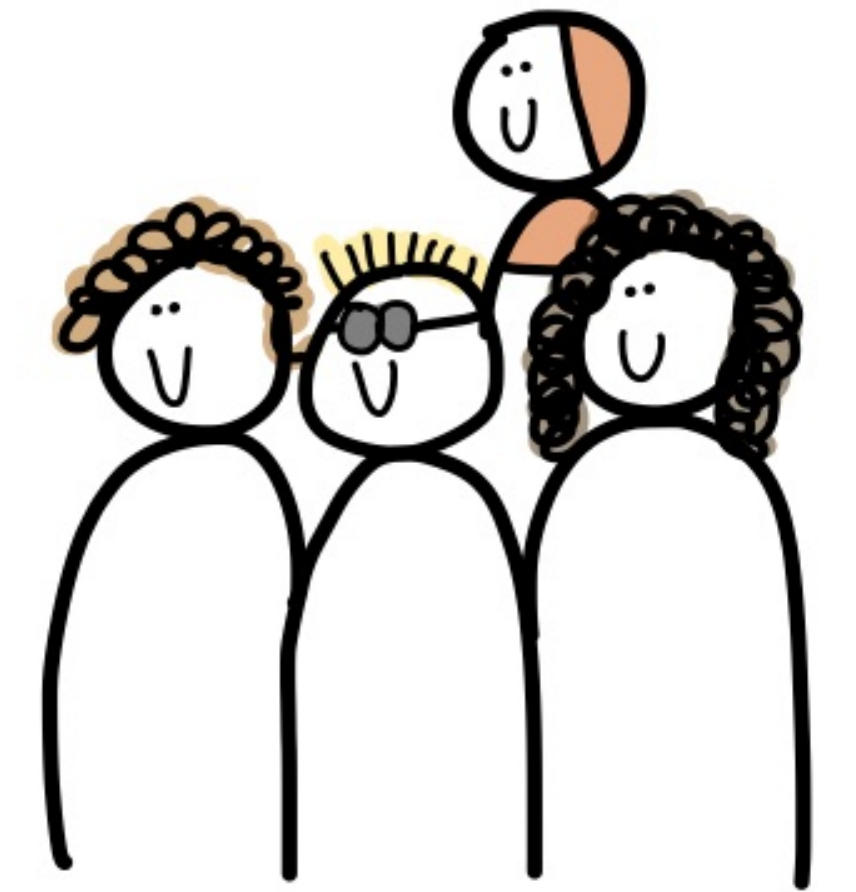
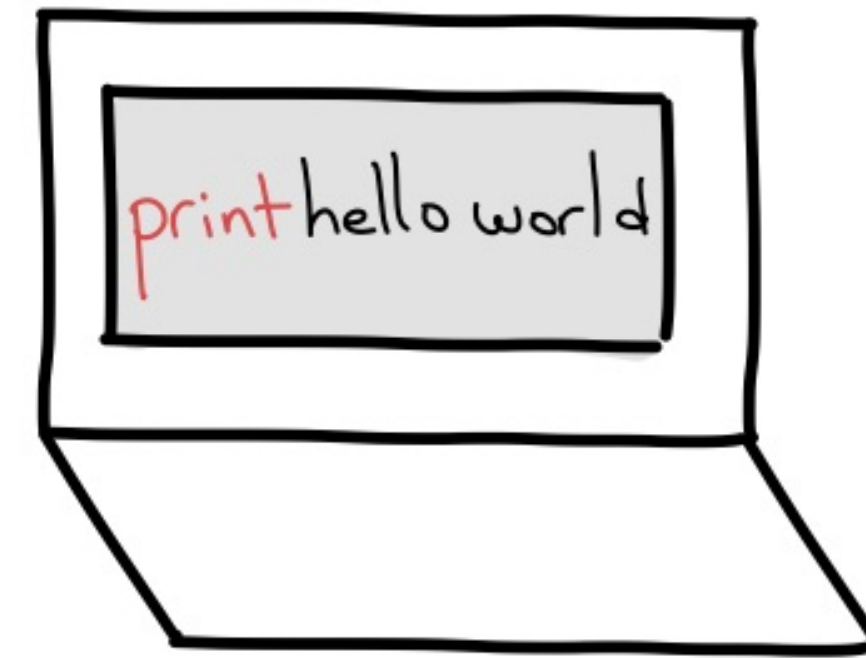
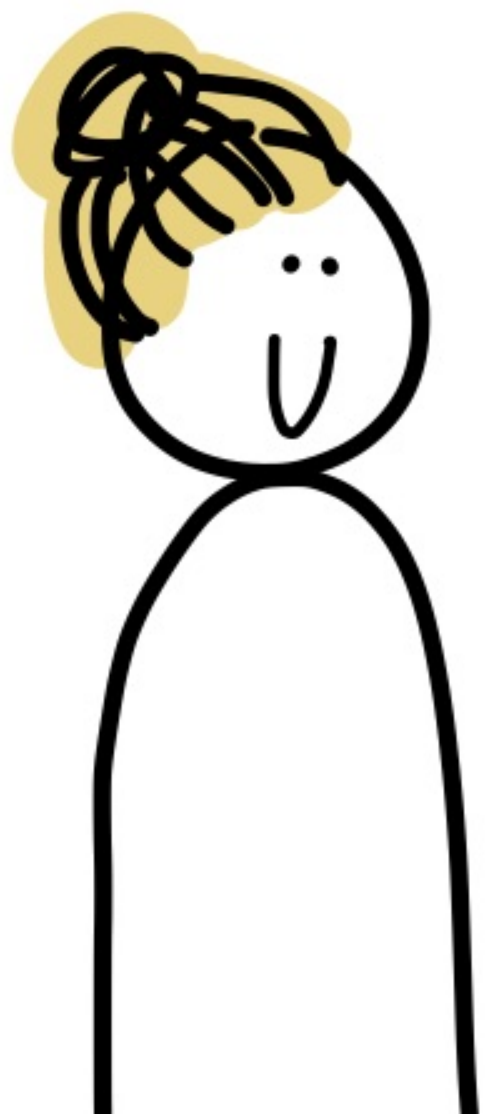


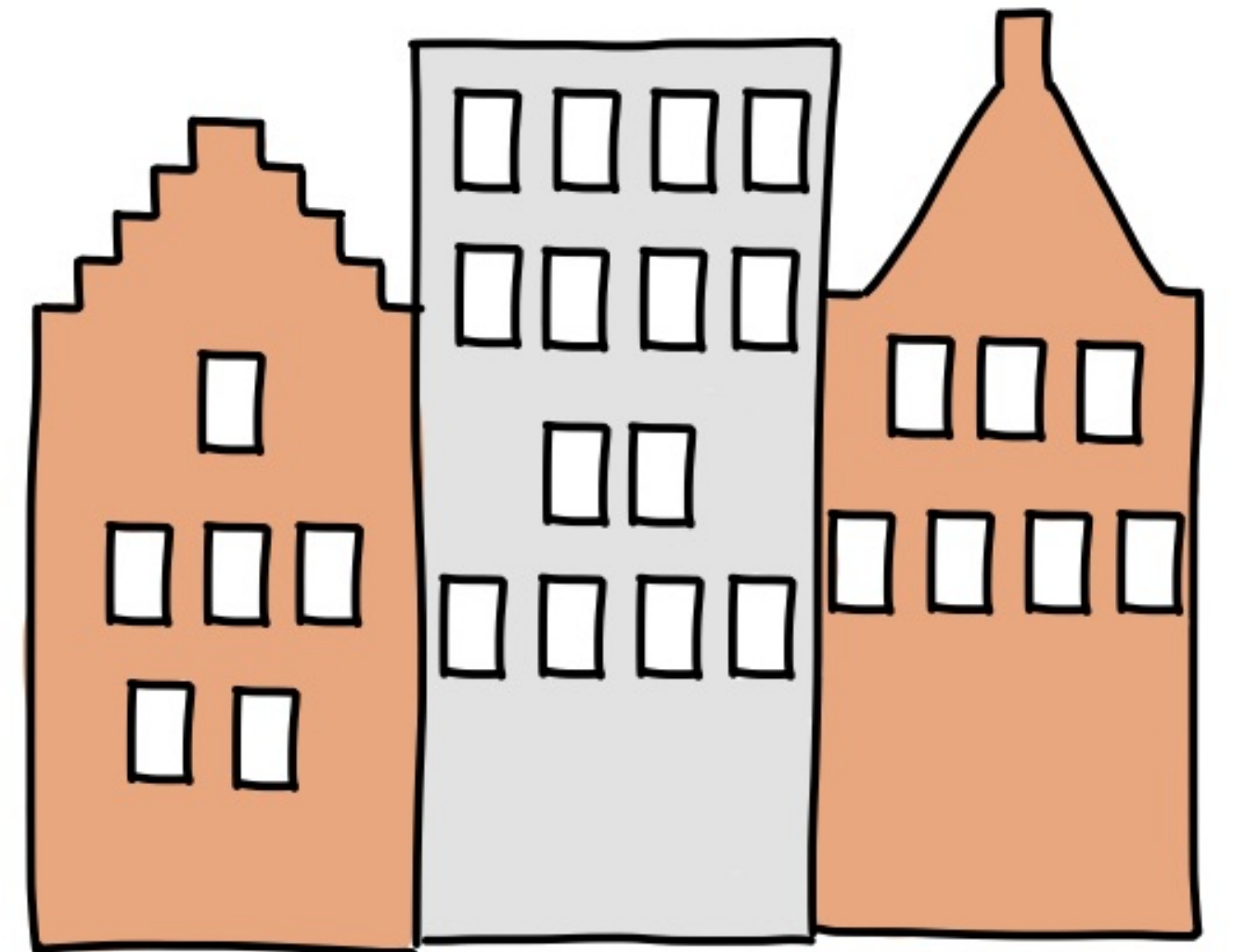
A human programming language

How to make programming languages more inclusive
and why that matters

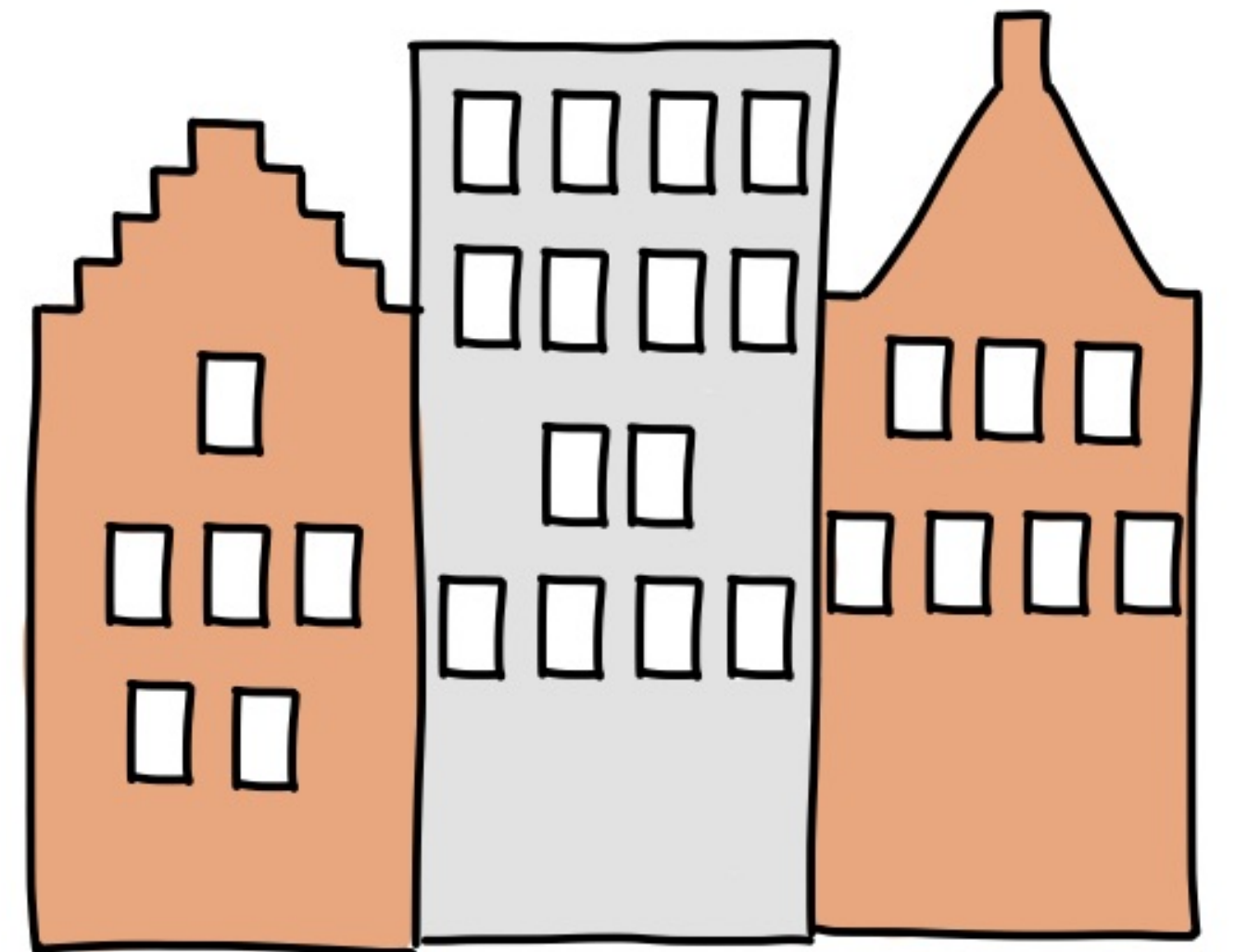


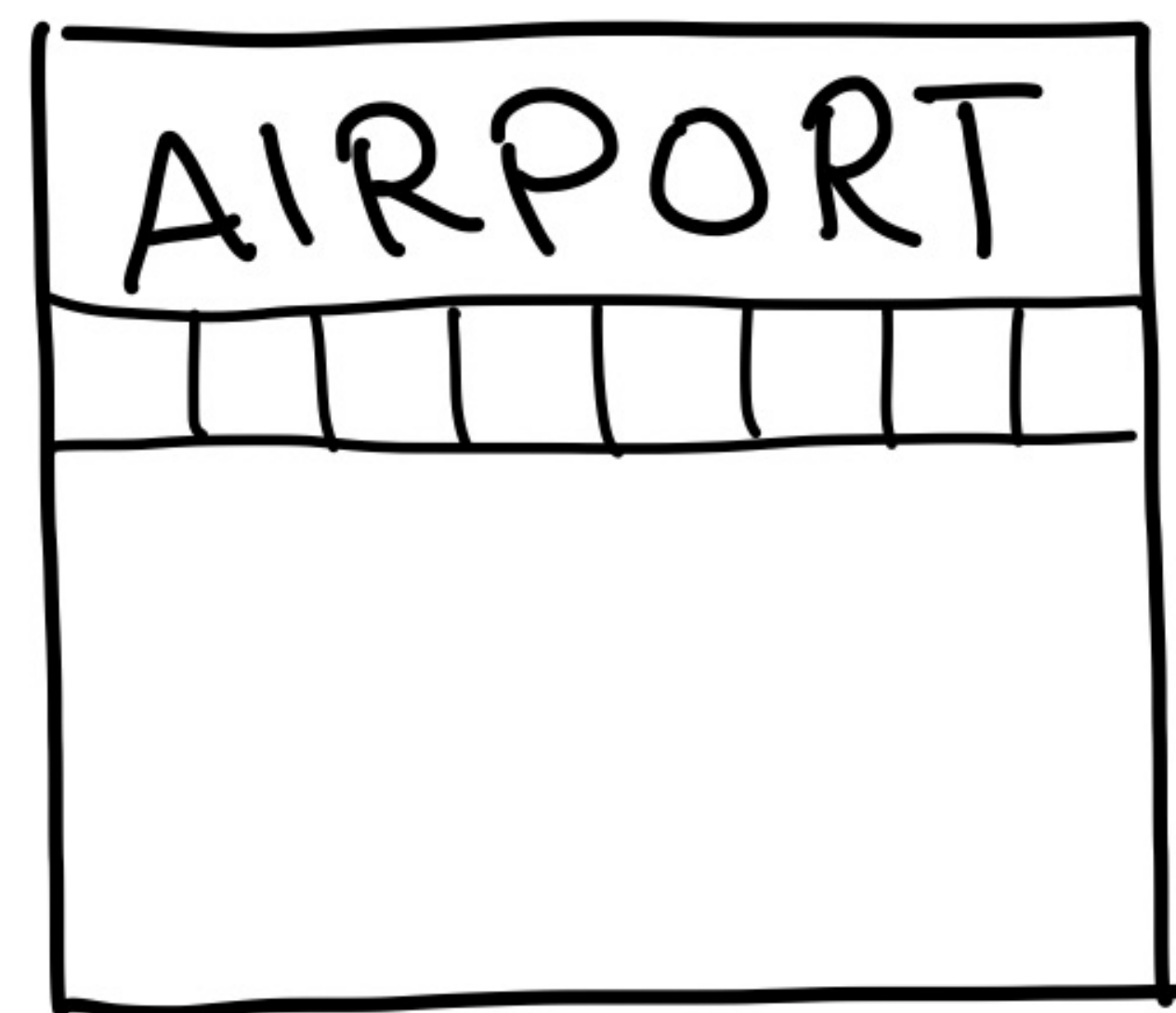
prof. dr. ir. Felienne Hermans

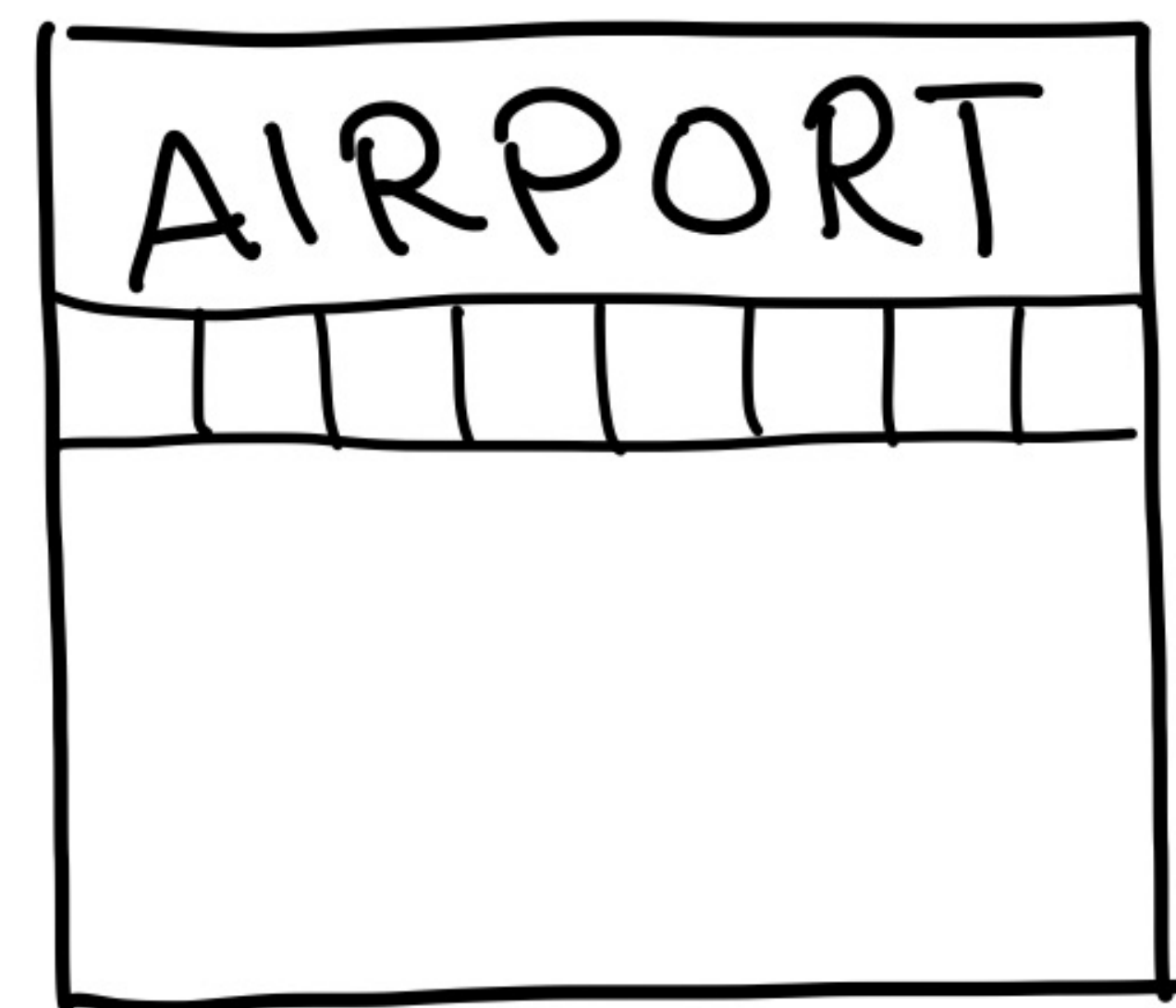
No need to go to Amsterdam



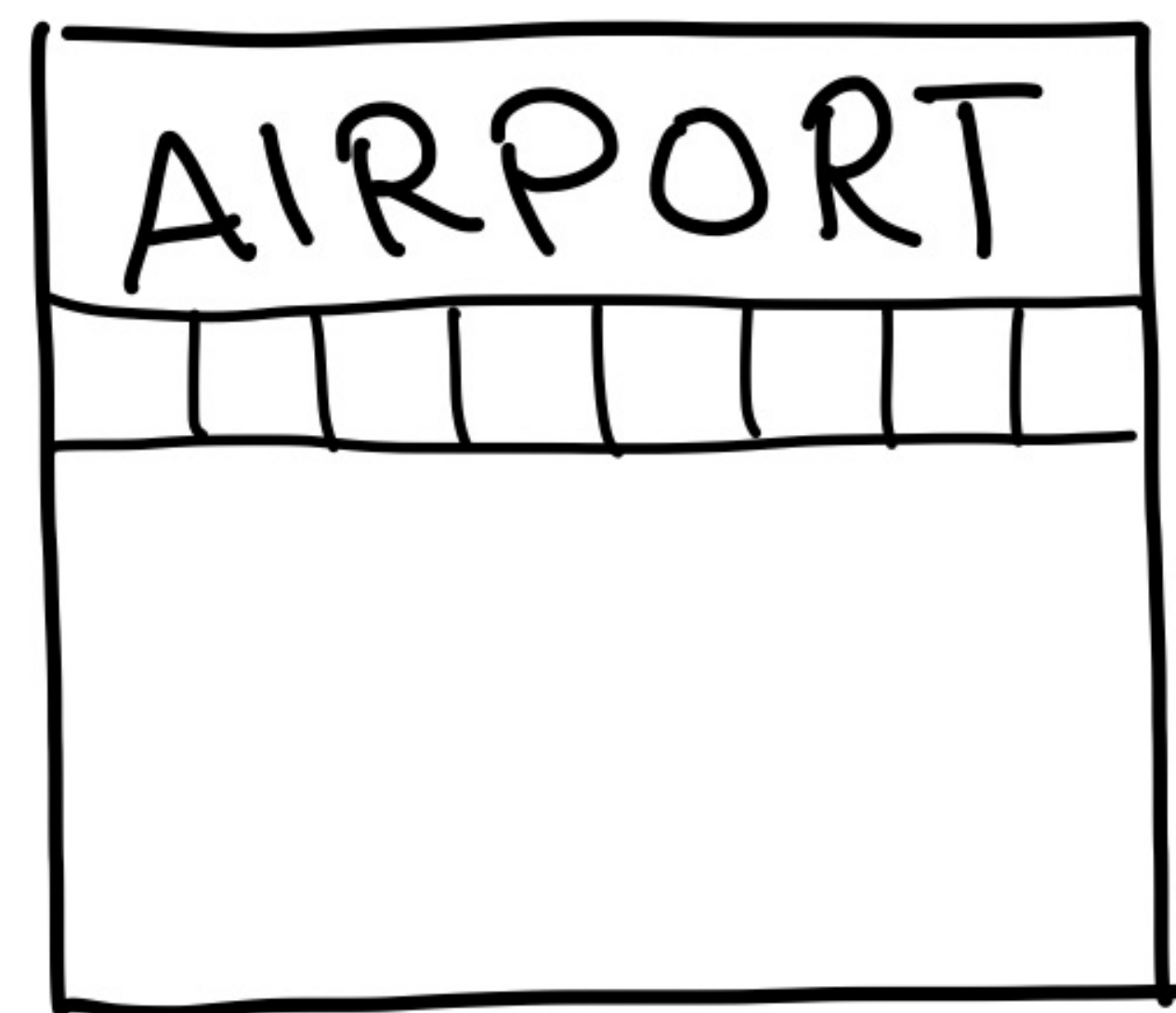
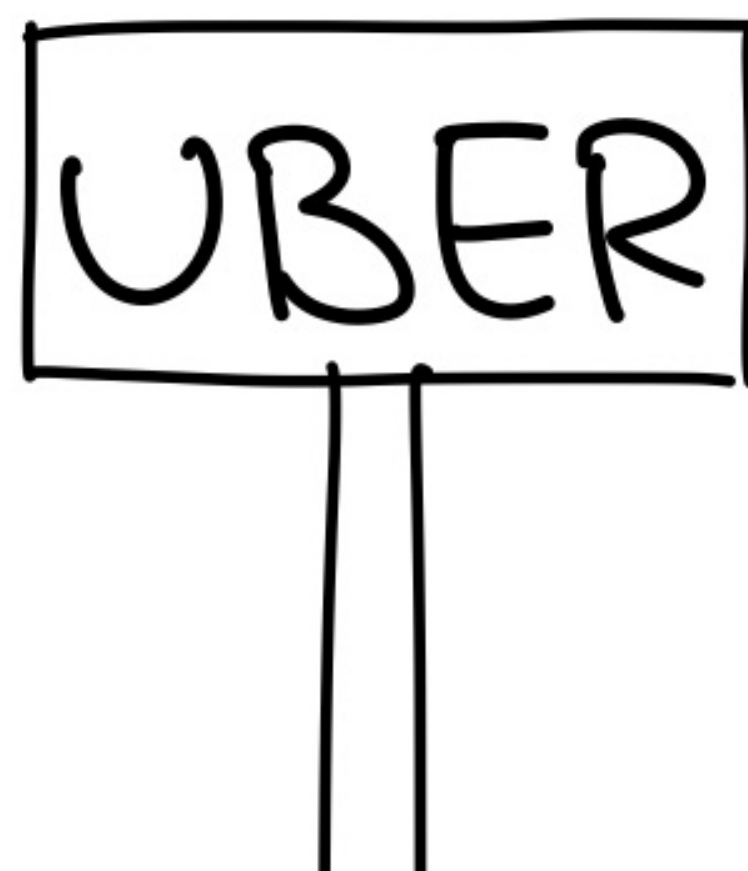
No need to go to Amsterdam
It is all on Instagram



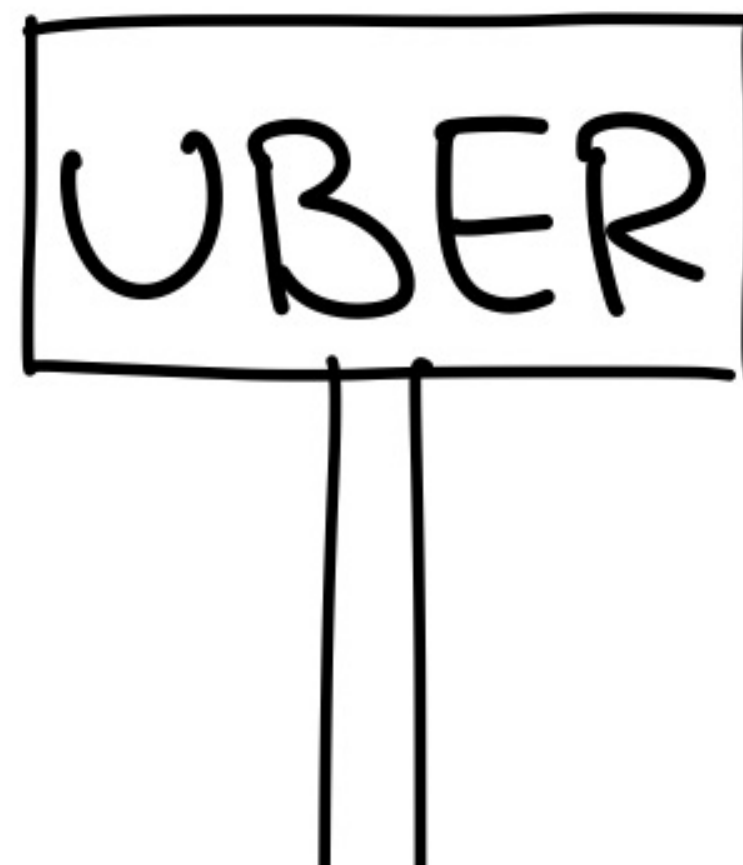
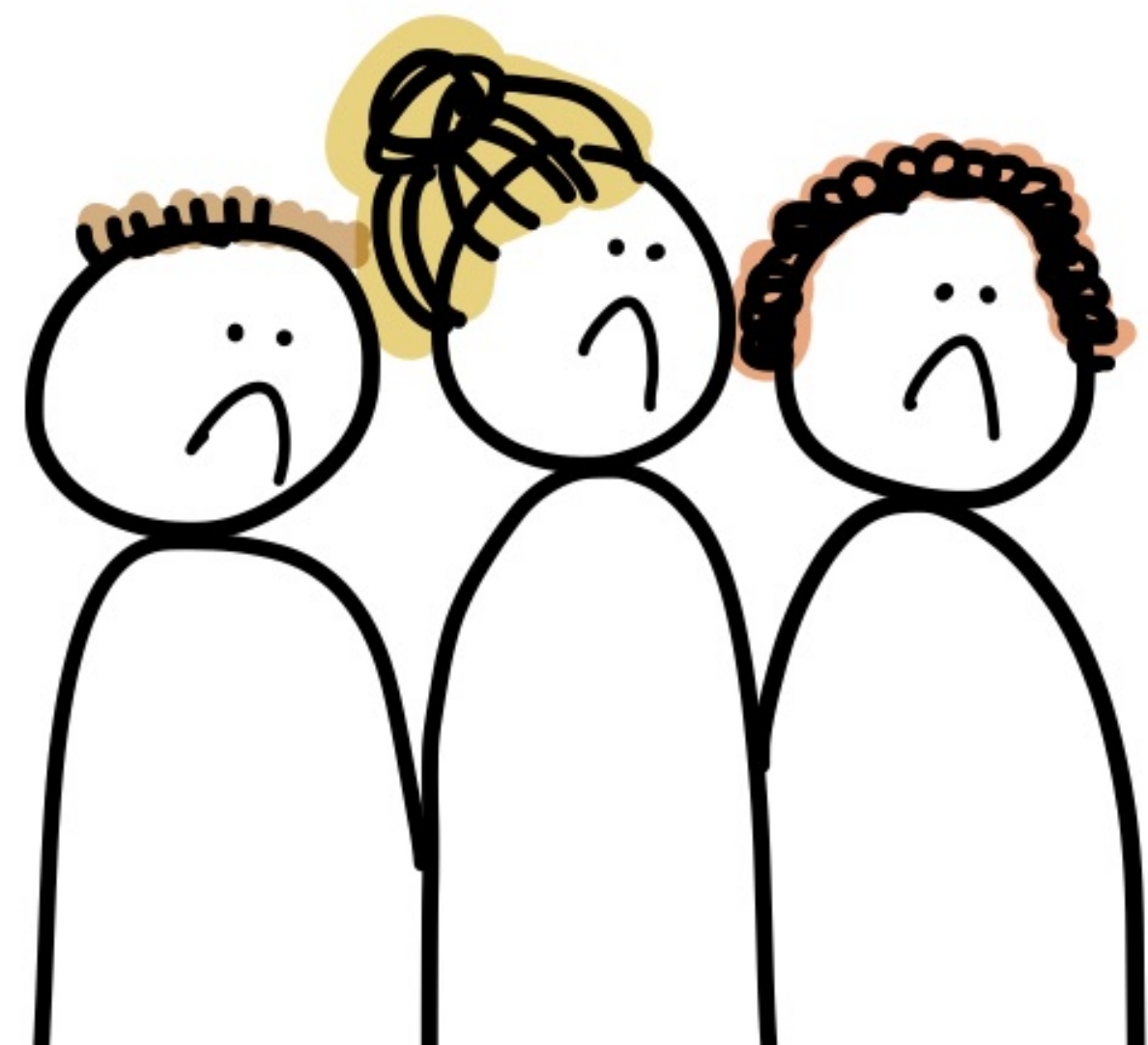


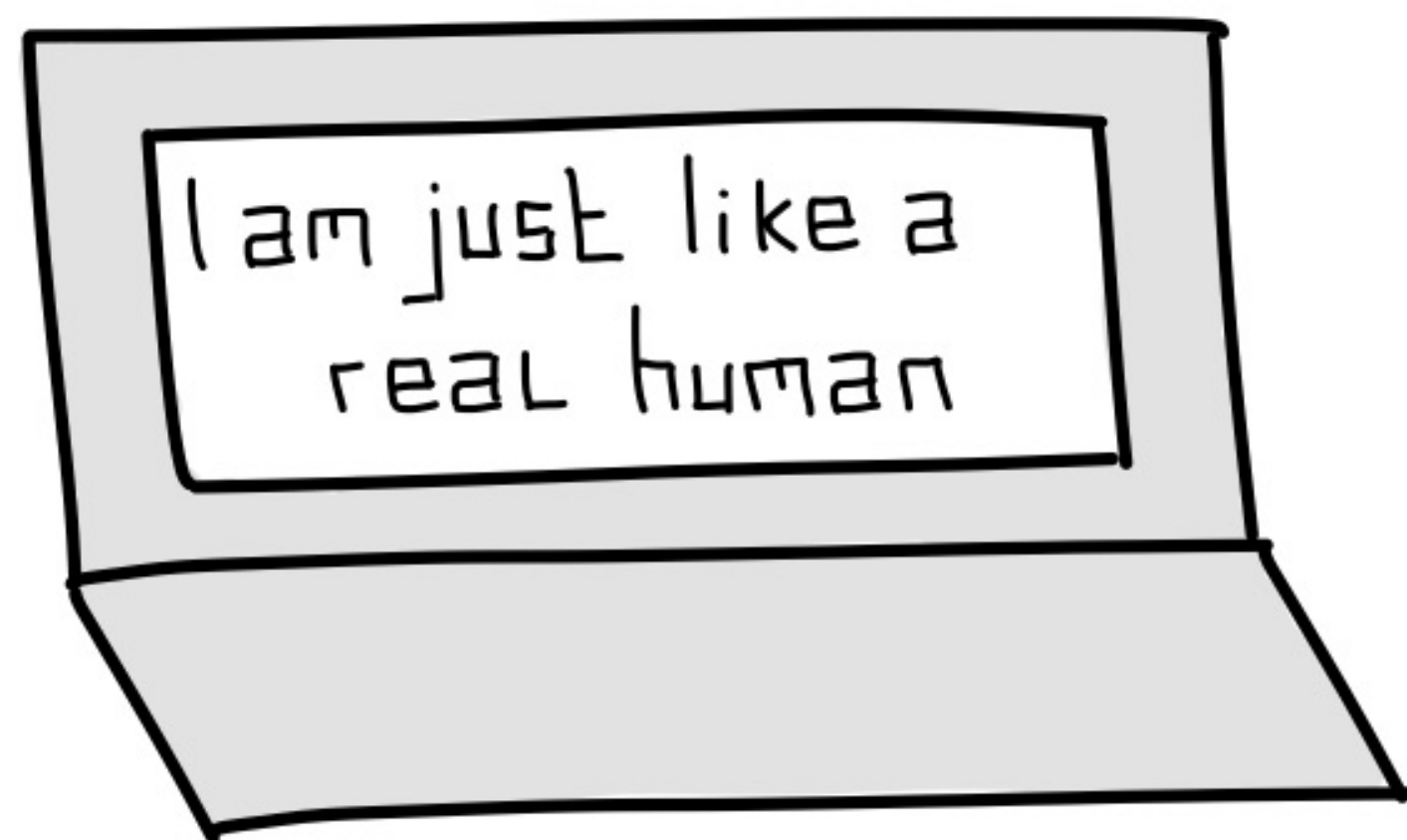


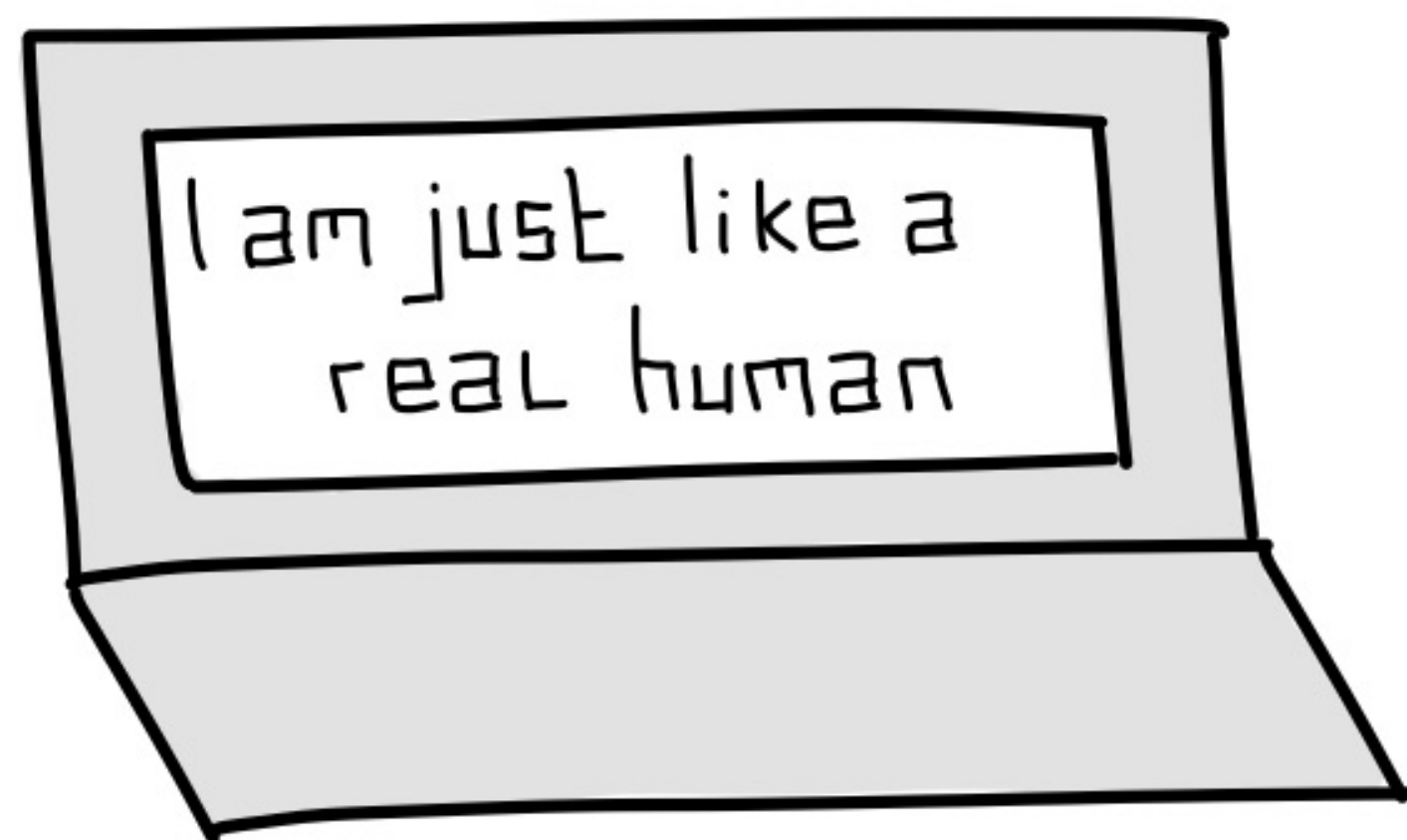




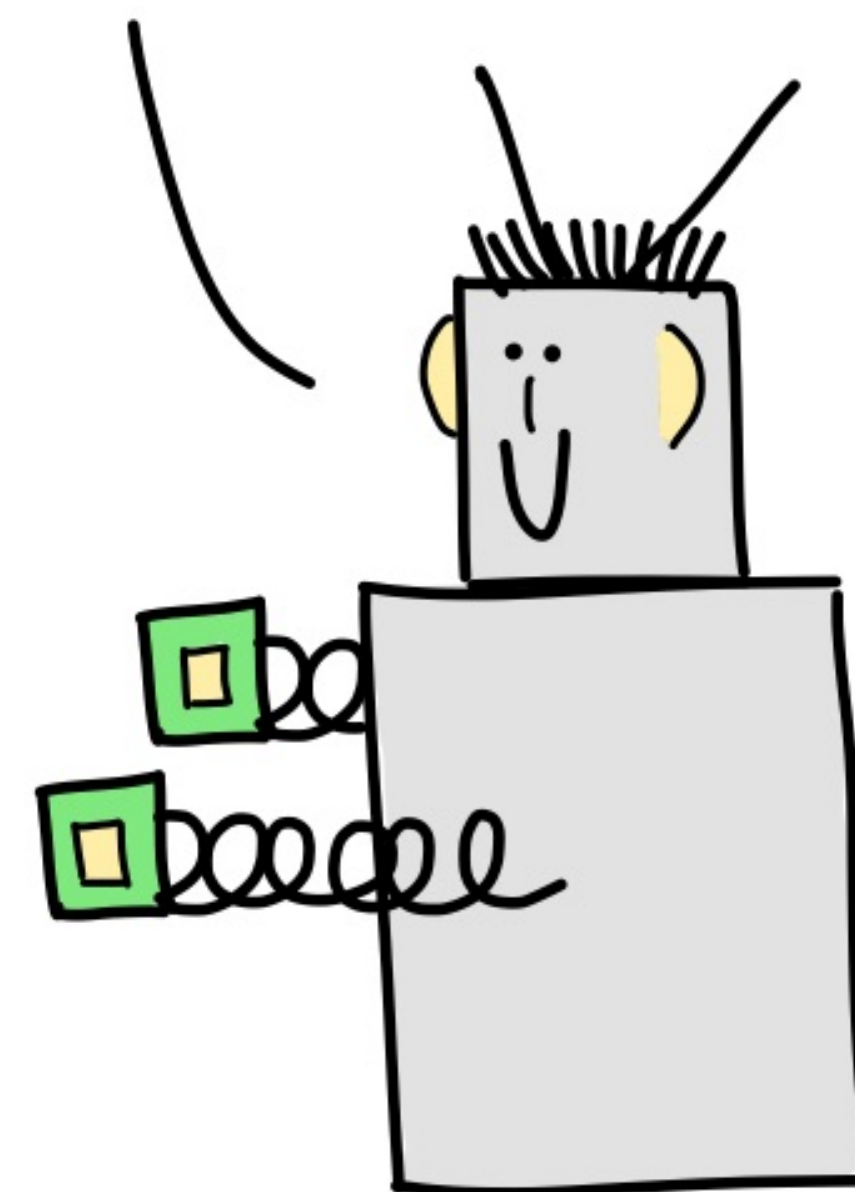
Let's build our own app!

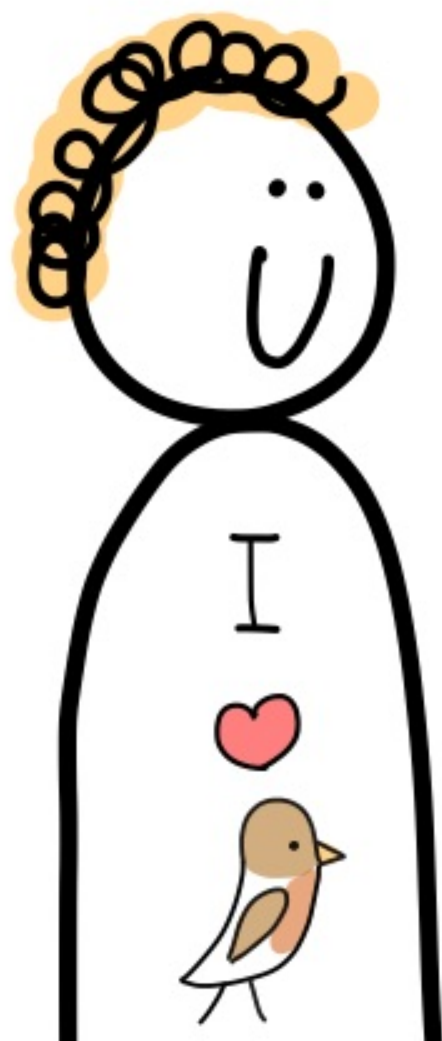


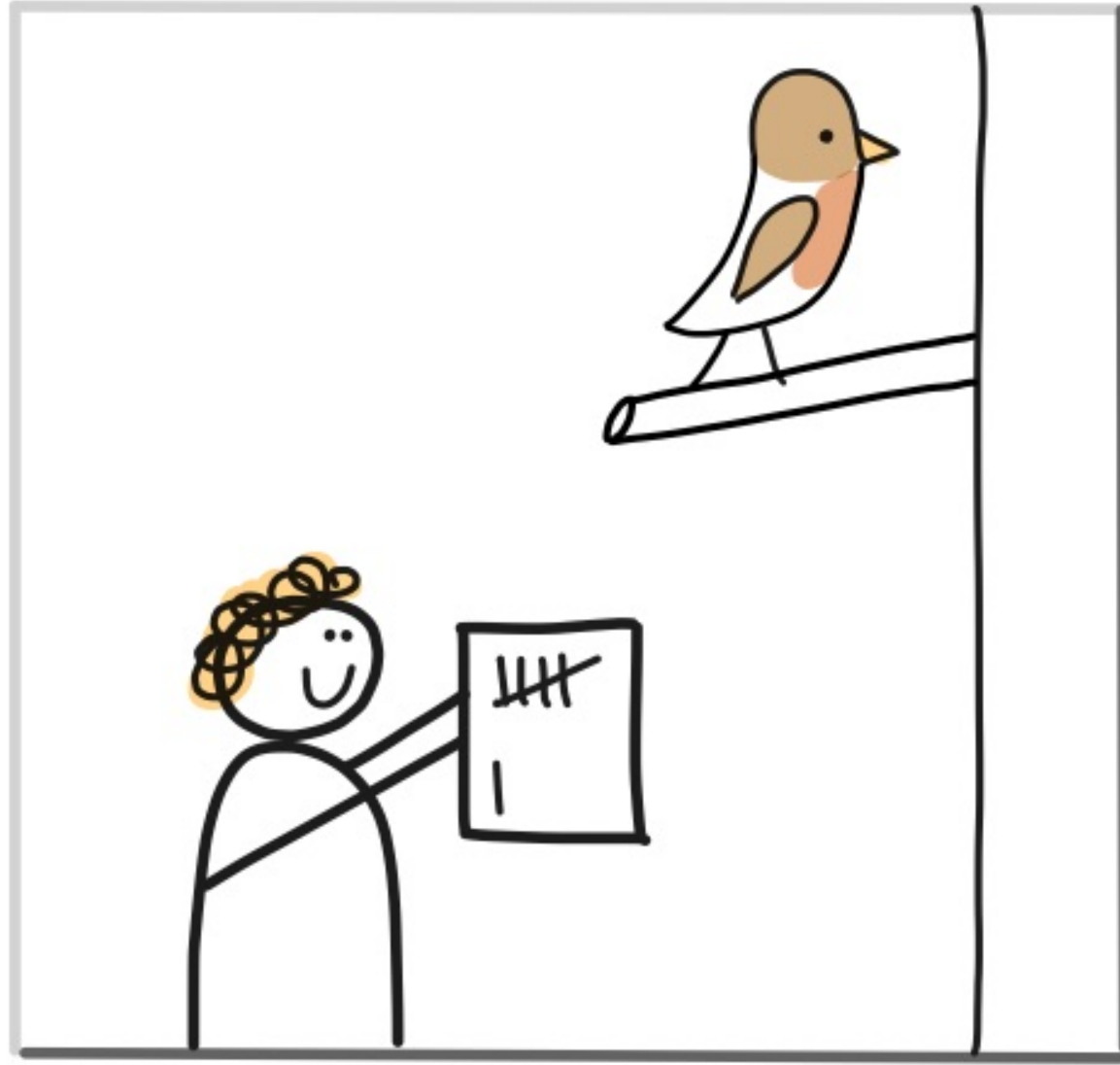
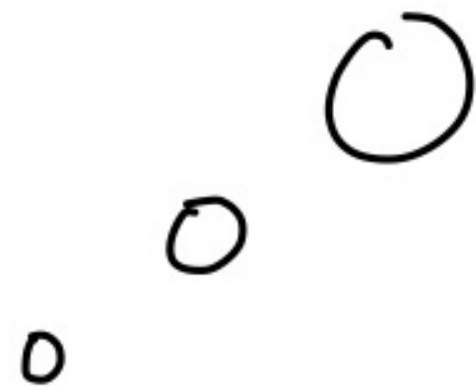
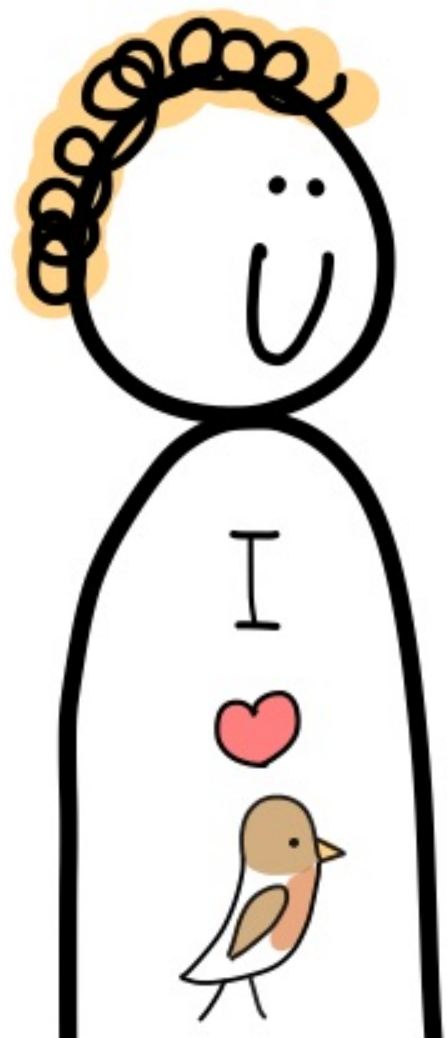


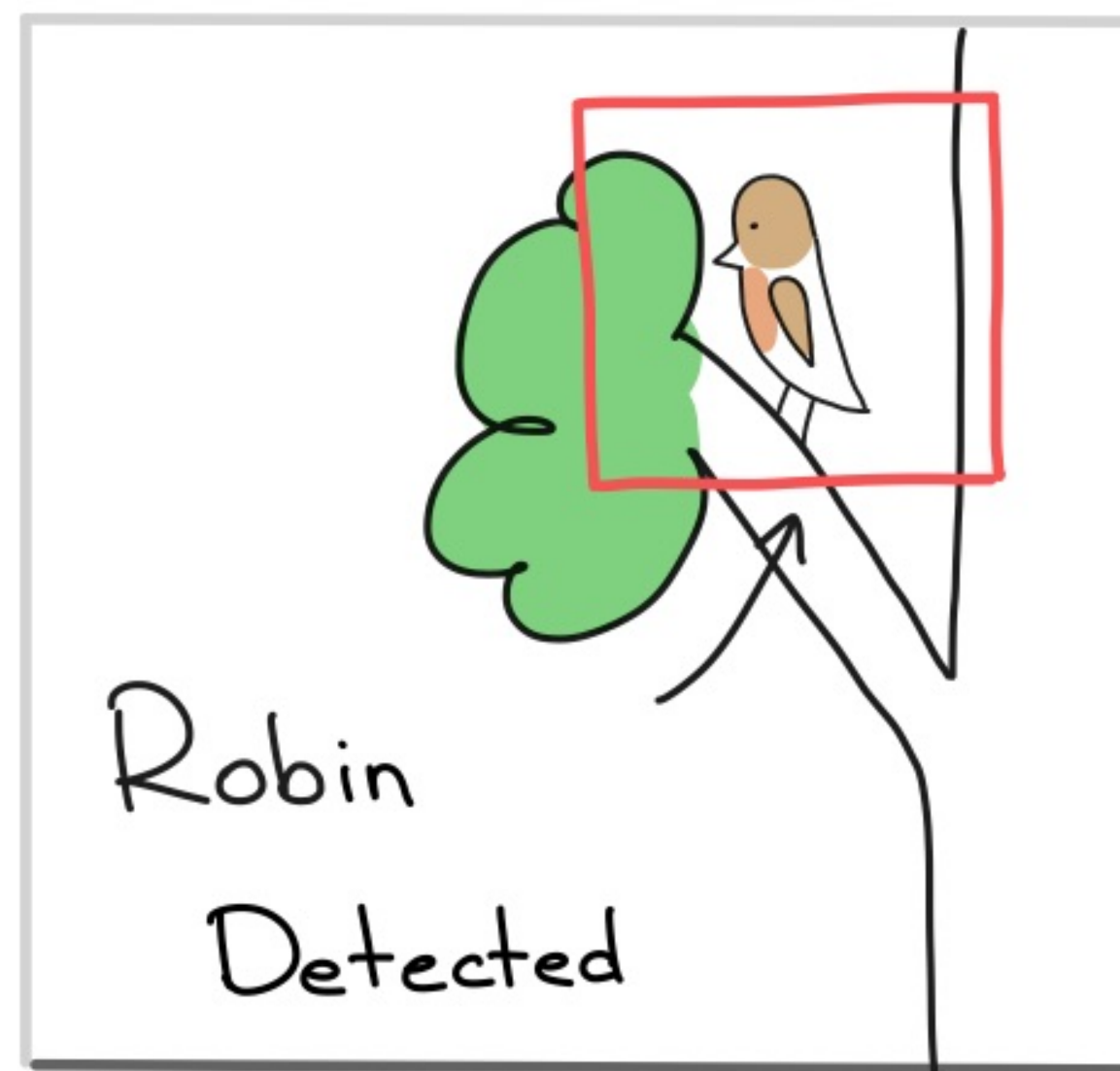
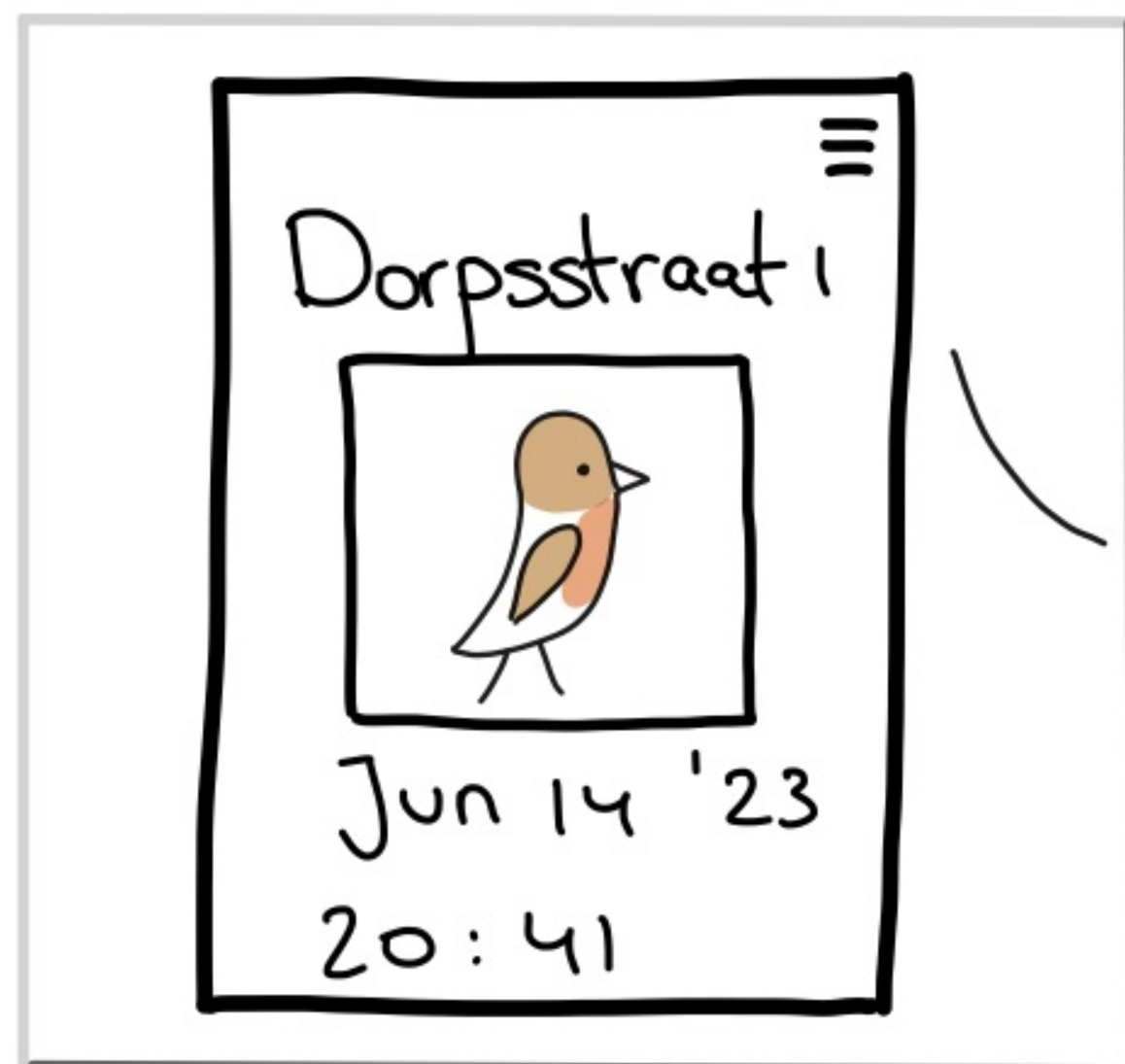


I am just like a
real human

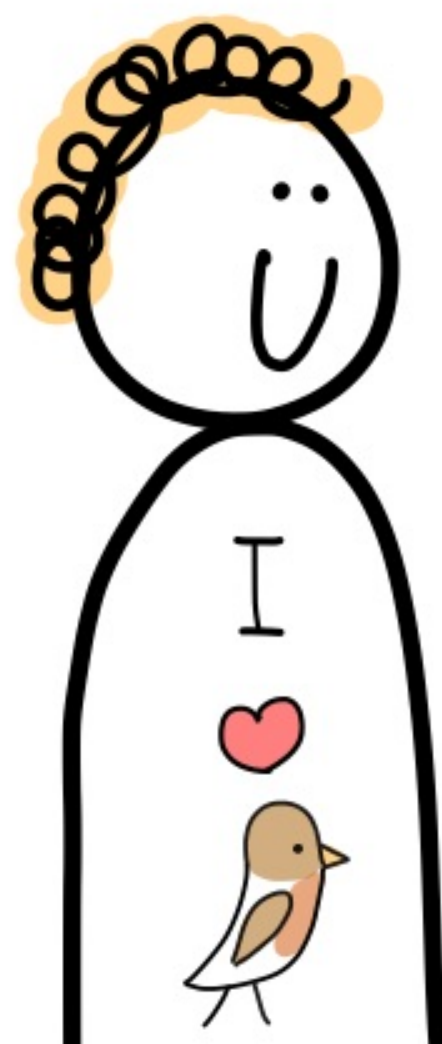




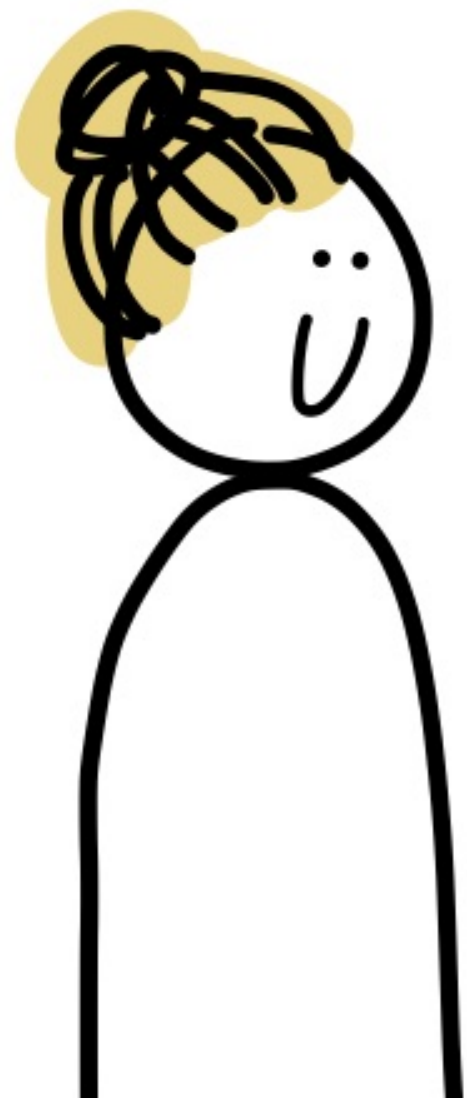




HILVERSUM (GPD) - In de zesde aflevering van de documentaire reeks 'Vogels op woensdag' is vandaag het roodborstje de hoofdpersoon. Incest, moord en doodslag en fervente gevechten om het grondgebied zijn misschien niet direct begrippen die aan het roodborstje doen denken. Het leven blijkt echter ook voor dit vogeltje hard te zijn. De BBC filmde het gedrag van het roodborstje in de schilderachtige tuinen van Cranborne Manor in Dorset in Engeland. Nico de Haan van de Vogelbescherming geeft het commen-

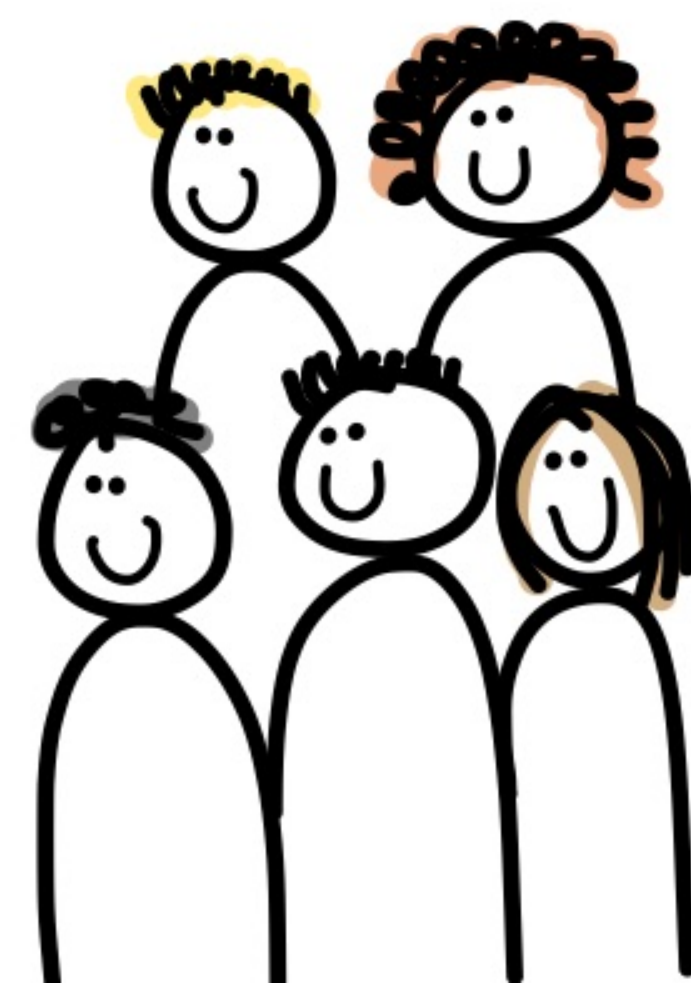


Everybody needs some
programming skills!

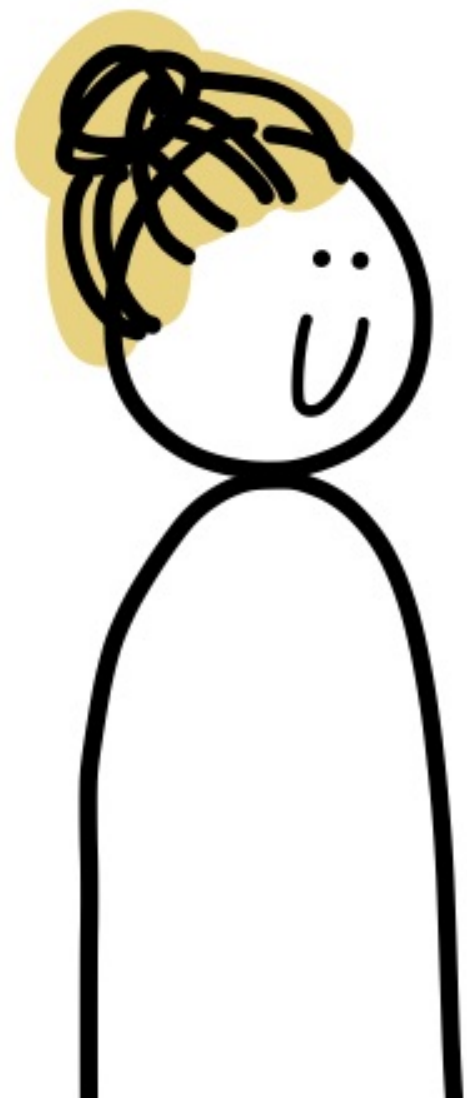




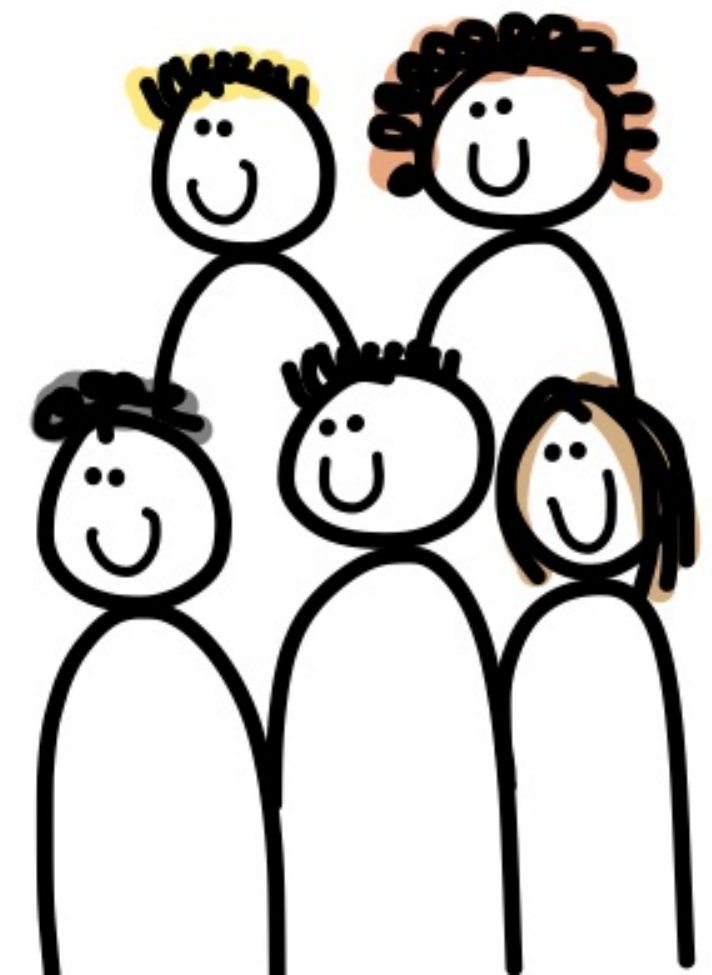
2013

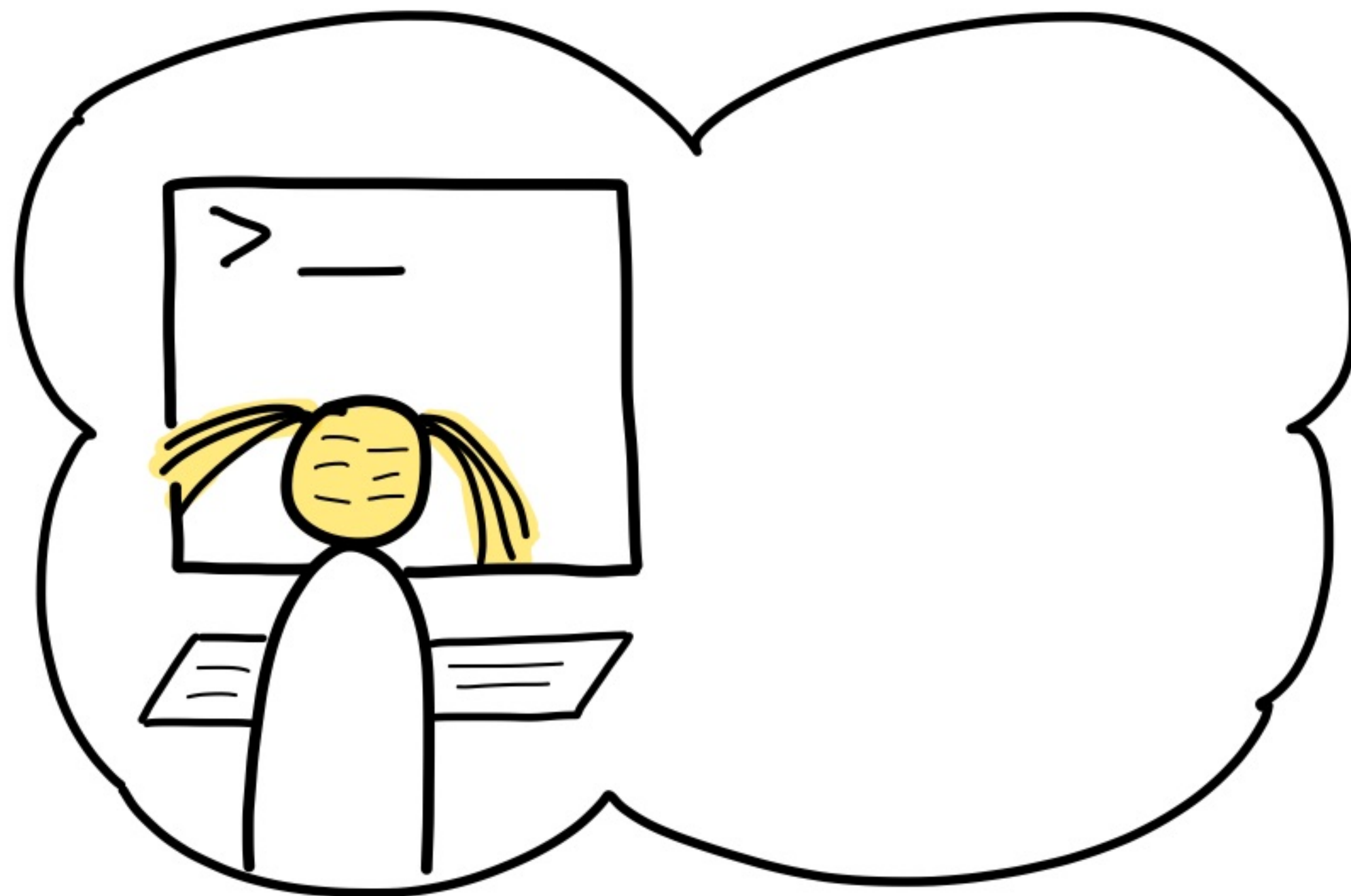
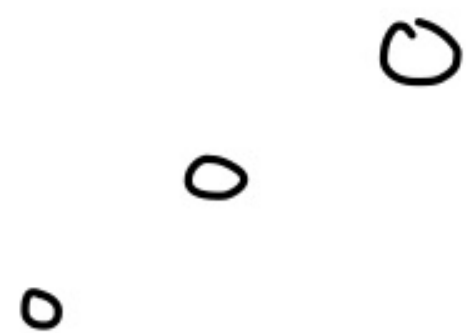
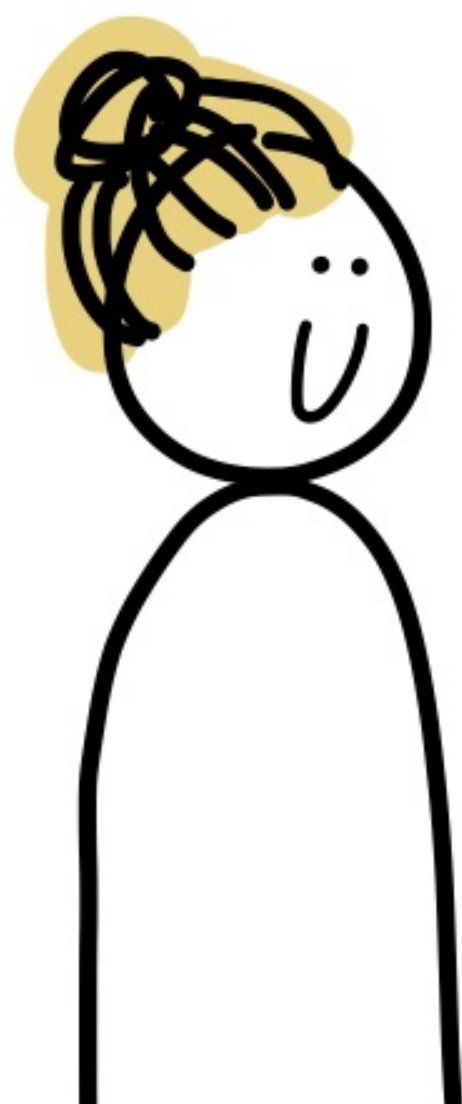


This is going to be great!

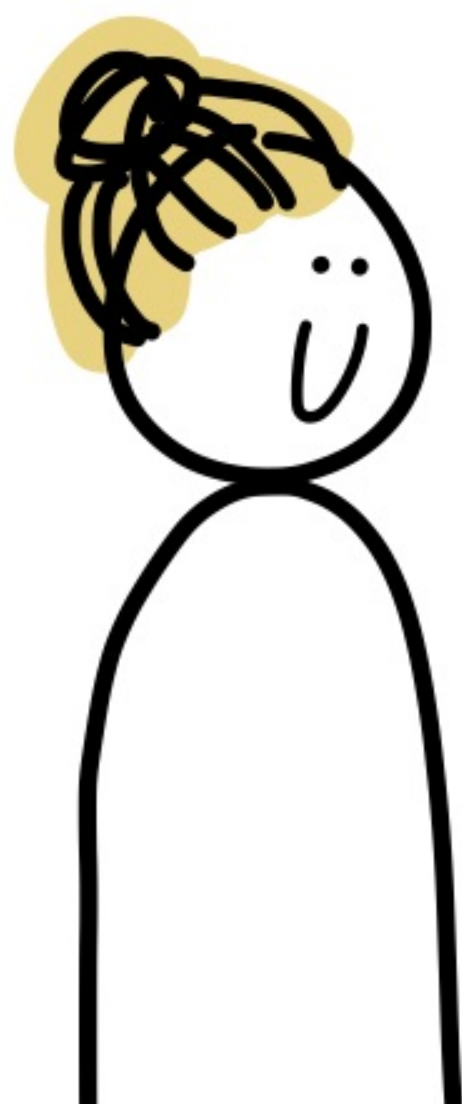


2013





1994

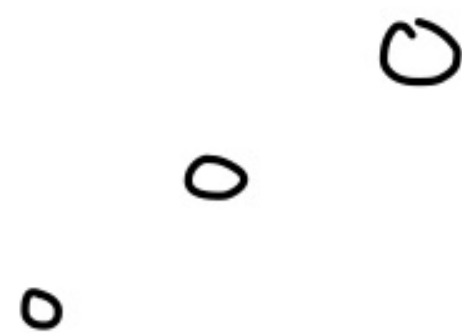
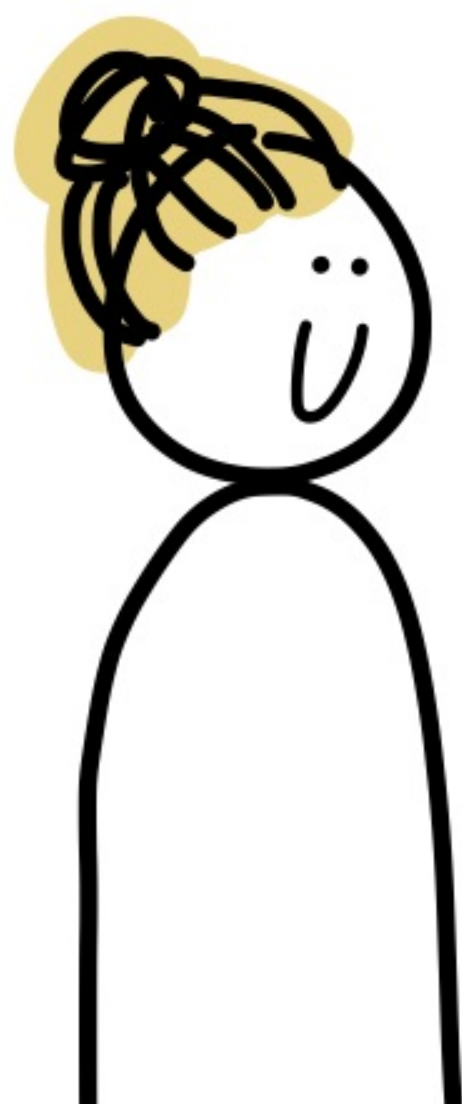


