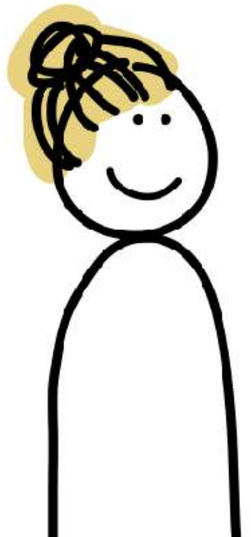
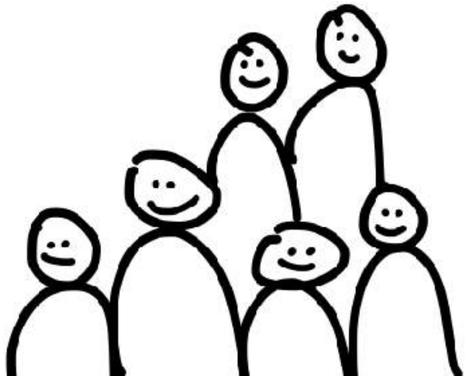
How to teach programming...

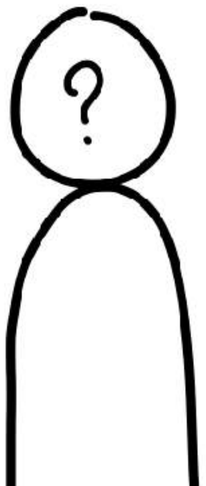
and other things



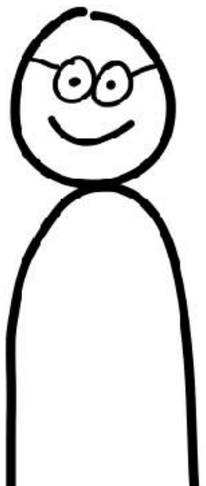
@Felienne



"Everyone should learn programming"

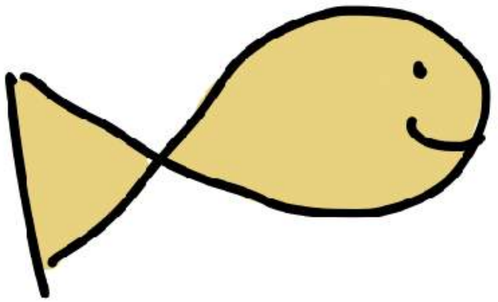


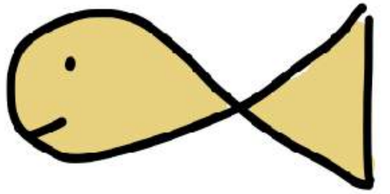
"Everyone should learn programming"

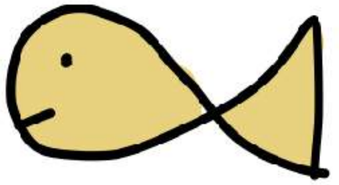


– Every programmer ever

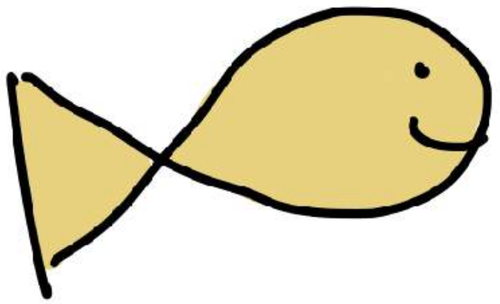
What is programming?

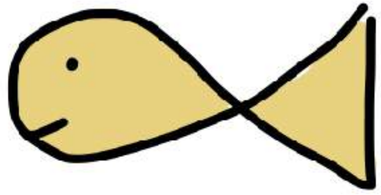


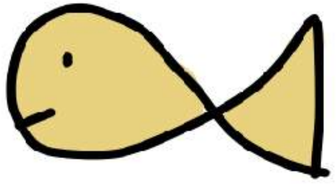




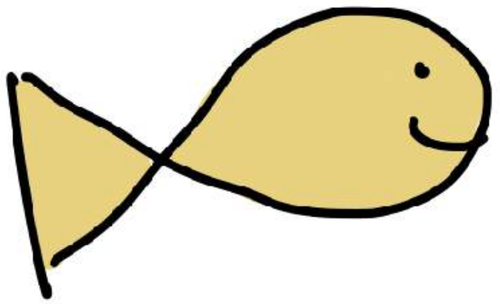
Hey folks!
How's the water?



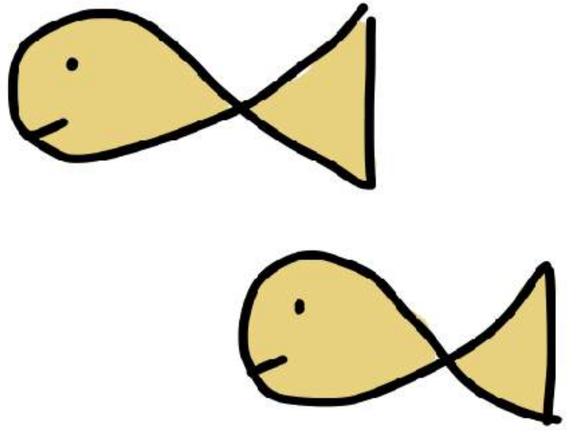


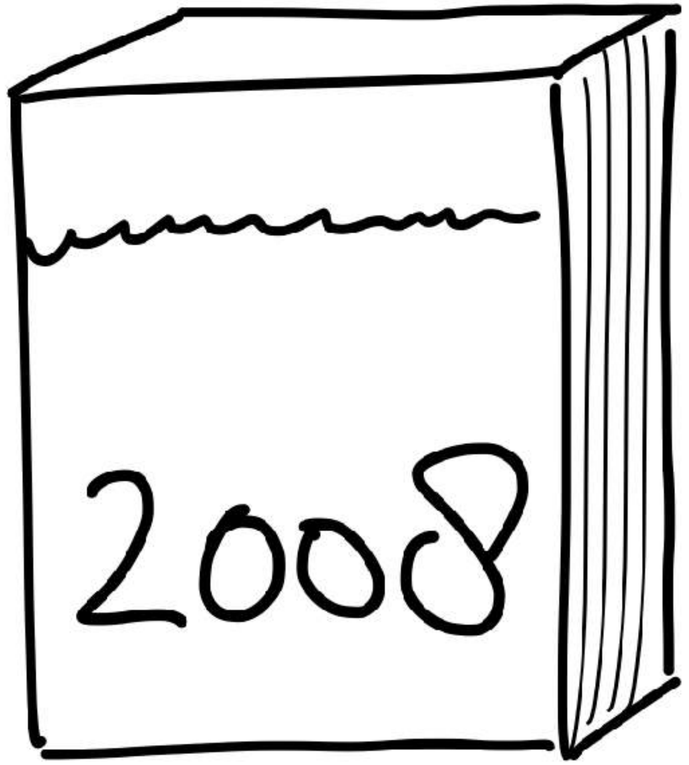


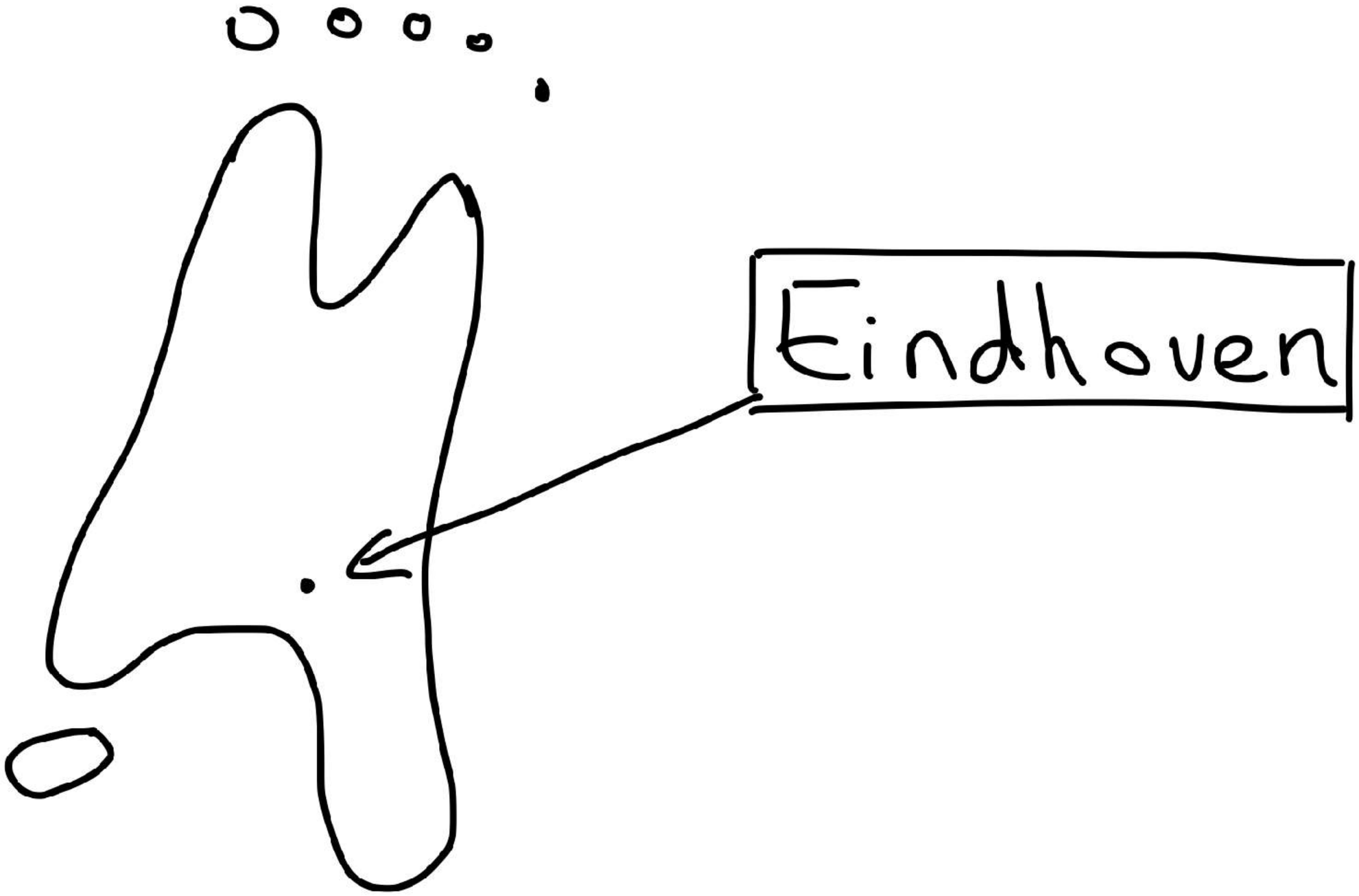
Hey folks!
How's the water?

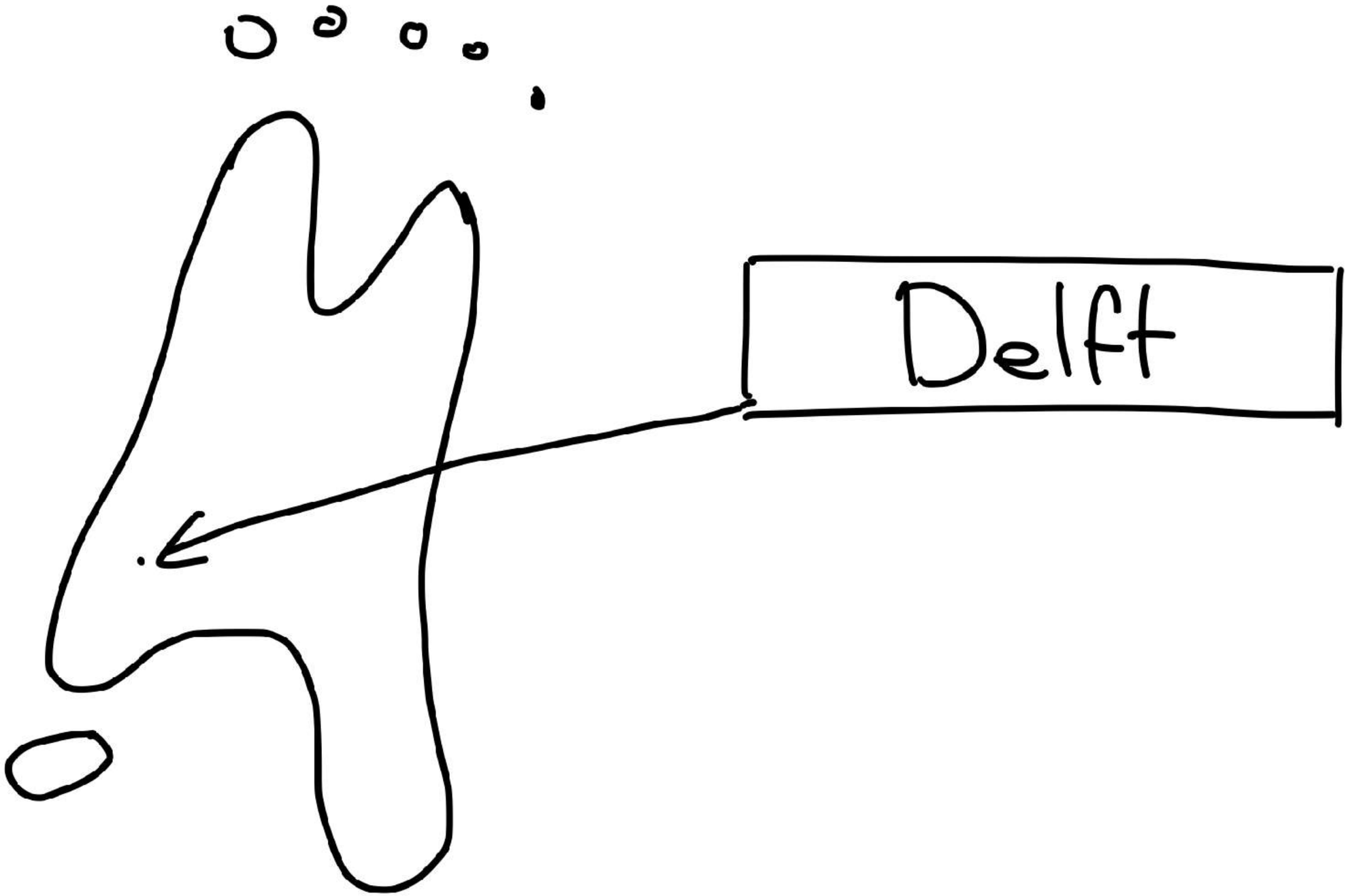


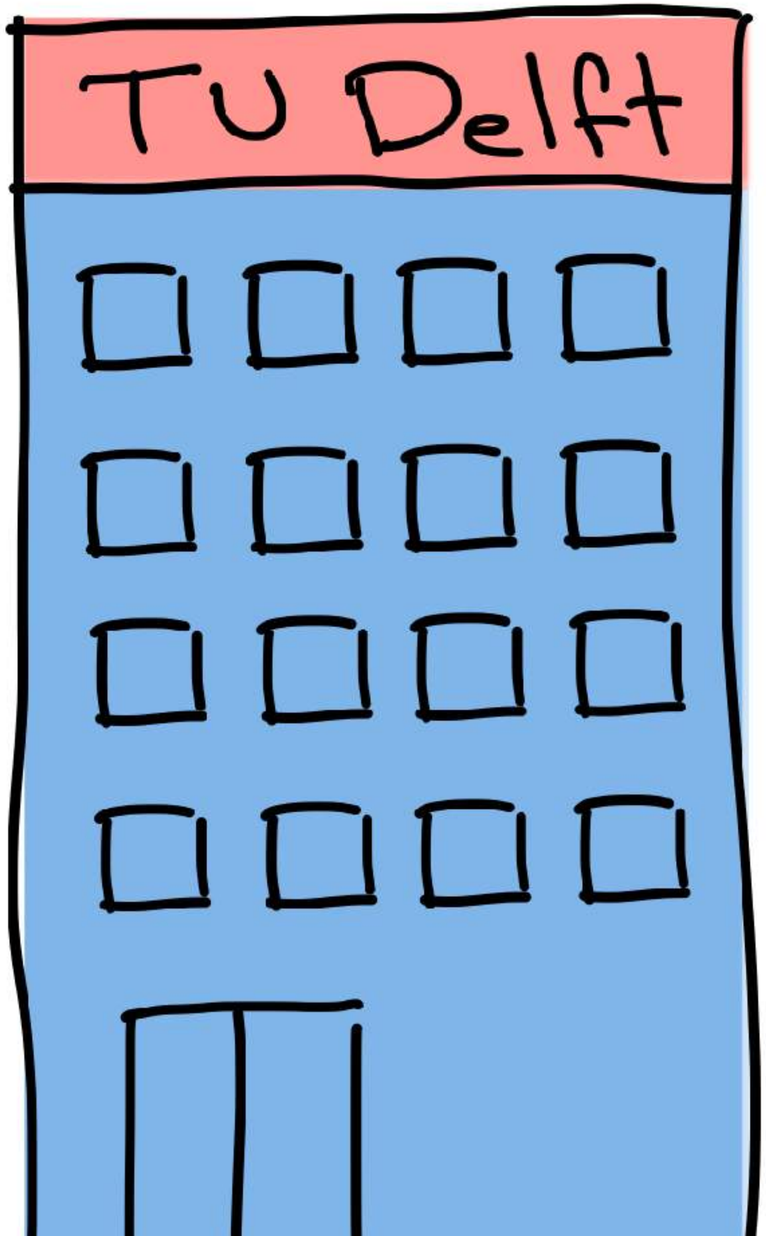
What's water?



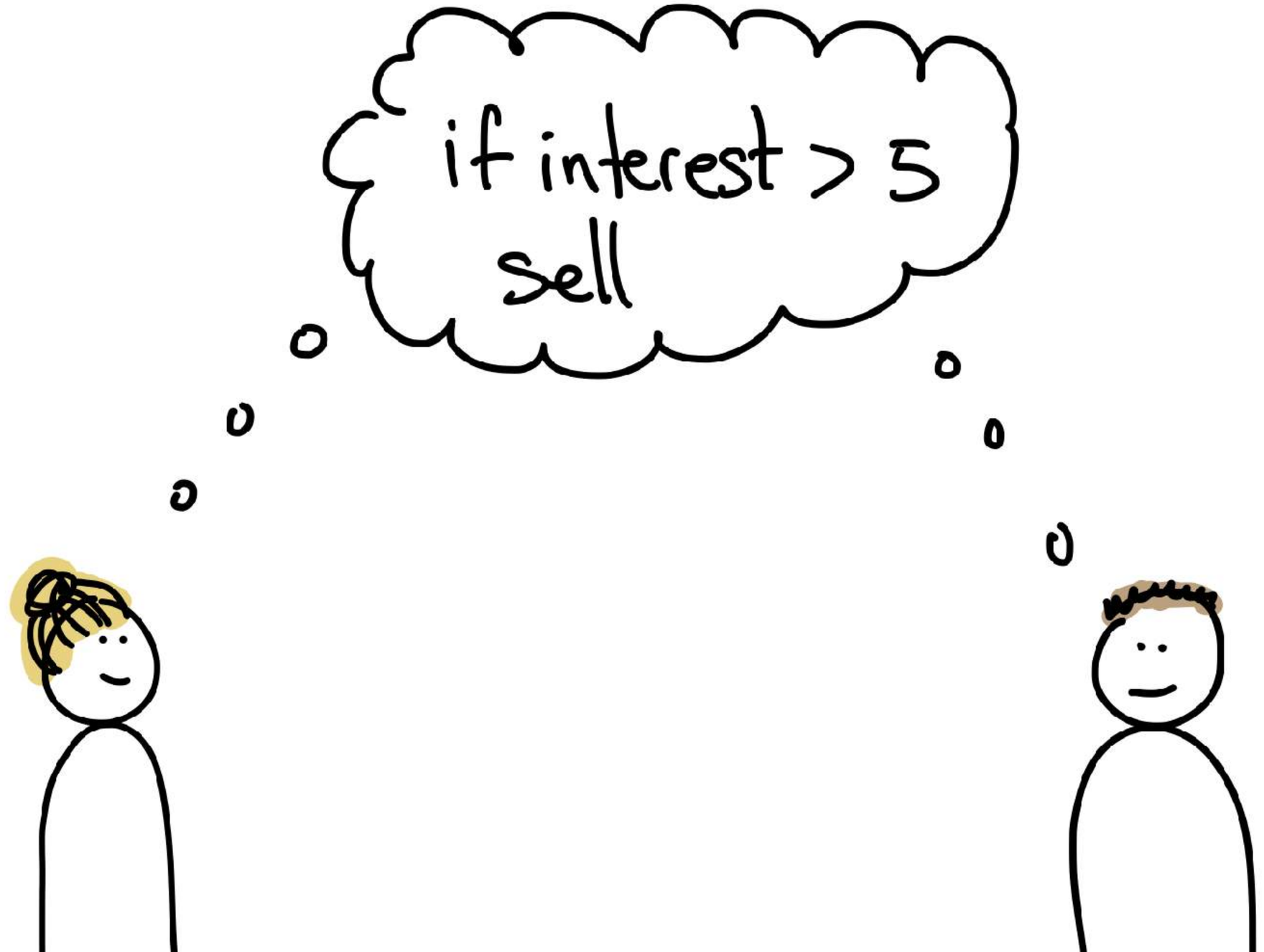

2008

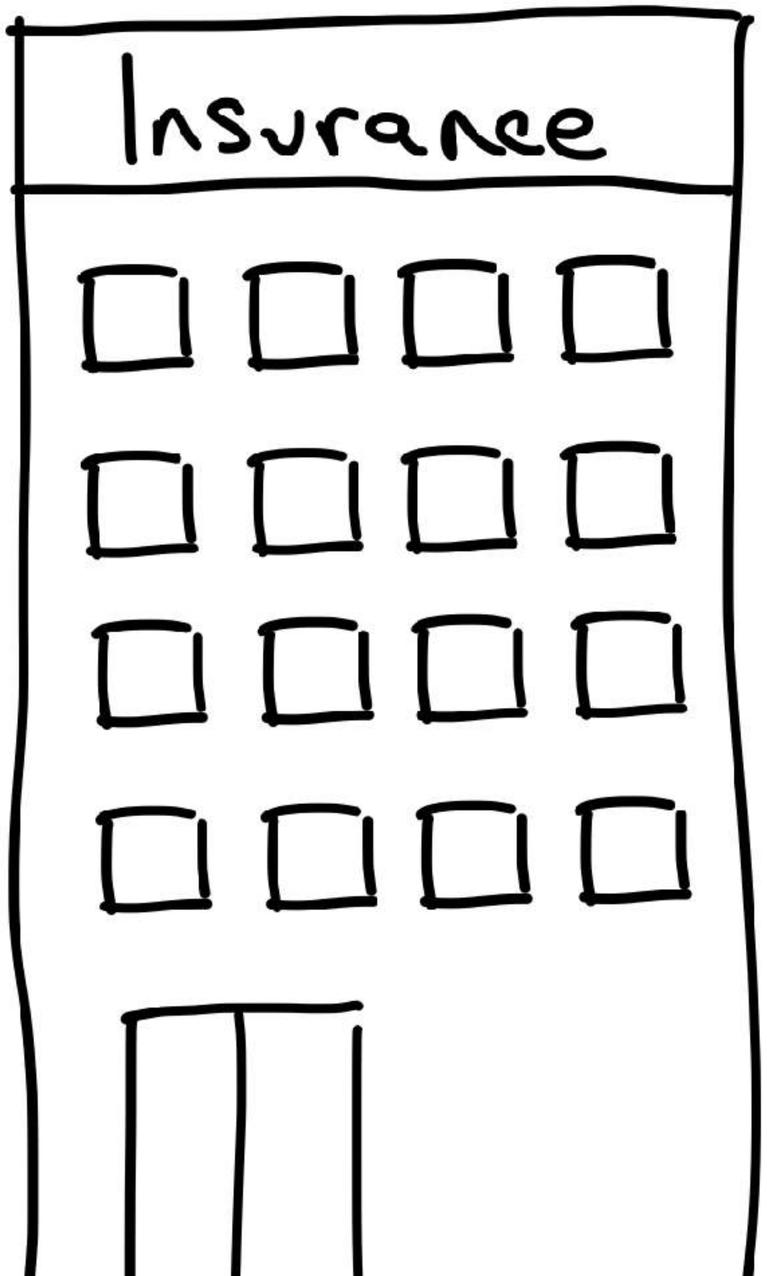

Eindhoven


Delft

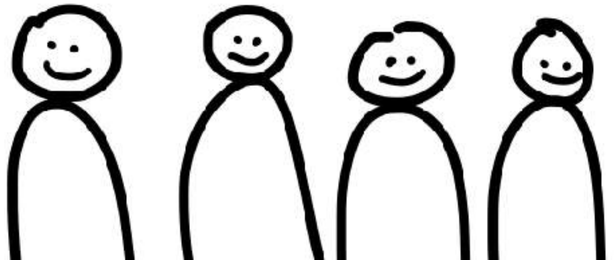

TU Delft

Let's research a DSL for finance

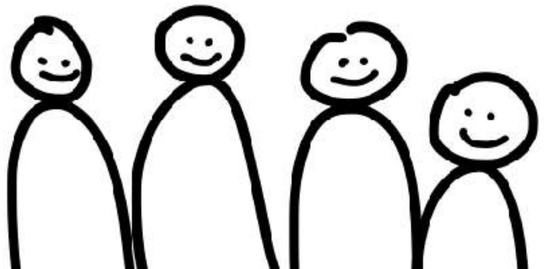

if interest > 5
sell


Insurance

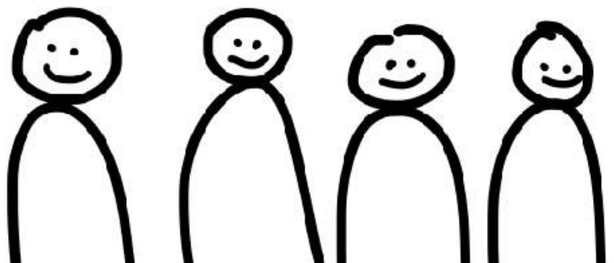
Users



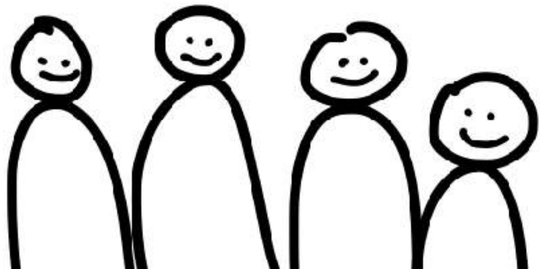
Programmers

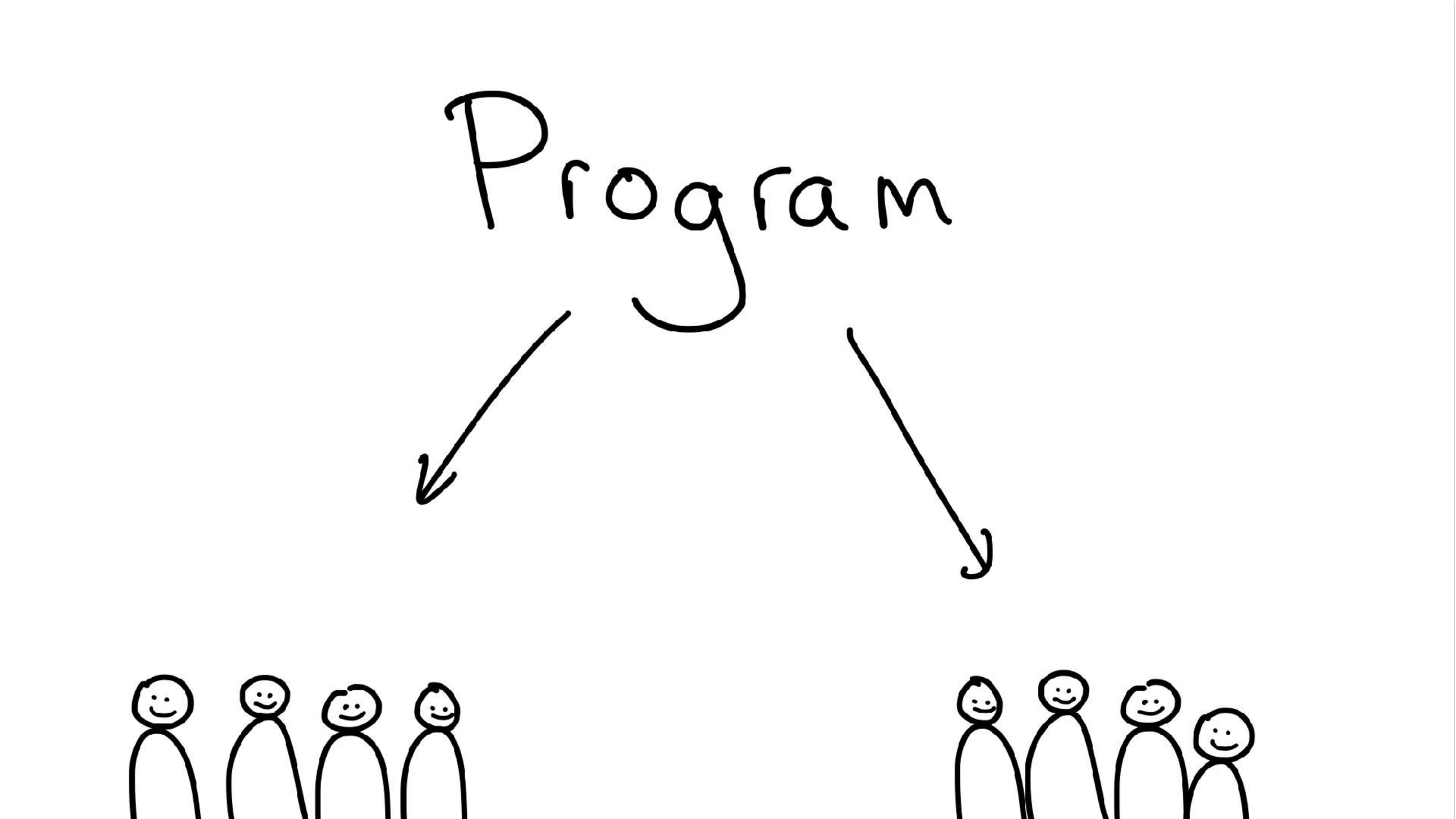


Use

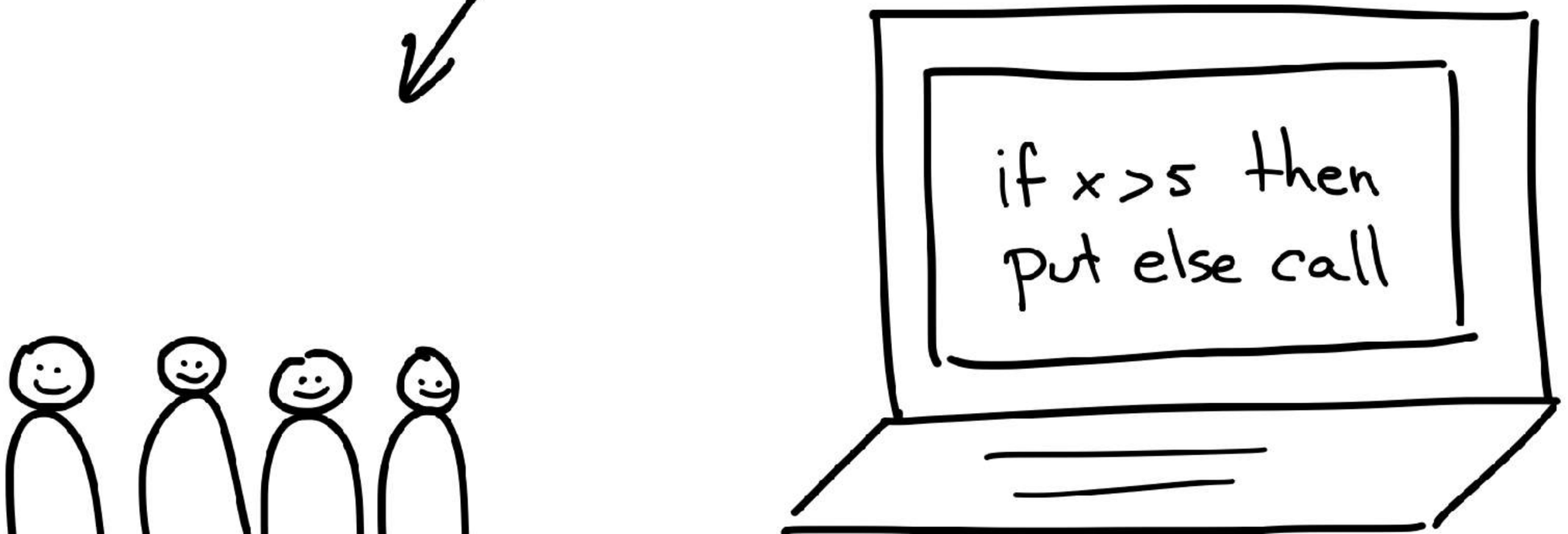


Program

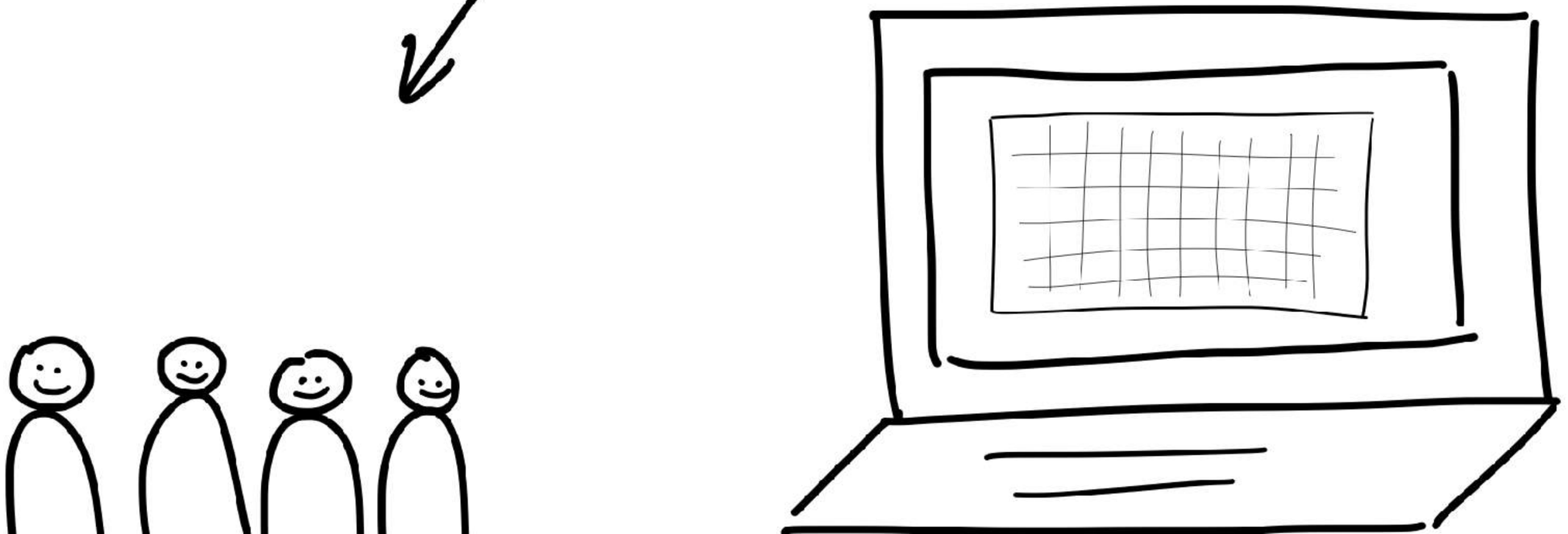



Program

Program



Program

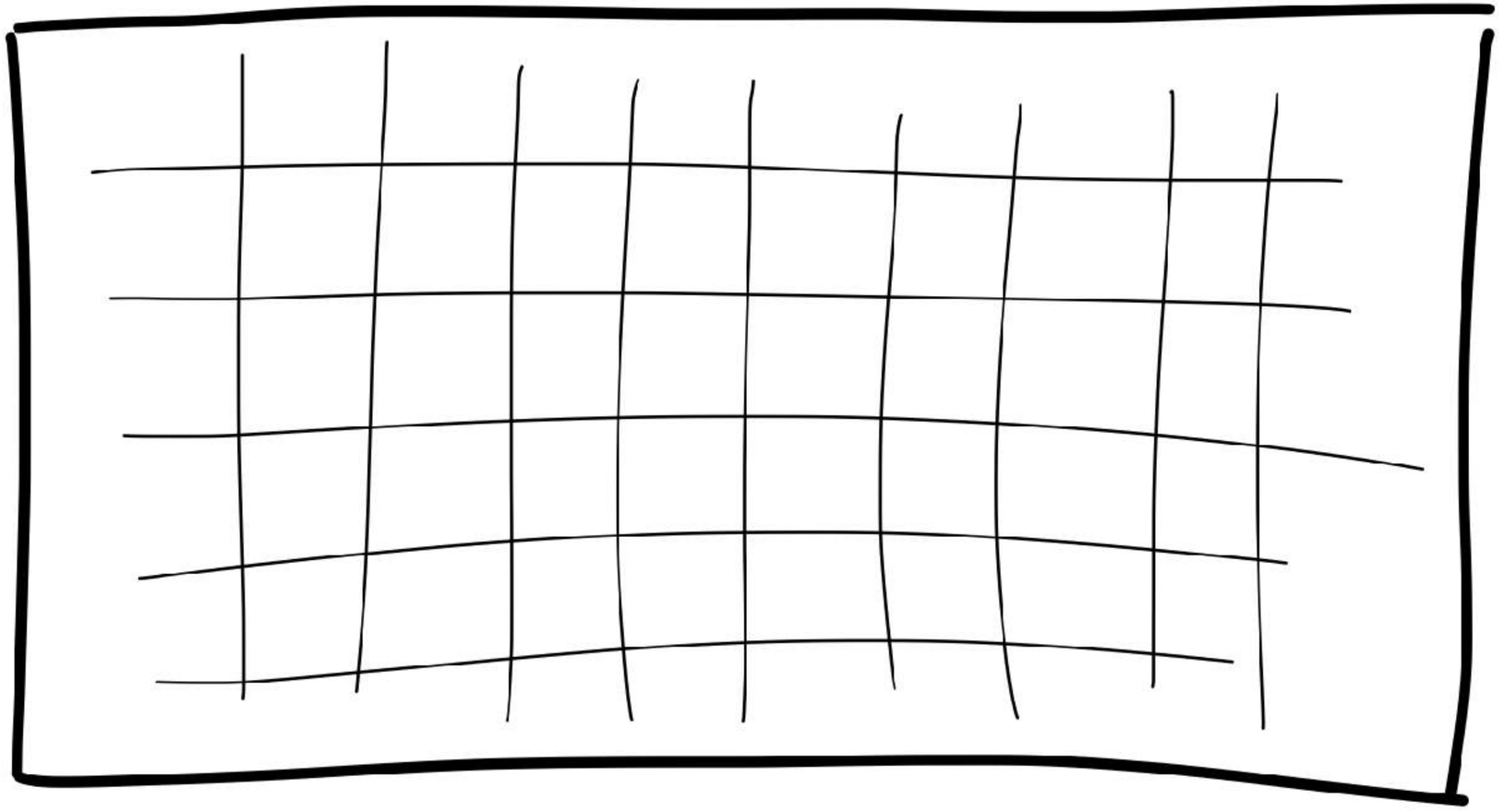


They don't need a DSL in finance...

