

calc_decimal_example

Student Group

First Name	Surname	Matrikel Nr.

Table of Contents

\$I.\quad\$ Calculation example for decimal value

Idea: The number \$2658.47\$ is only the representation with the numerals \$[0..9]\$, but what is the value behind it?

```
\begin{align*} \begin{smallmatrix} \color{black}{\text{number}:} & \color{black}{} & \\ \color{black}{2} & \color{black}{6} & \color{black}{5} & \color{black}{8.} & \color{black}{4} & \\ \color{black}{7} & \color{white}{\text{index}:} & \color{white}{i} & \color{white}{3} & & \\ \color{white}{2} & \color{white}{1} & \color{white}{0} & \color{white}{-1} & \color{white}{-2} & \\ \color{white}{\text{place value}:} & \color{white}{B^i} & \color{white}{10^3} & & & \\ \color{white}{10^2} & \color{white}{10^1} & \color{white}{10^0} & \color{white}{10^{-1}} & & \\ \color{white}{10^{-2}} & \color{white}{} & \color{white}{} & \color{white}{1000} & & \\ \color{white}{100} & \color{white}{10} & \color{white}{1} & \color{white}{0.1} & & \\ \color{white}{0.01} & \color{white}{\text{numerals}:} & \color{white}{z_i} & \color{white}{2} & & \\ \color{white}{6} & \color{white}{5} & \color{white}{8} & \color{white}{4} & \color{white}{7} & \\ \color{white}{\text{calc}.:} & \color{white}{z_i \cdot B^i} & \color{white}{2000} & & & \\ \color{white}{600} & \color{white}{50} & \color{white}{8} & \color{white}{0.4} & & \\ \color{white}{0.07} & \color{white}{\text{result}:} & \color{white}{\sum_i z_i \cdot B^i} & & & \\ \color{white}{2658.47} & \end{smallmatrix} \text{First: But space between the numerals to see the} \\ \text{thousands, hundreds, tens, ones, tenths, hundredths} \end{align*}
```

```
\begin{align*} \begin{smallmatrix} \color{black}{\text{number}:} & \color{black}{} & \\ \color{black}{2} & \color{black}{6} & \color{black}{5} & \color{black}{8.} & \color{black}{4} & \\ \color{black}{7} & \color{blue}{\text{index}:} & \color{blue}{i} & \color{blue}{3} & \color{blue}{} & \\ \color{blue}{2} & \color{blue}{1} & \color{blue}{0} & \color{blue}{-1} & \color{blue}{-2} & \\ \color{white}{\text{place value}:} & \color{white}{B^i} & \color{white}{10^3} & & & \\ \color{white}{10^2} & \color{white}{10^1} & \color{white}{10^0} & \color{white}{10^{-1}} & & \\ \color{white}{10^{-2}} & \color{white}{} & \color{white}{} & \color{white}{1000} & & \\ \color{white}{100} & \color{white}{10} & \color{white}{1} & \color{white}{0.1} & & \\ \color{white}{0.01} & \color{white}{\text{numerals}:} & \color{white}{z_i} & \color{white}{2} & & \\ \color{white}{6} & \color{white}{5} & \color{white}{8} & \color{white}{4} & \color{white}{7} & \\ \color{white}{\text{calc}.:} & \color{white}{z_i \cdot B^i} & \color{white}{2000} & & & \\ \color{white}{600} & \color{white}{50} & \color{white}{8} & \color{white}{0.4} & & \\ \color{white}{0.07} & \color{white}{\text{result}:} & \color{white}{\sum_i z_i \cdot B^i} & & & \\ \color{white}{2658.47} & \end{smallmatrix} \end{align*}
```

```
\begin{align*} \begin{smallmatrix} \color{black}{\text{number}:} & \color{black}{} & \\ \color{black}{2} & \color{black}{6} & \color{black}{5} & \color{black}{8.} & \color{black}{4} & \\ \color{black}{7} & \color{black}{\text{index}:} & \color{black}{i} & \color{black}{3} & & \\ \color{black}{2} & \color{black}{1} & \color{black}{0} & \color{black}{-1} & \color{black}{-2} & \\ \color{blue}{\text{place value}:} & \color{blue}{B^i} & \color{blue}{10^3} & \color{blue}{} & & \\ \color{blue}{10^2} & \color{blue}{10^1} & \color{blue}{10^0} & \color{blue}{10^{-1}} & \color{blue}{} & \\ \color{blue}{10^{-2}} & \color{white}{} & \color{white}{} & \color{white}{1000} & \color{white}{100} & \\ \color{white}{10} & \color{white}{1} & \color{white}{0.1} & \color{white}{0.01} & & \\ \color{white}{\text{numerals}:} & \color{white}{z_i} & \color{white}{2} & \color{white}{6} & & \\ \color{white}{5} & \color{white}{8} & \color{white}{4} & \color{white}{7} & & \\ \color{white}{\text{calc}.:} & \color{white}{z_i \cdot B^i} & \color{white}{2000} & & & \\ \color{white}{600} & \color{white}{50} & \color{white}{8} & \color{white}{0.4} & & \end{smallmatrix}