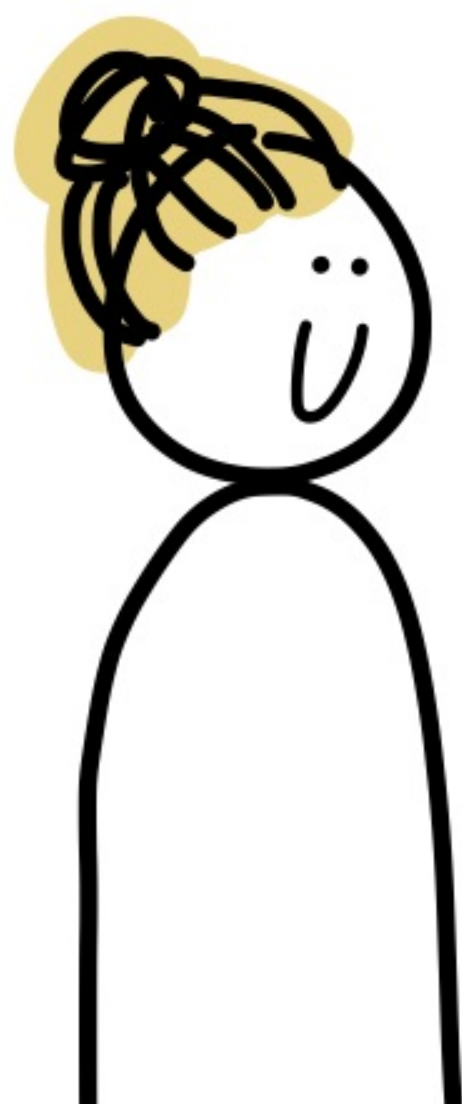
o

o

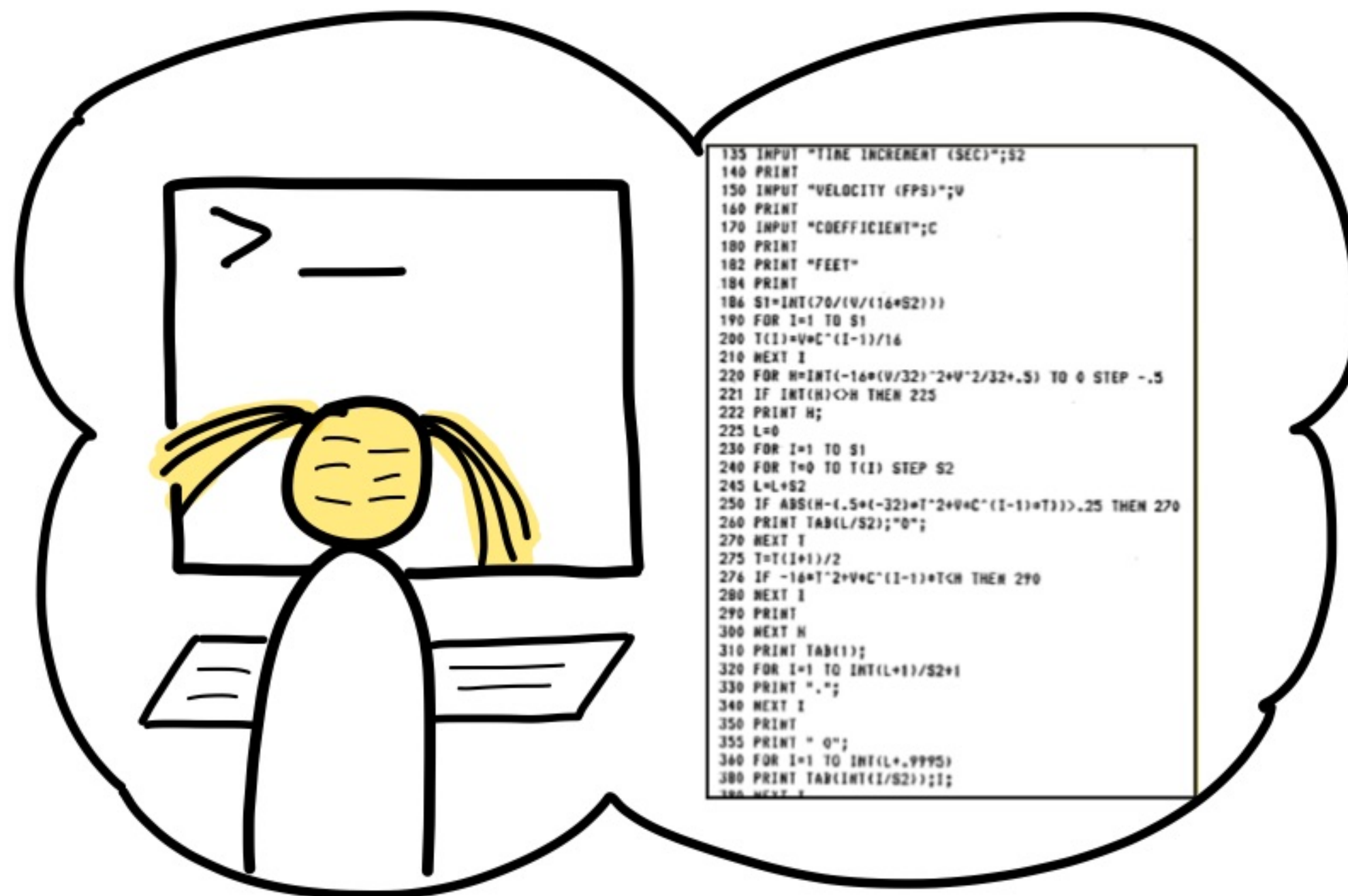
o

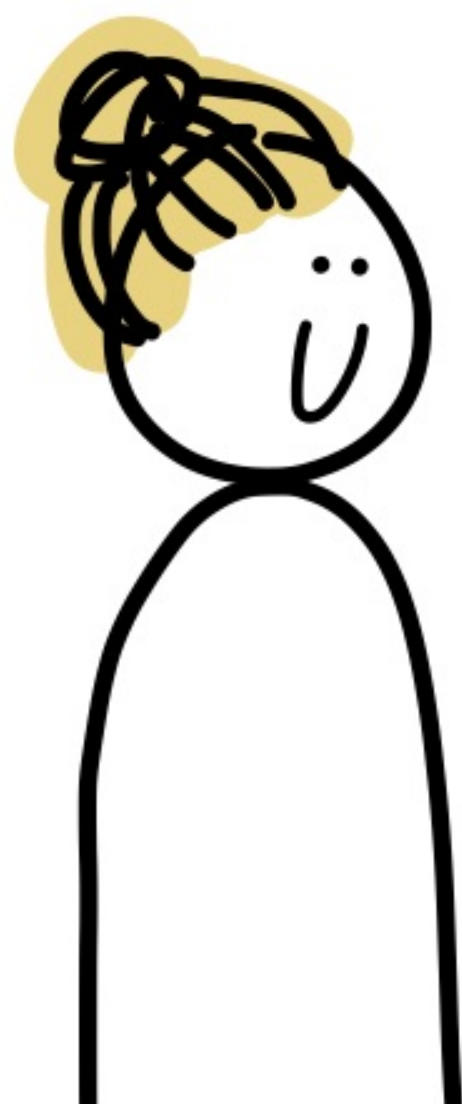




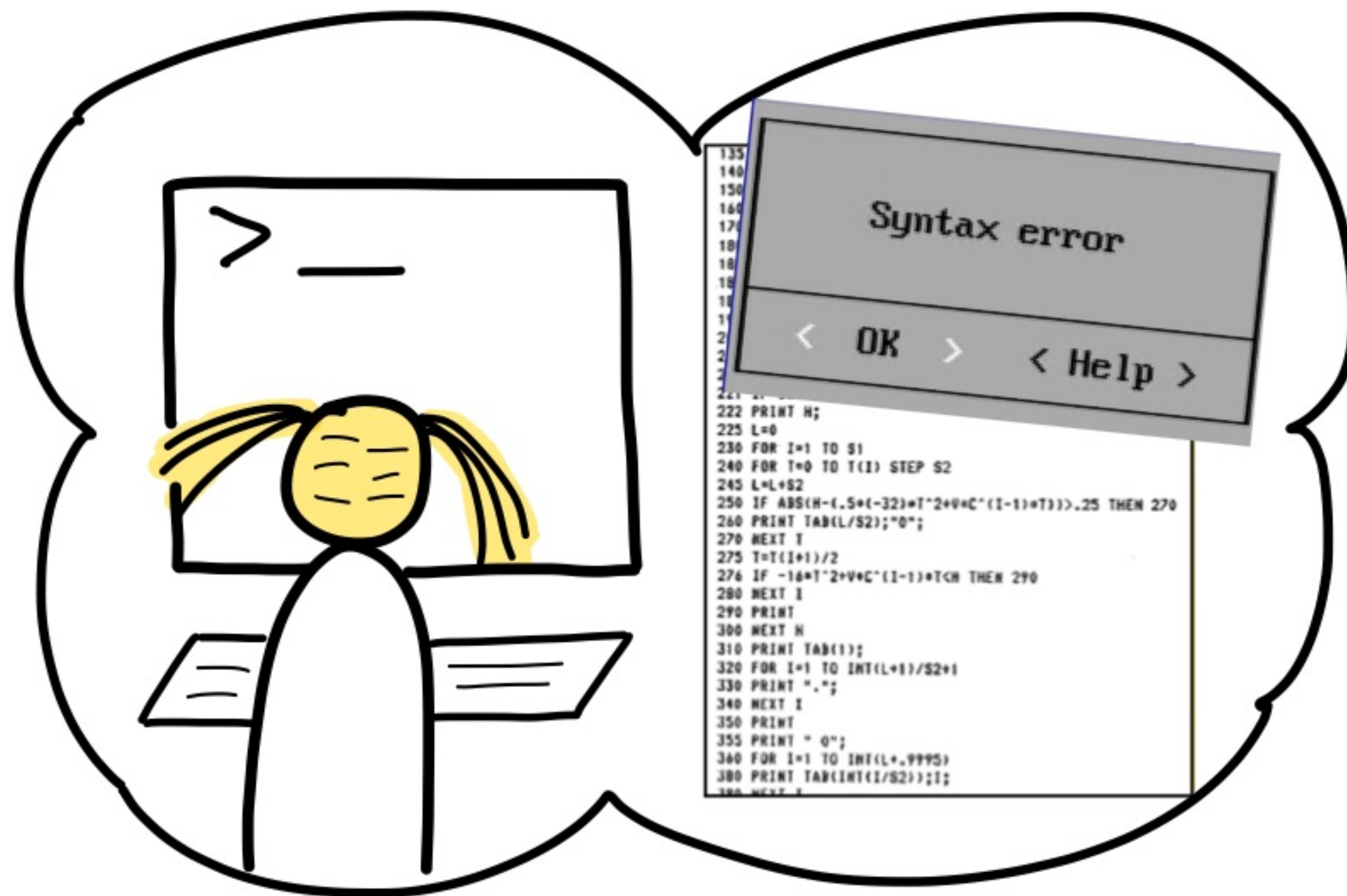


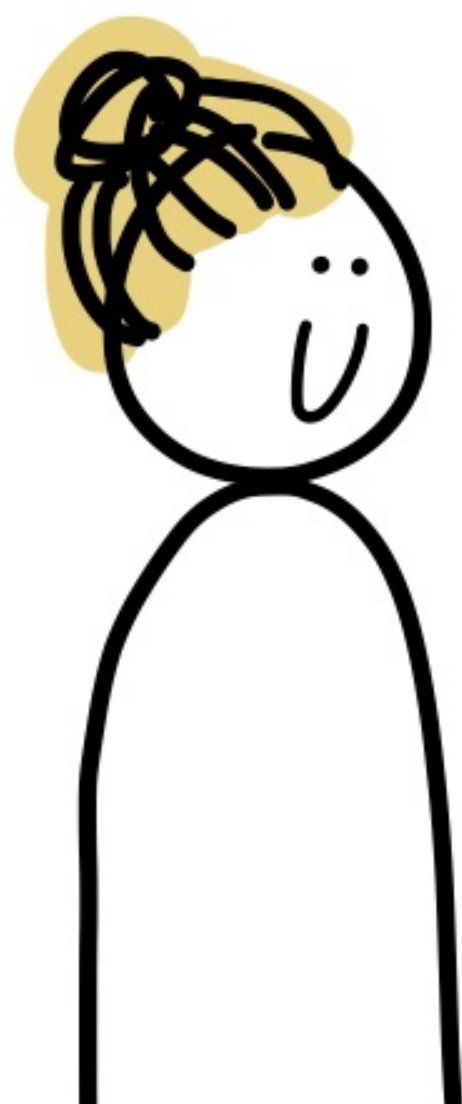
o
o
o



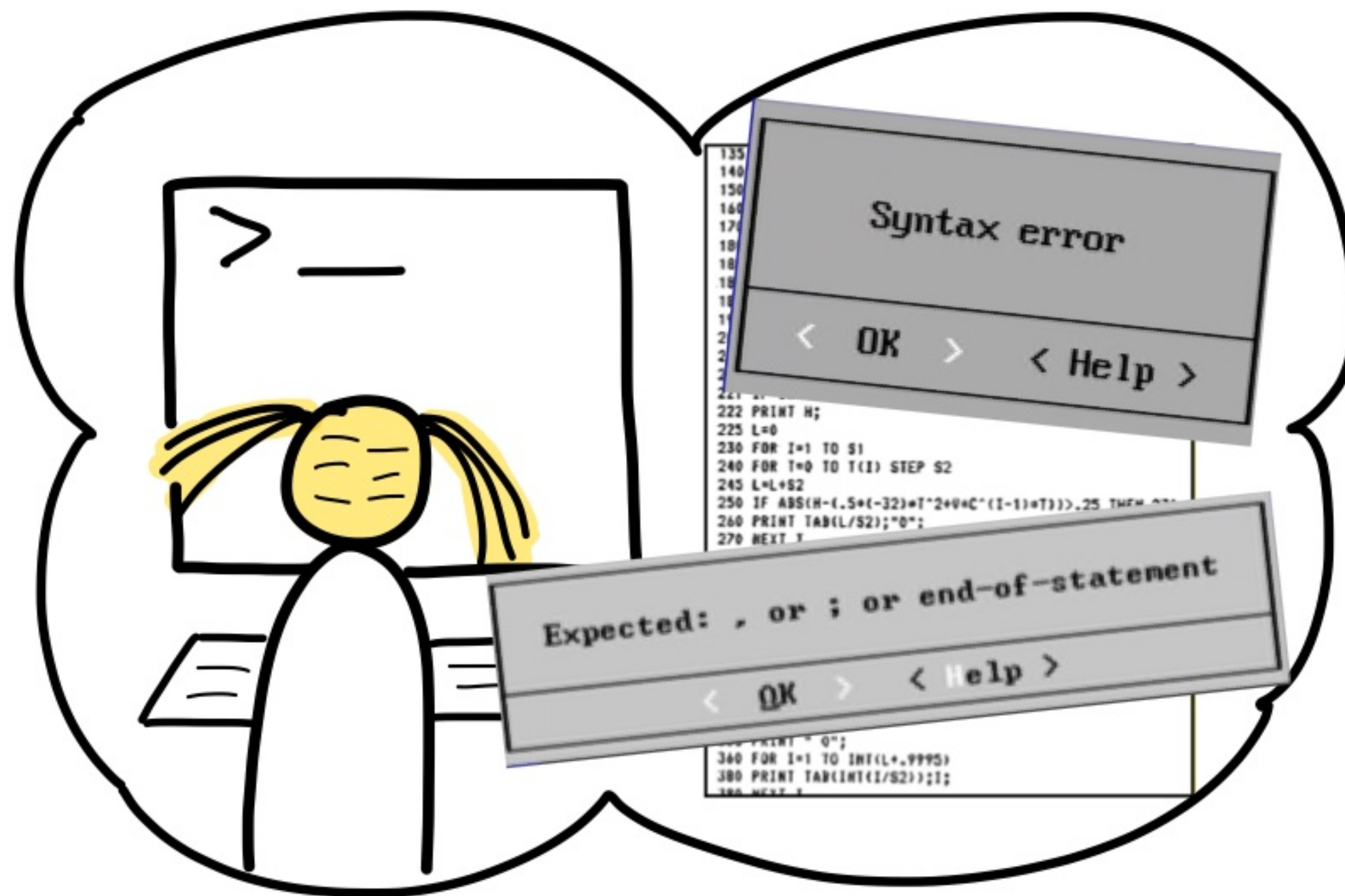


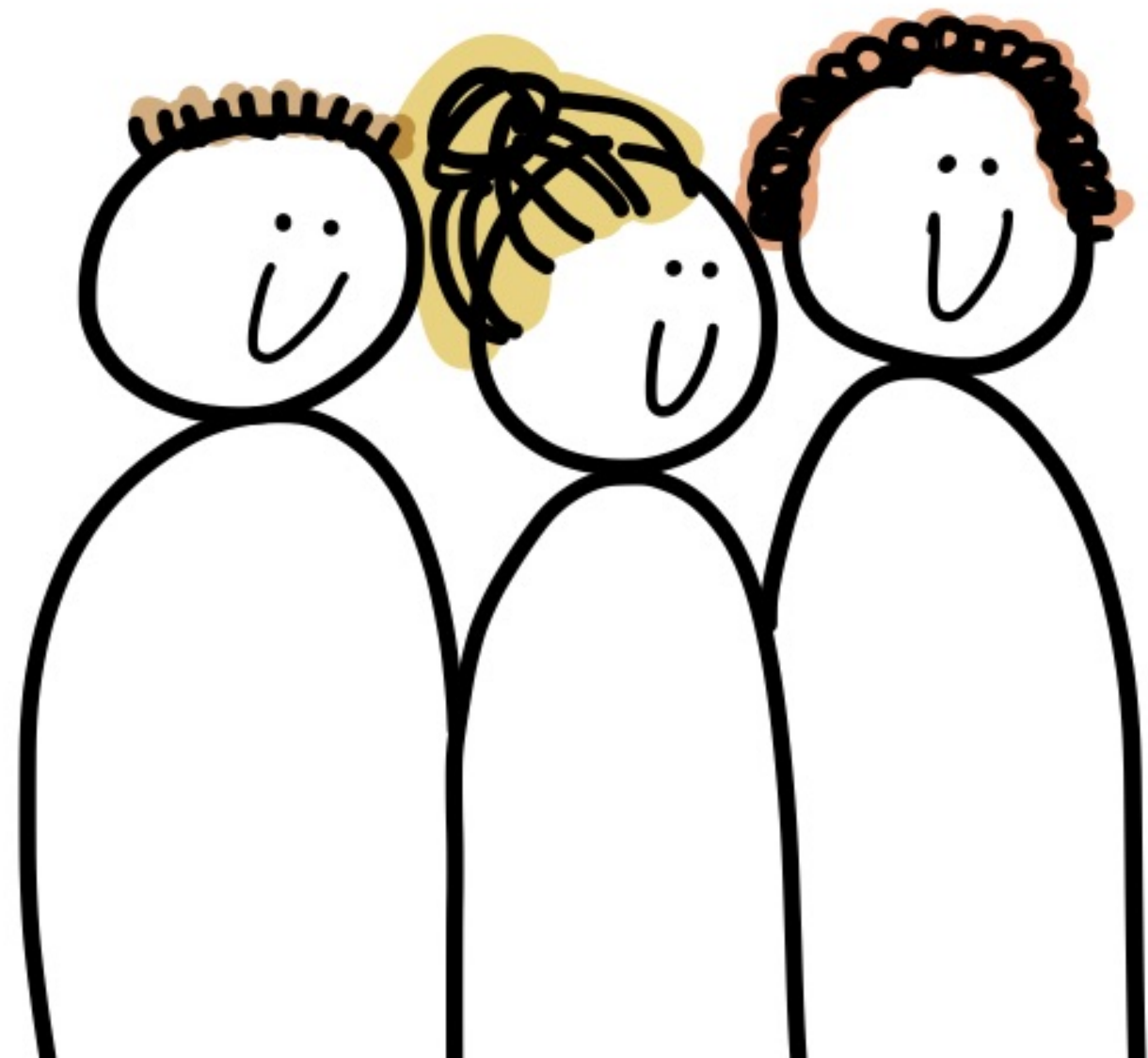
o
o
o





o
o
o

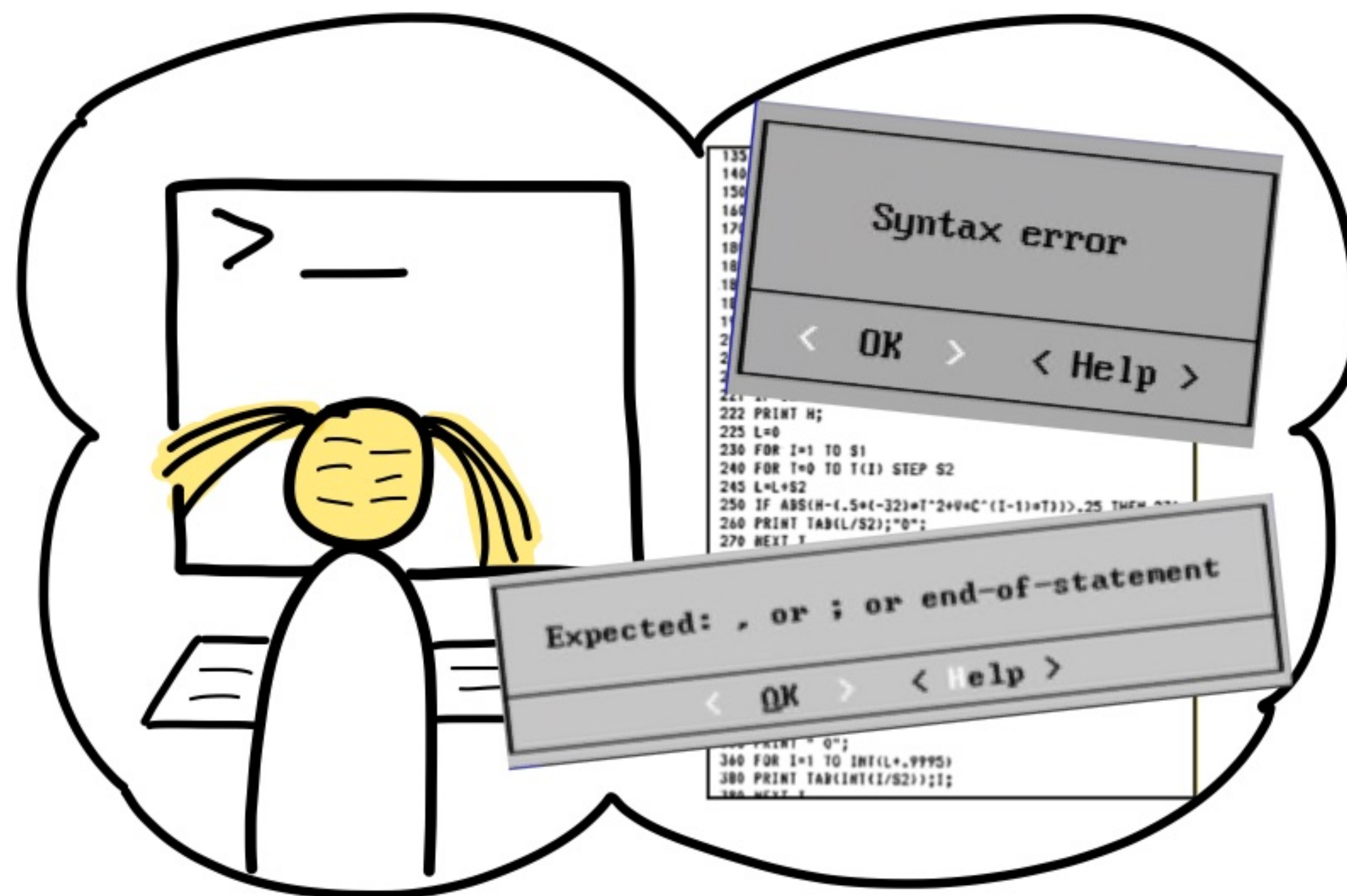




o

o

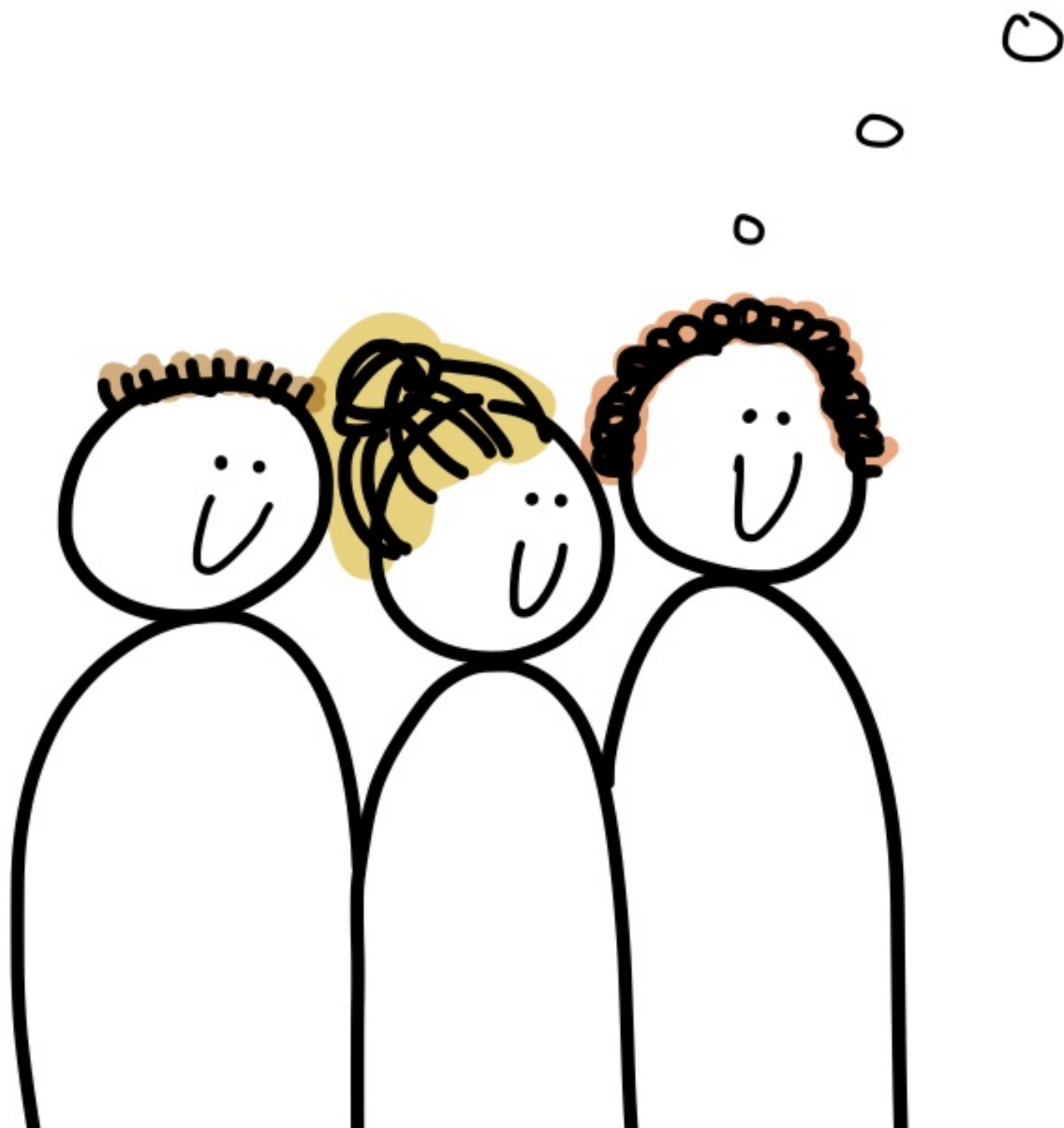
o

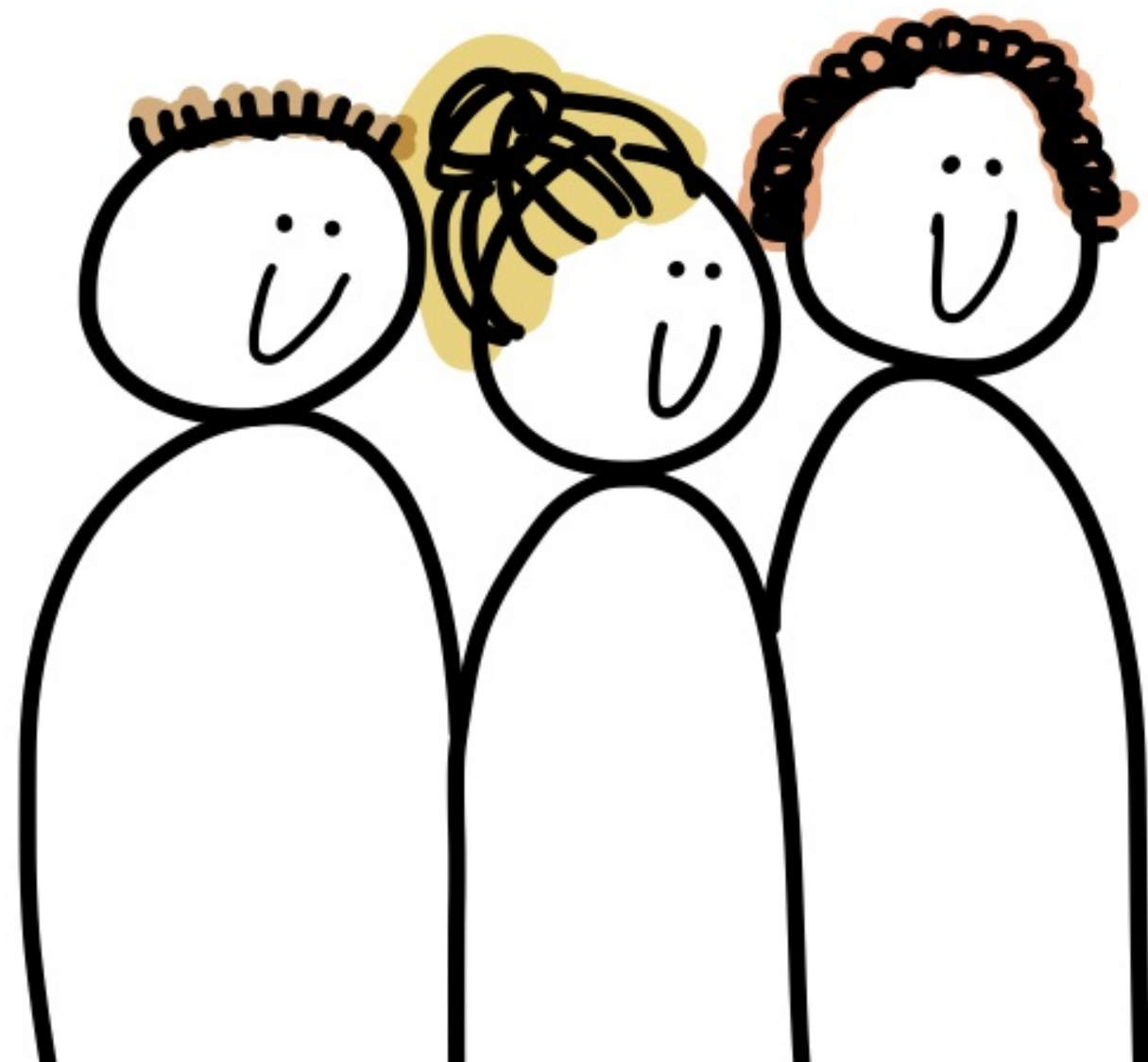




You

show me a hacker before they started learning anything





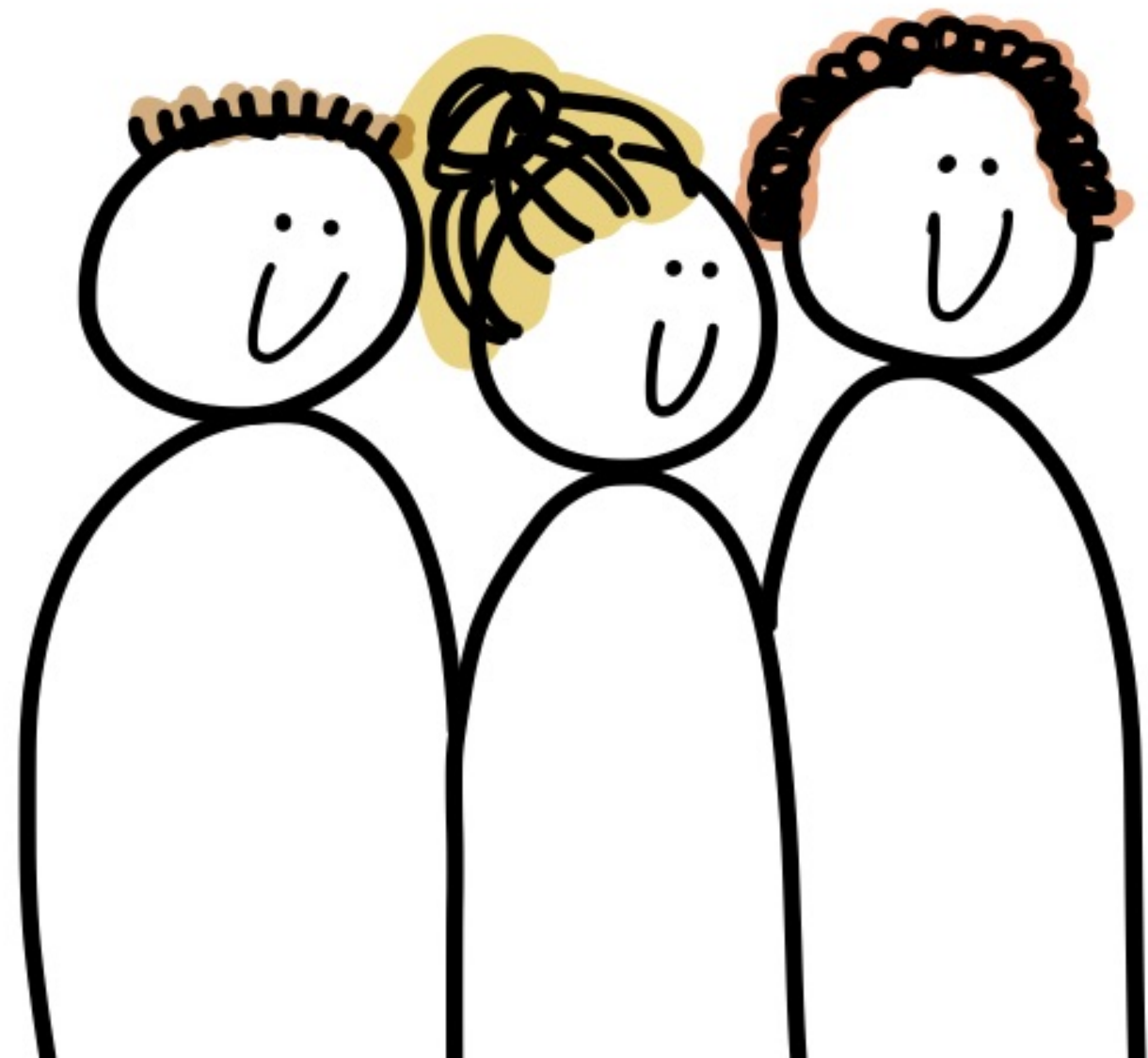
You

show me a hacker before they started learning anything



ChatGPT

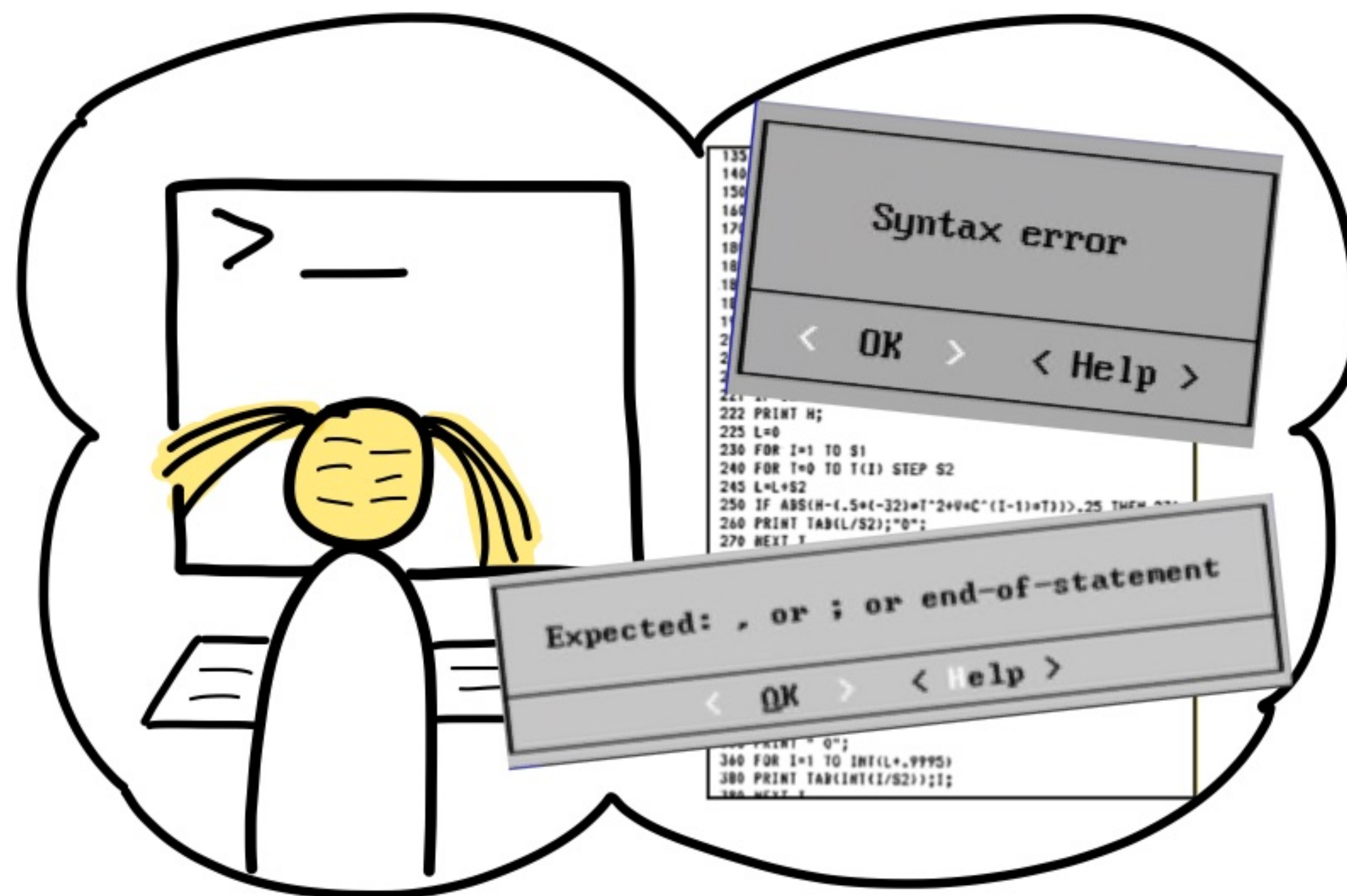




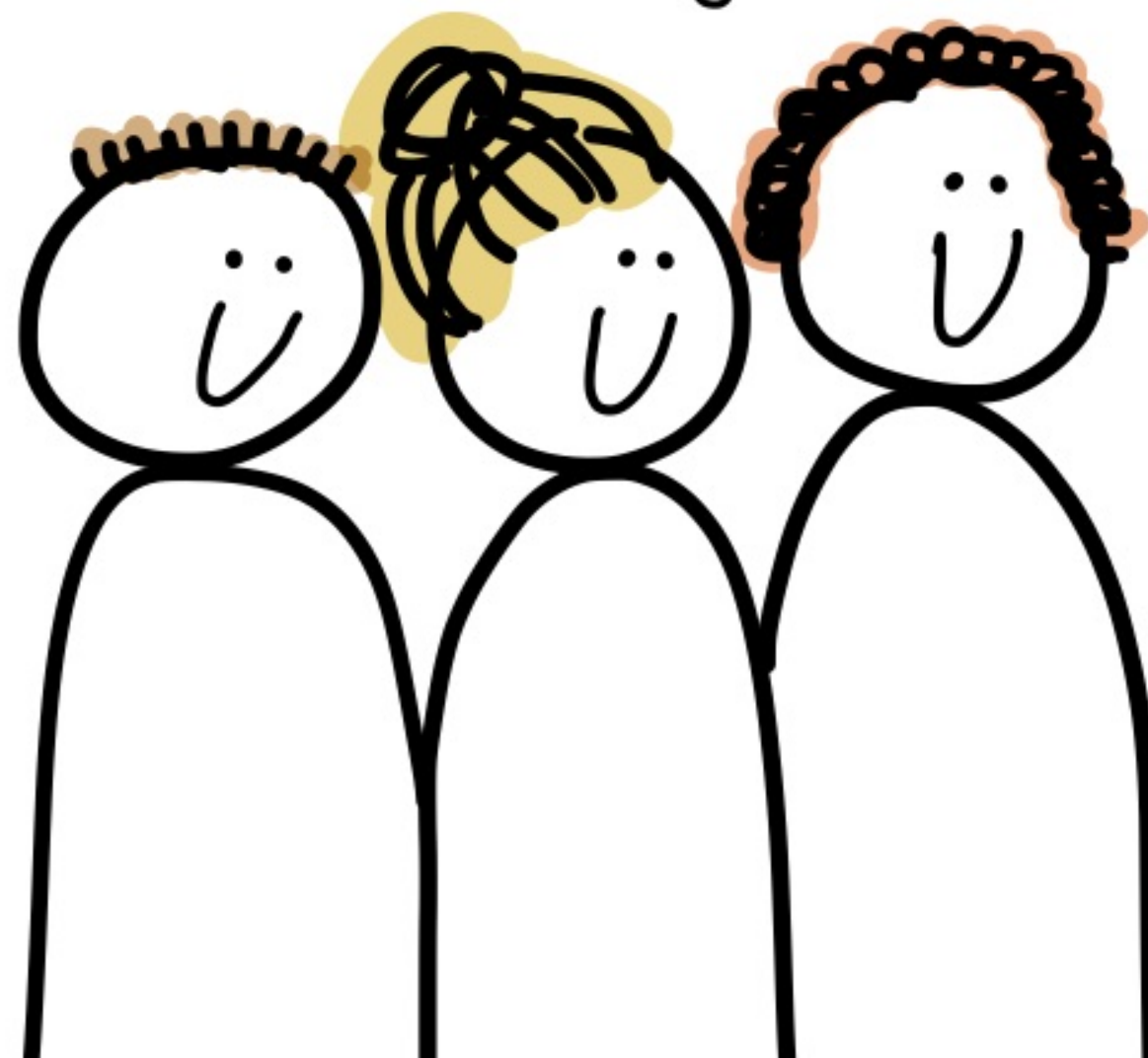
o

o

o

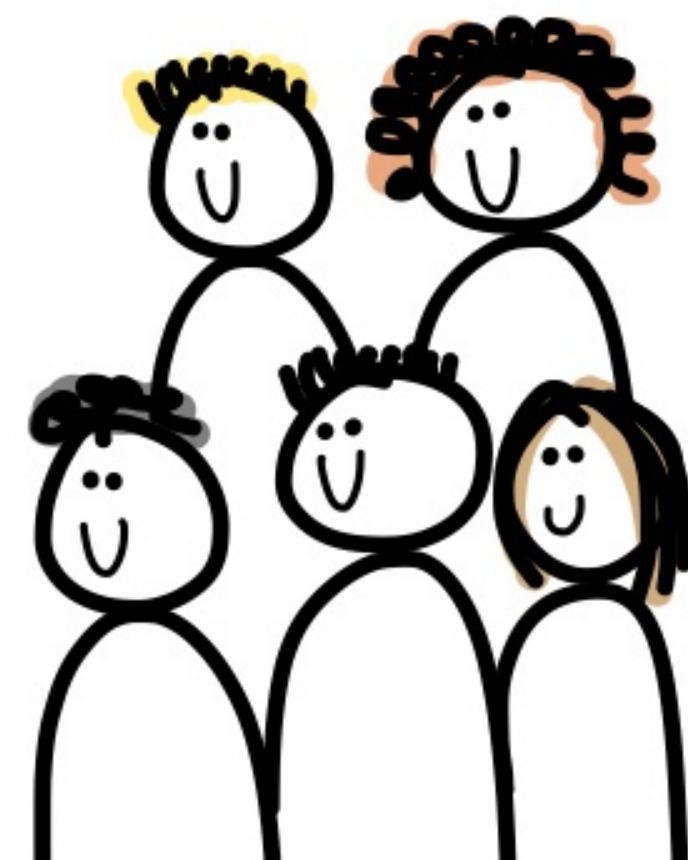


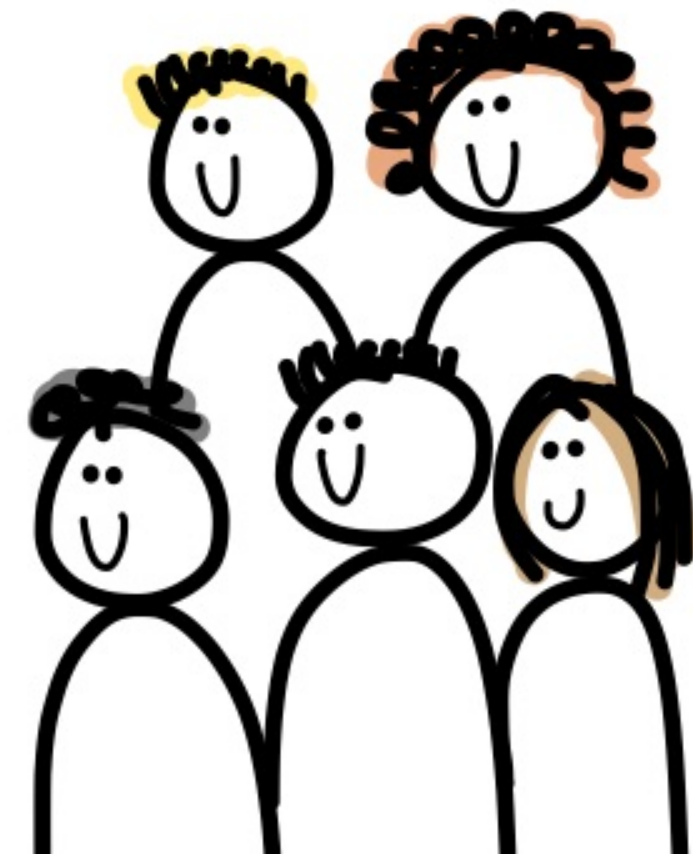
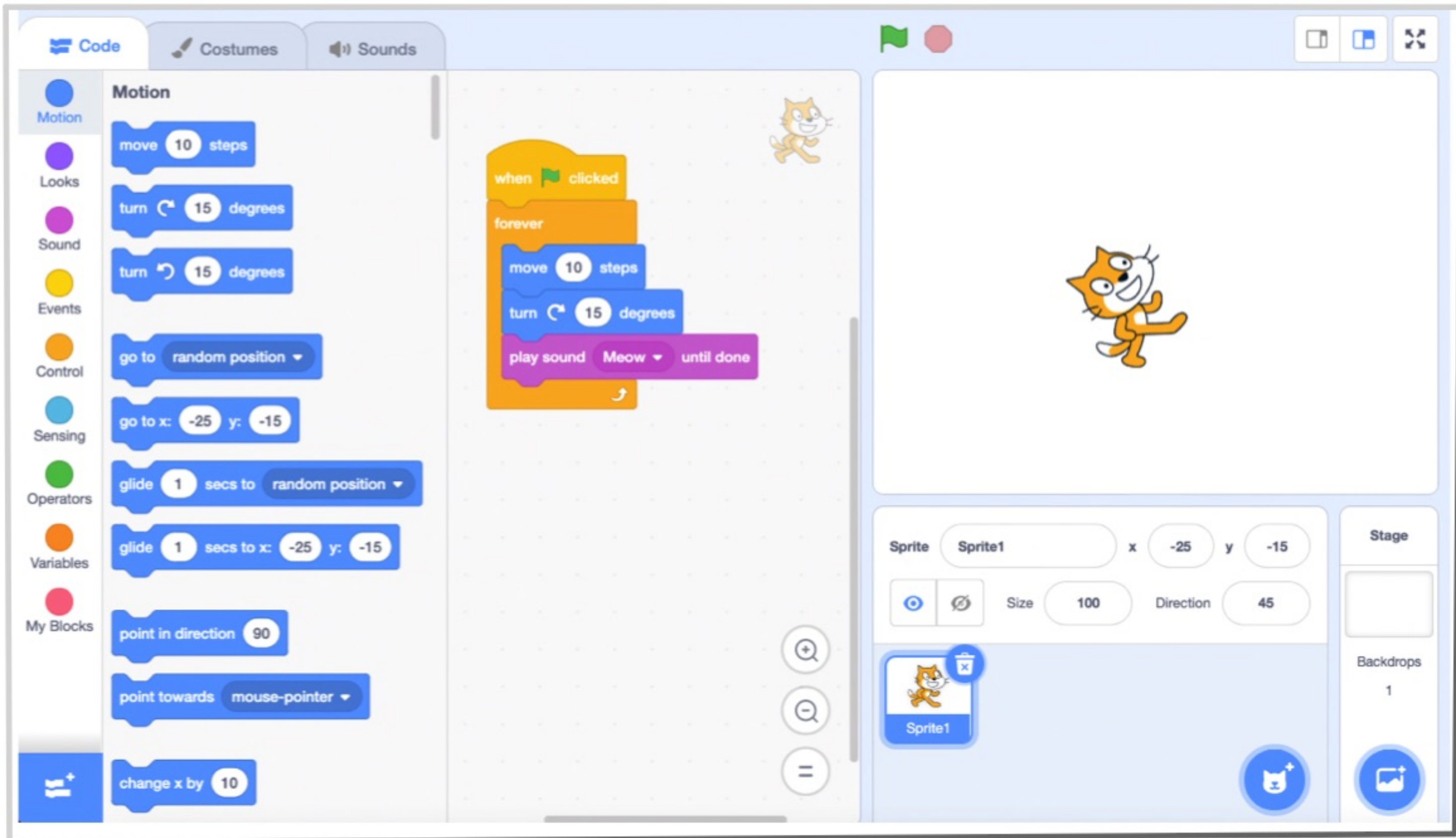
Compilers are
lovely teachers

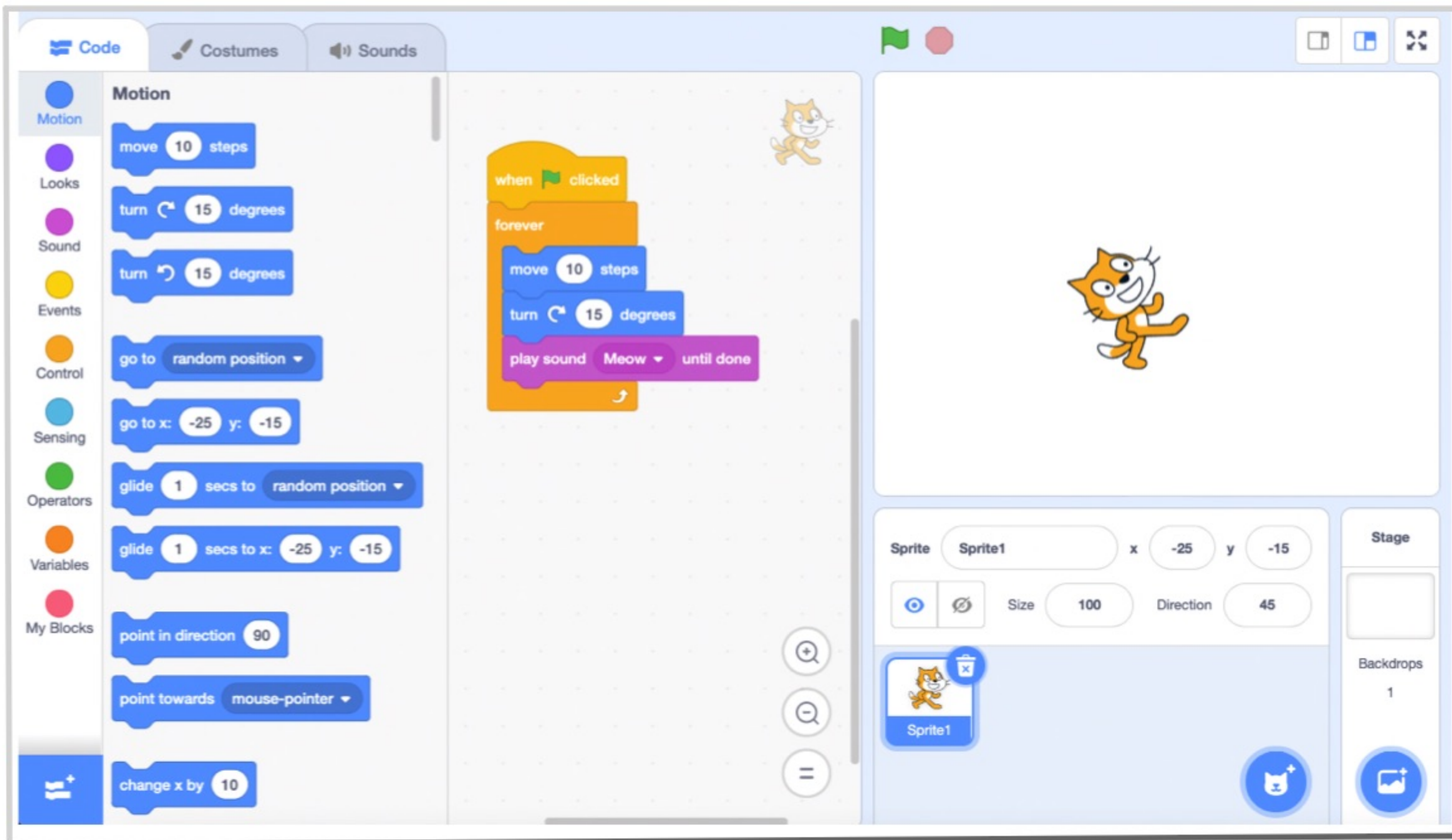


Compilers are
lovely teachers

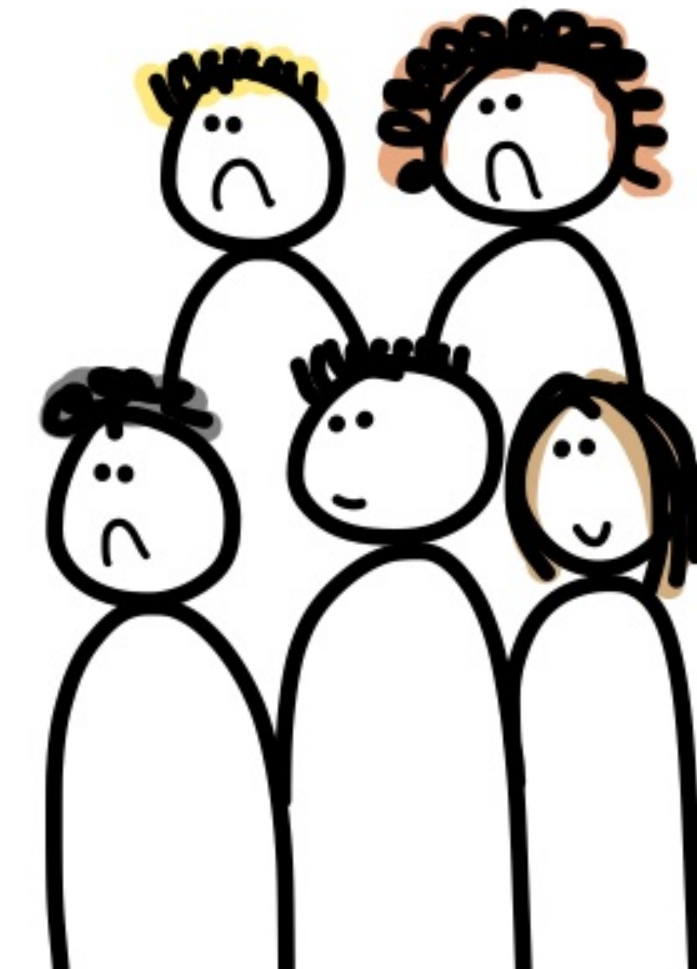








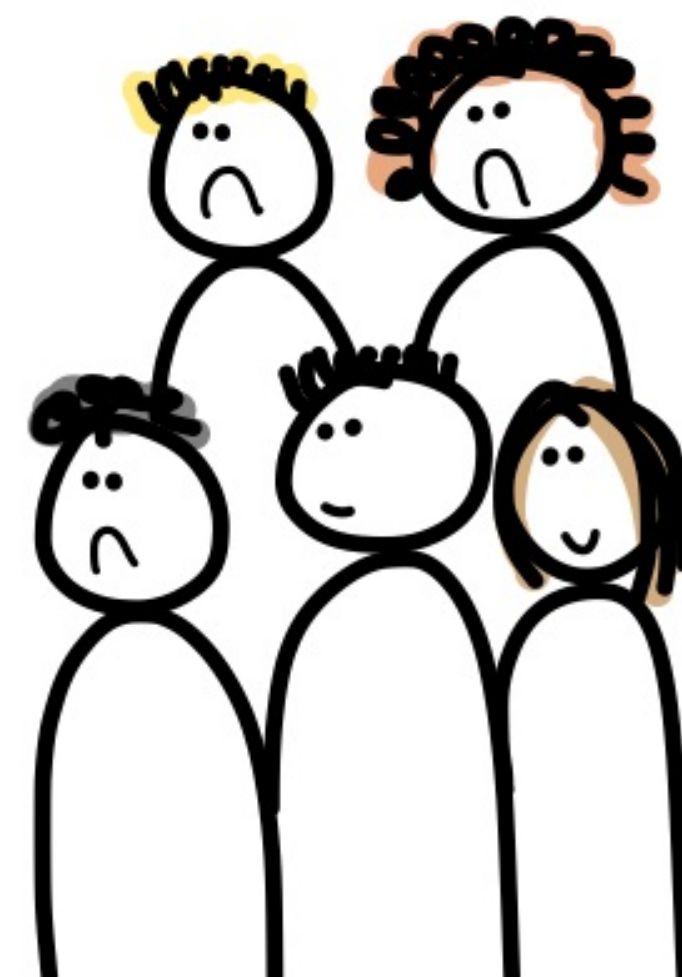
This is
for kids

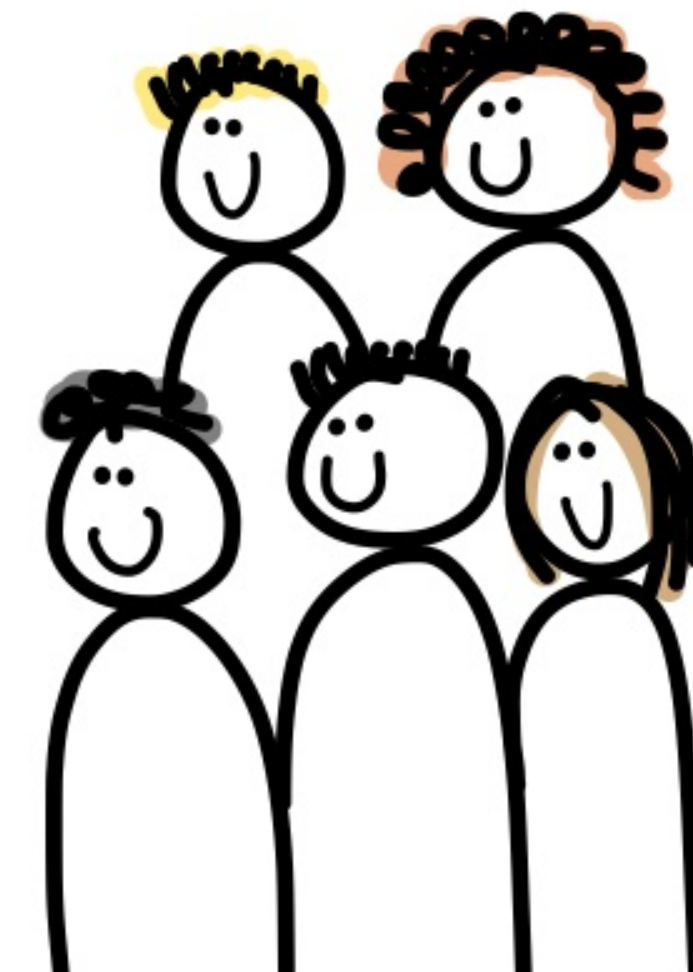
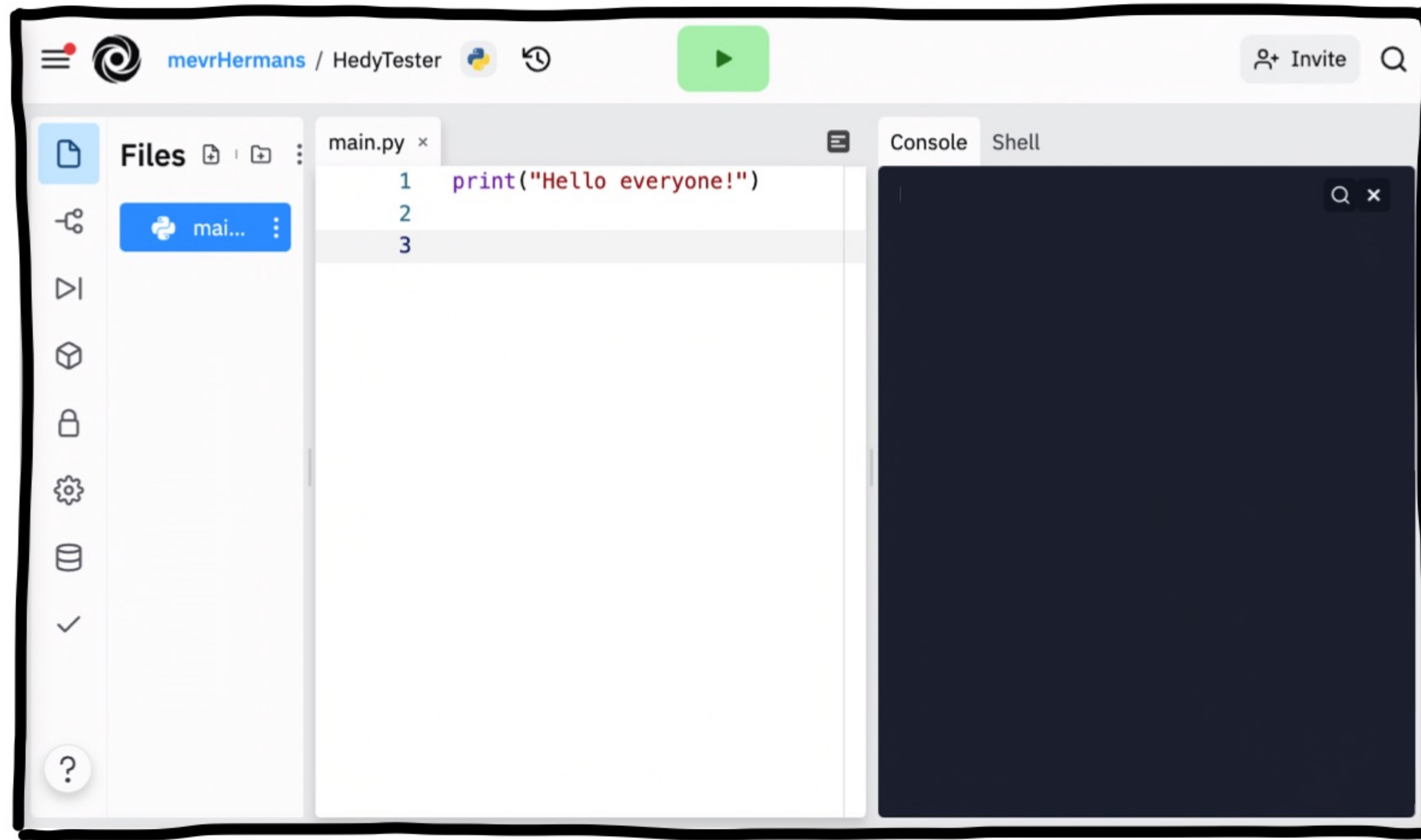


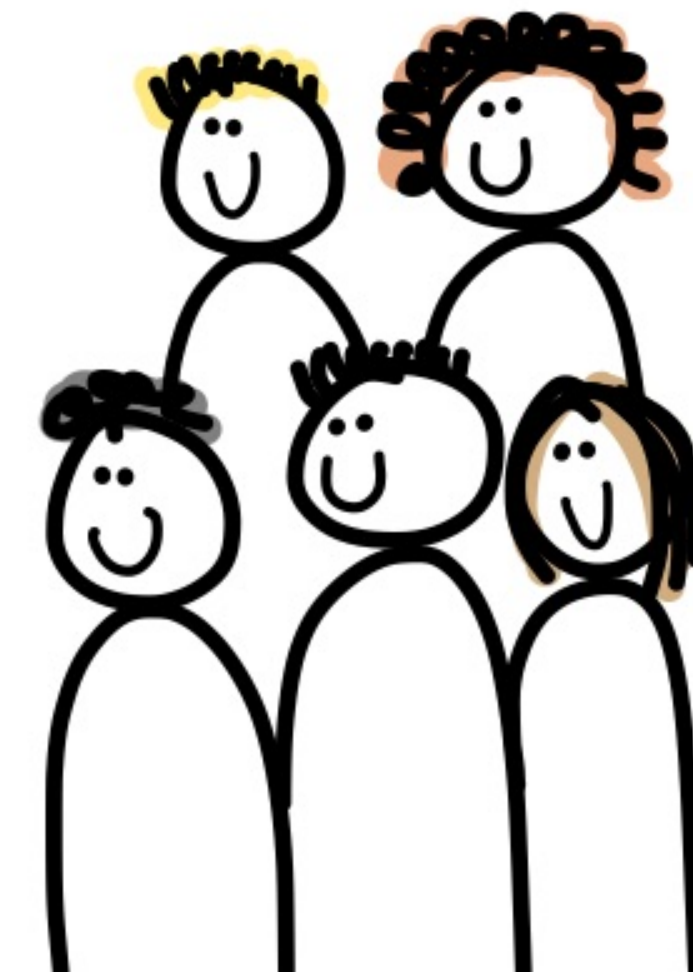
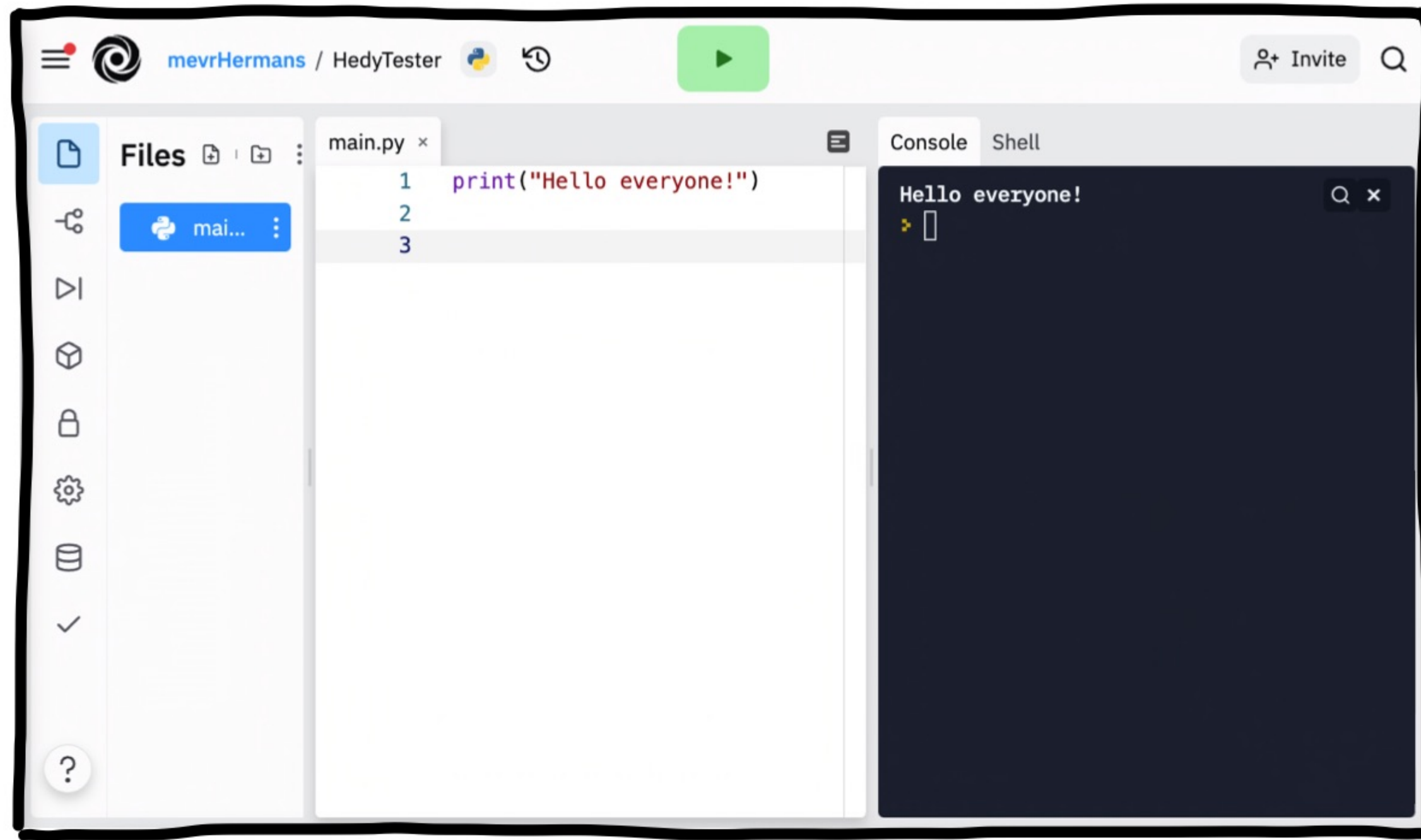
Let's do Python!

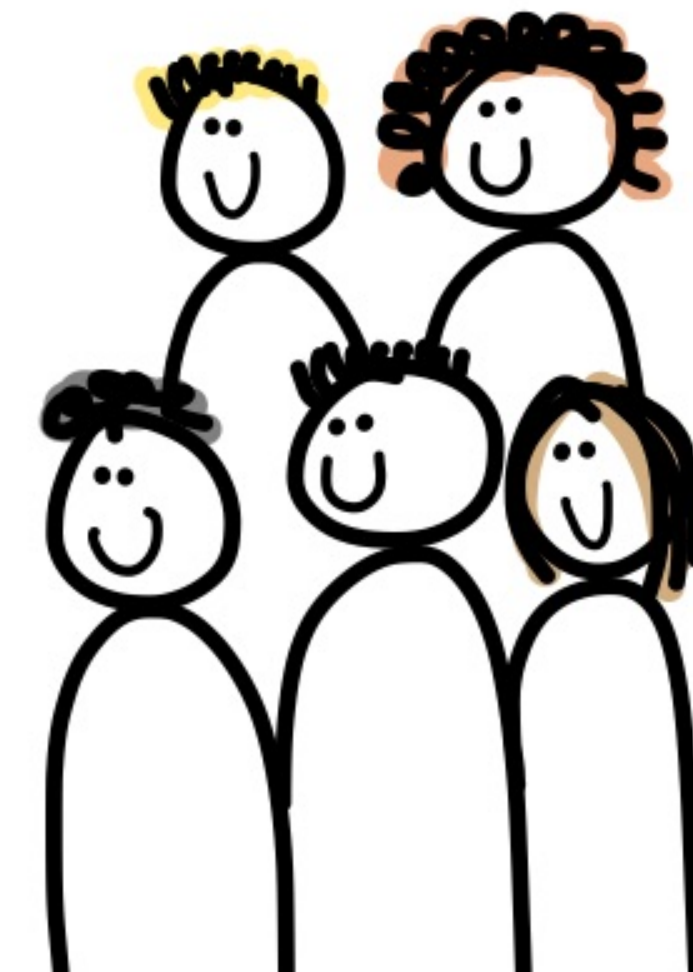
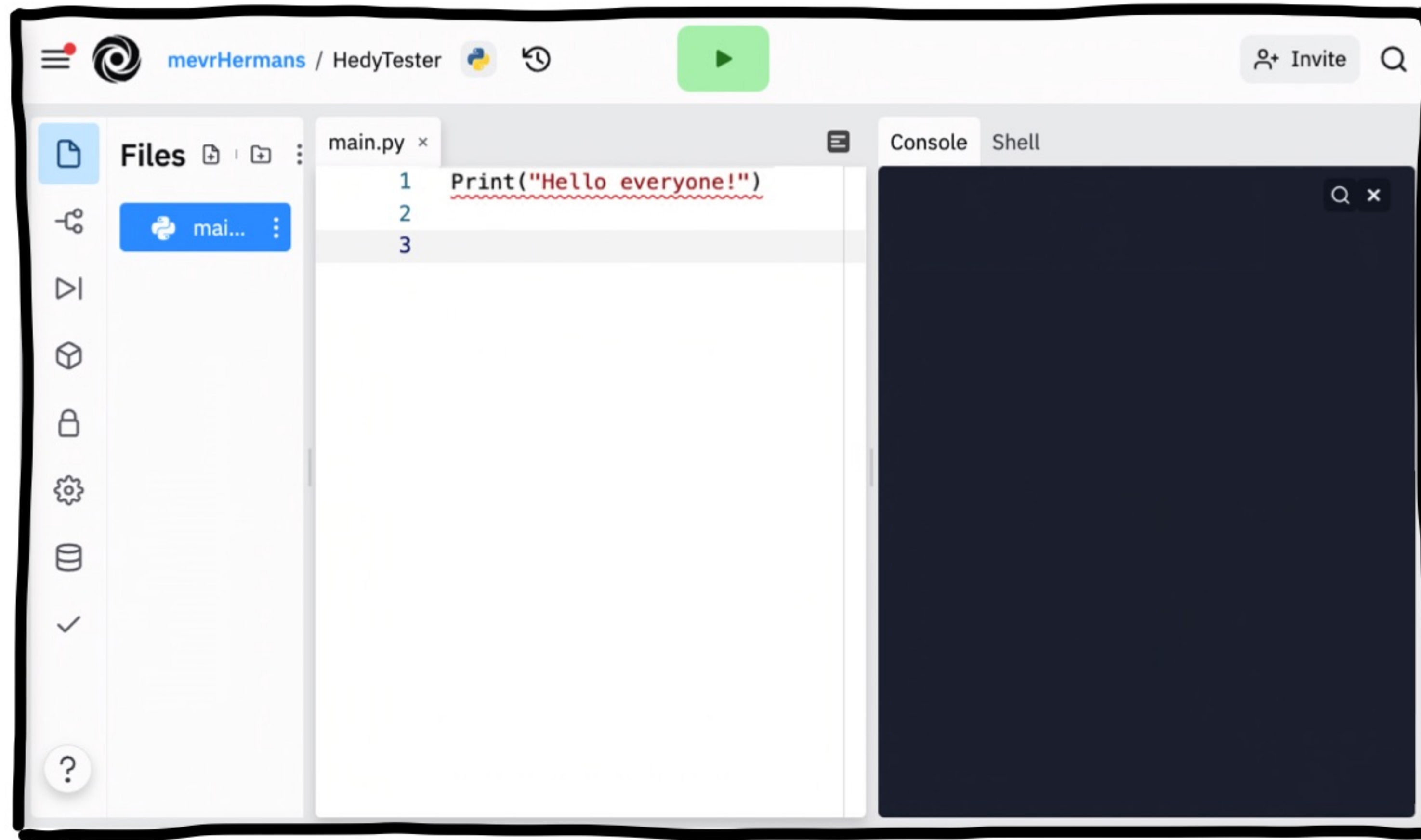


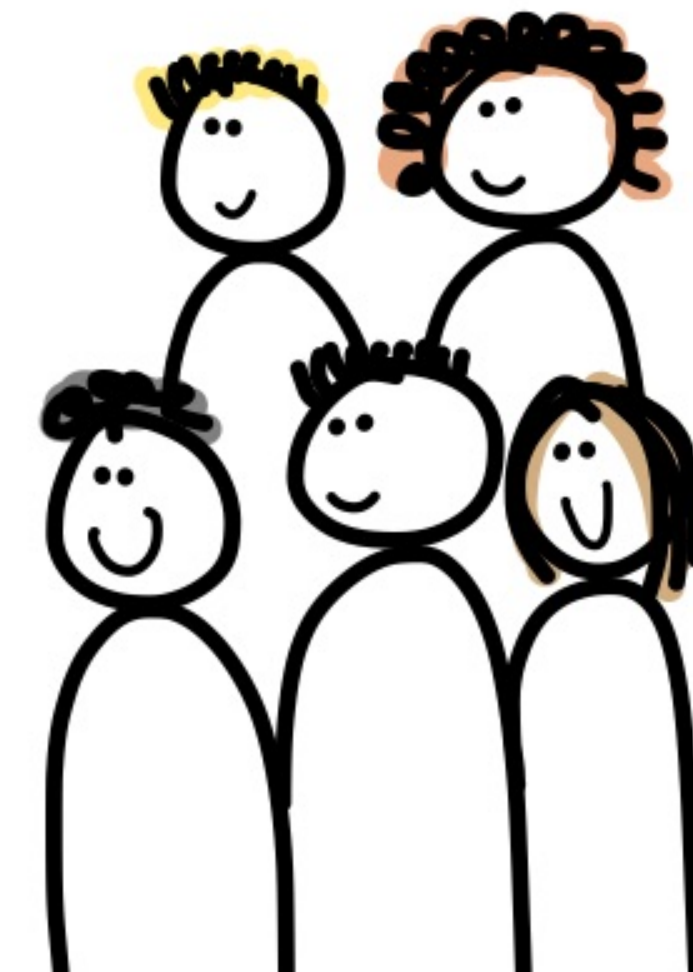
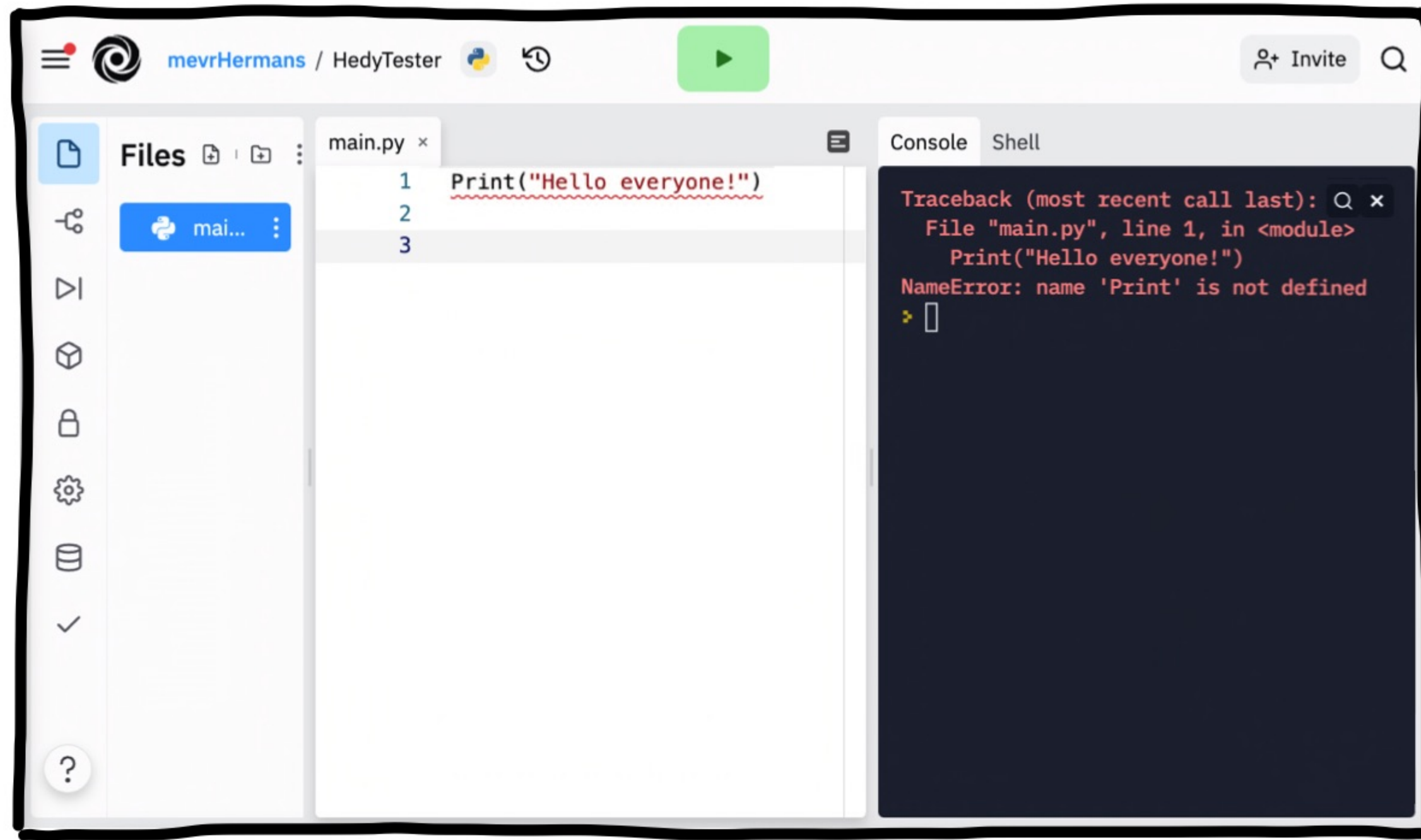
This is
for kids

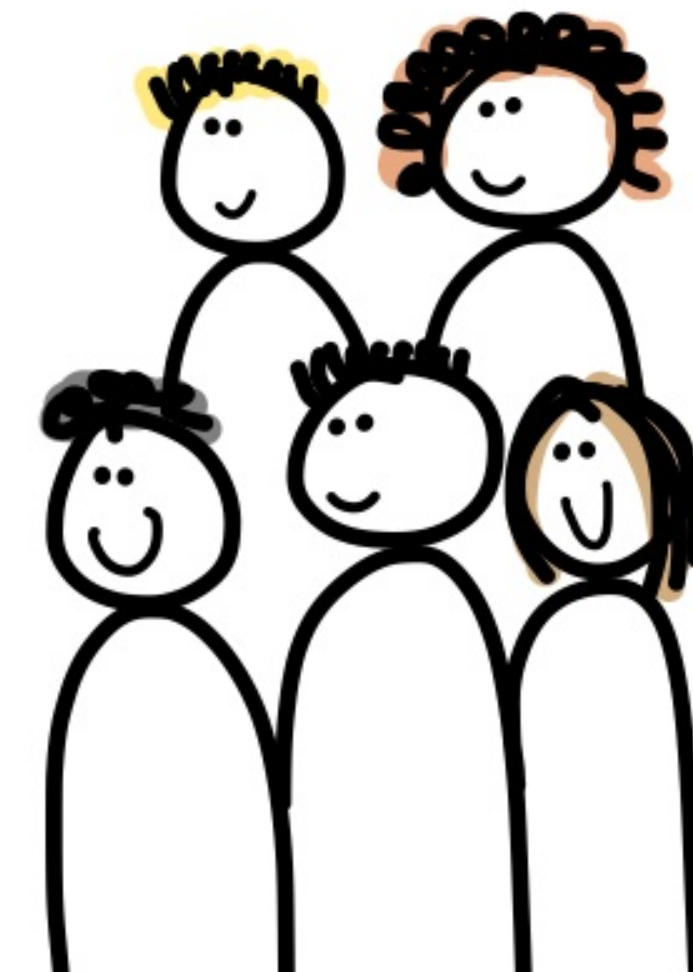
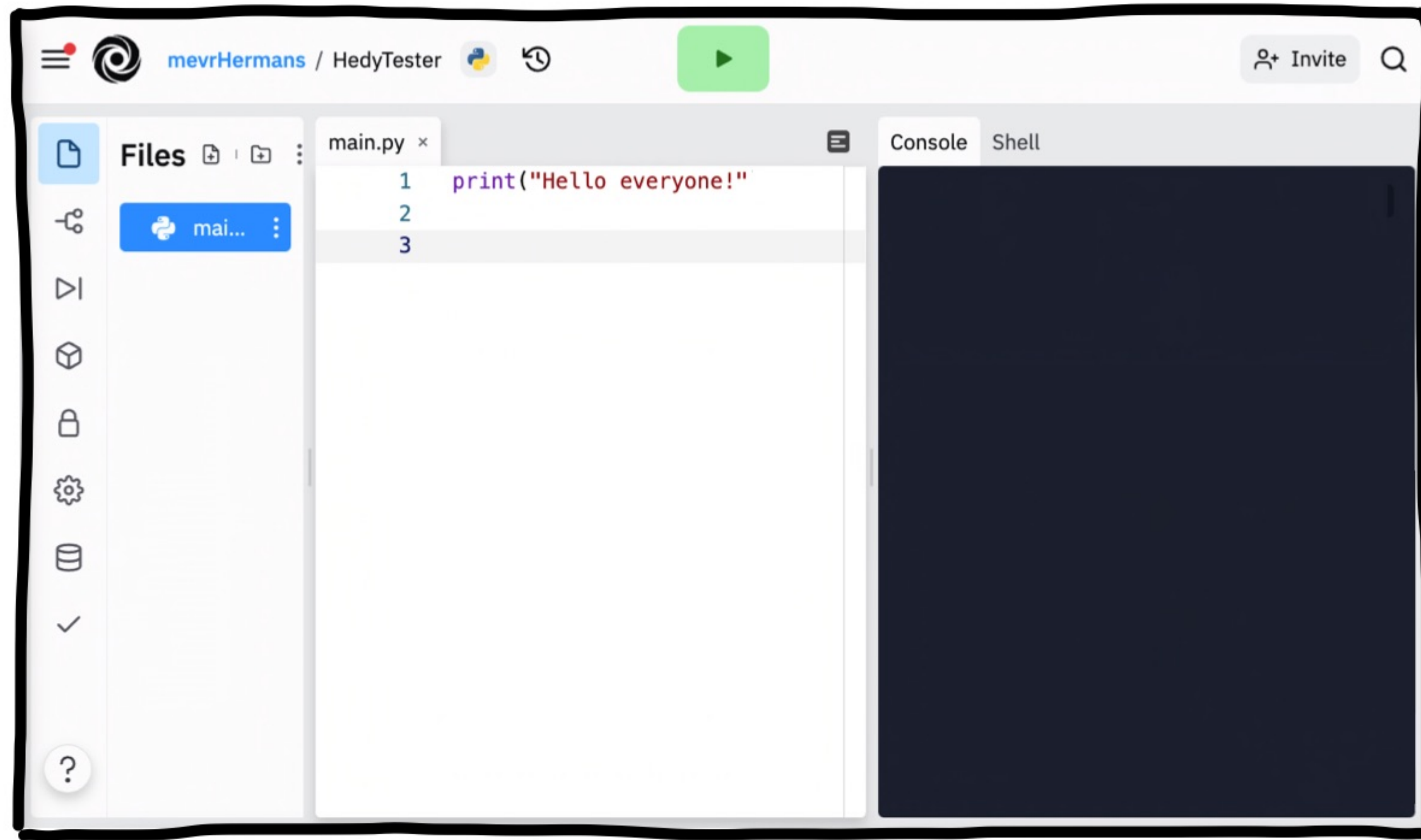


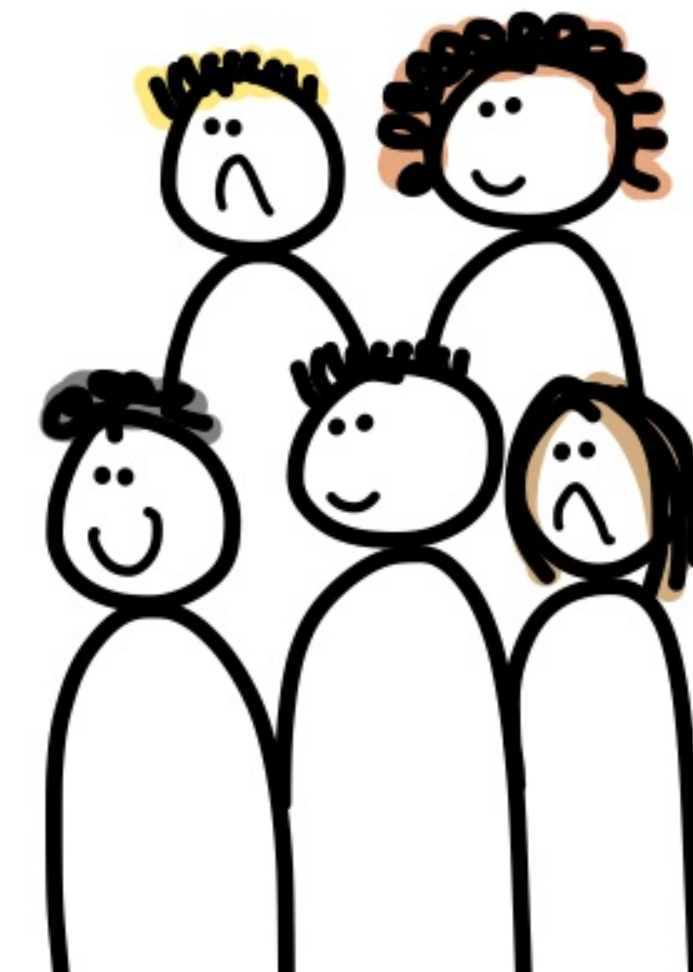
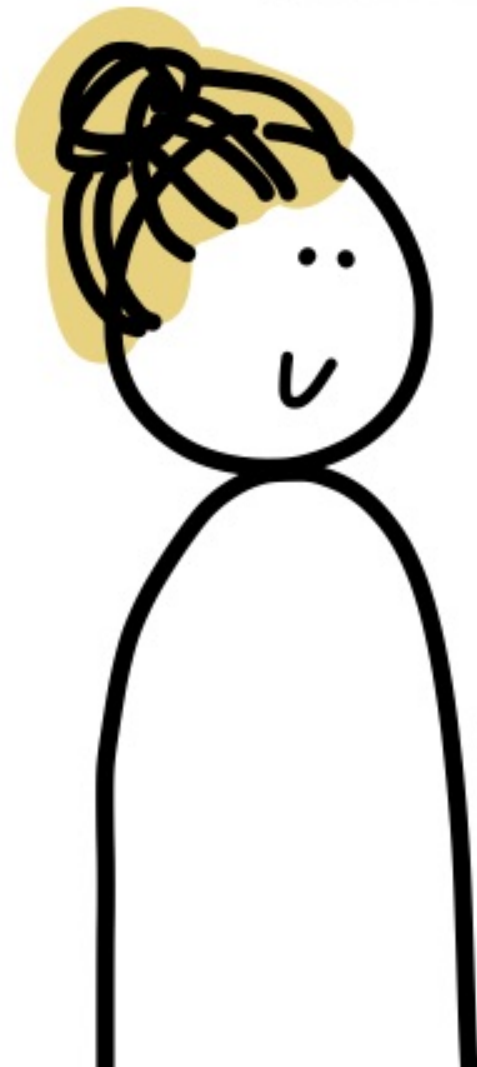
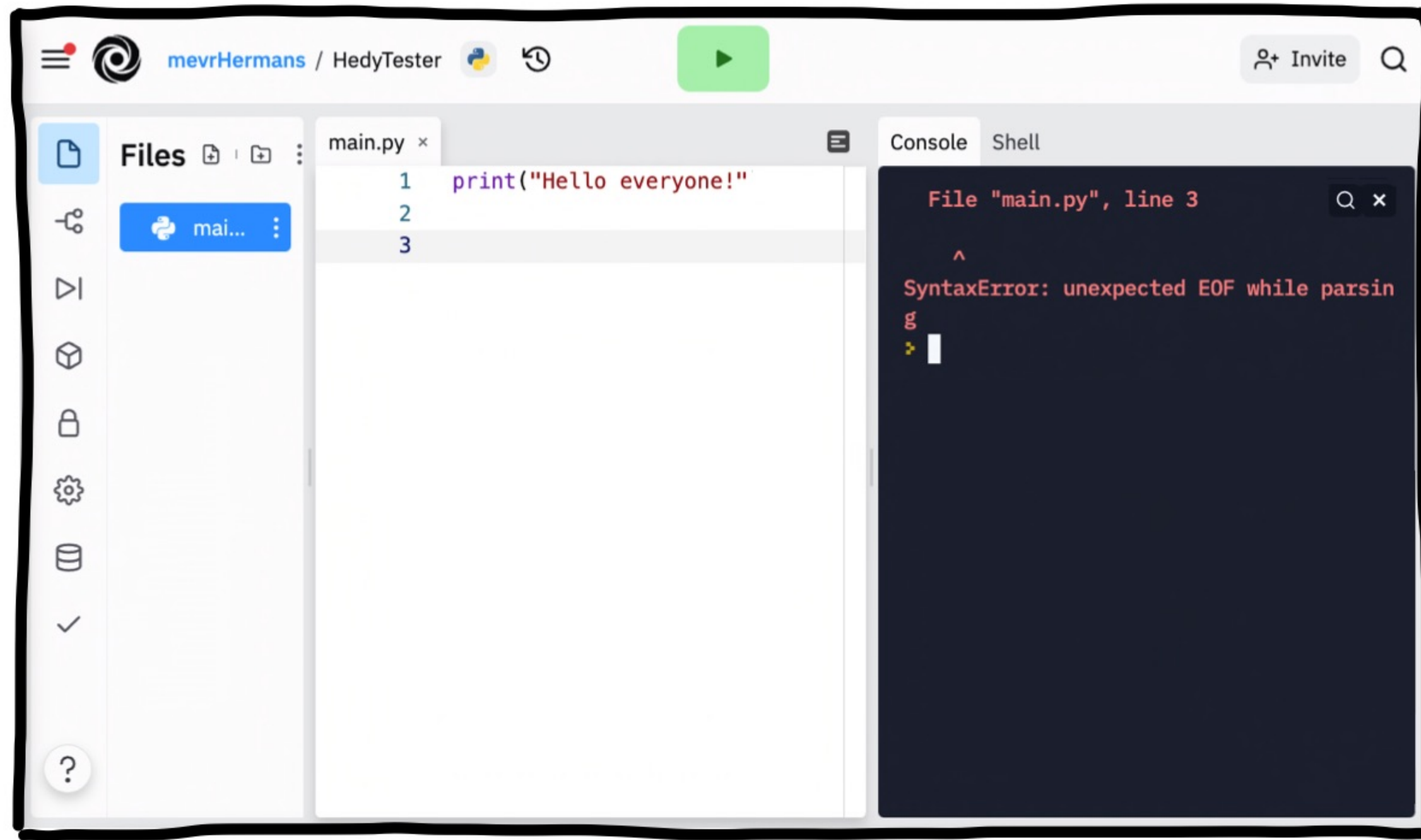


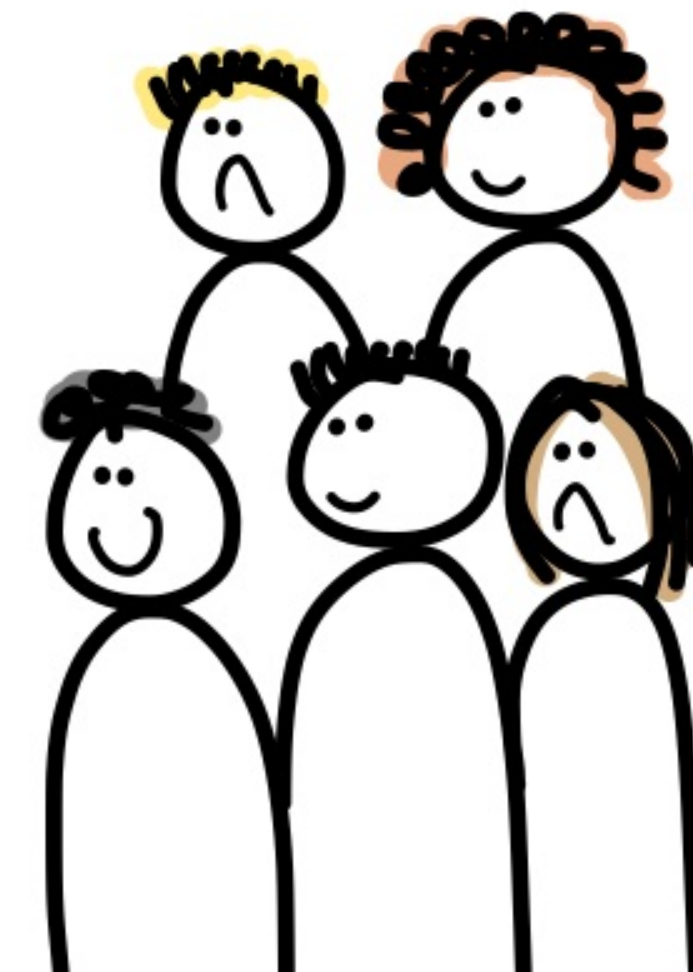
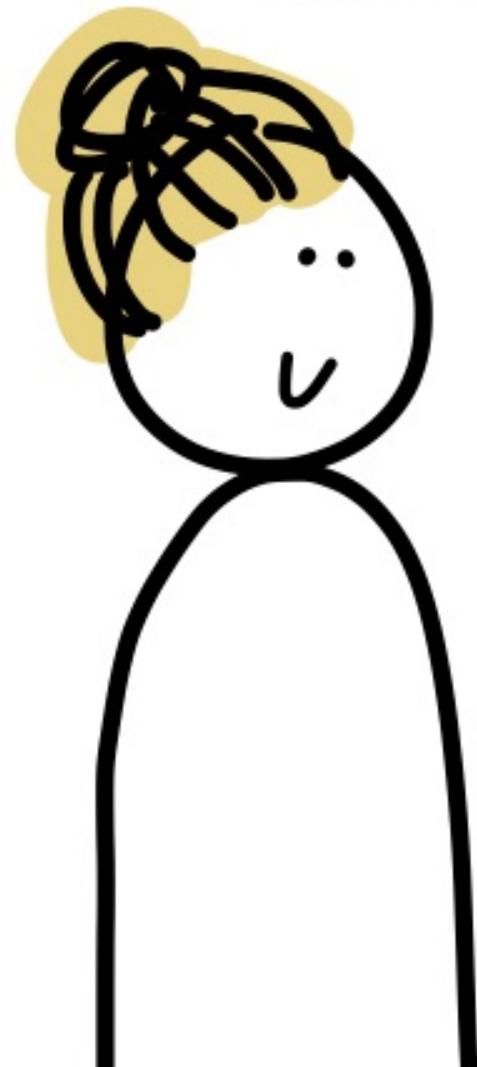
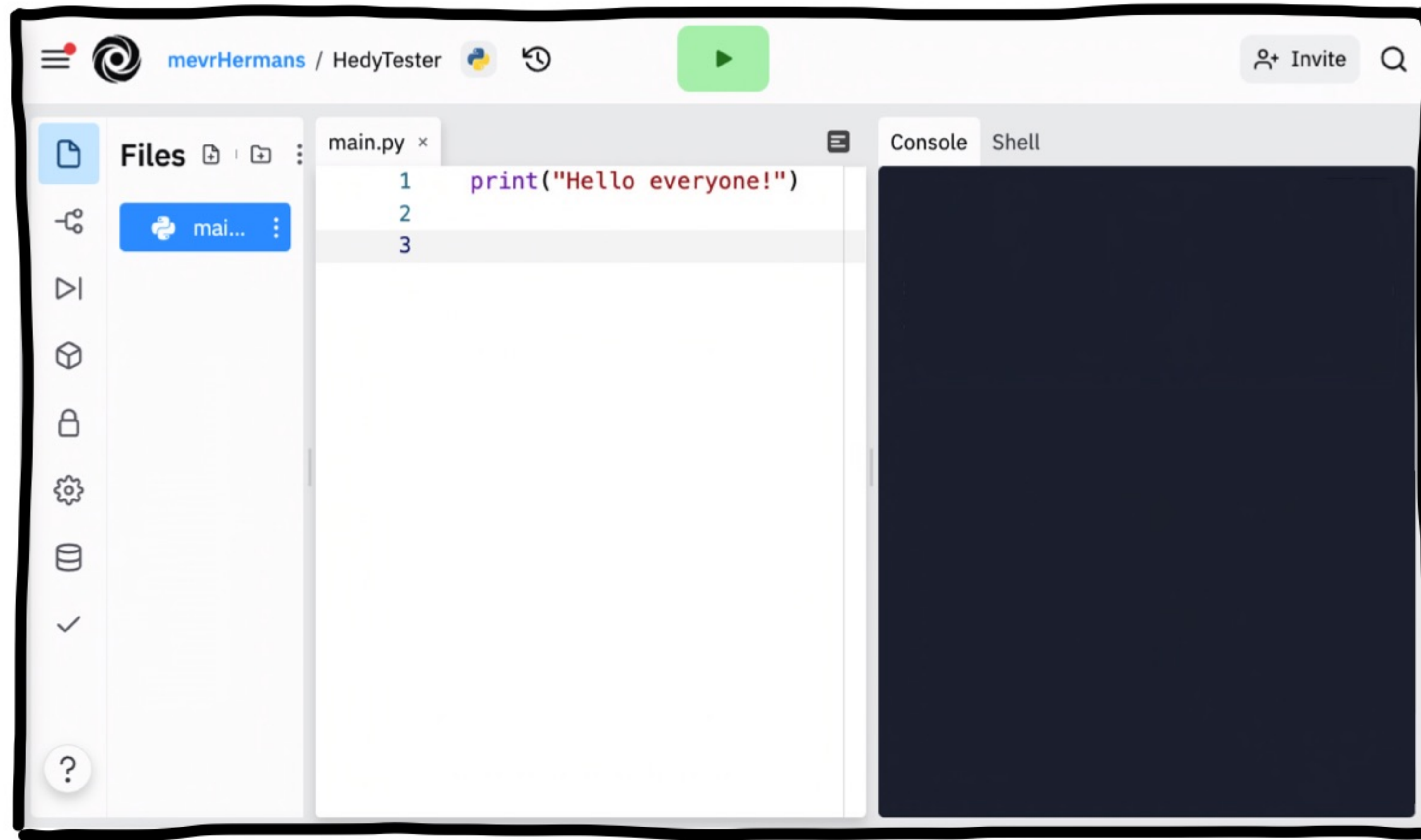