They already have DSL in finance...

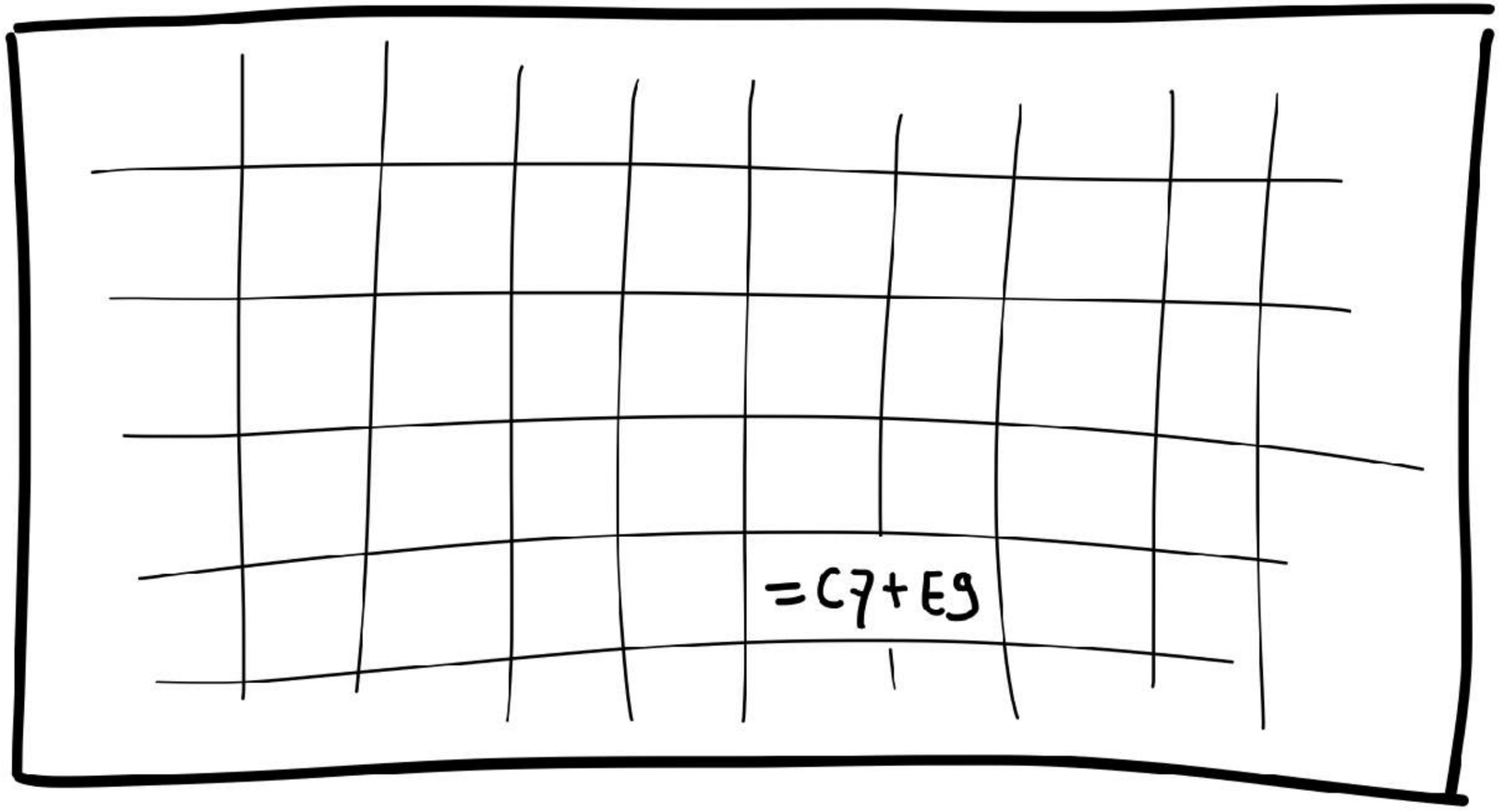
It's called Excel

Spreadsheets are code



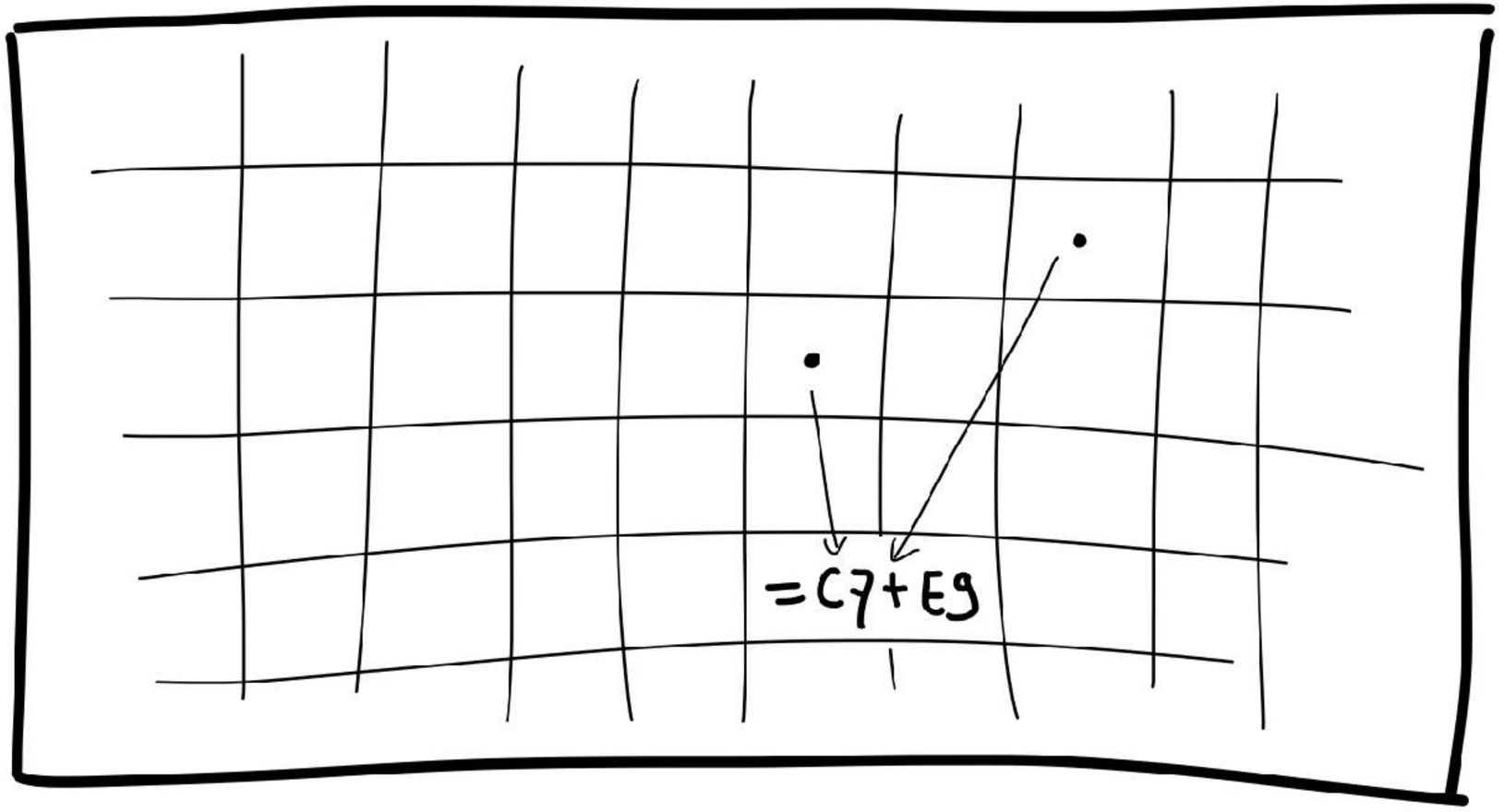
Spreadsheets are code

↑ functional



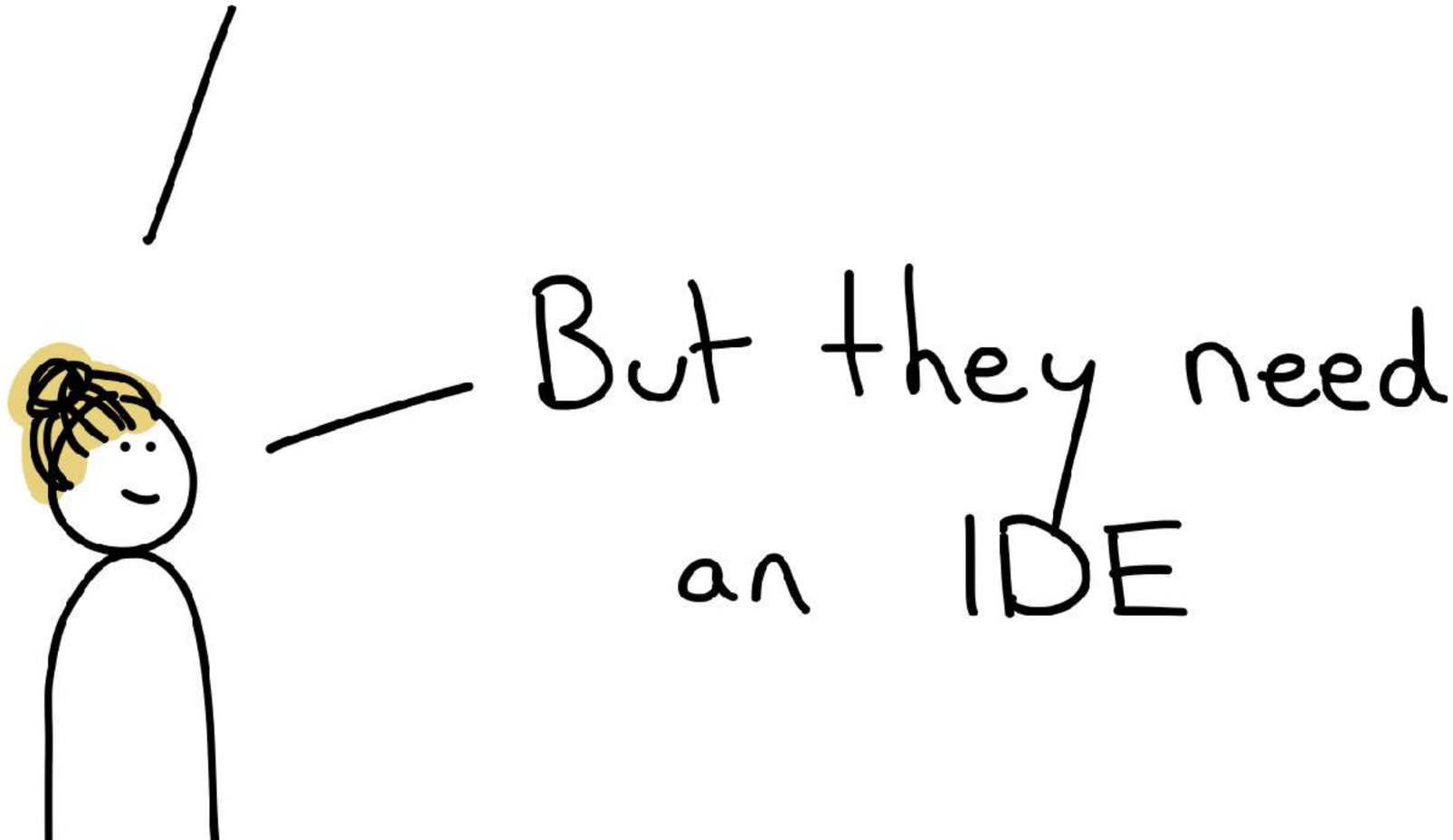
Spreadsheets are code

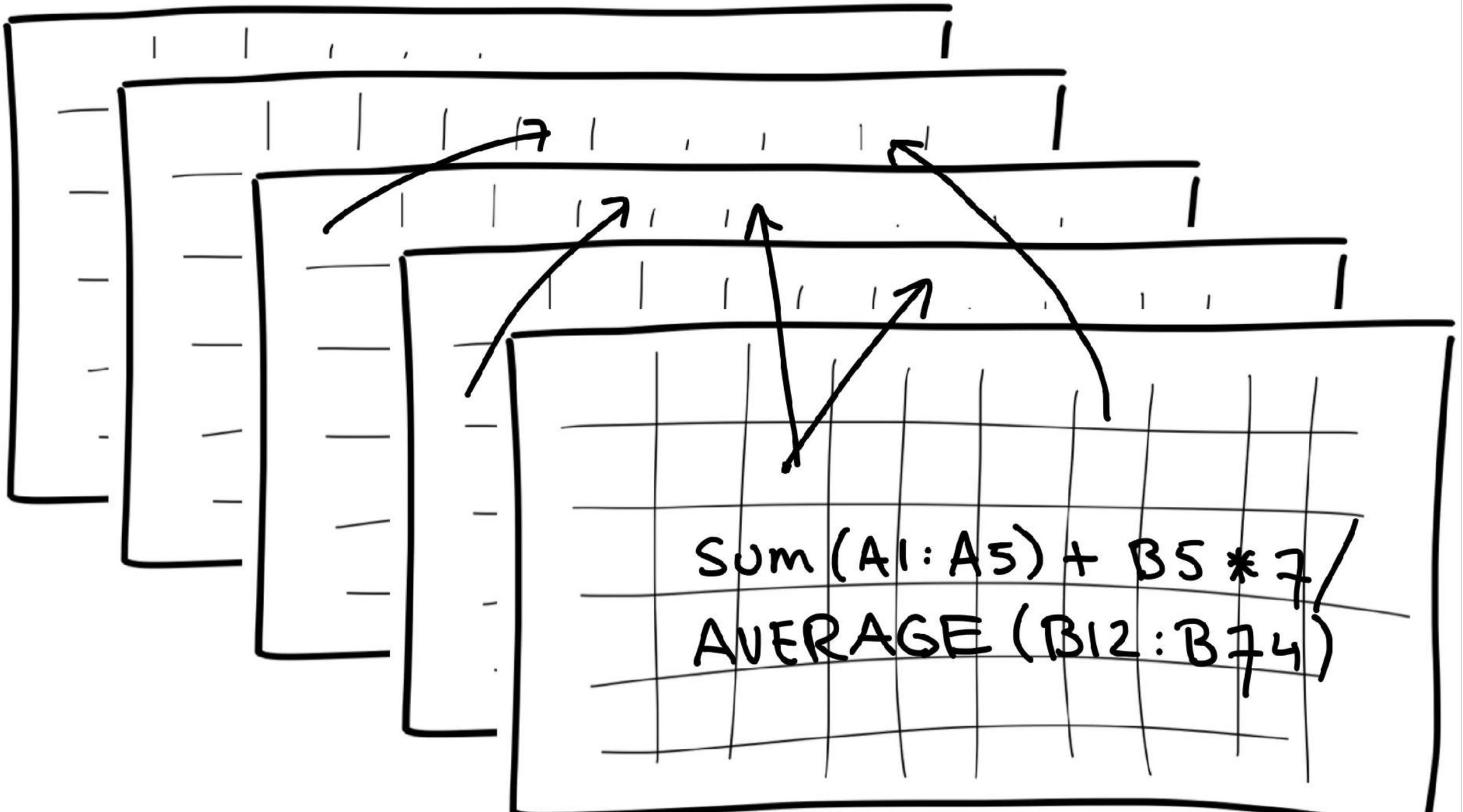
reactive



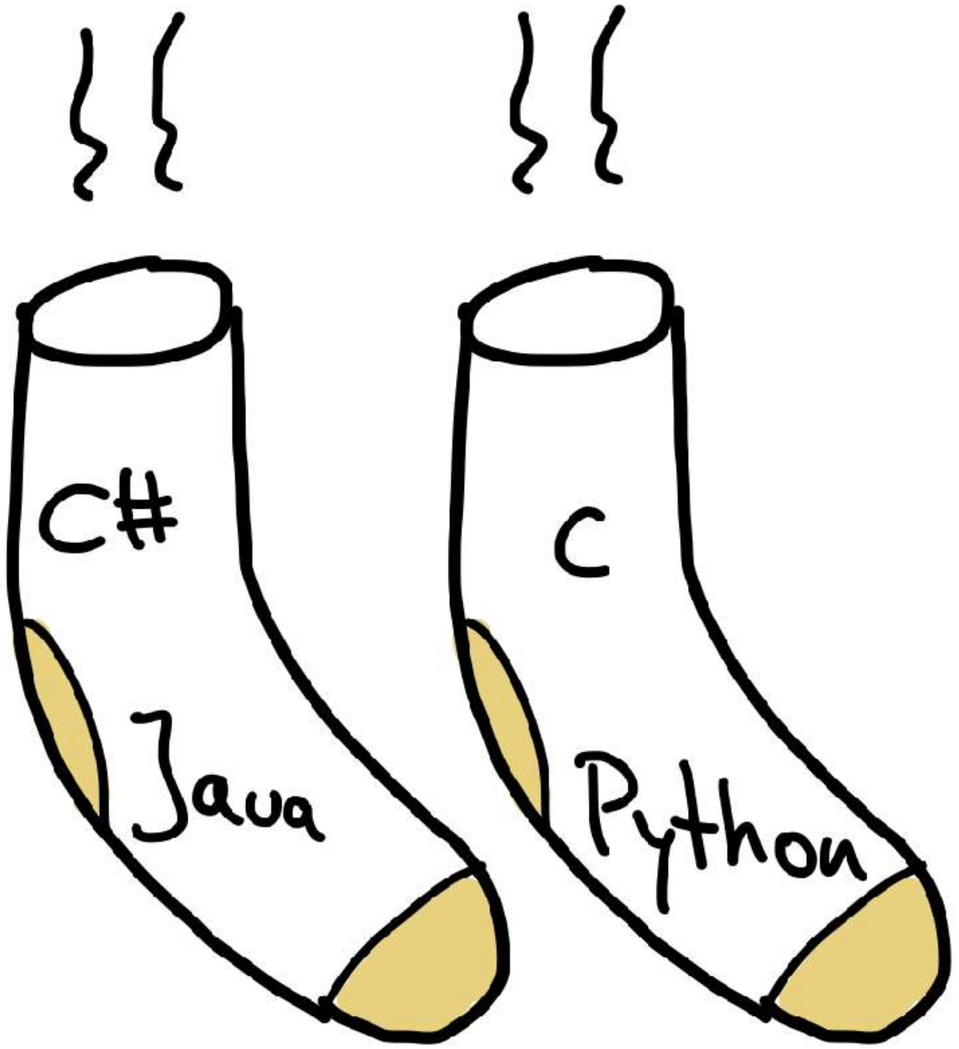
Spreadsheets are code

Spreadsheets are code



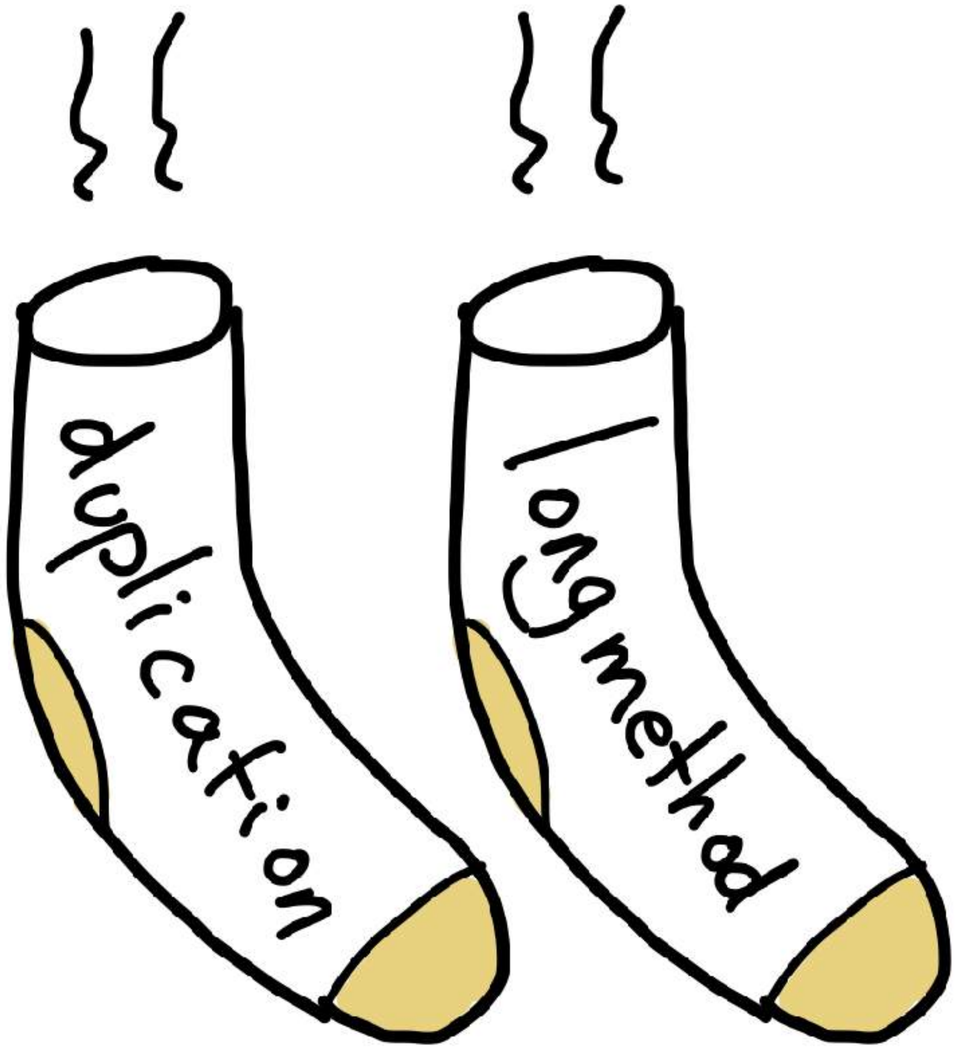

Sum(A1:A5) + B5 * 7
AVERAGE(B12:B74)

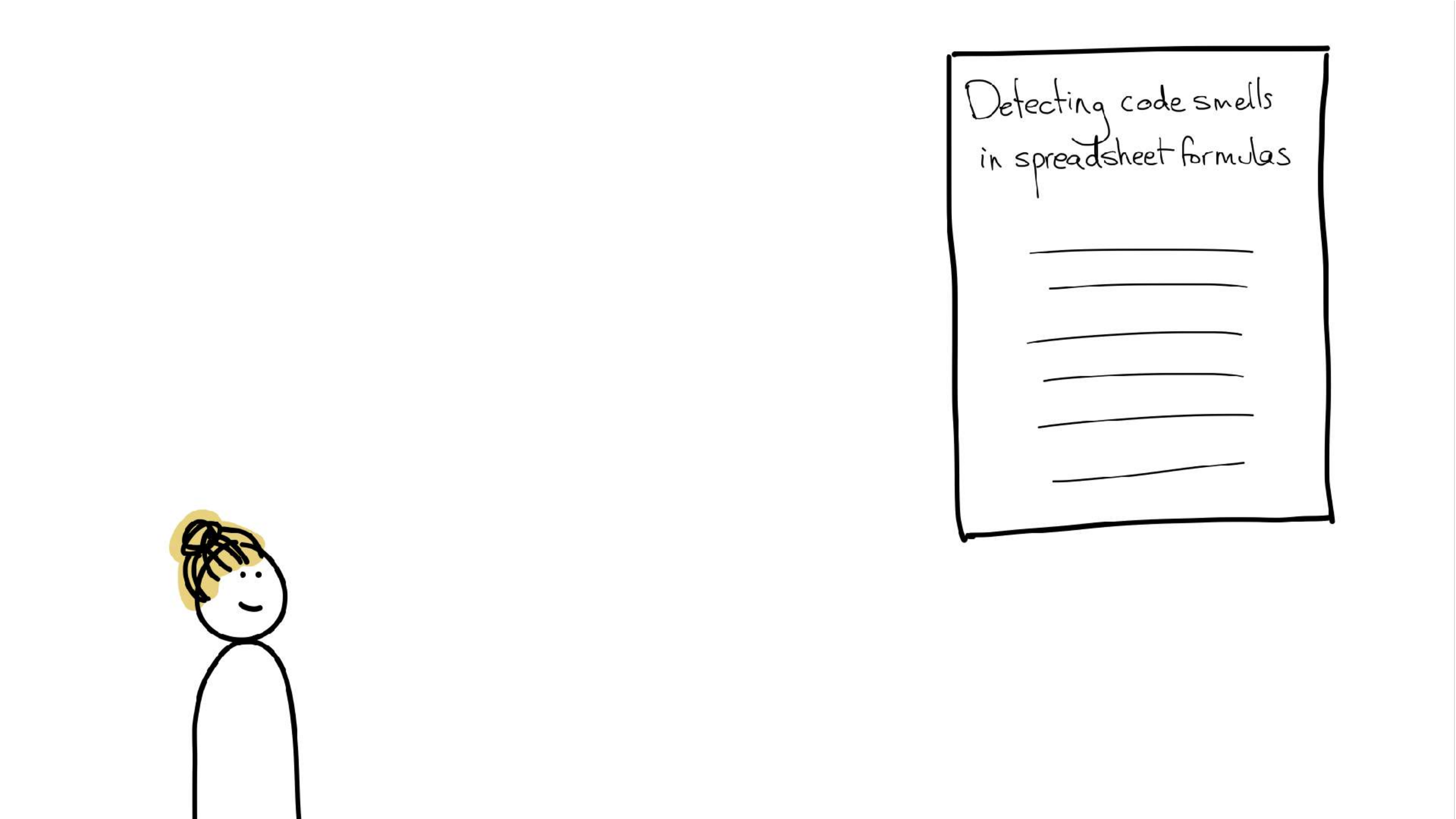
Code smells

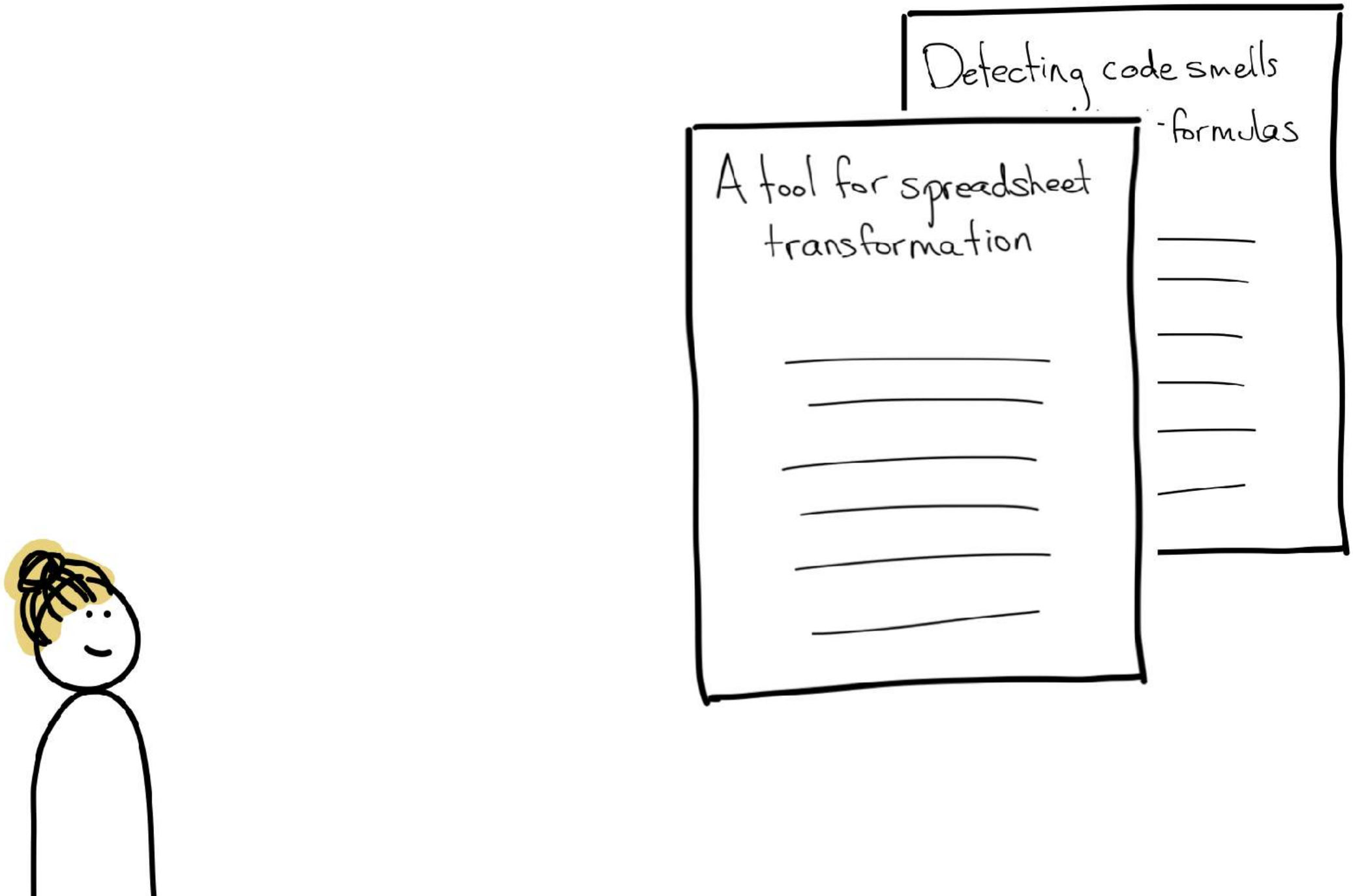


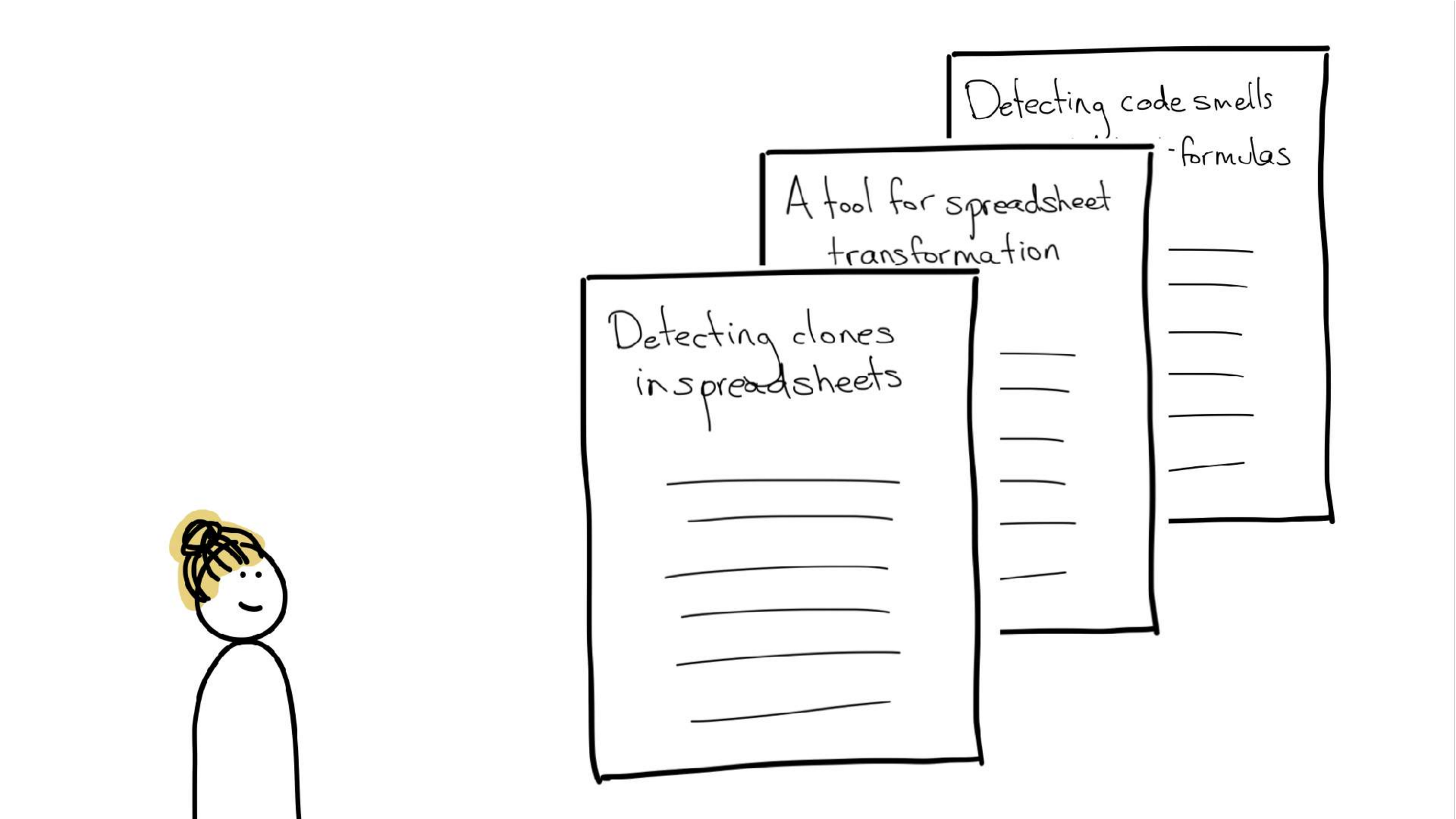
Code smells

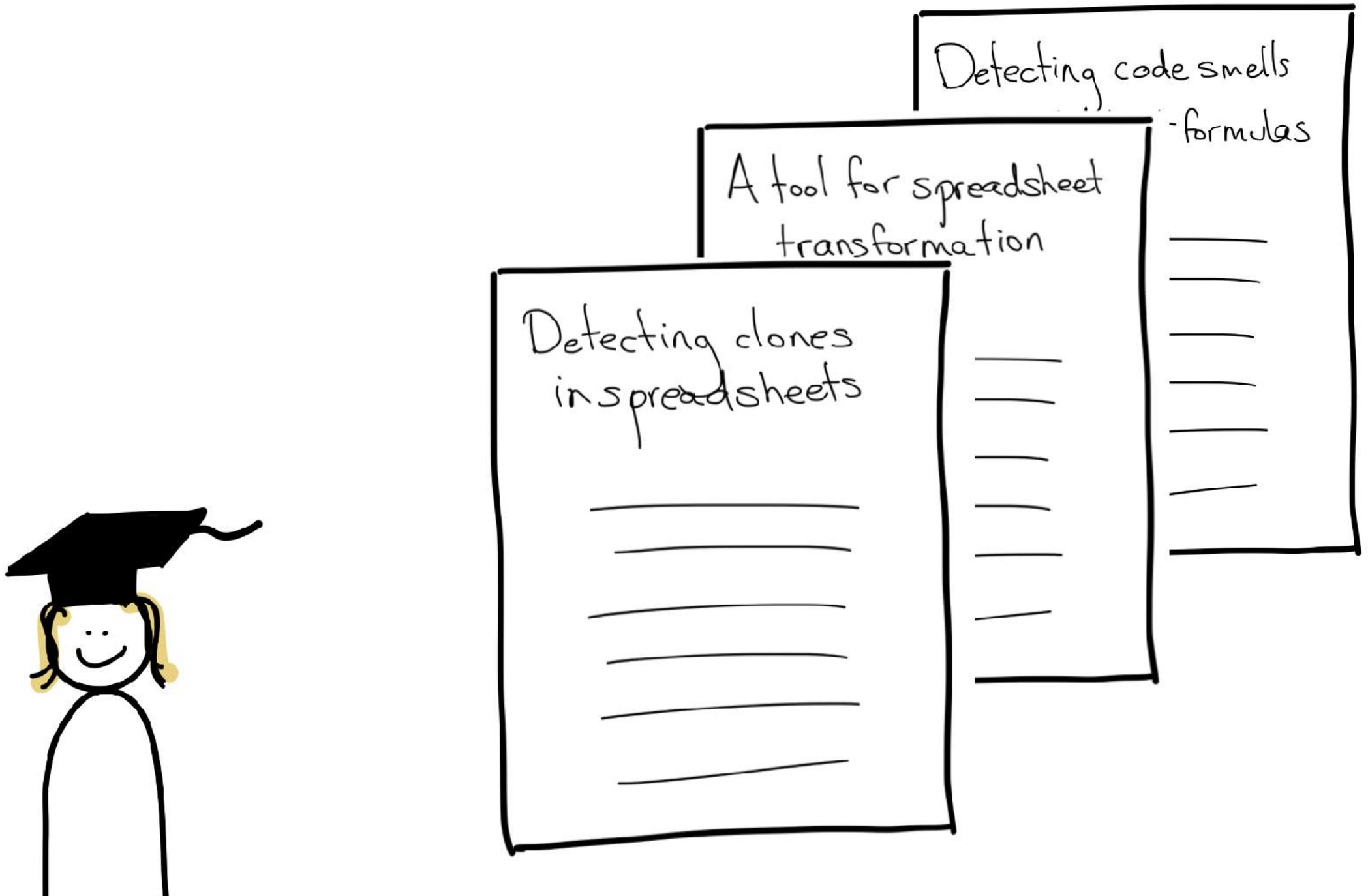
Code smells

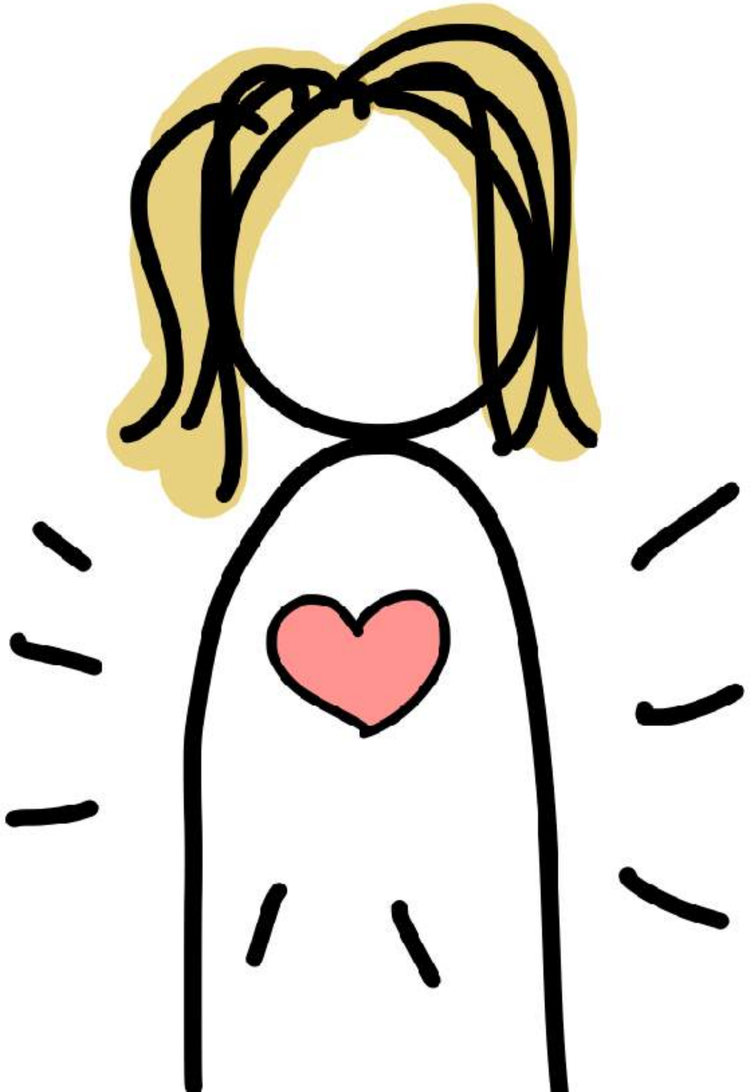



Detecting code smells
in spreadsheet formulas


Detecting code smells
- formulas
A tool for spreadsheet transformation

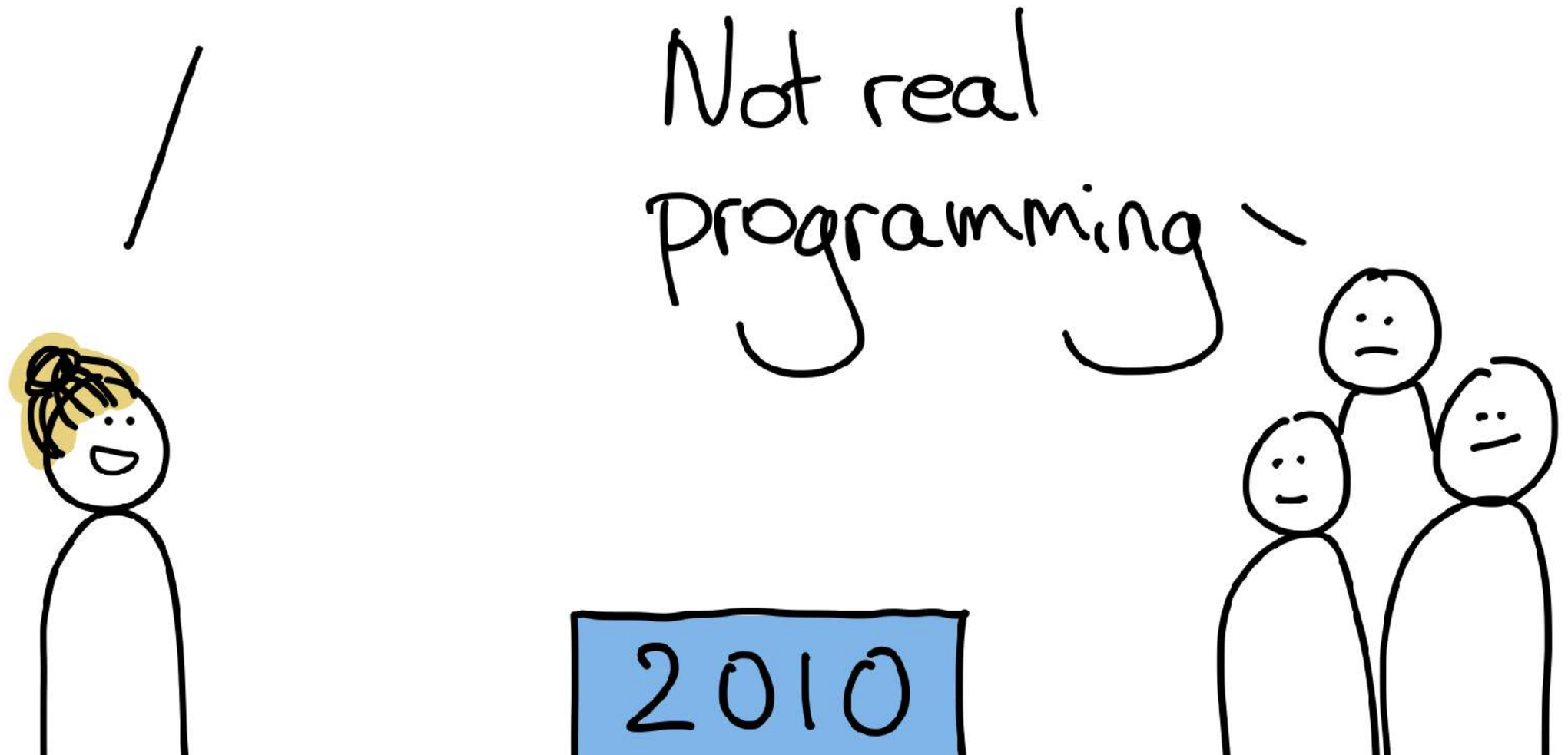

Detecting code smells
- formulas
A tool for spreadsheet transformation
Detecting clones in spreadsheets


