

Write all powers with positive exponents.

A

3. Simplify.

- a) $x^3 \cdot x^4$ b) $a^2 \cdot a^{-5}$
c) $b^{-3} \cdot b^5$ d) $m^2 \cdot m^{-3}$

4. Write as a single power.

- a) $0.5^2 \cdot 0.5^3$ b) $0.5^2 \cdot 0.5^{-3}$
c) $\frac{0.5^2}{0.5^3}$ d) $\frac{0.5^2}{0.5^{-3}}$

7. Write as a single power.

- a) $\left[\left(\frac{3}{5}\right)^3\right]^4$ b) $\left[\left(\frac{3}{5}\right)^3\right]^{-4}$
c) $\left[\left(\frac{3}{5}\right)^{-3}\right]^{-4}$ d) $\left[\left(-\frac{3}{5}\right)^{-3}\right]^{-4}$

8. Simplify.

- a) $\left(\frac{a}{b}\right)^2$ b) $\left(\frac{n^2}{m}\right)^3$
c) $\left(\frac{c^2}{d^2}\right)^{-4}$ d) $\left(\frac{2b}{5c}\right)^2$
e) $(ab)^2$ f) $(n^2m)^3$
g) $(c^3d^2)^{-4}$ h) $(xy^{-1})^3$

B

9. Simplify. State the exponent law you used.

- a) $x^{-3} \cdot x^4$ b) $a^{-4} \cdot a^{-1}$
c) $b^4 \cdot b^{-3} \cdot b^2$ d) $m^8 \cdot m^{-2} \cdot m^{-6}$
e) $\frac{x^{-5}}{x^2}$ f) $\frac{s^5}{s^{-5}}$
g) $\frac{b^{-8}}{b^{-3}}$ h) $\frac{t^{-4}}{t^{-4}}$

10. Evaluate.

- a) $1.5^{\frac{3}{2}} \cdot 1.5^{\frac{1}{2}}$ b) $\left(\frac{3}{4}\right)^{\frac{3}{4}} \cdot \left(\frac{3}{4}\right)^{\frac{5}{4}}$
c) $(-0.6)^{\frac{1}{3}} \cdot (-0.6)^{\frac{5}{3}}$ d) $\left(\frac{4}{5}\right)^{\frac{4}{3}} \cdot \left(\frac{4}{5}\right)^{-\frac{4}{3}}$
e) $\frac{0.6^{\frac{1}{2}}}{0.6^{\frac{3}{2}}}$ f) $\frac{\left(-\frac{3}{8}\right)^{\frac{2}{3}}}{\left(-\frac{3}{8}\right)^{\frac{1}{3}}}$
g) $\frac{0.49^{\frac{5}{2}}}{0.49^4}$ h) $\frac{0.027^{\frac{5}{3}}}{0.027^{\frac{4}{3}}}$

11. Simplify. Explain your reasoning.

- a) $(x^{-1}y^{-2})^{-3}$ b) $(2a^{-2}b^2)^{-2}$
c) $(4m^2n^3)^{-3}$ d) $\left(\frac{3}{2}m^{-2}n^{-3}\right)^{-4}$

5. Simplify.

- a) $\frac{x^4}{x^2}$ b) $\frac{x^2}{x^5}$
c) $n^6 \div n^5$ d) $\frac{a^2}{a^6}$

6. Simplify.

- a) $(n^2)^3$ b) $(z^2)^{-3}$
c) $(n^{-4})^{-3}$ d) $(c^{-2})^2$

14. Simplify. Which exponent laws did you use?

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

15. Evaluate each expression for $a = -2$ and $b = 1$. Explain your strategy.

- a) $(a^3b^2)(a^2b^3)$ b) $(a^{-1}b^{-2})(a^{-2}b^{-3})$
c) $\frac{a^{-4}b^5}{ab^3}$ d) $\left(\frac{a^{-7}b^7}{a^{-9}b^{10}}\right)^{-5}$

