Welcome to GPN

Tech
Inclusion

Thank you to our Sponsors!

Platinum Sponsor:

Tech
Inclusion

Who are the tutors?

Tech
Inclusion

Who are you?

Log on

Log on and jump on the GPN website

girlsprogramming.network/workshop

You can see:

- These **slides** (to take a look back or go on ahead).
- A digital copy of your **workbook**.
- Help bits of text you can **copy and paste**!

There's also links to places where you can do more programming!

Tech
Inclusion

Tell us you're here!

Click on the
Start of Day Survey
and fill it in now!

Tech Inclusion

Today's project!

Markov Chains!

What is a Markov Chain?

A Markov chain is a simple Artificial Intelligence!

Let's play a game with some cups to help explain it

Let's generate some text in the style of

Green Eggs & Ham by Dr Seuss

Do you like green eggs and ham?

I do not like them, Sam-I-am.

I do not like green eggs and ham.

Would you like them here or there?

I would not like them here or there.

I would not like them anywhere.

Let's play the cups game!

- Each cup is labelled with a word from Green Eggs and Ham

- Each cup contains the words that follow the "label" word in Green Eggs and Ham

Let's play the cups game!

Read the outside of your cup!

If you hear someone shout the word on the outside of your cup:

1. Pick a piece of paper from inside your cup
2. Shout out the word on the piece of paper
3. Put the piece of paper back in your cup

Tech Inclusion

Today we'll be making Markov Chains!

Markov chains are exactly what we just did with the cups!

Today we'll make the computer do it too to make some crazy stories!!

Here's one we made from some Shakespeare!

```
doth stay! All days when I compare thee to unseeing
eyes be blessed made By chance, or eyes can see, For
all the top of happy show thee in dark directed. Then
thou, whose shadow shadows doth stay! All days when I
compare thee in your self in inward worth nor outward
fair, Can make bright, How would thy shade Through
heavy sleep on the eye of life repair, Which this,
Time's pencil, or my pupil pen, Neither in the living
day, When in eternal lines of that fair from fair
thou grow'st, So should the lines to a summer's day?
```

Imagine if you used one of these to do your homework!!

Using the workbook!

The workbooks will help you put your project together!

Each **Part** of the workbook is made of tasks!

Tasks - The parts of your project

Follow the tasks **in order** to make the project!

Hints - Helpers for your tasks!

Stuck on a task, we might have given you a hint to help you **figure it out**!

The hints have **unrelated** examples, or tips. **Don't copy and paste** in the code, you'll end up with something **CRAZY**!

Task 6.2: Add a blah to your code!

This has instructions on how to do a part of the project

1. **Start by doing this part**
2. **Then you can do this part**

Task 6.1: Make the thing do blah!

Make your project do blah ….

Hint

A clue, an example or some extra information to help you **figure out** the answer.

```
print('This example is not part of the project' )
```

Tech Inclusion

Using the workbook!

The workbooks will help you put your project together!

Check off before you move on from a **Part**! Do some bonuses while you wait!

Checklist - Am I done yet?

Make sure you can tick off every box in this section before you go to the next Part.

Lecture Markers
This tells you you'll find out how to do things for this section during the names lecture.

Bonus Activities
Stuck waiting at a lecture marker?
Try a purple bonus. They add extra functionality to your project along the way.

☑ CHECKPOINT ☑

If you can tick all of these off you're ready to move the next part!
☐ Your program does blah
☐ Your program does blob

For Loops

★ BONUS 4.3: Do some extra!

Something to try if you have spare time before the next lecture!

Tech Inclusion

Intro to Programming

Tech
Inclusion

What is programming?

Programming is not a bunch of crazy numbers!

It's giving computers a set of instructions!

WHAT DO YOU WANT ME TO DO?

A Special Language

A language to talk to dogs!

Programming is a language to talk to computers

Tech Inclusion

People are smart! Computers are dumb!

Programming is like a recipe!

Computers do EXACTLY what you say, every time.
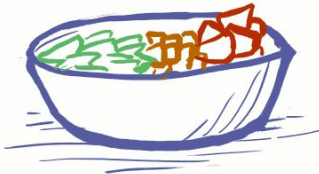
Which is great if you give them a good recipe!

SALAD INSTRUCTIONS

1) GET A LETTUCE HEAD, A CARROT, A TOMATO, A KNIFE, AND A BOWL

2) USE THE KNIFE TO CUT UP THE LETTUCE HEAD, CARROT, AND TOMATO

3) PUT THE LETTUCE, CARROT AND TOMATO IN THE BOWL

4) MIX THE CONTENTS OF THE BOWL

People are smart! Computers are dumb!

But if you get it out of order….

A computer wouldn't know this recipe was wrong!

People are smart! Computers are dumb!

Computers are bad at filling in the gaps!

A computer wouldn't know something was missing, it would just freak out!

Tech Inclusion

Everyone/thing has strengths!

`¯\_(ツ)_/¯`
Don't know LOL

- Understand instructions despite:
  - Spelling mistakes
  - Typos
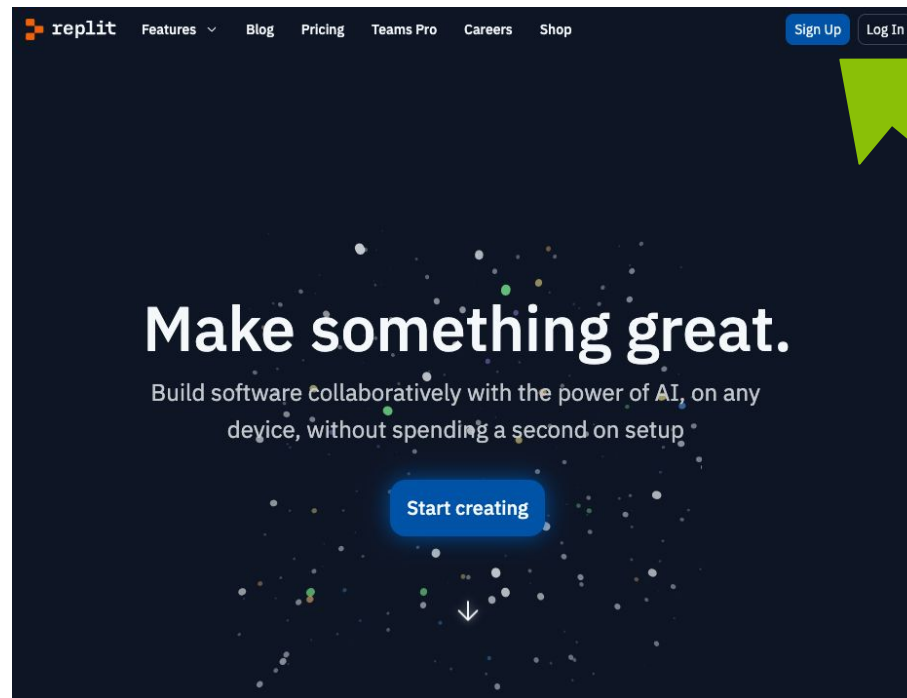 - Confusing parts
- Solve problems
- Tell computers what to do
- Get smarter every day

- Does exactly what you tell it
- Does it the same every time
- Doesn't need to sleep!
- Will work for hours on end!
- Get smarter when you tell them how

Tech Inclusion

Intro to Python

Let's get coding!