Detecting code smells
- formulas
A tool for spreadsheet transformation
Detecting clones in spreadsheets



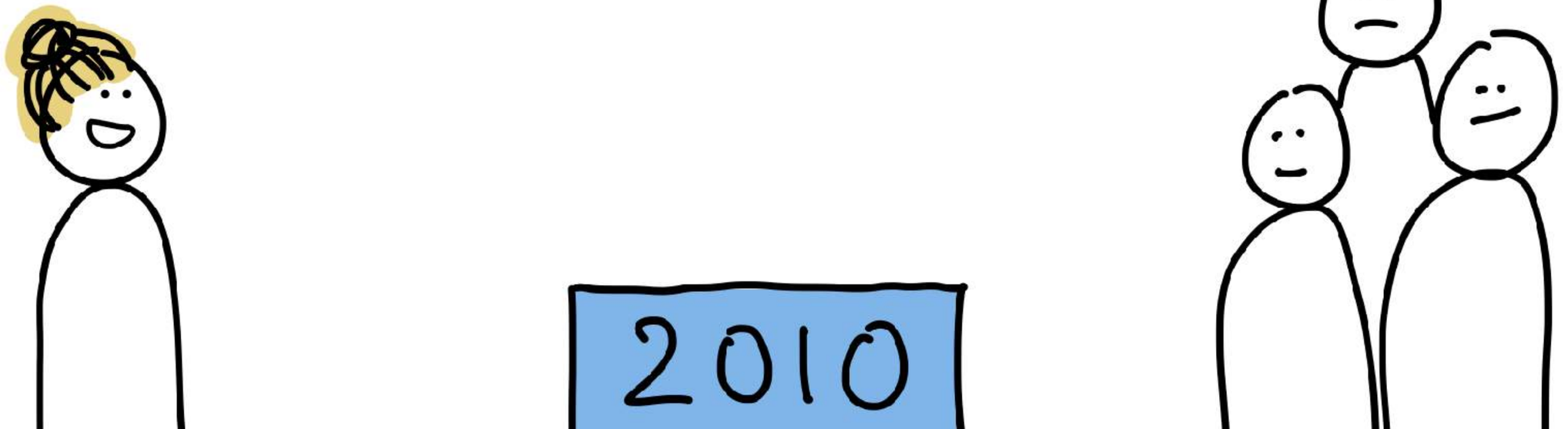
Spreadsheets are code

Spreadsheets are code

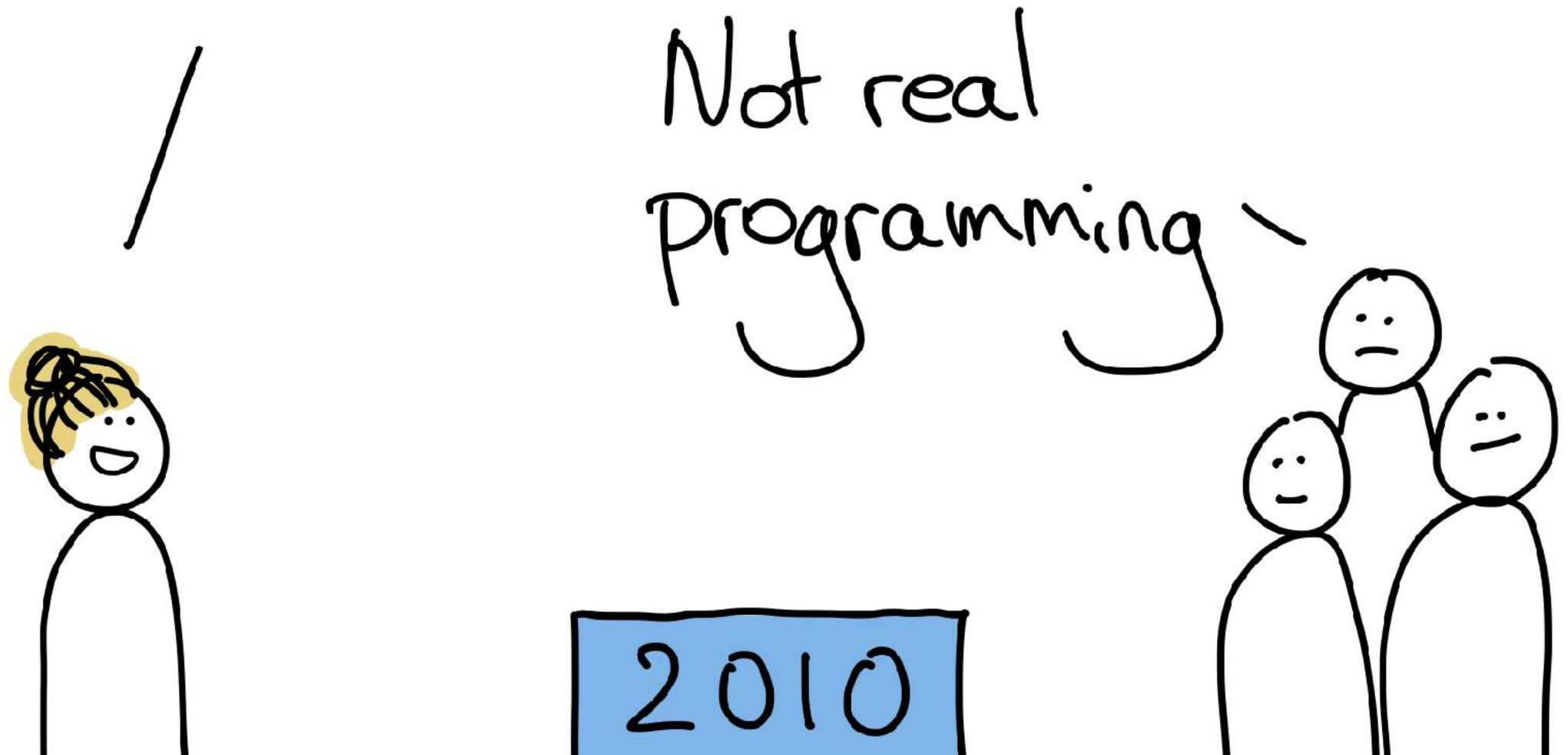


Spreadsheets are code

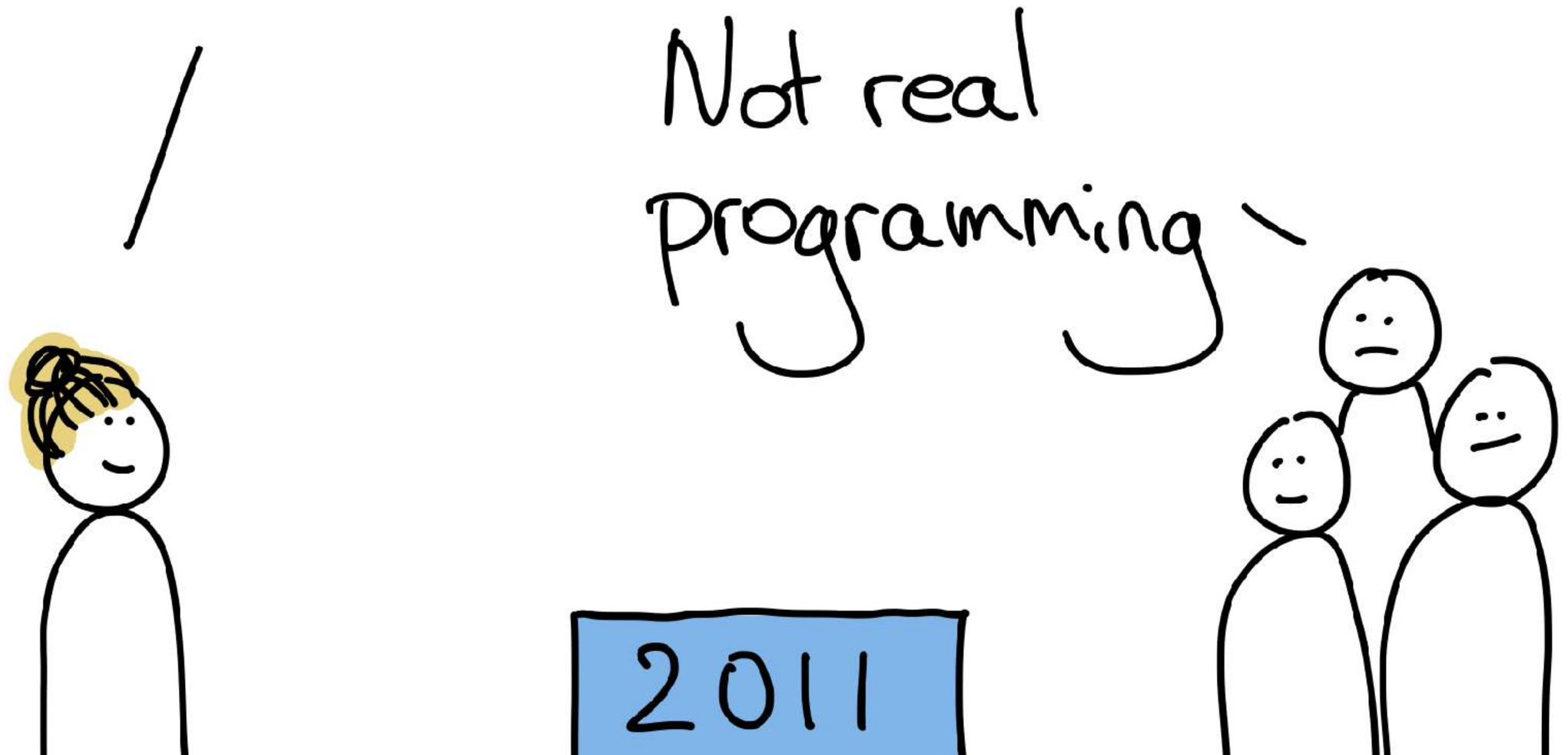
But... Functional & reactive!



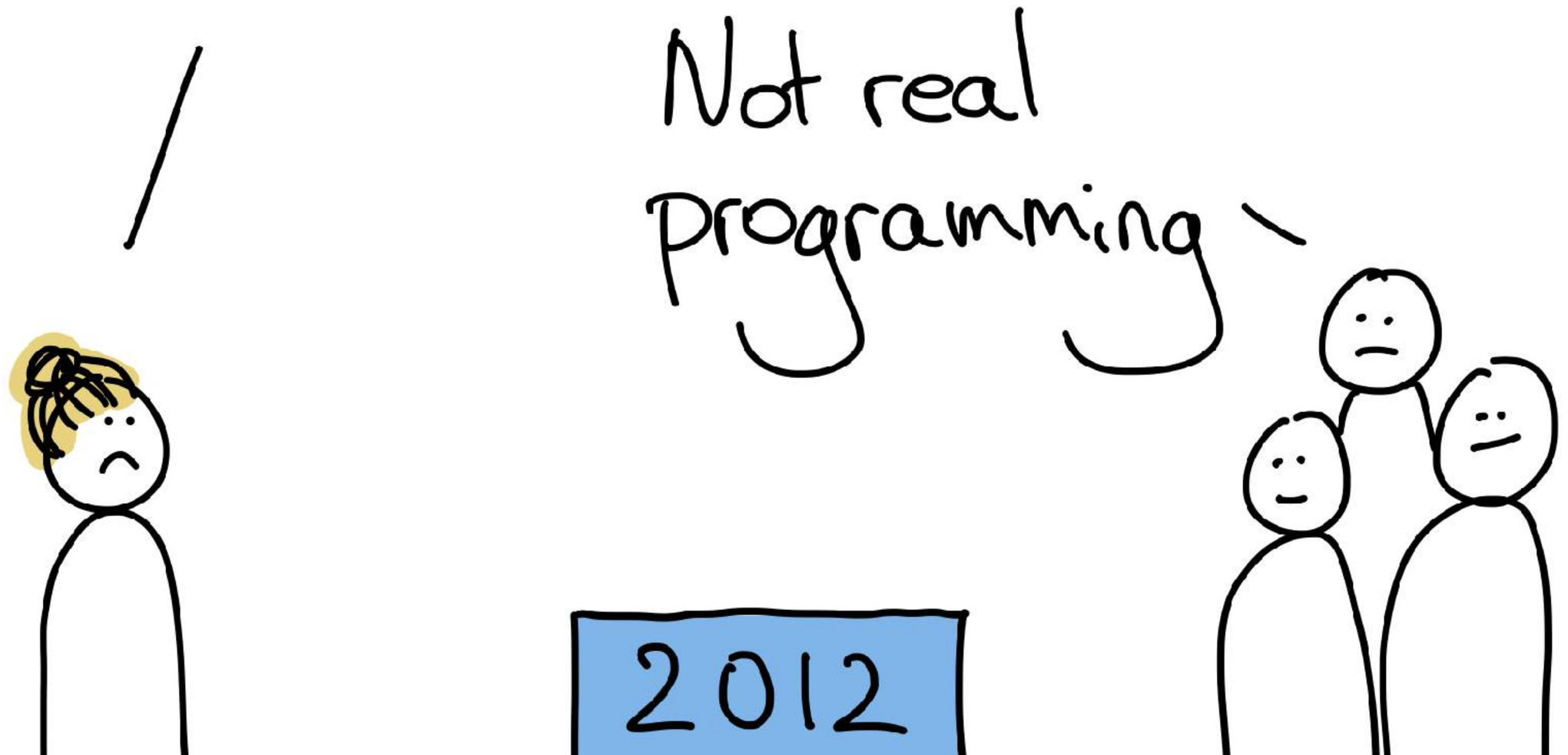
Spreadsheets are code



Spreadsheets are code

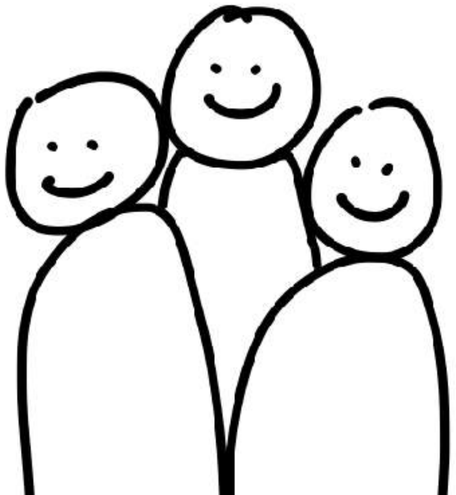


Spreadsheets are code



I ♥ running

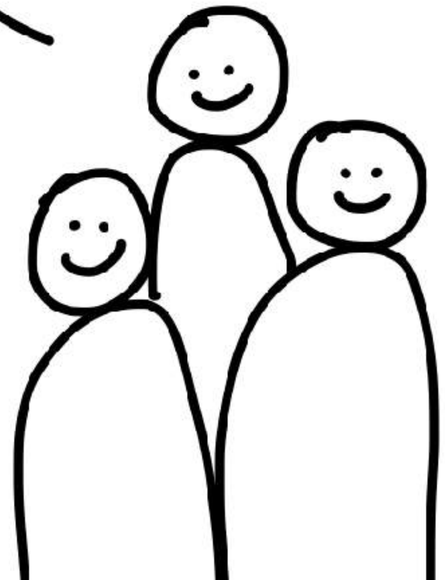
so do we!



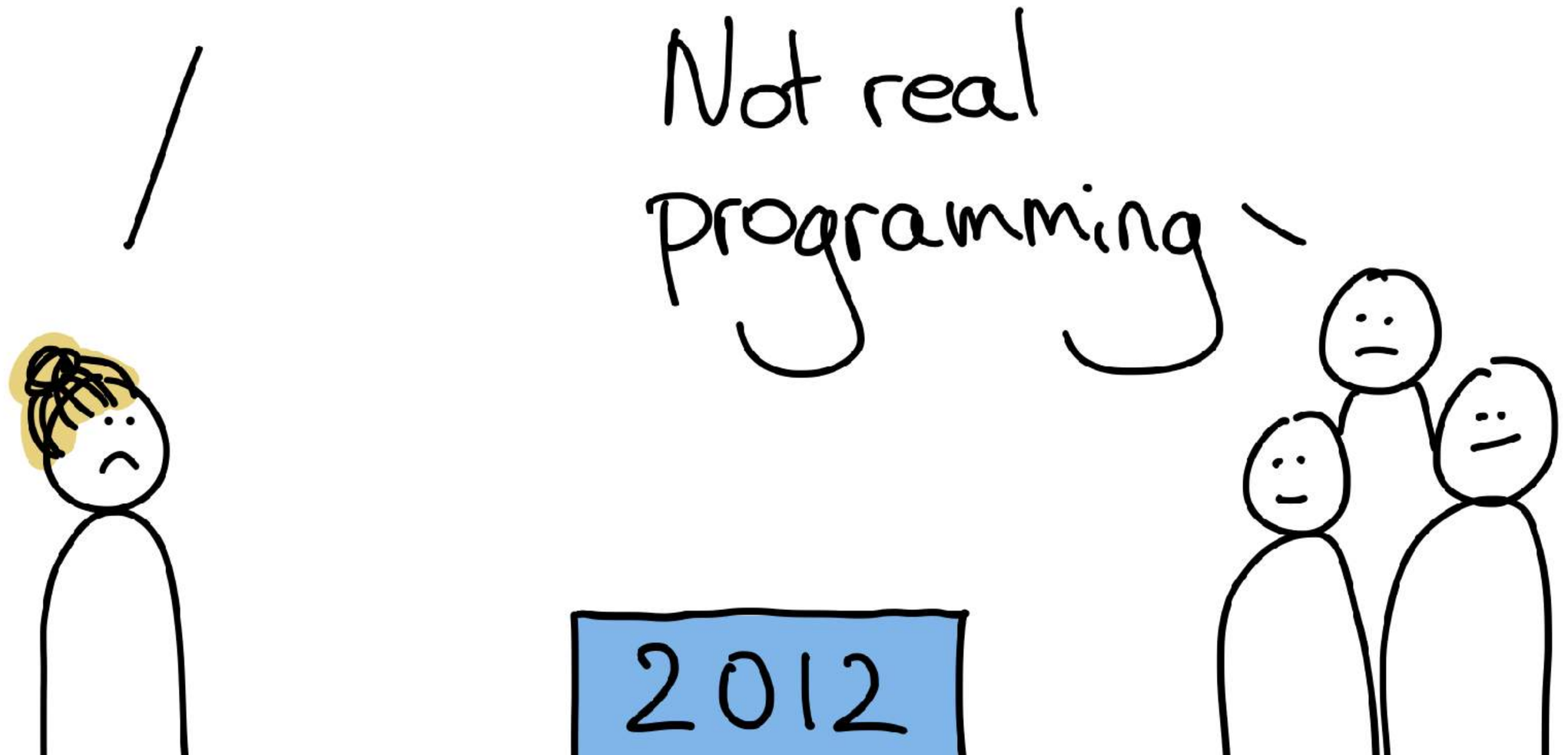
I ♥ knitting

so do we!

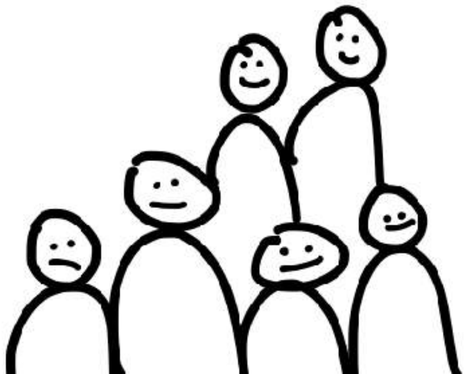
2016



Spreadsheets are code

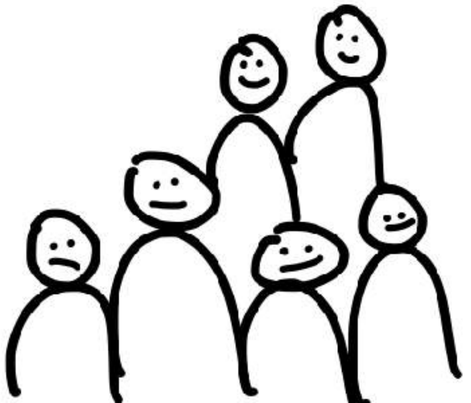


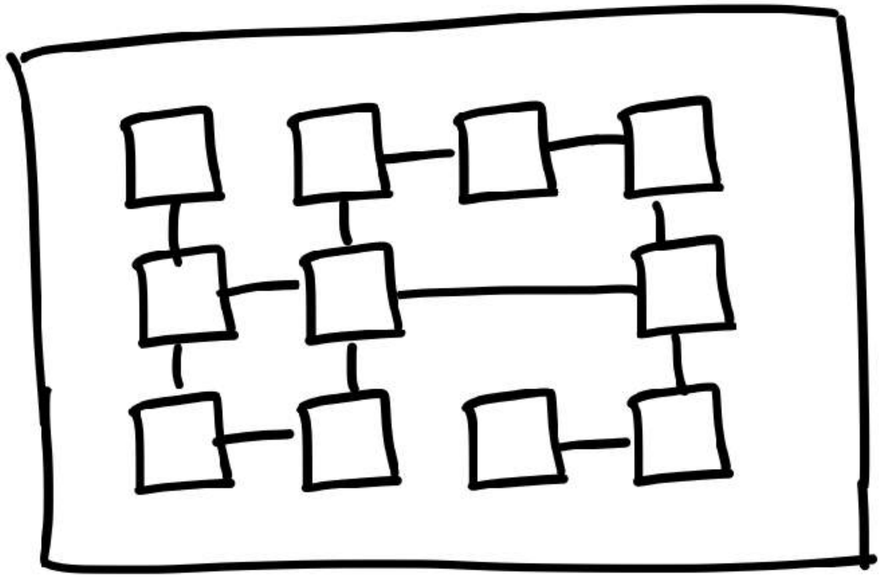
We'd love to learn programming

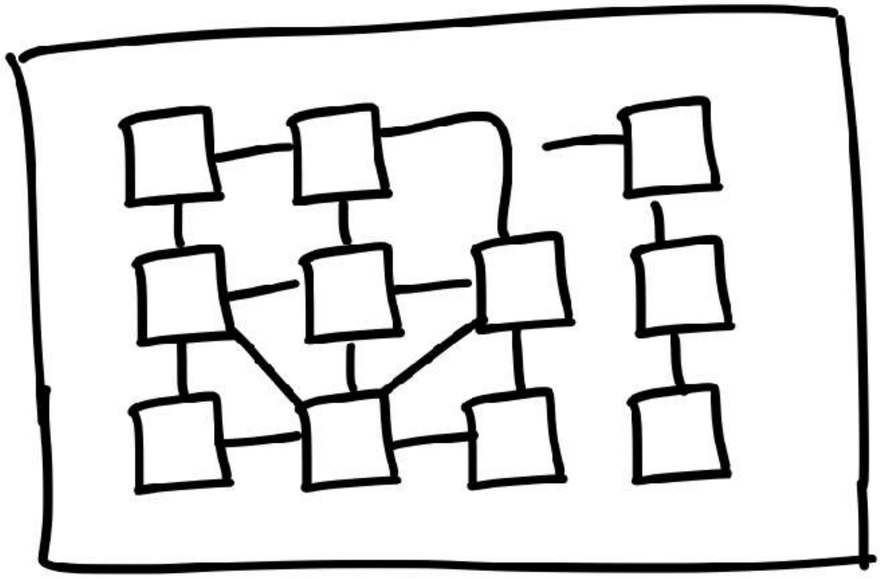


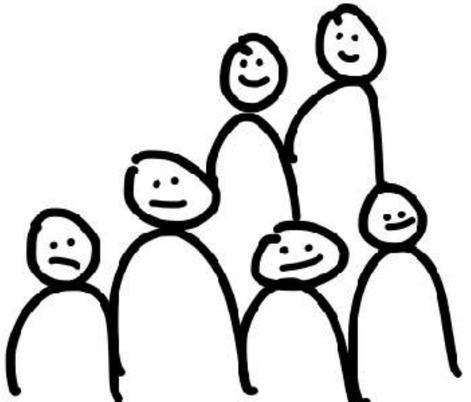
Yeah!

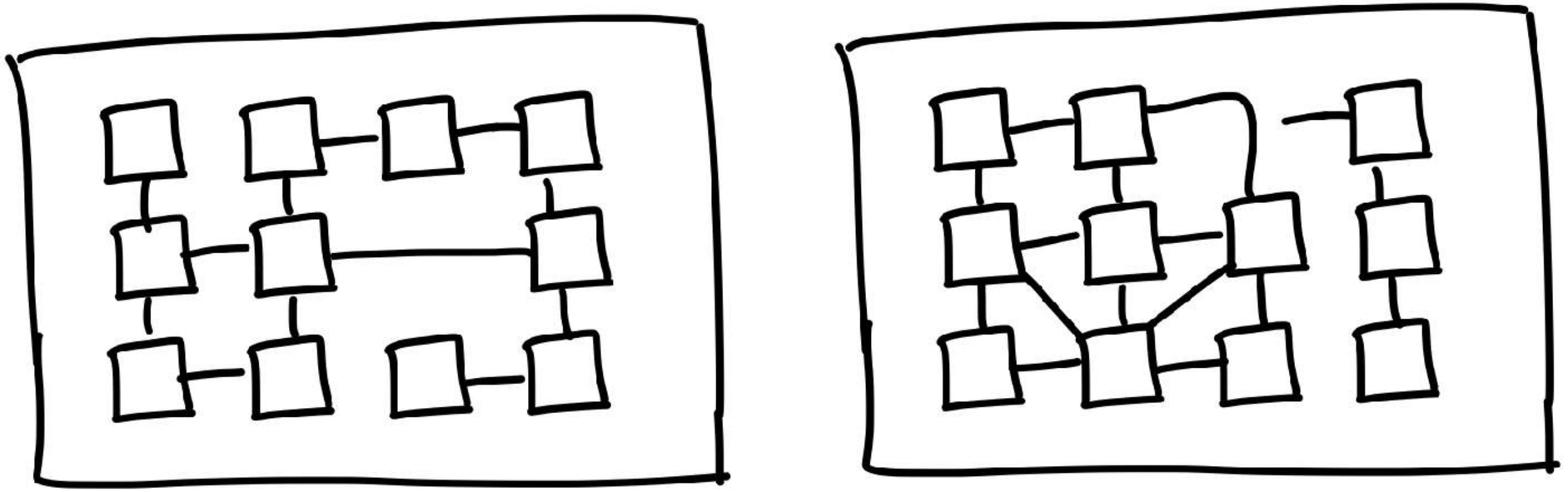
Let's program a LEGO robot

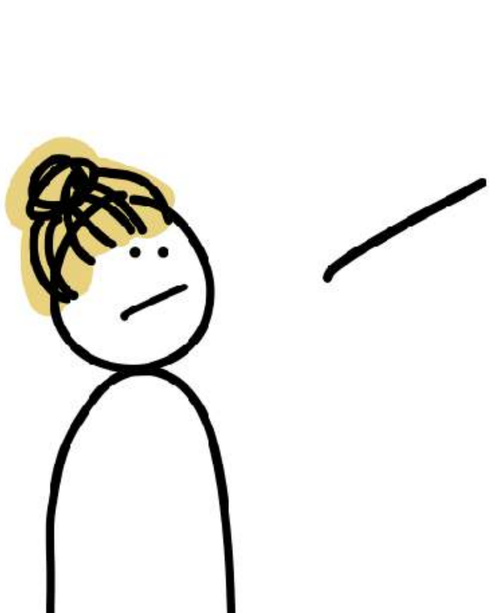




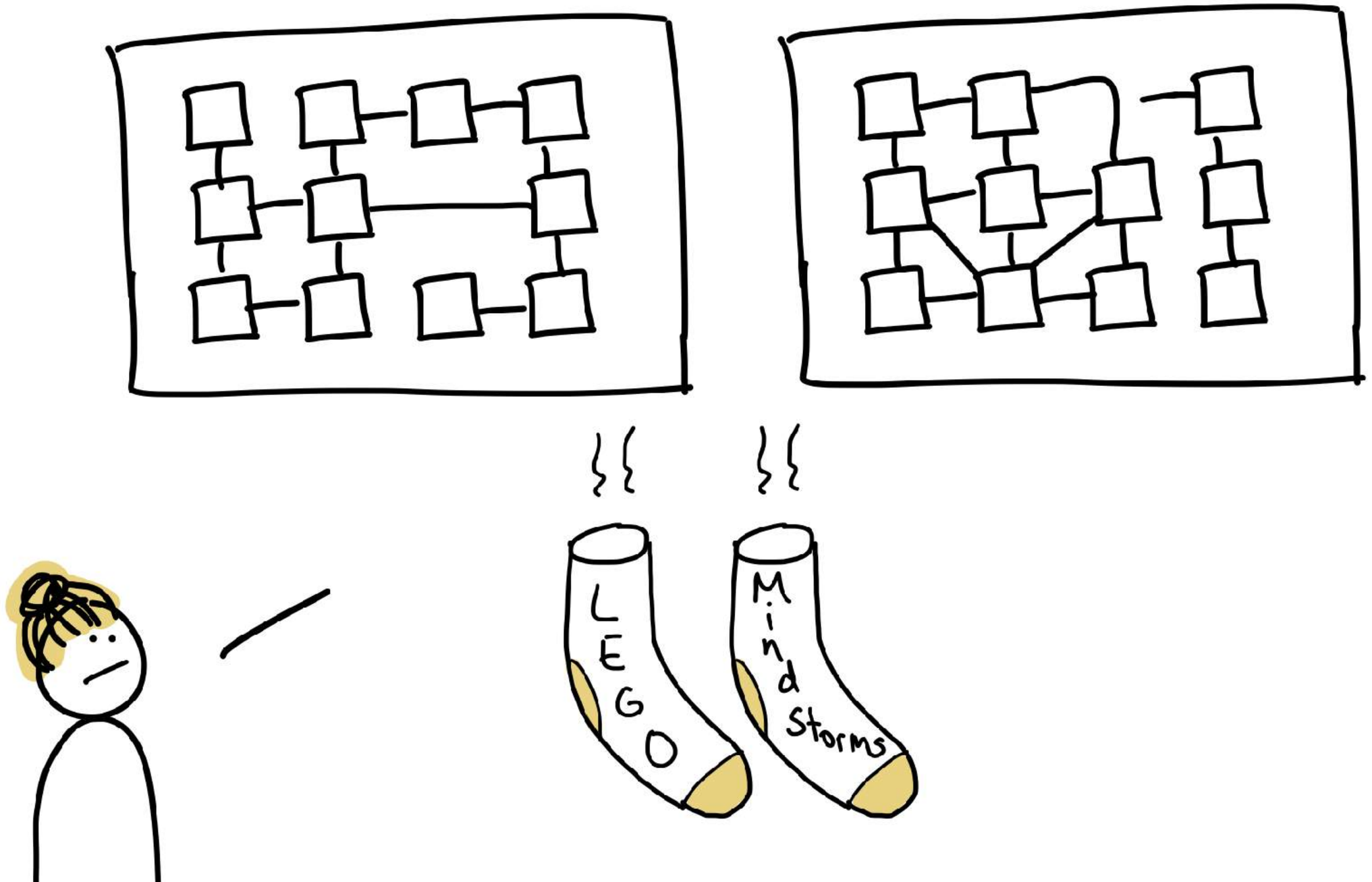


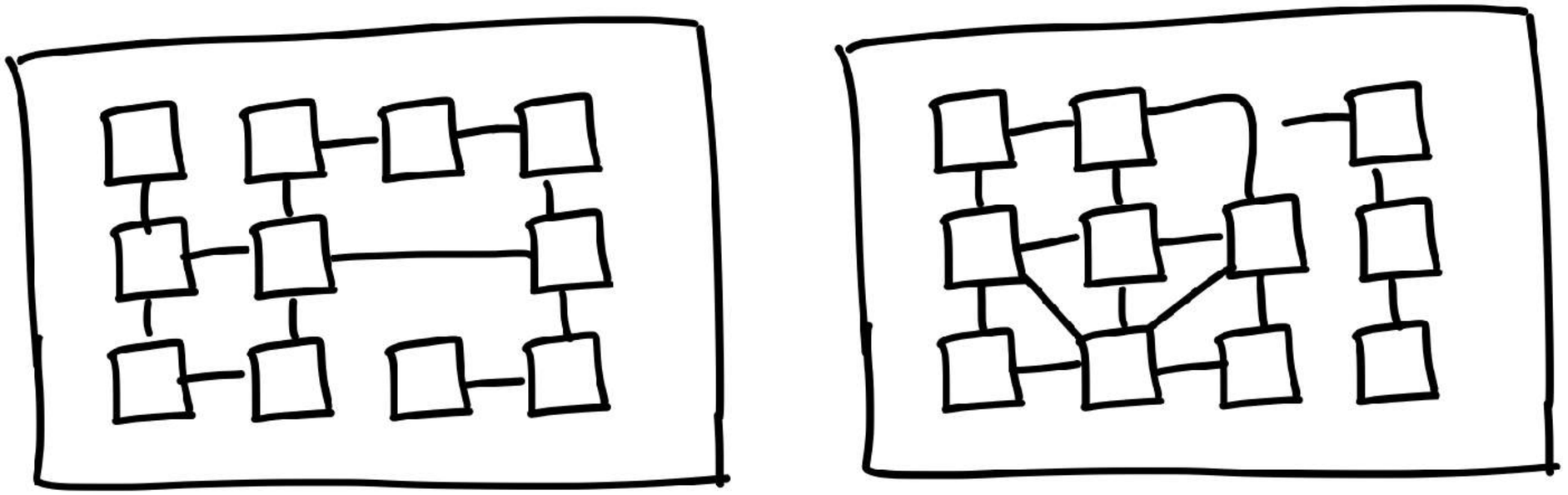


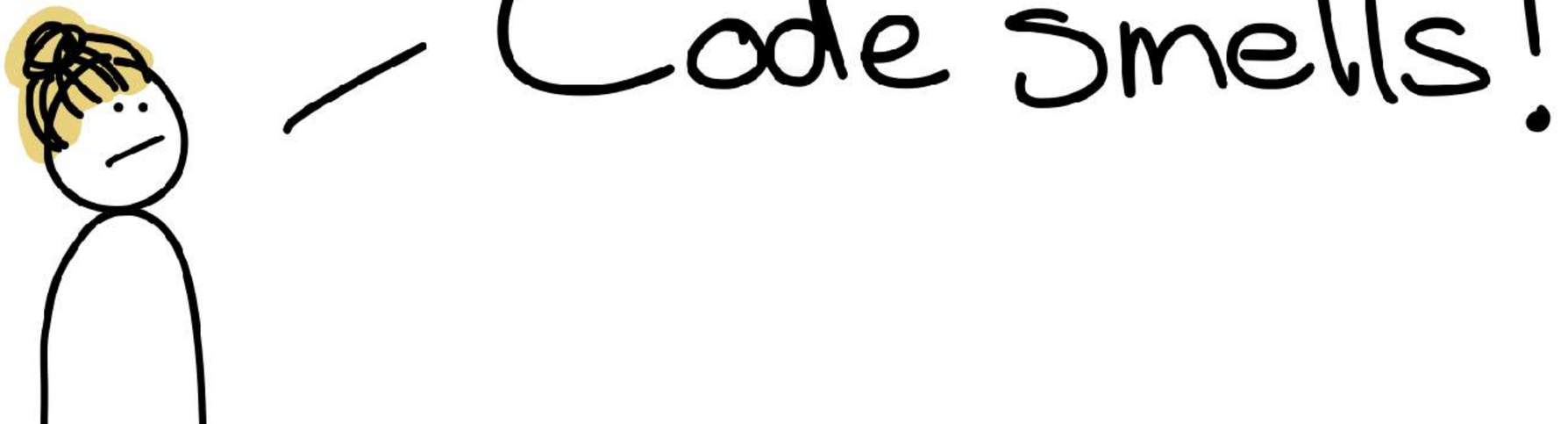


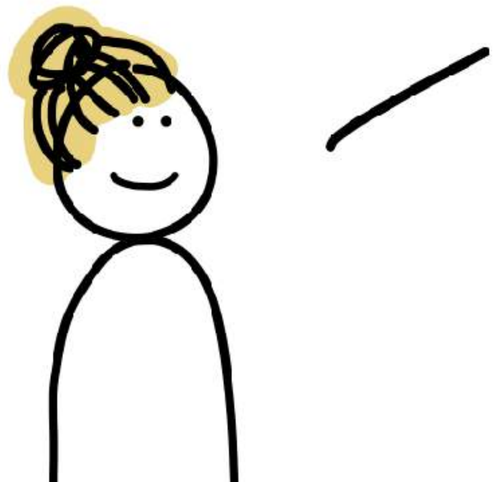


I've seen this before...