```

```
\color{white}{0.07} \\ \color{white}{\text{result}:} & \color{white}{\sum_i z_i \cdot B^i} & & \\ \color{white}{2658.47} \\ \end{smallmatrix} \end{align*}
```

```
\begin{align*} \begin{smallmatrix} \color{white}{\text{number}:} & \color{white}{} & \color{white}{2} & \color{white}{6} & \color{white}{5} & \color{white}{8.} & \color{white}{4} & \color{white}{7} \\ \color{white}{\text{index}:} & \color{white}{i} & \color{white}{3} & \color{white}{2} & \color{white}{1} & \color{white}{0} & \color{white}{-1} & \color{white}{-2} \\ \color{white}{\text{place value}:} & \color{white}{B^i} & \color{white}{10^3} & \color{white}{10^2} & \color{white}{10^1} & \color{white}{10^0} & \color{white}{10^{-1}} & \color{white}{10^{-2}} \\ \color{white}{} & \color{white}{} & \color{white}{} & \color{white}{} & \color{white}{} & \color{white}{1000} & \color{white}{100} & \color{white}{10} & \color{white}{1} & \color{white}{0.1} & \color{white}{0.01} \\ \color{white}{\text{numerals}:} & \color{white}{z_i} & \color{white}{2} & \color{white}{6} & \color{white}{5} & \color{white}{8} & \color{white}{4} & \color{white}{7} \\ \color{white}{\text{calc}.:} & \color{white}{z_i \cdot B^i} & \color{white}{2000} & \color{white}{600} & \color{white}{50} & \color{white}{8} & \color{white}{0.4} & \color{white}{0.07} \\ \color{white}{\text{result}:} & \color{white}{\sum_i z_i \cdot B^i} & & & & & & & \color{white}{2658.47} \end{smallmatrix} \end{align*}
```

```
\begin{align*} \begin{smallmatrix} \color{blue}{\text{number}:} & \color{blue}{} & \color{blue}{2} & \color{blue}{6} & \color{blue}{5} & \color{blue}{8.} & \color{blue}{4} & \color{blue}{7} \\ \color{blue}{\text{index}:} & \color{blue}{i} & \color{blue}{3} & \color{blue}{2} & \color{blue}{1} & \color{blue}{0} & \color{blue}{-1} & \color{blue}{-2} \\ \color{blue}{\text{place value}:} & \color{blue}{B^i} & \color{blue}{10^3} & \color{blue}{10^2} & \color{blue}{10^1} & \color{blue}{10^0} & \color{blue}{10^{-1}} & \color{blue}{10^{-2}} \\ \color{blue}{} & \color{blue}{} & \color{blue}{} & \color{blue}{} & \color{blue}{} & \color{blue}{1000} & \color{blue}{100} & \color{blue}{10} & \color{blue}{1} & \color{blue}{0.1} & \color{blue}{0.01} \\ \color{blue}{\text{numerals}:} & \color{blue}{z_i} & \color{blue}{2} & \color{blue}{6} & \color{blue}{5} & \color{blue}{8} & \color{blue}{4} & \color{blue}{7} \\ \color{blue}{\text{calc}.:} & \color{blue}{z_i \cdot B^i} & \color{blue}{2000} & \color{blue}{600} & \color{blue}{50} & \color{blue}{8} & \color{blue}{0.4} & \color{blue}{0.07} \\ \color{blue}{\text{result}:} & \color{blue}{\sum_i z_i \cdot B^i} & & & & & & & \color{blue}{2658.47} \end{smallmatrix} \end{align*}
```

```
\begin{align*} \begin{smallmatrix} \color{black}{\text{number}:} & \color{black}{} & \color{black}{2} & \color{black}{6} & \color{black}{5} & \color{black}{8.} & \color{black}{4} & \color{black}{7} \\ \color{black}{\text{index}:} & \color{black}{i} & \color{black}{3} & \color{black}{2} & \color{black}{1} & \color{black}{0} & \color{black}{-1} & \color{black}{-2} \\ \color{black}{\text{place value}:} & \color{black}{B^i} & \color{black}{10^3} & \color{black}{10^2} & \color{black}{10^1} & \color{black}{10^0} & \color{black}{10^{-1}} & \color{black}{10^{-2}} \\ \color{black}{} & \color{black}{} & \color{black}{} & \color{black}{} & \color{black}{} & \color{black}{1000} & \color{black}{100} & \color{black}{10} & \color{black}{1} & \color{black}{0.1} & \color{black}{0.01} \\ \color{black}{\text{numerals}:} & \color{black}{z_i} & \color{black}{2} & \color{black}{6} & \color{black}{5} & \color{black}{8} & \color{black}{4} & \color{black}{7} \\ \color{black}{\text{calc}.:} & \color{black}{z_i \cdot B^i} & \color{black}{2000} & \color{black}{600} & \color{black}{50} & \color{black}{8} & \color{black}{0.4} & \color{black}{0.07} \\ \color{black}{\text{result}:} & \color{black}{\sum_i z_i \cdot B^i} & & & & & & & \color{black}{2658.47} \end{smallmatrix} \end{align*}
```