Tech
Inclusion

Where do we program?

We'll use **Repl It** to make a Python project!

Go to replit.com in your web browser

Where do we program?

You need to sign up or sign in to start coding

If you have a **Google** or **Apple account** it's easiest to use that.

Or use an **email address** you are able to log into.

Creating our **Repl It Project**
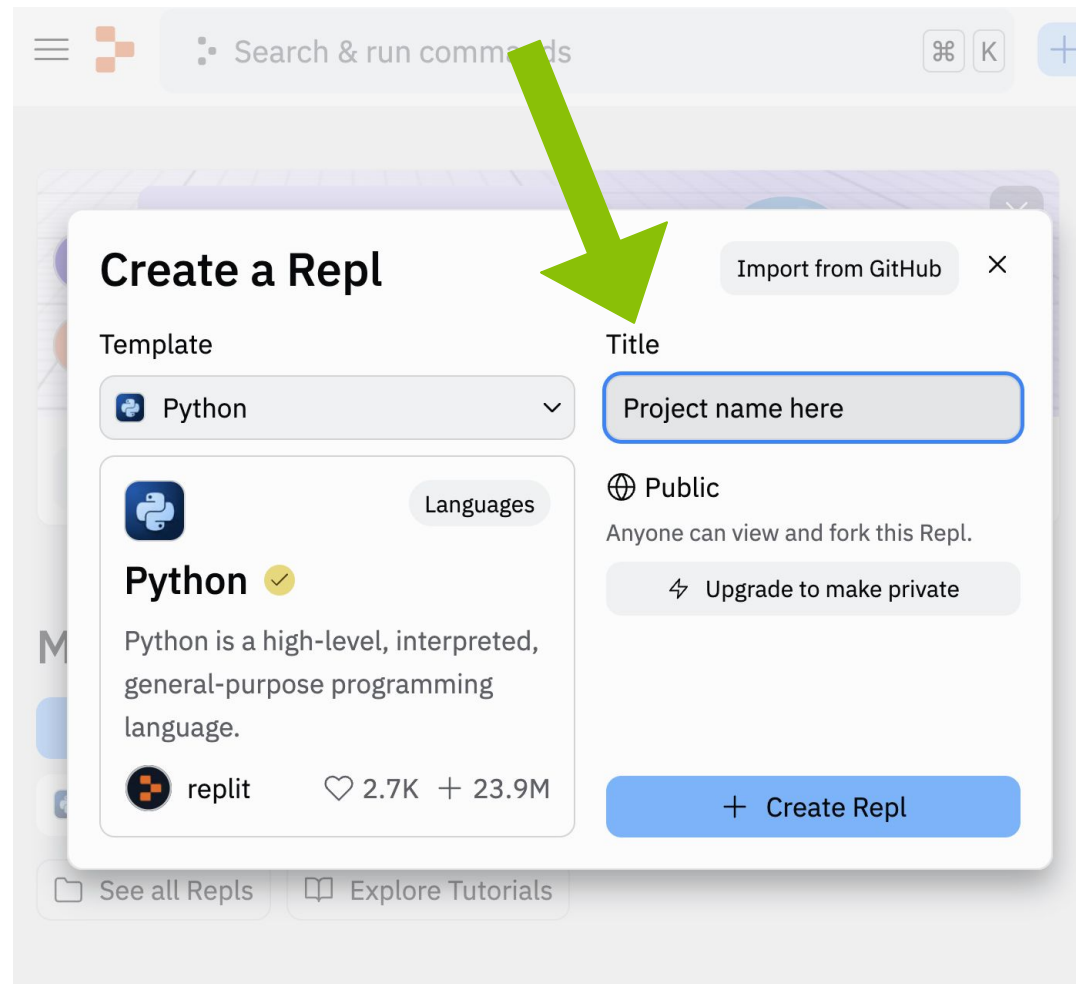
Let's create a new project
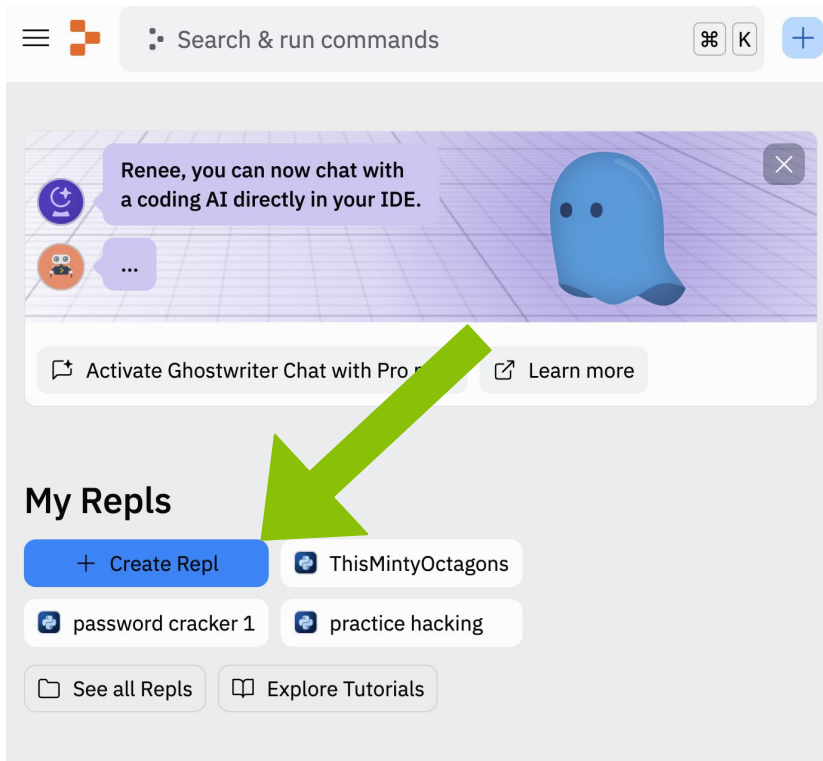
Select Python for the project template

