CSC104 fall 2013

Why and how of computing

week 1

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Text: *Picturing Programs*
http://www.picturingprograms.com

Outline

Who needs computational thinking?

- 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

- Insight into computing mindset: problem-solving and programs

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

How to do well at this course

- Read the course information sheet as a two-way promise
- humour me: read your email
- Question, answer, record, synthesize
- Collaborate with respect

What to do with computing machines?

Algorithms!

simple sequence of feasible steps to solve a problem
deterministic (in this course)
credit Al-Khwarizmi

Examples

- multiplication
- PBJ
- Google page rank

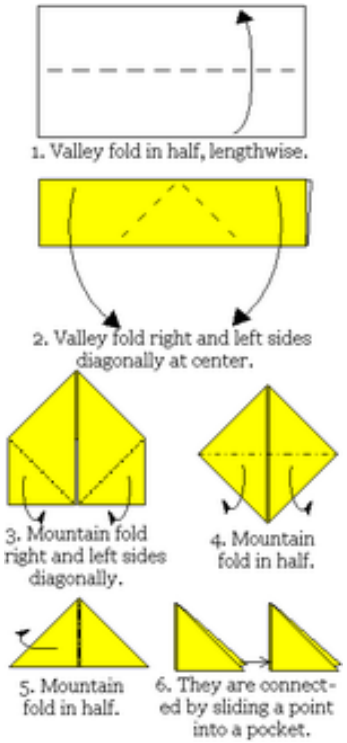
Sticky algorithm

pbj

peanut butter bread jam $\rightarrow$ PBJ sandwich
could you explain it to a friend
over the phone, who had
never made it?

- which operations are built-in?
- what if conditions change?
- name repeated operations
- does sequence matter?

paper folding



(ignore the diagram on the left)
fold over upper surface of paper strip
after one fold, it has a downward crease
fold the once-folded strip again
and it has one upward, two downward
there are good physical reasons you
can't experiment far beyond 6 folds
given the number of folds,
predict the pattern

For more information, and hints, see paper folding problem

2000+ year-old algorithm

Euclid's GCD

the largest whole number that divides two non-negative whole numbers is their Greatest Common Denominator (GCD)
we could find it by sifting through all the divisors, but there's a quicker way

Euclid noticed that (gcd $n1$ $n2$) = (gcd $n2$ (remainder $n1$ $n2$))
Also, (gcd $n1$ 0) = $n1$. Repeat as needed.

The way we were

grade school multiplication

×	0	1	2	3	4	5	6	7	8	9
0	0	0	0	0	0	0	0	0	0	0
1	0	1	2	3	4	5	6	7	8	9
2	0	2	4	6	8	10	12	14	16	18
3	0	3	6	9	12	15	18	21	24	27
4	0	4	8	12	16	20	24	28	32	36
5	0	5	10	15	20	25	30	35	40	45
6	0	6	12	18	24	30	36	42	48	54
7	0	7	14	21	28	35	42	49	56	63
8	0	8	16	24	32	40	48	56	64	72
9	0	9	18	27	36	45	54	63	72	81

We'd memorize, and organize, the algorithm for 27×38

Much better than XXVII × XXXVIII

Notes