

Summary of Exponent Laws

Recall: Grade 9/10 Exponent Laws

Product Law: $a^m \cdot a^n = a^{m+n}$

Quotient Law: $\frac{a^m}{a^n} = a^{m-n}$

Power of a Power Law: $(a^m)^n = a^{mn}$

Power of a Product Law: $(ab)^m = a^m b^m$ $(a+b)^m \neq a^m + b^m$

Power of a Quotient Law: $\left(\frac{a}{b}\right)^m = \frac{a^m}{b^m}$

Zero Exponent Law: $a^0 = 1$, $a \neq 0$

Negative Exponent Law: $a^{-m} = \frac{1}{a^m}$ or $\left(\frac{a}{b}\right)^{-m} = \left(\frac{b}{a}\right)^m$

Exponent Law Practice

Expand and simplify the following expressions.

a) 4^{-3}

$$= \frac{1}{4^3}$$
$$= \frac{1}{64}$$

d) $\frac{y^8}{y^6}$

$$= y^2$$

b) $2.53^{-5} \cdot 2.53^5$

$$= 2.53^{-5+5}$$
$$= 2.53^0$$
$$= 1$$

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

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

$\Delta = \frac{27}{8}$

c) $x^3 y^5 \cdot x^2 y^{-2}$

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

f) $(x^2 y)^3$

$$= (x^2)^3 y^3$$
$$= x^6 y^3$$

g) $\frac{x^2 y^{-4} z^{-2}}{p^{-1} q^3}$

$$= \frac{x^2 p^1}{y^4 z^2 q^3}$$

h) $(-3x)^4$

$$= (-3)^4 x^4$$
$$= 81x^4$$

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

$$= \frac{1(2^4)}{1} = \frac{16}{1} = 16$$
$$= \frac{1}{1/2^4} = 1 \div \frac{1}{16} = 1 \times \frac{16}{1} = 16$$

$$j) -2^4$$

$$= -16$$

$$k) (-2)^4$$

$$= (-2)(-2)(-2)(-2)$$

$$= 16$$

$$l) -1.53^0$$

$$= -1$$

$$m) x^2 \cdot x^4$$

$$= (xx)(xxxx)$$

$$= x^6$$

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

$$= x^{-3} = \frac{1}{x^3}$$

$$o) (-x)^2$$

$$= (-1)^2(x)^2$$

$$= 1x^2$$

$$= x^2$$

$$p) \left(\frac{3}{y}\right)^2$$

$$= \frac{3^2}{y^2}$$

$$= \frac{9}{y^2}$$

$$q) (x^3)^5$$

$$= (x^3)(x^3)(x^3)(x^3)(x^3)$$

$$= x^{15}$$

$$r) 3^{-4}$$

$$= \frac{1}{3^4}$$

$$= \frac{1}{81}$$

$$s) \frac{x^3}{x^3}$$

$$= x^0$$

$$= 1, x \neq 0$$

$$t) \left(-\frac{2x}{3}\right)^{-2}$$

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

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

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

$$= \frac{9}{(-2)^2(x)^2}$$

$$= \frac{9}{4x^2}$$

$$u) 5^{\frac{5}{3}} \cdot 5^{\frac{1}{3}}$$

$$= 5^{\frac{5}{3} + \frac{1}{3}}$$

$$= 5^{\frac{6}{3}}$$

$$= 5^2$$

$$= 25$$

Homework: pg 212 # 1-4(ac), 7- 8ac, pg 221 # 1-3, 4-9ac, 11ac, 13gh