Potenciação

$\mathbb{N} : \{0, 1, 2, 3, 4 \ldots\}$

Definições

$2^3 = \underbrace{2 \cdot 2 \cdot 2}_{3 \text{ vezes}}$

1) $a^n = \underbrace{a \cdot a \cdot a \cdot a \cdots a}_{n \text{ vezes}}$

2) $a^{-1} = \frac{1}{a} \therefore a^{-n} = \frac{1}{a^n}$

3) $a^{m/n} = \left(\sqrt[n]{a}\right)^m = \sqrt[n]{a^m}$

$\left(a^{1/n}\right)^m$

$\left(\sqrt[n]{a}\right)^m$

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

Propriedades

#01

$$a^m \cdot a^n = a^{m+n}$$

↳ Ex.: $3^2 \cdot 3^5 = \underbrace{3 \cdot 3}_{2x} \cdot \underbrace{3 \cdot 3 \cdot 3 \cdot 3 \cdot 3}_{5x} = 3^7$

#02

$$(a^m)^n = a^{m \cdot n}$$

↳ Ex.: $(5^2)^3 = (5 \cdot 5)^3 = 5^3 \cdot 5^3 = 5^{3+3} = 5^6$

#03

$$(a \cdot b)^n = a^n \cdot b^n$$

↳ Ex.: $(2 \cdot 3)^2$

$6^2 = 6 \cdot 6 = 36$ ✓

$2^2 \cdot 3^2 = 4 \cdot 9 = 36$ ✓

✓

#04

$$\left(\frac{a}{b}\right)^n = \frac{a^n}{b^n}$$

→ Ex.: $\left(\frac{8}{2}\right)^3$

↗ $4^3 = 4 \cdot 4 \cdot 4 = 64$

↘ $\frac{8^3}{2^3} = \frac{8 \cdot 8 \cdot 8}{2 \cdot 2 \cdot 2} = 64$

#05

$$a^0 = 1 \quad , a \neq 0$$

→ Ex.: $3^0 = 1$

$\pi^0 = 1$

#01

$a^m \cdot a^n = a^{m+n}$

$a^0 \cdot a^n = a^{0+n}$

$a^0 \cdot a^n = a^n$

1

#06

$$\frac{a^m}{a^n} =$$

→ Ex.:

Expoentes negativos

2^{-3} ?

$2^{3} \cdot 2^{-3} = 2^{3+(-3)} = 2^{0} = 1$

$2^{3} \cdot 2^{-3} = 1$

$\div (2^{3})$

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

$2^{-3} = 1/2^{3}$

$5^{-7} = 1/5^{7}$

#01) $a^{m} \cdot a^{n} = a^{m+n}$

#05) $2^{0} = 1$

⇒ Expoentes fracionários

#01) $a^m \cdot a^n = a^{m+n}$

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

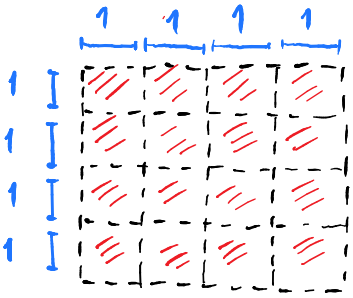
$a^{1/2} \cdot a^{1/2} = a$

↳ Ex.: $4 \cdot 4 = 16 \rightarrow 16^{1/2} = 4 \therefore \sqrt{16} = 4$

$7 \cdot 7 = 49 \rightarrow 49^{1/2} = 7 \therefore \sqrt{49} = 7$

$\sqrt[2]{\ } \rightarrow \sqrt{2}$

(raiz quadrada)