LEGO
Mind Storms



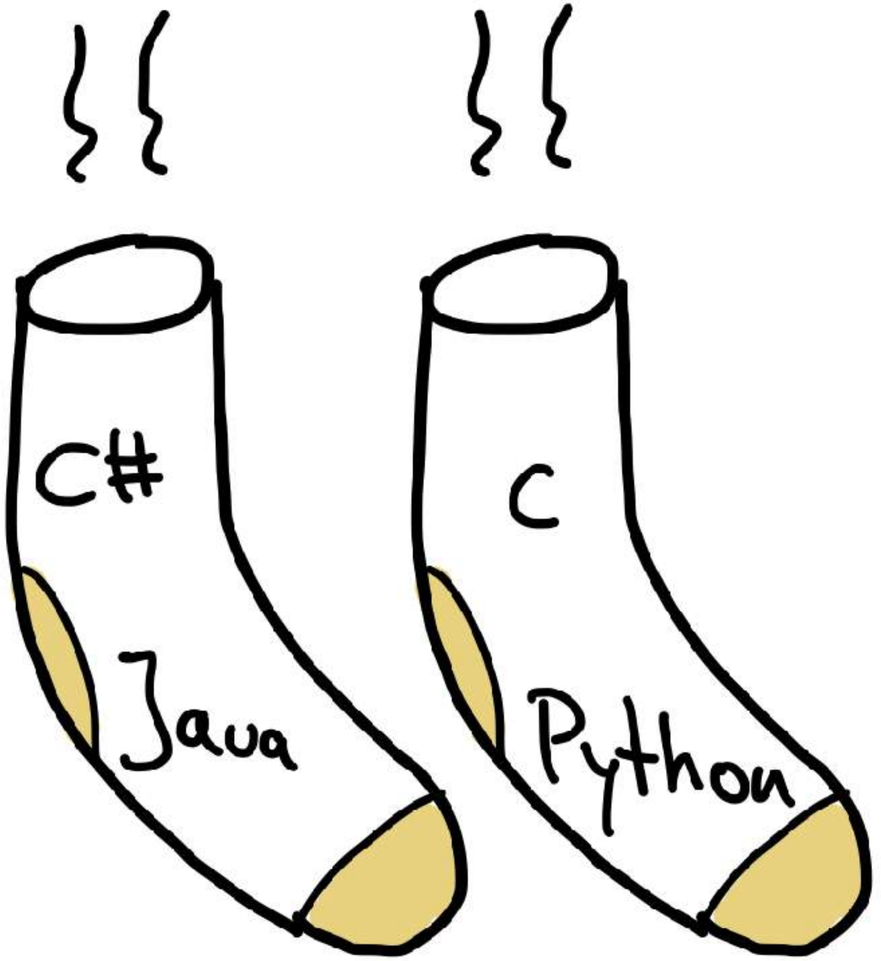

Code smells!



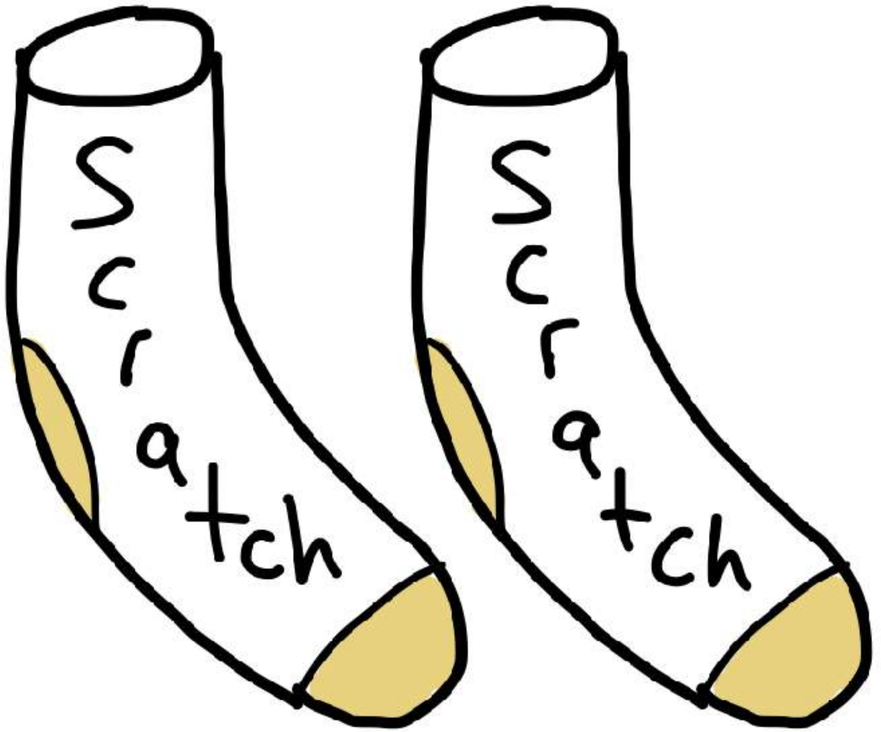
Just one little paper

Smells in block-based languages

Are smells bad?

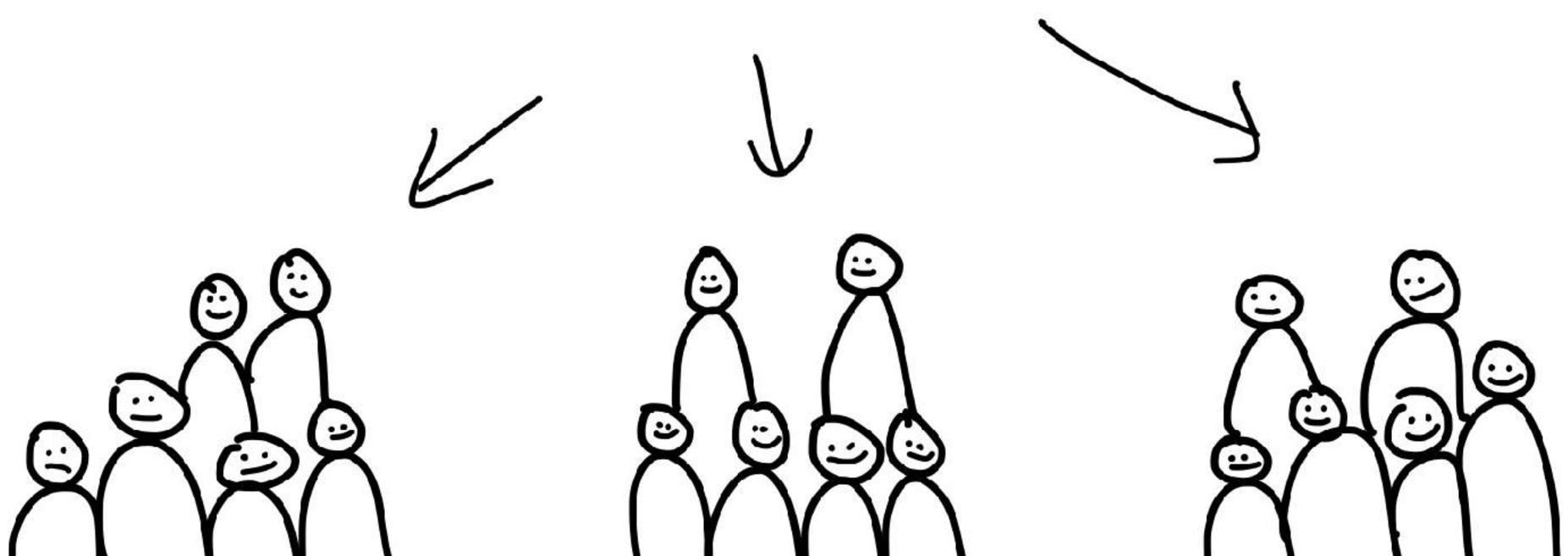


Are smells bad?



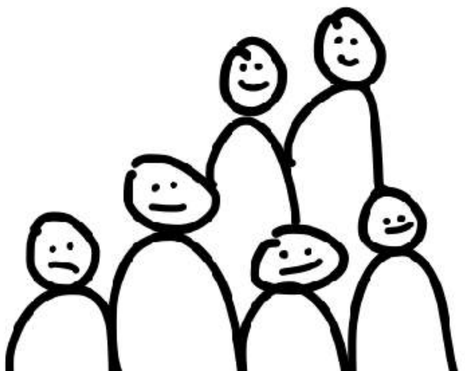
Are smells bad?

Fresh kids

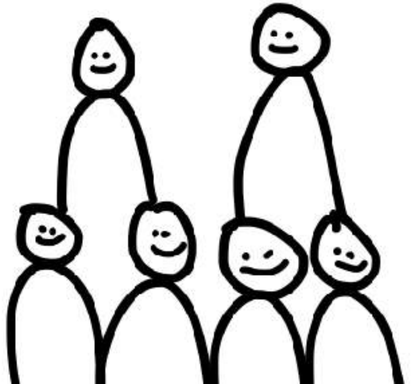


Are smells bad?

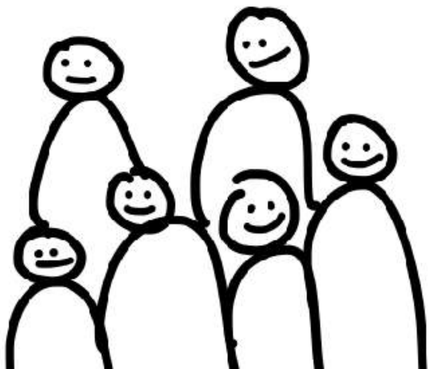
Nice code



Duplication



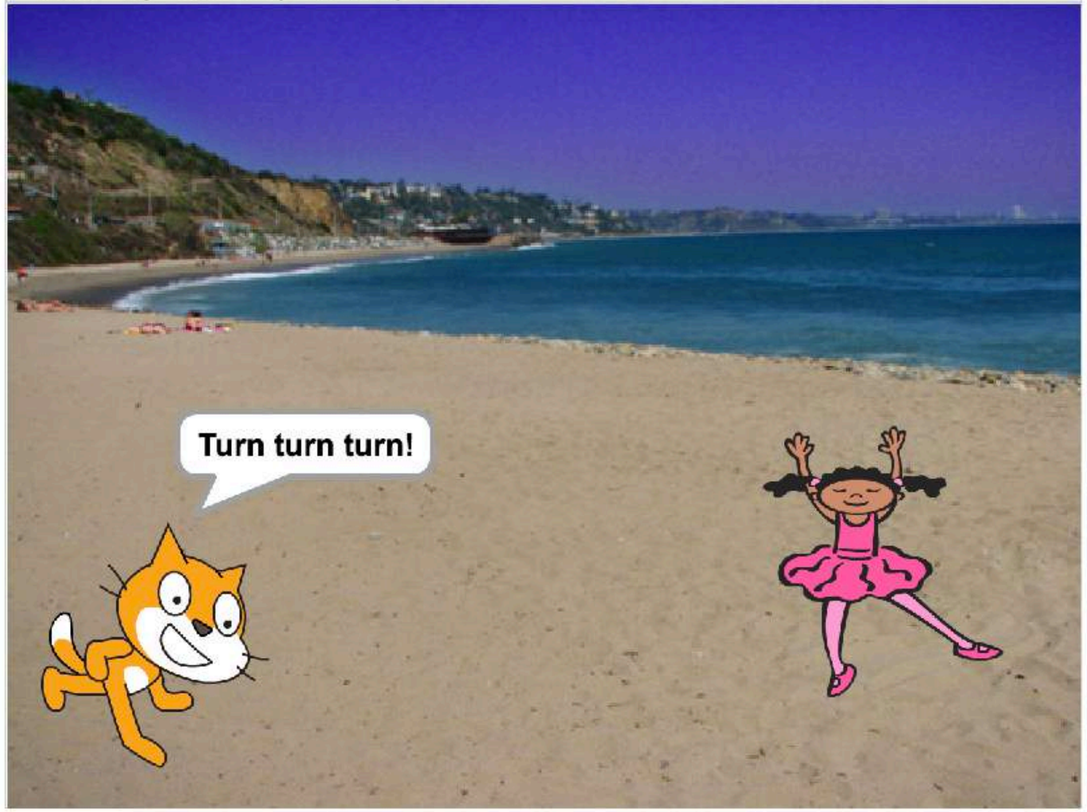
Long method



Secure | https://scratch.mit.edu/projects/200832937/#editor

SCRATCH | File | Edit | Tips | About | Save now | Felienne

Turn!
by Felienne (unshared)
v459.1



x: 222 y: 180

Sprites | New sprite:

Stage
2 backdrops

Sprite1

Ballerina

New backdrop:

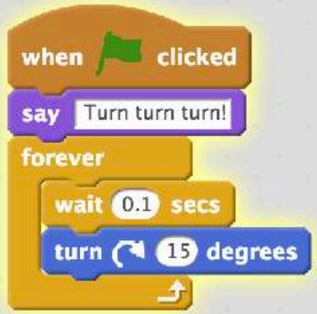
Scripts | Costumes | Sounds

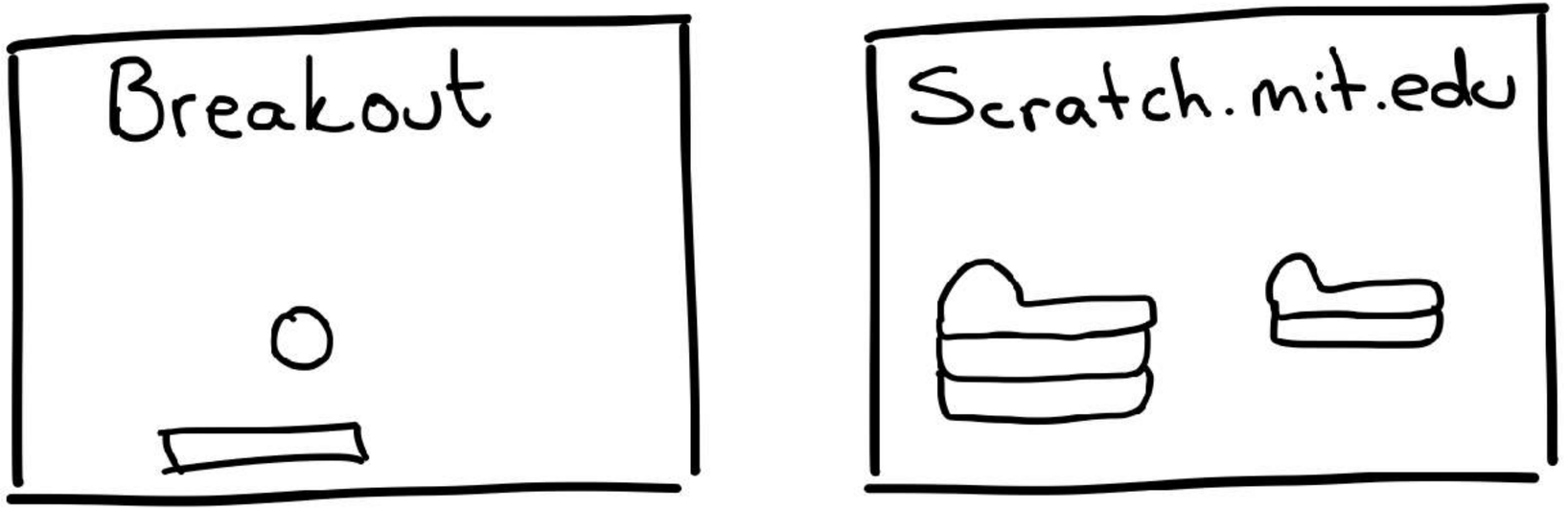
Share | See project page

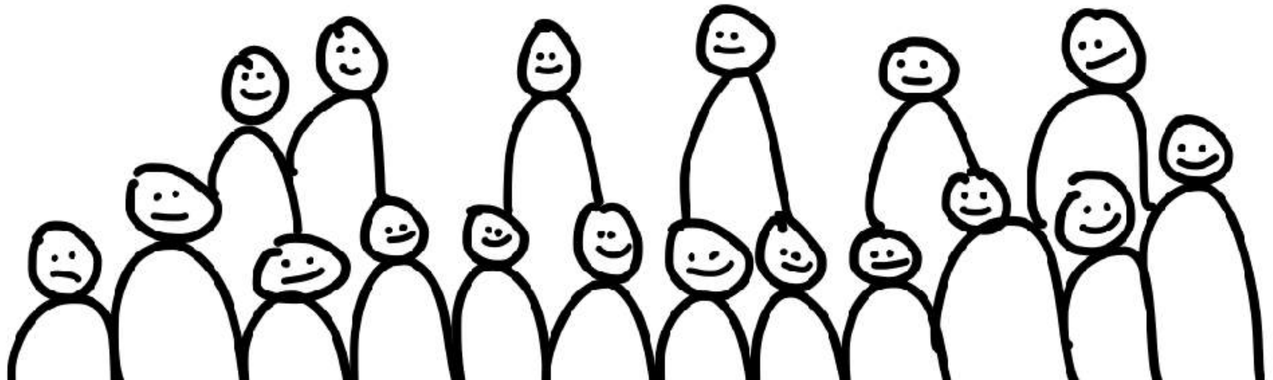
Motion | Looks | Sound | Pen | Data | Events | Control | Sensing | Operators | More Blocks

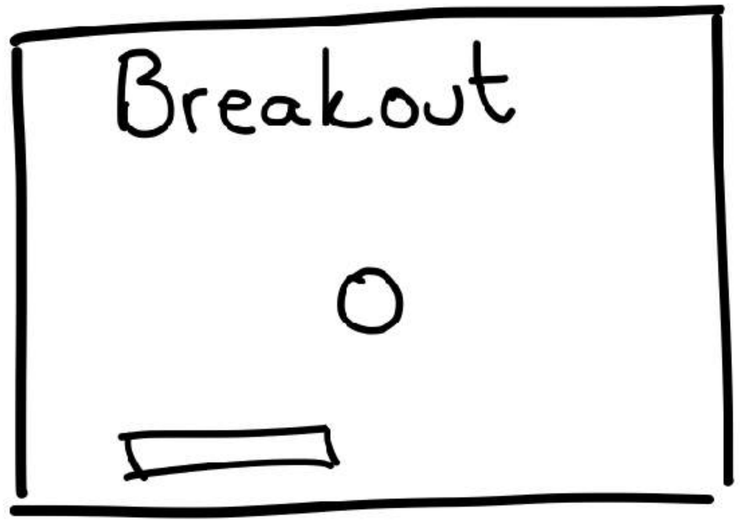
say Hello! for 2 secs
say Hello!
think Hmm... for 2 secs
think Hmm...
show
hide
switch costume to costume2
next costume
switch backdrop to beach malibu
change color effect by 25
set color effect to 0
clear graphic effects
change size by 10

x: -171
y: -105



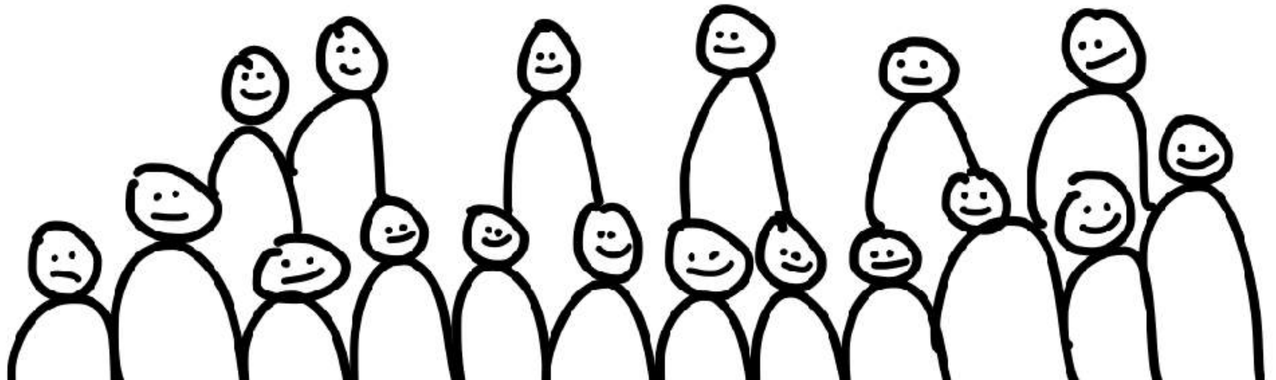

Breakout
Scratch.mit.edu



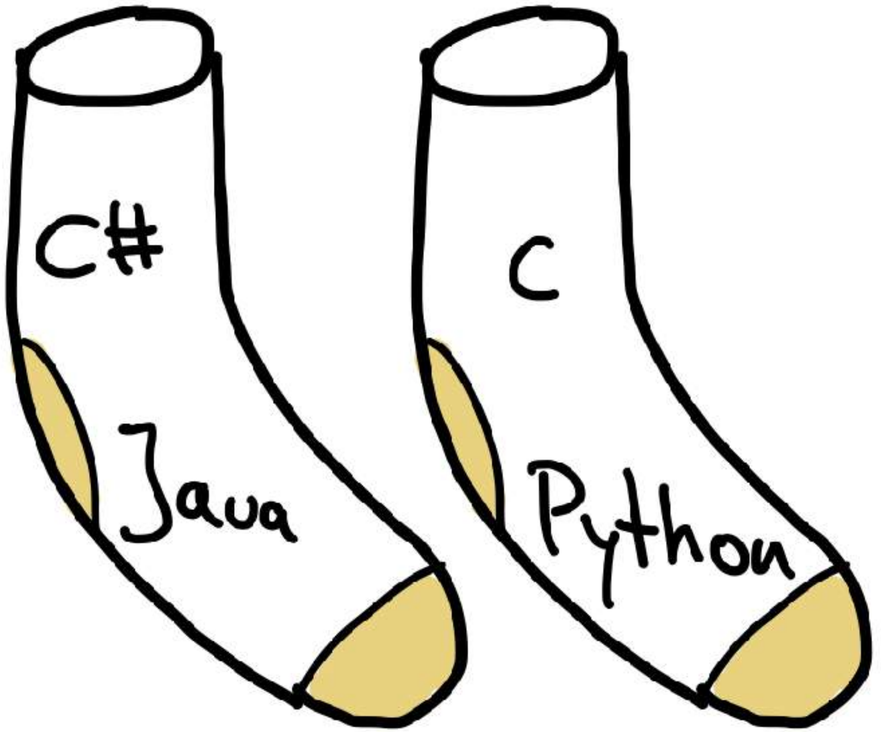


— Explain

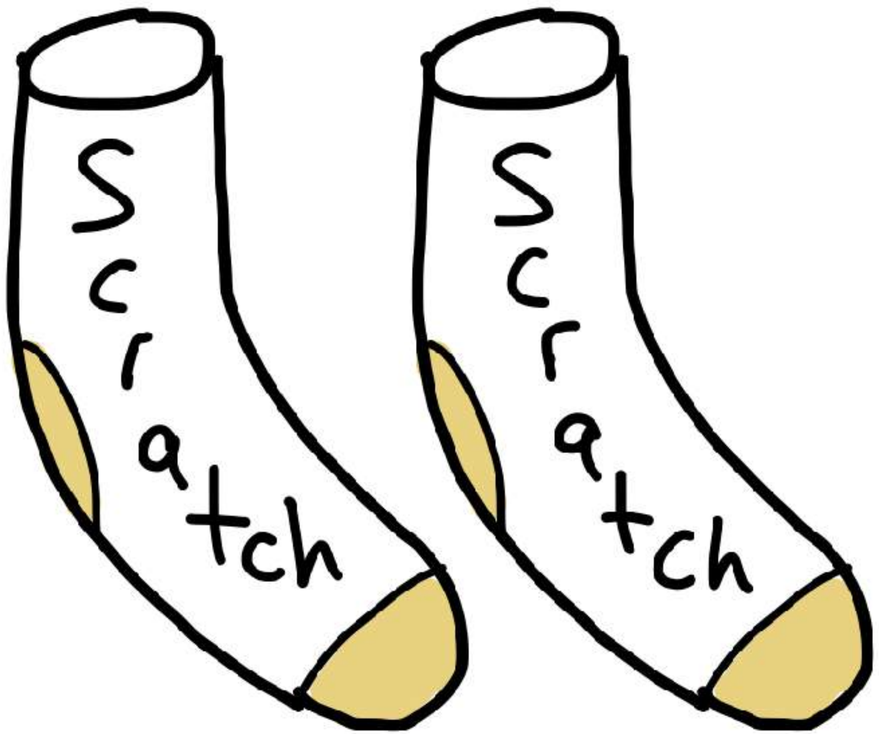
— Adapt



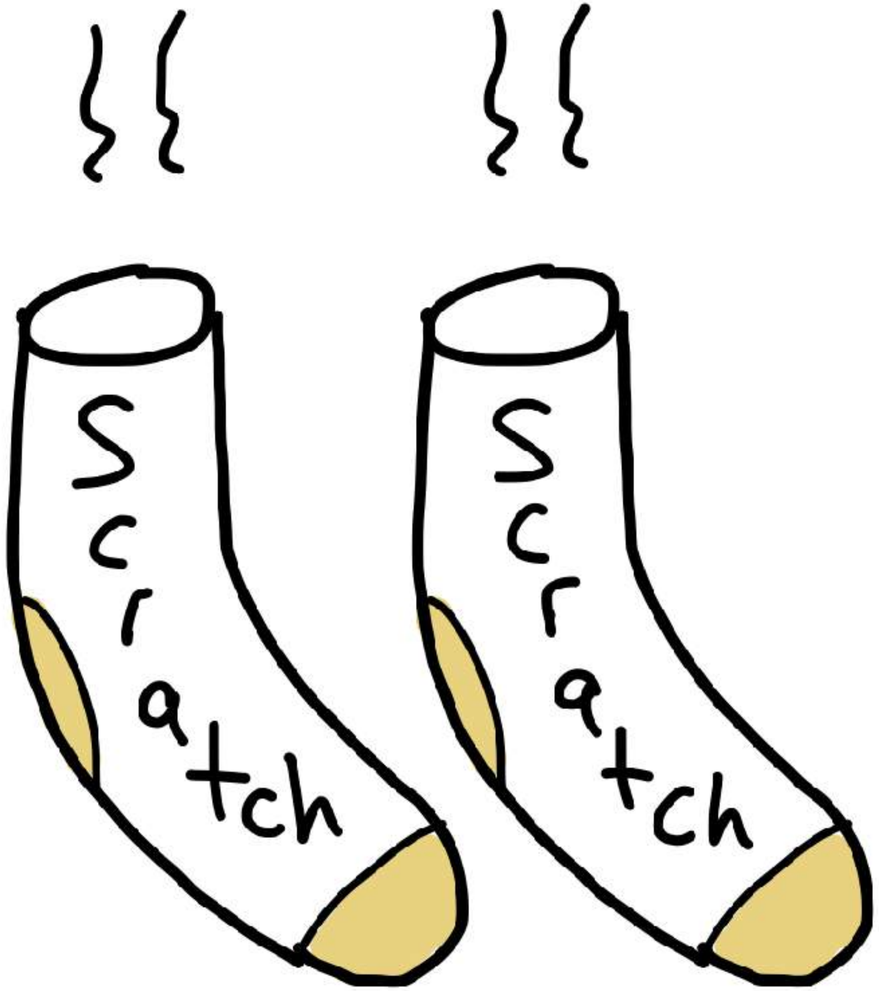
Are smells bad?



Are smells bad?



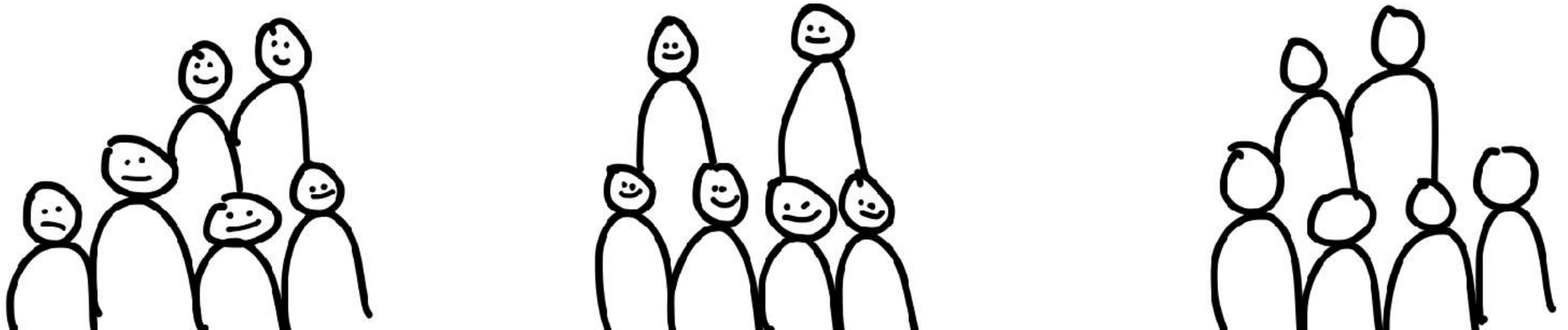
Are smells bad?



TL;DR

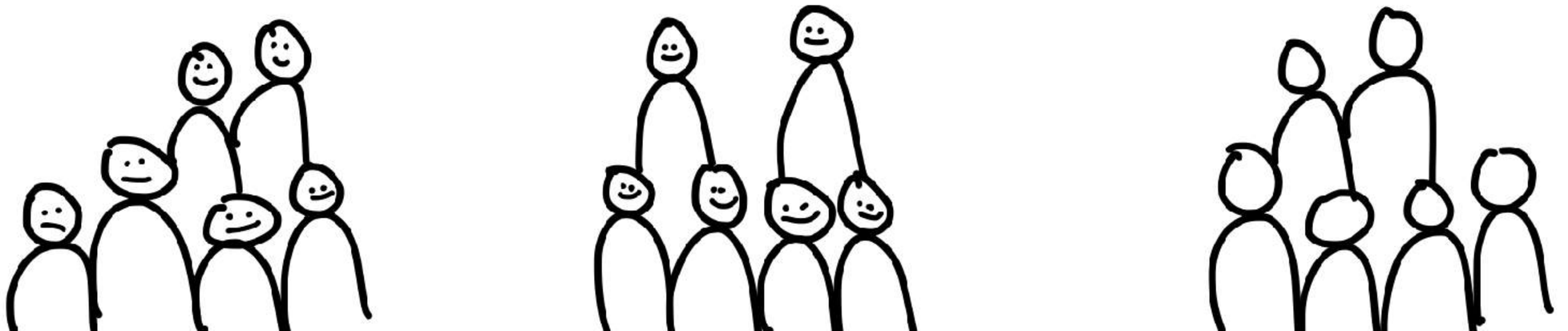
Yes

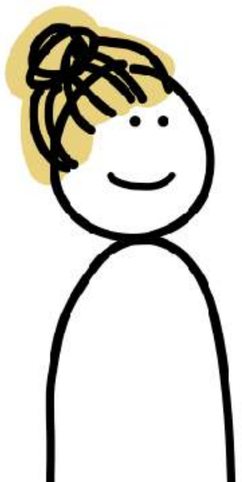
Are smells bad?



Are smells bad?

"Nice" group did better

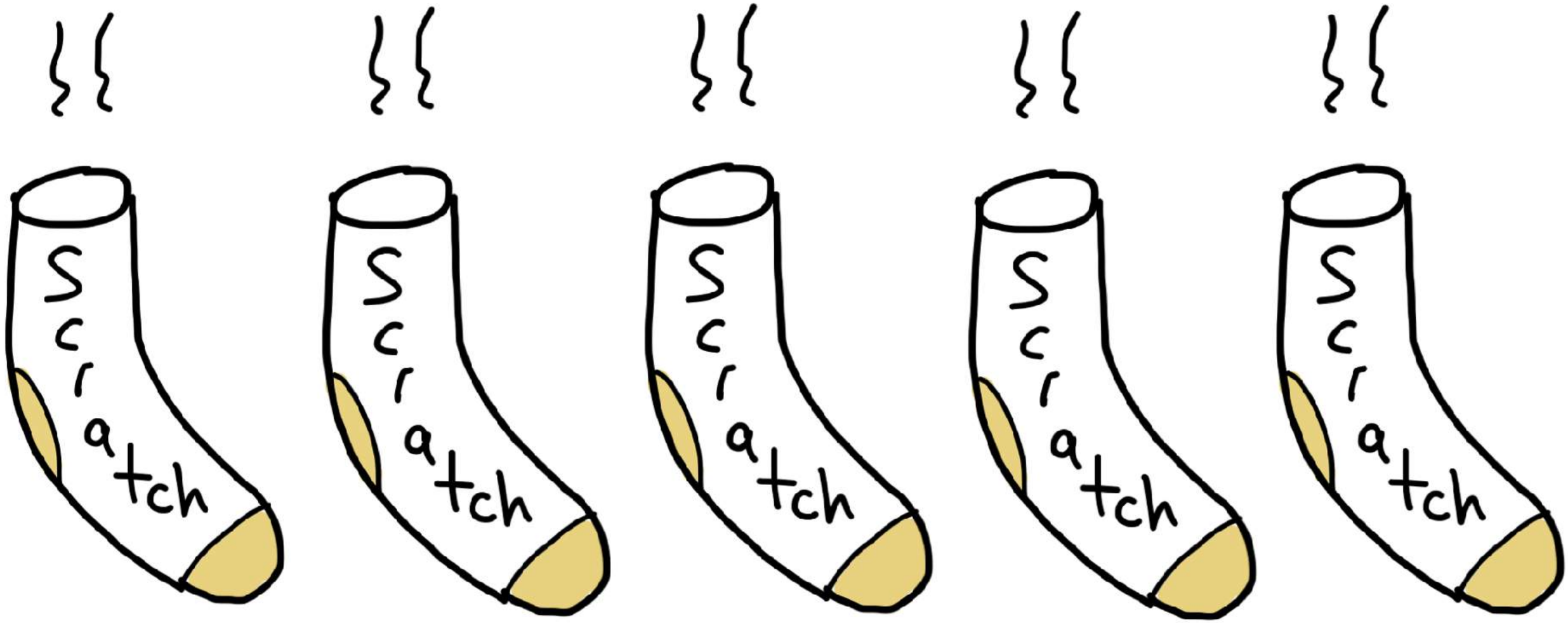




Ok maybe two papers

Do code smells hamper novice programmers?

Are code smells common?



Are code smells common?

250.000 Programs

Are code smells common?

30%

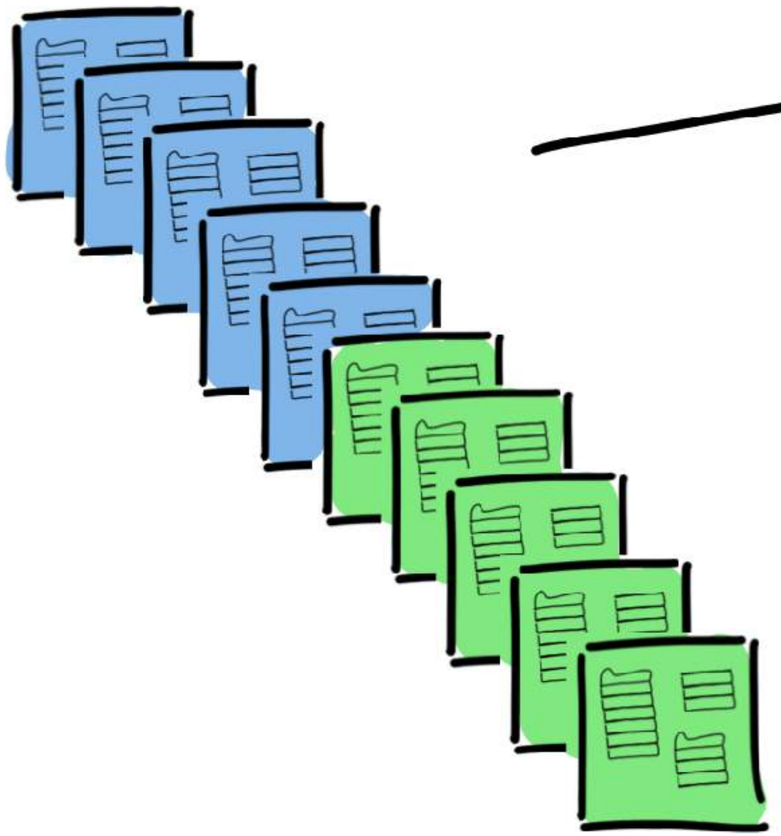
long method

Are code smells common?

26 %

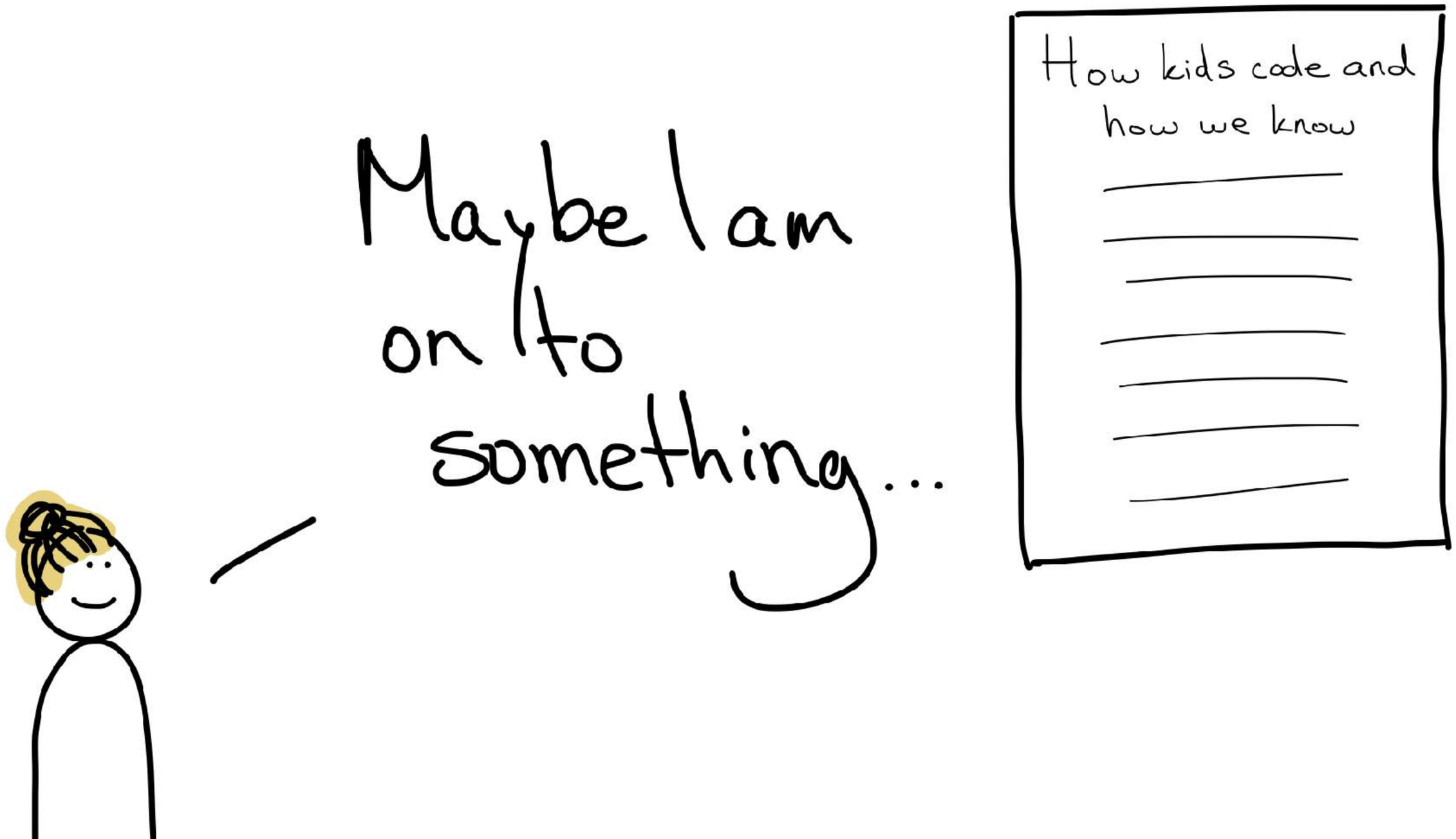
/ duplication

Are code smells common?

