

Welcome to GPN

# Thank you to our Sponsors!

Platinum Sponsors:

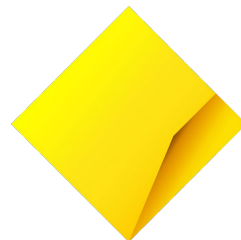


**Australian Government**

---

**Australian Signals Directorate**

Gold Sponsor:



**Commonwealth  
Bank**

Who are the tutors?

# Log on

## Log on and jump on the GPN website

[girlsprogramming.network/workshop](https://girlsprogramming.network/workshop)

Click on your node location

Click on your room.

From this page you can see:

- These **slides** (to take a look back or go on ahead).
- A link to your **workbook** in EdStem
- Other helpful bits to use through the day!

Tell us you're here!

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



Start of Day Survey

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 play the cups game!

## 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

We're going to write some text by randomly choosing a next word based on the word before it

# Let's play the cups game!

Read the outside of your cup!

**If** someone shouts 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

A tutor will write the words called out on the board



# 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 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!!**

# Introduction to Edstem

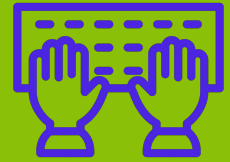
# Log on

Click on your **Workbook** link to take you into EdStem

Workbook

Slides

# Signing up to Edstem



Log in if you already have a an “Edstem” account from a past GPN

Already have an account? [Log in](#)

If you haven't got an account, let's make one:

1. Type in your Full Name
2. Type in your personal email
3. Click Create Account
4. Go to your email and verify your new account
5. Create a password

Full name

Email

you@girlsprogramming.network

Create account

Click Join Course

Join course

The name of your course will be at the top :

Markov G

*If you don't have access to your email account, ask a tutor for a GPN Edstem login*


# Getting to the lessons

1. Once you are in the course, you'll be taken to a discussion page.
2. Click the button for the lessons page (top right - looks like a book)



# The set up of the workbook

## The main page:

1. Heading at the top that tells you the project you are in
2. List of “Chapters” called something like **1:Welcome Message**  
They have an icon that looks like this:  

3. To complete your project, work through the chapters one at a time



- 1: Welcome message



- 2: The first word



- 3: What comes next?

# Inside a Chapter



Inside a Chapter there are two main types of pages:

- **Lessons** where you will do your coding.
  - They have this icon:



- **Checkpoints**



Checkpoint

Each chapter has a checkpoint to complete to move to the next chapter. Make sure you scroll down to see all the questions in a checkpoint.

There may also be **Bonus Lessons** to try if you want to or if you are waiting for the next lecture

☰ 1: Welcome message



1.1 Print a message



Checkpoint

# How to do the work



In each Lesson there is:

1. A section on the left with instructions
2. A section on the right for your code

You will need to **copy your code from the last lesson**, then follow the instructions to change your code

The screenshot shows a lesson interface with two main panels. The left panel, titled 'Description', contains the following text:

### 1.1 Print a message

You should wait for the Intro to Python lecture before you start this module

We want to print a message to tell the user what our program does.

1. At the top of your code, use the print statement to display the following message:  
*"I am a markov chain generator"*

Now run your program to see what happens!

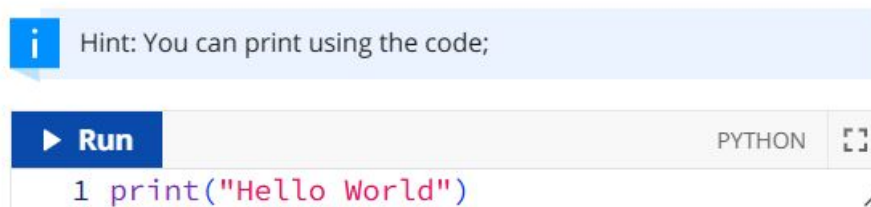
The right panel is a code editor window titled 'markov\_chains.py' with a 'Files' tab. It contains the following code:

```
1 # Start your code here
```

There are also Hints and Code Blocks to help you

# Hints


Sometimes in a lesson, there's some code we want you to do that might be a bit tricky, to help you out we've added some hints. They look like this:

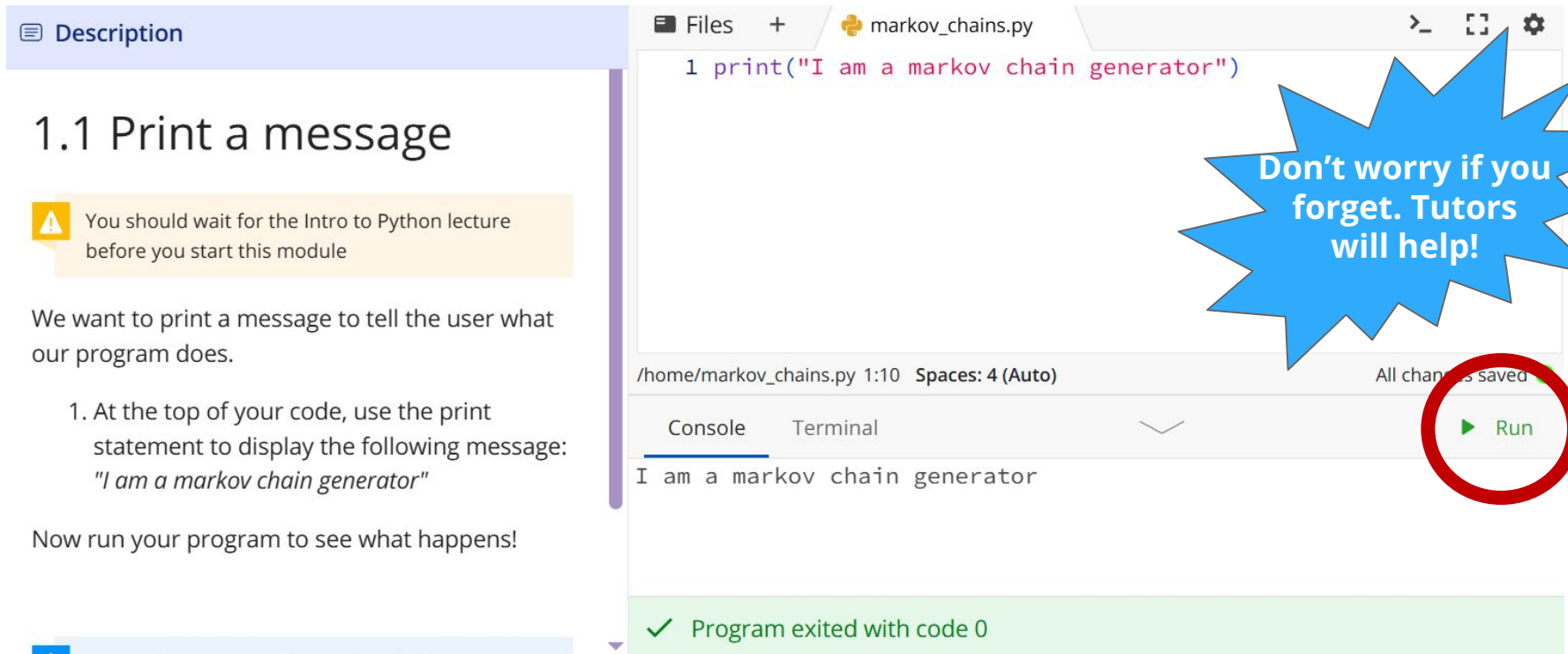


If you press the blue run button it will show you what that code does, you can even change the code to see if/how it changes.