Tech Inclusion
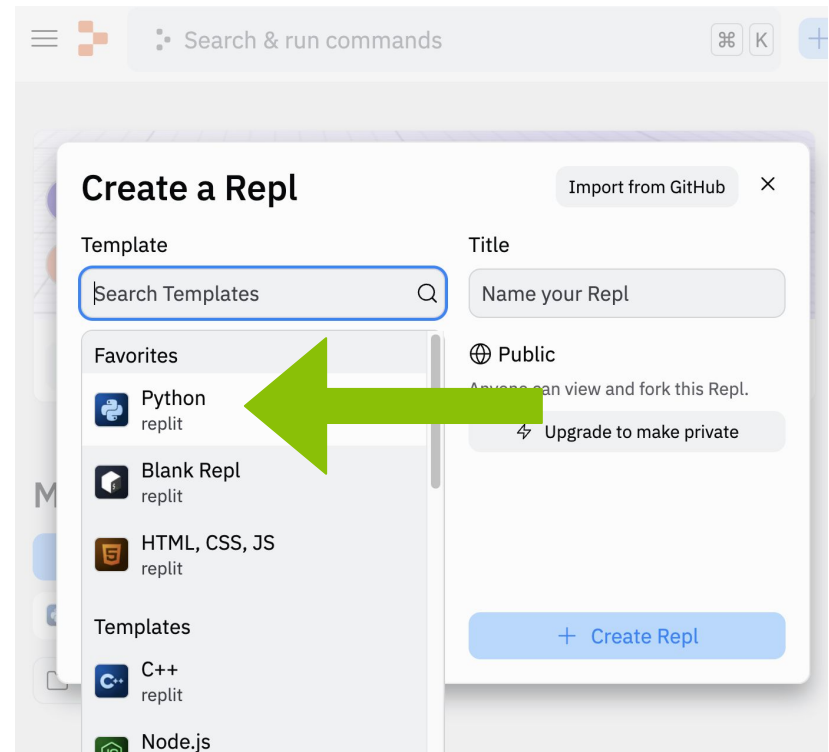
Creating our **Repl It Project**
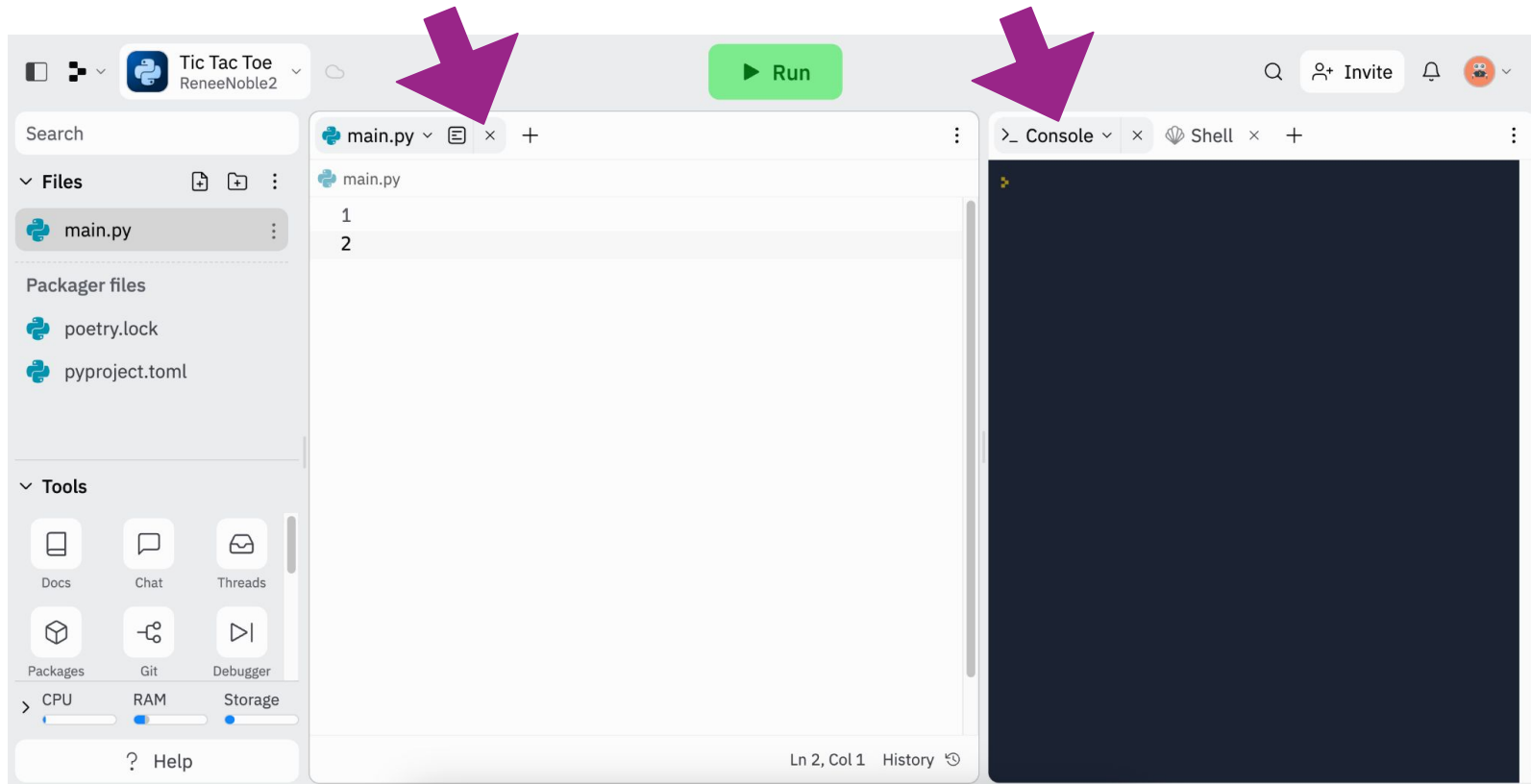
Don't forget to give your project a name!

Name it after today's project!

We're ready to code!

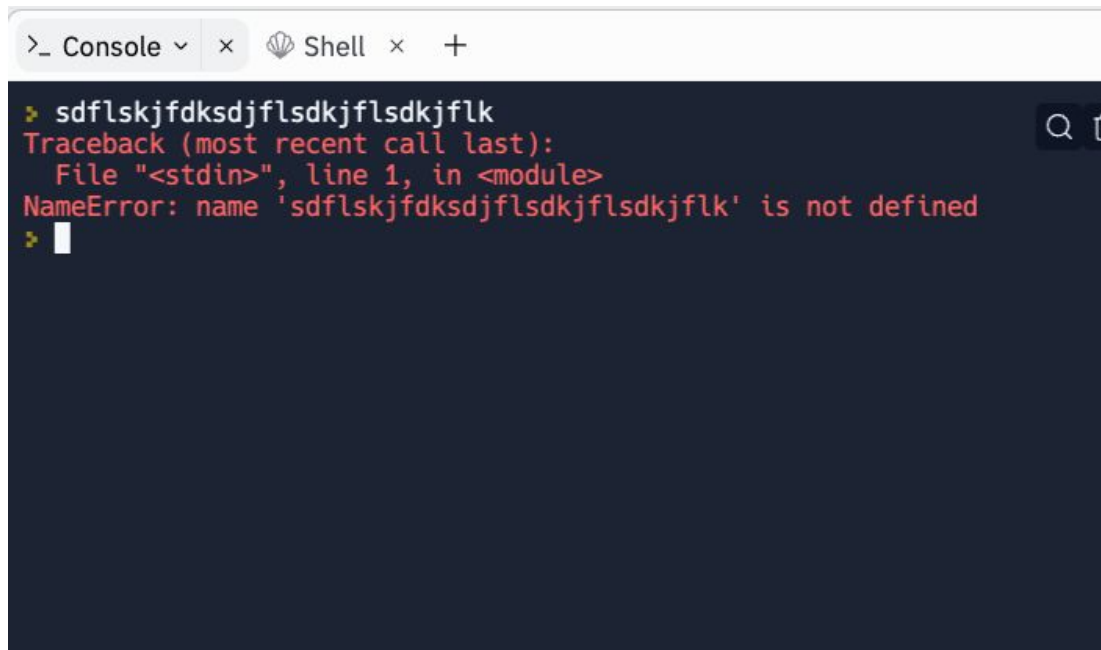**We'll write our project here in main.py**

You can test out Python code in the console

Tech Inclusion

Test the **console**! Make a mistake!

