the formula $V = s^3$.



STAAR Review:

24. Which of the following points is not a solution of the system of linear inequalities represented by the graph?



- (A) (4, 10)
- (B) (5, 8)
- (C) (-2, 8)
- (D) (0, 10)

25. A car dealership offers interest-free car loans for one day only. During this day, a salesperson at the dealership sells two cars. One of the clients decides to pay off a \$17,424 car in 36 monthly payments of \$484. The other client decides to pay off a \$15,840 car in 48 monthly payments of \$330. Which system of equations can you use to determine the number x of months after which both clients will have the same loan balance y (in dollars)?

(A) $y = -484x$
 $y = -330x$

(B) $y = -484x + 17,424$
 $y = -330x + 15,840$

(C) $y = -484x + 15,840$
 $y = -330x + 17,424$

(D) $y = 484x + 17,424$
 $y = 330x + 15,840$