Polyadische Zahlensysteme

Dezimal	Dual	Oktal	Hexadezimal
0	0	0	0
1	1	1	1
2	10	2	2
3	11	3	3
4	100	4	4
5	101	5	5
6	110	6	6
7	111	7	7
8	1000	10	8
9	1001	11	9
10	1010	12	A
11	1011	13	B
12	1100	14	C
13	1101	15	D
14	1110	16	E
15	1111	17	F
16	10000	20	10

Dualsystem (oder Binärsystem)
- Basis $b=2$
- Zahlenalphabet $\{0,1\}$

Oktalsystem
- Basis $b=8$
- Zahlenalphabet $\{0,1,2,3,4,5,6,7\}$

Hexadezimalsystem
- Basis $b=16$
- Zahlenalphabet $\{0,1,2,3,4,5,6,7,8,9,A,B,C,D,E,F\}$

Darstellung von Zahlen bei unterschiedlichen Basen

$$\overset{3\ 2\ 1\ 0}{8704_{10}} = 4\cdot 10^0 + 0\cdot 10^1 + 7\cdot 10^2 + 8\cdot 10^3$$

$$\overset{8\ 4\ 2\ 1}{1101_2} = 8+4+1 = 13_{10}$$

$$\overset{3\ 2\ 1\ 0}{CAFE_{16}} = 14\cdot 16^0 + 15\cdot 16^1 + 10\cdot 16^2 + 12\cdot 16^3 = 51966_{10}$$

$$7345_8 = 5\cdot 8^0 + 4\cdot 8^1 + 3\cdot 8^2 + 7\cdot 8^3 = 3813_{10}$$

$$z = \sum_{i=0}^{n-1} a_i \cdot b^i$$

$$z = (\ldots((a_{n-1}\cdot b + a_{n-2})\cdot b + a_{n-3})\cdot b + \ldots + a_1)\cdot b + a_0$$

Bsp.:

$$1092_{10} = ((1\cdot 10+0)\cdot 10+9)\cdot 10+2 = 1092_{10}$$

$$1571_8 = ((1\cdot 8+5)\cdot 8+7)\cdot 8+1 = 889_{10}$$

$$2B9_{16} = (2\cdot 16+11)\cdot 16+9 = 697_{10}$$

2B9

Umwandlung von Zahlen bei unterschiedlichen Basen

$42_{10} \rightarrow$ Dualsystem $(x=42,\ b=2)$

x / b	= y		z
42 / 2	= 21	Rest:	0
21 / 2	= 10	Rest:	1
10 / 2	= 5	Rest:	0
5 / 2	= 2	Rest:	1
2 / 2	= 1	Rest:	0
1 / 2	= 0	Rest:	1

$\longrightarrow$ Resultat: $42_{10} = 101010_2$

$322_{10} \rightarrow$ Hexadezimalsystem $(x=322,\ b=16)$

x / b	= y		z
322 / 16	= 20	Rest:	12
20 / 16	= 1	Rest:	4
1 / 16	= 0	Rest:	1

$\rightarrow$ Resultat $14C_{16}$

$A05F_{16}$

$1010 \rightarrow 0000$, $0101 \rightarrow 1111$

$\underbrace{00}\underbrace{1010}\ \underbrace{0000}\ \underbrace{0101}\ \underbrace{1111}$

1 2 0 1 3 7

1062_8

$001\ 000\ 110\ 010$

$\underbrace{001}\underbrace{000}\underbrace{110}\underbrace{010}$

2 3 2_{16}

Umwandlung gebrochener Zahlen zwischen Zahlensystemen

$$z = \sum_{i=-m}^{-1} a_i b^i$$

$$z = \left(\ldots\left(a_{-m}\cdot\frac{1}{b} + a_{-m+1}\right)\cdot\frac{1}{b} + a_{-m+2}\right)\cdot\frac{1}{b} + \ldots + a_{-2}\Big)\cdot\frac{1}{b} + a_{-1}\Big)\cdot\frac{1}{b}$$

Bsp.:

$0{,}1011_2$ $(m=4;\ a_{-1}=1,\ a_{-2}=0,\ a_{-3}=1,\ a_{-4}=1)$

$$0{,}1011_2 = \left(\left(\left(1\cdot\frac{1}{2}+1\right)\cdot\frac{1}{2}+0\right)\cdot\frac{1}{2}+1\right)\cdot\frac{1}{2} = 0{,}6875_{10}$$

$0{,}63_8$ $(m=2;\ a_{-1}=6,\ a_{-2}=3)$

$$0{,}63_8 = \left(3\cdot\frac{1}{8}+6\right)\cdot\frac{1}{8} = \frac{51}{64} = 0{,}796875_{10}$$

$0{,}6875_{10} \rightarrow$ Dualsystem $(b=2)$

x		b		y		z
0,6875	·	2	=	0,375	Überlauf:	1
0,375	·	2	=	0,75	Überlauf:	0
0,75	·	2	=	0,5	Überlauf:	1
0,5	·	2	=	0,0	Überlauf:	1

$\rightarrow$ Resultat $0{,}6875_{10} = 0{,}1011_2$

$0{,}796875_{10} \rightarrow$ Oktalsystem $(b=8)$

x		b		y		z
0,796875	·	8	=	0,375	Überlauf:	6
0,375	·	8	=	0,0	Überlauf:	3

$\rightarrow$ Resultat: $0{,}796875_{10} = 0{,}63_8$

① 7,4B

① 7 , 4 B

1101 0111 , 0100 1011

011 010 111, 010 010 110

3 2 7 , 2 2 6

$\rightarrow$ 327,226

Mc Clusky - Methode

$$h(a,b,c,d) = \bar{a}\bar{b}\bar{c}\bar{d} \vee a\bar{b}\bar{c}\bar{d} \vee \bar{a}\bar{b}c\bar{d} \vee a\bar{b}c\bar{d} \vee \bar{a}bc\bar{d} \vee abc\bar{d} \vee \bar{a}\bar{b}\bar{c}d \vee a\bar{b}\bar{c}d \vee ab\bar{c}d \vee abcd$$

a	b	c	d	
0	0	0	0	✓
1	0	0	0	✓
0	0	1	0	✓
1	0	1	0	✓
0	1	1	0	✓
1	1	1	0	✓
0	0	0	1	✓
1	0	0	1	✓
1	1	0	1	✓
1	1	1	1	✓

	a b c d	
0.	0 0 0 0	✓
1.	1 0 0 0	✓
	0 0 1 0	✓
	0 0 0 1	✓
2.	1 0 1 0	✓
	0 1 1 0	✓
	1 0 0 1	✓
3.	1 1 1 0	✓
	1 1 0 1	✓
4.	1 1 1 1	✓

	a b c d	
0.	- 0 0 0	✓
	0 0 - 0	✓
	0 0 0 -	✓
1.	1 0 - 0	✓
	1 0 0 -	✓
	- 0 1 0	✓
	0 - 1 0	✓
	- 0 0 1	✓
2.	1 - 1 0	✓
	- 1 1 0	✓
	1 - 0 1	✗
3.	1 1 1 -	✗
	1 1 - 1	✗

	a b c d
0.	- 0 - 0
	- 0 0 -
1.	- - 1 0

	$\bar{a}\bar{b}\bar{c}\bar{d}$	$a\bar{b}\bar{c}\bar{d}$	$\bar{a}\bar{b}c\bar{d}$	$a\bar{b}c\bar{d}$	$\bar{a}bc\bar{d}$	$abc\bar{d}$	$\bar{a}\bar{b}\bar{c}d$	$a\bar{b}\bar{c}d$	$ab\bar{c}d$	$abcd$
$a\bar{c}d$								X	X	
abc						X				X
abd									X	X
$\bar{b}\bar{d}$	X	X	X	X						
$\bar{b}\bar{c}$	X	X					X	X		
$c\bar{d}$			X	X	X	X				

$$\Rightarrow \quad h(a,b,c,d) = abd \vee \bar{b}\bar{c} \vee c\bar{d}$$