6.17 Laske ilman laskinta.

CAS

a) $\frac{2^{85}}{4^{41}}$ b) $\frac{3^{14}\cdot 6^{12}}{18^{12}}$

$4=2^2$

a) $\frac{2^{85}}{(2^2)^{41}} = \frac{2^{85}}{2^{2\cdot 41}} = \frac{2^{85}}{2^{82}} = 2^{85-82} = 2^3 = 8$

b) $\frac{3^{14}\cdot(2\cdot 3)^{12}}{(2\cdot 3\cdot 3)^{12}} = \frac{3^{14}\cdot 2^{12}\cdot 3^{12}}{2^{12}\cdot 3^{12}\cdot 3^{12}} = 3^{14-12-12} = 3^{-2} = \frac{1}{9}$

6.18 Sievennä.

CAS

a) $(3x^2)^3+(-2x^3)^2 = 3^3\cdot(x^2)^3+(-2)^2(x^3)^2 = 27x^6+4x^6 = 31x^6$

b) $(-3x^6)^3+(6x^9-4x^9)^2 =$

$(-3)^3\cdot(x^6)^3+(2x^9)^2 =$

$-27x^{18}+(2)^2\cdot(x^9)^2 =$

$-27x^{18}+4x^{18} = -23x^{18}$

6.19 Sievennä.

CAS

a) $\dfrac{x^{2^3}\cdot\left(6x^4\right)^2}{9x\cdot\left(-x^3\right)^2}$

b) $\dfrac{\left(-4x^3\right)^2\cdot\left(-2x^3\right)^3}{-32x^7}$

a) $\dfrac{x^8\cdot(6)^2\cdot(x^4)^2}{9x^1\cdot x^6} = \dfrac{x^8\cdot 36\cdot x^8}{9x^7} = 4x^9$

b) $\dfrac{(-4)^2\cdot(x^3)^2\cdot(-2)^3\cdot(x^3)^3}{-32x^7} = \dfrac{16\cdot x^6\cdot(-8)\cdot x^9}{-32x^7} = 4x^8$

Potenssi a^n

Eksponentti n	Määritelmä	Huomautuksia
$p \quad (p \in \mathbb{Z}_+)$	$a^p = \underbrace{a \cdot a \cdot \ldots \cdot a}_{p \text{ kpl}}$	a on kantaluku ja p eksponentti.
0	$a^0 = 1$	$a \neq 0$, 0^0 ei määritelty !
$-p \quad (p \in \mathbb{Z}_+)$	$a^{-p} = \frac{1}{a^p}$	$a \neq 0, b \neq 0, \left(\frac{a}{b}\right)^{-p} = \left(\frac{b}{a}\right)^p$
$\frac{p}{q} \quad (p \in \mathbb{Z}, q \in \mathbb{Z}_+)$	$a^{\frac{p}{q}} = \sqrt[q]{a^p}$	$a > 0$

$7^0 = 1$, $(-500)^0 = 1$, $(5x^3)^0 = 1$

Esim. $2^{-3} = \frac{1}{2^3} = \frac{1}{8}$ TAI $2^{-3} = \left(\frac{2}{1}\right)^{-3} = \left(\frac{1}{2}\right)^3 = \frac{1^3}{2^3} = \frac{1}{8}$

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

Esim $(3x^2)^{-3} = \frac{1}{(3x^2)^3} = \frac{1}{3^3 \cdot (x^2)^3} = \frac{1}{27x^6}$

TAI $(3x^2)^{-3} = 3^{-3} \cdot (x^2)^{-3} = \frac{1}{3^3} \cdot x^{-6} = \frac{1}{27} \cdot \frac{1}{x^6} = \frac{1}{27x^6}$

Kymmenen potenssit

$10^{-1} = \frac{1}{10^1} = 0{,}1$

$10^{-2} = \frac{1}{10^2} = \frac{1}{100} = 0{,}01$

$10^{-3} = \frac{1}{10^3} = \frac{1}{1000} = 0{,}001$

Esim. $0{,}000037\,m = 3{,}7 \cdot 10^{-5}\,m$ (5 kpl)

Esim. $2{,}56 \cdot 10^{-4}\,m = 0{,}000256\,m$