Basisinformationstechnologie I

Wintersemester 2022/23. Grundlagen II: Zeichencodierungen, Zahlensysteme. *Basierend auf Jan Wieners' Folien*

Institut für Digital Humanities, Historisch-Kulturwissenschaftliche Informationsverarbeitung | Prof. Dr. Øyvind Eide | Slavina Stoyanova

Inhalte der heutigen Sitzung

Kurzwiederholung

- Wissenspyramide
- Codierung

Zeichencodierungen

- ASCII / Extended ASCII
- ISO 8859-x
- UTF-8

Zahlensysteme

- Hexadezimal-
- Dezimal-
- Binärsystem

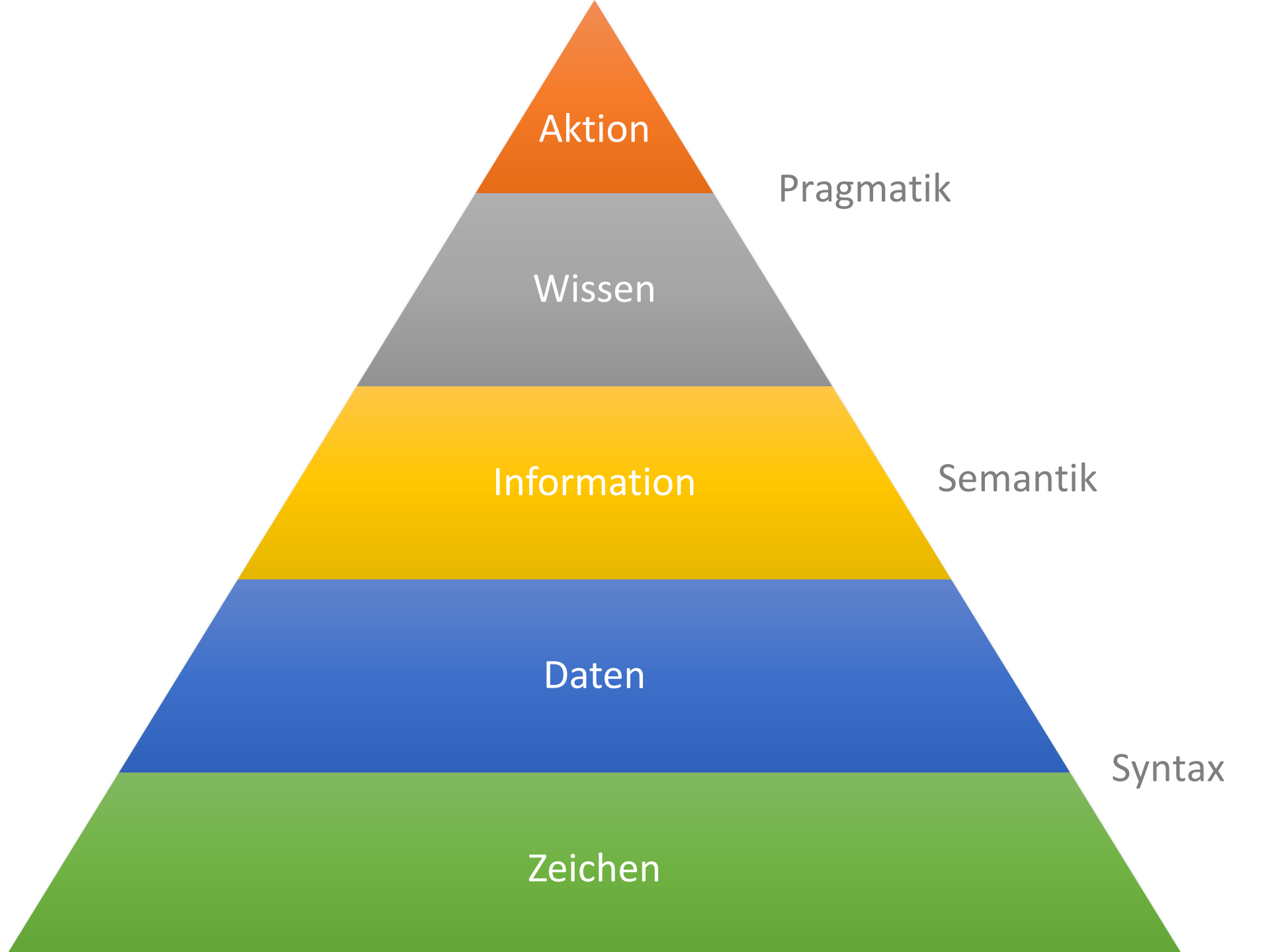
Umwandlung vom

- Dezimal- ins Hexadezimalsystem
- Hexadezimal- ins Dezimalsystem
- Dezimal- ins Binärsystem
- Binär- ins Dezimalsystem