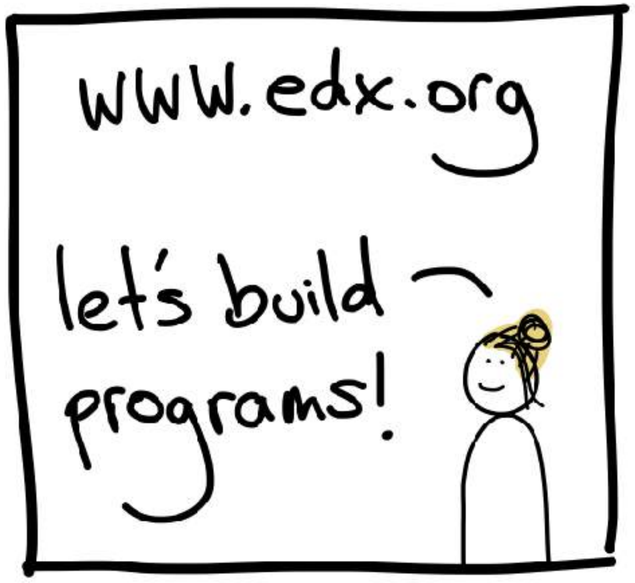


Interaction

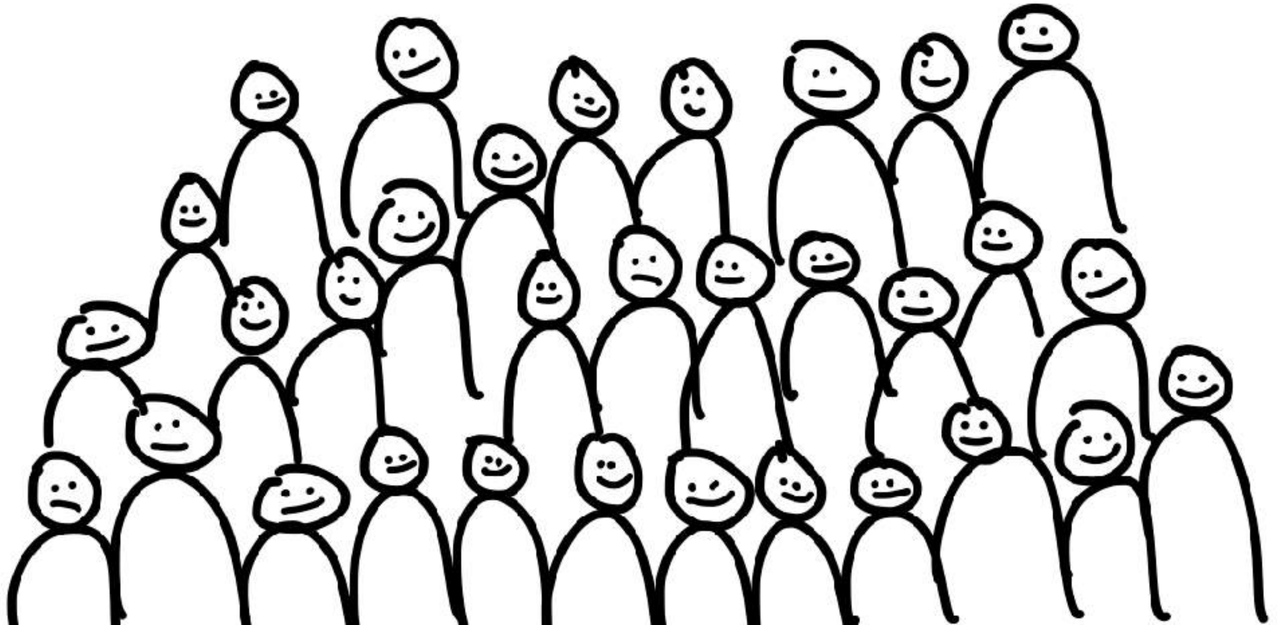
No interaction


Maybe I am on to something...
How kids code and how we know

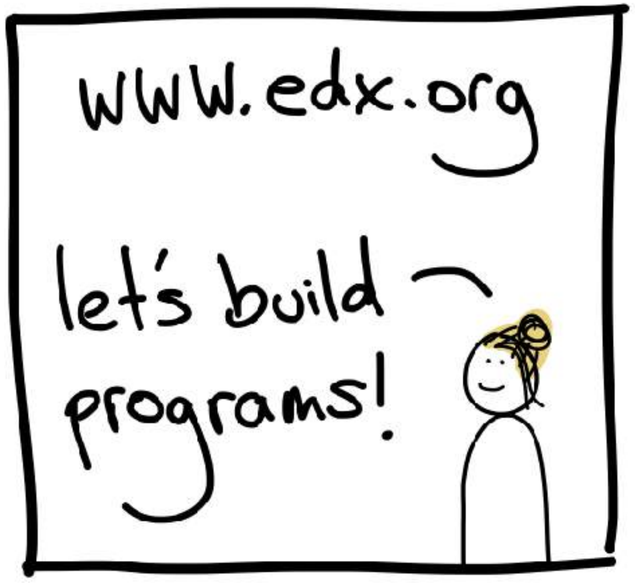
Can we teach smells?



3000 kids



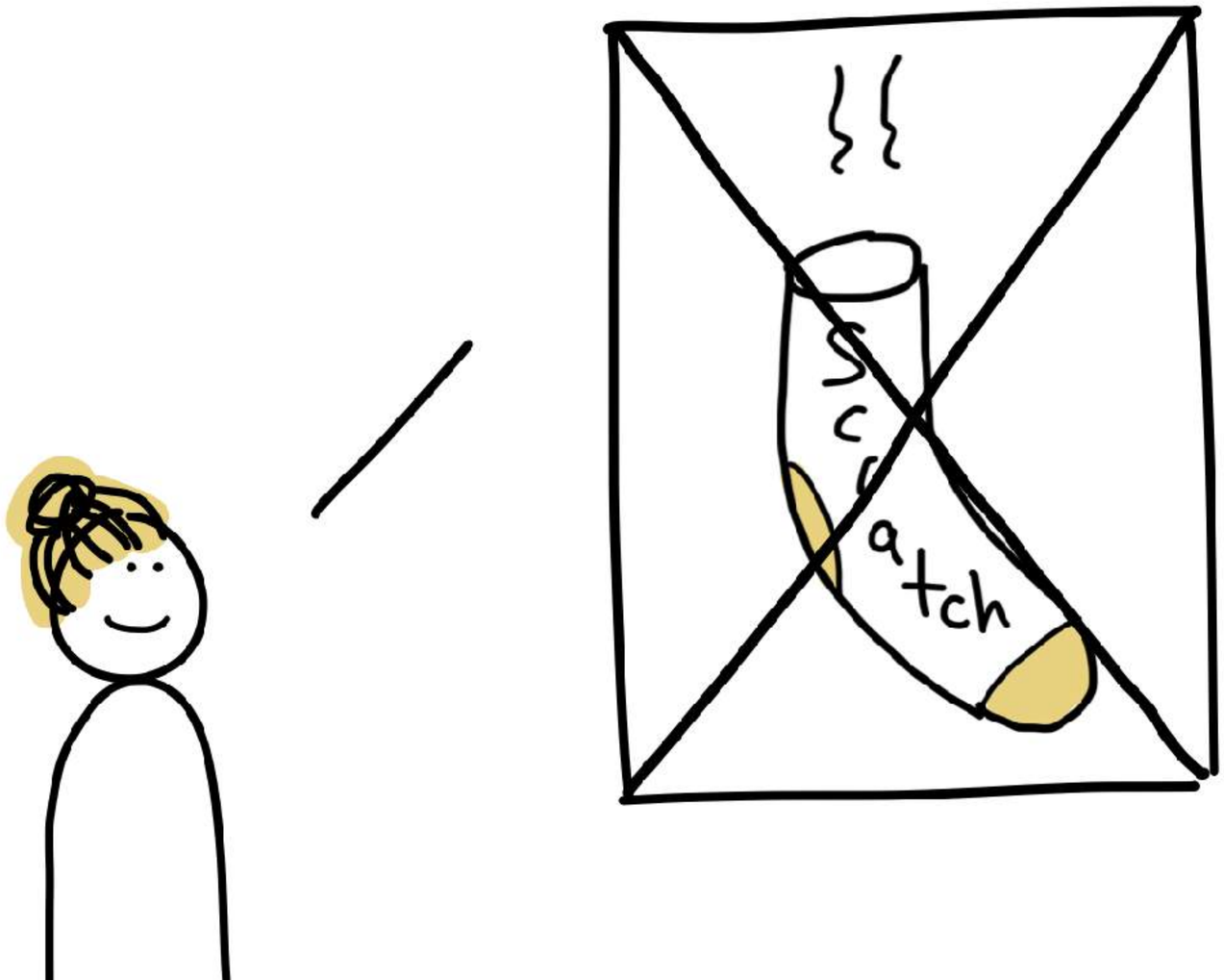
Can we teach smells?



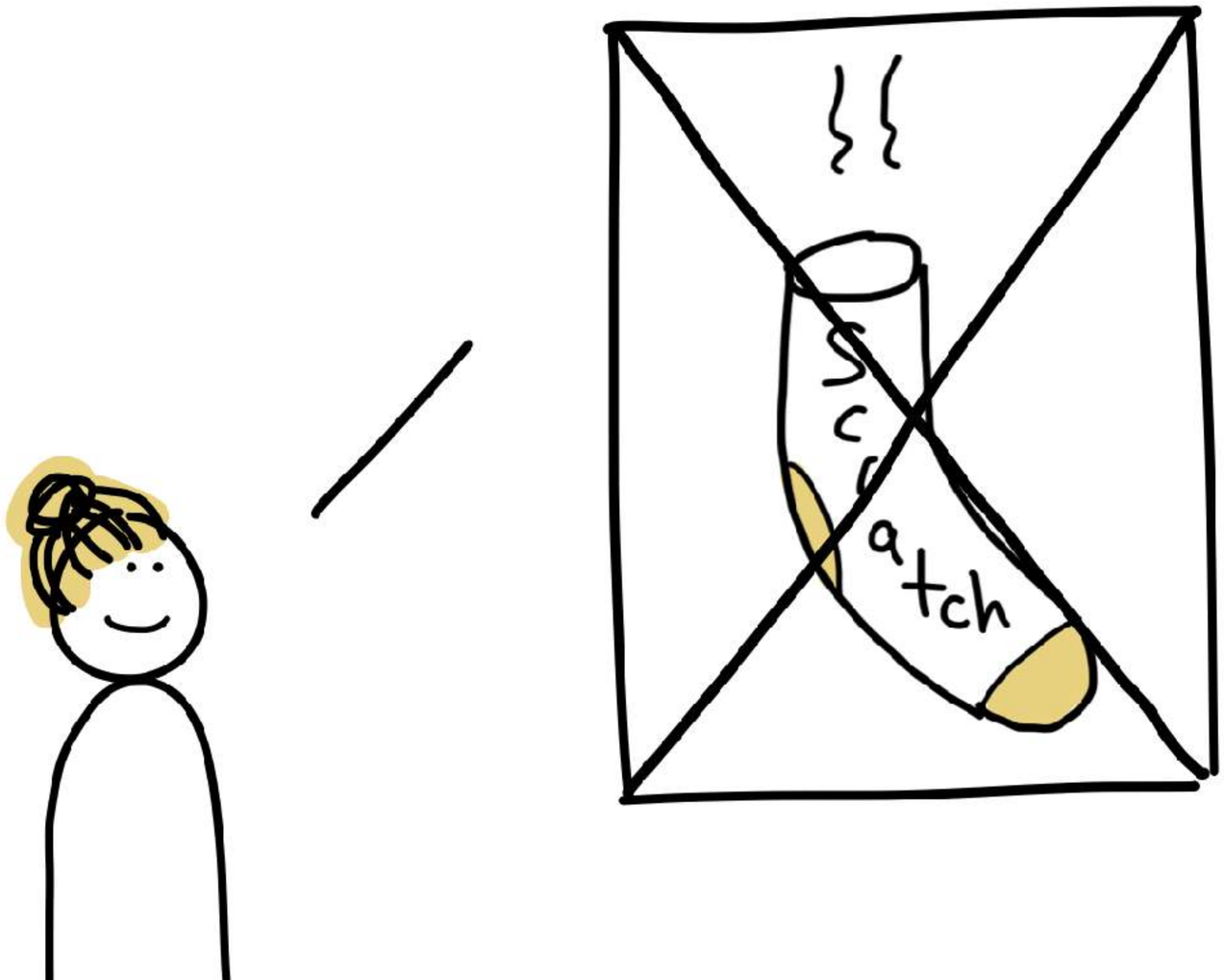
Programming

Smells

Can we teach smells?



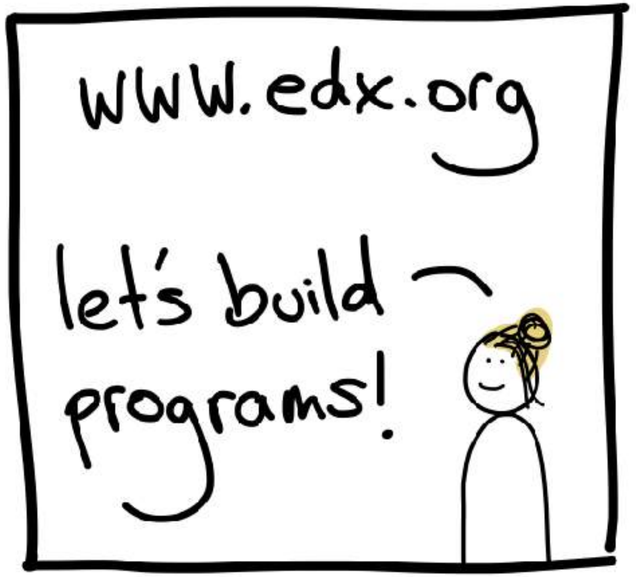
Can we teach smells?



TL;DR

Yes

Can we teach smells?



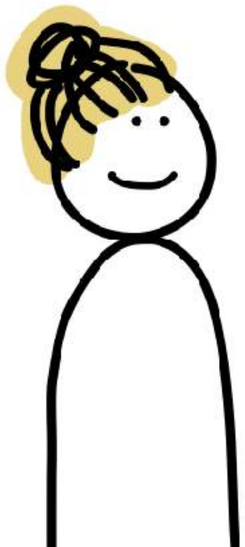
— Programming

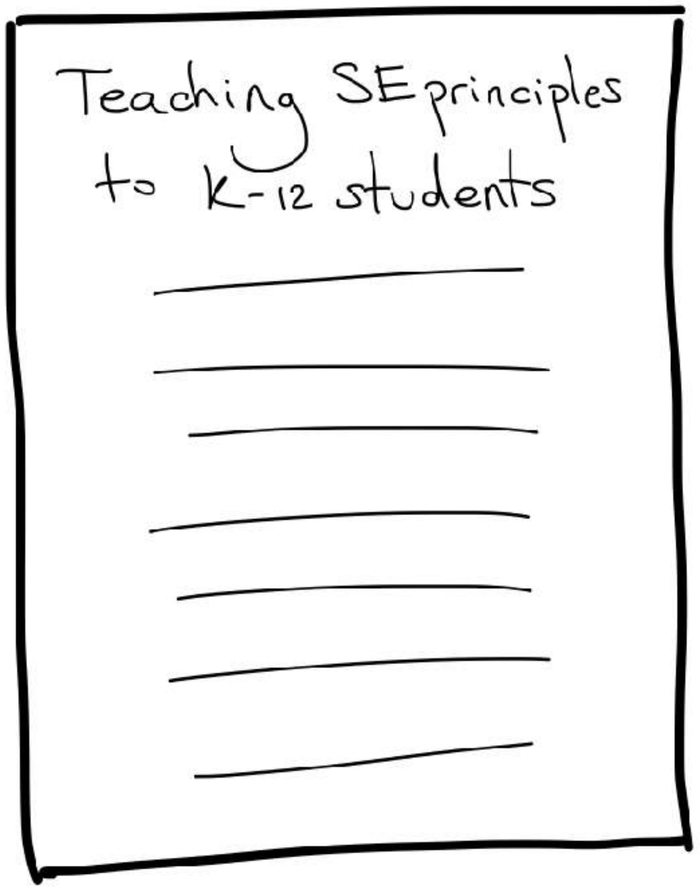
72

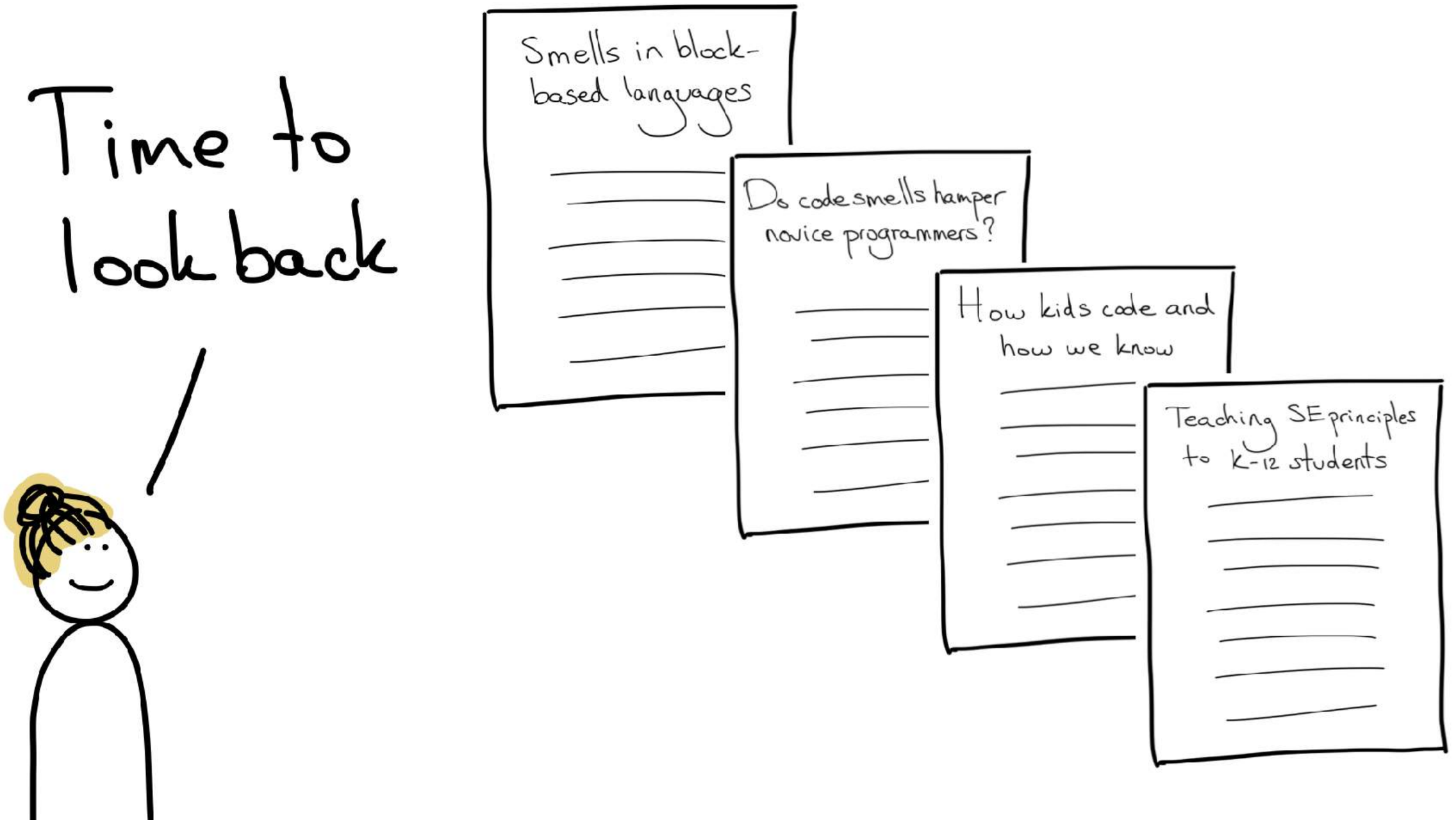
— Smells

85

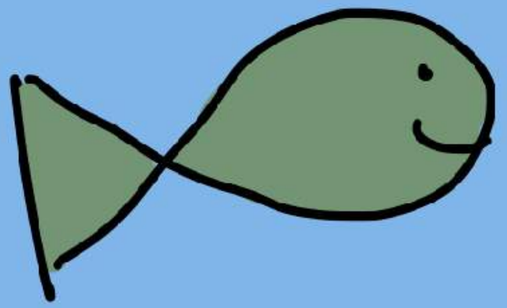
Maybe this is my new topic?

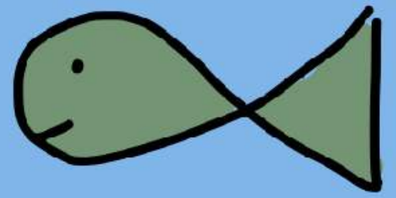


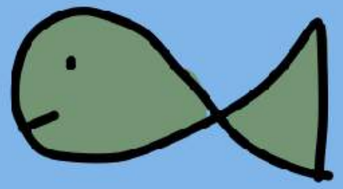



Time to look back
Smells in block-based languages
Do code smells hamper novice programmers?
How kids code and how we know
Teaching SE principles to K-12 students

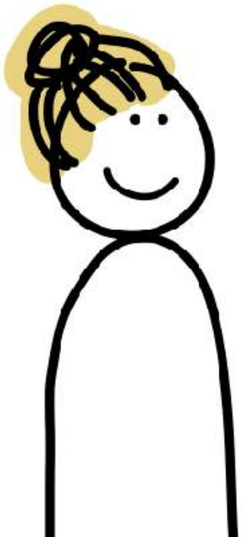
The water of programming

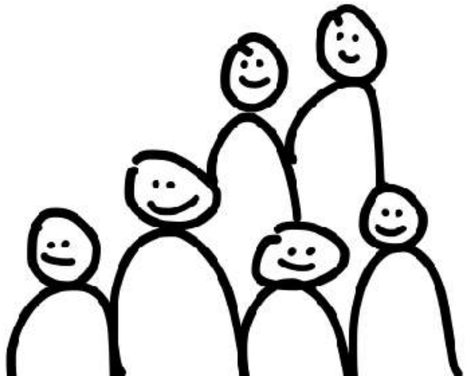






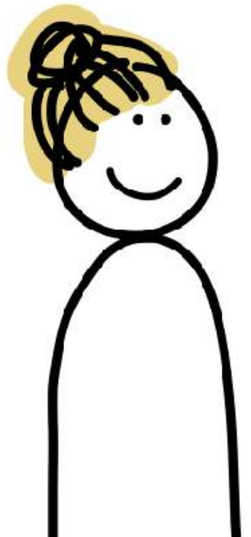
What I taught kids

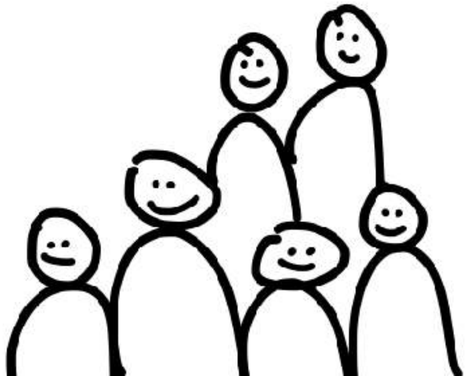




What I taught kids

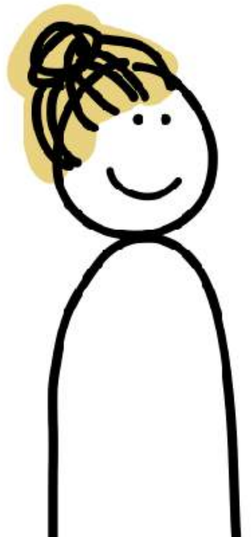
programming is...





What I taught kids

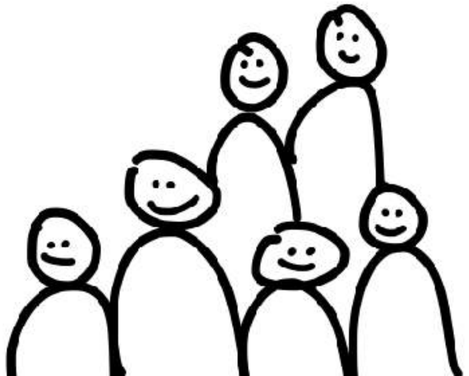
programming is...



— technology

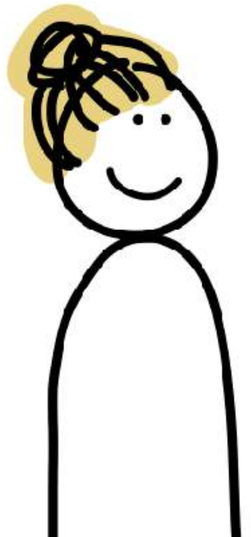
— games

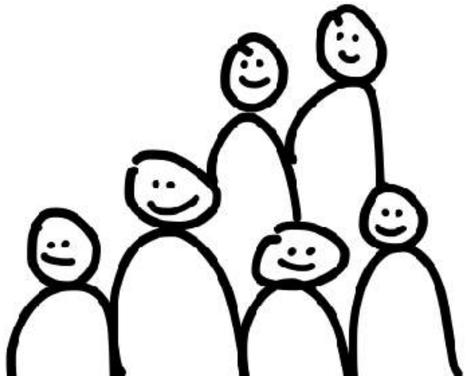
— learned through making programs



What I taught kids

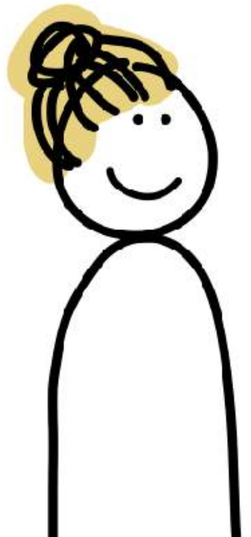
programming is not...



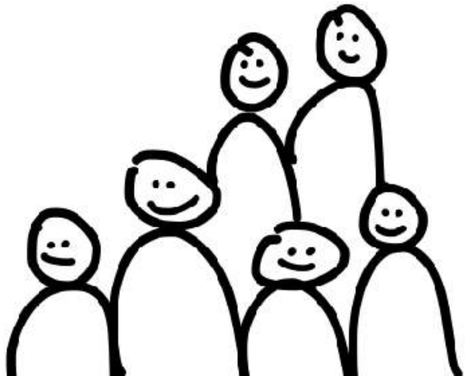


What I taught kids

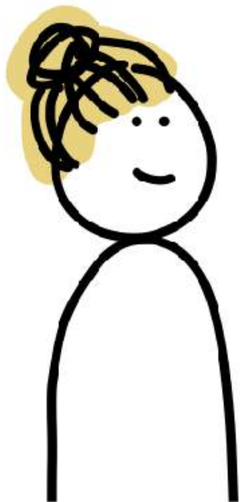
programming is not...



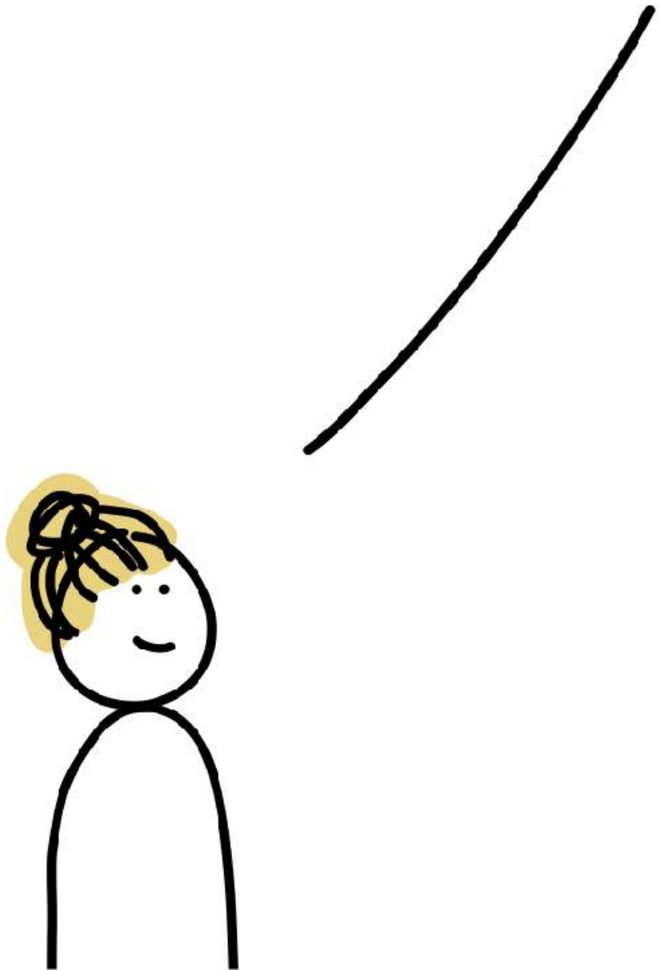
- art
- stories
- learned through practicing small steps



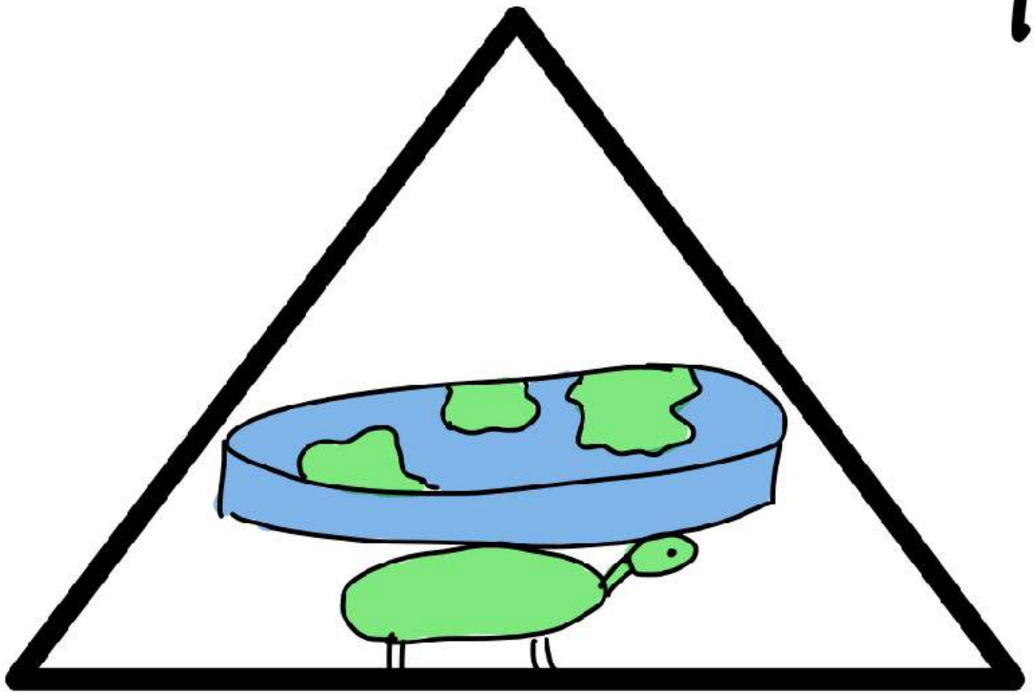
Less assumptions please



What is programming?

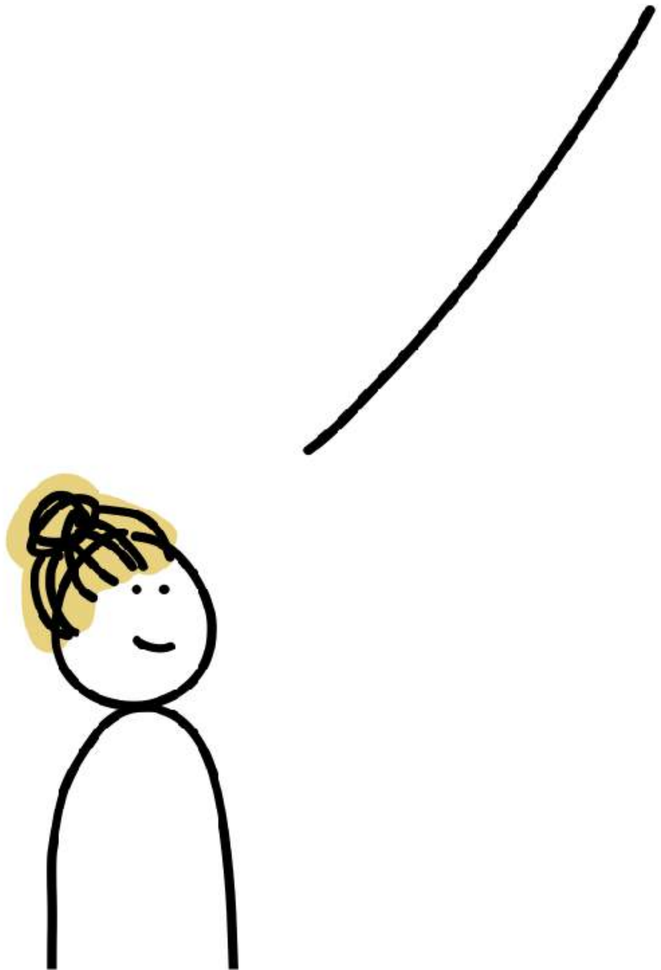


Beware Controversy ahead

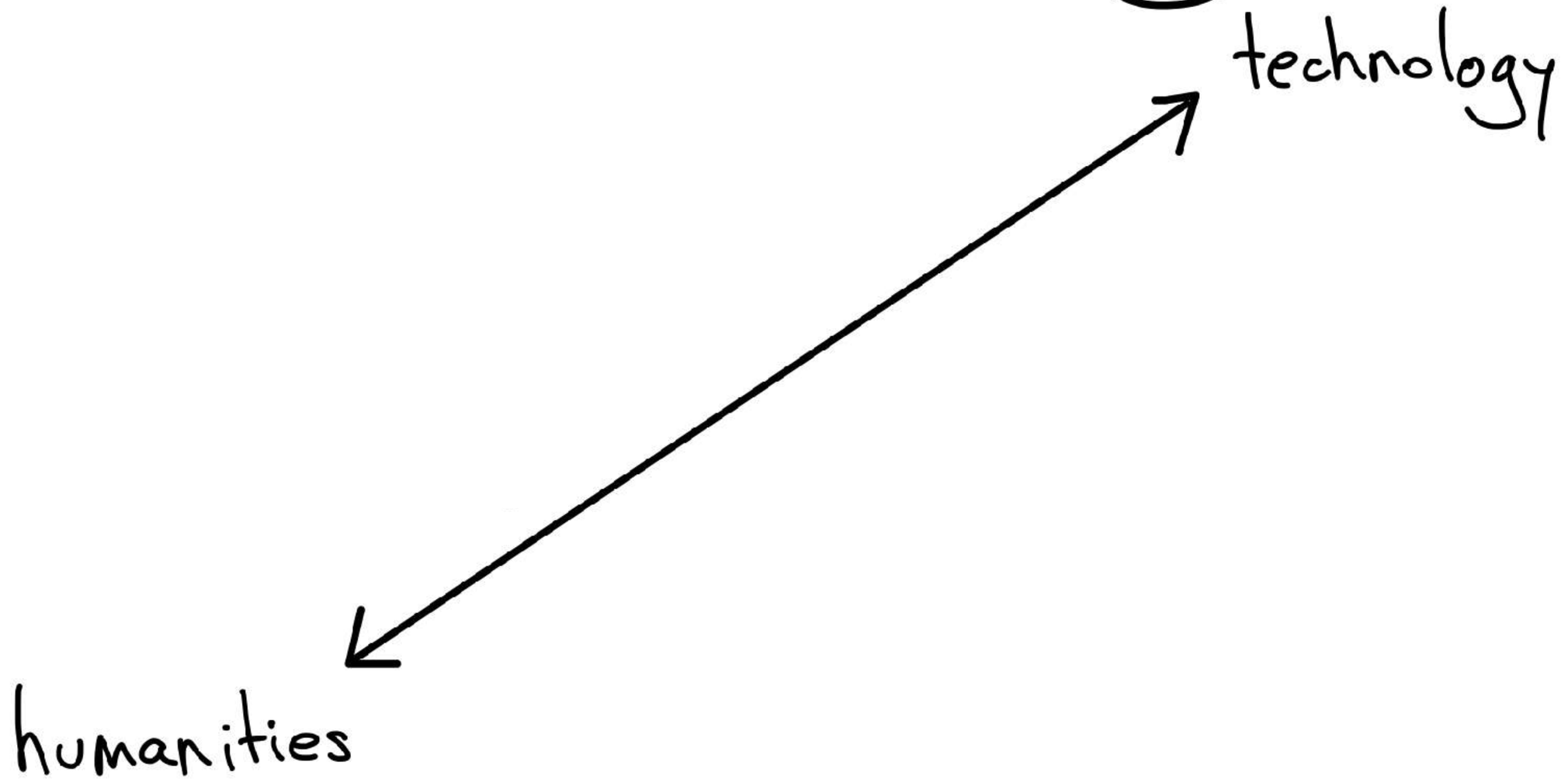


@Felienne

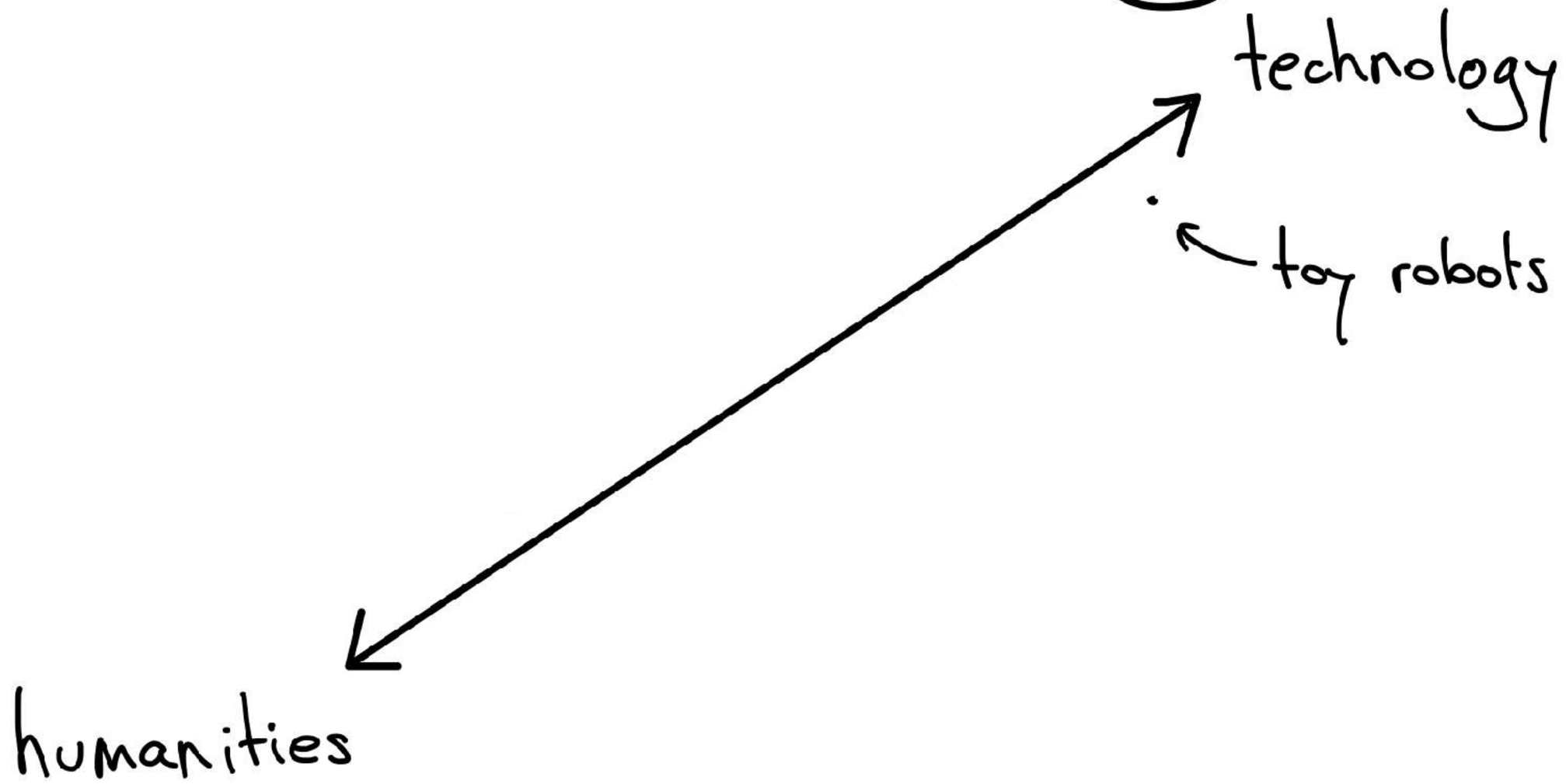
What is programming?