These are **just hints** make sure you're not copying the hint into your code as it will likely end up breaking. They are just to show you the kinds of things you can do.


# Running your code...

Click  in the bottom right hand corner  
Your code will run and any output will display in the Console



The screenshot shows a code editor interface. On the left, there is a 'Description' panel with the following content:

**1.1 Print a message**

 You should wait for the Intro to Python lecture before you start this module

We want to print a message to tell the user what our program does.

1. At the top of your code, use the print statement to display the following message:  
*"I am a markov chain generator"*

Now run your program to see what happens!

On the right, the code editor shows a file named 'markov\_chains.py' with the following code:

```
1 print("I am a markov chain generator")
```

Below the code editor, the 'Console' tab is active, displaying the output: 'I am a markov chain generator'. A red circle highlights the 'Run' button in the bottom right corner of the editor. A blue starburst callout next to the 'Run' button says: 'Don't worry if you forget. Tutors will help!'. At the bottom of the console, a green status bar indicates: '✓ Program exited with code 0'.

# Some shortcuts...

There are a couple things you can do to make copying your code from one page to another easier.

- 1. Ctrl + A** Pressing these keys together will select all the text on a page
- 2. Ctrl + C** Pressing these keys together will copy anything that's selected
- 3. Ctrl + V** Pressing these keys together will paste anything you've copied

On Macs use Command (⌘) instead of Ctrl

# Project time!

You now know all about the EdStem!

**You should now sign up and join our  
EdStem class.**

Remember the tutors will be around to help!

# Intro to Programming

# What is programming?



**Programming is not a bunch of crazy numbers!**

**It's giving computers a set of instructions!**



# A Special Language

A language to talk to dogs!



Programming is a language to talk to computers

# People are smart! Computers are dumb!

## SALAD INSTRUCTIONS

Programming is like a recipe!

Computers do EXACTLY what you say, every time.

Which is great if you give them a good recipe!

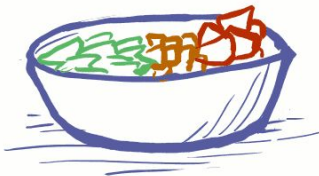
1) GET A LETTUCE HEAD, A CARROT, A TOMATO, A KNIFE, AND A BOWL



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!

## SALAD INSTRUCTIONS

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



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



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



4) MIX THE CONTENTS OF THE BOWL



# 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!

## SALAD INSTRUCTIONS



# Everyone/thing has strengths!



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

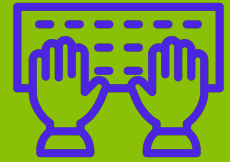


- Does exactly what you tell it
- Does it the same every time
- Doesn't need to sleep!
- Will work for hours on end!
- Get smarter when you tell them how

# Intro to Python

Let's get coding!



# Let's make a mistake!



Click on Chapter 1 **'Welcome message'**

The first lesson '1.1 Print a message' will open. It looks like this

## Markov Chains

-  1: Welcome message
-  2: The first word

The screenshot shows a coding challenge interface. At the top, there are navigation links for 'Lessons', 'Prev', and 'Next', and a title '1.1 Print a message'. On the right, there are buttons for 'Challenge', 'Submissions', and a menu icon. Below the title, a yellow banner indicates 'Discussion is set to read only'. The left sidebar shows a list of lessons, with '1: Welcome message' selected. The main content area is titled '1.1 Print a message' and contains a warning icon and text: 'You should wait for the Intro to Python lecture before you start this module'. Below this, it says 'We want to print a message to tell the user what our program does.' and lists a task: '1. At the top of your code, use the print statement to display the following message: "I am a markov chain generator"'. It concludes with 'Now run your program to see what happens!'. On the right, there is a code editor window titled 'markov\_chains.py' with a single line of code: '1 # Start your code here' and a cursor on the second line. The status bar at the bottom shows '/home/markov\_chains.py 2:1 Spaces: 4 (Auto)' and 'All changes saved'. At the very bottom, there are tabs for 'Console' and 'Terminal', and a 'Run' button.

# Let's make a mistake!



**Description**

## 1.1 Print a message

**⚠** You should wait for the Intro to Python lecture before you start this module

We want to print a message to tell the user what our program does.

- At the top of your code, use the print statement to display the following message: *"I am a markov chain generator"*

Now run your program to see what happens!

```
Files + markov_chains.py >_ [ ] [ ] [ ]  
1 # Start your code here  
2 sknvgj6489TEmdjs;shg
```

/home/markov\_chains.py 2:21 Spaces: 4 (Auto) All changes saved ●

Console Terminal ▶ Run

Type by **button mashing** the keyboard here - type anything you want

**Click** Run here to run your code!

## Did you get a big ugly error message?

```
Console Terminal  
sknvgj6489TEmdjs;shg  
AAAAAAAAAAAAAAAAAAAA  
NameError: name 'sknvgj6489TEmdjs' is not defined
```

# Mistakes are great!

*SyntaxError:  
Invalid Syntax*

**Good work you made an error!**

*ImportError  
No module  
named humour*

- 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!



*KeyError:  
'Hairy Potter'*

*AttributeError:  
'NoneType' object  
has no attribute  
'foo'*

*TypeError: Can't  
convert 'int' object  
to str implicitly*

# We can learn from our mistakes!

Error messages help us fix our mistakes!  
We read error messages from bottom to top

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
```


# We can learn from our mistakes!

Error messages help us fix our mistakes!  
We read error messages from bottom to top

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

# We can learn from our mistakes!

Error messages help us fix our mistakes!  
We read error messages from bottom to top

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

# 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

# Write some code!!

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

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

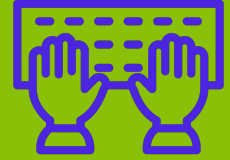
# Write some code!!

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!

# Write some code!!



1. Type the following into the code window (make sure you include the quotes (") at the start and end)
2. Run the code by clicking Run

```
print("hello world")
```

Did it print the text:

hello world

???

# 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="!")
```

# 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="!")
```

Using a comma (,) puts a space between the words

# 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!
```

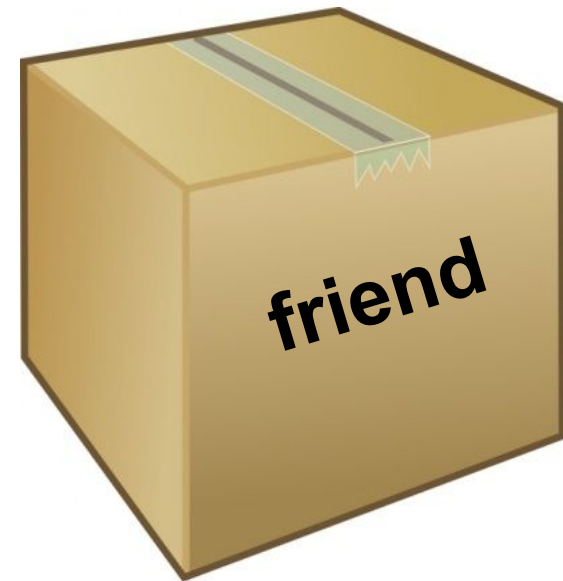
Note that this last one will not have a new line after it!