value		2	6	5	8 ,	4	7	
index	\$i\$	3	2	1	0	-1	-2	

\$\quad\quad\$ \$\quad\quad\$	\$\quad\quad\$	\$\quad\quad\$	\$\quad\quad\$	\$\quad\quad\$	\$\quad\quad\$	\$\quad\quad\$	\$\quad\quad\$	\$\quad\quad\$
\$\quad\quad\$	\$\quad\quad\$	\$\quad\quad\$	\$\quad\quad\$	\$\quad\quad\$	\$\quad\quad\$	\$\quad\quad\$	\$\quad\quad\$	
\$\quad\quad\$	\$\quad\quad\$	\$\quad\quad\$	\$\quad\quad\$	\$\quad\quad\$	\$\quad\quad\$	\$\quad\quad\$	\$\quad\quad\$	
\$\quad\quad\$ \$\quad\quad\$	\$\quad\quad\$	\$\quad\quad\$	\$\quad\quad\$	\$\quad\quad\$	\$\quad\quad\$	\$\quad\quad\$	\$\quad\quad\$	
value	2	6	5	8 ,	4	7		
index \$i\$	3	2	1	0	-1	-2		
place value	\$B^i\$ \$\{10^3\}\$ \$\{1000\}\$	\$\{10^2\}\$ \$\{100\}\$	\$\{10^1\}\$ \$\{10\}\$	\$\{10^0\}\$ \$\{1\}\$	\$\{10^{-1}\}\$ \$\{0.10\}\$	\$\{10^{-2}\}\$ \$\{0.01\}\$		
digit \$z_i\$	2	6	5	8	4	7		
calc. \$z_i\$ \$\cdot B^i\$	2000	600	50	8	0.4	0.07		
Result \$\sum_i z_i \cdot B^i\$	2658,47							
aus (2+3)		\$color{blue}\{l_p\} = color{blue}\{l_m\} = 0\$			\$l_p\$ und \$l_m\$ sind damit definiert			
aus (6)		\$color{blue}\{l_o\} = l_1\$			\$l_o\$ ist damit bekannt, wenn \$l_1\$ bekannt ist			
aus (7) und (3)		\$l_1 - l_2 - color{blue}\{0\} = 0\$						
		\$l_1 = l_2 = l_o\$						
		\$color{blue}\{l_1\} = color{blue}\{l_2\} = color{blue}\{l_o\}\$			mit (8) und (9): \$\boxed{}=\frac{U_{\boxed{}}}{R_{\boxed{}}}\$ und (5)			
		\$\frac{U_1}{R_1} = \frac{U_2}{R_2} = \frac{U_A}{R_1 + R_2}\$			Spannungsteilerformel, \$I=const.\$			
(10)		\$U_2 = U_A \cdot \frac{R_2}{R_1 + R_2}\$			Spannungsteilerformel			

