

Name:

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Date:

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Unit 9 Day 4 Warm up

Directions: Answer the questions below. Be all mathematical about it.

1. Find the **x- and y- intercepts** of the line represented by  $3x - 4y = 24$

$x: (8, 0)$

$y: (0, -6)$

2. What is the **slope** of the lines represented below?

a.  $3x - 4y = 24$

b.  $3 - \left(\frac{x}{4}\right) = 24$

$4y = 3x - 24$

$y = \frac{3}{4}x - 6$

$m = \frac{3}{4}$

undefined

3. Simplify:  $(4x^3)^2(2x^4)$

b.  $8x^9$

c.  $32x^9$

d.  $16x^{10}$

e.  $32x^{10}$

Which expression is equivalent to  $\frac{4a^8b^9}{36b^3a^6}$ ? Assume the denominator does not equal zero.

a.  $9a^5b^3$

b.  $9a^2b^6$

c.  $\left(\frac{1}{9}\right)a^5b^3$

d.  $\left(\frac{1}{9}\right)a^2b^6$



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Unit 8, Day 2 Notes

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Learning Targets

> I can simplify expressions with negative exponents.

REVIEW

Simplify.

a.  $3^3 = 27$

b.  $5^3 = 125$

c.  $2^5 = 32$

d.  $4^2 = 16$

e.  $2^3 = 8$

f.  $\frac{9}{3^4} = \frac{1}{9}$

g.  $\frac{15}{5^3} = \frac{3}{25}$

h.  $\frac{24}{2^5} = \frac{3}{4}$

Look at this pattern:

$2^5 = 32$     $2^4 = 16$     $2^3 = 8$     $2^2 = 4$     $2^1 = 2$

What happens each time the exponent decreases by one? Answer decreases by half

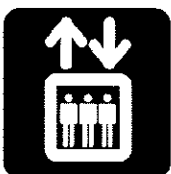
If this pattern continues, what would the value of  $2^0$  equal? 1

What would  $2^{-1}$  equal? 1/2

$2^0 = 1$     $2^{-1} = \frac{1}{2}$     $2^{-2} = \frac{1}{4}$     $2^{-3} = \frac{1}{8}$     $2^{-4} = \frac{1}{16}$

DEFINITION of NEGATIVE EXPONENTS

$a^{-n}$  is the reciprocal of  $a^n$ :  $a^{-n} = \frac{1}{a^n}$ ,  $a \neq 0$



Think of the “-” as an elevator; if you started on the top (numerator) then take the elevator down (denominator) and if you started on the bottom then take the elevator up!

Examples

1.  $m^{-7} = \frac{1}{m^7}$    2.  $3^{-2} = \frac{1}{9}$

3.  $y^0 = 1$    4.  $(-8x^3)^{-2} = \frac{1}{64x^6}$

5.  $(4x^7)^{-2} = \frac{1}{16x^{14}}$

YOU TRY:

A.  $x^{-3} = \frac{1}{x^3}$     B.  $2^{-3} = \frac{1}{8}$     C.  $y^{-6} = \frac{1}{y^6}$     D.  $x^0 = 1$     E.  $\left(\frac{1}{2}\right)^{-3} = 8$

$\frac{1}{16x^{14}}$     F.  $(4x^7)^{-2} = \frac{1}{4^2 x^{14}} = \frac{1}{16x^{14}}$     G.  $(-2x)^{-4} = \frac{1}{(-2)^4 x^4} = \frac{1}{16x^4}$     H.  $(3a^3b^5)^{-3} = \frac{1}{27a^9b^{15}}$

## Simplifying Expressions That Have Negative Exponents

Simplify  $2x^{-3}y^{-5}$  by rewriting with positive exponents. (Remember that the -3 exponent ONLY goes with the x and NOT the coefficient)

The sign of the exponent changes when the exponent is moved from the numerator to the denominator and vice versa!

$$2x^{-3}y^{-5} \rightarrow \frac{2}{x^3y^5}$$

EXAMPLES:

A.  $x^{-2}y^5 = \frac{y^5}{x^2}$

B.  $2x^{-7} = \frac{2}{x^7}$

C.  $\frac{2a^{-3}b^4}{c^4d^{-5}} = \frac{2b^4d^5}{a^3c^4}$

D.  $(3x^{-5})^2(4x^{-6}y^4) = \frac{36y^4}{x^{16}}$

E.  $\frac{12(x^{-2})^3}{4(x^{-4})^{-3}} = \frac{3}{x^{18}}$

YOU TRY:

1.  $x^8y^{-5}$

$$\frac{x^8}{y^5}$$

2.  $5x^{-3}$

$$\frac{5}{x^3}$$

3.  $\frac{3a^2b^{-7}}{c^{-3}d^4}$

$$\frac{3a^2c^3}{b^7d^4}$$

4.  $(-8a^{-3})^2(2a^{-3}c^5)$

$$\frac{128c^5}{a^9}$$

5.  $\frac{6(x^{-2})^2}{12(x^{-4})^{-1}}$

$$\frac{1}{2x^8}$$

CHALLENGE!

$$\left(\frac{2x^3}{y^4}\right)^{-1} = \frac{y^4}{2x^3}$$

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Unit 8 Day 2 Exit Ticket

Directions: Answer the questions below. Be all mathematical about it. Please show your work.