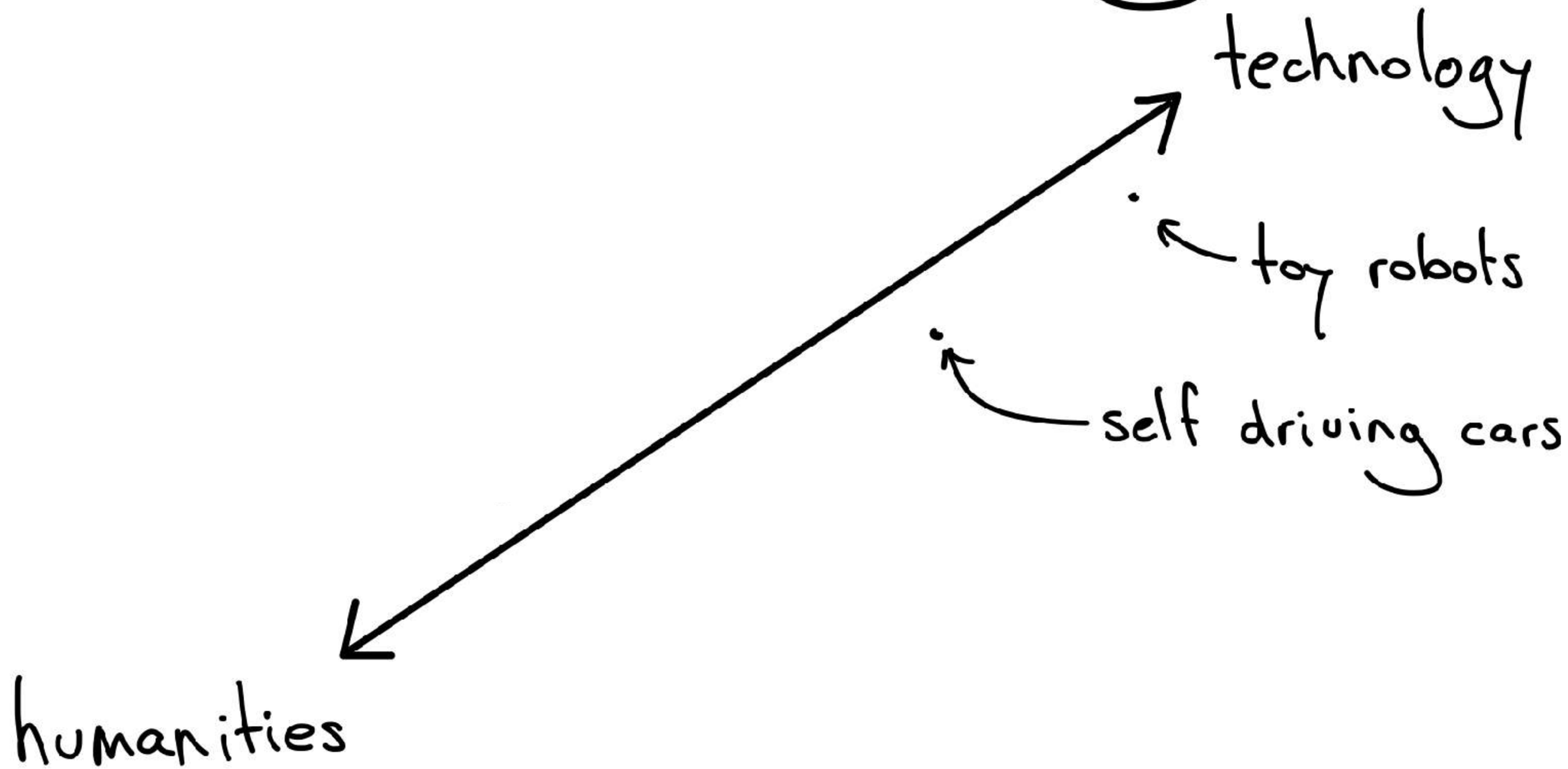
What is programming about?



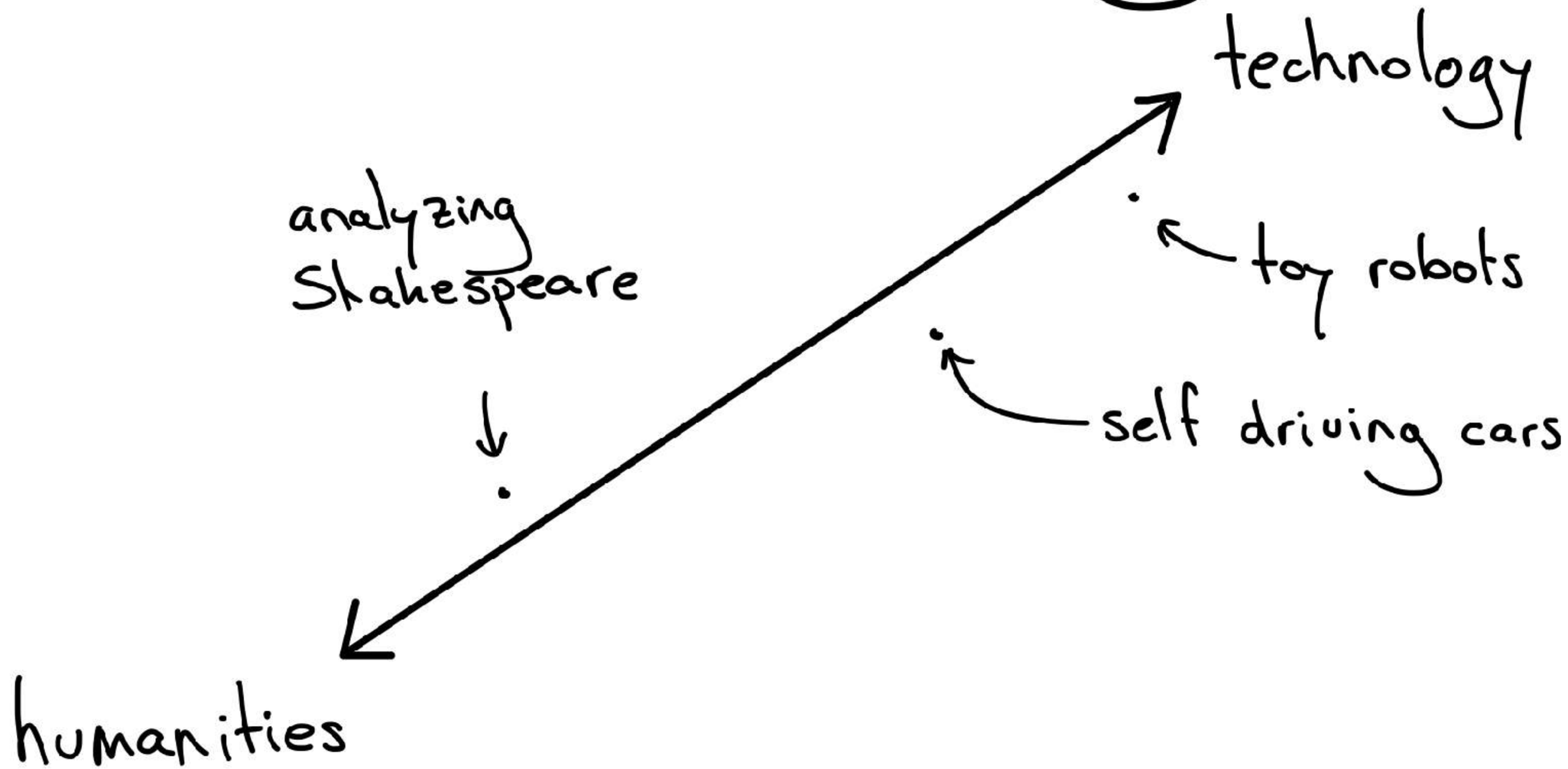
What is programming about?



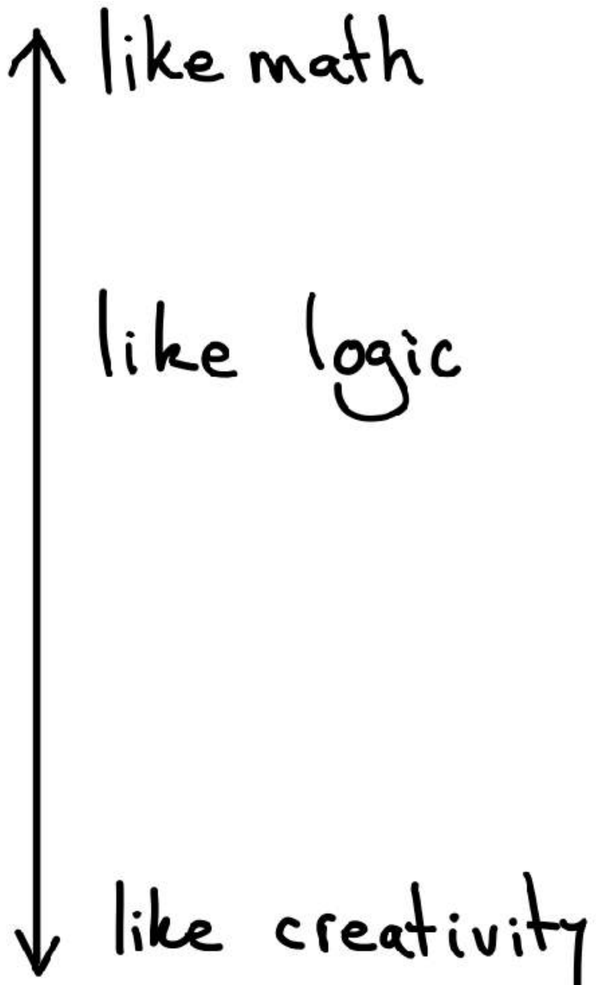
What is programming about?



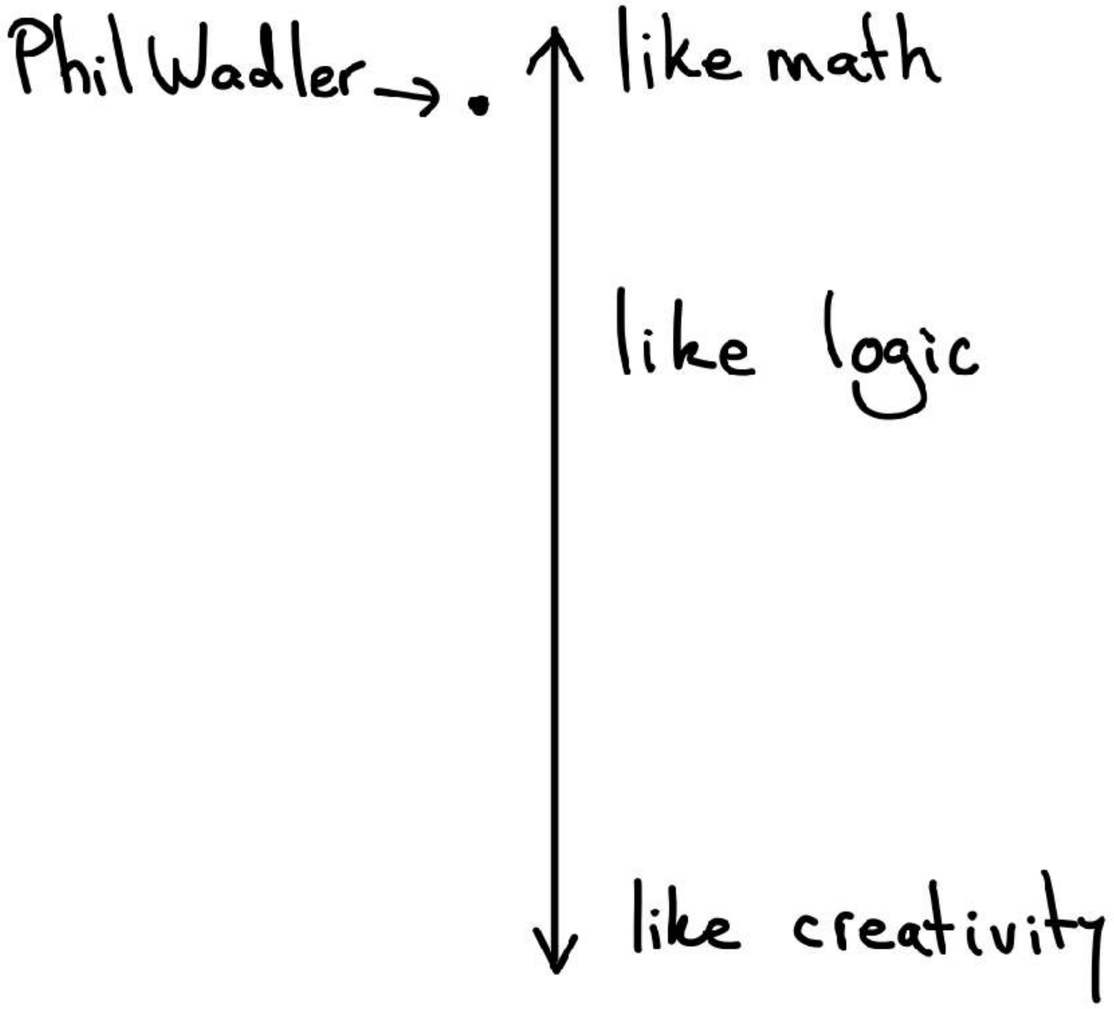
What is programming about?



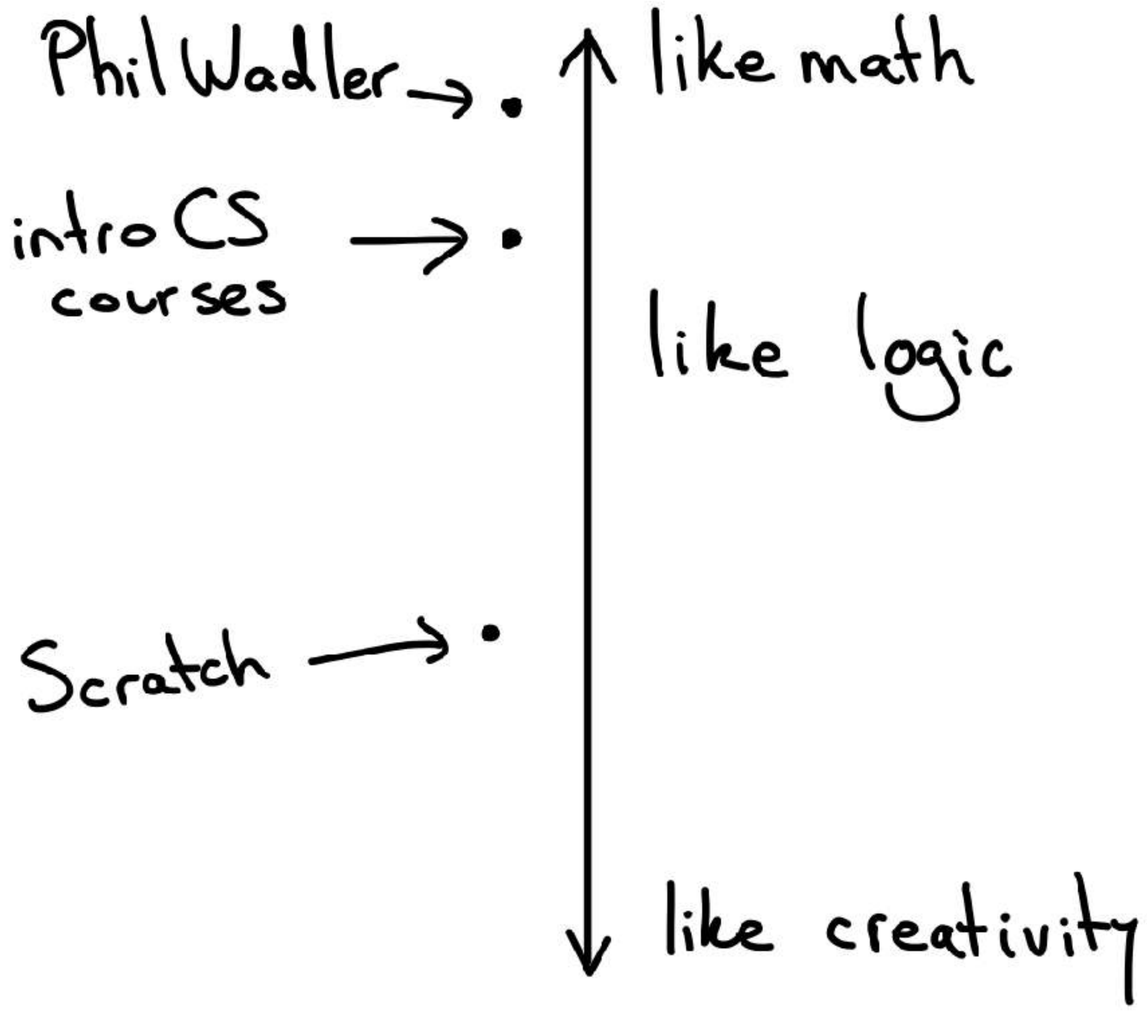
What is programming like?



What is programming like?

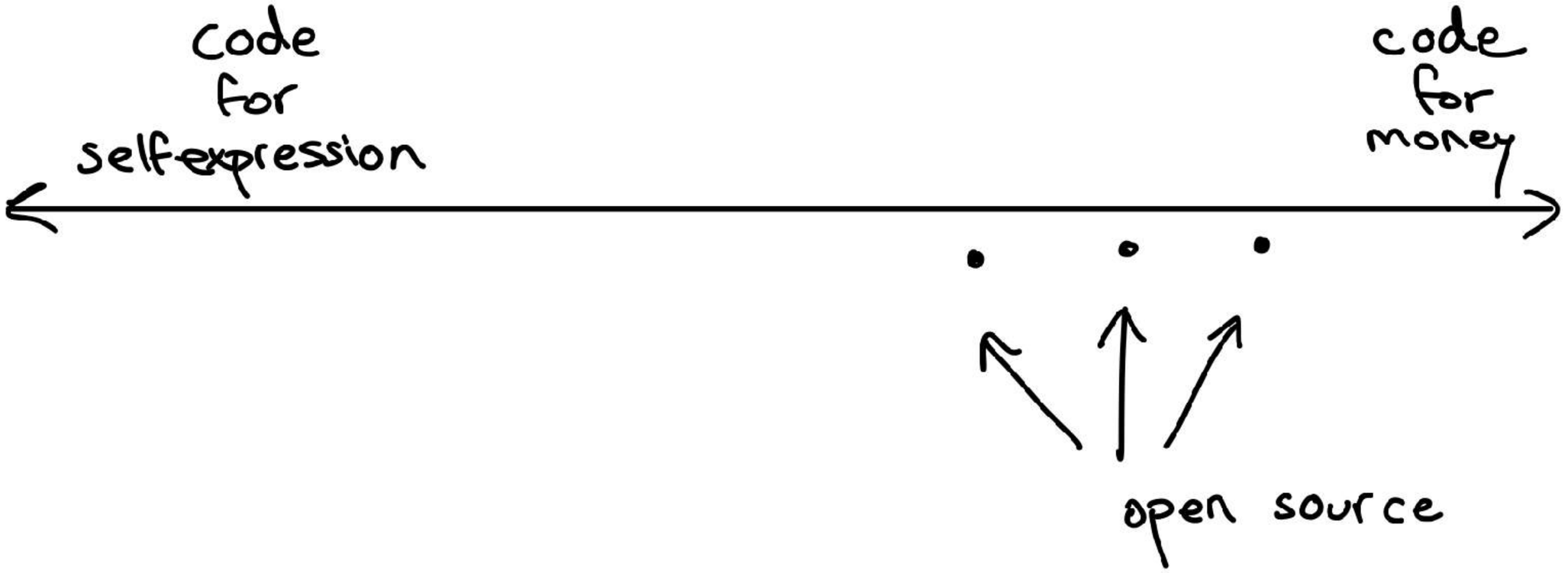


What is programming like?

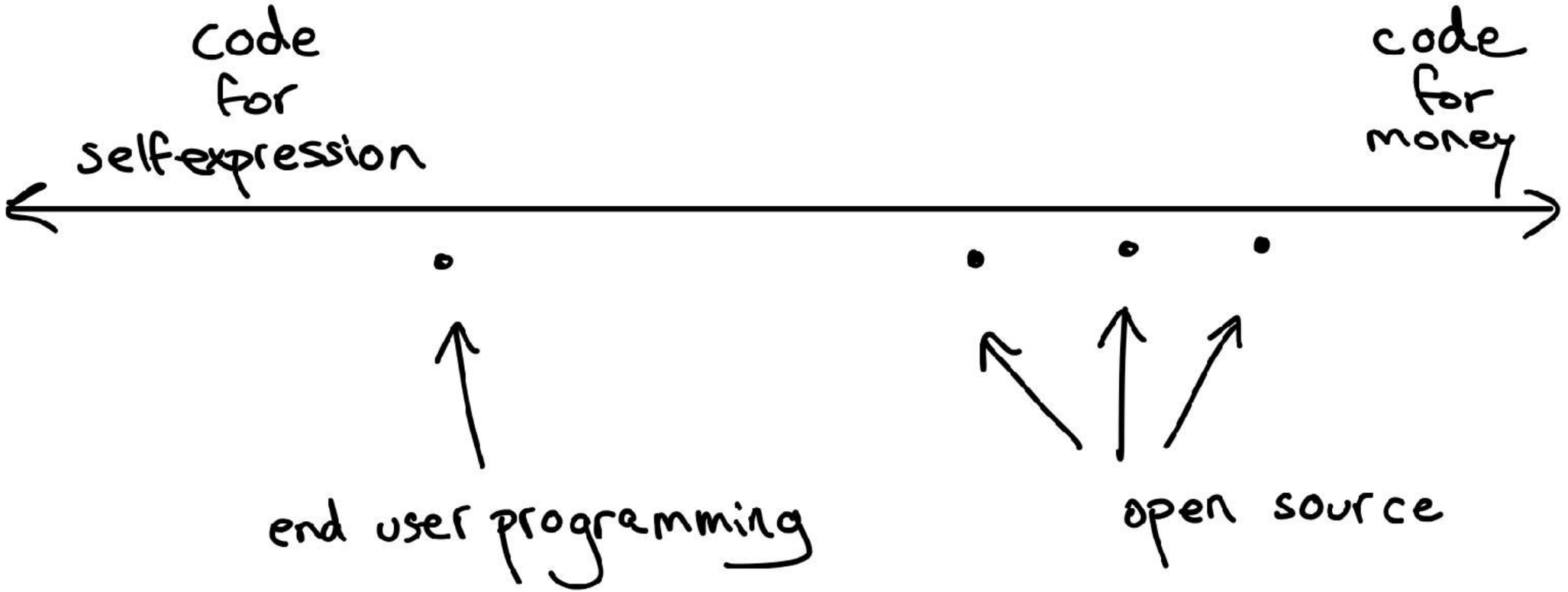


What is programming for?

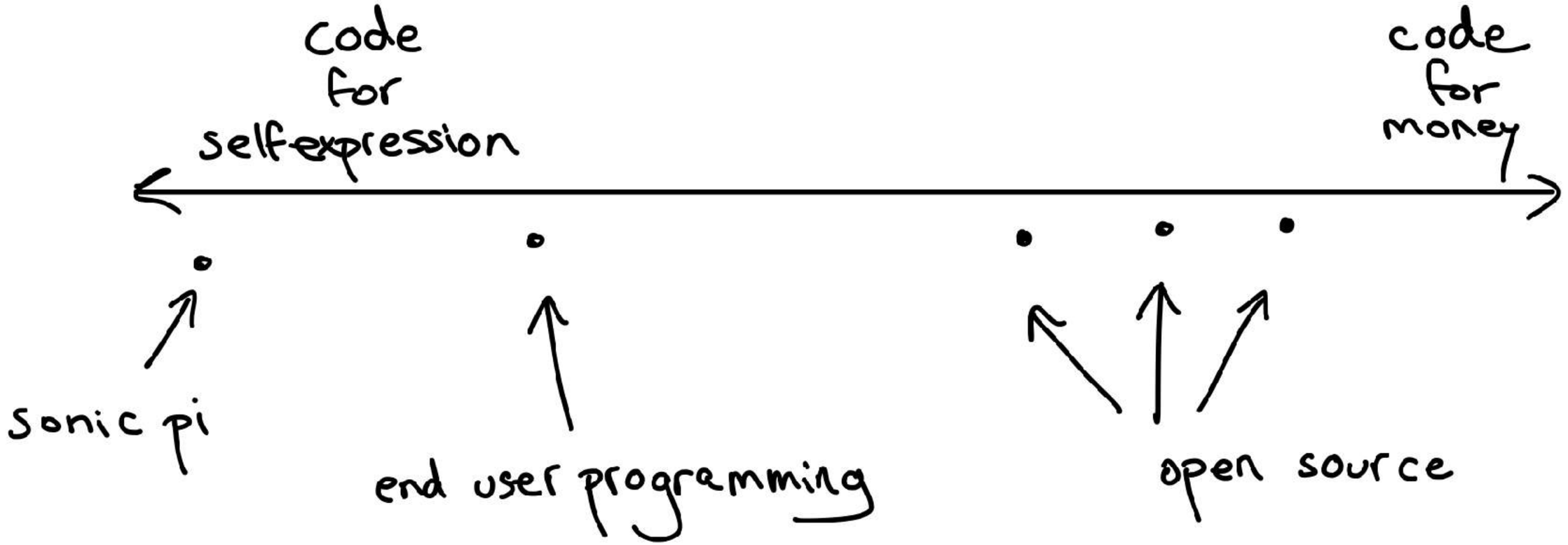
What is programming for?



What is programming for?

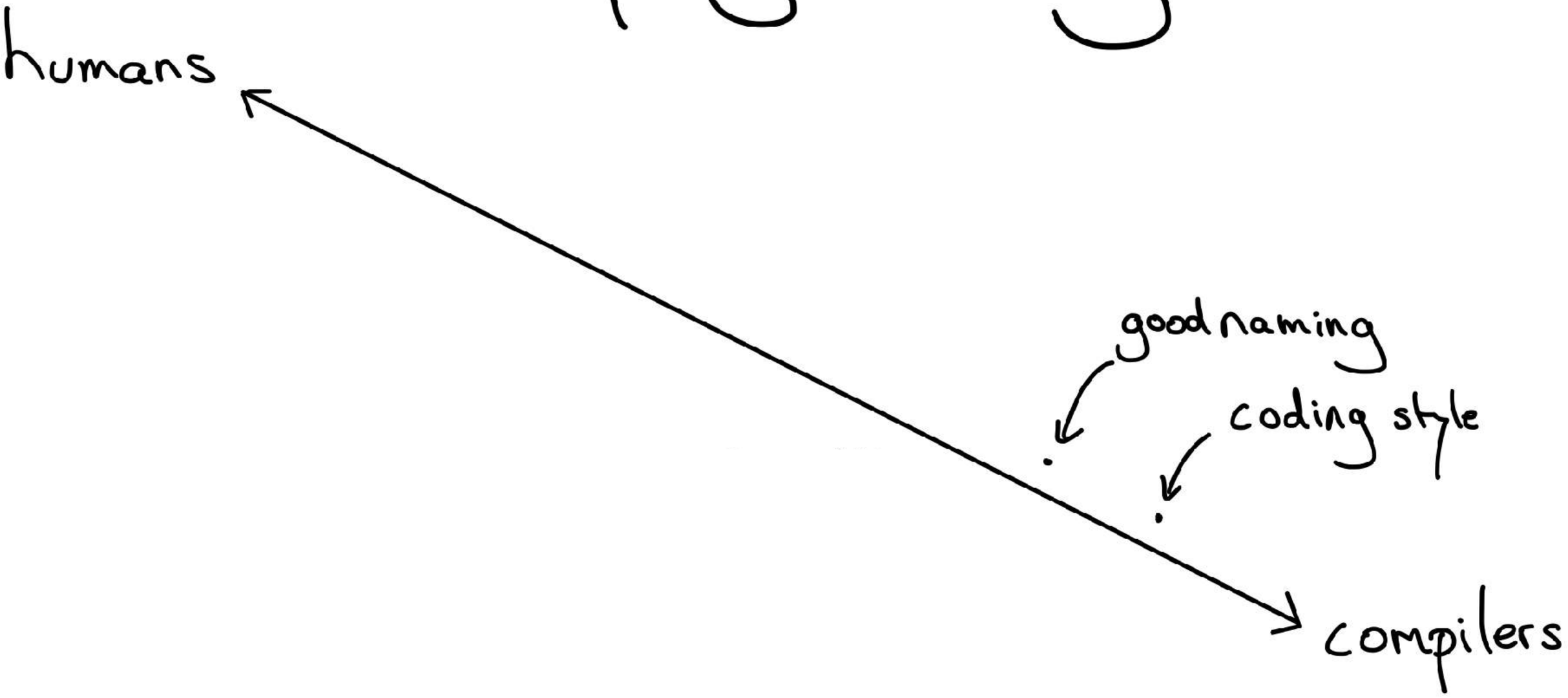


What is programming for?

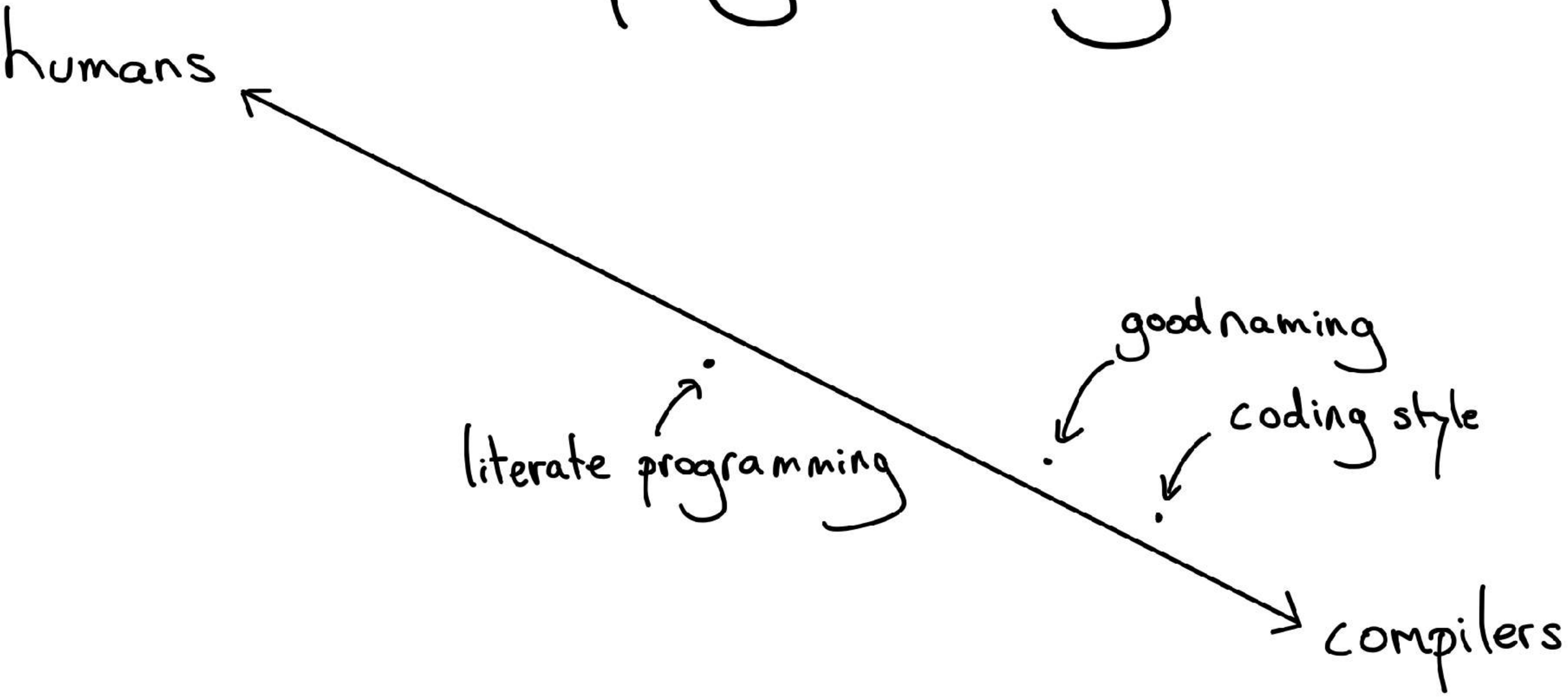


Who is programming for?

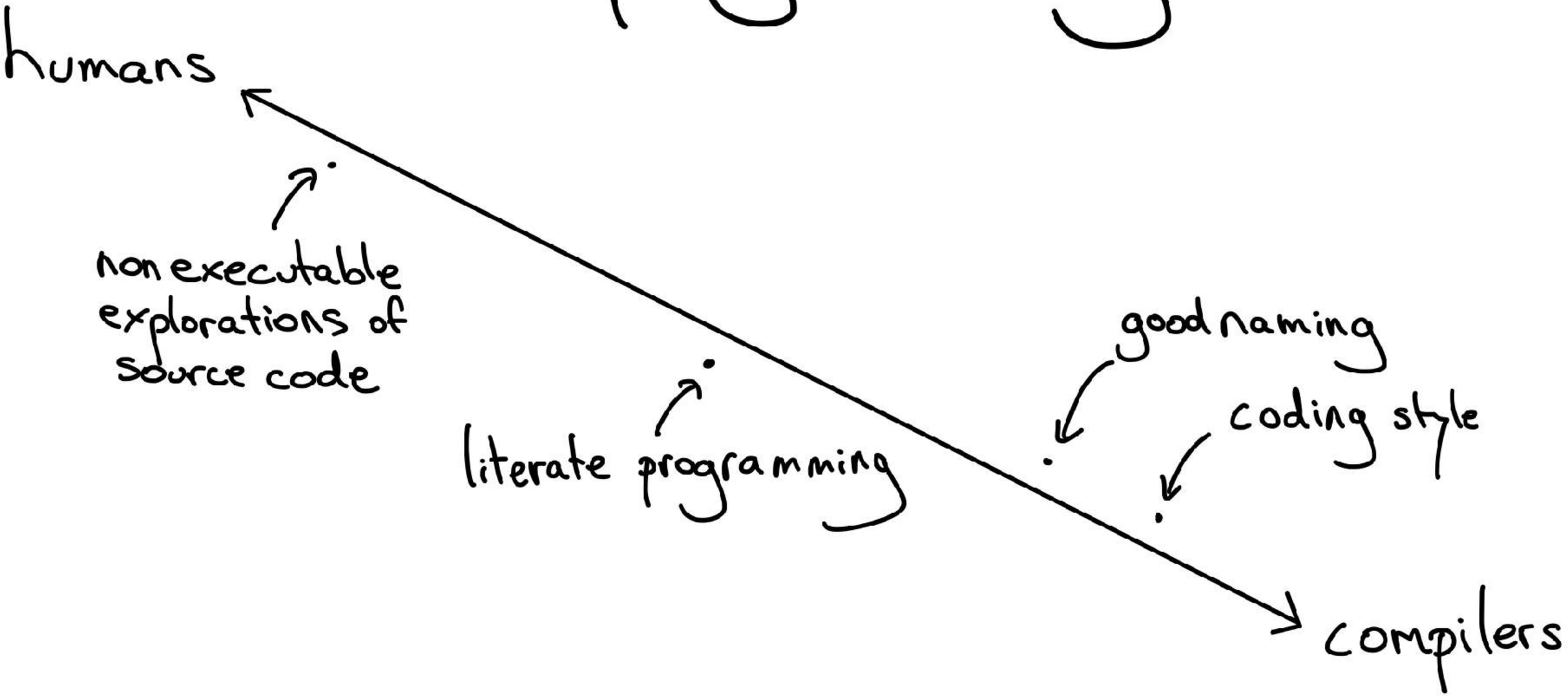
Who is programming for?



Who is programming for?



Who is programming for?



