

Series: Mathematics - from zero to engineer (11).

Converting numbers from different number systems to decimal using an alternative method.

1) $357,121_8 = 239,1582_{10}$

$$\begin{array}{r} 3 \\ \cdot 8 \\ \hline 24 \end{array} \quad \begin{array}{r} 5 \\ + 24 \\ \hline 29 \\ \cdot 8 \\ \hline 232 \end{array} \quad \begin{array}{r} 7 \\ + 232 \\ \hline 239 \end{array} \quad | \quad \begin{array}{r} 1 \\ \cdot 8 \\ \hline 8 \end{array} \quad \begin{array}{r} 2 \\ + 8 \\ \hline 10 \\ \cdot 8 \\ \hline 80 \end{array} \quad \begin{array}{r} 1 \\ + 80 \\ \hline 81 \end{array}$$

$$81 \cdot 8^{-3} = 81 \cdot \frac{1}{512} = \frac{81}{512} = 0,1582$$

- correct to four decimal places

2) $245,136_{12} = 341,1076_{10}$

$$\begin{array}{r} 2 \\ \cdot 12 \\ \hline 24 \end{array} \quad \begin{array}{r} 4 \\ + 24 \\ \hline 28 \\ \cdot 12 \\ \hline 336 \end{array} \quad \begin{array}{r} 5 \\ + 336 \\ \hline 341 \end{array} \quad | \quad \begin{array}{r} 1 \\ \cdot 12 \\ \hline 12 \end{array} \quad \begin{array}{r} 3 \\ + 12 \\ \hline 15 \\ \cdot 12 \\ \hline 180 \end{array} \quad \begin{array}{r} 6 \\ + 180 \\ \hline 186 \end{array}$$

$$186 \cdot 12^{-3} = 186 \cdot \frac{1}{1728} = \frac{186}{1728} = 0,1076$$

- correct to four decimal places

3) $11011,1011_2 = 27,6875_{10}$

$$\begin{array}{r} 1 \\ \cdot 2 \\ \hline 2 \end{array} \quad \begin{array}{r} 1 \\ + 2 \\ \hline 3 \\ \cdot 2 \\ \hline 6 \end{array} \quad \begin{array}{r} 0 \\ + 6 \\ \hline 6 \\ \cdot 2 \\ \hline 12 \end{array} \quad \begin{array}{r} 1 \\ + 12 \\ \hline 13 \\ \cdot 2 \\ \hline 26 \end{array} \quad \begin{array}{r} 1 \\ + 26 \\ \hline 27 \end{array} \quad | \quad \begin{array}{r} 1 \\ \cdot 2 \\ \hline 2 \end{array} \quad \begin{array}{r} 0 \\ + 2 \\ \hline 2 \\ \cdot 2 \\ \hline 4 \end{array} \quad \begin{array}{r} 1 \\ + 4 \\ \hline 5 \\ \cdot 2 \\ \hline 10 \end{array} \quad \begin{array}{r} 1 \\ + 10 \\ \hline 11 \end{array}$$

$$11 \cdot 2^{-4} = 11 \cdot \frac{1}{16} = \frac{11}{16} = 0,6875$$

4) $4C5,2B8_{16} = 1221,1699_{10}$

$$\begin{array}{r} 4 \\ \cdot 16 \\ \hline 64 \end{array} \quad \begin{array}{r} 12 \\ + 64 \\ \hline 76 \\ \cdot 16 \\ \hline 1216 \end{array} \quad \begin{array}{r} 5 \\ + 1216 \\ \hline 1221 \end{array} \quad | \quad \begin{array}{r} 2 \\ \cdot 16 \\ \hline 32 \end{array} \quad \begin{array}{r} 11 \\ + 32 \\ \hline 43 \\ \cdot 16 \\ \hline 688 \end{array} \quad \begin{array}{r} 8 \\ + 688 \\ \hline 696 \end{array}$$

$$696 \cdot 16^{-3} = 696 \cdot \frac{1}{4096} = \frac{696}{4096} = 0,1699$$

- correct to four decimal places

Review exercises

Express each of the following numbers in the decimal number system, correct to three decimal places.