\$II.\quad\$ Betrachtung der Spannungsverstärkung

aus (0)	$\$ \{ \text{color} \{ \text{blue} \} \{ A_V \} = \frac{\text{frac} \{ U_A \} \{ U_E \} \$}{\$ \text{quad} \$}$	$\$ \text{quad} \$$
$\$ \text{quad} \$$	$\$ \text{quad} \$$	$\$ \text{quad} \$$
$\$ \text{quad} \$$	$\$ A_V = \frac{\text{frac} \{ U_A \} \{ \text{color} \{ \text{blue} \} \{ U_E \} \$}{\text{mit (4): } \$ U_E = U_2 + U_D \$}$	$\$ \text{quad} \$$
$\$ \text{quad} \$$	$\$ \text{quad} \$$	$\$ \text{quad} \$$
$\$ \text{quad} \$$	$\$ A_V = \frac{\text{frac} \{ U_A \} \{ \text{color} \{ \text{blue} \} \{ U_2 + U_D \} \$}{\$ \text{quad} \$}$	$\$ \text{quad} \$$
$\$ \text{quad} \$$	$\$ \text{quad} \$$	$\$ \text{quad} \$$
$\$ \text{quad} \$$	$\$ A_V = \frac{\text{frac} \{ U_A \} \{ \text{color} \{ \text{blue} \} \{ U_2 \} + U_D \$}{\text{mit (10): } \$ U_2 = U_A \cdot \text{frac} \{ R_2 \} \{ R_1 + R_2 \} \$}$	$\$ \text{quad} \$$
$\$ \text{quad} \$$	$\$ \text{quad} \$$	$\$ \text{quad} \$$
$\$ \text{quad} \$$	$\$ A_V = \frac{\text{frac} \{ U_A \} \{ \text{color} \{ \text{blue} \} \{ U_A \cdot \text{frac} \{ R_2 \} \{ R_1 + R_2 \} \} + U_D \$}{\$ \text{quad} \$}$	$\$ \text{quad} \$$
$\$ \text{quad} \$$	$\$ \text{quad} \$$	$\$ \text{quad} \$$
$\$ \text{quad} \$$	$\$ A_V = \frac{\text{frac} \{ U_A \} \{ U_A \cdot \text{frac} \{ R_2 \} \{ R_1 + R_2 \} + U_D \$}{\$ \text{quad} \$}$	$\$ \text{quad} \$$
$\$ \text{quad} \$$	$\$ \text{quad} \$$	$\$ \text{quad} \$$
$\$ \text{quad} \$$	$\$ \text{quad} \$$	$\$ \text{quad} \$$
$\$ \text{quad} \$$	$\$ A_V = \frac{\text{frac} \{ U_A \} \{ U_A \cdot \text{frac} \{ R_2 \} \{ R_1 + R_2 \} + \text{color} \{ \text{blue} \} \{ U_D \} \$}{\text{mit (1)}}$	$\$ \text{quad} \$$
$\$ \text{quad} \$$	$\$ \text{quad} \$$	$\$ \text{quad} \$$
$\$ \text{quad} \$$	$\$ A_V = \frac{\text{frac} \{ U_A \} \{ U_A \cdot \text{frac} \{ R_2 \} \{ R_1 + R_2 \} + \text{color} \{ \text{blue} \} \{ \frac{\text{frac} \{ U_A \} \{ A_D \} \$}{\$ \text{quad} \$} \} \$}{\$ \text{quad} \$}$	$\$ \text{quad} \$$
$\$ \text{quad} \$$	$\$ \text{quad} \$$	$\$ \text{quad} \$$