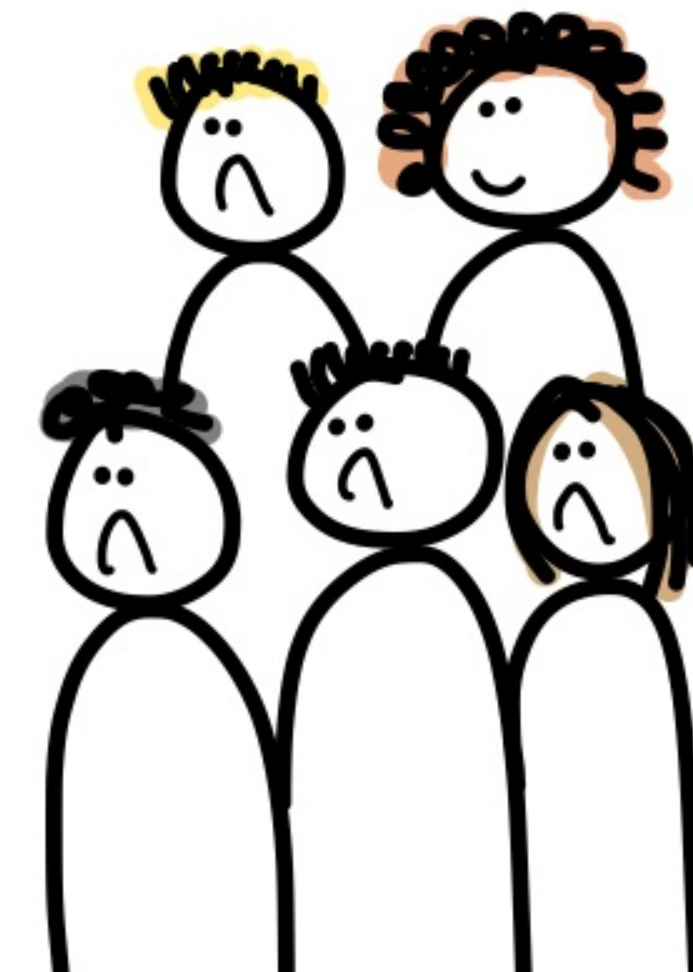
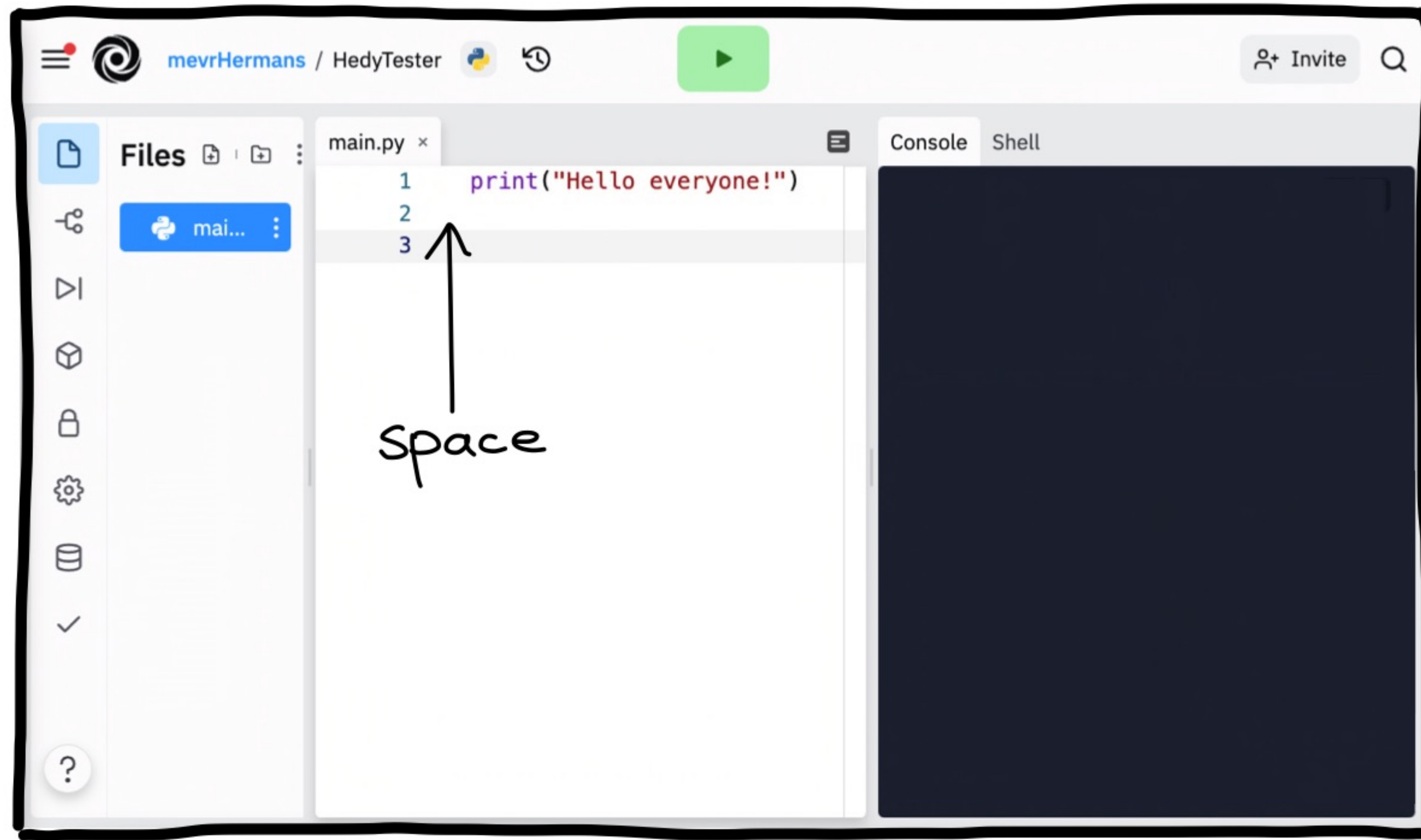


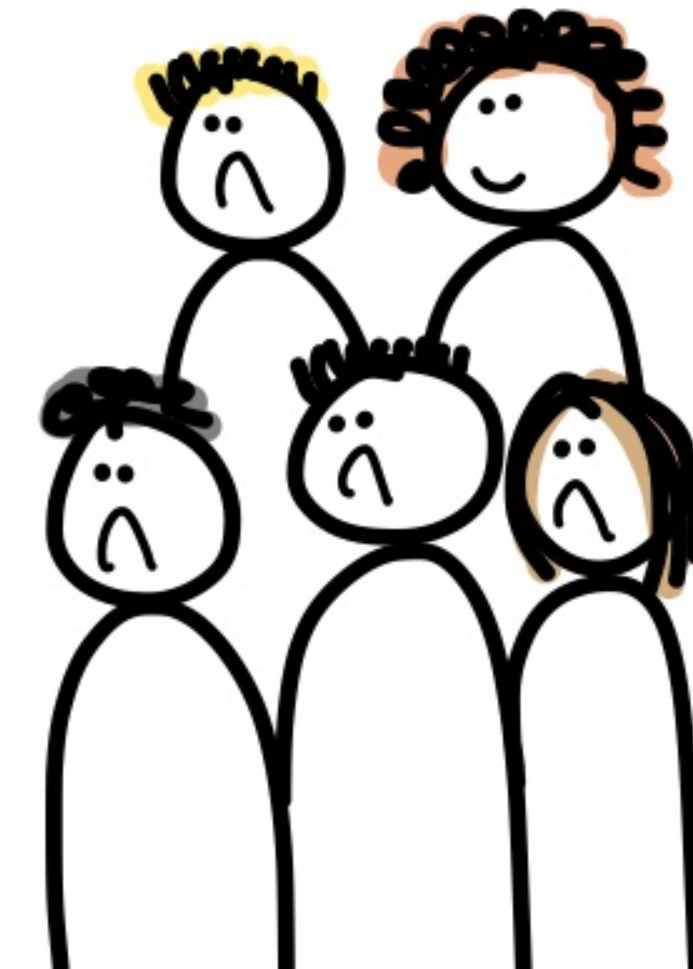
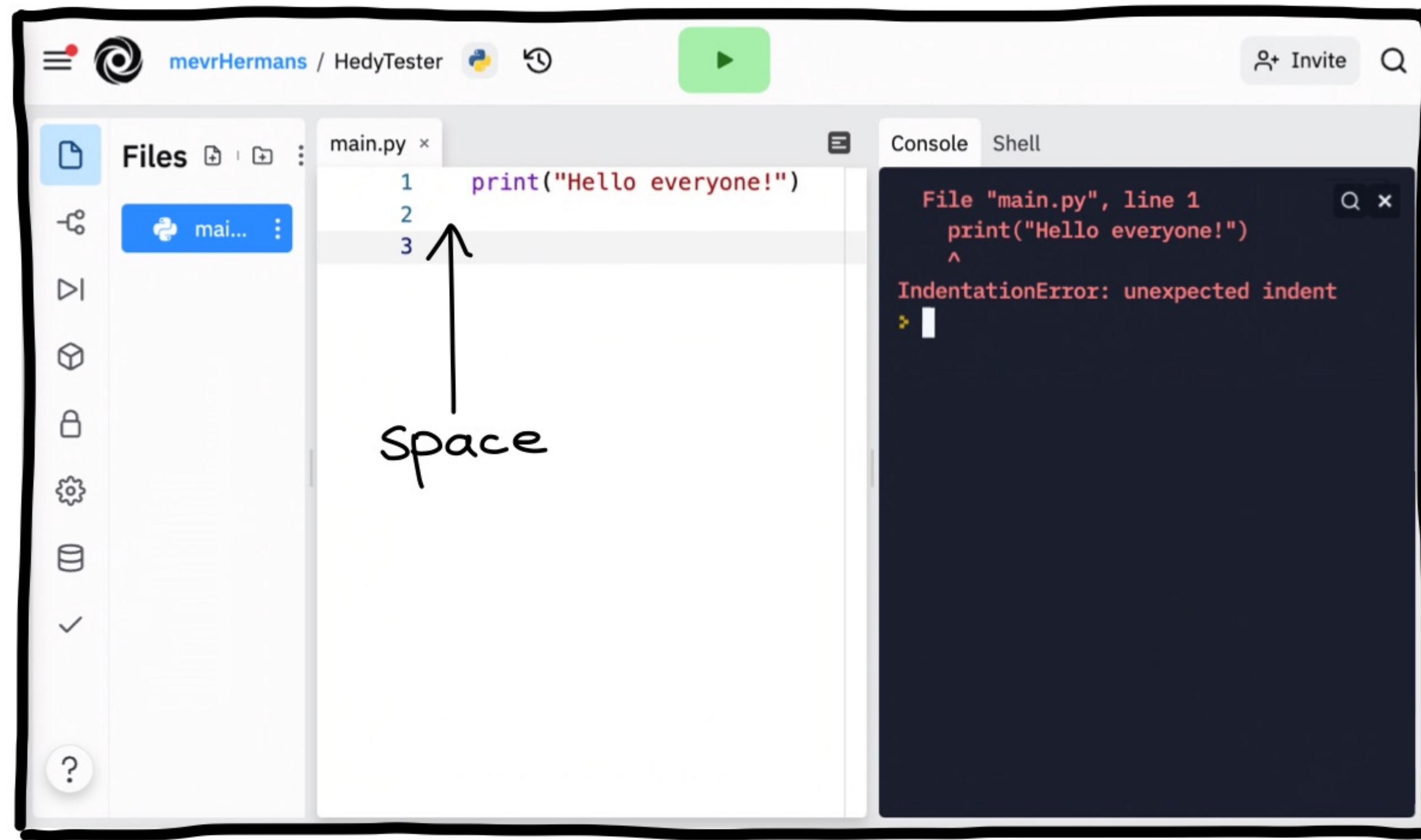


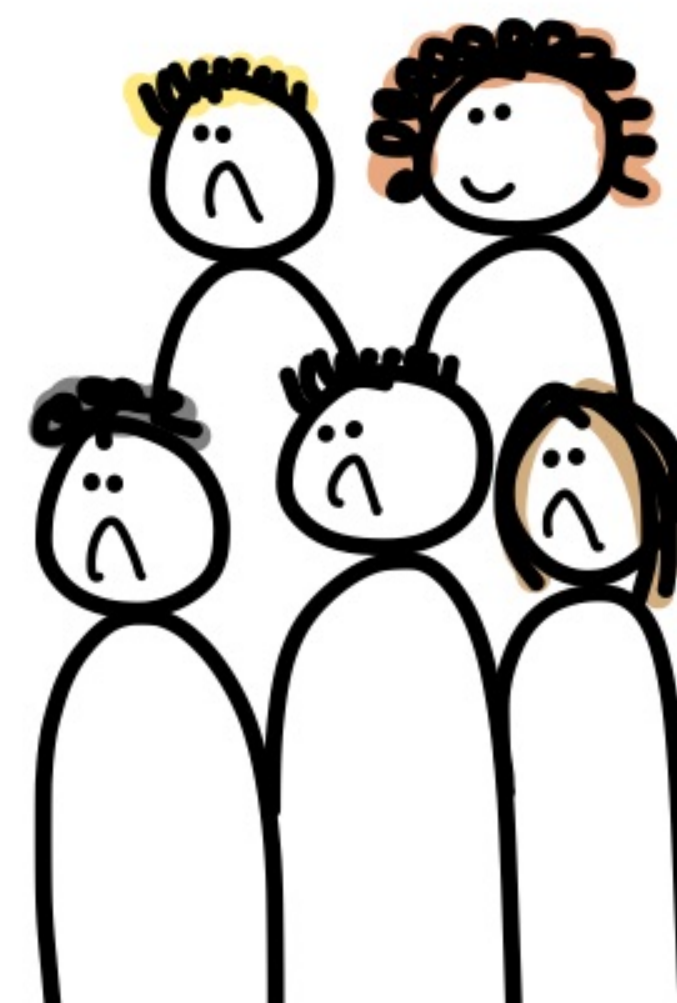
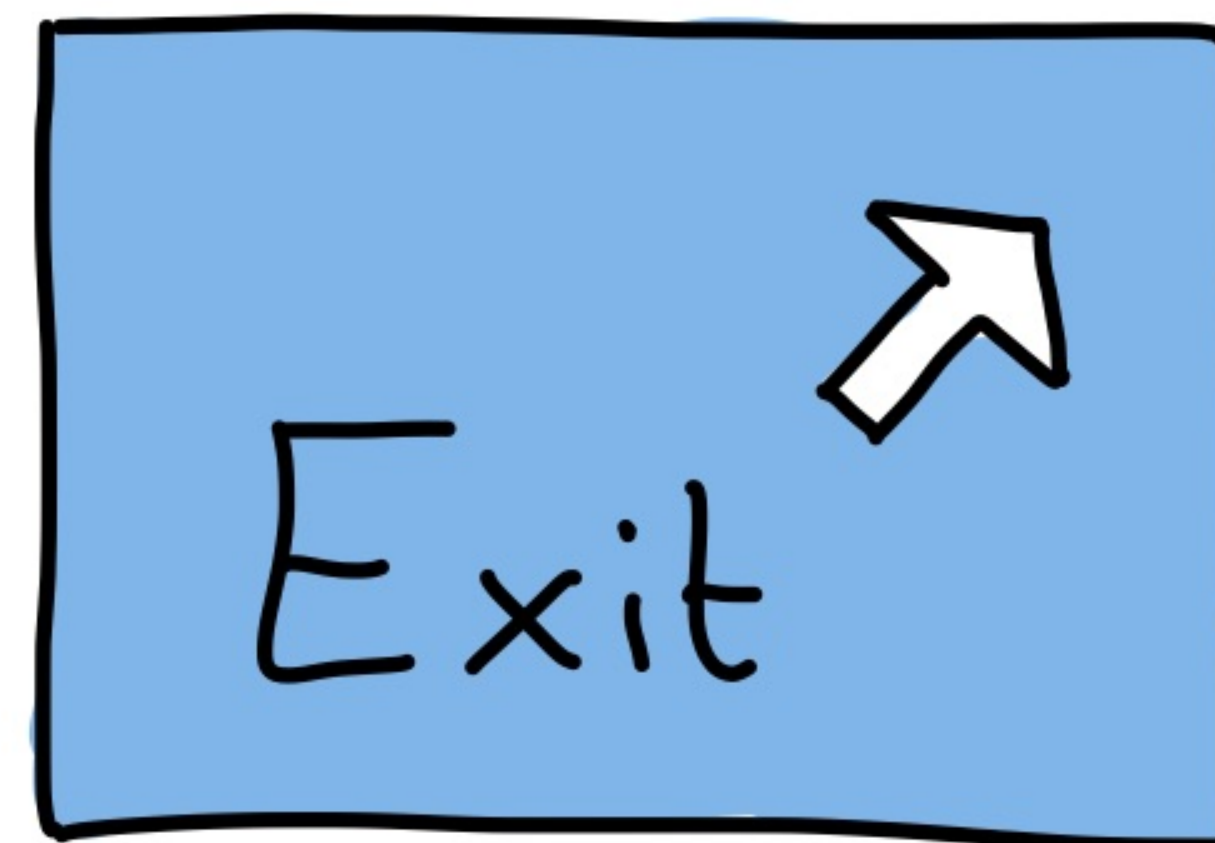
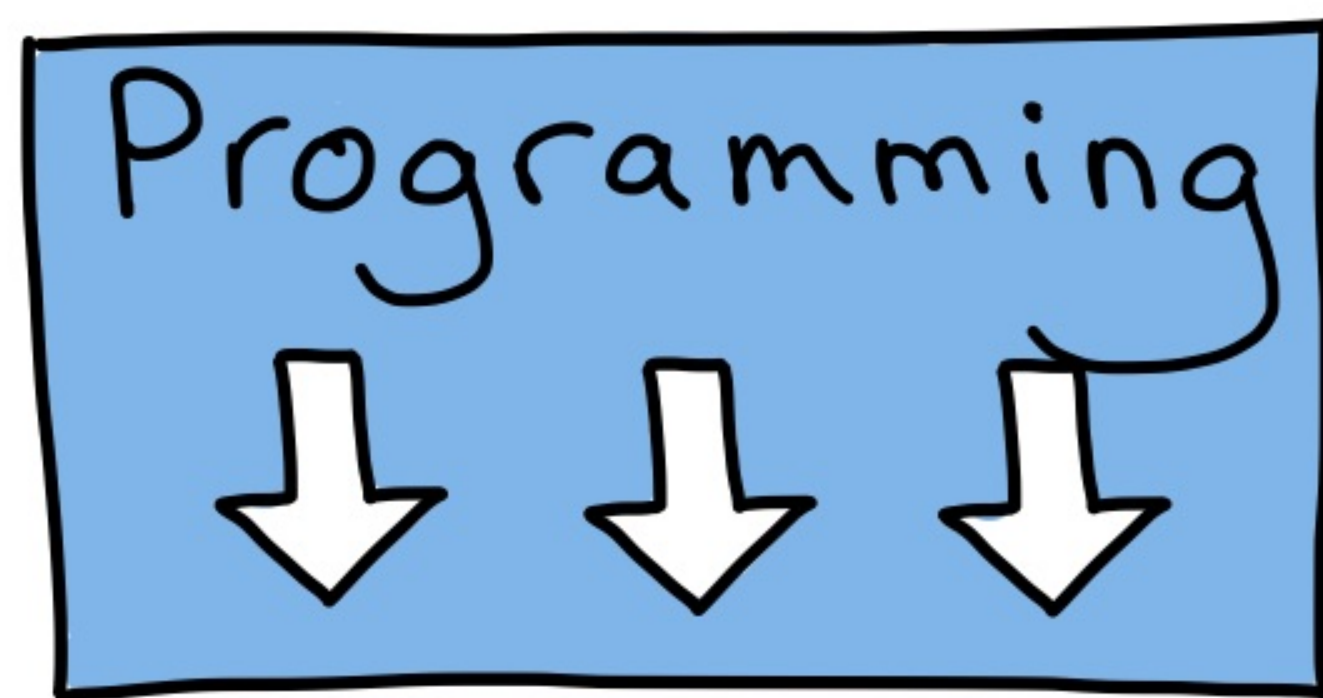


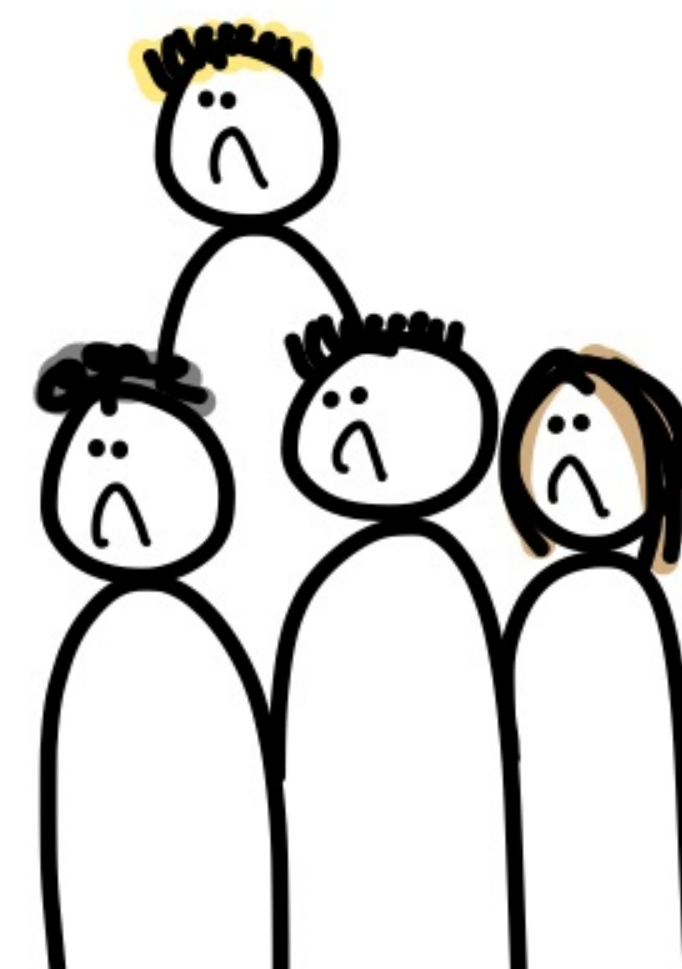
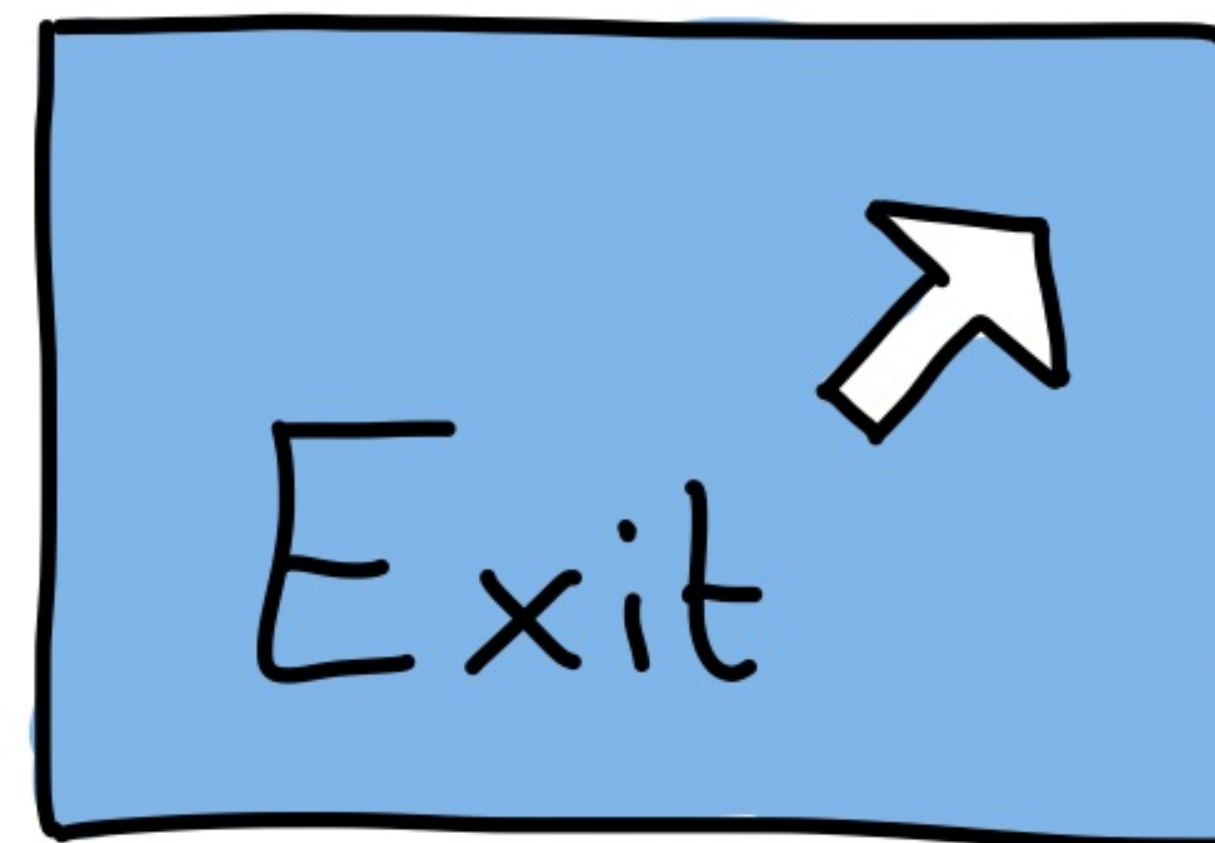
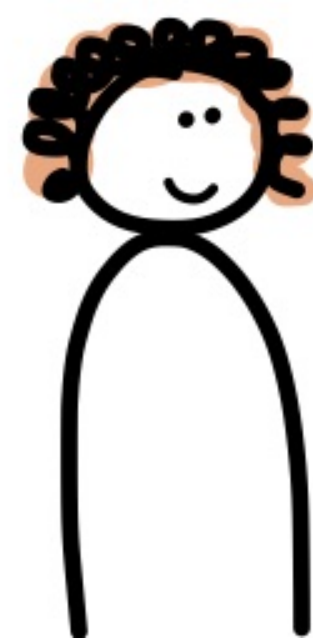
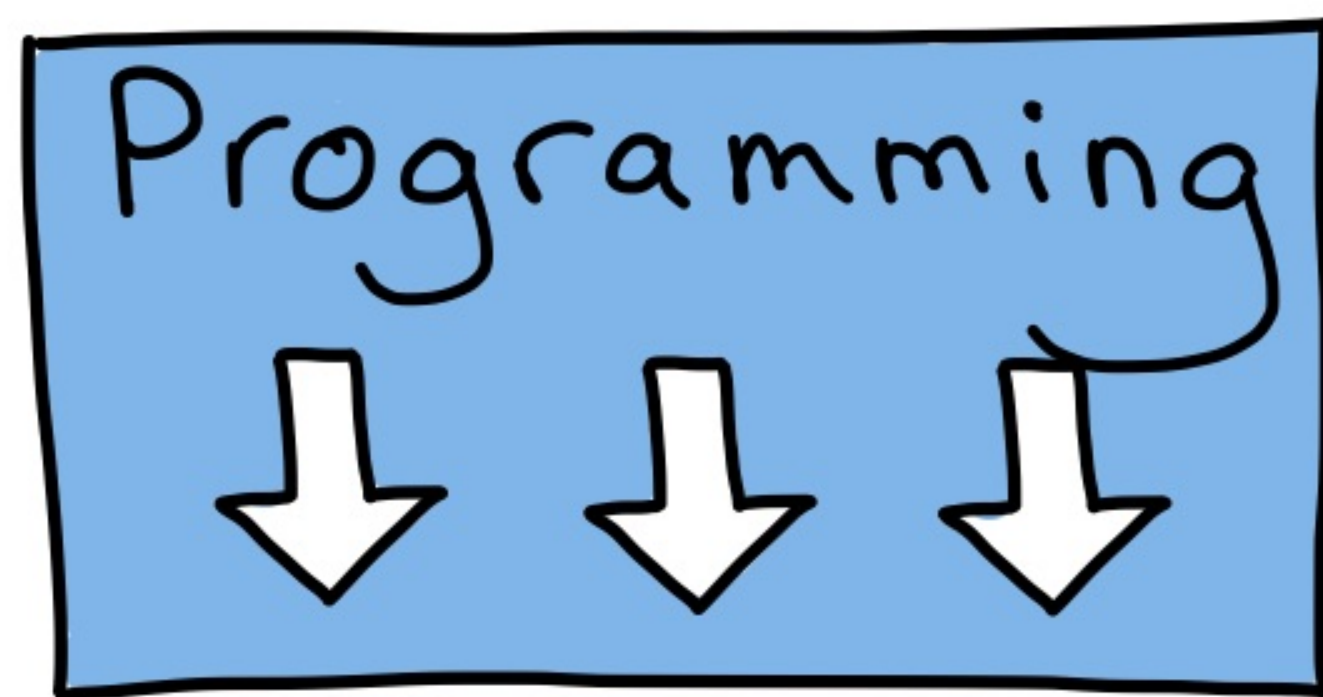


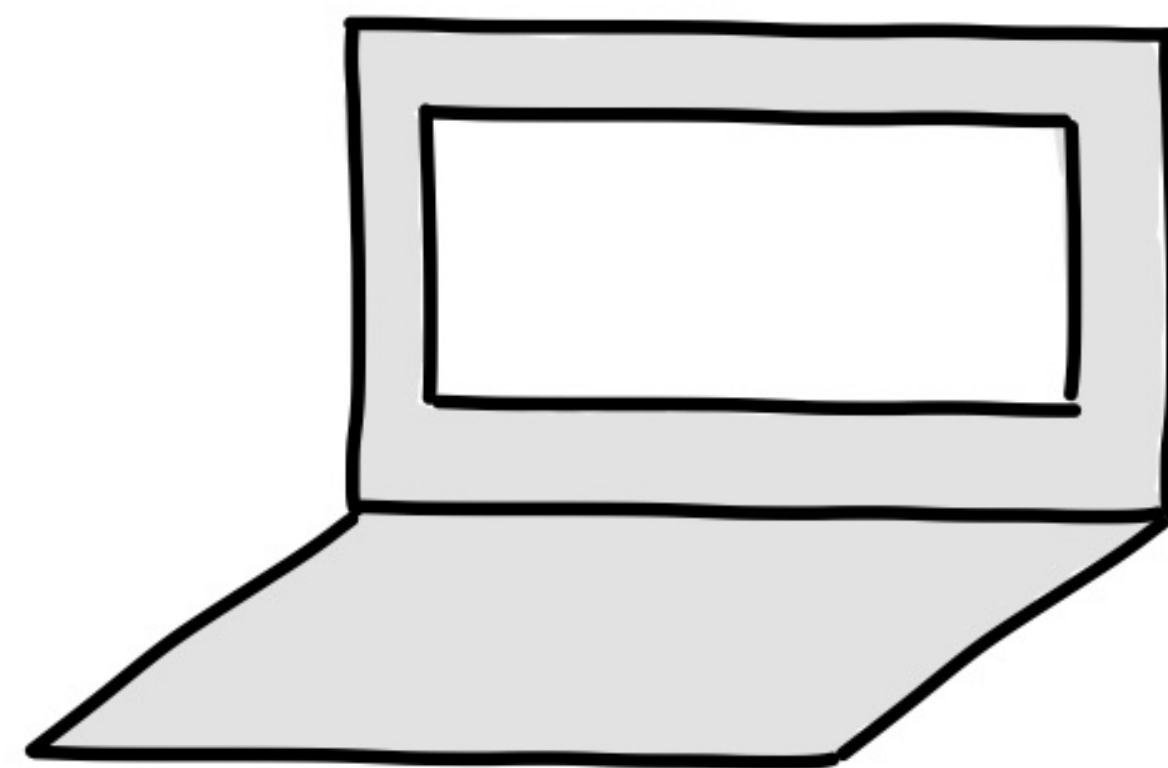
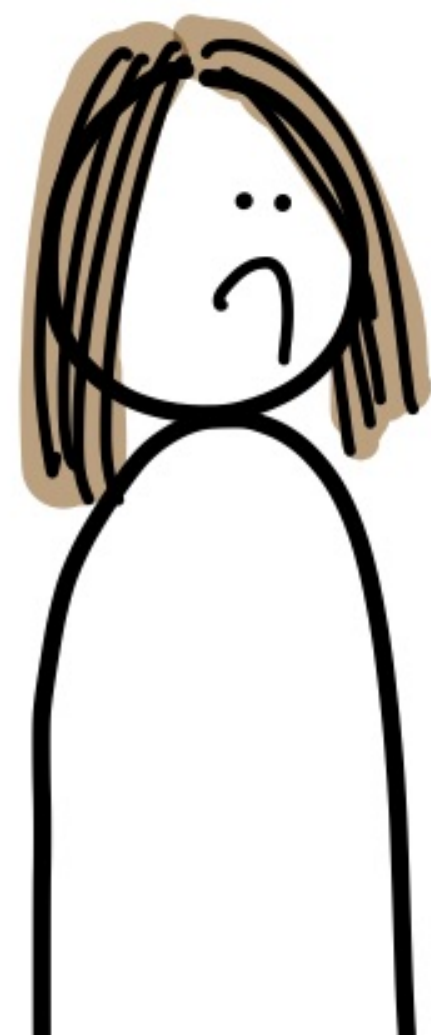


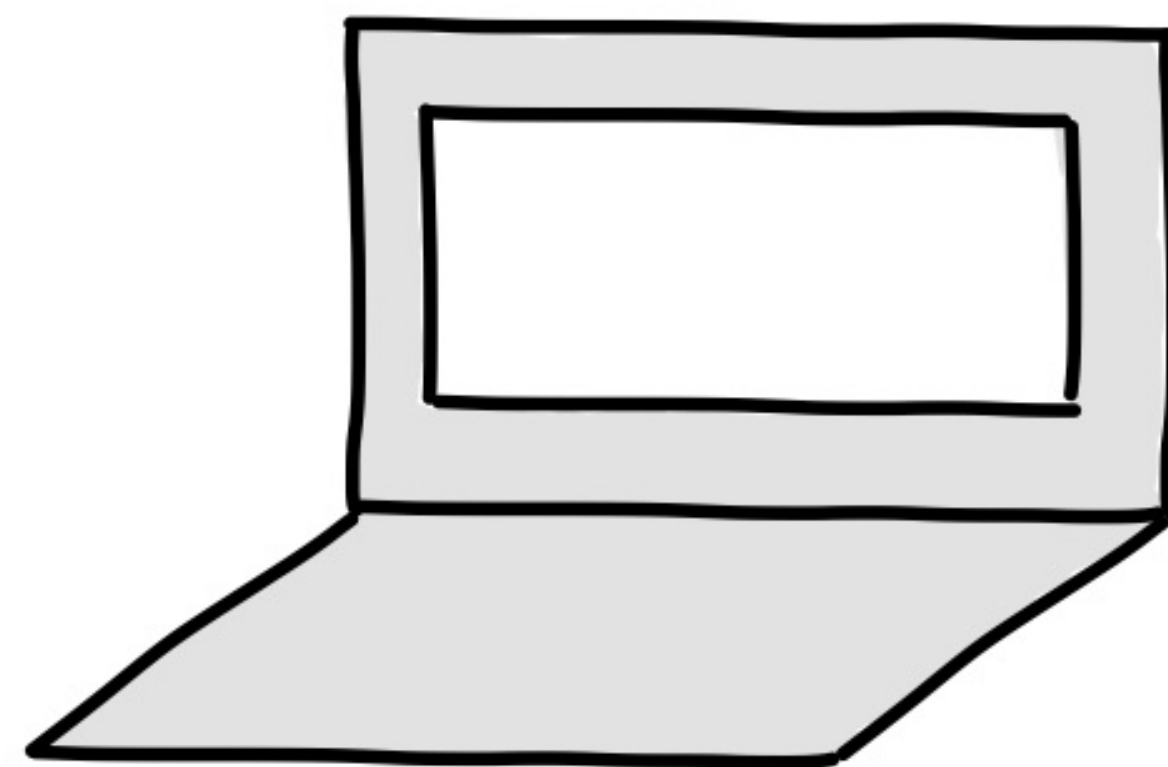
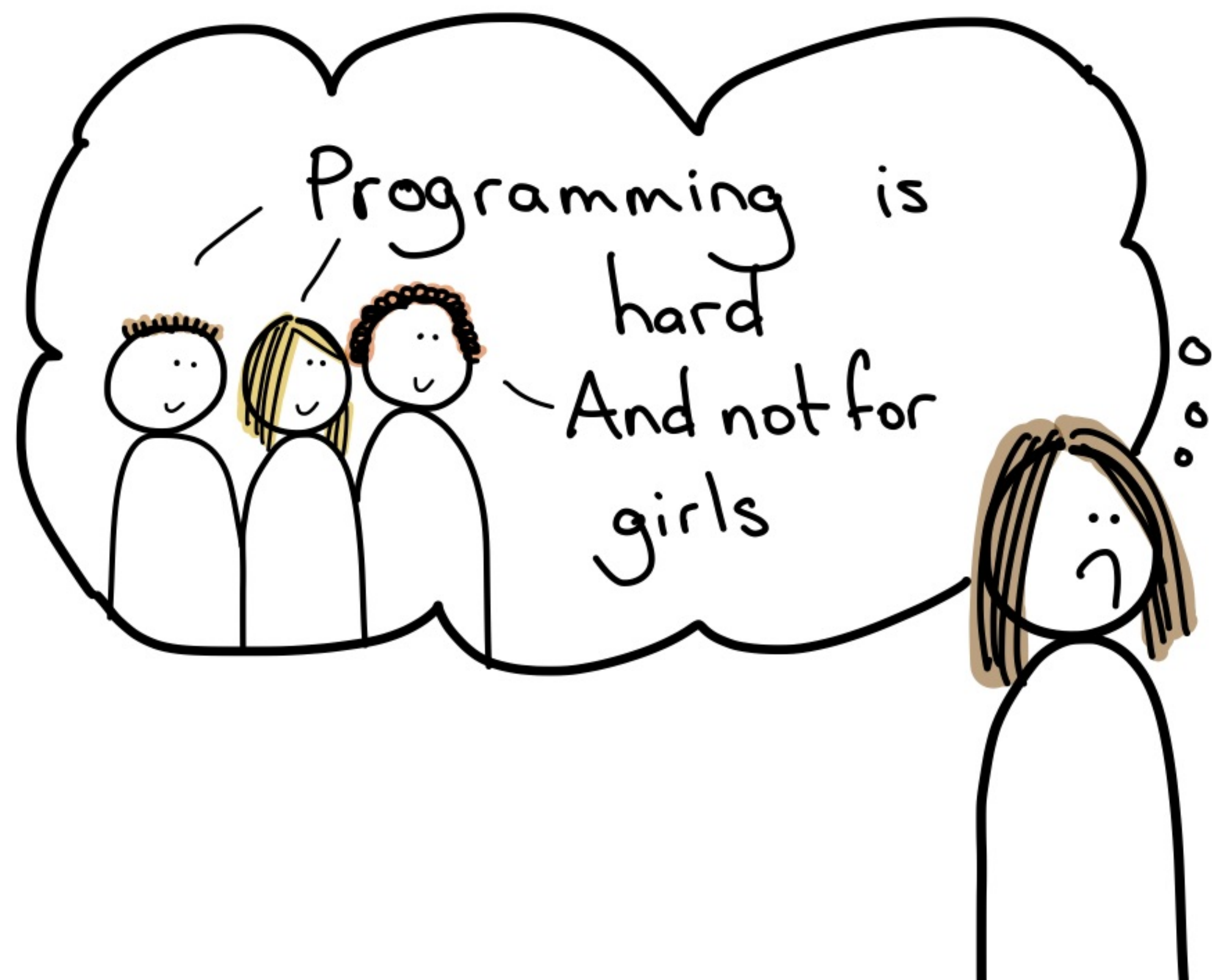


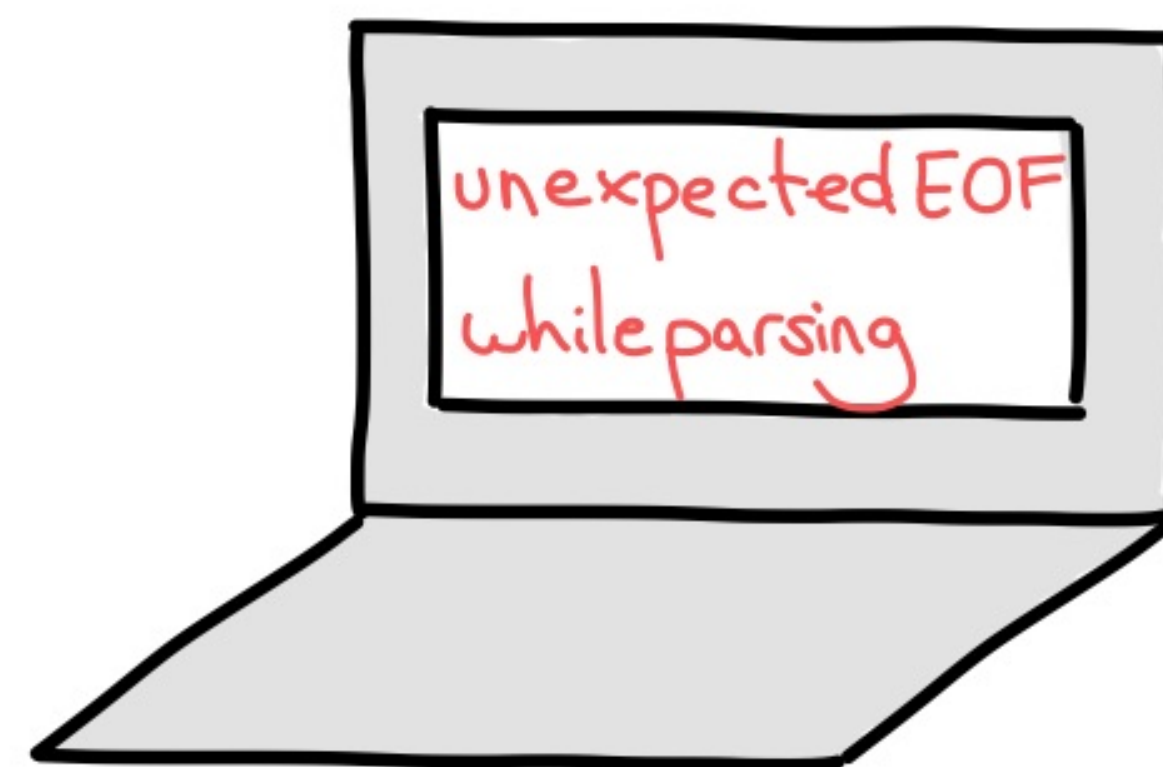
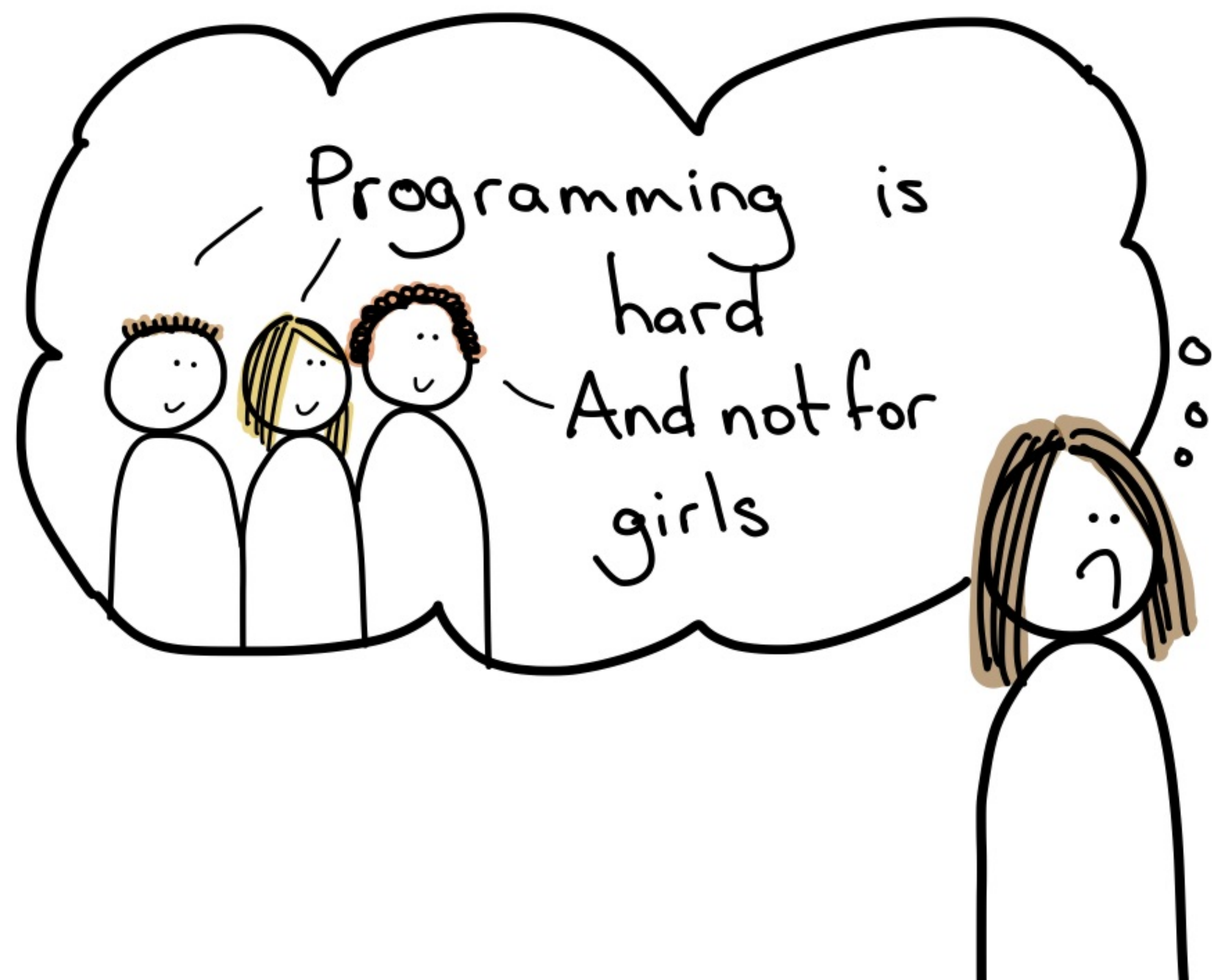




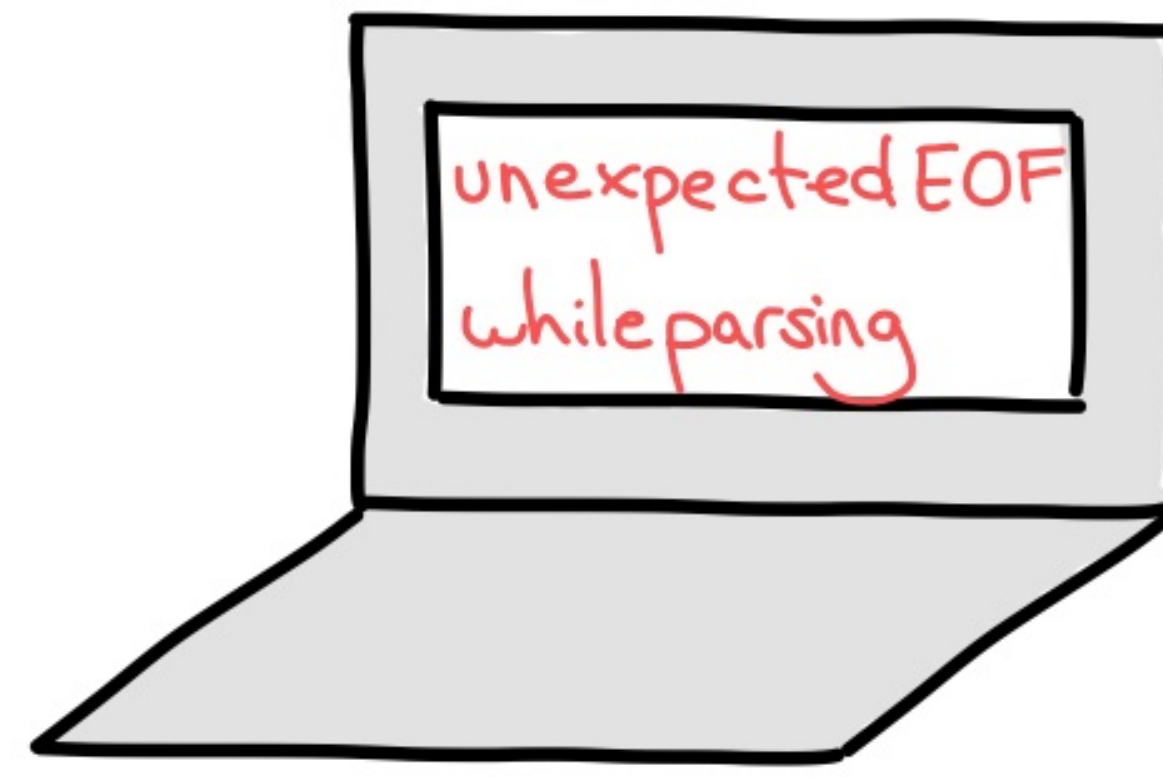
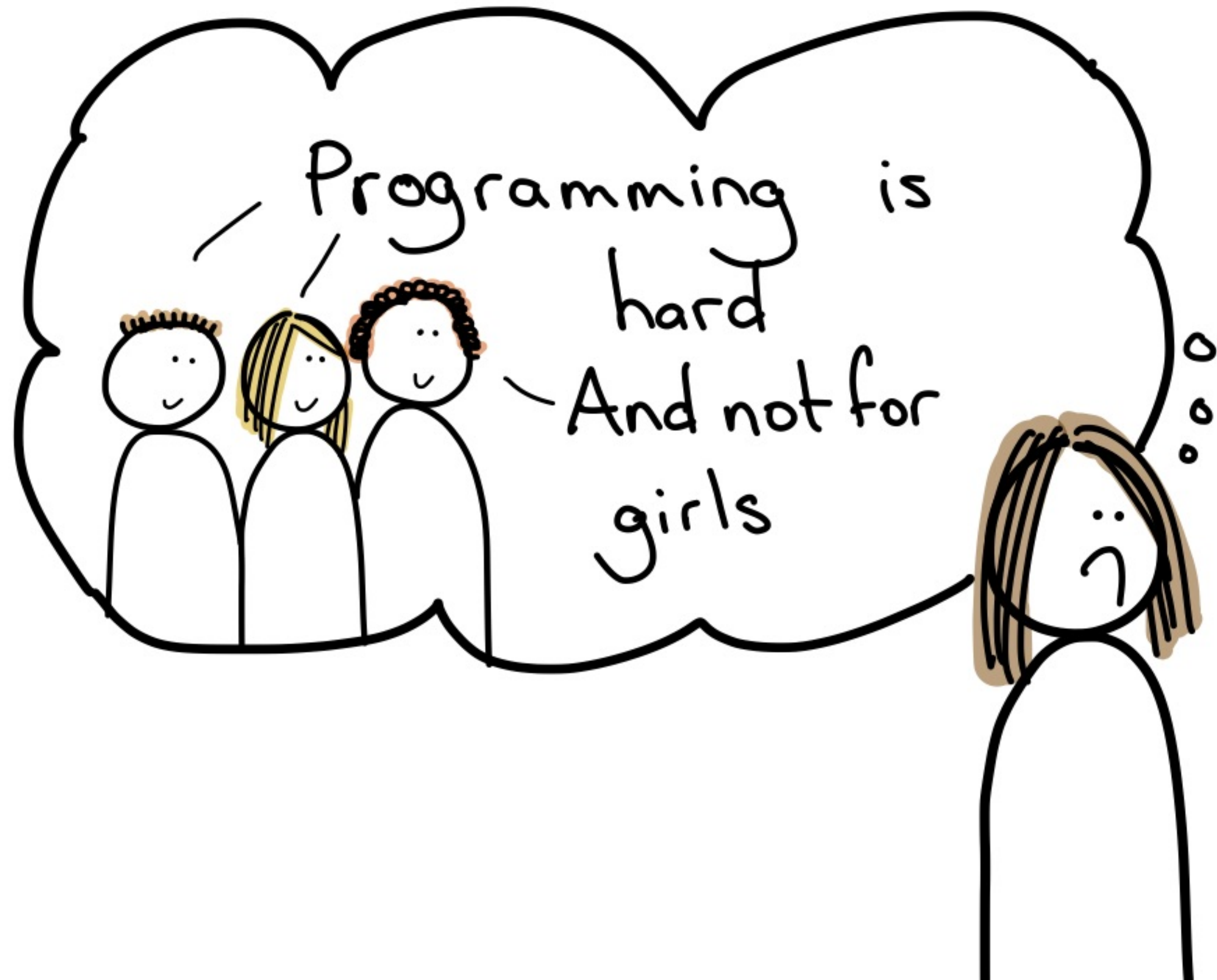








They were right!
This is not for me...



How do people learn?



How do people learn?

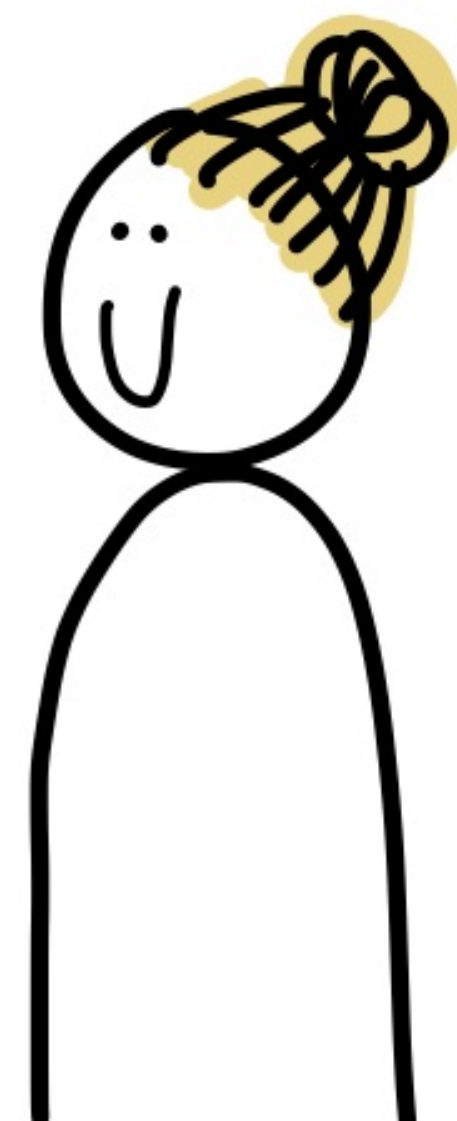


How do people learn?



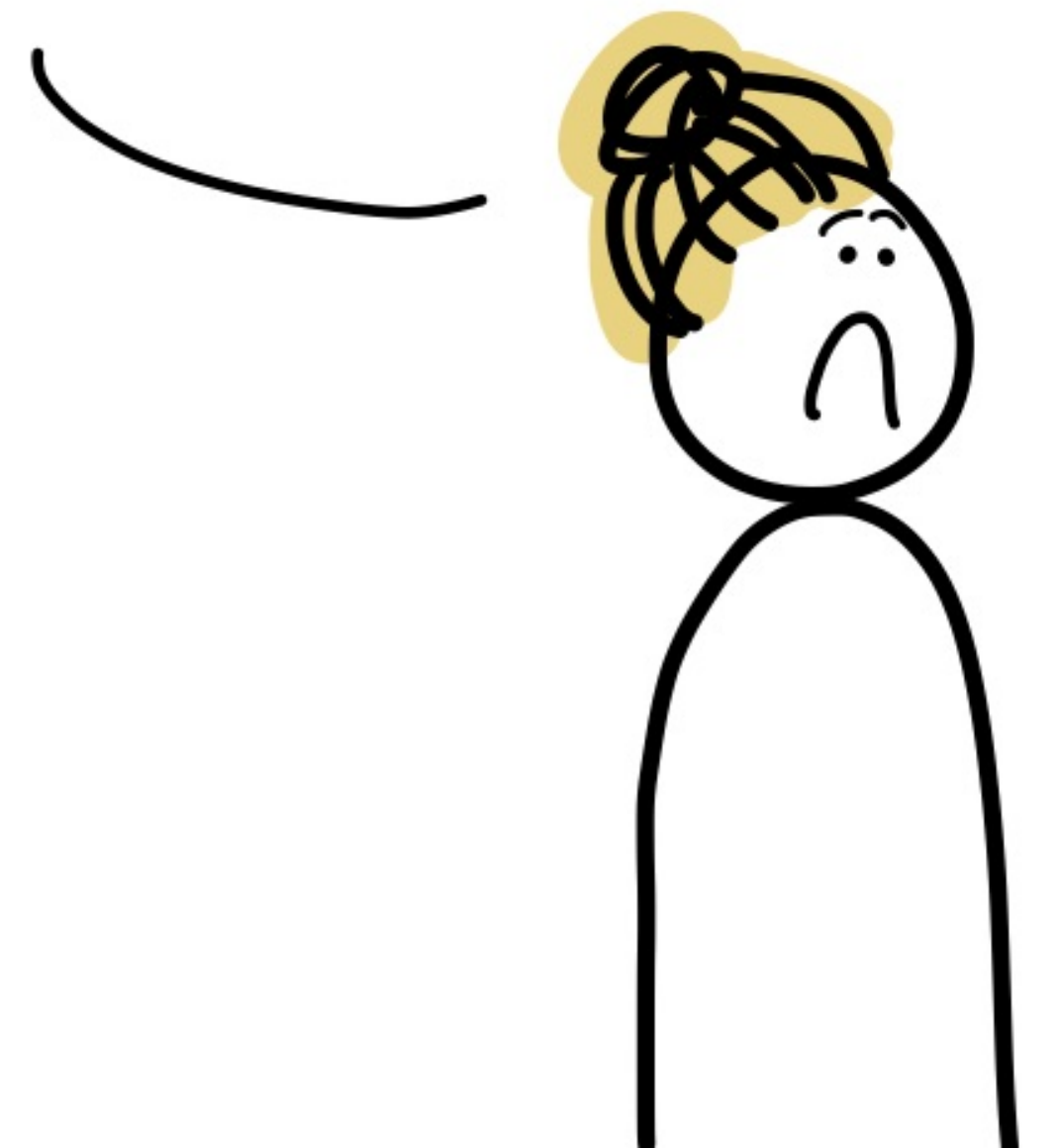
Don't worry!

Thinking is your job!



I am a failure...

I produce nothing...



aine



cat in tree



A cat in the tree.

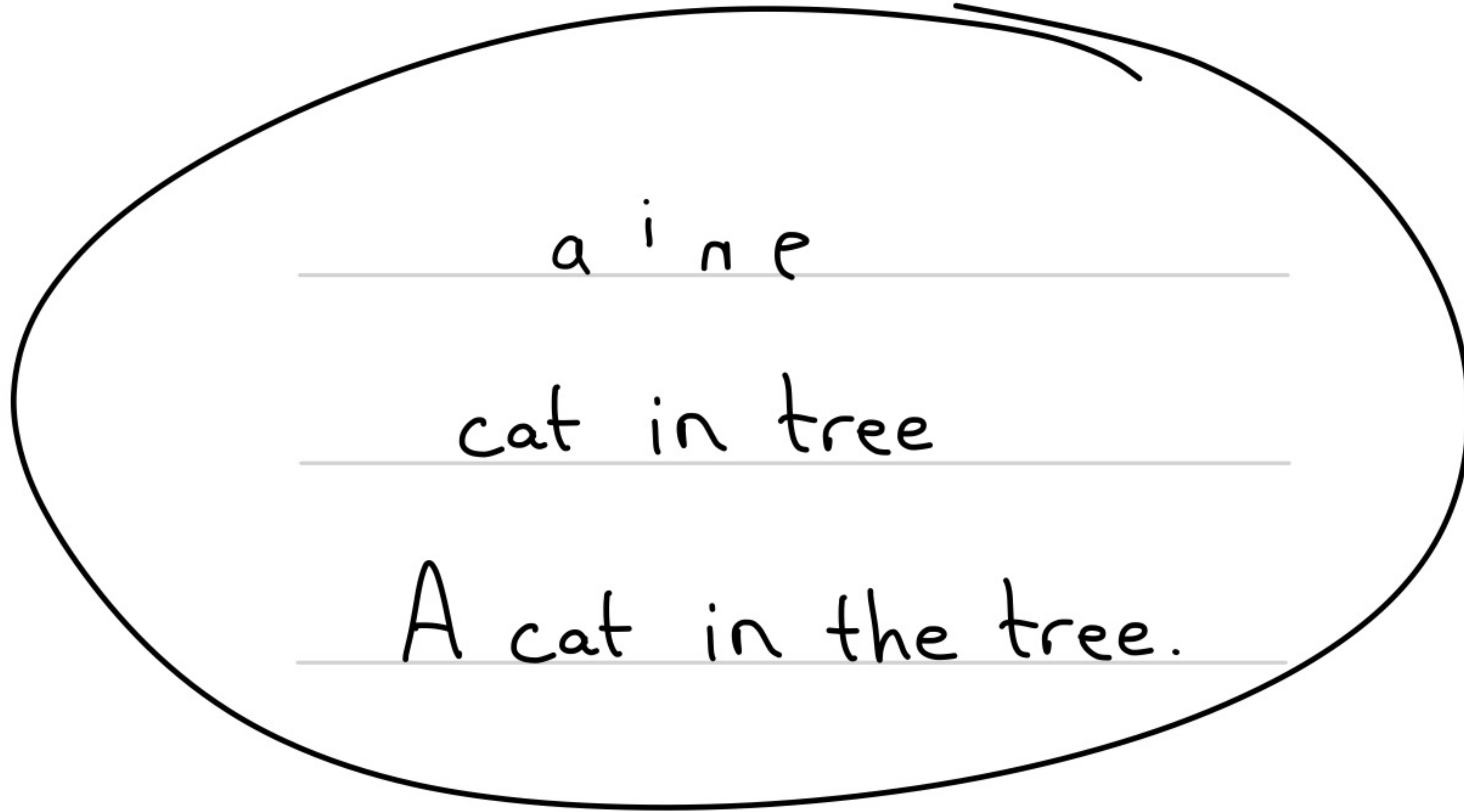


a i n e

cat in tree

A cat in the tree.





Code could be
like that



Try the code yourself with the green 'Run code' button under the programming field.

Ready? Then go to the next tab to learn your first command!

```
1 print hello YOW!!
```



Try the code yourself with the green 'Run code' button under the programming field.

Ready? Then go to the next tab to learn your first command!

```
1 print hello YOW!!
```

```
hello YOW!!
```

Try the code yourself with the green 'Run code' button under the programming field.

Ready? Then go to the next tab to learn your first command!

```
1 ask How are you?  
2 echo So you're...
```



Try the code yourself with the green 'Run code' button under the programming field.

Ready? Then go to the next tab to learn your first command!

```
1 ask How are you?  
2 echo So you're...
```



How are you?

How are you?

Enter

Try the code yourself with the green 'Run code' button under the programming field.

Ready? Then go to the next tab to learn your first command!

```
1 ask How are you?  
2 echo So you're...
```

So you're... great

end of the sentence. So you can't say "your hamburger is coming right up: .

That changes in level 2. In level 2 you'll learn to work with variables, that allow you to save multiple pieces of information and print them in any place you want. So let's go to the next tab!

```
1 name is Felienne
2 print hello name
```



Run code



Go back to level 1

Go to level 3

end of the sentence. So you can't say "your hamburger is coming right up: .

That changes in level 2. In level 2 you'll learn to work with variables, that allow you to save multiple pieces of information and print them in any place you want. So let's go to the next tab!

```
1 name is Felienne
2 print hello name
```

```
hello Felienne
```

end of the sentence. So you can't say "your hamburger is coming right up: .

That changes in level 2. In level 2 you'll learn to work with variables, that allow you to save multiple pieces of information and print them in any place you want. So let's go to the next tab!

```
1 name = 'Feliennne'  
2 print('hello', name)|
```

hello Feliennne



Run code



Go back to level 1

Go to level 3

Hedy

×

+

←

→

↺

hedy.org/hedy/4#default

🔍

📄

☆

🔍

⚙️

🖥️



⋮

```
print My name is name
```

1 print 'Hello'

←

Run code



Go back to level 3

Go to level 5

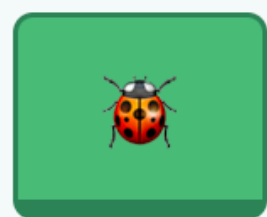
print My name is name

```
1 print 'Hello'
2 print 'How are you?'

```



Run code



Go back to level 3

Go to level 5

Hedy

×

+

←

→

↻

hedy.org/hedy/4#default

🔍

📄

☆

🔍

⚙️

🖱️

👤

⋮

```
print My name is name
```

1

print 'Hello'

2

print 'How are you?'

⏪

ⓘ

We can't run your program.

×

Be careful. If you **ask** or **print** something, the text should start and finish with a quotation mark. You forgot that for the text 'How are you?.'

Run code

🐛

Go back to level 3

Go to level 5

```
print('So your name is ', name)
```

```
1 print('Hello!')
2 for i in range(1, 10):
3     print('This is line ', i)
```

4



Run code

Go back to level 17


```
print('So your name is ', name)
```

```
1 print('Hello!')
2 for i in range(1, 10):
3     print('This is line ', i)
```

4



Hello!

This is line 1

This is line 2

This is line 3

This is line 4

This is line 5

This is line 6

This is line 7

This is line 8

This is line 9

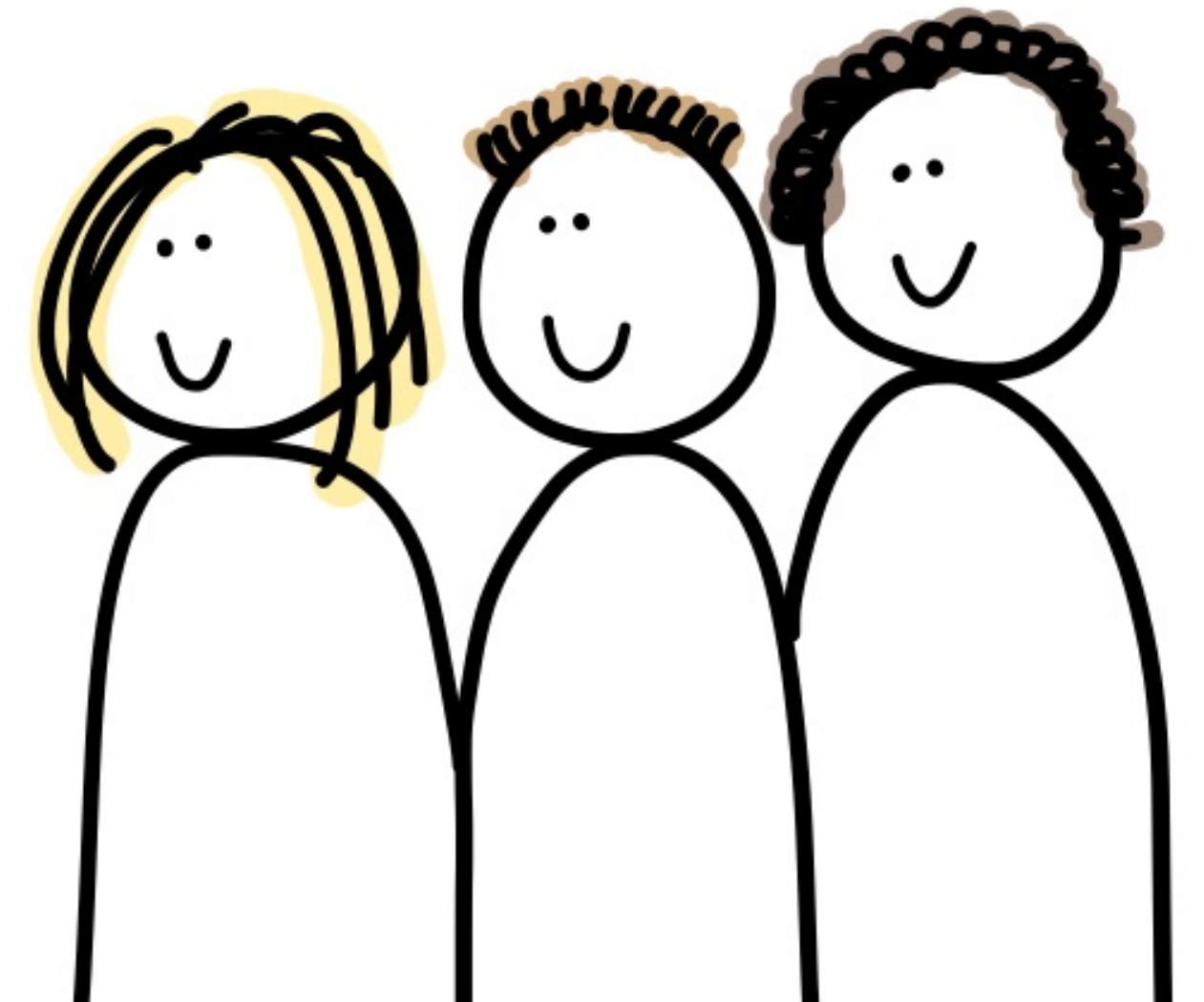
This is line 10



Run code

Go back to level 17

How do you make a
programming language?



cat at
foot

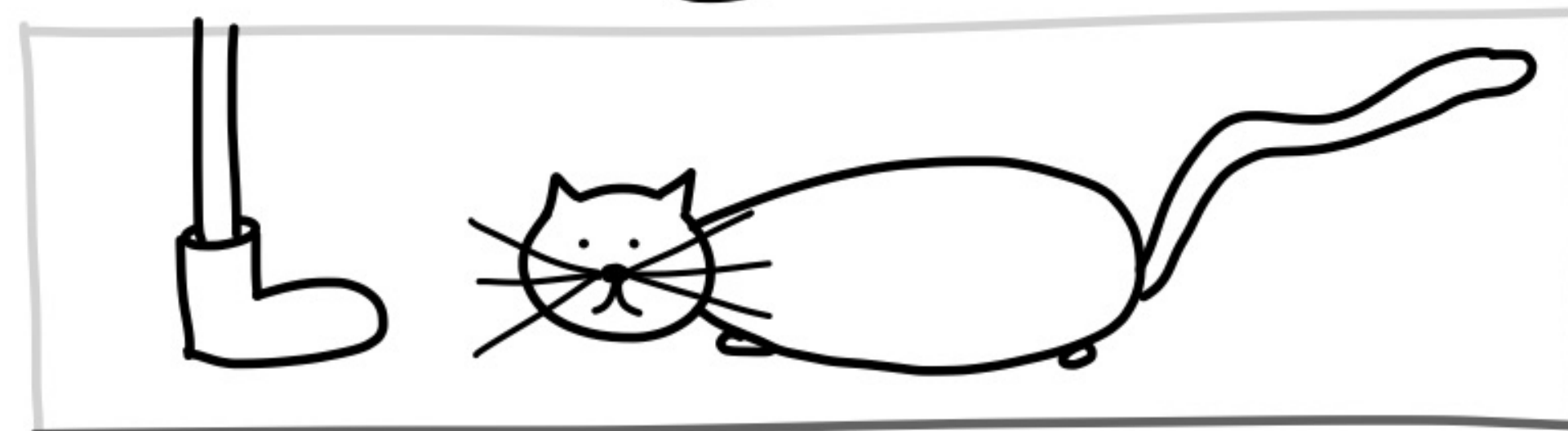


Spelling

c.a.t.a.t
f.o.o.t



Meaning



cat at
foot

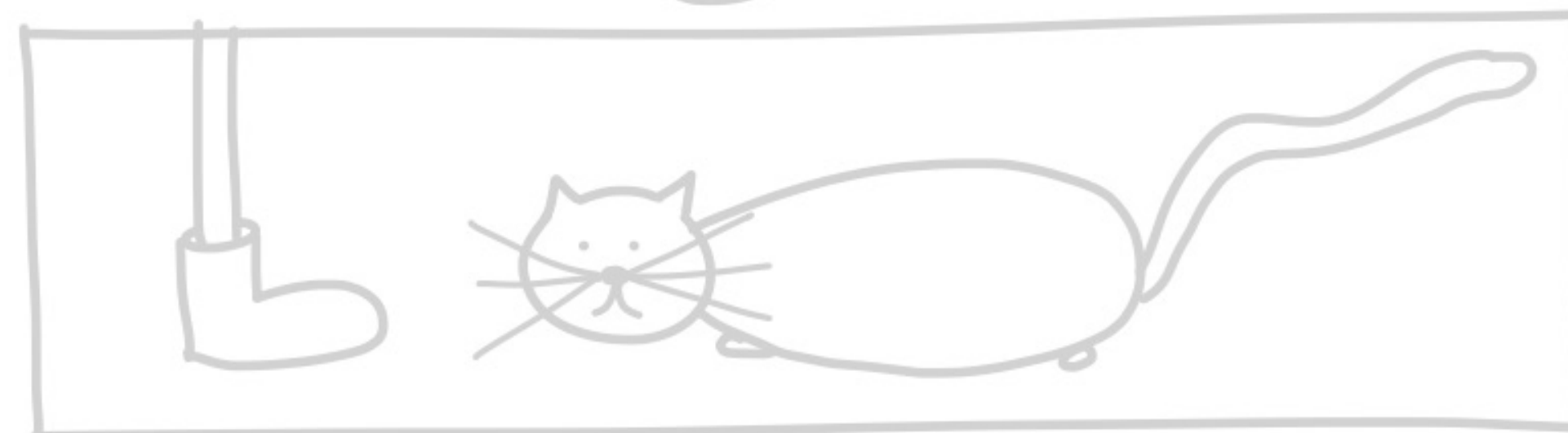


Spelling

c.a.t.a.t
f.o.o.t



Meaning



Syntax

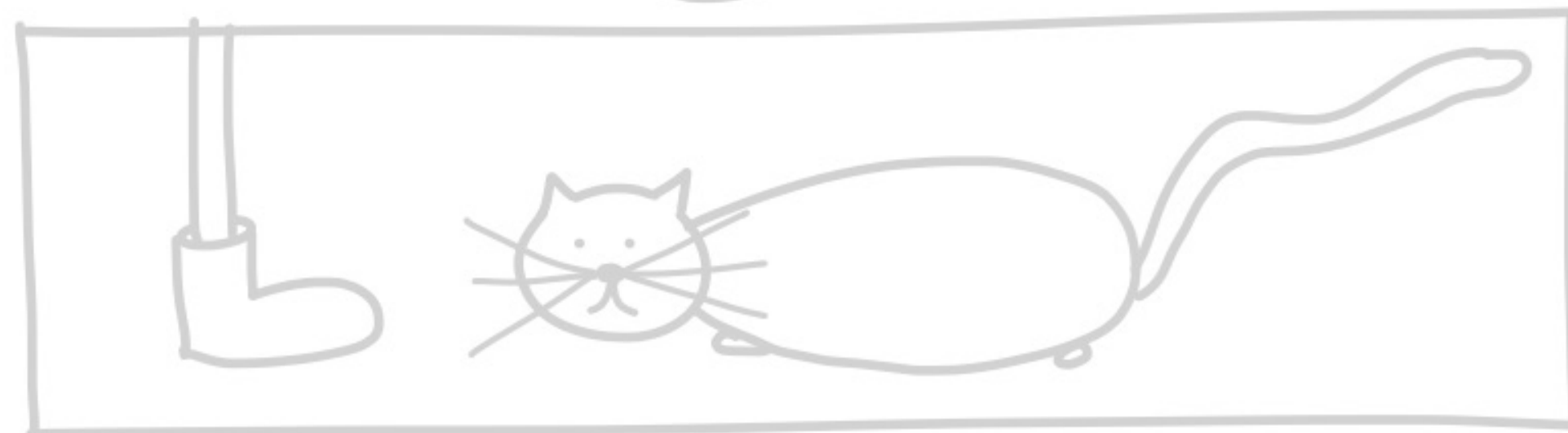
cat at
foot



c.a.t.a.t
f.o.o.t



Meaning



Hedy

```
print hello  
turn 120
```



Hedy

```
print hello  
turn 120
```



Syntax

```
print letters  
turn digits
```



Hedy

```
print hello  
turn 120
```



Syntax (Grammar)

```
print letters  
turn digits
```



Hedy

```
print hello  
turn 120
```



Syntax

```
print letters  
turn digits
```



Hedy

```
//print hello  
turn 120
```



Syntax

```
//print letters  
turn digits
```



Hedy

```
print hello  
turn 120
```



Syntax

```
print letters  
turn digits
```



Hedy

```
print hello  
turn 120
```



Syntax

```
print letters  
turn digits
```



Hedy

```
print hello  
turn 120
```



Syntax

```
print letters  
turn digits
```



Hedy

```
print hello  
turn 120
```



Syntax

```
print letters  
turn digits
```



Hedy

```
print hello  
turn 120
```



Syntax

```
print letters  
turn digits
```



Hedy

```
print hello  
turn 120
```



Syntax

```
print letters  
turn digits
```



Hedy

```
print hello  
turn 120
```



Syntax

```
print letters  
turn digits
```



Correct!



