CSC104 fall 2013

Why and how of computing

week 1

Danny Heap ← best

heap@cs.toronto.edu ← next best

BA4270 (behind elevators) ←

http://www.cdf.toronto.edu/~heap/104/W13/

read weekly

416-978-5899 ← worst

Text: *Picturing Programs*

http://www.picturingprograms.com

costs $\$4\frac{99}{tx}$

honour system

Outline

Who needs computational thinking?

single purpose,
not programmable,
not used throughout
society

- 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

this is why Dr Racket

Two tracks in this course

hands on computing

- Insight into computing mindset: problem-solving and programs

- History of computing technology, overview of modern computing OS, social issues unemployment privacy, etc.

How to do well at this course

- Read the course information sheet as a two-way promise
- humour me: read your email

daily, even?

- Question, answer, record, synthesize

you could print out slides + write on them

- Collaborate with respect ✓

Share, give credit

What to do with computing machines?

Algorithms!

simple sequence of feasible steps to solve a problem → simple enough for computer.

deterministic (in this course) → same steps → same answer

credit Al-Khwarizmi → from vast store of culture + knowledge in Arabian empire.

Examples

- multiplication
- PBJ
- Google page rank

Sticky algorithm

pbj

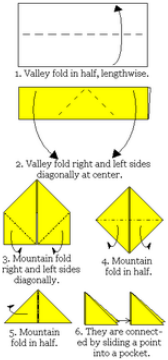
peanut butter bread jam $\rightarrow$ PBJ sandwich
could you explain it to a friend
over the phone, who had
never made it?

careful!

- which operations are built-in? → otherwise, explain "scoop"
- what if conditions change?
- name repeated operations → so we can re-use them
- does sequence matter? → spread PB before removing bread from bag

paper folding

1 fold:
2 folds:



(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

$\times$	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 $\times$ XXXVIII

Notes