Series: Mathematics – from zero to engineer (9)

Engineering notation.

1) convert the numbers in scientific notation to engineering notation:

a) $8,236 \cdot 10^{7} = 82,36 \cdot 10^{-1} \cdot 10^{7} = 82,36 \cdot 10^{6}$

b) $1,624 \cdot 10^{-4} = 162,4 \cdot 10^{-2} \cdot 10^{-4} = 162,4 \cdot 10^{-6}$

c) $4,827 \cdot 10^{4} = 48,27 \cdot 10^{-1} \cdot 10^{4} = 48,27 \cdot 10^{3}$

d) $6,243 \cdot 10^{5} = 624,3 \cdot 10^{-2} \cdot 10^{5} = 624,3 \cdot 10^{3}$

e) $3,274 \cdot 10^{-2} = 32,74 \cdot 10^{-1} \cdot 10^{-2} = 32,74 \cdot 10^{-3}$

f) $5,362 \cdot 10^{-7} = 536,2 \cdot 10^{-2} \cdot 10^{-7} = 536,2 \cdot 10^{-9}$

- in engineering notation, the exponent is restricted to a multiple of 3, for example: $10^{3}, 10^{6}, 10^{-3}, 10^{-6} \ldots$

2) $(4,72 \cdot 10^{2}) \cdot (8,36 \cdot 10^{5})$

a) $4,72 \cdot 8,36 \cdot 10^{7} = 39,4592 \cdot 10^{7} = 3,94592 \cdot 10^{8}$ → scientific notation

b) $394,592 \cdot 10^{-2} \cdot 10^{8} = 394,592 \cdot 10^{6}$ → engineering notation

Review exercises

Write each of the following numbers as a power.

a) $5^{8} \cdot 5^{2} = 5^{10}$

b) $6^{4} : 6^{6} = 6^{-2}$

c) $(7^{4})^{3} = 7^{12}$

d) $(19^{-8})^{0} = 19^{0} = 1$

Find the value of each of the following numbers, correct to three decimal places.

a) $16^{\frac{1}{4}} = \pm 2$

b) $\sqrt[3]{3} = 3^{\frac{1}{3}} = 1,442$

c) $(-8)^{\frac{1}{5}} = -1,516$

d) $(-7)^{\frac{1}{4}}$ → does not exist

Write each of the following expressions as a single decimal number.

a) $1,0521 \cdot 10^{3} = 1052,1$

b) $0,0135 : 10^{-3} = 0,0135 \cdot 10^{3} = 13,5$

c) $123,456 \cdot 10^{-2} = 1,23456$

d) $165,21 : 10^{4} = 165,21 \cdot 10^{-4} = 0,016521$

Write each of the following numbers in scientific notation.

a) $125,87 = 1,2587 \cdot 10^{2}$

b) $0,0101 = 1,01 \cdot 10^{-2}$

c) $1,345 = 1,345 \cdot 10^{0}$

d) $10,13 = 1,013 \cdot 10^{1}$

Write each of the following numbers in engineering notation.

a) $1,3204 \cdot 10^{5} = 132,04 \cdot 10^{-2} \cdot 10^{5} = 132,04 \cdot 10^{3}$

b) $0,0101 = 10,1 \cdot 10^{-3}$

c) $1,345 = 1,345 \cdot 10^{0}$

d) $9,5032 \cdot 10^{-8} = 95,032 \cdot 10^{-1} \cdot 10^{-8} = 95,032 \cdot 10^{-9}$

In each of the following cases, the numbers were obtained by measurement. Give the result of each calculation to the appropriate degree of accuracy.

a) $13,6 : 0,012 \cdot 7,63 - 9015 = -367,(6) = -370$ (to two significant figures)

↘ two significant figures

b) $\dfrac{0,003 \cdot 194}{13,6} = 0,042794 = 0,04$ (to one significant figure)

↘ one significant figure

c) $19,3 \cdot 1,04^{2,00} = 20,87488 = 20,9$ (to three significant figures)

three significant figures

d) $\dfrac{18 \cdot 2,1 - 3,6 \cdot 0,54}{8,6 \cdot 2,9 + 5,7 \cdot 9,2} = 0,46338 = 0,46$ (to two significant figures)