„Rechnen“ im Binärsystem

- Addition von Binärzahlen
- Multiplikation von Binärzahlen

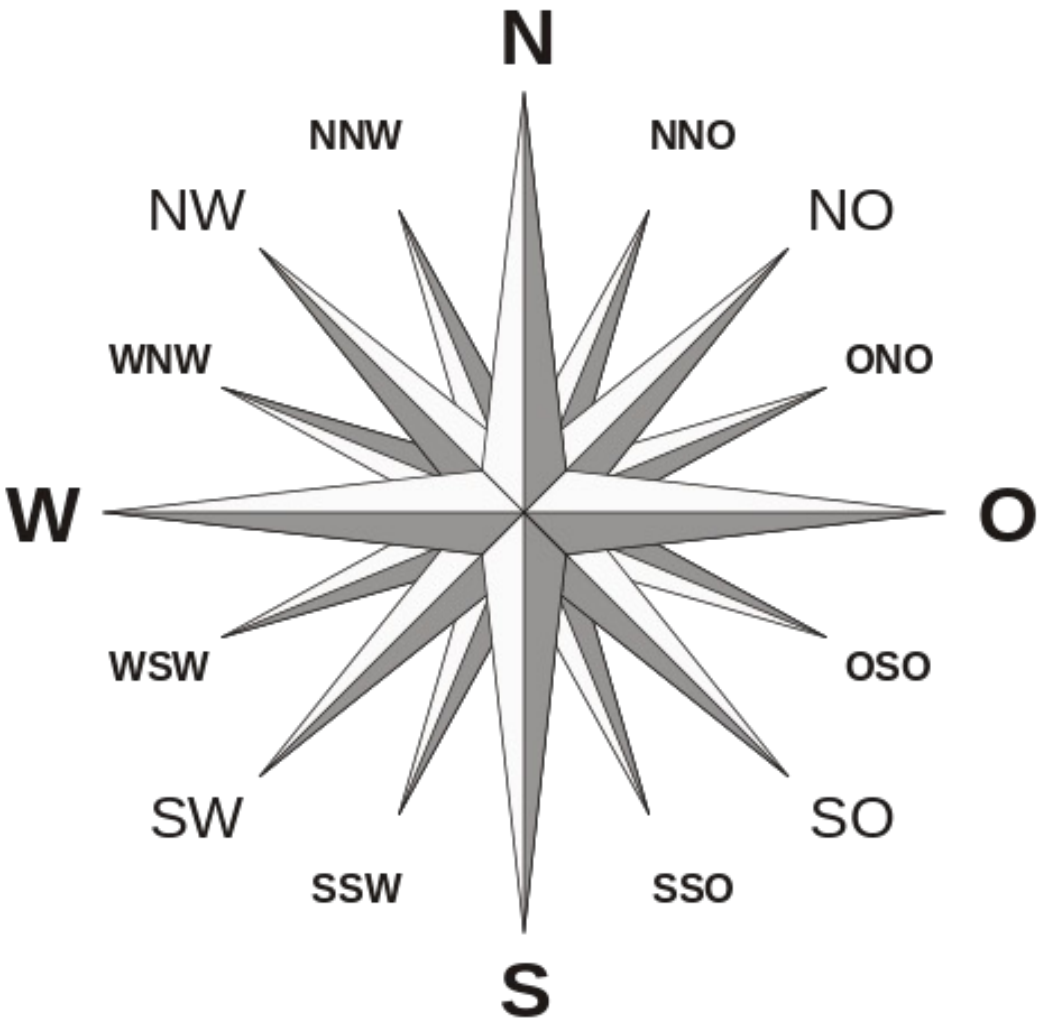
Kurzwiederholung


Aktion
Wissen
Information
Daten
Zeichen
Pragmatik
Semantik
Syntax

Bit / Bitfolgen, Codierung

Acht Möglichkeiten mit einem Codierungs- / Symbolvorrat von Bit:

- 0 0 0 = Nord
- 0 0 1 = NordOst
- 0 1 0 = Ost
- 0 1 1 = SüdOst
- 1 0 0 = Süd
- 1 0 1 = SüdWest
- 1 1 0 = West
- 1 1 1 = NordWest



Zeichencodierungen

ASCII TABLE

Decimal	Hex	Char	Decimal	Hex	Char	Decimal	Hex	Char	Decimal	Hex	Char
0	0	*[NULL]*	32	20	*[SPACE]*	64	40	@	96	60	`
1	1	*[START OF HEADING]*	33	21	!	65	41	A	97	61	a
2	2	*[START OF TEXT]*	34	22	"	66	42	B	98	62	b
3	3	*[END OF TEXT]*	35	23	#	67	43	C	99	63	c
4	4	*[END OF TRANSMISSION]*	36	24	$	68	44	D	100	64	d
5	5	*[ENQUIRY]*	37	25	%	69	45	E	101	65	e
6	6	*[ACKNOWLEDGE]*	38	26	&	70	46	F	102	66	f
7	7	*[BELL]*	39	27	'	71	47	G	103	67	g
8	8	*[BACKSPACE]*	40	28	(	72	48	H	104	68	h
9	9	*[HORIZONTAL TAB]*	41	29	)	73	49	I	105	69	i
10	A	*[LINE FEED]*	42	2A	*	74	4A	J	106	6A	j
11	B	*[VERTICAL TAB]*	43	2B	+	75	4B	K	107	6B	k
12	C	*[FORM FEED]*	44	2C	,	76	4C	L	108	6C	l
13	D	*[CARRIAGE RETURN]*	45	2D	-	77	4D	M	109	6D	m
14	E	*[SHIFT OUT]*	46	2E	.	78	4E	N	110	6E	n
15	F	*[SHIFT IN]*	47	2F	/	79	4F	O	111	6F	o
16	10	*[DATA LINK ESCAPE]*	48	30	0	80	50	P	112	70	p
17	11	*[DEVICE CONTROL 1]*	49	31	1	81	51	Q	113	71	q
18	12	*[DEVICE CONTROL 2]*	50	32	2	82	52	R	114	72	r
19	13	*[DEVICE CONTROL 3]*	51	33	3	83	53	S	115	73	s
20	14	*[DEVICE CONTROL 4]*	52	34	4	84	54	T	116	74	t
21	15	*[NEGATIVE ACKNOWLEDGE]*	53	35	5	85	55	U	117	75	u
22	16	*[SYNCHRONOUS IDLE]*	54	36	6	86	56	V	118	76	v
23	17	*[ENG OF TRANS. BLOCK]*	55	37	7	87	57	W	119	77	w
24	18	*[CANCEL]*	56	38	8	88	58	X	120	78	x
25	19	*[END OF MEDIUM]*	57	39	9	89	59	Y	121	79	y
26	1A	*[SUBSTITUTE]*	58	3A	:	90	5A	Z	122	7A	z
27	1B	*[ESCAPE]*	59	3B	;	91	5B	[	123	7B	{
28	1C	*[FILE SEPARATOR]*	60	3C	<	92	5C	\	124	7C	|
29	1D	*[GROUP SEPARATOR]*	61	3D	=	93	5D	]	125	7D	}
30	1E	*[RECORD SEPARATOR]*	62	3E	>	94	5E	^	126	7E	~
31	1F	*[UNIT SEPARATOR]*	63	3F	?	95	5F	_	127	7F	*[DEL]*

Wie lassen sich alle Zeichen der Zeichenkette „hallowelt“ in Großbuchstaben umwandeln?

„hallowelt“

ASCII TABLE

Decimal	Hex	Char	Decimal	Hex	Char	Decimal	Hex	Char	Decimal	Hex	Char
0	0	[NULL]	32	20	[SPACE]	64	40	@	96	60	`
1	1	[START OF HEADING]	33	21	!	65	41	A	97	61	a
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4	4	[END OF TRANSMISSION]	36	24	$	68	44	D	100	64	d
5	5	[ENQUIRY]	37	25	%	69	45	E	101	65	e
6	6	[ACKNOWLEDGE]	38	26	&	70	46	F	102	66	f
7	7	[BELL]	39	27	'	71	47	G	103	67	g
8	8	[BACKSPACE]	40	28	(	72	48	H	104	68	h
9	9	[HORIZONTAL TAB]	41	29	)	73	49	I	105	69	i
10	A	[LINE FEED]	42	2A	*	74	4A	J	106	6A	j
11	B	[VERTICAL TAB]	43	2B	+	75	4B	K	107	6B	k
12	C	[FORM FEED]	44	2C	,	76	4C	L	108	6C	l
13	D	[CARRIAGE RETURN]	45	2D	-	77	4D	M	109	6D	m
14	E	[SHIFT OUT]	46	2E	.	78	4E	N	110	6E	n
15	F	[SHIFT IN]	47	2F	/	79	4F	O	111	6F	o
16	10	[DATA LINK ESCAPE]	48	30	0	80	50	P	112	70	p
17	11	[DEVICE CONTROL 1]	49	31	1	81	51	Q	113	71	q
18	12	[DEVICE CONTROL 2]	50	32	2	82	52	R	114	72	r
19	13	[DEVICE CONTROL 3]	51	33	3	83	53	S	115	73	s
20	14	[DEVICE CONTROL 4]	52	34	4	84	54	T	116	74	t
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22	16	[SYNCHRONOUS IDLE]	54	36	6	86	56	V	118	76	v
23	17	[ENG OF TRANS. BLOCK]	55	37	7	87	57	W	119	77	w
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26	1A	[SUBSTITUTE]	58	3A	:	90	5A	Z	122	7A	z
27	1B	[ESCAPE]	59	3B	;	91	5B	[	123	7B	{
28	1C	[FILE SEPARATOR]	60	3C	<	92	5C	\	124	7C	|
29	1D	[GROUP SEPARATOR]	61	3D	=	93	5D	]	125	7D	}
30	1E	[RECORD SEPARATOR]	62	3E	>	94	5E	^	126	7E	~
31	1F	[UNIT SEPARATOR]	63	3F	?	95	5F	_	127	7F	[DEL]

Wie lassen sich alle Zeichen der Zeichenkette „hallowelt“ in Großbuchstaben umwandeln?