Type by **button mashing** the keyboard!

Then press enter!

Did you get a big red error message?

Tech Inclusion

Mistakes are great!

Good work you made an error!

- Programmers make A LOT of errors!
- Errors give us hints to find mistakes
- Run your code often to get the hints!!
- Mistakes won't break computers!
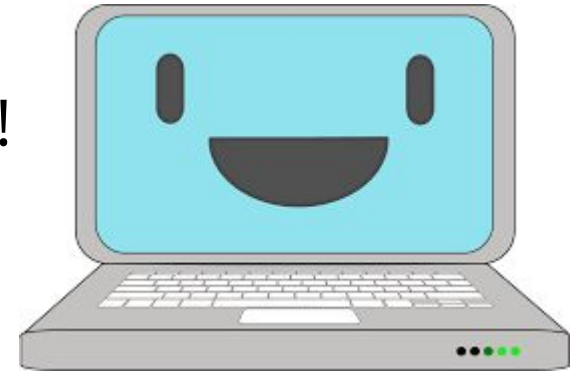
Tech Inclusion

We can learn from our mistakes!

Error messages help us fix our mistakes!

We read error messages from bottom to top

3. Where that code is

```
Traceback (most recent call last):
  File "C:/Users/Madeleine/Desktop/tmp.py", line 9, in <module>
    print("I have " + 5 + " apples")
TypeError: can only concatenate str (not "int") to str
```

1. What went wrong

2. What code didn't work

Tech Inclusion

Write some code!!

This is the first bit of code we will do. What do you think it does?

```python
print('hello world')
```

Tech Inclusion

Write some code!!

This is the first bit of code we will do. What do you think it does?

```
print('hello world')
```

It prints the words "hello world" onto the screen!

Tell me more!

We can `print` things in lots of different ways in python!

```
>>> print("Hello world!")


>>> print("Hello", "world!")


>>> print("Hello", "world", end="!")
```

Tell me more!

We can `print` things in lots of different ways in python!

```
>>> print("Hello world!")
Hello world!
>>> print("Hello", "world!")


>>> print("Hello", "world", end="!")
```

Tech
Inclusion

Tell me more!

We can `print` things in lots of different ways in python!

```
>>> print("Hello world!")
Hello world!
>>> print("Hello", "world!")
Hello world!
>>> print("Hello", "world", end="!")
```

Tell me more!

We can `print` things in lots of different ways in python!

```
>>> print("Hello world!")
Hello world!
>>> print("Hello", "world!")
Hello world!
>>> print("Hello", "world", end="!")
Hello world!
```

Note that this last one will not have a new line after it!

Variables are useful for storing things that change

(i.e. things that "vary" - hence the word "variable")

You can think of it like putting information in a box and giving it a name
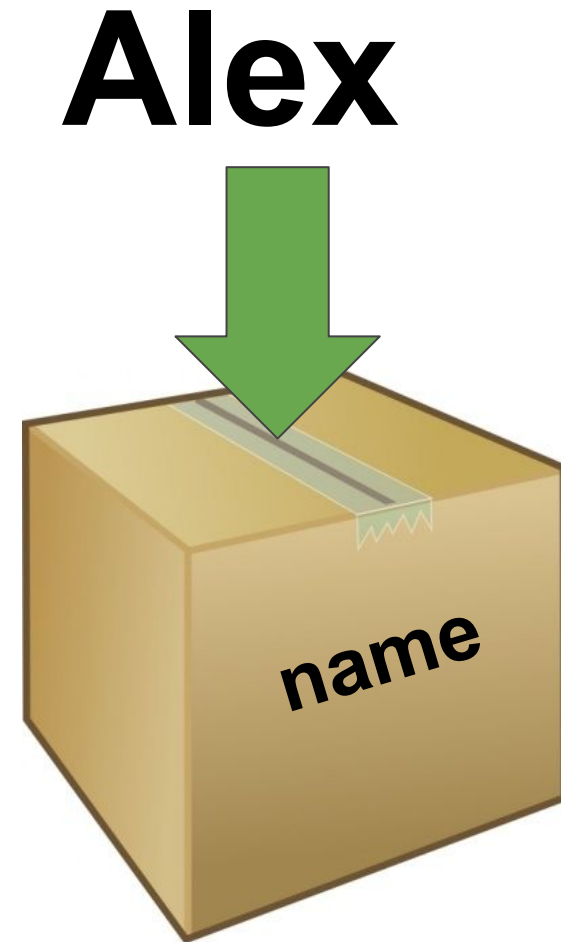
Alex

name

Variables

Instead of writing a name, we can use the name that is inside our variable! Here, we get the name out of the box.

```
print(name)
```

Alex

name

Tech Inclusion

Variables

Instead of writing a name, we can use the name that is inside our variable! Here, we get the name out of the box.

```
print(name)

Alex
```

Alex

name

Tech Inclusion

Reusing variables

We can replace values in variables:

```python
animal = "dog"
print("My favourite animal is a " + animal)
animal = "cat"
print("My favourite animal is a " + animal)
animal = animal + "dog"
print("My favourite animal is a " + animal)
```

What will this output?
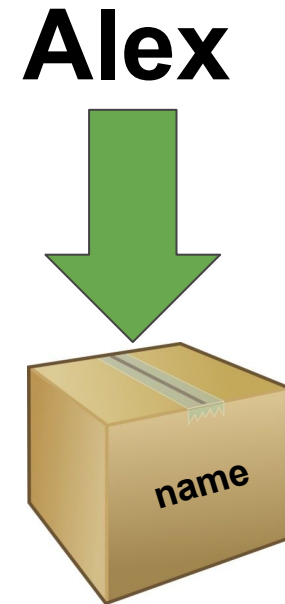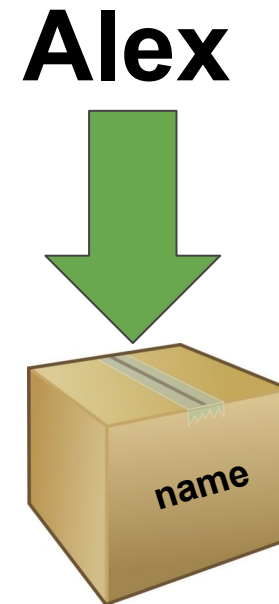
Reusing variables

We can replace values in variables:

```
animal = "dog"
print("My favourite animal is a " + animal)
animal = "cat"
print("My favourite animal is a " + animal)
animal = animal + "dog"
print("My favourite animal is a " + animal)
```

What will this output?
```
My favourite animal is a dog
My favourite animal is a cat
My favourite animal is a catdog
```

Tech
Inclusion

Asking a question!

It's more fun when we get to interact with the computer!

Let's get the computer to ask us a question!

```python
my_name = input('What is your name? ')
print('Hello ' + my_name)
```

What do you think happens?

Tech
Inclusion

Asking a question!

It's more fun when we get to interact with the computer!