Hedy

```
print hello  
turn ten
```



Syntax

```
print letters  
turn digits
```



Hedy

```
print help  
turn ten
```



Syntax

```
print letters  
turn digits
```



Hedy

```
print help  
turn ten
```



Syntax

```
print letters  
turn digits
```



Hedy

```
print hello  
turn ten
```



Syntax

```
print letters  
turn digits
```



Incorrect!
t is not a digit



cat at
foot

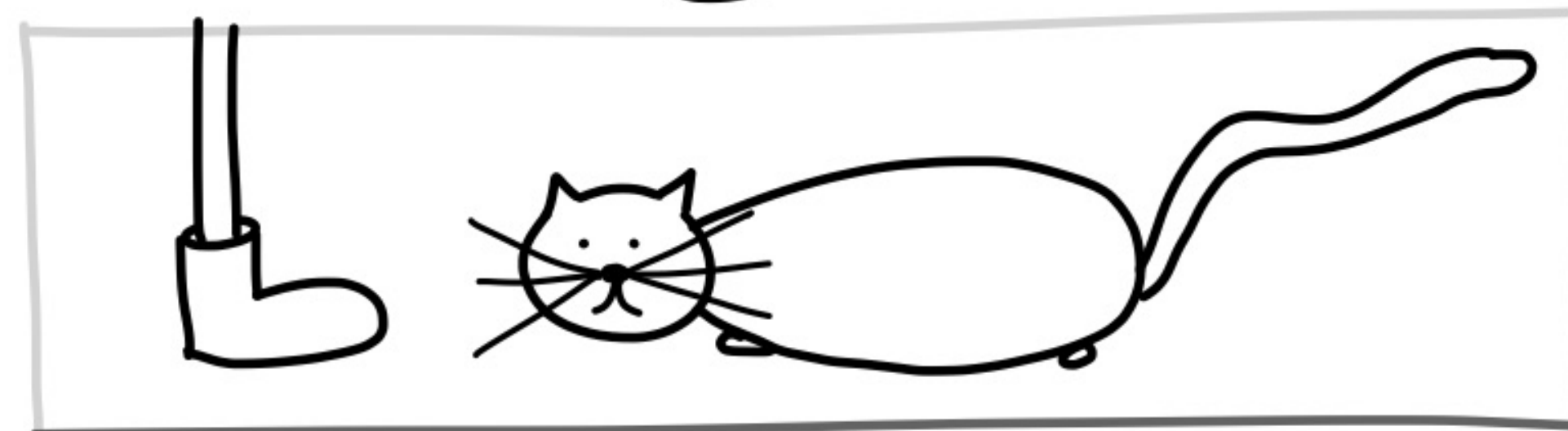


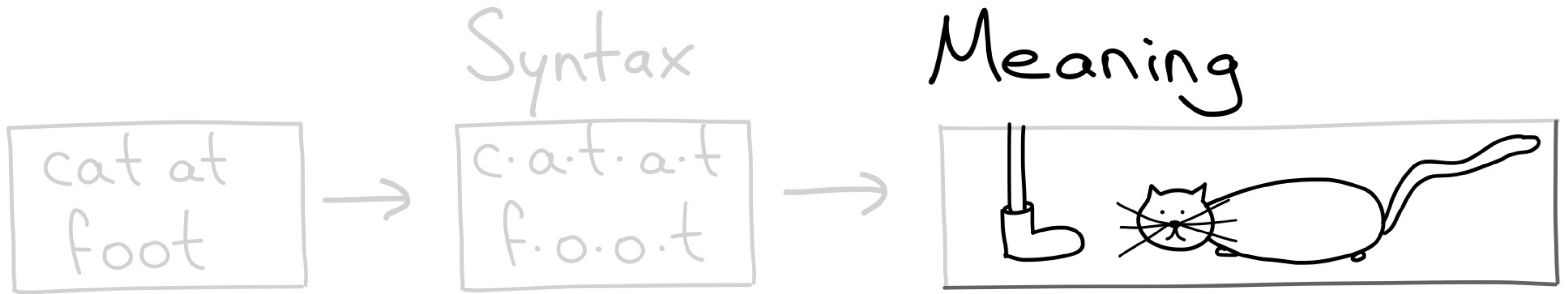
Syntax

c.a.t.a.t
f.o.o.t



Meaning





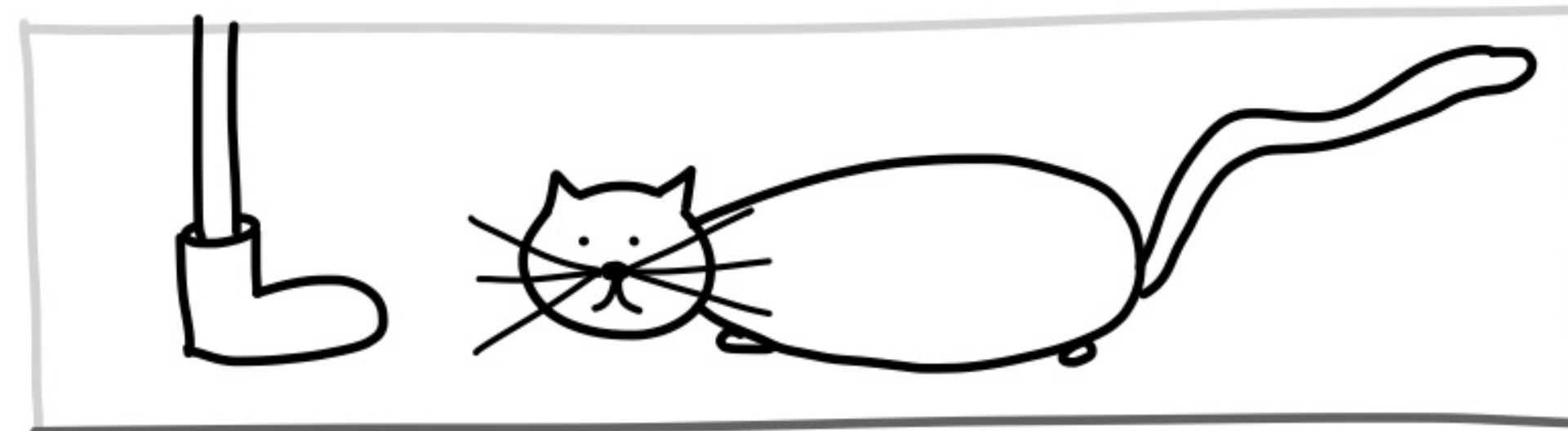
Syntax

Semantics

Cat at
foot



c.a.t.a.t
f.o.o.t



Syntax

Semantics

```
print hello  
turn 120
```



```
print letters  
turn digits
```



Syntax

Semantics

print hello
turn 120



print letters
turn digits

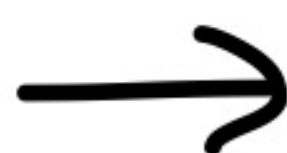


print all letters
turn digits degrees



Syntax

```
print hello  
turn 120
```

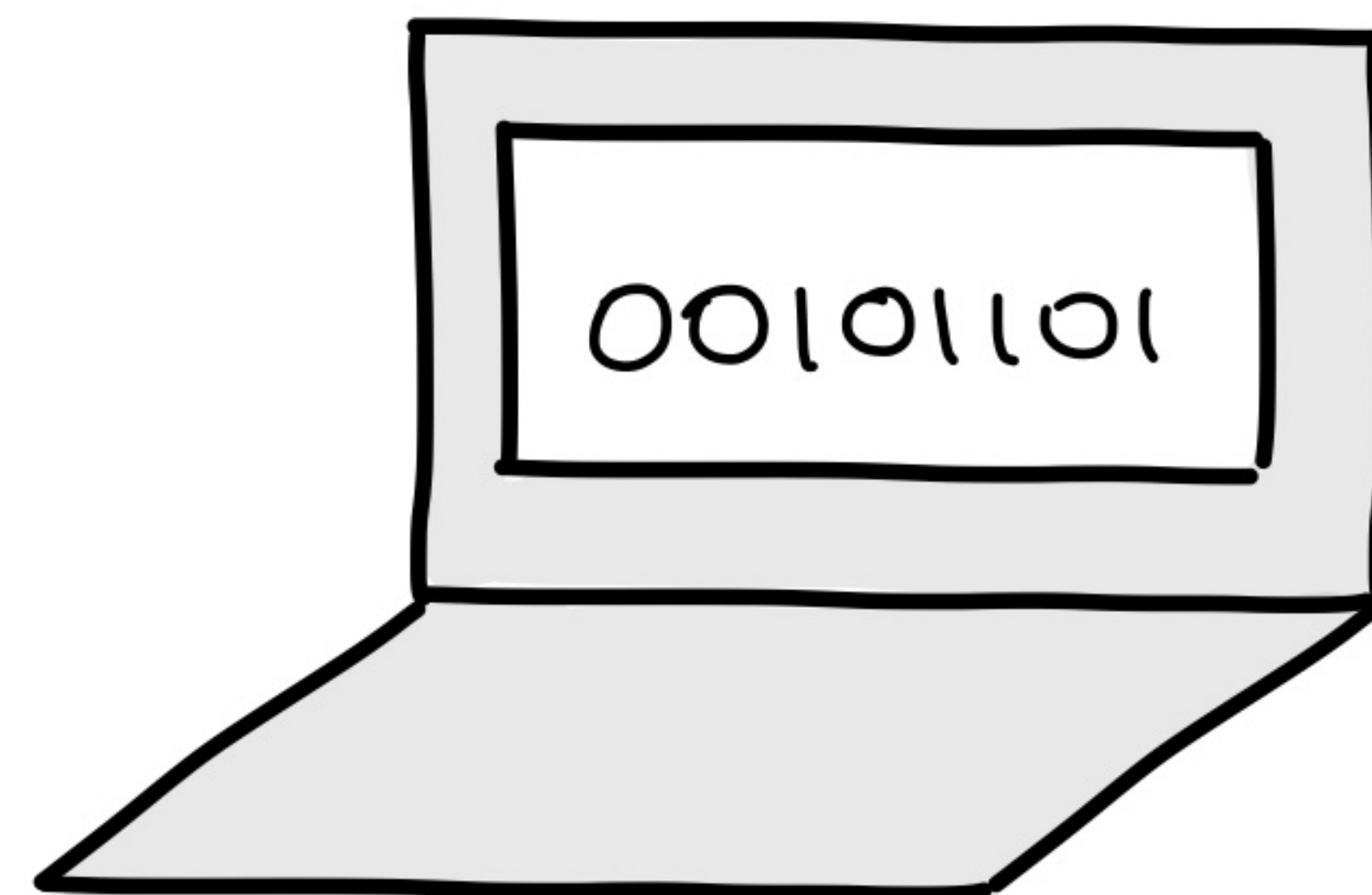


```
print letters  
turn digits
```



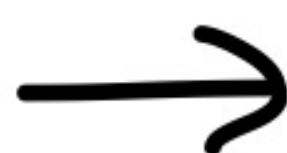
Semantics

```
print all letters  
turn digits degrees
```



Syntax

```
print hello  
turn 120
```

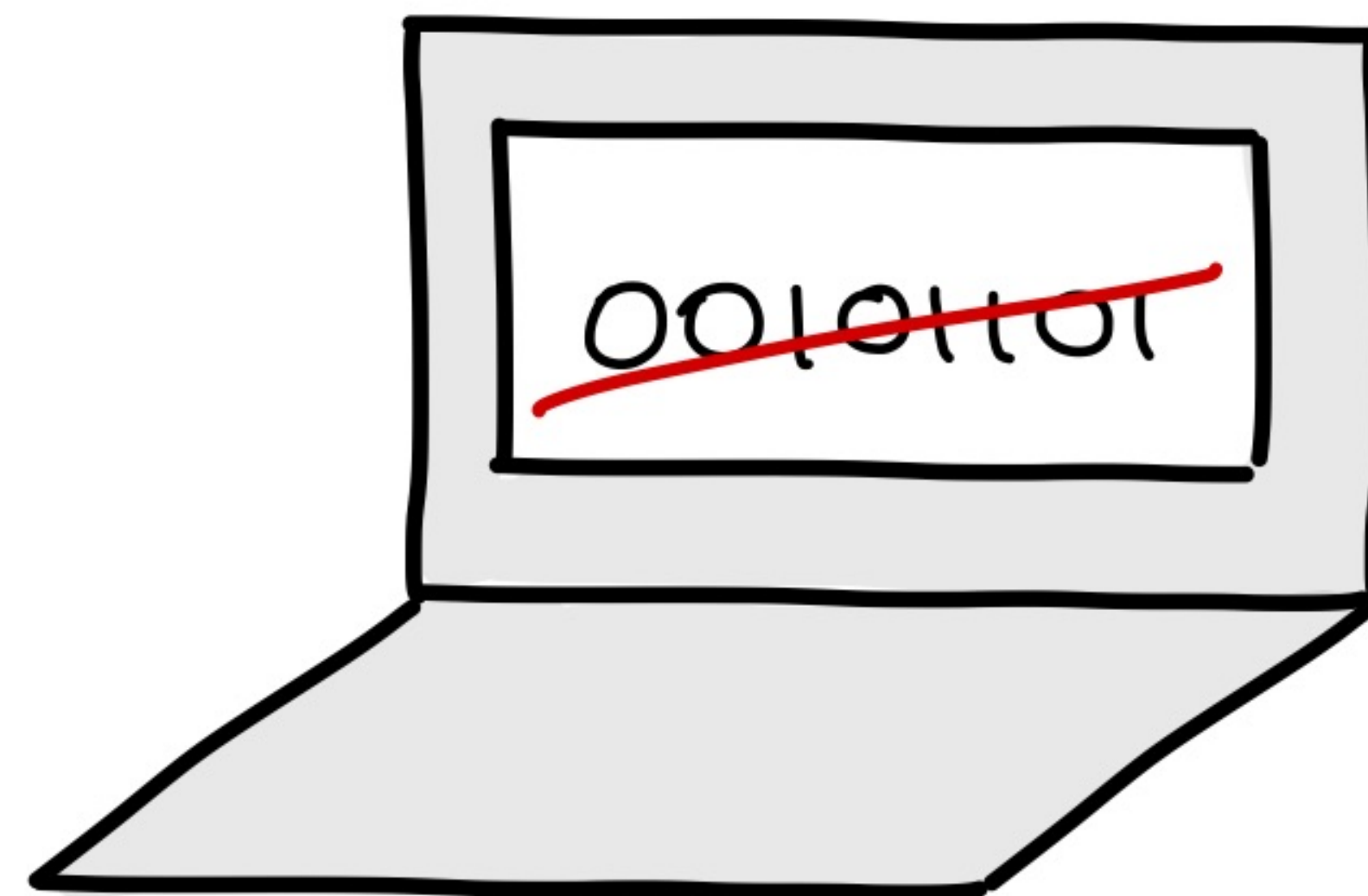


```
print letters  
turn digits
```



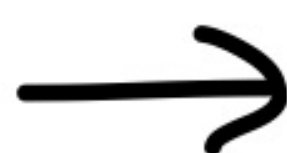
Semantics

```
print all letters  
turn digits degrees
```



Syntax

```
print hello  
turn 120
```

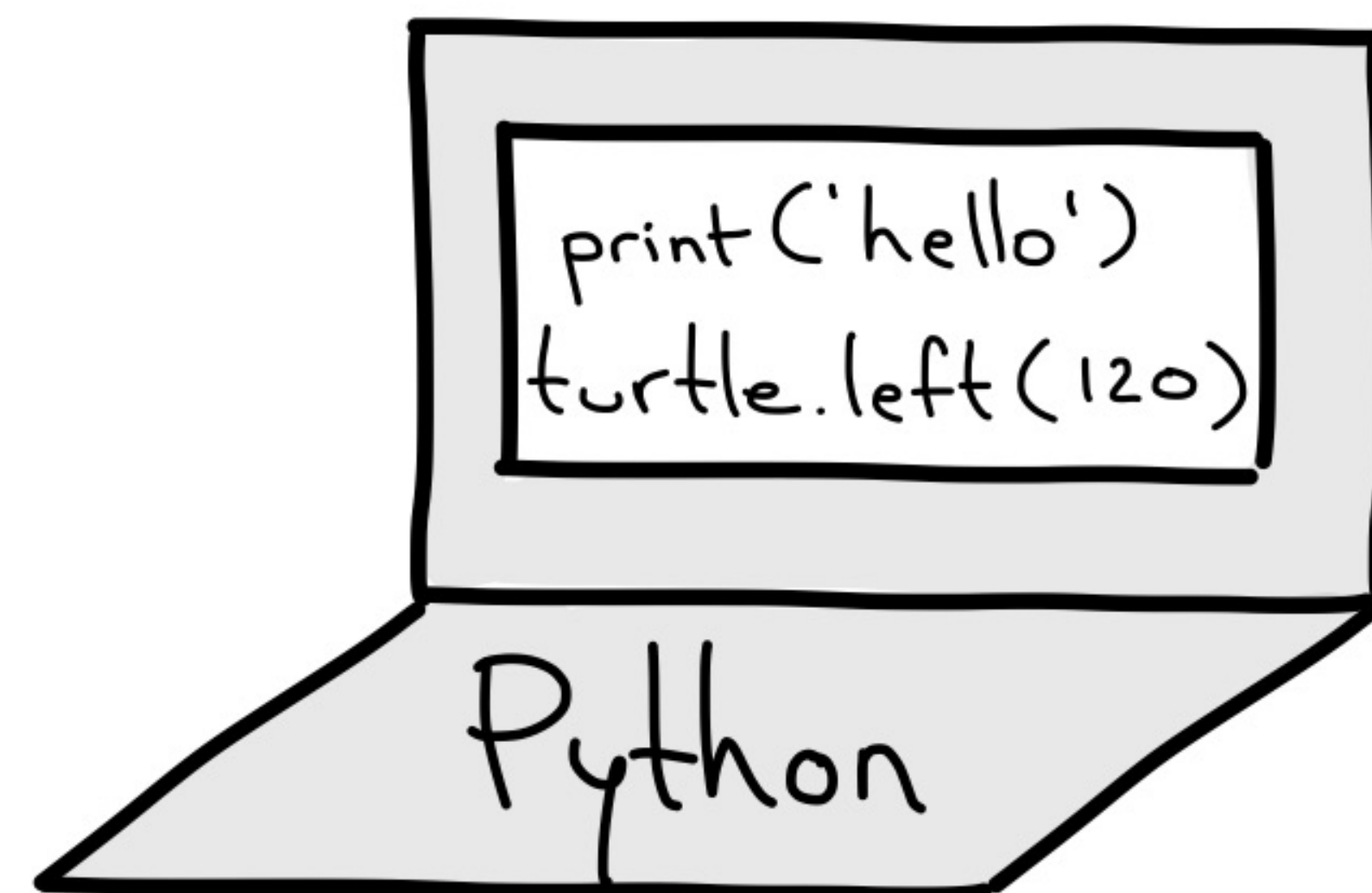


```
print letters  
turn digits
```



Semantics

```
print all letters  
turn digits degrees
```



Syntax

```
print hello  
turn 120
```

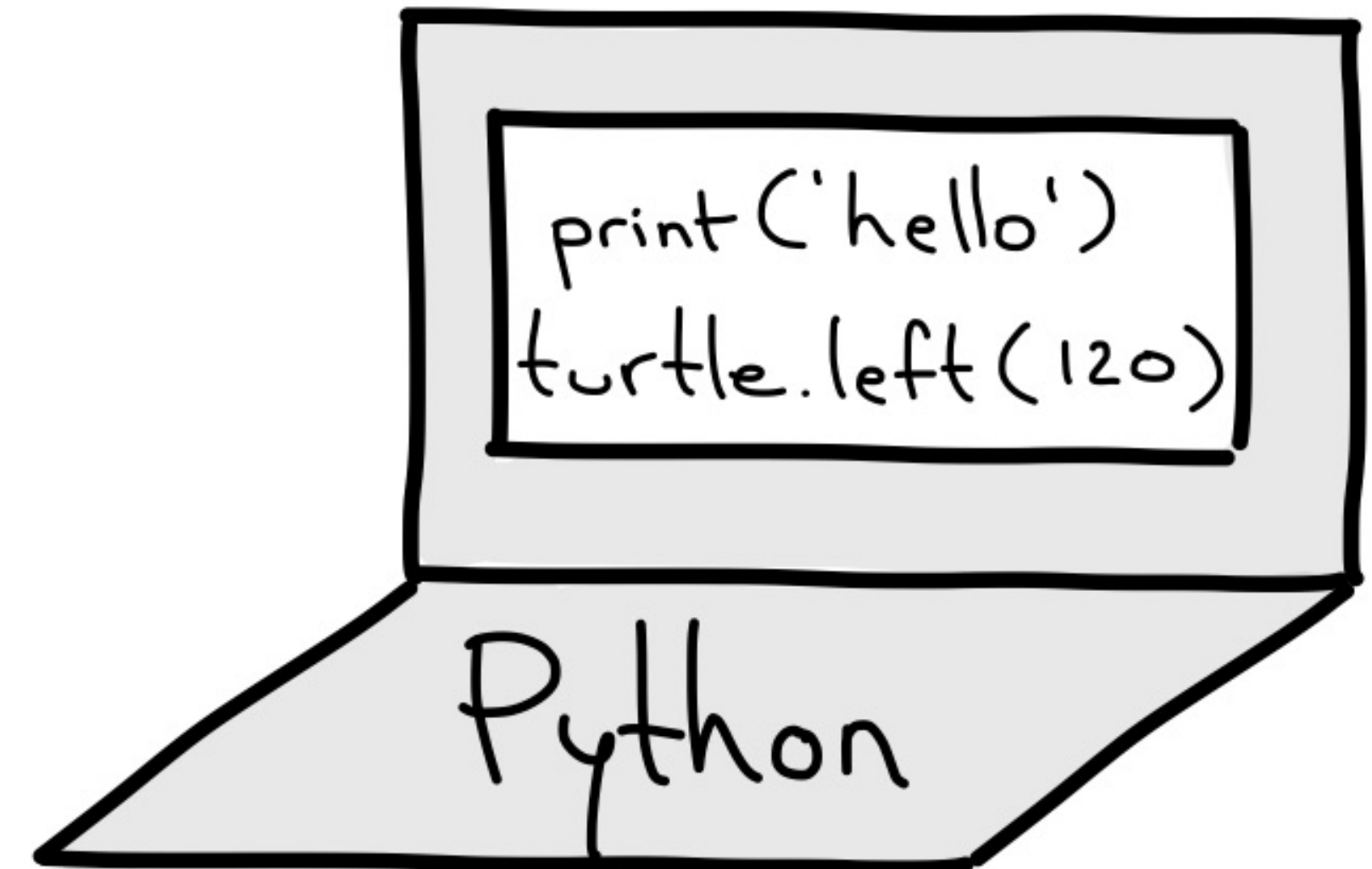


```
print letters  
turn digits
```

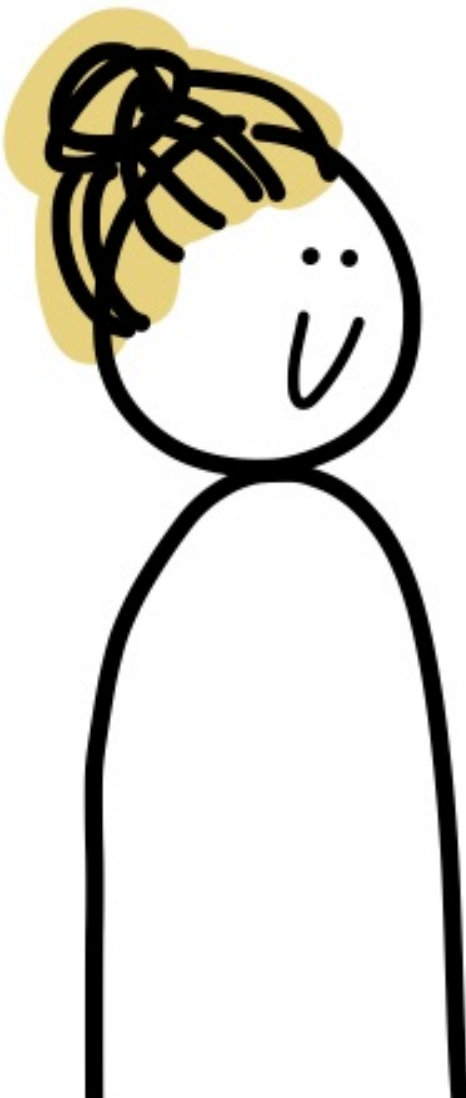


Semantics

```
print all letters  
turn digits degrees
```



1 syntax ✓



Level 2

```
print hello  
turn 120
```



Syntax 2

```
print letters  
turn digits
```



Semantics

```
print all letters  
turn digits degrees
```

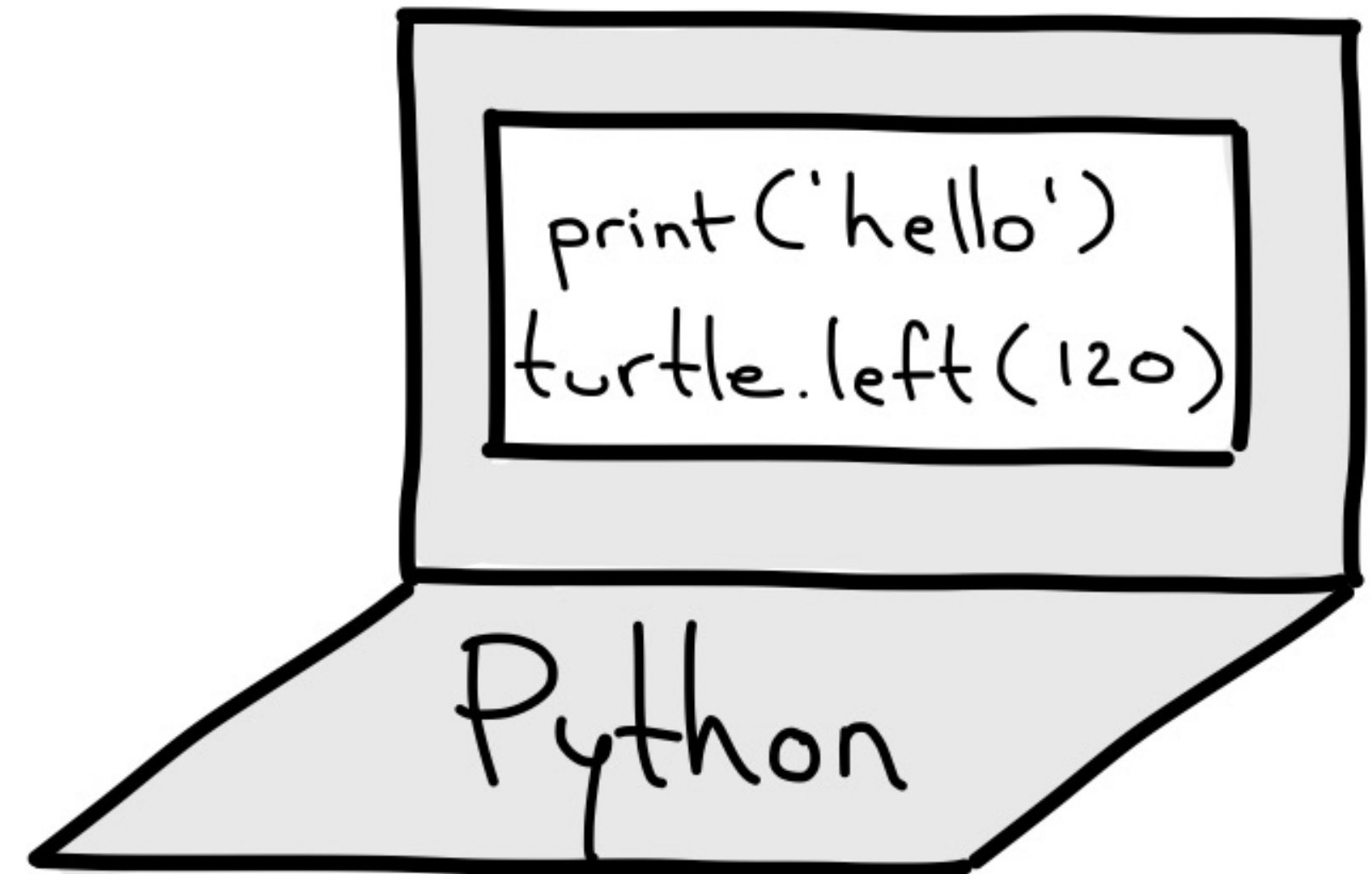
Level 4

```
print 'hello'  
turn 120
```



Syntax 4

```
print 'letters'  
turn digits
```



Level 2

```
print hello  
turn 120
```



Syntax 2

```
print letters  
turn digits
```

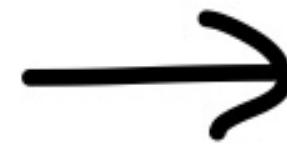


Semantics

```
print all letters  
turn digits degrees
```

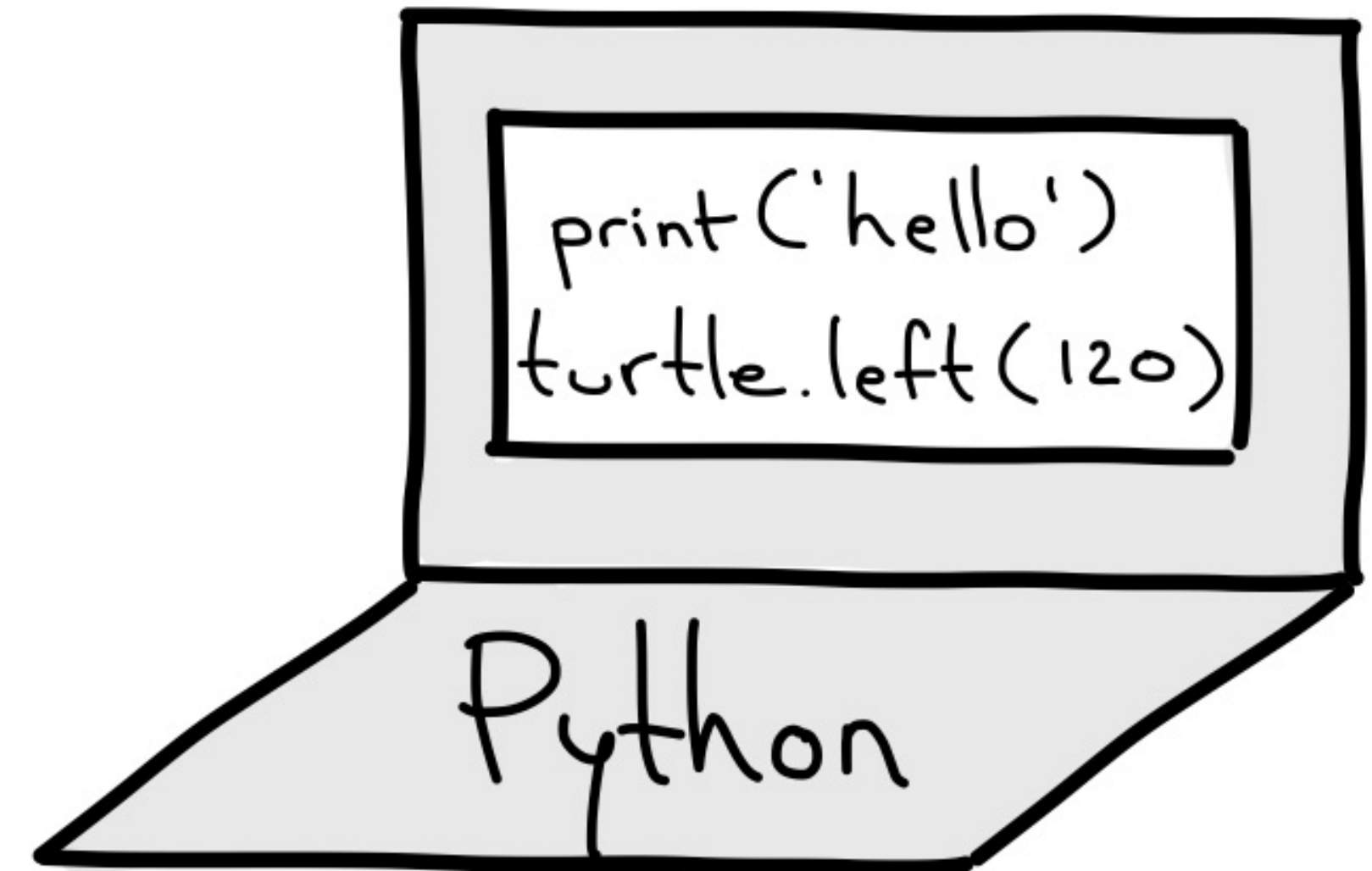
Level 4

```
print 'hello'  
turn 120
```



Syntax 4... 18

```
print 'letters'  
turn digits
```



Level 2

```
print hello  
turn 120
```



Syntax 2

```
print letters  
turn digits
```



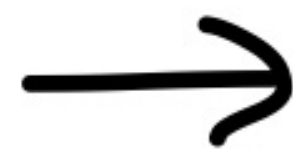
Semantics x 18

```
print all letters  
turn digits degrees
```



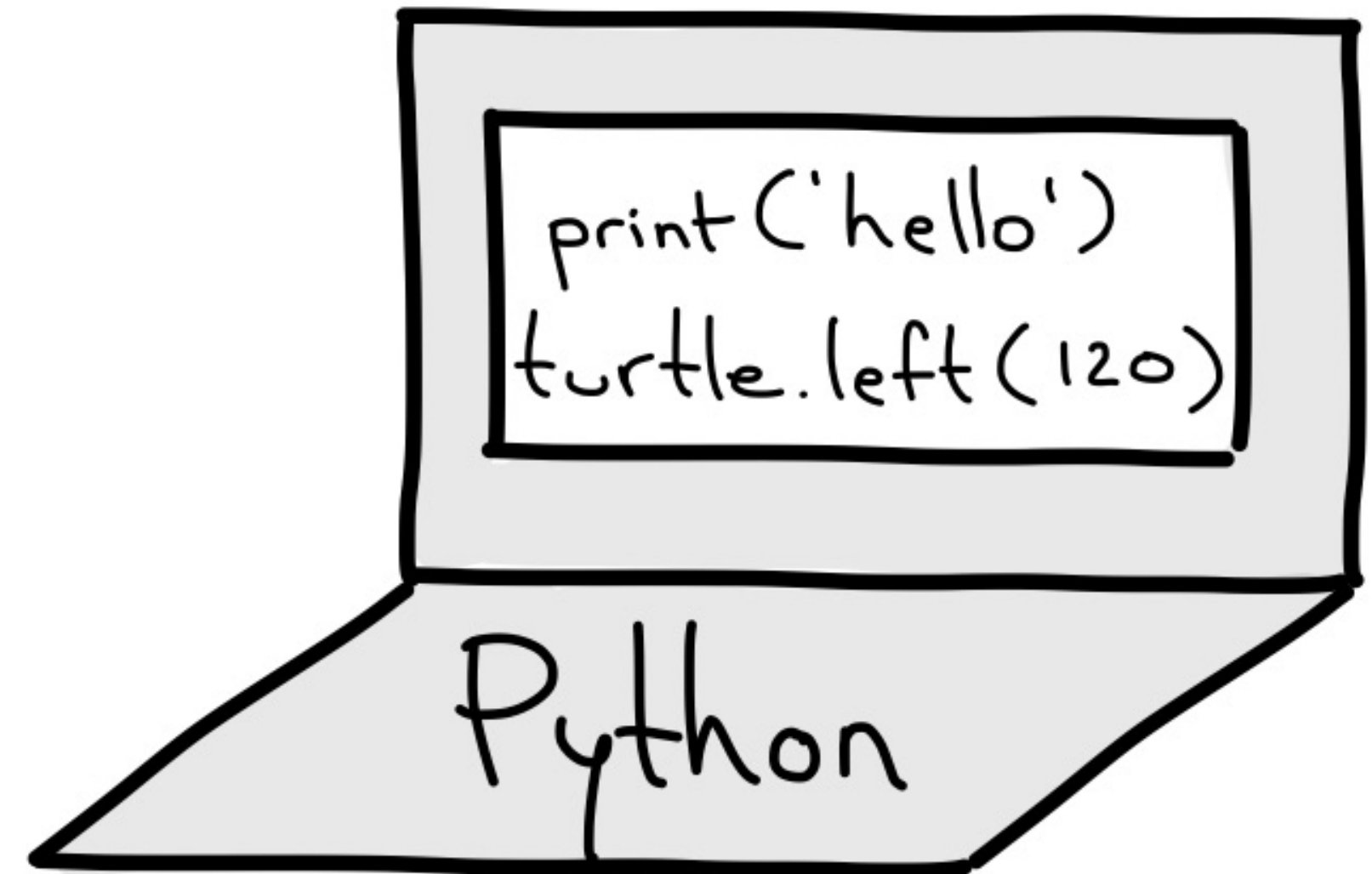
Level 4

```
print 'hello'  
turn 120
```



Syntax 4...18

```
print 'letters'  
turn digits
```



Level 2

```
print hello  
turn 120
```



Syntax 2

```
print letters  
turn digits
```



Semantics x 18

```
print all letters  
turn digits degrees
```

Level 4

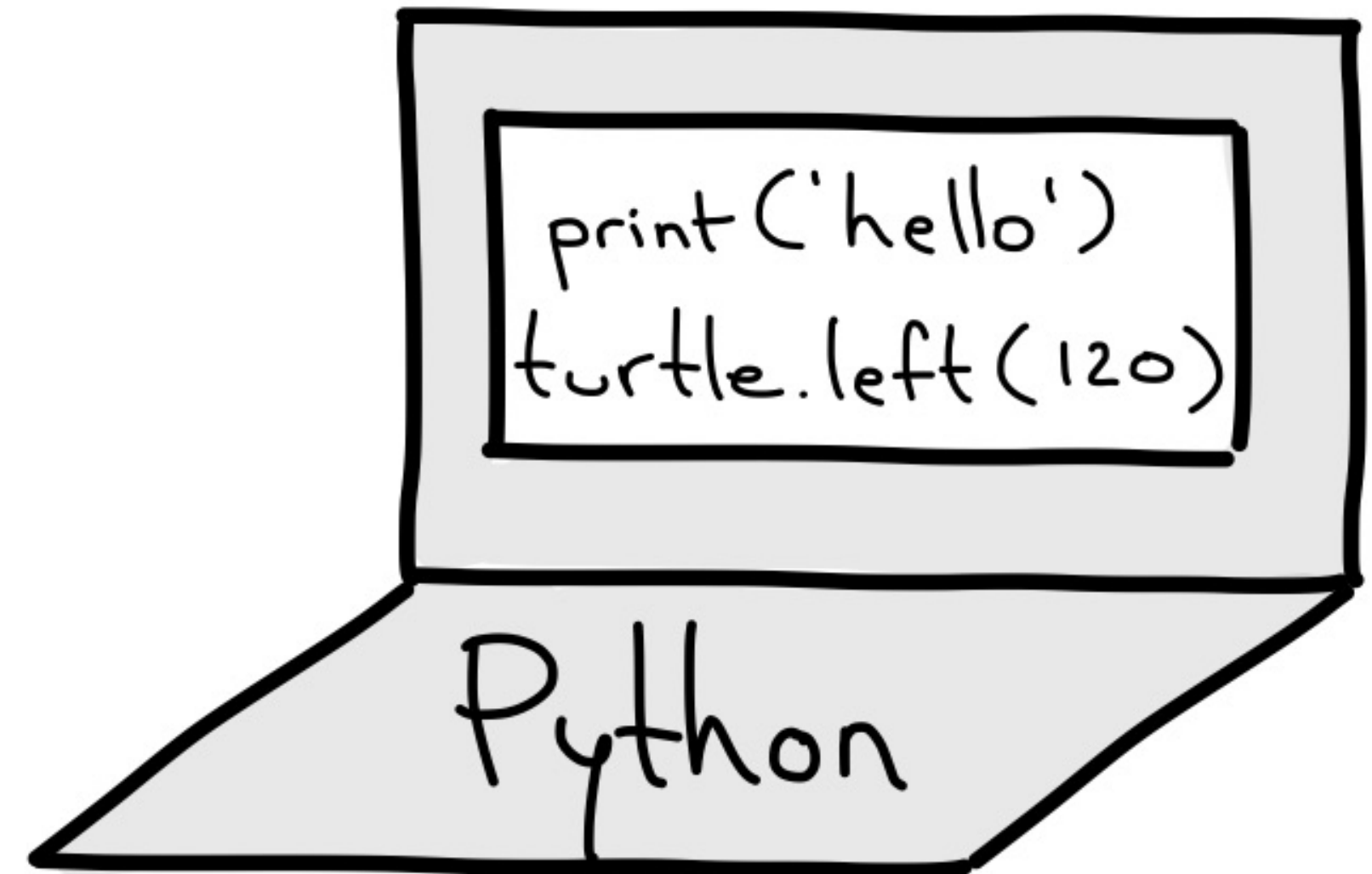
```
print 'hello'  
turn 120
```

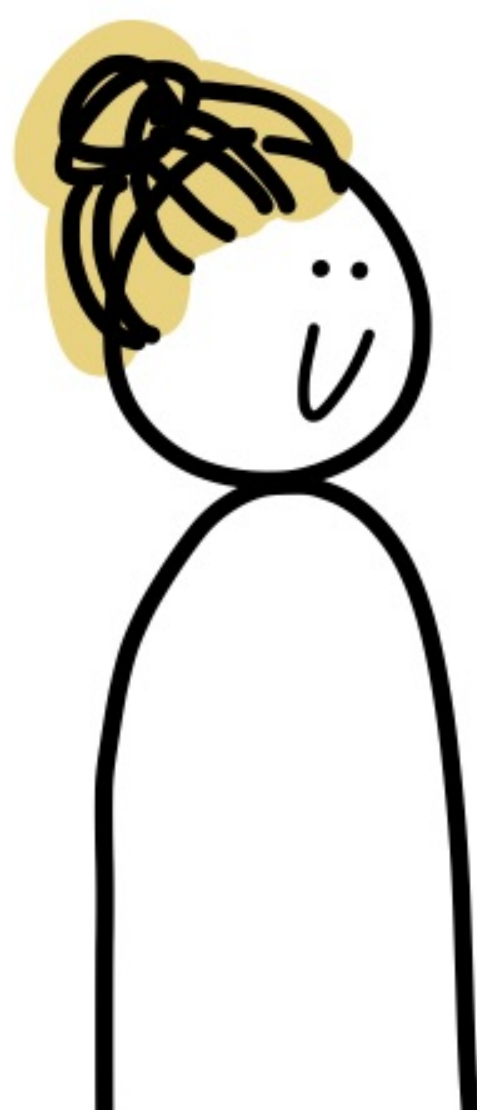
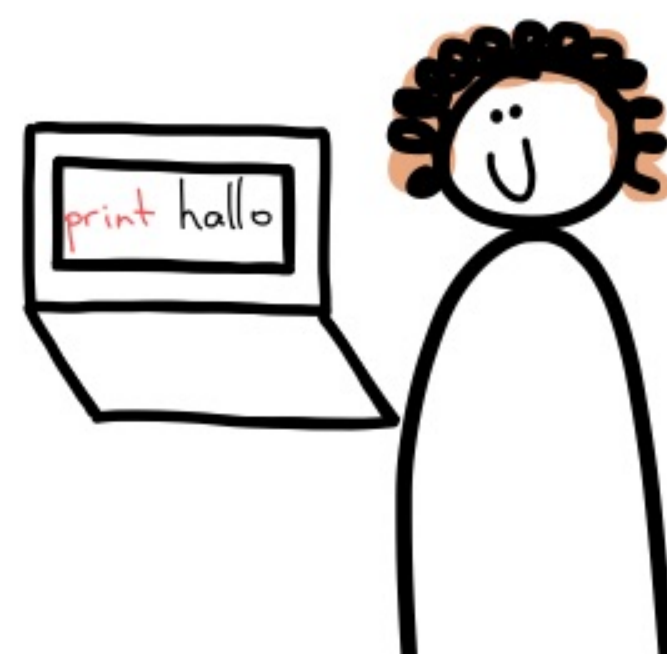
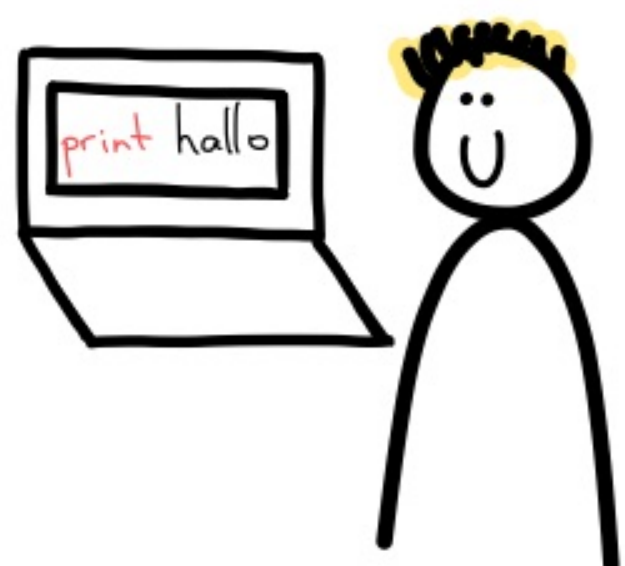


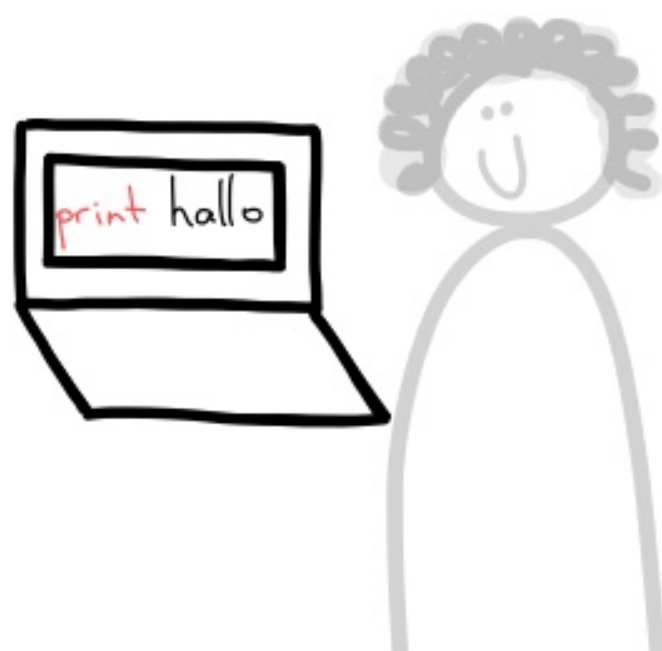
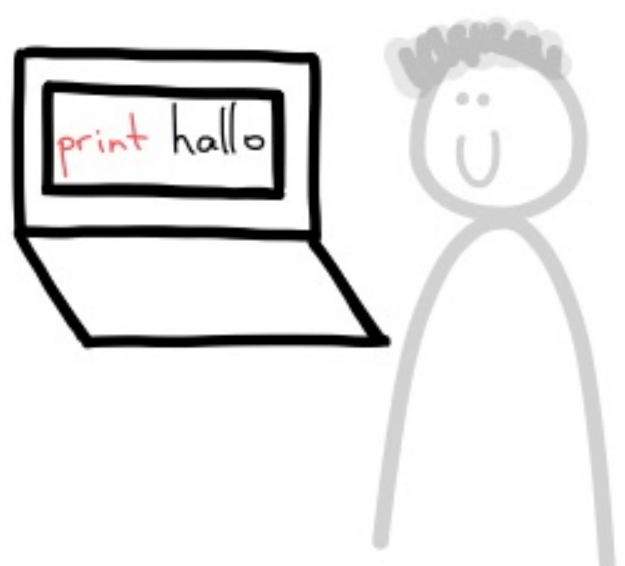
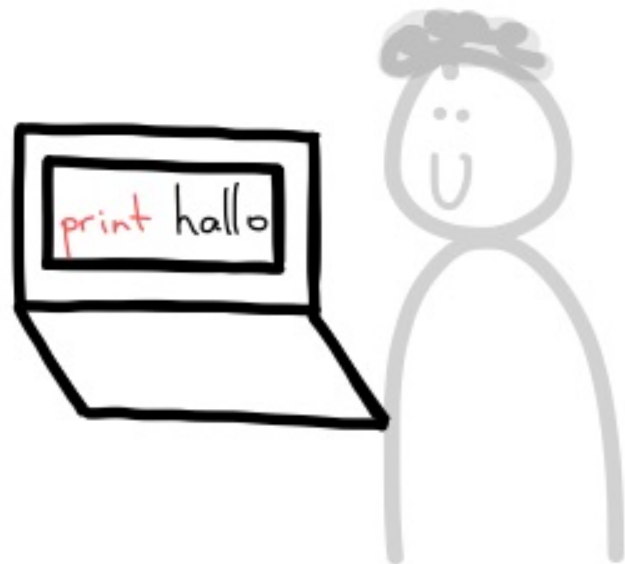
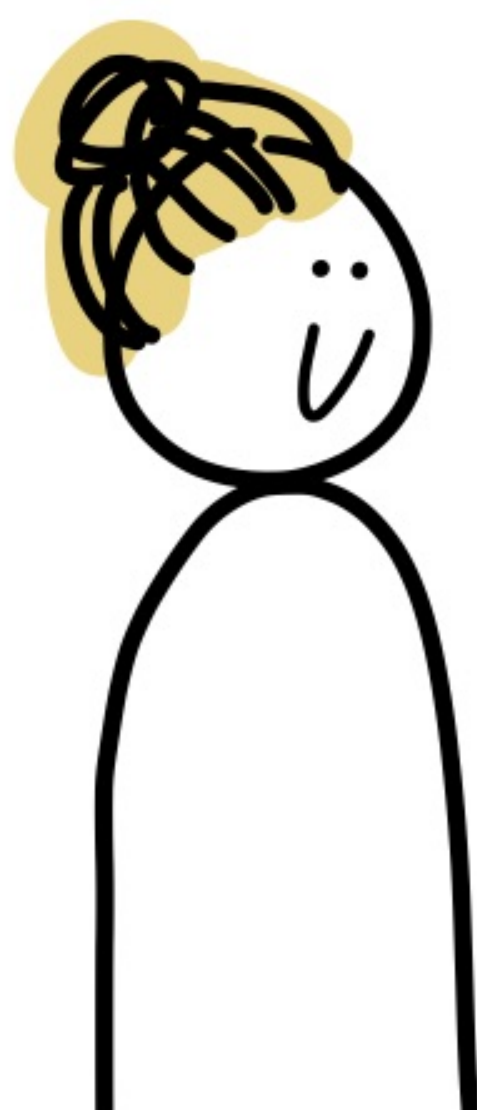
Syntax 4...
18

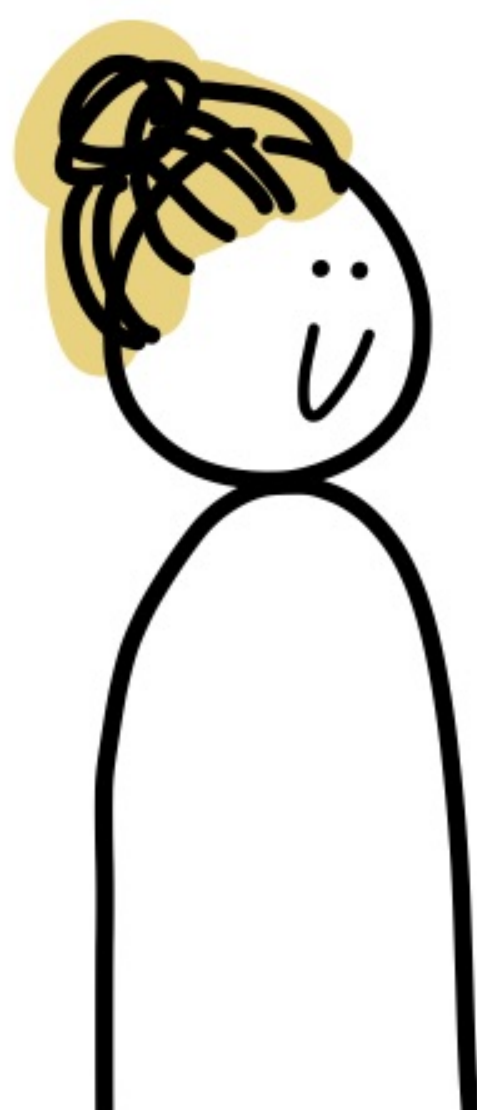
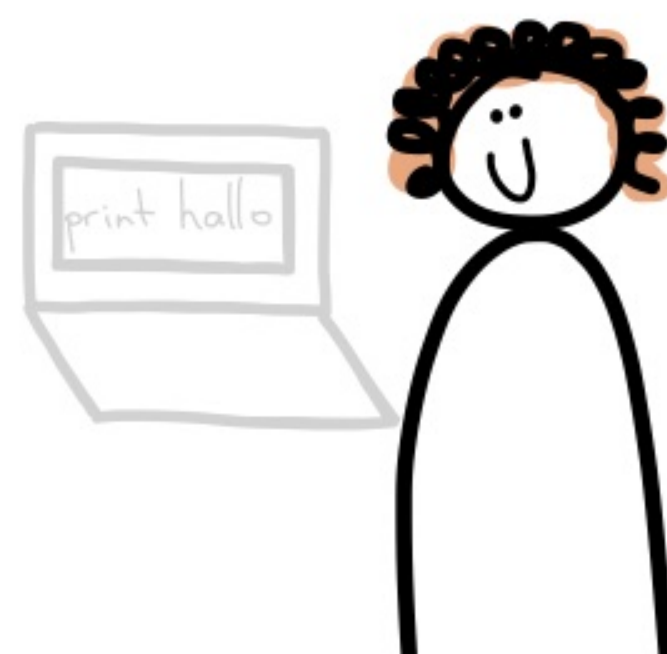
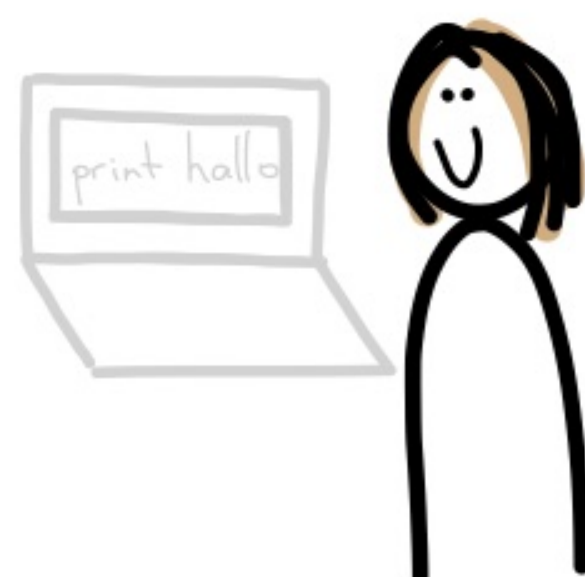
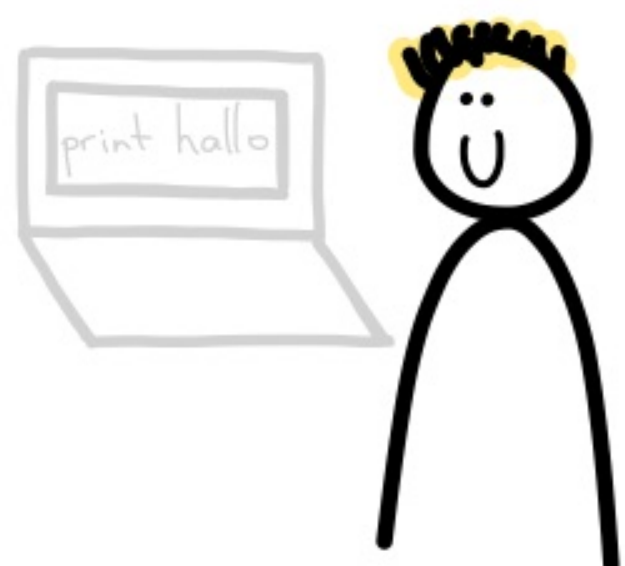
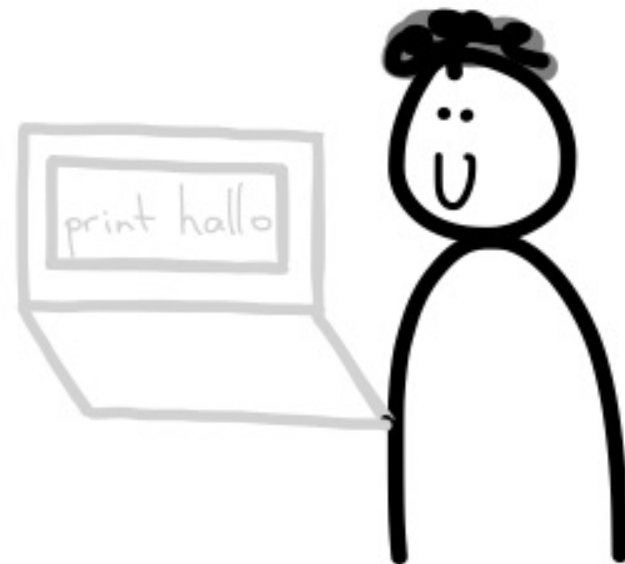
```
print 'letters'  
turn digits
```

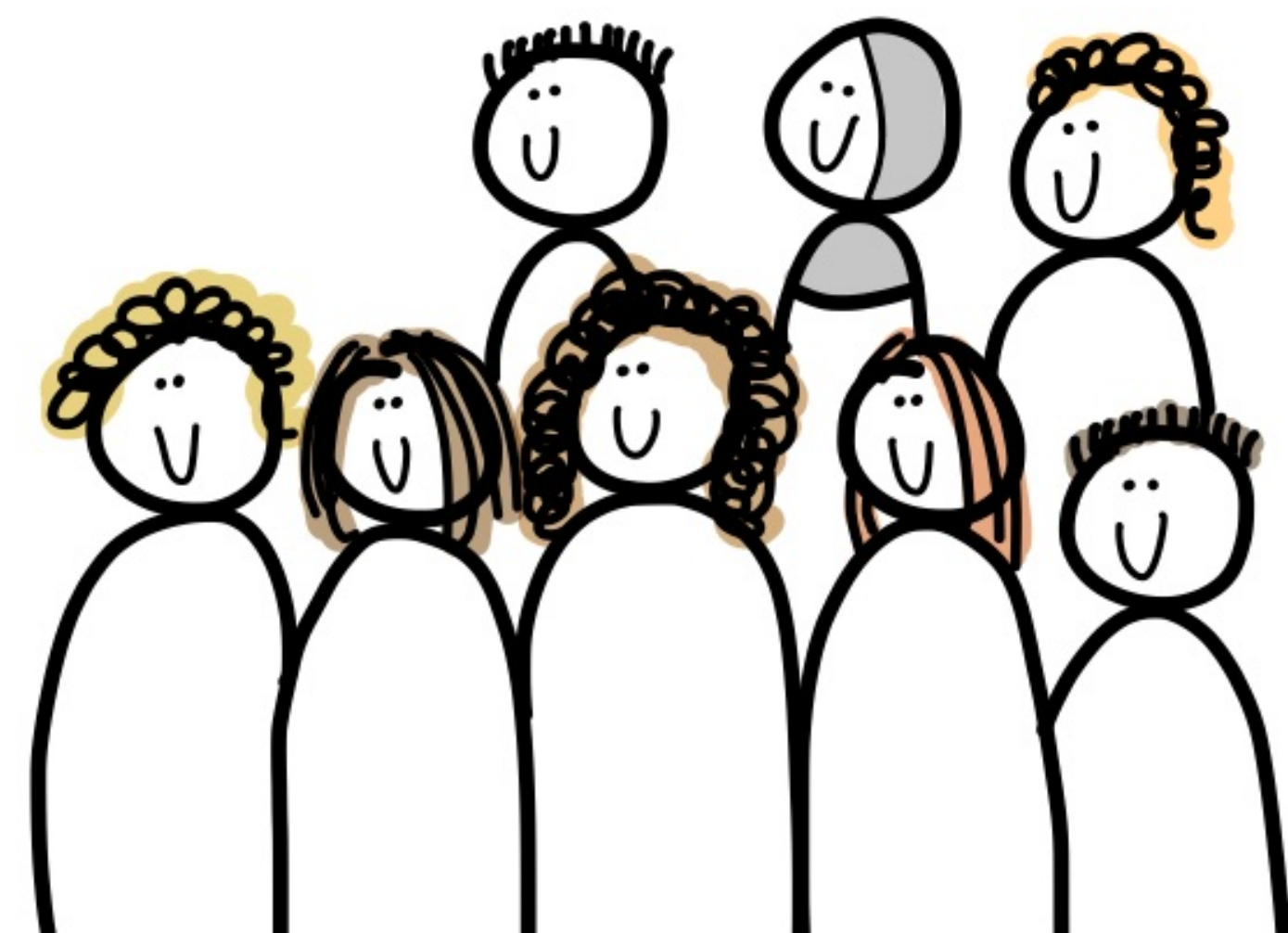
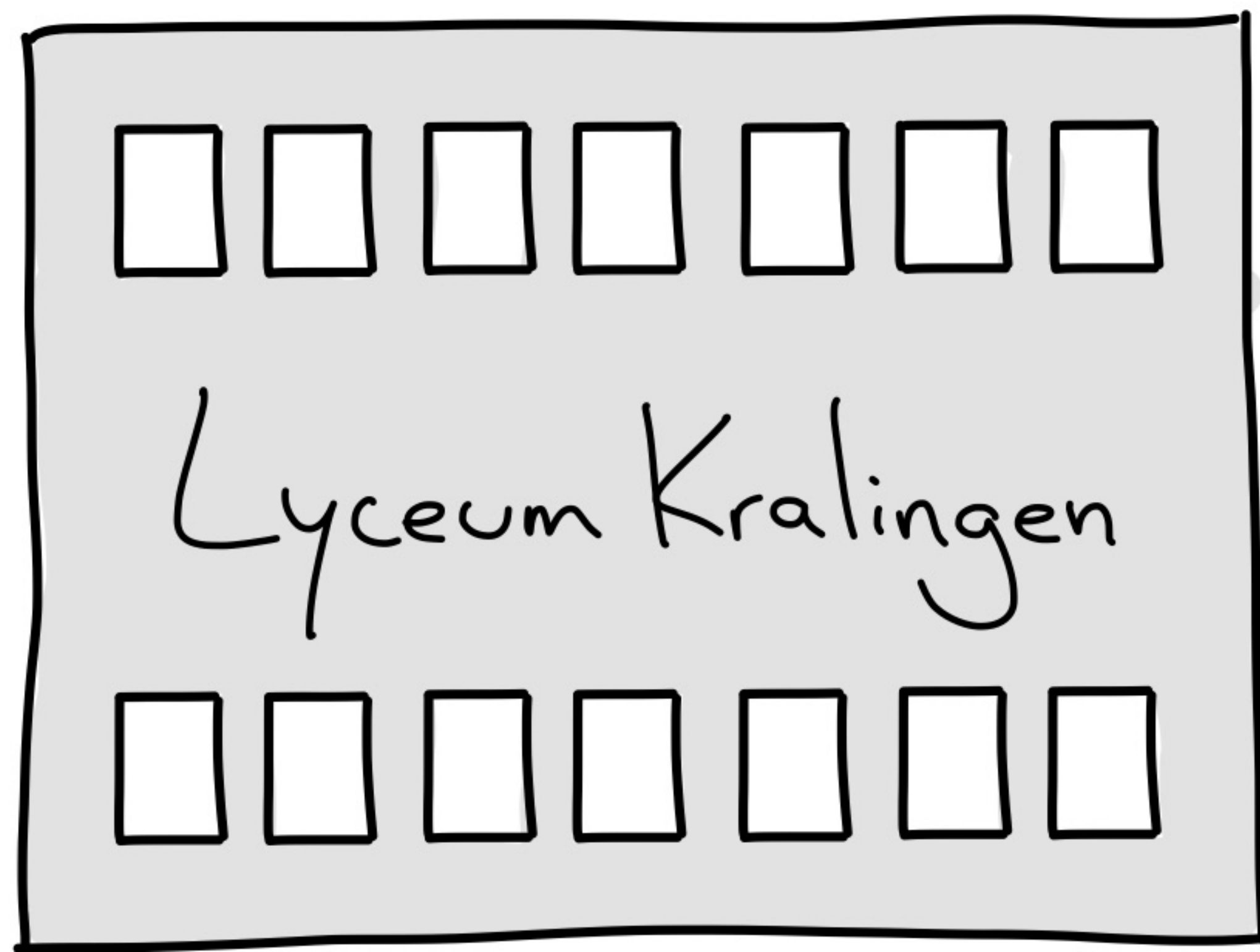
↓ x 18



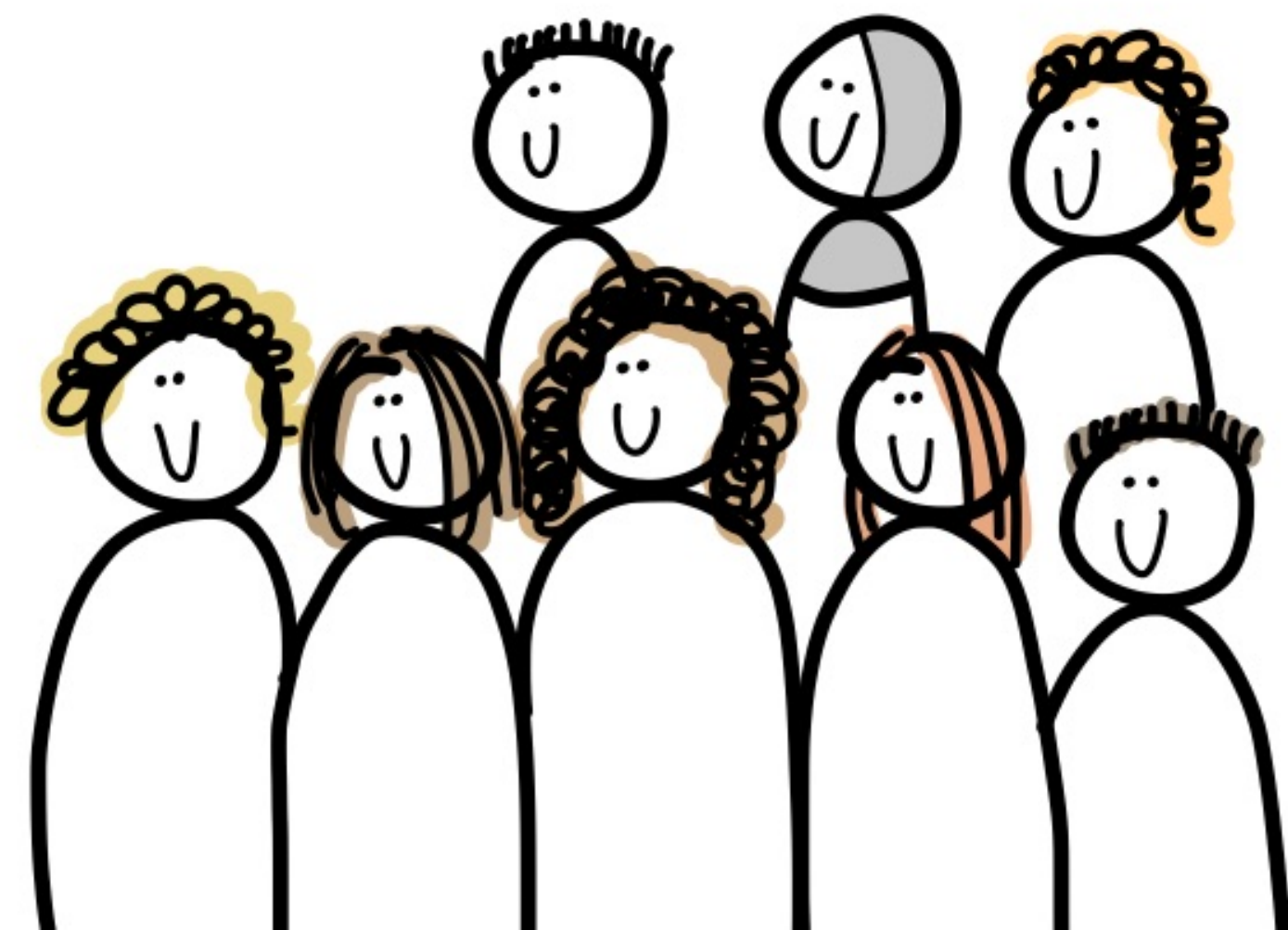
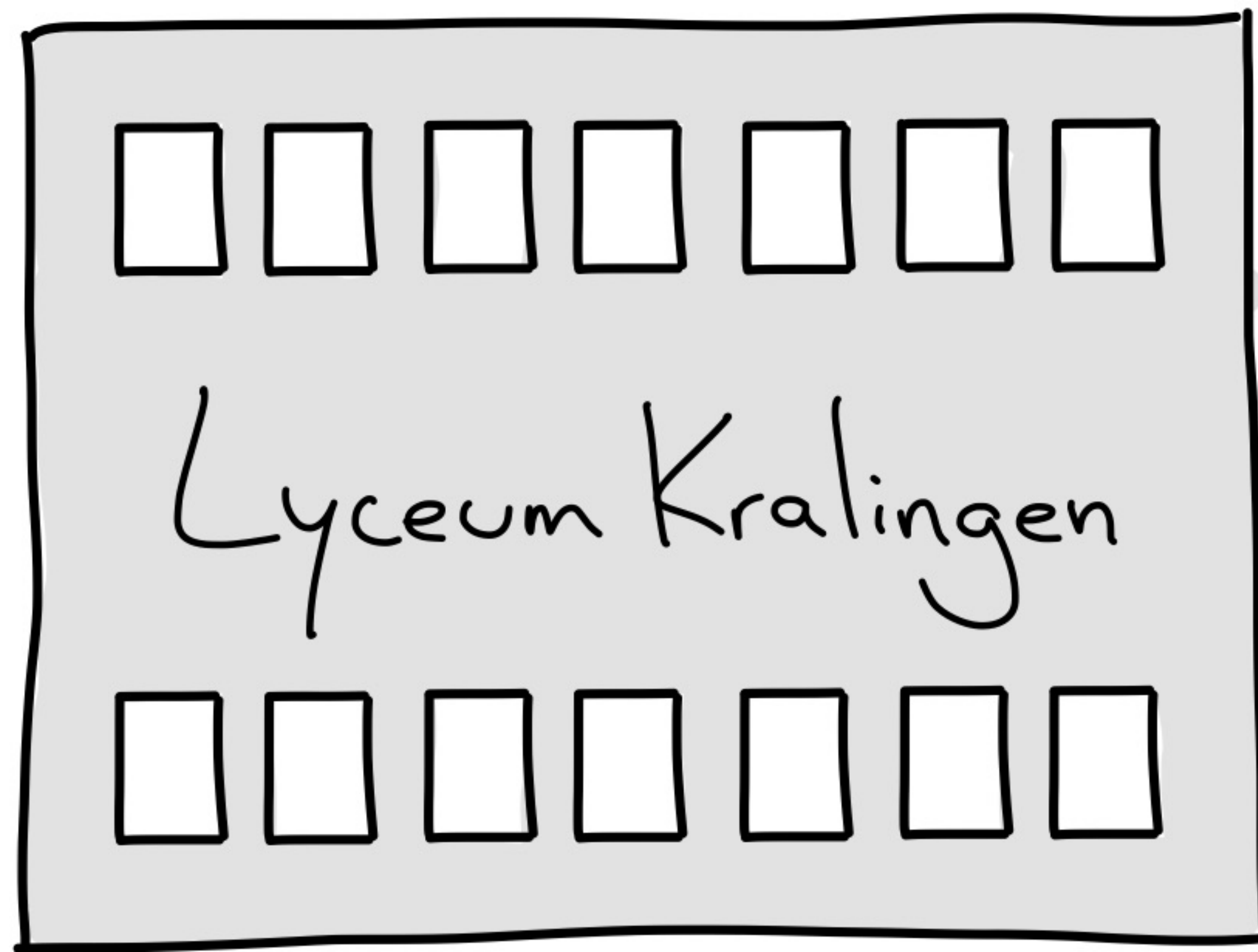


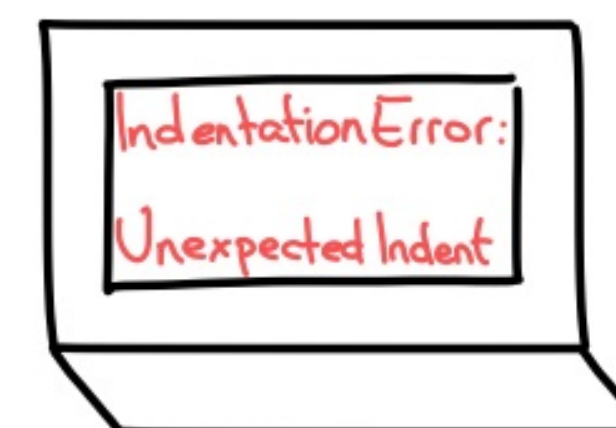
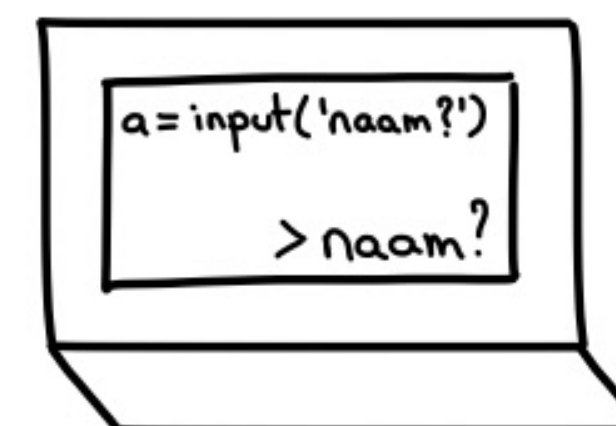
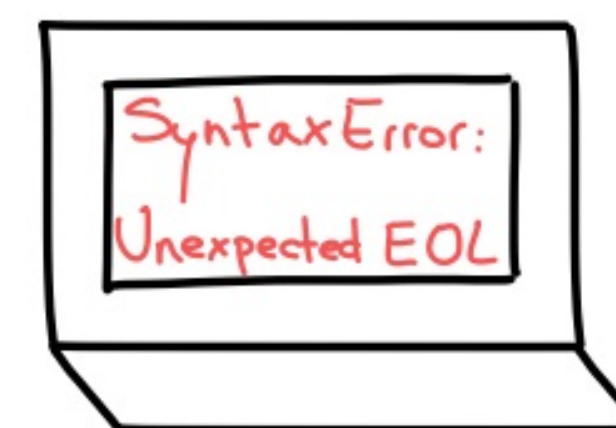
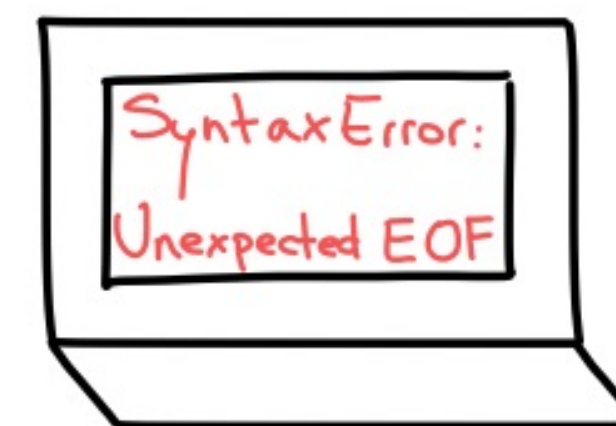
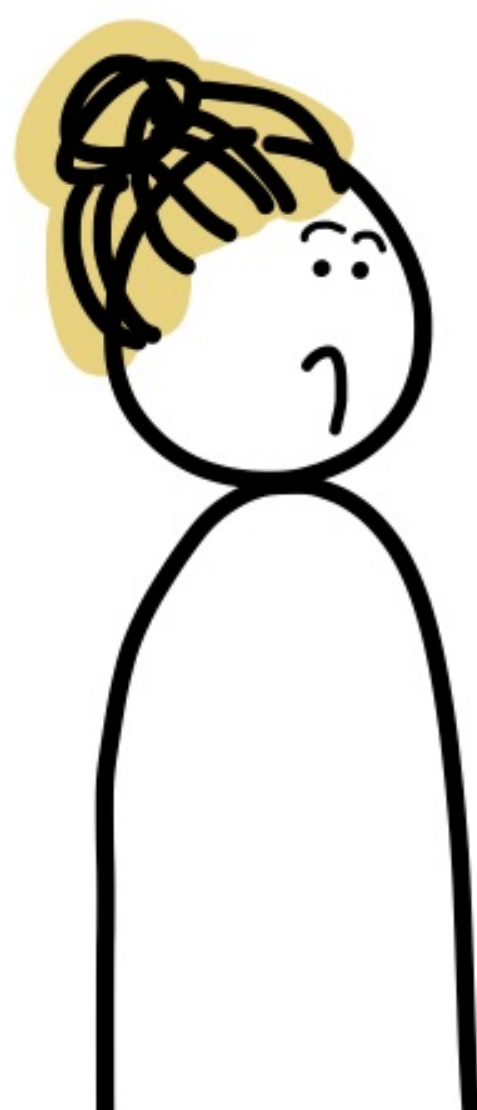




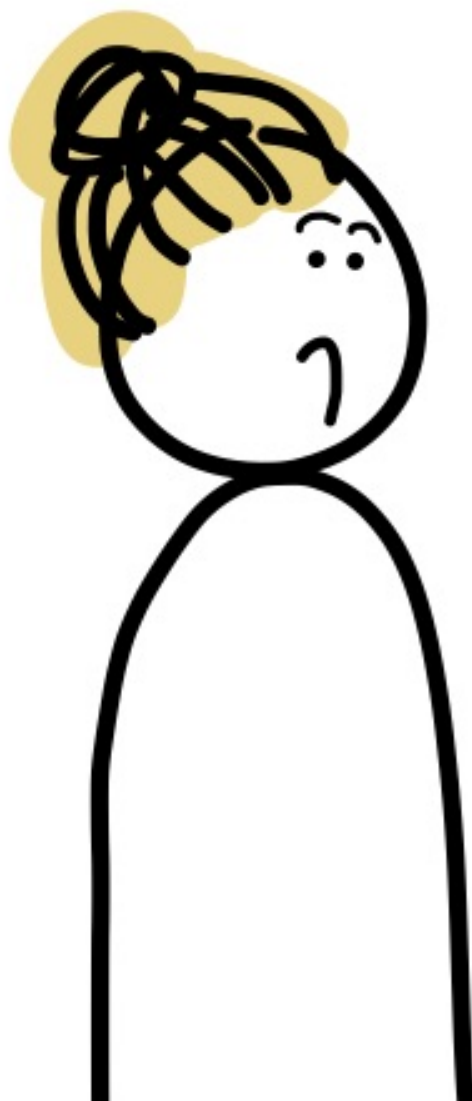
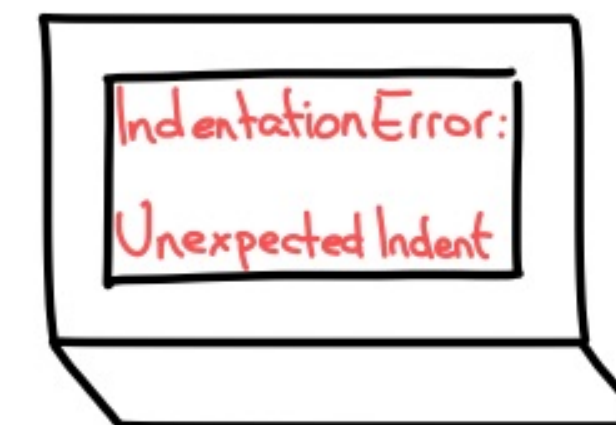
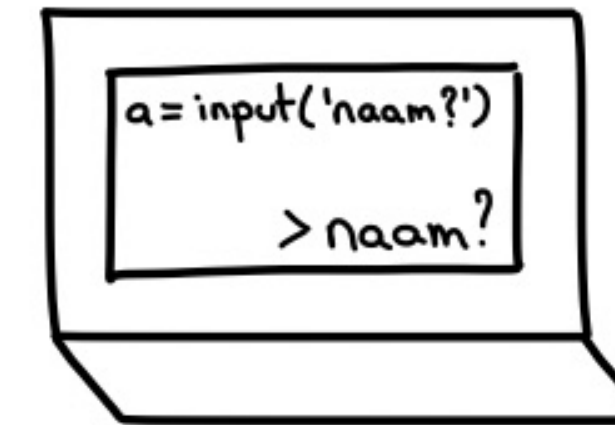
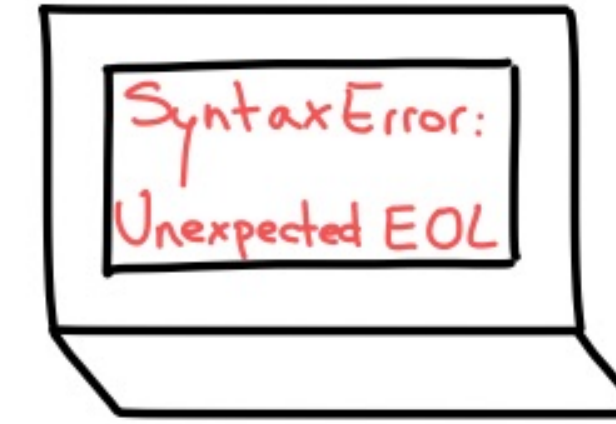
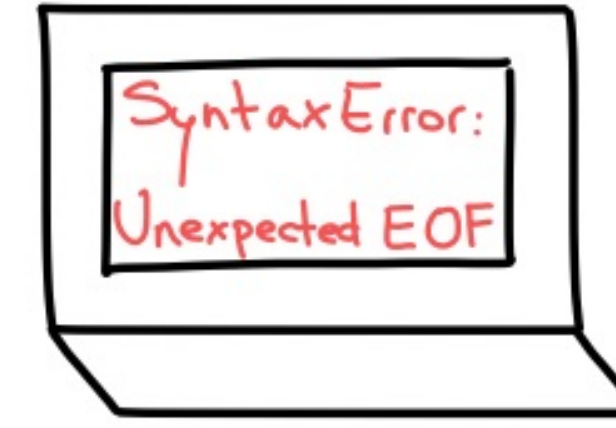


Let's do Hedy



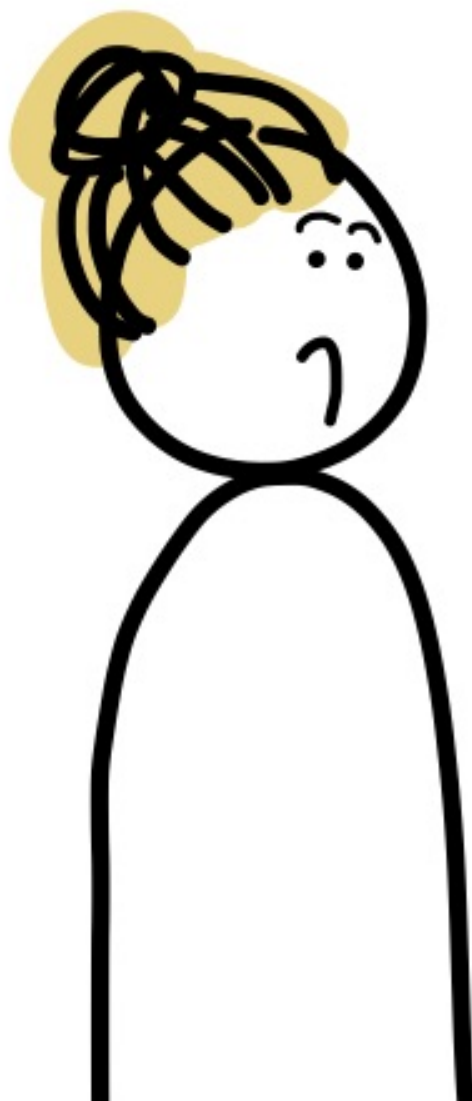
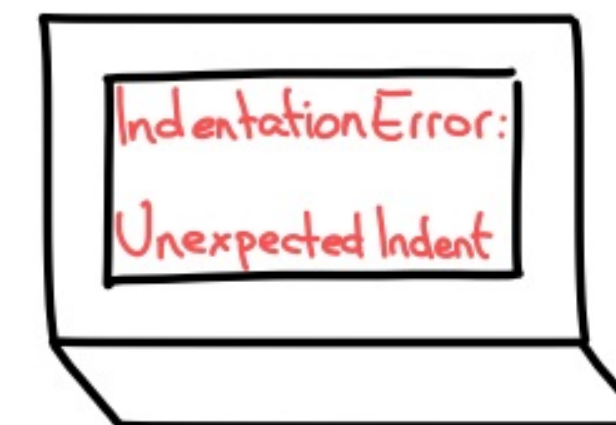
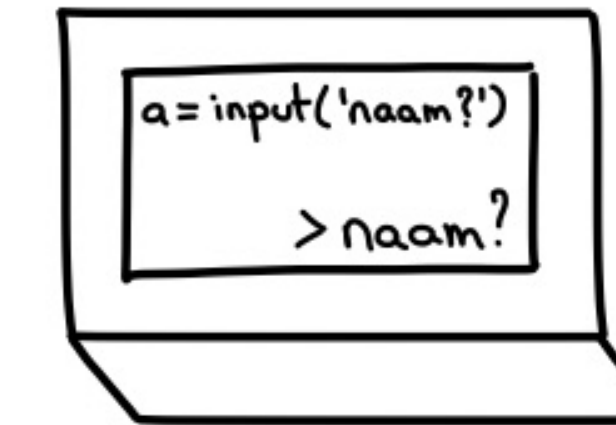
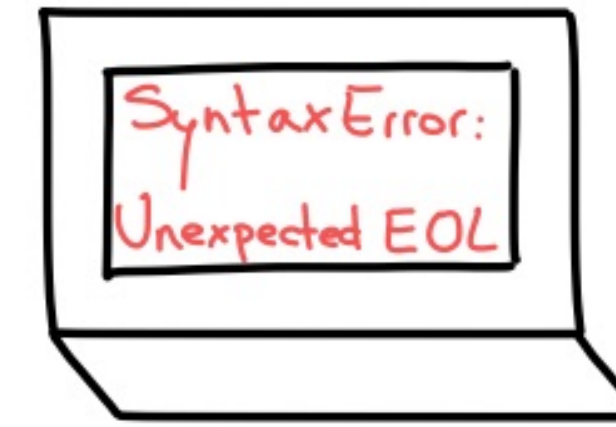
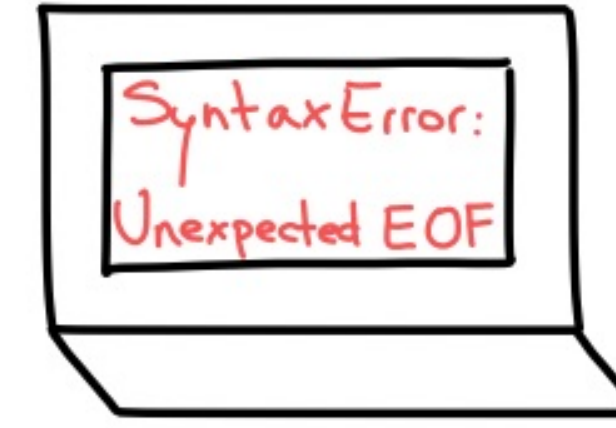


Ah... too many
brackets

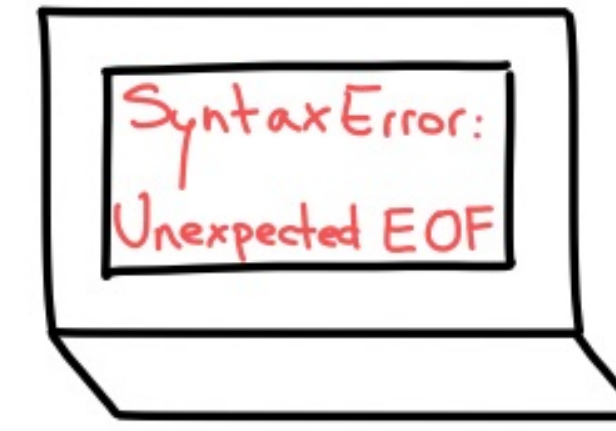


Ah... too many
brackets

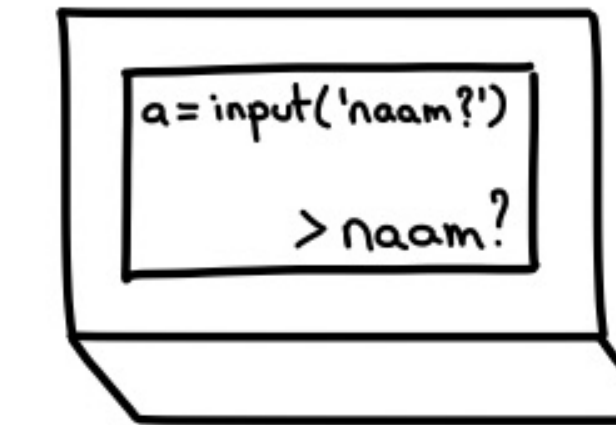
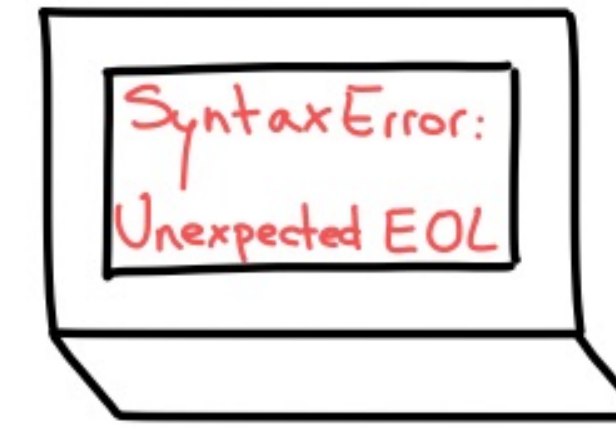
Ehm... let's see ...



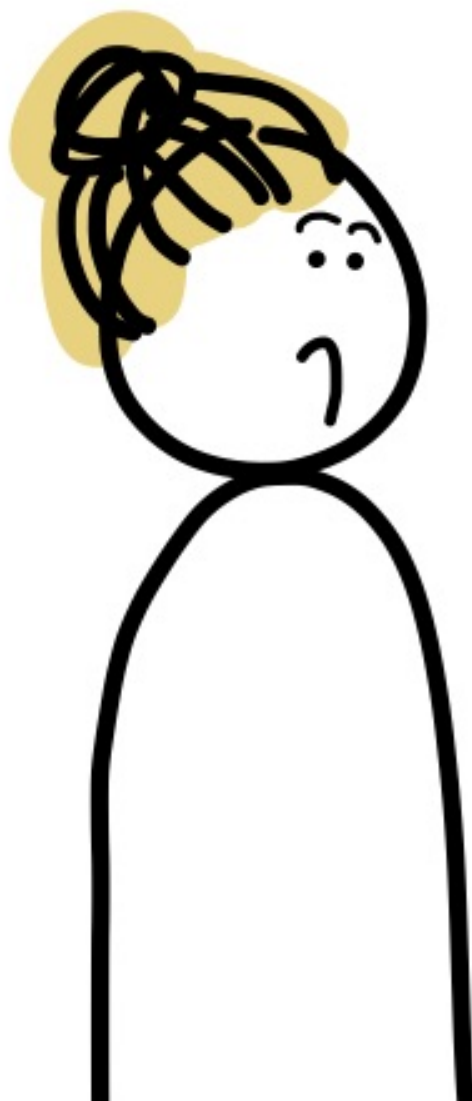
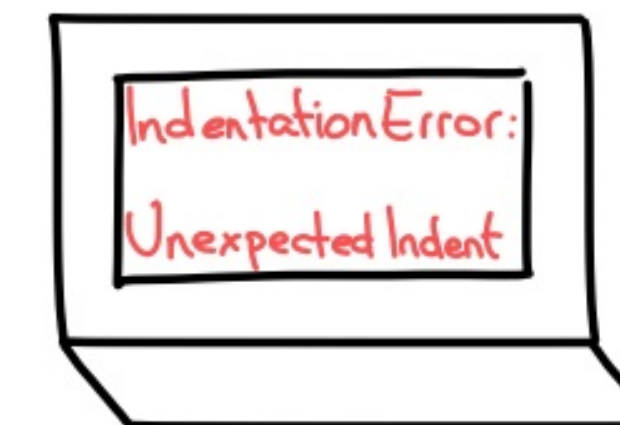
Ah... too many
brackets

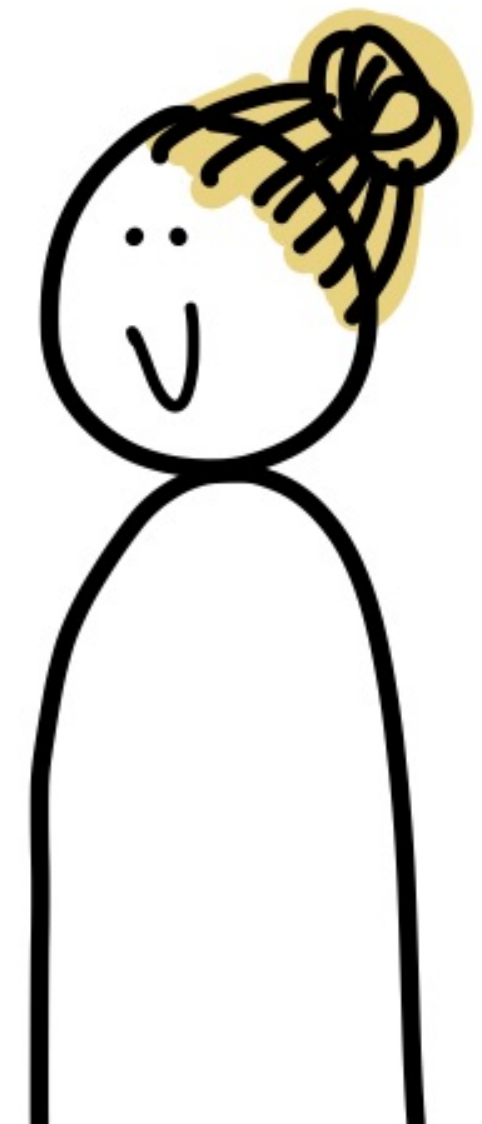
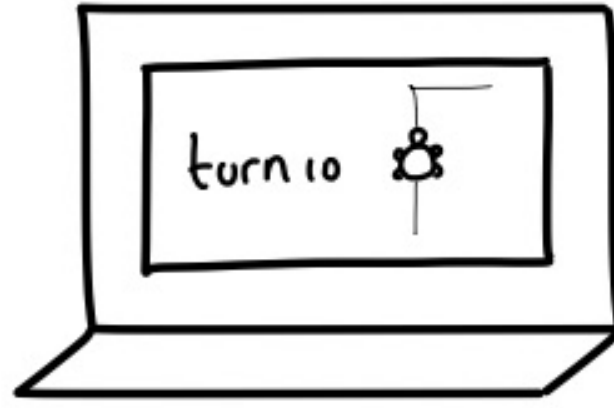


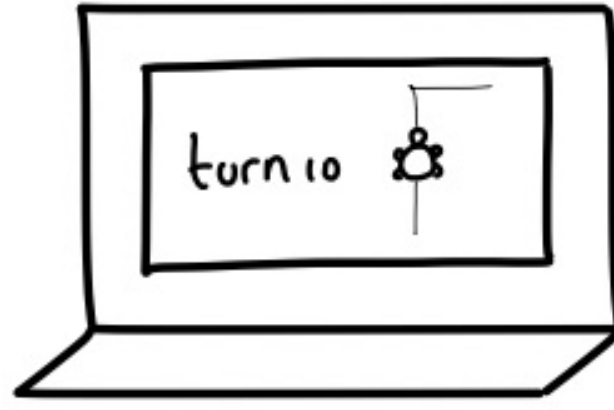
Ehm... let's see ...



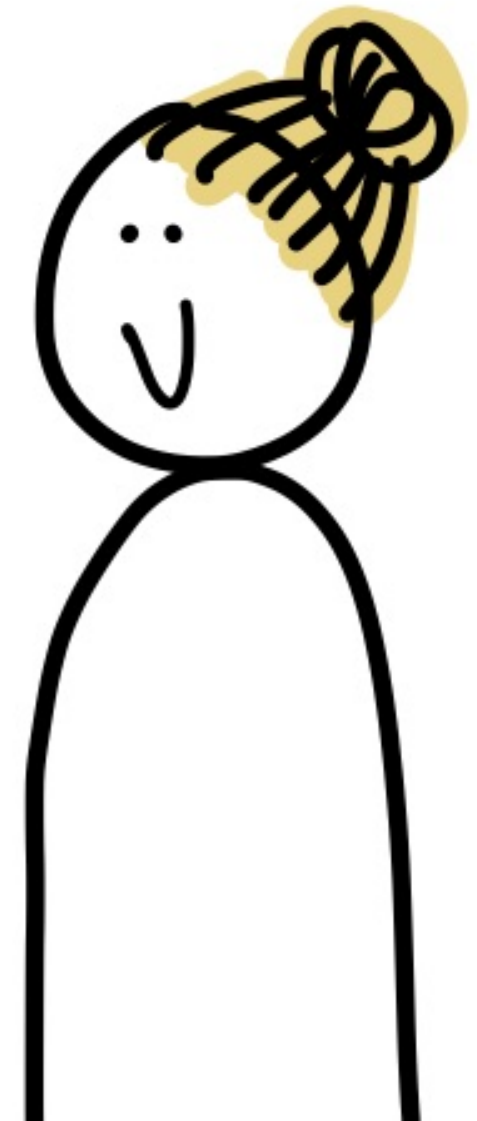
A space somewhere?

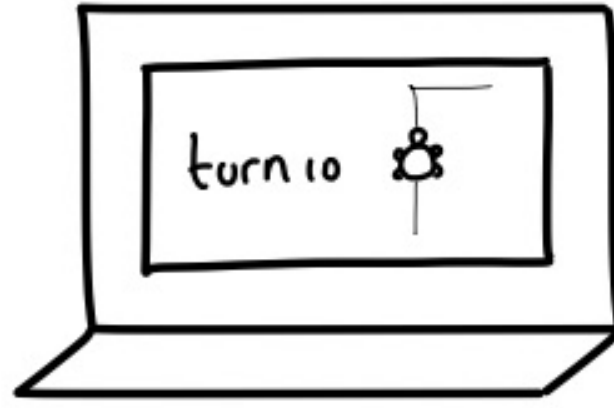






Check line 4!

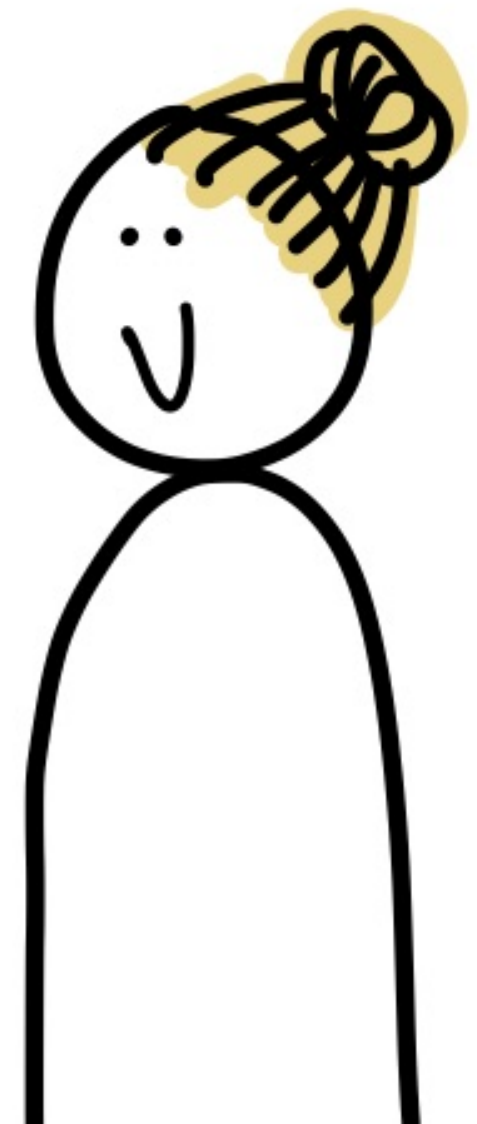




Check line 4!



Reread the error message



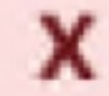
```
1 print Welcome, world!
```



```
1 print Welcome, world!
```



We can't run your program.



The code you entered is not valid Hedy code. There is a mistake on line 1, at position 12. You typed ',' but that is not allowed.




```
1 print Welcome, world!
```



We can't run your program.



The code you entered is not valid Hedy code. There is a mistake on line 1, at position 12. You typed ',' but that is not allowed.

Why can't I type?




```
1 print Welcome, world!
```



We can't run your program.



The code you entered is not valid Hedy code. There is a mistake on line 1, at position 12. You typed ',' but that is not allowed.