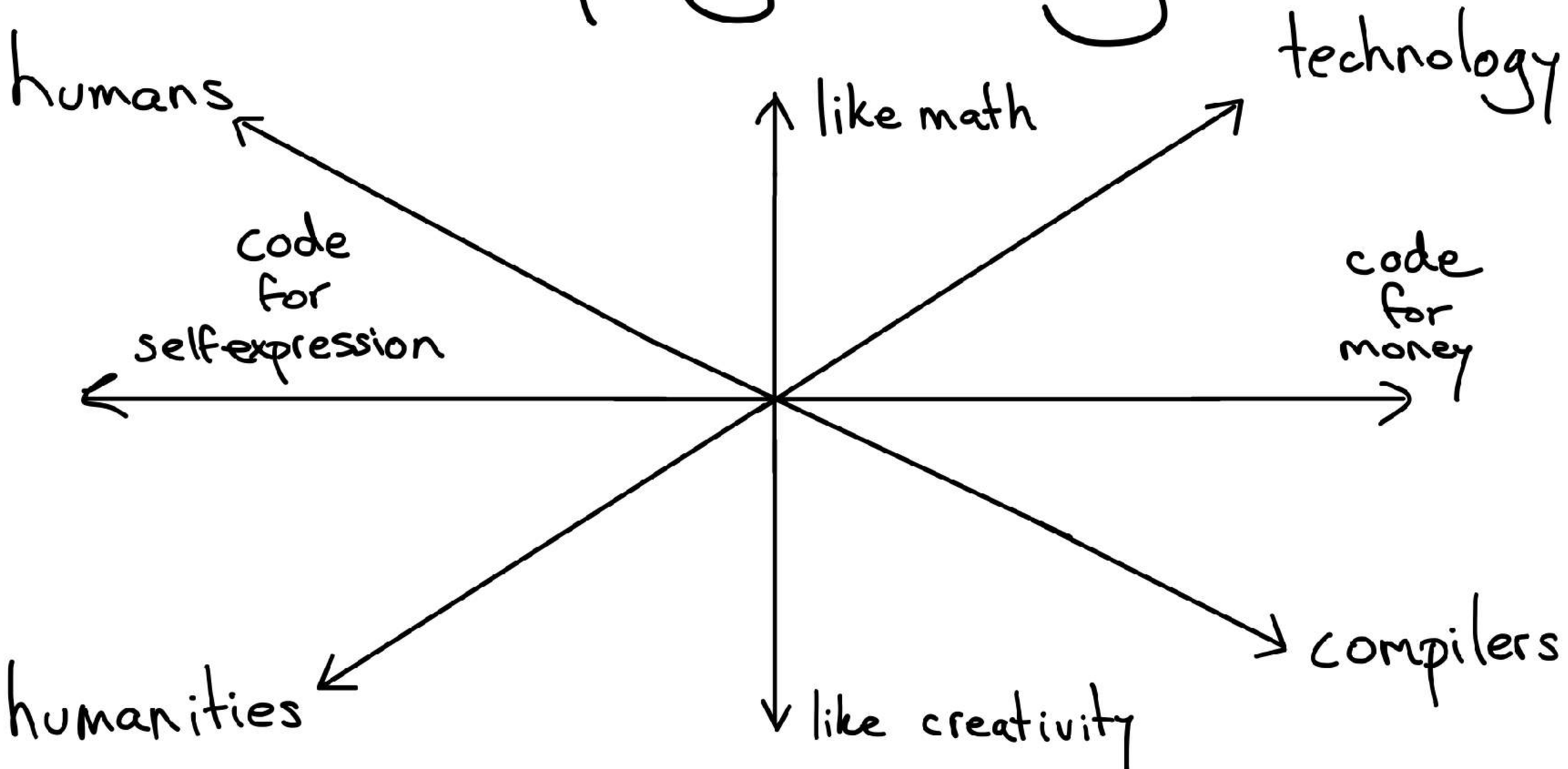
Who is programming for?

"We should liberate programming from the tyranny of execution"

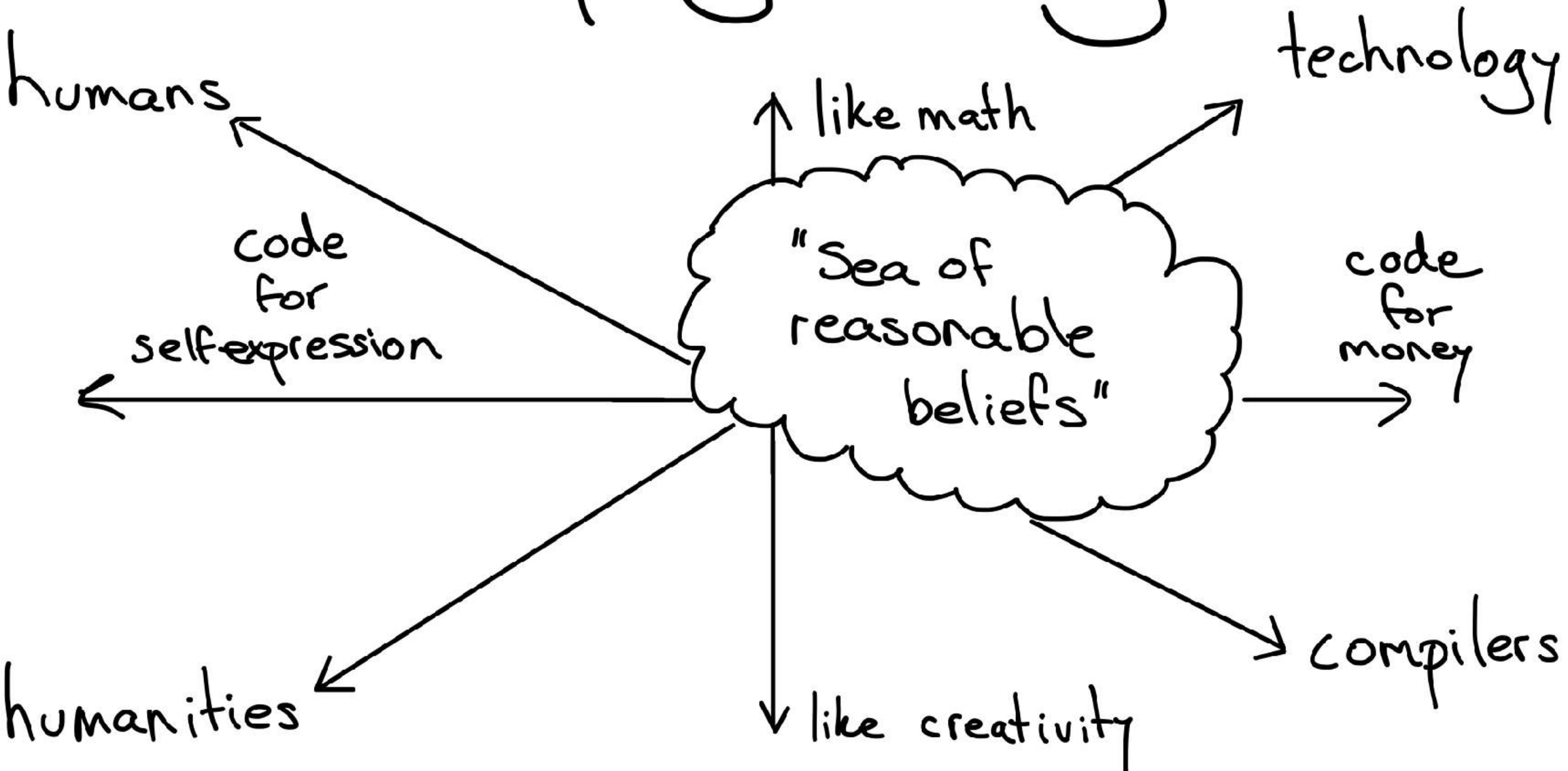
- Tomas Petricek

non executable explorations of source code

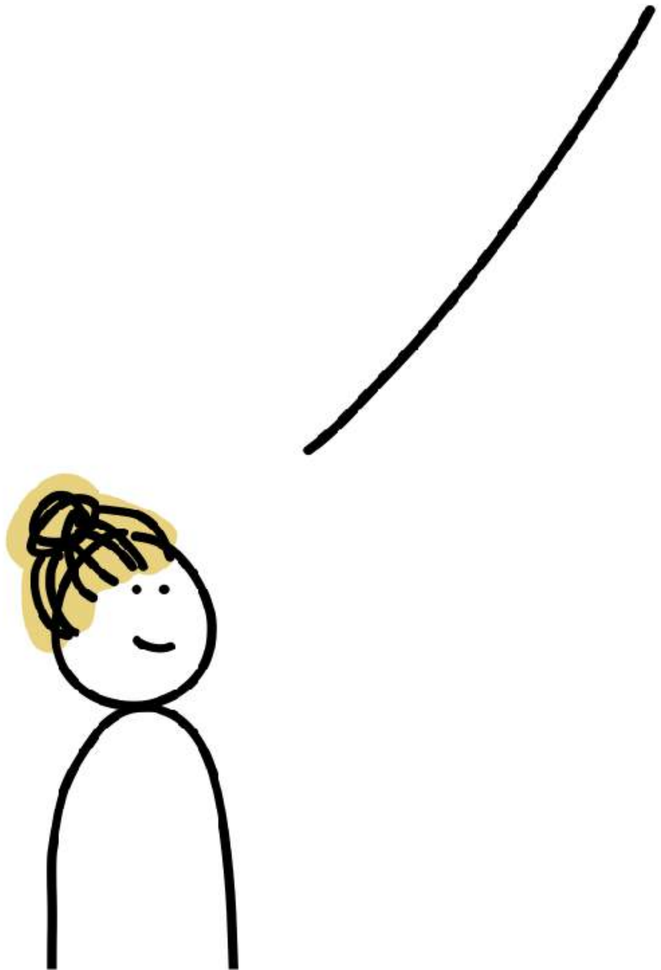
What is programming?



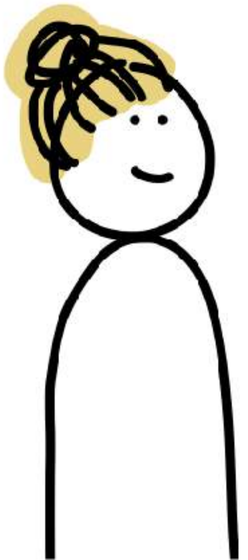
What is programming?



What is programming?



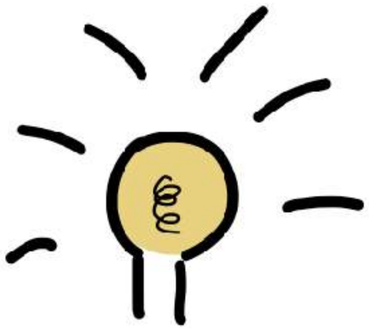
Programming is Writing

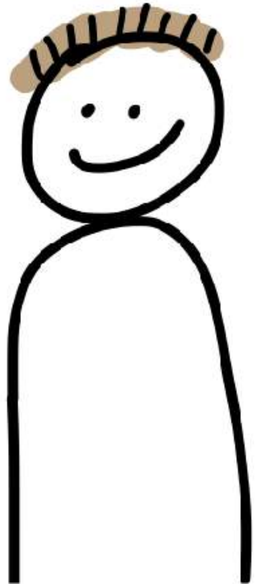


Programming is Writing

An app that tracks compliments

Programming is Writing



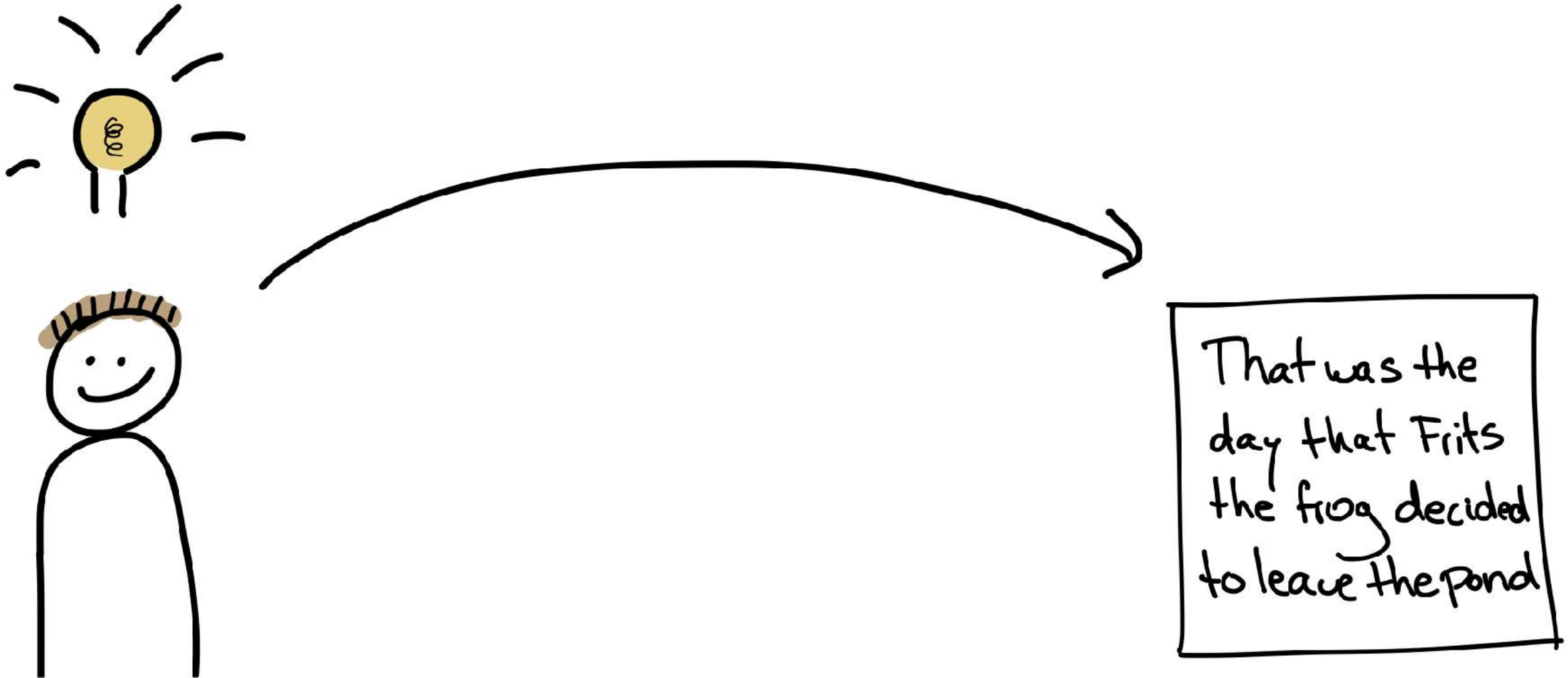


```
if compl.count
>5
print "Hooray"
else
 print "So sad"
```

Programming is Writing

A frog murders foreign diplomats

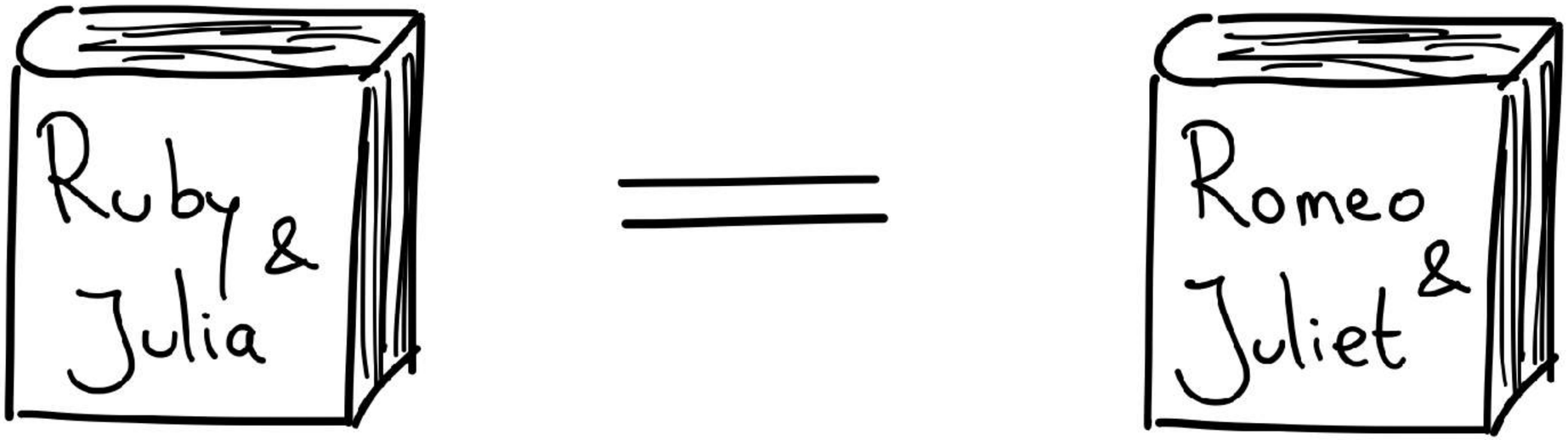
Programming is Writing



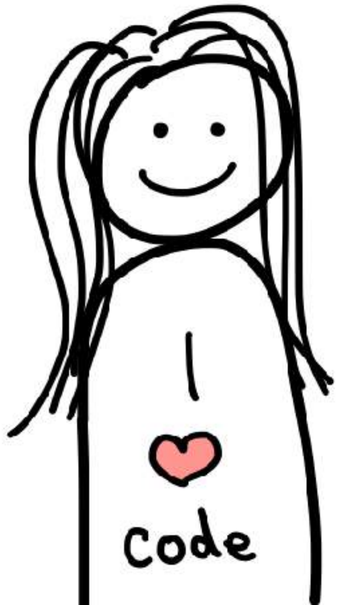
What is writing?

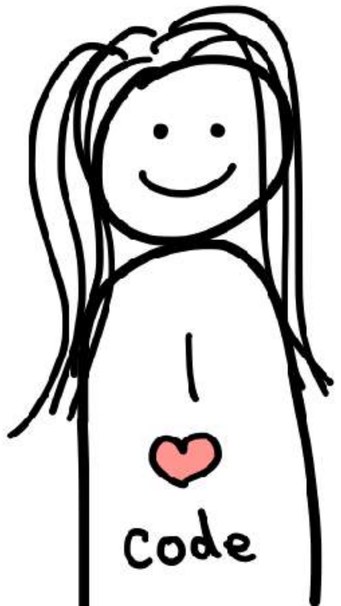
What is writing?

Language metaphor helps

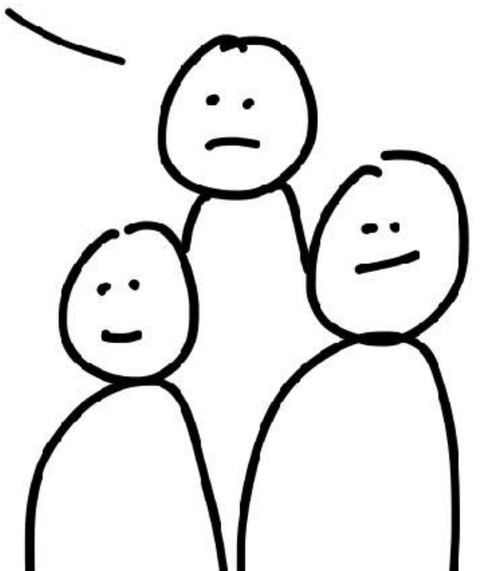


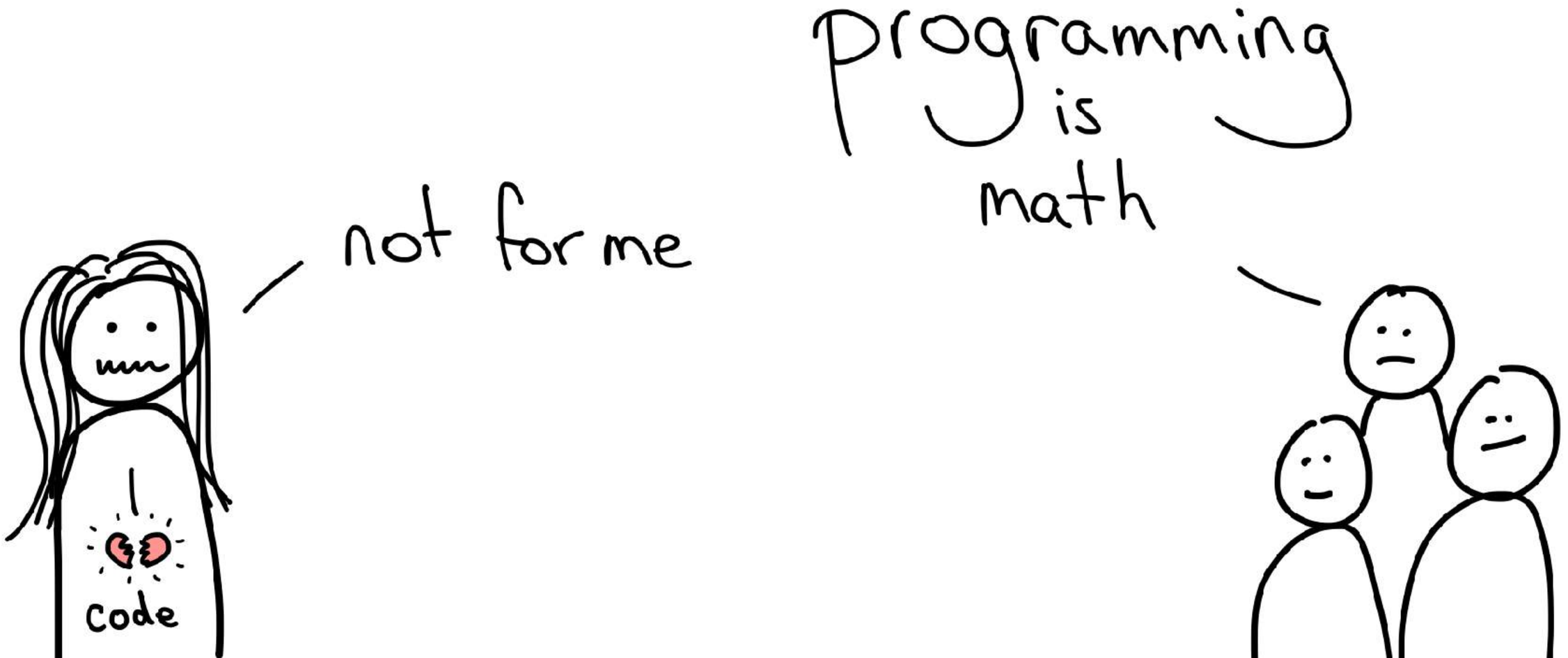
Everyone can learn it





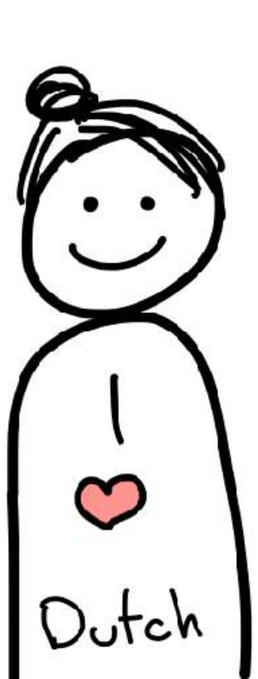
Programming
is
math




not for me
code
Programming
is
math

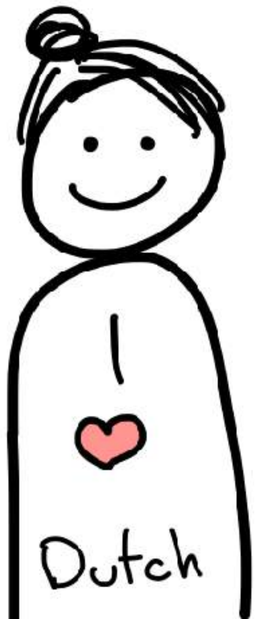
Some stuff makes no sense

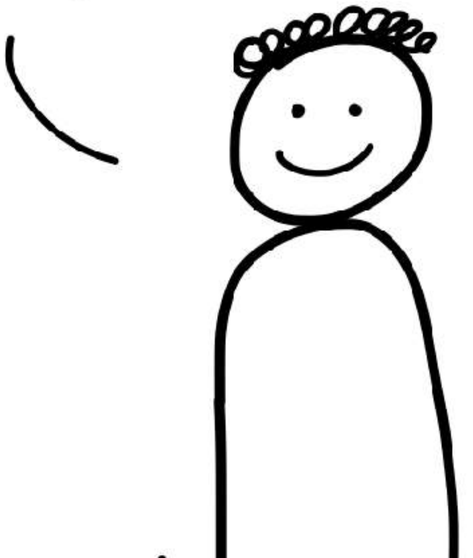
"I read a book"



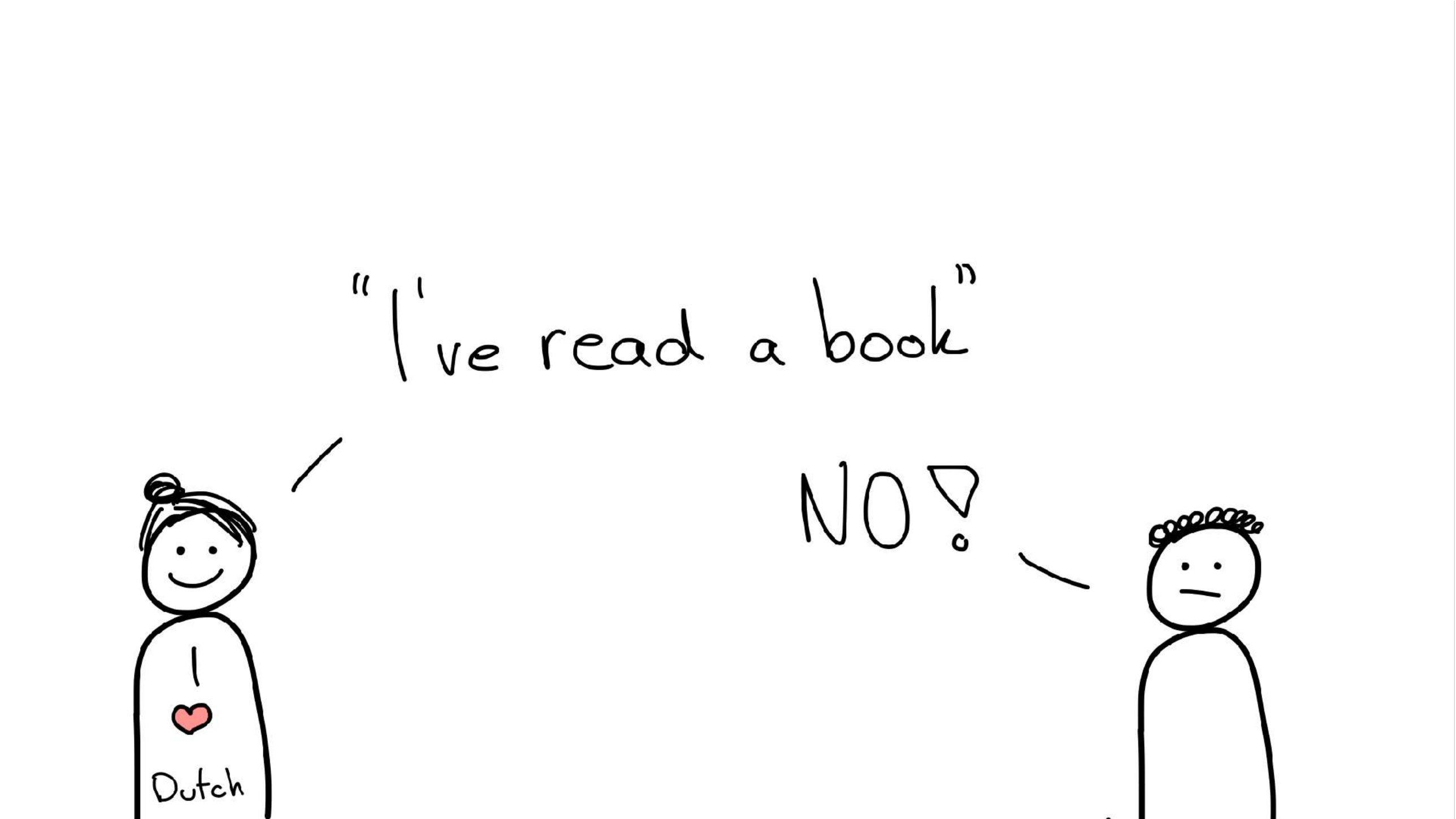
"I read a book"

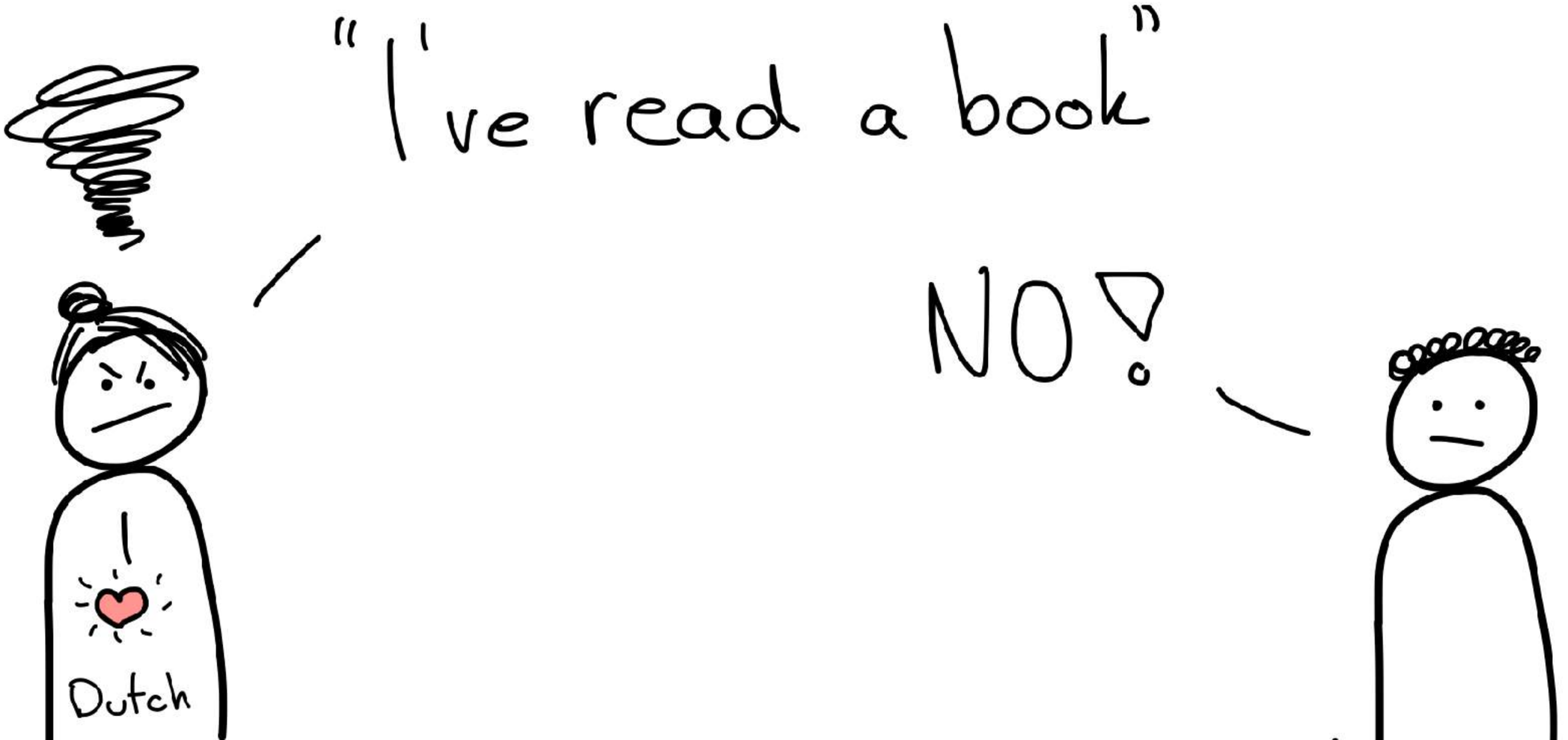
well done!



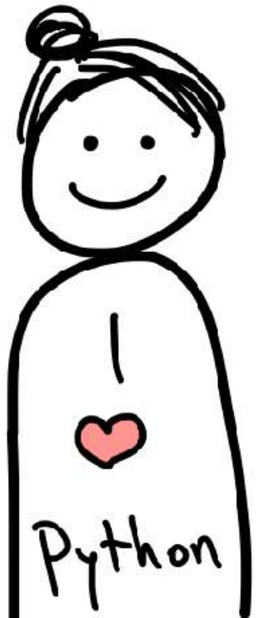


"I've read a book"


"I've read a book"
NO!
I
Dutch


"I've read a book"
NO!
Dutch

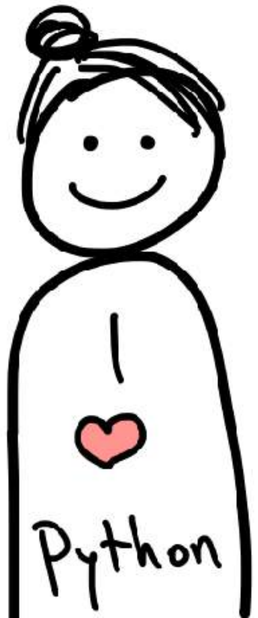
Some stuff makes no sense




```
squares = []
for i in range(5):
    squares.append(i*i)

also_squares = [i*i for i in range(5)]
```

Some stuff makes no sense




```
squares = []
for i in range(5):
    squares.append(i*i)

also_squares = [i*i for i in range(5)]
```

Some stuff makes no sense

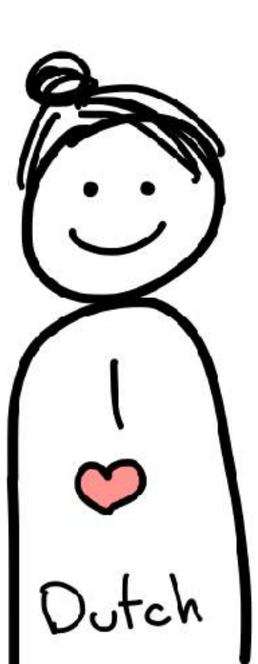
WHY??

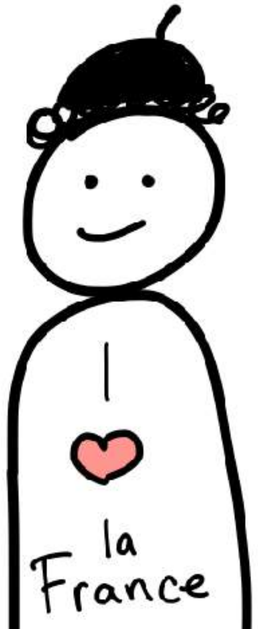
```
squares = []
for i in range(5):
    squares.append(i*i)

also_squares = [i*i for i in range(5)]
```

Some stuff is cultural

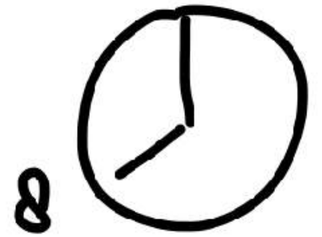
Want to come for coffee at 7 pm?

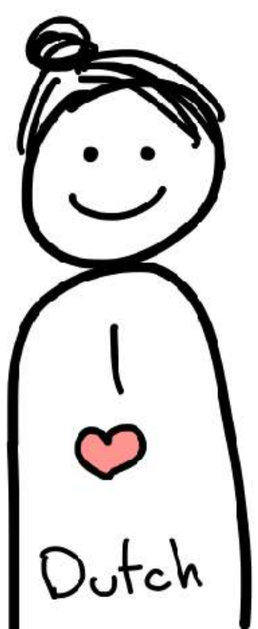


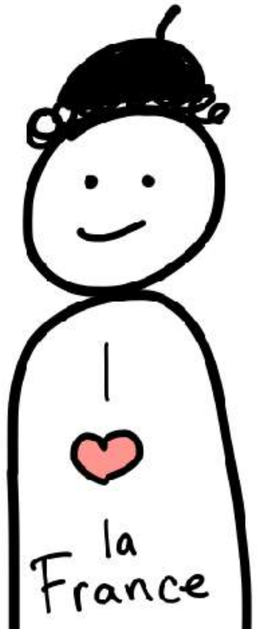


Some stuff is cultural

Want to come for coffee at 7 pm?

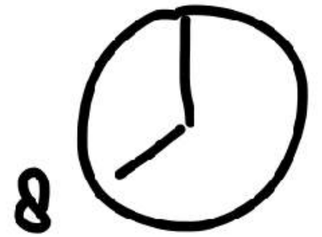


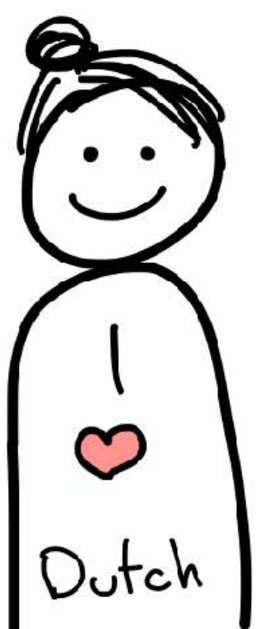




Some stuff is cultural

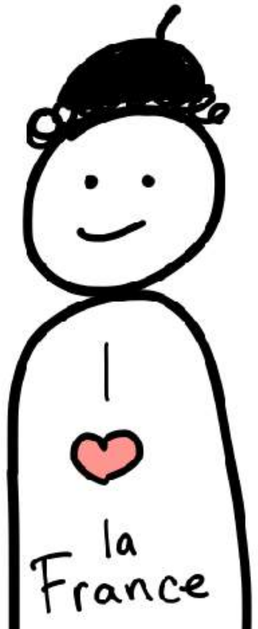
Want to come for coffee at 7 pm?



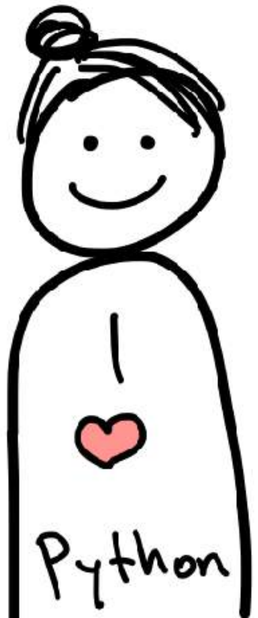


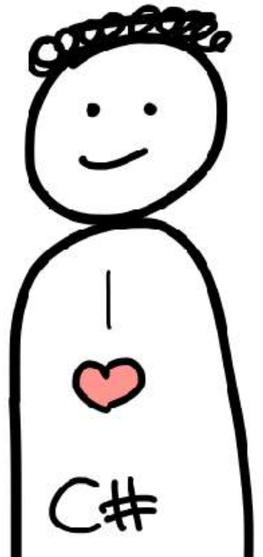
I am here

Where is the food?