Algorithmus

=========

Für jedes Zeichen in der Eingabezeichenkette „hallowelt“:

- Hole den dezimalen ASCII Wert des Zeichens
- Subtrahiere 32 vom entsprechenden Wert
- Gebe das Zeichen (also $ASCII_{klein} - 32$) aus

Grenzen des ASCII Codes?

ប្រាសាទអង្គរវត្ត

(ត្រូវបានបញ្ជូនបន្តពី Angkor Wat)

សម្រាប់ក្រុមភ្លេងរលោហៈវាយគោៈអារមរិក សូមមើល អង្គរវត្ត (ក្រុមភ្លេង) ។

អង្គរវត្ត ស្ថិតនៅក្នុងខេត្តសៀមរាប មានទីតាំងស្ថិតនៅភាគខាងជើងនៃក្រុងសៀមរាប ក្នុងស្រុកសៀមរាប មានចម្ងាយ ៧ គ.ម ពីទីរួមខេត្ត តាមផ្លូវកូម៉ែ ឬផ្លូវសាលដី ហោលៗ។ វាជាប្រជុំអគារប្រាសាទព្រហ្មញ្ញសាសនាធំបំផុតនិងវិមានសាសនាដ៏ធំបំផុតនៅក្នុងលោក។ ប្រាសាទត្រូវបានកសាងឡើងដោយសូរ្យវរ្ម័នទី២ ដែលជាស្នាដៃដ៏ធំចម្លងអស្ចារ្យនិងមានឈ្មោះល្បីល្បាញន្ទឹសុះសាយ ទៅគ្រប់ទិសទីលើពិភពលោក។ សង់ឡើងនៅដើមសតវត្សទី១២នៅយសោធរបុរៈ (សម័យបច្ចុប្បន្ន អង្គរ) អធិរាជាណាចក្រខ្មែរ ជាប្រាសាទតំណាងនិងព្រះសុសានចុងក្រោយរបស់ព្រះអង្គ។ ដែលងាកចេញពីប្រពៃណីសិវនិយមនៃព្រះរាជាមុនៗ អង្គរវត្តដែលជំនួសមកវិញ ឧទ្ទិសដល់ព្រះវិស្ណុ។ ជាប្រាសាទដែលនៅគង់វង្សល្អបំផុតនៅស្ថានីយនេះ វាគឺជាប្រាសាទតែមួយគត់ដែលបានបន្សល់ទុកនូវមជ្ឈមណ្ឌលសាសនាដ៏សំខាន់មួយចាប់តាំងពីមូលដ្ឋានគ្រឹះរបស់ខ្លួន – ដំបូងព្រហ្មញ្ញសាសនាបូជាដល់ព្រះវិស្ណុ ក្រោយមកពុទ្ធនិយម។ ប្រាសាទនេះស្ថិតនៅក្នុងរចនាបថបុរាណជាន់ខ្ពស់កំពូលនៃស្ថាបត្យកម្មខ្មែរ។ វាបានក្លាយជានិមិត្តរូបកម្ពុជា[១] ដែលរំលេចលើទង់ជាតិរបស់ប្រទេស ជារូបភាពតំណាងប្រទេសជាតិខ្មែរ និងវាក៏ជាការទាក់ទាញពួកអ្នកទេសចរណ៍សំខាន់របស់ប្រទេសនេះផងដែរ។

អង្គរវត្តរួមផ្សំនូវគ្រោងការគ្រឹះពីរនៃស្ថាបត្យកម្មប្រាសាទខ្មែរៈ ប្រាសាទភ្នំ និងប្រាសាទដែលមានថែវចុងក្រោយគេ ដោយផ្អែកលើស្ថាបត្យកម្មទ្រាវដើមដំបូង រួមមានលក្ខណៈពិសេសដូចជាជគតិ។ ប្រាសាទត្រូវបានរចនាដើម្បីតំណាងភ្នំព្រះសុមេរុ លំនៅនៃពួកទេវៈក្នុងទេវកថាព្រហ្មញ្ញៈ ក្នុងកសិណ រីគូទឹកព័ទ្ធជុំ វិញប្រហែលជា ១៦គ.ម ចំណែកកសិណពិតប្រាកដរបស់ប្រាសាទ មានបណ្តោយប្រវែង១៥០០ម x ទទឹង១៣០០ម លើ២០០ម ផ្លូវធំដើរចូលពីទិសខាងលិចទៅដល់ប្រាសាទកណ្តាលមានប្រវែង២៥០ម ឯកំពូលកណ្តាលខ្ពស់ធំជាងគេបំផុតរបស់នគរវត្ត មានកម្ពស់ ៦៥ម និងជញ្ជាំងខាងក្រៅ៣,៦ សហគមាត្រ (២,២ ម៉ៃ.)វែងគឺជាថែវមានបីជ្រុង ដែលថែវនីមួយៗឡើងខ្ពស់ទៅថែវដែលជាប់គ្នា។ នៅចំកណ្តាលនៃប្រាសាទបញ្ឈរនូវជួរចតុរង្គនៃប៉ម។ មិនដូចប្រាសាទនៅអង្គរភាគច្រើនទេ អង្គរវត្តបែរមុខទៅទិសខាងលិច ពួកអ្នកប្រាជ្ញជែកញែកថាជាចំណុចសំខាន់នៃប្រាសាទនេះ។ ប្រាសាទនេះត្រូវបានគេកោតសរសើរដោយសារភាពសម្បើមនិងរុងរឿងនៃស្ថាបត្យកម្មនេះ ចម្លាក់លៀនលឹមៗដែលលាតសន្ធឹង និងដោយសារពពួកទេវតាដែលតាក់តែងលើជញ្ជាំងប្រាសាទ។