Why can't I type?



```
1 print Welcome, world!
```

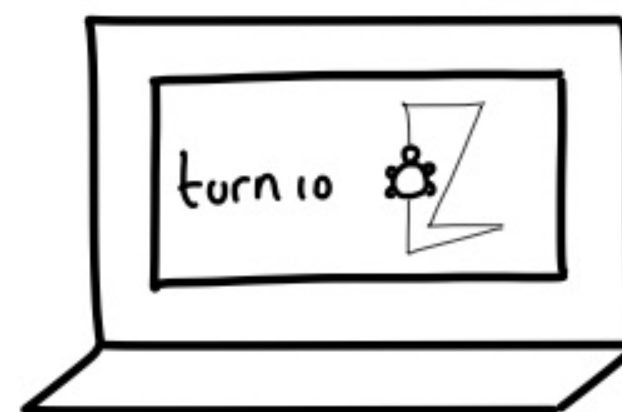
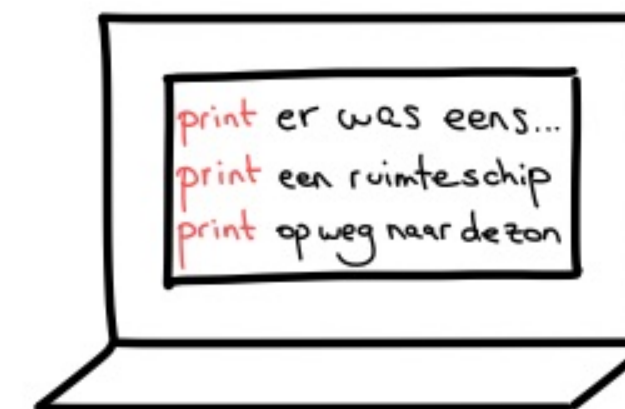
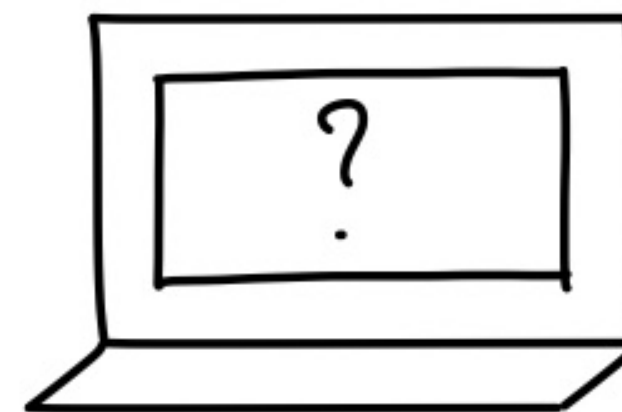
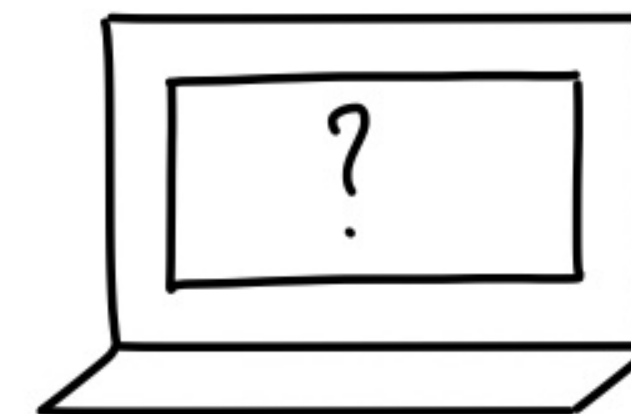
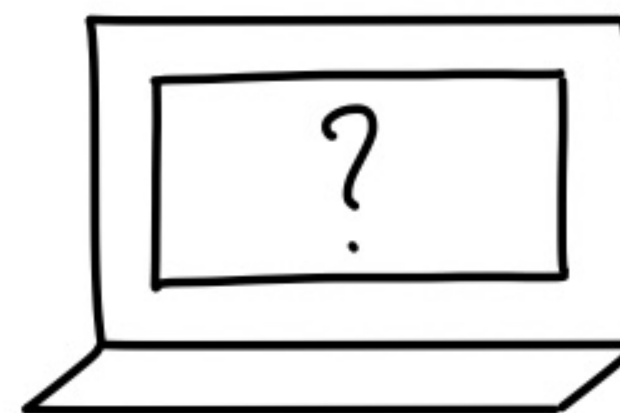
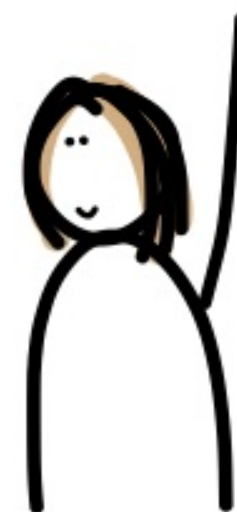
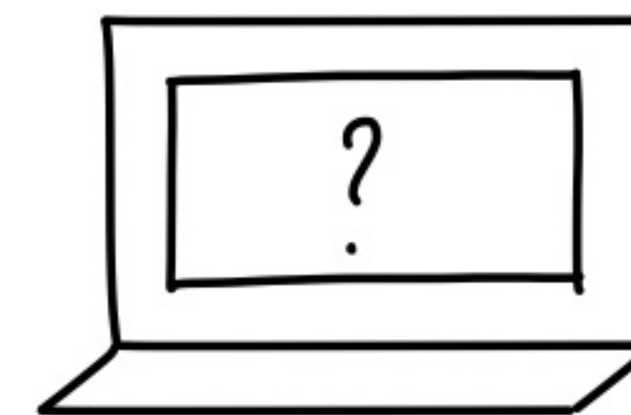
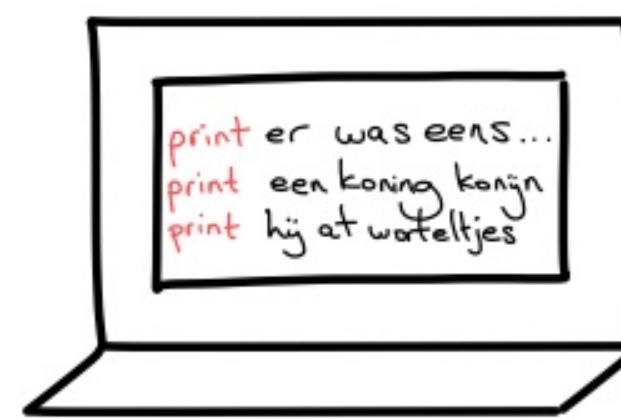
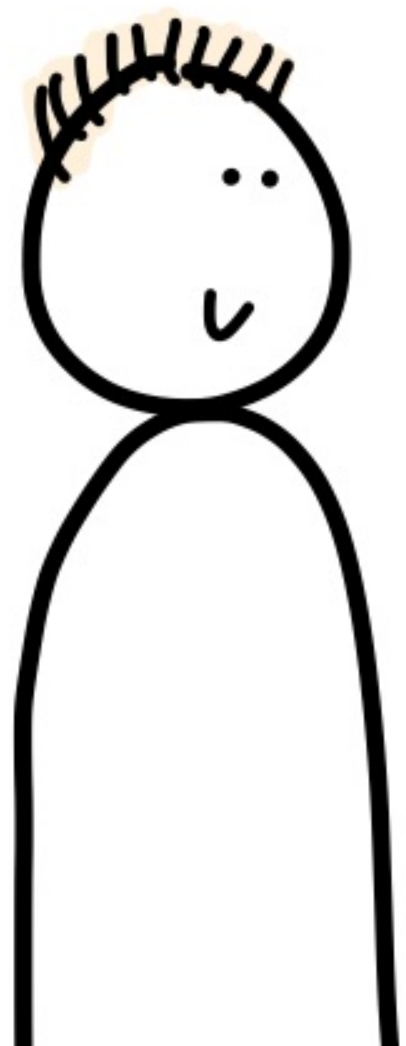


We can't run your program.

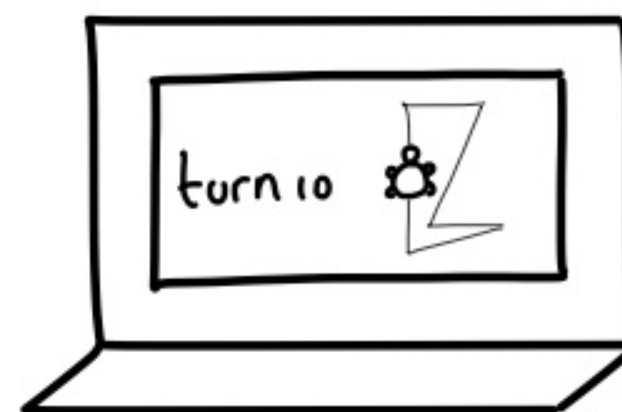
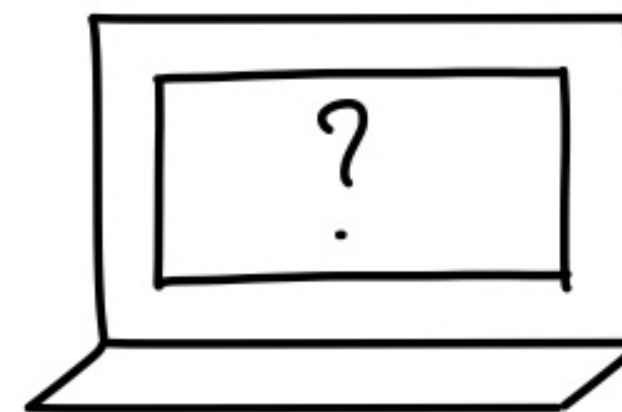
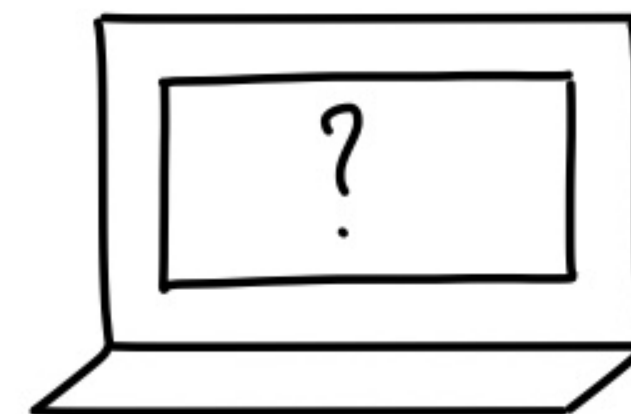
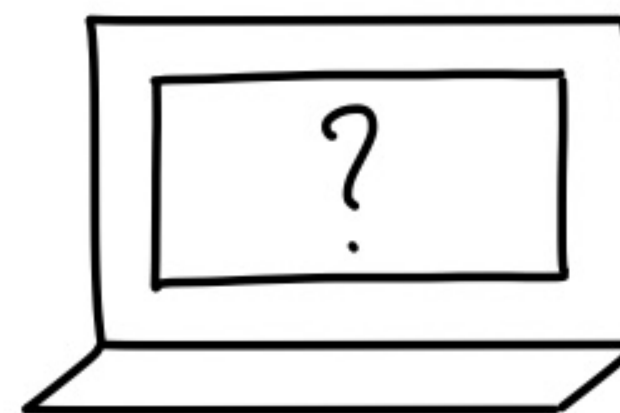
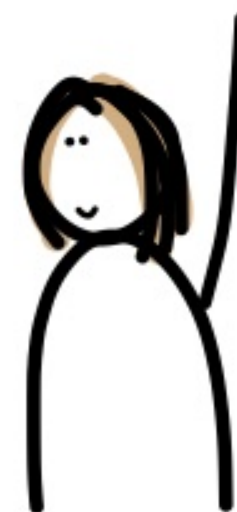
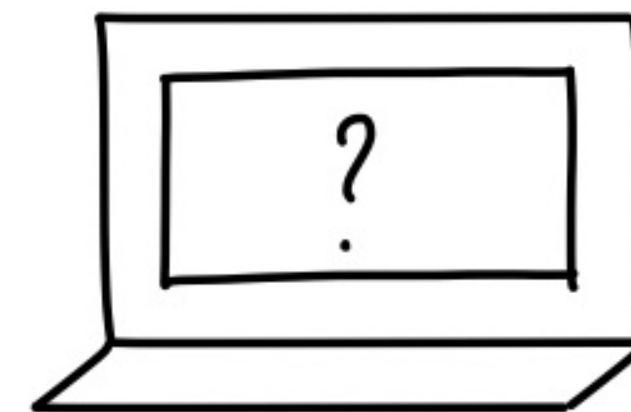
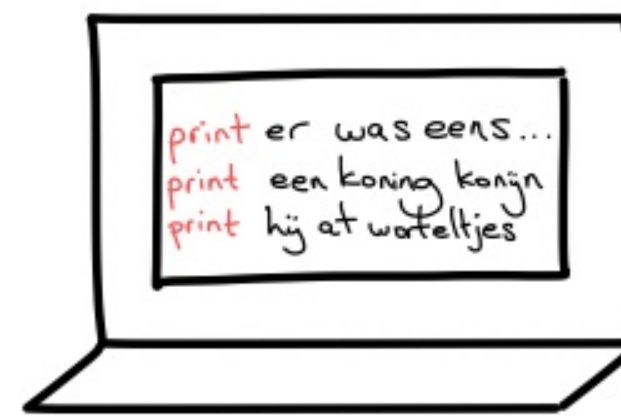
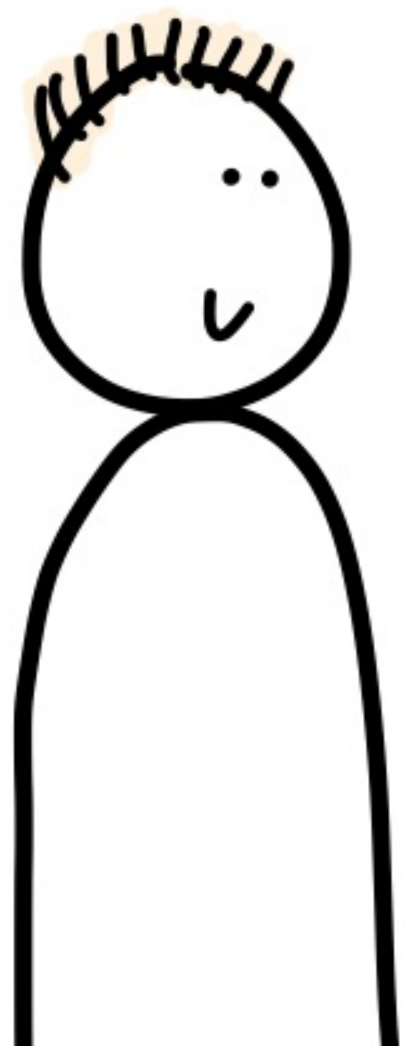


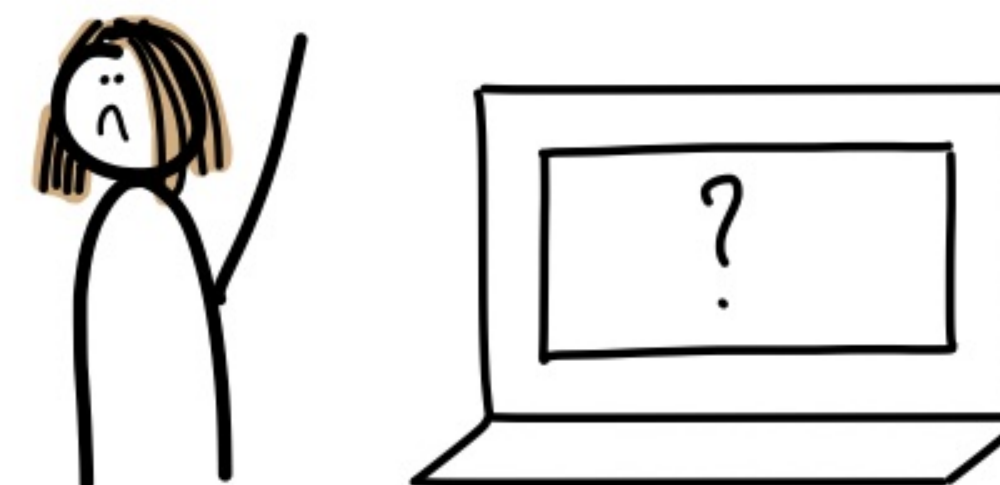
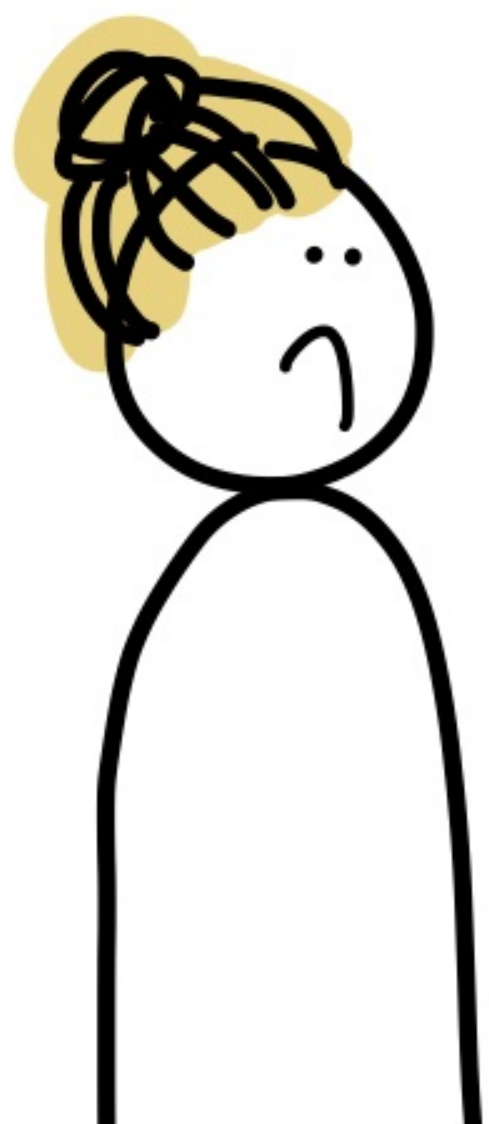
The code you entered is not valid Hedy code. There is a mistake on line 2, at position 14. You typed a comma, but that is not allowed.



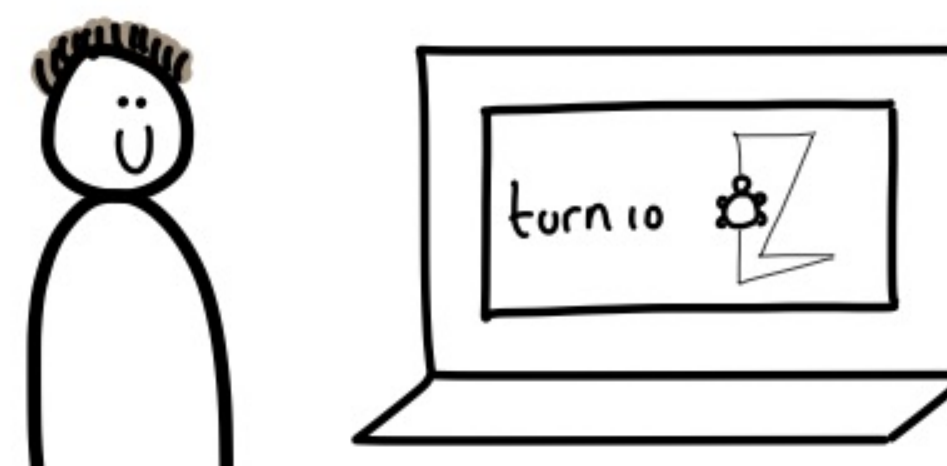


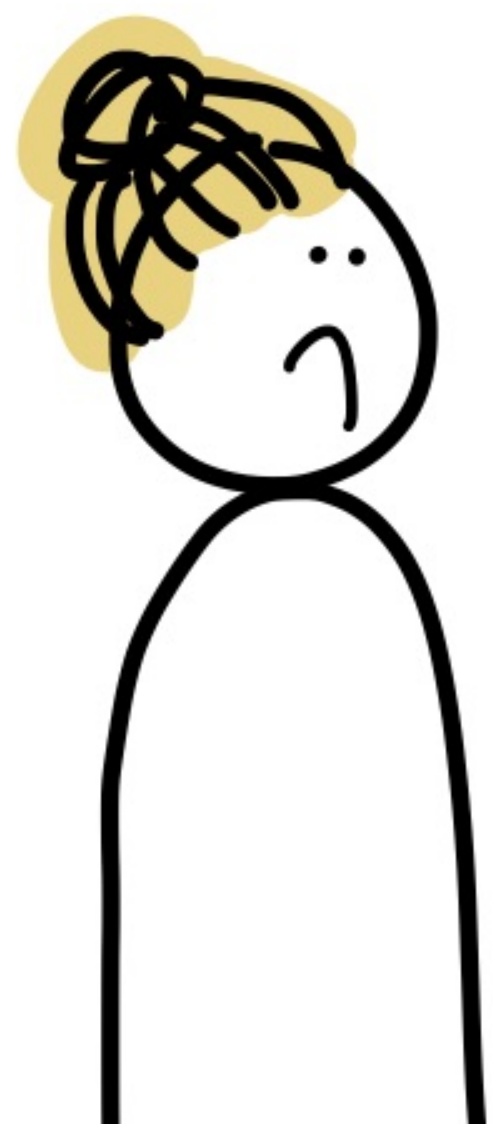
Ehm?



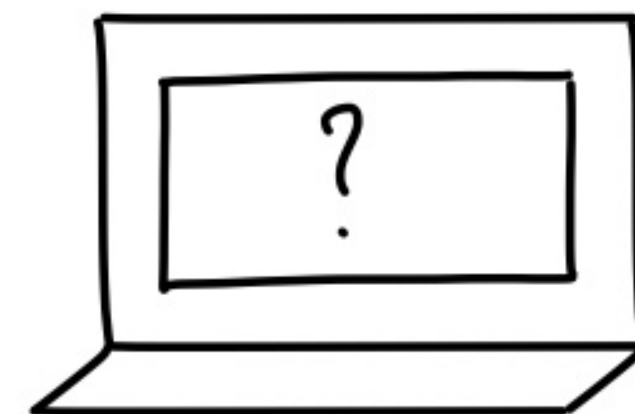


I love tinkering

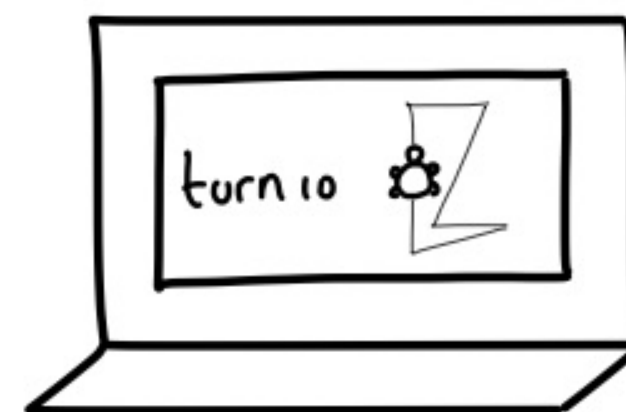


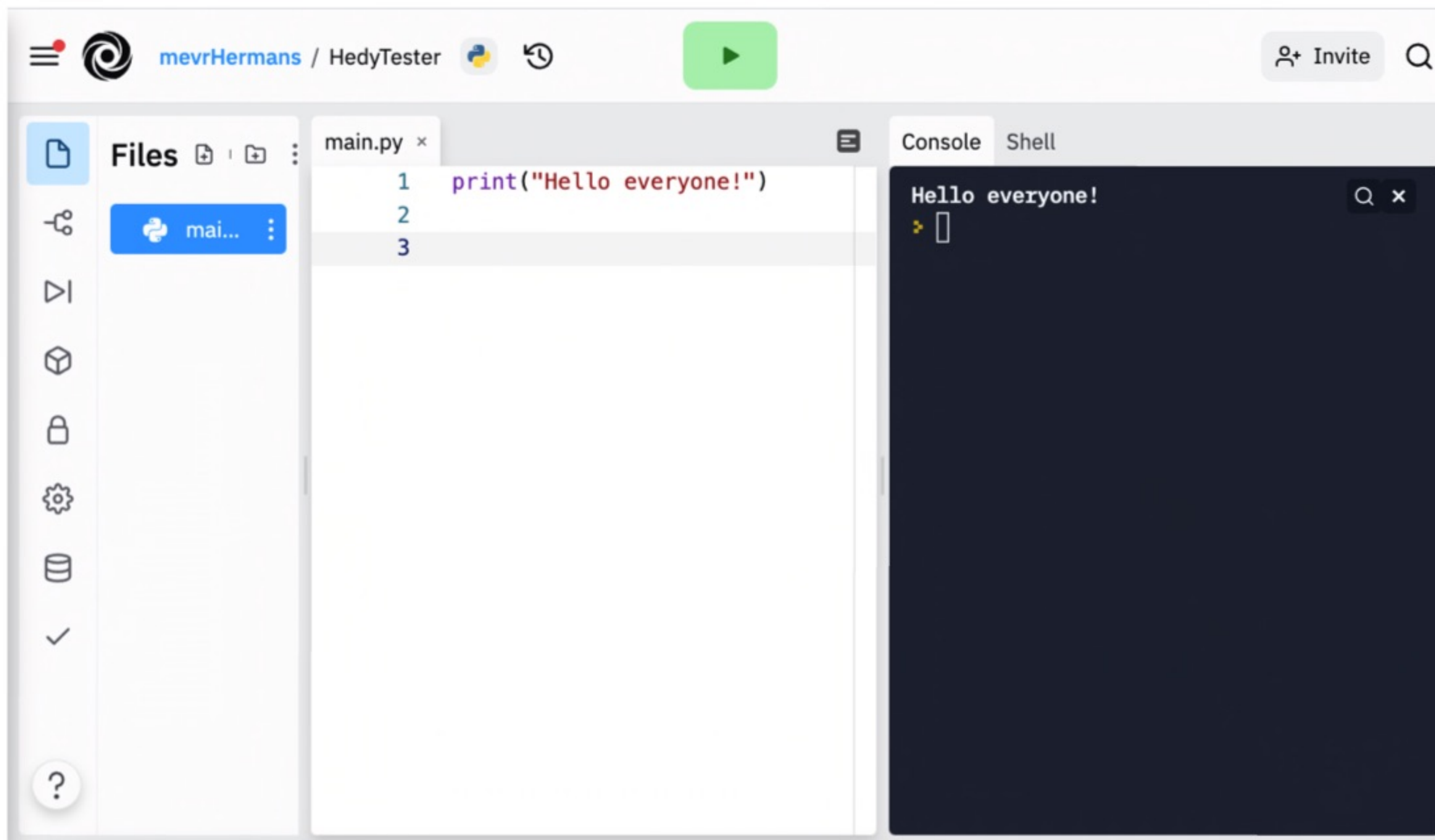


I don't

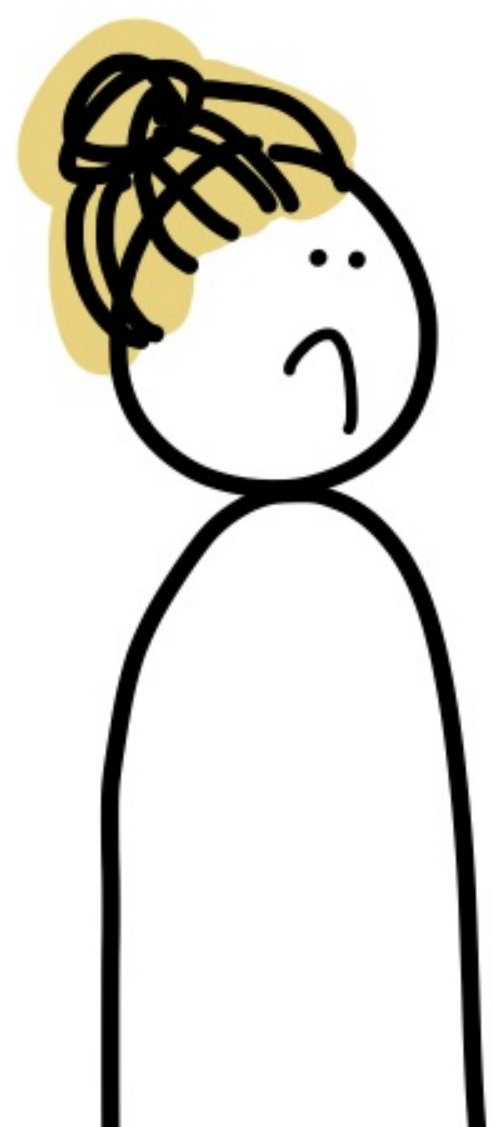
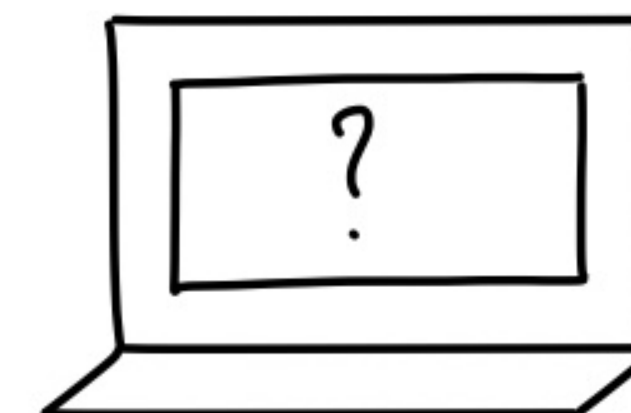


I love tinkering

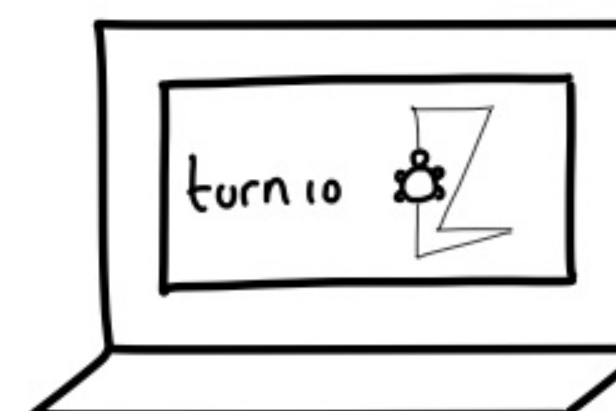


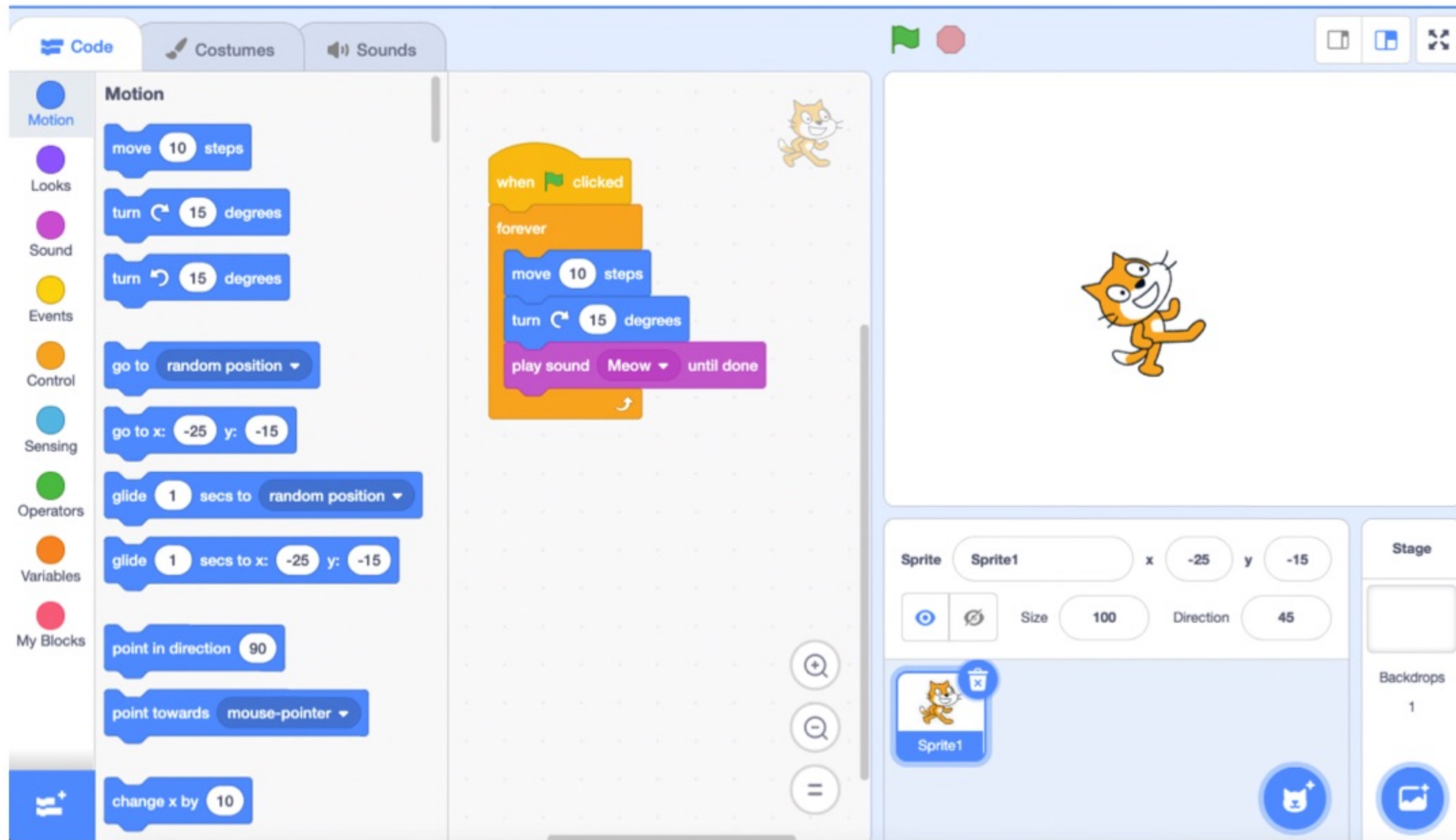


I don't

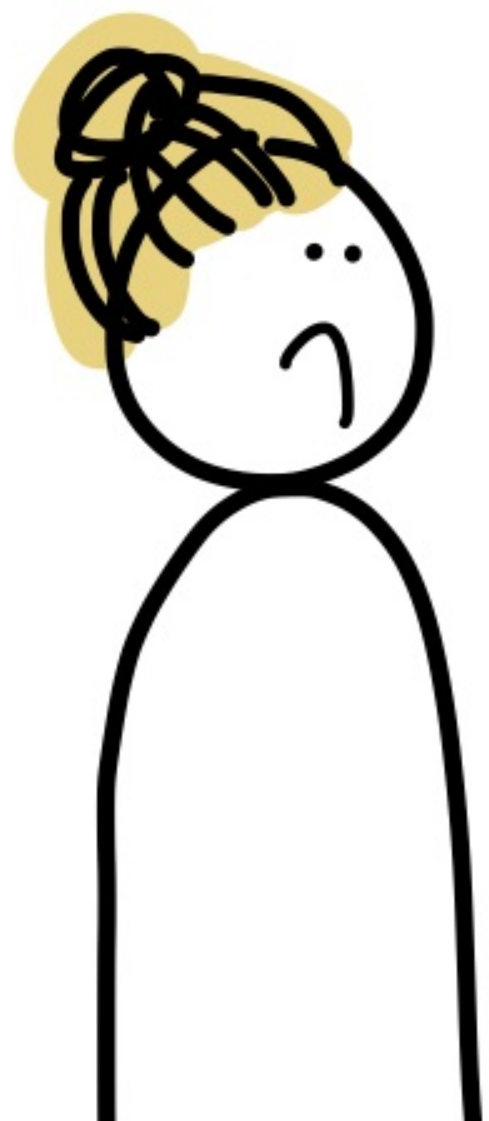
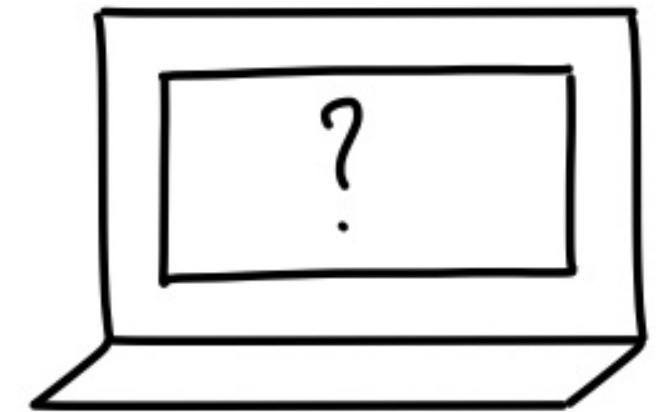


I love tinkering

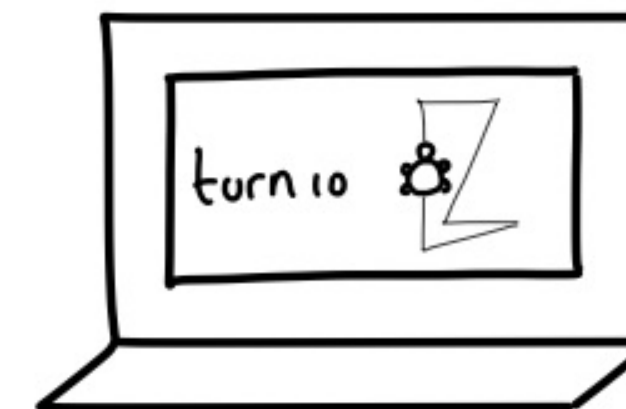




I don't



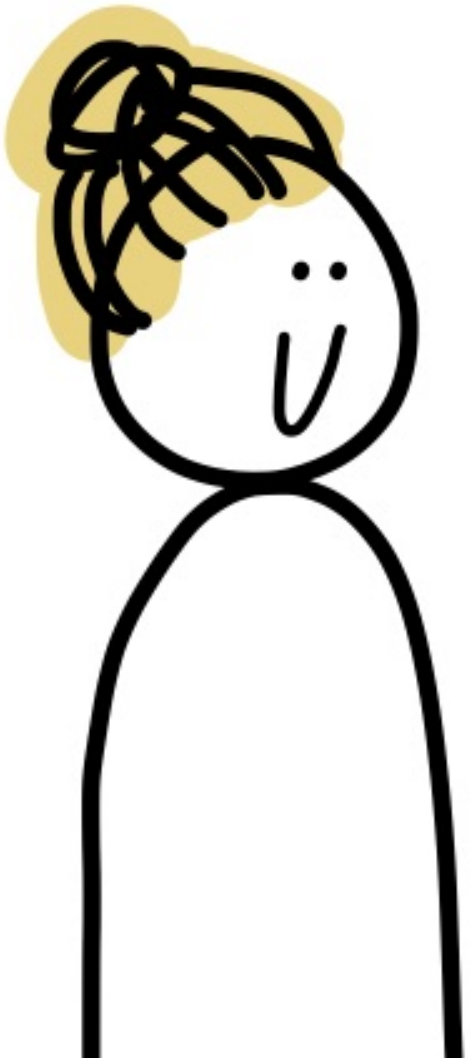
I love tinkering

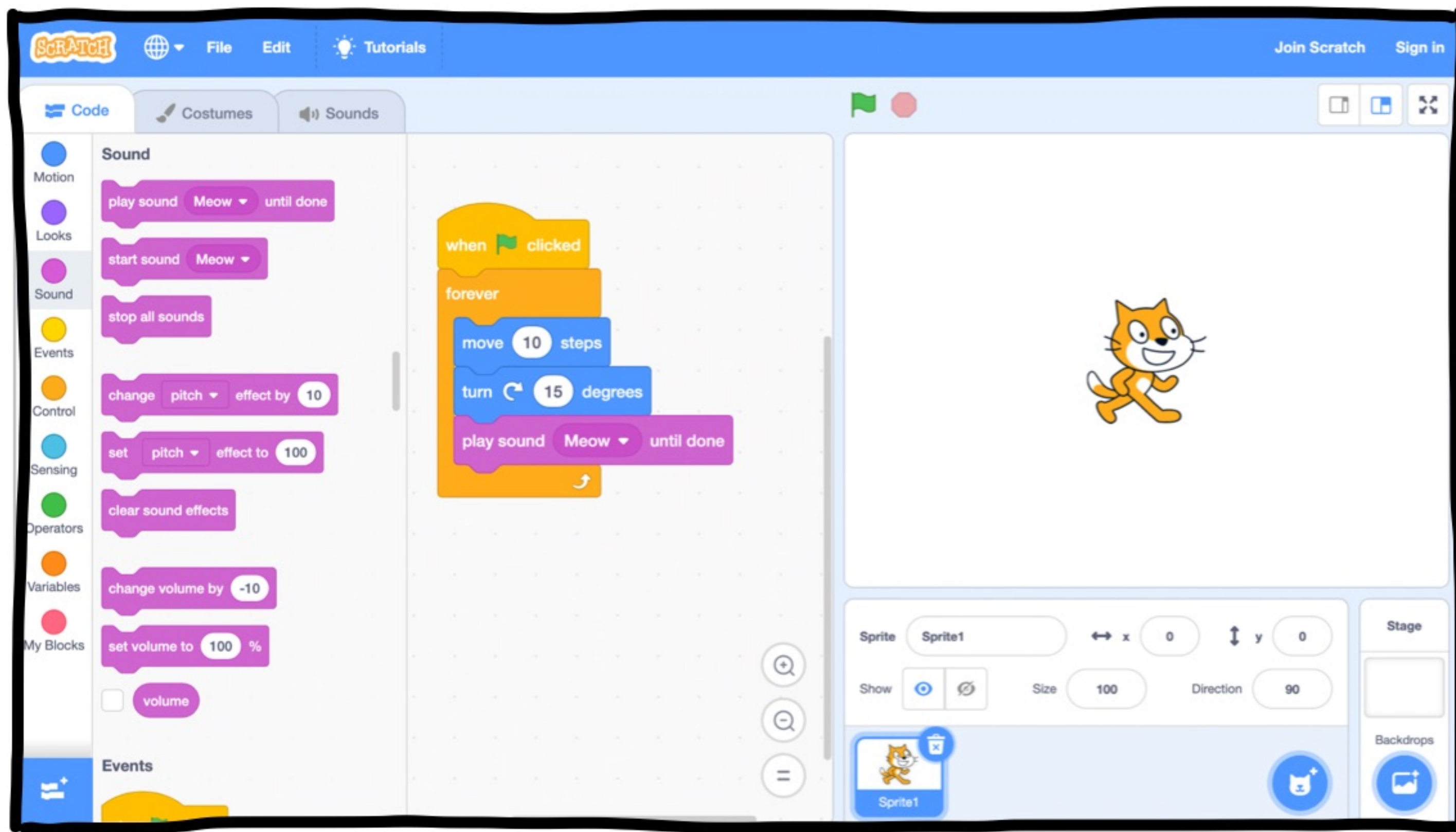


Tools for learning

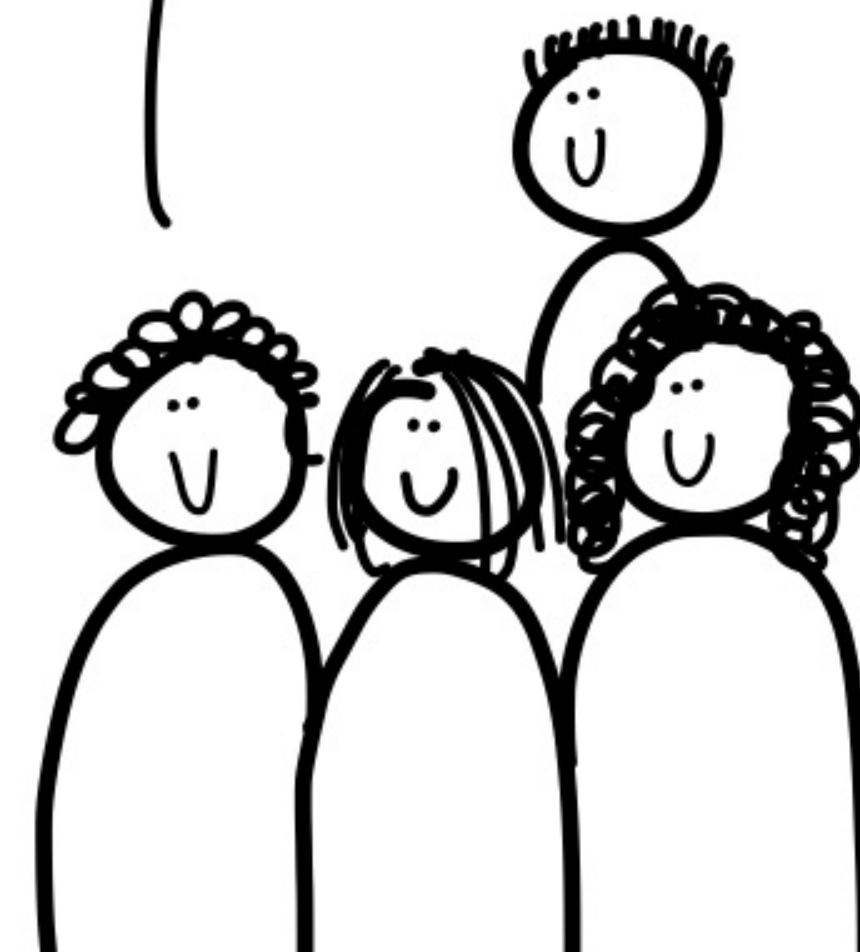
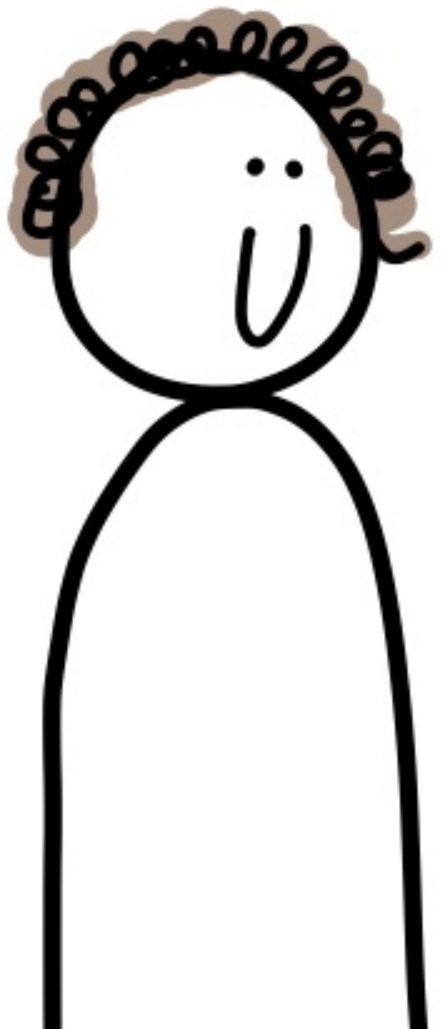
✓ ≠

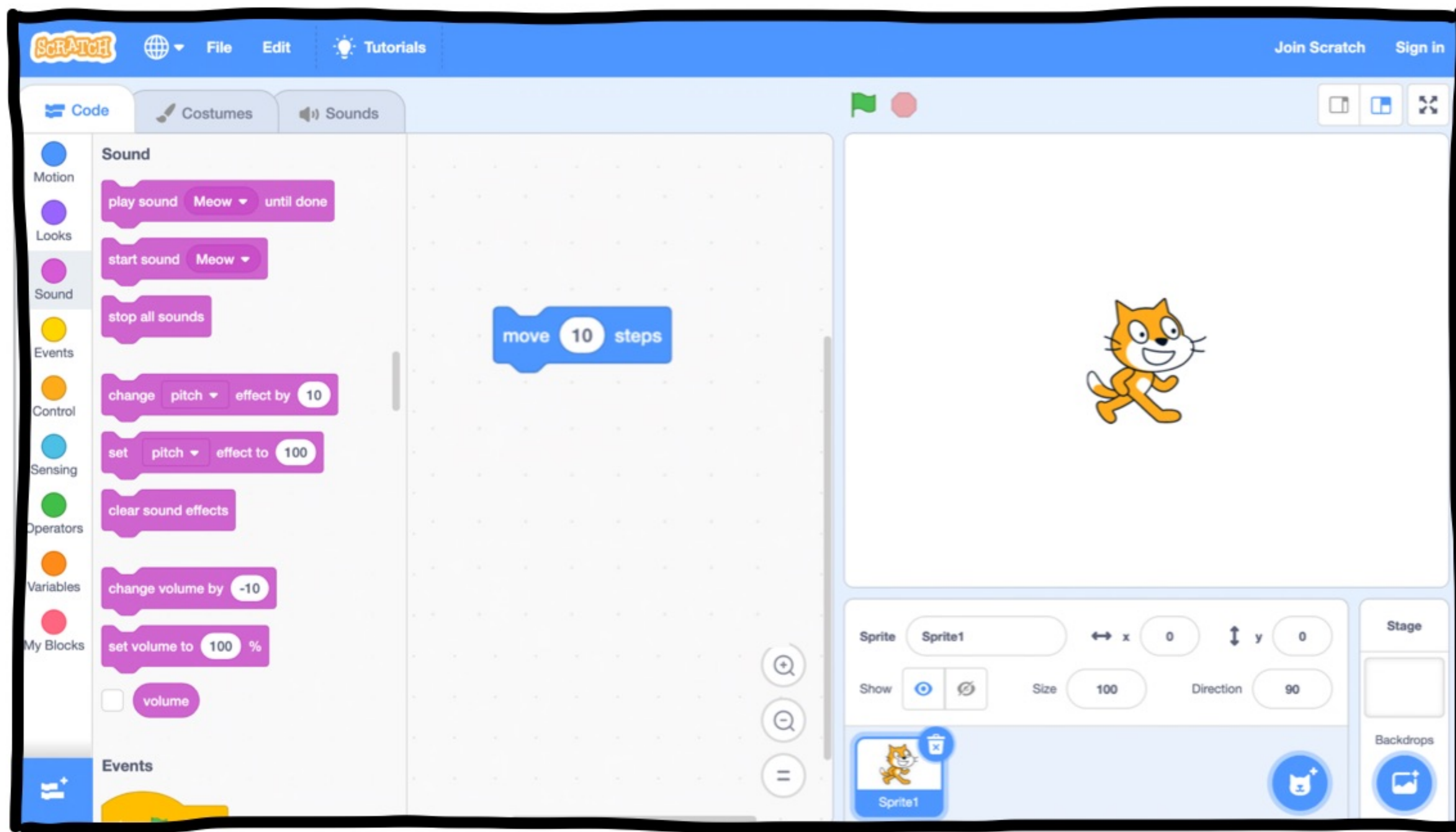
Tools for teaching



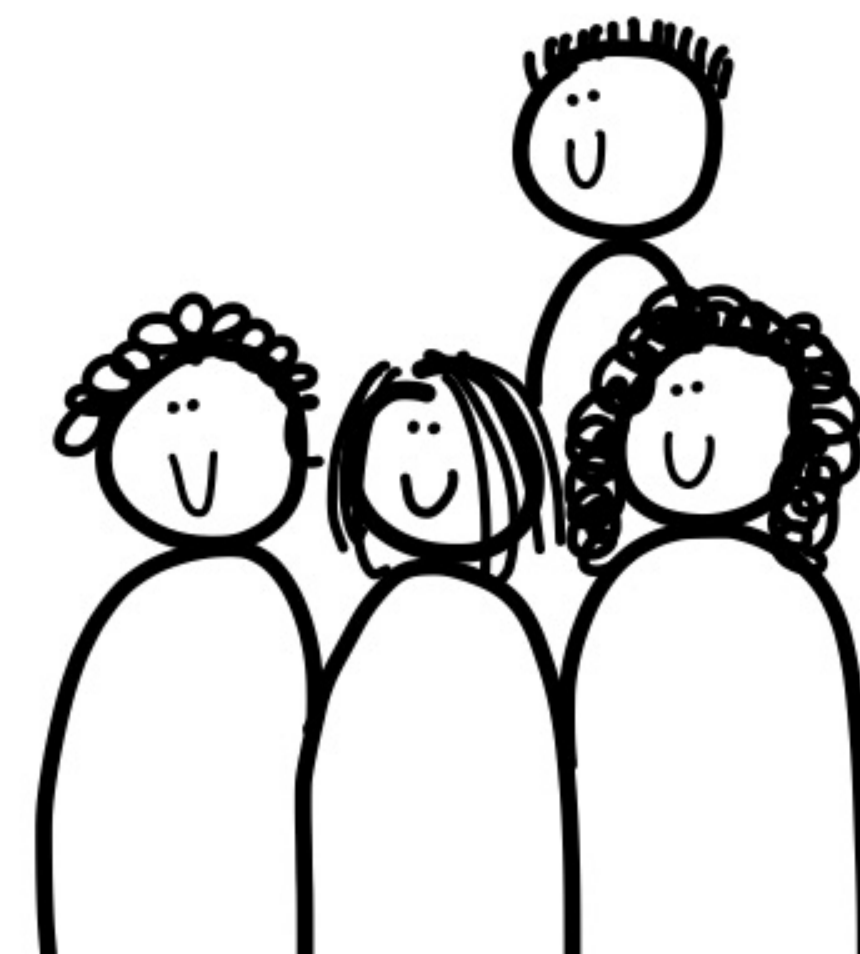
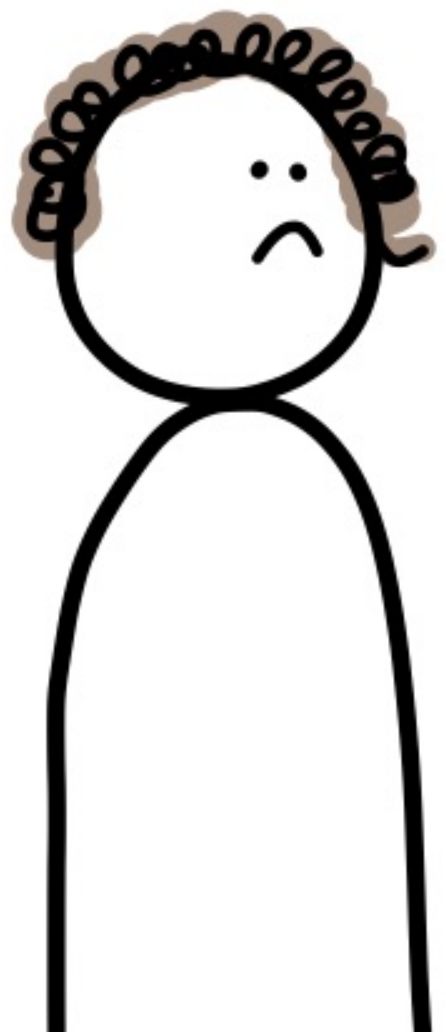


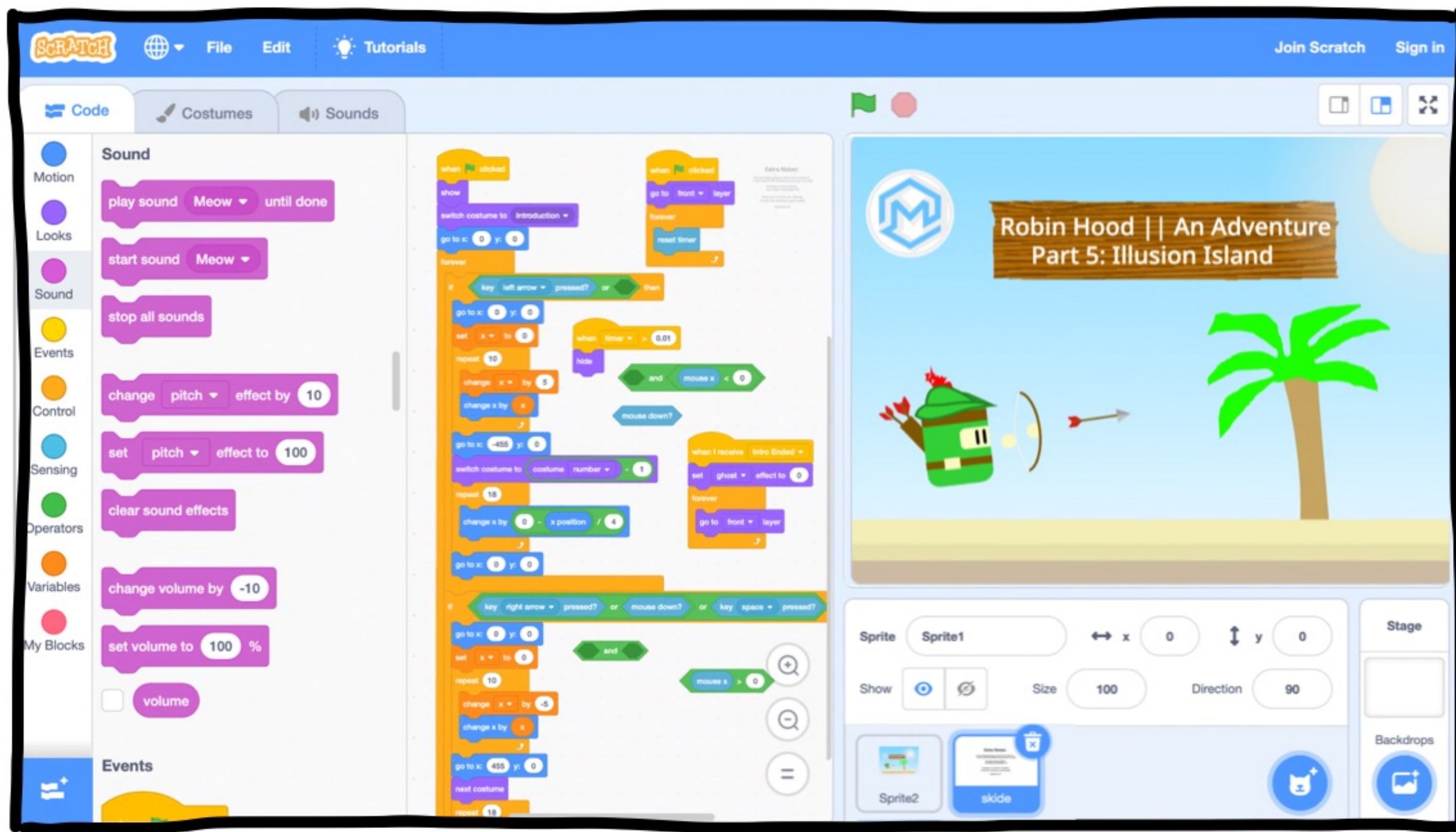
I did it!



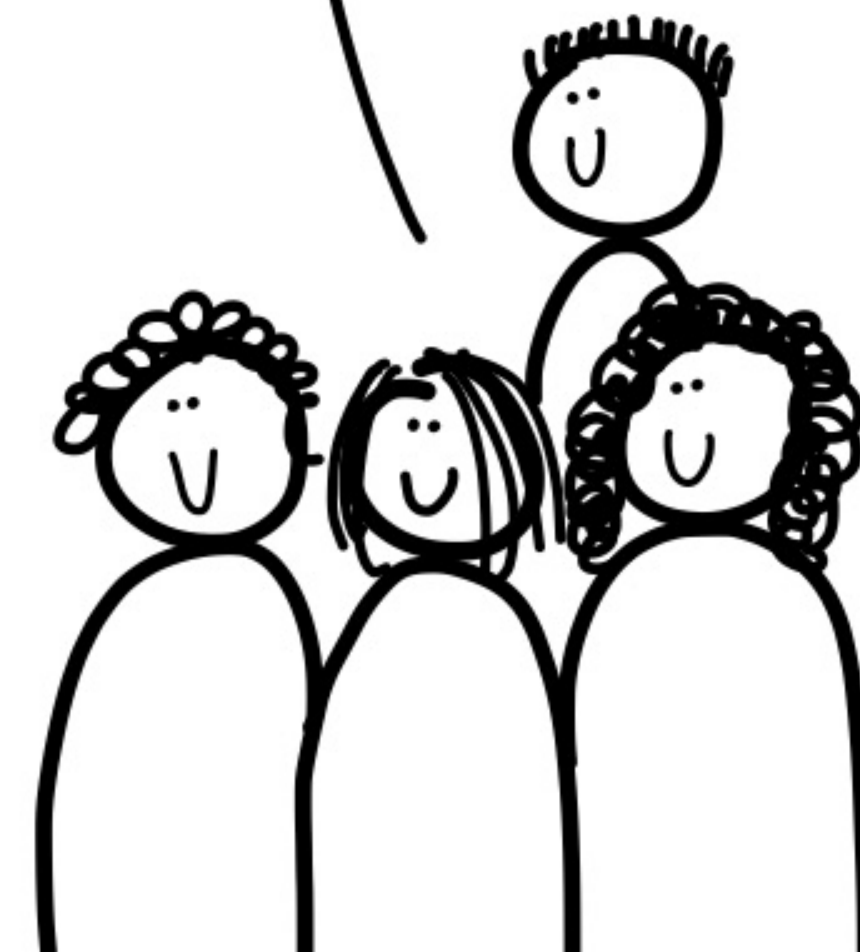
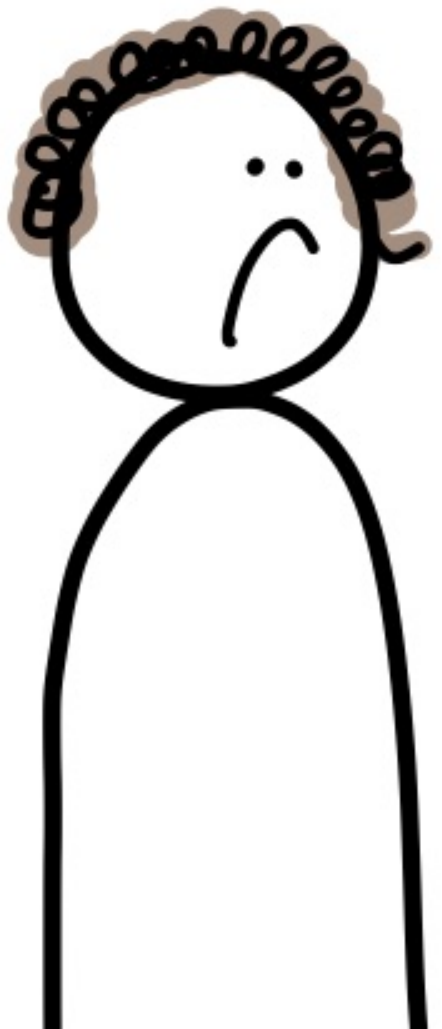


What do I do now?





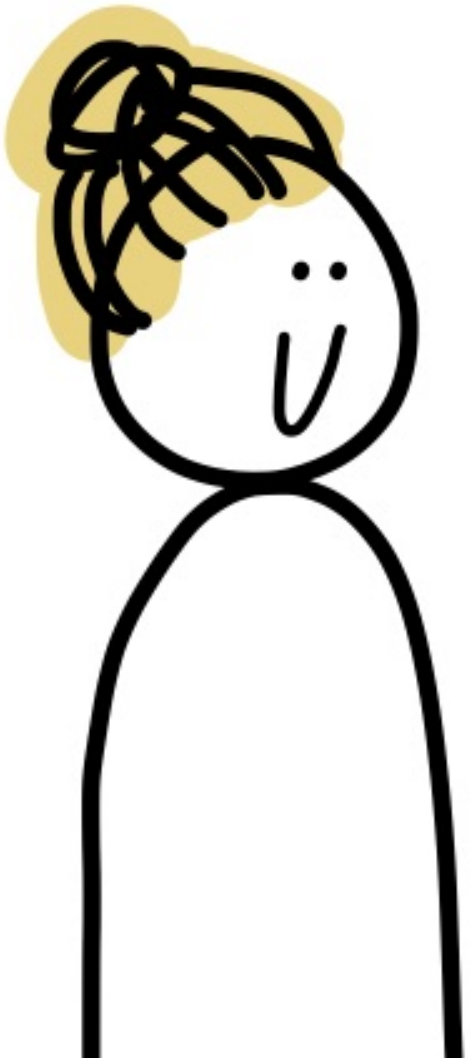
I built this!



Tools for learning

✓ ≠

Tools for teaching



Introduction

print

ask

Parrot

Rock, paper, scissors

Haunted House

Story

Turtle

Restaurant

Fortune teller

debugging

Puzzle

Quiz

The print command

You can print text to the screen using the `print` command.

Exercise

In Hedy you will find exercises in every adventure. An exercise allows you to practise the new commands and concepts, and lets you give your own twist to the example codes. In this exercise you will see a pink blank space. You have to fill something in the place of the blank space before the code can be ran.

Fill in the `print` command in the blank space and then add five more lines of code. Each line has to start with a `print` command. Have fun!

```
print Hi there, programmer!  
print Welcome to Hedy!
```



```
 Hello!
```



```
1 print Welcome to Hedy!
```

```
2
```



print

ask

Turtle

Draw Santa

Puzzle

Quiz

The print command

You can print text to the screen using the `print` command.

Exercise

In Hedy you will find exercises in every adventure. An exercise allows you to practise the new commands and concepts, and lets you give your own twist to the example codes. In this exercise you will see a pink blank space. You have to fill something in the place of the blank space before the code can be ran.

Fill in the `print` command in the blank space and then add five more lines of code. Each line has to start with a `print` command. Have fun!

```
print Hi there, programmer!  
print Welcome to Hedy!
```



```
 Hello!
```



```
1 print Hey, programmeur!  
2 print Welkom bij Hedy!  
3
```



print

ask

Turtle

Draw Santa

Puzzle

Quiz

Use the turtle to create a Santa Claus drawing!

Don't forget the turtle code: `forward` and `turn`

Use this code to get started

```
forward 10  
turn left
```



1



Run code



← Turtle

Puzzle →

Read aloud:



Programmer's mode

This level is locked

Level 2

Level 3

Level 4

Level 5

Level 6

Level 7

Level 8

Level 9

Level 10

Level 11

Level 12

Level 13

Level 14

Level 15

Level 16

Level 17

urtle

Draw Santa

Puzzle

Quiz

Command

to the screen using the `print` command.

d exercises in every adventure. An exercise allows you to practise the
d concepts, and lets you give your own twist to the example codes. In
ill see a pink blank space. You have to fill something in the place of the
e the code can be ran.

command in the blank space and then add five more lines of code. Each
h a `print` command. Have fun!

```
print Hi there, programmer!  
print Welcome to Hedy!
```



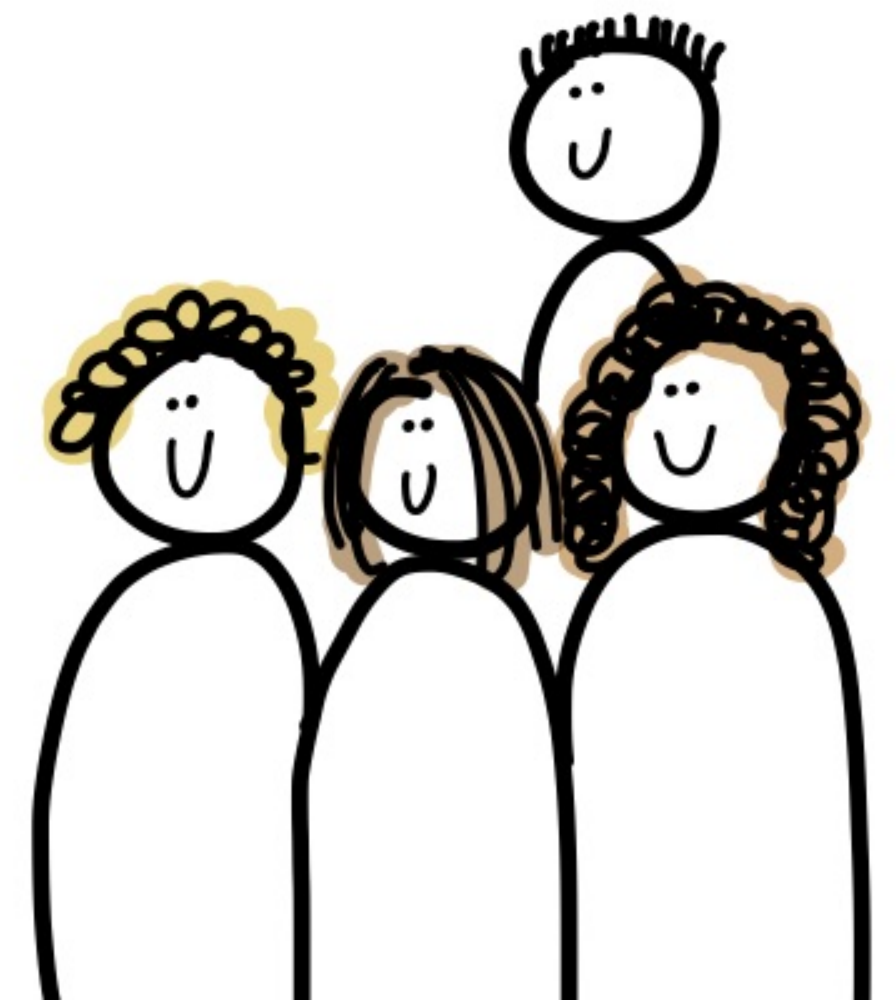
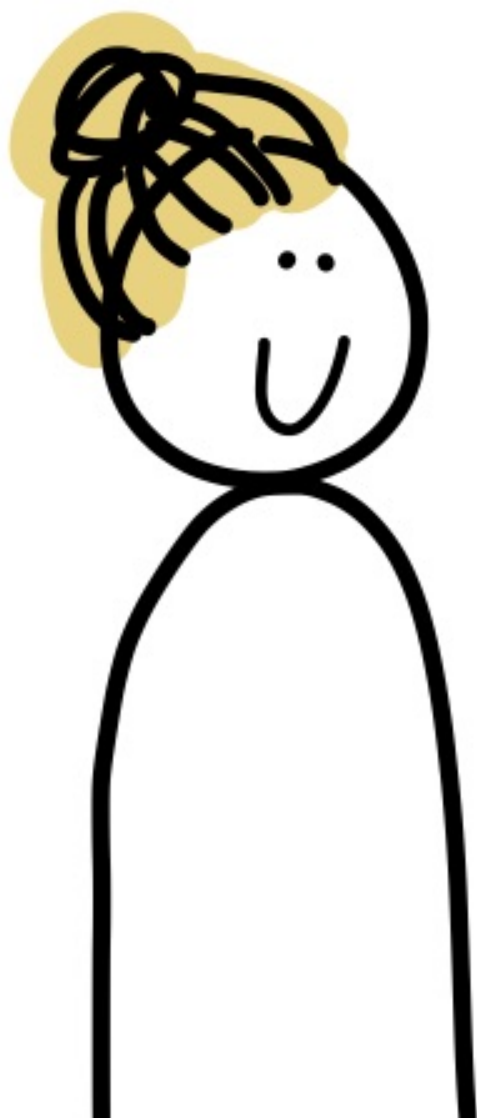
```
Hello!
```



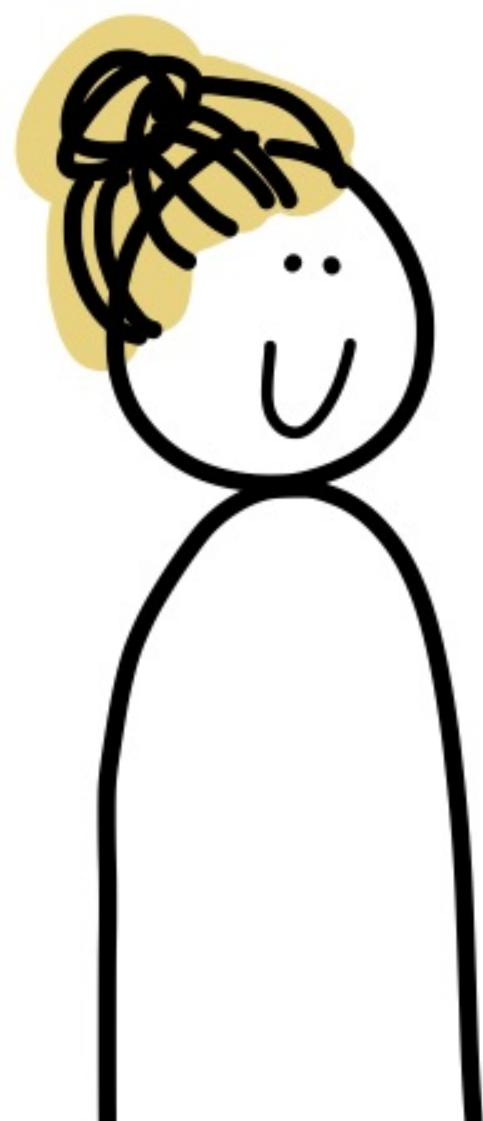
```
programmeur!  
bij Hedy!
```



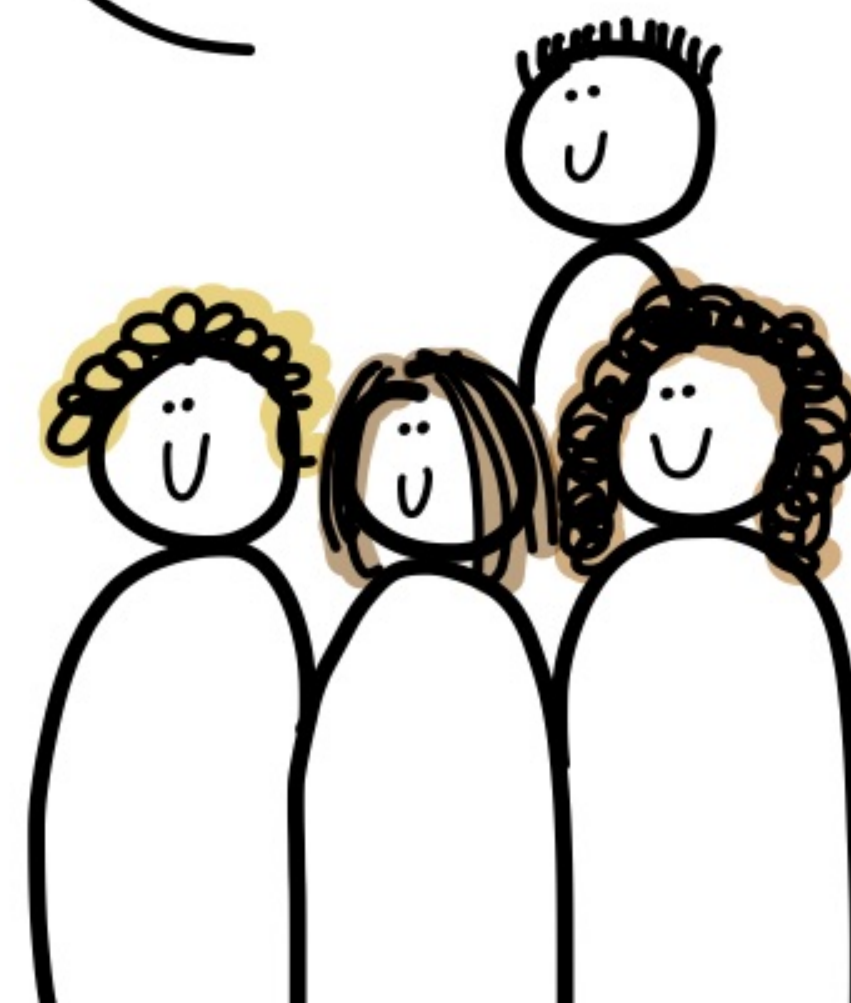
How to make
Hedy better?



How to make
Hedy better?



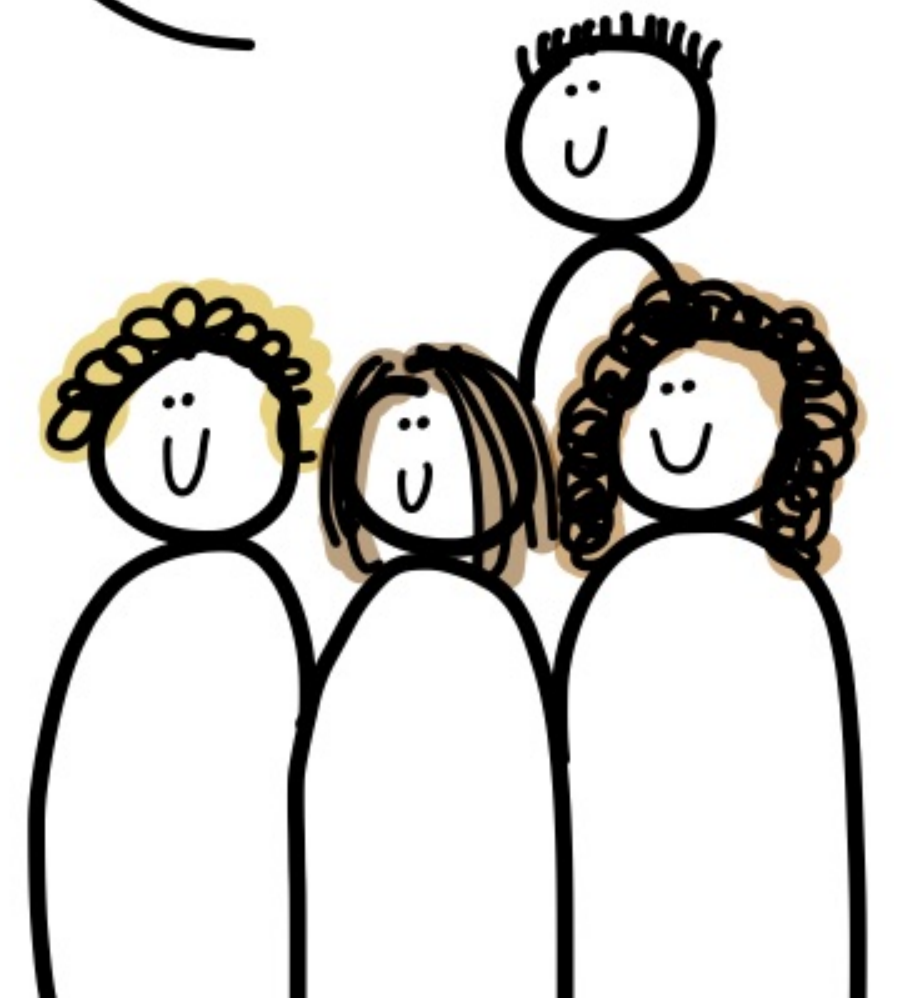
Hedy in Dutch!



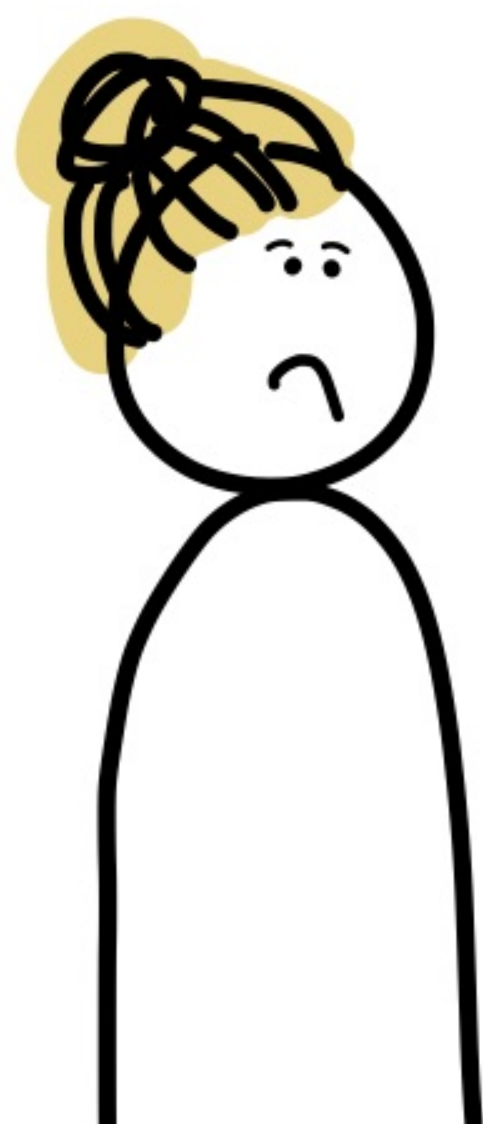
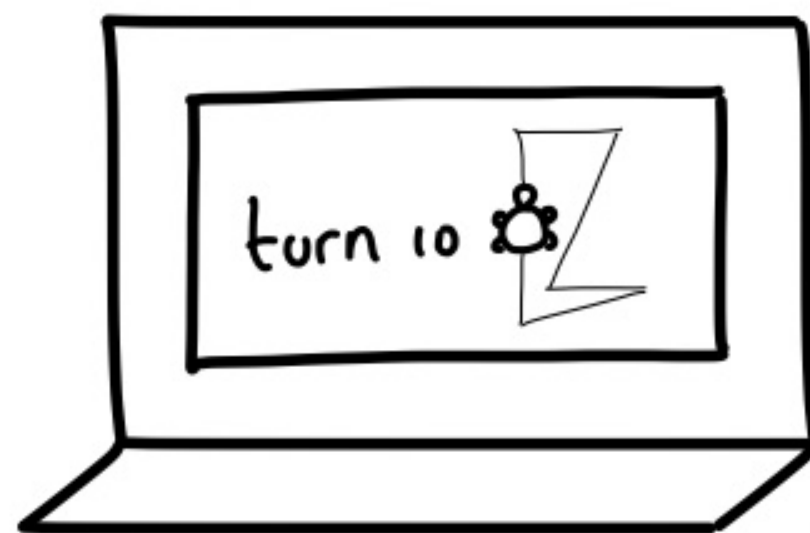
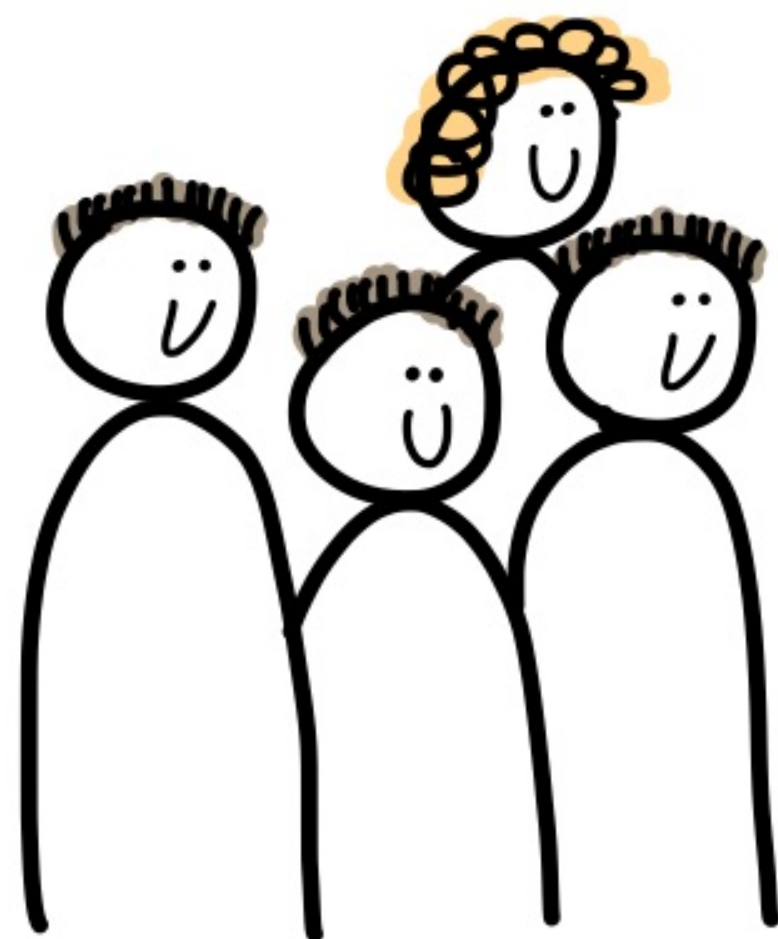
Really?



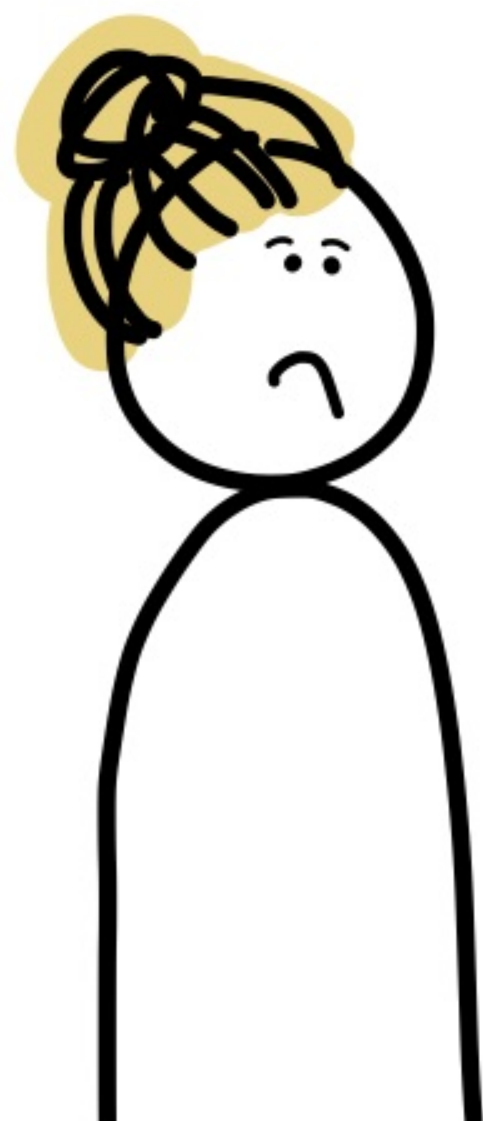
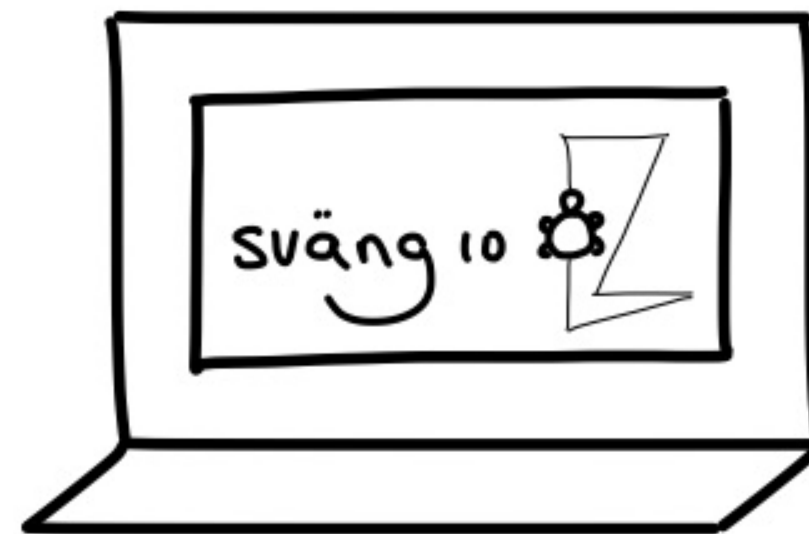
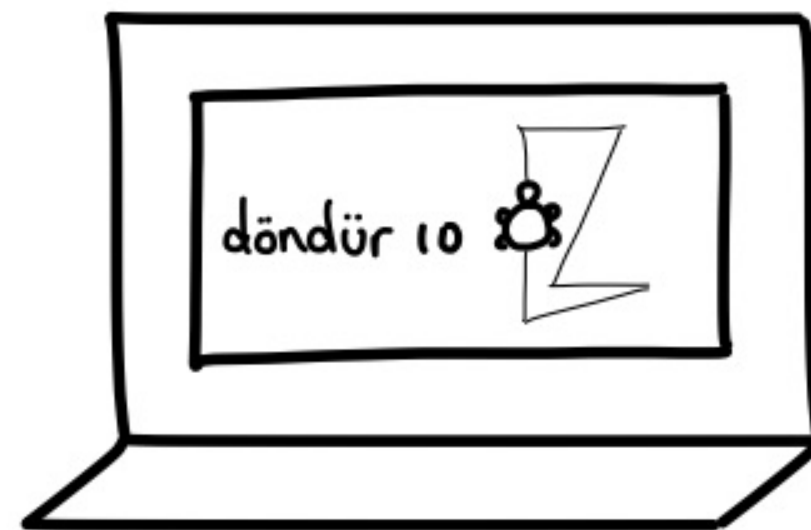
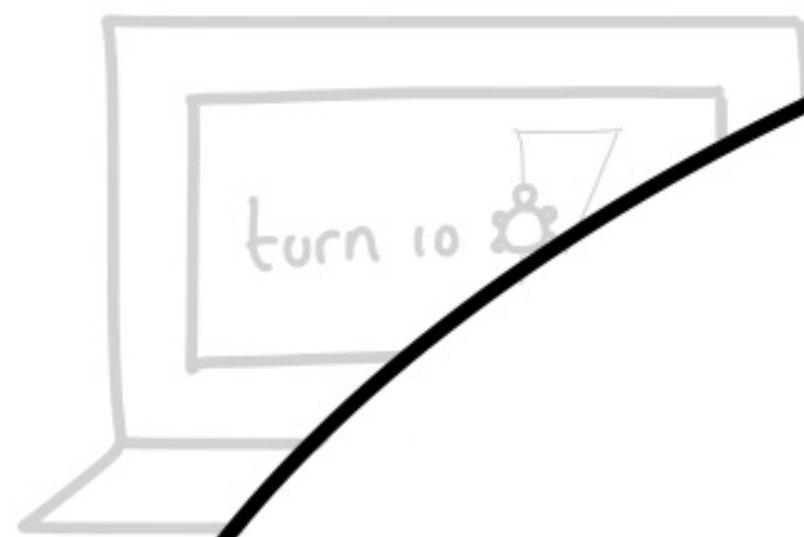
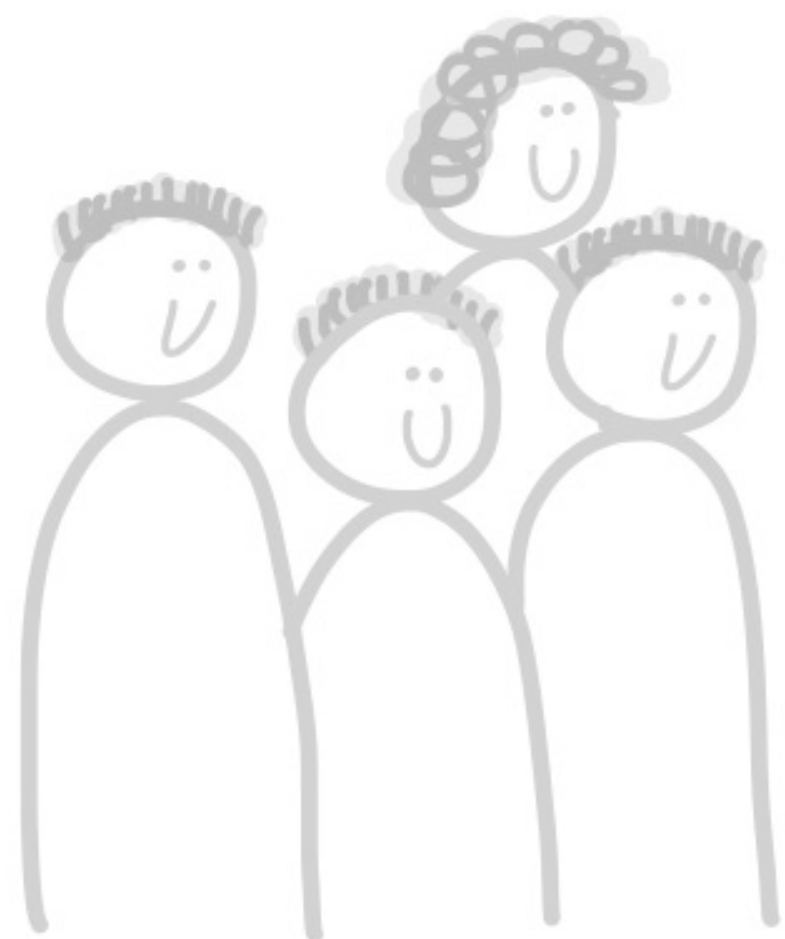
Hedy in Dutch!