Let's get the computer to ask us a question!

```python
my_name = input('What is your name? ')
print('Hello ' + my_name)
```

What do you think happens?

```
What is your name? Maddie
Hello Maddie
```

Asking a question!

```python
my_name = input('What is your name? ')
print('Hello ' + my_name)
```

What do you think happens?

```
What is your name? Maddie
Hello Maddie
```

We can use the answer the user wrote that we then stored later!

Girls' Programming Network

Tech Inclusion

Coding in a file!

Part 0 of your workbook is to create a new file. This is a picture of how to do it in IDLE
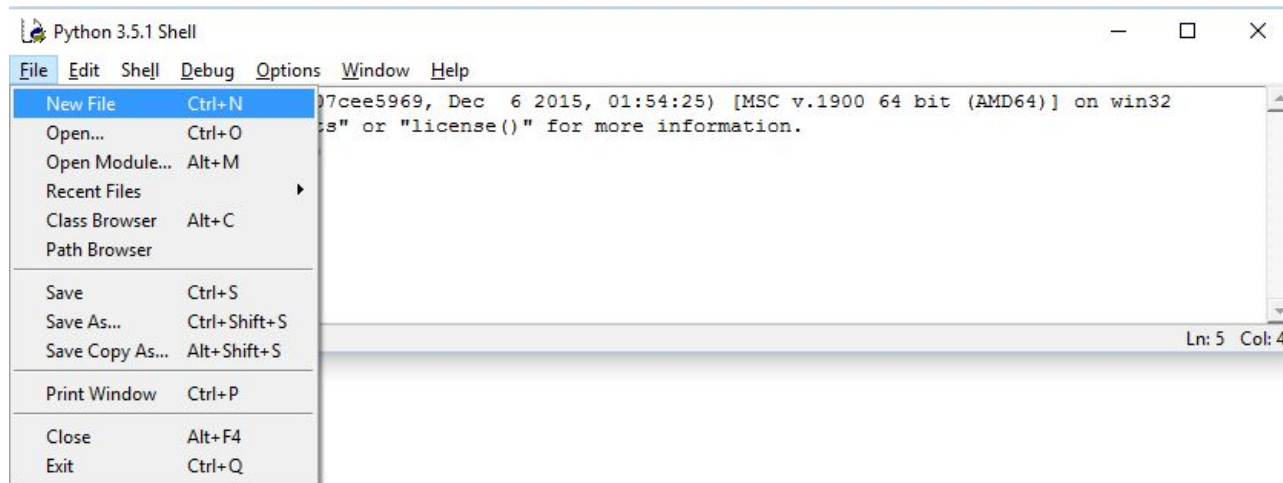
Name your file **markov_chains.py**

Adding a comment!

Sometimes we want to write things in code that the computer doesn't look at! We use **comments** for that!

Use comments to write a note or explanation of our code

Comments make code easier for humans to understand

```
# This code was written by Sheree
```

We can make code into a comment if we don't want it to run (but don't want to delete it!)

```
# print("Goodbye world!")
```

Project time!

You now know all about printing, variables and input!

Let's put what we learnt into our project

Try to do Part 0 - Part 2

The tutors will be around to help!

If Statements and Lists

Conditions!

Conditions let us make decision.

First we test if the condition is met!

Then maybe we'll do the thing

If it's raining take an umbrella

Yep it's raining

...... take an umbrella

Booleans (True and False)

Computers store whether a condition is met in the form of

True and **False**

To figure out if something is **True** or **False** we do a comparison

5 < 10	"Dog" == "dog"
3 + 2 == 5	"D" in "Dog"
5 != 5	"Q" not in "Cat"

Tech
Inclusion

Booleans (True and False)

Computers store whether a condition is met in the form of

True and **False**

To figure out if something is **True** or **False** we do a comparison

5 < 10   True   "Dog" == "dog"

3 + 2 == 5   "D" in "Dog"

5 != 5   "Q" not in "Cat"

Booleans (True and False)

Computers store whether a condition is met in the form of

True and **False**

To figure out if something is **True** or **False** we do a comparison

5 < 10	True	"Dog" == "dog"
3 + 2 == 5	True	"D" in "Dog"
5 != 5		"Q" not in "Cat"

Tech
Inclusion

Booleans (True and False)

Computers store whether a condition is met in the form of

True and **False**

To figure out if something is **True** or **False** we do a comparison

5 < 10	True	"Dog" == "dog"
3 + 2 == 5	True	"D" in "Dog"
5 != 5	False	"Q" not in "Cat"

Tech
Inclusion

Booleans (True and False)

Computers store whether a condition is met in the form of

True and **False**

To figure out if something is **True** or **False** we do a comparison

5 < 10	True	"Dog" == "dog"	False
3 + 2 == 5	True	"D" in "Dog"	
5 != 5	False	"Q" not in "Cat"	

Tech Inclusion

Booleans (True and False)

Computers store whether a condition is met in the form of

True and **False**

To figure out if something is **True** or **False** we do a comparison

5 < 10	True	"Dog" == "dog"	False
3 + 2 == 5	True	"D" in "Dog"	True
5 != 5	False	"Q" not in "Cat"	

Tech Inclusion

Booleans (True and False)

Computers store whether a condition is met in the form of

True and **False**

To figure out if something is **True** or **False** we do a comparison

5 < 10	True	"Dog" == "dog"	False
3 + 2 == 5	True	"D" in "Dog"	True
5 != 5	False	"Q" not in "Cat"	True

Tech
Inclusion

Conditions

So to know whether to do something, they find out if it's **True**!

```python
fave_num = 5
if fave_num < 10:
    print("that's a small number")
```

Tech
Inclusion

Conditions

So to know whether to do something, they find out if it's True!

```
fave_num = 5
if fave_num < 10:
    print("that's a small number")
```

That's the condition!

Tech Inclusion

Conditions

So to know whether to do something, they find out if it's True!

```
fave_num = 5
if fave_num < 10:
    print("that's a small number")
```

That's the condition!

Is it True that fave_num is less than 10?
- Well, fave_num is 5
- And it's True that 5 is less than 10
- So it is True!

Conditions

So to know whether to do something, they find out if it's **True**!

```python
fave_num = 5
if True:
    print("that's a small number")
```

Put in the answer to the question

Is it **True** that fave_num is less than 10?
- Well, fave_num is 5
- And it's **True** that 5 is less than 10
- So it is **True**!

Tech
Inclusion

Conditions

So to know whether to do something, they find out if it's True!

```
fave_num = 5
if True :
    print("that's a small number")
```

<u>What do you think happens?</u>

```
>>>
```

Tech
Inclusion

Conditions

So to know whether to do something, they find out if it's True!

```
fave_num = 5
if True :
    print("that's a small number")
```

What do you think happens?
```
>>> that's a small number
```

Tech
Inclusion

Conditions

How about a different number???

```python
fave_num = 9000
if fave_num < 10:
    print("that's a small number")
```

Tech
Inclusion

Conditions

Find out if it's **True**!

```
fave_num = 9000
if  False          :
    print("that's a small number")
```

Put in the answer to the question

Is it **True** that fave_num is less than 10?
- Well, fave_num is 9000
- And it's not **True** that 9000 is less than 10
- So it is _False_!