1. Simplify:  $\frac{20g^{-4}h^6}{4g^2h^{-8}}$

- a.  $\frac{5h^{14}}{g^6}$     b.  $\frac{h^{14}}{5g^6}$     c.  $\frac{5g^6}{h^{14}}$     d.  $\frac{g^6}{5h^{14}}$

2. Simplify:  $\left(\frac{a^2b^3}{a^{-1}b^{-3}}\right)^{-1}$

- a.  $\left(\frac{a^{-2}b^{-3}}{a^1b^3}\right)$     b.  $(a^3b^6)$     c.  $\left(\frac{a^1b^3}{a^2b^3}\right)$     d.  $\left(\frac{1}{a^3b^6}\right)$

3. Which expression is equivalent to  $(-2x^{-3})^2(3x^{-2})$ ?

- a.  $-12x^8$     b.  $\frac{-12}{x^8}$     c.  $\frac{12}{x^8}$     d.  $\frac{1}{12x^8}$

4. Simplify:  $\frac{(7a^{-3})^0}{4a^2b^{-3}}$

- a.  $\frac{4a^2b^3}{7a^3}$     b.  $\frac{1}{4a^2b^3}$     c. 0    d.  $\frac{b^3}{4a^2}$



Unit 7 Day 2 Practice --- Simplify all expressions. Leave no negative exponents.

$$\frac{2y^3 \cdot 3xy^3}{3x^2y^4}$$

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

$$\frac{2x^3}{(x^{-1})^3}$$

$$2x^6$$

$$\frac{(x^{-3})^4 x^4}{2x^{-3}}$$

$$\frac{x^5}{2}$$

$$\frac{x^{-12} x^4}{2x^{-3}} = \frac{x^{-8}}{2x^{-3}} = \frac{x^3}{2x^5} = \boxed{\frac{1}{2x^2}}$$

$$\frac{(2hj^2k^{-2} \cdot h^4j^{-1}k^4)^0}{2h^{-3}j^{-4}k^{-2}}$$

$$\frac{1}{2h^3j^4k^2}$$

$$\frac{1}{2h^{-3}j^{-4}k^{-2}}$$

$$\boxed{\frac{h^3j^4k^2}{2}}$$

Unit 7 Day 2 Practice --- Simplify all expressions. Leave no negative exponents.

$$\frac{(x^{-2}x^{-3})^4}{x^{20}}$$

$$\frac{(2x)^{-4}}{x^{-1} \cdot x}$$

$$\frac{1}{\cancel{16}x^4}$$

$$\frac{x^3y^3 \cdot x^3}{4x^2}$$

$$\frac{y^3x^4}{4}$$

$$(a^{-3}b^{-3})^0$$

$$1$$



Unit 7 Day 2 Practice --- Simplify all expressions. Leave no negative exponents.

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

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

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

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

$$\frac{9x^9z^6}{x^{-1}y^4z^5}$$

$$\frac{9x^{10}z}{y^4}$$

$$\frac{3x^3y^4}{2x^1 \cdot 4yx^2}$$

$$\frac{3xy}{8}$$

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

$$x^4y^3$$

Unit 7 Day 2 Practice --- Simplify all expressions. Leave no negative exponents.

$$(n^3)^3 \cdot 2n^{-1}$$

$$n^9 \cdot 2n^{-1}$$

$$2n^8$$

$$\frac{(2pm^{-1}q^4)^{-4} \cdot 2m^{-1}p^2}{\cancel{2pq^2}}$$

$$\frac{m^3}{16p^4q^2}$$

$$\frac{x}{(2x^0)^2}$$

$$\frac{x}{4}$$

$$ba^4 \cdot (2ba^4)^{-3}$$

$$\frac{ba^4}{8b^3a^{12}}$$

$$\frac{b}{8b^2a^8}$$

Unit 7 Day 2 Practice --- Simplify all expressions. Leave no negative exponents.

$$(2v)^2 \cdot 2v^2$$

$$8v^4$$

$$\frac{(2hj^2k^{-2} \cdot h^4j^{-1}k^4)^0}{2h^{-3}j^{-4}k^{-2}}$$

$$\frac{1 \cdot h^3 j^4 k^2}{2}$$

$$\frac{2m^{-4}}{(2m^{-4})^3} = \frac{2m^{12}}{8m^{14}}$$

$$\frac{1m^8}{4}$$

$$\frac{(2x^0y^2)^{-3} \cdot 2yx^3}{8y^6}$$

$$\frac{1x^3}{4y^5}$$

Unit 7 Day 2 Practice --- Simplify all expressions. Leave no negative exponents.

$$\frac{2x^2y^4 \cdot 4x^2y^4 \cdot \cancel{8x} x^3}{\cancel{8x^3} y^2}$$

$$\frac{8x^8y^6}{1}$$

$$\frac{(2m^2)^{-1}}{m^2}$$

$$\frac{1}{2m^4}$$

$$\frac{2k^3 \cdot k^2}{k^{-3}}$$

$$2k^8$$

$$\frac{(2pm^{-1}q)^{-4} \cdot 2m^{-1}p^t}{\cancel{2pq^2}}$$

$$\frac{m^8}{p}$$