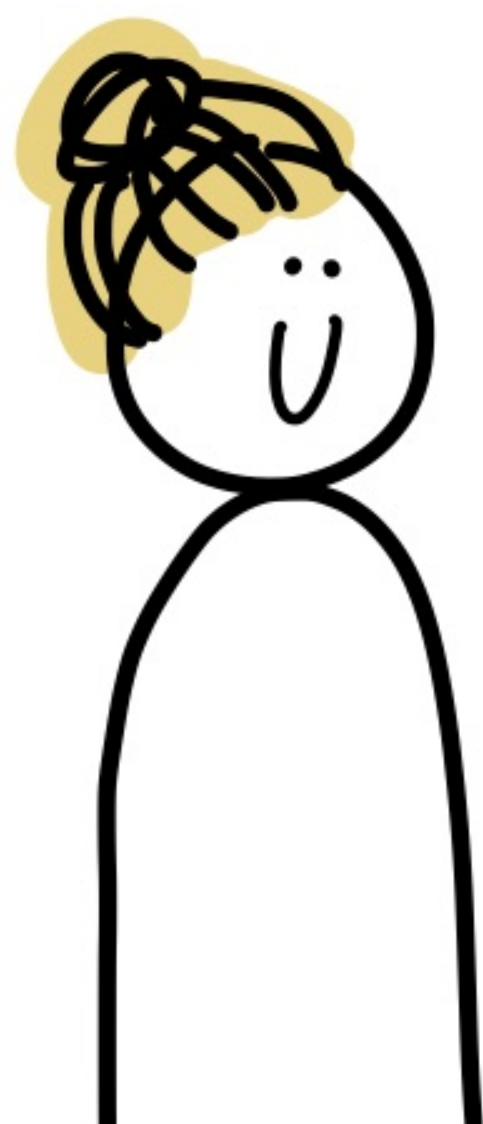
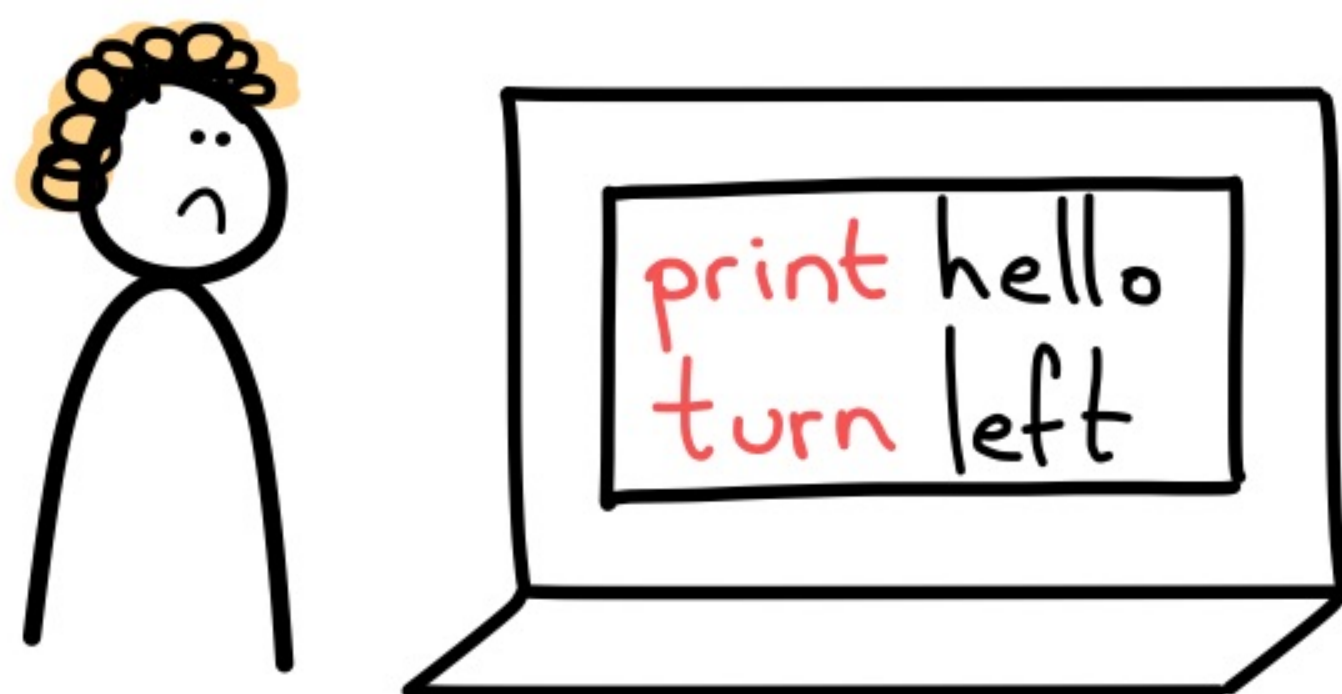


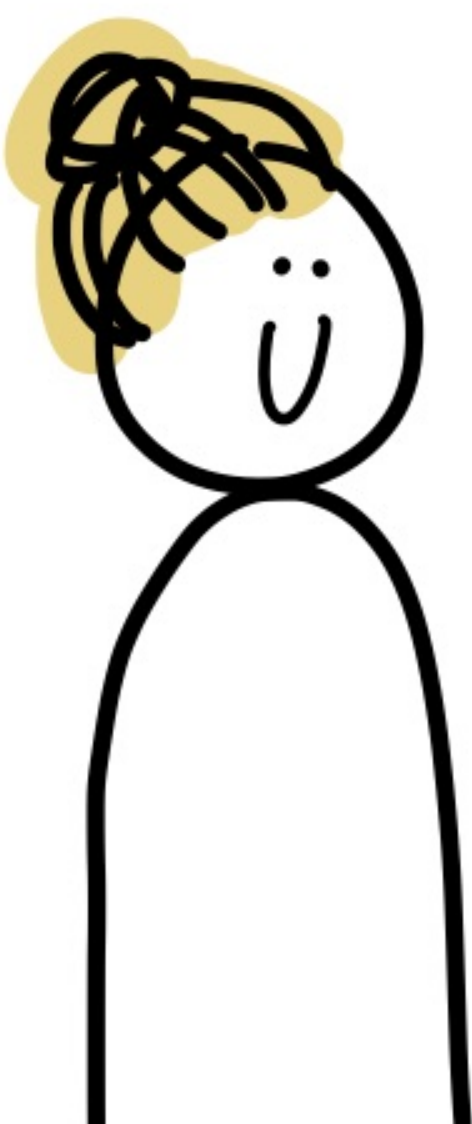
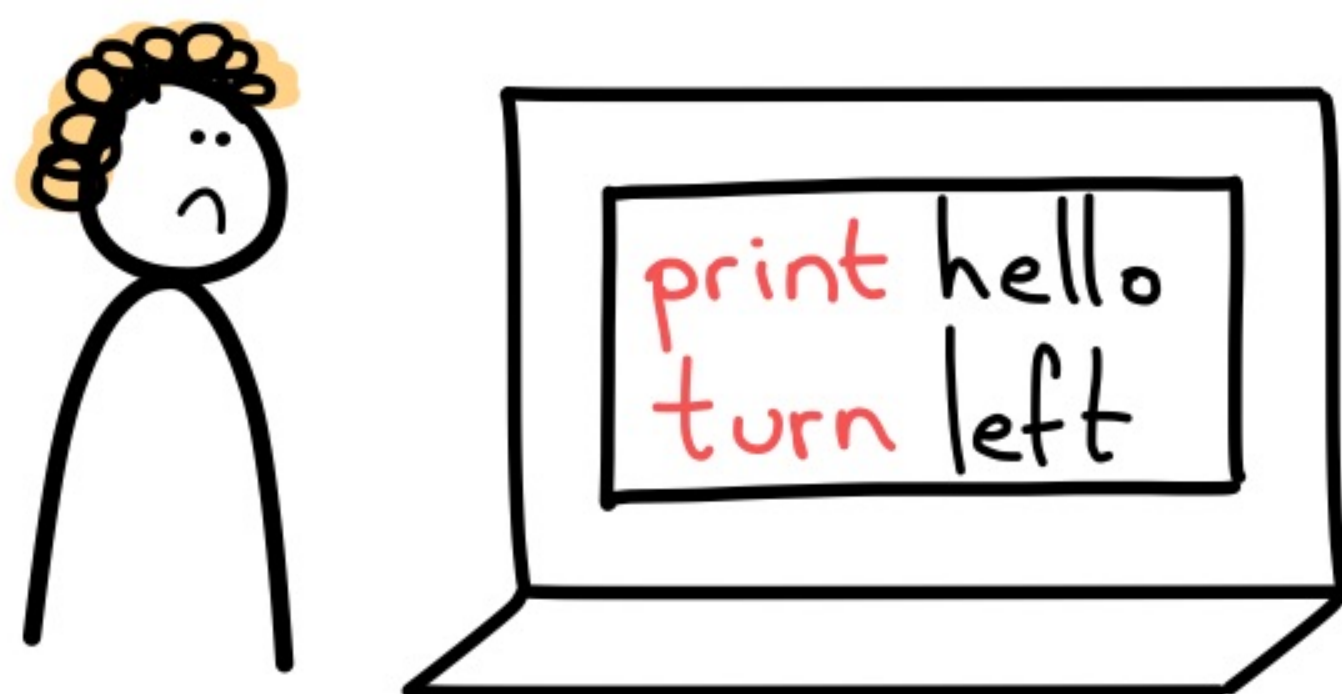
Looks good to me!



Looks good to me!

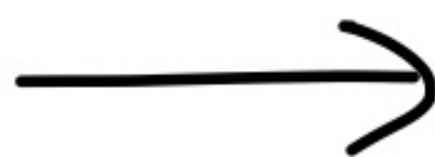






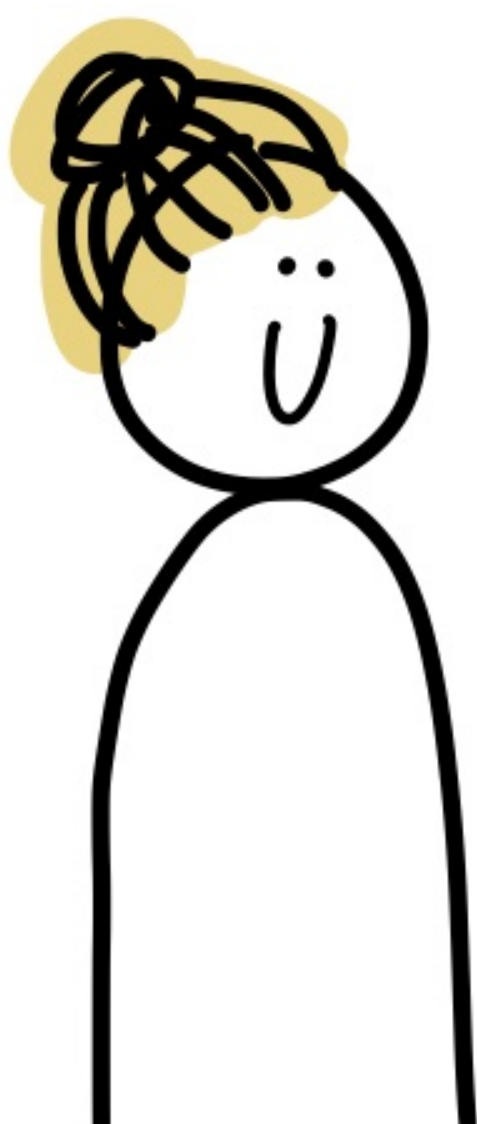
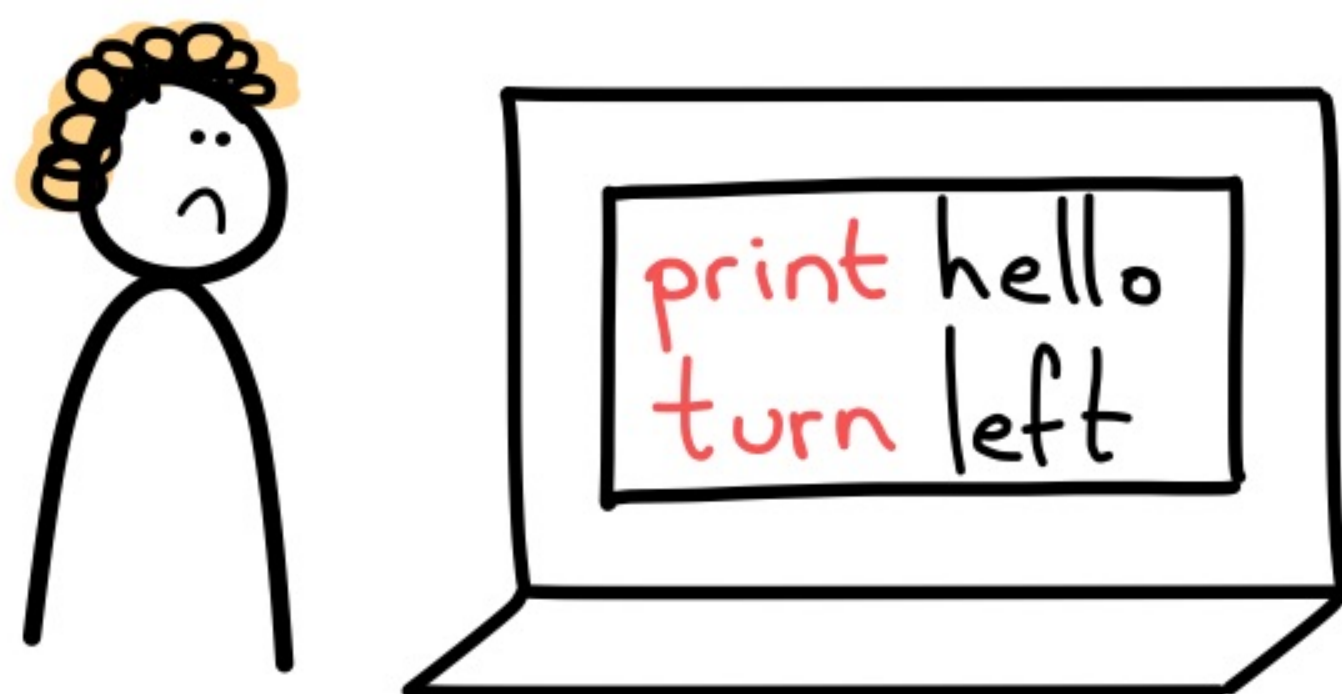
Hedy

```
print hello  
draai 120
```



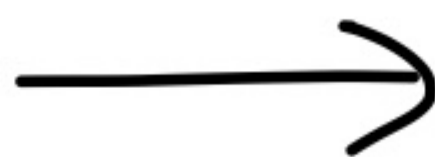
Syntax

```
print letters  
turn cijfers
```

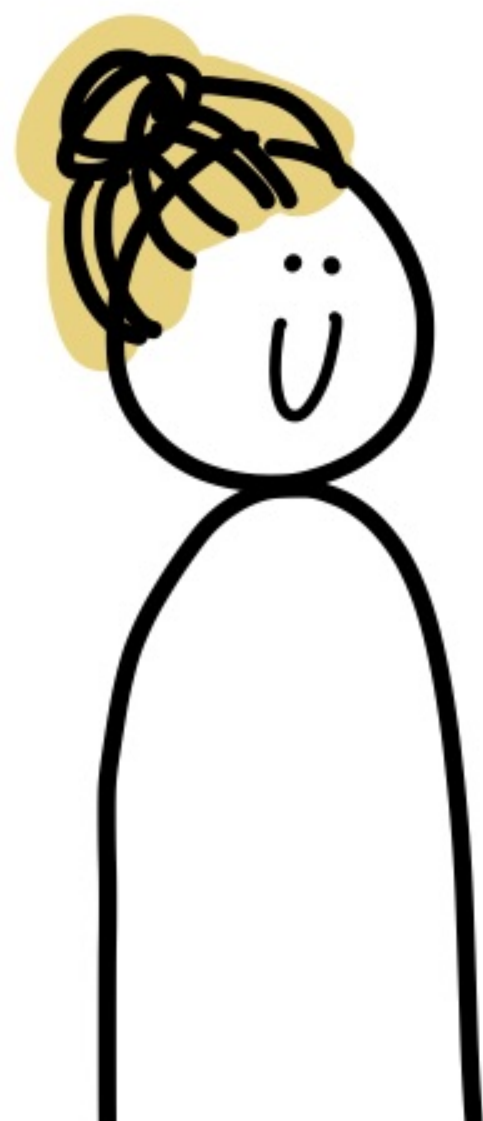
Hedy

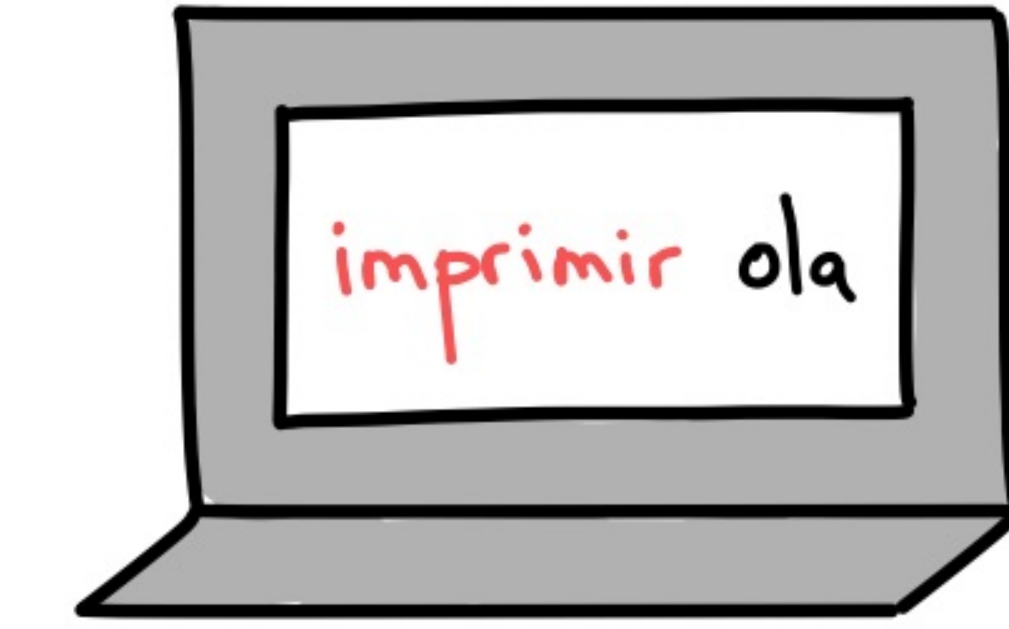
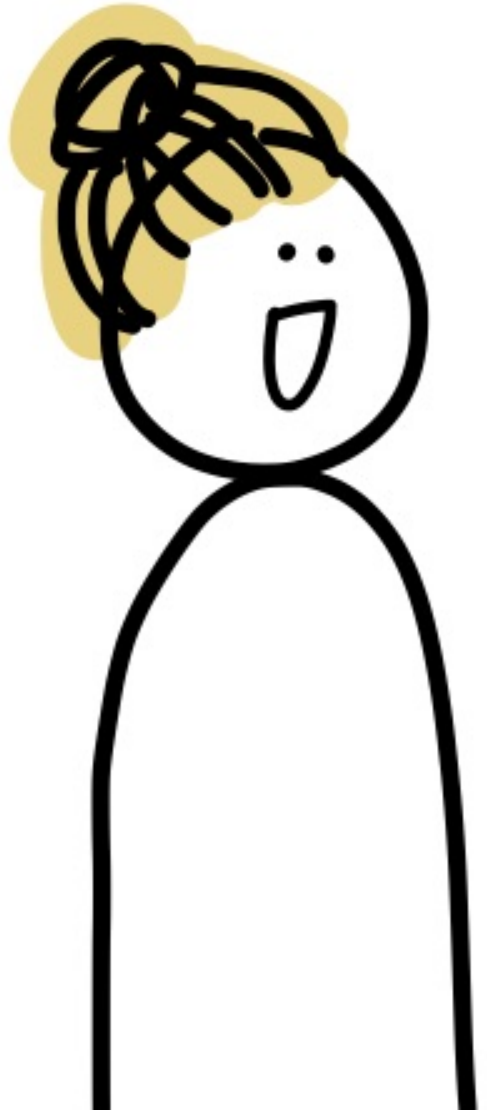
print hello
draai 120

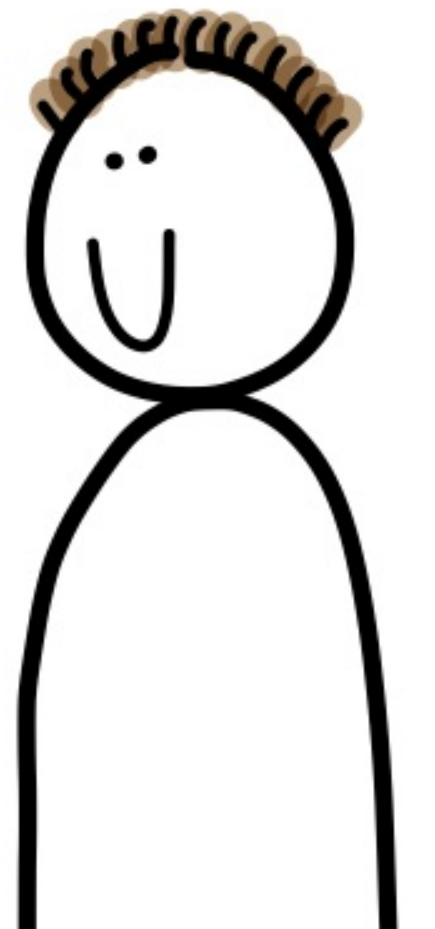
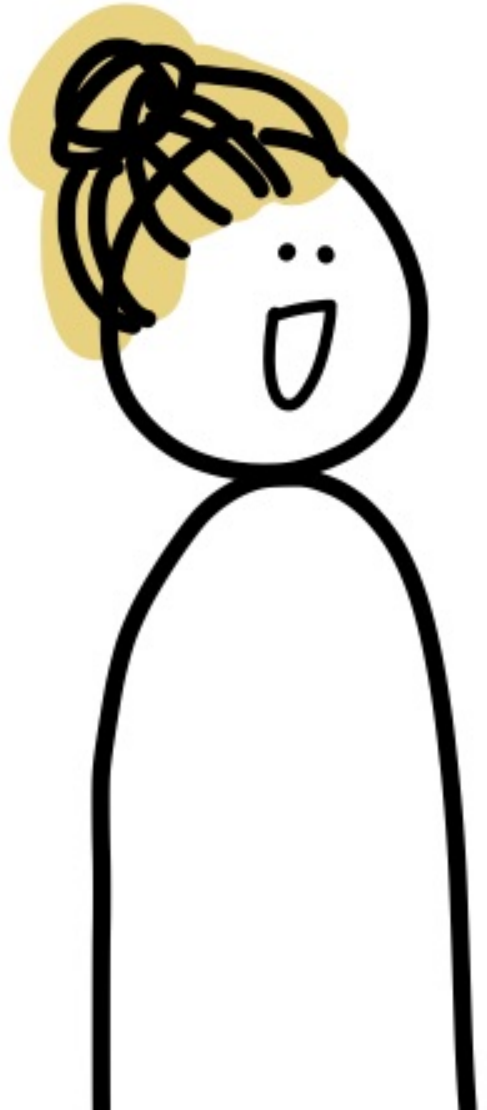


Syntax

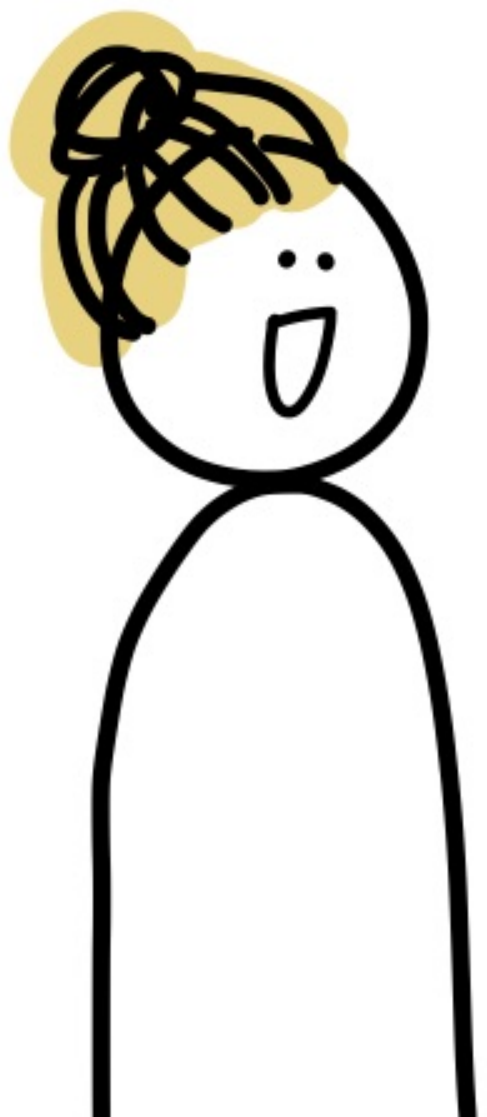
print letters
~~turn~~ draai cijfers





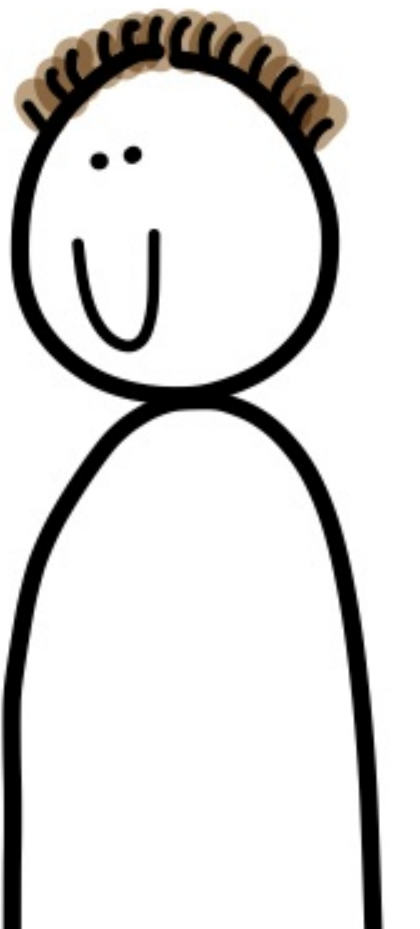
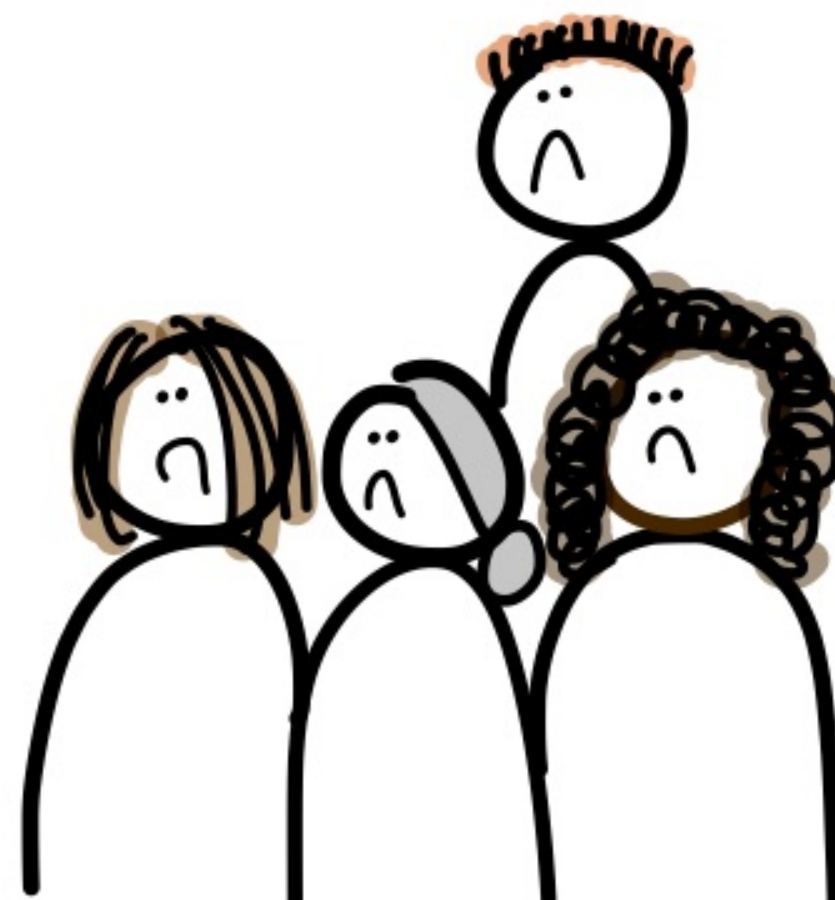
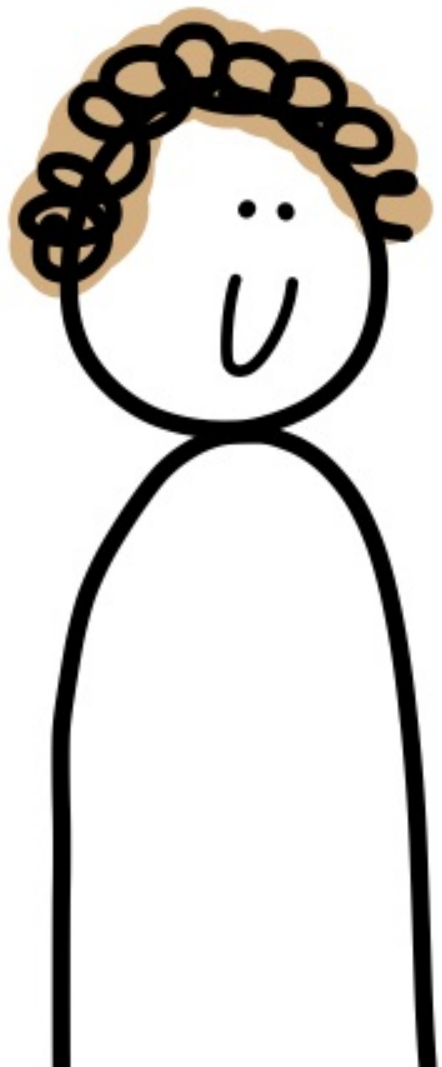


What about Arabic?



What about Arabic?

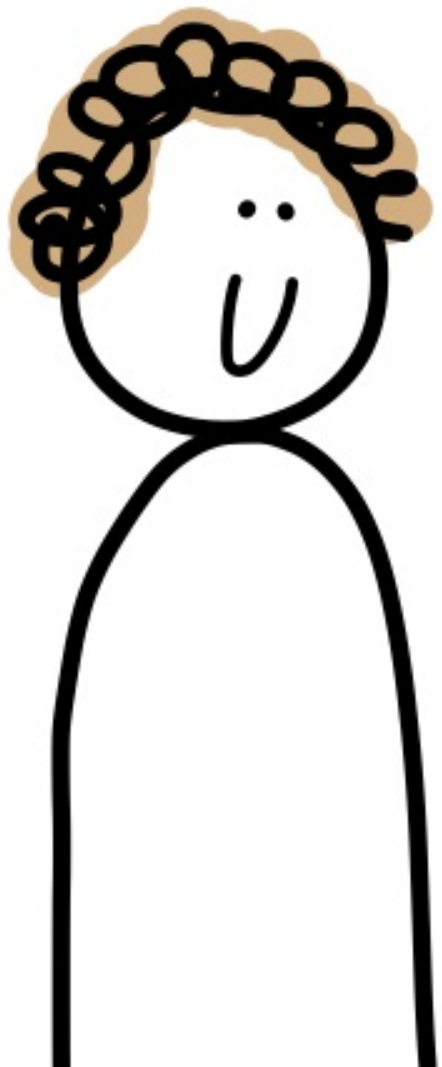
p..r..i..n..t



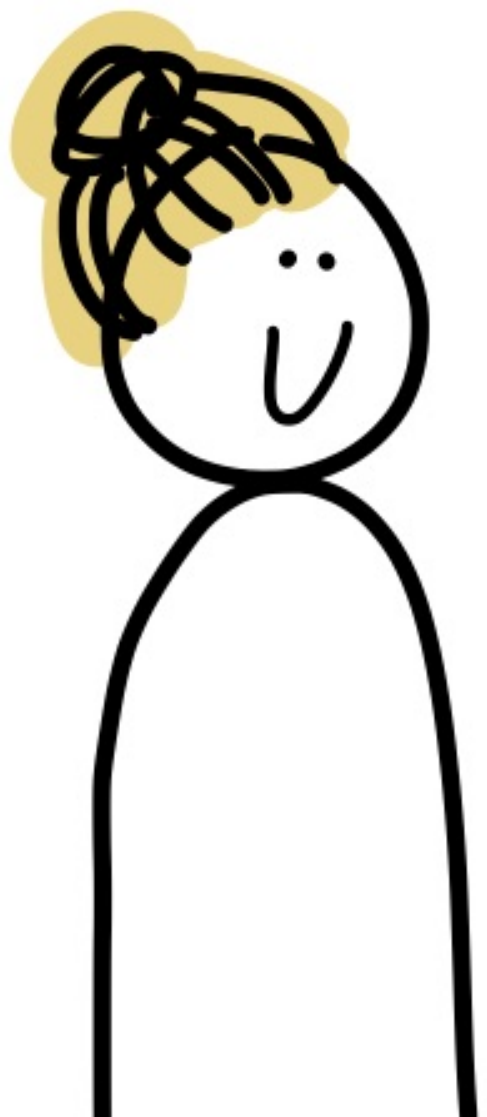
What about Arabic?

p..r..i..n..t

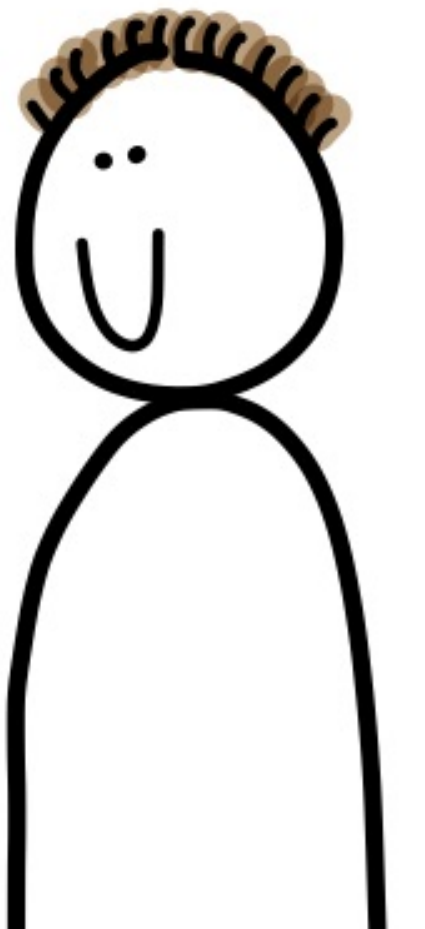
What is a p?



This is
easier to learn!

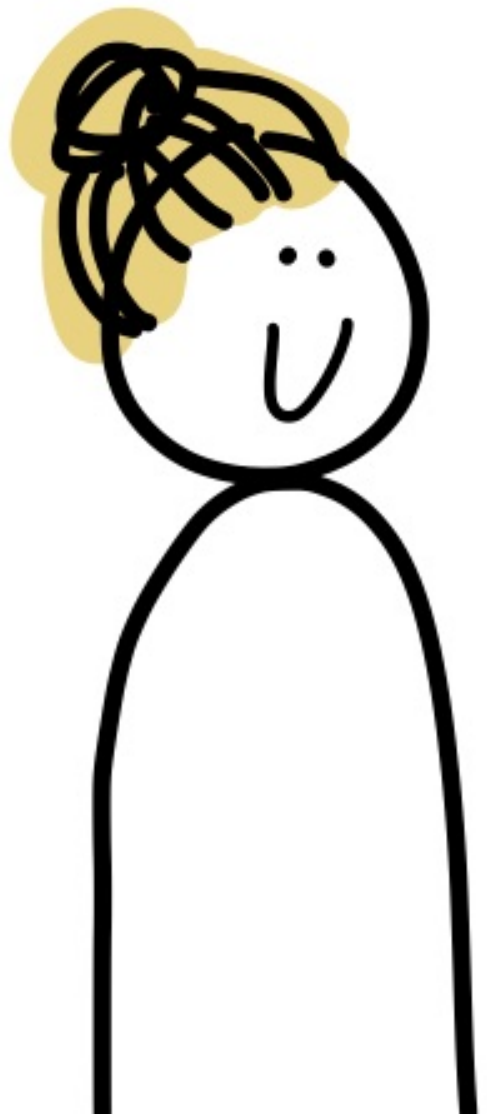


قول مرحبا !

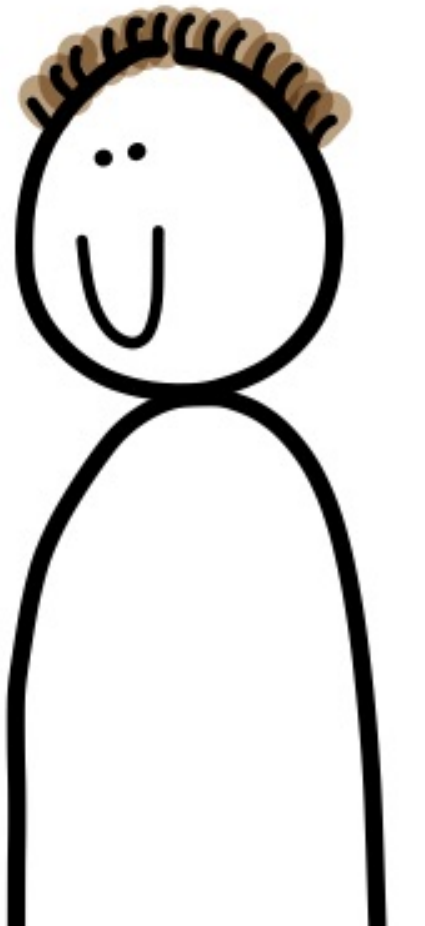


This is
easier to learn!

Yes and
easier to use!

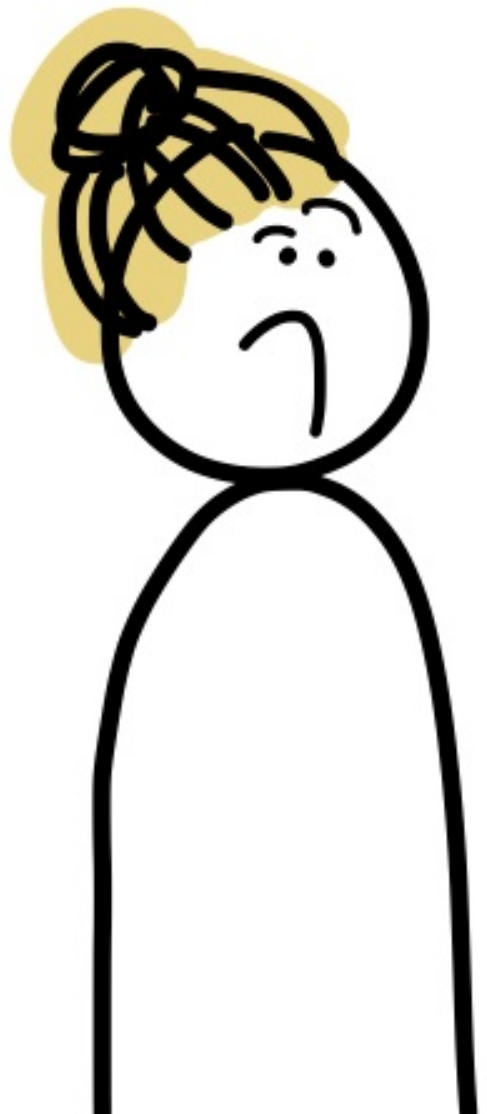


قول مرحبا !

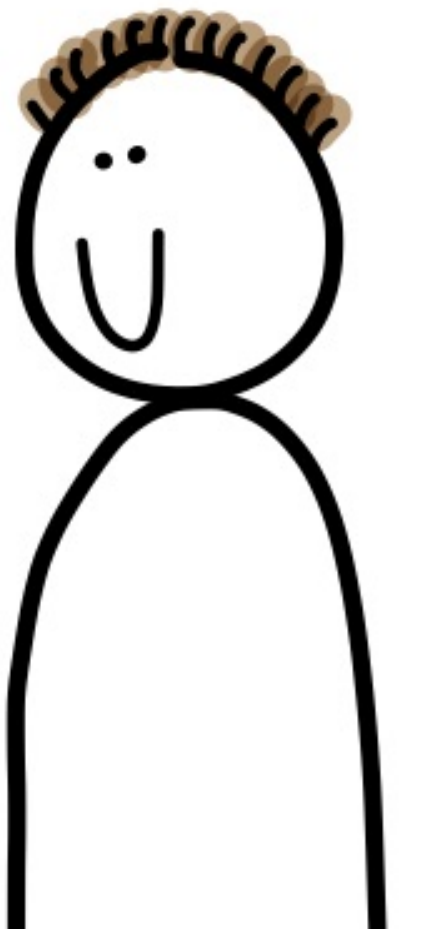


This is
easier to use?

Yes and
easier to use!

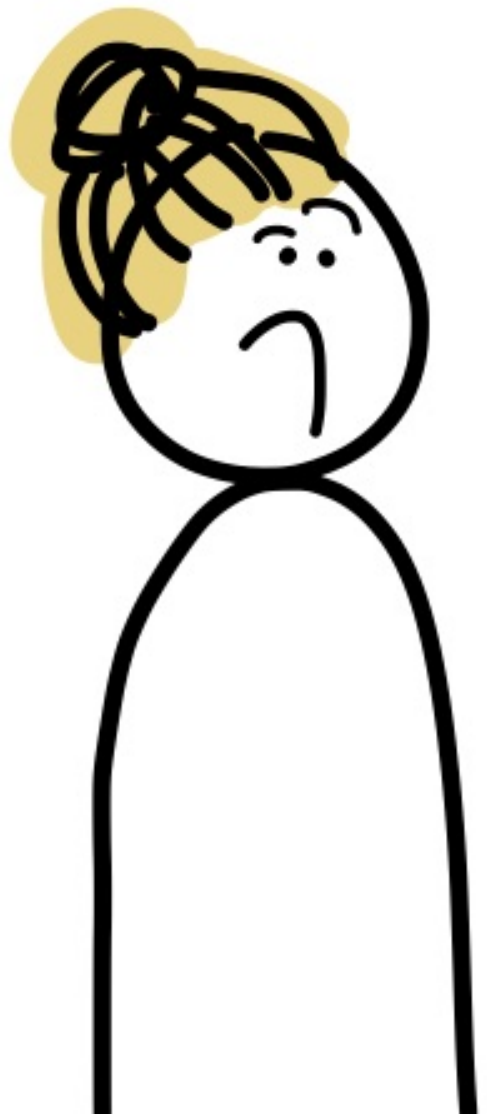


قول مرحبا!

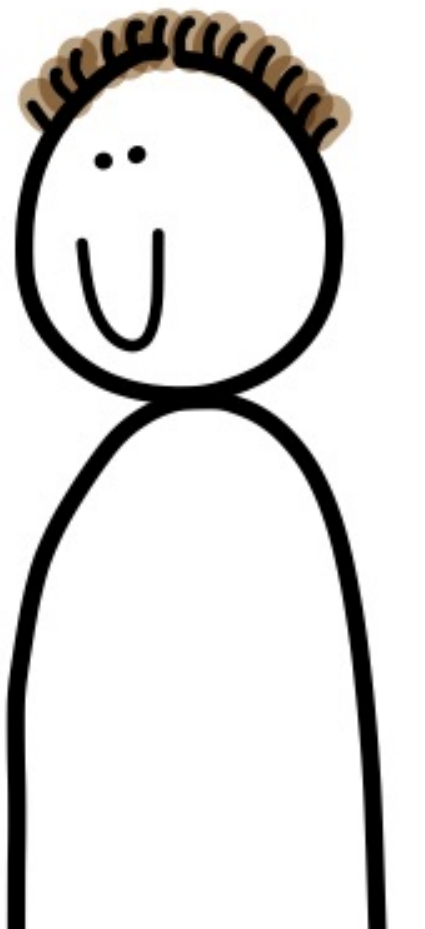


This is
easier to use?

Yes and
easier to use!

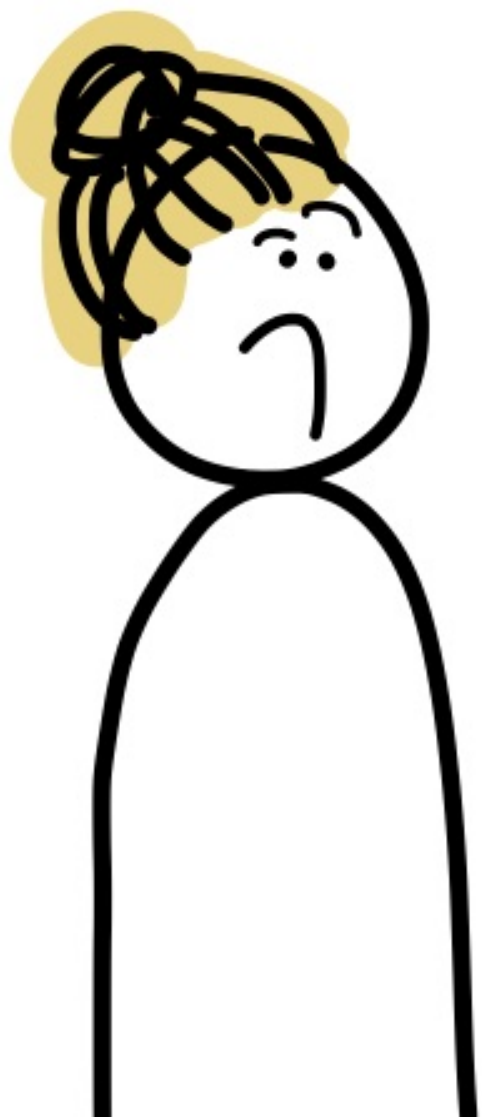


print مرحبا !



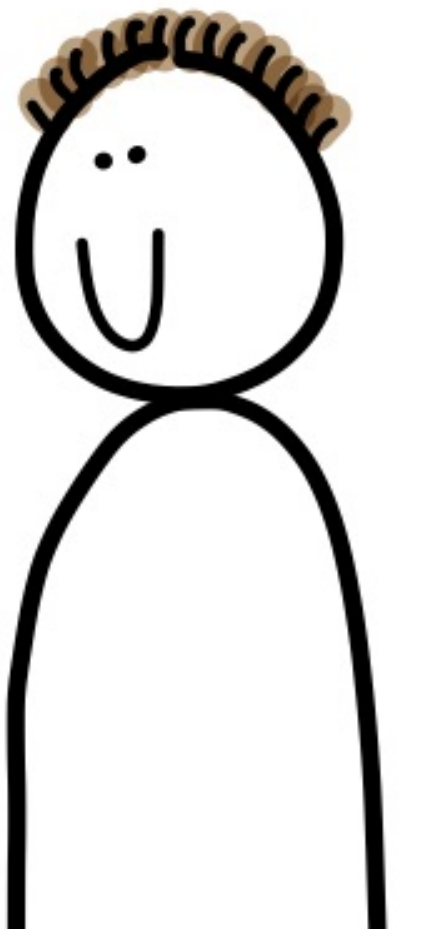
This is
easier to use?

Yes and
easier to use!



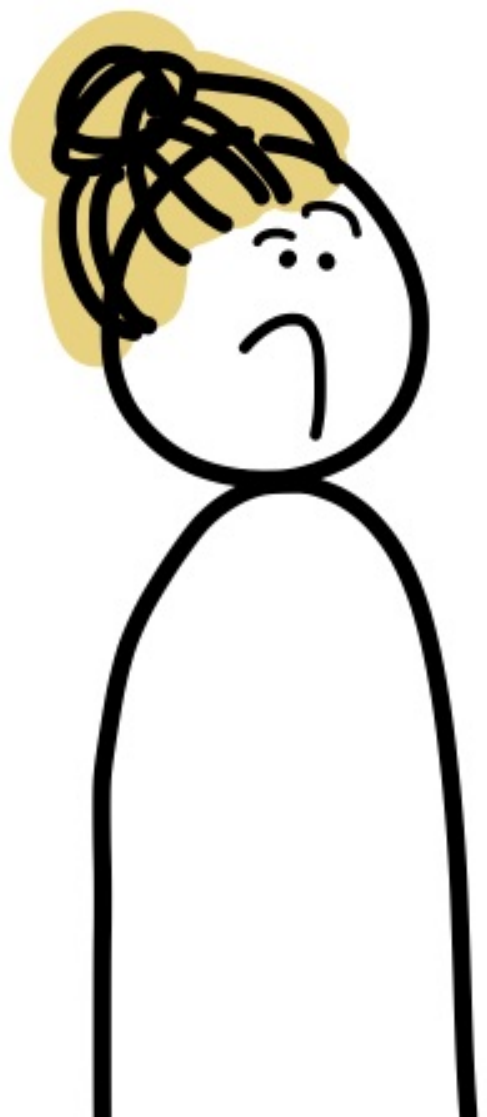
مرحبا !	print
---------	-------

English
keyboard



This is
easier to use?

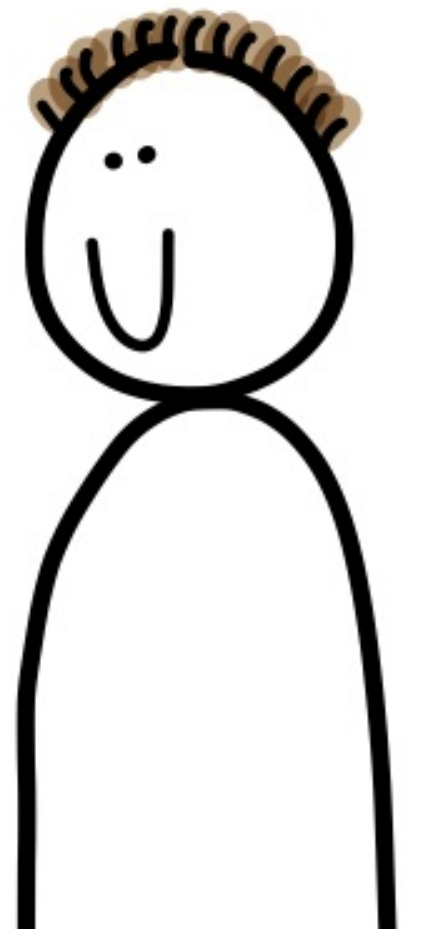
Yes and
easier to use!



مرحبا !	print
---------	-------

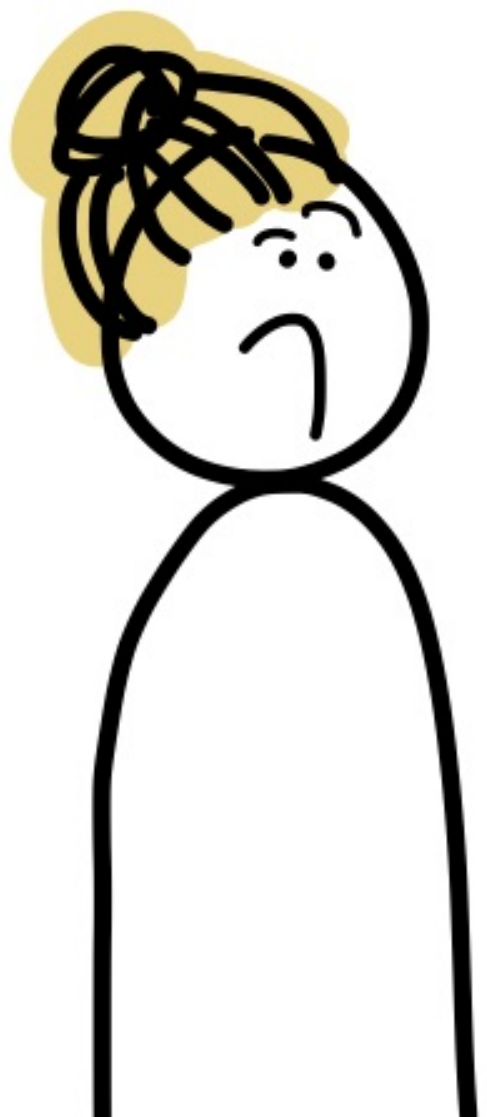
Arabic
keyboard

English
keyboard

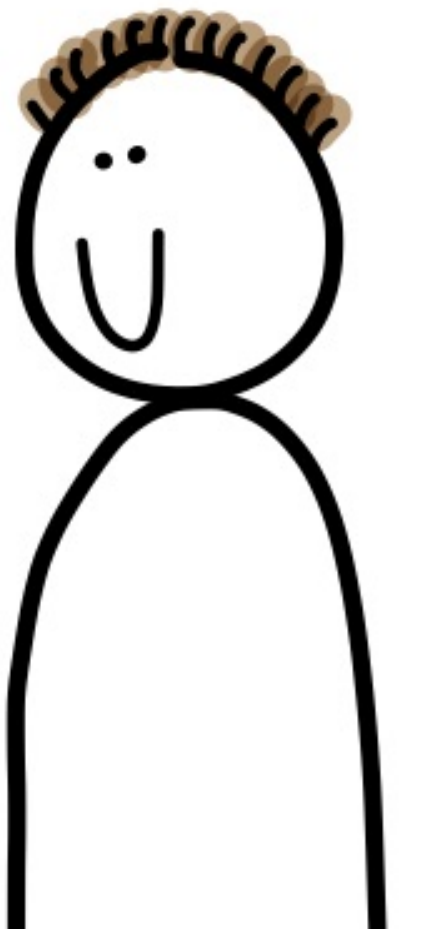


This is
easier to use?

Yes and
easier to use!

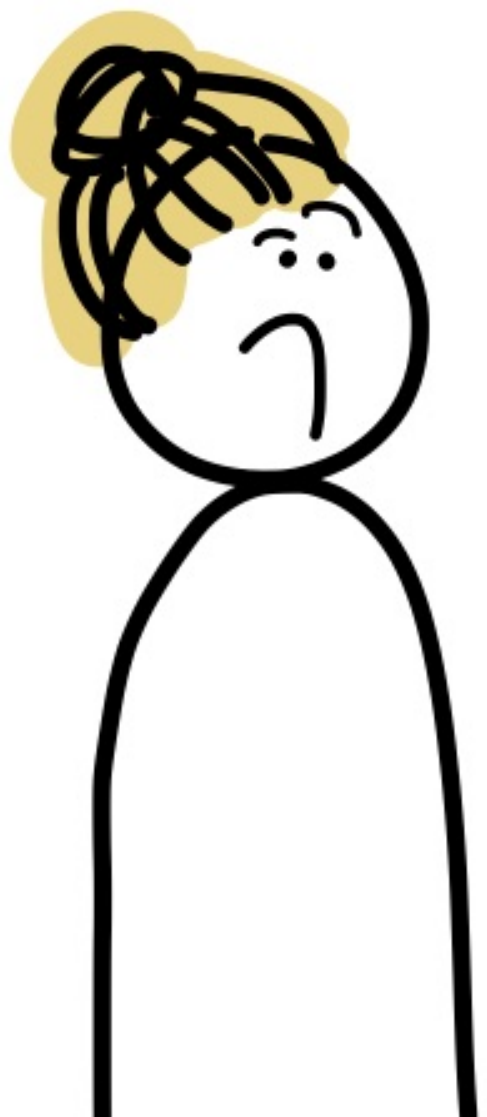


if اسمك is هيدي print "واو هذا رائع!"



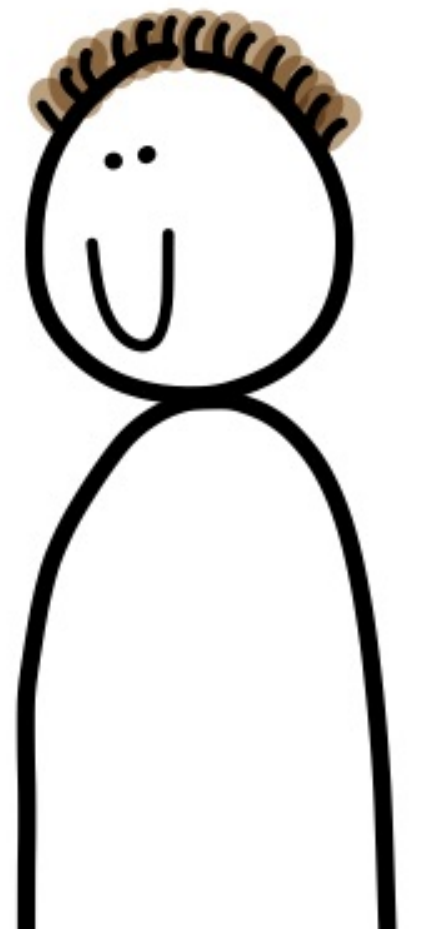
This is
easier to use?

Yes and
easier to use!



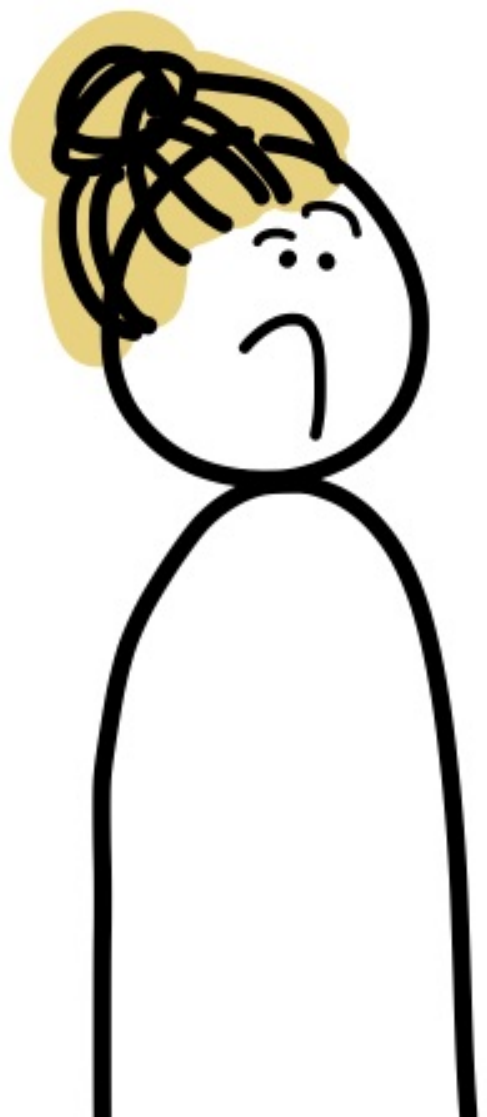
اسمك is هيدي print "واو هذا رائع!"

Ar | En

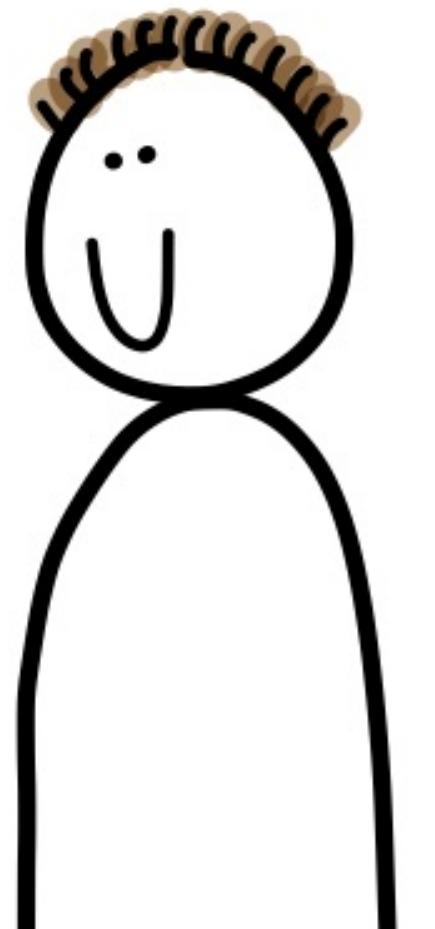


This is
easier to use?

Yes and
easier to use!

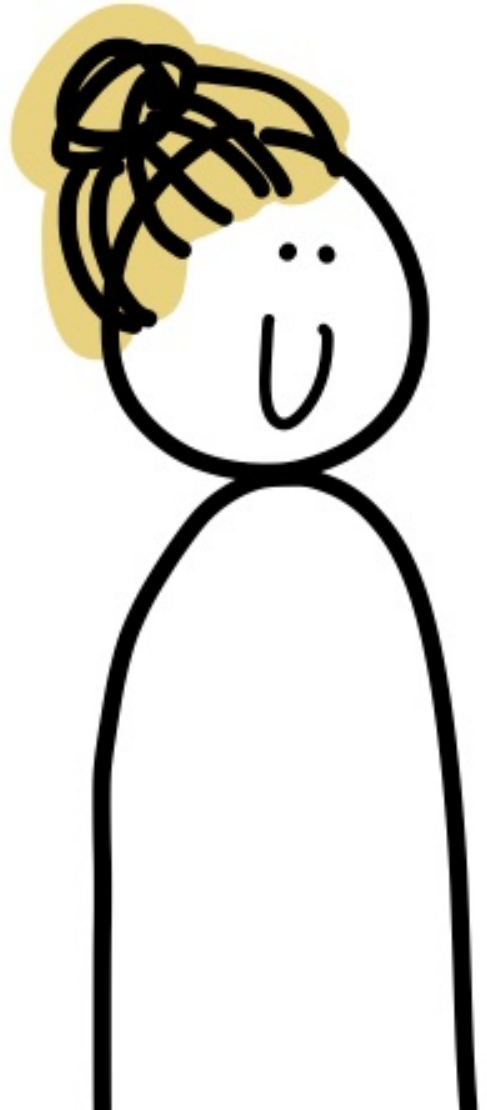


"واو هذا رائع!"	print	هيدي	is	اسمك	if
Ar	En	Ar	En	Ar	En



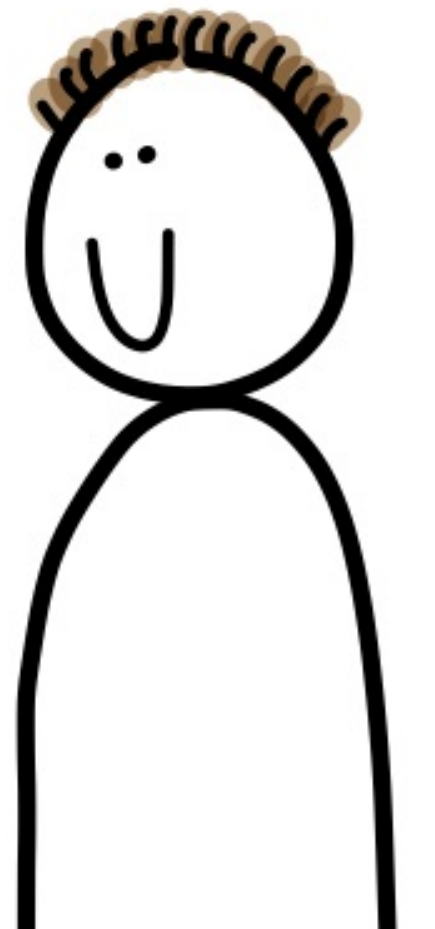
This is
easier to use !

Yes and
easier to use !

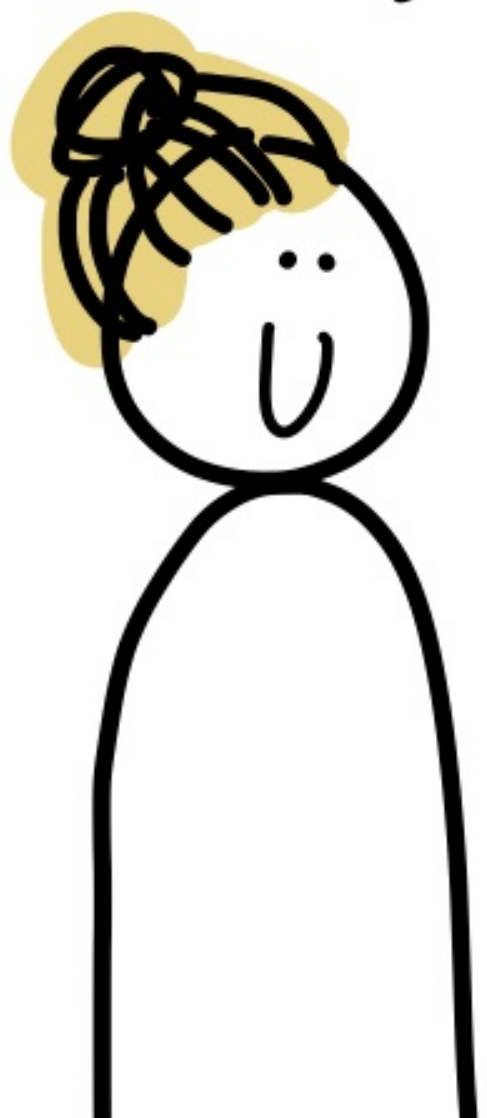


قول مرحبا !

One single
keyboard

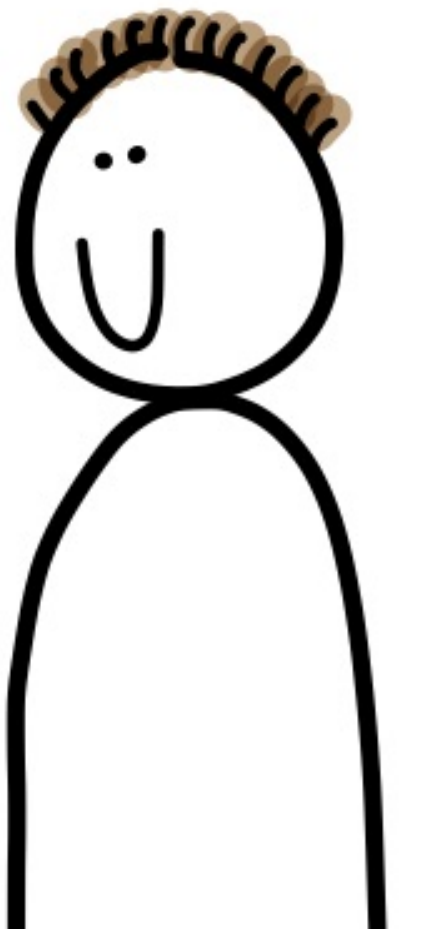


Argument in favor
of local keywords

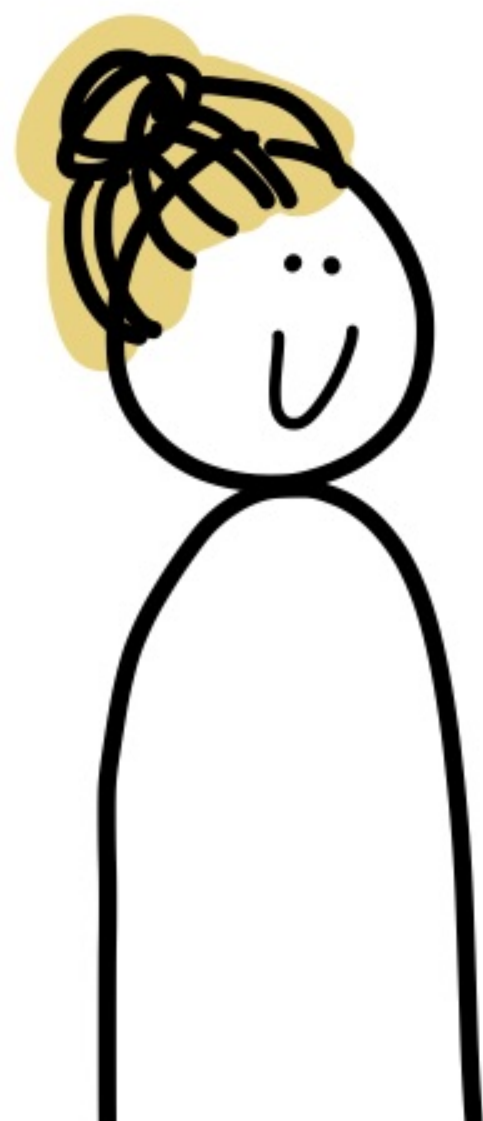


قول مرحبا!

One single
keyboard



Arabic letters?

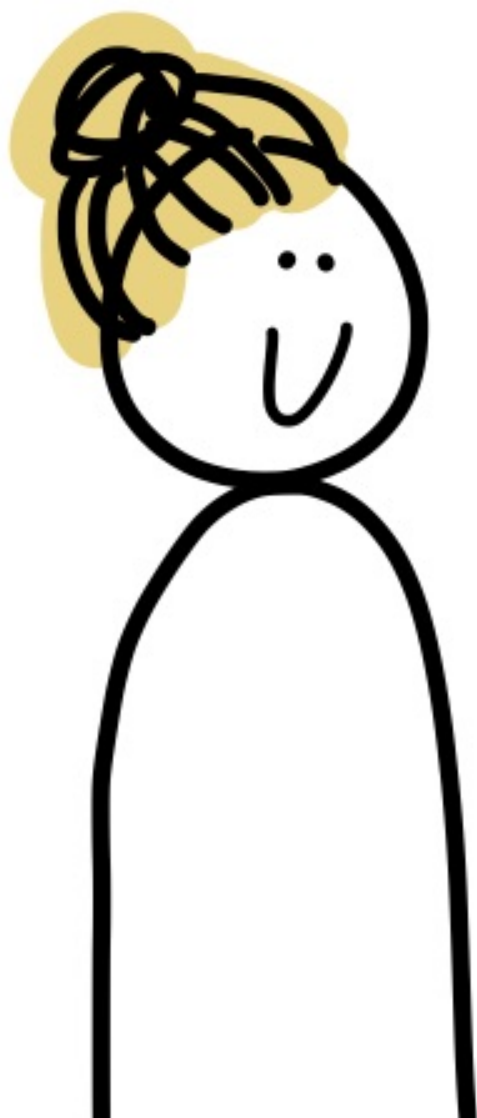


Arabic letters!

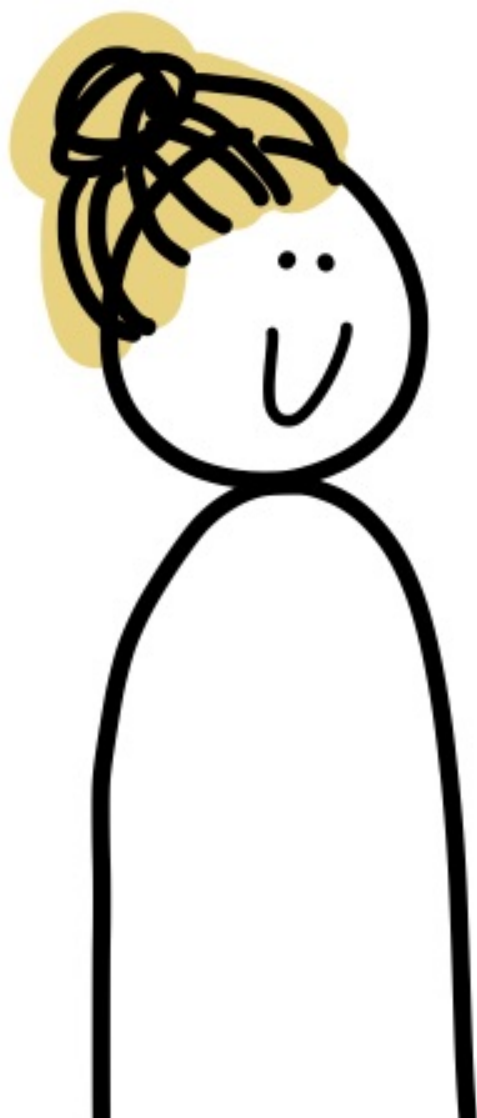
Hedy

print hello

استدر ١2٥



Arabic letters!



Hedy

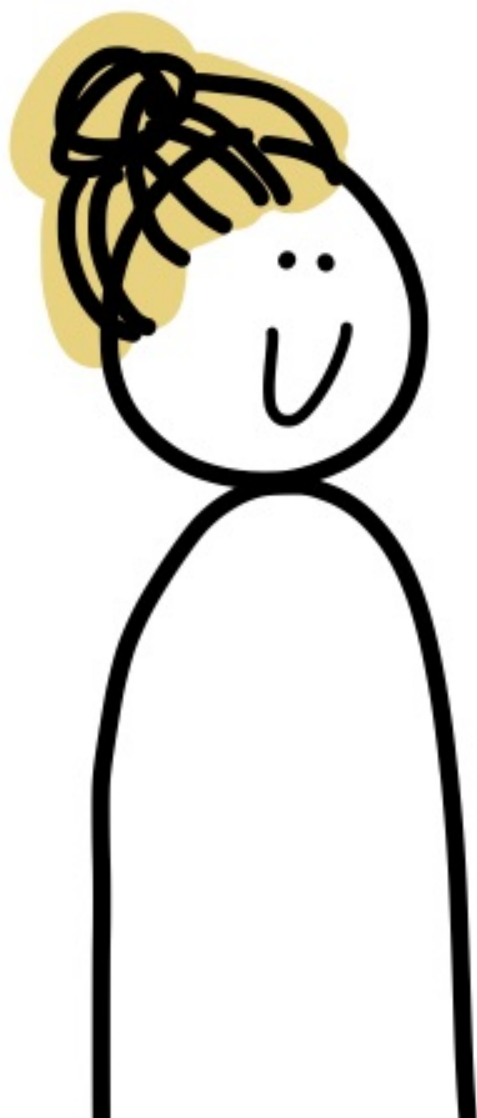
```
print hello  
استدر 120
```



Syntax

```
print letters  
turn digits
```

Arabic letters!



Hedy

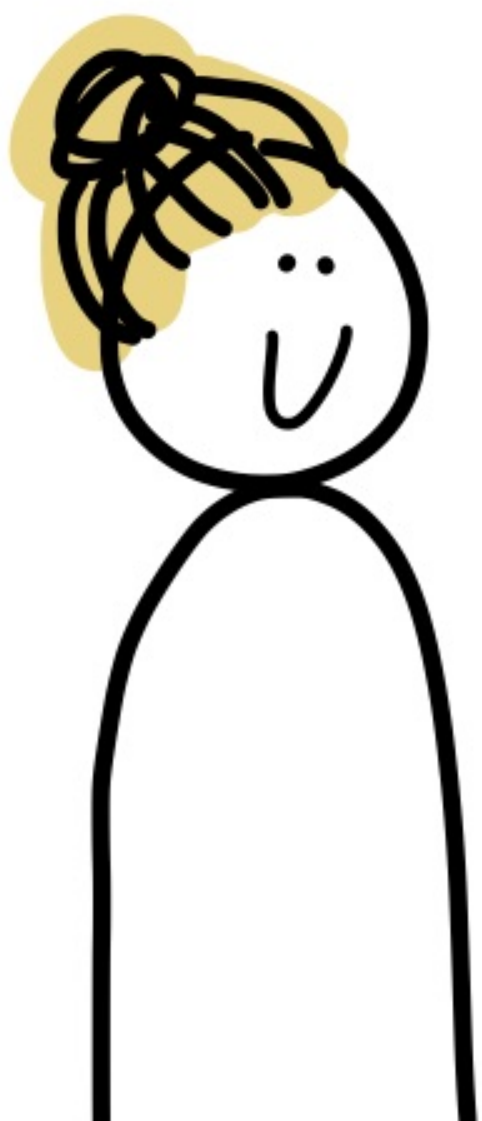
```
print hello  
استدر 120
```



Syntax

```
print letters  
استدر  
turn digits
```

Arabic letters!



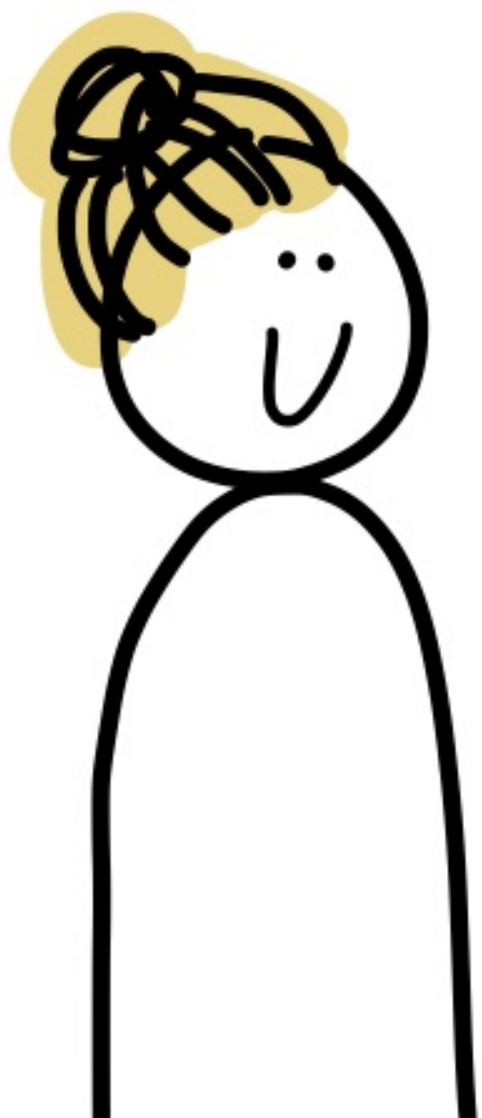
استدر	90	1
تقدم	100	2
استدر	90	3
تقدم	100	4
		5
		6

الذهاب الى المستوى 3

الرجوع الى المستوى 1

تنفيذ البرنامج

Arabic letters!



←

1
2
3
4
5
6

استدر 90
تقدم 100
استدر 90
تقدم 100

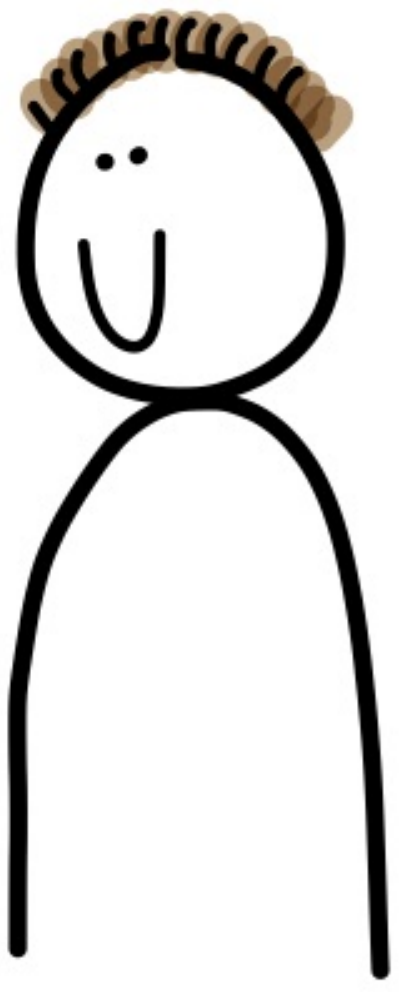
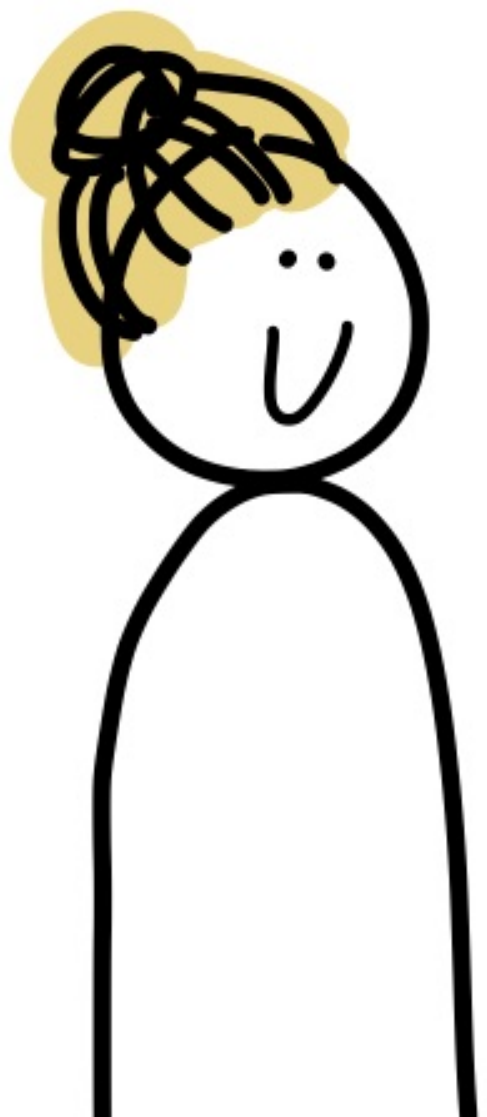
الذهاب الى المستوى 3

الرجوع الى المستوى 1

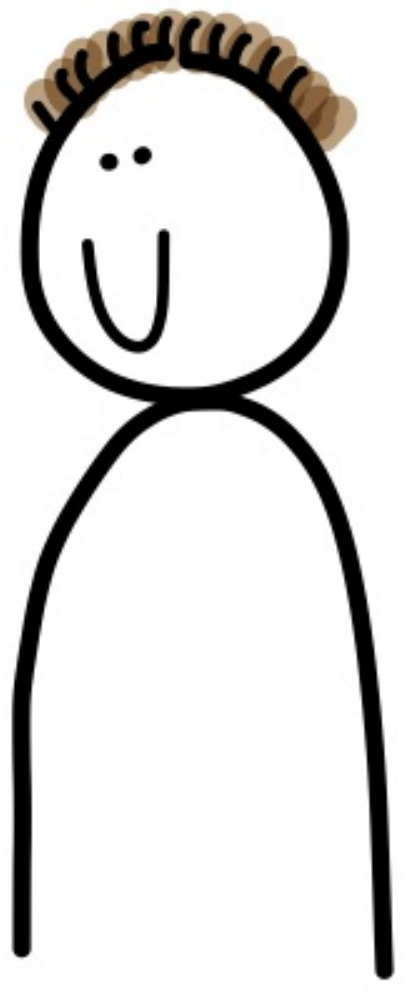
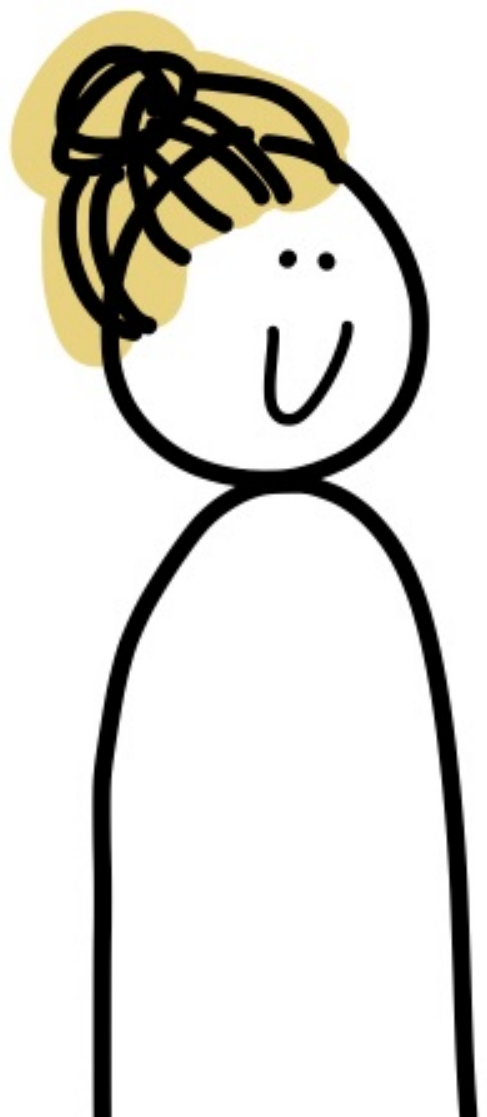
تنفيذ البرنامج

Can we add
Arabic numerals?

(

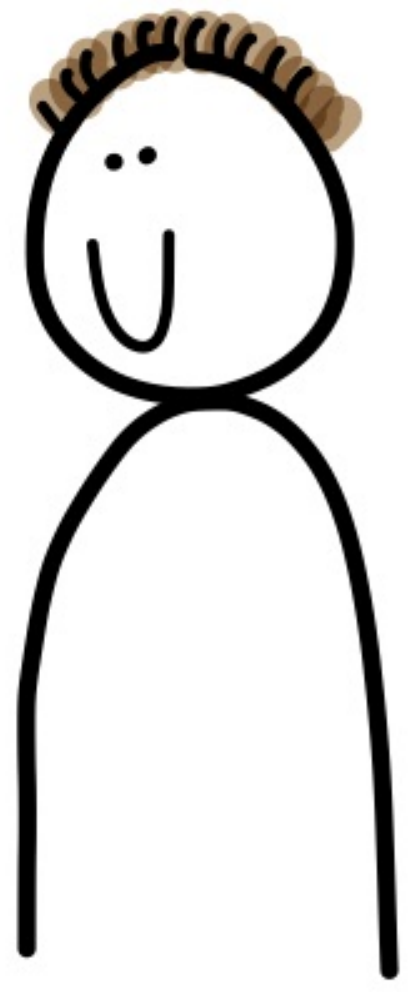
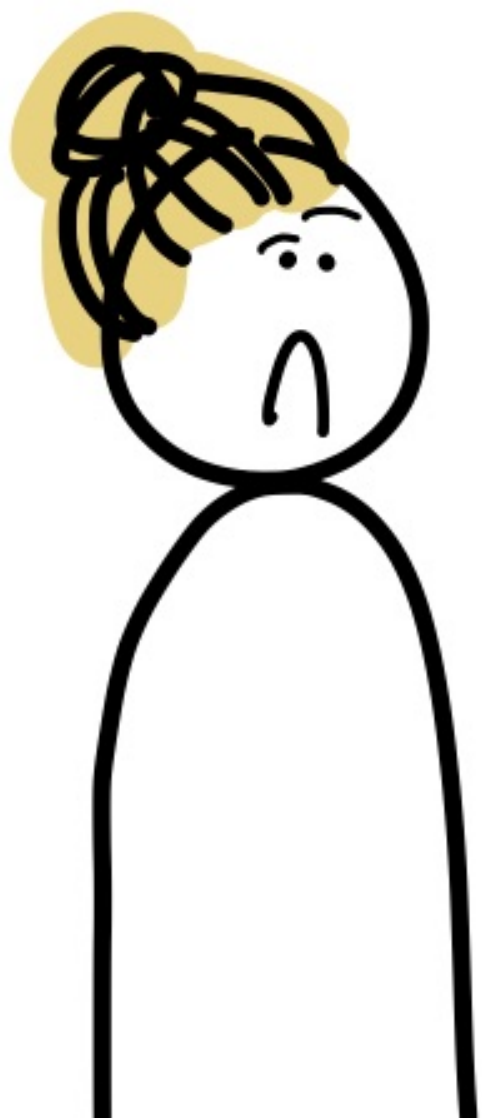


Can we add
Arabic numerals?



Can we add
Arabic numerals?

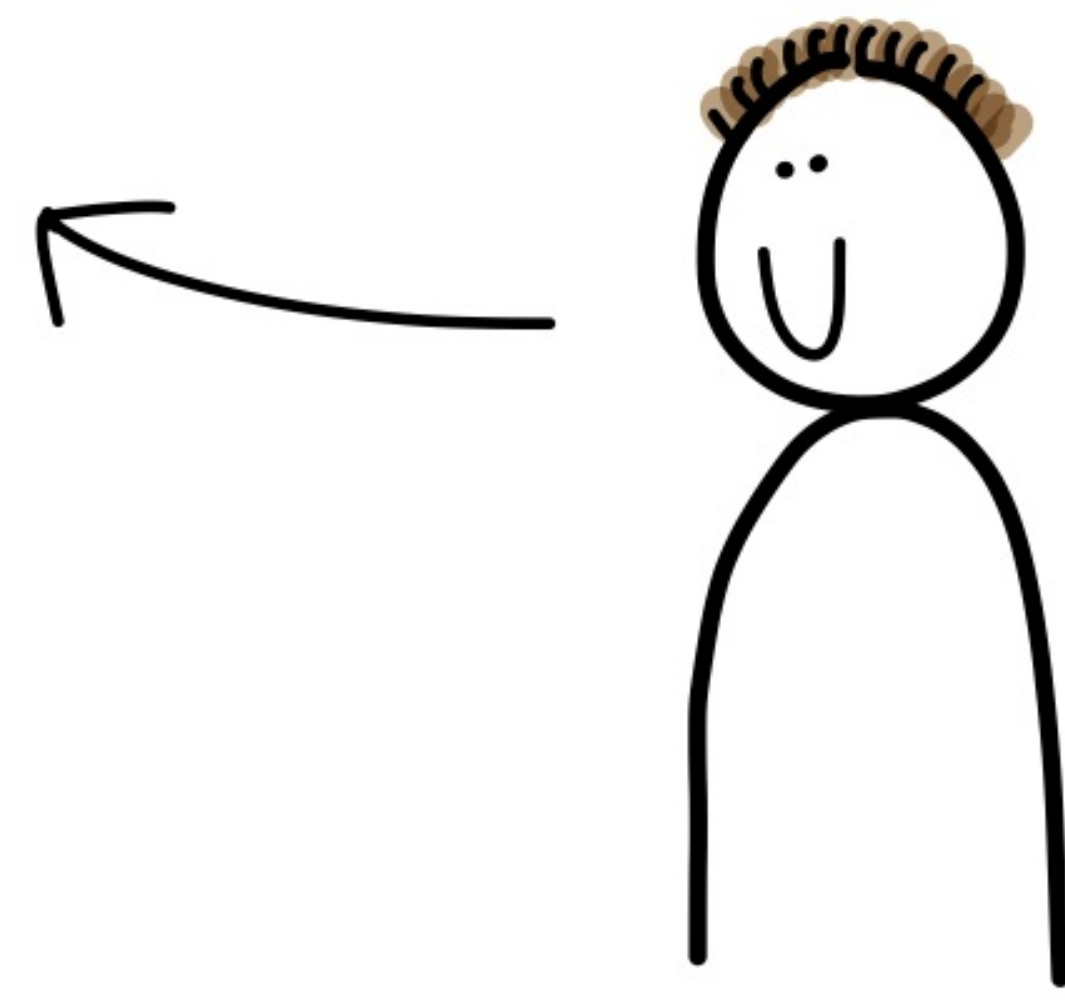
0 1 2 3 4 5 6 7 8 9



Can we add
Arabic numerals?