Tech Inclusion

How about a different number???

```python
fave_num = 9000
if fave_num < 10:
    print("that's a small number")
```

<u>What do you think happens?</u>

```
>>>
```

Conditions

How about a different number???

```python
fave_num = 9000
if fave_num < 10:
    print("that's a small number")
```

What do you think happens?
>>>

Nothing!

Tech
Inclusion

If statements

```python
fave_num = 5
if fave_num < 10:
    print("that's a small number")
```

This line …

… controls this line

Tech Inclusion

If statements

Actually .....

```
fave_num = 5
if fave_num < 10:
    print("that's a small number")
    print("and I like that")
    print("A LOT!!")
```

This line ...

... controls anything below it that is indented like this!

Tech Inclusion

If statements

```python
fave_num = 5
if fave_num < 10:
    print("that's a small number")
    print("and I like that")
    print("A LOT!!")
```

<u>What do you think happens?</u>

>>>

Tech Inclusion

If statements

```python
fave_num = 5
if fave_num < 10:
    print("that's a small number")
    print("and I like that")
    print("A LOT!!")
```

```
>>> that's a small number
>>> and I like that
>>> A LOT!!
```

Tech
Inclusion

If statements

```python
word = "GPN"
if word == "GPN":
    print("GPN is awesome!")
```

What happens?

Tech
Inclusion

If statements
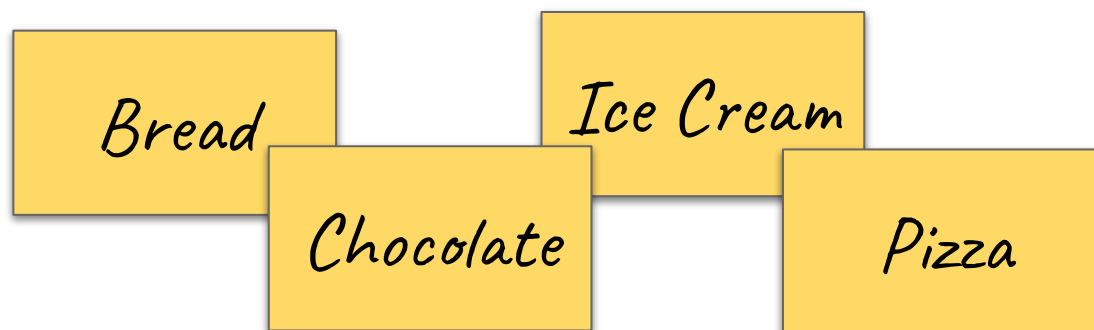
```
word = "GPN"
if word == "GPN":
    print("GPN is awesome!")
```

What happens?
```
>>> GPN is awesome!
```

Tech
Inclusion

Lists

When we go shopping, we write down what we want to buy!

But we don't store it on lots of little pieces of paper!

Bread

Chocolate

Ice Cream

Pizza

We put it in one big shopping list!

- Bread
- Chocolate
- Ice Cream
- Pizza

Lists

It would be annoying to store it separately when we code too

```
>>> shopping_item1 = "Bread"
>>> shopping_item2 = "Chocolate"
>>> shopping_item3 = "Ice Cream"
>>> shopping_item4 = "Pizza"
```
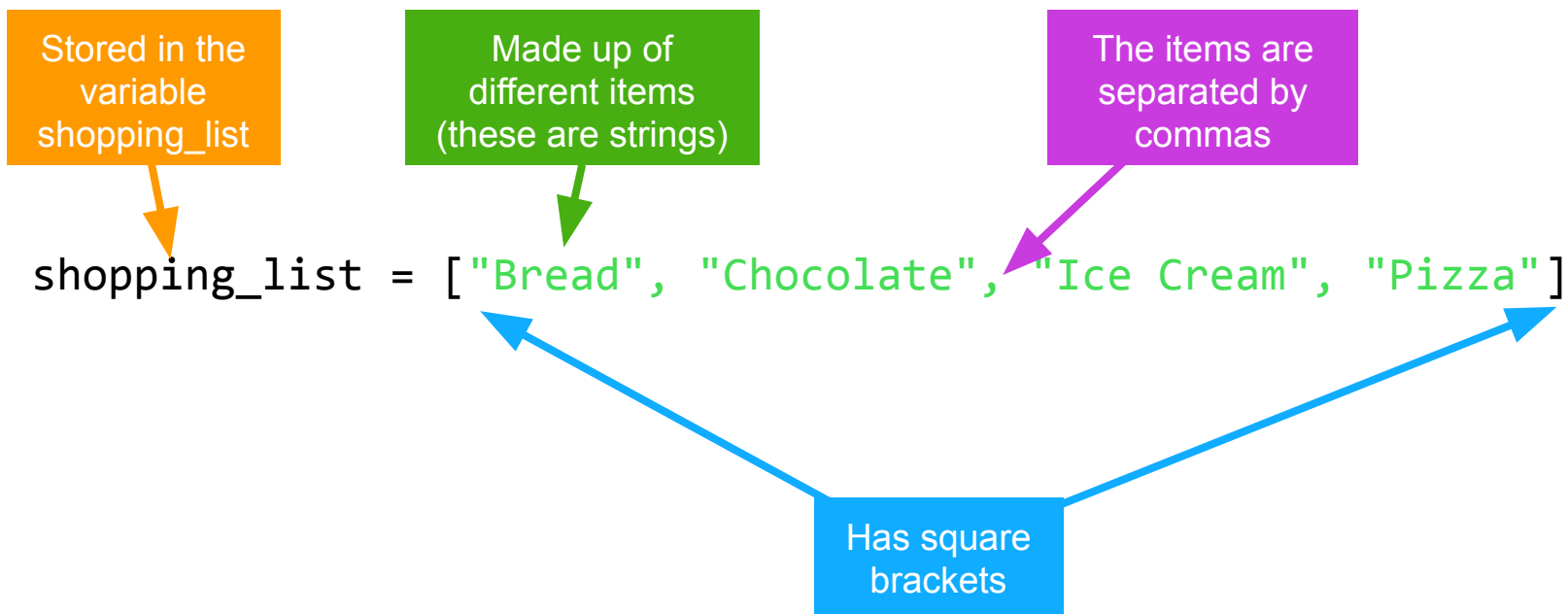
So much repetition!

Instead we use a python list!

```
>>> shopping_list = ["Bread", "Chocolate", "Ice Cream",
"Pizza"]
```

Tech
Inclusion

List anatomy

Stored in the variable shopping_list

Made up of different items (these are strings)

The items are separated by commas

```
shopping_list = ["Bread", "Chocolate", "Ice Cream", "Pizza"]
```

Has square brackets

Tech Inclusion

Project Time!

You now know all about **if** and lists!

See if you can do Part 3

The tutors will be around to help!

Tech Inclusion
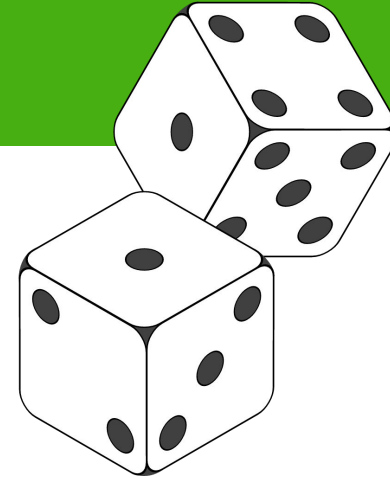
Random!