ឈ្មោះសម័យថ្មី អង្គរវត្តមានន័យថា *ទីក្រុងវត្ត* ក្នុងភាសាខ្មែរ *អង្គរ*មានន័យថា *ទីក្រុងរី ទីក្រុងធានី* ជាទម្រង់ប្រាក្រឹតនៃពាក្យ *នគរ* ដែលមកពីពាក្យសំស្ក្រឹត *nagara* (नगर)។[២] *វត្ត*គឺជាពាក្យខ្មែរសម្រាប់ *ទេវាល័យលើដី* បានមកពីពាក្យបាលី "vatta" (वत्त)។[៣] មុនពេលនេះ ប្រាសាទនេះត្រូវបានគេស្គាល់ថាជា *បរមវិសលោក* (Parama Vishnuloka ជាភាសាសំស្ក្រឹត) បន្ទាប់ពីងារបចាមរណៈនៃស្ថាបនិកនៃប្រាសាទ។[៤]

ទំព័រដើម
បន្លាស់ប្តូរថ្មីៗ
ជំនួយ
អត្ថបទថ្មីៗ
ទំព័រចៃដន្យ

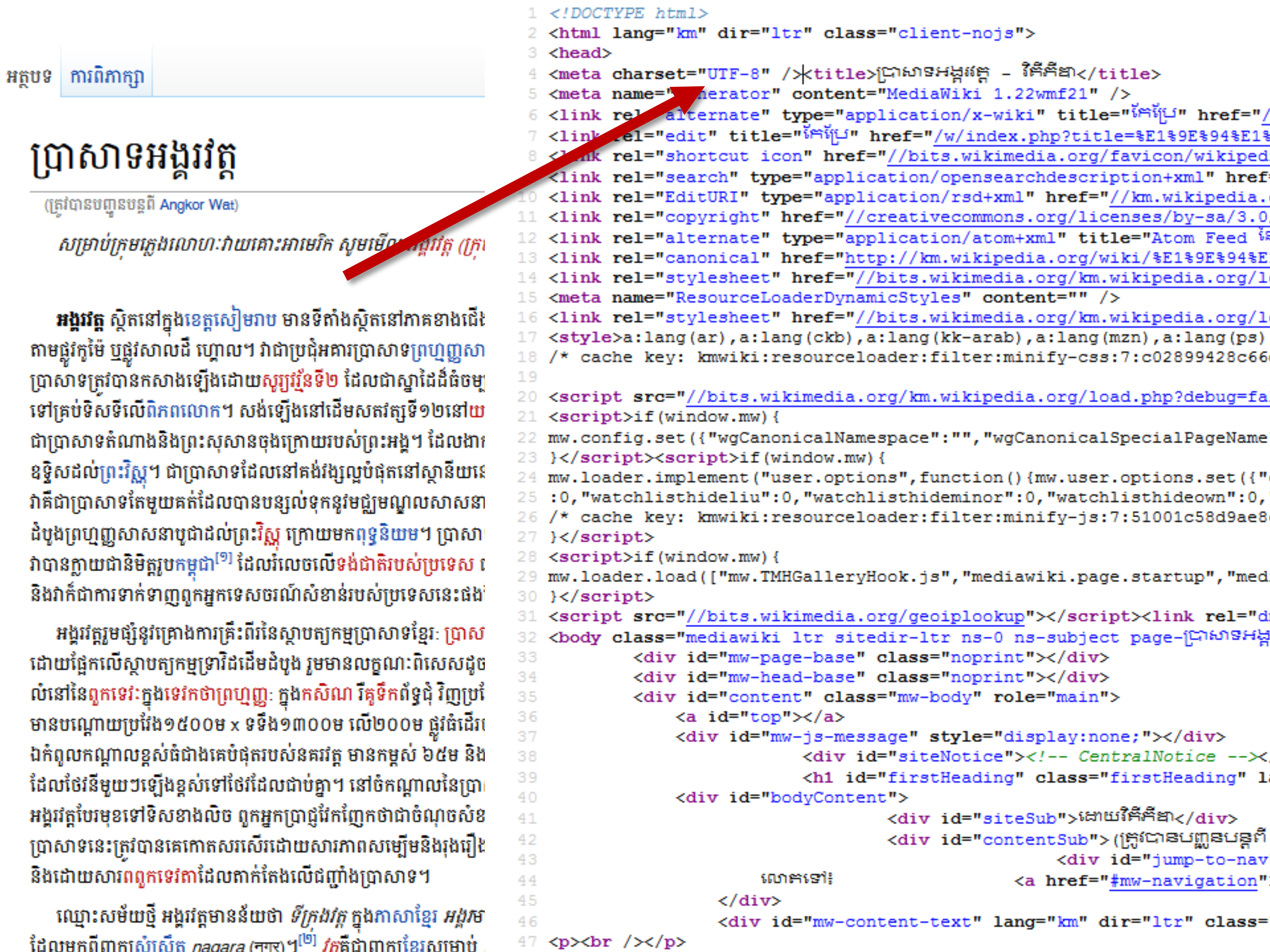
សហគមន៍
សុំធ្វើជាអ្នកអភិបាល
សុំប្តូរអត្តនាម
ផតថលសហគមន៍
ព្រឹត្តិការណ៍ថ្មីៗ

បោះពុម្ព/នាំចេញ

ប្រអប់ឧបករណ៍

ជាភាសាដទៃទៀត

Aragonés
العربية
Azərbaycanca
Беларуская
Беларуская (тарашкевіца)
Български
বাংলা
Bosanski
Català
Нохчийн
Česky
Cymraeg


អត្ថបទ
ការពិភាក្សា
ប្រាសាទអង្គរវត្ត
(ត្រូវបានបញ្ជូនបន្តពី Angkor Wat)
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<link rel="edit" title="កែប្រែ" href="/w/index.php?title=%E1%9E%94%E1%
<link rel="shortcut icon" href="//bits.wikimedia.org/favicon/wikiped
<link rel="search" type="application/opensearchdescription+xml" href=
<link rel="EditURI" type="application/rsd+xml" href="//km.wikipedia.
<link rel="copyright" href="//creativecommons.org/licenses/by-sa/3.0
<link rel="alternate" type="application/atom+xml" title="Atom Feed
<link rel="canonical" href="http://km.wikipedia.org/wiki/%E1%9E%94%E
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<script src="//bits.wikimedia.org/km.wikipedia.org/load.php?debug=fa
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}</script>
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}</script>
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<div id="content" class="mw-body" role="main">

<div id="mw-js-message" style="display:none;"></div>
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<h1 id="firstHeading" class="firstHeading" l
<div id="bodyContent">
<div id="siteSub">ដោយវិគីភីឌា</div>
<div id="contentSub">
<div id="jump-to-nav
<a href="#mw-navigation"
</div>
<div id="mw-content-text" lang="km" dir="ltr" class=
<p>
</p>

Teillösung: ASCII → ISO 8859

Normenfamilie ISO 8859

- 8-Bit-Zeichensatz
- ISO = Internationale Organisation für Normung (International Organization for Standardization)
- Spezifiziert die zusätzlich darstellbaren Zeichen; dabei entsprechen die ersten mit sieben Bit kodierbaren Zeichen (einschließlich führendes Nullbit) dem ASCII Code
- 15 Normen, von ISO 8859-1 bis 8859-16

