

Esim. a) $2^{-4} = \frac{1}{2^4} = \frac{1}{16}$

b) $\left(\frac{4}{5}\right)^{-3} = \left(\frac{1}{\frac{4}{5}}\right)^3 = \left(\frac{5}{4}\right)^3 = \frac{5^3}{4^3} = \frac{125}{64}$

7.2, 11, 19

6.16 a) $\frac{4^4 \cdot 15^4}{20^4} = \frac{(4 \cdot 15)^4}{20^4} = \left(\frac{4 \cdot 15}{20}\right)^4 = 3^4 = \underbrace{3 \cdot 3 \cdot 3 \cdot 3}_{9 \cdot 9} = \underline{81}$

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

7.18

$9,1 \cdot 10^{-31} \text{ kg}$ $1,7 \cdot 10^{-27} \text{ kg}$

a) $1,7 \cdot 10^{-27} \text{ kg}$ on isompi \Rightarrow protoni

b) $\frac{1,7 \cdot 10^{-27} \text{ kg}}{9,1 \cdot 10^{-31} \text{ kg}} = 1868,13 = \underline{1900}$

8. Melijojuuri

Esim. a) $x^2 = 9 \Leftrightarrow x = 3$ tai $x = -3$

b) $x^2 = 2 \Leftrightarrow x = \sqrt{2}$ tai $x = -\sqrt{2}$

c) $x^2 = -1$ ei ratk.

Yleisesti yhtälön $x^2 = a$ ratkaisin

1° $a > 0$: $x = \sqrt{a}$ tai $x = -\sqrt{a}$ ($x = \pm\sqrt{a}$)

2° $a = 0$: $x = 0$

3° $a < 0$: ei ratk.

Määr. $\sqrt{a} = b \Leftrightarrow \begin{cases} 1^\circ b^2 = a \\ 2^\circ b \geq 0 \end{cases}$

8.2 a) $\sqrt{9} = 3$, b) $\sqrt{1} = 1$, c) $\sqrt{0} = 0$, d) $\sqrt{100} = 10$

8.3 a) $-\sqrt{25} = -5$, b) $\sqrt{-25}$ ei ole määritelty

c) $12 - \sqrt{16} = 12 - 4 = 8$

8.4 , 14, 15, 16, 21, 24