# Variables

## **Variables are useful for storing things that change**

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

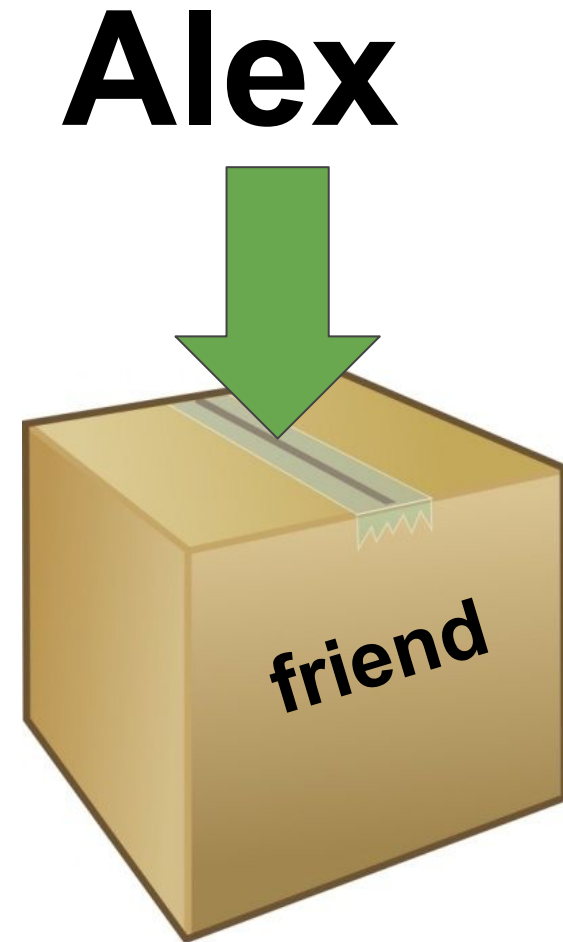
You can think of it like  
putting information in a  
box and giving it a label



# Variables

When coding, we can make a variable called **friend** and set it to a value like this

```
friend = "Alex"
```



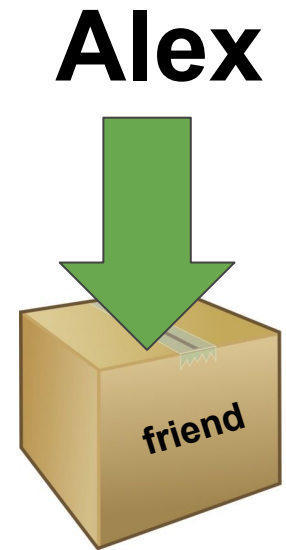
# Variables

Instead of writing the word “Alex”, we can write **friend** (the variable’s name).

The computer will substitute the current value of friend.

It’s like we’re getting the value out of the box!

```
print(friend)
```

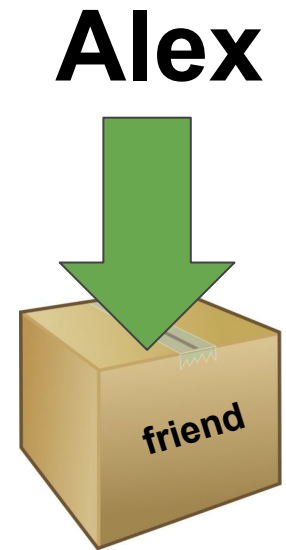


# Variables

Instead of writing the word “Alex”, we can write **friend** (the variable’s name).

The computer will substitute the current value of friend.

It’s like we’re getting the value out of the box!



```
print(friend)
```

Alex

# 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?

# 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`

# 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!**

```
my_name = input('What is your name? ')\nprint('Hello ' + my_name)
```

This is what happens ...


What is your name? Maddie

Hello Maddie

1. Computer prints 'What is your name?'
2. Computer waits for you to type in your name
3. Computer prints 'Hello Maddie'

# Breaking it down

Store the answer  
in the variable  
my\_name



```
my_name = input('What is your name? ')\nprint('Hello ' + my_name)
```

What do you think happens?

What is your name? Maddie

Hello Maddie

# Breaking it down

Store the answer  
in the variable  
my\_name

Writing input tells  
the computer to  
wait for a response

```
my_name = input('What is your name? ')\nprint('Hello ' + my_name)
```

What do you think happens?

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

```
Hello Maddie
```

# Breaking it down

Store the answer  
in the variable  
my\_name

Writing input tells  
the computer to  
wait for a response

This is the question  
you want printed to  
the screen

```
my_name = input('What is your name? ')\nprint('Hello ' + my_name)
```

What do you think happens?

What is your name? Maddie

Hello Maddie

# Breaking it down

Store the answer  
in the variable  
my\_name

Writing input tells  
the computer to  
wait for a response

This is the question  
you want printed to  
the screen

```
my_name = input('What is your name? ')\nprint('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!

# Breaking it down

**Big Tip** : Put a space at the end of the question so it won't be squished together with your answer - it looks nicer!

```
my_name = input('What is your name? ')\nprint('Hello ' + my_name)
```

**SPACE** 😊

