CSC104 fall 2012

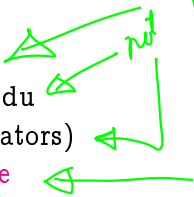## Why and how of computing

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BA4270 (behind elevators)

Course web page

416-978-5899

Text: Picturing Programs

Outline

Introduction

History of representing information

Notes

Who needs to know why and how?

Computers are to us as sand grains are to oysters — annoy into producing beautiful pearls.

← don't stick in forks

- We all consume computing, the thing is to change it

- Computers and networks change society — privacy, property, democracy, work, education — for better or worse

- We get an insight into computer culture by making some artifacts: programs

Two tracks in this course

- History of computing technology, overview of modern computing OS, social issues

- Insight into computing mindset: problem-solving and programs

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How to do well at this course

▶ Read the course information sheet as a two-way promise

▶ Question, answer, record, synthesize

write stuff!

▶ Collaborate with respect

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Representing even simple information is hard. Let's race through this table:

[handwritten annotations in red:]

NEWS FLASH: The best result was 12 characters in 300 seconds: "one or twice"

These were ≈ 20 character fragments from first sentence of "Alice in Wonderland"

Bits (b4 b3 b2 b1)	Row	0 (000)	1 (001)	2 (010)	3 (011)	4 (100)	5 (101)	6 (110)	7 (111)
0 0 0 0	0	NUL	DLE	SP	0	@	P	`	p
0 0 0 1	1	SOH	DC1	!	1	A	Q	a	q
0 0 1 0	2	STX	DC2	"	2	B	R	b	r
0 0 1 1	3	ETX	DC3	#	3	C	S	c	s
0 1 0 0	4	EOT	DC4	$	4	D	T	d	t
0 1 0 1	5	ENQ	NAK	%	5	E	U	e	u
0 1 1 0	6	ACK	SYN	&	6	F	V	f	v
0 1 1 1	7	BEL	ETB	'	7	G	W	g	w
1 0 0 0	8	BS	CAN	(	8	H	X	h	x
1 0 0 1	9	HT	EM	)	9	I	Y	i	y
1 0 1 0	10	LF	SUB	*	:	J	Z	j	z
1 0 1 1	11	VT	ESC	+	;	K	[	k	{
1 1 0 0	12	FF	FC	,	<	L	\	l		
1 1 0 1	13	CR	GS	-	=	M	]	m	}
1 1 1 0	14	SO	RS	.	>	N	^	n	~
1 1 1 1	15	SI	US	/	?	O	_	o	DEL

Early devices

tally systems

Clay tablets, read-only when baked,
read/write when sundried,
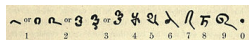havebeen in use for at least 5,000 years.

Abacuses, or abaci, have been
in use for nearly as long

Number systems and gears

ancient world

22 × 23 with roman numerals?

Hindu-Arabic numbers: positional notation,
and zero over 2000 years ago
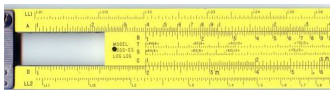slick algorithms, e.g. long multiplication

Antikythera mechanism
make us re-think
ancient technical skills

Gears and rules

machine age

$$3 \times 3 \times 3 = 3^3$$

$$3 \times 3 = 3^2$$

$$3^3 + 3^2 = 3^5$$

Add powers (logs) to multiply quickly, extract roots

Read the gears to
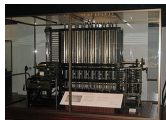extract taxes — Pascaline

Looms and engines

industrial revolution

Jacquard loom combined
steam and punch cards
for automatic patterns

Babbages difference engine
would have evaluated
polynomials like $3x^3 + 5x^2 - 7x + 9$

Before we continue the history of devices that represent and manipulate values, we'll stop to try out a modern environment that does these things. We'll need to:

- Start up the DrRacket programming environment
- Experiment with various values, including images, thanks to tools from Picturing Programs

Notes