ISO 8859-1	Latin-1, Westeuropäisch
-2	Latin-2, Mitteleuropäisch
-3	Latin-3, Südeuropäisch
-4	Latin-4, Baltisch
-5	Kyrillisch
-6	Arabisch
-7	Griechisch
-8	Hebräisch
-9	Latin-5, Türkisch
-10	Latin-6, Nordisch
-11	Thai
-13	Latin-7, Baltisch
-14	Latin-8, Keltisch
-15	Latin-9, Westeuropäisch
-16	Latin-10, Südosteuropäisch

ISO-8859-11 inklusive der in ISO/IEC 8859-11 nicht enthaltenen Steuerzeichen

Code	…0	…1	…2	…3	…4	…5	…6	…7	…8	…9	…A	…B	…C	…D	…E	…F
0…	NUL	SOH	STX	ETX	EOT	ENQ	ACK	BEL	BS	HT	LF	VT	FF	CR	SO	SI
1…	DLE	DC1	DC2	DC3	DC4	NAK	SYN	ETB	CAN	EM	SUB	ESC	FS	GS	RS	US
2…	SP	!	"	#	$	%	&	'	(	)	*	+	,	-	.	/
3…	0	1	2	3	4	5	6	7	8	9	:	;	<	=	>	?
4…	@	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
5…	P	Q	R	S	T	U	V	W	X	Y	Z	[	\	]	^	_
6…	`	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o
7…	p	q	r	s	t	u	v	w	x	y	z	{	|	}	~	DEL
8…	PAD	HOP	BPH	NBH	IND	NEL	SSA	ESA	HTS	HTJ	VTS	PLD	PLU	RI	SS2	SS3
9…	DCS	PU1	PU2	STS	CCH	MW	SPA	EPA	SOS	SGCI	SCI	CSI	ST	OSC	PM	APC
A…	NBSP	ก	ข	ฃ	ค	ฅ	ฆ	ง	จ	ฉ	ช	ซ	ฌ	ญ	ฎ	ฏ
B…	ฐ	ฑ	ฒ	ณ	ด	ต	ถ	ท	ธ	น	บ	ป	ผ	ฝ	พ	ฟ
C…	ภ	ม	ย	ร	ฤ	ล	ฦ	ว	ศ	ษ	ส	ห	ฬ	อ	ฮ	ฯ
D…	ะ	ั	า	ำ	ิ	ี	ึ	ื	ุ	ู	ฺ					฿
E…	เ	แ	โ	ใ	ไ	ๅ	ๆ	็	่	้	๊	๋	์	ํ	๎	๏
F…	๐	๑	๒	๓	๔	๕	๖	๗	๘	๙	๚	๛				

Und noch ein Standard: UTF-8

- UTF-8: In den 1990ern eingeführt von der ISO
- UTF → Implementierung von Unicode
- UTF-8 ist eine Mehrbyte-Codierung. Das bedeutet:
  - Dass 7-Bit ASCII-Zeichen mit einem Byte codiert werden, alle anderen verwenden zwischen 2 und 6 Bytes

Die Idee:

- Häufig benutzte Zeichen werden mit einem Byte codiert, seltenere mit mehreren Bytes – das spart Speicherplatz.
- UTF-8 codierte Dateien sind kompatibel zu 7-Bit ASCII

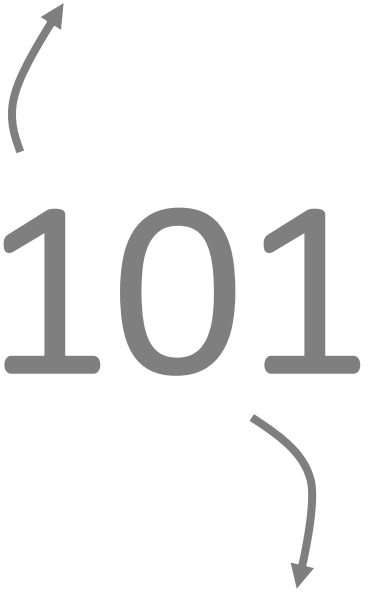
Zahlensysteme

101

„Mit der Symbolfolge 101 ist die Dezimalzahl Einhunderteins gemeint“

101

„Mit der Symbolfolge 101 ist die Dezimalzahl
Einhunderteins gemeint“



„Mit der Symbolfolge 101 ist die Binärzahl 101 gemeint. Der Binärzahl 101 entspricht die Dezimalzahl 5 (Fünf)“

Zahlensysteme

Dezimalsystem

10 Symbole: 0, 1, 2, 3, 4, 5, 6, 7, 8, 9

Zahlensysteme

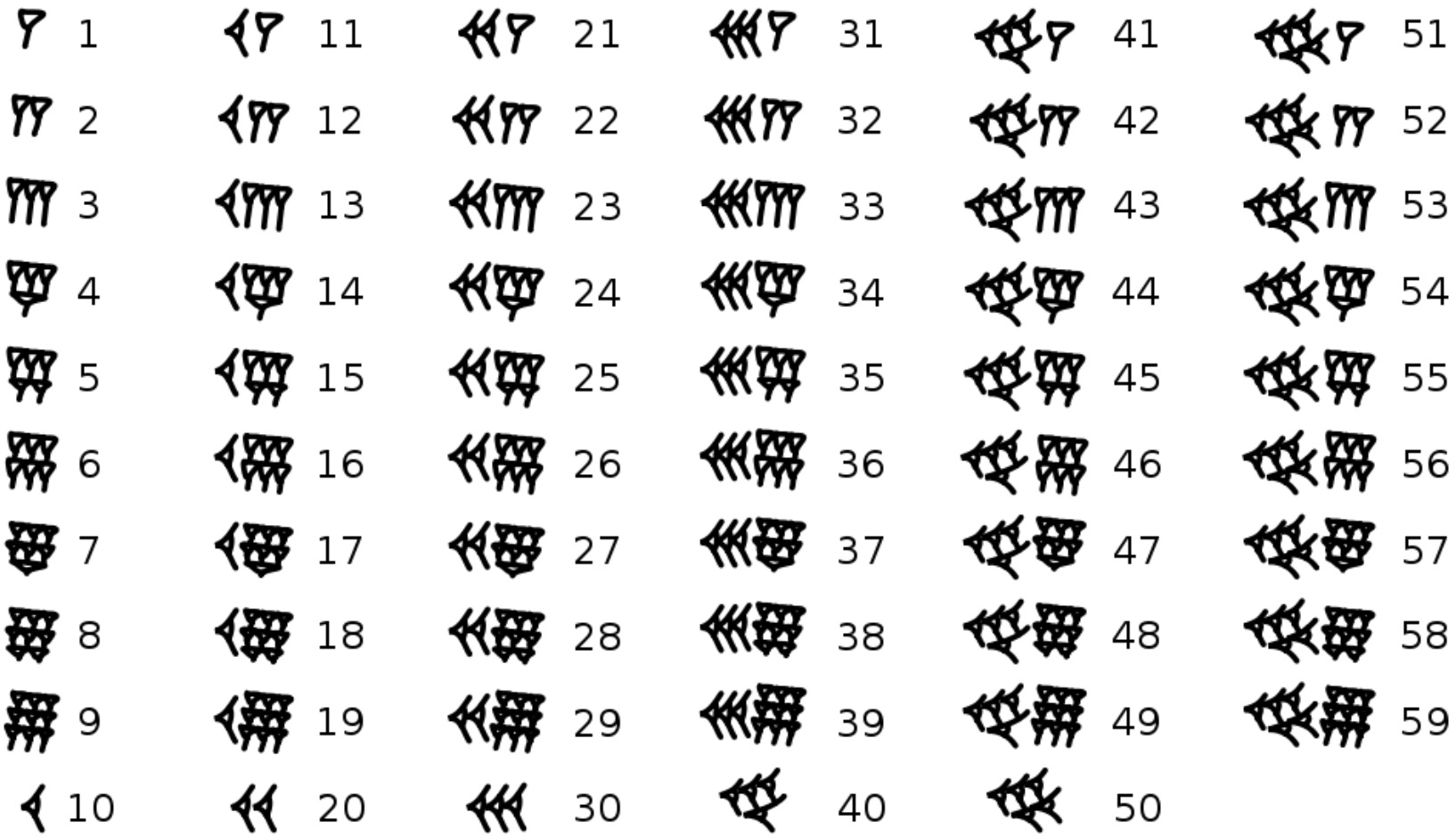
Dezimalsystem
10 Symbole: 0, 1, 2, 3, 4, 5, 6, 7, 8, 9

