6.15 Sievennä.

CAS **a)** $5xy(2x^5y)^3$

b) $\dfrac{(-x^3y)^7}{x^2\cdot(y^3)^2} = \dfrac{(-x^3)^7\cdot y^7}{x^2\cdot y^6} = \dfrac{-x^{21}y^7}{x^2y^6} = -x^{21-2}y^{7-6} = -x^{19}y$

6.16 Laske ilman laskinta.

CAS E3 **a)** $\dfrac{4^4\cdot 15^4}{20^4}$

b) $2^{343}\cdot 5^{345}\cdot 0{,}1^{343} = 2^{343}\cdot 5^{343}\cdot 5^2\cdot 0{,}1^{343} = (2\cdot 5\cdot 0{,}1)^{343}\cdot 5^2 = 1^{343}\cdot 5^2 = 1\cdot 25 = 25$

Esim. $\dfrac{5^9}{5^7} = 5^{9-7} = 5^2 = 25$

Esim. $\dfrac{3^7}{9} = 3^{7-9-2} = 3^{-2} = \dfrac{1}{3^2} = \dfrac{1}{9}$

$\dfrac{3\cdot3\cdot3\cdot3\cdot3\cdot3\cdot3}{3\cdot3\cdot3\cdot3\cdot3\cdot3\cdot3\cdot3\cdot3} = \dfrac{1}{3^2} = \dfrac{1}{9}$

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

b) $\left(\dfrac{2}{3}\right)^{-3} = \left(\dfrac{3}{2}\right)^3 = \dfrac{3^3}{2^3} = \dfrac{27}{8}$

Potenssi a^n

Eksponentti n	Määritelmä	Huomautuksia
p $(p \in \mathbb{Z}_+)$	$a^p = a\cdot a\cdot \ldots \cdot a$ (p kpl)	a on kantaluku ja p eksponentti.
0	$a^0 = 1$	$a \neq 0$, 0^0 ei määritelty
$-p$ $(p \in \mathbb{Z}_+)$	$a^{-p} = \dfrac{1}{a^p}$	$a \neq 0, b \neq 0, \left(\dfrac{a}{b}\right)^{-p} = \left(\dfrac{b}{a}\right)^p$

Kymmenen potenssit

$10^0 = 1$

$10^1 = 10$

$10^2 = 100$

$\vdots$

$10^6 = 1000000$

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

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

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

$\vdots$

$10^{-6} = \frac{1}{1000000} = 0{,}000001$

Esim a) $2{,}3 \cdot 10^4\ m =$

$2{,}3 \cdot 10000\ m = 23000\ m = 23\ km$

(4)

b) $4\,250\,000\ kg = 4{,}25 \cdot 10^6\ kg$

(6)

Esim. a)

$3{,}5 \cdot 10^{-3}\ m =$

$3{,}5 \cdot \frac{1}{1000}\ m = 3{,}5 \cdot 0{,}001\ m$

$= 0{,}0035\ m$

(3)

b) $0{,}000025\ g =$

$2{,}5 \cdot 10^{-5}\ g$

(5)

7.4 Sievennä.

CAS E2

a) $(4x)^{-2}$ **b)** $4x^{-2}$ **c)** $\left(\frac{2}{3x}\right)^{-4}$

a) $\frac{1}{(4x)^2} = \frac{1}{4^2x^2} = \underline{\underline{\frac{1}{16x^2}}}$

c) $\left(\frac{3x}{2}\right)^4 = \frac{(3x)^4}{2^4} = \underline{\underline{\frac{81x^4}{16}}}$