61A Lecture 13

Wednesday, October 2

Announcements

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  - Topics: Data abstraction, sequences, and non-local assignment.
  - Please RSVP on Piazza!
- Guest lecture on Wednesday 10/9, Peter Norvig on Natural Language Processing in Python.

Strings

Strings are an Abstraction

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Representing data:

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'200'      '1.2e-5'      'False'      '(1, 2)'
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(Demo)

String Literals Have Three Forms

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>>> 'I am string!'
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>>> "I've got an apostrophe"
"I've got an apostrophe"

>>> '您好'
'您好'
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"Line feed" character represents a new line

Strings are Sequences

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Length. A sequence has a finite length.

Element selection. A sequence has an element corresponding to any non-negative integer index less than its length, starting at 0 for the first element.

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>>> city = 'Berkeley'
>>> len(city)
8
>>> city[3]
'k'
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Encoding Strings

Representing Strings: the ASCII Standard

American Standard Code for Information Interchange

ASCII Code Chart

	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		!	"	#	$	%	&	'	(	)	*	+	,	-	.	/
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

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2		!	"	#	$	%	&	'	(	)	*	+	,	-	.	/
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	[	\	]	^	_
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2		!	"	#	$	%	&	'	(	)	*	+	,	-	.	/
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
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16 columns: 4 bits

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"Line feed" (\n)

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"Bell" (\a)

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(Demo)

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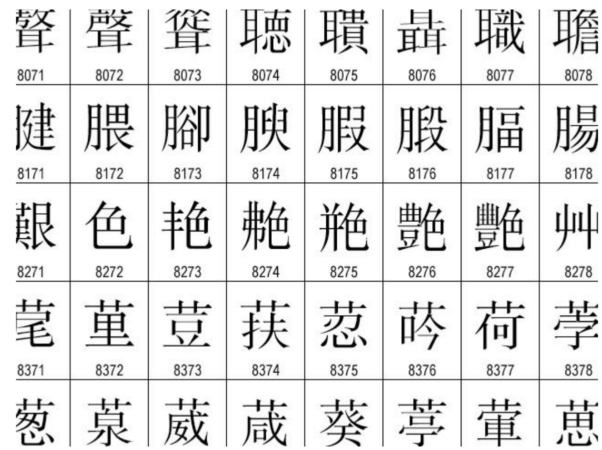
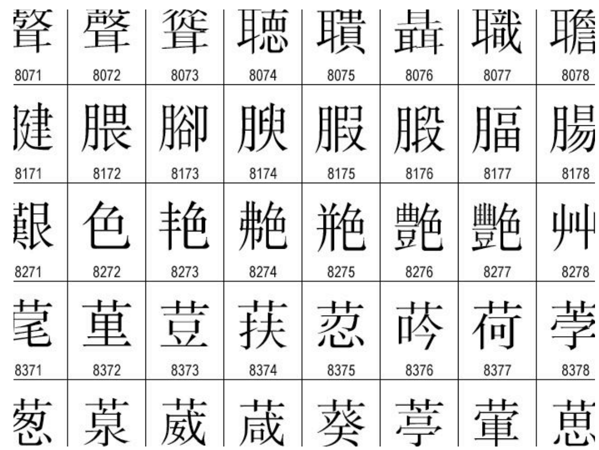


http://ian-albert.com/unicode_chart/unichart-chinese.jpg

Representing Strings: the Unicode Standard

- 109,000 characters



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Representing Strings: the Unicode Standard

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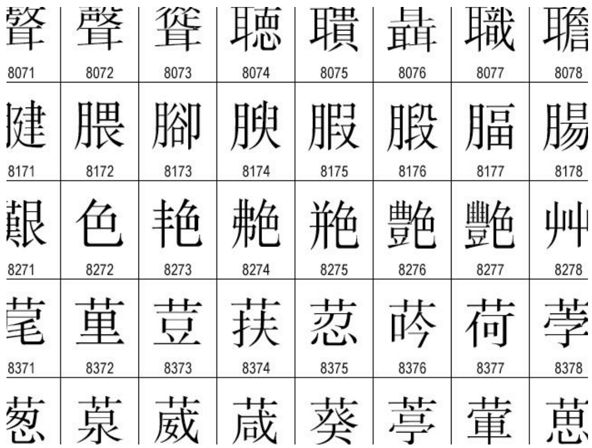
- 93 scripts (organized)



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Representing Strings: the Unicode Standard

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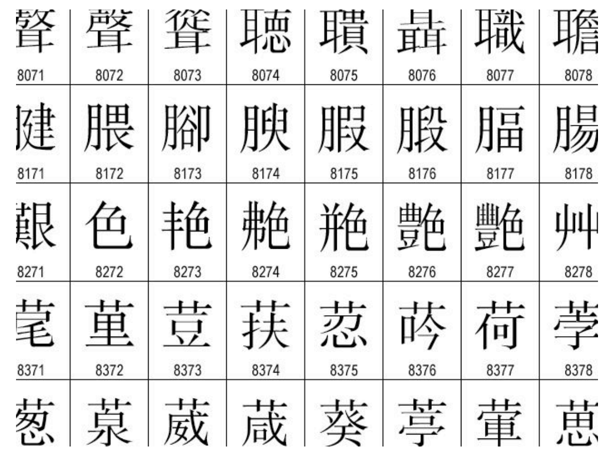
- Enumeration of character properties, such as case