Binärsystem
2 Symbole: 0, 1

Oktalsystem
8 Symbole: 0, 1, 2, 3, 4, 5, 6, 7

Hexadezimalsystem
16 („Hexa“) Symbole:
0, 1, 2, 3, 4, 5, 6, 7, 8, 9, A, B, C, D, E, F

Zahlensysteme…



https://de.wikipedia.org/wiki/Sexagesimalsystem#Sumerer

Binärdarstellung

Im Binärsystem stehen zur Codierung der Zahlen nur die Ziffern 0 und 1 zur Verfügung.

Die Ziffern der Binärzahl stellen die Koeffizienten der Potenzen von 2 dar:

10111 = ?

Binärdarstellung

Im Binärsystem stehen zur Codierung der Zahlen nur die Ziffern 0 und 1 zur Verfügung.

Die Ziffern der Binärzahl stellen die Koeffizienten der Potenzen von 2 dar:

$$10111 = 1*2^4 + 0*2^3 + 1*2^2 + 1*2^1 + 1*2^0$$
$$= 1*16 + 1*4 + 1*2 + 1*1$$
$$= 23 \text{ im Dezimalsystem}$$

Dezimaldarstellung

Die Ziffern einer Dezimalzahl stellen die Koeffizienten von Zehnerpotenzen („Dezi“ von griech. „déka“, zehn) dar:

Beispiele:

$$2351 = 2*10^3 + 3*10^2 + 5*10^1 + 1*10^0$$
$$= 2*1000 + 3*100 + 5*10 + 1*1$$
$$= 2351$$

$$15 = 1*10^1 + 5*10^0$$
$$= 10 + 5$$
$$= 15$$

Hexadezimaldarstellung

Im Hexadezimalsystem stehen zur Codierung von Zahlen die sechzehn (**Hexa**+Dezi) Ziffern 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, A, B, C, D, E, F zur Verfügung

Die Ziffern der Zahl im Hexadezimalsystem stellen die Koeffizienten der Potenzen von 16 dar.

Beispiele:

109 (im Hexadezimalsystem)

$=> 9*16^0 + 0*16^1 + 1*16^2$

$= 9 + 0 + 256$

$= 265$ (im Dezimalsystem)

$AFFE = A*16^3 + F*16^2 + F*16^1 + E*16^0$

$= 10*4096 + 15*256 + 15*16 + 14*1$

$= 45054$

Vier Zahlensysteme gegenübergestellt

Dezimal	0	1	2	3	4	5	6	7	8
Binär	0	1	10	11	100	101	110	111	1000
Oktal	?	?	?	?	?	?	?	?	?
Hexadezimal	0	1	2	3	4	5	6	7	8

Dezimal	9	10	11	12	13	14	15	16
Binär	1001	1010	1011	1100	1101	1110	1111	10000
Oktal	?	?	?	?	?	?	?	?
Hexadezimal	9	A	B	C	D	E	F	?

Vier Zahlensysteme gegenübergestellt

Dezimal	0	1	2	3	4	5	6	7	8
Binär	0	1	10	11	100	101	110	111	1000
Oktal	0	1	2	3	4	5	6	7	10
Hexadezimal	0	1	2	3	4	5	6	7	8

Dezimal	9	10	11	12	13	14	15	16
Binär	1001	1010	1011	1100	1101	1110	1111	10000
Oktal	11	12	13	14	15	16	17	20
Hexadezimal	9	A	B	C	D	E	F	10

Zahlensysteme: Umwandlung

Umwandlung Binärsystem → Dezimalsystem

Zur Umwandlung: Multiplikation der entsprechenden Ziffern mit den Zweierpotenzen:

10111 = $1*2^4 + 0*2^3 + 1*2^2 + 1*2^1 + 1*2^0$

= $1*16 + 1*4 + 1*2 + 1*1$

= 23

Übung: Binärzahl → Dezimalzahl

Übungsaufgaben

1 1011	=>	welche Zahl im Dezimalsystem?
0 1010	=>	welche Zahl im Dezimalsystem?
1100 0011	=>	welche Zahl im Dezimalsystem?

Übung: Binärzahl → Dezimalzahl

Lösungen

$1\ 1011_2$ $= 1*2^0 + 1*2^1 + 0*2^2 + 1*2^3 + 1*2^4$
$= 1 + 2 + 0 + 8 + 16$
$= 27_{10}$

$0\ 1010_2$ $= 0*2^0 + 1*2^1 + 0*2^2 + 1*2^3 + 0*2^4$
$= 0 + 2 + 0 + 8 + 0$
$= 10_{10}$

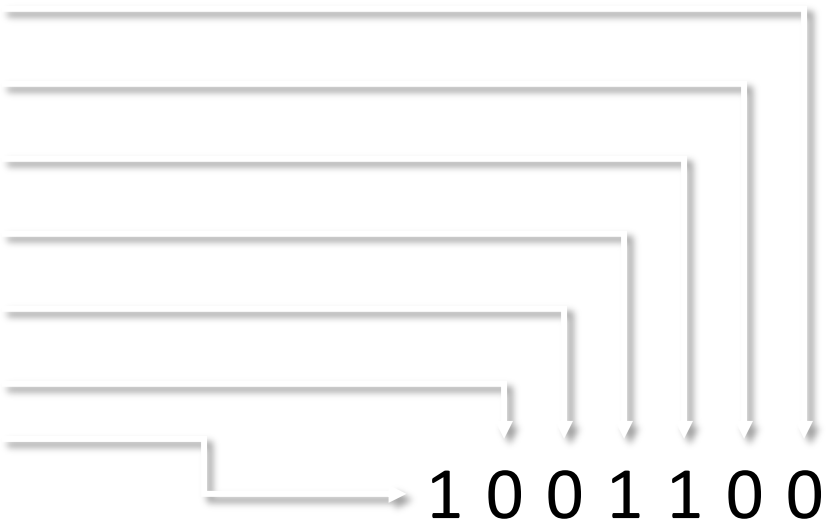
$1100\ 0011_2$ $= 195_{10}$

Umwandlung Dezimal→Binärsystem

Eine Dezimalzahl lässt sich über die Division durch 2 und Aufschreiben der Reste in eine Binärzahl umwandeln (das ist eine Möglichkeit, häufig lässt sich das auch im Kopf lösen).