16. Simplify.

- a) $m^{\frac{2}{3}} \cdot m^{\frac{4}{3}}$ b) $x^{\frac{3}{2}} \div x^{\frac{1}{4}}$
c) $\frac{-9a^{-4}b^{\frac{3}{4}}}{3a^2b^{\frac{1}{4}}}$ d) $\left(\frac{-64c^6}{a^9b^{-\frac{1}{2}}}\right)^{\frac{1}{3}}$

17. Identify any errors in each solution for simplifying an expression. Write a correct solution.

a) $(x^2y^{-3})(x^{\frac{1}{2}}y^{-1}) = x^2 \cdot x^{\frac{1}{2}} \cdot y^{-3} \cdot y^{-1}$
 $= x^1 \cdot y^3$
 $= xy^3$

b) $\left(\frac{-5a^2}{b^{\frac{1}{2}}}\right)^{-2} = \frac{10a^{-4}}{b^{-1}}$
 $= \frac{10b}{a^4}$

19. Identify the errors in each simplification. Write the correct solution.

a) $\frac{(m^{-3} \cdot n^2)^{-4}}{(m^2 \cdot n^{-3})^2} = (m^{-5} \cdot n^5)^{-6}$
 $= m^{30} \cdot n^{30}$
 $= (mn)^{30}$

b) $\left(r^{\frac{1}{2}} \cdot s^{-\frac{3}{2}}\right)^{\frac{1}{2}} \cdot \left(r^{-\frac{1}{4}} \cdot s^{\frac{1}{2}}\right)^{-1} = r^1 \cdot s^{-1} \cdot r^{-\frac{5}{4}} \cdot s^{-\frac{1}{2}}$
 $= r^{1-\frac{5}{4}} \cdot s^{-1-\frac{1}{2}}$
 $= r^{-\frac{1}{4}} \cdot s^{-\frac{3}{2}}$
 $= \frac{1}{r^{\frac{1}{4}} \cdot s^{\frac{3}{2}}}$

KEY

3.

a) x^7
b) $\frac{1}{a^3}$

c) b^2
d) $\frac{1}{m}$

14. a) $\frac{a^5}{b}$

b) $\frac{d^4}{c^2}$

15. a) -32

b) $-\frac{1}{8}$

c) $-\frac{1}{32}$

d) $\frac{1}{1024}$

4.

a) 0.5^5
b) 2^1

c) 2^1
d) 0.5^5

5.

a) x^2
b) $\frac{1}{x^3}$

c) n
d) $\frac{1}{a^4}$

16. a) m^2

b) $\frac{1}{x^4}$

c) $-\frac{3b^{\frac{1}{2}}}{a^6}$

d) $-\frac{4c^2b^{\frac{1}{6}}}{a^3}$

6. a) n^6

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

c) n^{12}

d) $\frac{1}{c^4}$

7. a) $\left(\frac{3}{5}\right)^{12}$

b) $\left(\frac{3}{5}\right)^{-12}$

c) $\left(\frac{3}{5}\right)^{12}$

d) $\left(-\frac{3}{5}\right)^{12}$

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

b) $\frac{n^6}{m^3}$

c) $\frac{d^8}{c^3}$

d) $\frac{4b^2}{25c^2}$

e) a^2b^2

f) n^6m^3

g) $\frac{1}{c^{12}d^8}$

h) $\frac{x^3}{y^3}$

9. a) x ; product of powers law

b) a^{-5} ; product of powers law

c) b^3 ; product of powers law

d) 1 ; product of powers law

e) $\frac{1}{x^7}$; quotient of powers law

f) s^{10} ; quotient of powers law

g) $\frac{1}{b^5}$; quotient of powers law

h) 1 ; quotient of powers law

10. a) 2.25

b) $\frac{9}{16}$

c) 0.36

d) 1

e) $\frac{5}{3}$

f) $-\frac{3}{8}$

g) $\frac{1000}{343}$

h) $\frac{3}{10}$

11. a) x^3y^6

b) $\frac{a^4}{4b^4}$

c) $\frac{1}{64m^6n^9}$

d) $\frac{16m^8n^{12}}{81}$