

answers HW page 70

1. $4^0 = 1$

2. $a^0 = 1$

3. $4a^0 = 4$

4. $5a^0m^3 = 5m^3$

5. $2^{-3} = \frac{1}{2^3} = \frac{1}{8}$

12. $2m^{-4}p^3 = \frac{2p^3}{m^4}$

13. $2^{-2}m^3p^{-7} = \frac{m^3}{2^2p^7}$

14. $b^{-2} \cdot b^4 \cdot b \cdot b^{-7} = b^{-4} = \frac{1}{b^4}$

15. $(x^5m^2)(x^{-6}m) = x^{-1}m^3 = \frac{m^3}{x}$

16. $3m^3p^2 \cdot 2m^{-5} = 6m^{-2}p^2 = \frac{6p^2}{m^2}$

$$6. 3^{-2} = \frac{1}{3^2}$$

$$7. -4^{-3} = \frac{-1}{4^3}$$

$$8. a^{-2} = \frac{1}{a^2}$$

$$9. 2a^{-3} = \frac{2}{a^3}$$

$$17. 5m^{-3}p \cdot 3m^3p^4 = 15p^5$$

$$18. \frac{6x^2m^3}{2x^5m} = 3x^{-3}m^2 = \frac{3m^2}{x^3}$$

$$19. \frac{8x^0p^{-5}m}{2m^3} = 4p^{-5}m^{-2} = \frac{4}{p^5m^2}$$

$$10. x^3 m^{-2} = \frac{x^3}{m^2}$$

$$11. -5x^3 m^{-2} = \frac{-5x^3}{m^2}$$

Challenge: (Yes, you need to try it!)

$$20. \frac{2x^{-5}y^3}{m^5} \cdot \frac{3m^2}{2y} = \frac{6x^{-5}y^3m^2}{2m^5y}$$

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

HW Page 70

warm up:

Rewrite each expression with positive exponents.

1. $2^0 = \underline{1}$

2. $4^{-4} = \frac{1}{4^4}$

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

4. $-4^0 = \underline{-1}$

5. $9 \cdot 7^0 = \underline{9}$

6. $m^3 n^{-5} = \frac{m^3}{n^5}$

7. $-2xy^{-6} = \frac{-2x}{y^6}$

8. $3x^7y^{-4} = \frac{3x^7y^4}{y^4}$

page 126 (not at the top)

Exponent Rule #5:

Examples: Simplify using positive exponents, (simplify completely)

$$1. (3^5)^4 = \underline{(3^5)(3^5)(3^5)(3^5)} \text{ or } \underline{3^{5+5+5+5}} \text{ or } \underline{3^{4 \cdot 5}} = \underline{3^{20}}$$

$$2. (y^2)^3 = \frac{y^2 \cdot y^2 \cdot y^2}{\text{or}} \text{ or } \frac{y^{2 \cdot 3}}{\text{or}} = y^6$$

3. $(2a^4)^2 = 2^1 a^4 \cdot 2^1 a^4$ or $2^2 a^{4+4}$ or $4 a^8$ = or

Jump to just multiplying exponents

4. $(3\text{mp}^5)^3 = \frac{3^3 \cdot m^3 \cdot p^{15}}{p} = 27m^3p^{15}$ or

5. $(-2g^2n^3)^2 = (-2g^2n^3)(-2g^2n^3) = 4g^4n^6$

To raise a base with a power to another power, multiply the exponents.

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

Rule:

$$(a^m)^n = a^{m \cdot n}$$

↑
times

Song to help you remember the rule:

To raise a power to a power, multiply... (exponents)

To raise a power to a power, multiply... (exponents)

To raise a power to a power, you don't have to look so sour,

To raise a power to a power, multiply... (exponents)

MyExponentSongMusicOnly



page 127

✓ Understanding Check:

a. $(2^5)^4 = 2^{20}$
 $2^5 \cdot 2^5 \cdot 2^5 \cdot 2^5$

b. $(k^3)^6 = k^{18}$
 $k^3 \cdot k^3 \cdot k^3 \cdot k^3 \cdot k^3 \cdot k^3$

c. $(4p^3m^5)^3 = 64p^9m^{15}$
 $4^3 p^9 m^{15}$

d. $(5a^2kw^2)^2 = 25a^4k^2w^4$
 $(5^2) a^{2 \cdot 2} k^{1 \cdot 2} w^{2 \cdot 2}$

e. $(6p^{-3}x^5)^2 = \frac{36x^{10}}{p^6}$
 $6^2 p^{-6} x^{10}$

f. $(-3mg^4p^0w^2)^4 = 81m^4g^{16}w^8$
 $(-3)^4 m^4 g^{16} w^8$

✓ Understanding Check:

a. $(2^5)^4 = 2^{20}$
 When the exponent is really big we usually leave it.

b. $(k^3)^6 = k^{18}$

c. $(4p^3m^5)^3 = 64p^9m^{15}$

d. $(5a^2kw^2)^2 = 25a^4k^2w^4$

e. $(6p^{-3}x^5)^2 = \frac{36x^{10}}{p^6}$

f. $(-3mg^4p^0w^2)^4 = 81m^4g^{16}w^8$

Exponent Rule #5 again, this time with fractions:

