

3.2 Exponent Laws

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MULTIPLYING POWERS

To multiply powers with the same base, you **ADD** the exponents

$$\text{ex. } 2^3 \times 2^2 = 2^{3+2} = 2^5 = \boxed{32}$$

$$\ast \frac{2^3 \times 3^2}{\text{different bases}} \ast$$
$$= \frac{8 \times 9}{\text{different bases}} = 72$$

DIVIDING POWERS

To divide powers with the same base, you **SUBTRACT** the exponents

$$\text{ex } \frac{2^6}{2^2} = 2^{6-2} = 2^4 = \boxed{16}$$

RAISEING POWERS, PRODUCT ; QUOTIENTS

To raise a power to a power, **multiply the exponents**

$$\text{ex } (2^3)^2 = 2^6 = \boxed{64}$$

$$\text{ex } \left(\frac{3^2}{4^1} \right)^3 = \frac{3^{2 \times 3}}{4^{1 \times 3}} = \frac{3^6}{4^3} = \frac{729}{64} = \boxed{114}$$

Zero Exponent LAW

A power with any base (other than 0) that has a **0 exponent**, is = 1

$$\text{ex } 2^0 \quad \text{ex } (-4)^0 \quad \text{ex } \cancel{-2}^0$$

= 1

= 1

↙ = -1 ↘ base
negative is 2
is not part of the base

NEGATIVE EXPONENT LAW

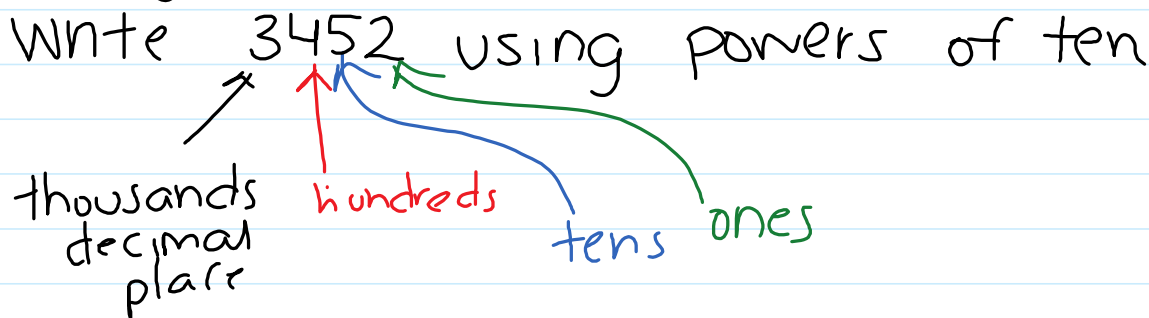
A power with a negative exponent becomes a fraction

$$\text{ex } 4^{-2} = \frac{1}{4^2} = \boxed{\frac{1}{16}}$$

$$\text{ex } \left(\frac{3}{-2}\right)^{-2} = \left(\frac{-2}{3}\right)^2 = \frac{(-2)^2}{(3)^2} = \boxed{\frac{4}{9}}$$

Writing Numbers using POWERS of 10

Write 3452 using powers of ten



$$= (3 \times 1000) + (4 \times 100) + (5 \times 10) + (2 \times 1)$$

$$= (3 \times 10^3) + (4 \times 10^2) + (5 \times 10^1) + (2 \times 10^0)$$

Ex #1

$$\begin{aligned} \text{(a)} \quad & [(-1)^3]^4 \\ & = (-1)^{3 \times 4} \\ & = (-1)^{12} = \boxed{1} \end{aligned}$$

$$\begin{aligned} \text{(b)} \quad & \frac{(-5)^6}{(-5)^4} = (-5)^{6-4} = (-5)^2 \\ & = \boxed{25} \end{aligned}$$

$$\begin{aligned} \text{(c)} \quad & -(3^7)^2 \\ & = -3^{7 \times 2} \\ & = \boxed{-3^{14}} \end{aligned}$$

$$\text{(d)} \quad 3^5 \times 3^2 = 3^{5+2} = \boxed{3^7}$$

$$\text{(e)} \quad (3 \times 4)^5$$

$$\text{(f)} \quad [(-2)^2]^{-3} \times (-2)^2$$

$$(e) \overbrace{(3 \times 4)^5} \\ = \boxed{(12)^5}$$

$$(f) [(-2)^2]^{-3} \times (-2)^2 \\ = (-2)^{-6} \times (-2)^2 \\ = (-2)^{-6+2} = (-2)^{-4} \\ = \frac{1}{(-2)^4} = \boxed{\frac{1}{16}}$$

$$(g) \left(\frac{1}{4}\right)^{-2} - \left(\frac{2^7 \times 2^{-5}}{2^3}\right)$$

$$= \left(\frac{4}{1}\right)^2 - \frac{2^{7+(-5)}}{2^3}$$

$$= 4^2 - \frac{2^2}{2^3} = 4^2 - 2^{2-3}$$

$$= 16 - 2^{-1}$$

$$= 16 - \frac{1}{2} = \boxed{15\frac{1}{2}}$$

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