

Suppose I have a problem in which I need to use the quotient-to-exponent rule along with the same-base product rule.

What steps would I use to simplify an expression like this:

$$\left(\frac{w}{x}\right)^{-3} \cdot \frac{w^4 x^{-2}}{x^7 w^{-5}}$$



Yikes, this problem looks scary. But if you remember to **work out the quotient-to-exponent rule first**, you'll do fine. Just follow the steps at right.



**Simplify:**

$$\left(\frac{w}{x}\right)^{-3} \cdot \frac{w^4 x^{-2}}{x^7 w^{-5}}$$

**Steps**

**1st)** Use quotient-to-exponent rule (p. 111).

$$\begin{aligned} &\left(\frac{w}{x}\right)^{-3} \cdot \frac{w^4 x^{-2}}{x^7 w^{-5}} \\ &= \frac{w^{-3}}{x^{-3}} \cdot \frac{w^4 x^{-2}}{x^7 w^{-5}} \end{aligned}$$

**2nd)** Combine numerators and denominators.

$$= \frac{w^{-3} w^4 x^{-2}}{x^{-3} x^7 w^{-5}}$$

**Steps**

**3rd)** Use same-base product rule (p. 89).

**4th)** Simplify.

**Example**

$$= \frac{w^1 x^{-2}}{w^{-5} x^4}$$

$$= \frac{w^6}{x^6}$$

Now try these:

a)  $\left(\frac{a}{c}\right)^4 \cdot \frac{c^3}{a^5}$       c)  $\frac{m^{-3} n^6}{m^4 n^{-7}} \cdot \left(\frac{m}{n}\right)^{-2}$

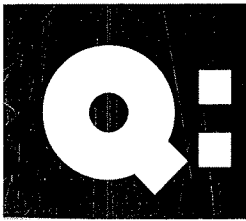
b)  $\left(\frac{x}{y}\right)^{-3} \cdot \frac{xy^2}{yx^3}$       d)  $\left(\frac{a}{b}\right)^{-2} \cdot \left(\frac{b}{a}\right)^{-3}$

e)  $\frac{9}{a} \cdot \frac{x}{y^4}$  (p)

f)  $\frac{m^9}{n^{15}} \cdot \frac{ac}{1}$  (a)

Answers:





## Use the exponent rules to simplify the expressions below.

State the value:

Simplify and write without negative exponents:

a)  $2^5$

b)  $(-2)^2$

c)  $7^1$

d)  $8^0$

e)  $(-8)^0$

f)  $-8^0$

g)  $5 + 3^0$

h)  $5 \cdot 3^0$

i)  $5 - 3^0$

k)  $\frac{5}{3^0}$

l)  $a^4 \cdot a^7$

m)  $a^{-6} \cdot a^{14}$

n)  $\frac{m^{11}}{m^3}$

p)  $a^2 a^0 b^4 b^0$

q)  $m^{-5}$

r)  $\frac{1}{y^{-7}}$

s)  $8x^{-2}y^{-3}$

t)  $\frac{r^{-2}t^{-4}}{a^{-7}b^{-5}}$

u)  $\frac{a^4}{a^7}$

v)  $\frac{y^8}{y^4}$

w)  $\frac{x^{-2}}{x^{-9}}$

x)  $\frac{a^{-2}a^5a^0}{a^7a^{-4}}$

y)  $\frac{x^{-6}y^8z^2x^{10}}{y^4x^{11}y^0z^{-6}}$

z)  $(y^2)^{-3}$

A)  $(5^x)^y$

B)  $b^3(b^2)^4b^0b^{-7}$

C)  $\frac{(c^4)^2c^3}{c^0c^{-10}}$

D)  $(pq)^{-6}$

E)  $(mr)^{-2}m^{-9}r^8$

F)  $\frac{(wy)^{-5}w^{-7}}{y^{10}(wy)^3}$

G)  $\left(\frac{x}{y}\right)^7$

H)  $\left(\frac{2}{a}\right)^2$

J)  $\left(\frac{p}{q}\right)^{-4}$



a) 32

b) 4

c) 7

d) 1

e) 1

f) -1

g) 6

h) 5

i) 4

k) 5

l)  $a^{11}$

m)  $a^8$

n)  $m^8$

p)  $a^2b^4$

q)  $\frac{1}{m^5}$

r)  $y^7$

s)  $\frac{8}{x^2y^3}$

t)  $\frac{a^7b^5}{r^2t^4}$

u)  $\frac{1}{a^3}$

v)  $y^{12}$

w)  $x^7$

x) 1

y)  $\frac{y^4z^8}{x^7}$

z)  $\frac{1}{y^6}$

A)  $5^{xy}$

B)  $b^4$

C)  $c^5$

D)  $\frac{1}{p^6q^6}$

E)  $\frac{r^6}{m^{11}}$

F)  $\frac{1}{w^{15}y^{18}}$

G)  $\frac{x^7}{y^7}$

H)  $\frac{4}{a^2}$

J)  $\frac{q^4}{p^4}$