Beispiel: Die Zahl 76_{10} soll ins Binärsystem umgewandelt werden

- 76 / 2 = 38; Rest 0
- 38 / 2 = 19; Rest 0
- 19 / 2 = 9; Rest 1
- 9 / 2 = 4; Rest 1
- 4 / 2 = 2; Rest 0
- 2 / 2 = 1; Rest 0
- 1 / 2 = 0; Rest 1



Umwandlung Dezimal→Binärsystem

$5_{10} = ?_2$

- 5 / 2 = 2; Rest 1
- 2 / 2 = 1; Rest 0
- 1 / 2 = 0; Rest 1

Übung: Dezimalzahl → Binärzahl

Übungsaufgaben

35 = Welche Binärzahl?

127 = Welche Binärzahl?

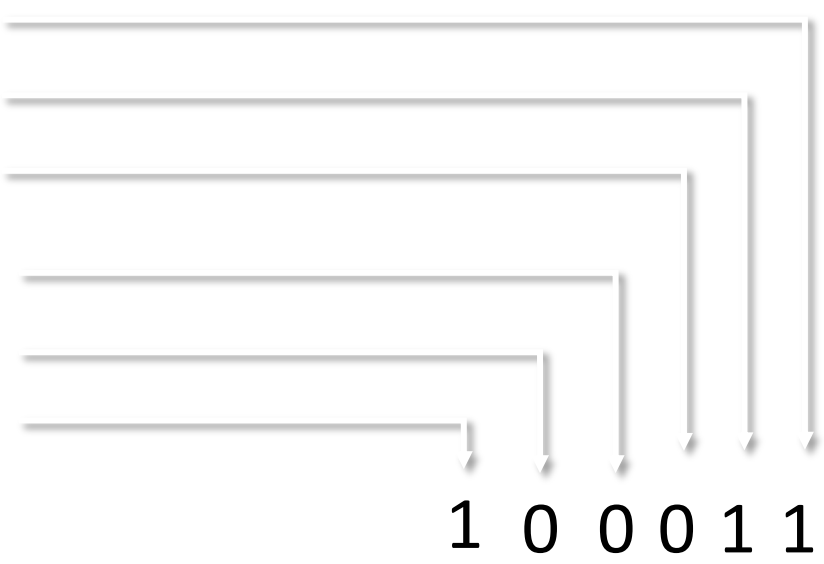
128 = Welche Binärzahl?

Lösungen

Umwandlung Dezimal→Binärsystem

35 = ?

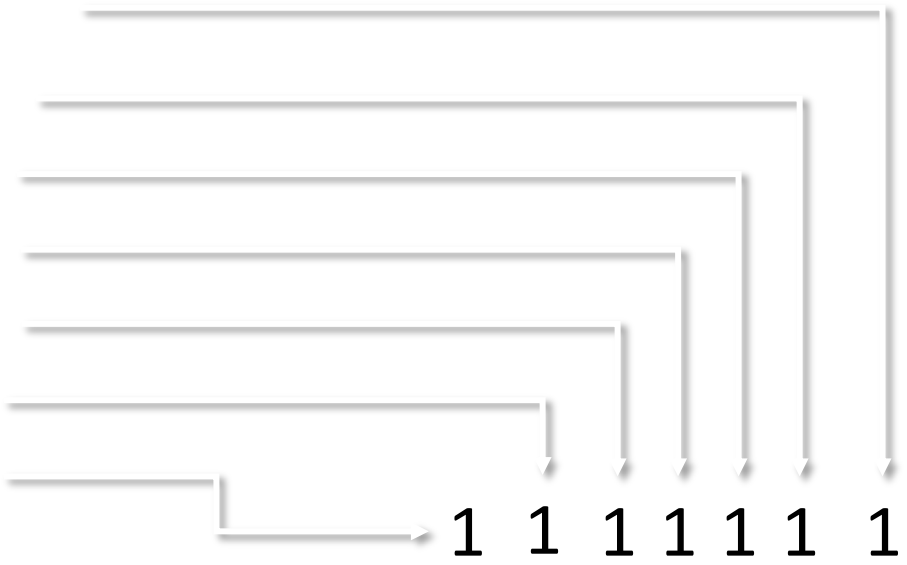
- 35 / 2 = 17; Rest 1
- 17 / 2 = 8; Rest 1
- 8 / 2 = 4; Rest 0
- 4 / 2 = 2; Rest 0
- 2 / 2 = 1; Rest 0
- 1 / 2 = 0; Rest 1



Umwandlung Dezimal→Binärsystem

127 = ?

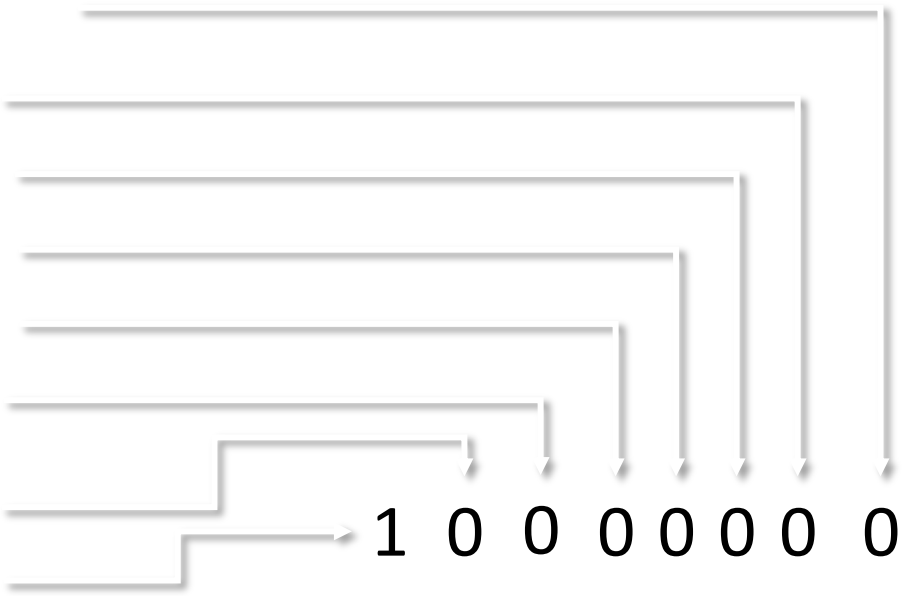
- 127 / 2 = 63; Rest 1
- 63 / 2 = 31; Rest 1
- 31 / 2 = 15; Rest 1
- 15 / 2 = 7; Rest 1
- 7 / 2 = 3; Rest 1
- 3 / 2 = 1; Rest 1
- 1 / 2 = 0; Rest 1



Umwandlung Dezimal→Binärsystem

128 = ?