```
What is your name? Maddie\nHello Maddie
```

**NO SPACE** 😞

```
What is your name?Maddie\nHello Maddie
```

# 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 Lessons 1 & 2**

Don't forget to copy your code when you move to a new Lesson!

The tutors will be around to help!

# If Statements and Lists

# Conditions!

Conditions let us make decisions.

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`

`3 + 2 == 5`

`5 != 5`

`"Dog" == "dog"`

`"D" in "Dog"`

`"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  "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

|                         |                   |                               |
|-------------------------|-------------------|-------------------------------|
| <code>5 &lt; 10</code>  | <code>True</code> | <code>"Dog" == "dog"</code>   |
| <code>3 + 2 == 5</code> | <code>True</code> | <code>"D" in "Dog"</code>     |
| <code>5 != 5</code>     |                   | <code>"Q" not in "Cat"</code> |

# 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

|                         |                    |                               |
|-------------------------|--------------------|-------------------------------|
| <code>5 &lt; 10</code>  | <code>True</code>  | <code>"Dog" == "dog"</code>   |
| <code>3 + 2 == 5</code> | <code>True</code>  | <code>"D" in "Dog"</code>     |
| <code>5 != 5</code>     | <code>False</code> | <code>"Q" not in "Cat"</code> |

# 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

|                         |                    |                               |                    |
|-------------------------|--------------------|-------------------------------|--------------------|
| <code>5 &lt; 10</code>  | <code>True</code>  | <code>"Dog" == "dog"</code>   | <code>False</code> |
| <code>3 + 2 == 5</code> | <code>True</code>  | <code>"D" in "Dog"</code>     |                    |
| <code>5 != 5</code>     | <code>False</code> | <code>"Q" not in "Cat"</code> |                    |

# 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

|                         |                    |                               |                    |
|-------------------------|--------------------|-------------------------------|--------------------|
| <code>5 &lt; 10</code>  | <code>True</code>  | <code>"Dog" == "dog"</code>   | <code>False</code> |
| <code>3 + 2 == 5</code> | <code>True</code>  | <code>"D" in "Dog"</code>     | <code>True</code>  |
| <code>5 != 5</code>     | <code>False</code> | <code>"Q" not in "Cat"</code> |                    |

# 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

|                         |                    |                               |                    |
|-------------------------|--------------------|-------------------------------|--------------------|
| <code>5 &lt; 10</code>  | <code>True</code>  | <code>"Dog" == "dog"</code>   | <code>False</code> |
| <code>3 + 2 == 5</code> | <code>True</code>  | <code>"D" in "Dog"</code>     | <code>True</code>  |
| <code>5 != 5</code>     | <code>False</code> | <code>"Q" not in "Cat"</code> | <code>True</code>  |

# 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")
```

# 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!

# 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**!

```
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**!

# 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?

```
>>>
```

# 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
```

# Conditions

How about a different number???

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



# Conditions

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

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

What should  
this say?

# Conditions

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

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

What should  
this say?

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**!

# Conditions

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

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

What should  
this say?

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**!

# Conditions

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

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

What do you think happens?

```
>>>
```

# Conditions

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

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

What do you think happens?

```
>>>
```



**Nothing!**

# If statements

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

This line ...

... controls this line

# 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!



# If statements

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

What do you think happens?

>>>

# If statements

```
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!!
```

# If statements

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

What happens?

# If statements

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

What happens?  
>>> GPN is awesome!

## Remember ...

**==**

**When testing for equals in your condition**

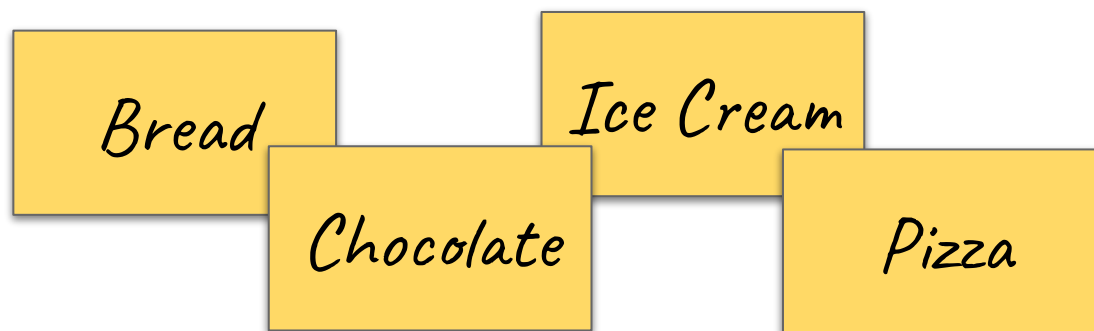
**:**

**At end of each if line to say you have finished writing your condition**

# 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!



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"]
```

# List anatomy

Stored in the  
variable  
shopping\_list

shopping\_list = ["Bread", "Chocolate", "Ice Cream", "Pizza"]

# List anatomy

Stored in the  
variable  
shopping\_list



Made up of  
different items  
(these are strings)



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

# List anatomy

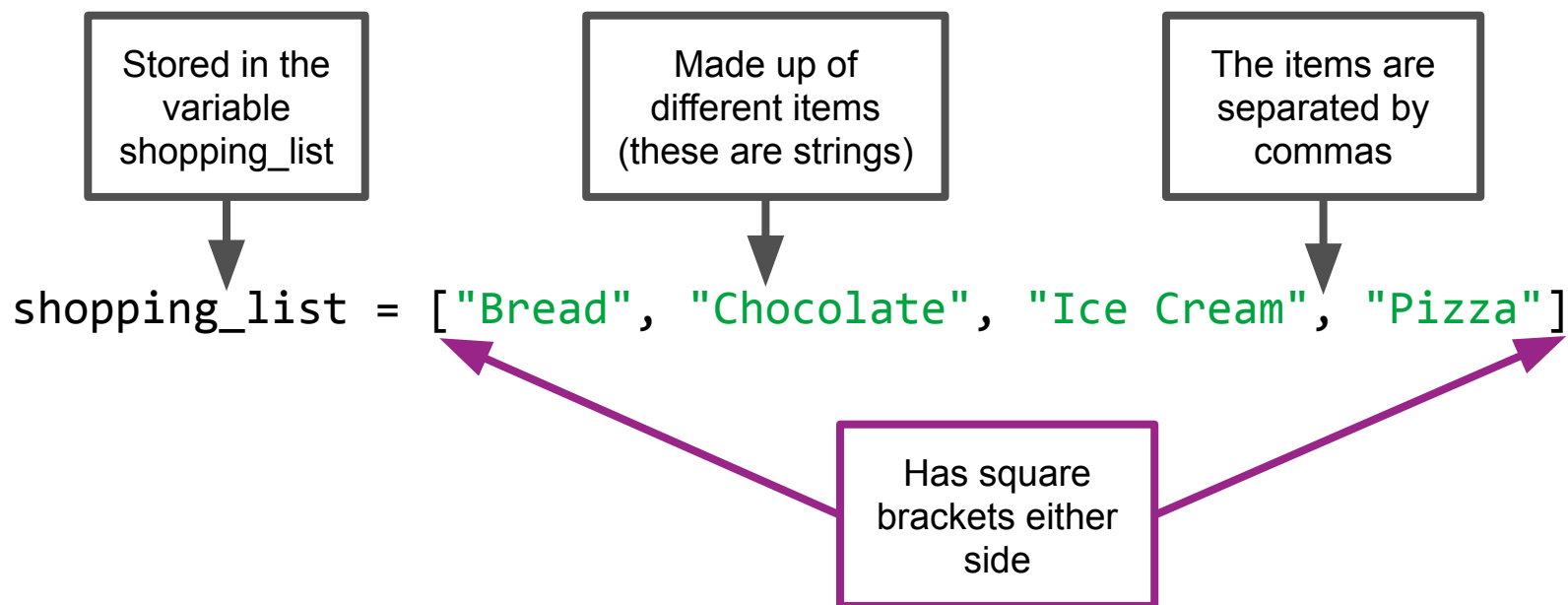
Stored in the  
variable  
shopping\_list

Made up of  
different items  
(these are strings)

The items are  
separated by  
commas

shopping\_list = ["Bread", "Chocolate", "Ice Cream", "Pizza"]

# List anatomy



# Lists

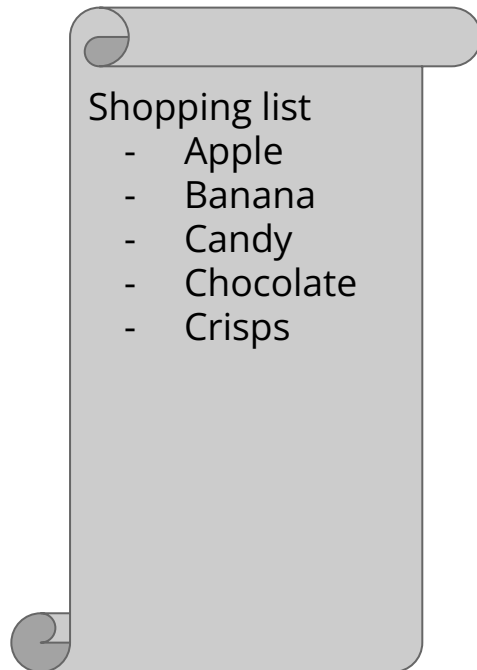
You can print a list

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

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

# What's an index?

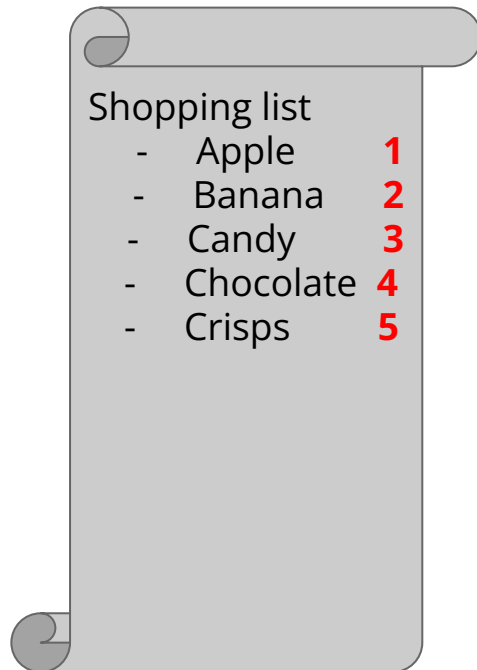
A list has many items, indexing lets us get one item from the list using its position number;



What is the fourth item I need to buy?

# What's an index?

A list has many items, indexing lets us get one item from the list using its position number;




What is the fourth item I need to buy?

chocolate!

# How do I know how long

We use indexes (or the position number) to pick an item in a list