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Representing Strings: the Unicode Standard

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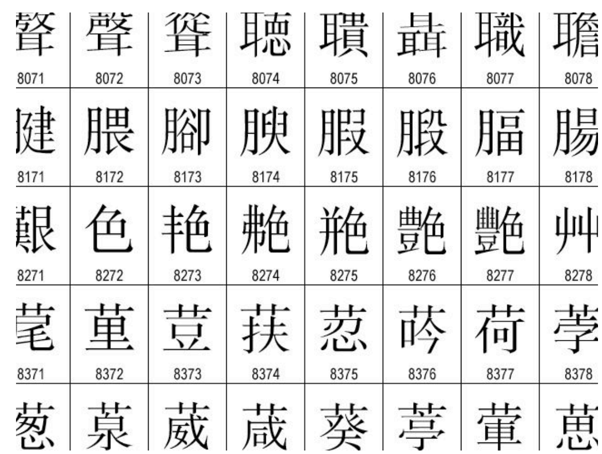
- 93 scripts (organized)
- Enumeration of character properties, such as case
- Supports bidirectional display order



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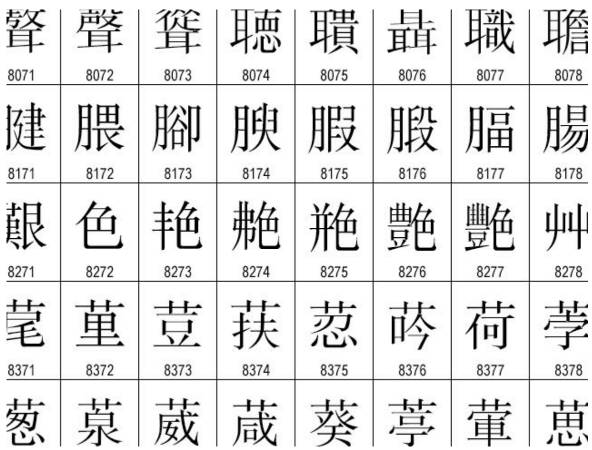

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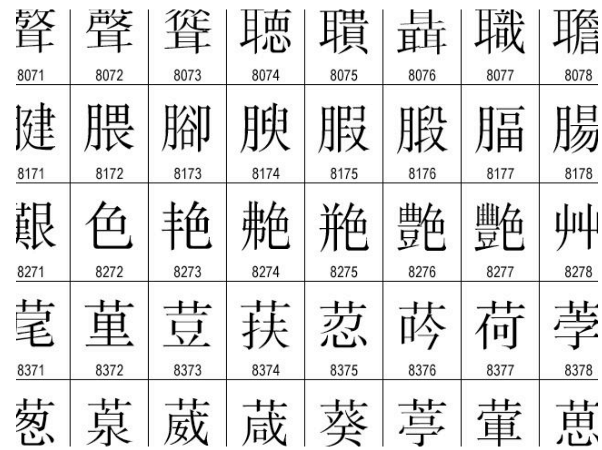

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U+0058 LATIN CAPITAL LETTER X

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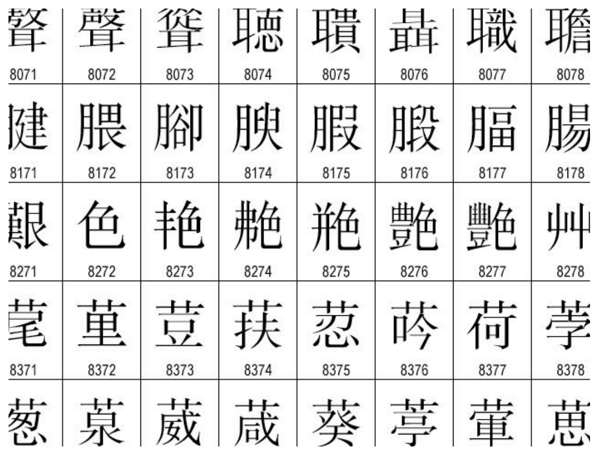

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U+263a WHITE SMILING FACE

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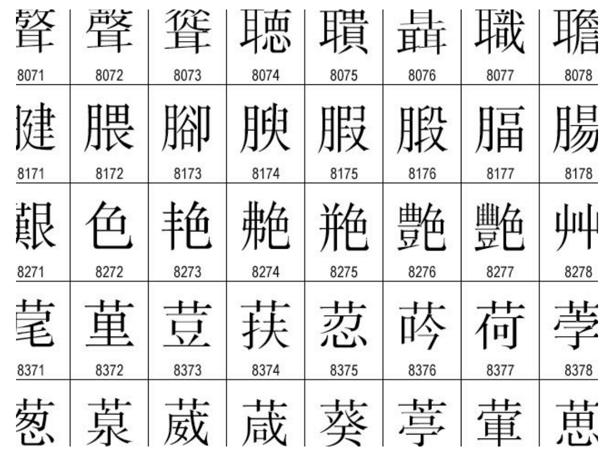

