

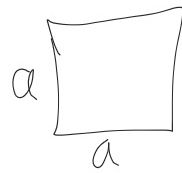
$$-2^4 + 3 = -16 + 3 = -13$$

$$(-2)^4 + 3 = 16 + 3 = 19$$

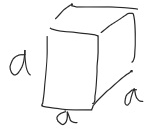
$$\left(\frac{3}{4}\right)^3 = \frac{3}{4} \cdot \frac{3}{4} \cdot \frac{3}{4} = \frac{3 \cdot 3 \cdot 3}{4 \cdot 4 \cdot 4} = \frac{3^3}{4^3}$$

neliö : potenssin 2

kubtia : potenssiin 3



$$\text{ala} = a^2$$



$$\text{tilavuus} = a^3$$

# Potenssien lasku (~~saantoja~~) logiikkaa

$$3^4 \cdot 3^5 = \underbrace{3 \cdot 3 \cdot 3 \cdot 3}_{\text{red}} \cdot \underbrace{3 \cdot 3 \cdot 3 \cdot 3 \cdot 3}_{\text{blue}} = 3^9$$

$$\left(\frac{7}{4}\right)^{21} \cdot \left(\frac{7}{4}\right)^{13} = \left(\frac{7}{4}\right)^{21+13} = \left(\frac{7}{4}\right)^{34}$$

$$y^5 \cdot y^{17} = y^{5+17} = y^{22}$$

$$(a \cdot b)^4 = (a \cdot b) \cdot (a \cdot b) \cdot (a \cdot b) \cdot (a \cdot b) \\ = a \cdot a \cdot a \cdot a \cdot b \cdot b \cdot b \cdot b = a^4 \cdot b^4$$

$$(a+b)^4 = (a+b) \cdot (a+b) \cdot (a+b) \cdot (a+b) \\ = (a \cdot a + a \cdot b + b \cdot a + b \cdot b) \cdot (a+b) \cdot (a+b)$$

$$\neq a^4 + b^4 \quad \text{E!!}$$

$$= a^4 + 4a^3b + 6a^2b^2 + 4ab^3 + b^4$$

# negatiivinen eksponentti

esim.  $2^{-3}$  ?

$$\boxed{2^a \cdot 2^b = 2^{a+b}}$$

$$2^{-3} \cdot 2^4 = 2^{-3+4} = 2^1 = 2$$

$$2^{-4} \cdot 2^8 = 2^{-4+8} = 2^4$$

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

$$2^{-1} \cdot 4 = 2 \quad || : 4$$

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

Määritelmä:  $2^{-a} = \frac{1}{2^a}$

$$2^{-3} \cdot 2^5 = 2^{-3+5} = 2^2$$

$$\frac{1}{2^3} \cdot 2^5 = \frac{2 \cdot 2 \cdot \cancel{2} \cdot \cancel{2} \cdot \cancel{2}}{\cancel{2} \cdot \cancel{2} \cdot \cancel{2}} = 2^2$$

Esim.

$$3^{-4} \cdot 3^4 = 3^{-4+4} = 3^0 = 1$$

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

Voidaan todeta

$$a^0 = 1$$

$(0^0 ?)$  Epäselvä