~~0~~ ~~1~~ ~~2~~ ~~3~~ ~~4~~ ~~5~~ ~~6~~ ~~7~~ ~~8~~ ~~9~~

. \ ˆ ˆ ε 0 7 v 1 9

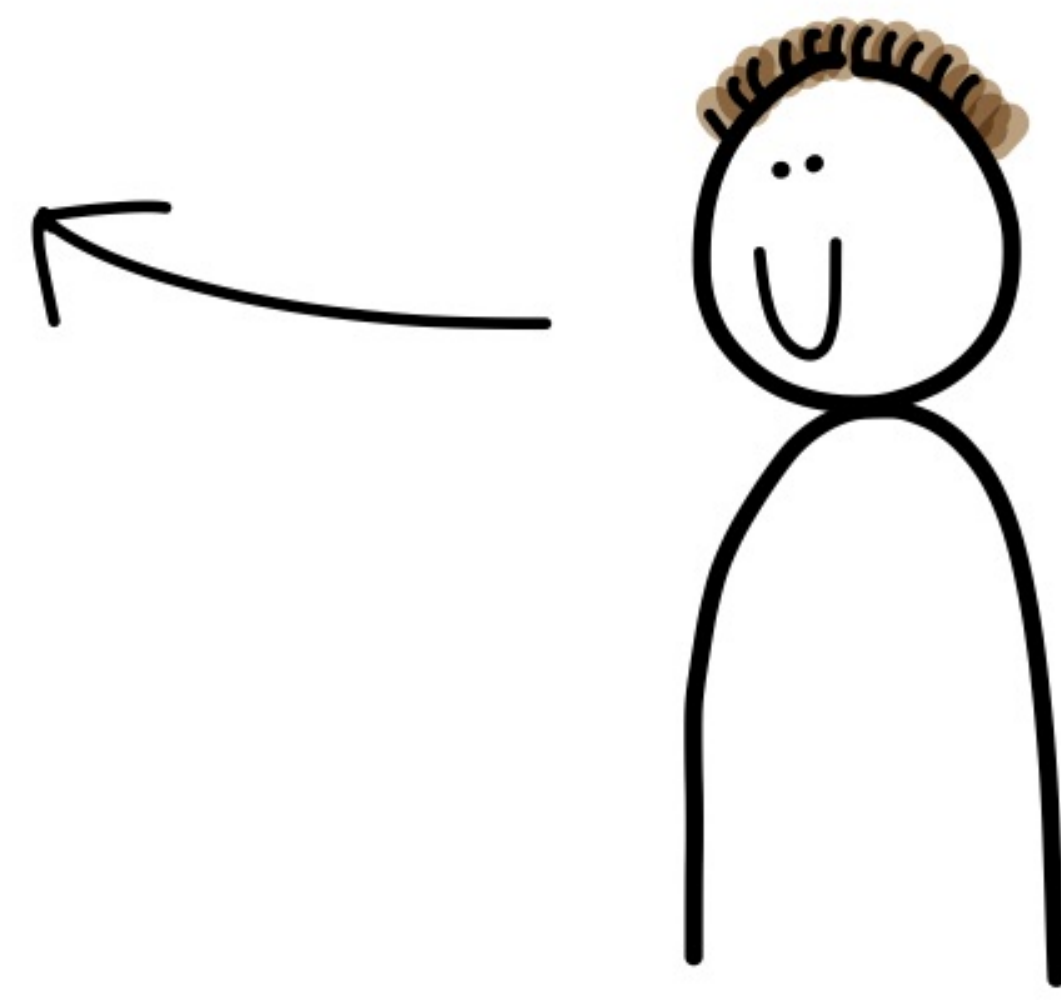
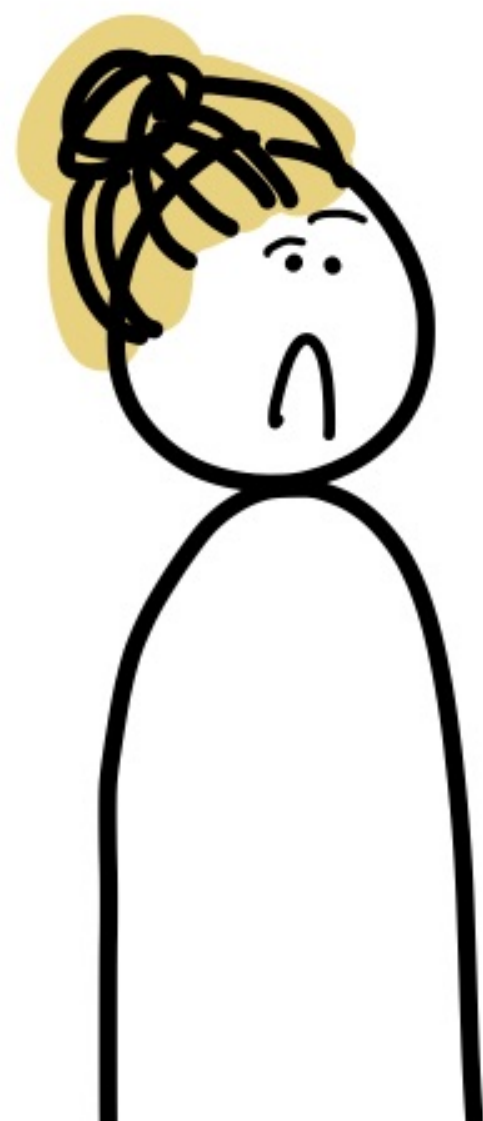


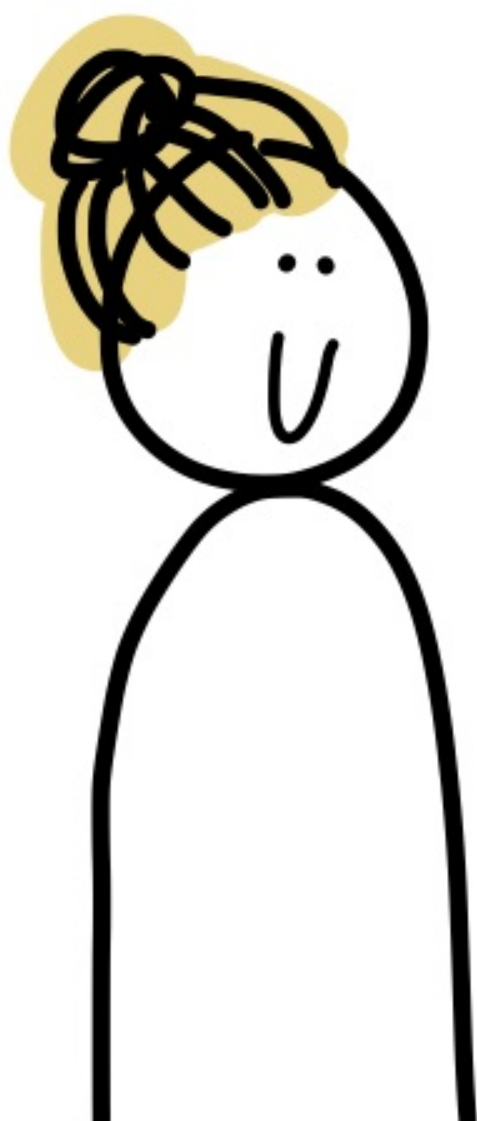
Wut?

Can we add
Arabic numerals?

~~0~~ ~~1~~ ~~2~~ ~~3~~ ~~4~~ ~~5~~ ~~6~~ ~~7~~ ~~8~~ ~~9~~

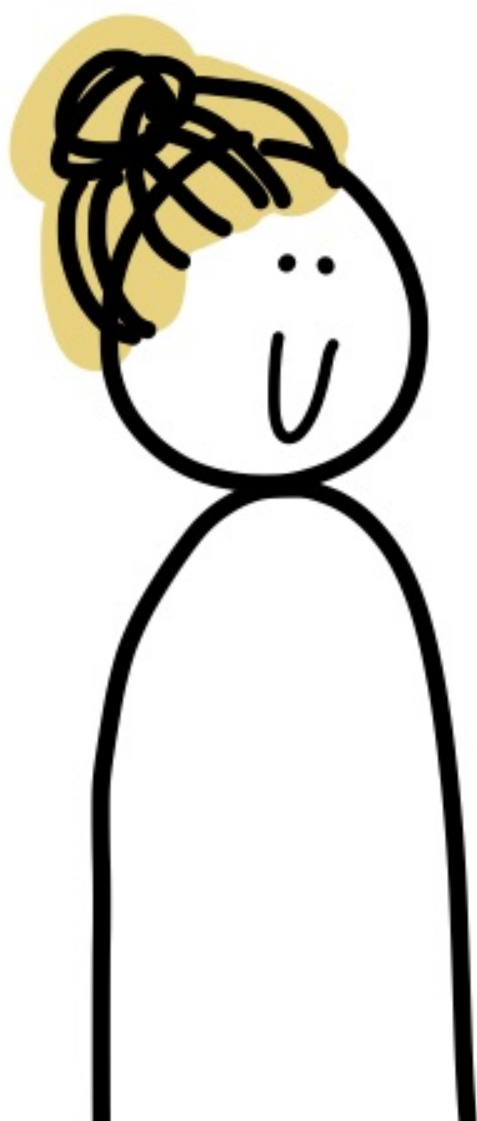
. \ ʼ ʹ ε 0 7 v 1 9





```
main.py × + ⋮
main.py
1 print(2+9)
2

>_ Console × ⌵ Shell + ⋮
11
> □
```



```
main.py × + ⋮
main.py
1 print(2+9)
2

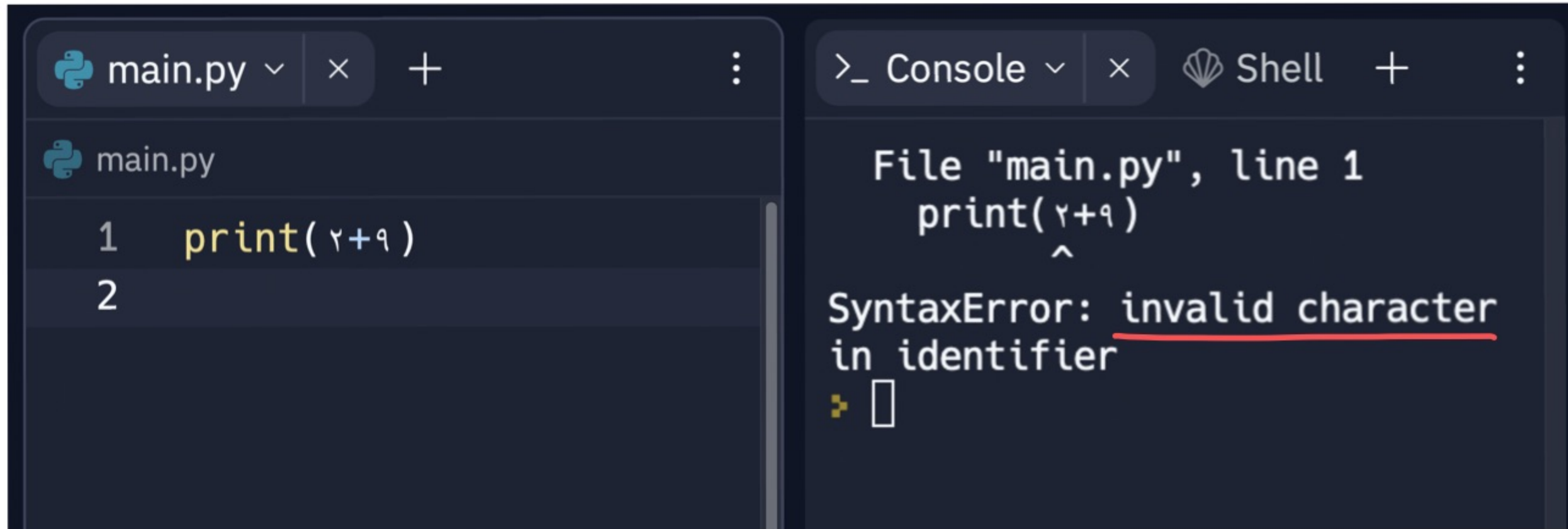
>_ Console × ⌵ Shell + ⋮
11
> □
```




```
main.py × + ⋮
main.py
1 print(ʎ+9)
2

>_ Console × ⚙ Shell + ⋮
File "main.py", line 1
    print(ʎ+9)
          ^
SyntaxError: invalid character
in identifier
> □
```


Miranda Fricker



The screenshot shows a Python IDE with two panels. The left panel, titled 'main.py', contains the following code:

```
1 print(ʎ+9)
2
```

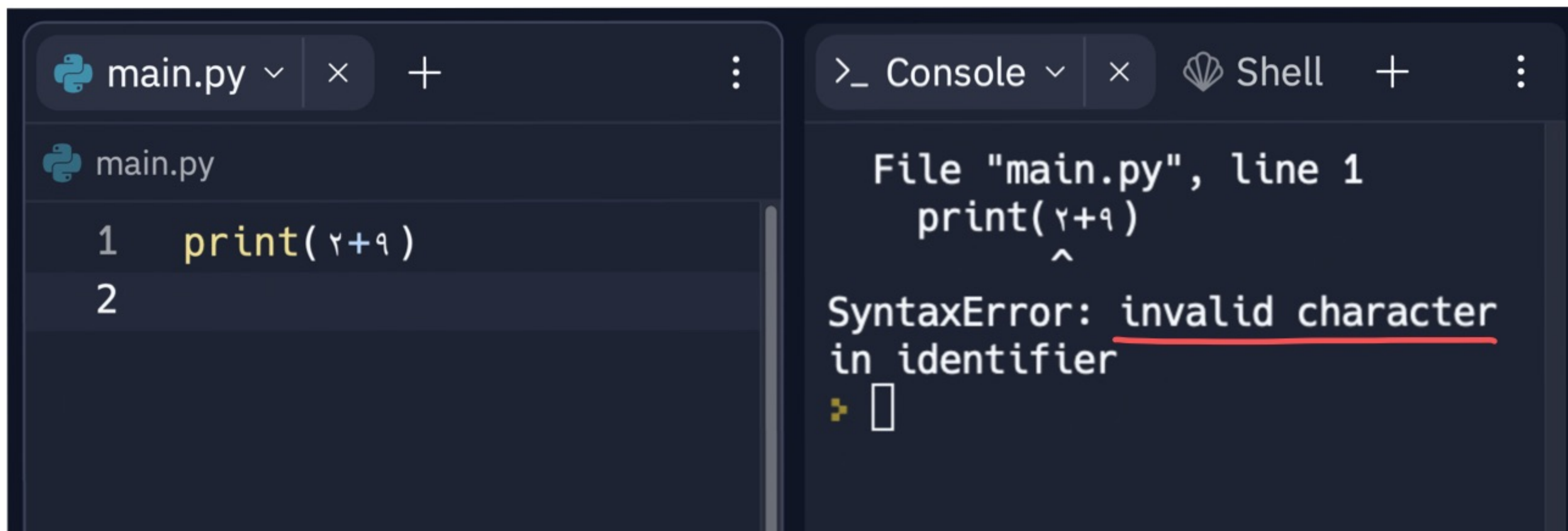
The right panel, titled '>_ Console', shows the output of the code execution:

```
File "main.py", line 1
    print(ʎ+9)
          ^
SyntaxError: invalid character
in identifier
>
```

An arrow points from the name 'Miranda Fricker' to the right panel of the IDE.



This is epistemic injustice



The screenshot shows a code editor with two panels. The left panel, titled 'main.py', contains the following code:

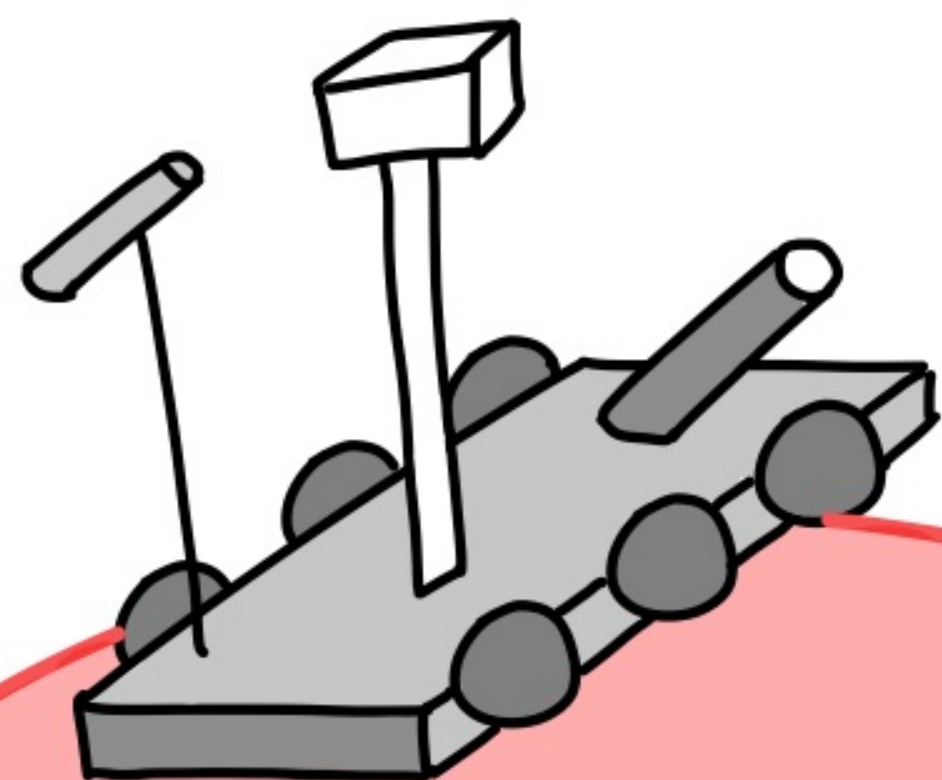
```
1 print(2+9)
2
```

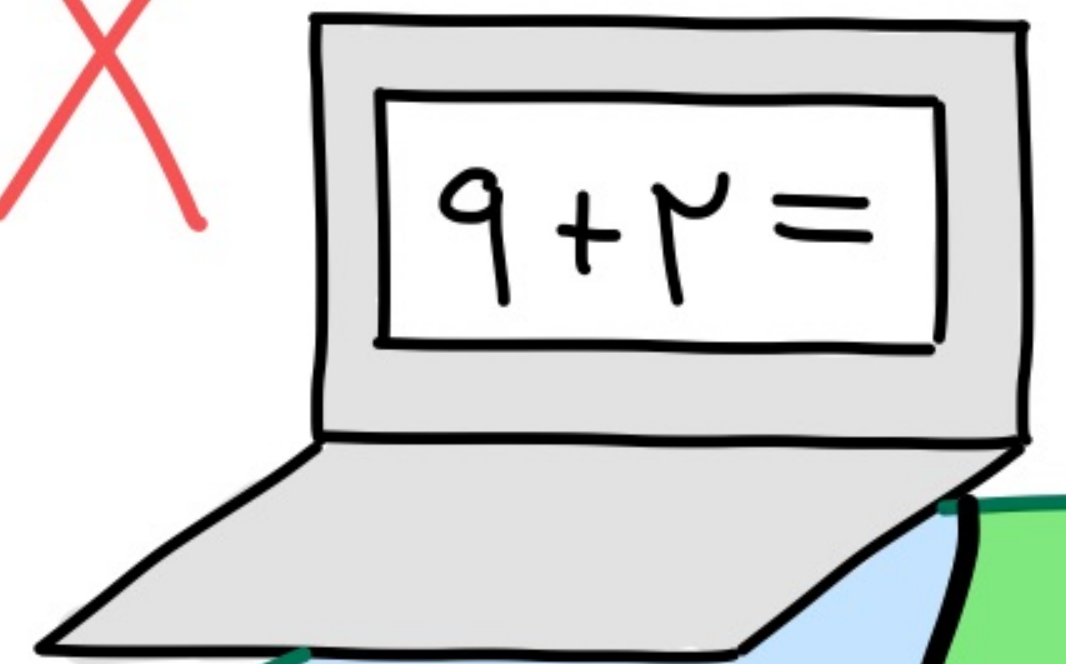
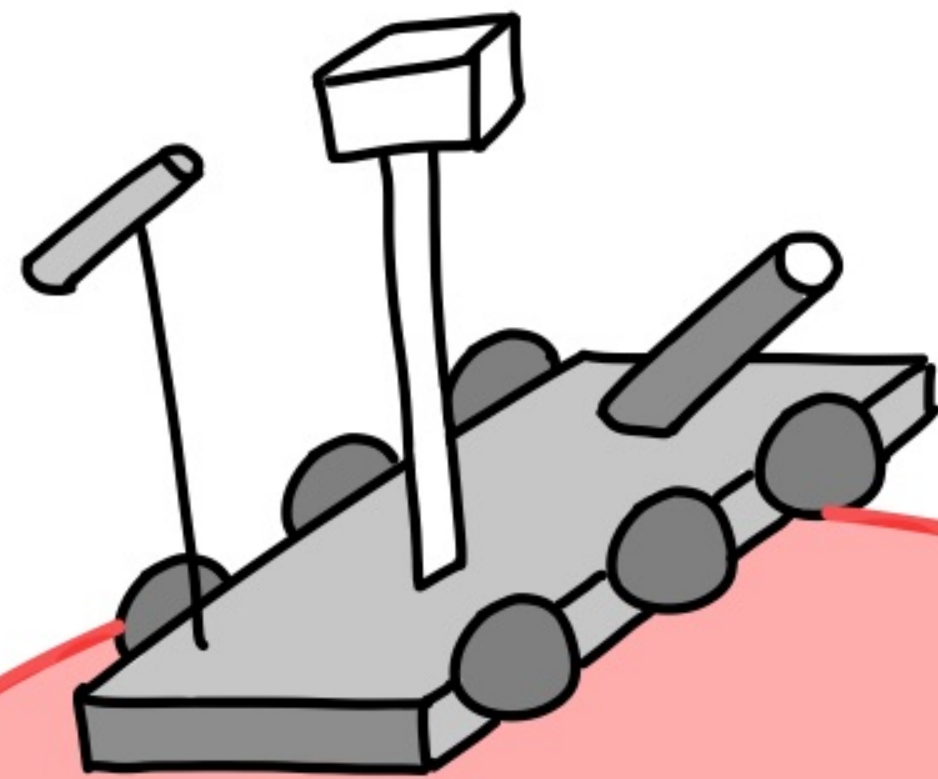
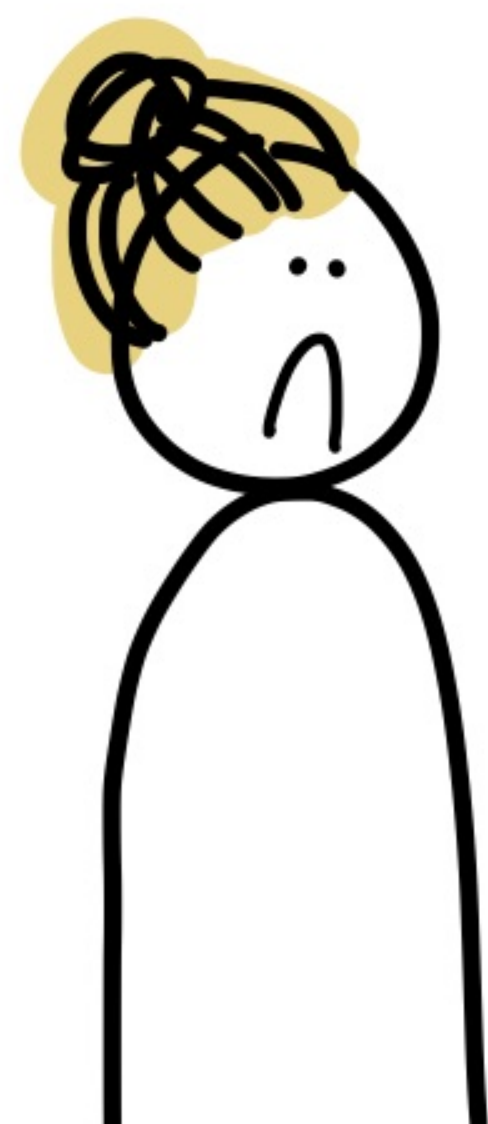
The right panel, titled '>_ Console', shows the output of the code execution:

```
File "main.py", line 1
    print(2+9)
          ^
SyntaxError: invalid character
in identifier
>
```

A line from the text 'This is epistemic injustice' points to the error message in the console.







Arabic_numerals_c

main.c

main.c

```
1 #include <stdio.h>
2
3 int main(void) {
4     printf(٩+٢);
5     return 0;
6 }
```

2. C

Console

Shell

Run

676ms on 12:22:00, 10/24 ✓

٢+٩

Run

15s on 12:22:07, 10/24 ●

```
./main.c:4:10: error: use of undeclared identifier '٢'
    printf(٢+٩);
           ^
./main.c:4:13: error: use of undeclared identifier '٩'
    printf(٢+٩);
           ^
```

2 errors generated.
make: *** [Makefile:10: main] Error 1

ArabicnumeralsC



Deploy



main.cpp

```
main.cpp
3 int main() {
4     std::cout << ٩+٢;
5 }
```

Console Shell

Run 14s on 12:25:01, 10/24

```
./main.cpp:4:16: error: use of undeclared identifier '٢'
    std::cout << ٢+٩;
                  ^
./main.cpp:4:19: error: use of undeclared identifier '٩'
    std::cout << ٢+٩;
                  ^
2 errors generated.
make: *** [Makefile:10: main] Error 1
```

3. C++

Main.java

Main.java

```
2 public static void main(String[] args) {  
3     System.out.println(٩+٢);  
4 }  
5 }
```

Console Shell

Run 12s on 14:43:20, 10/24

```
./Main.java:3: error: illegal non-ASCII digit  
    System.out.println(٢+٩);  
                        ^  
./Main.java:3: error: illegal non-ASCII digit  
    System.out.println(٢+٩);  
                        ^
```

2 errors

4. Java

Arabic_numerals_C# (1)



Deploy



main.cs

main.cs

```
1 using System;
2
3 class Program {
4     public static void Main (string[] args) {
5         Console.WriteLine(٩+٢);
6     }
7 }
```

5. C#

Console

Shell

Run

12s on 14:44:37, 10/24

```
/home/runner/ArabicnumeralsC-1/main.cs(5,23): error CS1056: Unexpected character '٢' [/home/runner/ArabicnumeralsC-1/main.csproj]
/home/runner/ArabicnumeralsC-1/main.cs(5,25): error CS1525: Invalid expression term '' [/home/runner/ArabicnumeralsC-1/main.csproj]
/home/runner/ArabicnumeralsC-1/main.cs(5,25): error CS1056: Unexpected character '٩' [/home/runner/ArabicnumeralsC-1/main.csproj]
```

The build failed. Fix the build errors and run a gain.

6. Javascript

```
1 console.log(٩+٢)
```

```
>_ Console × Shell × +
Run 371ms on 12:23:08, 10/24 ⚠

/home/runner/Arabicnumeralsjs/index.js:1
console.log(٢+٩)

SyntaxError: Invalid or unexpected token
    at internalCompileFunction (node:internal/vm
:73:18)
    at wrapSafe (node:internal/modules/cjs/load
er:1178:20)
    at Module._compile (node:internal/modules/cj
s/loader:1220:27)
    at Module._extensions..js (node:internal/mod
ules/cjs/loader:1310:10)
    at Module.load (node:internal/modules/cjs/lo
ader:1119:32)
    at Module._load (node:internal/modules/cjs/l
oader:960:12)
    at Function.executeUserEntryPoint [as runMai
n] (node:internal/modules/run_main:81:12)
    at node:internal/main/run_main_module:23:47

Node.js v18.16.1
```

```
main.vb
1 Module HelloWorld
2   Sub Main()
3     System.Console.WriteLine(٩+٢)
4   End Sub
5 End Module
```

Console Shell

Run 39s on 14:47:01, 10/24

```
/home/runner/ArabicnumeralsVB/main.vb(3,38): error BC30201: Expression expected. [/home/runner/ArabicnumeralsVB/main.vbproj]
/home/runner/ArabicnumeralsVB/main.vb(3,38): error BC30037: Character is not valid. [/home/runner/ArabicnumeralsVB/main.vbproj]
/home/runner/ArabicnumeralsVB/main.vb(3,40): error BC30037: Character is not valid. [/home/runner/ArabicnumeralsVB/main.vbproj]
```

The build failed. Fix the build errors and run again.

7. Visual Basic

8. PHP

The screenshot shows a web browser window at `replit.com/@Felienn/ArabicnumeralsPHP2#main.php`. The Replit interface includes a file explorer at the top left showing `Arabic_numerals_PHP2` and a code editor with `main.php`. The code in the editor is:

```
1 <?php
2 echo ٩+٢;
```

The code is being executed, and the output is shown in the console. The console displays three warnings:

```
Warning: Use of undefined constant ٢ - assumed '٢' (this will throw an Error in a future version of PHP) in /home/runner/ArabicnumeralsPHP2/main.php on line 2

Warning: Use of undefined constant ٩ - assumed '٩' (this will throw an Error in a future version of PHP) in /home/runner/ArabicnumeralsPHP2/main.php on line 2

Warning: A non-numeric value encountered in /home/runner/ArabicnumeralsPHP2/main.php on line 2

0
```


main.sql - Arabic_numerals_sql

replit.com/@Felienn/Arabicnumeralssql#main.sql

Finish update

Arabic_numerals_sql

main.sql

main.sql

1 SELECT ٩+٢;

Console

Shell

Interpret

3s on 14:51:42, 10/24

-- Loading resources from main.sql
Parse error near line 1: no such column: ٢
SELECT ٢+٩;
^--- error here
SQLite version 3.39.4 2022-09-29 15:55:41
Enter ".help" for usage hints.
❏

9. SQL


```
1 section .data
2     number1 db ٢
3     number2 db ٩
4     result db 0
5
6 section .text
7     global _start
8
9 _start:
10    mov al, [number1]
11    mov bl, [number2]
12    add al, bl
13    mov [result], al
14
```

10. Assembly

Console

Run 31ms on 15:10:44, 10/24

```
main.asm:2: error: symbol `٢' not defined
main.asm:3: error: symbol `٩' not defined
```

Hedy!

قول ٩+٢

1

2

١١

قول ٩+٢

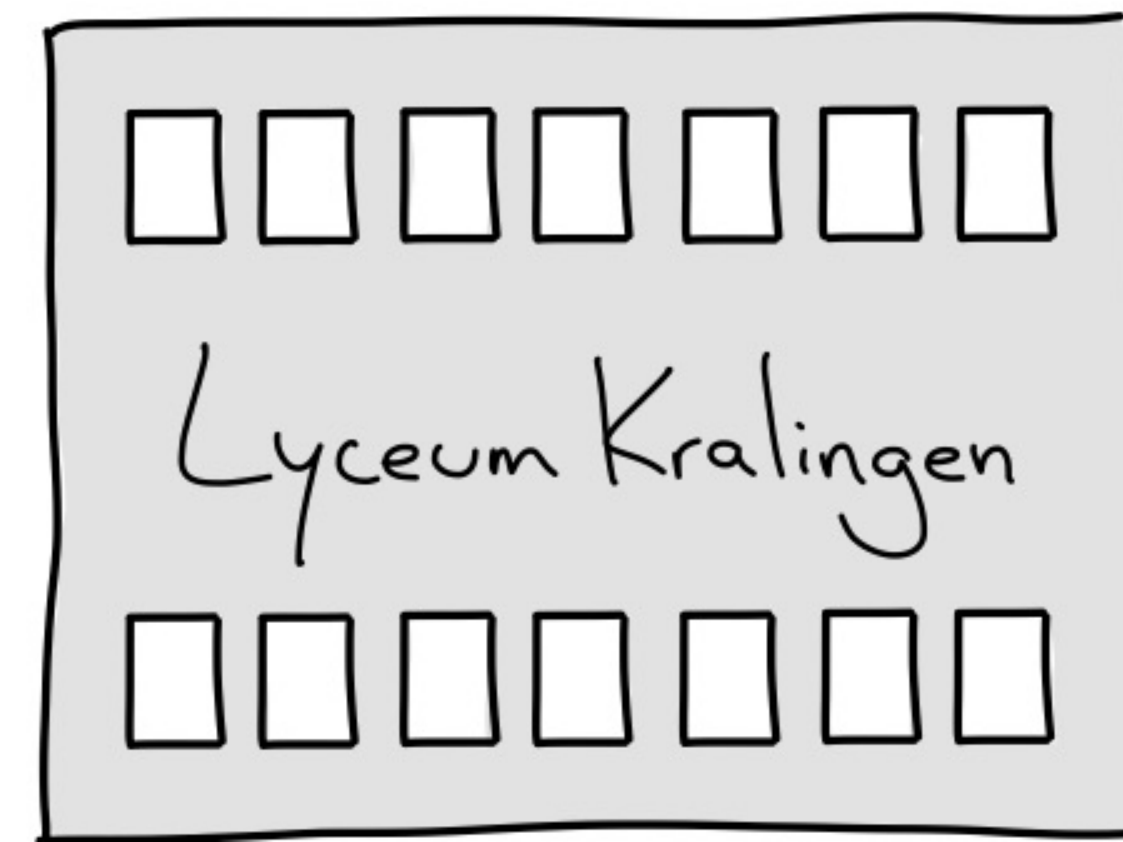
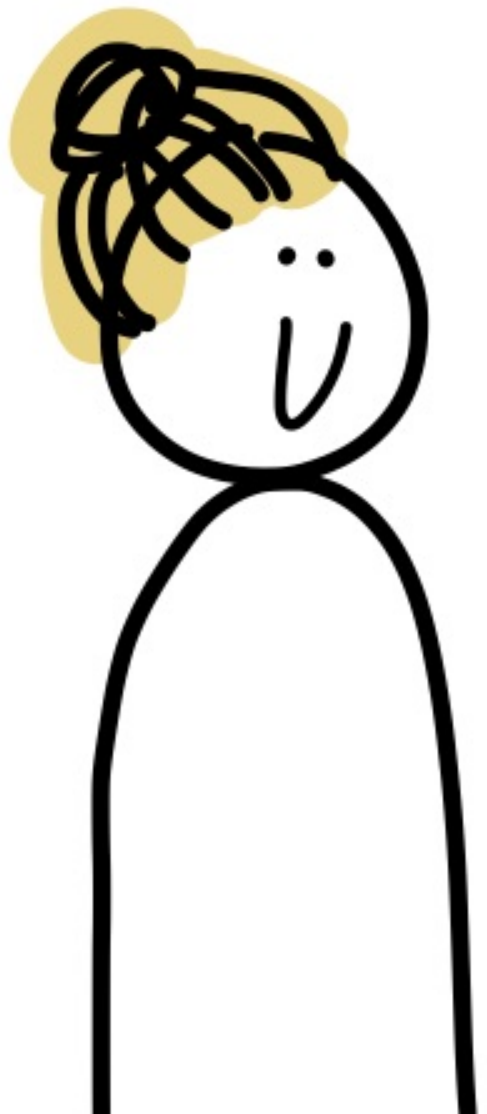
1

2

1 لكل دورة في نطاق ١ الى ٥
2 قول دورة
3

١ لكل دورة في نطاق ١ الى ٥
٢ قول دورة
٣

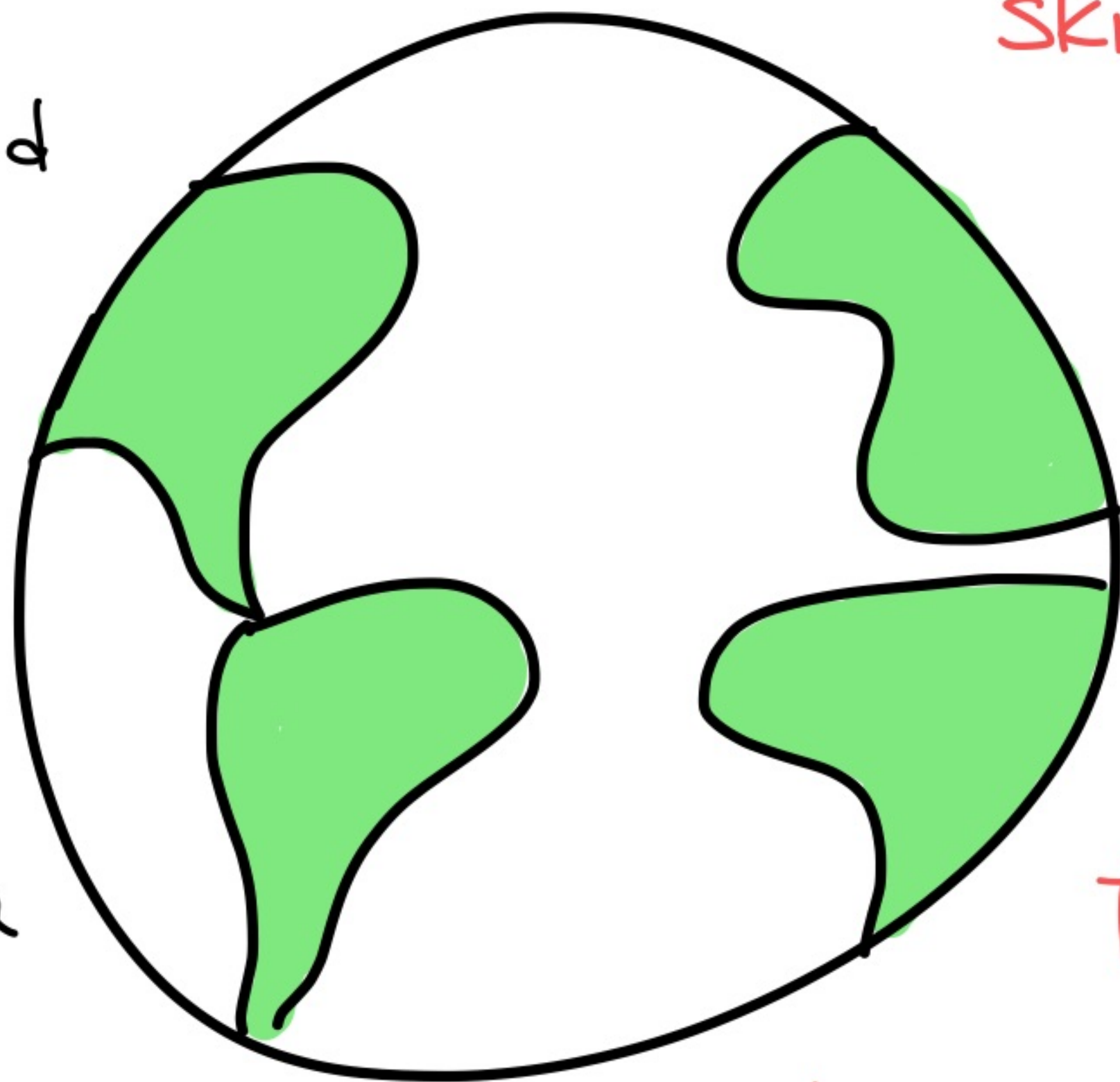
١
٢
٣
٤
٥



print hello world

imprima olá

imprimir ola



skriv Hej!

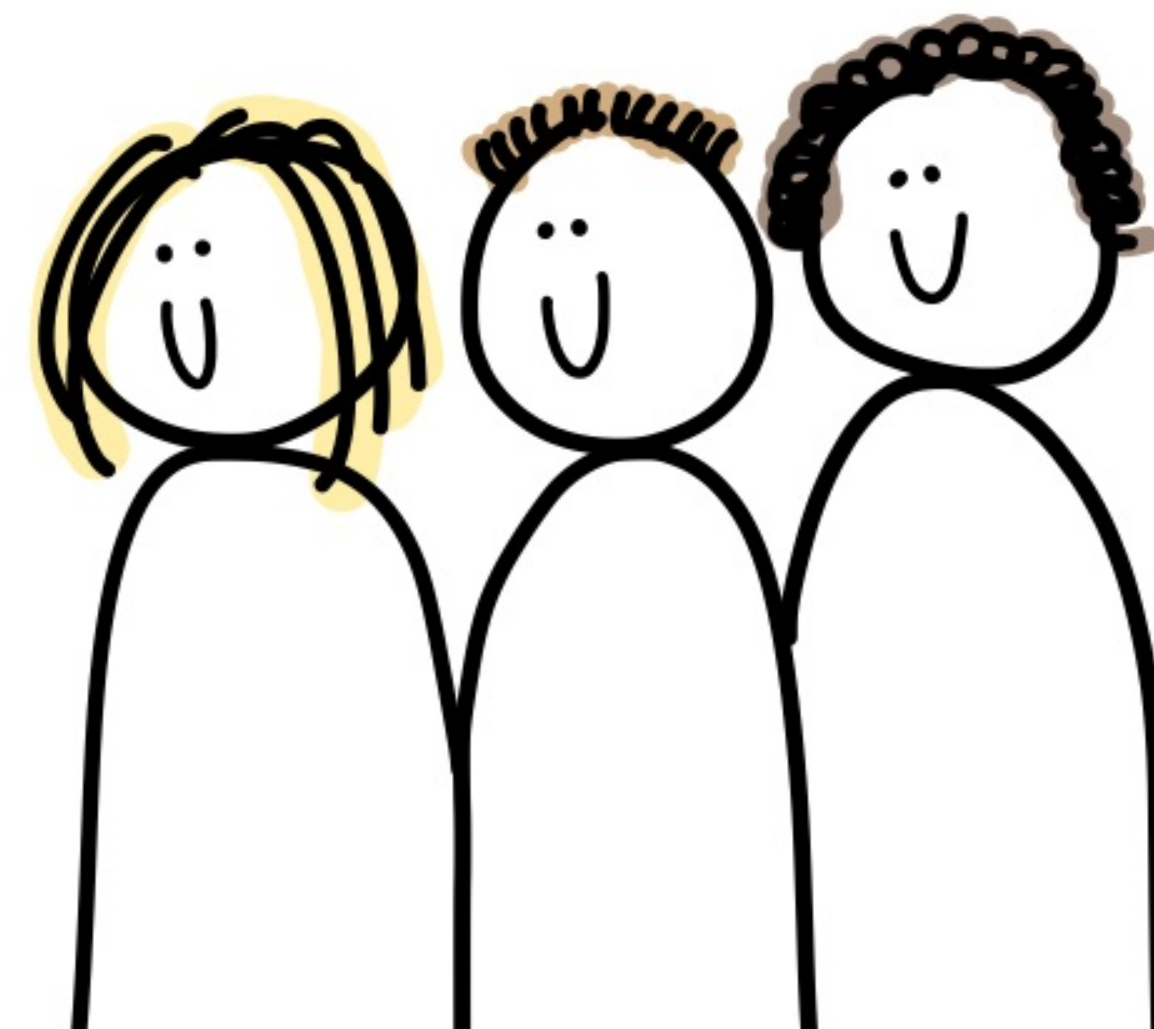
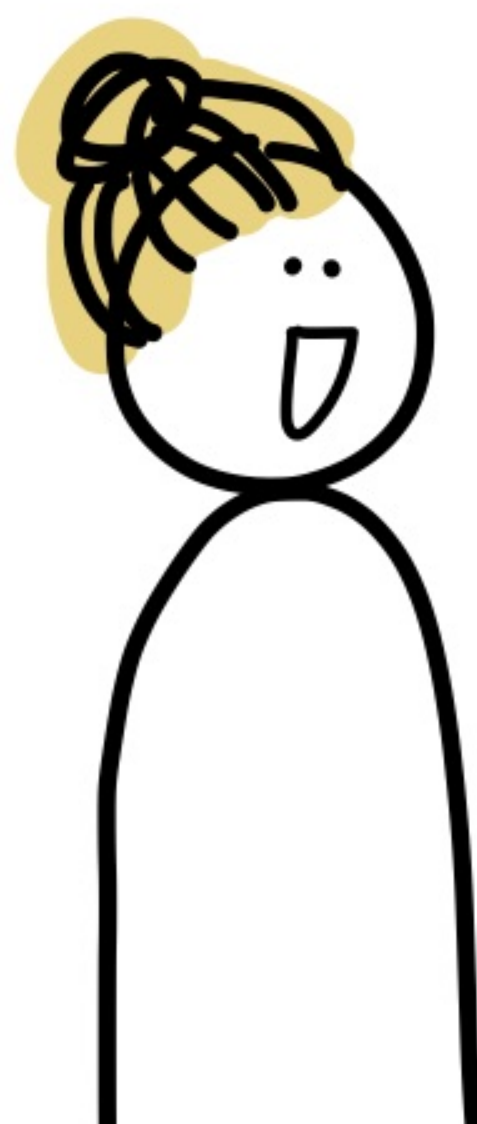
drucke Hallo

affiche bonjour

xuất Xin chào

प्रिंट हेलो

gatisa dumela



A Framework for the Localization of Programming Languages

Authors: [Alaaeddin Swidan](#), [Feliene Hermans](#) [Authors Info & Claims](#)

SPLASH-E 2023: Proceedings of the 2023 ACM SIGPLAN International Symposium on SPLASH-E • October 2023 • Pages 13–25

• <https://doi.org/10.1145/3622780.3623645>

Published: 19 October 2023 [Publication History](#)



 0  0

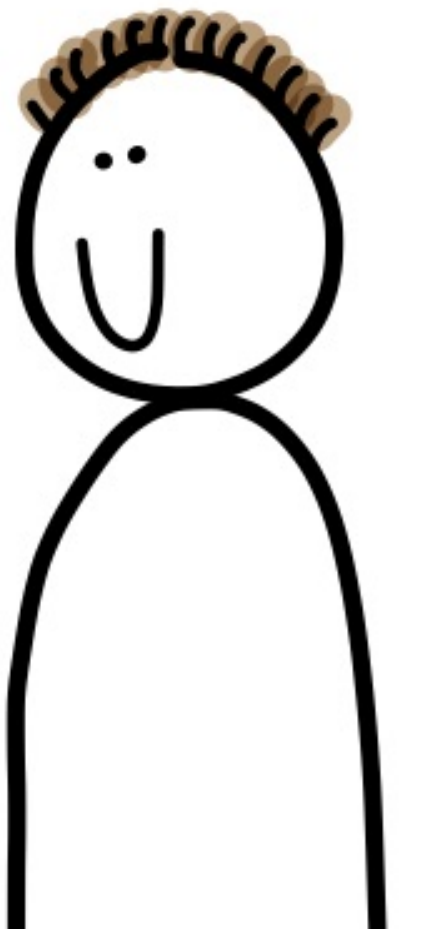
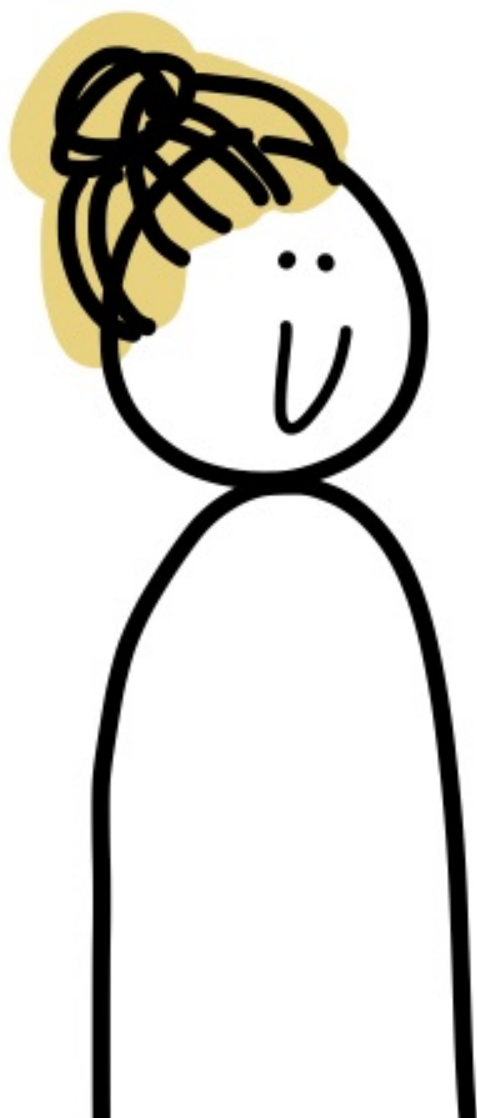


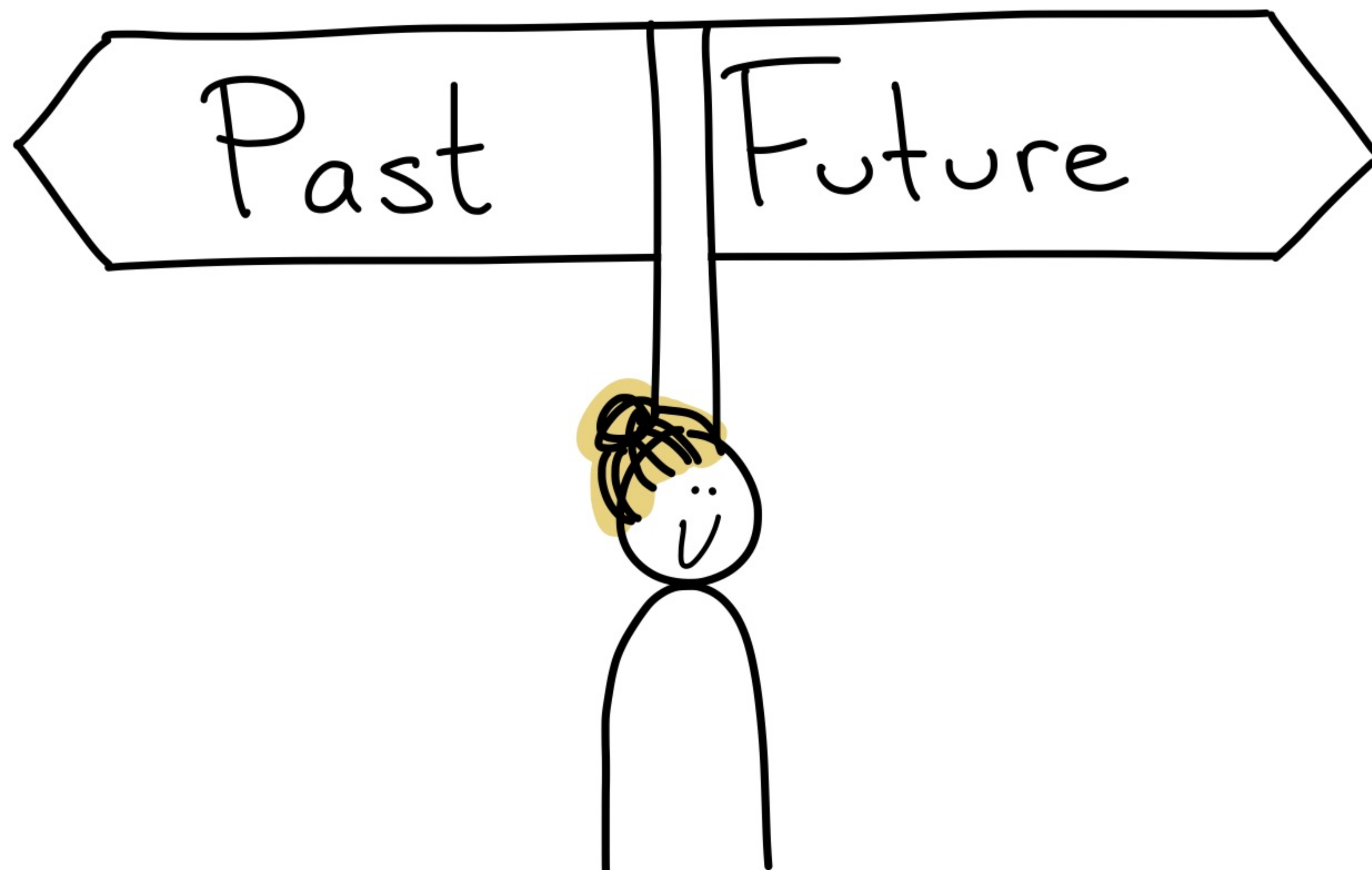
 eReader

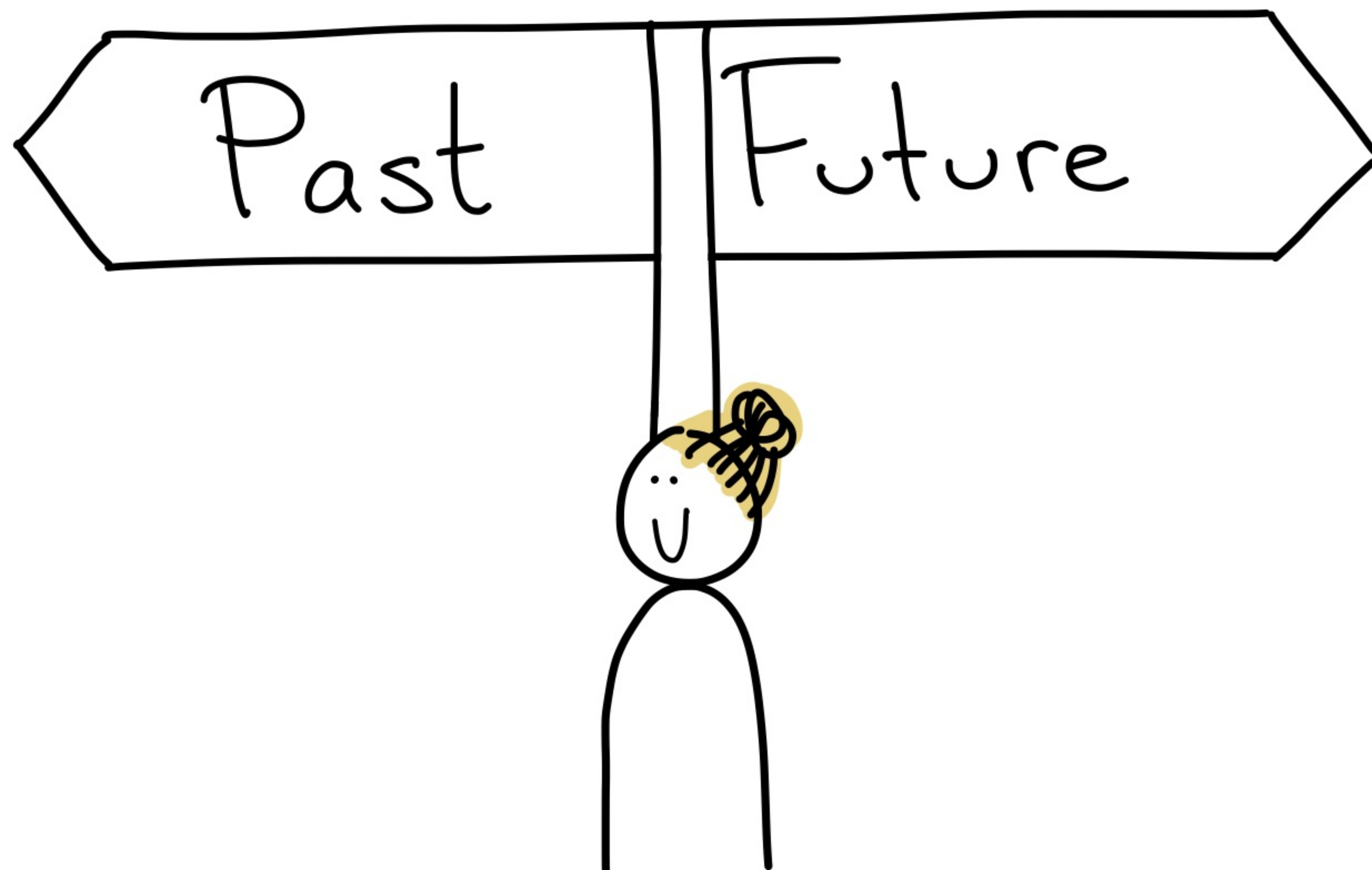
 PDF

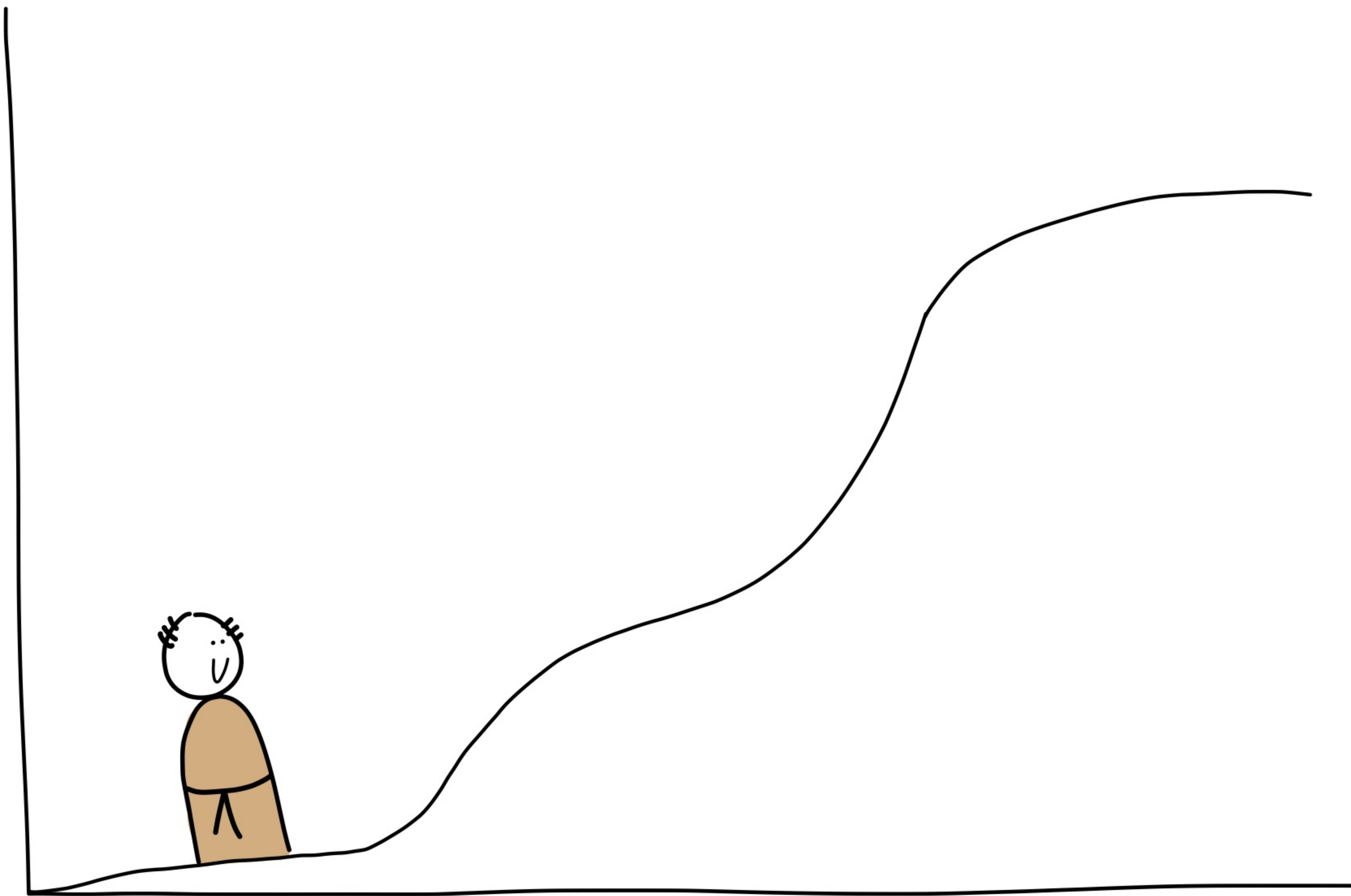
ABSTRACT

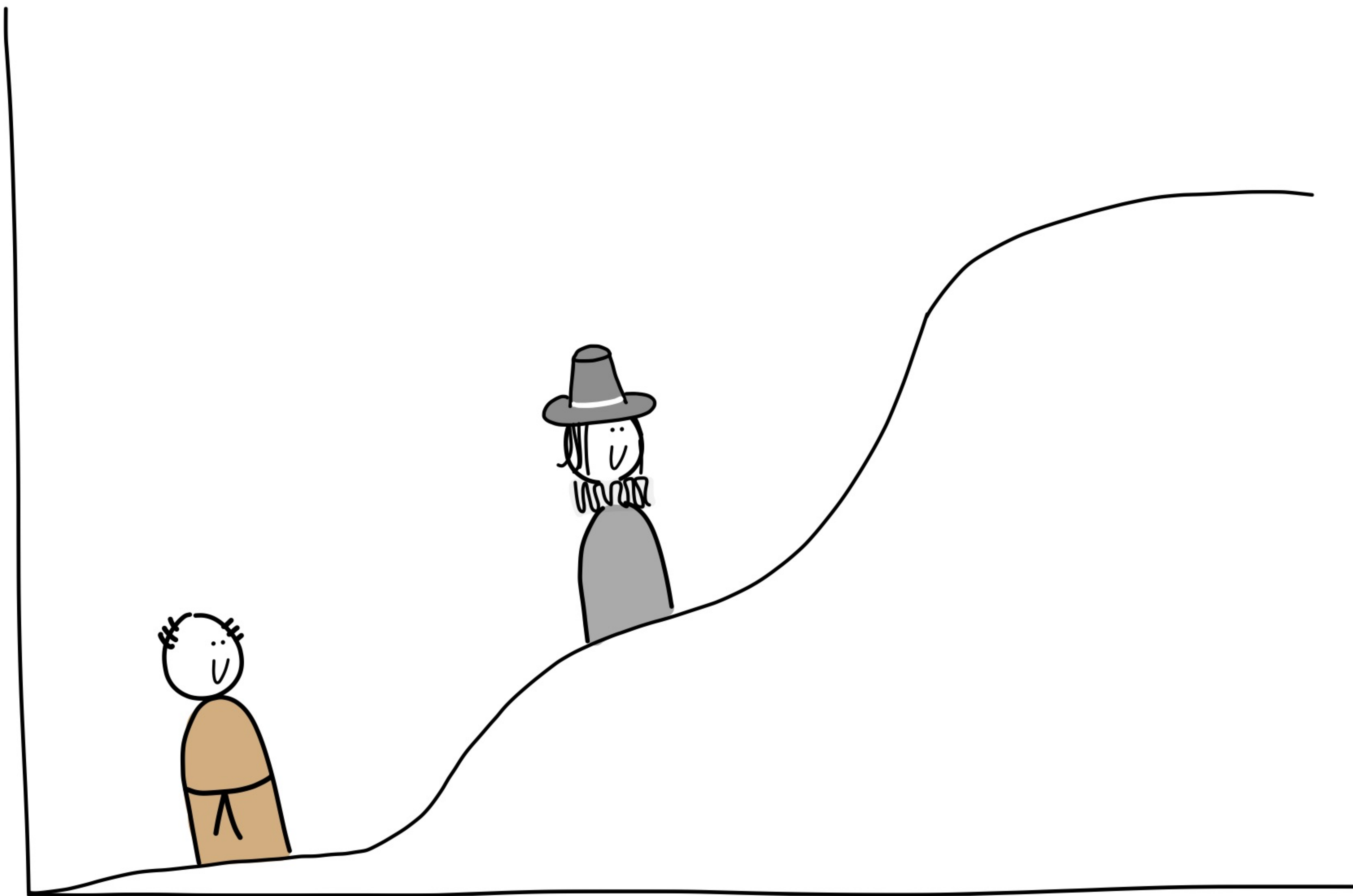
Most programming languages are only available in English, which means that speakers of other languages need to learn at least some English before they can learn to program. This creates well-documented barriers to entry into programming. While many educational programming languages are localized in some way (e.g. keywords), they often miss important other aspects (e.g. numerals or word order). This paper describes a framework of 12 aspects of programming languages that can be localized, helping tool designers localize their languages better and educators to make more informed decisions about introductory languages in non-English contexts.

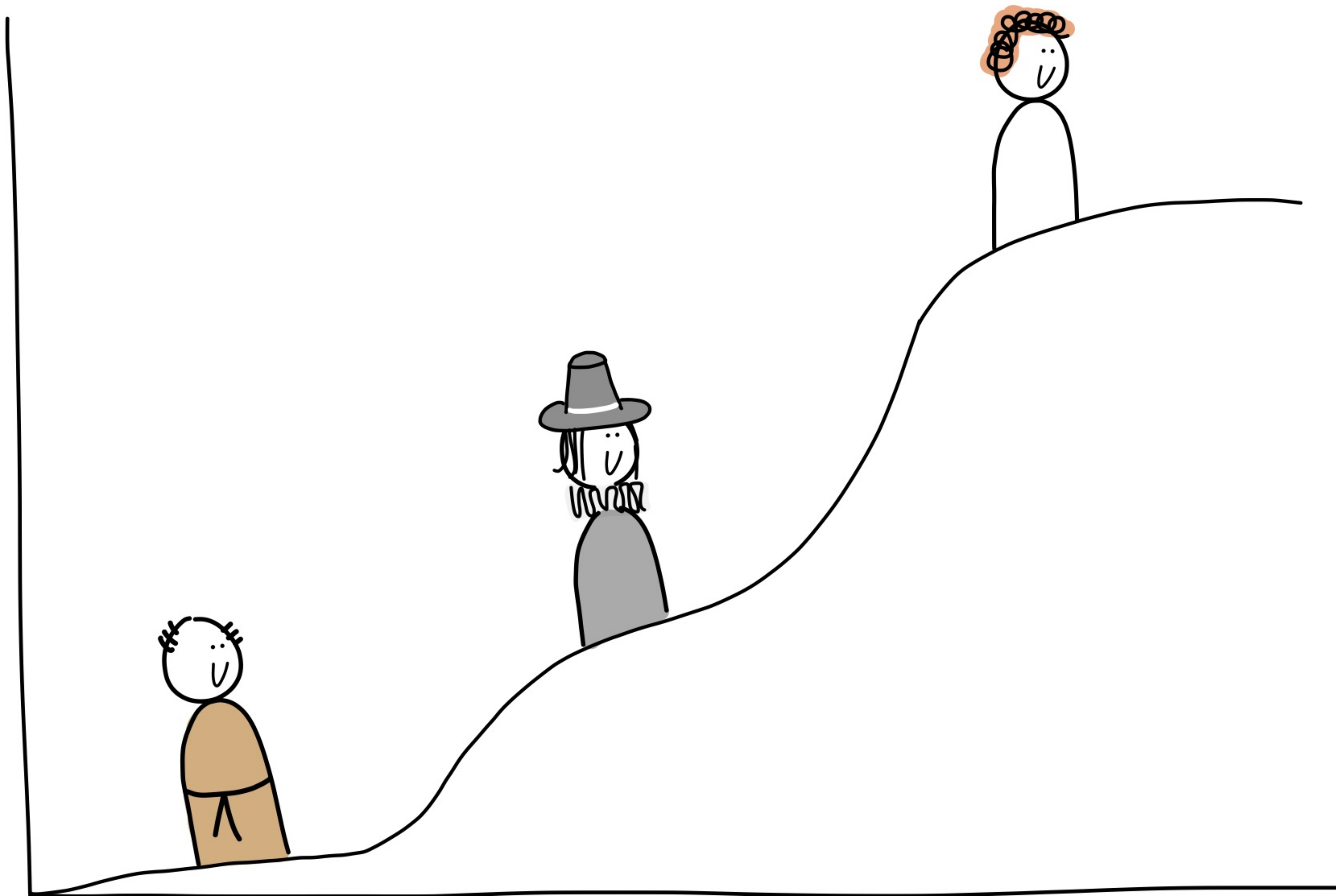


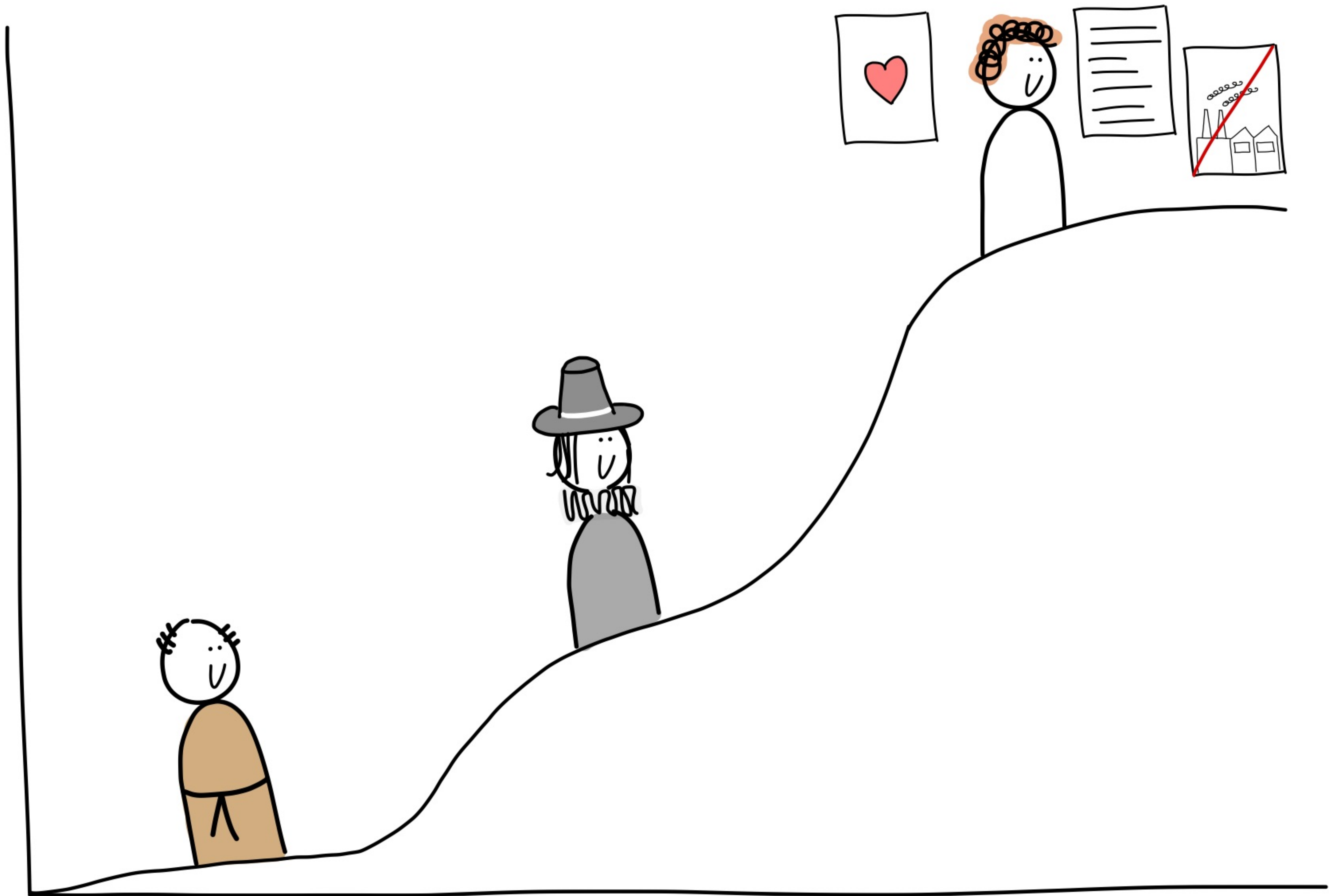


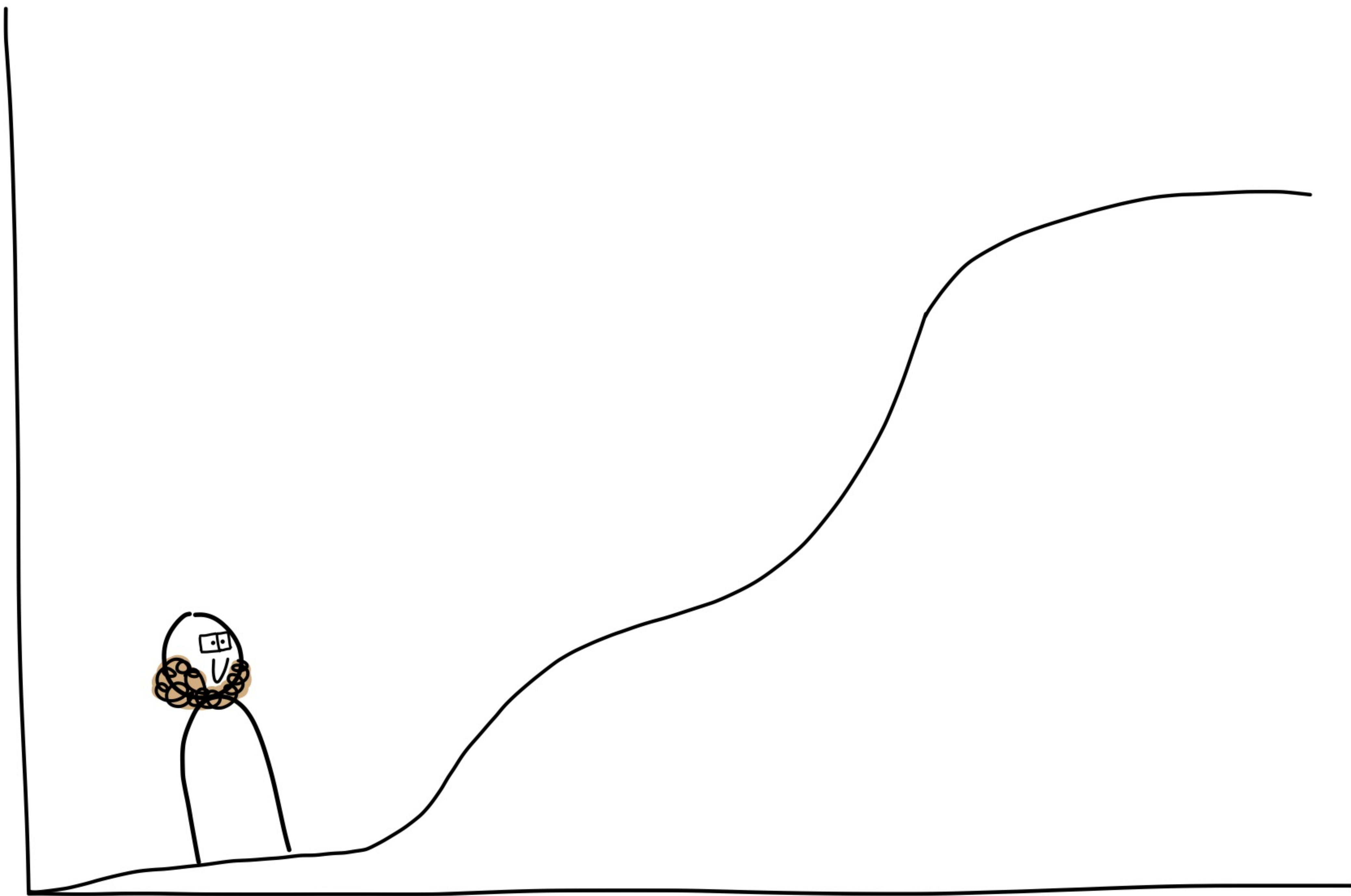


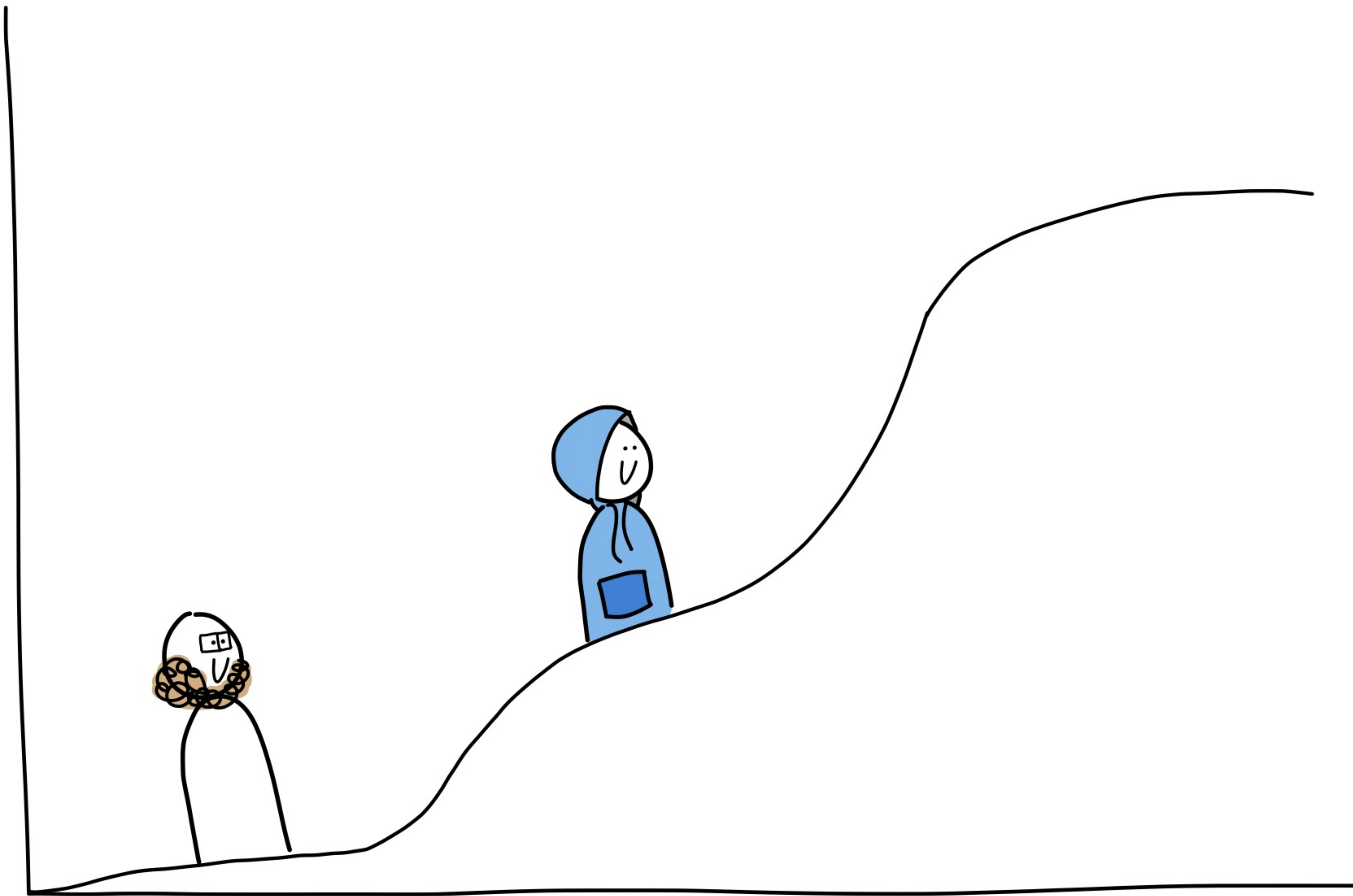


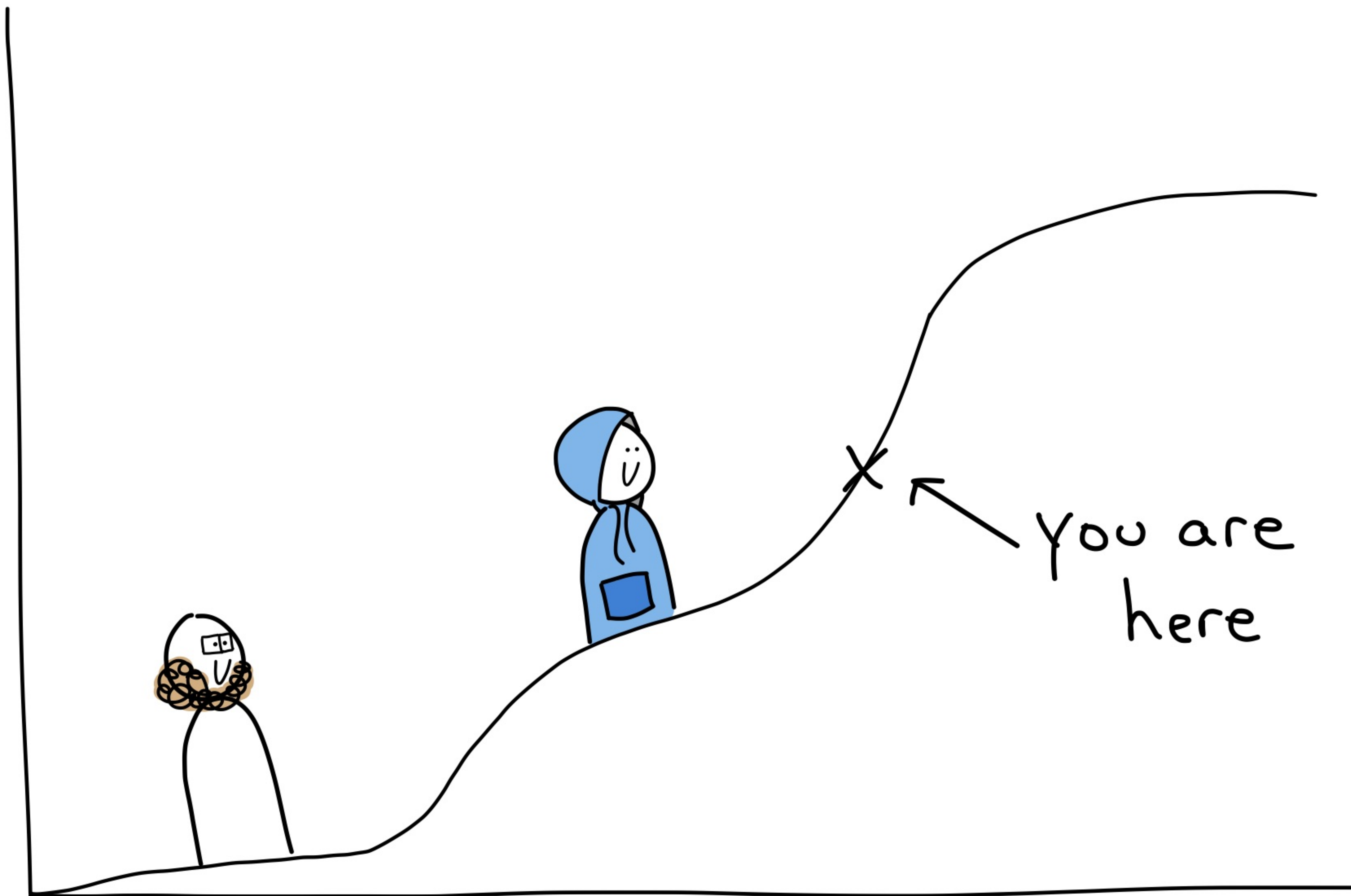


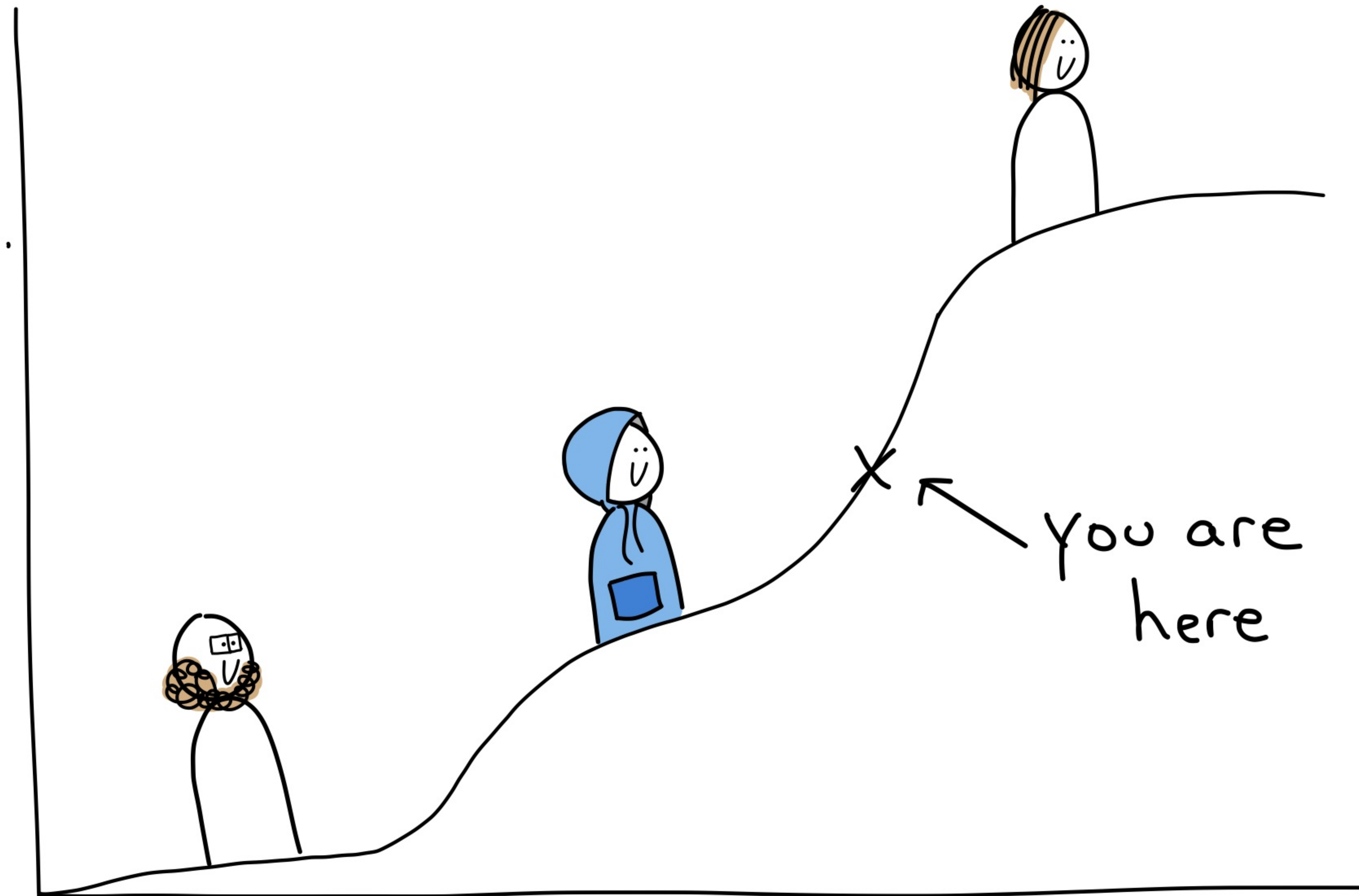


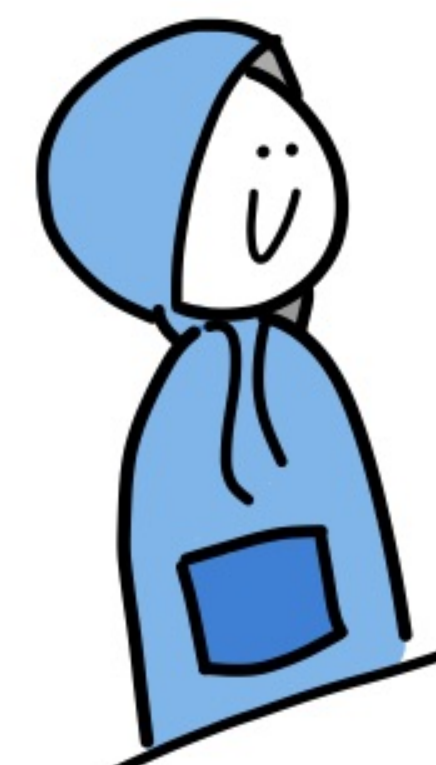
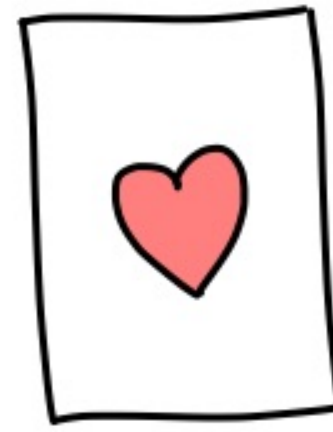
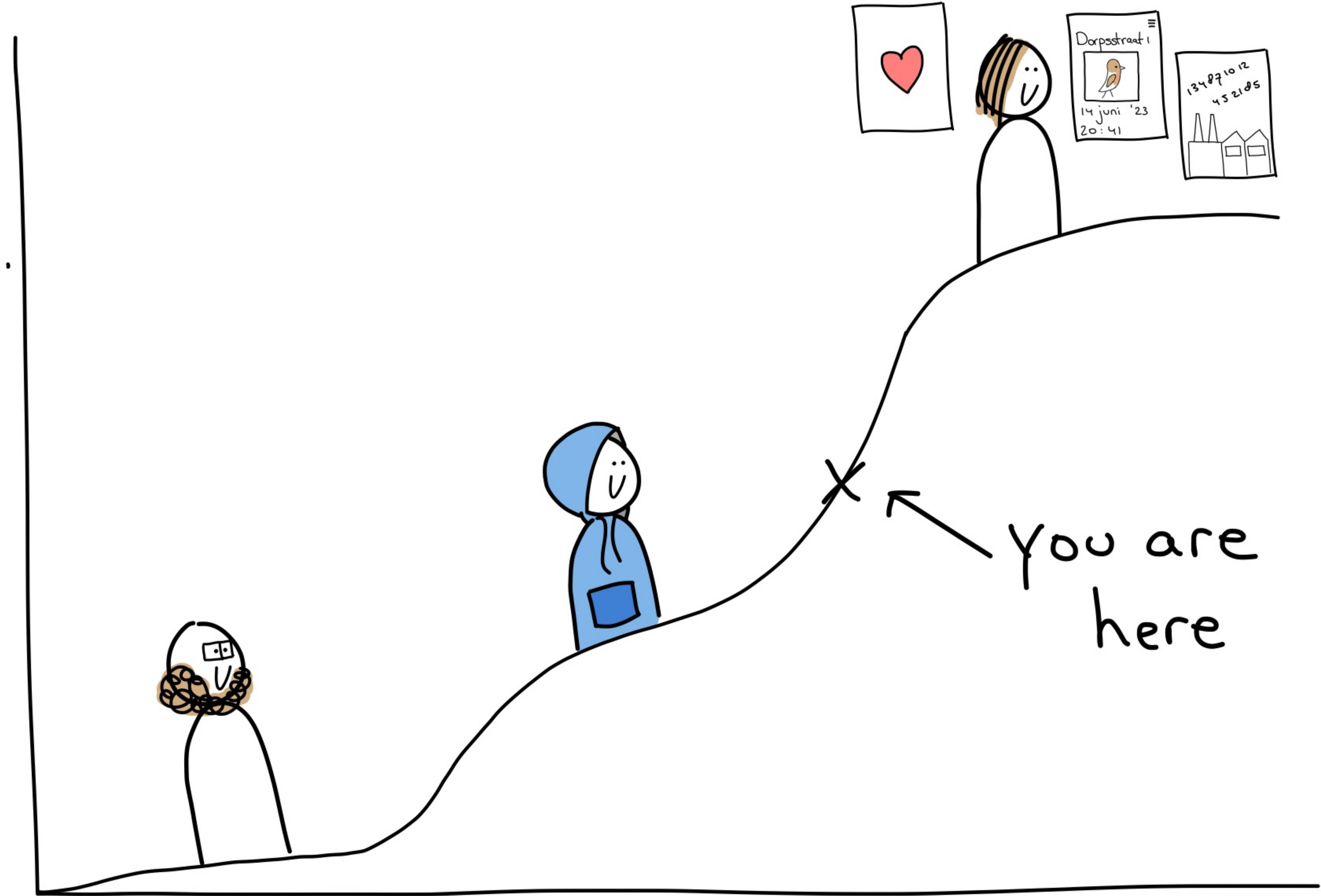