- 128 / 2 = 64; Rest 0
- 64 / 2 = 32; Rest 0
- 32 / 2 = 16; Rest 0
- 16 / 2 = 8; Rest 0
- 8 / 2 = 4; Rest 0
- 4 / 2 = 2; Rest 0
- 2 / 2 = 1; Rest 0
- 1 / 2 = 0; Rest 1



Last, but not...: Umwandlung Hexadezimalsystem →Dezimalsystem

Zur Umwandlung: Multiplikation der entsprechenden Ziffern mit den Potenzen von 16:

AFFE $= A*16^3 + F*16^2 + F*16^1 + E*16^0$

$= 10*4096 + 15*256 + 15*16 + 14*1$

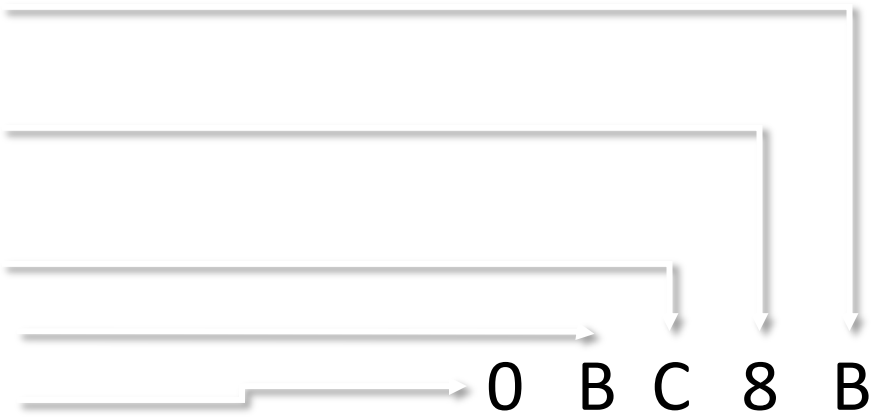
$= 45054$

Umwandlung Dezimal→Hexadezimalsystem

Eine Dezimalzahl lässt sich über die Division durch die Basis 16 und Aufschreiben der Reste in eine Hexadezimalzahl umwandeln.

Beispiel: Die Dezimalzahl 48267 soll ins Hexadezimalsystem umgewandelt werden

- 48267 / 16 = 3016
  Rest : 11 → B
- 3016 / 16 = 188
  Rest: 8
- 188 / 16 = 11
  Rest: 12 → C
- 11 / 16 = 0; Rest : B
- 0 / 16 = 0; Rest: 0



Übung: Dezimalzahl → Hexadezimalzahl

Übungsaufgaben

16 = Welche Hexadezimalzahl?

64 = Welche Hexadezimalzahl?

127 = Welche Hexadezimalzahl?

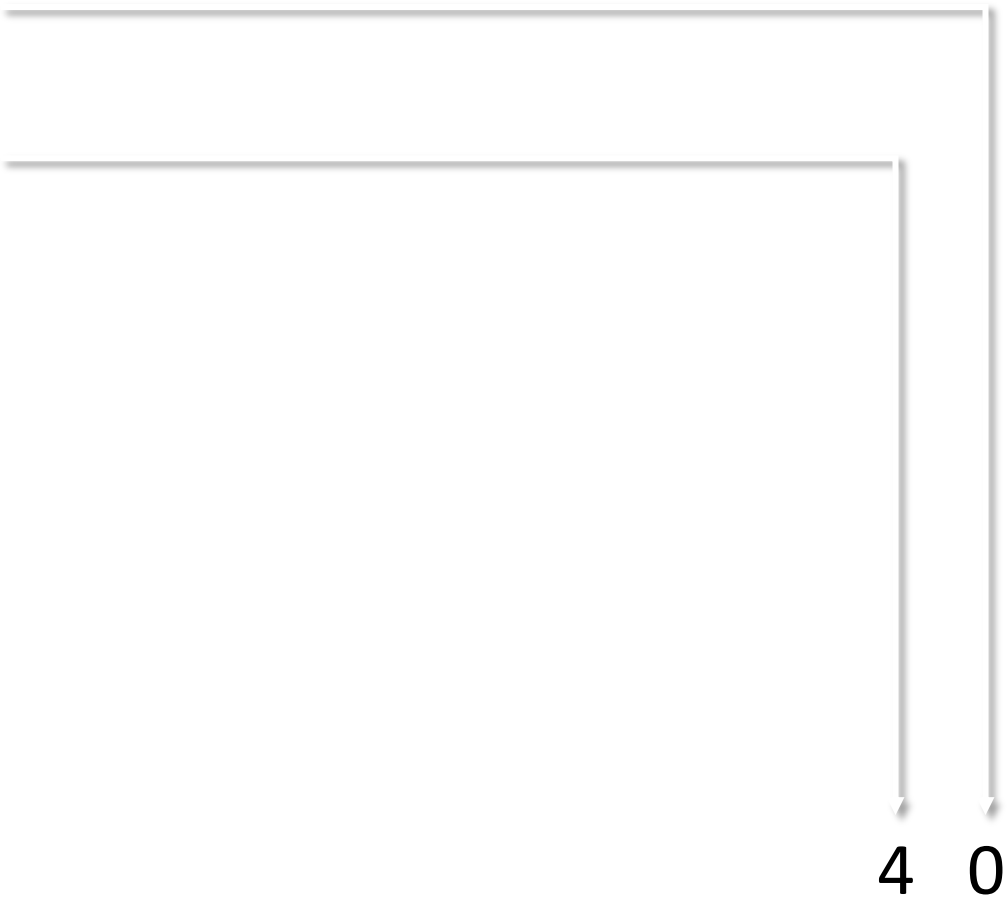
Lösungen

Umwandlung Dezimal→Hexadezimalsystem

- 16 / 16 = 1
  Rest : 0 → 0
- 1 / 16 = 0
  Rest: 1

Umwandlung Dezimal→Hexadezimalsystem

- 64 / 16 = 4
  Rest : 0 → 0
- 4 / 16 = 0
  Rest: 4



Umwandlung Dezimal→Hexadezimalsystem

- 127 / 16 = 7
  Rest : 15 → F
- 7 / 16 = 0
  Rest: 7

Bildnachweise

- https://simple.wikipedia.org/wiki/ASCII