

Exponent Laws Part 1

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Mathematics 9 Exponents Exponent Laws Part 1

A. Exponent Laws

1) Product of Powers Law

$$a^m \times a^n \quad \text{or} \quad (a^m)(a^n) = a^{m+n}$$

a) $2^3 \times 2^2$
 $\overset{3+2}{=} 2^5$

b) $\left(\frac{4}{7}\right)^5 \times \left(\frac{4}{7}\right)^{-2}$
 $= \left(\frac{4}{7}\right)^{5+(-2)}$
 $= \boxed{\left(\frac{4}{7}\right)^3}$

c) $(m^5 n^2)(m^{-3} n^1)$
 $= m^{5+(-3)} n^{2+1}$
 $= \boxed{m^2 n^3}$

d) $y^{\frac{7}{2}} \times y^{-\frac{3}{2}}$
 $= y^{\frac{7}{2} + -\frac{3}{2}}$
 $= y^{\frac{4}{2}} = \boxed{y^2 \text{ or } y^{\frac{2}{1}}}$

2) Quotient of Powers Law

$$a^m \div a^n \text{ or } \frac{a^m}{a^n} = a^{m-n}$$

a) $4^5 \div 4^2$

$$= 4^{5-2}$$

$$= \boxed{4^3}$$

b) $\frac{7^2}{7^{-4}}$

$$= 7^{2-(-4)} = 7^{2+4}$$

$$= \boxed{7^6}$$

c) $\frac{m^{-2}}{m^{-6}}$

$$= m^{-2-(-6)} = m^{-2+6}$$

$$= \boxed{m^4}$$

d) $\frac{x^3 y^5}{x^1 y^2}$

$$= x^{3-1} y^{5-2}$$

$$= \boxed{x^2 y^3}$$

e) $\frac{a^{\frac{3}{2}}}{a^{-\frac{5}{2}}}$

$$= a^{\frac{3}{2}-(-\frac{5}{2})}$$

$$= a^{\frac{3}{2}+\frac{5}{2}} = \boxed{a^4}$$

3) Zero Exponent Law

$$a^0 = 1$$

$$\frac{5^2}{5^2} \rightarrow \frac{25}{25} = 1 \quad \frac{5^2}{5^2} = 5^{2-2} = 5^0 = 1$$

a) 5^0

$$= \boxed{1}$$

b) $(-4)^0$

$$= \boxed{-1}$$

c) $(-y)^0$

$$= \boxed{-1}$$

B. Practice Questions

1) Write the following as a single power and then evaluate.

a) $4^8 \div 4^6$

$$= 4^{8-6}$$

$$= \boxed{4^2} \text{ or } \boxed{16}$$

b) $\frac{(-2)^2}{(-2)^{-2}}$

$$= (-2)^{2-(-2)} = (-2)^{2+2}$$

$$= \boxed{(-2)^4} \text{ or } \boxed{16}$$

c) $\left(\frac{2}{3}\right)^{-2} \times \left(\frac{2}{3}\right)^{2+5}$

$$= \left(\frac{2}{3}\right)^{-2+1+5}$$

$$= \boxed{\left(\frac{2}{3}\right)^4} \text{ or } \boxed{\frac{16}{81}}$$

2) Simplify the following.

a) $(m^3)(m^2)(m^{-1})$

$$= m^{3+2+(-1)}$$

$$= \boxed{m^4}$$

b) $\frac{x^6 y^3}{x^{6-1} y^{3-1}}$

$$= \frac{x^6 y^3}{x^5 y^2}$$

$$= \boxed{x^5 y^4}$$

c) $\frac{(a^2 b^{-3})(ab^5)}{(ab^{-1})(ab^{-2})}$

$$= \frac{a^{2+1} b^{-3+5}}{a^{1+1} b^{-1+2}}$$

$$= \frac{a^3 b^2}{a^2 b^{-3}}$$

$$= a^{3-2} b^{2-(-3)}$$

$$= \boxed{a b^5}$$

Assignment: Exponent Laws Part 1 Assignment

Name: _____

Exponent Laws Part 1 Assignment

1. Write the following as a single power.

a) $8^3 \times 8^4$

b) $(-3)^4 \times (-3)^{-1}$

c) $\left(\frac{2}{5}\right)^{-6} \times \left(\frac{2}{5}\right)^9$

d) $\frac{x^{-3}}{x^{-7}}$

e) $m^{\frac{8}{3}} \div m^{-\frac{2}{3}}$

f) $(a^2 b)(a^4 b^2)$

g) $\frac{x^4 y}{x^2 y^{-5}}$

h) $(-3)^5 \times (-3) \times (-3)^{-3}$

i) $\frac{mn^{-2} p^3}{m^{-1} n^{-5} p^2}$

j) $-\left(-\frac{1}{4}\right)^3 \times \left(-\frac{1}{4}\right)^{-3}$

k) $(a^2 b c^{-3})(a^4 c^2)(b c^3)$

l) $\frac{x^5 y z^{-2}}{x^2 y^{-3} z^{-3}}$

2. Evaluate the following.

$$\text{a) } \left(2^2\right)\left(2^3\right)$$

$$\text{b) } \frac{6^5}{6^5}$$

$$\text{c) } \frac{\left(3^3\right)\left(3^5\right)}{\left(3^2\right)\left(3^3\right)}$$

$$\text{d) } (-5)^5(-5)^{-2}$$

$$\text{e) } \left(\frac{2}{3}\right)^{-2} \times \left(\frac{2}{3}\right)^5$$

$$\text{f) } -(-5)^3 \times (-5)^0 \times (-5)^{-1}$$

$$\text{g) } (3)^{-5}(3)(3)^4$$

$$\text{h) } \frac{\left(2^{-2}\right)\left(2^5\right)}{\left(2^2\right)\left(2^{-3}\right)}$$

$$\text{i) } \frac{(-6)^4(-6)^{-2}}{(-6)^{-1}}$$

$$\text{j) } \frac{8^3 \times 8 \times 8^{-5}}{8^{-2} \times 8^{-1}}$$

$$\text{k) } \frac{(-2)^4(-2)^{-2}(-2)^{-1}}{(-2)^{-3}(-2)^{-2}}$$

$$\text{l) } \frac{\left(\frac{2}{5}\right)^{-2} \times \left(\frac{2}{5}\right)}{\left(\frac{2}{5}\right)^{-4}}$$

Answers

1. a) 8^7

b) $(-3)^3$

c) $\left(\frac{2}{5}\right)^3$

d) x^4

e) m^2

f) a^6b^3

g) x^2y^6

h) $(-3)^3$

i) m^2n^3p

j) -1

k) $a^6b^2c^2$

l) x^3y^4z

2. a) 32

b) 1

c) 27

d) -125

e) $\frac{8}{27}$

f) -25

g) 1

h) 16

i) -216

j) 64

k) 64

l) $\frac{8}{125}$