Exponent Rules

$a^2 = a \cdot a$

in general if $n = 1, 2, 3, \ldots$

$\frac{a}{b} \cdot \frac{c}{d} = \frac{a \cdot c}{b \cdot d}$

$$a^n = \underbrace{a \cdot a \cdot \ldots \cdot a}_{n \text{ times}}$$

$-2^2 = -2 \cdot 2 = -4$

$(-2)^2 = (-2)(-2) = 4$

$a^2 a^3 = (a \cdot a)(a \cdot a \cdot a) = a \cdot a \cdot a \cdot a \cdot a = a^5$

General rule: $a^m a^n = a^{m+n}$

$\frac{a^3}{a^2} = \frac{a \cdot a \cdot a}{a \cdot a} = a \cdot \left(\frac{a}{a}\right) \cdot \left(\frac{a}{a}\right) = a(1)(1) = a = a^1$

General rule: $\frac{a^m}{a^n} = a^{m-n}$

$a^{2-3} = a^{-1} = \frac{a^2}{a^3} = \frac{a \cdot a}{a \cdot a \cdot a} = \left(\frac{a}{a}\right)\left(\frac{a}{a}\right)\frac{1}{a} = (1)(1) \cdot \frac{1}{a} = \frac{1}{a}$

$\boxed{a^{-1} = \frac{1}{a}}$ In general: $a^{-n} = \frac{1}{a^n}$

What is a^0?

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

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

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

$$1 = \frac{a}{a} = \frac{a^1}{a^1} = a^{1-1} = a^0$$

What is $a^{1/2}$?

$$a^{1/2} \cdot a^{1/2} = a^{1/2+1/2} = a^1$$

$$\left(2^{1/2}\right)^2 = 2^{1/2} \cdot 2^{1/2} = 2$$

$$\Downarrow$$

$$\boxed{2^{1/2} = \sqrt{2}}$$

In general: $a^{\frac{1}{n}} = \sqrt[n]{a}$

$$a^{\frac{m}{n}} = \sqrt[n]{a^m}$$

$\sqrt{36} = 6$

b/c

$6^2 = 36$

$\sqrt[3]{2}$ obeys

$\left(\sqrt[3]{2}\right)^3 = 2$

What is $(ab)^2$?

$$(ab)^2 = (ab)(ab) = a \cdot a \cdot b \cdot b = a^2 b^2$$

General rule: $(a \cdot b)^m = a^m b^m$

Fractions in denominator

flip & mult. by denom fraction

$$\frac{\frac{a}{b}}{\frac{c}{d}} \overset{\text{rule}}{=} \left(\frac{a}{b}\right)\left(\frac{d}{c}\right)$$

$$\frac{bd}{bd} = 1$$

$$\frac{\frac{a}{b}}{\frac{c}{d}} = \left(\frac{\frac{a}{b}}{\frac{c}{d}}\right)(1)$$

$$= \left(\frac{a/b}{c/d}\right)\left(\frac{bd}{bd}\right)$$

$$= \left(\frac{\frac{a}{b}\frac{bd}{1}}{\frac{c}{d}\frac{bd}{1}}\right) = \frac{abd}{b} = \frac{cbd}{d} = \frac{\left(\frac{ad}{1}\right)\left(\frac{b}{b}\right)}{\left(\frac{cb}{1}\right)\left(\frac{d}{d}\right)}$$

$$= \frac{ad}{cb}$$

Simplify "write with fewest symbols possible" (4)

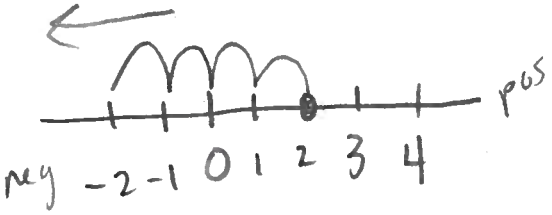
① $6-(2-(5-1))$

$=6-(2-4)$

$=6-(-2)$

$=6+2=8$

minus signs annihilate



② $\dfrac{5}{4x} \div \dfrac{10}{8y} = \dfrac{\frac{5}{4x}}{\frac{10}{8y}}$

put stuff to right below in a fraction

$=\left(\dfrac{5}{4x}\right)\left(\dfrac{8y}{10}\right)$

$=\dfrac{40y}{40x} = \left(\dfrac{40}{40}\right)\left(\dfrac{y}{x}\right) = \dfrac{y}{x}$

(3) $\frac{3}{4x+2y} \cdot \frac{2x+y}{6} = \frac{3(2x+y)}{(4x+2y)6}$

$4 = 2 \cdot 2$

$= \frac{2x+y}{2[2(2x+y)]}$

$= \frac{2x+y}{2[2(2x+y)]}$

$= \frac{1}{4} \cdot \frac{2x+y}{2x+y}$ $\nearrow = 1$

$= \frac{1}{4}$

(5) $\frac{3}{6} = \frac{3}{2 \cdot 3} = \frac{1}{2}\left(\frac{3}{3}\right)$

$= \frac{1}{2}$

$ax + ay = a(x+y)$

(4) Simplify

$w^2 b^4 w^3 b^9 = w^2 w^3 b^4 b^9$

$= w^{2+3} b^{4+9}$

$= w^5 b^{13}$

$-x = (-1)x$ ⑥

⑤ $14wwxxwxyzz$

$=$

$14w^3x^3y^0z^2$

⑥ $(8x)(2x)+(3x)(-x)+(-3x)(-5x)$

$= 16x^2 - 3x^2 + 15x^2$

$= (16-3+15)x^2$

$= 28x^2$

⑦ $6q^2 - 5q(q+1)$

$= 6q^2 - 5q^2 - 5q$

$= q^2 - 5q$

$= q(q-5)$