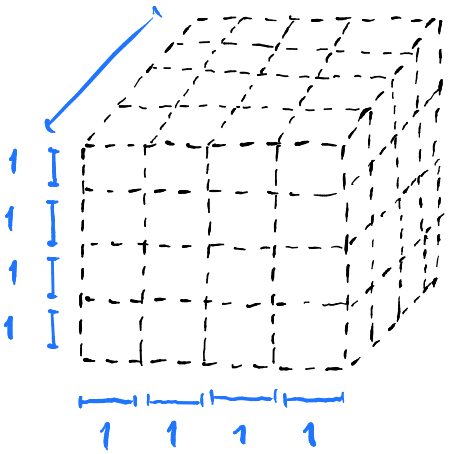
- $a^{1/3}$

$8^{1/3} = 2 \therefore \sqrt[3]{8} = 2$

$a^{1/3} \cdot a^{1/3} \cdot a^{1/3} = a$

↳ Ex.: $2 \cdot 2 \cdot 2 = 8$

$\sqrt[3]{64} = 4$



Aplicações

#01 : Conversão de Unidades

$\times 10$ km → 1000 m

$\times 10$ hm → 100 m

$\times 10$ dam → 10 m

m

$\times 10^{-1}$ dm → $\frac{1}{10}$ m = 10^{-1} m = 0,1 m

$\times 10^{-1}$ cm → $\frac{1}{100}$ m = 10^{-2} m = 0,01 m

$\times 10^{-1}$ mm → $\frac{1}{1000}$ m = 10^{-3} m = 0,001 m

↘ Os prefixos dizem tudo!

c → centi → centésima parte

$\left(\frac{1}{100} \text{ ou } \frac{1}{10^2} \text{ ou } 10^{-2}\right)$

· Ex.:

1 cm → 10^{-2} m

1 cg → 10^{-2} g

1 cs → 10^{-2} s

1 mm → 10^{-3} m

1 mg → 10^{-3} g

1 ms → 10^{-3} s

1 mL → 10^{-3} L

· Ex.:

1 K.g = 10^{3} g

1 Km = 10^{3} m

1 KC = 10^{3} C

1 KS = 10^{3} seg

Conversão de unidades de área

i) $(1\,cm)^2 = (10^{-2}\,m)^2$

$1^2 \cdot cm^2 = (10^{-2})^2 \cdot m^2$

$1\,cm^2 = 10^{-4}\,m^2$

ii) $(1\,mm)^2 = (10^{-3}\,m)^2$

$1\,mm^2 = 10^{-6}\,m^2$

iii) $1\,km$ $\quad (1\,km^2 \rightarrow cm^2)$

$1\,km = 10^3\,m = 10^3 \cdot 10^2\,cm$

$(1\,km)^2 = (10^5\,cm)^2 \quad \therefore \quad 1\,km^2 = 10^{10}\,cm^2$

Conversão de unidades de volume

i) $(1\,cm)^3 = (10^{-2}\,m)^3$

$1\,cm^3 = 10^{-6}\,m^3$

ii) $(1\,dm)^3 = (10^{-1}\,m)^3$

$1\,dm^3 = 10^{-3}\,m^3$

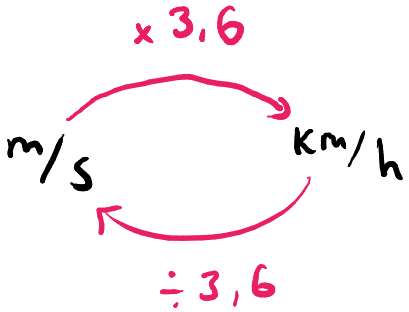
iii) $(1\,mm)^3 = (10^{-3}\,m)^3$

$1\,mm^3 = 10^{-9}\,m^3$

#02 Unidades compostas

Ex.:

1)



1 h → 60 min → 60 · 60 s

1 min → 60 s

1 h = 3600 s

$\frac{1\,h}{3600} = 1\,s$

$$\frac{1\,m}{s} = \frac{10^{-3}\,km}{\frac{1}{3600}\,h}$$

$$\frac{1\,m}{s} = 10^{-3}\,km \cdot \frac{3600}{1\,h} = 3{,}6\,km/h$$

2) $$\frac{180\,cm}{min} = \frac{180 \cdot 10^{-2}\,m}{60\,s} = 3 \cdot 10^{-2}\,m/s$$

$$= \frac{3}{100}\,m/s = 0{,}03\,m/s$$