```
fruits = ["apple", "banana", "cherry"]  
fruits[1]
```



The list we want  
to pick an item  
from


# How do I know how long

We use indexes (or the position number) to pick an item in a list

```
fruits = ["apple", "banana", "cherry"]  
fruits[1]
```



The name of the list



The list we want to pick an item from

# How do I know how long

We use indexes (or the position number) to pick an item in a list

```
fruits = ["apple", "banana", "cherry"]  
fruits[1]
```

The name of the  
list

The diagram consists of three boxes with arrows pointing upwards. The first box on the left is labeled 'The name of the list' and has a grey arrow pointing to the word 'fruits' in the code above. The second box in the middle is labeled 'The index (position) of the item' and has a purple arrow pointing to the number '1' in the code above. The third box on the right is labeled 'The list we want to pick an item from' and has a grey arrow pointing to the list of strings in the code above.

The index  
(position) of the  
item

The list we want  
to pick an item  
from

# But wait!

When we index, we start counting from 0

```
fruits = ["apple", "banana", "cherry"]  
fruits[1]
```

So we are actually picking the item "banana"

# Project Time!

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

See **if** you can do **Lesson 3**

The tutors will be around to help!

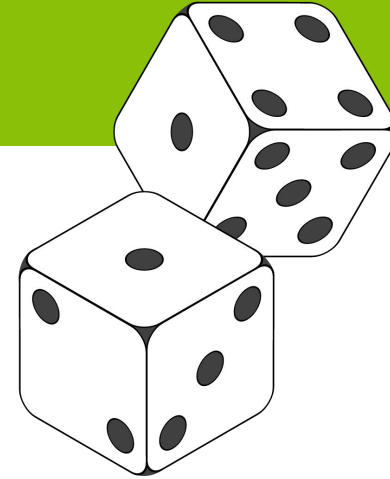
Random!

# That's so random!

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



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



We want the computer to be random sometimes!