Tech
Inclusion

That's so random!

There's lots of things in life that are up to chance or random!

We want the computer to be random sometimes!

Python lets us **import** common bits of code people use! We're going to use the **random** module!

Tech Inclusion

Using the random module

Let's choose something randomly from a list!

This is like drawing something out of a hat in a raffle!

Here's an example!

1. **Import the random module!**
   ```
   >>> import random
   ```

2. **Copy the shopping list into IDLE**
   ```
   >>> shopping_list = ["eggs", "bread", "apples", "milk"]
   ```

3. **Choose randomly! Try it a few times!**
   ```
   >>> random.choice(shopping_list)
   ```

Tech
Inclusion

Using the random module

You can also assign your random choice to a variable

```
>>> import random
>>> shopping_list = ["eggs", "bread", "apples", "milk"]
>>> random_food = random.choice(shopping_list)
>>> print(random_food)
```

Tech
Inclusion

Project Time!

Raaaaaaaaaandom! Can you handle that?

Let's try use it in our project!

Try to do Part 4

The tutors will be around to help!

For Loops

Tech Inclusion

For Loops

For loops allow you to do something a certain number of times.

We use them when we know exactly how many times we want to do something!

For Loops

```
number = 10
for i in range(number):
    #Do something
```

For Loops

```
number = 10
for i in range(number):
    #Do something
```

The for word tells python we want to use a loop

Tech Inclusion

For Loops

This `i` is a temporary variable which will count how many times we have looped.

```
number = 10
for i in range(number):
    #Do something
```

The `for` word tells python we want to use a loop

Tech Inclusion

For Loops

This `i` is a temporary variable which will count how many times we have looped.

```
number = 10
for i in range(number):
    #Do something
```

The for word tells python we want to use a loop

This part says we want to loop `number` amount of times (in this case, 10)

Tech Inclusion

For Loops

This `i` is a temporary variable which will count how many times we have looped.

```python
number = 10
for i in range(number):
    #Do something
```

The `for` word tells python we want to use a loop

The code indented in the loop is what will happen every time.

This part says we want to loop `number` amount of times (in this case, 10)

Tech Inclusion

Looping how many times?

We can loop through a list:

```
friends = 4
for i in range(friends):
    print("Hello friend!")
```

What's going to happen?

We do what's in the for loop as many times as what is in the "range"

Looping how many times?

We can loop through a list:

```
friends = 4
for i in range(friends):
    print("Hello friend!")
```

What's going to happen?

```
>>> Hello friend!
>>> Hello friend!
>>> Hello friend!
>>> Hello friend!
```

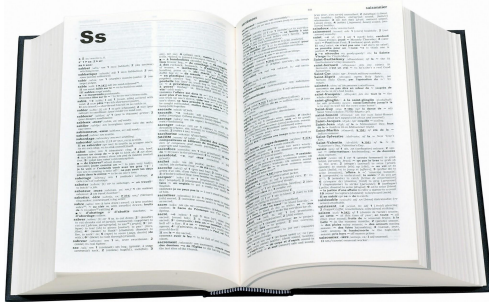We do what's in the for loop as many times as what is in the "range"

Tech
Inclusion

Project Time!

Now you know how to use a for loop!

Try to do Part 5
…if you are up `for` it!

The tutors will be around to help!
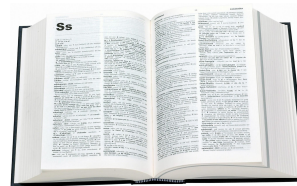
Lists and Dictionaries

Dictionaries!

You know dictionaries!

They're great at looking up thing by a word, not a position in a list!

Look up
Hello

Get back
A greeting (salutation) said when meeting someone or acknowledging someone's arrival or presence.

Looking it up!

There are lots of times we want to look something up!

Competition registration

Team Name → List of team members

Phone Book

Name → Phone number

Vending Machine

Treat Name → Price

Tech Inclusion

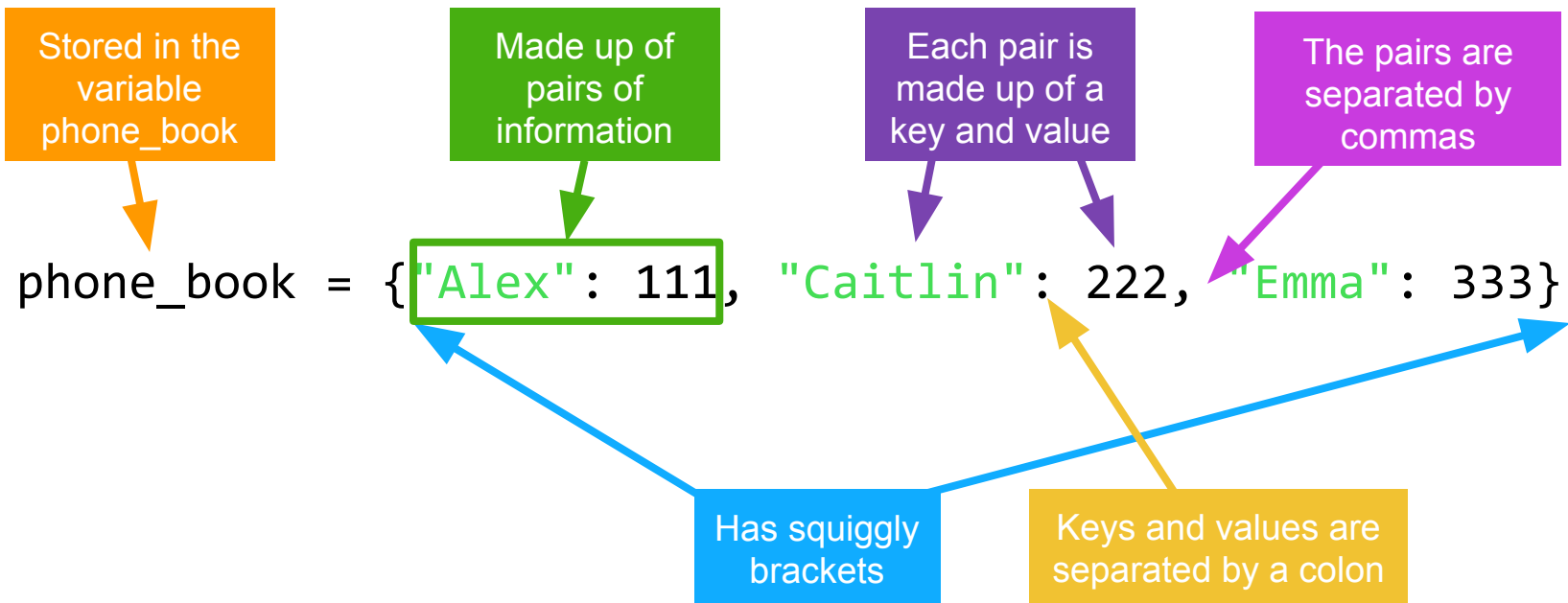# Looking it up!

Phone Book

Name → Phone number

Key

Value

**We can use a dictionary for anything with a
key → value pattern!**

Tech Inclusion

Dictionaries anatomy!