Examples: Simplify using positive exponents, (simplify completely)


$$\left(\frac{x^3}{y}\right)^4 = \frac{\frac{x^3}{y} \cdot \frac{x^3}{y} \cdot \frac{x^3}{y} \cdot \frac{x^3}{y}}{\frac{3a^4}{m^2} \cdot \frac{3a^4}{m^2} \cdot \frac{3a^4}{m^2}} \text{ or } \frac{x^{12}}{y^4} = \underline{\hspace{2cm}}$$

$$\left(\frac{3a^4}{m^2}\right)^3 = \frac{\frac{3a^4}{m^2} \cdot \frac{3a^4}{m^2} \cdot \frac{3a^4}{m^2}}{\frac{3^3 a^{12}}{m^6} \cdot \frac{27a^{12}}{m^6}} \text{ or } \underline{\hspace{2cm}} \text{ or } \underline{\hspace{2cm}}$$

Jump to just multiplying exponents and ***Reduce first if you can!!!***

$$\left(\frac{20b^3p^3x}{8pm^4x^3}\right)^4 \text{ Reduces to } \left(\frac{4b^3p^2}{m^4x^2}\right)^4 = \frac{4^4 b^{12} p^8}{m^{16} x^8} = \frac{256b^{12}p^8}{m^{16}x^8}$$

To raise a quotient (fraction) to a power, multiply the exponents.

Rules: $\left(\frac{a}{b}\right)^m = \frac{a^m}{b^m}$  $\left(\frac{a^m}{b^n}\right)^x = \frac{a^{mx}}{b^{nx}}$

✓ Understanding Check:

a. $\left(\frac{m^2}{x}\right)^3 =$

b. $\left(\frac{a^3}{2p^6}\right)^5 =$

c. $\left(\frac{3x^4}{4y^5}\right)^2 =$

d. $\left(\frac{6x^3}{4mp^5}\right)^2 =$

e. $\left(\frac{9x^3y^2m^3}{3xy^2m^5}\right)^6 =$

✓ Understanding Check:

a. $\left(\frac{m^2}{x}\right)^3 = \boxed{\frac{m^6}{x^3}}$

b. $\left(\frac{a^3}{2p^6}\right)^5 = \boxed{\frac{a^{15}}{2^5 p^{30}}}$

c. $\left(\frac{3x^4}{4y^5}\right)^2 = \frac{3^2 x^8}{4^2 y^{10}} = \boxed{\frac{9x^8}{16y^{10}}}$

d. $\left(\frac{3x^3}{2amp^5}\right)^2 = \frac{3^2 x^6}{2^2 m^2 p^{10}} = \boxed{\frac{9x^6}{4m^2 p^{10}}}$

e. $\left(\frac{3x^2}{8x^2 m^2}\right)^6 = \frac{3^6 x^{12}}{8^6 m^{12}} = \frac{729x^{12}}{m^{12}}$

127

page 128



Warning – This can get confusing, pay attention...

A negative base (with parenthesis) raised to an even exponent will become positive.

Example: $(-2)^6 = (-2)(-2)(-2)(-2)(-2)(-2) = 2^6 = 64$

A negative base (with parenthesis) raised to an odd exponent will stay negative.

Example: $(-2)^5 = (-2)(-2)(-2)(-2)(-2) = -32$

A negative base without parenthesis will **stay** negative!

Example: $-2^4 = -1 \cdot 2 \cdot 2 \cdot 2 \cdot 2 = -16$

Examples:

Will the following produce positive or negative answers? (Write: pos. or neg.)

$-1 \cdot 2^3$
 a. $-2^3 = -8$ neg
 $-1 \cdot 2^2$
 b. $-2^2 = -4$ neg
 $(-2)^3 = -8$ neg
 c. $(-2)^3 = -8$ neg
 $(-2)^2 = 4$ pos
 d. $(-2)^2 = 4$ pos
 $-2^{-2} = -\frac{1}{4}$ neg
 e. $-2^{-2} = -\frac{1}{4}$ neg
 $(-2)^{-2} = \frac{1}{4}$ pos
 f. $(-2)^{-2} = \frac{1}{4}$ pos

Understanding Check:

Simplify.

$-2^3 = -1 \cdot 2^3$ neg
 a. $-2^3 = -1 \cdot 2^3$
 $= -1 \cdot 8$
 $= -8$
 $-2^4 = -1 \cdot 2^4$ neg
 b. $-2^4 = -1 \cdot 2^4$
 $= -16$
 $(-5)^3 = -125$ neg
 c. $(-5)^3 = -125$
 $(-1)^6 = 1$ pos
 d. $(-1)^6 = 1$
 $(-k)^4 = k^4$ pos
 e. $(-k)^4 = k^4$
 $(-m^4)^2 = m^8$ pos
 f. $(-m^4)^2 = m^8$
 $(-p^2)^3 = -p^6$ neg
 g. $(-p^2)^3 = -p^6$
 $(-2m^3)^4 = (-2)^4 m^{12} = 16m^{12}$ pos
 h. $(-2m^3)^4 = (-2)^4 m^{12} = 16m^{12}$
 $(-3a^2p^3)^3 = -27a^6p^9$ neg
 i. $(-3a^2p^3)^3 = -27a^6p^9$

✓ Understanding Check:

Simplify.

a. -2^3

neg.

b. -2^4

neg.

c. $(-5)^3$

neg.

d. $(-1)^6$

pos.

e. $(-k)^4$

pos.

f. $(-m^4)^2$

pos.

g. $(-p^2)^3$

neg.

h. $(-2m^3)^4$

pos.

i. $(-3a^2p^3)^3$

neg.



Exponent Song

(Sung to the tune of, "If you're happy and you know it...")

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Homework:

Hw page 71