# Using the random module



Let's choose something randomly from a list!

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

We use **random.choice** to randomly select something from a list

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

Each time we run this we would probably get a different answer

eggs OR bread OR apples OR milk

# Using the random module



You can also assign your random choice to a variable and then use that variable in your code

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

The variable **random\_food** contains the random choice that was made from the list

# Project Time!

Raaaaaaaaandom! Can you handle that?

**Let's try use it in our project!**  
**Try to do Lesson 4**

The tutors will be around to help!

# For Loops

# 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

# 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

# For Loops

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

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

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)

# For Loops

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

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

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)

# 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"

# Project Time!

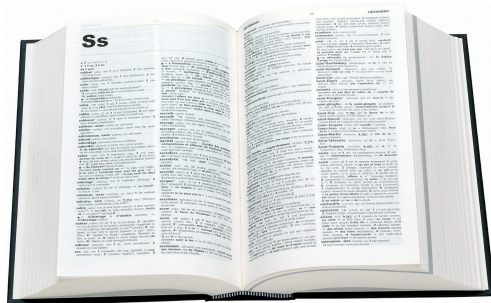
Now you know how to use a for loop!

**Try to do Lesson 5**  
**...if you are up **for** it!**

The tutors will be around to help!

# Dictionaries

# Dictionaries!

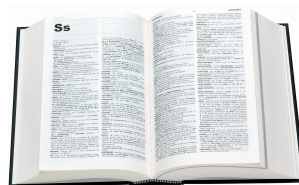