1) $11001, 11_2 = 25,750_{10}$

$$\begin{array}{r} 1 \\ \cdot 2 \\ \hline 2 \end{array} \quad \begin{array}{r} 1 \\ + 2 \\ \hline 3 \\ \cdot 2 \\ \hline 6 \end{array} \quad \begin{array}{r} 0 \\ + 6 \\ \hline 6 \\ \cdot 2 \\ \hline 12 \end{array} \quad \begin{array}{r} 0 \\ + 12 \\ \hline 12 \\ \cdot 2 \\ \hline 24 \end{array} \quad \begin{array}{r} 1 \\ + 24 \\ \hline 25 \end{array} \quad \begin{array}{r} 1 \\ \cdot 2 \\ \hline 2 \end{array} \quad \begin{array}{r} 1 \\ + 2 \\ \hline 3 \end{array}$$

$$3 \cdot 2^{-2} = 3 \cdot \frac{1}{4} = \frac{3}{4} = 0,750$$

- correct to three decimal places.

2) $776, 143_8 = 510,193_{10}$

$$\begin{array}{r} 7 \\ \cdot 8 \\ \hline 56 \end{array} \quad \begin{array}{r} 7 \\ + 56 \\ \hline 63 \\ \cdot 8 \\ \hline 504 \end{array} \quad \begin{array}{r} 6 \\ + 504 \\ \hline 510 \end{array} \quad \begin{array}{r} 1 \\ \cdot 8 \\ \hline 8 \end{array} \quad \begin{array}{r} 4 \\ + 8 \\ \hline 12 \\ \cdot 8 \\ \hline 96 \end{array} \quad \begin{array}{r} 3 \\ + 96 \\ \hline 99 \end{array}$$

$$99 \cdot 8^{-3} = 99 \cdot \frac{1}{512} = \frac{99}{512} = 0,193$$

- correct to three decimal places.

3) $4X9, 2\wedge 5_{12} = 405,246_{10}$

$$\begin{array}{r} 4 \\ \cdot 12 \\ \hline 48 \end{array} \quad \begin{array}{r} 10 \\ + 48 \\ \hline 58 \\ \cdot 12 \\ \hline 696 \end{array} \quad \begin{array}{r} 9 \\ + 696 \\ \hline 705 \end{array} \quad \begin{array}{r} 2 \\ \cdot 12 \\ \hline 24 \end{array} \quad \begin{array}{r} 11 \\ + 24 \\ \hline 35 \\ \cdot 12 \\ \hline 420 \end{array} \quad \begin{array}{r} 5 \\ + 420 \\ \hline 425 \end{array}$$

$$425 \cdot 12^{-3} = 425 \cdot \frac{1}{1728} = \frac{425}{1728} = 0,246$$

- correct to three decimal places.

4) $6F8, 3D5_{16} = 1784,240_{10}$

$$\begin{array}{r} 6 \\ \cdot 16 \\ \hline 96 \end{array} \quad \begin{array}{r} 15 \\ + 96 \\ \hline 111 \\ \cdot 16 \\ \hline 1776 \end{array} \quad \begin{array}{r} 8 \\ + 1776 \\ \hline 1784 \end{array} \quad \begin{array}{r} 3 \\ \cdot 16 \\ \hline 48 \end{array} \quad \begin{array}{r} 13 \\ + 48 \\ \hline 61 \\ \cdot 16 \\ \hline 976 \end{array} \quad \begin{array}{r} 5 \\ + 976 \\ \hline 981 \end{array}$$

$$981 \cdot 16^{-3} = 981 \cdot \frac{1}{4096} = \frac{981}{4096} = 0,240$$

- correct to three decimal places.