CSC104 winter 2013

Why and how of computing

week 3

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Text: Picturing Programs
↳ ch 1,2,3,4,5

how to solve it

it being a new problem

Clearly there's no fool-proof method, but there's some techniques that often make progress. It helps to write down the whole process:

- Understand the problem
  - given — # of folds
  - required — crease pattern
- Devise (one or more) plan(s) (see notes at end)
  - try small cases, look for a pattern.
- Try the plan
- Look back

paper folding?

try it out

- Understand the problem (what's given, what's required)?
- Devise a plan
- Try at least one plan (be ready to abandon it too)
- Look back

In media res

racing with Alice

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

b_7 →				0	0	0	0	1	1	1	1
b_6 →				0	0	1	1	0	0	1	1
b_5 →				0	1	0	1	0	1	0	1
Bits	b_4 ↓	b_3 ↓	b_2 ↓	b_1 ↓	Row ↓ / Column →	0	1	2	3	4	5	6	7
	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

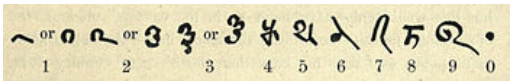
tally systems

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

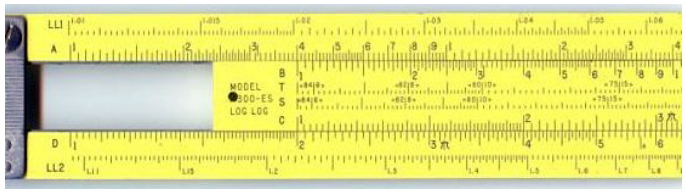


Hindu-Arabic numbers: positional notation, and zero over 2000 years ago
slick algorithms, e.g. long multiplication

Antikythera mechanism
make us re-think
ancient technical skills

Gears and rules

machine age



Add powers (logs) to multiply quickly, extract roots

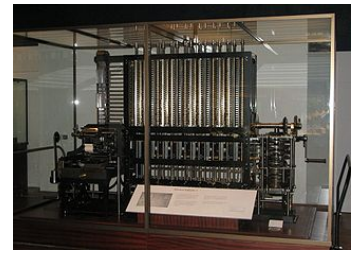
Read the gears to extract taxes — Pascaline

Looms and engines

industrial revolution

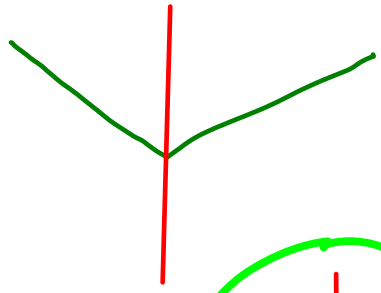
Jacquard loom combined
steam and punch cards
for automatic patterns

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

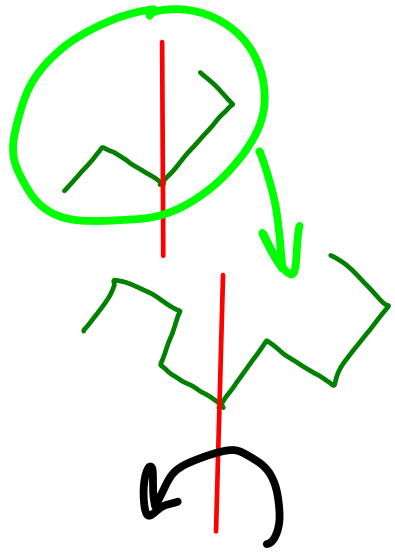


Notes

1 fold



2 folds:



3 folds:

U U D D U D D

1 fold

D

2 folds:

U D D

U U D D U D D