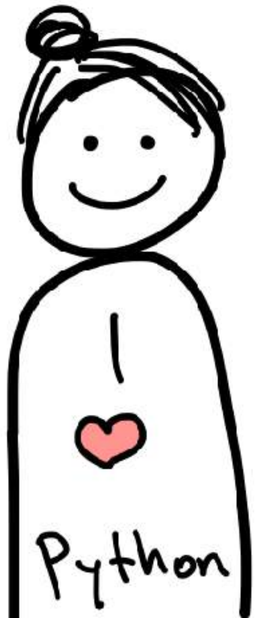
Some stuff is cultural

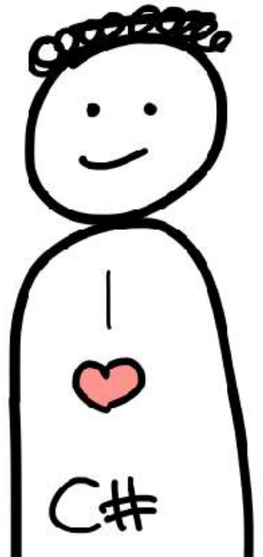




Some stuff is cultural

number_of_hearts = 12



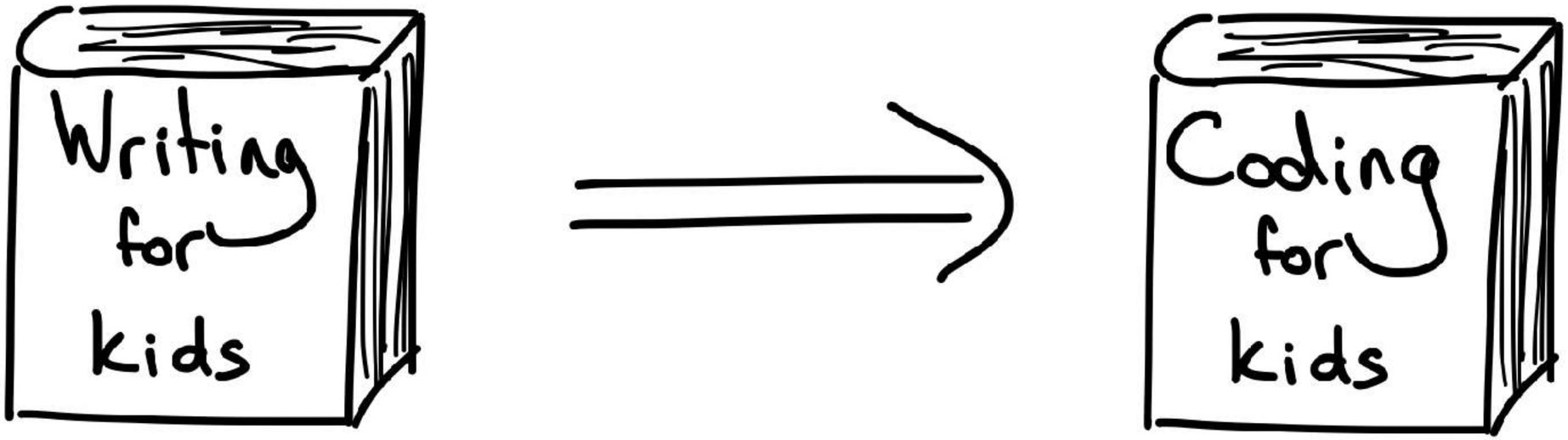


Some stuff is cultural

number_of_hearts = 12

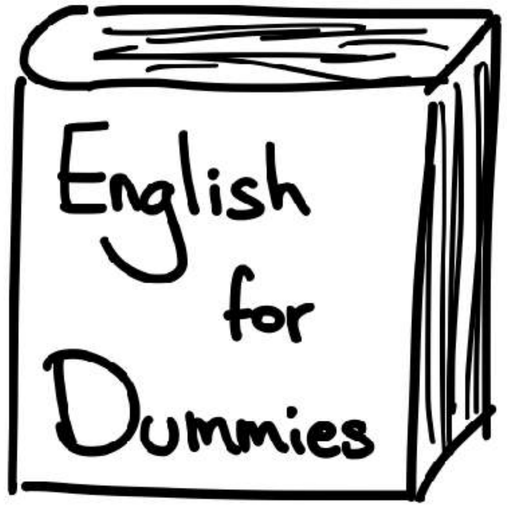
nHearts = 12

Teach programming like language



What do we know about teaching language?

Teach programming like language



listening

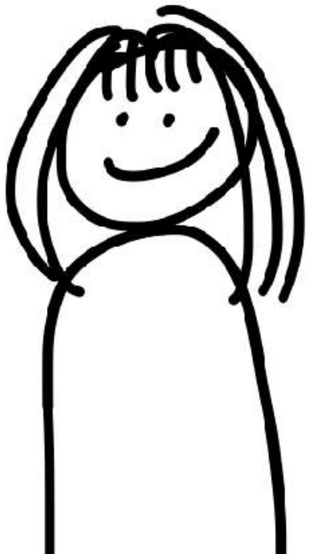
reading

speaking

writing

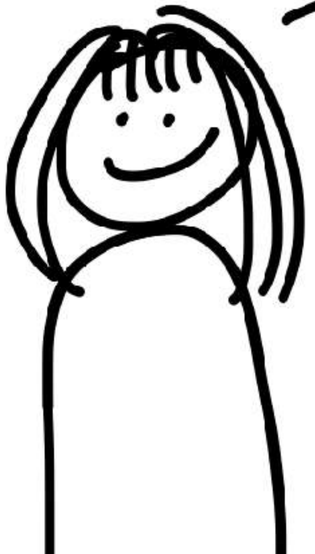
word lists

Phonics vs. Whole Language



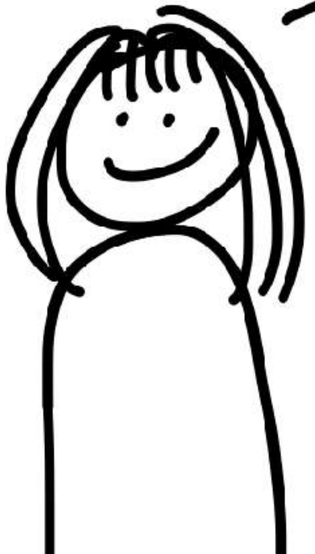
Phonics vs. Whole Language

r.ea.d

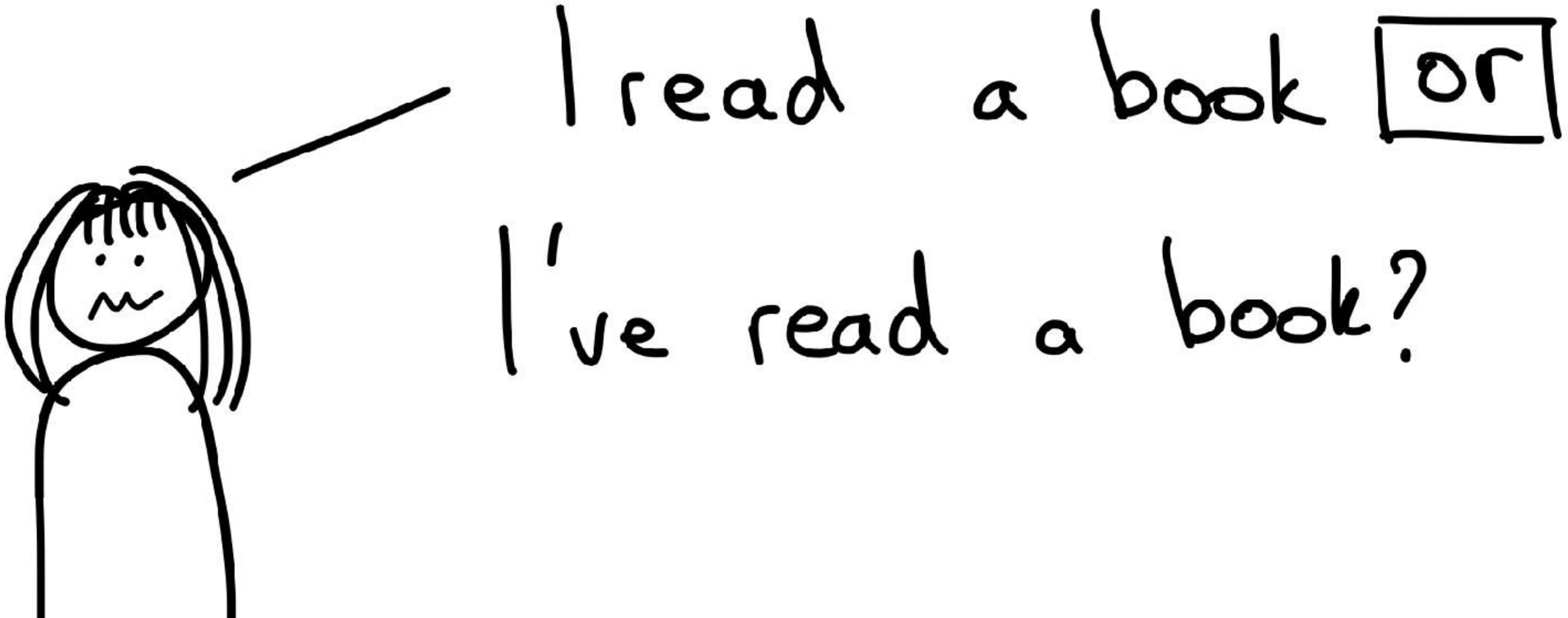


Phonics vs. Whole Language

I read a book



Phonics vs. Whole Language



Phonics vs. Whole Language

this is a loop

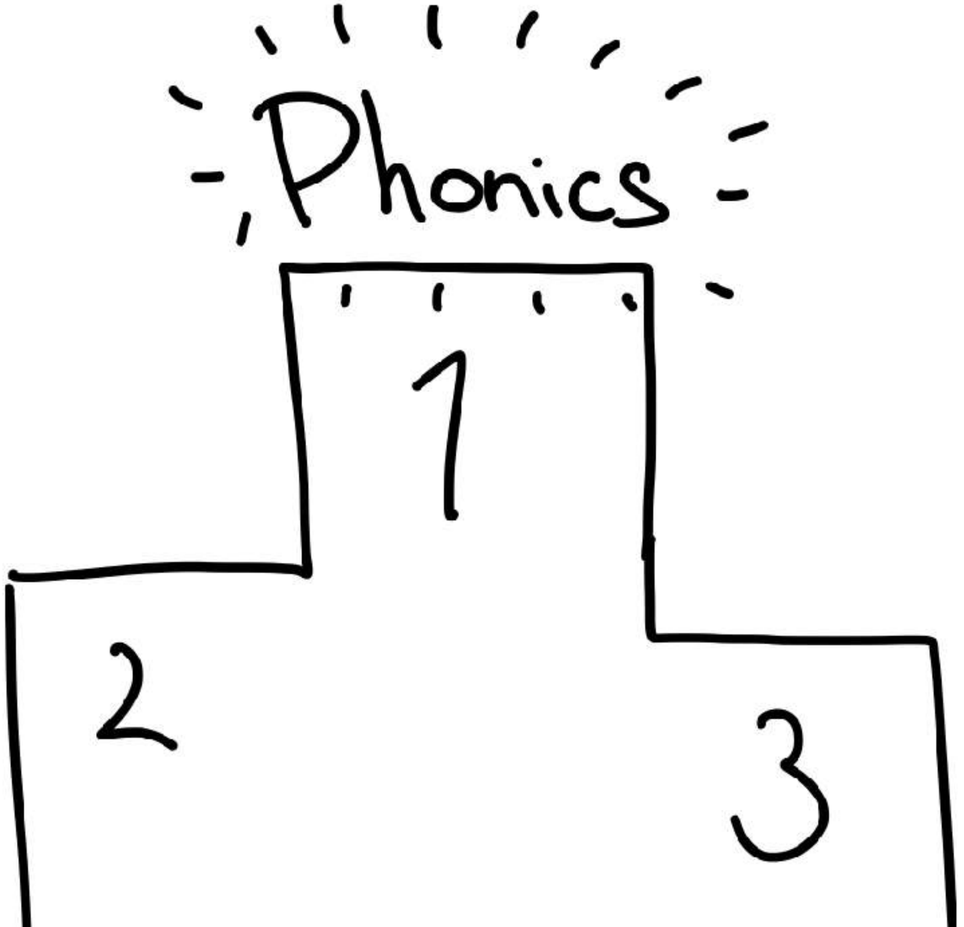
now go reverse a string

Phonics vs. Whole Language

.if. .{.

.x=5.

Phonics vs. Whole Language



Phonics vs. Whole Language

› Education

Headteachers who resist teaching phonics are failing students, minister warns

8

share

Phonics vs. Whole Language

› Education

Headteachers who resist teaching phonics are failing students, minister warns

8

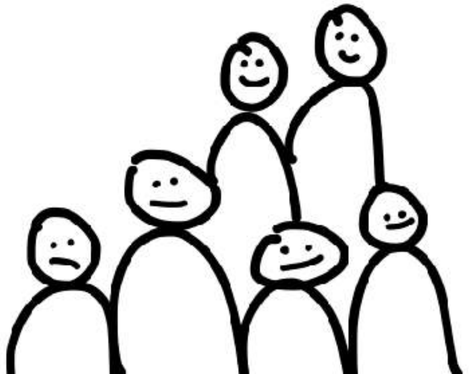
share

Sommen stampen terug van weggeweest

SAMENLEVING

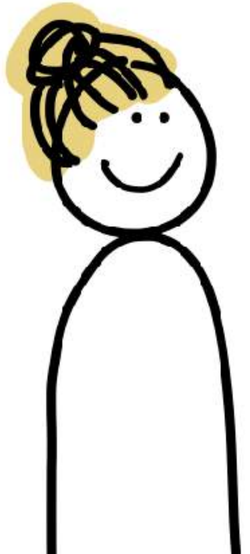
Petra Vissers – 18:21, 3 november 2017

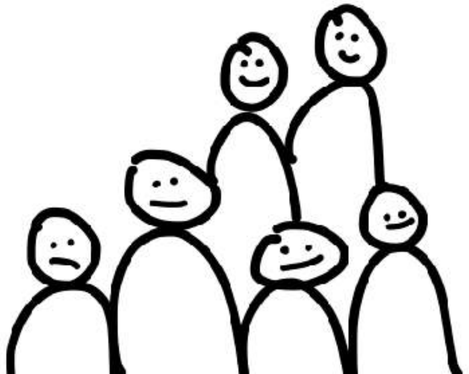
Towards a phonics approach



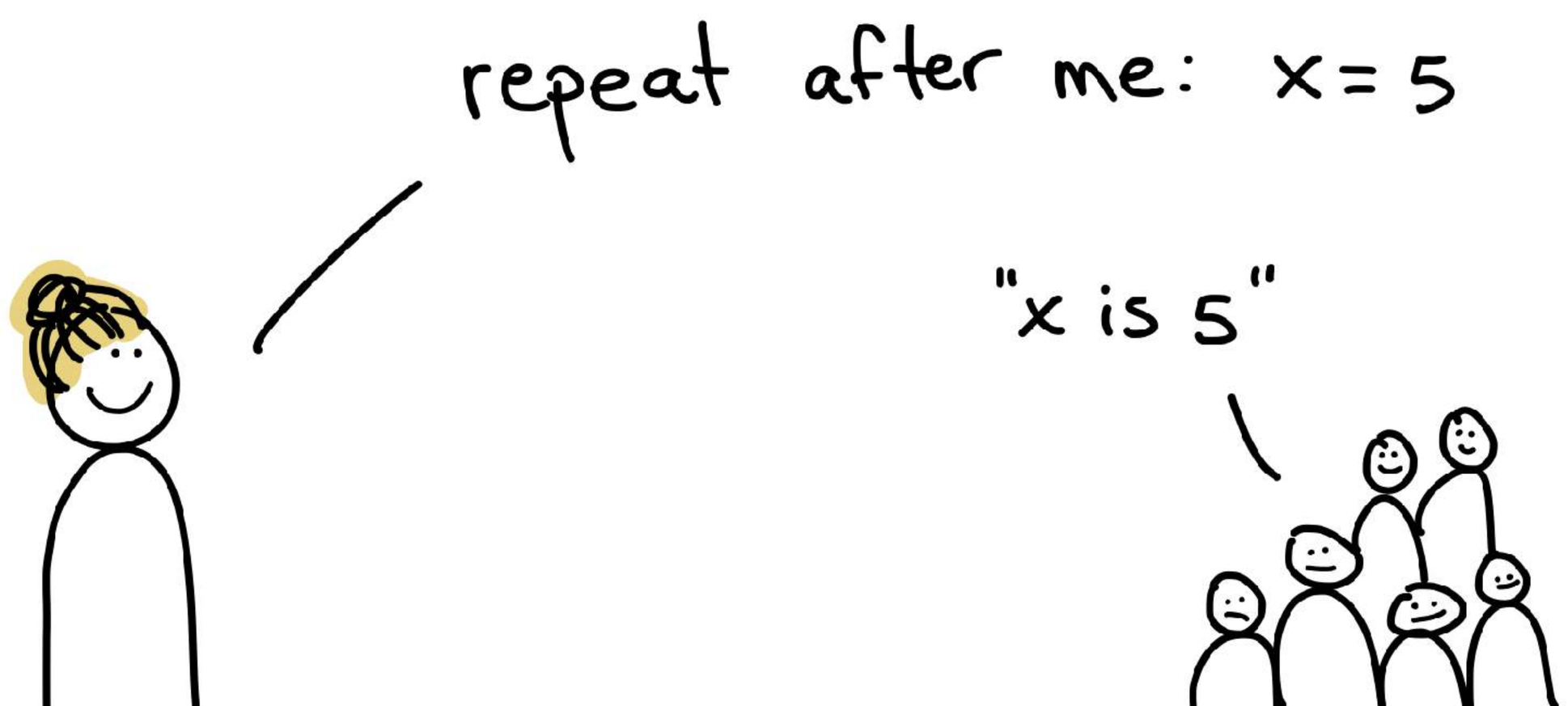
Towards a phonics approach

repeat after me: $x = 5$





Towards a phonics approach



Towards a phonics approach

Homework

Fill in the blanks:

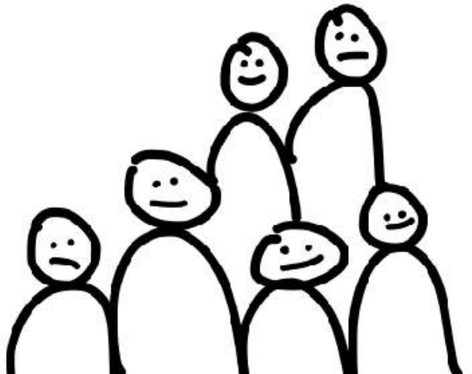
$x = 5$

$x _ 5$

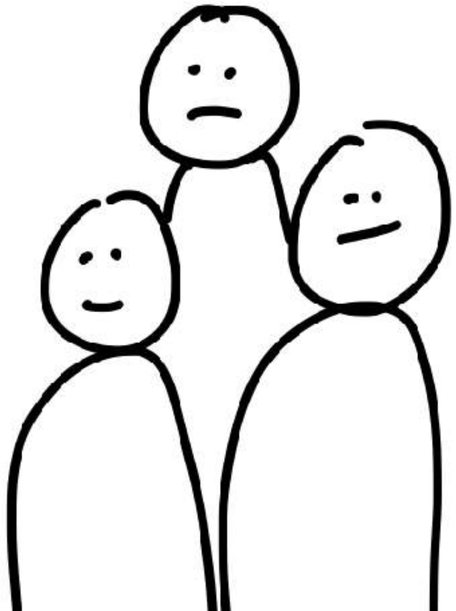
$x = _$

$_ = 12$

$_ = _$



Towards a phonics approach

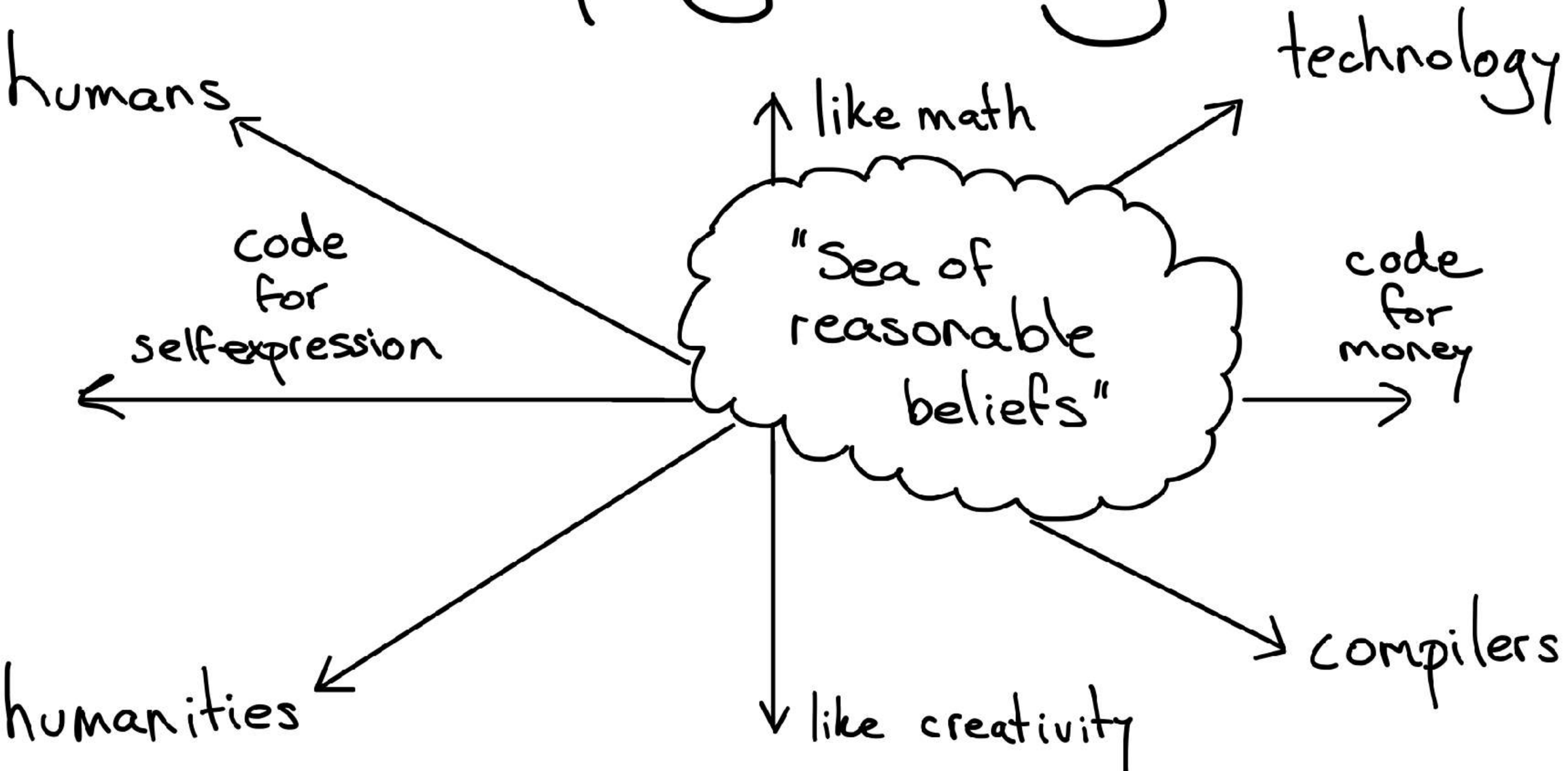


Towards a phonics approach

Towards a phonics approach

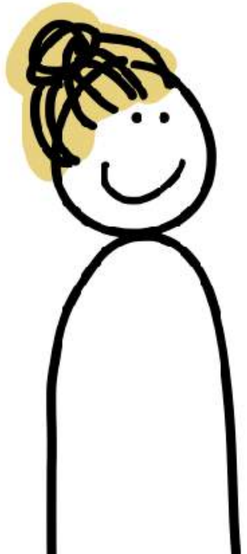
That does not matter

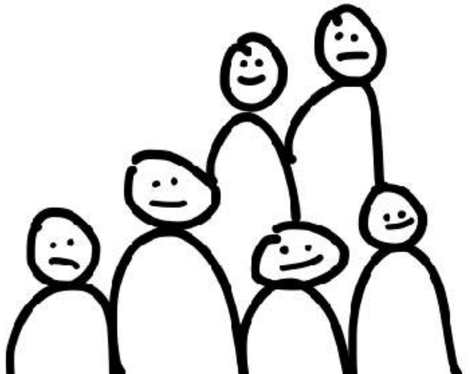
What is programming?



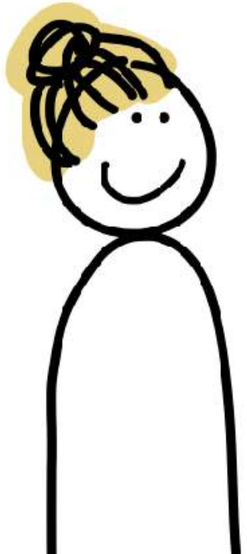
Towards a phonics approach

Now you know assignment.
What will you build?

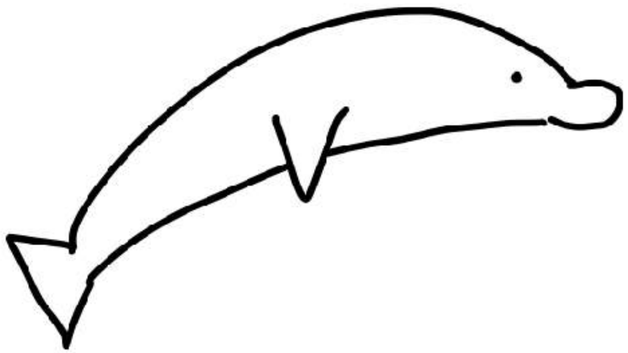




Towards a phonics approach

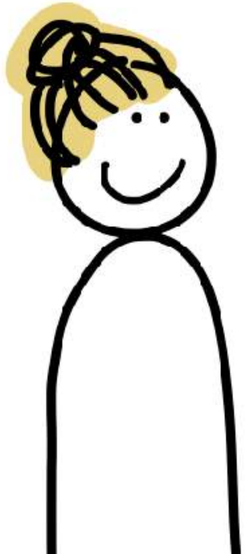


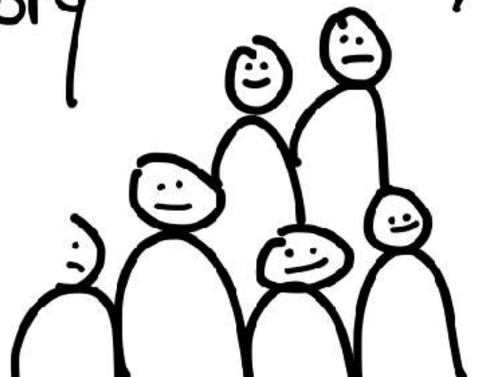
Towards a phonics approach



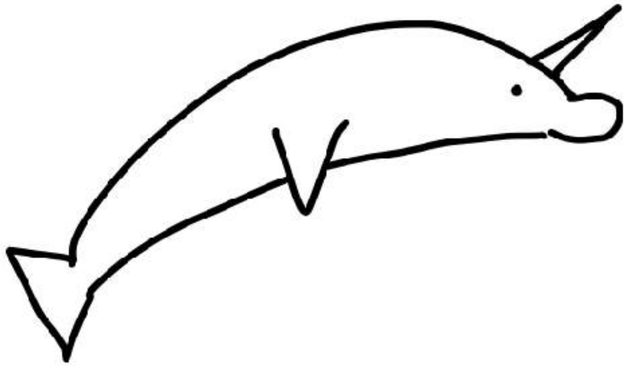
Supermarket app

Narwhal story



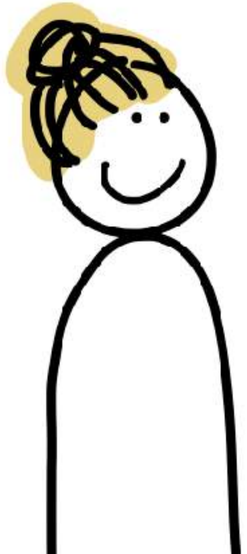


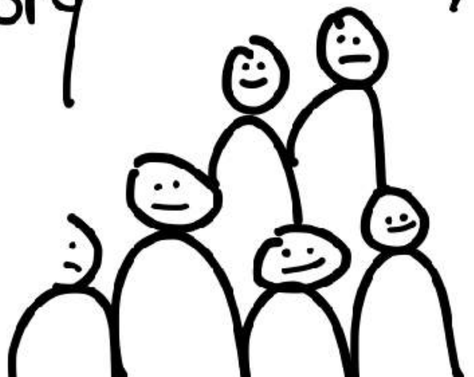
Towards a phonics approach

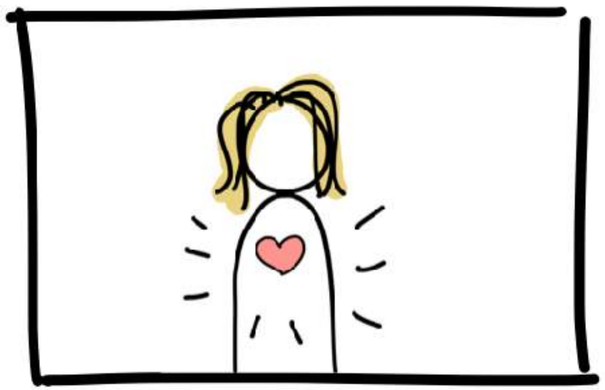


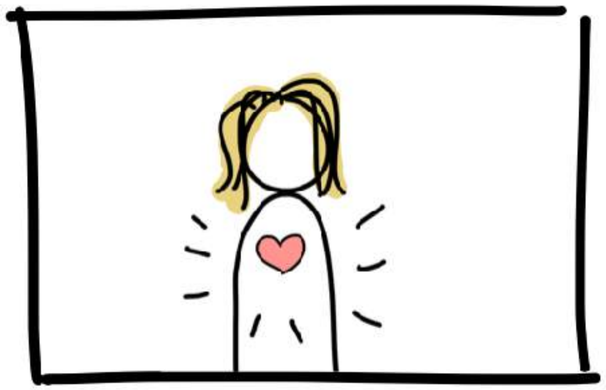
Supermarket app

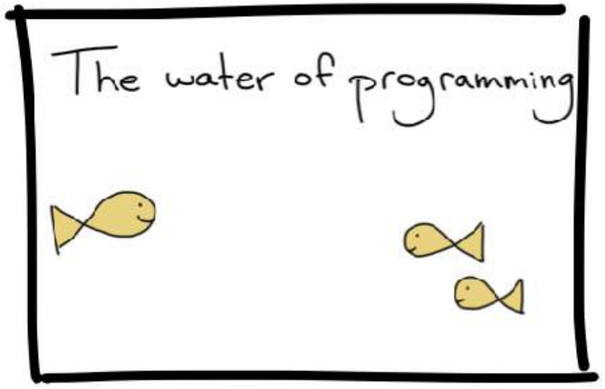
Narwhal story

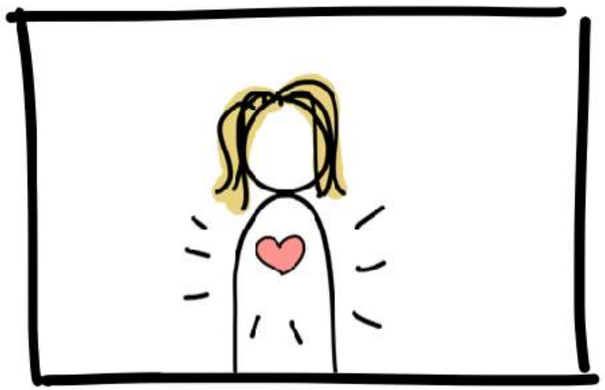


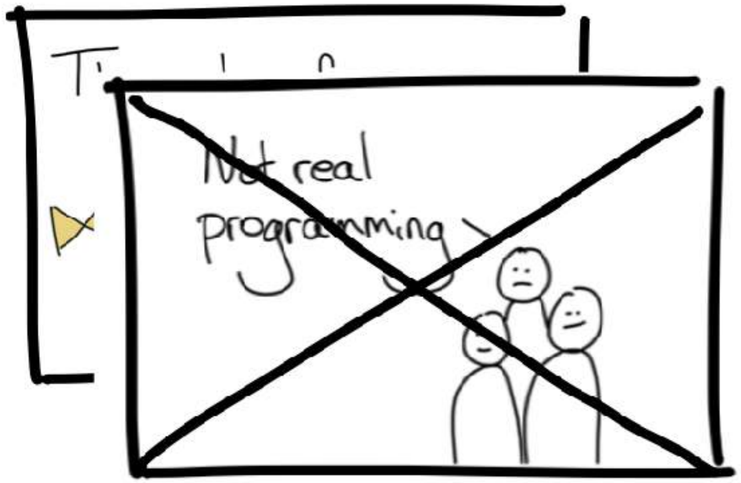


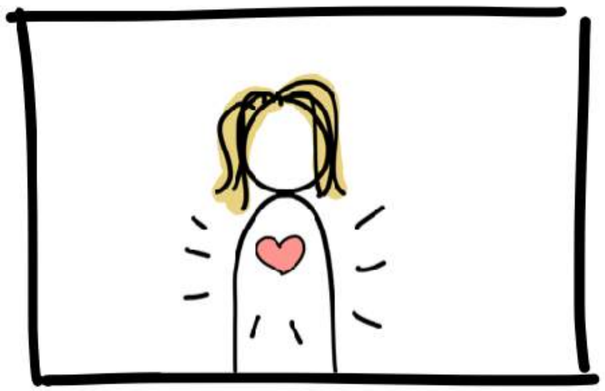


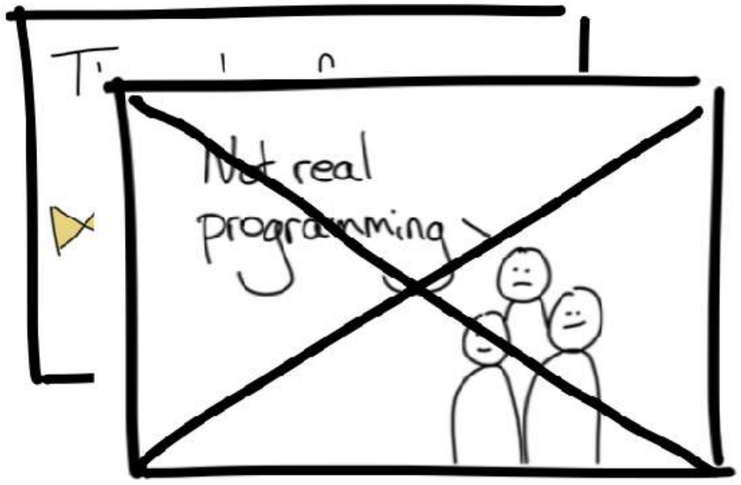


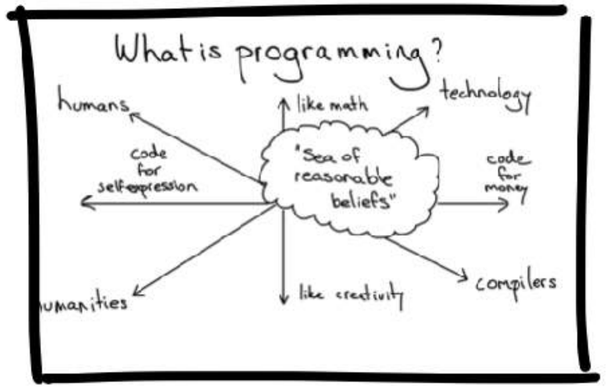

The water of programming

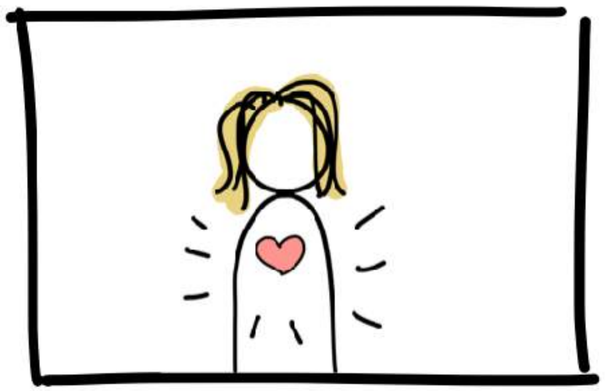


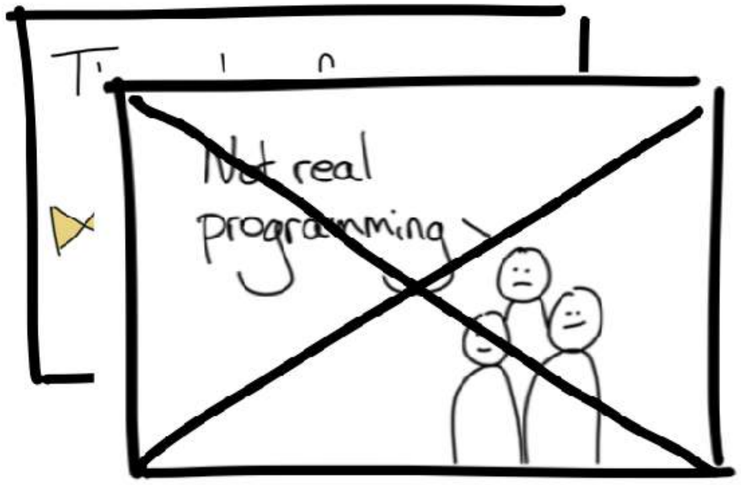

Not real
programming

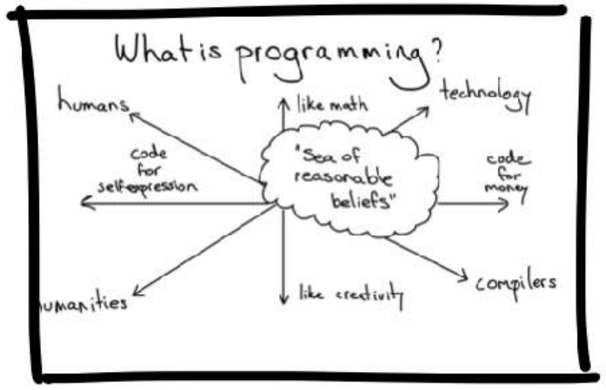


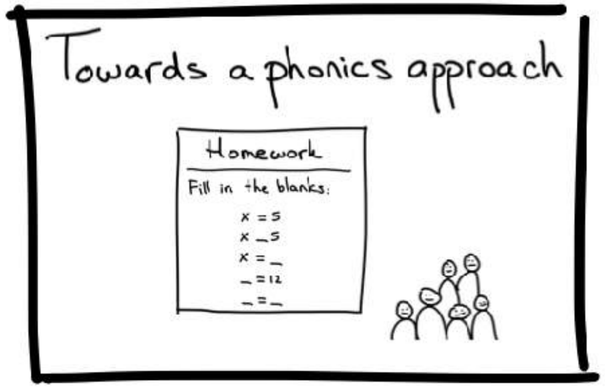

Not real
programming


What is programming?
humans
like math
technology
code for self-expression
"Sea of reasonable beliefs"
code for money
humanities
like creativity
compilers

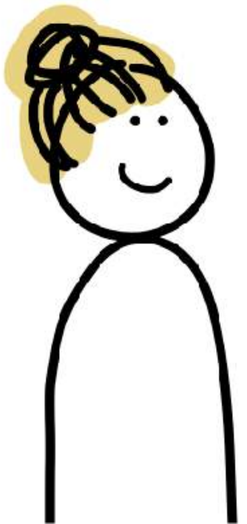



Not real
programming


What is programming?
humans
like math
technology
code for self-expression
"Sea of reasonable beliefs"
code for money
humanities
like creativity
compilers

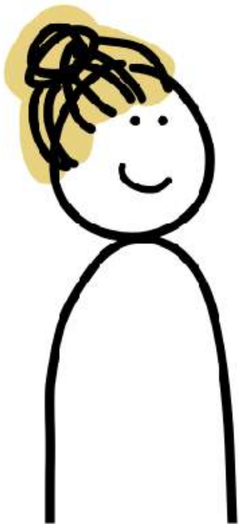

Towards a phonics approach
Homework
Fill in the blanks:
x = 5
x _ 5
x = _
_ = 12
_ = _

THE END



@Felienne
felienne.com

THE END

Slides made with Goodnotes& Pencil

@Felienne
felienne.com