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U+2639 WHITE FROWNING FACE

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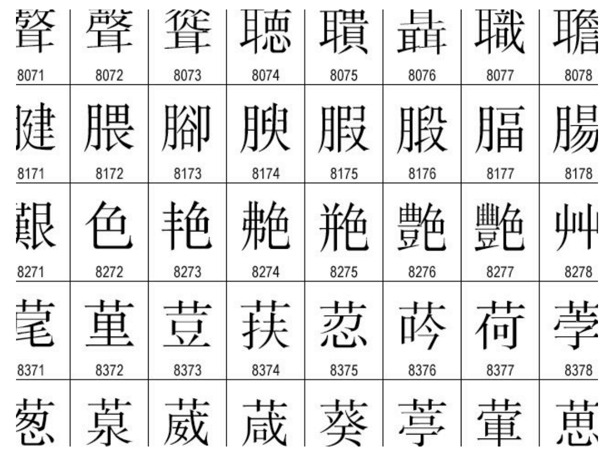

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U+0058 LATIN CAPITAL LETTER X

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'☺'

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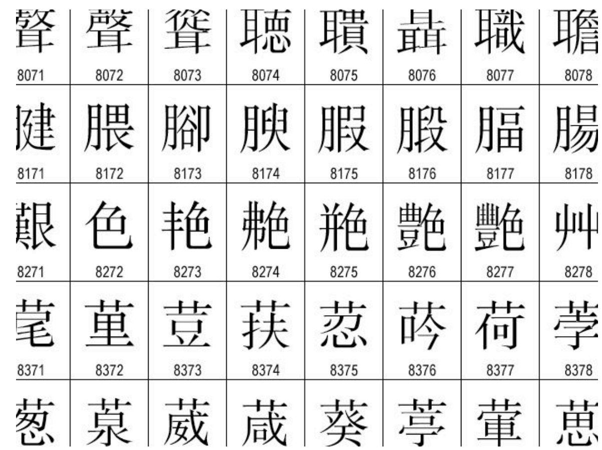


http://ian-albert.com/unicode_chart/unichart-chinese.jpg

U+0058 LATIN CAPITAL LETTER X

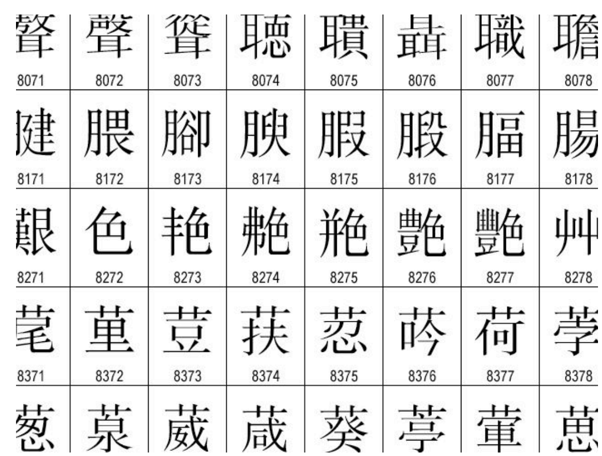
U+263a WHITE SMILING FACE

U+2639 WHITE FROWNING FACE

'☺' '☹'

Representing Strings: the Unicode Standard

- 109,000 characters
- 93 scripts (organized)
- Enumeration of character properties, such as case
- Supports bidirectional display order
- A canonical name for every character



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(Demo)

Representing Strings: UTF-8 Encoding

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UTF (UCS (Universal Character Set) Transformation Format)
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bytes			integers
	00000000	0	
	00000001	1	

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bytes	00000000	0	integers
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	00000010	2	

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(Demo)

Sequence Processing

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Consider two problems:
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Sequence Processing

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- Sum the even members of the first n Fibonacci numbers.

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map fib:
```

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map fib:	0, 1, 1, 2, 3, 5, 8, 13, 21, 34, 55.

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accumulate sum:
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filter even:           0,       2,       8,           34,    .

accumulate sum:        .,       .,       .,           .,  =44
```

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enumerate words:

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map first:	'U',		'C',	'B'
accumulate tuple:				

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filter capitalized:		'University',		'California',	'Berkeley'	
map first:		'U',		'C',	'B'	
accumulate tuple:	(	'U',		'C',	'B'	)

Mapping a Function over a Sequence

Apply a function to each element of the sequence

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(Demo)

Iteration and Accumulation

Iterable Values and Accumulation

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Iterable objects give access to their elements in order.

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tuple	Return a tuple containing the elements

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tuple	Return a tuple containing the elements
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tuple	Return a tuple containing the elements
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For statements also operate on iterable values.

Reducing a Sequence

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First argument:
A two-argument function

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First argument:
A two-argument function

Second argument: an
iterable object

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>>> from functools import reduce
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120
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First argument: A two-argument function

Second argument: an iterable object

Similar to accumulate from Homework 2, but with iterable objects.

Generator Expressions

One large expression that evaluates to an iterable object

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(Demo)