$\$ \text{quad} \$$	$\$ A_V = \frac{\text{frac} \{ U_A \} \{ U_A \cdot \text{frac} \{ R_2 \} \{ R_1 + R_2 \} + \frac{\text{frac} \{ U_A \} \{ A_D \} \$}{\$ \text{quad} \$} \} \$}{\$ \text{quad} \$}$	$\$ \text{quad} \$$
$\$ \text{quad} \$$	$\$ \text{quad} \$$	$\$ \text{quad} \$$
$\$ \text{quad} \$$	$\$ A_V = \frac{\text{frac} \{ \text{color} \{ \text{blue} \} \{ U_A \} \} \{ \text{color} \{ \text{blue} \} \{ U_A \} \cdot \text{frac} \{ R_2 \} \{ R_1 + R_2 \} + \frac{\text{frac} \{ \text{color} \{ \text{blue} \} \{ U_A \} \{ A_D \} \$}{\$ \text{quad} \$} \} \$}{\text{Erweitern mit } \$ \frac{\text{frac} \{ 1 \} \{ U_A \} \$}{\$ \text{quad} \$}}$	$\$ \text{quad} \$$
$\$ \text{quad} \$$	$\$ \text{quad} \$$	$\$ \text{quad} \$$
$\$ \text{quad} \$$	$\$ A_V = \frac{\text{frac} \{ 1 \} \{ \frac{\text{frac} \{ R_2 \} \{ R_1 + R_2 \} + \frac{\text{frac} \{ 1 \} \{ A_D \} \$}{\$ \text{quad} \$} \} \$}{\$ \text{quad} \$}$	$\$ \text{quad} \$$
$\$ \text{quad} \$$	$\$ \text{quad} \$$	$\$ \text{quad} \$$
$\$ \text{quad} \$$	$\$ A_V = \frac{\text{frac} \{ 1 \} \{ \frac{\text{frac} \{ R_2 \} \{ R_1 + R_2 \} + \text{color} \{ \text{blue} \} \{ \frac{\text{frac} \{ 1 \} \{ A_D \} \$}{\$ \text{quad} \$} \} \$}{\text{mit } \$ \frac{\text{frac} \{ 1 \} \{ A_D \} \$}{\$ \text{quad} \$} \rightarrow (A_D \rightarrow \infty) \$}$	$\$ \text{quad} \$$
$\$ \text{quad} \$$	$\$ \text{quad} \$$	$\$ \text{quad} \$$
$\$ \text{quad} \$$	$\$ A_V = \frac{\text{frac} \{ 1 \} \{ \frac{\text{frac} \{ R_2 \} \{ R_1 + R_2 \} \$}{\$ \text{quad} \$} \} \$}{\text{Bruch umformen}}$	$\$ \text{quad} \$$
$\$ \text{quad} \$$	$\$ \text{quad} \$$	$\$ \text{quad} \$$
$\$ \text{quad} \$$	$\$ A_V = \frac{\text{frac} \{ R_1 + R_2 \} \{ R_2 \} \$}{\$ \text{quad} \$}$	$\$ \text{quad} \$$
$\$ \text{quad} \$$	$\$ \text{quad} \$$	$\$ \text{quad} \$$

From: <https://wiki.mexle.te.hs-heilbronn.de/> - **MEXLE Wiki**

Permanent link:
[https://wiki.mexle.te.hs-heilbronn.de/introduction to digital systems/calc decimal example?rev=1631666698](https://wiki.mexle.te.hs-heilbronn.de/introduction%20to%20digital%20systems/calc%20decimal%20example?rev=1631666698)

Last update: 2021/09/15 02:44