***You know dictionaries!***

**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

# Looking it up!



Phone Book

Name → Phone number



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

# Dictionaries anatomy!

**This is a python dictionary!**


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

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

# Dictionaries anatomy!

**This is a python dictionary!**

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



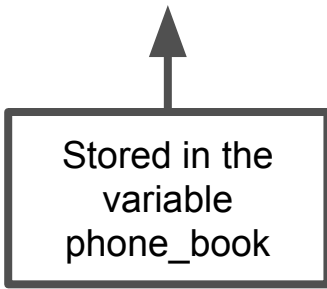
Stored in the  
variable  
phone\_book

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

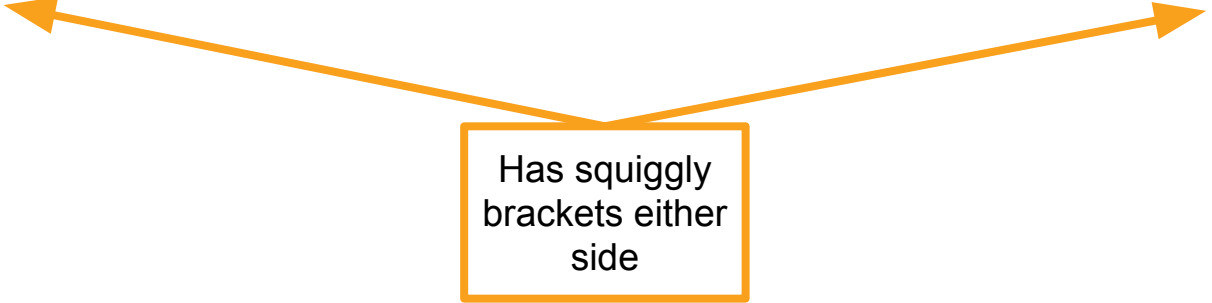
# Dictionaries anatomy!

**This is a python dictionary!**

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



Stored in the  
variable  
phone\_book

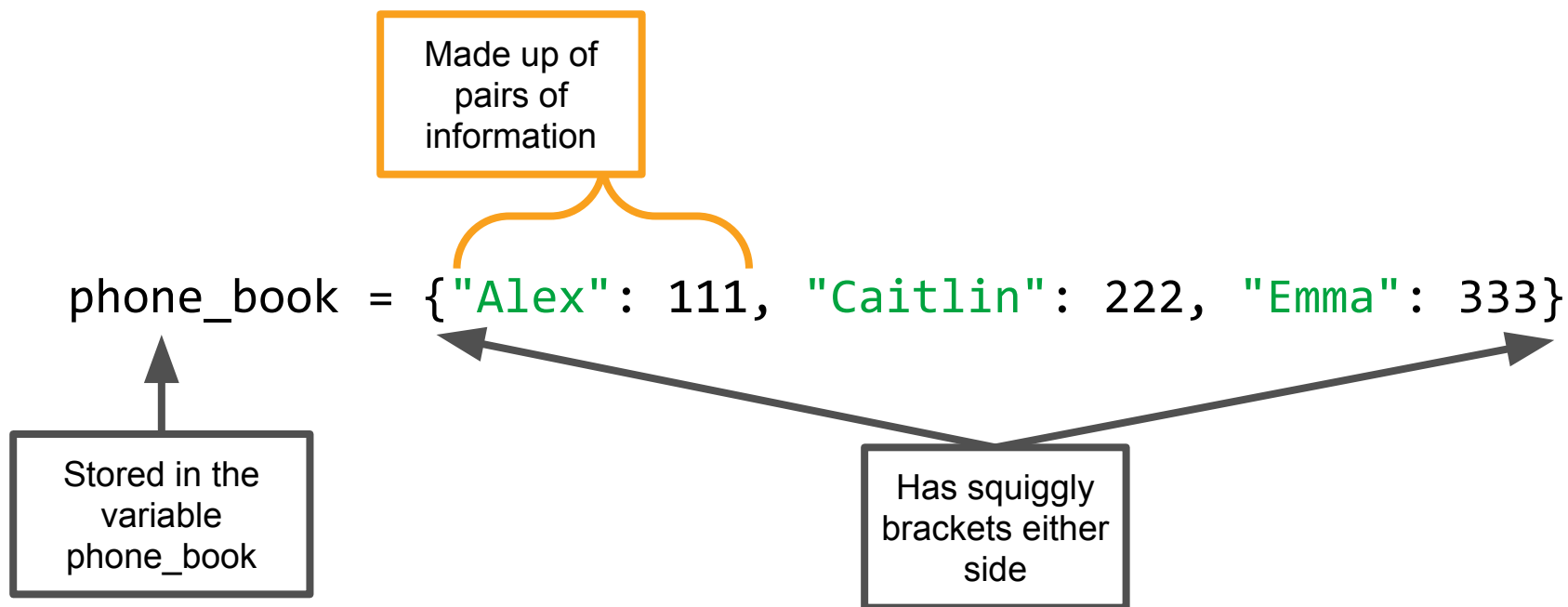


Has squiggly  
brackets either  
side

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

# Dictionaries anatomy!

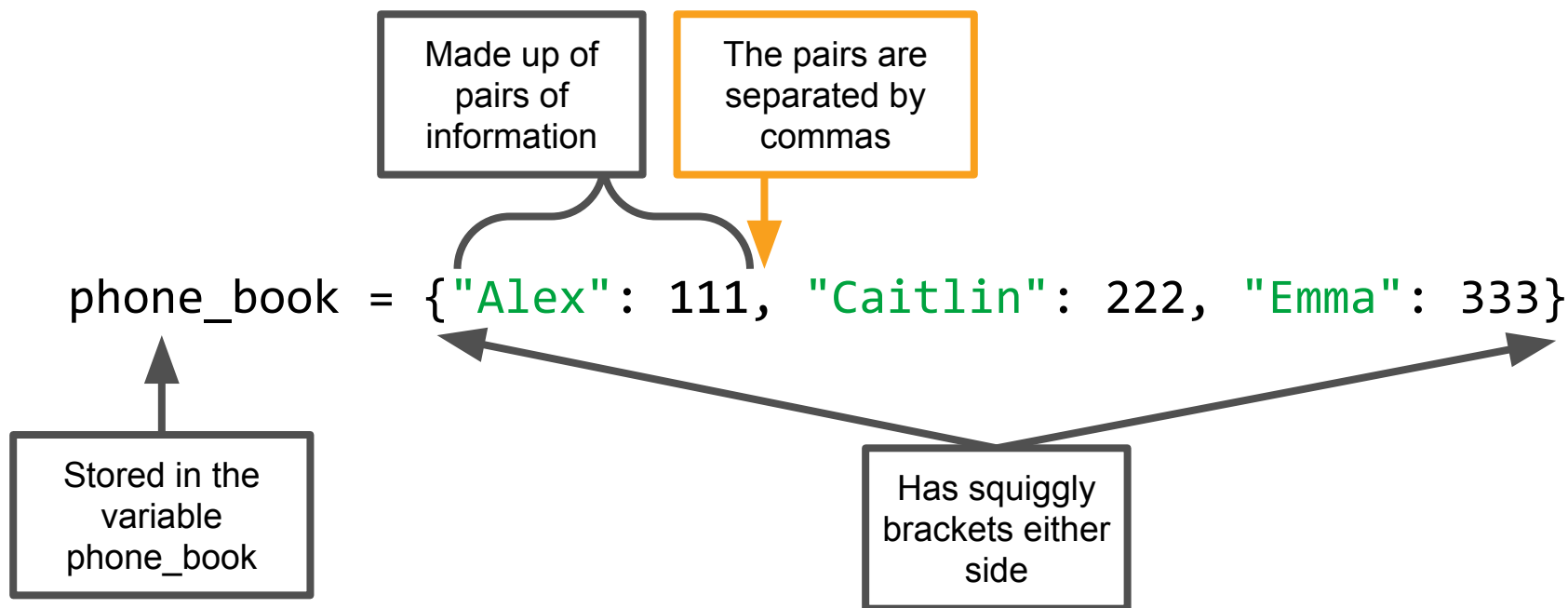
**This is a python dictionary!**



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

# Dictionaries anatomy!

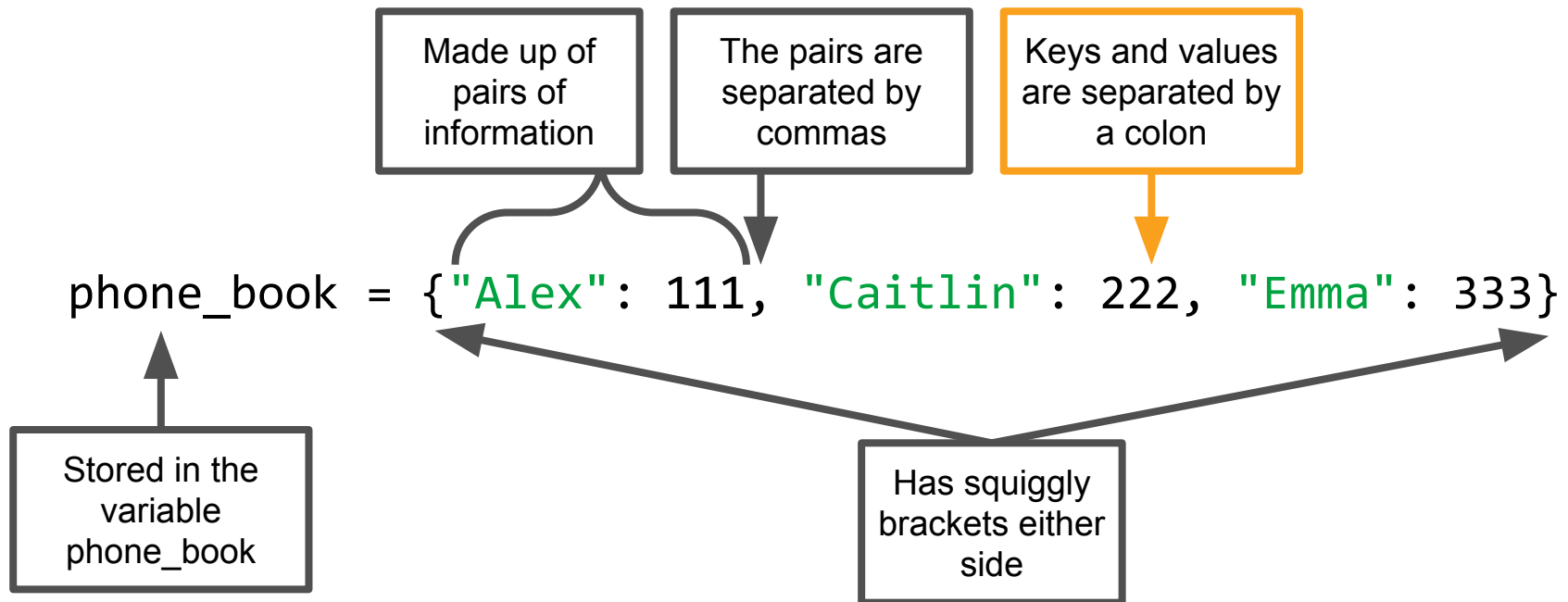
**This is a python dictionary!**



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

# Dictionaries anatomy!

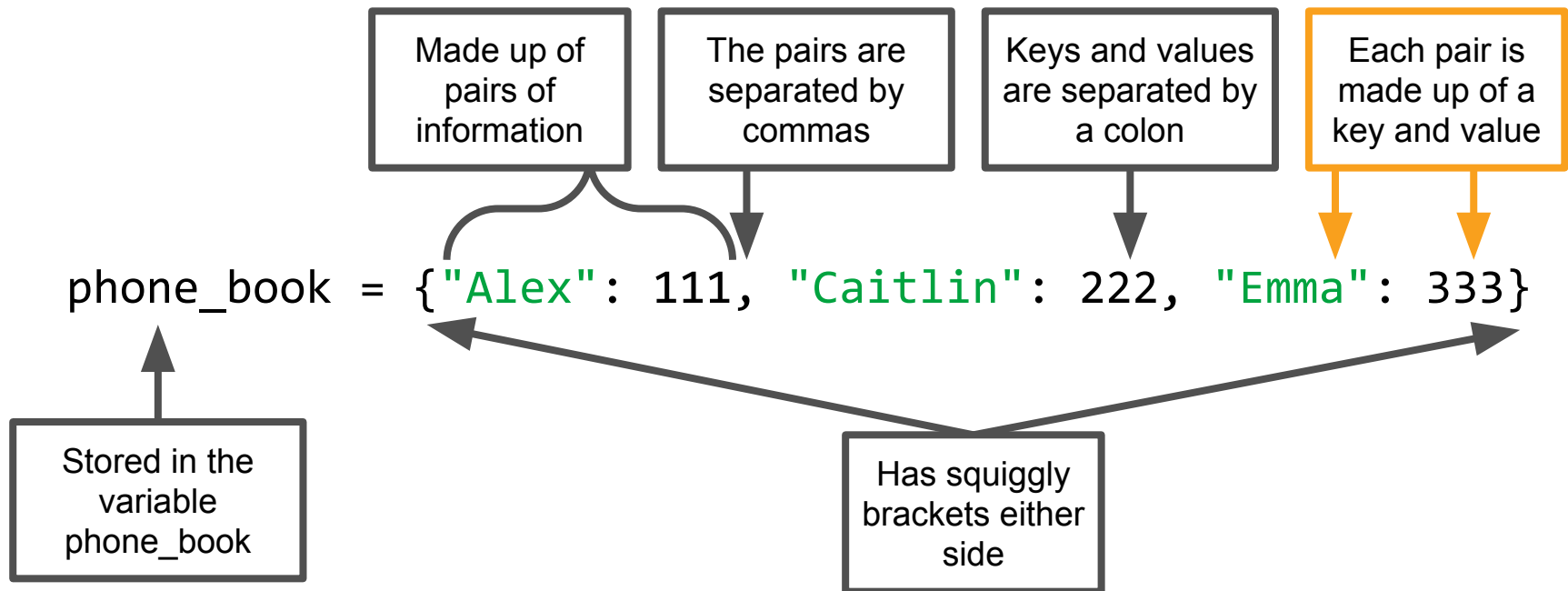
**This is a python dictionary!**



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

# Dictionaries anatomy!

**This is a python dictionary!**



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

# 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"]
```