This is a python dictionary!

Stored in the variable phone_book

Made up of pairs of information

Each pair is made up of a key and value

The pairs are separated by commas

```
phone_book = {"Alex": 111, "Caitlin": 222, "Emma": 333}
```

Has squiggly brackets

Keys and values are separated by a colon

This dictionary has Alex, Caitlin and Emma's phone numbers

Tech Inclusion

Playing with dictionaries!

Let's try using the phone book!

- Let's create the phonebook

```
>>> phone_book = {
    "Alex": 111, "Caitlin": 222, "Emma": 333
}
```

- Let's get Alex's number from the phonebook
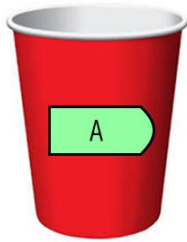
```
>>> phone_book["Alex"]
111
```

Cups!!

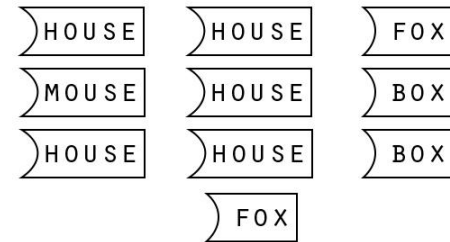**Remember the cups activity from the start of the day?**
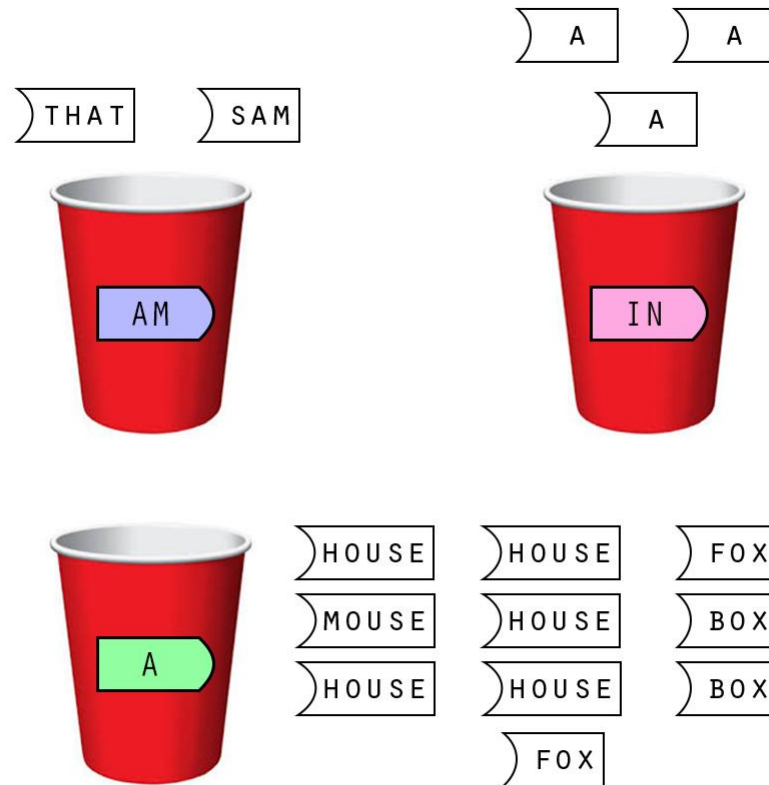
Tech Inclusion

A Single Cup!

The word "A" **can be followed by** **Any of these words**

Key

Value

Tech Inclusion

A Single Cup!

The word "A" **can be followed by** **Any of these words**
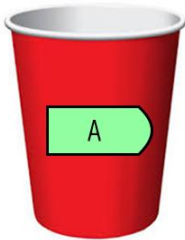
HOUSE	HOUSE	FOX
MOUSE	HOUSE	BOX
HOUSE	HOUSE	BOX
	FOX	
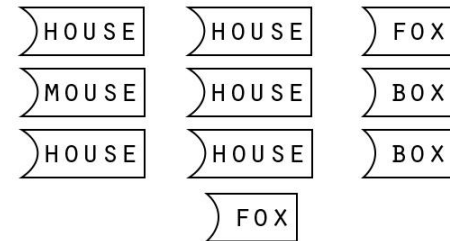
We can store the slips of paper as a python list!

```python
['house', 'mouse', 'house',
'mouse', 'box', 'fox', 'box',
'fox', 'house', 'mouse']
```

Tech Inclusion

A Single Cup!

The word "A" **can be followed by** **Any of these words**

HOUSE HOUSE FOX
MOUSE HOUSE BOX
HOUSE HOUSE BOX
       FOX
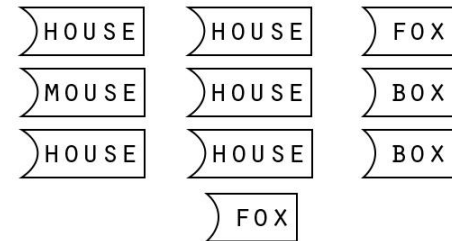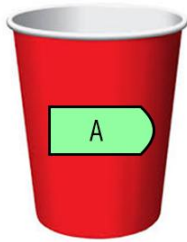
We want to look up the word "a" and get back the list!

```
{ 'a'  :  ['house', 'mouse', 'house',
           'mouse', 'box', 'fox', 'box',
           'fox', 'house', 'mouse']}
```

Tech
Inclusion

A Single Cup!

So we get a Dictionary with a List value!

```
{ 'a'  :  ['house', 'mouse', 'house',
           'mouse', 'box', 'fox', 'box',}
           'fox', 'house', 'mouse']
```
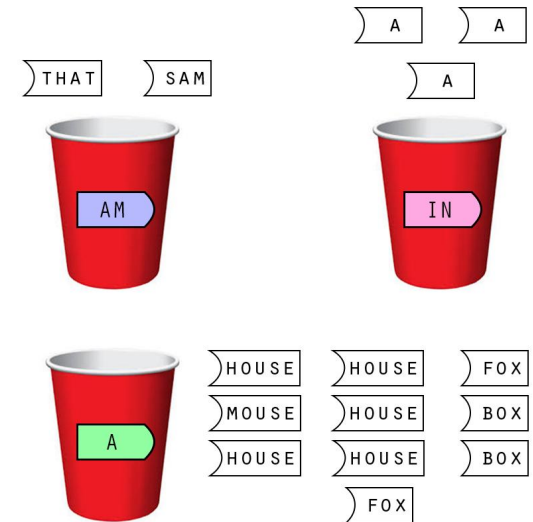
Key

Value

If you look up "A" you get back a list of all the words that can follow "a"

Tech Inclusion

Cups → Dictionary with lists!

Here's what it looks like for a few more cups!

```python
cups = {'am': ['Sam', 'That'],
        'In': ['a', 'a', 'a'],
        'a' : ['house', 'mouse',
               'house', 'mouse',
               'box', 'fox', 'box',
               'fox', 'house',
               'Mouse']
        ....}
```


You can get the whole cup dictionary from today's website!

Tech Inclusion

Project time!

You now know all about lists and dictionaries!

Let's put what we learnt into our project
Try to do Part 6

The tutors will be around to help!

Tech
Inclusion