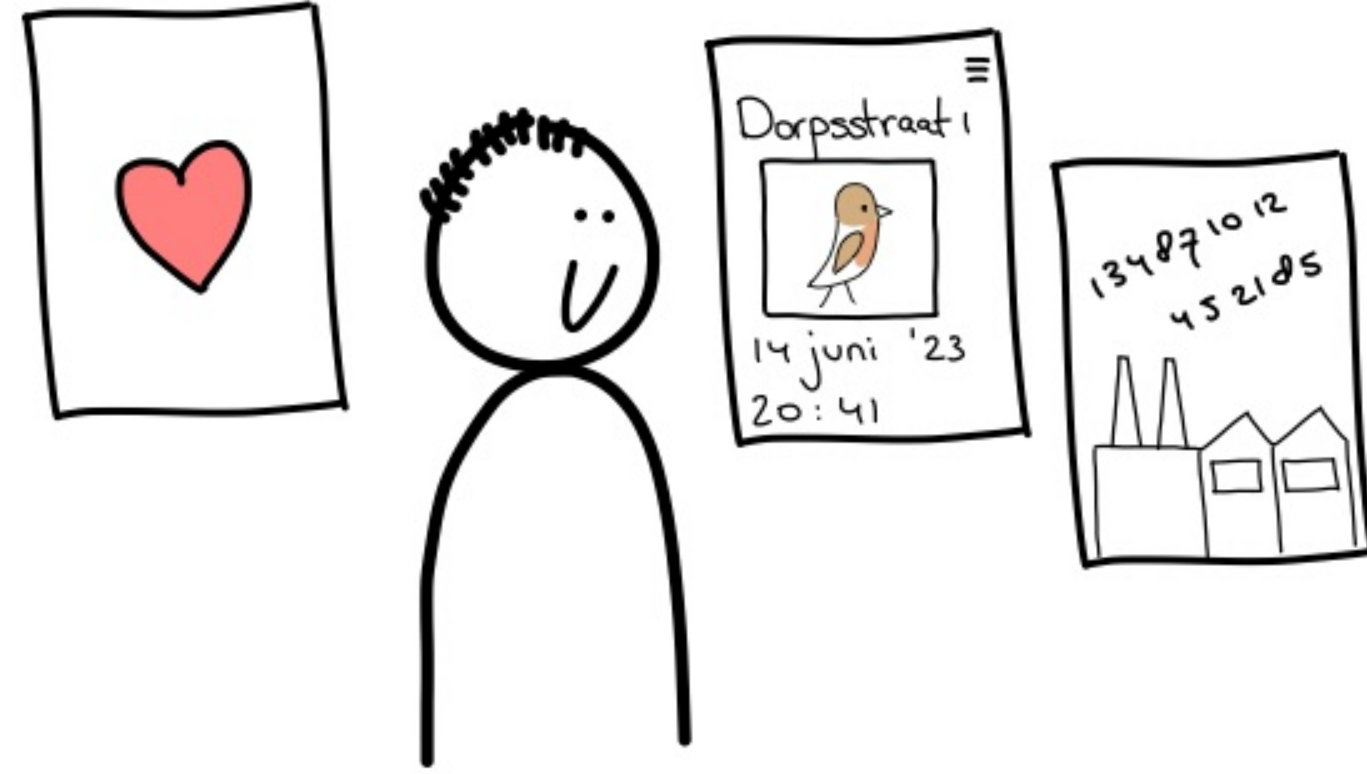


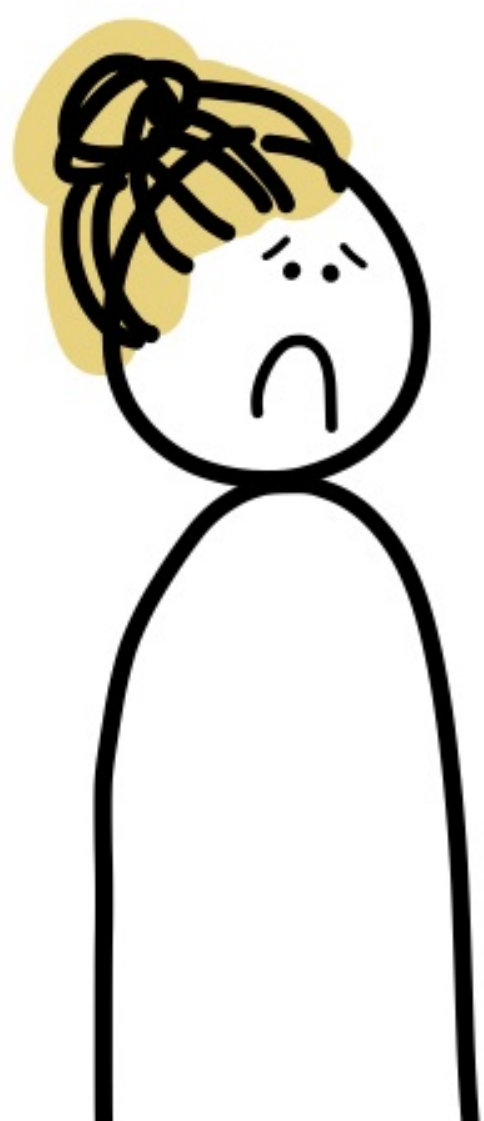


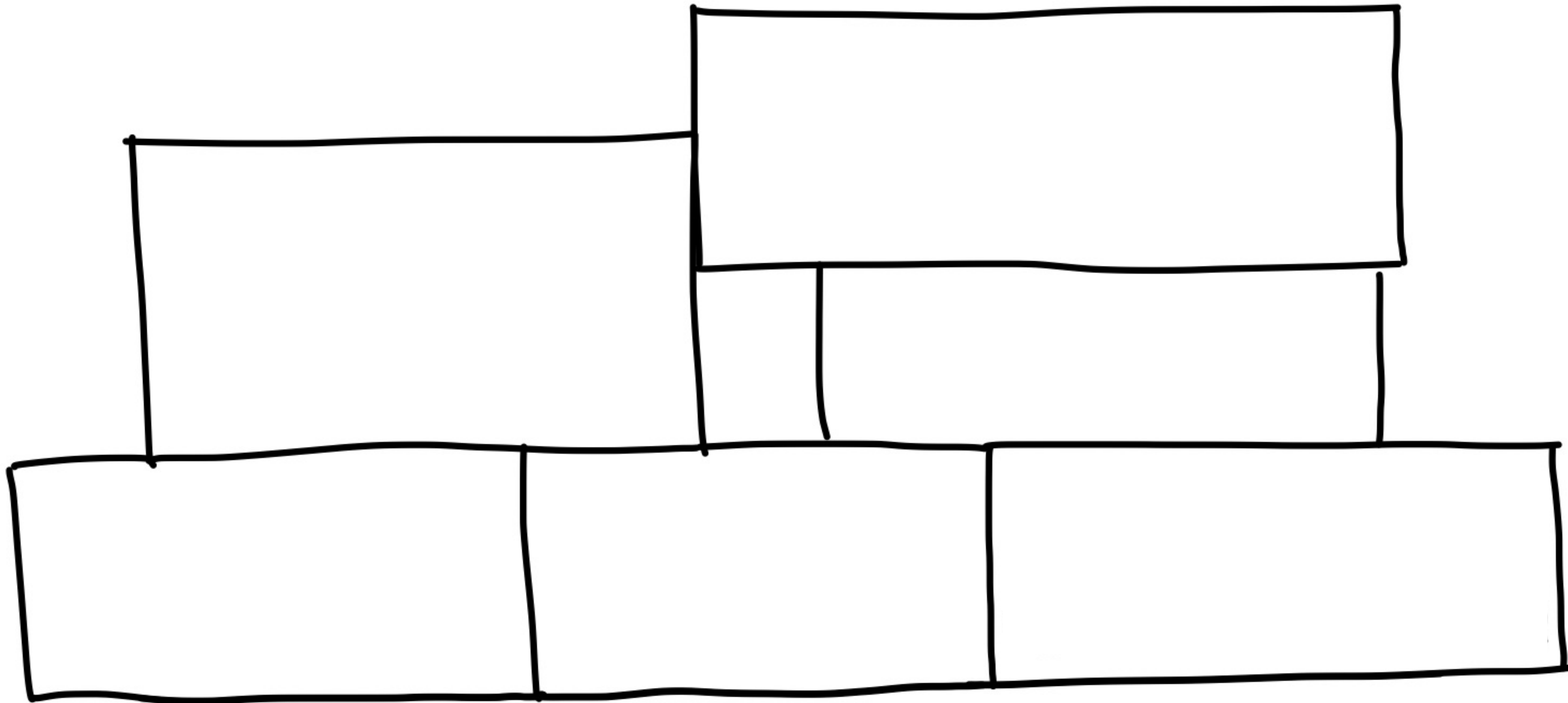
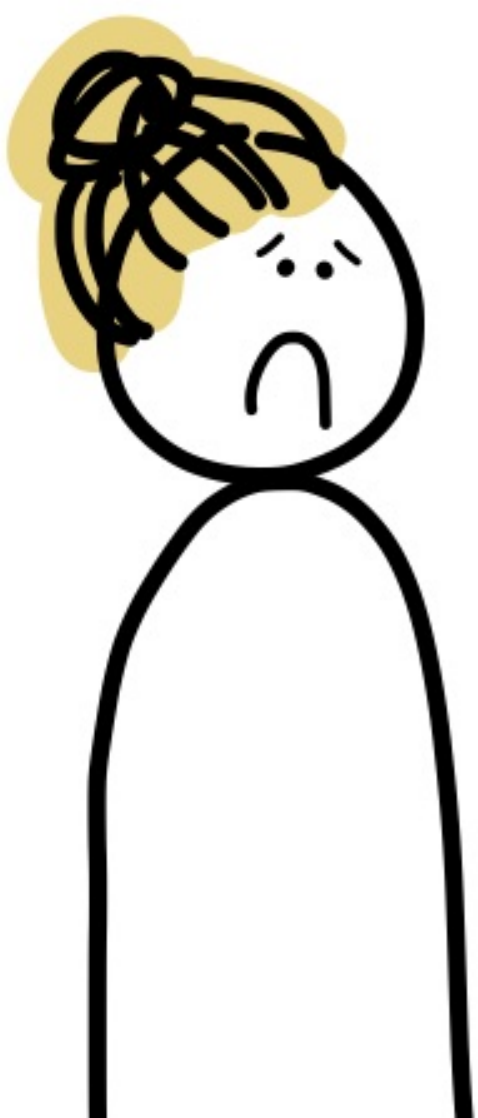


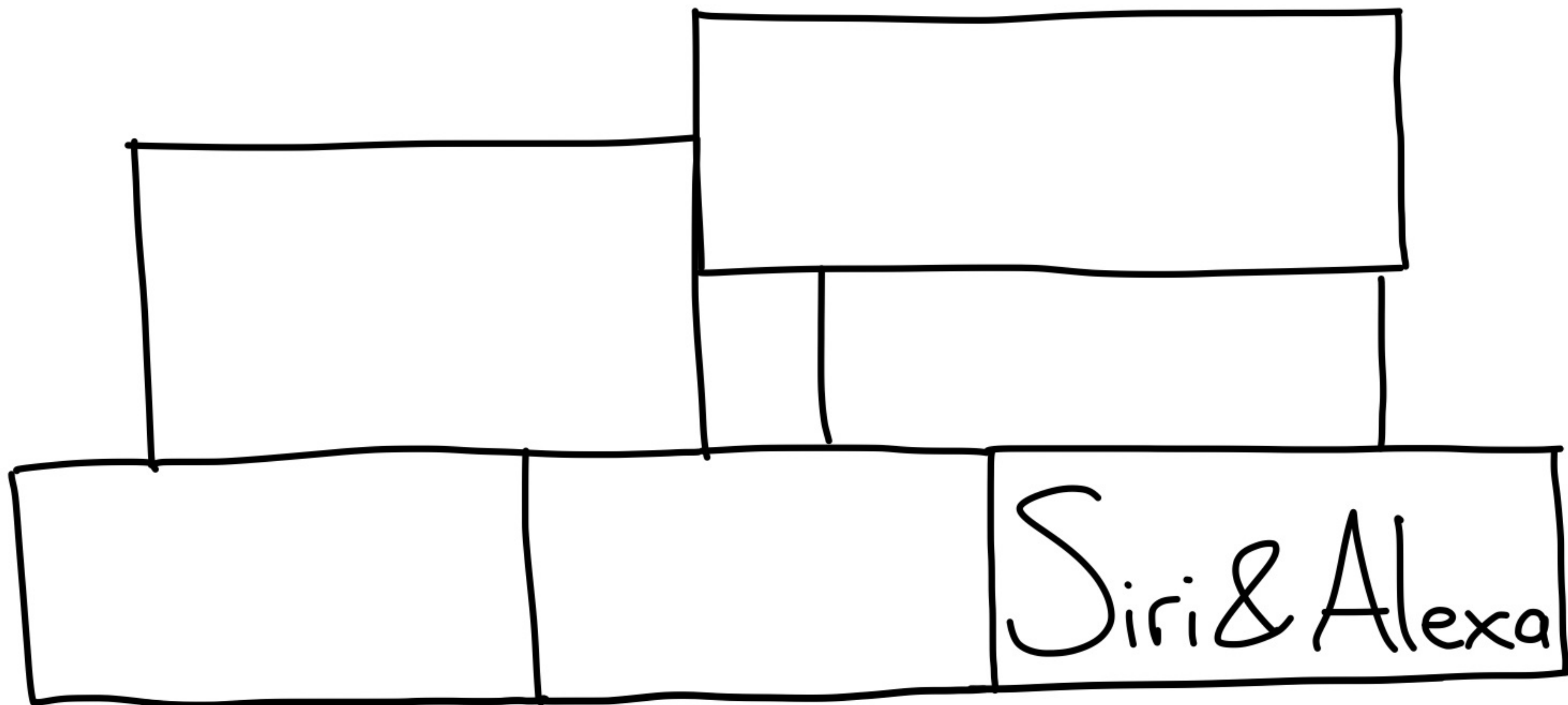
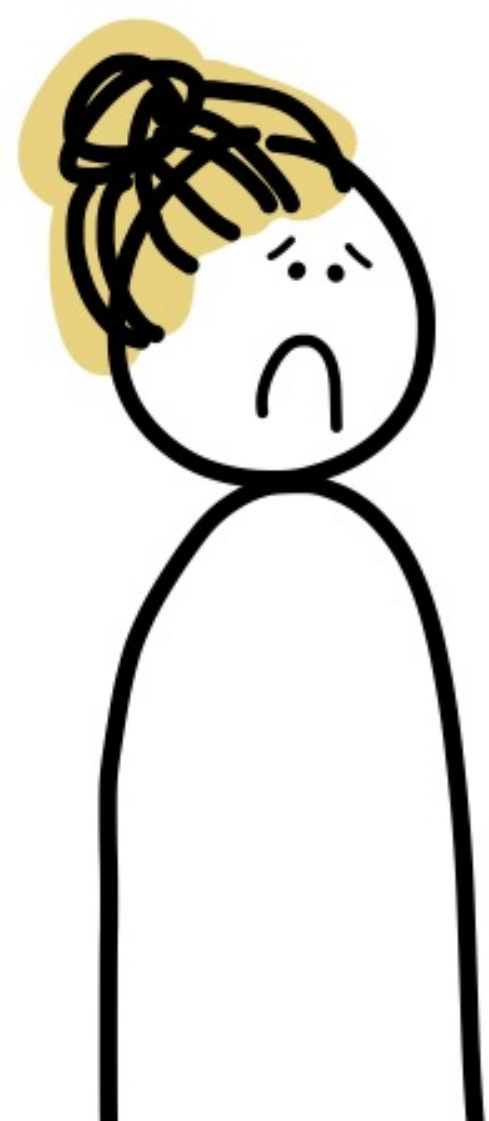


You are
here

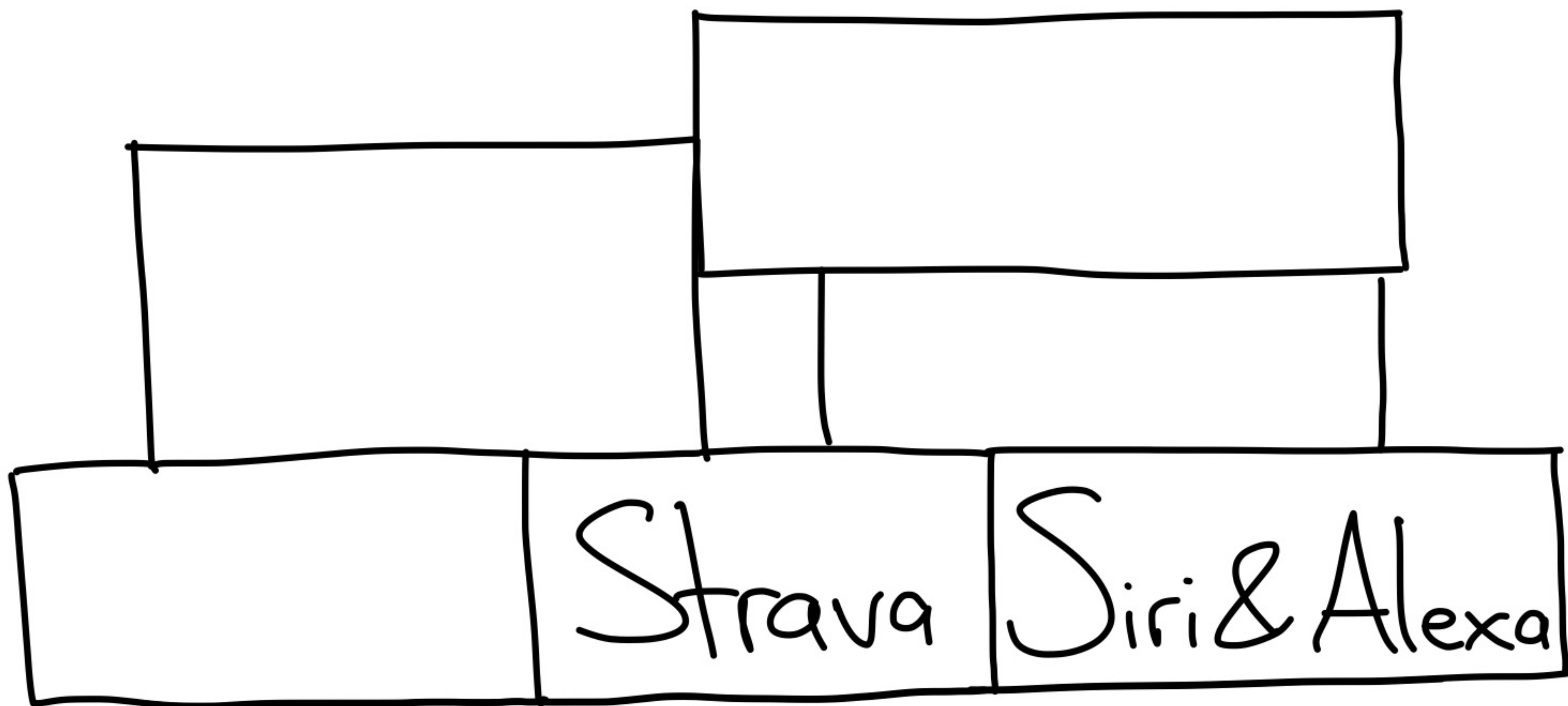
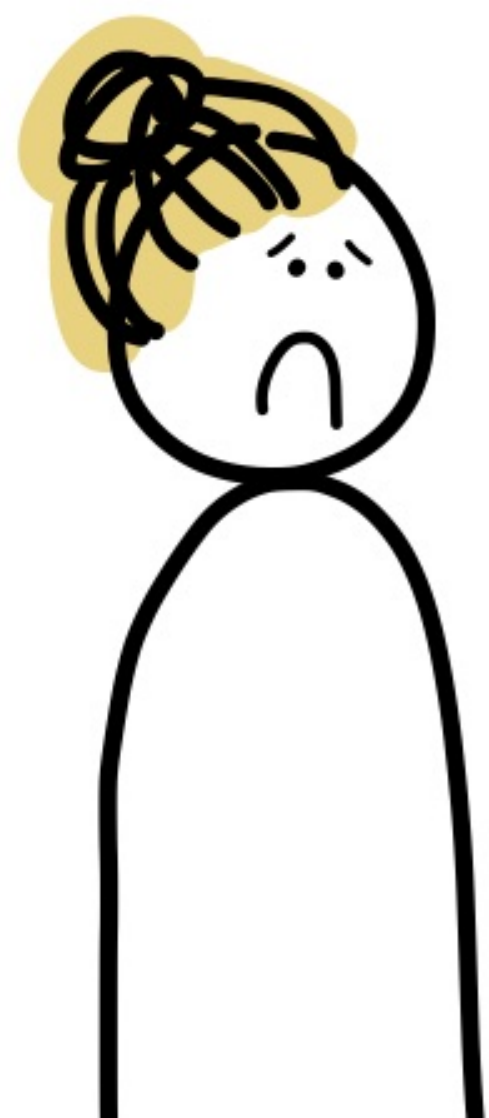




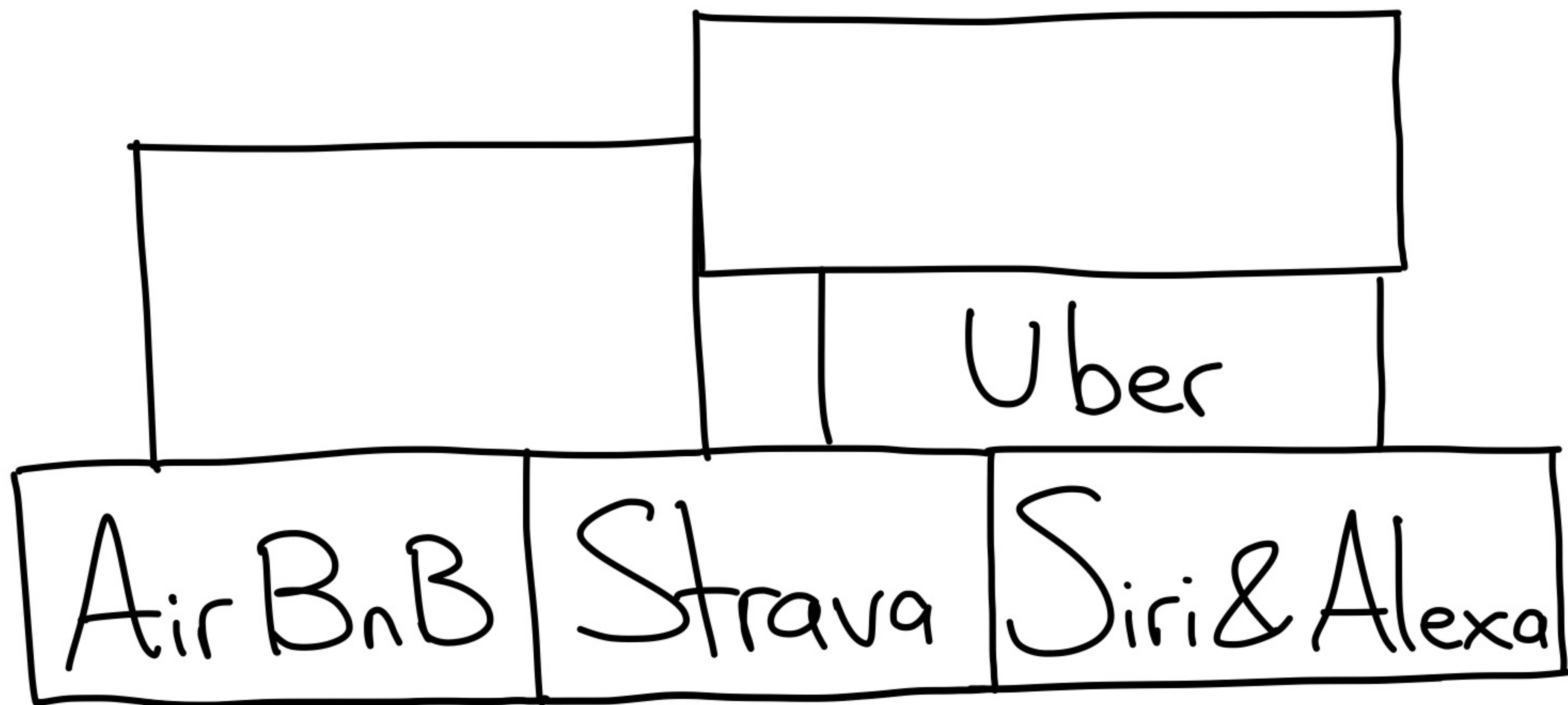
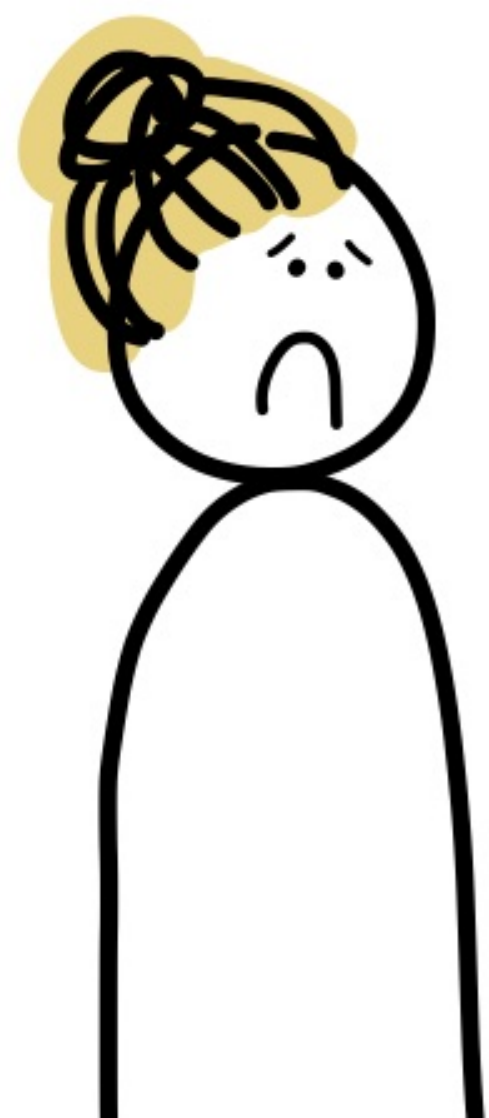




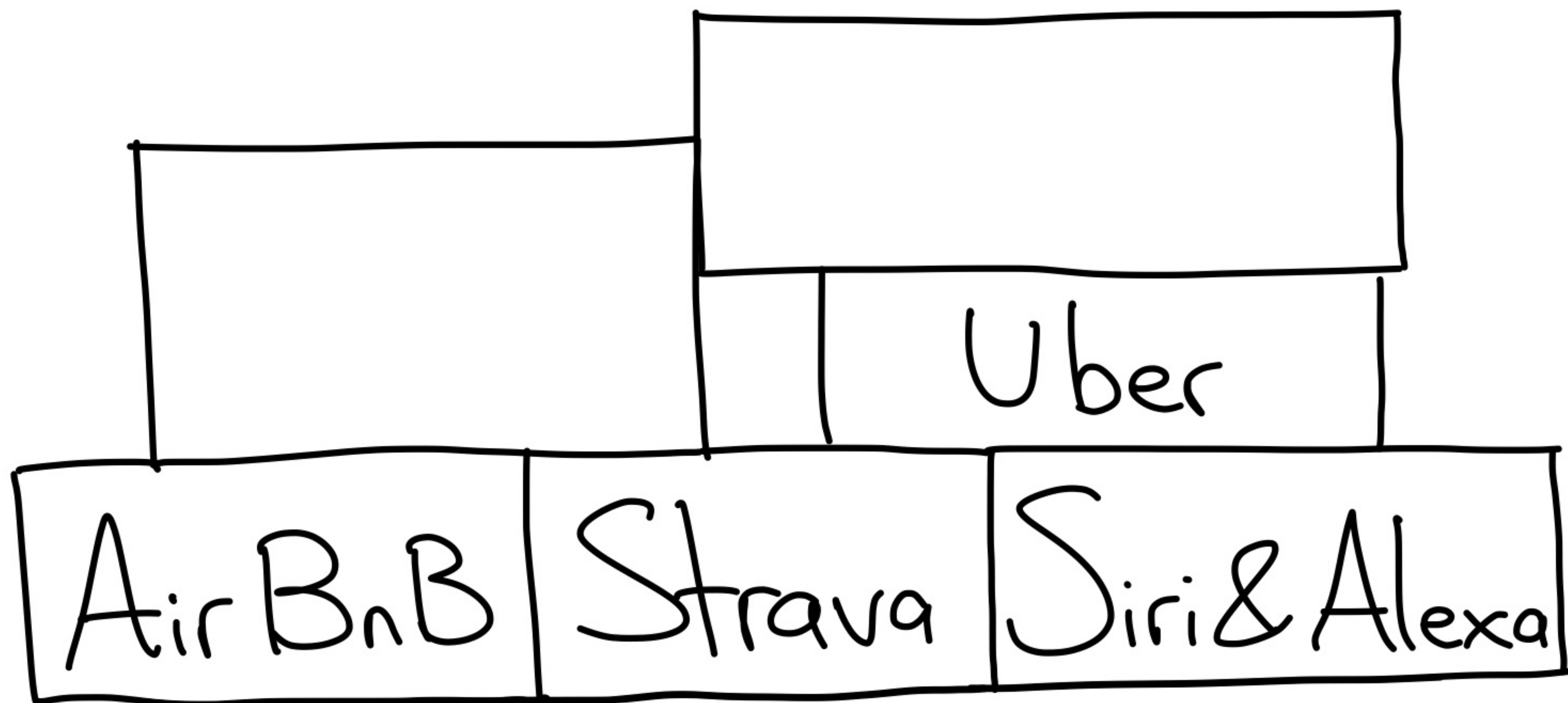
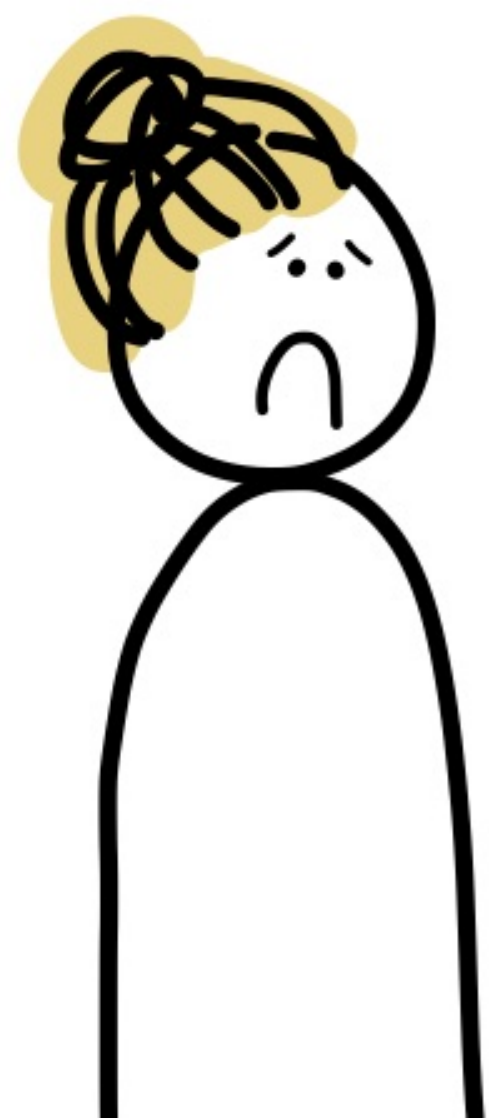
Female voices?



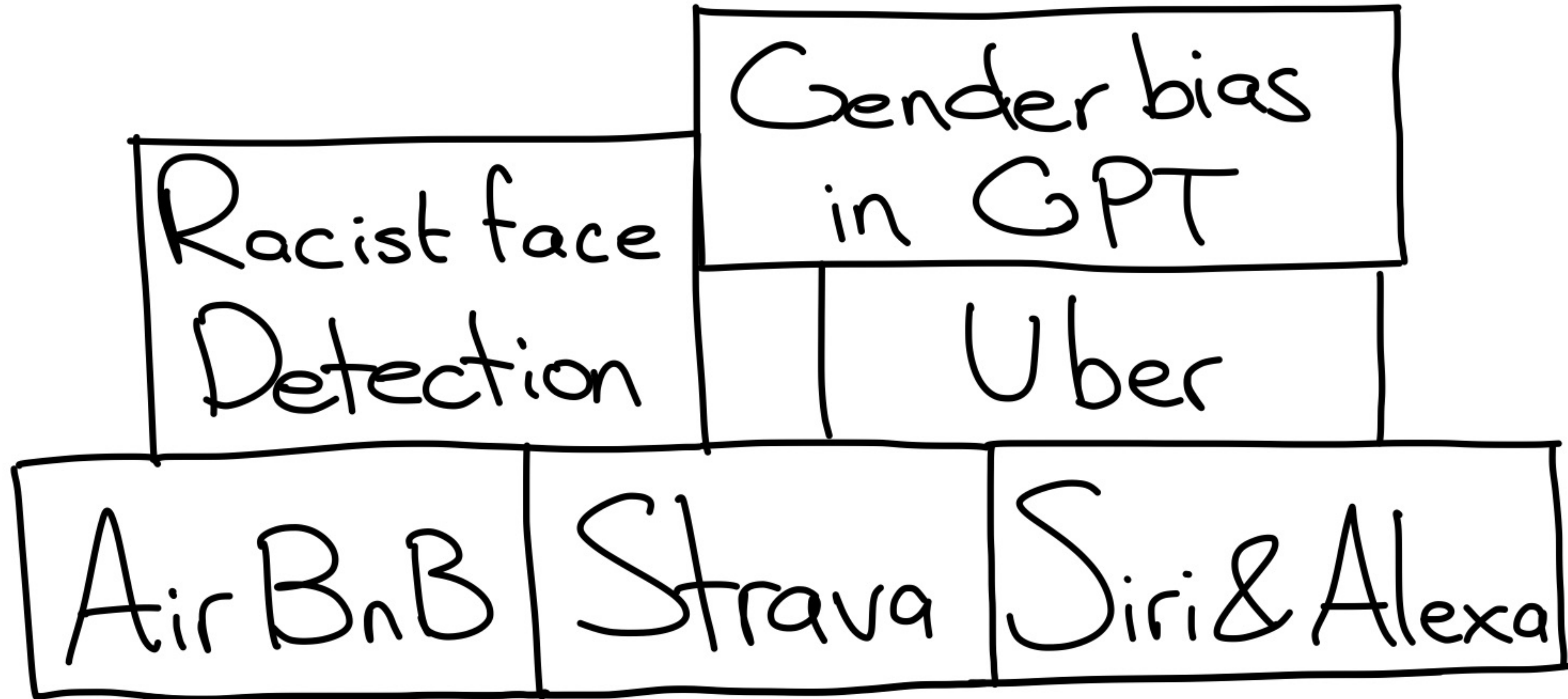
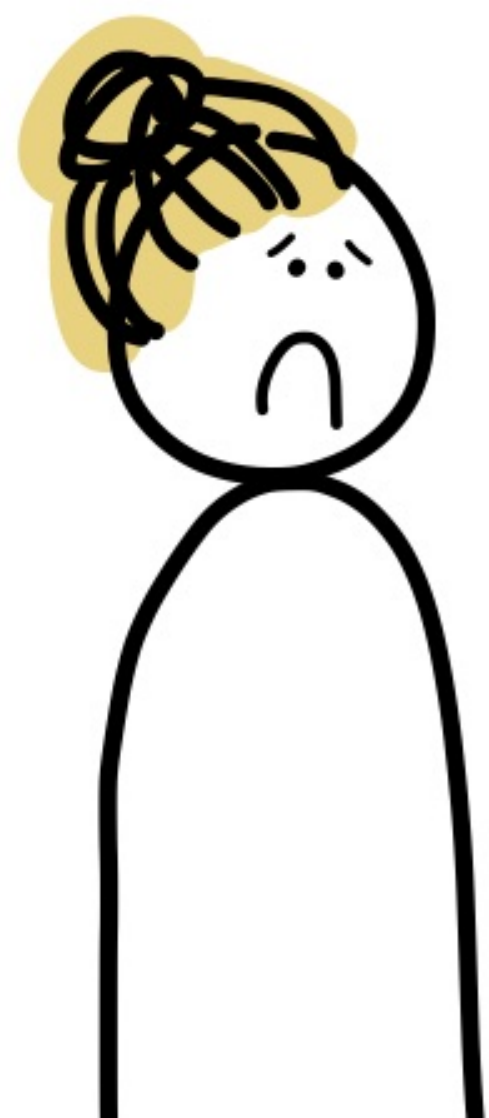
Tracks 35 bike parts
but no bra?



Whose neighborhood is affected?

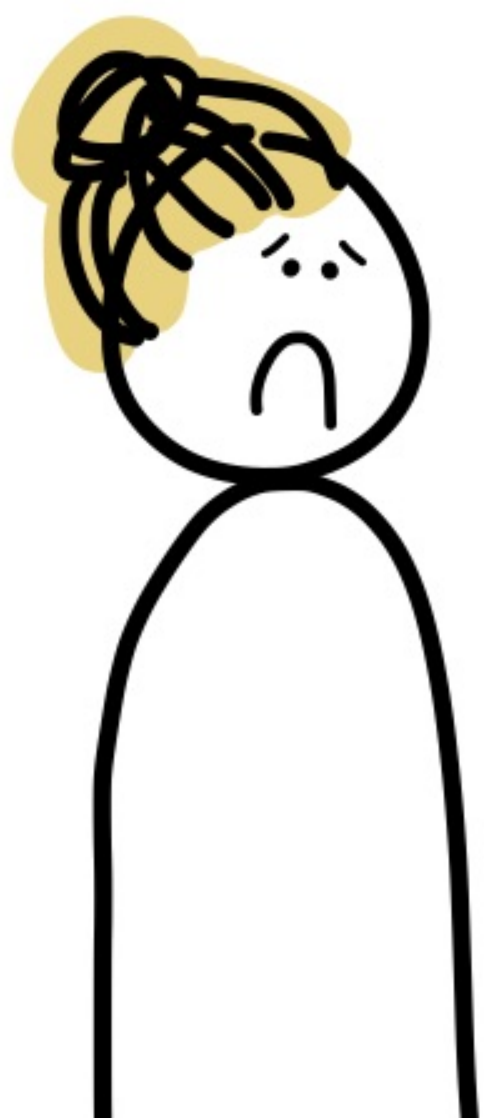


Whose livelihood is affected?





Racist face Detection			Gender bias in GPT		
			Uber		
Air BnB		Strava		Siri & Alexa	
Scratch	Fortran	PHP	Delphi	Ruby	C
Java Script		SQL	Assembly		VB.NET
Swift	C++	Java	C#	VB	Rust
				python	Go



Scratch	Fortran	PHP	Delphi	Ruby	C	VB.NET
Java Script		SQL	Assembly			R
Swift	C++	Java	C#	VB	python	

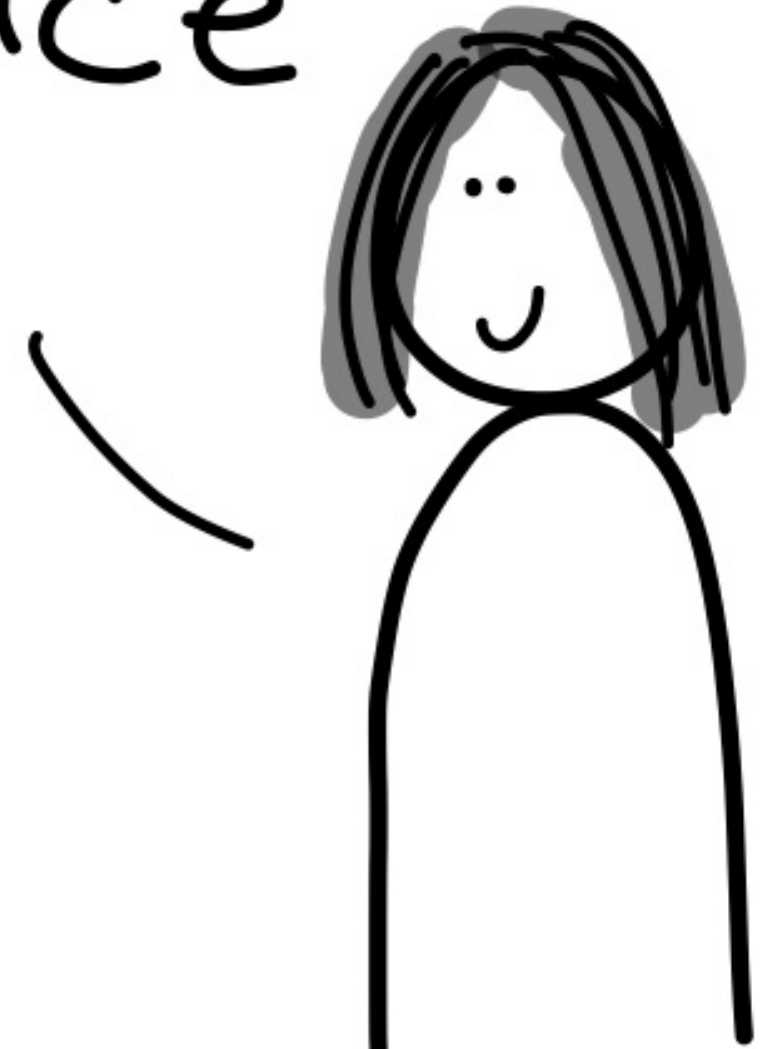


Scratch	Fortran	PHP	Delphi	Ruby	C	VB.NET
Java Script		SQL	Assembly		R	Rust
Swift	C++	Java	C#	VB		Go
				python		

```
#include <iostream>

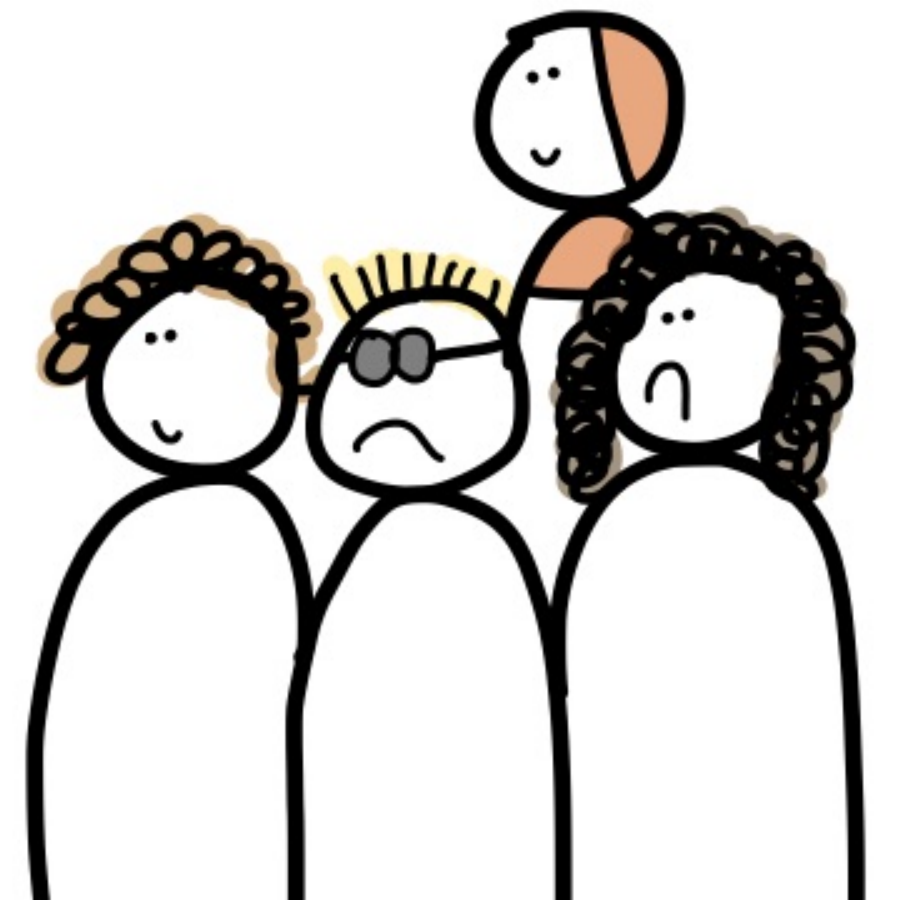
int main() {
    std::cout << "Hello World!";
    return 0;
}
```

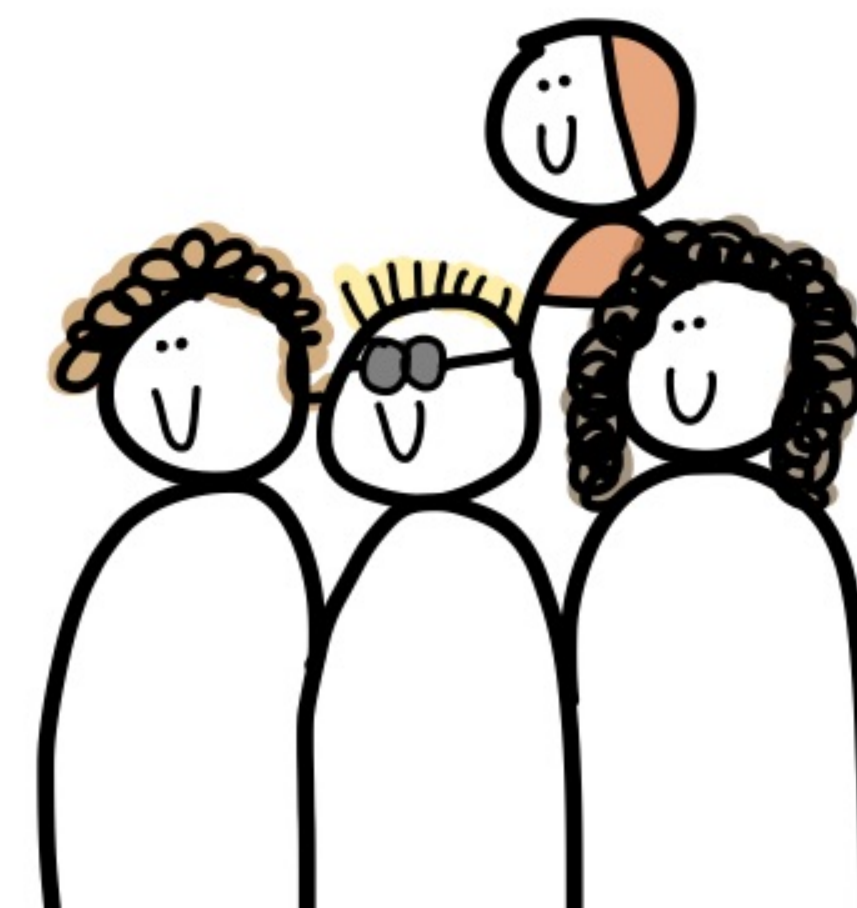
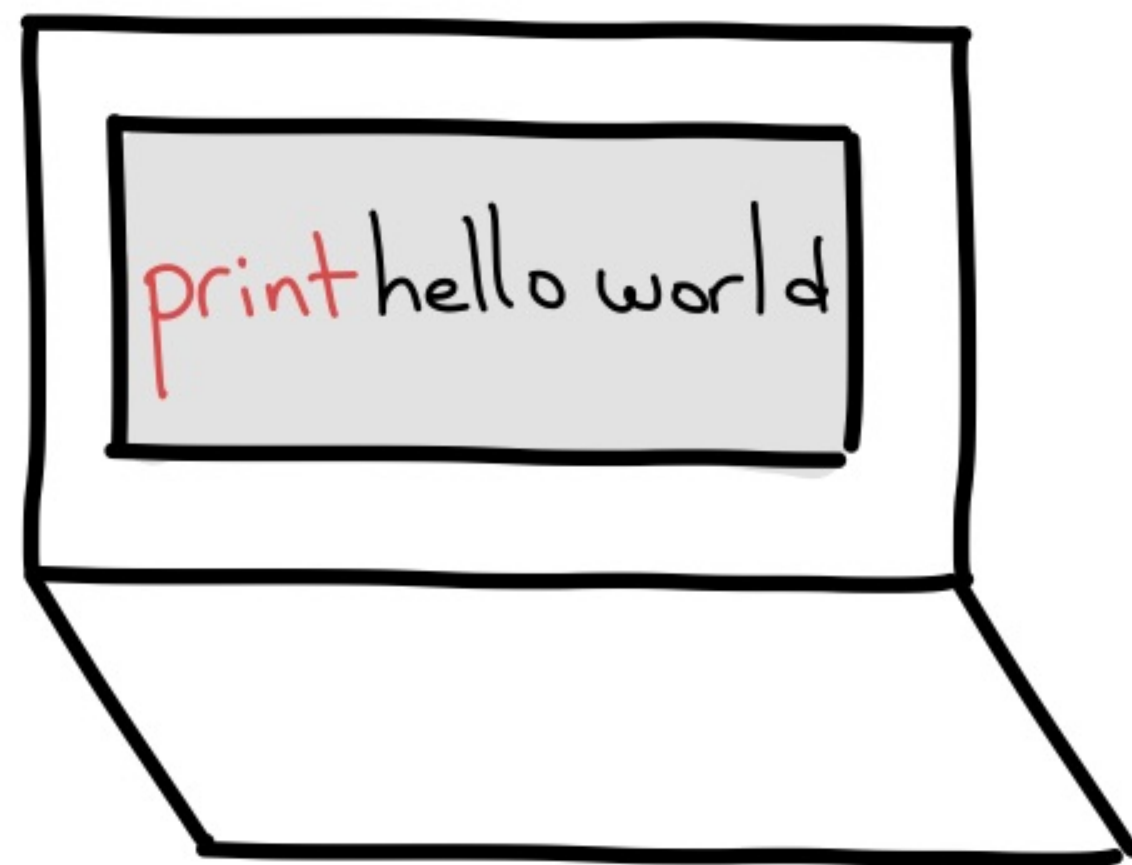
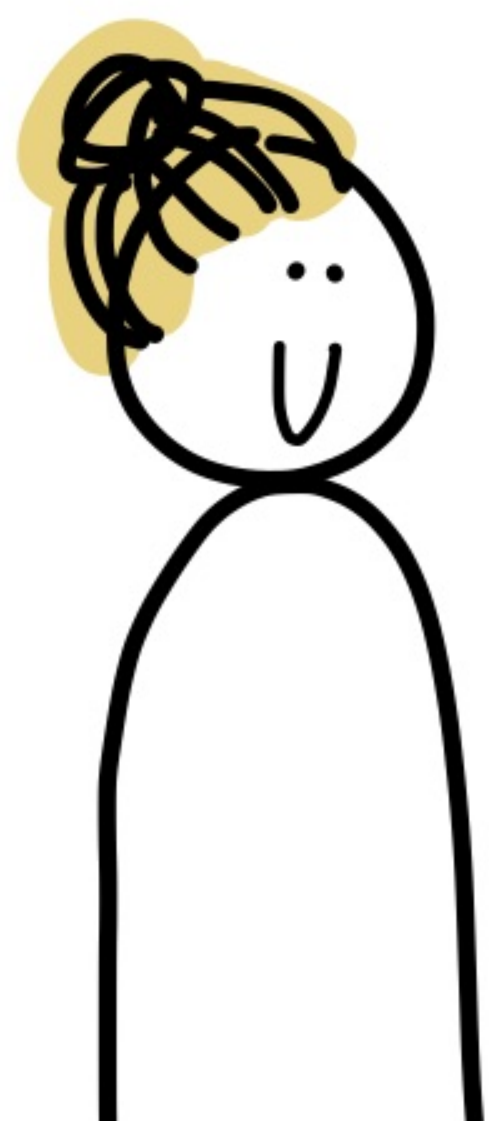
This is epistemic injustice



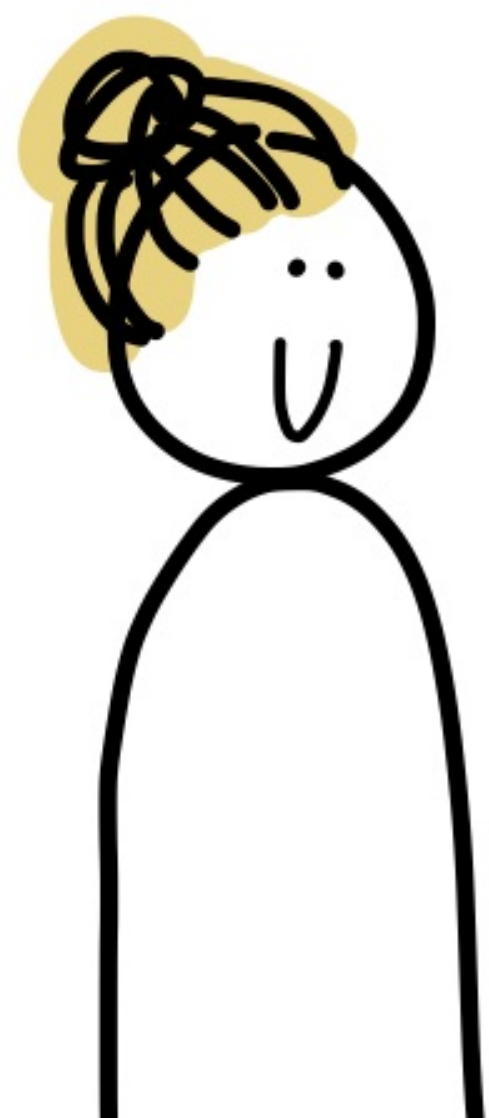

```
#include <iostream>
```

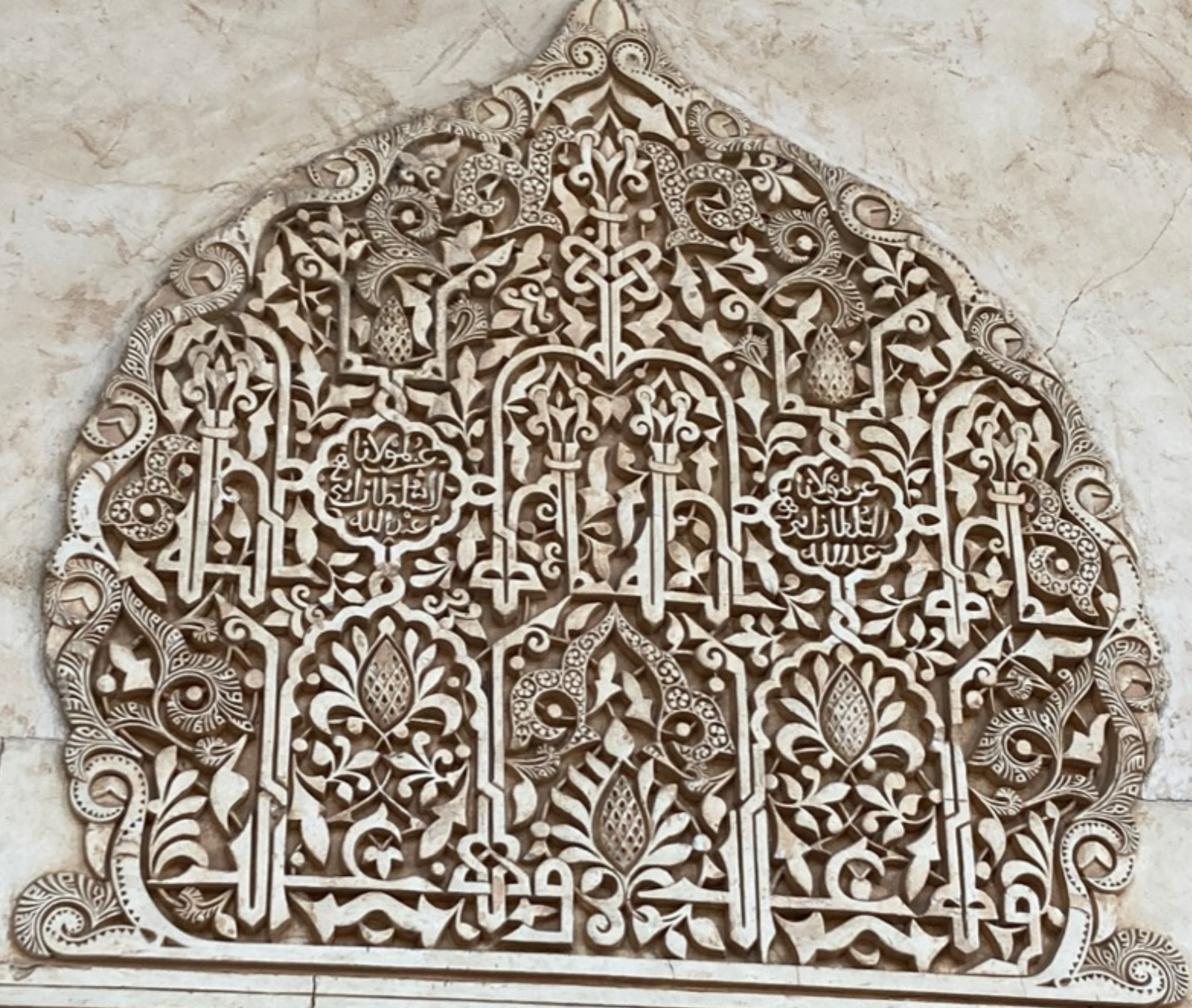
```
int main() {  
    std::cout << "Hello World!";  
    return 0;  
}
```

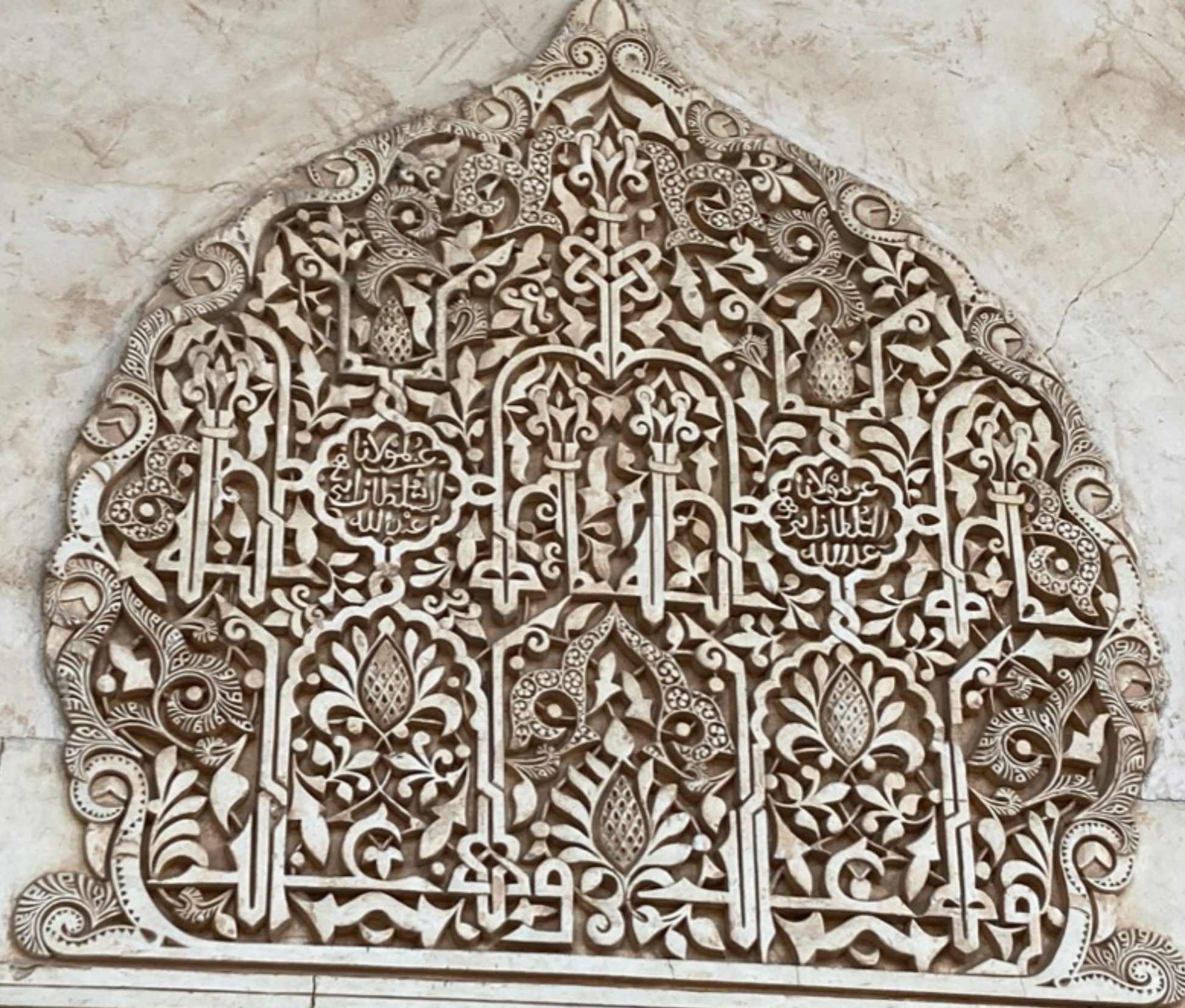


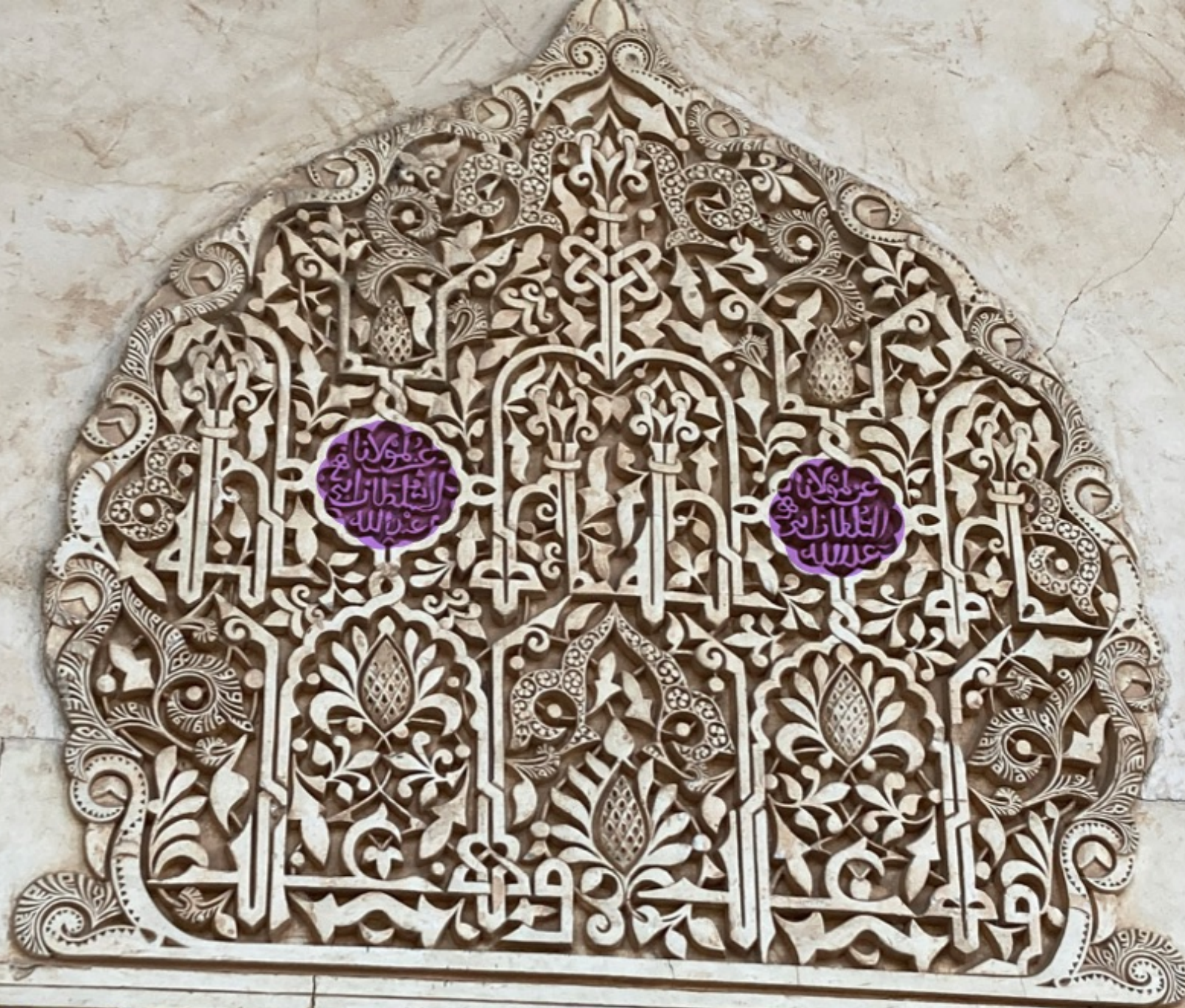


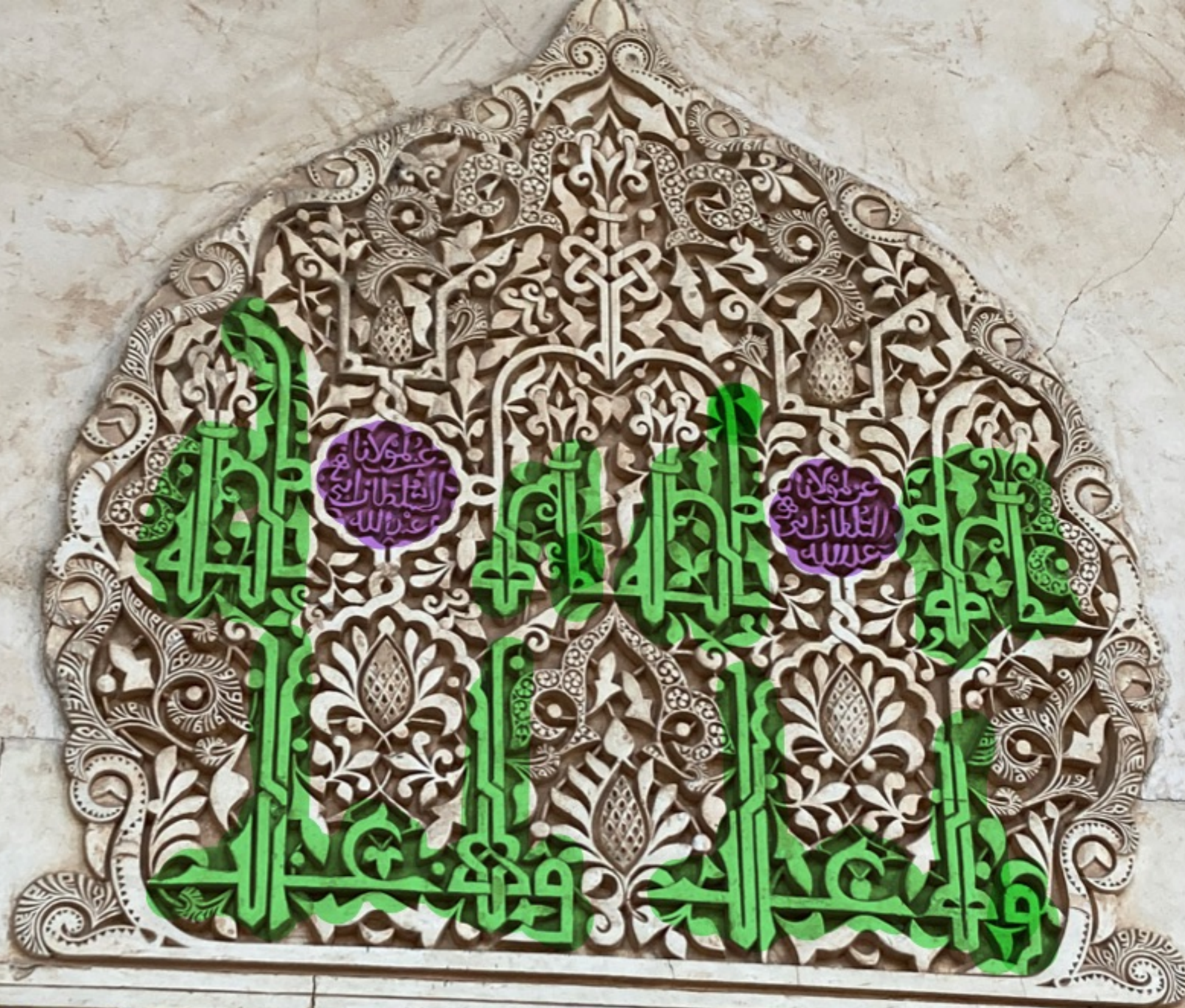
We are missing out on
so many PL ideas!











فاددته وليستحيل نقل اكن من مكان الى مكان **الثالث**

ما نحن بصددده وموا لبنكائات الدورية المعمولة من بالذواليب

من الحد يداوا لفلولا ذوا النحاس والحشب يدبر بعضها بعضا

على نسب عددية في اسنانها او مقادير افطارا واقربها من المحرك



1 اسمك هو اسأل 'من يمشي في الغابة؟'
2 قول اسمك 'يمشي عبر الغابة'
3 قول اسمك '...واجه الوحش'
4 النهاية هو اسأل 'هل تريد نهاية جيدة او سيئة؟'
5 اذا النهاية هي جيدة قول اسمك 'ياخذ السيف ويهرب الوحش بسرعة'
6 وإلا قول 'الوحش يأكل' اسمك
7

الرجوع الى المستوى 4



تنفيذ البرنامج



القراءة بصوت عال:

```
6 _PRINT: ( "_" "ل" *"_ "و" *"_ "ق" *"_* | "print") _SPACE?
7 _ASK: ( "_" "ل" *"_ "أ" *"_ "س" *"_ "ا" *"_* | "ask") _SPACE?
8 _ECHO: ( "_" "د" *"_ "د" *"_ "ر" *"_* | "echo") _SPACE?
9 _FORWARD: ( "_" "م" *"_ "د" *"_ "ق" *"_ "ت" *"_* | "forward") _SPACE?
10 _TURN: ( "_" "ر" *"_ "د" *"_ "ت" *"_ "س" *"_ "ا" *"_* | "turn") _SPACE?
11 left: ( "_" "ر" *"_ "ا" *"_ "س" *"_ "ي" *"_* | "left") _SPACE?
12 right: ( "_" "ن" *"_ "ي" *"_ "م" *"_ "ي" *"_* | "right") _SPACE?
13 black: ( "_" "د" *"_ "و" *"_ "س" *"_ "ا" *"_* | "black") _SPACE?
14 blue: ( "_" "ق" *"_ "ر" *"_ "ز" *"_ "ا" *"_* | "blue") _SPACE?
15 brown: ( "_" "ي" *"_ "ن" *"_ "ب" *"_* | "brown") _SPACE?
16 gray: ( "_" "ي" *"_ "د" *"_ "ا" *"_ "م" *"_ "ر" *"_* | "gray") _SPACE?
17 green: ( "_" "ر" *"_ "ض" *"_ "خ" *"_ "ا" *"_* | "green") _SPACE?
18 orange: ( "_" "ي" *"_ "ل" *"_ "ا" *"_ "ق" *"_ "ت" *"_ "ر" *"_ "ب" *"_* | "orange") _SPACE?
19 pink: ( "_" "ي" *"_ "ر" *"_ "ه" *"_ "ز" *"_* | "pink") _SPACE?
20 purple: ( "_" "ي" *"_ "ج" *"_ "س" *"_ "ف" *"_ "ن" *"_ "ب" *"_* | "purple") _SPACE?
21 red: ( "_" "ر" *"_ "م" *"_ "ح" *"_ "ا" *"_* | "red") _SPACE?
22 white: ( "_" "ض" *"_ "ي" *"_ "ب" *"_ "ا" *"_* | "white") _SPACE?
23 yellow: ( "_" "ر" *"_ "ف" *"_ "ص" *"_ "ا" *"_* | "yellow") _SPACE?
24 _IS: _SPACE ("هي" | "هو" | "is") _SPACE
25 _SLEEP: ( "_" "ر" *"_ "ظ" *"_ "ت" *"_ "ن" *"_ "ا" *"_* | "sleep") _SPACE?
26 _ADD_LIST: ( "_" "ف" *"_ "ض" *"_ "ا" *"_* | "add") _SPACE
```



1 اسمك هو اسأل 'من يمشي في الغابة؟'
2 قول اسمك 'يمشي عبر الغابة'
3 قول اسمك '...واجه الوحش'
4 النهاية هو اسأل 'هل تريد نهاية جيدة او سيئة؟'
5 اذا النهاية هي جيدة قول اسمك 'ياخذ السيف ويهرب الوحش بسرعة'
6 وإلا قول 'الوحش يأكل' اسمك
7

الرجوع الى المستوى 4



تنفيذ البرنامج



القراءة بصوت عال:



1 اسمك هو اسأل 'من يمشي في الغابة؟'
2 قول اسمك 'يمشي عبر الغابة'
3 قول اسمك '...واجه الوحش'
4 النهاية هو اسأل 'هل تريد نهاية جيدة او سيئة؟'
5 اذا النهاية هي جيدة قول اسمك 'ياخذ السيف ويهرب الوحش بسرعة'
6 وإلا قول 'الوحش يأكل' اسمك
7

الرجوع الى المستوى 4



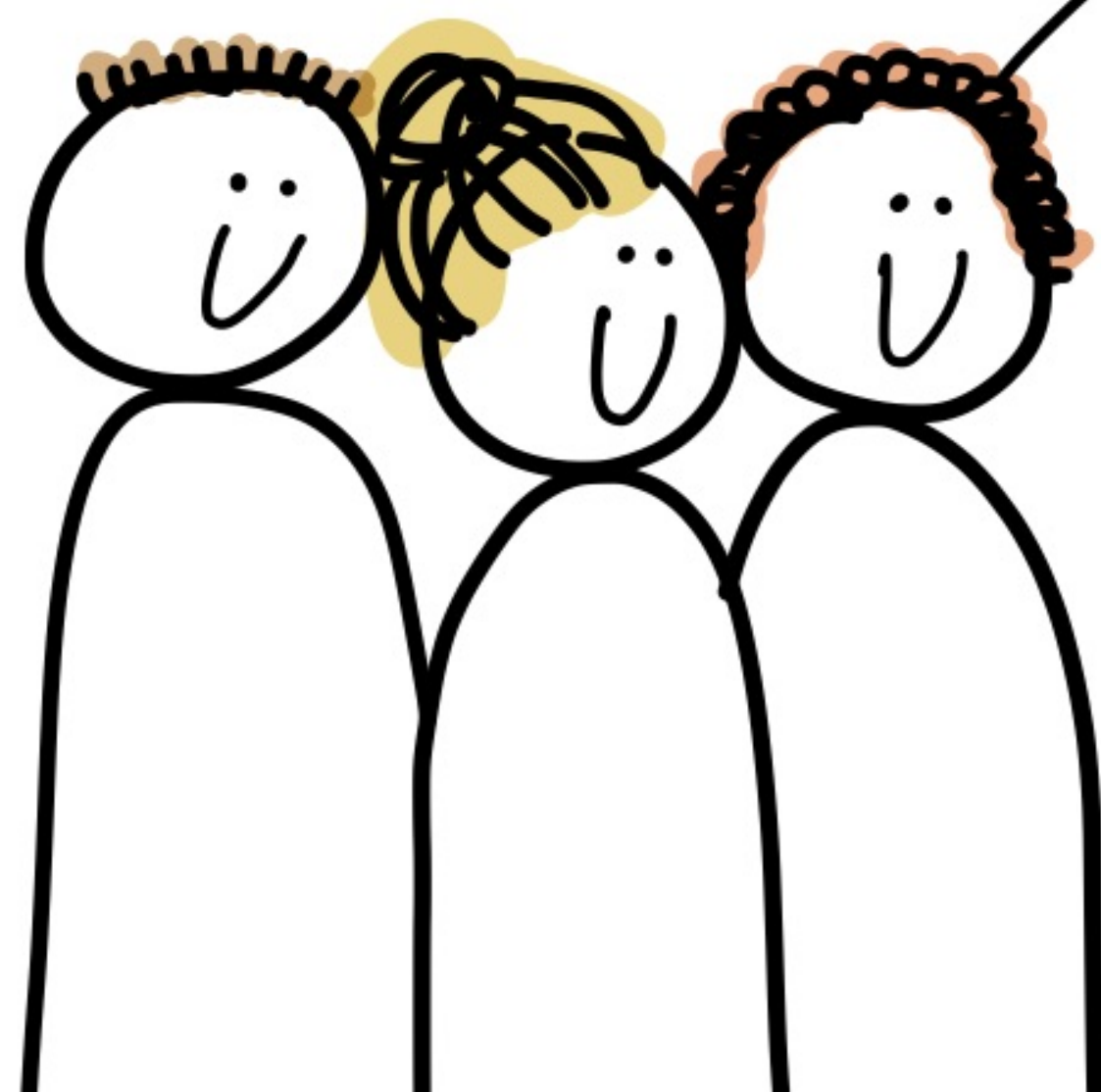
تنفيذ البرنامج



القراءة بصوت عال:

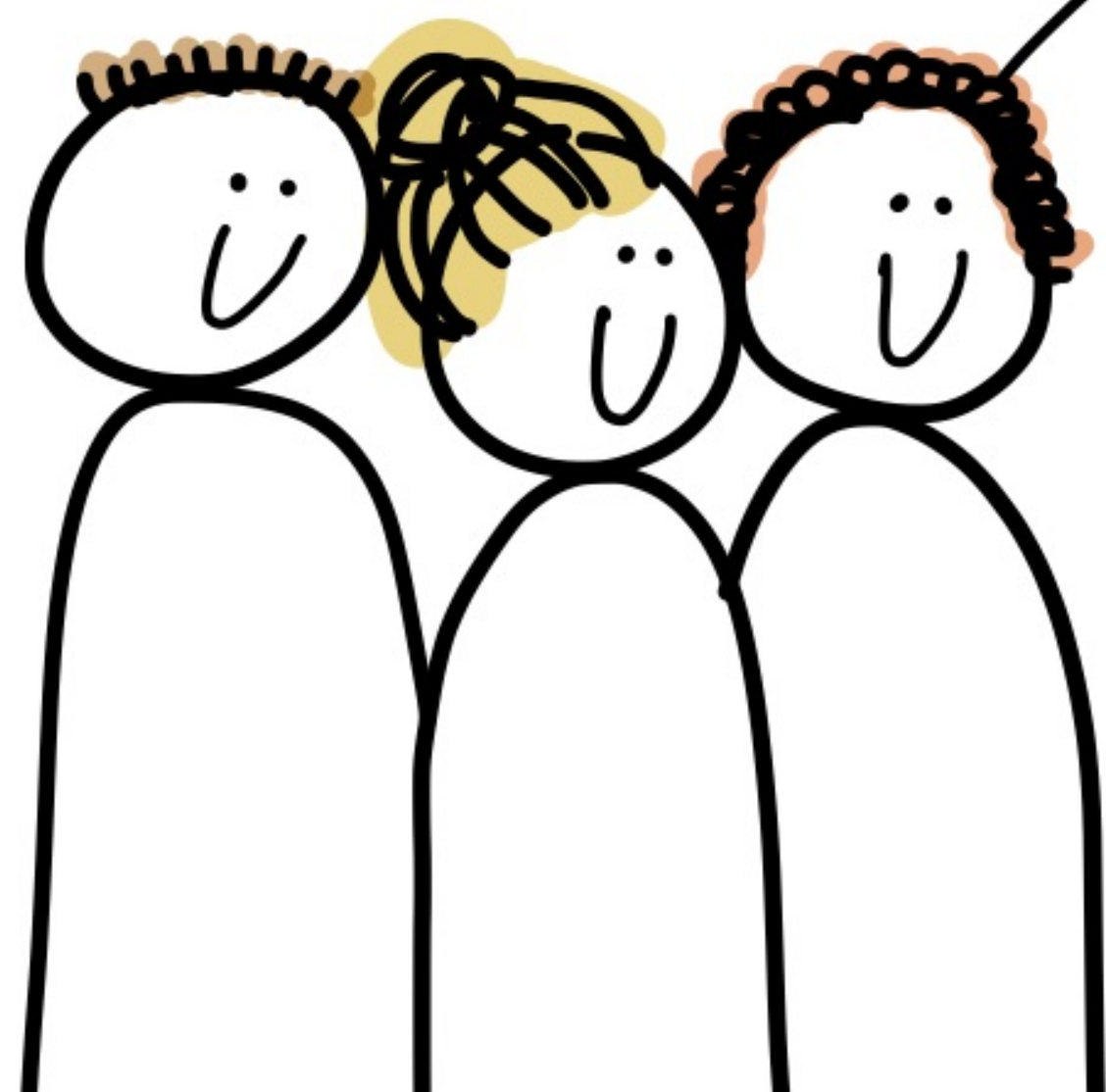
Hedy Community

Join us!



Hedy Community

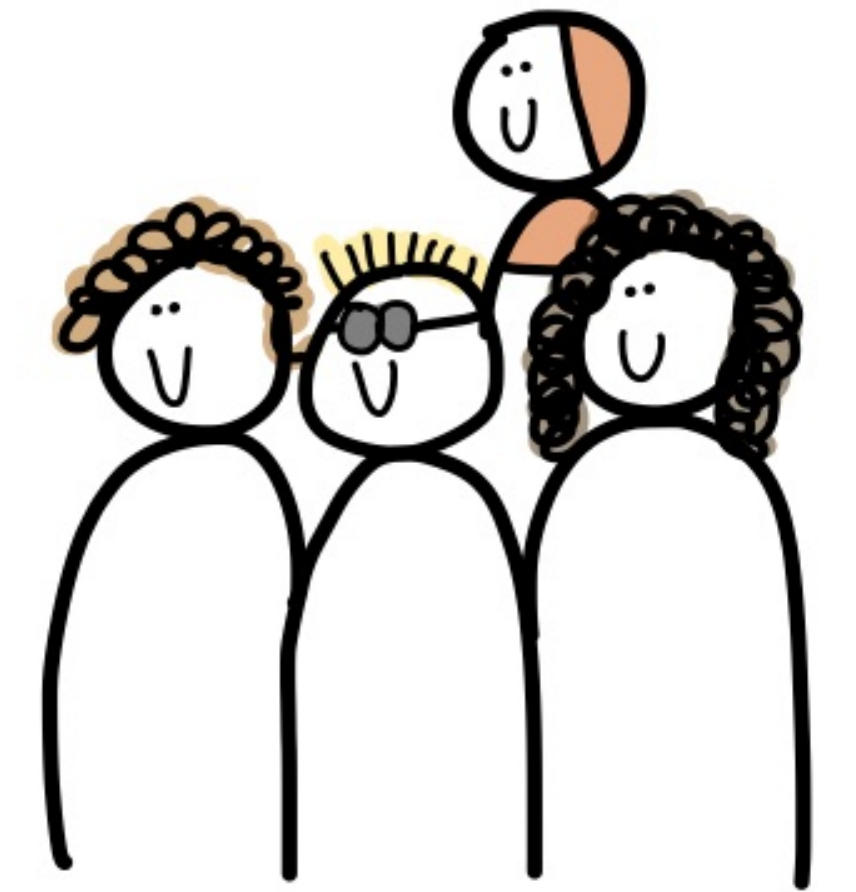
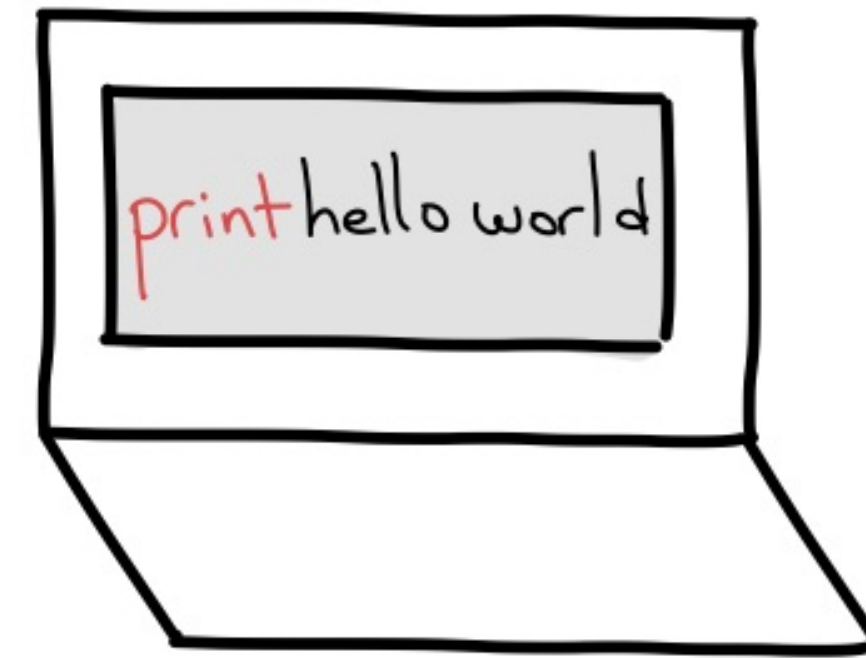
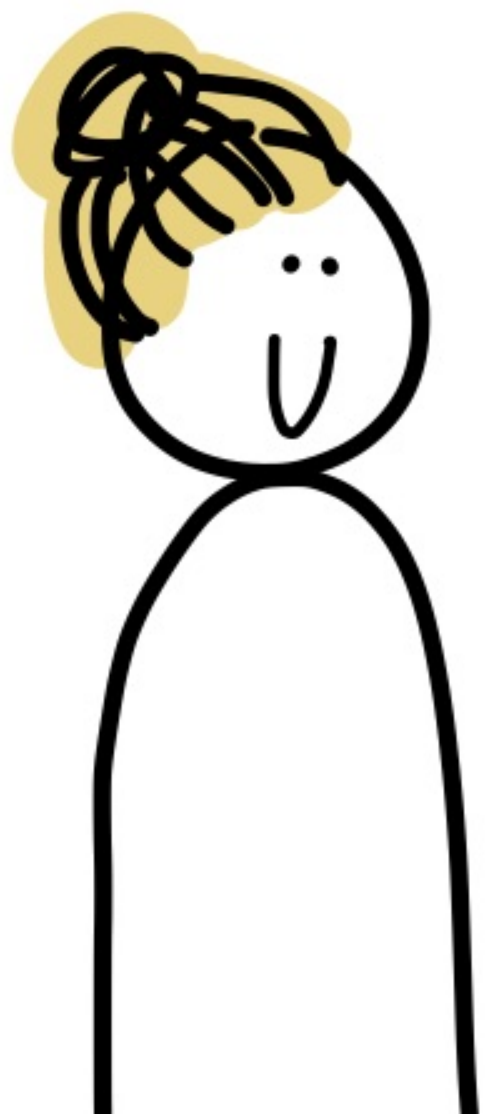
Join us!



www.hedy.org/join

A human programming language

How to make programming languages more inclusive
and why that matters



prof. dr. ir. Felienne Hermans