# Playing with dictionaries!

Let's try using the phone book!

- Let's create the phonebook

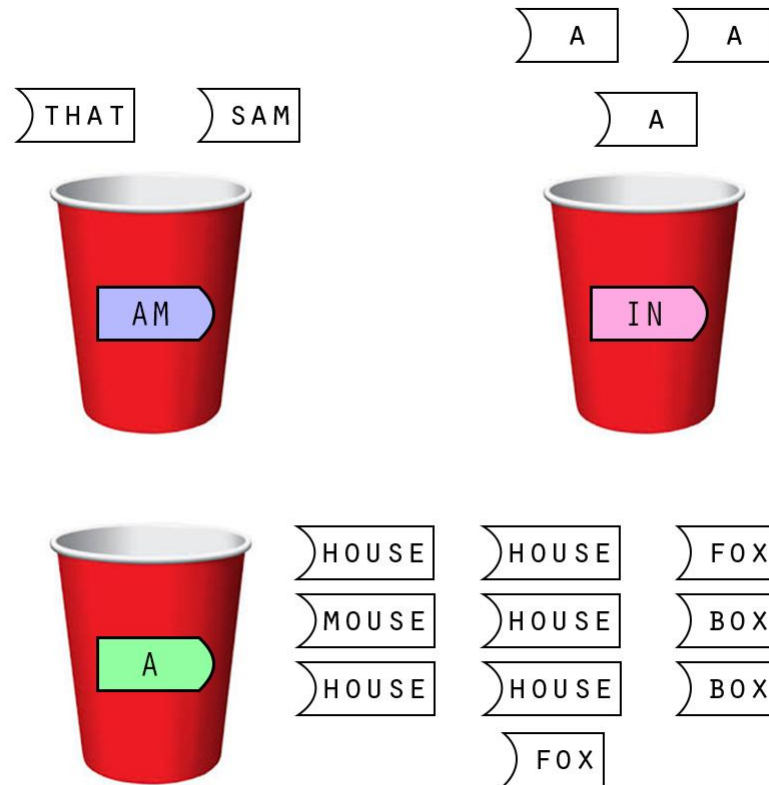
```
>>> phone_book = {  
    "Alex": 111, "Caitlin": 222, "Emma": 333  
}
```

- Let's get Alex's number from the phonebook

```
>>> phone_book["Alex"]  
111
```

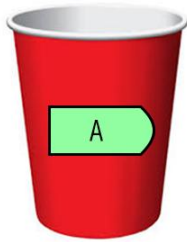
# Cups!!

Remember the cups activity from the start of the day?



# A Single Cup!

The word "A"

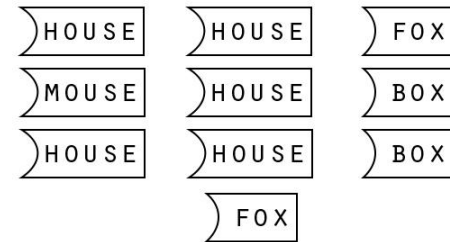


Key

can be followed by



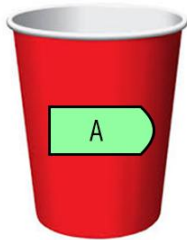
Any of these words



Value

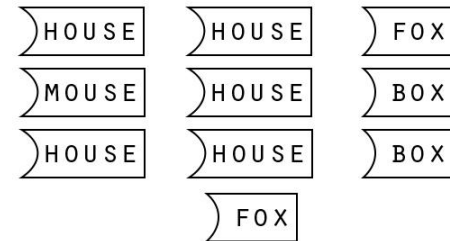
# A Single Cup!

The word “A”



can be followed by

Any of these words



We can store the slips of paper as a python list!



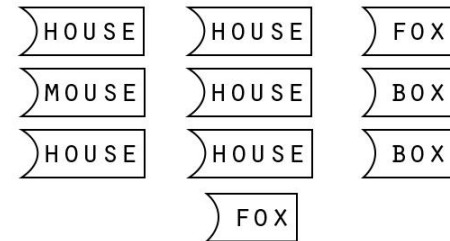
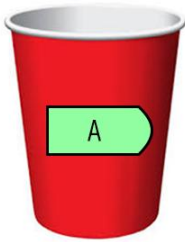
```
['house', 'mouse', 'house',  
'mouse', 'box', 'fox', 'box',  
'fox', 'house', 'mouse']
```

# A Single Cup!

The word “A”

can be followed by

Any of these words



We want to look up  
the word “a” and get  
back the list!

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

# A Single Cup!

**So we get a Dictionary with a List value!**

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

↑  
Key

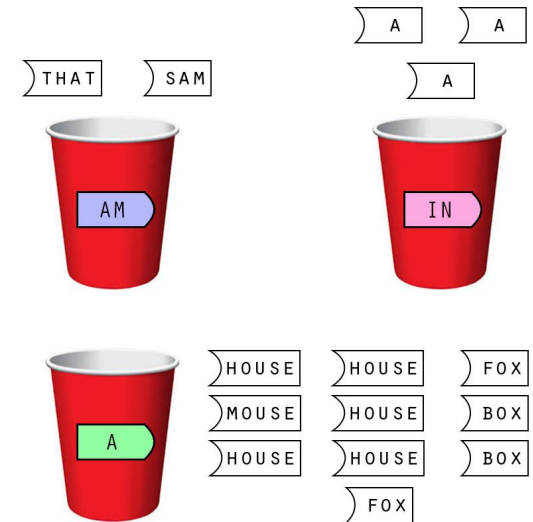
↑  
Value

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

# Cups → Dictionary with lists!

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

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

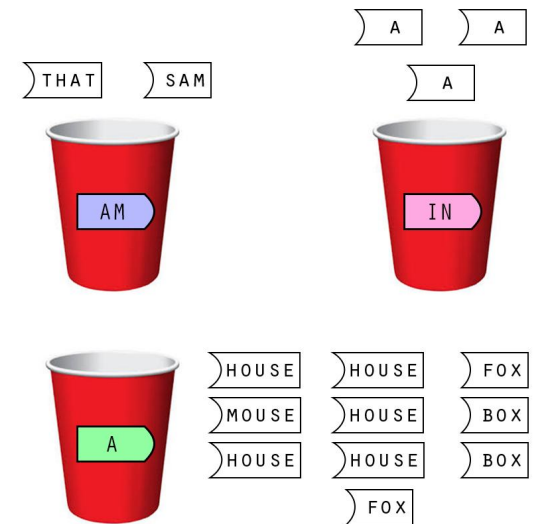


You can get the whole cup dictionary from today's website!

# Is it there?

We can check if something is a key in a dictionary like this:

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



```
if current_word in cup:
```

# Project time!

You now know all about lists and dictionaries!

**Let's put what we learnt into our project**  
**Try to do Lessons 6 & 7**

The tutors will be around to help!